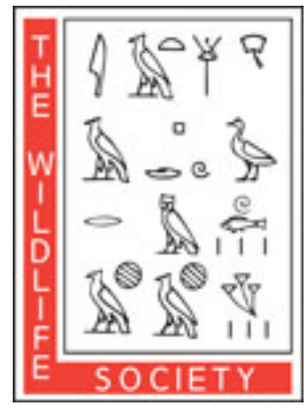

WINTER FOOD HABITS OF RIVER OTTERS IN WESTERN OREGON[1]

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Abstract: Contents of the digestive tracts of 75 river otters (*Lutra canadensis*) collected in western Oregon between 15 November and 15 February, 1970–71 and 1971–72, were identified. Fish were the main staple of the diet, occurring in 80 percent of all digestive tracts examined. Major fish families represented were Cottidae (31 percent), Salmonidae (24 percent), and Cyprinidae (24 percent). Crustaceans, amphibians, and birds were other important food items occurring in 33, 12, and 8 percent, respectively, of all digestive tracts examined.

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This paper documents food habits of river otters in Oregon. The study is based upon examination of digestive tracts of 103 otters harvested in Oregon by fur trappers during the 1970–71 and 1971–72 trapping seasons.

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METHODS

Frozen, skinned otter carcasses obtained from Oregon trappers were thawed and eviscerated in the laboratory. Analysis of the stomach and intestinal tract of each otter was done separately. After volume and weight of each was recorded, stomach contents were placed in a series of fine mesh screens and thoroughly washed. Intestinal contents were agitated in hot water in order to fragment the heavy mucus covering prior to washing. Analysis followed Lagler and Ostenson (1942).

In this investigation, emphasis was placed on frequency of occurrence of food items. Volume measurements taken were considered less reliable because of difficulty in accurately separating flesh and bones of various food items present in a single otter digestive tract. Also, differential rates of digestion of food items may have occurred as has been described by Swanson and Bartonek (1970).

RESULTS

Digestive tracts of 103 river otters were examined (83 collected during the 1970–71 trapping season and 20 collected during the 1971–72 trapping season). Of the 103 otter digestive tracts examined, food items were found in 44 stomachs and 75 intestines (Fig. 1). Fourteen otters containing food items were taken in the last half of November, 37 in December, 16 in January, and 8 in the first half of February.

Vegetative material, such as bits of twigs, leaves, or grass occurred commonly in the digestive tracts of the river otters and was not considered to be a food item. This material is believed to have been taken accidentally by the otter (Lagler and Ostenson 1942) or because of frustration or hunger while in the trap (Ryder 1955, Knudsen and Hale 1968). Digestive tracts which contained vegetation only were classed as being empty.

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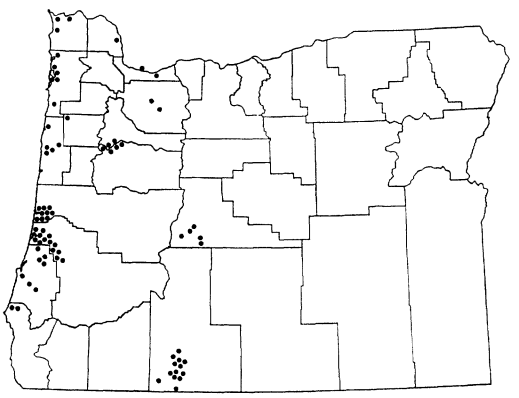

Fig. 1. Site of capture of 75 river otters containing food items.

Fish were found to be the most important food item as indicated by high frequency of occurrence and high volume (Table 1). Other major food items by frequency of occurrence were crustaceans, amphibians, mollusks, and birds. By volume the order of importance of these food items was birds, crustaceans, amphibians, and mollusks. Similar results were obtained by Lagler and Ostenson (1942), Wilson (1954), Greer (1955), Ryder (1955), Hamilton (1961), Sheldon and Toll (1964), and Knudsen and Hale (1968).

Families of fishes occurring most frequently in the otter digestive tracts were the Cottidae, Salmonidae, Cyprinidae, Ictaluridae, and Centrarchidae. Four other families were represented in only one or two digestive tracts—Percidae, Catostomidae, Petromyzontidae, and Trichodontidae.

The family Cottidae, represented by sculpins (*Cottus* sp.), was found in 31 percent of the otter digestive tracts. Often a number of sculpins were eaten in a single meal; at least 14 were recorded from a single otter stomach. Most sculpins were 5–10 cm long.

The family Salmonidae occurred in 24 percent of the digestive tracts. Coho salmon (*Oncorhynchus kisutch*) were found most frequently (13 percent) followed by trout (*Salmo* sp.) and chars (*Salvelinus* sp.). Many of the salmon preyed upon by the otters were quite large (up to an estimated 80 cm) and the otters apparently ate until gorged when a salmon was captured, accounting for the high percentage volume of the fishes in the digestive tract (Table 1). Salmon were taken by otters in the coastal streams during the last half of November and December when the fish enter the rivers to spawn. Grinnell et al. (1937:281) mention that trappers have reported otters eating dead salmon in California. It is not known to what extent salmon represented in this study were taken as carrion, though there is evidence that otters will capture and eat salmon prior to spawning. In two cases, otter digestive tracts were found to contain salmon eggs, flesh, and bones. No one else has reported on the occurrence of salmon in the otter diet.

The family Cyprinidae was represented by tui chub (*Gila bicolor*), northern squawfish (*Ptychocheilus oregonensis*), common carp (*Cyprinus carpio*), and longnose dace (*Rhinichthys cataractae*). Cyprinids were found in 24 percent of the digestive tracts examined. All but one tui chub were taken by otters in the Klamath Basin of southern Oregon. Northern squawfish were taken by otters in the Santiam River of central western Oregon. Both species were particularly abundant in the area where they were utilized as food (Schultz 1936).

Bullheads (*Ictalurus* sp.) were the only members of the family Ictaluridae found in the otter digestive tracts. Neither they nor the Centrarchids, represented by sunfishes (*Lepomis* sp.), appeared to be a major food item by frequency of occurrence, although, because two otters ate several large bullheads prior to capture, bullheads did account for 12 percent of total volume of food items.

Table 1. Number of occurrences, percentage frequency, and percentage volume of classes and families of food items occurring in the stomach and intestines of 75 river otters collected in western Oregon, 15 November–15 February 1970–71 and 1971–72.

Food item	Stomach			Intestine			Overall	
	Number of occurrences	Percentage frequency	Percentage volume	Number of occurrences	Percentage frequency	Percentage volume	Number of occurrences	Percentage frequency
Fish	38	86	70	60	80	73	60	80
Cottidae	12	27	8	23	30	17	23	31
Salmonidae	13	30	33	18	24	22	18	24
Cyprinidae	8	18	12	15	20	22	18	24
Ictaluridae	3	7	12	4	5	6	5	7
Centrarchidae	4	9	4	4	5	2	5	7
Percidae	2	5					2	3
Catostomidae				1	1		1	1
Petromyzontidae	1	2					1	1
Trichodontidae				1	1		1	1
Unidentified	4	9		13	17		15	20
Crustaceans	9	20	7	20	27	11	25	33
Pacifascidae	6	14		19	25		19	25
Grapsidae				1	1		1	1
Oniscidae	3	7		3	4		5	7
Amphibians	4	9	5	9	12	4	9	12
Ranidae	4	9		6	8		7	9
Hylidae				1	1		1	1
Ambystomidae	1	2		2	3		2	3
Salamandridae				1	1		1	1
Birds	4	9	19	5	7	10	6	8
Anatidae	2	5		3	4		3	4
Rallidae	1	2		1	1		1	1
Unidentified	1	2		1	1		2	3
Mollusks	1	2		7	9		8	11
Pleuroceridae				6	8		6	8
Unionidae	1	2		1	1		2	3
Miscellaneous[a]	2	5		4	5		5	7

[a] Beaver (Castoridae) hair in two intestines; muskrat (Cricetidae) hair in one stomach and one intestine; garter snake (Colubridae) in one intestine; leech (Hirudinidae) in one stomach.

Crustaceans were the second most important class of food items by frequency of occurrence. Crayfish (*Pacifasticus* sp.) occurred most frequently, although one otter digestive tract contained six purple shore crabs (*Hemigrapsus nudus*) and five (7 percent) contained pillbugs (*Armadillidium vulgare*). The importance of crustaceans in the otter diet has also been shown by Lagler and Ostenson (1942), Wilson (1954), Ryder (1955), Hamilton (1961), Sheldon and Toll (1964), and Knudsen and Hale (1968).

Amphibians appeared in 12 percent of the otter digestive tracts. Most frequently found were frogs (*Rana* sp. and *Hyla* sp.) although a northwestern salamander (*Am-*

bystoma gracile), a Pacific giant salamander (*Dicamptodon ensatus*), and a rough-skinned newt (*Tarica granulosa*) had also been eaten by otters. The occurrence of the rough-skinned newt is particularly interesting, as it secretes a very toxic poison. The otter eating the newt apparently suffered no ill effects, as remains of the newt were taken from the terminal portion of the otter intestine, and the otter had since fed on a number of small sculpins, the remains of which were found in both the stomach and the intestine.

Remains of six birds were found. Four of the six could be identified; these were an American widgeon (*Mareca americana*), a canvasback duck (*Aythya valisineria*), a ruddy duck (*Oxyura jamaicensis*), and an American coot (*Fulica americana*). Waterfowl and shore birds as otter prey have also been reported by Lagler and Ostenson (1942), Wilson (1954), and Greer (1955). Because of the large volumes of bird flesh and feathers consumed by the otters, birds comprised 19 percent of the total volume of food items in the stomachs and 10 percent of total volume of food items in the intestines. All birds were taken from coastal areas during November and December when waterfowl hunting pressure was heavy, and it is quite possible that they represent crippled individuals or carrion.

Mollusks comprised less than 1 percent by volume of the food items although they occurred in 11 percent of the digestive tracts. The freshwater periwinkle (*Oxytrema silicula*) was the most commonly eaten mollusk. While these gasteropods did not appear to comprise any considerable portion of the otter diet in this sample, I have observed otter fecal passages comprised solely of crushed periwinkle shells indicating that otters may feed extensively on them. Two pelecypods were found, both of which were freshwater mussels (*Anodonta californiensis*). Morejohn (1969) reports extensive use of freshwater mussels as food items by river otters in west-central California.

Insects occurred in 25 percent of the digestive tracts. Because of their fragmented condition, it is believed that most, possibly all, of these insects were obtained from the alimentary tracts of fishes eaten by the otters. In no case were insect remains discovered in an otter digestive tract that did not also contain fish remains. Lagler and Ostenson (1942) and Sheldon and Toll (1964) believed this to be the case, although others, notably Greer (1955) and Knudsen and Hale (1968), believed that insects were taken directly by the otters and may even represent a moderately important food item.

Mammal remains were limited to trace amounts of beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) hair; no mammal bones were found. These hairs were probably contaminants ingested by the otters or accidentally introduced by the trappers in the pelting operation, although Greer (1955) and Field (1970) present evidence that otters will prey upon other mammals.

Identifiable remains of one reptile, a garter snake (*Thamnophis* sp.), and one leech (Hirudinidae) were also found.

DISCUSSION

Fish comprised by far the major portion of the winter diet of 75 river otters in Oregon. Those fish families most frequently occurring in the otter diet in Oregon were the Cottidae, Salmonidae, Cyprinidae, Ictaluridae, and Centrarchidae in that order, although the Salmonidae were the most important single food item by percentage volume.

Ryder (1955) hypothesized that fish were

preyed upon by river otters in proportion to their abundance in the water and in inverse proportion to their swimming ability. Erlinge (1968), in his food studies on captive European river otters (*L. lutra*), substantiated Ryder's (1955) hypotheses and in addition showed that otters preferred larger (15–17 cm) fishes over smaller (less than 15 cm) fishes, although no species of fish was subject to selective hunting pressures by otters. These preferences are well shown in Oregon data, where the sedentary sculpins, large cyprinids, and larger salmon were most frequently preyed upon by the otters. Although salmon were found to occur frequently in the otter diet during the late fall months, the effects of this predation are considered to be unimportant to the salmon population because of the low population density of river otters and because some of the salmon were probably taken as weak "spawn outs" or carrion.

Erlinge's (1968) food preference investigation on European river otters demonstrated that otters selected prey primarily on the basis of activity shown by the prey item. Highly motile prey, such as fishes, was preferred over such less motile prey as crustaceans and amphibians. Both of these groups were preferred over nonmotile prey, such as carrion and shellfish. These preferences were reflected by the order of frequency of occurrence of the major classes of prey items taken in western Oregon, i.e. fishes, crustaceans, amphibians, birds (probably taken as crippled individuals or carrion), and mollusks.

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