R E P O R T

SOME PRELIMINARY OBSERVATIONS ON THE FORAGING OF SEA OTTERS OFF THE OUTER COAST OF WASHINGTON STATE, USA

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Abstract: Since reintroduction of sea otters began in 1969 off the Olympic Peninsula of Washington State, USA, the population has increased to 360. We begun studying the natural history of this populaton in Summer 1994. This paper presents some of our findings on foraging behaviour and food habits. Clams and crabs predominate, with the addition of snails. Mean dive times of about 56 seconds for females and 68 seconds for males were found, with 89% of dives successfully obtaining prey. Prior to 1995 this area has received little predation pressure from sea otters, and we anticipate seeing a very different array of prey items at the new site.

INTRODUCTION

In 1969 and 1970 a total of 59 sea otters (*Enhydra lutris kenyoni*) (WILSON *et al.* 1991) was released off the west coast of the Olympic Peninsula of Washington State (JAMESON *et al.* 1982); all had been translocated from Amchitka Island, Alaska. In 1969 the otters were released directly to the open ocean which resulted in the death of at least 16 individuals. Mortality was probably higher because some carcasses undoubtedly went undiscovered. In 1970 release procedures were changed, and the 30 otters were allowed to acclimate for several days in floating pens prior to release. All were liberated in excellent condition. Thus, the initial nuclear population in Washington could never have been larger than 43 otters and may have dropped to less than 10 individuals by the early 1970's. No surveys were conducted to assess the success of this translocation until 1977 (JAMESON et al., 1982, 1986). Since then, however, the population has grown at an average rate of about 16% yr^{-1}. In August of 1994 360 otters were counted during the annual survey

The National Biological Service in cooperation with the Washington Department of Fish and Wildlife began a study of the natural history of the Washington population in summer 1994. Data have been collected on time/activity budgets, reproduction, movements, and foraging. In this report I want to briefly present some of our findings on foraging behavior and food habits. Much of the information is still preliminary and subject to modification as additional data are collected. The project is scheduled to last for 3 years from the beginning date in July 1994.

METHODS

During the period from 8 June to 20 July 1994, 21 sea otters were captured on the outer coast of Washington's Olympic Peninsula, 7 independent females (6 adult and 1 subadult) and 9 independent males (7 adult and 2 subadult). Five pups were also taken, 3 females and 2 males. All otters were weighed and when an individual was anesthetized several morphometric measurements, blood samples and a premolar were collected. Most were marked with PIT tags, and all but small pups were tagged with plastic flipper tags. Radio transmitters were implanted in 17 individuals.

Foraging data were collected by observing focal animals with 50-80X telescopes and binoculars. Observation bouts continued as long as the focal animal could be seen. Data recorded included dive time, surface time, prey item, and prey number. Prey items were grouped by taxa and summed over all records. Results are presented as percentages of total number of foraging dives and total number of prey items (tab. 1). When possible, instrumented otters were selected for observation, but when none were in the observation area data were collected from unmarked animals. Mean dive times were calculated for each sex and age class (tab. 2).

RESULTS

Over 4000 foraging dives were observed and over 10000 prey items noted during the period (tab. 1). Data were analyzed by frequency of occurrence and by number. Bivalves predominated in both analyses at 34% and 29% respectively. Crabs were next by occurrence, and snails were the third most frequently occurring prey item. However, when analyzed by number the ranking changes with crabs ranking third, sea urchins fourth and snails second just below bivalves. This is because sea otters often capture more than a single item when feeding on snails and urchins. Unidentified prey predominated in every analysis. This category is comprised of items too small or too nondescript to be identified accurately.

Table. 1: Summary of sea otter foraging data collected in Washington, summer 1994. Data are grouped by major taxonomic group.

Group	Occurrence	Prey number	Prey not counted	Prey number + prey not counted	Percent occurrence	Percent by number	Percent prey number + prey not counted
Bivalve	1364	2657	182	2839	33.85	29.18	28.01
Crab	461	661	50	711	11.44	7.26	7.02
Snail	431	2603	53	2656	10.70	28.58	26.21
Gumboot Chiton	70	73	0	73	1.74	0.80	0.72
Sea Urchin	65	293	11	304	1.61	3.22	3.00
Worm	41	62	10	72	1.02	0.68	0.71
Sea Star	18	18	0	18	0.45	0.20	0.18
Sea cucumber	7	7	0	7	0.17	0.08	0.07
Kelp	2	2	0	2	0.05	0.02	0.02
Unidentified Prey	1569	2720	722	3452	38.94	29.98	34.06
Octopus	1	1	0	1	0.02	0.01	0.01
Total	4029	9107	1028	10135	100.00	100.00	100.00

Clams, crabs, snails and small unidentified items account for 95% of the prey by occurrence, and number. Therefore, at least by the measure used here, most of the remaining items are of little importance to sea otters in Washington. Only one *Octopus* spp. was observed in our sample; but, we have noted several times, incidental to other work, sea otters feeding on large octopus. These may take an hour to consume and sometimes are not completely eaten before the feeding individual becomes sated. The importance of octopus is probably under estimated in our sample.

Dive times were analyzed for all age classifications except pups (tab. 2). The mean grouped dive time for females was 56.1 seconds (SE = 0.34), and 58.8 (SE = 1.07) for grouped males. Adult females spent an average of 57.4 (SE = 0.38) seconds submerged when foraging, only slightly more than grouped females. Adult males spent 71.1 (SE = 3.11) on an average foraging dive somewhat longer than the group mean. Subadult females spent 44.5 (SE = 1.11) seconds on an average dive about 12 seconds less than adults. Subadult males were submerged an average of 55.8 (SE = 1.05) about 15 seconds less than adult males.

Table. 2: Analysis of dive times (in seconds) for foraging sea otters in Washington, summer 1994

	Mean	**Number Dives**	**Standard Deviation**	**Standard Error**	**Maximum**	**Minimum**
all female	56.1	5109	24.56	0.34	307	3
all males	58.8	637	27.00	1.07	181	3
adult females	57.4	4229	25.22	0.38	307	3
adult males	71.1	127	35.15	3.11	181	16
subadult females	44.5	215	16.28	1.11	83	5
subadult males	55.8	510	23.59	1.05	107	3
juvenile female	48.2	74	14.34	1.67	74	17
all sea otters*	56.5	5855	24.8	0.32	307	3

* includes 109 records where sex was unknown

DISCUSSION

BOWLBY et al. (1988) present data on sea otter foraging in the same general area where our data were collected. No major differences in prey consumed were noted between studies. Clams, and crabs predominated in their study as they did in the current study. The notable exception is the abundance of snails observed in this study and the absence of snails in BOWLBY et al. (1988). We do not know whether this reflects a change in food habits since the 1988 study or a difference in data collection methods.

Mean dive times calculated for this study are similar to those presented by BOWLBY et al. (1988) even though their sample sizes were much smaller. Ages were not determined in their study, but the average dive time for females was 56.8 (SD = 32.4) seconds and in this study 56.1 (SD = 24.6). Interestingly, the mean foraging dive calculated by BOWLBY et al. (1988) for males of 68.6 (SD = 28.3) is similar to the value for adult males in this study. Sea otters in both studies successfully obtained prey on 89% of foraging dives. We will concentrate foraging effort in 1995 in a new

area just recently occupied by sea otters. Prior to 1995 this area has received little predation pressure from sea otters, and we anticipate seeing a very different array of prey items at the new site.

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