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Food Habits of Jumping Mice (*Zapus trinotatus* and *Z. princeps*) in Western North America

Abstract

Major foods of 69 western jumping mice, *Zapus princeps*, and 93 Pacific jumping mice, *Z. trinotatus*, were generally similar to those of meadow jumping mice, *Z. hudsonius*. Seeds, particularly grass seeds, and fruits, such as of *Rubus* and *Vaccinium*, were important, as was the fungus *Endogone*. Animal matter was less abundant than in *Z. hudsonius*, but the chief animal food in *Z. princeps* and *Z. trinotatus* was lepidopterous larva as in *Z. hudsonius*.

Introduction

Detailed studies have been presented of the food habits of jumping mice, *Zapus hudsonius* and *Napeaozapus insignis* from New York (Whitaker, 1963a, 1963b) and *Z. hudsonius* from Indiana (Whitaker and Mumford, 1971). There is scant information, however, concerning the foods of the western or Pacific jumping mice, *Z. princeps* or *Z. trinotatus*, although several papers refer in general terms to their diets. Some of these papers are cited here. Maser and Franklin (1974) stated that thimbleberry (*Rubus parviflorus*), salmonberry (*R. spectabilis*), evergreen huckleberry (*Vaccinium ovatum*), skunk cabbage (*Lysichitum americanum*), seeds, moss, and fungi were foods of *Z. trinotatus* in Oregon, and Maser (unpublished) found that blueleaf huckleberry (*Vaccinium deliciosum*), Himalayan blackberry (*Rubus procerus*), and stinking current (*Ribes bracteosum*) were utilized as foods in Oregon. Dalquest (1948) listed velvet grass (*Holcus lanatus*), grass seeds, dock (*Rumex*), skunk cabbage, and blackberries as foods of this species in Washington. Clark (1971) presented a general analysis of the foods of *Z. princeps* from Teton County, Wyoming. He found "seeds" to comprise the greatest quantity of the diet (82 percent volume, 100 percent frequency) followed by green vegetation and arthropods in trace amounts. Bailey (1930) found only "clean white starch" in *Z. princeps* which he examined from Yellowstone Park, Wyoming. Grass seeds were reported as foods by Armstrong (1972), Ingles (1965), Henshaw and Birdseye (1911), and Banfield (1974) from several localities. Banfield (1974) listed "summer berries." Whitaker (1962) reported small percentages of *Endogone* from the stomachs of *Z. princeps* from California, and Dowding (1955) reported *Endogone pulvinata* from this species in Alberta, Canada.

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The purpose of this paper is to present information on the food habits of *Z. trinotatus* and *Z. princeps* from western North America.

Methods and Materials

Jumping mice for this study were collected during two trips into western North America by Gwilym S. and Diana B. Jones in the summers of 1973 and 1974, and by Chris Maser during his work on mammals of the Oregon Coast (1970-1973). Stomach contents were examined with a 10 to 70 power, zoom dissecting microscope. Identifications were made by comparison with known items. Stomachs from *Zapus princeps* were examined from the following localities: British Columbia (26 stomachs, most from near Quesnel), Wyoming (21, most from Albany and Carbon Counties), California (11 from Nevada County), and Utah (11, most from Weber County). Stomachs from *Zapus trinotatus* were examined from the following localities: Oregon (43, from several counties), British Columbia (27, most from the Fraser River Valley near Hope), Washington (20, most from Mason County), and California (3 from Humboldt County).

Results and Discussion

Results of stomach analysis are presented for *Zapus trinotatus* (Table 1) and *Z. princeps* (Table 2). For comparison, some of the major foods of *Z. hudsonius* from New York (Whitaker, 1963a) were summarized. Since most of the present collections were in summer, *Z. hudsonius* data for July, August, and September were used, including 159, 138, and 191 stomachs respectively. Percentage volumes of major groups of foods for those months were grass seeds 36.4, 26.9, 30.8; other seeds 21.7, 28.5, and 23.3; *Endogone* 16.7, 15.1, 19.5; lepidopterous larvae 5.6, 6.5, 8.4; other animal foods 1.3, 2.1, 2.8; and fleshy fruits (*Fragaria*, *Vaccinium*, *Rubus*, and *Viburnum*) 4.6, 7.6, and 5.7.

There are great similarities between the food habits of eastern and western jumping mice. Seeds, particularly grass seeds, are the predominant food. Seed content in the stomachs of *Z. trinotatus* ranged from 49.6 to 56.6 percent of the total volume, and in *Z. princeps* it ranged from 28.8 to 52.3 percent. These are similar to the values from New York (54.1 to 58.1 percent). Grass seeds ranged from 33.8 to 46.7 in *Z. trinotatus*, 9.5 to 62.1 in *Z. princeps* and 26.9 to 36.4 in *Z. hudsonius*.

The second major group of foods eaten by North American zapodids consists of subterranean fungi, particularly *Endogone*. *Endogone* ranged from 5.5 to 19.9 percent volume in *Z. trinotatus*, 1.4 to 17.7 in *Z. princeps*, and 15.1 to 19.5 in *Z. hudsonius*. Odors emitted by the maturing sporocarps allow the mice to detect and dig out the hypogeous fungi. In eastern *Z. hudsonius*, *Endogone* is usually found in greater abundance in individuals from more moist situations. (Whitaker, 1962, 1963a), but we have too little information to determine the relationship of this food to habitat of western or Pacific *Zapus*.

Animal materials, chiefly lepidopterous larva, were eaten at rates of 6.9, 8.6, and 11.2 percent in the summer by *Z. hudsonius*. Animal materials were utilized slightly less in this sample of *Z. trinotatus*, with values ranging from 3.5 to 6.3 percent volume. In *Z. princeps* from British Columbia and Wyoming, animal foods totaled only 0.8 and 3.8 percent of the volume respectively. However, in those from California and Utah they were 13.7 and 45.1 respectively. Local abundance of larvae and other insects probably influenced the values in these small samples.

TABLE 1. Food from 43 stomachs of *Zapus trinotatus* from Oregon, 3 from California, 20 from Washington, and 27 from British Columbia.

	Oregon & California		British Columbia		Washington	
	% vol.	% freq.	% vol.	% freq.	% vol.	% freq.
Grass seeds	37.5	73.9	46.7	92.6	33.8	90.0
<i>Rubus spectabilis</i> Salmonberry	15.0	28.3	0.1	3.7	10.4	35.0
Unidentified seeds	10.5	23.9	2.9	11.1	5.1	40.0
Starchy material	9.3	13.0	3.7	3.7	—	—
<i>Endogone</i>	6.1	30.4	5.5	51.9	19.9	70.0
Lepidopterous larvae	5.0	45.7	4.0	18.5	2.5	20.0
<i>Vaccinium parviflorum</i> Red Huckleberry	3.9	6.5	—	—	1.5	5.0
<i>Cerastium</i> seeds	3.5	10.9	trace	7.4	17.6	60.0
Unidentified vegetation	3.1	28.3	3.9	44.0	5.0	55.5
Unidentified fungi	1.7	15.2	trace	3.7	2.8	20.0
<i>Lonicera involucreta</i> Twinberry	1.5	2.2	1.8	22.2	—	—
Unidentified insect	1.0	19.6	0.4	18.5	0.8	20.0
<i>Gaultheria shallon</i> seeds Salal	0.8	6.5	—	—	0.1	5.0
<i>Rubus</i> sp.	0.4	2.2	—	—	0.1	5.0
Formicidae	0.2	4.3	—	—	—	—
Unidentified animal	0.1	2.2	—	—	0.2	10.0
<i>Rumex</i> seeds	0.1	4.3	trace	3.7	—	—
Aphididae	trace	2.2	trace	3.7	—	—
Moss	—	—	0.2	3.7	0.5	5.0
<i>Rubus parviflorus</i> Thimbleberry	—	—	30.6	59.3	—	—
Mites	—	—	0.1	7.4	—	—
Coleoptera	—	—	trace	3.7	—	—
	99.7	.	99.9	.	100.3	.

The last major category of foods eaten by zapodids is that of the fleshy fruits, such as those of *Vaccinium* or *Rubus*. Fruits, heavily utilized by North American zapodids, are likely preferred over many types of foods, as they are generally consumed when available. Some fruits are available for only a short period, but may form a major proportion of the diet at that time. The kinds of fruit vary. In the east, major fruits are the strawberry (*Fragaria virginiana*), the various blackberries and raspberries (*Rubus* spp.), the blueberries (*Vaccinium* spp.), and the fruit of arrowwood (*Viburnum dentatum*). In the west, the fruits of *Rubus* and *Vaccinium* are again eaten, particularly salmonberry (*R. spectabilis*), thimbleberry (*R. parviflorus*), and red huckleberry (*Vaccinium parviflorum*). Salmonberry was the major food in a series of stomachs examined from *Z. princeps* from British Columbia, and also in *Z. trinotatus* from Oregon, California, and Washington. *Vaccinium* and other fruit presently unidentified were also important. Fruit of thimbleberry (actually mostly seeds in this case) was important in the *Z. trinotatus* sample from British Columbia. The fruits of both salmonberry and thimbleberry fall to the ground when mature and are readily available to the mice. The mice obtain some berries, such as those of salal (*Gaultheria shallon*), by climbing into the low bushes.

Food habits of North American mice of the genus *Zapus* are similar in that the various species feed on the same four major groups of foods. The group listed in

approximate order of decreasing use are: seeds, particularly grass seeds, subterranean fungi of the genus *Endogone*, animal materials, particularly lepidopterous larvae, and fleshy fruits, varying with locality.

TABLE 2. Food from 26 stomachs of *Zapus princeps* from British Columbia, 11 from California, 21 from Wyoming, and 11 from Utah.

	British Columbia		California		Wyoming		Utah	
	% vol.	% freq.	% vol.	% freq.	% vol.	% freq.	% vol.	% freq.
<i>Rubus spectabilis</i> Salmonberry	27.8	42.3	—	—	—	—	—	—
Grass seeds	23.1	50.0	45.9	54.5	62.1	80.1	9.5	18.2
<i>Endogone</i>	12.9	46.2	17.7	54.5	9.1	28.6	1.4	9.1
<i>Vaccinium</i>	10.4	23.1	—	—	0.7	4.8	—	—
Unidentified vegetation	9.8	53.9	5.0	27.3	5.2	38.1	2.7	18.2
Unidentified fruit	8.7	19.2	—	—	—	—	—	—
Unidentified seeds	5.6	19.2	6.4	36.4	6.1	23.8	41.4	90.9
Unidentified fungi	1.0	3.8	5.5	9.1	2.9	9.5	—	—
Lepidopterous larvae	0.6	7.7	10.0	27.3	0.5	4.8	42.3	81.8
Scarabaeidae	0.2	3.8	—	—	—	—	0.9	9.1
<i>Cerastium</i> seeds	0.1	3.8	—	—	5.5	14.3	—	—
Starchy material	—	—	5.0	18.2	4.5	4.8	—	—
Unidentified insect	—	—	2.3	27.3	1.2	9.5	0.5	9.1
Carabidae	—	—	1.4	9.1	—	—	—	—
<i>Rubus</i> sp.	—	—	0.9	9.1	—	—	—	—
Coleoptera	—	—	—	—	1.4	4.8	—	—
Diptera	—	—	—	—	0.7	4.8	—	—
Chrysomelid larvae	—	—	—	—	—	—	0.9	9.1
Formicidae	—	—	—	—	—	—	0.5	9.1
TOTAL	100.2	—	100.1	—	99.9	—	100.1	—

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