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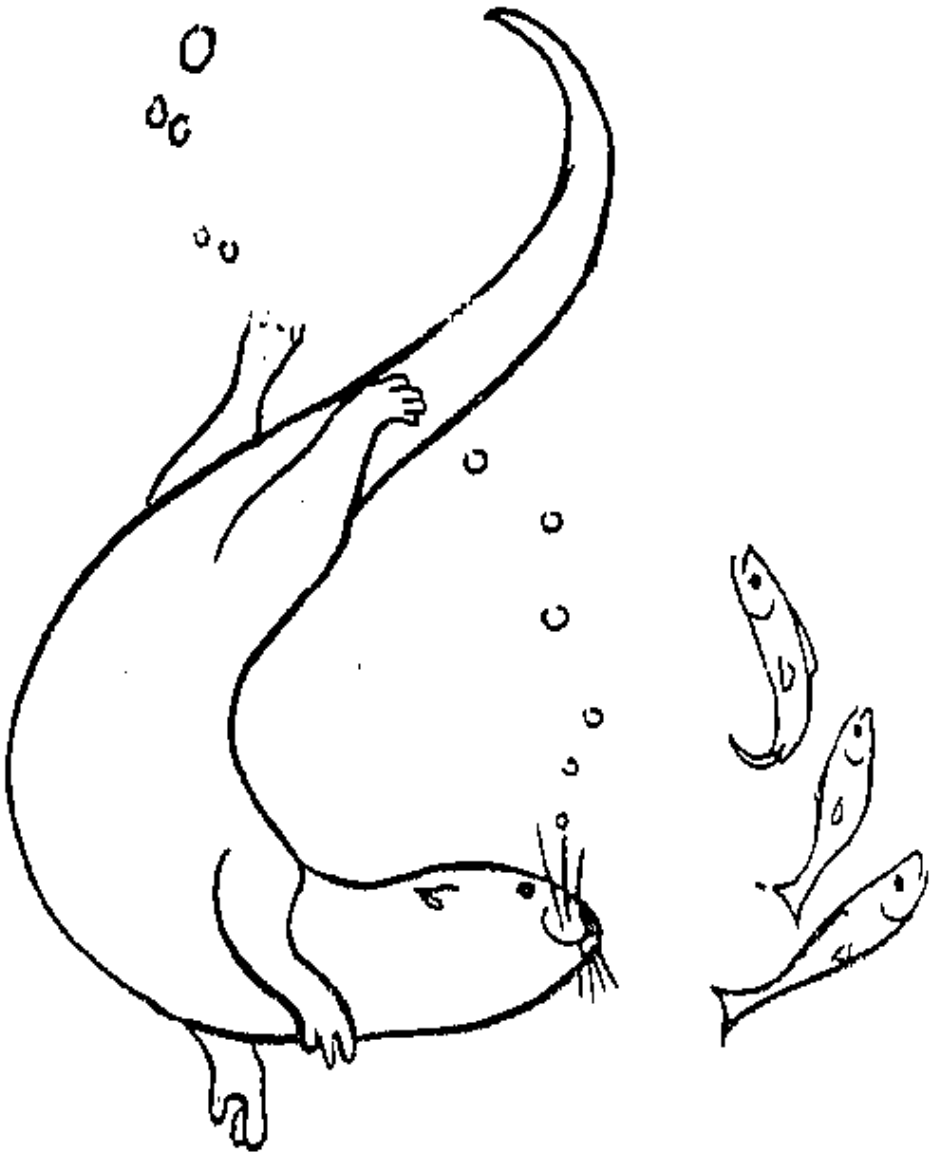

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IUCN OTTER SPECIALIST GROUP BULLETIN

The Bulletin appears annually. News items, short articles, reports, symposium announcements and information on new publications are welcome. All submissions should be typed in double-spacing. Articles should not exceed 2000 words in length i.e. about 7 pages of double-spaced type, including diagrams and tables.

Submit articles for publication to Dr D T Rowe-Rowe, PO Box 662, Pietermaritzburg, 3200 South Africa.

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IUCN/SCC OSG GROUP

The Otter Specialist Group is now facing its biggest challenge since the development of our Action Plan, the reality of translating this plan into real conservation fiction. Now that our Action Plan has been in print for two years, it is time for another stage of development to begin. As you know, our document, "Otters, an Action Plan for their Conservation" did a reasonable job of showing the state of our information (or lack of it!) about the status of otter populations in most countries worldwide. Although this is a useful reference book, it is difficult to translate this document into fundable(indabla proposals to initiate further conservation action.

Accordingly, in 1993, I would like to focus our efforts on developing particular and well-designed proposals to generate the funding necessary for our work to continue and expand. These projects, to be successful, need an interdisciplinary focus, with conservation and with other taxa that share our otter habitats. To this end, I am working on forging closer ties for our group with other related IUCN Specialist Groups, including those concerned with marine mammals, river turtles, crocodilians, other small carnivores, as well as with the Wetlands Programme and Ramsar.

Your help is needed individually to insure the success of this effort. As a goal, we need to develop a few interdisciplinary proposals for each of our regions that are designed around tin conservation needs and funding sources for these areas. The IUCN/SSC Sir Peter Scott Fund has made a small amount of funding available to us to develop these regional proposals and locale funding for them. In the upcoming months, your regional coordinators and 1 will look to all of you for your ideas for projects, your suggestions for possible funding sources and for your help in taking the Otter Specialist Group to its next stage of development.

I hope to see many of you in South Africa in September where we can work together to shape the future of our group and the species and habitats we represent worldwide. If you cannot attend this meeting, your input is still very valuable to all of us. Your regional coordinators and I look forward to hearing from you and to working closely with you in 1993.

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R E P O R T

SURVEY OF A TRANSLOCATED SEA OTTER POPULATION

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Abstract: The Washington sea otter population is important because it is the only one having the dual distinction of becoming successfully established and being intensively monitored. Fifty-nine sea otters were released off the west coast of the Olympic Peninsula of Washington State during the summers of 1969 and 1970; all had been translocated from Amchitka Island, Alaska. In 1970, 30 otters were released. Surveys to assess the results of this translocation began in 1977. Since we began our current survey method in 1989, the population has grown, despite the oil spills of 1988 and 1991, at an average rate of about 16 % a year. In 1991 a large group broke away from the main population and established itself in Makah Bay about 15 km north of where they were the previous year. Females with pups now occur from Duk Pt to Destruction island.

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 during the summers of 1969 and 1970 (Jameson et al, 1982); all had been translocated from Amchitka Island, Alaska. In 1969 the otters were released, with no time to acclimate or recondition their fur, directly to the open ocean. Sixteen of the 29 sea otters translocated in 1969 were found dead within 2 weeks on beaches near the release site. No doubt some carcasses 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 1970s. No surveys were conducted to assess the success of this translation until 1977 (Jameson el al. 1982, 1986, Table 1). All sites within the study area are located off the west coast of Washington's Olympic Peninsula between Destruction Island (47°40.5'N; 124°29.1'W) and Cape Flattery (48°23,5'N; 124°44,1'W). From 1977-1981 surveys were conducted by U.S. Fish end Wildlife Service (FWS) biologists. Since 1985 surveys have been conducted cooperatively by FWS and Washington Department of Wildlife (WDW) biologists.

METHODS

The 1992 survey was conducted from 6 through 8 July, The entire coastline from Pt Grenville (47° 18,8'N; 124°16,6'W) to Cape Flattery was surveyed. Most of the population was surveyed from a fixed-winged aircraft, but three ground stations were occupied (Sand Pt, Cape Alava, and Makah Bay). The survey spanned a three day period. Two complete counts of the sea otter range were made each survey day, conditions permitting; ground counters, with the aid of 50X telescopes and 10x50 binoculars, kept more or less continuous tallies of the sea otters in their respective areas. Both ground and aerial observers recorded otter numbers and locations on field maps for later entry into a computer database. Each replicate total is the sum of aerial plus ground counts. Therefore, two complete counts of the population were made each day, weather conditions permitting.

RESULTS AND DISCUSSION

Conditions in 1992 were generally good. Morning fog hampered the operation somewhat, and on 7 July precluded one survey. Thus, 5 counts of (he entire range were completed, 2 on 6 July, I on 7 July and 2 on 8 July. The variation among counts was somewhat higher than previous years (CV = 21,3 %), which was due, primarily, to variation among aerial counts. This was not unexpected because conditions were poor for aerial observations during several of the replicates. The highest count was on 7 July when 298 sea otters (268 independents, and 30 pups) was tallied between Pt. Grenville and Cape Flattery. However, the Makah Bay male group was very difficult to count on 7 July because of rough water and

boats disturbing the sea otters. On the previous day 57 were seen in Makah Bay, and on 8 July 60 were observed in the same areai. There was no evidence of a shift between Makah Bay and Cape Alava, the nearest other concentration of otters, so I included the high Makah Bay count in the survey total. The total was, therefore, reached by summing the highest daily count for the southern (Destruction Is to La Push) and northern sections (La Push to Pt. of Arches + Makah Bay). The result is 313 sea otters counted off the Washington coast in July 1992 (Table 1). This is an increase of over 13 % from the July 1991 count of 276.

Table 1: Results of surveys of the sea otter population in Washington, 1977-1992.

YEAR	Number Independents	Pups	Total
1977	15	4	19
1978*	12	0	12
1979	NO SURVEY		
1980	NO SURVEY		
1981	35	1	36
1982	NO SURVEY		
1983	48	4	52
1984	NO SURVEY		
1985	60	5	65
1986	NO SURVEY		
1987	89	5	94
1988	NO SURVEY		
1989	198	10	208
1990	197	15	212
July 1991	259	17	276
Oct 1991	242	20	262
1992	283	30	313

*The 1978 results are probably not indicative of the actual number of sea otters in the population because Inclement weather conditions precluded a thorough survey of the south portion of the range.

In 1988 and again in 1991 the outer coast of the Olympic Peninsula was hit by two spills of bunker fuel oil, both from shipping accidents. The 1988 spill occurred in December; the 1991 spill in late July. Over 1 million litres were spilled in 1988; the 1991 amount was similar.

The sea otter population was relatively unaffected by both spills, although thousands of seabirds died in each. No oiled sea otters were found in 1988, and only one was found in 1991. This animal did, however, die of complications caused by oiling (Nancy J. Thomas, DVM, National Wildlife Health Research Centre, Necropsy Report). In 1991 the spill occurred within two weeks of tho completion of our July survey. In addition to the effort directed toward carcass recovery, the FWS and WDW conducted a follow-up survey two months after the spill. Results of that survey were not significantly different from the pre-spill count of 276 (Table 1.). By the time the oil reached the otter range it had degenerated to relatively small patches and most of the volatile compounds had evaporated leaving what is referred to as mousse. Unlike during the Exxon Valdez oil spill, Washington sea otters escaped contact with freshly spilled oil because of its patchy distribution and condition when it reached the sea otter range.

Since we began our current survey method in 1989, the population has grown, despite the oil spills of 1988 and 1991, at an average rate of about 16 % a year. When we began our surveys in 1977 (Jameson *et al*. 1982) the population was distributed between Destruction Island and Cape Alava, a distance of about 60 km. In 1992 the population was distributed between Destruction Island and Makah Bay, a distance of about 80 km. Prior to 1991 the distribution had changed little from what it was in 1977. Until then all the population growth had taken place within the 1977 boundaries. In 1991 a large group broke away from the main population and established itself in Makah Bay about 15 km north of where they were the previous year. The distribution of 1992 was similar to 1991. Females with pups now occur from Duk Pt to Destruction island. The behaviour of, and the lack of pups among, the sea otters in Makah Bay indicates a large group of males. The low pup ratios noted at Destruction Is also suggests the sex ratio there may be skewed toward males. Sand Pt seems to be a site favoured by females with pups. Fourteen pups and 28 independent animals were counted there on 8 July 1992, a ratio of 50:100.
The Washington sea otter population is important because it is the only one having the dual distinction of becoming successfully established and being intensively monitored. Other populations have been

successful, but few data are available on their patterns of growth. Others that have been intensively monitored, Oregon and San Nicolas Island, California, have failed, or appear to be heading toward failure (Jameson *el al.* 1982, Rathburn *et al*. 1991). The Washington sea otter population will continue to be monitored and plans are in place to expand the study to include collection of data on female reproductive rates and pup survival. This information, and the population growth data, will provide a basis for comparison with populations that are either stable or growing at rates below what is expected for populations reoccupying historic habitat. The southern sea otter (*E. l. nereis*, Wilson *et.al.* 1991) population in California is one such a population. Since 1982 this population has grown at 5,1 % per year, considerably lower than the Washington population and lower than most sea otter populations for which growth rates are available. Contrasting the reproductive and pup survival rates of the Washington and California populations will hopefully provide insight into why the growth rates are so different, if not tell us what is causing the difference. Once that point is reached, researchers can attempt to uncover the cause or causes of the differences.

REFERENCES

Jameson, R.J., Kenyon, K.W., Johnson, A.M. & Wight, H.M. (1982) History and status of translocated sea otter populations in North America. *Wildlife Society Bulletin* **10**: 100-107.

Jameson, R.J., Kenyon, K.W., Jeffries, S. & VanBlaricom, G.R. (1986). Status of a translocated sea otter population and its habitat in Washington. *The Murrelet* **67**: 84-87.

Rathburn, G.B., Jameson, R.J., VanBlaricom, G.R. & Brownell, R.L. (1990). Reproduction of sea otters to San Nicolas Island. California: Preliminary results for the first year. Natural History Foundation of Orange County, CA., Occasional Papers 99-114.

Wilson, D.E., Bogan, M.A., Brownell. R.L. Jr., Burdin, A.M. & Maminov, M.K. (1991). Geographic variation in sea otters, *Enhydra lutris*. *Journal of Mammalogy* **72**: 22-36.

REPORT

OTTERS AND GILLNET FISHING IN LAKE MALAWI NATIONAL PARK

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Abstract: At the south end of Lake Malawi, the small national park is home to spotted-necked and Cape clawless otters. The park contains five enclaved villages that depend on gillnet and longline fishing for their livelihood. The author surveyed the fishermen of Chembe village for fishing methods, gear and problems with animals. Theft of fish from nets by otters was complained of, but there were no reports of otters drowning in gillnets. The author intends to extend his survey to the other four villages in Lake Malawi National Park.

Lake Malawi is the southernmost basin in the African Great Rift Lakes system and contains the most diverse community of freshwater fishes in the world, with approximately 1000 species. Lake Malawi National Park was created in 1980 at the southern end of the lake to protect a representative sample of these fishes and their habitats. The park encompasses much of the rocky Nankumba peninsula as well as 13 islands scattered around it, and includes a 100m aquatic zone along its shorelines. This area is also home to many other animals such as birds, hippopotamus, crocodiles, monitor lizards, turtles, and two species of otters. Both the spotted-neck otter *Lutra maculicollis* and the Cape clawless otter *Aonyx capensis* occur in the park, and are common at some localities.

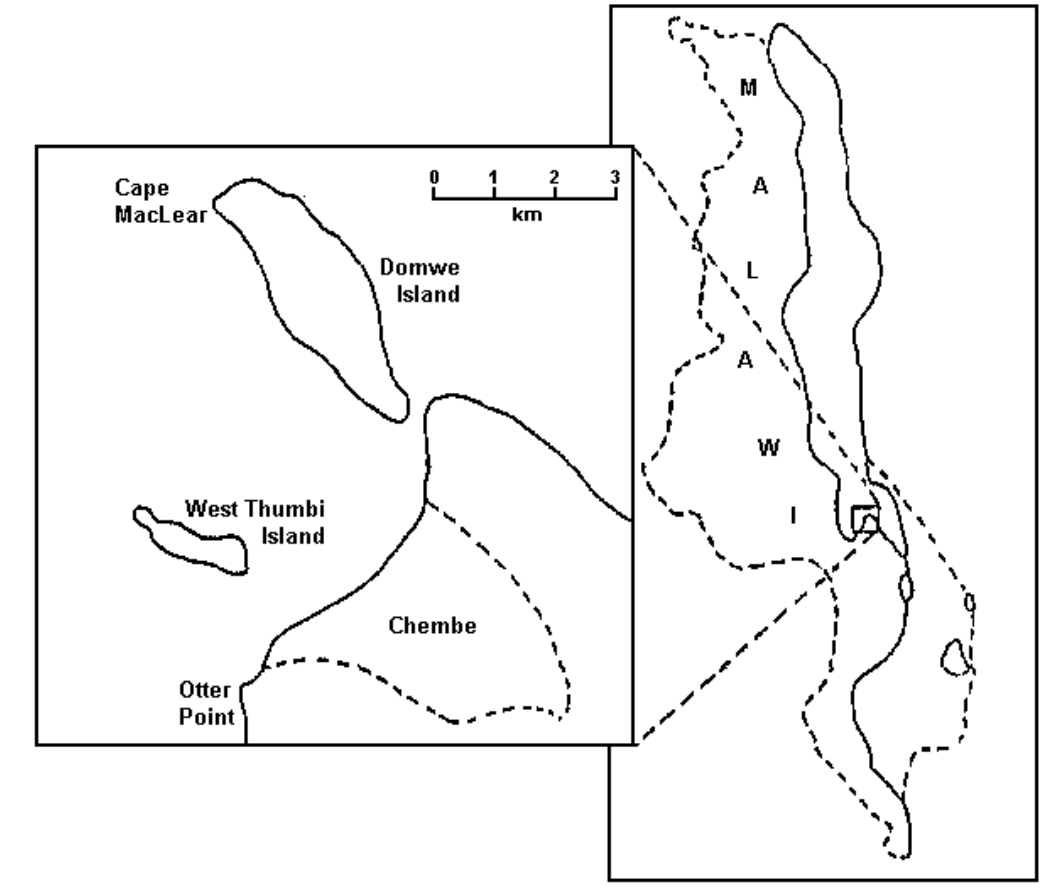

Figure 1. Location of Cape MacLear and the Chembe village enclave in Lake Malawi National Park

Although the park is small (87 km^2), it contains five enclave villages with a combined population of nearly 10 000 people. These villages are almost completely dependent on fishing for their livelihood, hence the area is subject to intensive fishing pressure. The 100 m aquatic zone is closed to fishing, but certain fishing gears are regularly used very near or inside this zone. Open-water seine nets ("chirimila") are sometimes pulled towards shore by fishermen standing on the rocks, while gillnets and longlines are often set perpendicular to the shore with one end in the aquatic zone.

I began a research project in 1992 on the fishery of Chembe village (Fig.1), the largest of the enclave villages with a population of 4700 people. Since favoured fishing areas and prime otter habitat seem to overlap, especially at Domwe Island, West Thumbi Island, and Otter Point, I decided to look at the effects of this fishery on the otters. The only gear which appears to pose a threat are the gillnets as otters can become entangled in them and drown. Thus the objects of this study are to determine which otter species occur in the area, the incidence of otter mortality in gillnets, and which areas may require further protection

METHODS

Chembe fishermen were surveyed and observations were made to find out where otters are common and which species occur in the area. The number of gillnet fishermen in Chembe village, the total length of all gillnets combined, and preferred gillnetting areas were also determined. A sample of gillnet fishermen was interviewed about problems they have with otters and the incidental catch of otters and other animals in their nets. Currently, gillnet catches are being examined to check for drowned otters and otter-damaged fish, and gillnetting techniques in otter inhabited areas are being observed.

PRELIMINARY RESULTS AND 1993 PROGRAMME

Otters were frequently seen from January to August 1992, around Domwe Is., West Is., and Otter Point by myself and other park staff, and fishermen reported seeing otters very often around the two islands. From September to November 1932, a volunteer and I searched for otters in the Otter Point area during the first or last hours of daylight approximately 50 times. In total 24 sightings of 1-4 individuals were made, and 5 otters were positively identified as spotted-necked otters by their neck markings. \of these, 4 individuals were seen playing together on a rock. All other otters worn either swimming or diving in the lake but their small size (1 m) suggests that most or all of these were also this species, and of course it is possible that the same individuals were seen repeatedly.

While the majority of otters sighted thus far in the Cape MacLear area appear to be spotted-neckod otters, one otter seen in nearby Monkey Bay in June 1992, was positively identified as a Cape clawless otter. Although this was a juvenile about as big as an adult spotted-necked otter, it was easy to identify as it was chased into my office by dogs, where it promptly curled up in a corner for a nap! It was rudely awakened and returned to the lake unharmed. The habitat in Monkey Bay is similar to that around Chembe village with rocky shorelines bordering a beach, so this species may occur throughout the park.

The survey of Chembe fishing gear revealed 18 gillnet fishermen operating a total of 7,5 km of net with mesh sizes varying from 65 to 125 mm. Individual gillnets are from 200 to 700 m in length and 1,7 to 5,0 m deep. Preferred gillnetting areas are Domwe and West Thumbi Islands, with Otter Point and Chembe beach being of secondary importance.. About 75 % of all gillnetting takes place around Domwe Is.

In September 1992, 16 of those gillnet fishermen were interviewed about problems they have with animals. All complained vigorously about otters eating fish caught in the nets, and crabs, turtles and crocodiles wore also mentioned as problem animals. However, none of the fishermen reported ever catching an otter in the nets nor had any of them ever heard of this happening. They did say that turtles and crocodiles are caught occasionally in their nets, and on 4/1/93 a juvenile crocodile was brought to me which had become entangled in a gillnet and drowned. Gillnet fishermen may be reluctant to mention that otters are caught in their nets since otters are usually seen in the park where gillnet fishing is prohibited.

In January 1993, I started examining gillnet catches and observing gillnet fishing techniques as part of my ongoing village fishery study. I look for drowned otters, note otter damage to fish and nets, ask fishermen about otters, and observe the setting and retrieval of gillnets. I plan on collecting those data on a weekly basis until October 1993. In July, I will extend the otter study to the other four enclave villages where the numbers of gillnets will be counted and gillnet fishermen interviewed about otters as was done in Chembe.

R E P O R T

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

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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.

SHORT COMMUNICATION

CURRENT OTTER STUDIES IN SOUTH AFRICA

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Two studies on South African otters are currently being undertaken: one in the Cape Province and the other in Natal.

In the Cape Province Jan Nel and Michael Somers, of University of Stellenbosch, are continuing research on the clawless otter Aonyx capensis (see OSG Bulletin 7: 36). The current project. "Otters as bio-indicators in freshwater ecosystems" will run for three years. Surveys of five river systems will be undertaken to investigate otter abundance in relation to prey availability, vegetation characteristics, presence of pollutants in both water and prey, human disturbance, and other possible factors. In one area a more detailed study will be undertaken, concentrating on otter density, dispersion, habitat use, diet and prey availability. Finally, a model will be constructed, based on otter abundance, for predicting levels of habitat disturbance or degradation in other river systems.

Caterina Carugali has started a project in the Natal Drakensberg Park, under supervision by Mike Perrin (University of Natal) and me (Natal Parks Board) on habitat, prey, and area requirements of otters in the Natal Drakensberg. Three rivers within the mountainous 240 000 ha park will be surveyed, as well as at least one stretch of one of these rivers flowing through farmland. The aims of the project are to determine the area requirements (length of stream per individual) of both the clawless otter and the spotted-necked otter Lutra maculicollis; identify characteristics of the habitat and prey availability which influence otter abundance; provide management guidelines and identify areas which can be managed to benefit otters; and formulate an index which can be used to assess other streams.

REPORT

ŤREBOŇ BIOSPHERE RESERVE OTTER PROJECT

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Abstract: A project on the ecology of otters in the Ťreboň Biosphere Reserve is proposed. Until recently, this network of man-made wetlands has been excellent otter habitat, with sustainable exploitation by both man and nature. In recent years, economic factors have led to this balance being distorted in man's favour, with habitat destruction, pollution and calls for compensation for otter damage to fish farms, and even the right to kill otters. Little is known of the current status of the otter population in the reserve, and this project aims to address this and to form a Ťreboň Otter Protection Plan.

This article is a summary of a proposal for a long term research project into the ecology of the otter Lutra lutra in the Ťreboň Biosphere Reserve. The project will be a cooperation between the Czech Institute for Nature Protection (ČUOP) and the Dutch Otterstation Foundation (SON), in close association with the Austrian Institute for Wildlife Biology and the British Institute of Terrestrial Ecology.

INTRODUCTION

The negative influences from man on the otter are all too familiar by now. Documentation of otter hunting for fur or pestilence control go back several centuries. From the 1950s onward, the indirect influence of man through pollution, habitat destruction and other methods began to play an even greater

role in the decline of the otter populations. The resulting decimation or complete extermination of most European otter populations are well documented. The otter is now registered as an endangered species in many European countries, including the ČFSR.

The actions of man have not always been detrimental to the otter. The development of the man-made wetland ecosystem which comprises the Třeboň Biosphere Reserve (South Bohemia) may serve as an example where the otter, till recently, has profited largely from man's activities. At present there are over 22 000 artificial fish ponds in South Bohemia, covering over 400 km^2 of water.

A large part of it is concentrated along the Lužnice River in the Třeboň Basin. Here the construction of a network of small and large fishponds with connecting canals started as early as the 13th century, with most of the ponds dating from between the 14th and 17th century. During the following centuries of constant management an intricate network of ponds, supply and drainage canals, rivers, brooks, marshes, peat bogs and wetland meadows developed into a wetland of international importance. In between the water bodies are mixed forests, pine forests and agricultural lands. There are only a small number of little villages in the area. A nice balance was established between the natural wetland growth and incursions necessary for proper economical management of the ponds, forests and agricultural lands.

In this artificial ecosystem the otter has established a thriving population. The fish ponds and the other water bodies provide a year-round supply of food. Not only in the form of commercial harvested fish but also with numerous other fish and other prey species which profit from the eutrophication for fish production. Constant water management and mechanical whirling keep part of the water bodies open, even in the most severe winters. Vegetation in this wetland ecosystem developed into an ideal otter habitat. The hardly accessible read beds and marsh vegetation provide ample cover and quietness necessary for holts and suitable breeding places.

However, in spite of the nationally and internationally recognised importance of this man-made ecosystem it is severely endangered. During the second half of this century the activities in all economic sectors increased to meet the demands for bigger harvests and shorter harvest cycles. In the last two decades the economical pressure rose to a level where interests of each sector conflict with those of the other sectors and that of nature conservation. A heavy burden has been put on the ecosystem through the abundant use of artificial fertilizer for both agricultural and piscicultural use, shortening of the fish harvest cycle, the use of heavy machinery for the cleaning of the ponds, streams and river banks, increase in industrial and agricultural waste, increase in recreational pressure, etc. The otter population can become an easy victim of these economic developments. Privatisation of the fish ponds and the resulting increasing economic pressure has already led to increasing complaints about the otters preying on the fish in ponds. As a result the requests for compensation and even legal killing of otters to protect the crop are rising. The risk of illegal killing to save expensive fencing will rise accordingly. The increase in recreational pressure and the use of heavy machinery increase the level of disturbance and can also become a threat to the presence of the otter and the conservation of suitable otter habitat. The levels of the different forms of water pollution are also increasing steadily. With the increasing levels of pollutants the long-term preservation of the otter population in this Biosphere Reserve will be, or is already, severely at risk.

WHY THE ŤREBOŇ BIOSPHERE RESERVE OTTER PROJECT?

The presence of any endangered species in a Protected Landscape or Nature Reserve warrants a study into the role and conservation needs of that species within that reserve. More specific, during several international otter symposia and workshops the need to study and protect existing otter populations is repeatedly stressed. Especially the good populations should receive extra-attention: "conduct the necessary research to identify regional conservation problems and to establish a sound scientific basis for maintaining viable populations" (Resolution of the Fifth international Otter Colloquium).

However, little is known about the actual status of the Třeboň otter population. The proposed project is designed to fill this gap in knowledge. Another important aspect of this study will be the formulation of a regional otter conservation plan: The Třeboň Otter Protection Plan. This plan should entail an evaluation of the specific values of this ecosystem as otter habitat. Recommendations will include, amongst others, maximum acceptable pollution levels, the preservation of specific core areas as breeding reserves, river management, water management and the improvement of the ecological

infrastructure to enable safe migration. The study should be accompanied by a long term monitoring programme on the results and the full implementation of the Ťreboň Otter Protection Plan. The results of the study can also be used for the development or habitat management of other (new) wetlands.

As has been expressed in several international publications, conservation of the otter is more than just conservation of yet another endangered species. As an opportunistic predator the otter occupies a large distribution, both in area and in different habitat types. However, as top predator in an aquatic environment the otter is highly sensitive to every form of disturbance, pollution and habitat destruction. This sensitivity makes the otter a good indicator species for the status of its environment and especially of clean water and sound water management. Most people are not very familiar with the otter and its appearance owing to its nocturnal life style. Once people become familiar with the otter, however, they mostly become attracted to this playful animal. This attraction enhances its role as ambassador for a clean environment. In the Ťreboň Biosphere Reserve the otter can play just such a role. By accepting the otter as key species another step in the full implementation of the concept of the Man And Biosphere programme (the international UNESCO programme for Biosphere Reserves) will have been made. With the increasing threat to, and the ongoing destruction of, this unique ecosystem and its inhabitants, any extra attention and pressure may shift the balance back towards sound ecosystem management.

The above-mentioned arguments stress the need for a long term research and protection programme for the otter population in the Ťreboň Biosphere Reserve! The fact that the otter in this reserve has been neglected till now makes the need for this project even more pressing.

SHORT COMMUNICATION

WEST JAVAN OTTER SURVEY PLANNED FOR 1993

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In cooperation with PHPA (Directorate General of Forest Protection and Nature Conservation) and AWB (Asian Wetland Bureau-lndonesia, I will conduct an otter survey in West Java as part of my MSc research. Although all four Asian otter species (Lutra lutra, Lutra perspicillata, Lutra sumatrana, Aonyx cinerea) have been historically reported from West Java, no survey has over been conducted on the actual distribution, different habitat use, and ecological demands of the probably coexisting species. Reports of otter sightings have decreased drastically over the last 30 years, possibly indicating a tremendous decline of otter populations in West Java.

Total conversion of different tropical forest types, particularly mangroves, lowland forest and riparian woodland, have already completely changed the original habitat of many species, including most of the mammals in West Java. As there is not much unused land left in the province, agriculture and aquaculture have to become more intense over the next 20 years.

Otters are affected in every part of the province of West Java, especially in the highly populated fertile plains. They are being threatened by a combination of habitat destruction, hunting, trapping, and environmental pollution. The lack of precise field data about species distribution, ecology and species values in both, natural and cultivated areas, hampers the development of an appropriate management and protection strategy.

The main object of the project is to improve the knowledge on West Javan otter species in a broad sense, and to develop a regional action plan for otter conservation. Present distribution and status will be evaluated and otter habitats will be assessed. PHPA field staff will be trained on-thn-job for otter surveys and for awareness consultancy in rural communities. A joint
PHPA/AWB-lndonosia otter awareness campaign will follow the first phase of this project which is scheduled to start in May 1993.

R E P O R T

THE EURASIAN OTTER ON THE THAINGUEN PLATEAU (VIETNAM)

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Abstract: Spraint surveys were carried out in two locations on the Thainguen Plateau, in northern Zilai province, Thailand in 1989-90, for *Lutra lutra barang*. Fish, amphibians and crabs form most of the diet. Spraints in wooded areas were mostly on logs and stones in rivers, but in open areas, they are found on the river banks. Where otter spraint is found, no other droppings of carnivores that mark territory thus were found. The otters moved about 3 km per day. In places of plenty of food and holts they can stay for some days. After 15-20 or more days otters again cover the same route within their home range.

The otter, which inhabits Indochina belongs to the form *Lutra lutra barang* F. Cuvier, 1823 (Heptner et al, 1967). Very little is known about the ecology and biology of this otter form (Pierce et al, 1990; Foster-Turley el at.. 1990). Thus our data about this otter form collected in South Vietnam are of certain interest.

The study was carried at two localities in the northern part of the Thainguen Plateau in Zalai Province (formerly Zalai-Kontum) in December of 1989 and January of 1990. The first locality is in the upper reaches of the Ba and Kon rivers, approximately 75 km north of Ankhe city and is in the primary tropical forest, 900 m ASL. The second locality is situated more to the south. It is in the suburbs of Buon Lyoi, 50 km north of Ankhe city and also belongs to the high primary tropical forest, 600 to 700 m ASL. Both areas have low human population density.

In total 45 segments of riverbank, each 1000 m long, were searched for the signs of otters. The greatest area searched lay along the Thia and Buon Lyoi rivers and their tributaries. The spraints on the sand bars, stones and logs in the stream as well as other otter signs were mapped. On the sand bars otters scraped up sand into small mounds and defecated on top. In the faecal deposits there were commonly 1-8 spraints. In some cases higher numbers of spraints were found. It is interesting to note that on stones, logs and sandy bars with otter spraints, there were no faeces of other mustelids, viverrids or other tropical carnivorous animals which mark their territory. If the substratum was suitable, other traces should have been found too.

Otter spraints were dried, broken and analysed. Five prey classes were present in the diet of otters of Thainguen Plateau: fish (14-85 %), amphibians (9,5-57 %), crabs (3,8-54,2 %); water insects and snails were of minor importance in the diet (0,8-8,0 %). Considerably greater densities of spraints were found in the junctions of rivers and their tributaries. On the Thainguen Plateau traditional places (sprainting sites) were used for scent marking. Such sprainting sites occurred most frequently at the intervals of 2 to 10m, sometimes, 200 to 300 m. Intervals of 200-300 m without sprainting sites most probably do not disrupt the information necessary to moving otters. The sprainting sites were found mostly on stones (49.2 %) and logs (28,6 %). We want to stress that in woody areas sprainting sites of otters were mostly found in the river, whereas in open areas - on river banks. In woody areas otters have presumably more dangers, thus they choose stones and logs in the river as the places for sprainting. Our data show that the otter moves about 3 km per day and makes periodical movements from one site to another within its home range. In places of plenty of food and holts they can stay for some days. After 15-20 or more days otters again cover the same route within their home range.

REFERENCES

Foster-Turley, P., Macdonald, S., & Mason, C. (Eds) (1990). Otters. An action plan for their conservation. 126pp. IUCN, Gland, Switzerland.

Heptner, V.G., Naumov, N.P. Yurgenson, P.B., Sludsky, A.A., Chirkova, A.F. & Banikov, A.G. (1967). Mammals of the Soviet Union. Vol. 2. Part I. Moscos. 1003pp. [In Russian].

Pierce, G.J., Harding, M,, Spray, C.J., Vitale, A., Stuart, E., Conacher A., Readman, F., Galbraith, C., & Robinson, I. (1990). Otters of Lake Songkla, Southern Thailand. Otters. The Journal of the Otter Trust. Vol. 2. No. 4. p. 25-32.

REPORT

THE NEOTROPICAL RIVER OTTER *Lutra longicaudis* IN IBERÁ LAGOON, ARGENTINA

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Abstract: The neotropical river otter has suffered intense hunting pressure in Argentina. Over the last two decades, hunting has decreased. A survey was carried out in an area where otters appear to be abundant, the Iberá Swamps and Lagoons Reserve, where the government has concentrated conservation efforts. A good population was found here and in several other lagoons in the reserve, but not in the total area because hunting is not controlled in most of the large extension of the reserve.

Very little is known about the neotropical river otter, *Lutra longicaudis* in Argentina, as in other Latin-American countries inhabited by the species. Some reports came from Mexico (Gallo 1986, 1989), Brazil (Blacher 1987, 1992b). and recently Uruguay (Bardier 1992a, b). This widely ranged otter has suffered a high hunting pressure in the current century, for its pelt, and has disappeared from many areas where it was abundant in Argentina. But in the last two decades the hunting decreased, and otter populations seem to have recovered in parts of its original range. Currently, one of the most profitable habitats of the neotropical otter in Argentina is the Iberá Swamps and Lagoons Reserve, an important wetland system in the northeast of the country.

THE AREA

The Iberá Swamps and Lagoons Reserve (13 000 km^2) is situated in Corrientes province (Figure 1). The environment consists basically of a vast green extension of aquatic and semi-aquatic vegetation (*Scirpus californicus*, *Cyperus giganteus*, *Fuirena robusta*, *Thalia multiflora*, *Typha* spp.), interrupted by several clearwater ponds, blocked short streams, and lagoons of 3-5 m deep. A particular low density floating soil, locally known as "embalsado" is the substratum of a poorly distributed woody vegetation (*Erithryna crista-galli*, *Nectandra falcifolia*, *Sapium haematospermum* Neill 1981).

In the Iberá Lagoon - where the local authorities put their major conservation effort - otters have recovered since the ban on hunting in the early 1980s. In this report I'll summarise the most important points after six visits to the area (1989-1992).

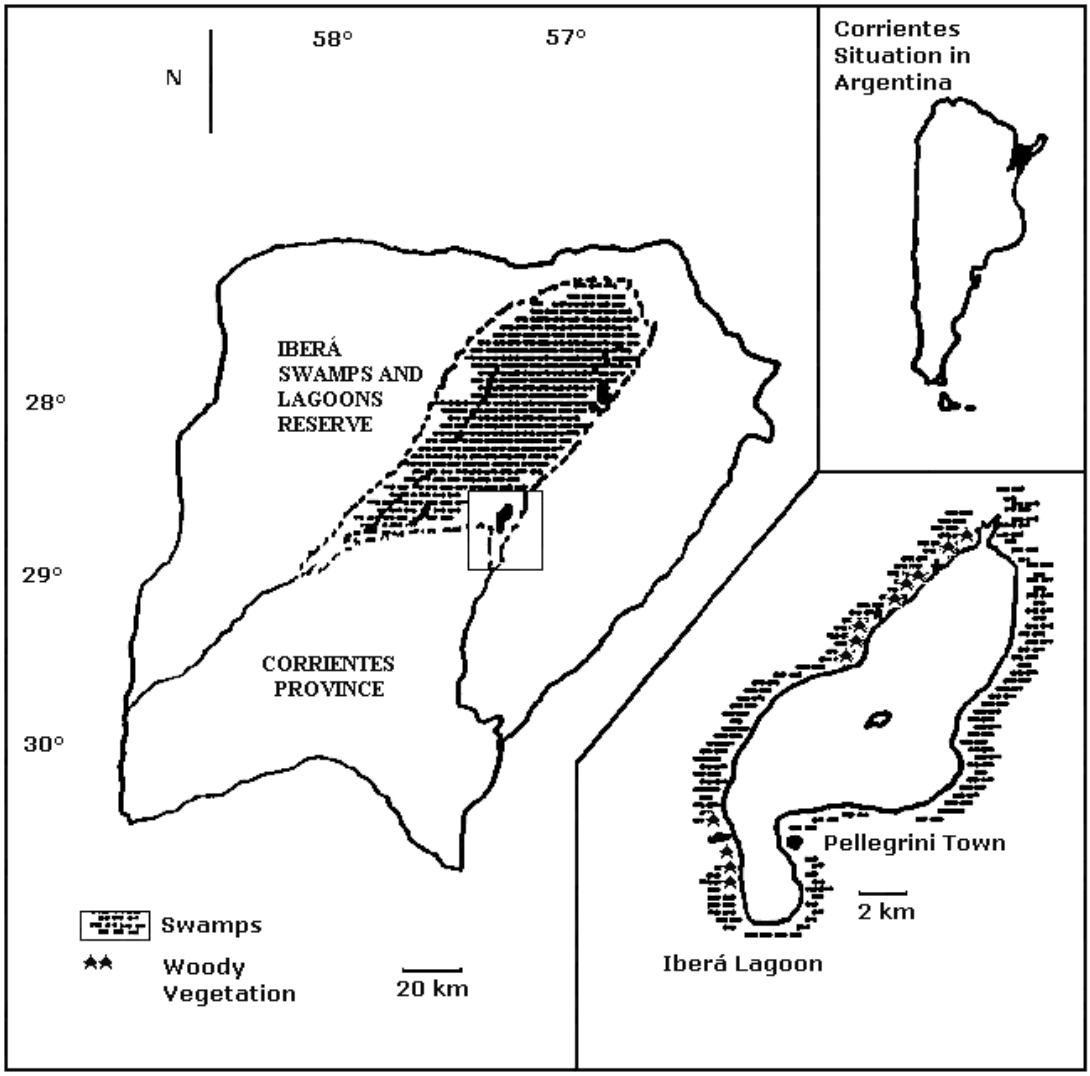

Figure 1: Location of study area

DIURNAL ACTIVITY

The otters show little fear and can be observed during daylight. During journeys searching for otters by canoe, I got an average of one sighting every 1-3 hours. Foraging activities occur all day, but were more frequent in the middle and late afternoon. Most of the sightings were of lone animals. Groups always consisted of a female with her cubs (1 or 2 in all cases recorded).

Nocturnal activity was recorded once. Tomás Waller, searching for caimans at night, told me he had never seen otters in his nocturnal surveys, using potent spotlights. I think otters could move nocturnally. but it is difficult to detect them without telemetry.

FOOD HABITS

Foraging behaviour is similar to that described for the European otter (Erlinge 1968, Mason & Macdonald 1986). Smaller prey items are consumed in the water, making several swallowing head movements at the surface, and large ones are grabbed with the claws and taken ashore.
Food availability seems to be high in the lagoon, and otters are successful in their dives (e.g. I saw an adult female with her one-year-old cub pursuing and catching six different sized fish in twenty minutes).

An analysis of an initial spraint sample (n = 46) shows mainly fish (relative frequency = 85 %), consisting of *Cichlidae* (34,5 %), *Erithrinidae* (16 %) and *O. siluriformes* (13,5 %). Crabs seam to be an important item, more in winter (13,4 %) than in summer (3,9 %). Molluscs, reptiles and rodents are much less important (Parera 1992).

Fast-moving fish, like the aggressive and more abundant piranha (*Serrasalmus* spp.) seems to be avoided by the otters.

SPRAINTING

Lutra longicaudis seems to prefer solid, dry and high platforms for sprainting, e.g. root systems of *Nectandra falcifolia*, rocks of an artificial embankment, and planks under a bridge. Where these surfaces are not available, otters spraint on the embalsado, humid, and frequently flooded surface.

Sprainting is more important during the winter season (e.g. at an exceptional sprainting site I found more than 50 faeces in the winter and only one in the summer). Green jelly-like secretions (as those described for *Lutra lutra*) were frequently found in the winter, but scarce in the summer.

NUMBERS

In Iberá lagoon otters are frequently seen, approaching 5-6 m from the observer, uttering their typically inquisitive "hahh". This allowed us to count otters directly, using a linear transect method.

In collaboration with the Reserve Guardians I made partial and total counts along the Lagoon perimeter (54,5 km), and estimate a number 80-140 otters living along the shoreline. The otter density is high - similar to those found from other *Lutra* living in coastal habitats - (Kruuk et al, 1987; Beja 1991), which points out the high productivity of the system (Parera 1993).

CONSERVATION

By the 1970s the *Lutra longicaudis* population of the Iberá area (not only the lagoon) was very low due to the excessive illegal hunting. As local people told me "to find an otter was almost impossible". Since 1983, when the area became a wild-life reserve and the authorities emphasized their efforts to control the lagoon, the otter population recovered rapidly. The same occurs in several other lagoons in the reserve, but not in the total area because hunting is not controlled in most of the large extension of the reserve (official financial support is the major problem).

As this is the most important area for this otter, conservation efforts should be strengthened.

ACKNOWLEDGEMENTS *- I thank Dr Pedro Pere Muñoz and Dr Vincente Fraga, Directors of the Iberá Reserve, and all staff who assisted me in the field. The work was possible thanks to FUCEMA and Dirección Nacional de Fauna Silvestre. I thank Dr Pablo Oliva for his interest and assistance.*

REFERENCES

Bardier, G. (1992)a. Uso de recursos y características del Hábitat de *Lutra longicaudis* en el arroyo Sauce, Uruguay. *Bol. Soc. Zool. Uruguay (2° época)* **7**: 59-60

Bardier, G. (1992)b. Hábitat u signos de actividad del lobito de río (*L. longicaudis*)- 5° Reun. Esp. Mam. Acuat. Am. Sur. ARC.

Beja, P. (1991). Diet of otters (*Lutra lutra*) in closely associated freshwater and marina habitats in south -west Portugal. *J. Zool. Lond*. **225**: 141-152.

Blacher, C. (1987). Ocorrencia e preservação de *Lutra longicaudis* (Mammalia - Mustelidae) no literal de Santa Catarina. *Boletim FBCN* **22:** 105-117.

Erlinge, S. (1968). Food studies on captive otters (*Lutra lutra*) *Oikos* **19**: 259-270.

Gallo. J. (1986). Otters in Mexico. *J. Otter Trust* **1** (10): 19-.24

Gallo. J. (1989). Distribución y estado actual de la nutria *L. longicaudis annectens* en la Sierra Madre del Sur, Mexico. Master's thesis. Univ. Mexico. 236 pp.

Kruuk, H., Conroy, J.W. & Moorhouse, A. (1987). Seasonal reproduction, mortality and food of otters (*Lutra lutra*) in Shetland. **Symp. Zool. Soc. Lond**. **58**; 263-278

Mason. C. & Macdonald. S. (1986). Otters: ecology and conservation. -Cambridge University Press. Cambridge

Neill, J. (1981). Panorama ecológico de los cuerpos de agua del Nordeste argentino. Sym. VI Jor. Arg.Zool. 115-151. Argentina

Olimpio. J. (1992). Consideraçoes preliminares sobre habitos alimentares de *Lutra longicaudis*, na lagoa de Peri. Brasil. Annales 3° Reun. Esp. Mam. Acuat. Am. Sur. 36-42.

Parera, A. (1992). Análisis de la dieta *Lutra longicaudis* en la laguna Iberá, Argentina. 5° Reun. Esp. Mam. Acuat. Am. Sur, Argentina.

Parera, , A. (1993). Aplicación de censos directos sobre la población de *Lutra longicaudis* de laguna Iberá, Argentina. XVI Reunión Arg. Ecol. Puerto Madryn, Argentina

R E P O R T

TOTAL MERCURY AND METHYLMERCURY LEVELS IN FISH FROM THE DEPARTMENT MADRE DE DÍOS, PERU

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Abstract: Very little is known about environmental contamination in most otter species. In the range of the Giant Otter, Pteronura brasiliensis, gold miners discharge a great deal of methylmercury into the environment, and this is known to biomagnify in the food chain. Assays for methylmercury were carried out on fish collected in the Madre de Dios department of Peru, from near gold mining areas, and also from more than 100km away; additional fish were obtained from fish markets. Results show that significant contamination occurs in fish bigger than the normal prey size of the otters, but at present, there are low levels in prey species - this should be monitored closely in future.

Despite growing concern and research interest in the contamination of otters and their food in Europe and North America (*Lutra lutra* and *Lutra canadensis*), very little is known about levels of hazardous substances in otters from other areas. In particular it could be of interest whether regions far away from industry and civilisation are contaminated too.

The giant otter *Pteronura brasiliensis* is categorized as almost extinct in two countries of its original distribution, seriously endangered in seven countries, and widespread only in Surinam and Guyana (Foster-Turley et al., 1990). In 1990 a long term investigation and conservation project on *Pteronura brasiliensis* was started by Frankfurt Zoological Society and Munich Wildlife Society. As part of the Giant Otter Project fish from the southeast of Peru (see Fig. 1) were analysed for their content of mercury and methylmercury. In the area of River Madre do Díos there are still huge parts of untouched tropical rainforest, however, local colonization and gold mining have started. Gold occurs as dust in the sediments of-the rivers and after concentration by washing the mixture of sand and gold is treated with mercury for extraction. With data from the "Banco del Minero" we assume the annual mercury discharge to be in the region of about 9000 kg. As methylmercury biomagnifies upward in the foodchain, top level predators such as otters may accumulate mercury up to toxic levels.

Figure 1: Location of Study Area

MATERIAL AND METHOD

All fish were collected in the Department Madre de Dios. They were caught in rivers and lakes close to the gold-mining activity, but also more than 100 km away in virgin areas, and additionally some were bought on local fishmarkets. Samples were taken from the following fish genera: *Potamorhina*, *Serasalmus*, *Plagioscion*, *Prochilodus*, *Cynodon*, *Myleus* and big catfish like *Pseudopimedolus* and *Pseudoplatystoma*.

Muscle samples wore stored either in formalin (10 %) or in absolute ethanol prior to analysis. Methylmercury was separated following the method of Bender (1989) using toluene as a solvent for the separation of organic from inorganic mercury. The disintegration is done according to the method of Schnitzer et al. (1987) using a microwave disintegrator (Prolabo Microdigest 300). Mercury levels in the solutions were detected by using Hitachi Z-8100 Polarized Zeeman Atomic Absorption Spectrophotometer with a hydride formation system. For proof of the method, total mercury concentration in a reference standard MA-A-2TM (fish), prepared by the IAEA was determined.

RESULTS AND DISCUSSION

The findings for the reference standard were between 90 % end 92 % of the given value. No corrections for mercury concentrations in fish were made.

Mercury levels in those fish which already have been analysed are below 0.2µg/g wet weight (ppm). This is in the range or slightly higher than the mercury level which is assumed to be tolerable for *Lutra lutra* (Hovens 1992). Six big fish (up to 50 kg) had a total mercury body burden of 0.46 to 1.55 µg/g wet weight which is lower than the levels for walleye (*Stizostedion vitreum*) reported from a mercury polluted river in Canada (Fimreite et al. 1973). There are many factors influencing the mercury levels in fish e.g. size of watershed, direct atmospheric deposition, local geology (Wren et at. 1988), low calcium level or pH (Wren et al. 1983). The explanation for the levels of mercury in our study might be owing to a combination of some of these factors.

Corresponding to results of Cappon et al. (1981) a similar proportion of methylmercury to mercury (61 to 97 %) in muscle tissues was found.

Considering the limited number of samples, mercury and methylmercury levols seem to be low in some species and within the tolerable range. Fish with high mercury levels (*Pseudopimelodus* and *Pseudoplatystoma*) are too big (approximately 50 kg) to be a prey for the otter. After having finished the analysis of all samples a full report including a detailed discussion will be published elsewhere. This report will be available from the authors. Nevertheless, direct mercury discharge in areas with viable otter populations should be strictly controlled or preferably banned completely. Particularly as a subtle effect of low mercury concentrations on sublethal mercurialism; i.e. on reproduction and survival of otter populations, cannot be excluded.

REFERENCES

Bender H.M. (1989). Vorkommen von Quecksilber im Seehund (*Phoca vitulina*) und in Eiern von Flußseeschwalben. Dissertation. Tierärztliche Hochschule Hannover.

Cappon. C.J., & Smith, J.C. (1981), Mercury and selenium content and chemical form in fish muscle. *Arch. Environ. Contam. Toxicol*. **10**: 306 - 319.

Fimreite, N. & Reynolds, L.M. (1973). Mercury contamination of fish in Northwestern Ontario. *J. Wildl. Man*. **37**: 62-68.
Foster-Turley. P., Macdonald, S.M. & Mason, C.F., Eds (1990). Otters - an action plan for their conservation. IUCN, Gland.

Hovens, J.P.M. (1992). Microvorontreinigingen in waterbodems en visbiota in Nederland; de visotter (*Lutra lutra*) als normsteller. SON Leeuwarden & Landbouwuniversiteit Wegeningen verslag nr. 3044.

Schnitzer, G., Pellerin, C. & Clouet, C. (1987). The use of microwaves in wet digestion of a biological substance with a view to assay of mercury by atomic absorption spectrometry (AAS)

Wren, C.D. & MacCrimmon. H. (1983). Mercury levels in sunfish relative to lake pH and other environmental variables of Precambian shield lakes. *Can. J. Fish, Aquat. Sci.* **40**: 1737 - 1744.

Wren, C.D. & Stokes, P.M. (1988). Depressed mercury levels in biota from acid and metal stressed lakes near Sudbury, Ontario. *Ambio* **17**: 28-30

R E P O R T

ORGANOCHLORINE CONTAMINANTS IN SPRAINTS FROM CAPTIVE OTTERS

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Abstract: Assays for DDE, Dieldrin and PCBs were carried out on captive otters to provide a baseline of presumed uncontaminated animals for comparison with results from surveys in the wild. Results for captive animals were much lower than those from upland Wales, which has a thriving population of wild otters.

Over the past three years we have undertaken detailed regional surveys of the levels of organochlorine contaminants in spraints of otters *Lutra lutra*. .All natural habitats may have been subject to historical contamination of these persistent chemicals and contamination is likely to be continuing in many wetlands. It seemed therefore of value to analyse a sample of spraints from captive otters, fed a zoo diet, to provide a reference against which to compare samples from wild otters. We were fortunate in being able to collaborate with the Alpenzoo, Innsbruck, Austria, on this project.

METHODS

Spraints wore collected during July and August 1990 from:-

1. a female, born in the wild in eastern Germany (former GDR) and about 4 years old. This animal had not yet bred.
2. a female, born in 1979 in the Alpenzoo, together with her cub, born in January 1990 (spraints from the cub could not be separated). The female had produced 8 litters since 1982, totalling 16 cubs, 14 of which survived.

Otters in the Alpenzoo are fed carrots in the morning. In the afternoon they receive food, *ad libidum*. consisting of either guinea pigs, veal, chicken; rats, hens, salmonids or cow heart. They have a weekly supplement of vitamins, this diet is thus likely to be low in contaminants.

Spraints were kept deep-frozen prior to analysis. Organochlorine concentrations were determined on a Varian 3300 gas chromatograph, with a tritium electron capture detector, using a 25m capillary column. PCB concentrations were determined against an Aroclor 1260 standard. The detection level was 0,01 mg kg^{-1} lipid. Details of extraction and analytical methods are given in Mason el al. (1992).

RESULTS

Results are given below in mg kg^{-1} lipid (nd = below limit of detection).

Table 1: Results

	n	DDE	DIELDRIN	PCBs
Female 1 % detected	24	 96	 66	 100
mean		0.07	0.04	0.99
range		nd - 0.38	nd - 0.49	0.10 - 5.59
Mother and Cub % detected	21	 48	 29	 95
mean		0.04	0.01	0.39
range		nd - 0.83	nd - 0.05	nd - 1.64

Contaminants were detected in a greater percentage of samples from Female 1 than from the Mother and Cub. Mean concentrations were also higher in spraints from Female 1 than from the Mother and Cub. However means (of samples above the limit of detection) were not significantly different for DDE or Dieldrin, though they were for PCBs ($t = 2.06$; $P < 0.05$).

DISCUSSION

The Mother and Cub had a lower proportion of contaminated spraints, compared with Female 1, and a lower mean level of contamination, significantly so in the case of PCBs. The sample may have had a higher proportion of cub spraints (which were not distinguished from the mother) and a growing cub may assimilate contaminants across the gut wall more efficiently than does an adult (this is certainly true, for example, with metals such as lead), leading to less contaminant being rejected in the spraints. Alternatively Female 1 may have been releasing contaminants in secretions via her anal gland at a greater rate than did Mother and Cub.

Nevertheless the concentration of contaminants in spraints from these captive otters is low. Mason & Macdonald (in press) calculated environmental background levels of contaminants in spraints from a large sample (n = 288) from rivers in upland Wales, U.K., where otter populations are thriving. These background levels (mg kg^{-1} lipid) were:-

DDE 1.61 Dieldrin 1.07 PCBs 2.22

Clearly spraints from the captive otters fed a zoo diet were 2-6 times lower in PCBs than these background levels, and an order of magnitude lower still for organochlorine pesticide residues.

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REFERENCES

Mason, C.F. & Macdonald, S.M. (*in press*). Impact of organochlorine pesticide residues and PCBs on otters (*Lutra lutra*) : a study from western Britain. Science of the Total Environment.

Mason, C.F., Macdonald, S.M. , Bland, H.C. & Ratford, J. (1992). Organochlorine pesticide and PCB contents in otter (*Lutra lutra*) scats from western Scotland. *Water, Air and Soil Pollution* **64:** 617 - 626

R E P O R T

RELATIONSHIPS BETWEEN PCBS IN OTTER LIVERS AND SPRAINTS FROM GUT AND ENVIRONMENT

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Abstract: Spraints from 29 otters found dead in south west Ireland during 1984 - 90 were analysed for PCBs, and the levels compared with those in the livers of the same animals. A strong correlation was found, indicating that spraints can be used to estimate PCB pollution burden in live otters.

PCBs measured in otter *Lutra lutra* spraints may derive from two sources, from unassimilated material from the gut or from material excreted in secretions from the anal gland. Otters assimilated 91,6 % of ingested PCBs in feeding experiments (Smit 1990), 8,4 % being passed through the gut with the spraints. Anal gland secretions of rnustelids may be rich in PCBs (Larssen *et al*. 1990) but preliminary observations have suggested that the contribution of PCBs from anal glands to individual spraints is small relative to the contribution of the diet (M. Smit, *in litt*.). On this basis the PCBs measured in spraints largely reflect the last meal. Nevertheless with samples of both spraints and otters from a range of sites with differing contamination, one might expect an overall correlation between PCBs in spraints and in tissues. This theme is explored below.

METHODS

Of 33 otters found dead over the period 1984-90 in southwest Ireland, spraints were present in the rectums of 29. They were stored deep-frozen prior to analysis, as were the livers of the otters. In November and December 1991 207 spraints were collected from sites in southwest Ireland (mainly County Cork) and stored deep-frozen. Methods for sample preparation and analysis are given in Mason & O'Sullivan (1992) and O'Sullivan *et al*, *in press*).

RESULTS

Detailed results of the analysis of otter livers are presented in Mason & O'Sullivan (1992). Of those otters whose rectums contained spraints, PCS concentrations in livers ranged from 0,18-1 23,2 mg kg^{-1} lipid. PCB concentrations in the spraints ranged from 0,21 - 18,22 mg kg^{-1} lipid. Although the ranges of concentrations of PCBs in livers and spraints are very different, the coefficients of variation are very similar (157 % for liver samples, 145 % for spraint samples).

PCB concentrations in liver tissue and rectum spraints are significantly correlated ($r = 0,68$, $P < 0.001$) and can be represented by the equation:-

liver concentration = 4,69 + 4,62 spraint concentration

The mean PCB concentration in spraints from the rectum (n = 29) was 2,69 mg kg^{-1} lipid, while the mean concentration in spraints from the environment (n = 207) was 1,45 mg kg^{-1} lipid. An analysis on long-transformed data showed the differences in means not to be statistically significant (F = 2.27, P>0.05).

DISCUSSION

That spraints from the rectum and from the environment had mean PCB concentrations which were not significantly different supports the view that PCBs in environmental spraint samples derive largely from the last meal i.e. that proportion of the total PCB ingested which is not absorbed through the gut wall. Spraints from the rectum could not have received PCB secreted from the anal gland.

The correlation between PCB levels in rectum spraints and livers shows that spraints can be used to assess the likely pollution burden of otters. Otters with high body burdens will be feeding in contaminated areas, which will be reflected in their diet and hence their spraints. It should be emphasized however, that, because otters have a diverse diet, even in contaminated sites, some of the prey will have low levels of contamination and spraints collected from a single site may have widely differing concentrations of PCBs, as indeed has bean shown with otters themselves. As many spraints as practicable should therefore be analyzed from a site or region before the likely impact of PCBs on an otter population is assessed.

ACKNOWLEDGEMENTS *- This work formed part of a study funded by the World Wide Fund for Nature. U.K.*

REFERENCES

Larsson, P., Woin, P. & Knulst, J. (1990). Differences in uptake of persistent pollutants for predators feeding in aquatic and terrestrial habitats. *Holarctic Ecology* **13**: 149-155.

Mason, C.F. & O'Sullivan, W.M. (1992). Organochlorine pesticide residues and PCBs in otters (*Lutra lutra*) from Ireland. *Bulletin of Environmental Contamination and Toxicology* **48**: 387-393.

O'Sullivan, W.M., Macdonald, S.M, & Mason, C.F. (*in press*). Organochlorine pesticide residues and PCBs in otter spraints from southern Ireland. *Biology and Environment.*

Smit, M. (1990). De belasting van waterbodens en biotas (vis en otter) met Microverontreingingen. Stichting Otterstation Nederland, Groningen.

REPORT

AKTION FISCHOTTERSCHUTZ E. V. (GERMAN CAMPAIGN FOR OTTER PROTECTION): ACTIVITIES 1992

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Abstract: This report covers captive animal studies during period, studies in the wild including one on avoidance of otter road traffic casualties commisioned by the Ministry of Traffic, which will be used to inform new highway building, two surveys and a pollution assay in 6 states showing poor otter numbers correlate with higher PCB levels. A habitat management programme, Otter 2000, establishing migration corridors for otters was initiated. There has been good progress with the revitalisation of the River Ise. The Otter-Zentrum itself has had a very good year, with high visitor numbers and many new births.

RESEARCH IN CAPTIVITY

At the research station in Hankensbüttel, the following main studies were completed, continued or started (Rogoschik 1992):

- a morphological study of the organs of *Lutra lutra* (Zogall 1992);
- an ethological study on the marking behaviour of *Lutra lutra* (Heins 1992);
- an ethological study on the prey catching behaviour of *Lutra lutra*, which will run until 1995;
- a long-term study on the ontogeny of otter cubs born in captivity, which includes 8 litters;
- a study on PCB levels in spraints of otters in captivity was started in 1992 (Reuther 1992b) and will be continued in 1993.

RESEARCH IN THE WILD

- In cooperation with the ministry of environment of Mecklenburg-Vorpommern (a federal state in the north of East-Germany) a telemetry study has been started in 1992. To date one female otter has been caught and tracked.
- By order of the Federal Ministry of Traffic a study was started to avoid traffic accidents with otters. This problem is increasing in East-Germany after the German reunification. The results of this study - which will be finished at the end of 1993 - shall be taken into account when all the new highways will be built which are planned by the government.

SURVEYS

- A survey using the standard method in Lower-Saxony (a federal state in the north of West-Germany) was finished in autumn 1992. Of 938 sites only 18 (1,9 %) were found positive (Binner et al., in prep.).
- In December 1992 a two-year survey using the standard method was started in Mecklenburg-Vorpommem. Appr. 1000 sites will be surveyed.

POLLUTION

- 133 otter spraints from 6 German federal states where analyzed for the pesticides Lindane, Dieldrin and DDE and for PCBs to get an overview of the potential contaminant burden of otters via their prey. The data give the impression that in areas where otter populations are not thriving or not increasing the majority of spraints show a higher pollution burden than in areas where the populations are stable or increasing (Reuther & Mason 1992).

HABITAT MANAGEMENT

At a meeting entitled "Otter Protection in Germany" on September 5-6, 1992 where more than 70 people working in otter conservation participated, an otter habitat network programme was presented. It is based upon the idea of migration corridors which shall guide otters from the increasing populations in East Germany to the fragmentary populations in the west. With this programme "Otter 2000" a network of otter habitats will be established (Reuther 1992c).

RIVER ISE PROJECT

The revitalisation of the river Ise network (now more than 450 km long) makes good progress. More than 100 ha of property on both sides of the main river were bought and changed from industrial to alternative agriculture. More than 15 km of hedges and riparian forest were planted. A team of 6 scientists and several students or external experts has done a lot of scientific studies within this project (Prauser et al., 1992, Reuther 1992d).

OTTER CENTRE

In 1992 more than 112 000 people visited the Hankensbüttel Otter Centre, that means that since its opening in 1988 more than 500 000 visitors have come to this nature conservation education centre. A now stonemarten enclosure for the public was opened in 1992.

BREEDING

Two litters of *Lutra lutra* were born on September 22 (1,1) and November 8 (2,1). These increase the number of litters born in the otter centre since 1988 to 6 and the number of cubs to 13. At the end of 1992. 19 otters were kept at the otter centre.

REFERENCES

Binner. U., Reuther, C & Blanke, D. (*in prep*) Zur Verbreitungssituation des Fischotters in Niedersachsen - Naturschutz und Landschaftspflege in Niedersachsen.

Heins, B. (1992). Untersuchungen zum Markierungsverhalten das Europäischen Fischotters *Lutra lutra* (Linne, 1758) unter Gehegebedingungen. Dissertation Tierärztliche Hochschule Hannover

Prauser, N., Bausch, B., Dreier, B., Fendrich, U., Sander, R. & Wesseler, E. (1992). Revitalisierung in der Ise-Nierderung Teil B: Landschaftsbewertung und Szenarien.- *Habitat* No. **5**, 194 pp.

Reuther, C., Ed. (1992a). Otterschutz In Deutschland. *Habitat* No. **7**, 176 pp.

Reuther. C. (1992b). Einige rnethodenkritische Betrachtungen zur Untersuchung der PCB-Belastung von Ottern. pp. 163-170 in **Reuther, C**. (1992a).
Reuther, C. (1992c) Otter 2000 - Eine Vision für den Otterschut In Deutschland. pp 113-126 In: **Reuther, C. (1992a).**

Reuther, C. (1992d) Das E + E-Vorhaben "Revitalisierung in der Ise-Niederung - Biotopvernatzung am Beispiel der Leittierart Fischotter" pp. 85-92. In: **Reuther, C (1992a)**.

Reuther, C, & Mason, C.F. (1992). Erste Ergebnisse von Kotanalysen zue Schadstoff-Belastung deutscher Otter pp. 7-21. In: **Reuther, C (1992a).**

Rogoschik, B. (1992). Überblick über die Forschungsarbeiten am Eurasischen Fischotter In den Forschungsgehegen der Aktion Fischotterschutz e.V. pp. 23-27. In **Reuther, C. (1992a)**

Zogal, A. (1992). Morphologie und topographische Anatomie def Brust-, Bauch, und Beckenhohlenorgane des Eurasischen Fischotters (*Lutra lutra* L. 1758). Dissertation Tierärztliche Hochschule Hannover

REPORT

BEHAVIOUR OF OTTERS IN A COASTAL MARINE HABITAT: ABSTRACT OF WORK IN PROGRESS

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Abstract: After reviewing the history of the study, the sudden and catastrophic loss of all three breeding females is described.

The behavior of a marine coastal population of otters, *Lontra* (=*Lutra*) *canadensis*, has been observed since 1983 and studied formally since 1986 at Trinidad Bay, California. From 1986-1992,1 conducted >1,700 sessions, and recorded >6,000 otter-hours of direct visual observations. Since 1988, at least 1 otter was seen during 9 of 10 sessions. From 1983-1992, 6-18 otters shared a core area of <1 km^2. Otters were observable at close distances (5-100m). With repeated viewings, individuals were identified reliably by noting each otter's unique combination of facial, physical, and behavioral characteristics.

The otters at Trinidad Bay form 2 distinct societies: a maternal 'family', and a male-centered 'clan'. The family unit is matriarchal, enforcing female dominance and female intrasexual territoriality. An adult female defends a maternal territory from which she expels most other females. Elder daughters may return to live with their mother and her subsequent litters, serving as enforcers of their mother's territory, and providing comfort behaviors to their mother's pups. A dominant mother and an adult daughter with pups may form a 'maternal alliance', creating a cohesive, 3-generation 'super-family' unit. After females are 1 year old, however, a mother will usually attack and expel a yearling female of the other mother, even if the yearling she expels is her own granddaughter. Territorial attacks by females can be extremely fierce. In July, 1992, an elder daughter of the dominant female killed her mother's yearling daughter.

Adult males at Trinidad Bay are gregarious, forming a seasonally-stable, cohabitating, egalitarian 'clan'. Typically, the clan comprises all of the population's 5-8 adult males. Since 1983, no adult female has been a member of this wandering social group. Males are tolerated in the maternal territory as temporary residents and social subordinates, but the resident adult females and the adult males of the clan do not interact freely. The result of their mutual avoidance is a strict behavioral segregation of the sexes. The strength of this sexual segregation is remarkable: as of June, 1992, it had been 70 mon. since I saw an adult female and an adult male just forage together. Generally, the only prolonged social interaction that adult females and adult males engage in is copulation, during the females' annual estrus in mid-April.

From 1986-1991, I studied the behavioral development of otters. I chronicled the development of 6 litters (22 pups) by the same mother, and 3 litters (7 pups) by that mother's daughters. 'The 2 females born in 1986 were sexually mature at 24 mon., but remained nulliparous until 48 and 60 mon. respectively. The first daughter to give birth was accepted into a maternal alliance with her mother. When the other daughter became a primipara, her mother expelled her from the maternal territory.

At Trinidad Bay, otters achieve proficiency in aquatic locomotion only 9 wks. after leaving the natal nest, but proficiency in aquatic hunting requires over 9 mon. of trial-and-error learning. Basic self sufficiency in food procurement is attained at 37-42 wks., but the young do not achieve optimal utilization of food sources and habitat until after they are abandoned by their mother at 48 wks. Independent yearlings do not disperse from their home area voluntarily. After 3 mon; of independence, yearlings of both sexes usually join the clan. In her 16th mon., a yearling female either returns to her mother or remains with the clan. A juvenile female may remain a member of the clan until she is expelled incidentally by a territorial female, or until the males shun her after sexual maturity. Males raised at Trinidad Bay travel widely along the coast, but most continue to base their activities at their home area. At times, however, adult males that were not raised at Trinidad Bay have joined the local clan, indicating that some males do disperse permanently from their home area. Elder adult males are noticeably less gregarious than younger adult males, and elders may leave the clan or be expelled after achieving seniority around age 10. The eldest known otter at Trinidad Bay, 'Old Mama', was estimated to be 11 years of age when she was last seen in July, 1992.

REPORT FROM TRINIDAD BAY : 1992

1 never imagined that it would end so suddenly, so violently, or so absolutely. This summer, the ultimate calamity befell the otters at Trinidad Bay, California. Within 10 days in July, all 3 adult females in my study population died. Old Mama and both of her 6-year-old daughters. Mama Junior and Scarnose - all dead in less than a fortnight. The matriarchy that stood rock-stable for the last 6 years collapsed completely, virtually overnight, and the pivotal event was a *murder*. For the first time in my 9-year study, I documented an intraspecific killing, and I recorded, on videotape, a mother otter's cries of mourning for her slain daughter...

The first disaster of 1992 was a total reproductive failure by the adult females. None of the mothers had pups that survived their first weeks. Both Old Mama and Junior had shown signs of maternity early on, but when each returned from her natal exile, neither had pups, nor did they show signs of recent lactation.

The only good news of 1992 was that Scarnose - expelled by Old Mama last year when Scar became a primipara - survived her near-fatal battle with mastitis after all, and gave birth to at least 2 pups this spring. When Scar first returned from her banishment, she'd been gone from Trinidad Bay for *319 days*, and I'd long given her up for dead. I was thrilled to see her again! And I was amazed at how well her 5 cm. diam. self-inflicted 'surgery' wound had healed. She bore a noticeable depression on her belly where her right rear mamma used to be, and a 1 cm. diam. furless patch in place of the nipple. Scarnose thus became the first known otter to give herself a functional mastectomy, and survive!

Unfortunately, in late May, as Scar suckled her new pups, she experienced a recurrence of mastitis, this time involving her left mammae. In response, Scarnose abandoned her pups. She brought the pups to a vegetated ledge on a cliff face near the core den, and just left them. Numerous attempts were made to rescue the pups, but we were not successful. Thus did I obtain the grimmest datum of my study: if <10-week-old pups have access to a water source, they can survive 4 days without succor. As tragic as the deaths of those pups were, this was only the beginning.

The spring had started out hopefully, though, as 4 of last year's 6 pups survived to independence (I'd never had so many yearlings to observe). As has been the pattern, the yearlings gradually socialized more with the male clan. All 3 of Junior's yearlings eventually joined the clan (including Junior's yearling females Orange Lip and White Line), but Old Mama's yearling female, Little Porpoiser, never spent enough time with the males for me to regard her as a true clan member. In fact, during late winter and early spring, Porpoiser didn't seem to be resident here at all. I guessed that Porpoiser was living somewhere near Mama, who, like all adult females from March to May, was occupying a natal den away from her home area. (I say 'near' Mama, not 'with' Mama, as maternal females are aggressively intolerant of *all* other otters until after their pups are weaned. Numerous small bite wounds on Porpoiser's nose attested to her attempts to interact with her intolerant mother.)

When Old Mama re-established residence at Trinidad harbor On 3 June, though, she was already amicable and cohabitating with Porpoiser, more than a month earlier than I'd ever seen Mama tolerant of an elder offspring. That, along With Mama's regressed mammae, was clear proof she had no pups. After birthing 22 pups in 6 annual litters, Mama was finally getting a year off. This respite from pup-

rearing transformed Mama behaviorally. In all the years I'd known her. Mama was a seriously task-oriented animal, with little time or inclination for play. If she did play, it was usually with her pups, much less with her adult daughters, and certainly *never* with any of the males. Old Mama was the stoic of the population, as befitted her *alpha* social rank and maternal responsibilities. This year, though, Old Mama had no maternal duties, and for the first lime, I got to see her long-repressed playfulness. Mama and Little Porpoiser were each other's constant companions and playmates. The antics of this elderly mother and her hyper-playful young daughter were a true delight to watch. I felt really good for Old Mama. Never in my life had I seen such a hard working mother, and how, at last, Grandma was finally free to simply enjoy life, and the company of her obviously beloved Porpoiser. During Mama's brief idyll, remarkable changes were to unfold in the social structure of the Trinidad otters.

In the last 2 letters in this series, I described the rigid social segregation of the sexes among adult otters in this population., To illustrate the strength of this segregation, I've been tracking 2 very long 'strings' in my behavior data. As of June 1992, it had been almost 6 years since I saw an adult female and an adult male just forage together, and 4 years since I saw adults of the opposite sex interact playfully. During Mama's idyll, this segregation began to crumble visibly - and it was the matriarch herself who took the initiative. The first record to fall was the 'no-play' string. On 10 June 1992,1 saw Old Mama wrestle briefly with her adult grandson, Junior's'90. The last time I'd seen inter-sexual play by adults was 11 June 1983 (revised date), when the Two Sisters played with an adult male, 1,134 sessions ago. The 'no-forage' string ended 11 June 1992, when Mama, Junior's'90, and Mama's 4 yearling descendants entered the water as a group and fished under a dock. Old Mama and her adult grandson only stayed together foraging for 2 minutes, and nothing was captured, but that brief swim broke that longest of all strings at 1,481 sessions. The last time I'd seen Mama forage with an adult male was 9 Sep. 1986.

Not only was Old Mama becoming more tolerant of the males, she also became remarkably tolerant and accepting of Junior's yearlings. In almost all social interactions, Mama favored her Porpoiser, but as the first week of June passed, Junior's 3 yearlings, all members of the clan now, were treated with increasing grandmotherly affection. A picture I will treasure in my mind forever is the sight of this old matriarch, playfully beset on all sides by her 4 yearling descendants and her adult grandson. As fate would have it, though, these were to be the last happy days that Mama - and I - would know here.

The big mystery of June was the noticeable absence of Mama Junior. It was totally uncharacteristic for Junior not to be in residence at the harbor this time of the season. I had long ago concluded that Junior was Mama's 'heiress apparent', and that Junior would remain In Mama's territory until she inherited it in her own right. But this June, Junior was definitely not living here. I reasoned that Junior - now a mother in her prime - had established her own territory adjacent to Mama's territory.

in a way, I was glad for Mama that Junior was not here, because I feared that Junior would attempt to expel Porpoiser, Last year, in 1991, Junior had asserted her ascending dominance by means of aggression toward other mothers' young. Junior attacked Mama's yearling daughter One Eye and her sister Scarnose' pups, expelling One Eye from the home area and contributing to Scar's forced banishment. Because Junior had this tendency to aggress against other females' young, I predicted that, if Junior ever returned, she would attack Porpoiser.

And so my prediction came true. On 16 June, after an absence of over 2 weeks, Junior returned to Trinidad harbor. The next day, Porpoiser was gone, and Mama sat alone in front of her den, peering, waiting. Junior attempted to interact with Mama, putting on a remarkably juvenile display of submission and play solicitation, but Mama ignored Junior totally. On the 18th, Porpoiser was back with Mama; Junior would not return for another 2 weeks. Then was the unimaginable to be realized. On 4 July, in their mother's presence. Junior attacked...and killed...Little Porpoiser.

Mama defended Porpoiser, biting a large chunk of flesh out of Junior's face, but the deadly deed was done. Porpoiser lay slain in Old Mama's den.

Mama's eldest daughter, her loyal lieutenant of the last 5 years, had killed Mania's youngest daughter, the joy of her life, in cold blood. For 3 days, Mama did not leave the place where her daughter lay. She stopped eating, stopped grooming, stopped all social interaction. This otter mother was doing just what a human mother would do: she mourned...and she cried. Atop her place of vigil at the death den, Old Mama would wail - a high, wavering, descending, almost loon-like wail - a truly haunting sound I'd

never heard an otter make before. Her cries were audible 100 m. away. Mama's lamentation was the most piteous expression of grief I'd ever witnessed. There, far out on the headland, was a wild mother, dispossessed of love and utterly alone, wailing to the Four Winds over the murder of her lastborn daughter.

I last saw Mama 5 days after Porpoiser's death, and it was obvious she had lost the will to live. That last day, Mama looked absolutely wretched: she was emaciated and completely apathetic. By this time, her wailing had all but stopped, but up close, I could still hear her crying softly. As Old Mama visited the docks for the last lime - the place where she had provided for her pups all those years - she would walk a few steps, sit immobile, close her moist eyes and emit a plaintive, wavering whimper. She paused at scenting places, her head bowed, perhaps sniffing the last traces of her daughter in life. When Mama returned to her den, I heard her give one last wailing lament, and then, nothing more. I never saw my dear Old Mama again.

After Junior killed Porpoiser, I expected her to return to the harbor permanently. If her attack was intended to displace the young rival for her mother's territory (and favor), then, logically, Junior should have moved back in. As it happened, I only saw Junior twice more in the harbor, and she was definitely not acting 'at home'. When Junior was here, she was constantly on alert, as if anticipating an attack at any time, zigging, and zagging back and forth in the water, looking this way and that, avoiding landfall, never marking. Junior probably had good reason to be wary. Having killed Porpoiser in her mother's presence, and having been attacked viciously by Mama in the process, I doubt Junior would ever have been accepted back by her mother, even had Mama lived. I saw Mama Junior for the last time just the day after I last saw Old Mama. Sometime between 11-14 July, Junior was killed on Indian Beach, north of the harbor. Another animal had torn open the right side of her neck. Magnificent Junior, by far the fittest of all Mama's daughters, did not live to inherit the territory she had defended so staunchly all her adult life. In the end, Junior died exiled, impelled in large measure by the consequences of her own actions to forfeit her lifelong home -and ultimately, to forfeit her life itself.

With Mama and Junior gone, there was nothing now to prevent Scarnose from re-establishing residence. I saw Scar here on 7 of the 10 days after Mama was last seen, and 1 was really glad she was coming back. Even if Scar turned out to be an unfit mother because of her recurrent mastitis, she was still my favorite of all Mama's 22 offspring, and I welcomed her return. There was an amusing irony that the scrawny runt from the litter of 1986 would become the matriarch of Trinidad Day. During the period she was reconnoitring the harbor, I remember thinking; "The queen is dead. Long live the queen." But there would be no 'Queen Scarnose'. My miracle girl, Scarnose-Little Pup, swam out of my life forever on 19 July, Some time the next day, she was killed by poachers. Those thoroughly despicable people had no conception of what bright a light they snuffed out with their hateful ignorance.

So it was that, in only 10 days, all of the adult females died: the old matriarch herself, and the entire generation of daughters that should have inherited Mama's territory and carried on her maternal line. The population was reproductively dead. At one point in July 1991, there were 18 otters at Trinidad Day; 13 of whom were known descendants of Old Mama. As of Dec. 1992, only a year and a half later, there were no resident otters. None. Even the males were no longer using the harbor dens. From 18 otters to nil in 18 months. I'd never imagined such a debacle were possible.

Of all the female descendants of Old Mama, only 1 granddaughter is known to still be alive: Junior's daughter Orange Lip. If she survives to maturity this spring, she may be the new resident adult female at Trinidad (and I'll rename her Junior, Jr.). I say 'may' because, as of Jan. 1993, the little girl was still a full-fledged member of the male clan. She goes where the males go, and lately, the males are just not living here. Another adult female could move in and displace Orange Lip at any time. This is too prime a territory to remain vacant. How ironic it would be if, after producing 31 known descendants, the lineage of Old Mama were to die out here. How very fragile even an apparently thriving otter population can be...

Before I close, I must make an important point, lest noble Mama Junior be vilified wrongly. You must know that Junior's aggressive behavior to her young kin was not an aberration. Ever since there has been more than one mother resident here, it has been a noticeable pattern for a mother to behave agonistically toward the young of other mothers. Even Mama attacked her own granddaughters: in one case with no less savage intensity than Junior employed on Porpoiser. In mid-June, after Junior

attacked Mama's yearling daughter for the first time, Mama's previously amicable behavior toward Junior's yearling daughters turned suddenly violent. On 20 June, Mama bit off the front of Orange Lip's nose, and on the 22nd, I watched as Mama attacked While Line with absolutely astonishing ferocity. For 2 terrifying minutes, Mama tore at the back of White Line's head with unrestrained fury. It truly looked like Mama would kill her granddaughter, apparently for no other reason than White Line had approached Porpoiser and Mama for social interaction. After Mama's attack, While Line disappeared from Trinidad harbor for almost 2 months: expelled from her home area by her own grandmother. White Line did not return until long after Mama's death, but she was still traumatized behaviorally. I never again saw White Line interact socially with any of the other otters, even with her own sister. White Line was last seen on 1 Oct.

Until this year, I thought I understood this social system and its ecological and evolutionary significance. This was a matriarchy in which a dominant mother allowed her eldest, fittest daughter to share and enforce her territory, to join her in a maternal alliance (comprising the dominant mother's grandpups), and to inherit her territory after her. But this year, in the absence of pups, the stable mother-daughter alliance degenerated Into violent intrafamilial warfare, and everything came apart. Perhaps there were just too many otters here. Perhaps that's why the mothers failed this year, and why they turned so aggressively on each other's daughters. Those are logical and parsimonious conclusions, to be sure, but they do not encompass the totality of the actual events. The complexity of behavior can defy tidy reduction.

But now it's my task to attempt just that: to translate the wonders I've witnessed to words, so that all - scientists and laymen alike - may enter the world of these extraordinary otters. Old Mama and the Two Sisters are gone now, but in my thoughts, and in my works, this treasure of Trinidad Day shall live on.

REPORT

THE OTTERPARK *AQUA*LUTRA

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Abstract: The activities of the Dutch Otterstation Foundation (SON) are described, notably the foundation of Otterpark *AQUA*LUTRA,which consists of a breeding centre, a research centre and a visitor centre. Each of these is described in turn. The Otterpark is situated in the "Groene Ster" nature reserve near Leeuwarden, Friesland, Netherlands.

INTRODUCTION

The deterioration of the fresh water environment has taken its toll; the otter, one of the most beautiful animals the Dutch fauna possessed, is now extinct, The otter is an important indicator species for the quality of the fresh water environment. The high sensitivity of the otter to the deterioration of its habitat has given this animal the image of "ambassador of the fresh water environment". The fact that this animal has become extinct, therefore casts suspicion on the state of the fresh water environment in Nederland.

The Dutch Otterstation Foundation (SON) was established on 27 November 1985 with the aim to contribute to environmental recovery and nature development of the Dutch fresh water ecosystem. The recovery of the Dutch otter population and its habitat, the fresh water environment, will crown it all. SON is engaged in natural and environmental education, research, advising in environmental policy, and the preparation of a national otter breeding programme. Its most important activity however, is the realization of the Otterpark *AQUA*LUTRA.

Together with the nature trust "It Fryske Gea" the SON set up the Working-group Otters Friesland (WOF). Large subsidies were received after the report "de Otter bliuwt in wrotter" was delivered. These made it possible to develop new otter habitats in the "Oude-Venen" (a large fresh water

environment in Friesland) and to isolate other parts in this area from the polluted 'boezem' water (water from the Rhine via the Ijsselmeer).

THE OTTERPARK *AQUA*LUTRA

One of the most important activities of the SON is the realization of Otterpark *AQUA*LUTRA. SON started the construction of the Otterpark in 1992. The Otterpark will consist of a breeding centre, a research centre and a visitor centre. An appeal is made to trade and industry to contribute in paying the costs of this project by means of sponsoring. The Otterpark will be situated in the nature reserve "De Groene Ster" close to Leeuwarden, Friesland. The entire site measures 10 ha. Walks and excursions through impressive flora and fauna in the midst of the many indigenous birds, combined with the possibility of a visit to the exposition and a route through the park, will attract many visitors. Thorough national marketing and publicity efforts should make the prognosis of 40 000 visitors in 1993 to 100 000 before the end of the century hold.

THE BREEDING CENTRE

In view of planting otters in Nederland in the future, SON has applied itself from the start to house and breed otters. The policy has always been to free otters only after sufficient environmental recovery and nature development is realized. The first "release" will be an experiment to check whether sufficient management measures have been taken. SON has acquired experience abroad and in its own (temporary) research centre in Haren, not far from Groningen.

THE VISITORS CENTRE

An impressive national "natural and environmental educational centre" will be constructed in Otterpark *AQUA*LUTRA. Over the past few years, large interest for a visitors centre has arisen in which otters can be seen in a natural environment. The interest of the media for such a centre underlines the previous statement. This increasing interest runs parallel to the increasing involvement of the public for the condition of nature and environment.

Otterpark *AQUA*LUTRA is a unique attraction park. It is enjoyable, instructive and exploratory. The first otters will probably come to the Otterpark in April or May 1993. Not only otters, but also beavers and many other animals can be seen in the Otterpark. There will be bird-watching posts and beautiful brooks full of fish that one can see through periscopes, an underwater tunnel in the otter basin and spectacular feeding moments. In the exposition building there will be a multi-media show, a live otter cartoon, aquaria and large expositions. A restaurant for refreshments and a recreation-ground for the children will complete the Otterpark.

The SON hopes to welcome members of the IUCN to Otterpark *AQUA*LUTRA in the near future.

R E P O R T

THE OTTER IN LITHUANIA

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Abstract: Official otter counts in Lithuania are not well-done, and underestimate the otter population. In fact, otters live in all 44 regions of Lithuania. Otter hunting is illegal in Lithuania. Conservation efforts concentrate the otters' habitat, establishing a network of reserves protecting the small rivers of the country.

It is necessary to present some facts about Lithuanian rivers and lakes before problems of otters will be discussed.

RIVERS AND LAKES

The territory of Lithuania is 65 200 km^2. There are only two big rivers - Nemunas and Neris (their length is more than 500 km), 17 medium-length rivers (their length is 100 to 500 km) and more than 29 000 small rivers (their length is less than 100 km). The total length of Lithuanian rivers is 63 700 km. Small rivers make 94 % of the total length of the Lithuanian rivers. The total length of unregulated rivers of Lithuania Is only about 17 000 km.

The average density of the rivers net is 1,2 km/km^2. The naturality of Lithuanian rivers (according to parts of unregulated river-beds) is shown in Fig.1.

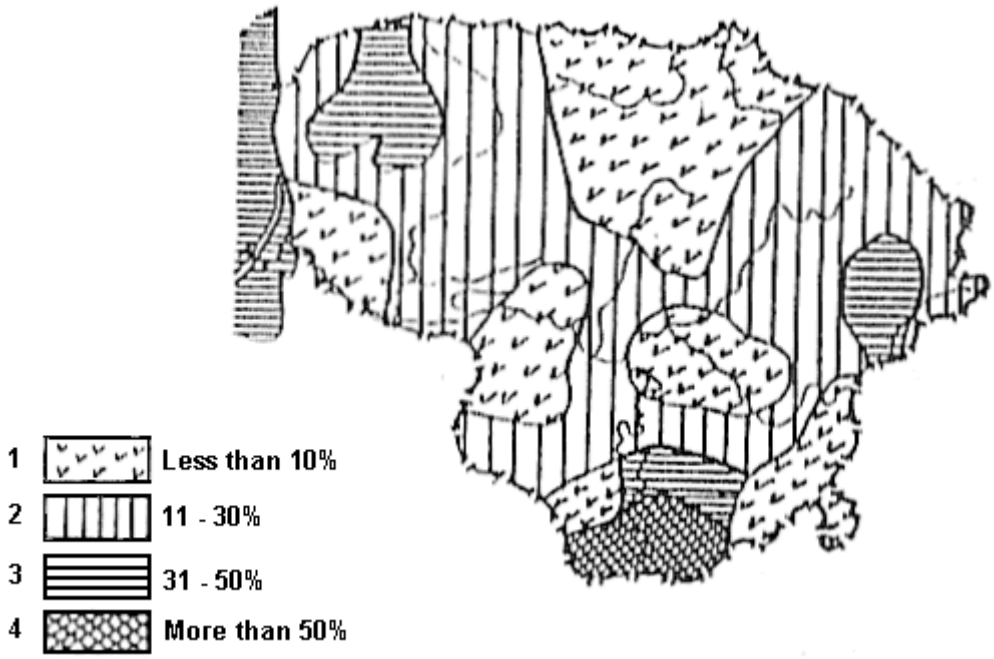

Figure 1. The naturalness of Lithuanian rivers according to the unregulated river-beds (from Kavaliauskas &Vaitkevičius, 1990)

There are about 6000 lakes In Lithuania. 2850 of them are bigger than 0,5 ha, but only 17 are bigger than 10 km^2. The majority of lakes are concentrated in 5 regions of Lithuania (there are 44 regions). These regions are: Ignalina, Lazdijai, Molêtai, Trakai and Zarasai. The biggest number of lakes in these regions are connected with each other.

Some conclusions can be drawn from statements which are mentioned above:

1. Small water bodies are characteristic of Lithuania.
2. Hydrographical net is rather dense in Lithuania.

OTTER STATUS IN LITHUANIA

It must be stated that the true status of the European otter is still unknown in Lithuania. It Is because of the small number of scientific investigations on otters done in Lithuania and the lack of reliable data. The estimate of Lithuanian game fauna (it includes otters) is done in Lithuania yearly but thE data of otter numbers are very unreliable and fully incorrect sometimes.

The map of otter distribution and density in Lithuania (Fig. 2.) is based on these questionable otter data, but when there are no other more reliable data it must be published.

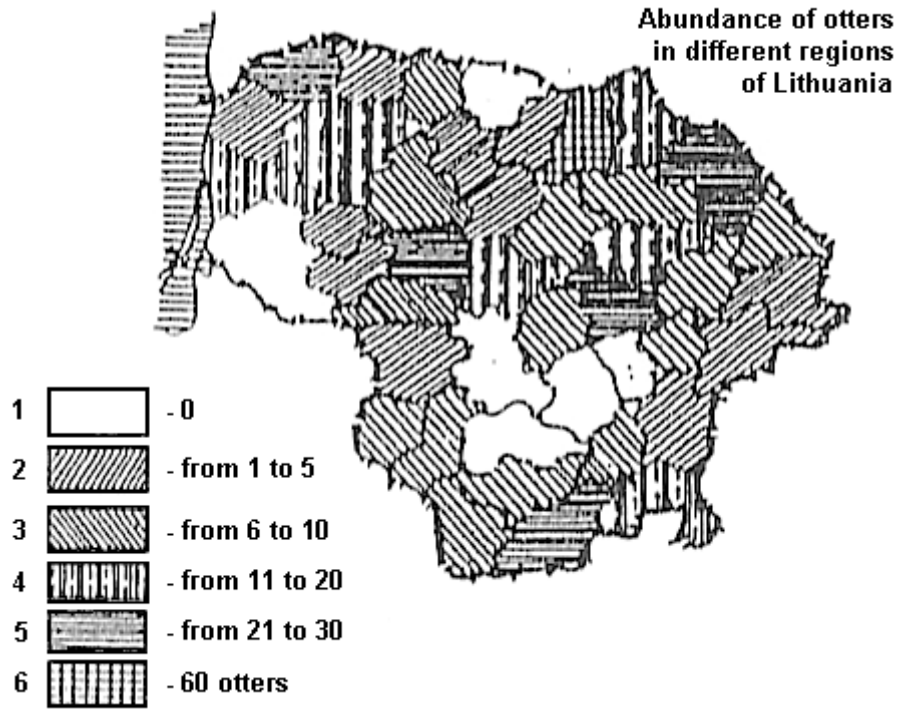

Figure 2.Abundance of otters in Lithuania in 1990 according to the EPD data. The total number of otters 423 specimens (adapted from Buranauskas & Mickus, 1990)

According to the official otter data there were 420 otters in 1990 and only 340 in 1991 in Lithuania. Otter presence is proved only in 35 regions of 44 in Lithuania in 1991.

It must be asserted that these data are considerably diminished. Investigations were done in 1991 and their results allow us to maintain that otters live in all 44 regions of Lithuania. This fact means that the data from at least 9 regions where the presence of otter was not proved are incorrect.

There are two reasons why otter estimate data are very unreliable:

1. People who carry out otter counts have no material interest to do this work precisely (this work is not paid for) and as a rule they have no interest or experience.
2. There are still no scientific methods on how to estimate otter numbers in Lithuania.

Such a vague situation with otter status forced the Lithuanian Environmental Protection Department to assign means to create survey methods and to include the otter into Lithuanian Red Data Book as an insufficiently investigated species.

OTTER CONSERVATION

Otter conservation measures may be divided into two groups: direct conservation measures and indirect conservation measures.

Hunting of otters has been forbidden in Lithuania since 1975. The fine of 2000 roubles is levied for poaching, and is 1,5 times bigger if poaching takes place in a reserve or in any other are of similar status; or if a poacher uses a snare.

Indirect conservation is conservation of habitats suitable for otters.

It is well known that otters prefer to dwell in unregulated rivers with dense riparian vegetation, i.e. in habitats where the natural environment is still intact. Such habitats are of high value not only in case of otter presence there but for many other reasons, too. Realising the value of such habitats the group of geographers lead by Dr Povilas Kavaliauskas created a plan to conserve small rivers in Lithuania. The first 12 small rivers reserves were set up in 1974. Now there are 33 such reserves in different parts of Lithuania. The work to set up the net of hydrological and hydrographical reserves is going on in Lithuania and another 36 reserves would be set up in the near future. When this work is finished it will be possible to state that almost every valuable small river is under protection in Lithuania.

REFERENCES

Kavoliauskas, P. & Vaitkevičius, E. (1990). Mazųjų upelių likimas. (The state of small rivers) Vilnius, Mokslas. 94 pp.

Baranauskas, K, & Mickus, A. (1990). The investigation of distribution and abundance of the otter (*Lutra lutra* L.) and European mink (*Mustela lutreola* L.). Lithuanian Acad, Sci., Inst. of Ecology, Theriological Lab., Unpubl. report. (in Lithuanian).

SHORT COMMUNICATION

FOOD OF *Lutra lutra* IN CENTRAL FINLAND

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Abstract: In the years 1988-1992 3095 faeces of otters were analysed in YIä-Savo, Central Finland. Because the report (Skarén 1992) was written in Finnish, I present the main results here. Fish are the preferred prey, some carrying significant pollutant burdens, but in winter, frogs are significant. Muskrats are also frequently eaten in winter. Crayfish are rare in the area due to disease, but where present are eaten, and presence in spraint could be used to track the recovery of crayfish populations.

In the years 1988-1992 3095 faeces of otters were analysed in YIä-Savo, Central Finland. Because the report (Skarén 1992) was written in Finnish, I present the main results here.

STUDY AREA AND METHOD

Description of the study area is given in Skarén & Kumpulainen (1986), The western part (Iisaimi river system) is more eutrophic mainly owing to agriculture. The eastern Nilsiä river system is sparsely inhabited and oligotrophic. The size of the present study area is about 12000km^2.

In order to declare the seasonal variation in diet the spraints were collected every month through the years. The following limiting dates of the four seasons were used: 1 March, 1 June, 1 September and 1

November. Similar-looking spraints were pooled. Therefore there are altogether 2355 samples concerning 3095 faeces. Thus one sample contains on an average 1,3 spraints. The samples were soaked in hot water with dentists' Corega-tabs and sieved through 1,5 mm-gauge mesh. Material which passed the mesh was analysed using a stereo microscope.

The results are given both as percentages of frequencies (Table 1) and as bulk percentages after scoring the volume of each item in each scat (Fig, 1).

Table 1: Per cent frequency of the components of otter diet in Ylä-Savo

	Spring	Summer	Autumn	Winter
Amphibia	50.2	10.8	35.6	63.1
Lacerta	-	0.3	-	-
Aves	2.1	19.1	8.3	2.9
Ondatra	17.8	14.5	18.7	18.3
Mammalia	28.9	27.5	37.2	25.4
Cyprinidae	27.5	56.5	57.7	16.1
Perca	54.7	54.9	57.3	47.5
Gymnocephalus	34.6	20.1	27.4	20.7
Esox	26.1	44.8	41.9	16.6
Lota	13.3	4.9	12.3	14.1
Salmonidae	2.8	5.2	10.5	5.0
Cottus	22.7	3.1	8.2	36.4
Pungitius	3.3	-	6.9	-
Pisces	94.5	93.5	93.6	88.1
Astacus	5.2	8.6	4.6	6.0
Dytiscus	1.4	0.3	1.2	0.6
Mollusca	-	-	0.2	0.5
Berries of *Vaccinium vitis-idaea*	0.2	-	-	-
Number of samples	422	324	503	1106

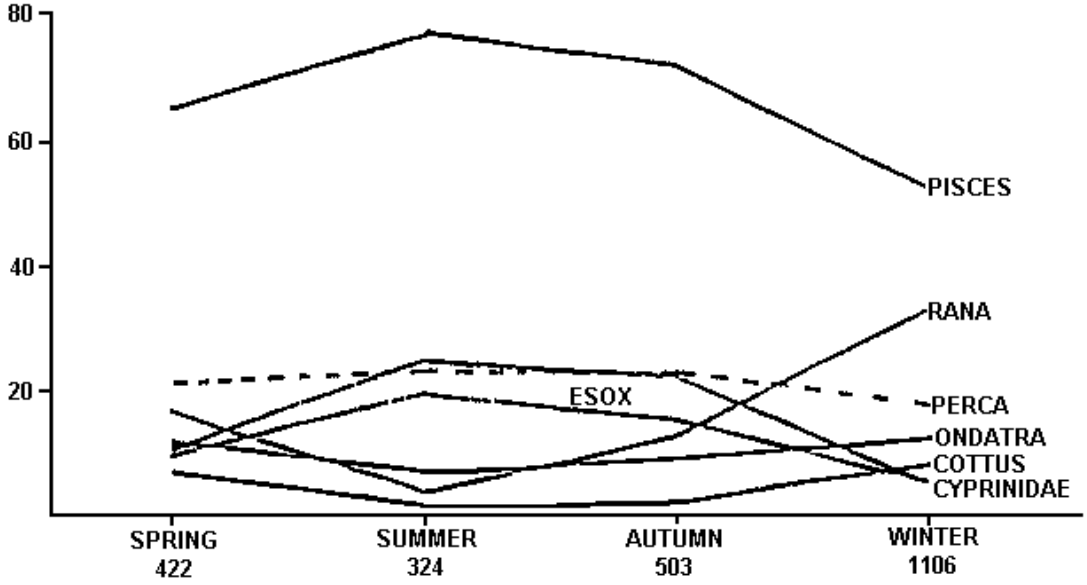

Figure 1.Seasonal shift in the diet of otters, expressed as bulk percentages in the volume. Sample sizes below.

RESULTS

Fish was preferred prey. Most waters here freeze in winter and therefore fewer fish are available. In summer 93,5 % of samples contained fish with about 75 % bulk percentage. *Perca fluviatilis* is always the most important fish prey. The perches eaten were small, but probably the main source of heavy metals found in otters. *Gymnocephalus cernua* is less common than perch. Respectively it is less frequently found in spraints. *Esox lucius* is the third potential major source of pollutants. It is more difficult to catch in winter and so the accumulation of pollutants may temporally decrease. Every

second spraint in summer contained pike, in winter only 16,6 % ($P < 0,001$). *Lota lota* is another dangerous fish to otters as a source of e.g. mercury. However, especially in summer it is rarely taken. Salmonidae are not common in the study area. The maximum bulk percentage value was 7,8 % salmonids in autumn in the oligotrophic parts of the Nilsiä river system. Only two fish farming ponds are here, both keeping *Oncorhynchus mykiss*, which otters visit once or twice monthly, but have thus far done only minor damage.

Cottus spp (*C. cottus, C. poecilopus*) are small fishes, apparently taken as relief food, especially in winter. They live in rapids which don't freeze. Locally their role seems to be important. Every second spraint on Matkusjoki river contained *Cottus* in winter. However, the bulk percentage was only 13.0. Even so, only Matkusjoki perch reached higher bulk percentages in winter. Cyprinidae are favoured most in summer. They spend winter deep under ice in seas and rivers and are therefore more difficult to catch.

Amphibia. No traces of toad (*Bufo bufo*) were found in the faeces. Toads live here but are not common. Two frogs (*Rana temporaria* and *R. arvalis*) are present but their identification in scats is not possible. Therefore both species have been united as *Rana* spp.

Frogs seem to be very important prey in winter. The hibernating animals are found in ditches of moors, in wells and on banks of rivers. One could imagine that the proportion of frogs increases in spring at their breeding time. However, this is not the case. The ice is melting and more fish can be caught. If other food is available otters leave frogs.

In the whole material frogs ore less often caught in spring than in winter (Table 1, X^2 19,7; $P<0,001$). However, there is a clear difference (X^2 5,41; $P = 0,02$) in the spring proportion of frogs between the eutrophic Iisaimi and the oligotrophic Nilsiä river systems. In the oligotrophic eastern rivers the proportion of frogs remains as high in spring (n = 81 in 162 samples) as in winter (165/281). Thus amphibians are a particularly important compensating food in rivers where apparently less prey (e.g. muskrats) is available.

Birds are rarely taken. Some young, downy waterfowl are caught in early summer. In autumn the bulk percentage is highest (2.5 %). This is probably owing to waterfowl hunting: otters catch the wounded birds escaped from hunters. At least the following species were taken: *Anas* sp. *Mergus merganser*, *Podiceps cristatus* and *Cinclus cinclus*. Some tens of dippers spend winter on the same rapids with otters. However, only once the bird remnants wore confirmed to belong to *Cinclus*. The rarest bird taken by otters was a kingfisher (*Alcedo attis*).

Mammalia. By far the most important mammalian prey was muskrat *Ondatra zibethica*. In the eutrophic parts of the study area it was common every year. One reason may be that very few hunters currently trap it owing to low prices of the pelt. Otters eat about 50 % of the muskrat leaving the skin, tail, skull, stomach and intestines. These parts weighed 250 grams in a 500 gram female muskrat. Thus catching such a muskrat corresponds to about 50 *Cottus* fishes. Taking muskrats otters save much trouble and energy in the hard times of winter. It is impossible to estimate how many muskrats are taken, therefore the total biomass eaten cannot be evaluated. The proportion of muskrats starts to increase after summer remaining on a relatively high level until the next summer. In the total sample (Table 1) this tendency is not significant (X^2 2,7; $P = 0,10$) because samples originating from oligotrophic areas obscure the results. However, In the eutrophic Iisaimi river system with more muskrats the difference is clear (X^2 5.66: $P<0,02$). Watervoles *Arvicola terrestris* were rarely taken. But for some reason they were not often seen in either of these years. Otters caught even watershrews (*Neomys fodiens*) more frequently than watervoles.

Crayfish. The study area was formerly a very important source of crayfish (*Astacus fluviatilis*). After *Aphanomyces astaci* infections the crayfish populations have remained low. Therefore they are rarely caught by otters. Spraints of otters may be used as a tool in mapping the distribution and possible recovery of crayfish populations. According to Harris (1968) the scales of crayfish pass through otters within one hour. Thus otters probably don't go very far before leaving the scats containing crayfish. Acidification seems to cause the absence of crayfish in the oligotrophic parts of the study area.

CONCLUSIONS

The otter population of the present study area seems to be viable. It may thrive best on the eutrophic part of the area in spite of more people living there. Nutrients originating from sewage, agriculture and cattle-farming are the main causes of eutrophication of the Iisaimi river system. Otters benefit because of more shelter and food (including muskrats and crayfish). But if the eutrophication is too strong, resulting in fish kills due to oxygen shortage, the otter population will be in danger. The prey choice strategy described here enables a stable otter population. Every winter some family groups are seen, the last on 9 January 1992.

REFERENCES

Harris, C.J. (1968). Otters: a study of the recent Lutrinae. Weidenfeid & Nicolson, London.

Skarén. U. & Kumpulainen, J. (1986). Recovery of the otter L*utra lutra* population in North Savo, Central Finland, with an analysis of environmental factors. *Lutra* **29**: 117-140.

Skarén. U. (1992) Saukon ravinto Ylä-Savossa. *Savon Luonto* **23**: 38-47.

R E PO R T

ARTIFICIAL FOOD SUPPORT FOR *Lutra lutra* IN A RIVER IN SPAIN

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Abstract: In the Spanish Pyrenees, otters are only present in six rivers, and populations are fragmented by hydrological schemes, and high, dry mountains. Because of the great water level fluctuations caused by hydroelectricity generation, fish levels often drop very low, endangering the otters. It was decided to restock one of the rivers, the Noguera Ribagorçana, with two species found below the dams and thus native to the river, which are better able to cope with high fluctuations in water level. An ongoing monitoring program shows otters are using this new resource.

Although European otter populations in Spain are in an acceptable state, according to the results of the "Otter Survey" (Delibes 1990), its status in the Mediterranean slope is considerably worrying (Ruiz-Olmo *et al* 1989a). The Iberian rivers flowing to the Mediterranean Sea are the ones most disturbed by several classical factors, which influence the distribution of this mustelid (Mason & Macdonald 1986). To these factors can be added others, originating in the overuse of the hydrological resorts (Jimenez & Lacomba 1989) and the isolation of the populations (Ruiz-Olmo *et al*. 1989b).

In the Spanish Pyrenees the otter only survives in six rivers, containing eight different populations. They are completely isolated by dams and high mountains, often considerably dry. In NE Iberia, two translocated otters and a wild one, followed by means of radio-tracking (Ruiz-Olmo & Jimenez, *in press*; Ruiz-Olmo, Lopez-Martin & van Iersel, *unpublished*) show a loyalty to the watercourses without moving away from them. It is because of this that these populations are susceptible to minor environmental modifications.

The river Noguera Ribagorçana is one of these rivers, with two well defined and clearly isolated subpopulations. The one situated in the middle course of the river occupies a length of about 55 km. The estimate carried out (Ruiz-Olmo, *in prep*.) shows minimal population densities fluctuating between 0,35 and 0,91 individuals/km, although it is estimated that this is somewhat high. This would represent at least 35 otters, probably some 40-60. It seems that this population is small, possibly close to the concept of minimal viable population (Soule 1987: Ruiz Olmo *et al*. 1989b; Wansink & Rigenaldus, 1989).

In the winter of 1991-1992 an obvious decrease in the presence of fish was noted. During the year 1992 we started electrofishing in the river Noguera Ribagorçana to establish the state of the fish population. In several stretches we found abnormally low densities of fish, with approximately 114 fish of more than 4 cm per km, representing approximately 5-8 kg/km and 100-150 kg/ha. In the years 1989 and 1990 the electrofishing showed a medium density of 6707 fish of more than 4 cm per km (range 1495-13942 fishes). The most affected species was the French nase (*Chondrostoma toxostoma*), a cyprinid that in this population represents, about 65,7 % of the prey consumed by the otter (Ruiz-Olmo *et al.* 1989c). Previously, the disappearance of the otter has been detected in the rivers Algars and Montsant, after important mortalities of fish in respectively 1987-88 and 1989. All of this signifies a warning to be alert and to conserve this otter population (one of the four most important in NE Iberia).

The causes of this major decrease in the otter population are not clear. There haven't been big mortalities because of contamination, as it doesn't exist in this stretch (Ruiz-Olmo, Delibes, Lopez-Martin & Hernandez *in prep*.), nor because of diseases caused by fungi or other pathogens. Numbers of dead fish have been observed frequently; caused by the abrupt changes of the water level in the river (up to 1-2 m), owing to hydro-electric exploitation upstream. Increases of the water level are usually associated with high increases of the width of the river, at some points more than 100 m. When the level goes down abruptly, many fish get trapped in small pools. In these cases they are not only eaten by the otters, but also by foxes *Vulpes vulpes*, Egyptian vultures *Neophron percnopterus*, and kites *Milvus* sp. These resources that temporarily facilitate fishing for the otter, can be fatal in the long term. The abrupt changes of the water level could also affect egg-laying of fish and survival of the fish-nurseries. Moreover, during the period referred to some moments of drought and drastic decrease of waterflow were observed in 1991, which without doubt also affected the fish population.

For the above reasons it was decided to artificially boost the fish population. In January of 1991 -1000 fish were liberated (about 600 kg) at two points of known otter occurrence, where one showed diurnal behaviour. In October of 1992 about 17 300 fish of an average size between 22 and 25 cm (2600 kg) were liberated at seven places on the river Noguera Ribagorçana, along a stretch of some 26 km. This operation represents the liberation of an average of 692 fish/km or 104 kg/km.

The fish belonged to the two species living in this zone, namely the French nase and *Barbus graellsi*, from the same river, downstream from the dams functioning as barriers to the distribution of otters. In this way the availability of food for the otter was not affected, and nor were kinds or ecotypes of fish introduced potentially different from those in this zone.

With this operation two goals are thought to be achieved:

- Supply enough food for the otter for a sufficiently long period.
- Strengthen the autochthonous fish population to obtain their reestablishment reproducing themselves (Iberian cyprinids are perfectly wall adapted to strong environmental fluctuations because of a higher biological efficiency) and therefore the availability of food for the otter.

The efficiency of the measurement will be tasted by means of radio-tracking of a wild female otter, present in this zone, and electrofishing to estimate the fish populations. Initial data show an important use of this new resource by otters.

ACKNOWLEDGEMENTS *- "Chema" Lopez-Martin, Erwin van lersol, Josa Antonio Muñoz, Josep Jordana, Antonio Berenjeno, "Cinto" Medina, Llorenç Ricou, Josep Bolado, Miquel Palacin, Leocadio Cruz and Angel Cierco have assisted in the program of ichthyological reinforcement.*

REFERENCES

Jimenez, J & Lacomba, I. (1989). The influence of water demands on otter (*Lutra lutra*) distribution in Mediterranean Spain. In: Proceedings V. Int. Otter Coll., Hankensbüttel 1989 (**C. Reuther & Röchert, R.**, Ed). *Habitat*, **6**: 249-255.

Mason, C.F. & Macdonald, S.M. (1986). Otters. Ecology and conservation Cambridge Univ. Press.

Ruiz-Olmo, J. & Jimenez, J. (*in press*). Radio-tracking of two recovered and translocated otters in N.E. Spain.

Ruiz-Olmo, J., Jimenez, J. & Delibes, M. (1989a). La nutria en la vetiente maditerránea de la peninsula ibérica. *Quercus*.

Ruiz-Olmo, J. Jimenez, J. & Lacomba, I. (1989b). Length of hydrologic basins and population viability of the otter in rivers in eastern Spain. In: Proceedings V. Int. Otter Coll., Hankensbüttel 1989 (**C. Reuther & Röchert, R.**, Ed). *Habitat*, **6**: 255-258.

Ruiz-Olmo, J., Jordan, G. & Gosalbez, J. (1989c). Alimentación de la nutria (*Lutra lutra* L., 1758) en el N.E. de la Peninsula lbérica. *Doñana. Acta Vert.*, **16**(2): 227-237.

Soule, M.E., Ed. (1987). Viable populations for conservation. Cambridge Univ. Press.

Wansink, E.H. & Rigenaldus, F. (1989). Restoring the Dutch otter population using the minimum viable population concept. In: Proceedings V. Int. Otter Coll., Hankensbüttel 1989 (**C. Reuther & Röchert, R.**, Ed). *Habitat*, **6**: 243-248

R E P O R T

OTTER DISTRIBUTION AND CONSERVATION IN THE CZECH REPUBLIC

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[2]Otterstation ČUOP. Pavlov 54, 5844 01 Ledeč nad Sázavou, Czech Republic

Abstract: The otter has been protected in the Czech Republic since 1949. A survey of otters was made during the last four years. A large population exists in the south, a smaller one in the east and a much smaller one in the north. Conservation activities concentrate on pollution levels, which are giving cause for concern, breeding and reintroduction, in collaboration with the Dutch Otterstation, to bridge between the isolated populations, and habitat restoration.

PRESENT STATUS

The otter has been protected since 1949 and appears on the Czech Red List of Endangered Species (Baruš *et al*, 1989). Since 1988 the Czech Institute for Nature Conservation (ČUOP) has been active in otter research and protection.

In the last four years members from ČUOP yearly organized a monitoring programme using more than 150 fieldworkers to survey for otter signs in the fresh snow. Based on these results we presume that there are approximately 300-350 otters left in the Czech Republic. Their distribution is shown in Figure 1 (Toman 1992).

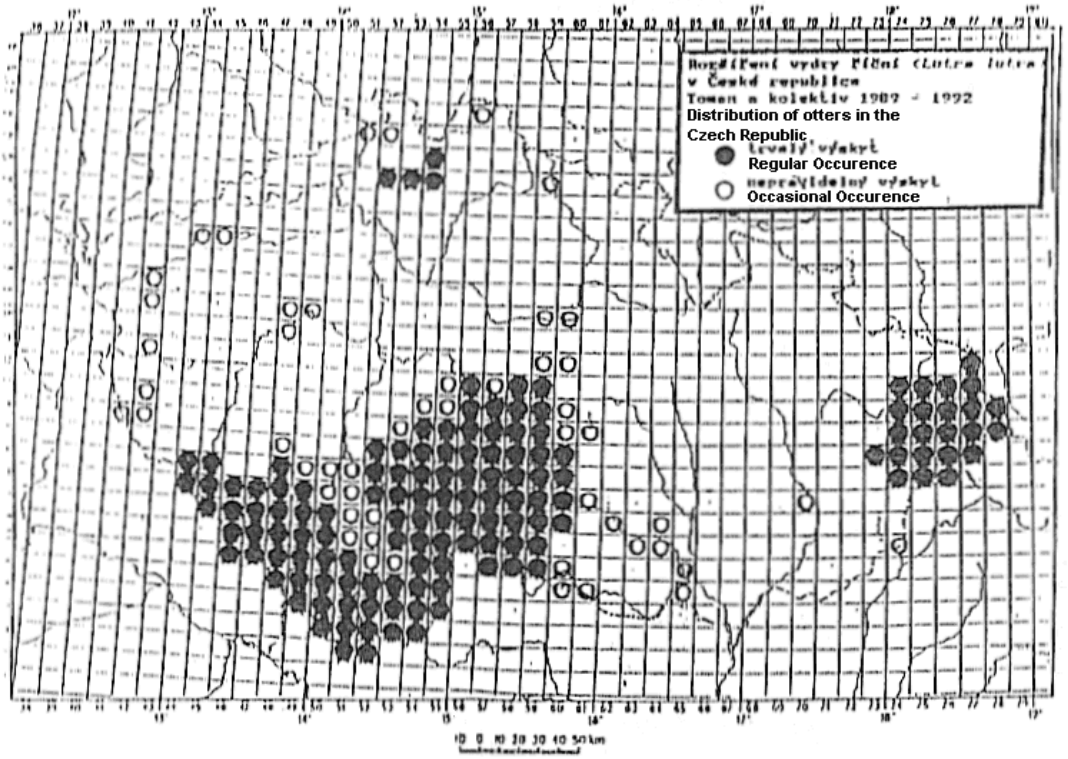

Figure 1. Distribution of Otters in the Czech Republic

At present there are three isolated populations. The north Bohemian population is linked with the population in former East Germany. The population in north-east Moravia is linked with the Slovak and Polish populations. South Bohemia harbours the strongest population of the Czech Republic. Otters there used three different habitats, mountain with oligotrophic streams, South Bohemian fishpond area, and highland area with small streams and ponds. This population makes up about 85 % of the total Czech population. The South-Bohemian population is linked with the remaining populations in the Bavarian forest and Austria.

CONSERVATION ACTIVITIES

In 1988, ČUOP started the "Otter Conservation Programme" for the Czech Republic (Hlaváč, 1991). This programme focuses on three different approaches.

1. Field Research

To continue research on distribution, ecology and diet of the otter, water pollution, habitat destruction, etc. In the last two years twelve dead otters were analysed for PCBs. Contents ranged from 19-260 mg/kg of fat, the main being 112 mg/kg (Hlaváč & Toman, 1991). These data are cause for serious concern. Research on PCS pollution will continue through analysing food, spraints and dead otters in several different habitats to examine the flow of pollution through the foodchain.

2. Breeding and Reintroduction Programme

In 1990 a research and breeding station was founded in Pavlov near Havličkův Brod. Here otters are kept for breeding and fundamental research. At present there are three wild-found otters. This spring construction will be finished. By than the station will comprise six big enclosures and a quarantine enclosure.

Together with the Dutch Otterstation Foundation, ČUOP has a joint breeding and reintroduction programme. For this a limited number of otters from the South-Bohemian population will be caught over a number of years. Additional otters will be obtained through the programme for care of injured otters at the Otterstation and through exchange with other otter-breeding stations.

In the area between the existing populations the otter became extinct owing to hunting. At present this area still has large regions with good otter habitat. However, natural migration from the present populations is impossible or does not occur. It is now debated whether repopulation of these empty niches should occur solely through natural migration or that the South-Bohemian and Moravian populations should be linked through reintroduction. The possibilities for improving natural migration from South Bohemia north-eastward will be investigated.

3. Restoration of otter habitat

This is a relatively new problem for the nature conservationists in our country. There are many canalized streams and now a big government project for revitalisation has begun. In 1992 revitalisation of the first two streams has started. The aspect of isolation of otter habitat and dissection of home ranges through improvements of roads will receive attention through a pilot study.

REFERENCES

Baruš, V. et al (1989). Červená kniha, (Red book) Vol II. SZN Praha.

Hlaváč, V. (1991). The programme for otter rescue in the Czech Republic, *Vydra* **2:** 3-6

Hlaváč, V. & Toman, A. (1991). Finding of dead otters (*Lutra lutra*) and preliminary results of analyses of dead animals. *Vydra* **2**: 7 – 9

Toman, A. (1992). First results of Action Otter. *Vydra* **3**: 3-8.

REPORT

DISTRIBUTION OF *Lutra lutra* IN BRITTANY AND FIRST PREVENTATIVE MEASURES AGAINST ROAD TRAFFIC

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Abstract: Otters are relatively common in Brittany unlike the rest of France. A survey was carried out from 1986 to 1990, which showed good otter numbers in the inland third of the country, correlating strongly with areas of good water quality. There is some evidence of otters spreading out to adjacent areas. A large consultation exercise aimed at preventing otter deaths on roads has led to enforcement of the 1976 Nature Conservation Act to protect otters. As a result of this, many otter underpasses have been built under roads, and a survey has been commissioned to assess their efficiency.

Otters, absent or very rare from the north, most of the east and the southeast of France, are relatively widespread on the Atlantic coast and in the Massif Central. Supported by the French ministry of Environment, World Wildlife Fund and many other financial backers, a National Action Plan has been introduced in 1989 by the Société Française pour l'Etude et la Protection des Mammifères. This paper is a summary of a report which is a contribution to this Action Plan and has been published in 1991 for the Direction Régionale de l'Environnement in Brittany (Lafontaine, 1991).

DISTRIBUTION OF OTTERS

A regional survey has been carried out from 1986 to 1990 in order to update previous data (cf IUCN OSG Bulletin 3). More than one hundred people took part, most of them observing the standard survey method described by MacDonald (1990). Distribution of otters, displayed by subunits of river catchments and by occurrence levels (see map), showed that the species still occupies the third - mainly inland - of this country; 76% of positive subunits show a good or very good water quality[1], while 7 % of them, mainly southwestern wetlands from the Atlantic coast, show bad water quality. Adversely -

but not surprisingly - otter signs were not recorded in catchments where low flowing water quality is very bad (east and northwest, of the country).

Coastal and insular otters still remain on the west end south coasts, but become restricted in range. The Molène Archipelago (Regional Park of Armorique), recently labelled *Man and Biosphere Reserve*, holds the most westerly and unusual population.. Extrapolating occupied areas by occurrence levels, mean numbers of otters in Brittany have been estimated between 150 and 250 individuals, that is to say about 25 % of the total French strength. Recent data suggest a re-colonisation process in subunits adjacent to the central core.

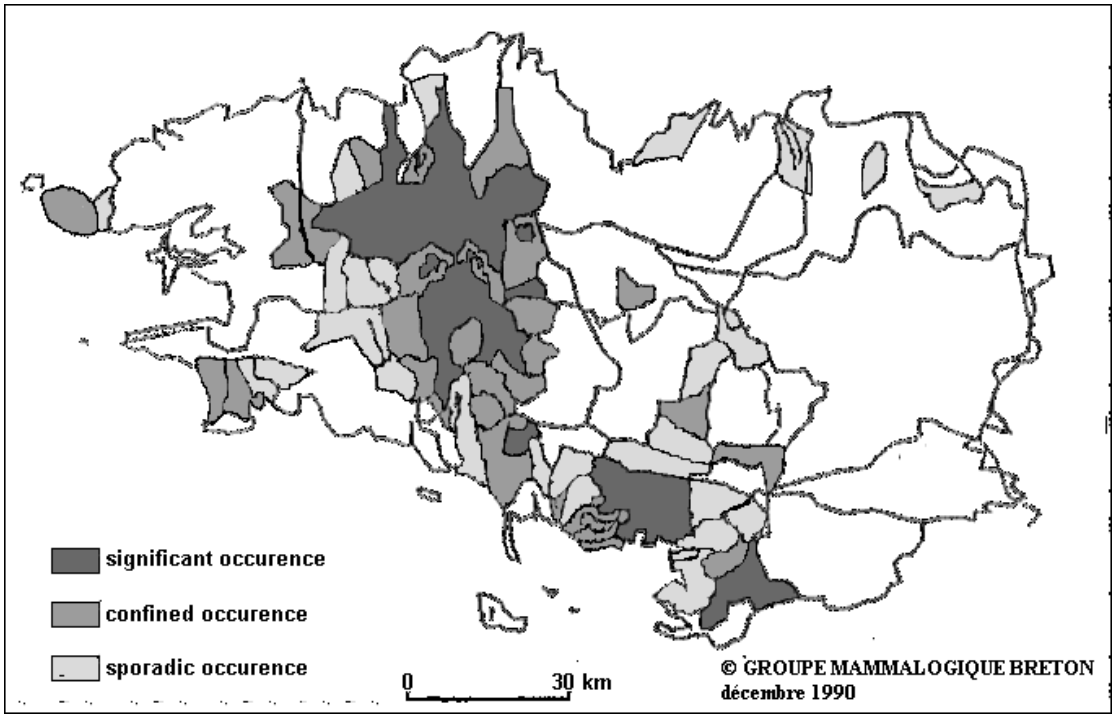

Figure 1. Otters *Lutra lutra* in Brittany. Survey 1988 - 1990. Distribution by subunits of river catchments (click for larger version)

PREVENTATIVE MEASURES AGAINST ACCIDENTAL MORTALITIES

From 1986 to 1990, 22 otter road mortalities have been recorded in the country; this is the first known mortality factor but other ones[2] (e.g. poaching, mink and nutria trapping, rodents poisoning...) are probably underestimated. Following useful advice from R. Green (Vincent Wildlife Trust, U.K.) or A.B. Madsen (National Forest and Nature Agency, Denmark), and road works schemes increasing drastically, a large consultation has started with national or departmental road authorities, in order to suggest and provide preventive measures. The 1976 Nature Conservation Act has planned this obligation for protected species but it had never been enforced for otters. For the first time In France:

- nearly 15 otter underpasses (pipes or culverts + fences) will be achieved by the end of this year. Unit costs vary from FF 20 000 to 300 000.
- a highly murderous road (up to 26 000 cars/day, Lafontaine 1991) has been made up in June 1992, in order to build an otter underpass (cost: FF 200.000; Department of Morbihan, near the city of Vannes. c.f. IUCN/OSG Bulletin 5).

Ordered by the French Ministry of Environment, a survey is now in progress in order to test the respective efficiency of these underpasses. Further cooperation should be welcome with foreign experiences. A technical seminar (including also otter accounting during hydraulic works and wetland management) will be arranged during autumn 1993 to show these achievements.

People interested in attending have to write to:
Direction Régionale de l'Environnement, 10 rue des Dames, F-35000 Rennes, France.

REFERENCES

Lafontaine, L. (1991). La loutre et la route. Groupe Mammalogique Breton, Parc Naturel Régional d'Armorique (report 1st part, 114 p.)

NOTES

[1]1981-88 Basin Agency Survey, including several criteria (mainly organic and bacteriological), but not pesticides and PCBs contamination.

[2]No true evidence has allowed to accredit the fact that beavers could significantly undermine otter populations, which seem healthy where the single beaver colony has been reintroduced.

REPORT

FIELD SURVEY OF *Lutra lutra* ON CORFU ISLAND (GREECE)

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Abstract: A study on Corfu Island in 1986 describes an otter population strongly threatened by building activities and pollution from olive pressing factories. This present report shows the accurate situation in 1992. Otters no longer breed on the west coast, where two major populations have been extirpated. Pressure from tourist development, fishfarming and uncontrolled poaching, even in reserves, threatens remaining otter populations. Conservation and restoration of the remaining wetlands is urgently needed.

INTRODUCTION

A recent study on Corfu Island in 1986 (Gaethlich 1988), describes an otter population strongly threatened by building activities and pollution from olive pressing factories. This present report shows the accurate situation in 1992, while the anthropic pressure is dramatically increasing on the wildlife, especially on the otter.

METHODS

This field survey was carried out only on the main island from 22 April 91 to 05 May 91, from 23 September 91 to 17 March 92 and from 27 April 92 to 13 June 92. The 8 sites studied by Gaethlich and all the rivers and all the inland or coastal wetlands were regularly surveyed by walking or canoeing. At each site a minimum of 2 km of shore or bank was checked for all otter signs (spraints, tracks, "slides", holts, resting sites). Beaches, sea cliffs out of reach on foot and less suitable places were only sometimes visited and, unfortunately, never once islets and small Islands. An inquiry was also conducted among the Greek population, administration, fishermen and hunters.

STUDY AREA

Corfu (Kerkyra) is the north-westernmost island in the Ionian sea, separated from the southern coast of Albania by a 2 km wide strait. Along the west coast, there are high cliffs and long sandy beaches, but very few rivers or water springs. On the opposite, the other coasts are lower with some rivers, water springs, three large lagoons, some little ones and the last salina. In 1974, 30 % of the whole area was occupied by an old cultivated forest of olive trees, 30 % by other crops (vines, fruit, vegetables). Now the 100 000 inhabitants gave up farming on account of the tourism expansion. In 1991, 4374 charters and many ferries conveyed a million tourists from May to October. There is no intensive fish farming. Intensive livestock breeding or agriculture, maize, or industry. So chemical pollution seems to be low, except in the olive groves whore people use without circumspection a lot of toxic sprays (e.g.gramoxone).

RESULTS

Otter distribution in Corfu

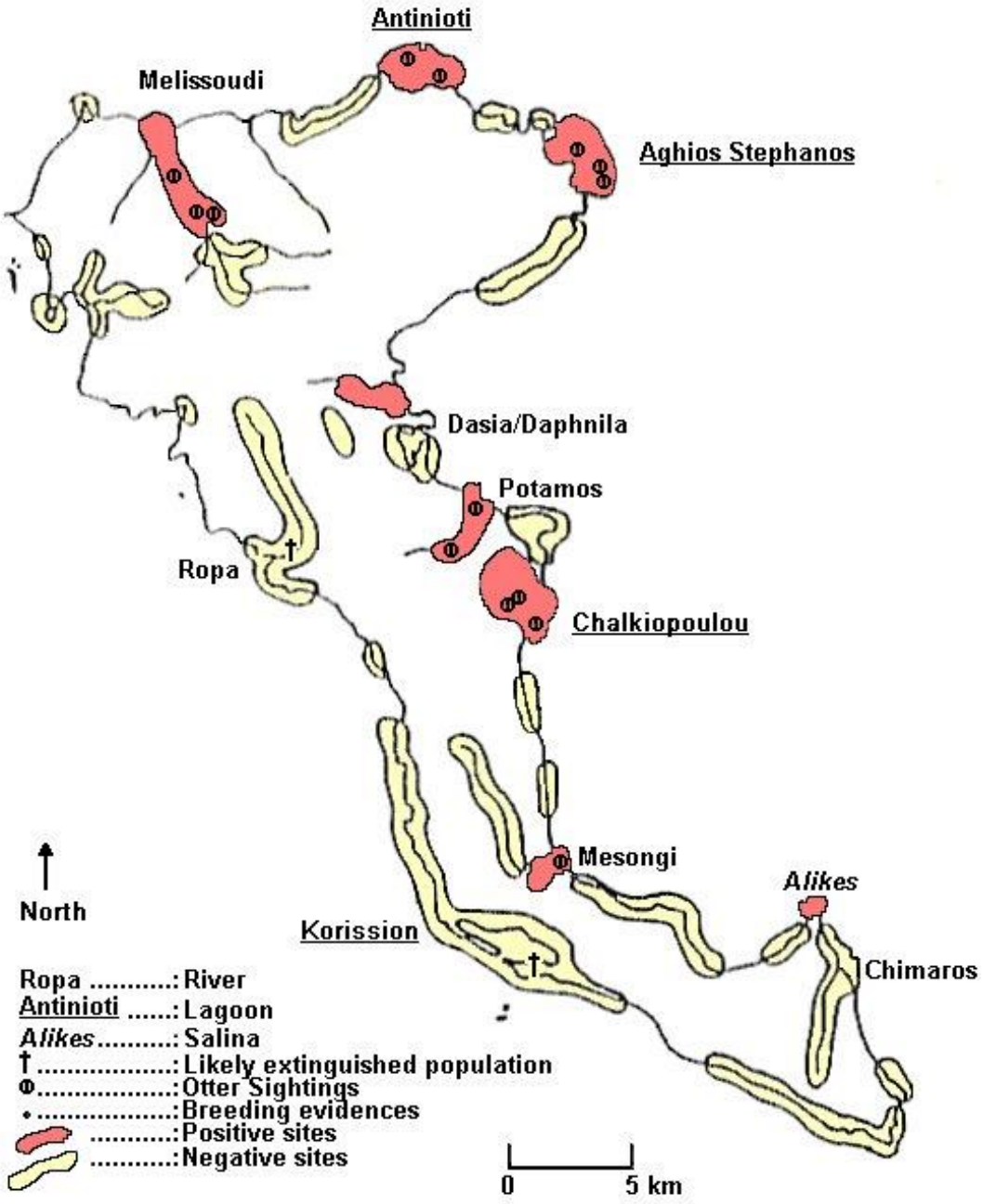

Figure 1. Corfu: Distribution of Otters in 1992

1. ***West coast and extinct otter populations:***

It seems that there are no more otters on the west coast. A drainage work reclaimed the wetlands of the Ropa valley (20 km^2) in 1904. The surviving population seems to have disappeared. According to the hunters, it happened in 1968-1970 when the golf course was constructed. The Korission lagoon (500 ha.) sheltered otters in 1986 (Gaethlich). In spite of a very close survey, no otter, nor spraint nor foot-print was found in 1992. The otter population was likely wiped out by hunters and fishermen at request of the Italian fishing concessionaries. The other parts of the west coast seem suitable for otters: food, holts in undisturbed rocky places at the bottom of high cliffs, no pollution and few tourist resorts. Is the lack of fresh water the reason?

2. Salina: Alikos/Lefkimmi:

This last salina (130 ha) does not shelter otters; it seems unsuitable. Only footprints were found once on the beach (likely an erratic otter).

3. Rivers and estuaries:

On the north and east coasts, rivers are eutrophic and obstructed by vegetation and dead trees. The banks are covered with a lush and impenetrable vegetation. These sites are very suitable for otters because they supply a lot for possibilities of food and holts. In Melissoudi, Dasia/Daphnila and Potamos, the otters seem to be able to bear organic pollutions from small litter dumpings and direct domestic sewages. But the olive oil pressing units throw out water directly into the rivers. This strong pollution appears to wipe out the otters (e.g. in Chimaros no sign, in Mesongi few ones).

4. Lagoons:

In the north, Antinioti lagoon (100 ha) shelters the most likely important population of otters, in spite of the daily and strong bird shooting from October to May. The reason is a huge reed bed that provides food as well as quiet hides and holts without pollution. In the north-east end, near Aghios Stephanos, 3 little lagoons (each one, 2 ha) nearly free of main pollution and disturbance are a cosy place for a coastal population. Surrounded by Kerkya town and suburbs (30 000 inhabitants), Chalkiopoulou lagoon still hides otters in spite of strong bird shooting, international airport, pollution from direct sewage and large illegal infillings.

Biology/Ecology

1. Breeding:

In 1992, from direct watching and footprints, otters still regularly breed in many freshwater, brackish and coastal wetlands of Corfu island.

2. Dependence on freshwater:

The otter distribution appeared to follow the freshwater localisation map. The lack of freshwater would seem to limit the settling of coastal otters. Further confirmation is needed.

3. Spraints:

Spraints ware mostly found on white supports (natural or artificial): limestone rock, wood, plastic bag or box, polystyrene box.

4. Pollution and disturbance:

In Corfu, otters are able to live and bread very close to the intense human activities in the suburbs and the crowded tourist resorts; they often bear a heavy organic pollution. But in such a case, otters absolutely require an easy sized and important prey biomass, close refuges as well as the lack of chemical pollution.

5. Dispersion:

Only a narrow strait (2 km) separates the large coastal wetlands of south Albania from the most hopeful otter population of Corfu. Presently, exchanges between these two populations are possible but unknown

Survey among the human population

In Corfu, among the Greek population, exclusively fishermen and hunters close to the lagoons know this animal. But only some of them can supply some information about otters. The otters would have been deliberately wiped out from Korission lagoon by fishermen. In the past, they sometimes shot otters in Chalkiopoulou lagoon, and sold the pelts in Kerkyra town.

Threats and otter conservation

In 1992, Corfu still shelters a population of otters. But this species is really endangered. Saving otters means saving last wetlands. This preservation requires some drastic measures. The strongest threats are: .

a. uncontrolled and booming of popular tourism: partial or complete illegal infilling, illegal building, straight sewage and litter dumpings in the wetlands.
b. official policy of inaction: the economic expansion is free, chaotic, without development scheme, but under the pressure of foreign lobbies! Therefore offenders are rarely prosecuted. From October to May, the poaching is a daily behaviour everywhere, even within the 2 game reserves. The local administration asks for a nature police and powerful game keepers team with real abilities and powers.
c. intensive fish farming schemes: supported by foreign lobbies, some schemes threaten the great lagoons. The ecosystems would be seriously altered by the discharges of droppings, the wastes of chemical or pharmaceutical treatments and the introduction of foreign species. The new conservation in Corfu urgently requires three measures:
    i. Chalkiopoulou lagoon needs a restoration plan of the traditional fishing ditches, the stopping of pollution and infillings, the persecuting of the offenders; it would reconcile the economic activities (fishing, tourism, suburb expansion) with the requirements of the nature conservation.
    ii. Aninioti lagoon needs a restoration of the huge reed beds to the advantage of fishermen, birds and otters. The successful restoration of "La Gabrière" lake in Brenne/France (Trotignon & Williams 1990) should be an excellent example for Antinioti.
    iii. A nature sanctuary for the 3 little lagoons near Aghios Stephanas. The very limited size and the lack of building, pollution and main disturbance on this area is an opportunity to establish a nature sanctuary ("Otter Haven").

CONCLUSION

The otter still breeds in freshwater, brackish and coastal wetlands of Corfu. The species is therefore endangered by tourism expansion. Otter conservation requires a real policy of conservation for the remaining wetlands.

ACKNOWLEDGEMENTS *- Lionel Lafontaine (S.O.S. Otters Network Coordinator) made very helpful comments on early drafts of this manuscript. I thank him for his advice.*

REFERENCES

Gaethlich, M. (1988). Otters in western Greece and Corfu. I.U.C.N. Otter Specialist Group Bulletin, 3: 16-23.

Trotignon, J. & Williams, T. (1990). Favoriser la vie dans les élangs. Atelier technique des espaces naturels. 68 p.

SHORT COMMUNICATION

SOUTH AMERICAN MEETING OF SPECIALISTS IN AQUATIC MAMMALS

Anibal Parera

Proyecto Ariraí, Virrey Cevallos 215 4°C, 1077 Buenos Aires, Argentina

Since 1982, every two years, the South American Meeting of Specialists in Aquatic Mammals has been taking place in different Latin-American countries (to date Argentina, Brazil, Uruguay and Chile). Different activities (conferences, talks, posters, workshops and courses) about Cetaceans, Pinnipeds, Manatees and aquatic Mustelids are developed.

The 5th meeting took place in Buenos Aires and It was organized by Australis Foundation and sponsored by the Museo Argentino de Ciencias Naturales, from the 28 September to the 2 October 1992. As far as the organizing aspects of the event is concerned, we should say that it was faultless. Out of 156 papers presented, only six of them were about otters (*Lutra longicaudis*, *Pteronura brasiliensis*, *Lutra provocax* and *L. felina*). This shows the lack of working groups studying otters in Latin-America. It is important to bear in mind that this is the unique international meeting in Latin-America where works about otters are continually presented.

Among new projects involving otters, I'd like to stress Omacha Foundation Project, coordinated by Sandra Beltrán, whose aim is to begin a long term study of *Pteronura* in the Colombian Amazonia. Though traditionally the meetings included round table discussions about otter issues, in this opportunity it was not held. We hope that this point and the lack of works presented in the 5th meeting, take a different turn for the 6th, which will take place in Florianopolis (Brazil) in 1994.

List of Abstracts dealing with Otters

Bardier, G. Habitat y signos de actividad del "lobito de río" *Lutra longicaudis*.

Capella, J., Yerko, V. & Cerda, E. Distribución espacial, abundancia y reproducción de la nutria. Marina en el norte de Chile.

Parera, A. Análisis de la dieta de *Lutra longicaudis* en Laguna Iberá, provinvia da Corrientes, Arg.

Parera, A. Disminución potencial del hábitat de *Lutra longicaudis* en el área de influencia de la Represa Yacyretá, Argentina y Paraguay.

Rosas, F. & Kesa, K, Conteudo mineral do pelo da Ariranha (*Pteronura brasiliensis*).

Schiavini, A. Nutrias, *Lutra* sp. en Tierra del Fuego, Argentina.

SHORT COMMUNICATION

CO-OPERATIVE CAPTIVE MANAGEMENT PROGRAMS: EXCHANGE OF INFORMATION

Pat Foster-Turley

Marine World Foundation Marine World Parkway Vallejo. CA 94589 USA

Cooperative programs for management and breeding of captive otter populations are increasingly becoming an international effort. At present two species of otters, *Lutra lutra* and *Aonyx cinerea*, are being managed by studbooks which record the birth, breeding and mortality information on all individuals maintained in zoos and other cooperating captive animals facilities. If you are maintaining either of these species, and have not already done so, please provide information on all your otters to these studbook keepers:

Aonyx cinereus
International Studbook
Susan Engfer
Cheyenne Mountain Zoo
Colorado Springs, CO 80901
USA

United Kingdom Region
John Wheeler
London Zoo, Regent's Park
London NW1 4RY
UK

Lutra lutra
Paul Vogt
Krefelder Zoo
Uerdinger Strasse 377
D-4160 Krefeld 1
Germany

In addition, otters are included in more generalized regional captive conservation programs for small carnivores, the Taxon Advisory Groups (TAGs). Two TAGs now exist for small carnivores, one in the United Kingdom, and one in the United States. These cooperative programs aim toward increased coordination of captive field conservation programs for targeted species found in a number of zoos. For more information about these TAGs, contact their chairmen:

European Small Carnivore TAG
Paul Robinson
Southport Zoo
Princes Pork
Southport
Merseyside PR8 1RX
UK

North American Small Carnivore TAG

John Camio
Metro Toronto Zoo
P O Box 280, West
Hill
Ontario M1E 4H5
Canada

or

Pat Foster-Turley
Marine World Foundation
Marine World Parkway
Vallejo, CA 94589
USA

SHORT COMMUNICATION

GIANT OTTER STUDY IN PERU COMPLETED

Christof Schenk and Elke Staib

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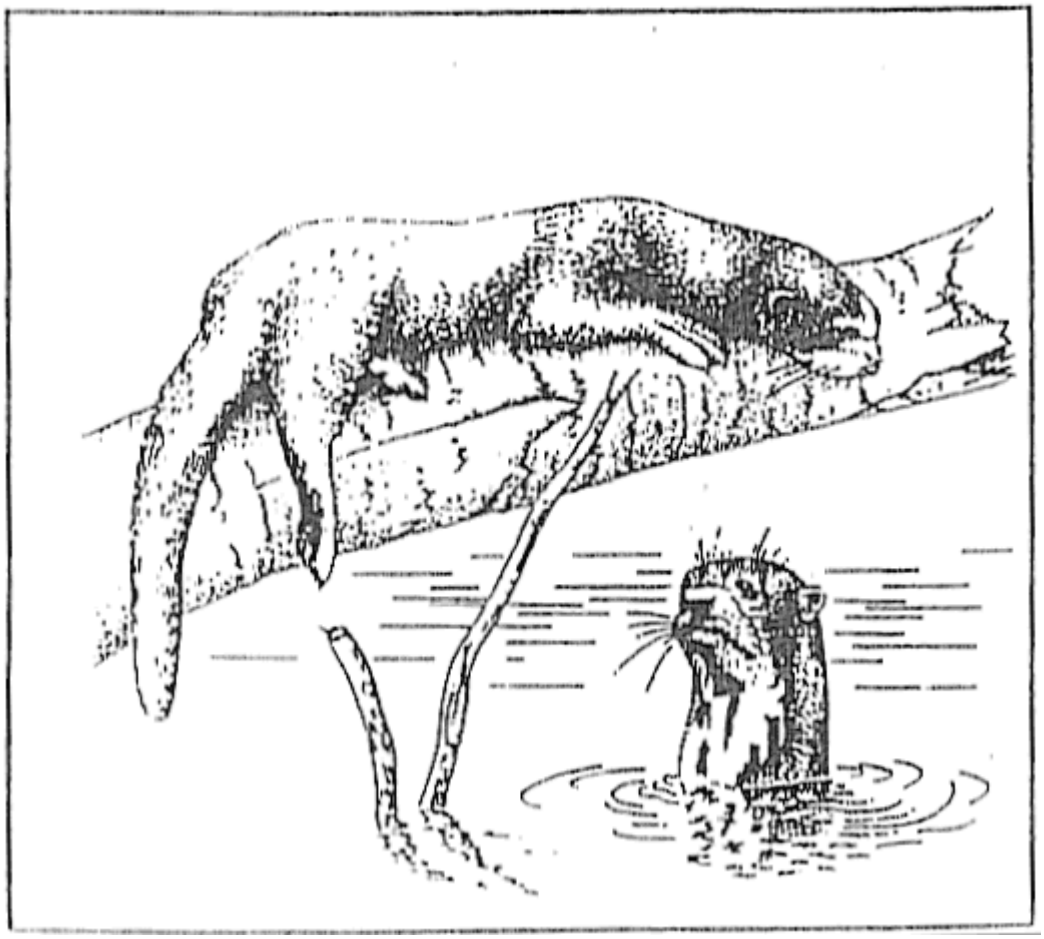
Between July 1990 and November 1992 giant otters *Pteronura brasiliensis* were studied in Manu National Park (18000km^2) and the Tambopata region (14800km^2) of Peru. The fieldwork was aimed at determining otter distribution and relative abundance in areas subjected to different human influences; analysing habitat use; studying behaviour; and identifying threats to giant otter populations.

Much data have been collected on the above aspects. These will be analysed and reports will be prepared. The nature of the reports (in English and Spanish) will be such that they provide useful information to local conservationists and tourist guides. Aspects of the findings will also be presented at the Sixth International Otter Symposium in South Africa.

The study areas will be revisited to estimate giant otter numbers in Manu National Park, present seminars to conservation authorities, and lay the foundations for a public-awareness campaign.



LITERATURE

Compiled by Sheila Macdonald
(Where known, the author's address is given in parentheses)

Addison, M Fox, G.A. & Gilbertson, M., Eds (1991) Proceedings of the Expert Consultation Meeting on Mink and Otter, Windsor, Ontario. 13 papers, 30 pp.
(International Joint Commission, 100 Quellette Ave, 8th Floor, Windsor, Ontario N9A 6T3, Canada)
Beja, P.R. (1992) Effects of freshwater availability on the summer distribution of otters *Lutra lutra* in the southwest coast of Portugal. *Geography* **15**: 273-278.
(Lab. Maritimo de Guia, Forte Na Sra de Guia, 2750 Cascais, Portugal)
Delibes, M., Macdonald, S.M. & Mason, C.F, (1991). Seasonal marking, habitat and organochlorine contamination in otters (*Lutra lutra*): a comparison between catchments in Andalusia and Wales. *Mammalia* **55**: 567-578.
(Estación Biológica de Doñana, Pabellon del Peru, Avda. Maria Luisa s/n 41014 Sevilla, Spain)
Green, G.A. & Brueggeman. J.J. (1991). Sea otter diets in a declining population in Alaska. *Mar. Mammal Sci.* **7**: 395-401.
(Ebasco Environmental, 10900 N.E. 8th Street, Bellevue, Washington 98004, U.S.A.)
IUCN (1992). Otters, 32 pp.
(World Conservation Centre, 1196 Gland Switzerland)
Kemenes, I. & Nechay, G. (1990) The food of otters *Lutra lutra* in different habitats in Hungary. *Acta Theriol*. **35**: 17-24.
(Ministry for Nature Protection and Water Management, Budapest, Kolto u. 21, 1221, Hungary)
Kozenn, I., Urban, P., Stouracova, I. & Mazur, I. (1992). The diet of the otter (*Lutra lutra* Linn.) in the Pol'ana protected landscape region. *Folia Zoologica* **41** (2): 107-122.
(Institute of Systematic and Ecological Biology, Czechoslovak Academy of Sciences, Brno)
Kruuk, H. (1992). Scent marking by otters (*Lutra lutra*): signalling the use of resources. *Behavioural Ecology* **3**(2): 133-140.
(Institute of Terrestrial Ecology, Banchory AB31 4BY, U.K.)
Kvitek, R.G., Oliver, J.S., DeGange, A.R. & Anderson, B.S. (1992) Changes in Alaskan soft-bottom prey communities along a gradient in sea otter predation. *Ecology* **73**(2) : 413-428.
(Zoology Dept, NJ-15, University of Washington, Seattle, Washington 98195, U.S.A.)
Lunnon, R.M. & Reynolds. J.D. (1991). Distribution of the otter *Lutra lutra* in Ireland, and its value as an indicator of habitat quality. In: **Jeffrey, D.W. & Madden, B.** (eds) Bioindicators and Environmental Management, 435-443. Academic Press.
(Dept Zoology, Trinity College, Dublin 2, Ireland)
Madsen, A.B., Christensen, N.C. & Jacobsen, L. (1992) Odderens (*Lutra lutra* L.) forekomst i Denmark 1991 og udviklingen i bestnaden 1986-1991. *Flora og Fauna* **98** (3 + 4): 47-52.
(Karesten Iversensvej, 8270 Højbjerg, Denmark)
Marshall, H. (1991) Recent otter records in Devon. Rep. Trans. Devon Ass. Advmt Sci. 123: 137-148.
(Meadowside, Virginstow, Beaworthy, Devon EX21 5DZ, U.K.)
Mason, C.F., Macdonald, S.M., Bland, H.C. & Ratford. J, (1992) Organochlorine pesticide and PCB contents in otter (*Lutra lutra*) scats from western Scotland. *Water, Air and Soil Pollution* **64**: 617-626.
(Dept Biology, University of Essex, Colchester, C04 3SO, United Kingdom)
Mason, C.F. & Madsen, A.B. (1992) Mercury in Danish otters (*Lutra lutra*). *Chemosphere* **25**(6): 865-867.
(Address as above)
Mason, C.F. & O'Sullivan, W.M. (1992) Organochlorine pesticide residues and PCBs in otters (*Lutra lutra*) from Ireland, *Bull. Environ. Contam. Toxicol* **48**: 387-393.
(Address as above)
Mason, C.F, & Rowe-Rowe, D.T. (1992) Organochlorine pesticide residues and PCBs in otter scats from Natal. *S. Afr. J. Wildl. Res.* **22**: 29-31.
(Address as above)
Otters - Journal of the Otter Trust (1991). 12 pp.
(The Otter Trust, Earsham, nr. Bungay. Suffolk NPI35 2AF, U.K.)
Pikulik. M.M. & Sidorovich, V.E. (1991) Evaluation of the structural and functional relationships of semiaquatic predators and amphibians of Belarus. *Ekologiya (Sverdl.)* **6**: 28-36.
(Institute of Zoology. F. Skoring St 27, Minsk - 220600, Belarus)

Reuther, C., Ed. (1992) Otterschutz In Deutschland. Conference proceedings with 29 papers. *Habitat* **7**: 176 pp.
(Otter Zentrum. D-3122 Hankensbüttel, Germany)
Rowe-Rowe, D.T. (1992) Survey of South African otters In a freshwater habitat, using sign. *S. Afr. J. Wildl. Res.* **22**: 19-55.
(Natal Parks Board, P.O. Box 662, Pietermaritzburg 3200, Republic of South Africa)
S**ielfeld. W.H. (1989)**. Sobreposicion de nicho y patrones da distribucion de Lutra felina y L. provocax (Mustelidae, Carnivora) en el medio marino de Sudamerica Austral. *An. Mus. Hist. Nat. Valparaiso* **20**: 103-108.
(Departamento da Ciencias del Mar, Universidad Arturo Prat, Casilla 121, Iquique. Chile)
V**ydra, Bulletin of the Czech Otter Group, N°2. 1991**. Containing 13 papers.
(Stredisko Havličkův Brod, Stanice pro Ochranu, Fauny, Pavlov 54, 584 01 Ledeč nad Sázavou, Czech Republic)
Wickens. J.D. (1991) Otter survey of Roaringwater Bay, South West Cork, Ireland - 1990. *Bulletin of Sherkin Island* N°**12**. 38 pp.
(Sherkin Island Marine Station, Sherkin Island, Co. Cork, Ireland)
Woodin. S.J. & Farmer, A.M. (1992) Impacts of sulphur and nitrogen deposition on sites and species of nature conservation importance in Great Britain. *Biological Conservation* **63**: 23-30.
(Dept. Plant and Soil Science, University of Aberdeen, St. Machar Drive, Aberdeen, U.K.)
Wren, C.D. (1991) Cause-effect linkages between chemicals and populations of mink (*Mustela vison*) and otter (*Lutra canadensis*) in the Great Lakes Basin. *Journal of Toxicology and Environmental Health* **33**: 549-585.
(Ecological Services for Planning Ltd, Guelph, Ontario, Canada)

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