

Winter Diet of the Harlequin Duck at Sequim Bay, Puget Sound, Washington

Abstract

Little information is available concerning the diet of harlequin ducks (*Histrionicus histrionicus*), therefore we examined their diet in Sequim Bay, Puget Sound, WA. We analyzed esophagi and gizzard contents of 21 harlequin ducks collected during the winter at the mouth of Sequim Bay. Principal food items were found to be snails, limpets, crabs, and chitons. Most of the prey of the harlequin duck was associated with rocky areas. Results of this study indicate that rocky shoreline areas are very important to harlequin ducks and should be protected.

Introduction

The distribution of harlequin ducks (*Histrionicus histrionicus*) includes the Pacific coastline from Alaska to central California (Bellrose 1976). Cottam (1939) discovered that crustaceans and molluscs made up most of the diet of harlequin ducks collected from Alaska, British Columbia, Quebec, Alberta and California. Vermeer (1983) provided a detailed dietary analysis of harlequin ducks from the Strait of Georgia, British Columbia, and he showed that their principal food items were snails, limpets, fish eggs, crabs, chitons, algae, and bivalves. Hirsch (1980) gave information on the foraging habitats, but not the diet, of harlequin ducks in Puget Sound, Washington. Our objective was to acquire information on the diet of wintering harlequin ducks at Sequim Bay, Puget Sound, Washington, as none of the earlier studies provide these data.

Methods

Harlequin ducks were collected at the mouth of Sequim Bay during November, December and January from 1982 through 1985. Contents of esophagi and gizzards were removed from 21 ducks (14 males and 7 females) and preserved in formalin. These contents were then sorted into taxa using a dissecting scope. Total volume, percent of volume and number of individuals were determined for each prey taxa. Kozloff (1974) identified the habitats of many invertebrates in Puget Sound and we used these data to make prey species habitat associations in order to establish the feeding habitat preferences of harlequin ducks.

Results and Discussion

The principal food items were snails, limpets, crabs, and chitons (Table 1). The snail, *Littorina scutulata*, was the most common species found in the ducks' diet (24.6%). Vermeer (1983) noticed many hermit crabs (*Pagurus* sp.) within *Littorina* shells and suggested they were consumed along with the shells. However, few *Littorina* shells contained hermit crabs in this investigation. *Notoacmaea* spp. was the most common limpet and second most abundant food item. *Hemigrapsus oregonensis* and *Mopalia* spp. were respectively the most common crab and chiton consumed. Our results show the diet of harlequin ducks in Sequim Bay and the Strait of Georgia (Vermeer 1983) to be very similar. The only significant difference was the presence of fish eggs in the diet of ducks collected from the Strait of Georgia (Vermeer 1983). We found no fish eggs in the esophagi or gizzards examined, probably due to the time of year at which the birds were collected.

The habitat preferences of the prey items consumed suggest they were eaten while the ducks were feeding among rocks. For example, 67 percent of harlequin duck prey was associated with rocky areas, 13 percent with sandy areas, and 20 percent with seaweeds (kelp—*Alaria* spp. and *Macrocystis* spp., eelgrass—*Zostera marina*). Hirsch (1980) noted that harlequin ducks preferred shallow eelgrass and kelp communities close to shore. When making our collections, we observed that harlequin ducks fed near shore (within 50 m) over cobble to cobble/rock substrate of gradual gradient, and over sand substrate of gradual gradient containing eelgrass or kelp vegetation. Both our research and that of Vermeer (1983) showed these areas to be important feeding habitats of

TABLE 1. Winter foods of harlequin ducks from Sequim Bay, Washington, 1982 to 1985.

Food Type	Volume (ml)	Percent volume	No. indiv.
Snails			
<i>Liitorina scutulata</i>	15.5	24.6	262
<i>Lacuna</i> spp.	1.1	1.7	22
<i>Nucella emarginata</i>	.8	1.3	4
<i>Nassarius mendicus</i>	.5	.8	4
<i>Margarites pupillus</i>	.1	.2	2
Unident. fragments	.5	.8	
(Total snails)	(18.5)	(29.4)	(294)
Limpets			
<i>Notoacmaea</i> spp.	11.9	18.9	101
<i>Collisella pelta</i>	1.4	2.2	11
<i>Acmea mitra</i>	.4	.6	1
<i>Colisella instabilis</i>	.2	.3	1
(Total limpets)	(13.9)	(22.0)	(114)
Crabs			
<i>Hemigrapsus oregonensis</i>	7.1	11.4	4
<i>Cancer</i> spp.	.9	1.4	1
<i>Pagurus</i> spp.	.3	.5	5
Unident. fragments	1.4	2.2	
(Total crabs)	(9.7)	(15.5)	(10)
Chitons			
<i>Mopalia</i> spp.	6.6	10.5	144
Bivalves			
<i>Mytilus edulis</i>	.1	.2	1
Unident. fragments	.5	.8	
(Total bivalves)	(.6)	(1.0)	(1)
Shrimp			
<i>Jassa falcata</i>	.4	.6	2
unident. fragments	.7	1.1	
(Total shrimp)	(1.1)	(1.7)	(2)
Miscellaneous			
<i>Idotea</i> spp.	2.4	3.8	2
Unident. fragments	10.1	16.1	
TOTALS	62.9	100.0	567

harlequin ducks so rocky shores and seaweed areas should be identified in Puget Sound and protected from catastrophies such as oil spills and other pollutants.

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Literature Cited

Bellrose, F. C. 1976. Ducks, geese, and swans of North America. Stackpole Books.
Cottam, C. 1939. Food habits of North American diving ducks. U.S. Dept. of Agric. Tech. Bull. 643.
Hirsch, K. V. 1980. Winter ecology of sea ducks in the inland marine waters of Washington. University of Washington, Seattle. M.S. Thesis.

Kozloff, E. N. 1974. Keys to the marine invertebrates of Puget Sound, the San Juan Archipelago and adjacent regions. Univ. Washington Press, Seattle.
Vermeer, K. 1983. Diet of the harlequin duck in the Strait of Georgia, British Columbia. *The Murrelet* 64:54-57.

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