IUCN OTTER SPECIALIST GROUP BULLETIN
VOLUME 8 PAGES 6 - 9

Citation: **Butler, J. (1993)** Resource Use within the Crab-Eating Guild in Upper Kairezi River, Zimbabwe: Proposed Project. *IUCN Otter Spec. Group Bull*. **8**: 6 - 9

RESOURCE USE WITHIN THE CRAB-EATING GUILD IN UPPER KAIREZI RIVER, ZIMBABWE: PROPOSED PROJECT

James Butler

Dept Biological Sciences, University of Zimbabwe, Box MP 167, Mount Pleasant, Harare, Zimbabwe

Abstract: The management problem that this study will address is the apparent decline in the biological productivity of the Upper Kairezi River for rainbow trout. Fishery managers believe that the cause could be predation on trout by resident Cape Clawless Otters and the African mottled eel. The area is part of a CAMPFIRE (Communal Areas Management Programme For Indigenous Resource) programme and agriculture is excluded from the environs. However, owing to the falls in catches, fishermen have been discouraged, generating insignificant revenue from the KRPA and undermining local commitment to the conservation of the resource and its flora and fauna. This study aims to investigate competition between the otters, eels and trout for the river crab food resource, the form and extent of resource partitioning occurring among the predators and the predator-prey relationships between the otters and eels (predators), on trout (prey). Without this evidence, the danger is that the Cape clawless otters of the Upper Kairezi will be relegated to vermin status and controlled as such before scientific evidence has been produced to prove their innocence.

INTRODUCTION

The management problem that this study will address is the apparent decline in the biological productivity of the Upper Kairezi River for rainbow trout *Oncorhyncus mykiss*, as indicated by the falling catches and average weights in the Nyanga Downs Fly Fishing Club (NDFFC) returns. Fishery managers believe that the cause could be predation on trout by resident Cape Clawless Otters *Aonyx capensis* and by the African mottled eel *Anguila bengalensis labiate*. Another possibility is the adverse effect of competition between the three species for the river crab *Potamon perlatus* on the trout population (Hamilton, pers. comm.). The river crab is the largest invertebrate in the rivers of the Nyanga region, and is a major food resource for both the trout and the otter, occurring with a median percentage frequency of 13,1 % and 100 % respectively in their diets (Turnbull-Kemp 1960a). Little is known about the diet of the mottled eel in the area (Turnbull-Kemp and Douglas, pers. comm.).

The Upper Kairezi River drains the northern slopes of Mount Inyarigani in Rhodes-Nyanga National Park, which is situated in the Eastern Highlands of Zimbabwe. Immediately outside the park boundary in the Nyamaropa Communal Land, the local Tangwena community has established the Kairezi River Protected Area (KRPA), a 1645 ha conservation corridor along 15 km of the river, from which all agricultural activity has been excluded to prevent overgrazing, erosion and siltation of the watershed. The KRPA is part of a CAMPFIRE (Communal Areas Management Programme For Indigenous Resources) programme that aims to use the trout fishing on the Upper Kairezi (Moore 1992). However, owing to the falls in catches, fishermen have been discouraged (Hamilton, pers. comm.), generating insignificant revenue from the KRPA and undermining local commitment to the conservation of the resource and its flora and fauna (Moore, pers. comm.).

In order to improve catch returns and revenue to the community, the fishery managers need to know the extent to which competition occurs within the crab-eating guild, and the degree of predation on trout by otters and eels. There is a danger that owing to the worldwide reputation of all otter species for eating fish (Harris 1968), the Cape clawless otters of the Upper Kairezi will be relegated to vermin status and controlled as such before scientific evidence has been produced to prove their innocence (Turnbull-Kemp 1960b).

Owing to human population growth and the pressure of expanding agricultural activities on river catchments in developing nations, the IUCN has established an Otter Specialist Group and an Action Plan for Otter Conservation to research the status of otter populations and habitats in the world (IUCN 1992; Rowe-Rowe 1991): this project aims to contribute to the IUCN's southern African survey on the status of the Cape clawless otter. The clawless otter is not a fully protected species in Zimbabwe, and Gibson (1991) notes that outside National Parks the major threat to the species is disturbance and the destruction of suitable habitat owing to agricultural activity: it would seem that the otters of the Upper Kairezi are also threatened by persecution.

OBJECTS

The objects of this study are to examine the following trophic relationships within the crab-eating guild:

1. The nature of the competition between the otters, eels and trout for the river crab food resource.
2. The form and extent of resource partitioning occurring among the predators.
3. The predator-prey relationships between the otters and eels (predators), on trout (prey).

The results obtained will be used to consider the following management options:

1. Should otter or eel populations be controlled to increase the availability of crabs for the trout?
2. Should otter or eel populations be controlled to reduce the predation and mortality of the trout population?

METHODS

To reduce competition, organisms may partition food resources either by habitat type or food type (Connell 1975; Schoener 1974).

Partitioning by habitat selection

The Upper Kairezi will be divided into two habitat types: riffles and pools. The nature of the river bed is such that large boulders and rocks occur uniformly in both riffles and pools, forming ideal habitat for the river crab (Arkell 1979). Therefore the only differences between the two habitat types are water depth and velocity.

Clawless otters are known to establish "seats" for basking, where latrines for sprainting are also located (Rowe-Rowe 1985; Turnbull-Kemp 1960b). Although otters may choose seats on the basis of other criteria such as security or aspect, it will be assumed that the sites chosen will also be located closest to their optimum feeding habitat. Transect sampling will be carried out along both banks to establish the location of seats in relation to river habitat type. A chi-square test will be used to determine whether there is a significant difference between the expected and observed frequency of usage. Bonferroni confidence Intervals will be calculated to determine which habitat types are preferred (Randall Byers & Steinhorst 1984).

Trout and eel habitat preferences will be sampled by catch per unit effort, with equal length sampling periods for pools and riffles. The same statistical methods will be used as described above to determine habitat selection. Interspecific overlaps will be calculated using the MacArthur-Levins method (Lawlor 1980).

Partitioning by prey size

If significant overlap between habitats is established, diet analysis will be carried out. Much clawless otter diet analysis has been undertaken using faecal remains or "scats" (Arden-Clarke 1983; Kruuk & Goudswaard 1990; Rowe-Rowe 1977; Van der Zee 1981; Verwoerd 1987). Seat contents will be recorded by type, and by the frequency of occurrence and the volumetric content of each type. Crab remains will be divided into three size classes: large (carapace width 30-35 mm), medium (20-25 mm), and small (< 1 5 mm); (Arkell 1979). Crab sizes and quantities will be determined by measuring eye-stalk lengths (which correlate with carapace width), and numbers (Nel, in prep.)

While sampling for habitat selection, all trout and eels caught will be killed, weighed, and measured for length, stomach contents will be removed and partitioned in the same manner as described for otter scats (Maitland 1965; Thomas 1962; Warren et al 1964). Warren et al illustrated that trout prey selection is governed by mouth gape restrictions, and therefore age; as a result, the gape sizes of all trout and eels caught will be measured and related to the sizes of crab found in the stomach analyses.

Rowe-Rowe (1977) noted that clawless otter predation on trout increased during the winter, and that smaller sizes were selected (< 200 mm long), The NDFFC plans to stock the Upper Kairezi with fingerling trout in March 1993. In order to test whether the otter and eel diet switches to greater numbers of trout owing to the abundance of small, weakened prey, sampling will be carried out immediately after stocking and into the winter, and compared with the pre-March, summer results.

Prey population structure

River crab population density and structure will be sampled using the mark and recapture method (Templeton 1978). Both riffle and pool habitats will be sampled, and densities and structures compared using chi-square tests. Population structure will be tabulated by size and compared with the tabulated size selection of each predator (Arkell 1979).

Fishermen and local people's perceptions

Questionnaires will be submitted to NDFFC members to establish current perceptions of the alleged otter problem. Open-ended interviews will be conducted with the local population to assess their attitudes to possible otter conservation on the Kairezi River. Both methods should produce useful information for the implementation of any local action plan for otter conservation.

Timing

Fieldwork should be completed by the end of June 1993, and the final report should be available by the end of September 1993.

REFERENCES

Arden-Clarke, C. (1983). Population density and social organisation of the Cape clawless otter, *Aonyx capensis* Schinz. in the Tsitsikama Coastal National Park. M.Sc. thesis. University of Pretoria, South Africa.

Arkell, G.E.F. (1979). Aspects of the feeding and breeding biology of the giant kingfisher. *The Ostrich* **50**: 176-181.

Connell, J.H. (1975). Some mechanisms producing structure in natural communities, pp. 460-490 in: **M.L. Cody & J.M. Diamond** (Eds.) Ecology and Evolution of Communities. Balknap Tress, Cambridge, Massachusetts.

Gibson, D.St.C. (1991). The status and distribution of small carnivores in Zimbabwe. Annex 8 in: Protected Species In Zimbabwe. Department of National Parks and Wildlife Management, Harare.

Harris, C.J. (1968). Otters: A Study of Recent Lutrinae. Weidenfield and Nicolson. London.

IUCN (1992). *Otter Specialist Group Bulleti*n, **Number 7**. Pietormaritzburg, South Africa.

Kruuk, H. & Goudswaard, P.C. (1990). Effects of Changes in Fish Populations in Lake Victoria on the Food of Otters (*Lutra maculicollis* and *Aonyx capensis*). *African Journal of Ecology* **28**: 322-329.

Lawlor, L.R. (1980). Overlap, similarity and competition coefficients. *Ecology* **61**: 245-251.

Maitland, P.S. (1965). The feeding relationships of salmon, trout, minnows, stoneloach and three-spined sticklebacks in the River Endrick, S*cotland. Journal of Animal Ecology* **34**: 109-133.

Moore, D. (1992). Draft Kairezi River Protected Area. Unpublished Working Draft, Centre for Applied Social Studies, University of Zimbabwe, Harare.

Randall Byers, C & Steinhorst, R.K. (1984). Clarification of a technique for analysis of utilisation-availability data. *Journal of Wildlife Management* **48**: 1050-1053.

Rowe-Rowe, D.T. (1977). Food ecology of otters in Natal, South Africa. *Oikos* **28**: 210-219.

Rowe-Rowe, D.T. (1985). Facts about otters. *Wildlife Management*. **Number 10**. Natal Parks Board, Pietermaritzburg, South Africa.

Rowe-Rowe, D.T. (1991). Status of otters in Africa. In: **C. Reuther & R. Rochert (Eds)** Proceedings for the V. International Otter Colloquium. *Habitat* **6**, Hankensbüttel.

Schoener, T.W. (1974). Resource partitioning in ecological communities. *Wildlife* **185**: 27-38.

Templeton, R.J. (1978). Some ecological and biological aspects of the freshwater crab, *Potamonautes obesus obesus* in Lake Mollwaine. Unpublished Certificate of Field Ecology, University of Zimbabwe, Harare.

Thomas, J.D. (1962). The food and growth of brown trout (*Salmo trutta* L.) and its feeding relationships with salmon parr (*Salmo salar* L.) and the eel (*Anguilla anguilla* L.) in the River Teifi, west Wales. *Journal of Animal Ecology* **31**: 175-205.

Turnbull-Kemp, P.St.J. (1960a). Quantitative estimations of populations of the river crab, *Potamon (Potamonautes) perlatus* (M.Edw.) in Rhodesian trout streams. *Nature* **185**: 481.

Turnbull-Kemp, P.St.J. (1960b). Trout in Southern Rhodesia - 6: Wildlife of the trout streams. *Rhodesian Agricultural Journal* **57**: 134-140.

Van der Zee, D. (1981). Prey of the Cape clawless otter. *Journal of Zoology* **194**: 467-483.

Verwoerd, D.J. (1987). Observations on the food and status of the Cape clawless otter *Aonyx capensis* at Betty's Bay, South Africa. *South African Journal of Ecology* **22**: 33-39.

Warren, C.E., Wales, J.H., Davies, G.E. & Doudoroff, P. (1964). Trout production in an experimental stream enriched with glucose. *Journal of Wildlife Management* **28**: 61 7-660.