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CONTENT

ARTICLES & REPORTS

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IUCN OTTER SPECIALIST GROUP BULLETIN

The IUCN Otter Specialist Group Bulletin appears biannually. Articles, reports, symposium announcements and information on recent publications are welcome. All submissions should be typed in double-spacing. The submission of an electronic manuscript (winword, wp or ASCII) on diskette is strongly recommended. Articles should not exceed 2000 words in length, i.e. not to exceed four printed pages, including diagrams and tables. For longer articles please contact the editor. Diagrams, maps and tables should be included as a photocopy ready for reprint.
Articles will be fully reviewed. Reports will be printed without further consideration. Authors are requested to add a notice whether they submit an article or a report.

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NOTE FROM THE EDITOR

The 11th issue of the IUCN Otter Specialist Group Bulletin is now in your hands. I hope that this issue will fullfill the expectations. Thanks to all whose comments are used for further changes in the Bulletin. Some of you send me information on their last publications which makes the compilation of the list on recent publications much easier. I encourage everyone to send information on publications and suggestions for further improvements. Please send articles and reports on diskettes whenever possible as otherwise articles have to be retyped by myself.

In the last issue a leaflet was enclosed in order to see who is still interested in the Bulletin. Most of them were sent to me and some of you enclosed a contribution to the costs for publishing this journal. Thanks to all who did so. Unfortunately not all cheques from overseas could be used due to very high bank charges. Despite this fact the amount sent to me covers the mailing cost for a complete issue which is a very big help in producing the Bulletin. As not all on the mailing list requested further issues with the leaflet I decided to send copies of this issue to all who published articles on otters in the last years and were not receiving the Bulletin yet. I hope that this will lead to a wider distribution of our Bulletin.

For the next issue I plan to split the publications in two sections. Articles will be fully reviewed by at least two reviewers. Reports will be published without a review system as we had it the last years. Authors are requested to indicate in which section their article should be included. I hope that this system will improve the quality and acceptance of our Bulletin.

In the last months I got a lot of requests on copies of older issues of the IUCN Otter Specialist Group Bulletin. I decided to provide copies as a service to all readers. They will be sold for the costs of copying and postage. The amount has to be send in advance. Please contact me if you are interested in previous issues.

Photos for the front cover are welcome and will be send back on request. Name of authors will be mentioned on page 1.

The production of this issue is sponsored by Serotherapeutisches Institut Wien. Furthermore the first two advertisements (Knesebeck Verlag, München; Oxford University Press, Oxford) in the history of the Bulletin are enclosed. I would like to thank Hans Kruuk, Christoph Schenk and elke Staib for their initiatives.

Arno Gutleb

REPORT

THE HAIRY-NOSED OTTER IN PENINSULAR MALAYSIA

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Historically, four species of otters have been recorded in Malaysia. These are Smooth Otter *Lutrogale perspicillata*, Hairy-nosed Otter *Lutra sumatrana*, Eurasian Otter *Lutra lutra* and Oriental Small-Clawed Otter *Aonyx cinerea*. However over the past twenty-five years, only *L. perspicillata* and *A. cinerea* have been recorded in Peninsular Malaysia, while in East Malaysia (Malaysian Borneo) *L. perspicillata*, *Lutra sumatrana* and *A. cinerea* continues to exist.

In the peninsula, *L. lutra* is known only from the locality of the offshore islands of Langkawi in the Straits of Malaca (Medway, 1969) and thereafter have been no sightings since. Similarly *L. sumatrana* had not been recorded in the peninsula since the sixties.

In 1991, during surveys in the state of Perak on the west coast, an otter skull was obtained from a roadkill close to recently cleared peat swamp forest. Subsequent identification of this skull by the British Museum of Natural History confirmed that it belonged to *L. sumatrana*. This was the first confirmation for the continued existence of this species in the peninsula.

In 1994, again during surveys of peat swamp forests close to Nenasi in the state of Pahang on the east coast, another otter roadkill was found. The carcass was examined and photographed and positively identified as *L. sumatrana*, making it the second peninsular record of this species this decade.

Both animals were found next to peat swamp forests; this common factor leads one to postulate that this species may be associated with the swamp forest habitat as opposed to *L. perspicillata*, which is predominantly coastal and *A. cinerea* which is wide ranging. A close association with the dense swamp forest habitat and difficult field identification could explain the lack of sightings of this species.

Projects are being planned to survey the southeast Pahang peat swamp forest (where the second specimen was recovered) and attempt to locate a population of *L. sumatrana* as well as comprehensive surveys of the Langkawi island complex to determine the status of otters and other mammals there. If *L. lutra* still exists on Langkawi, it is most likely to be in the little surveyed mountains.

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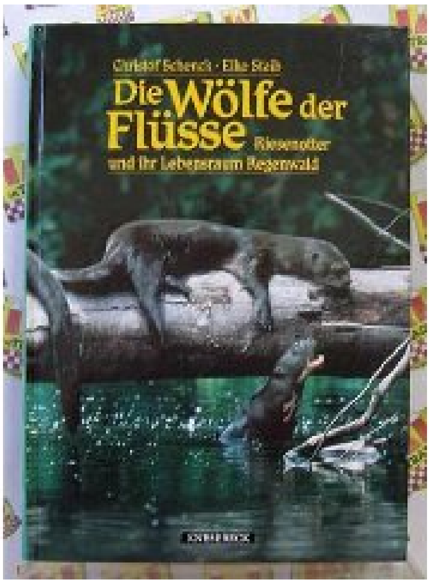

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REPORT

NEWS FROM THE GIANT OTTER PROJECT IN PERU

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Abstract: In 1994 in Manu National Park, the Otorongo group is now led by Isla; there is further evidence that tourism is affecting breeding adversely. Tourism has doubled this year, but the national park authority have signed an agreement accepting responsibility for protecting the animals, and are building an observation tower for tourists that does not seem to trouble the otters. We organsied a seminar on "Management of tourism in the reserves of Madre de Dios" in the department capital, Puerto Maldonado, and contributed to another organised by the University of Cusco and the park administration. We published a booklet containing the most important results of our study. We investaged the acoustic communication of giant otters under water, finished a study on mercury contamination of fish, produced a book, "Die Wölfe der Flüsse - Riesenotter und ihr Lebensraum Regenwald", and produced a TV film "Die Riesenotter vom Madre de Dios".

The project "Status, habitat and conservation of Giant Otters (*Pteronura brasiliensis*) in Peru" from the Frankfurt Zoological Society, - Help for Threatened Wildlife - started in 1990. After nearly three years of continuously fieldwork, the project is now run with a yearly two months fieldwork period in Peru and ongoing analysing, management and coordination in Germany. Following we give the report for 1994.

MONITORING OF THE GIANT OTTER POPULATION IN MANU NATIONALPARK IN PERU

Since the beginning of the project, nearly five years ago, we censused the entire Giant Otter population in Manu Nationalpark at least once a year. Giant Otters can be distinguished from one another by their throat markings and therefore we are able to include even individuals in our stock-taking. So we receive, besides the number of the otters, also important data about reproduction, social biology, mortality and migration of this population. In 21 oxbow lakes of the Manu river we counted a total of 33 animals in 5 groups and 2 solitarians. This number is less than in the years before (about 45 animals), but we found certain signs (fresh tracks, scats, dens) from three more groups. This suggests that the population of Giant Otters in Manu Nationalpark remains constant in the last four years.

We stayed some days with our main study group at Lake Otorongo, which we studied over more than ten months before. The Otorongo otters had a litter of two cups. It was interesting, that "Triangel", the reproductive female since 1992, transfered her leader position to her younger sister "Isla", even though "Triangel" remains within the group. "Nuevo", the reproductive male, continued in his position. He joined the group 1991, when the leading female and male at that time disappeared.

Our studies of the last years indicate, that the traffic by tourist canoes on the oxbow lakes may reduce the reproductive success of the otters. As a result of our seminar with the parkrangers last year the administration of the Manu Nationalpark prohibited the visit of Lake Otorongo by canoe. An illegal used canoe was removed. At Lake Salvador, which is the only oxbow lake with a lot of tourist canoes at the moment, we did not observe any offspring this year either - which is an exception among Manu´s otter population.

INCREASING TOURISM

Less problems with terrorism and Cholera resulted in an increase of tourism in Peru, specially in the tropical rainforest areas in the southeastern. More than thousand visitors had been recorded in Manu Nationalpark up to September, the douple compared with the previous yearly numbers. Therefore the ideas and campaigns from the project concerning a tourism which takes care for nature and Giant Otters are just in time.

On the instructions from the project the artist Yvette Delgado Vasquez from Cusco produced 8 panels with information in english and spanish about Giant Otters and rules to observe these animals without disturbing them. These panels were put up at control posts of the nationalpark and other reserves and at tourist lodges.

With the agreement of the nationalpark administration and all the local tourist agencies we planned to build up an 10 meters tall observation tower at Lake Otorongo. A provisional platform last year showed that a stationary construction at the shore of the lake allows terrific spottings and that the otters get used to it very rapidly. Unfortunately there had been delays with the carrying out. Now the administration of the Manu Nationalpark accept responsibility and we hope that the tower will be finished before the next tourism season will begin in May this year.

COOPERATION

After intensive cooperation for years an agreement between the Giant Otter Project and the administration of the Manu Nationalpark was signed this year. This agreement contents the continue of the cooperation concerning the monitoring of the Giant Otter population, the education of the parkrangers, the public relations work and the making out of management plans in the future.

EDUCATION

In cooperation with the FPCN (Fundación Peruana para la Conservación de la Naturaleza) and with the SNPH (Santuario Nacional Pampas del Heath - a reserve at the river Heath, the border to Bolivia, where we proved Giant Otters 1992) we organized a seminar with the subject " management of tourism in the reserves of Madre de Dios ". The seminar was held from 17th to 20th of September in Puerto Maldonado, the capital of the departement. Different groups were represented by nearly 60 participants: rangers from the SNPH, two members from every local tourist lodge, independent tourist guides from Puerto Maldonado, representatives of the university and the schools, representatives of the native and settler comunities, the local forestry police, the state tourism authority, representatives of peruvian and international conservation organizations and journalists. The lectures were as different as the participants. There were talks about "reserves in the Departement Madre de Dios, characteristics and their significance for the development of the region","natives and tourism" and "introduction to the ecology of tropical rainforests". The Giant Otters as bioindicators and flag ship species had been a main subject. A two days excursion to the reserve Explorers´ Inn at the river Tambopata formed part of the seminar. An information folder and a certificate was given to the participants.

In Cusco the information from the Giant Otter project formed part of a three days seminar organized by the university of Cusco and the administration of the Manu Nationalpark.

In 1994 we published a booklet comprising the most important results of our studies and recommendations for a better protection of the highly endangered Giant Otters. The 36 pages long booklet is available in english and spanish. We took 2000 booklets with us to Peru and presented them in a press conference to INRENA in Lima (Instituto Nacional de Recursos Naturales, the ministery of agriculture and conservation). Representatives of the german embassy, peruvian universities, ministery, german schools, tourism agencies and conservation organisations were present.

FURTHER ACTIVITIES

We concluded successfully the investigaton to the acoustic comunication of Giant Otters under water, which was realized together with Massoud Yasseri in the Zoo of Hagenbeck in Hamburg. We have been able to record sounds of Giant Otters under water (a publication is in work).

The investigations to the contamination of fish with mercury (mercury is used by goldminers) within our study area also came to an end. The analysing of our samples was done by Arno Gutleb from the University of Veterinary in Vienna (a publication is in preparation).

Heide Khanmoradi from the University of Munich finished her thesis about diet ecology of Giant Otters. She analysed the scat samples which we collected within the framework of the project from 1991 to 1993.

Giant Otters are highly endangered by the destruction of tropical rainforest. Most of the activities leading to deforestation (gold-mining, oil exploration, lumbering, tourism) are connected with the industrial countries. To draw attention to the endangered Giant Otters and the destruction of tropical rainforest in Peru, public relations work also in Europe is important. In this context we published the book "Die Wölfe der Flüsse - Riesenotter und ihr Lebensraum Regenwald" and produced the film "Die Riesenotter vom Madre de Dios" which was on TV on the 17th of April 1995, 20.15, German TV, ARD, "Expeditionen ins Tierreich".

Acknowledgement - The project is financed by the Frankfurt Zoological Society, - Help for Threatened Wildlife - and is carried out in co-operation with the Wildbiologische Gesellschaft München e.V. We like to thank the Peruvian authorities INRENA, SNPH and the administration of the Manu National Park for the possibility to carry out the field work and for all support.

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This booklet may be ordered (please include 2$ for national and 3$ for international mailing; by plane: Europe: 5$, World: 10$).

R E P O R T

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

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

INTRODUCTION

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

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

METHODS

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

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

RESULTS

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

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

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

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

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

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

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

* includes 109 records where sex was unknown

DISCUSSION

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

Mean dive times calculated for this study are similar to those presented by BOWLBY et al. (1988) even though their sample sizes were much smaller. Ages were not determined in their study, but the average dive time for females was 56.8 (SD = 32.4) seconds and in this study 56.1 (SD = 24.6). Interestingly, the mean foraging dive calculated by BOWLBY et al. (1988) for males of 68.6 (SD = 28.3) is similar to the value for adult males in this study. Sea otters in both studies successfully obtained prey on 89% of foraging dives. We will concentrate foraging effort in 1995 in a new area just recently occupied by sea otters. Prior to 1995 this area has received little predation pressure from sea otters, and we anticipate seeing a very different array of prey items at the new site.

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CALL FOR INFORMATION

I write to you as chairman of the Veterinary Group to ask for your assistance in supplying us with a list of any diseases which are perceived by any of your members to be threat to the wild populations of the taxa in which your group has a special interest. We are also anxious to receive details of the causes of any morbidity or mortality of which your members may be aware. Reference to reports, scientific papers, newspapers articles, etc. are also of concern to us. Please draw our attention to any such publications or send us photocopies for our database. Please also inform us of any specialist wildlife disease diagnostic laboratories of which you are aware.

In return, we hope to be able to offer you the service for which our group was formed. We would particularly like to draw you attention to the extreme importance of obtaining veterinary advice whenever wild animal capture, translocation, reintroduction or restoration projects are components of your Action Plans.

The risk of transmission of important diseases of human, domestic livestock, and other wild animals when wild or captive-bred animals are translocated, even over short distances from one ecozone or biotope to another, can be considerable and must be minimized by appropriate screening, quarantine, and where necessary, vaccination.

M.H. Woodford,

Chairman Veterinary Group IUCN-SSC,

500 23rd Street, N.W., Apt. B-709,

Washington D.C. 20037,

USA

REPORT

EVIDENCE FOR ILLEGAL ATTEMPTS TO KILL OTTERS (*Lutra lutra*) IN AUSTRIA

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Abstract: Following collection of 17 otter carcasses for necroscopy from the Waldviertel area of Austria, two were found to have old fragments of bullets in their bodies. In neither case was this the cause of death, nor had physiological mobilization of lead occurred. One had fragments of two different kinds of bullets in it, implying it had been shot at and wounded twice, the other once. Otter hunting is forbidden throughout Austria but this indicates that illegal hunting is taking place.

The otter (*Lutra lutra*) is fully protected under hunting laws in most European countries (MACDONALD and MASON, 1990). Nevertheless there is some evidence for illegal hunting and lead pellets were found in animals (MADSEN et al., 1994; TOMAN, 1995).

In Austria there are attempts to collect all otters found dead, although dead otters belong principally to the hunters. The number of known cases of dead otters is increasing over the past years and most of the carcasses were given to us. On all these carcasses necropsy including x-ray, histopathology, bacteriology, virology and parasitology is conducted. Whenever possible the age of the animal is determined following the method of HEGGBERGET (1984).

17 otters found dead (1989-1993) were collected and stored deepfrozen prior to further examination. On all otter carcasses x-rays have been carried out. In two otters both from the Waldviertel, the main area of otter distribution in Austria (GUTLEB, 1994), fragments of bullets were found in the x-rays.

<u>Case 1:</u> A male animal, about 9 years old, was slain with a wooden stick on the court of a farm (8.1.1993). The man claimed his fear from rabies as the reason to kill the animal. Though the otter had non suppurative encephalitis rabies could be excluded by immunohistology.

Radiographic findings: Lead shotgun pellets were seen caudal and near to the left jaw joint, at the base of the right orbit, at the caudal aspect of the 13th thoracic vertebra, and at the cranial articular processes of the 7th lumbar vertebra. Various fragments of bullets of 6x7 mm respectively 7x4 mm in size and irregular contours could be seen in the mid of the right orbit and at the distal and cranial edge of the right tibia. Superimposed to the skull and the left hind paw many very small fragments of bullets - abrasions - were found. Fractures of the right zygomatic arch, the right branch of the mandible and of the bones of the calvaria could be detected. Bilateral omarthrosis and spondylosis could be seen (fig. 1).

Necropsy: In the subcutis of head and neck there were multiple large haemorrhages. In addition to the fractures demonstrated in the x-ray we found multiple fissures in the neurocranium. The fragments of the bullets lay in the tissue without any reaction.

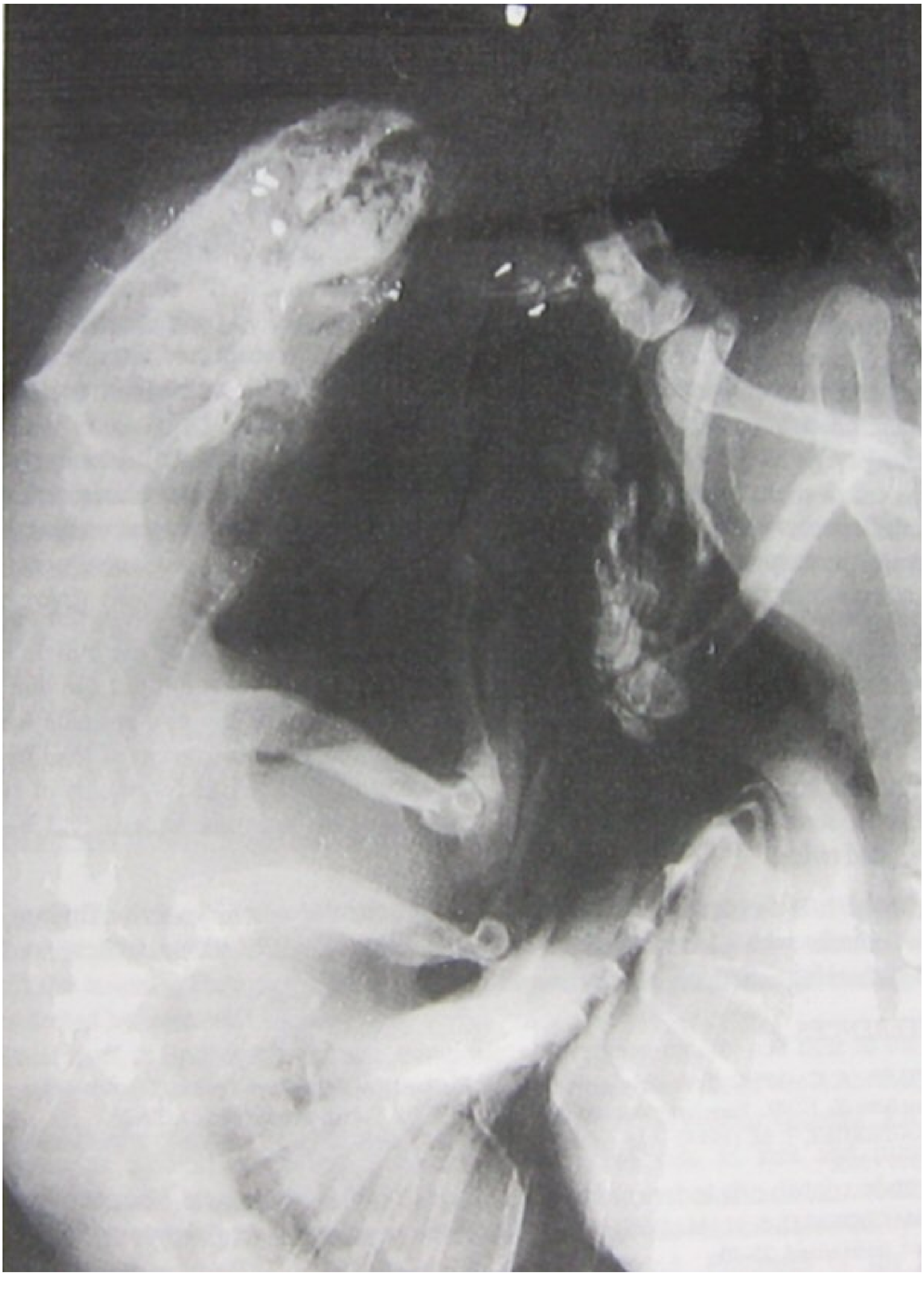

Figure 1. X-ray of a male otter, whole body, dorsoventral projection: lead shotgun pellets and various fragments of bullets spread over the whole body (case 1)

Case 2: A male otter (age not determined yet) was found dead near a road (21.4.1993). The animal obviously had died after a collision with a car.

Radiographic findings: A 7x8 mm large square fragment of a bullet with irregular contours was found in the 9^{th} intercostal space. Another smaller fragment 4x3 mm in size could be seen superimposed to the lateral end of the 10^{th} rib, another very small amount at the 6^{th} rib. Pneumothorax was detected in both pleural spaces. The abdominal structures were not clearly visible due to suspected intraperitoneal fluid. Fracture of the pelvis was obvious, luxation of the iliosacral joint could not be excluded, but no alteration on vertebrae and ribs was seen.

Necropsy: While the abdominal cavity was completely filled with blood, there was only a slight haemothorax. In the pelvic region we found severe haemorrhage in the muscles additional to the lesions seen in x-ray. Again there was no reaction around the fragments of the bullets.

Both animals died because of traumatic insults (one animal was slain, the other died after a collision with a car). As in both cases the fragments of the bullets lay in the tissue without any reaction it is proved that the animals did not die due to the shots. In addition the lead levels in liver and kidney of the two animals were far beyond what is assumed to be critical for mammals. Mobilization of lead from the pellets had therefore not occurred. The otter of case 1 had fragments of two different sorts in its body. So it must be assumed that this animal had been wounded twice.

Although it is forbidden to hunt otters throughout the whole year the finding of two animals with pieces of metals in their body gives a strong indication for illegal hunting practice

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SHORT COMMUNICATION

A FOX FINDS A DEAD OTTER

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In January 1995 I was told that a fox had killed an otter in Sonkajärvi, Finland. I skied to the place, which was an unfrozen rapid on the Matkusjoki River.

The man who found the otter told he skied every day by this place. Thus the meeting of the fox and otter was discovered at once. The fox had dragged the otter about ten meters and then partly buried it in the snow. However, I saw only old otter tracks (there had been light snow a couple of days earlier) while the fox tracks were quite fresh.

Gradually the cause of events became clear. The otter had died a few days earlier after climbing from the water. There was even an otter-formed hole in the icy snow, because the cooling body had melted the adjacent snow. Then light snow had partly covered the body. Therefore the man did not discover it, though daily skiing by the place at a distance of about 30 meters. Then came the fox. It had calmly walked to the otter, dragged it some meters and then for some reason abandoned it. The fox had left the place peacefully walking, but nevertheless it possibly had heard something alarming and therefore did not start eating the otter.

The otter was an exceptionally young one for this time of year in Finland. According to the structure of the skull it possibly had been born late summer 1994. It was a 2230 g male with 530 cm head and body, and 275 cm tail lengths.

In necropsy. it was at once clear that the animal had been sick. There were no signs of violence. Instead, most of the intestines and one third of the stomach were black. It seemed that the cause of death was an serious inflammation due to some microbe. The alimentary tract of the otter was empty and the subcutaneous fat scanty. The liver weighed only 65 g or 2,9% of the whole weight.

R E P O R T

NONMETRIC SKULL DIVERGENCE IN THE OTTER - ASSESSING GENETIC INSULATION OF POPULATIONS

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ABSTRACT: The craniometric variation and non-metric skull divergence between populations of the otter *Lutra lutra* (Linné, 1758) were studied using more than 430 skulls from different regions of Eastern Germany. No direct regional differences in skull measurements could be established for this area. The comparison of the morphological variation by non-metric skull characters adduces not or unimportant differentiations for most regions. Otter populations with greater geographic distances have partly higher measures of divergence. But only the population from the Baltic coast stand out against each other with a relative important epigenetic distance. Until now there does not exist a general reproductive and genetic insulation between the otter populations of Eastern Germany.

INTRODUCTION

Genetic insulation is one of the most reliable indications to show where species are endangered or on further decrease. The situation of the otter *Lutra lutra* (Linné, 1758) in Western and Central Europe gives an example. In many parts of this area the population splittings have been followed by considerable decrease or extinction (Reuther, 1992).

Until now in the eastern part of Germany there have been otter occurrences of high density and vital condition. Obviously the important losses of otters mainly by road killing seems to be compensated by healthy population parts with stable reproduction. However, recent surveys provide a picture of patchy otter distribution in East Germany too (Labes et al., 1989; Ansorge and Striese, 1993; Dolch et al., 1993). In addition, there is little knowledge of the problem that there were already genetic differences between these populations keeping not directly in reproductive contact.

Besides cytogenetical and biochemical techniques the classic morphological skull studies can be used to obtain information about the populations divergence. Checking qualitative skull characters the evaluation of "epigenetic distances" between the populations is able to solve the question above.

MATERIAL AND BASIC METHODS

The study is based on 430 skulls of the river otter originating from several natural regions of East Germany (Figure 6).

Most of the whole material was collected as road victims over the last ten years by the Zoologisches Institut der Universität Halle, the Museum der Westlausitz Kamenz and the Staatliches Museum für Naturkunde Görlitz.

Table 1. Specimens by Lände in which they were collected

OL	Oberlausitz	216
NL	Niederlausitz	58
OR	Oderregion	47
MB	Mark Brandenburg	40
ME	Mecklenburg	47
BC	Baltic coast	22

The studied otters were classified into three "relative age classes" (RAC) after Reig and Ruprecht (1989) grouping the skulls with identical stage of development. This classification depends on the general obliteration of sutures, the development of the postorbital constriction, the sagittal crest, the bone deposition around canine alveoles and the surface structure of brain-pan. The abrasion of teeth seems to be unsuitable even for an approximate age estimation of the otter skulls. According to the methodic experiences of Bree et al. (1966), Stubbe (1969), Heggberget (1984), Skarén (1987) and Uthleb et al. (1992) the relative age classes 1, 2 and 3 stand for juvenile, subadult and adult specimens. In addition most adult otters were aged by the configuration of incremental cementum lines applying an efficient method of low speed sawing (Driscoll et al., 1985; Ansorge, in press).

To characterize potential differences in skull size 10 linear dimensions (Table 2, Figure 1) were used corresponding with the measurements defined by Driesch (1976).

Table 2. Measurement Dimensions (see also Figure 1)

1	(*cbl*)	condylobasal length: posterior margin of condyli occipitales - prosthion
2	(*blbs*)	pharyngeal base length of the brain-stem: basion - suture between pterygoid and palatinum
3	(*zb*)	zygomatic breadth: zygion - zygion
4	(*bb*)	breadth of braincase: euryon - euryon
5	(*sh*)	skull height without sagittal crest: base of os occipitale - upper point of braincase beside the crista sagittalis
6	(*utr*)	length of upper tooth row: alveolar distance C-M^1
7	(*al*)	angular length: infradentale - processus angularis
8	(*ltr*)	length of lower tooth row: alveolar distance C-M_2
9	(M_1l)	length of M_1: greatest length of M_1
10	(M_1b)	breadth of M_1: greatest breadth of M_1

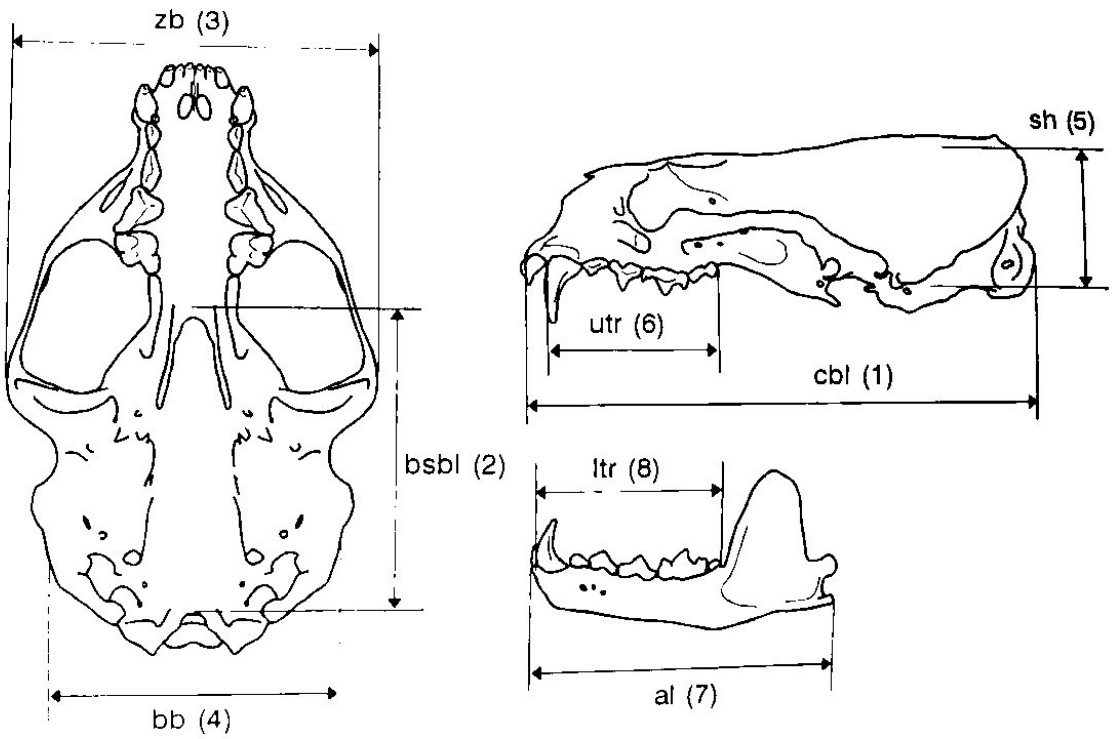

Figure 1. Skull measurements of the otter

All data were statistically processed by the mean (x), the range (x_{max}, x_{min}), the standard deviation (s), the variability coefficient (v= 100 s/x) and Student's t-test to secure significance of mean differences (α<0.05). As well each population group was computed separately according to sexes, age classes and regions. Metric similarity of the region samples was calculated by the "average taxonomic distance" (ATD) based on sample means of adult males. Clustering on the ATD matrix was performed by "unweighted pair group method with arithmetic average" (UPGMA) both using NTSYS-pc (Numerical Taxonomy and Multivariate Analysis System) (Rohlf, 1994).

To determine the morphological differentiation with regard to the epigenetic distances, 12 nonmetrical traits were checked. The characters have been chosen according to the rare investigations on other carnivores (Sjovold, 1977; Wiig and Lie, 1984; Wiig and Andersen, 1988; Ansorge, 1992) and own preliminary studies (Table 3, Figure 2).

Table 3. Non-Metric Traits (see also Figure 2)

No.	Abbreviation	Trait
1	(*Feth*)	foramina ethmoidalia completely separated
2	(*Ffr*)	foramen frontale present
3	(*Ccd*)	canalis condylaris double
4	(*Ccv*)	canalis condylaris open ventrally
5	(*laFbt*)	lateral accessory foramen bullae tympani present
6	(*maFbt*)	medial accessory foramen bullae tympani present
7	(*Fosd*)	foramen ovale subdivided
8	(*eFov*)	emissary foramen beside the foramen ovale present
9	(P^1)	first upper premolar missing
10	(*aFmd*)	accessory anterior foramen mandibulare present
11	(*Fcor*)	foramen coronoidale present
12	(M_2)	last lower molar missing

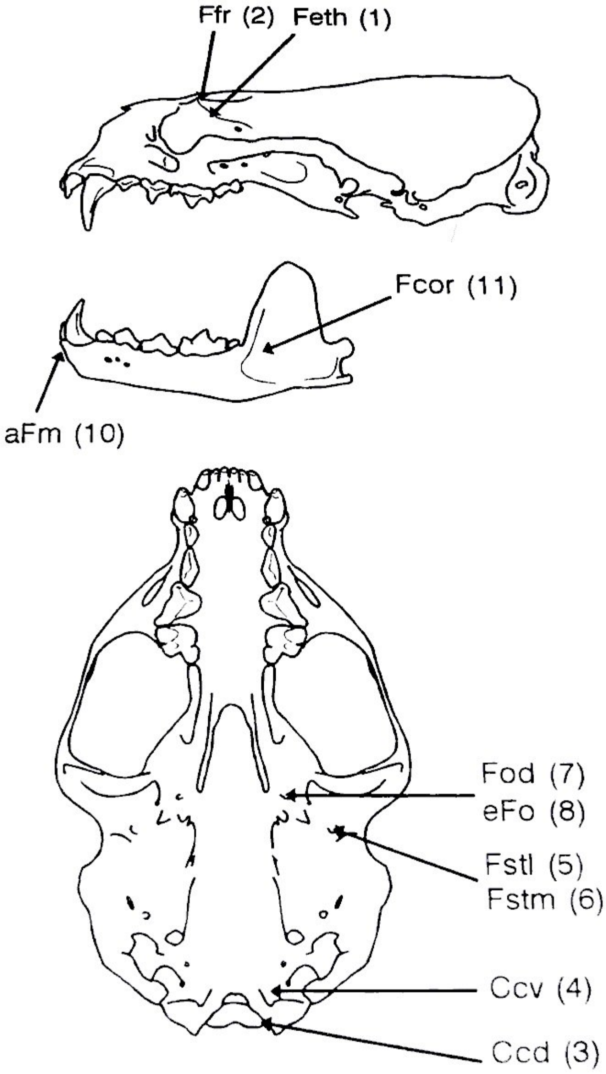

Figure 2. Positions of nonmetric traits in the otter skull

Bilateral traits were taken from both sides of the skull and separately as well as together calculated. The frequencies of trait expressions were compared by the chi-square test including the analyse of homogeneity in age and sex. For computing the epigenetic distances the formula of "mean measure of divergence" (MMD) proposed and derived by Sjovold (1977) could be used. Variance and standard deviation (S_{MMD}) of the MMD are necessary to prove statistic significance by MMD > 2 S_{MMD}. Tree matrix and phenogram of MMD were computed by cluster analysis (UPGMA of NTSYS-pc).

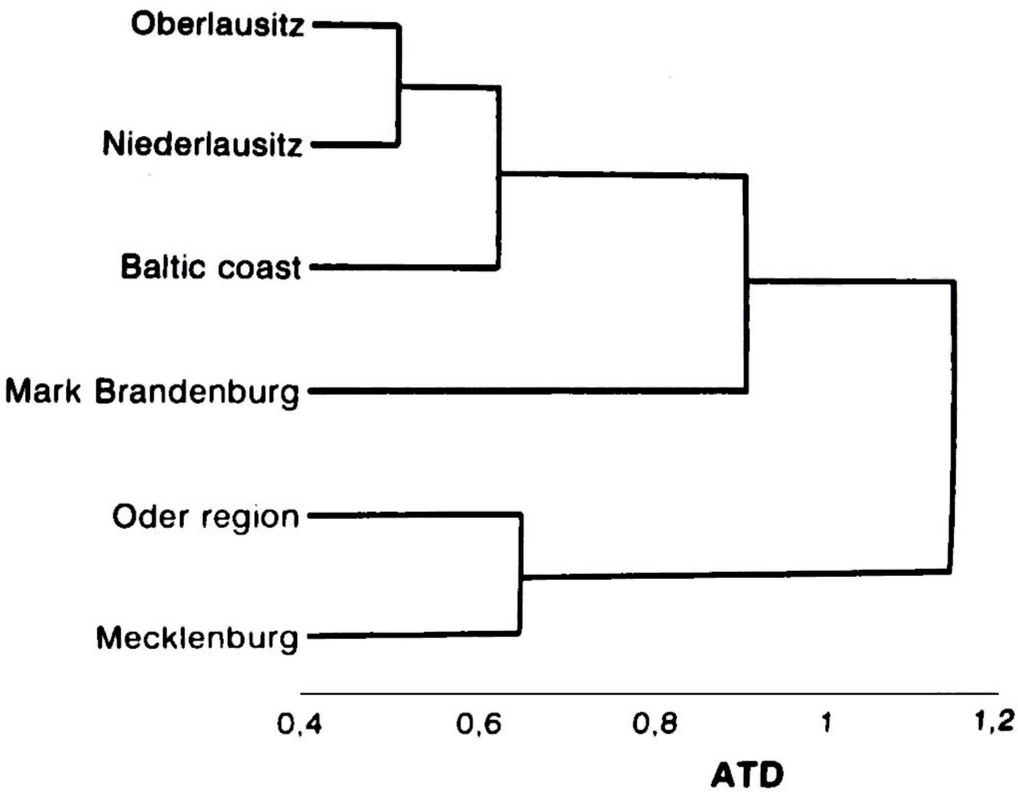

Figure 3. UPGMA dendrogram derived from ATD between sample means of adult male otters

The size differences can be illustrated by the range of variation in skull length (*cbl*) in Figure 4.

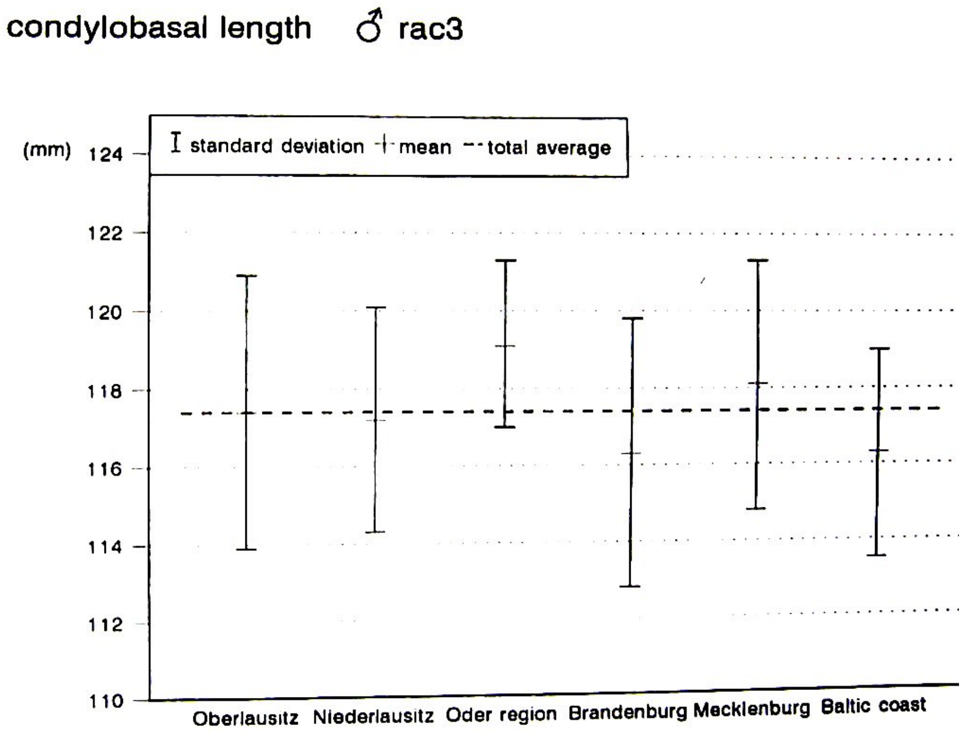

Figure 4. Range of variation of condylobasal length (cbl) among the otter populations

Table 4: Sample means of skull measurements for adult male otters (RAC 3) from different regions

	OL	NL	OR	MB	ME	BC
Cbl	117.56	117.18	119.11	116.29	118.05	116.26
Blbs	56.21	57.11	56.68	56.88	56.18	56.03
Zb	73.42	73.78	75.93	75.23	75.34	73.36
Bb	50.60	51.29	52.48	52.07	52.23	50.19
Sh	35.09	35.74	35.78	35.72	35.72	35.31
Utr	35.95	35.72	35.36	34.98	35.46	35.21
Al	74.95	75.41	76.06	75.42	77.19	74.77
Ltr	43.47	43.91	43.36	42.88	44.33	43.76
M_1l	13.44	13.38	13.53	13.74	13.64	13.80
M_1b	6.74	6.83	6.89	6.90	6.96	7.15

Table 5a: Skull measurements of adult otters (RAC 3) from Eastern Germany (males RAC 3)

	x	s	v	x_{min}	x_{max}	n
Cbl	117.41	3.31	2.82	106.1	124.3	102
Blbs	56.33	2.24	3.97	51.3	61.4	101
Zb	73.87	3.11	4.21	65.9	81.5	96
Bb	51.09	1.82	3.56	45.8	56.1	101
Sh	35.43	1.24	3.50	32.5	38.2	101
Utr	35.68	1.21	3.40	32.4	39.5	121
Al	75.19	2.84	3.78	66.9	82.0	132
Ltr	43.42	1.40	3.23	38.4	47.9	138
M_1l	13.55	0.68	5.05	11.3	15.4	145
M_1b	6.82	0.34	4.91	5.9	7.7	147

Table 5b: Skull measurements of adult otters (RAC 3) from Eastern Germany (females RAC 3)

	x	s	v	x_{min}	x_{max}	n
Cbl	109.57	3.19	2.91	104.1	121.0	64
blbs	52.70	1.93	3.65	48.1	57.5	63
zb	67.33	2.53	3.76	61.8	74.8	58
bb	48.61	1.51	3.12	45.5	52.9	64
sh	33.36	1.46	4.38	29.8	38.0	62
utr	33.41	1.10	3.30	30.4	36.9	80
al	68.88	2.29	3.32	63.5	76.9	91
ltr	40.28	1.19	2.96	37.5	44.2	95
M_1l	12.71	0.71	5.57	10.5	14.4	98
M_1b	6.36	0.25	3.93	5.8	7.1	97

The evaluation of nonmetric characters yielded seven features with sufficient regional differences determined by the MMD (mean measure of divergence) – Table 6.

Table 6: Traits with significant regional differences

foramina ethmoidalia completely separated	(*Feth* 1)
foramen frontale present	(*Ffr* 2)
canalis condylaris double	(*Ccd* 3)
canalis condylaris open ventrally	(*Ccv* 4)
foramen ovale subdivided	(*Fosd* 7)
emissary foramen beside the foramen ovale present	(*eFov* 8)
foramen coronoidale present	(*Fcor* 11)

But three of them (*Feth*, *Ffr*, *Fcor*) had to be excluded from further investigation because sex or age dependence was significantly proved for these traits.

The remaining nonmetric characters contributed to the computation of MMD (mean measure of divergence) for the different regions listed in Table 7. There is a variable morphological differentiation of the otters among the studied area. Every sample shows significant distance to at least one each other. However most of the MMD amount to only low degree except the otters from the Baltic coast. They have the greatest and significant distances to all the other samples. This is confirmed by the UPGMA clustering of the MMD matrix in Figure. 5. The four southern natural regions Oberlausitz, Niederlausitz, Oder region and Mark Brandenburg form a group with low differentiation. In contrast the Baltic coast population is clearly separated from the others.

Table 7: Mean measure of divergence (MMD) matrix of the otter samples from different regions of Eastern Germany

	OL	NL	OR	MB	ME
NL	0.025*				
OR	0.012	0.016			
MB	0.035*	0.001	0.001		
ME	0.076*	0.015	0.028	0.054*	
BC	0.143*	0.060*	0.161*	0.075*	0.088*

* significant difference

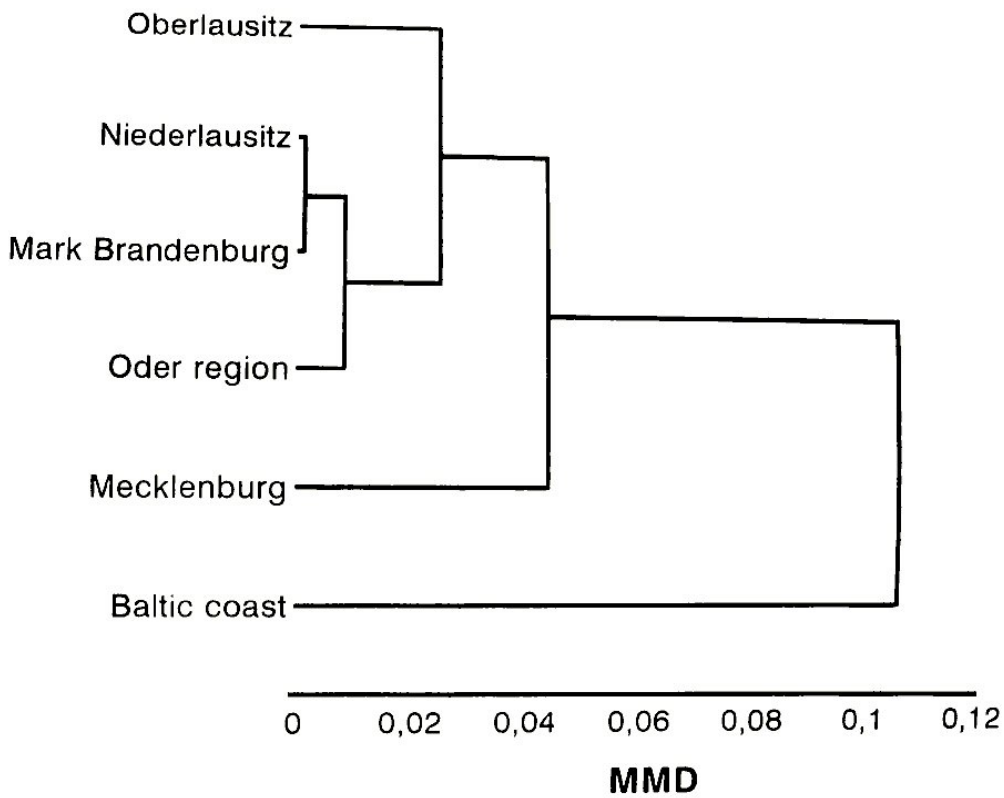

Figure 5: UPGMA dendrogram of MMD between the otters of the six natural region

In addition the epigenetic distance between the western and the eastern part of the Oberlausitz pondland was checked to receive a methodical standard value. As expected the low MMD = 0.03 (S_{MMD} = 0,01) indicates the level of populations being closed or closely related as well as emphasizes the siutability of the method.

Between the studied populations there are only small differences in skull size showing statistical significance in few measurements. The measure means in Table 4 (male RAC 3) allow the indication of a not directed size pattern. Therefore the complete basic statistic of all adult otters from the studied area is given in Table 5.

In the mammalogy morphometric differences are favorably used as criteria for taxonomic classification below the species level. But these are based as on genetically fixed morphological variation as also on the modifications induced by environmental factors in a broad sense. In this account there could appear size differences between the animals of adjoining populations without any taxonomic relevance.

Thus the studied skull samples of the otter from Eastern Germany show no clinal variation but a mosaic-like size pattern. These regional differences in skull size seems to be compensated in greater distances (Figure 4). Surely the semiaquatic habits of the otter equalize the unknown factors system affecting body size. According with this Hysing-Dahl (1959) and Zejda and Voskar (1987) remark the lack of regional variability in Norwegian and Czechoslovakian otters.

There are only few useful series of measures from other parts of the European area to estimate the geographic variation of the species (Norway: Hysing-Dahl, 1959; Czechoslovakia: Zejda and Voskar, 1987; Central Finland: Skarén, 1987; Belorussia: Sidorovic, 1990; European part of Russia: Zejda and Voskar, 1987; Germany: present study). Considering the restrictions by age and sex no clinal variation can be detected in relation to otters of Eastern Germany. Certainly the skull size of the otter is not sufficient to indicate separated populations.

To evaluate geographic differentiation of mammal populations further detailed findings have been adduced by the study of qualitative morphological skull characters. They are of different biological relevance than dimensions of the skull. These non-metrical traits seems to be slightly influenced by environmental factors. Being affected by genetic components the occurrence of the qualitative features does not randomly arise. For the estimation of the traits heritability see also Hilborn (1974), Berry (1975), Korey (1980) and Richtsmeier and McGrath (1986). However the morphological differentiation by non-metric characters gives a certain measure of the epigenetic populations distance.

The results obtained by this method show a largely different view than the craniometric variation among the East German otters (compare Figure 3 with Figure 5). Considering the divergence grouping (Figure 5) and the geographic situation (Figure 6) there is a cluster of four natural regions in the middle and southern part of the studied area. These regions show just as low epigenetic distances as the natural units within the Oberlausitz do it (see above). Therefore the otters of these areas do not belong to separate populations and live in reproductive connection.

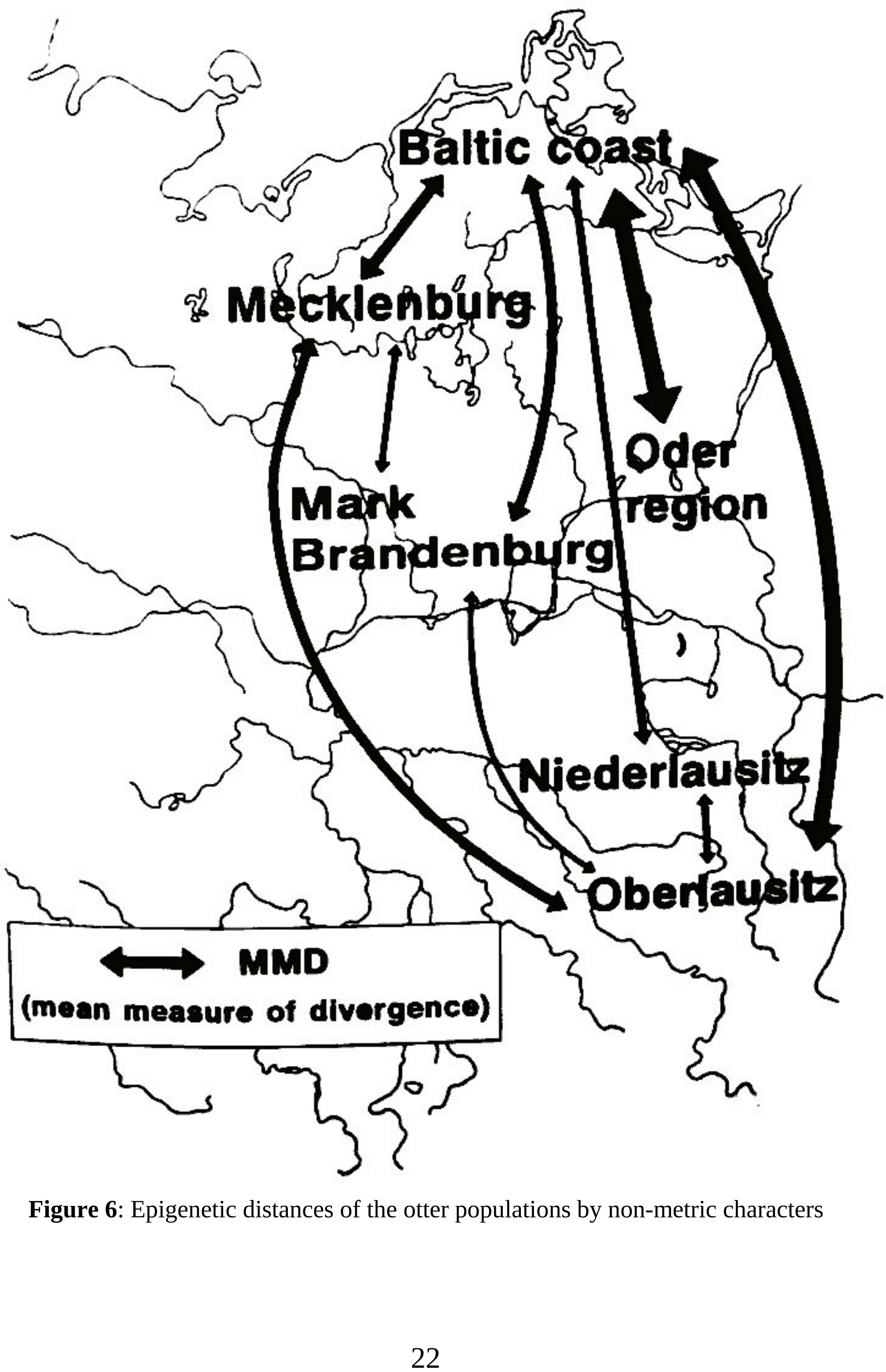

Figure 6: Epigenetic distances of the otter populations by non-metric characters

But unexpected results were established by comparing morphological skull differentiation between the Baltic coast and the inland populations. There is a high degree of divergence segregating the otters of the coast from all the others. The large epigenetic distances point to a lower reproductive contact.

Similar morphological differences were found by Sidorovich (1990) between the otter populations of two river systems in Byelorussia. But he used completely different skull characters influenced by muscle development and environmental factors. This prevents a directly comparison to this study.

Further conclusions will not be meaningful until the divergence between completely separated populations will have been researched. Then the signs of a potential isolation could be estimated more precise.

However the present study gives a good view of the differentiation of otter populations in Eastern Germany by their non-metric skull characters. According to that there do not exist a general genetic insulation among the centres of otter occurrences in this area. They seem to live in reproductive contact until now, perhaps except the otters from the Baltic coast.

SUMMARY

The craniometric variation and non-metric skull divergence between populations of the otter *Lutra lutra* (Linné, 1758) were studied using more than 430 skulls from different regions of Eastern Germany. No direct regional differences in skull measurements could be established for this area. The comparison of the morphological variation by non-metric skull characters adduces not or unimportant differentiations for most regions. Otter populations with greater geographic distances have partly higher measures of divergence. But only the population from the Baltic coast stand out against each other with a relative important epigenetic distance. Until now there does not exist a general reproductive and genetic insulation between the otter populations of Eastern Germany.

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R E P O R T

PRELIMINARY STUDIES ON THE FEEDING ECOLOGY OF THE OTTER *Lutra lutra* AT PITCHAVARAM, EAST COAST OF INDIA

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ABSTRACT: Observations were made on the distribution, food and feeding ecology of common otter, *Lutra lutra* in Uppanar and Coleroon rivers at Pitchavaram in the east coast of India. In freshwater, fish were the dominant prey item, whereas in estuarine habitat, crabs formed half the prey. By direct observation, the otters spent 40% of the day swimming/hunting, and 70% of feeding dives were successful.

INTRODUCTION

Otters are considered as the indicators for the healthiness of the wetland habitats (FOSTER-TURLEY et al., 1990). Otter population is showing a decline from many wetlands due to their destruction by pollution and other human induced stresses like deforestation and conversion into agricultural and aquaculture lands (FOSTER-TURLEY et al., 1990). Studies on the European otters have indicated that in any given area one time human disturbance could be a major factor for the decline of the otter population (JOINT OTTER GROUP, 1977). Studies on the population and feeding ecology of Indian otters are very limited (PRATER, 1988; HUSSAIN, 1992). In the present study, observations were made on the distribution, food and feeding ecology of common otter, *Lutra lutra* in Uppanar and Coleroon rivers at Pitchavaram in the east coast of India.

MATERIAL AND METHODS

The study area include Pichavaram mangrove forest and about 5 km stretch of Coleroon and 5 km stretch of Uppanar rivers (11º 25´ N, 74º 47´ E). Block I is on the Coleroon River, about 2 km south of the confluence with its distributary into the Bay of Bengal, the Uppanar River. Block II is 7 km of the estuarine Uppanar (including the mangrove forest), and Block III is 8 km of the freshwater Uppanar River. The banks of these rivers are covered with open land, cultivated land, aquaculture ponds and thick bushes. The mouth region of the Uppanar river is occupied by an extensive mangrove forest.

RESULTS AND DISCUSSION

Analysis of the spraints indicated (Table 1) the dominant prey species for these otters in block I was fishes (71.54%) while crabs, prawns and insects contributed 14.3%, 7.15% and 3.57% respectively and the unidentified organisms 3.57%. In block II the crabs were the dominant prey items (45.45%) with fishes (36.36%), prawns (9.07%) and insects (9.0%) forming the rest. In block III fishes (68.18%) were the dominant prey items and prawns, crabs and insects constituted 13.64%, 9.1% and 9.1% respectively. It is a well known fact that the fishes formed the major food item of otters (MACDONALD and MASON, 1987) and especially in *Lutra lutra* (KRUUK et al., 1987) but in some habitats, a change in the food preference was seen with the crustaceans forming the main food item (MACDONALD and MASON, 1987). The food habits of otters are studied by the percentage occurrence of the food item in the spraints. This is an indirect method and it is biased. Especially the crustaceans which have higher proportion of hard particles will be over represented in the analysis of the spraints (TILER et al., 1987).

Table 1. Occurrence of prey species in the spraint analysis in the Pichavaran area

Area	**Fish**		**Crab**		**Prawn**		**Insect**		**Others**	
	A	**R**	**A**	**R**	**A**	**R**	**A**	**R**	**A**	**R**
Block I n=20	20	71.54	4	14.30	2	7.15	1	3.57	1	3.57
Block II	4	36.36	5	45.45	1	12.50	1	12.50	0	0.00
Block III	15	68.18	2	9.10	3	13.64	2	9.10	0	0.00

* A - signifies actual abundance, R - signifies relative percentage

Otter diurnal activity of otter were recorded for about 638 minutes of which 42.84% (273.4 min) of time was spent for moving or swimming, 30.87% (190 min) for resting, 20.3% (129.4 min) for feeding, 3.79% (24.2 min) of time for playing and 2.14% (14 min) for other activities (Table 2). Generally, activity studies are made using radio telemetry (ESTES et al., 1987), which provides an indirect information on the activity of the animal. In the present study the results made by direct observation give exact time activity budget of the animal.

Table 2: Time activity budget of otter in Pichavaran area

	Period of observation	**Swimming**	**Resting**	**Feeding**	**Playing**	**Other**
Minutes	638.4	273.40	197.90	129.40	24.20	14.00
%		42.84	30.87	20.30	3.79	2.14

During feeding activity of otter, 54 feeding dives were recorded in the total observation period, of which 39 dives (72.0%) were successful (Table 3). In the succesful dives, otter captured fishes for 22 times (56.4%), whereas crabs 8 times (20.5%), prawn 1 time (2.5% and unidentified forms 8 times (20.5%). This indicates that crab can be an alternative or secondary prey items for otter. The feeding activity study corroborates, the scat analysis of the otters of the area indicating fish as the major food item, followed by crabs and prawns.

Table 3: Percentage of feeding success and prey capture by the successful dive

	Total feeding dives observed	Successes	Failure	Prey caught during successful dive			
				Fish	Crab	Prawn	Unidentified
N	54	39	15	22	8	1	8
%		72.0	27.8	56.4	20.3	2.5	20.5

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R E P O R T

DIET AND CONSERVATION STATUS OF CAPE CLAWLESS OTTERS IN EASTERN ZIMBABWE

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Annotated from: **Butler, J. R. A., du Toit, J. T. (1994)**. Diet and conservation status of. Cape clawless otters in eastern Zimbabwe. *S.Afr.J.Wildl.Res*. **24**: 41-47

ABSTRACT: Kairezi otters are subject to human disturbance in the KRPA, including trapping at the Nyafaru trout farm, they are not regularly hunted, and the national park at least offers the population some protection. However there is a long-term threat to the catchment´s otters from habitat loss: clearance of riverine thicket for fuel wood is escalating within the KRPA, but most clearance is likely to be downstream in the unprotected areas of the communal land. Since the otters occur at naturally low densities in the catchment they are highly vulnerable to population fragmentation. Many rivers in Zimbabwe´s eastern highlands face a similar situation of degradation by subsistence agriculture, and therefore it is fair to conclude that the conservation status of the region's clawless otter population is fragile. If the problems of the KRPA could be solved the scheme could act as a model for further community-based catchment conservation schemes in the area, within which clawless otter conservation could be promoted.

INTRODUCTION

Since 1988 a CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) scheme has been established along a 7 km stretch of the Kairezi River in the eastern highlands of Zimbabwe. The river flows from Nyanga National Park into an adjacent subsistence agricultural (communal) area and has been stocked with rainbow trout *Oncorhynchus mykiss*. The local population sell the fishing rights and have established a conservation corridor, the Kairezi River Protected Area (KRPA), in which livestock grazing, human settlement and fuel-wood cutting are restricted to prevent soil erosion and siltation of the catchment and to ensure the future sustainability of the scheme. However, trout catches have declined since 1988, discouraging visiting fishermen and reducing the revenue generated for the local community. Consequently the justification for the conservation corridor is being lost and human encroachment, overgrazing and wood-cutting are rife in the KRPA.

Trout anglers have suspected that predation by resident Cape clawless otters *Aonyx capensis* is one of the causes of the decline in trout numbers. This study investigated this assumption and also considered the population density and conservation status of clawless otters in the catchment.

METHODS

A total of 20 km of the Kairezi watercourse was studied intensively between January and June 1993, covering both the KRPA and the Nyanga National Park. In February 800 trout of approximately 200 mm in length were stocked at four sites within the KRPA. Otter scats were collected from the area every month and their contents were analyzed (after ROWE-ROWE, 1977a; VAN DER ZEE, 1981; VERWOERD, 1987). The lengths of trout eaten were estimated by comparing bones found in scats with those of specimens of a known size. The area was searched intensively for otter signs. Holts were categorized as "main" or "subsidiary" (KRUUK and HEWSON, 1978) according to their frequency of signs activity. Inter-holt distances were measured along the Kairezi´s course. Open-ended interviews were carried out among members of the local community to establish the extent of otter hunting and trapping. River crab *Potamon perlatus* densities were estimated by mark-recapture sampling at two sites within the KRPA and related to estimated otter densities.

RESULTS

Diet

Of the 255 scats collected, trout remains occurred in six of them (1% RF). Crabs, catfish, frogs and dragonfly larvae constituted 93.6% of the diet (table 1). The trout eaten were estimated to be 190-260 mm long, and five of the scats containing them were found in the KRPA.

Table 1. Summary of food items recorded in 255 *Aonyx capensis* scats collected from the Upper Kairezi River between January and June 193. (%RF=relative frequency of occurrence)

Prey	Occurrence Actual	%RF
River crab, *Potamon perlatus*	255	41.9
Mountain catfish, *Amphilius uranoscopus*	115	18.9
Dragonfly larvae, *Anax imperator*	72	11.8
River frog, *Rana angolensis*	67	11.0
Ruminant dung	29	4.8
African mottled eel, *Anguilla bengalensis*	19	3.1
Dung beetles, *Onitis, Diastellopalpus spp.*	13	2.1
Rainbow trout, *Oncorhynchus mykiss*	6	1.0
Locust, Acrididae	6	1.0
Vlei rat, *Otomys irroratus*	5	0.8
Grasshopper, Tettigoniodea	4	0.7
Shield bug, Pentatomidae	4	0.7
Herald snake, *Crotaphopeltis hotamboeia*	2	0.3
Brown water snake, *Lycodomorphus rufulus*	2	0.3
Dragonfly larvae, Libellulidae	2	0.3
Moth adult, Sphingidae	1	0.2
Caterpillar, Lepidoptera	1	0.2
Soldier termite, Termitidae	1	0.2
Earwig, Forficulinae	1	0.2
Common toad, *Bufo regularis*	1	0.2
Masked weaver, *Ploceus velatus*	1	0.2
Dragonfly adult, *A. imperator*	1	0.2

Otter numbers and status

Nine holts were located in the study area, three of which were recognized as main holts. The mean distance between all holts was 1.15 km (n=8, S.E.=1.51, range=0.33-1.6) and the overall holt density was 0.45/km of watercourse. The mean distance between main holts was 3.27 km. Local inhabitants explained that otters are not hunted with dogs because they are hard to catch and aggressive. Although the animal´s face oils are considered valuable as a fertility enhancement for women, otters are not regularly killed for this purpose. Eight otters have been trapped since 1988 at a local trout farm in the village of Nyafaru where they are a regular pest, killing trout indiscriminately.

Crab densities

The overall density of crabs was 0.32 crabs/m^2 and the mean width of crabs caught was 27.1 mm (n=88, S.E.=0.6, range=18.7-39.5).

DISCUSSION

Otters do eat trout in the Kairezi but in the months studied they were an unimportant food item, suggesting that otters predation is not the cause of the KRPA´s problems. This result is similar to that of ROWE-ROWE (1977a), who also found that trout were unimportant prey for clawless otters inhabiting a dam (2% RF) and a stream (3% RF) in Natal, South Africa.

The catfish and eels were more important fish prey than trout for Kairezi clawless otters can partly be explained by the species´ characteristic morphology. Clawless otters have evolved as predators of benthic animals which they catch largely by feel with their sensitive, fingered front feet (ROWE-ROWE, 1977b, 1977c; ZEE, 1981; VERWOERD, 1987), and are therefore better adapted to catching benthic fish such as catfish and eels. Trout live mid-water where the otters could only locate them by sight.

Otters usually prey on smaller fish which are slower and easier to catch, and possibly more numerous (ROWE-ROWE, 1977a, 1977c; ZEE, 1981; KRUUK and MOORHOUSE, 1990). This selectivity is marked for salmonids which are swifter swimmers than most fish species preyed upon by otters (ERLINGE, 1968; ROWE-ROWE, 1977c). Thus in Natal 90% of the trout eaten by clawless otters were less than 200 mm long (ROWE-ROWE, 1977a), yet in the Kairezi the trout eaten either equaled or exceeded this size. A possible explanation is that they were disabled fish that were stocked in February. Farmed trout frequently have mutilated fins from contact with others in stewed ponds and in natural situation their swimming ability is impaired, making them easier for otters to catch, as ERLINGE (1968) demonstrated. In comparison, smaller wild trout in the Kairezi may have been swifter swimmers and less naive to predators.

The holts found were similar in character to those described by ROWE-ROWE (1992) in Natal. In comparison with the Natal holt densities of 3.1/km (ROWE-ROWE, 1992) the Kairezi densities of 0.45/km were considerably lower. Using the minimum coastal estimate of on adult otter per four holts (ARDEN-CLARKE, 1986; VERWOERD, 1987; ROWE-ROWE, 1992), which may not be applicable to freshwater habitats, the density of otters on the Kairezi was approximately 1/10 km, which is also considerably lower than ROWE-ROWE (1992) estimate in the Drakensburg of 1/3-4 km of riverbank.

It is also possible that clawless otter densities in freshwater are related to the density of their staple food, *Potamonautes spp*. crabs. The density of crabs in the Kairezi (0.32/m^2) was considerably lower than on the Buffalo River (1.72-5.25/m^2) (HILL and O´KEEFE, 1992) and the Eerste River (2.0/m^2) (ARKELL, 1979) in South Africa. Clawless otters occur in the Buffalo (HILL, pers. comm.) and giant kingfishers *Ceryle maxima* are present on the Eerste (ARKELL, 1979), so an absence of predation is unlikely to be the reason for the high crab densities on these rivers. Crabs are central to stream nutrient cycling (HILL and O`KEEFE, 1992) and their density may therefore be an indication of a catchment´s productivity. The headwaters of the Kairezi are nutrient-poor, and the relatively low density of crabs and otters may be a reflection of this.

Although the Kairezi otters are subject to human disturbance in the KRPA, and particularly threatened by trapping at the Nyafaru trout farm, they are not regularly hunted, and the national park at least offers the population some protection. However there is a long-term threat to the catchment´s otters from habitat loss. Although the clearance of riverine thicket for fuel wood is escalating within the KRPA, the most clearance is likely to be occurring downstream in the unprotected areas of the communal land. Since the otters occur at naturally low densities in the catchment they are highly vulnerable to population fragmentation. Many rivers in Zimbabwe´s eastern highlands face a similar situation of degradation by subsistence agriculture, and therefore it is fair to conclude that the conservation status of the region's clawless otter population is fragile. If the problems of the KRPA could be solved the scheme could act as a model for further community-based catchment conservation schemes in the area, within which clawless otter conservation could be promoted.

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R E P O R T

CAPE CLAWLESS OTTERS (*Aonyx capensis*) AS INDICATORS OF WATER POLLUTION BY HEAVY METALS AND PESTICIDES IN ZIMBABWE

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ABSTRACT: This project aims to determine the level, type and sources of pollution from agricultural pesticides and industrial heavy metals in Lake Chivero, Zimbabwe, along with the extent of bioaccumulation and the effect on otter populations. As a control, we will also analyze data from the relatively unpolluted eastern highlands. The project is expected to be completed in September 1995.

INTRODUCTION

The role that otters can play as indicators of the ‘health’ of the wetlands that they inhabit has been emphasized by the IUCN Otter Specialist Group. As the dominant predator in many aquatic ecosystems chemical pollutants will accumulate in their bodies, causing death or reduced breeding success and their ultimate local extinction (FOSTER-TURLEY et al., 1990). Most of the studies relating otter distribution to water pollution have been carried out in Europe, and the Eurasian otter *Lutra lutra* has been the indicator species concerned (e.g. MASON, 1989; MASON et al., 1992; MASON, 1993; MASON and MACDONALD, 1993; GUTLEB, 1994; ELMEROS and LEONARDS, 1994; MACDONALD and MASON, 1994). The monitoring, regulation and control of water pollution from agriculture and industry in most European countries is feasible, and consequently has been included as a major aspect of the proposed IUCN Action Plan for European Otters (FOSTER-TURLEY et al., 1990). In Africa, however, where economic development is often of higher priority than the conservation of the environment, the control of water pollution and the protection of wetlands is rarely considered, and often the legislative and administrative framework necessary to implement pollution control has yet to be developed.

QUESTIONS

The project aims to answer three questions:

1) What are the pollutants present in Lake Chivero, and what are their sources?
2) What is the extent of the bioaccumulation in the food chain of Lake Chivero?
3) What are the levels of toxic pollutants in the Cape clawless otter population of Lake Chivero relative to clawless otters inhabiting an unpolluted area of Zimbabwe, and what threats do these toxins pose to the lake’s otter population?

METHODS

To sample the levels of bioaccumulation at different stages within the food chain, both producers and consumers are being collected and analyzed for the presence of polychlorinated biphenyls (PCBs) and heavy metals. Phytoplankton (*Microcystis spp*.), oligochaetes (*Limnodrilus spp*.), benthic invertebrates (predominately Chironomidae) and four fish species (green-headed bream *Oreochromis macrochir*, dwarf bream *Haplochromis acuticeps*, spot-tailed bream *Alestes imberi* and catfish *Clarias garipeinus*) will be trapped in different areas of the dam and at the mouths of the tributary rivers. Comparisons will be made between the sampling sites to determine the different pollutants present, and therefore their possible sources according to the presence of agriculture and industry on each tributary.

To determine the bioaccumulation of pollutants in the dominant consumers of the food chain, white-breasted cormorants *Phalacrocorax carbo lucidus* will be shot wherever possible and their body tissue will be analyzed. In the absence of a ready supply of clawless otter carcasses, scats (spraints) will be collected from scat sites around the lake and deep frozen prior to analysis. Scats contain chemical residues and have proved suitable indicators of the presence of toxins in otters by other workers (e.g. ELMEROS and LEONARDS, 1994; GUTLEB, 1994; MACDONALD and MASON, 1994). As a comparison of 'normal' levels of chemical present in Zimbabwean clawless otters scats are also being collected from the Kairezi River located in the eastern highlands, where otters exist in a national park and a subsistence agricultural area, and the only possible source of pollution is organophosphates from cattle dipping (BUTLER, 1994; BUTLER and DU TOIT, 1994). The analyses of all samples should be completed by September 1995.

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R E P O R T

HINDERING OTTER (*Lutra lutra*) ROAD KILLS PART 2

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ABSTRACT: This is the second part of a detailed enquiry into the relative effectiveness of different otter Road Traffic Accident prevention measures, with practical advice on construction.

EVALUATION OF THE RESULTS

The results in Part 1 (KÖRBEL, 1994) show, for the most part, the degree and distribution of the individual mapped factors for recorded accident sites only. Since it was possible to obtain comparable data on these factors for relatively few sites, the strength of these results is reduced. It is, therefore, not possible to extrapolate significant values for the individual mapped factors for the whole of the investigated region as calculations were made based on the sample only - determined by the recorded accident sites. This means that, for example, the result concluding that the majority of accidents sites coincide with the presence of rectangular or tunnel shaped ducts is correct. However, the question remains open just how representative these ducts are for the total region. Perhaps it is the case that roads intersecting a waterway signal, for the majority of cases, the presence of a duct.

The results did show, however, that potential accident sites cannot be predicted based on water way or biotope criterion as the available distribution of the accident sites on hand fell on all biotope and water types. Accident sites where a road did not intersect a water way were characteristically sites where several water bodies or water ways are in close vicinity of each other. However, in a few cases, sites were documented where an otter tried to cross a road at great distance from a water-way/road-way in close proximity. Preventive measures for the protection against otter road kills should, therefore, be undertaken at all sites where road way and water way are in close proximity of one another or an intersection exists.

The type of the road way is irrelevant as the risk of accident is dependent on the volume of traffic. For example, if "country roads" - which in their present poor condition and consequent lower traffic volume and speed have not been the sites of otter road kills - were to be improved, increased traffic volume and new accident sites are to be expected.

RECOMMENDATIONS FOR PREVENTIVE MEASURES TO AVOID OTTER ROAD KILLS

Just as the mapped results show, there are two basic distinctions among the types of accident sites: either a road and water intersect, or water exists on both sides between which otters cross and lies in close vicinity of a road. A procedure used to determine in which of the two cases mentioned above a road section falls and which measures can be taken is shown in Figure 1 (“revier” = habitat).

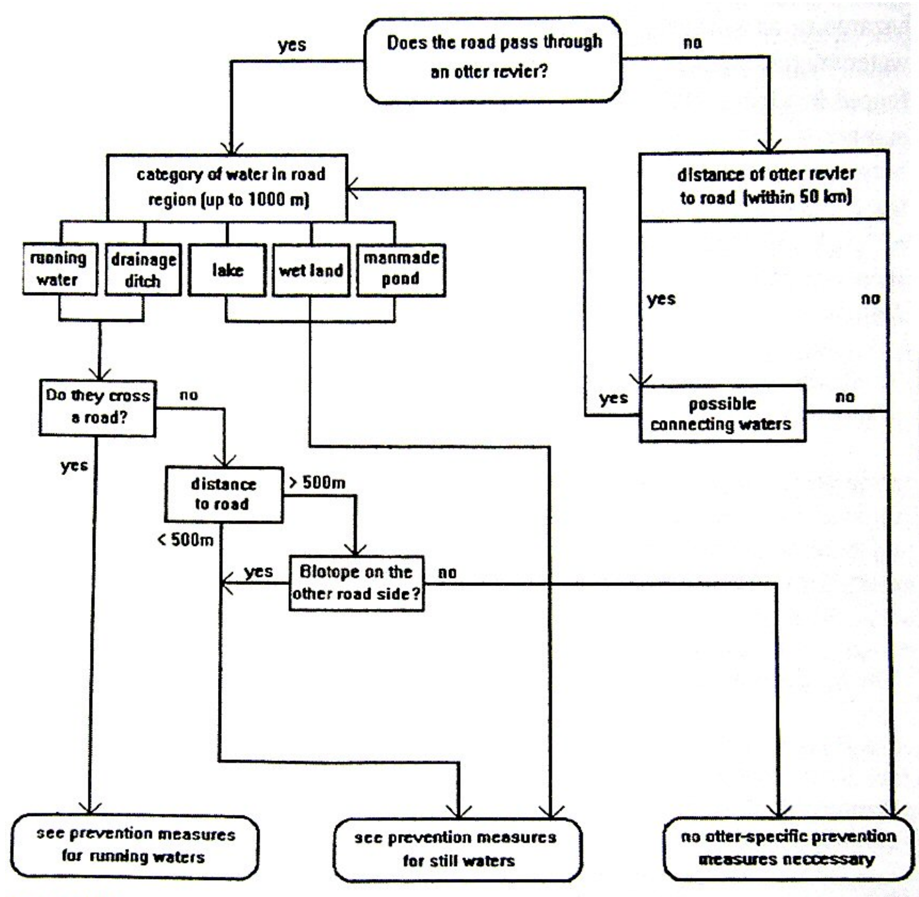

Figure 1: Determination of preventive measures

If the road bed does not actually run through an otter territory, it is still important to take measures within a 50 km range of the territory boundaries as otters are known to travel distances of 20 km during their active hours at night. In addition, it is important to take into consideration the possibility of migration as well a change in areas within a territorial range and that associated travel routes must be taken into account even at distances falling far outside the 50 km buffer. A restriction of preventive measures exclusively to existing otter territories would not allow the option of otters reestablishing populations in the gaps and, thus, recovery from its depleted number. For this reason, measures must be taken especially for those water ways where isolated otter populations exist so that connections among smaller populations can be reestablished and a chance for survival is given.

In most cases, the consideration of all waters lying within 1000 m of the road bed network seems to be adequate as approximately 95% of waters (not intersected by a road) lie within 1 km from a road (see Part 1, Table 8). If it is, however, evident that otters are present in only portions of the considered area or that there is a network of frequented biotopes, then the range considered for preventive measures must extend well beyond 1000 m from the road.

CONSTRUCTION DESIGN OF BRIDGES AND DUCTS FOR NEW ROAD CONSTRUCTION SITES

Water and roads intersect at about 55% of the recorded accident sites, whereby this includes dried river beds and drainage ditches, as well as rivers (Part 1, Table 6). All water types show to be equally under risk. Even apparently unimportant and at times dried river beds can serve as passageways within otter territories or into areas outside of them. Preventive measures must, therefore, cover all water ways that intersect with a road.

Determining factors influencing whether an otter is forced to cross a road could lie on physical qualities of a bridge’s or duct’s construction, the presence of dams or similar obstacles or high water levels associated with the construction forms mentioned. The following preventive measures with respect to these factors are recommended:

Bridge and duct construction

Tunnels ought to be avoided in general as otters pass through tunnels of a certain minimum size and only when they are dry, not when water is diverted through them.

All waters which intersect a road within an existing or potential otter habitat ought to be crossed by bridge, for example, a rectangular shaped bridge. The bridge must span the water way leaving ample space on both sides for a natural river bank underneath the bridge. A width-height-length relationship acceptable to otters' needs to consider length of bridge span, bridge height above the bank, bank width and length underneath the bridge.

The following guidelines have been calculated for the measure of bridges:

Length up to 10 m:	Height at least 100 cm above high water mark, 150 cm bank width on each side of which at least 100 cm lies above the high water mark.
Length up to 15 m:	Height at least 150 cm above high water mark, 200 cm bank width on each side of which at least 150 cm lies above the high water mark.
Length over 15 m :	per 100 cm additional length add 5 cm height above high water mark, 250 cm bank width on each side of which at least 200 cm lies above the high water mark.

Banks

The river banks underneath the bridge ought not to have an incline greater than 25%. The ground covering ought to reflect the natural surroundings and is not to be secured, cemented or the like. A few field stones would probably increase the attractiveness of the bank as marking area. The bank area adjacent to water also should not be secured. Possible wash out areas as well as new sediment deposits under the bridge are welcomed as they add added structure and, therefore, attractiveness for otters. Extra greening of the banks does not appear to be necessary.

Steering Measures

Latest telemetry results and observations via infrared cameras show that otters not only travel direct at the waters edge but also at some distance from it. To avoid these cases leading an otter to cross a road, a steering mechanism for each bridge is necessary. For this, fencing has been recommended. A six-sided, plastic coated mesh (mesh size: 4 cm, gauge: 3 mm) has worked well. The height of the fence should extend 150 - 160 cm above ground surface. To avoid the effects caused by erosion or digging, the fence should extend another 40 - 50 cm below ground surface. The fence should lie parallel to the road, not to the water way, to steer otters traveling at greater distance from the waters edge. About 100 m on each side of the bridge appears to be an adequate length.

Dams and other obstacles

The combination bridge/ dam is to be avoided in general. In addition, steps must be taken to ameliorate all sorts of measures having lead to an obstruction or restriction at the waters surface or on the river banks underneath or in close proximity to a bridge (within 100 m).

Lastly, it should be mentioned that the efforts to replace ducts with bridges not only benefits otters and other river bank dwelling mammals; it has a positive effect on the entire water ecology. A duct in a water way has the effect of a near to impassible ecological barrier. Because of the restriction of the water way, ducts, as a rule, prohibit the passing of otters, limits territorial and hunting flights of dragonflies and complicates the dispersion of many water insects. A conversion from duct to bridge compensates these negative effects. The new river bank has a positive influence on insects within the zone of the water's edge as well as for amphibians and spiders.

CONSTRUCTION DESIGN OF ROADS WITHIN REGIONS WITH OTTER OCCUPIED WATERS

Running waters did not intersect with roads at about 46% of the mapped accident sites (Part 1, Table 6). This means that about half of all otter victims occurred at sites where preventive measures concerning bridge construction would not have been useful, as no water existed at these sites.

The construction design of the preventive measure needs to accommodate the site and situation. Based on several experiences concerning the passage of otters and ducts, a model can be developed which would accommodate the local conditions. This models holds a preference for a fencing in of the areas considered particularly hazardous and the use of tunnel passages.

The fencing should extend on each side 100 m beyond the zone considered as hazardous, as it cannot be assumed that otters will, when crossing between two water sources, choose the most direct path. The tunnel passages connecting the fenced in zones ought to lie at a distance of not more than 200 m apart from one another. A distance of about 200 m appears to be adequate, as a greater distance between passages leads to ”impatience” of the otter which then opts to climb over the fence - which it is physically capable of doing. In addition, the fencing needs to be placed such that the roaming otter is steered direct into the entrance of the tunnel passage (i.e. so that no possibility exits that the otter misses the passage entrance).

To obtain an adequate relationship between width and height (diameter) to length of the tunnel, the following proportions should be employed:

up to 10 m tunnel length:	100 cm tunnel diameter
up to 15 m tunnel length:	120 cm tunnel diameter
up to 25 m tunnel length:	150 cm tunnel diameter
more than 25 m tunnel length:	construction of a ”dry tunnel” according measures for road construction (see below)

The height and width of the ”dry tunnel” correlates to length as follows:

Height: by 25 m length, height at least 150 cm, per 100 cm more in length add 5 cm more in height.
Width: by 25 m length, width at least 300 cm, per 100 cm more in length add 10 cm more in width.

It is again important in such cases as these that the tunnel passages and ”dry tunnels” remain dry at all times of the year. This means that the entrances of either must either be even with ground level or slightly raised (up to 10 cm).

The tunnel passage or ”dry passage” should contain a 10 cm layer of sand or natural substrate found in the nearby surroundings.

In conclusion, it ought to be stressed that preventive measures of this sort are for the most part for the benefit of the otter, but have as a positive aspect benefits for other species. Similarly, the effect of isolating the road ways can, at least for parts, have similar effects for the little regarded animal groups, such as, ground dwelling insects and spiders.

There are also positive effects to be expected for small mammals, too. Representative of this group and thought to be endangered is the species water shrew (*Neomys fodiens*).

The following species ought also to be mentioned as they, too, will travel through the tunnel passages: muskrat (*Ondatra zibethica*), brown chested hedge hog (*Erinaceus europaeus*), badger (*Meles meles*), beaver (*Castor fiber*), fox (*Vulpes vulpes*), common house rat (*Rattus rattus*), ermine (*Mustela erminea*), common weasel (*Mustela nivalis*), mink (*Mustela vison*), stone marten (*Martes foina*), polecat (*Mustela putorius*), common wild rat (*Rattus norwegicus*).

A positive effect for amphibians is not to be excluded; however, these sites and preventive measures have been chosen to protect the otter. It is clear that the recommended steering mechanisms and fencing is of a mesh size too large to steer the passing of amphibians into the tunnel passages. For the protection of amphibians, other preventive strategies would need to be employed.

RECOMMENDATIONS FOR THE REMEDIATION OF EXISTING ACCIDENT SITES

The loss of otters due to traffic related fatalities in the time since the reunification of Germany has increased by more than 500%. In addition to the implementation of preventive measures for traffic related deaths of otters in road construction matters, it is also necessary to remediate known existing sites of traffic death.

Based on the great variety in type of accident site, no general solution can be offered suiting all sites. An individualized action plan must be devised for each site based on the already named factors and in cooperation with the local nature conservation authorities, especially with the local otter protection group.

Based on the nature of the site, the following possibilities exist:

- Accident sites which do not intersect with a flowing water way
  For securing these sites, it is possible to implement the steering mechanisms and passage tunnels using the methods already described.
- Accident sites which intersect a flowing water way
  If the river or stream flows underneath a road and through a duct or rectangular duct and is very constricted at some point in its width, then the first goal would be to install a wide spanning bridge.

If this is not possible, then dry tunnels need to be constructed left and richt of the duct. Measurements for the dry tunnel passages and their corresponding steering mechanisms are to be used as described above for tunnel passages.

If the river or stream flows through a duct or rectangular duct, underneath a road and is not very constricted at some point in its width, then a berm can be built below the opening at the base of the bridge. A similar system has been recommended by STRIESE and SCHREYER (1993) for the improvement of bridges. These berm can only partially replace the non-existing river banks. Berms need to be at least 30 cm in width, and they should not lie higher than 20 cm above the water's surface. This solution is only applicable for locations with a constant water level, as berms should not be flooded at times of high water. Additional steering mechanisms are also in these cases absolutely necessary.

However, when the water way under consideration undergoes extreme water level fluctuation, which would at times overflow the berms, then tunnel passages left and right of the duct are necessary.

CONTROL FOR SUCCESS

After implementing the recommended measures for the various landscape, water, as well as, road types, a phase needs to be planned for in which the effectiveness is determined. In addition to direct observations, it is also possible to collect information via tracks left in the sand or via infra red film sequences. Without such a control, it is possible that errors in concept, design or planning inadvertently add to traffic deaths of otters at existing remediated sites or those planned for the future. Because of this possibility, it is essential that this control phase be completed, compared with the results from other projects and published promptly.

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Seminar on the Conservation of the European Otter (*Lutra lutra*)

The proceedings of the seminar, which was held in Leeuwarden, The Netherlands, 7-11 June 1994 are published. On 231 pages topics refering to status and distribution, reproduction and ecology, pollution, habitat quality and ecological networks are presented. A large number of contributions was presented by participants from former east European countries.
For further information please contact:
Otterpark Aqualutra, De Groene Ster 2, 8926 XE Leeuwarden, The Netherlands

WWF Forschungsberichte

In this publication serie of WWF Austria two issues on the otter *Lutra lutra* were published. Aspects covered are status of the otter in Austria, ecology, otter and fish ponds, causes for otter mortality, etc.
For further information please contact:
Hannes Seehofer, WWF Österreich, Ottakringerstr. 116, A-1160 Wien, Austria

Bulletin Vydra

The 5th issue of this bulletin covers various aspects of the otter *Lutra lutra* in the Czech Republic and in Slovakia. A total of 23 articles gives a lot of information on research projects (status, conservation, feeding ecology, pollution, fish fauna) in this two european countries. Furthermore articles cover the otter in the Zabajkalski National Park, Sibiria and its distribution in Morocco.
For further information please contact the editors:
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Ales Toman, Stanice ochrany fauny CUOP, Pavlov 54, 584 01 Ledec n. Sazavou, Czech Republic

Lutreola - Investigations of Mustelids and other Carnivorous Mammals in Russia (ed. V.V. Rozhnov)

This newsletter and journal which is to be issued twice a year, will feature the following materials:
- original studies of Russian specialists on mustelids and small carnivores
- translations of the most interesting papers appearing in the publications of Russia and other CIS countries
- comprehensive surveys of all Russian publications on this animal group
- other information concerned with mustelids and other carnivores

Additionally information retrieval, photocopying ($3 for ten pages) and translation of Russian literature on carnivores ($5 per page) will be available on order.
For further information please contact the editor:
A.N. Severtsov
Institute of Evolutionary Morphology & Animal Ecology
33 Leninski Prospekt
117071 Moscow, Russia

Die Wölfe der Flüsse - Riesenotter und ihr Lebensraum Regenwald
Schenck, C., Staib, E.
The two biologists give a report of their project on giant otters in the Manu National Park, Peru. Topics covered are their observations on the social behaviour of the giant otter, feeding ecology and possible threats like gold mining or tourism.

Also see page 4

Knesebeck Verlag, München, 1994, ISBN 3-926901-73X

Russian Literature

Dr. Jevgeni Shergalin is providing literature reviews for the Russian literature on all aspects of biology. For further information please contact:
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Wild Otters - Predation and Population
Kruuk, H.

“Despite the popularity of otters, there has been no previous attempt at a scientific description of populations and behaviour of this species, Lutra lutra, in the wild. This book has been written from direct observations of otter populations in scotland, where the animals are still abundant. There is a great need for this kind of natural history, firstly because it provides the basic for active conservation management, and secondly because of the interest and naturalists of the unque and fascinating ecology of mammals living in a very hostile environment.” (Oxford University Press)

Oxford University Press, 1995, 304 pages, 67 halftones, 74 line drawings and figures, £30.00, ISBN 0-198540701 (see also the enclosed flyer)

Second International Martes Symposium

Edmonton, Alberta, Canada August 12 - 16, 1995
Sessions will deal with taxonomy and genetics of martes, population ecology and management, habitat characteristics and utilization, wildlife techniques, integrating martes in forest management. Access to the mammalogy collection at the Provincial Museum Alberta (over 10,000 specimens, including 139 specimens of the genus *Martes*, and also *Lutra canadensis*) is available to conference participants before, during or after the symposium).
For additional information please contact:
Gilbert Proulx, Alpha Wildlife Research & Management Ltd., 9 Garnet Crescent, Sherwood Park, Alberta, Canada T8A 2R7

LAST MINUTE NOTES

ZOO ANIMAL BEHAVIOUR AND WELFARE
A Summer School, 17 - 28 July 1995, Edinburgh Zoo

Designed for all those involved in the management and husbandry of captive animal populations, whether these be in zoos, safari parks, wildlife centres or rear-and-release schemes, ZOO ANIMAL BEHAVIOUR AND WELFARE will update participants with the latest scientific theory in the areas of behaviour and welfare, showing how this theory can be practically implemented back home in the participant´s place of work.

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