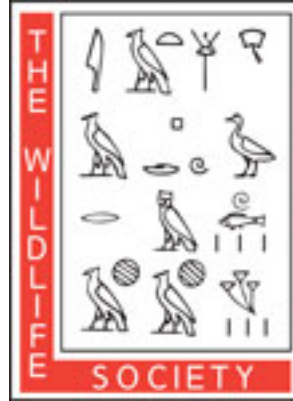


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FOOD REMAINS FROM BALD EAGLE NEST SITES ON CAPE BRETON ISLAND, NOVA SCOTIA

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The food habits of breeding bald eagles (*Haliaeetus leucocephalus*) in the Canadian Maritimes have not been described. In this region, the highest known density of eagle nests is around Bras d'Or Lake on Cape Breton Island where up to 24 nests within 10 km² have been recorded (pers. observ.). Wright (1953) reported on eagle–waterfowl relationships in New Brunswick. Erskine (1968) and Gittens (1968) recorded casual observations of eagles taking prey and of food remains at nest sites in Nova Scotia. This report is based on a study of food habits of bald eagles on Cape Breton Island, Nova Scotia (Cash 1981). The objective was to describe the diet for this eagle population in anticipation of future habitat changes in the area.

STUDY AREA AND METHODS

Cape Breton Island is characterized by steep forested hills up to 532 m high and many freshwater lakes including the 57-km² Lake Ainslie. Nesting eagle habitat, however, is found predominantly around the Bras d'Or Lake, a 1,050-km² inland sea with numerous shallow bays, inlets, and barrier–beach ponds. Fish populations include cod (*Gadus* sp.), winter flounder (*Pseudopleuronectes americanus*), American eel (*Anguilla rostrata*), skates (*Raja* sp.), alewife (*Alosa pseudoharengus*), Atlantic salmon (*Salmo salar*), speckled trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*S. gairdneri*) (Sabeau 1983).

Food remains were collected both from nests and within a 5-m radius about the bases of nest trees in June and July from 1977 through 1981. Over the 5 years, 130 collections were made involving 76 different nests, 67 were within the Bras d'Or Lake or Lake Ainslie basins. The nine

remaining nests were on the island's Atlantic coastline. Forty-four nests were sampled once, 21 twice, 8 three times, and 3 four times. Eight collections from one area were identified by year but not by nest site.

Foods were identified by comparison with reference collections at the Acadia University Museum. Additional reference material was prepared as required. Food items from the nest sites were examined three times to ensure that identification was as consistent and accurate as possible. The minimum number of animals per taxon present was determined to be equal to the greatest number of the same remains of that taxon (Mollhagen et al. 1972, Dunstan and Harper 1975). If, for example, a nest contained seven right and six left humeri of great blue heron (*Ardea herodias*), seven of these birds were tallied. Collections obtained from the same nests in different years were treated as different samples. Hence, calculations of percent occurrence were based on 130 different samples collected from 76 different nest sites.

RESULTS

Thirty-six vertebrate species were identified in food remains from bald eagle nest sites (Table 1). Because these items were collected from within the nests or beneath the nest trees, they represent debris accumulated during the period of nest use. Fish constituted 66% of the identified prey and occurred in 92% of the collections. Cod accounted for 71% of fish and nearly half of all identified items. Winter flounder and skates were identified in collections from 17 and 10 sites, respectively. Brown bullheads (*Ictalurus nebulosus*) were the third most common fish but occurred at only two nest sites. Other fish identified from food collections included two additional marine species, three anadromous, and a catadromous species (Table 1).

Bird remains were recovered from 46% of the nest sites and accounted for nearly 24% of

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Table 1. Food remains from bald eagle nest sites on Cape Breton Island, Nova Scotia, 1977–81.

Food item	Occurrence ^a			
	Individuals (N = 508)		Nest collection (N = 130)	
	N	%	N	%
Fish (Osteichthyes)				
Cod	238	46.9	78	60.0
Winter flounder	20	3.9	17	13.1
Brown bullhead	16	3.1	2	1.5
Skate	11	2.2	10	7.7
Other fish ^b	9	1.8	6	4.6
Unidentified fish	40	7.9	32	24.6
Fish—subtotal	334	65.8		
Birds (Aves)				
Great blue heron	48	9.4	18	13.8
Cormorant	19	3.7	17	13.1
Domestic chicken	11	2.2	10	7.7
Herring gull (<i>Larus argentatus</i>)	7	1.4	6	4.6
Great black-backed gull (<i>L. marinus</i>)	6	1.2	5	3.8
Other birds ^c	15	3.0	15	10.8
Unidentified birds	15	2.9	15	11.5
Birds—subtotal	121	23.8		
Mammals (Mammalia)				
Snowshoe hare	26	5.1	26	20.0
Muskrat	5	1.0	5	3.8
Other mammals ^d	18	3.5	13	10.0
Unidentified mammals	4	0.8	4	3.1
Mammals—subtotal	53	10.4		
Total food items	508	100.0		

^a Occurrence based on 130 collections from 76 sites.^b Trace amounts (<1.0%) of alewife, pollock (*Pollachius virens*), eel, shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*), and sculpin (Cottidae).^c Trace amounts (<1.0%) of common eider, mergansers, common crow (*Corvus brachyrhynchos*), American bittern (*Botaurus lentiginos*), common loon, Canada goose, and black duck.^d Trace amounts (<1.0%) of cow, bobcat, white-tailed deer, mink (*Mustela vison*), dog, red fox (*Vulpes vulpes*), sheep, pig, horse, river otter (*Lutra canadensis*), and meadow vole (*Microtus pennsylvanicus*).

total food items. Thirteen species of birds were identified in the food collections. Of these, great blue heron, cormorants (*Phalacrocorax* sp.), and domestic chickens made up about 65% of avian prey. Gulls (*Larus* sp.) and other waterfowl, including common loon (*Gavia immer*), Canada goose (*Branta canadensis*), black duck (*Anas rubripes*), common eider (*Somateria mollissima*), and mergansers (*Mergus* sp.), were less frequently found in the food debris but collectively formed 21% of identified avian prey.

Mammal remains occurred in 33% of the collections although the 13 identified species totaled slightly over 10% of the total (Table 1). With the exception of snowshoe hare (*Lepus*

americanus), mammals formed a relatively unimportant portion of the total items found at nests. Hares were the third most numerous of all prey items and second most common food to appear in the collections. Muskrat (*Ondatra zibethicus*) was the next most common mammal, and body parts of cow, white-tailed deer (*Odocoileus virginianus*), bobcat (*Felis rufus*), dog, sheep, pig, and horse were also recovered. Two invertebrates found in the nest debris were blue mussel (*Mytilus edulis*) and crab (*Cancer* sp.). An additional 108 individual food items could not be identified. Of these, 40 were fish, 15 were birds, and 4 were mammals. A sun visor cap, eagle eggshell fragments, and remains of eagle nestlings were among the miscellaneous items recovered from the nest sites.

DISCUSSION

The apparent predominance of fish in the diet of bald eagles nesting on Cape Breton Island reflects the food preferences of other eastern populations of this bird. Fish constituted 90% of their diet in New Brunswick (Wright 1953), 78% in Florida (McEwan and Hirth 1980), and 77% in inland Maine nesting eagles (Todd et al. 1982). Brown bullheads were common prey in these studies. Although this species is widespread on mainland Nova Scotia (Scott and Crossman 1973), it is presently known from only 4 of 61 lakes on Cape Breton Island (B. Sabeau, pers. commun.). Cod, normally a deep-water fish but common in Bras d'Or (W. F. Black, unpubl. rep., Bras d'Or Lakes Aquaculture Conf., Sydney, N.S., 1975), are observed in surface waters near barrier-beach pond outflows in spring. These fish also are considered undesirable by some fishermen and may have been discarded (J. G. Fennell, pers. commun.).

Birds formed the primary diet of eagles in coastal Maine (Todd et al. 1982) and Alaska (Murie 1940, Sherrod et al. 1976). Birds listed in Table 1, except the Canada goose, are common permanent or summer residents on Cape Breton Island (Tufts 1962). Canada geese were recently introduced onto Cape Breton Island (F. J. Payne, pers. commun.). Heron and cormorant colonies occur along the Atlantic coastline of Cape Breton Island and on islands in Bras d'Or Lake (pers. observ.).

Dietary variations observed between, as well as within, eagle populations suggest they are opportunistic feeders. Great blue herons have been reported as minor items in diets of eagles in Oklahoma (Lish 1973) and Maine (Todd et

al. 1982). Wright (1953) believed eagles did not prey on herons and several times observed the two species perched close to one another. Bayer (1979) observed eagles attacking herons but also believed these attacks to be rare. In contrast, heron remains were found in 18 (14%) food collections and totaled nearly 10% of all vertebrate remains in this study. These nests were situated near heron colonies or their foraging areas. Collections from these nests conspicuously lacked cod remains.

Farms on lowlands surrounding the lake are likely sources of dead domestic animals. Flesh and bones of large mammals such as deer are undoubtedly taken as carrion, but whether smaller vertebrates were scavenged or captured as live prey was undetermined.

Biases in this study likely involve underrepresentation of fish in the food remains. Fish remnants decompose more quickly than skeletal parts of birds and mammals. Bones of the more easily digested fish may be nearly absent (Todd *et al.* 1982). Large animals that are fed on as carrion may be underrepresented in food taken to the nest (McEwan and Hirth 1980). During warm weather, unconsumed food items decompose rapidly, consequently the collections largely reflect the more recent diet. Food debris spilled to the ground may be removed by other scavengers.

Direct observations of eagle feeding activity and samplings of fresh prey need to be conducted concurrently with collections of food debris to reduce biases in determining complete diet composition (Todd *et al.* 1982). The present food habits study has clearly shown that nesting eagles on Cape Breton Island exploit a wide variety of available foods. The findings are in agreement with results of other studies that illustrate the opportunistic behavior of these birds.

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