IUCN OTTER SPECIALIST GROUP BULLETIN
VOLUME 1 PAGES 11 - 12

Citation:Rowe-Rowe, D. (1986) African Otters - is their Existence Threatened? IUCN Otter Spec. Group Bull. **1**: 9 - 11

DIETARY VARIATION IN SEA OTTERS (*ENHYDRA LUTRIS*)

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The generally secretive and often nocturnal habitats of otters makes behaviour in this group difficult to study. Thus, our knowledge of diet is poor for most otter species. The sea otter is a notable exception. This species feeds extensively during the day. Furthermore, its prey are brought to the surface and eaten, and since most foraging occurs in shallow waters near shore, many aspects of diet and foraging behaviour can be determined by direct observation.

In the mid-1970's my colleagues (R. J. Jameson and A. M. Johnson) and I began an intensive and wide-ranging study of diet and foraging behaviour in the sea otter. Our study was conducted at three locations within the present range of the species-. the western Aleutian Islands, Prince William Sound, and central California. Because of overexploitation during the fur trade of the 18th and 19th centuries, and subsequent recovery following protection at the beginning of this century, sea otter populations had been re-established for varying lengths of time at each of these locations. We selected two study populations at each location: one that had been long established and one that had been more recently established. Our general purpose was to 1) describe large-scale geographical patterns in diet and foraging behaviour in sea otter, and 2) compare the effect of population status (i.e. length of time since re-establishment) on these measures.

We found considerable geographic variation in the diet, although not surprisingly considering the well known faunal variation across the rim of the eastern North Pacific Ocean. Twelve common prey types were eaten in the western Aleutian Islands, the most important of which were green sea urchins and nearshore fishes. Four prey types were eaten in Prince William and nearly all of these were clams and mussels. Nineteen prey types were eaten in central California, including crabs, sea urchins, abalones, top snails, and octopus. A less expected finding was that the longer established populations had more diverse diets (as measured by eveness) at all three locations. Extensive analyses were done to determine the principal sources of variation in diet, dive times, and surface feeding intervals. We evaluated such variables as age class, sex, reproductive condition (i.e. females with or without pups), water depth, tidal level, weather conditions and others. Although many of these variables had statistically significant effects, individuals contributed most variation in foraging behaviour in all instances. This finding was unexpected and eventually led us to look at the question of individual variation in more detail.

About 3 years ago K. Lyons and I began an intensive study of individual variation in sea otter foraging. This work was done in the general vicinity of the Monterey Peninsula, California, and was possible because the California Department of Fish and Game had marked a number of sea otters in the area with coloured flipper tags. These animals could be identified from shore with the aid of a high resolution spotting scope. Over the past several years we have accumulated extensive records on prey composition of about 15 individuals. In total, more than 25,000 foraging dives have been observed during the study, and we have virtually continuous records of some animals for the entire study period. The results are fascinating! We have discovered that although diet is diverse at the level of the population, it is not at the level of the individual. Most individuals specialize on one or several prey types. Furthermore, dietary preferences of individuals appear to be maintained through time, with one interesting exception. On several occasions during this study, known females gave birth to pups. In each case prey choice changed markedly following the birth, but then returned to the earlier condition following weaning.

The results of this recent work have altered my view on several aspects of the foraging biology of sea otters. Whereas earlier it appeared that individuals were rather catholic foragers, it now seems that there is considerable variation among highly specialized individuals. This finding has important implications to the ecology and social behaviour of sea otters, particularly in view of the fact that food can be a major limiting resource to this species. What are the costs and benefits of feeding on different prey? In view of the long period of association between mother and pup, is it possible that foraging variation has a matrilineal pattern of inheritance? Is diet related to social rank, and are there consequent differences in reproductive success? These are some of the questions my colleagues and I are now addressing and hope to answer in the years to come.