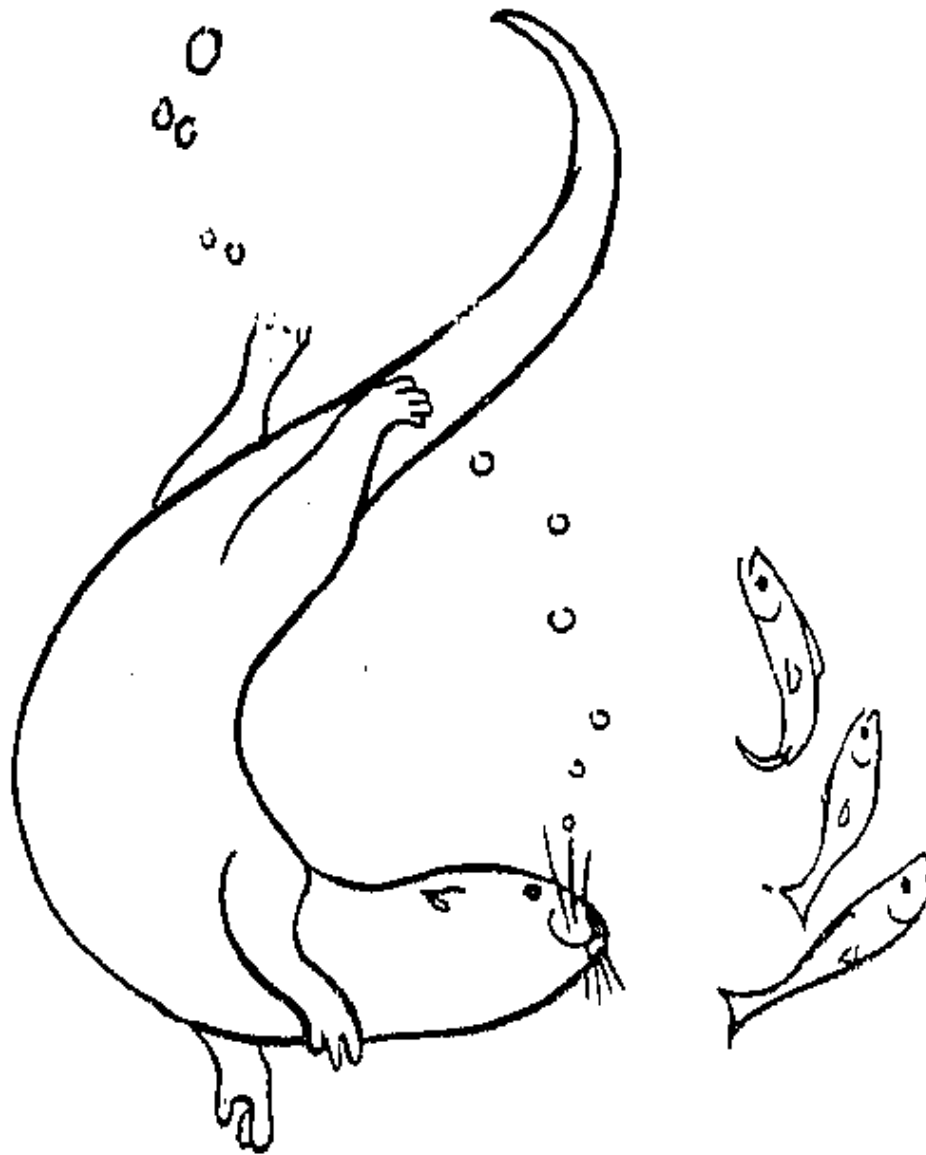


IUCN Otter Specialist Group Bulletin

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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.

Deadline for next issue: 1 February 1992



SA Nature Foundation
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The production and distribution of this issue has been sponsored by Natal Parks Board and the Southern African Nature Foundation.

IUCN/SCC OSG GROUP

Greetings to all of our members of the IUCN Otter Specialist Group. This edition of the Otter Specialist Group Newsletter is the first one produced by our new Editor, Dave Rowe-Rowe. Thanks and sincere gratitude are due Chris Mason, our former Newsletter Editor for all his hard work and dedication over the years. Without Chris's tenacity, this publication would have floundered long ago. I would also like to formally thank Dave Rowe-Rowe and his sponsoring organisations, the Natal Parks Board and Southern African Nature Foundation, for embarking on this new endeavour. With Dave's abundant enthusiasm and dedication to otter conservation, I'm sure this will continue to be a publication that we will all be proud to use and contribute to.

At long last the IUCN document *Otters: An Action Plan for their Conservation* has been published and distributed. Thanks to all of you for your contributions to this large-scale project. All members of the Otter Specialist Group, all contributors mentioned in the acknowledgement section, and other concerned parties suggested by the Regional Coordinators have all been mailed copies from the IUCN office in Switzerland or from George Rabb's office in Chicago. The American Association of Zoological Parks and Aquariums (AAZPA), one of the funders of this publication, has also provided copies to all zoos in the United States. The Chairman of our group and all Regional Coordinators and chapter authors have also received additional copies for distribution. Now that this document is in so many hands, and is readily accessible to others who wish a copy, it is time to begin to take action. I sincerely hope that this publication helps you in your own fund-raising efforts. Please let me know if there is anything else I can do to help you raise funds for your otter conservation projects.

In addition to the change in our Newsletter Editor, there are other administrative changes in our group. After many long years of service and hard work for the Otter Specialist Group, Sheila Macdonald resigned as European Co-Coordinator and Claus Reuther is now the sole European Co-Coordinator. Also, Charles Santiapillai of Indonesia has resigned in his duties from most of his IUCN Specialist Group activities, including ours. If any of you Asian members have enough institutional support to cover your mailing and communication costs and would like to serve as our Asian Coordinator, please contact me. Until then, I will continue to oversee this area.

For the next six months I will be finishing up my PhD dissertation on "Foraging Ecology of Malaysian Otters" at the Department of Zoology, University of Florida, Gainesville, Florida 32611 (Fax: 904-392-3704; Phone: 904-392-1107). Please feel free to contact me there and I will continue to server your otter conservation needs in any way I can. I look forward to hearing from you and to seeing the flourishing of your otter conservation projects.

Pat Foster-Turley

REPORT

DISTRIBUTION OF *LUTRA LUTRA* IN THE HIGHLANDS OF SRI LANKA

Padma Kumari de Silva

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Abstract: The only otter found in Sri Lanka is *Lutra lutra*. A survey was carried out in 1989/1990 in the highland region of the island, an area drained by four river systems. Abundant signs of otters were found. Freshwater crabs form the main part of the otters' diet in the study area, where few fish are found. Although at present, otters are plentiful, partly because access to tea plantations is limited, reducing pressure on otters living on them, this may not continue as vegetable farming increases, bringing pesticide and fertiliser washoff and soil erosion. Mining is also causing increased water turbidity, and fish farming is leading to otters being destroyed. Peak Wilderness Sanctuary and the Horton Plains National Park help to protect otters and other wildlife, but conservation measures need to be put in place now to protect otters against these growing threats.

Sri Lanka, a continental island of 65 600 km² in area and located just south of India, has only one species of otter, namely *Lutra lutra*, although two other species *L. perspicillata* and *Aonyx cinerea* are present on the Indian mainland. Apart from the general information based on the chance records of sightings, not much is known about its distribution and ecology in Sri Lanka (de Silva & Santiapillai 1988; de Silva 1989). This paper presents some aspects of ecology and distribution of the species in the streams and tributaries of four major river systems in the highlands, > 1000 m above sea level.

STUDY AREA AND METHODS

Topographically, Sri Lanka consists of three peneplains. In general, the first, the second and the third peneplains extend, respectively, from 0 to 122 m, 305 to 762 m above MSL (Cooray 1984). The highlands are, therefore, mostly in the third and the oldest peneplain, which is situated in the central part of the island. The highlands are drained by four major river systems (Figs 1A & 1B).

Climatically, a dry zone and a wet zone can be distinguished in the island (Fig. 1A) depending on the pattern of rainfall. The wet zone receives rains from the two monsoons, the south-west and the north-east, and these rains are rather evenly distributed throughout the year. The dry zone, on the other hand, receives rains only from the north-east monsoon, and because of the seasonality of the rains, there is a distinct dry period. The highlands are in the wet zone. Of the four rivers studied, Kelani and Kalu have south-west monsoonal basins while Mahawell and Walawe receive benefits from both monsoons.

The streams and rivers were examined for otter signs (spraints, footprints, holts and actual presence) following, in general, the method of Macdonald (1988). In each stream and tributary, a stretch of about 600m along the bank and flowing water areas was searched at every 5 km interval. When otter signs were detected, or at the end of the 600 m stretch, the search was discontinued and started afresh at the next 5 km stretch. The study was carried out in 1989/1990.

Spraints, when found, were carefully collected and studied in the laboratory to determine the prey species and the order of significance of the latter in the diet of the otter.

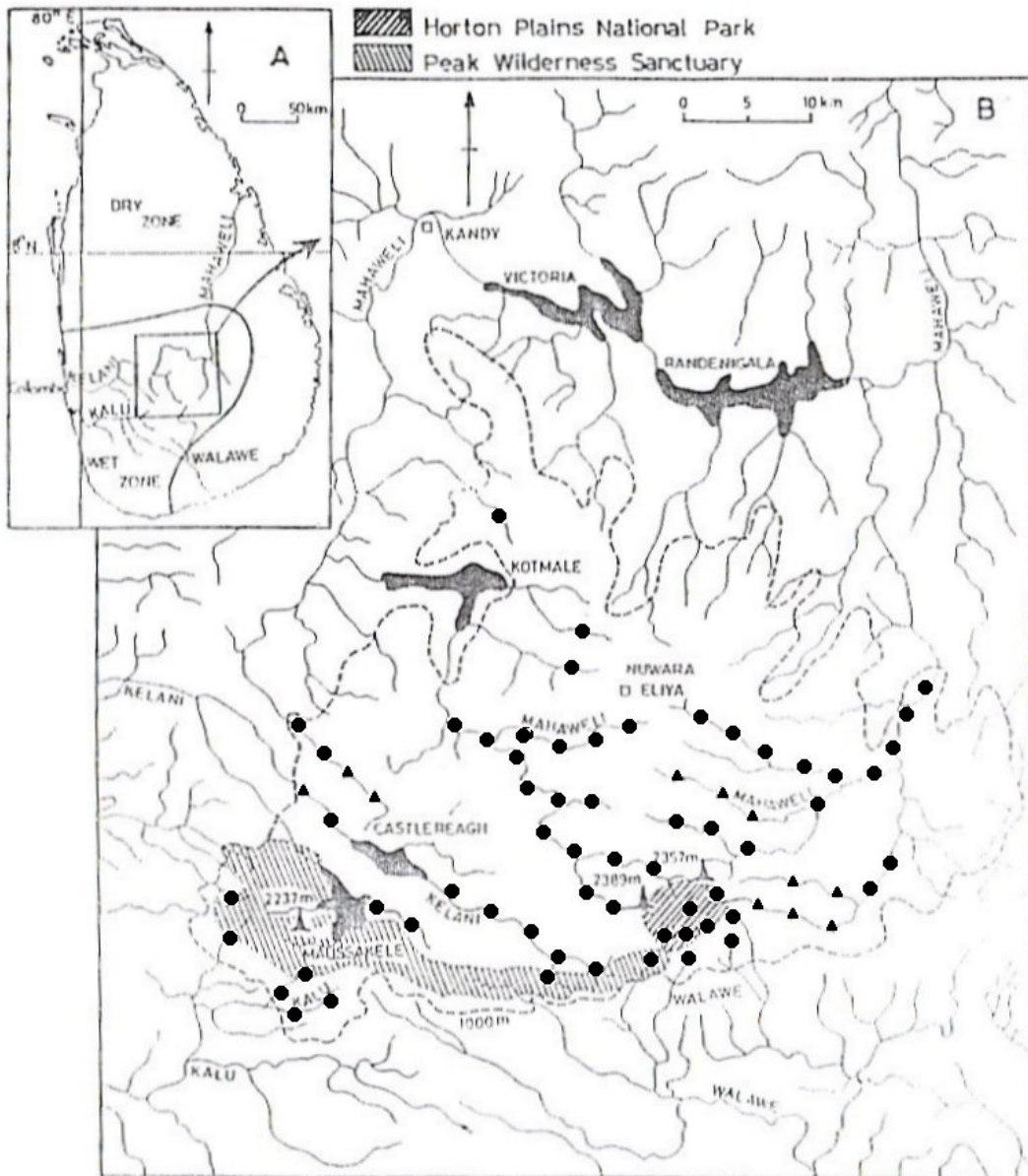


Figure 1. (A) Map of Sri Lanka showing the wet and dry climatic zones and the four river systems surveyed in the highlands. (B) A detailed map of the highlands indicating the sites studied in the four river systems. 1000m contour line is also shown, circles = Positive sites; triangles = Negative sites

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RESULTS AND DISCUSSIONS

Sixty out of 71 sites studied (Fig. 1B, Table 1) in the highlands were positive for otter signs indicating a high frequency of occurrence of the otter in the region. Headwaters of all four river systems contained otter signs.

Table 1: The frequency of occurrence of otter

	No. of Sites Surveyed	No. of Positive Sites	No. of Negative Sites	% of Positive Sites
Mahaweli river	47	37	10	79
Kolani river	11	10	1	91
Kalu river	5	5	0	100
Walawe river	8	8	0	100
Total	71	60	11	85

Freshwater crabs formed the main food item of *L. lutra* in the highlands. Three species of potamonid crabs, namely *Parathelphusa enodis*, *P. rugosa* and *P. soror* are found in the region (de Silva & de Silva 1991). The most common species is *P. rugosa*, which is the largest species growing to about 50mm carapace length, although specimens of carapace length up to about 30 mm are common, and is ubiquitously present in the area. Fish was only of secondary importance in the diet. Only 11 out of 70 of freshwater fish species of Sri Lanka are found above 1000m elevation, while only one species, namely, the introduced rainbow trout (*Salmo gairdneri*) is found above 1500m (de Silva & de Silva 1991). Most of the fish species in the highlands are small (< 100 mm) and are not very common in the streams in the area.

Although the otter is widely distributed in the highlands and apparently is in no danger at present, there are signs that this satisfactory state may not continue for long. This is because the stream habitat in the highlands is now threatened, although to a lesser extent than that in lowlands, by man's direct and indirect interference. A large area of the highlands was cleared less than a century ago by the colonialists for tea plantations. However, this appears to be a blessing in disguise for the otter as the access to tea plantations is restricted. Unplanned settlements are not allowed and the tea plantations do not seem to affect the streams to a significant extent. The forest areas in the highlands are presently cleared mostly for vegetable and potato cultivation and for establishing settlements. Such practices, beside reducing the forest cover, cause soil erosion and contribute to water pollution. Fertilizers get washed down into streams. Pesticides, which are being increasingly and indiscriminately used by vegetable farmers, could drastically affect the food chains in the streams. New settlements will bring along with them the inevitable biological pollution of the streams.

High turbidity of water was observed in some of the sites visited. This was mainly owing to sand extraction for building purposes and gem-mining. High turbidity could affect the fish and other fauna of the streams thus affecting the food supply of the otters. Water diversion and reservoir construction may cause loss of otter holts.

The recent development of pond culture of fish in some of the tea estates could be detrimental to the otter population as the fish farmer will destroy the otter, which will invade his fish ponds. Such incidents have already occurred.

On the positive side, the presence of Peak Wilderness Sanctuary and the Horton Plains National Park (Fig. 1B) as well as other small forest reserves in the area will help the otter as well as the other wildlife.

Thus, although at present *L. lutra* appears to be safe in the highlands of Sri Lanka, conservation measures must be taken now in order to assure the future well-being of the otter as well as other wildlife in the area.

ACKNOWLEDGEMENTS -I acknowledge the field assistance provided by many persons, of whom Mrs U.D. Hindagala and Messrs G.N.Wollone and K.G. Mahinda need special mention. My thanks are due to Drs Sheila Macdonald, University of Essex, United Kingdom and Charles Santiapillai, Chief Scientific Officer of WWF/IUCN Asian programme, Bogor, Indonesia, for their general advice during the project, and to Mr T.S.B. Alagoda of University of Peradeniya for drawing the figures. This study was made possible by a grant provided by the Otter Zentrum, Hankensbüttel, Germany.

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REPORT

RADIOTRACKING A TRANSLOCATED OTTER IN SPAIN

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Abstract: A subadult male otter, injured in a road traffic accident, was found in central Spain. After treatment, it was considered suitable for return to the wild. The opportunity was taken to radio track the released otter, using a subcutaneous transmitter implanted under the shoulder skin. This was very successful, and considered to be an improvement on harnesses and intraperitoneal implants. A new study is now taking place using two adult otters.

A young (< 1 year) male otter was found injured in March 1990 on a road close to the upper Gabriel river (Jucar basin, Central E Spain). It showed a little limp, possibly caused by a traffic casualty. After healing it was carried to the "Mata del Fang" Wildlife Research and Recovery Centre (Generalitat Valenciana, Regional Government). The specimen was examined through X-ray revealing a broken humerus, already knotted with a small deviation.

Blood samples proved normal haematological values and the animal could walk, run and swim properly. During all the time it was kept in captivity, the otter looked well and its behaviour was shy and aggressive, therefore it was considered feasible to return it to the wild.

It was decided to translocate the specimen to the Bergantes river (Ebro basin, NE Spain; 580 m altitude) which supports a good otter population, has very rich fish fauna, and optimum possibilities for controlling and following the animal. A radio-tracking project was planned rating all the different methods.

Harnesses have been much criticized for the chance of engaging with branches or any obstacle under water, movement limitations, and wound possibility. Intra-peritoneal implantation has many advantages, e.g. no influence on the otter's locomotion, less influence on behaviour and less possibility of casualties. Successful results have been obtained in *L. canadensis* (Melquist & Hornocker 1979,

1983; Hoover 1984; Reid et. al. 1986), *L. provocax* (Chehebar, in verbis) and *L. lutra* (Conroy, Armeno & Sjoason, in verbis). Despite these advantages, many problems have been found related to the surgical approach; danger of death, danger of infection, and decrease in the transmitter signal owing to body mass.

We consider that the subcutaneous implantation could have some advantages if a transmitter with small dimensions and low weight could be produced. An AVM transmitter, P2B model with K-16 battery (life expectancy up to 2 years) and custom application M-Module Implant, measuring 63 x 17x16 mm (flex antenna of 195 x 0,8 mm) and weighing 26.5 g, was considered as a good one to do the experiment. The otter weighed 4.6 kg therefore the transmitter accounted for only the 0,6 % of its weight.

The otter dorsum was elected to be the place of implantation because:

1. It is exposed out of the water more frequently.
2. It is very difficult for the animal to bite himself.
3. It has no influence on locomotion and head movement.

The animal was anaesthetized with Ketamine HC1 and xylazine (20 mg/1 and 1 mg/kg respectively). The surgical procedure consisted of a single transverse incision of 35 mm, just behind the withers.

Afterwards, the otter remained in an indoor holding pen for nine days, and then drugged again and examined, checking that the incision had healed. On June 7, the otter was carried to a hacking enclosure (40 x 40 m) placed in the river. During all the time it remained inside the enclosure it showed strict nocturnal behaviour and it was verified that it could fish easily by itself. Six days later a sudden flood destroyed the enclosure and the otter escaped.

The specimen was followed for 25 days. During that period it took up a home range of 20,7 km length of the river, and recorded a greatest movement of 9 km in one day. The behaviour was normal (nocturnal, crepuscular), and characteristic of a young individual in dispersion.

On the 26 th day, the transmitter was found in the river bed, the antenna was cut off and there was no sign of the otter. Two days before it was observed at night showing normal behaviour (going through 6,2 km that night and 4,0 km the night before it disappeared), with no sign of open incision. In spite of careful searching we found no trace of fight, depredation, or hunting.

The experience has been positive. One disadvantage of this implantation is the transmitter's shape (a smaller, plain one will probably be better).

Advantages are the small size, no entry of the body cavity (less danger of infection, complication and death), easily and quickly done, and it would be easy to take the transmitter in case the otter is recaptured.

This kind of implantation could be an important way of monitoring Lutrinae in the future. In January 1991 we started with two new adult otters, from Galicia (NE of Spain), which were provided by our colleague Dr Antonio Callejo.

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REPORT

FISH FARMING AND OTTERS IN PORTUGAL

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Abstract: In Portugal fish farming has expanded very rapidly in the last decade, with trout, mullet, cuttlefish, seabream, eel, salmon and prawns being intensively reared in artificial ponds. A questionnaire was sent to all known fish farmers to assess the effect of predation, especially by otters; no compensation scheme exists in Portugal. This paper discusses the results of this exercise. It is suggested that fish farmers need to look beyond economic and technological aspects of aquaculture and consider the wider environmental impact of their activities.

In Portugal fish farming has expanded very rapidly in the last decade, mainly after 1985. There are two governmental bodies with authority to license the projects. One for aquaculture in freshwater systems and the other for fish farming in coastal environments such as marshes and lagoons. A high percentage of these farms are financed by EEC funds and some are still in development.

The most common species reared are the rainbow trout (*Salmo gairdneri*) in freshwater and the mullet (*Mugil* spp.), common cuttlefish (*Sephia officinalis*), gilthead seabream (*Sparus auratus*), eel (*Anguilla anguilla*), striped seabream (*Pagellus mormyrus*), common sole (*Solea vulgaris*), seabass (*Dicentrarchus* spp.), white seabream (*Diplodus* spp.), Atlantic salmon (*Salmo solar*) and Kuruma prawn (*Penaeus japonicus*) in salt or brackish water.

Pond culture is the system used most often - earth or cement ponds provided with water at ambient temperature and salinity where fish, fry, fingerlings or shrimp (post-larvae or juveniles) are stocked. They are usually collected from the wild or produced in hatcheries. The extensive production where no food is supplied by man is being gradually abandoned because of its low productivity, and replaced by semi-intensive and intensive fish farming. The polyculture of eels, common soles, seabasses and gilthead seabreams is very common in ponds, while cage culture has until now only concerned rainbow trout in dams. An interesting aspect of this activity is presently the conversion of all salinas for intensive aquaculture. Previously only extensive fish farms were associated with salt exploitation.

At the end of 1990 a general questionnaire was sent to all known fish farmers (n = 208). The object was to determine the impact of predation in their exploitation, in an attempt to figure out the magnitude of financial losses, especially due to otter activities.

Only 29.3 % of the farmers returned the form.

The European otter (*Lutra lutra* L.) is still widespread all over the country and otters are strictly protected by law. However the Portuguese state does not compensate for damage.

Otters and other predators

Otters, cormorants, herons, egrets, and gulls were reported as the more frequent visitors and users of fish farms. Predation as well as disturbance causing stress on the fish were the main problems. Fish farmers complained more about predation by otters than by birds. However, there are great differences in the scale of predation reported from farmers in the same area, and the financial losses are unknown. In some places it was reported that otters take fish all year round.

How to prevent the damage

Several owners have tested different methods such as fencing, human surveillance and dogs to prevent otters and avian predators coming in to the ponds. Other deterrents such as sonic scarers, lights, scarecrows, crossed nylon wires, traps, shots and poisoned baits were also referred to.

Electric fencing is not often used in Portugal, first because of the high price and second because a lot of farms are located in wetlands. Although being fully protected in Portugal, several otters are certainly killed each year on fish farms. Nobody has an idea of the total number of these illegally killed animals.

Opinions

These are different attitudes towards the otter. Some farmers consider them as serious pests and claim that otters are thriving because otters now get plenty of food from fish farms. In their opinion this situation is not acceptable since they have no compensation for the financial losses. None estimated the total yearly losses.

A more understanding group desires the cooperation of nature conservation associations to help them keep otters out of their areas. The possibility of transporting animals away from fish farming areas is plausible, but the problem is to find places sufficiently away from farms but not too distant from the capture areas.

Only a few farmers like to see otters and other wildlife species in and around their areas claiming that the damages they cause are not too significant. Generally this opinion comes from younger farmers.

These three different attitudes to otters are interesting. Something very similar was mentioned by Skarén (1990) in Finland.

Discussion

Additional data on fishfarms are certainly necessary.

The development of aquaculture has been viewed mainly from socio-economic and technological perspectives. Environmental problems have been scarcely considered and sometimes even neglected. Aquaculture, owing to the location of enterprises, is exposed to a variety of predatory wildlife which can cause considerable losses of fish, fry, fingerlings or shrimp. On the other hand the intensive fish culture in ponds is entirely dependent on incorporation of food resulting in great amounts of organic effluents. This material, associated with antibiotics used both to prevent and treat diseases, has sometimes led to water pollution problems.

However, damage by wildlife is the farmers' main concern, and some have claimed a negative impact of pollution caused by agricultural practises and industry wastes on the water quality.

Another aspect of the activity is the fish farm escapes of cultured fish, products of years of selective breeding, which can be genetically different from wild stocks. The maintenance of a viable wild gene pool is highly desirable and one must bear in mind that breeders depend to a large extent on wild stocks as a source of genetic material for further improvements on farmed stock.

When biological resources are considered, the promotion of production depends, in fact, on the quality of the environment and its maintenance (UNEP 1990). Fish farmers need to assess not just the impact of the environment on their activities, but also the impacts of their activities on the environment. It is important that adequate management measures are incorporated into all farms at the project stage (SSGA 1990).

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REPORT

CESIUM-137 LEVELS DETECTED IN OTTERS FROM AUSTRIA

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Abstract : Pollution seems to be one of the most important causes for the decline of the European otter (*Lutra lutra*). The accident in the Chernobyl nuclear power plant added another aspect to environmental pollution. Few data on cesium-137 contents in otters are available, so levels were measured in 3 otters from Austria. All levels found were very low.

Pollution seems to be one of the most important causes for the decline of the European otter (*Lutra lutra*), but very little is known about hazards to otters in Austria due to heavy metals, organochlorines and PCBs. In order to follow the recommendations of the IUCN Otter Specialist Group on the importance of a pollution risk assessment for any otter conservation programme, WWF Austria initiated investigations on this subject. For this purpose there will be a cooperation of the WWF Research Institute, Institute for Wildlife Biology and Game Management/University of Agriculture, Vienna and the Institute for Medical Chemistry/University of Veterinary Medicine. Vienna (Gutleb 1990).

The accident in the Chernobyl nuclear power plant added another aspect to environmental pollution. Few data on cesium-137 contents in otters are available. Therefore cesium-137 levels were measured in otters from Austria.

Material and Method

In our investigation, cesium-137 contents in muscle tissue were determined by a high purified germanium detector, efficiency 19%.

The explosion of the nuclear power plant in Chernobyl happened on 26 April 1986. Otter no. 1 died October 1987 and the other two in 1990. Two otters were found in the southeast of Austria and the third in the north. Individual data are listed in Table 1. These areas received only a moderate amount of cesium-137 fallout, i.e. 370 - 740 Bq/kg grass, compared with highly contaminated areas having 14 950 Bq/kg (Shonhofer 1986).

Table 1

Otter No	Sex	Age	Weight kg	Found	Place	Cs-137 Bq/kg fresh weight
1	m	old	8.7	04.10.87	Gussing	<5
2	m	young	3.8	31.01.90	Gussing	<5
3	f	old	7.5	20.05.90	Pfaffenschlag	

Results

Cesium-137 contents in muscle tissues of otters 1 and 2 were below the limit of detection. In otter 3, tissue levels of 7 Bq/kg fresh weight were found.

Discussion

There are only few available cesium-137 data on otters. In Georgia a maximum content of 785.9 Bq/kg (average 252.5 Bq/kg) in muscle tissues of *Lutra canadensis* which were collected in 1976-1977 was measured. In addition bones of *Lutra canadensis* have been analyzed in Canada for their content of radium-226. The maximum value was 466.6 Bq/kg.

Two old male otters have been analyzed in Finland. The first otter died in February 1986 and a cesium-137 content of 250 Bq/kg was found. The other died in August 1986: cesium-137 content 1250 Bq/kg (Skarén 1988a). An old female otter has been analyzed in October 1987 and 85 Bq/kg were found (Skarén 1988b).

In Great Britain otter scats were measured for radiation with a maximum value of 79 500 Bq/kg (dry weight) after the Chernobyl explosion (Mason & Macdonald 1988).

Our analyzed contents are much lower than all other reported before.

An explanation for this might be the low radiation found in fish from Austria. Because freshwater fish is consumed by the Austrian population only a very small extent, other food has been measured preferentially by the Austrian authorities. Therefore only limited data on fish are available. Fish from Austrian otter habitats show levels lower than 245 Bq/kg fresh weight (Schonhofer 1989) compared with an average value of 9800 Bq/kg fresh weight in Sweden (Hakanson et al 1989). Saxen reported average values from 1400 Bq/kg to 6600 Bq/kg fresh weight for different species in Central Finland (Saxen & Rantavaara 1987). All these data are from 1986. Skarén (1988a) concluded that the Chernobyl explosion had few acute effects on otters in Finland although almost nothing is known about the risks of low level contamination by radiation in otters. Although only few samples were analyzed in Austria, the otters seem to be unaffected by the cesium-137 fallout.

ACKNOWLEDGEMENTS -We thank Mr W.D. Rausch and Mr E Leidinger for their comments on a preliminary draft of this paper.

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SHORT COMMUNICATION

OTTERS IN THE EASTERN RED DATA BOOKS

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Following the idea of IUCN Red Data Book, similar publications were later prepared in many countries. Most of these national Red Data Books (RDBs) describe otters and thus constitute an interesting source of information on legal status and attitudes towards these animals as well. For the purpose of this article I included RDBs published in so-called East Europe and USSR: 1. national RDBs from Bulgaria (1985), USSR (1985) and Poland (in print); 2. republican RDBs from Czech S.R. (1983) and 9 Soviet Republics (1978-1987)(for complete list see references).

The description of status of the otters is summarized in Table 1. As some of the RDBs used non-standard criteria of status description, I converted them to the nearest IUCN RDB criteria. The RDBs from Byeloruss, Latvia and Lithuania did not include otter and are not listed in the Table.

Table 1: Otters in Red Data Books

E = Endangered; V = Vulnerable; R = Rare
+ = Protected; ! = Protection of selected subspecies only

	Otter	Sea Otter
Poland	R +	
Czech SR	E	
Bulgaria	E +	
USSR	R + !	R +
RFSFR	R + !	R +
Yakutsk ASSR	V +	
Latvia	V +	
Armenia	E +	
Kazakhstan	R +	
Turkmenia	R +	

The otter *Lutra lutra* is the most often described species among all mustelids: it is listed in 10 out of 13 RDBs (while e.g. the European mink is listed only 5 times). Most RDBs consider it under the Rare category (5 times), three as Endangered, and two as Vulnerable. Almost all RDBs, that include the otter, also contain information about legal protection of the species. Only the Czech RDB does not mention it. In Latvia and Kazakhstan the otter receives partial protection. The RDQ of USSR protects only two subspecies of otter: *L. lutra meridionalis* Ognev, 1931 as Rare, and *L. Lutra seistanica* Birula, 1912 as a Rare and Decreasing subspecies. The former subspecies is also the only one protected by the RDB of RSFSR. Otters of subspecies *L. lutra seistanica* are protected by republican RDBs from Turkmenia and evidently Kazakhstan, where those animals are described under the incorrect scientific name of *Lutra seistanica*. All other RDBs mentioned in the [Table 1](#) confirm full protection of the species (since 1960 in Armenia; since 1962 in Bulgaria, where a penalty of 150 leva for killing the otter is also established).

Two subspecies of the sea otter: *Enhydra lutris lutris* Linnaeus, 1758 and *E. lutra gracilis* Bechstein, 1800; are protected by the RDBs of USSR and RSFSR, both under the Rare Category.

The national and republican Red Data Books generally reflect little interest in protection of mustelids and the otter is the only exception. This species is recognised as Rare or Endangered and is commonly protected. Most of RDBs indicate the presence of otters in protected areas and list protection measures to be taken. These measures, however, are of general character (better species protection, protection of habitats) and have little value for promoting specific conservation actions. The fact, that the otter is not listed in RDBs of Byelorussia, Lithuania and Ukraine, as well that only selected subspecies are protected in USSR and RSFSR, seems to reflect the conflict between furbearer and game policies.

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SHORT COMMUNICATION

OTTER NEWS FROM DENMARK

Aksel Bo Madsen

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Stopgrids or stopnets in all otter areas

To protect otters in Denmark the Ministry of Fisheries has declared that all fisherman in the northern part of Jutland must use Stopgrids or stopnets in fish traps.

The new stopgrid-stopnet law replaces two former proclamations regarding fisheries in the watersheds of the rivers Hvidbjerg and Karup. The area in which their use is now mandatory coincides with known otter distribution. Besides freshwater habitats the law also applies to certain brackish and saltwater areas, particularly in the Limfjord.

The law, made in collaboration with the Ministry of Environment and Forest and Mature Agency, based on work started by Project Otter in 1985, will be enforced from 1 January 1991 until 30 April 1995. There is reason to hope that the small Danish otter population will increase during this five-year period. During this period the otter population will be monitored by both the Forest and Mature Agency and the Ministry of Fisheries.

A brochure written in Danish, and illustrated in colour, outlining the use of stopgrids and stopnets is available from the address given above.

Second Danish otter survey

Otter distribution was surveyed in Denmark during 1984 - 86. During the spring of 1991 the survey will be repeated, completely covering the counties in which otters were recorded during the previous survey viz. Nordjylland, Viborg, Ringkøbing, Århus, and Vejle. Throughout the rest of the country only watersheds, where the expected occurrence of otters has been reported, will be visited. The extent and duration of the survey is somewhat limited by finances, but I am sure useful comparative information will be collected.

Otters and Motor Traffic

The following is a summary of the recently published paper "Oddere *Lutra lutra* og trafik", written in Danish (See [Recent Publications](#) for full reference).

As an introduction, the numbers of otters killed by cars in Denmark and other European countries is presented showing that the problem is considerable.

The investigation is based on the following sources: information of 39 otters killed by cars and delivered to the Natural History Museum, Århus, observations on marking behaviour at 48 different bridges with possibilities for marking, experiences with game mirrors placed at 13 bridges over River Skals, and direct observations of otters crossing the road at the dam of Virksund

Many otters were killed at places without banks under bridges or at dams between two wetlands. Although otters are killed in all months of the year, an increasing trend of collisions is seen in the months July - December.

25 (64 %) male otters, especially adult sexually mature males were killed in the traffic, probably as a result of their greater activity in the home-range than that of females.

In 66 (73 %) of the visits at bridges with banks, the otters preferred to mark with spraints at the bank rather than outside the bridge. Footprints and tracks on banks showed that the otter, in many cases, continued under the bridge.

The effect of game mirrors at bridges to prevent traffic killing otters is evaluated to be smaller than the efforts. Problems with maintenance are extensive in relation to a full non-risk possibility for passage.

Direct observations seem to show that otters are not able to estimate the risk in crossing roads. The consequence of abovementioned investigations is that we must try to prevent the otters crossing the roadway, either by luring them under roadsystems on stones and banks, or by forcing them away from the road by means of fences.

REPORT

AKTION FISCHOTTERSCHUTZ E.V. (GERMAN CAMPAIGN FOR OTTER PROTECTION) ACTIVITIES 90/91

Ralf Röchert

Aktion Fischotterschutz E.V., Sudendorfallée 1, Postfach 1216. W-3122 Hankensbüttel, Federal Republic of Germany.

With the political changes in Germany, much of our work has recently been redirected towards East Germany. Different from the old territory of the Federal Republic, where otters are at the brink of extinction, *Lutra lutra* did survive in many parts of East Germany. Especially in the new states of "Mecklenburg-Vorpommern", "Brandenburg", and "Sachsen" the otter is still fairly common. However, realising the enormous political pressure for a quick economic development in the five East German states, the otter's future in the former GDR is anything else but safe.

In the long run, therefore, we are determined to develop a successful conservation and management scheme for the otter's remaining habitats in East Germany. Oddly enough the "long run" has to be covered in rather short time if we are to cope with the current speed of investors and political decision makers. On the other hand conservationists in the GDR have done a good job between the fall of the wall and the unification, and many of the finest areas are under full or preliminary protection. New national parks, and biosphere or nature reserves of reasonable size have been created. Thus the general prerequisites, under which we have to operate, are not rosy, but could be worse.

So far four projects are in progress or in preparation and thus due to be started in 1991, i.e.:

The distribution of stop-grids to East German fishermen and related publication of an information booklet

According to the records of Stubbe (1989) the drowning of otters in fyke nets has been one of the two major, identifiable death causes in the GDR. Especially fatal is the situation in the states of Mecklenburg-Vorpommern, and the northern districts of Brandenburg, where fyke nets accounted for more than 50 % of the toll.

With financial support of the German Environmental Minister we ordered 1 000 stop-grids from Denmark and will distribute them to fishermen in Mecklenburg-Vorpommern and Brandenburg during the next months. An information booklet is just about to be published. As many commercial fishermen in East Germany go for pike and cyprinids as much as for eel we furthermore plan to test a fyke net with an escape funnel that has been developed by two East German fishermen.

A long term, telemetric study on otters

In spring we will start a telemetric study on otters in an area called the "Spreewald", which recently got the status of an UNESCO Biosphere Reserve. The study will last for about a decade. For the time being it is started as a Ph.D. study by Morten Behrens but, after having made first experiences, should be extended.

A study on Hg, PCBs and some other chlorinated hydrocarbons

In the GDR otter populations of different status exist: thriving, scattered and endangered ones. Thus we will start a study on Hg and chlorinated hydrocarbons (esp. PCBs) and otters, consisting of two parts. One being the analysis of dead otters, the other one being a monitoring study on about 30 selected otter habitats (including some, where the otter disappeared, as a comparison) using roach as an indicator organism. We try to answer two questions:

1. Is there any relation between the status of otters and the pollution of the habitats with PCBs or other noxious substances?
2. Is it possible to establish a risk level for certain substances (based on concentrations in extractable fat of roach) that can be used for habitat assessments and management schemes?

This should be started in spring or summer with the fish samples to be taken in autumn.

A survey of otters in the former GDR using the British Survey Method

Coordinated by Michael Stubbe from the University of Halle, the status and distribution of the otter has been recorded continuously during the past decades. Still there has not yet been the chance to do a survey according to the British Survey Method. Thus we intend to start such a survey as soon as we get the necessary funds.

Other projects

Besides the activities in East Germany some other projects have begun or continued. Two Ph.D. studies are in full progress, one being on the anatomy of otters (done by the veterinarian Anja Zogal), the other one being on the development of vocalisation of otters by Barbel Rogoschik (Rogoschik 1989). With two Ph.D. studies, on marking behaviour and on predatory behaviour, plans exist but have not yet been promoted.

We bred one otter last year, but are reluctant to continue with the breeding programme, as we start to run short of enclosure space. Bearing in mind the inadequate conditions under which otters are frequently kept in captivity, we decided not to sell our animals. Instead we developed a sort of "rent-system". We set up a contract with zoos or wildlife parks, in which the conditions under which the otters have to be kept, are put down in detail. The conditions have to reach the high standard maintained in the OTTER-ZENTRUM, which some of you saw during the last otter colloquium (including size and design of the enclosures, proper veterinarian care, etc.). The animals can always be investigated by us and, should it become necessary, reclaimed. Yet only two small wildlife parks could conform to the contract conditions, although interest in receiving otters has been high. For these reasons we are considering discontinuing the breeding programme

The restoration of the River Ise system (river and tributaries about 110 km long) is amidst the realisation phase. The River Ise and most of its tributaries have been intensively channelised in the past. To revitalise this system we set up a project in 1987. Among others two principal objectives are followed: human activities shall be done with no or minor technical reconstruction. Instead the dynamics of the river system itself shall be strengthened. The project is funded by the German Environmental Minister as "research and development project". After the planning stage has been finalised by the end of 1989 we could start with the realisation, since the necessary financial support of 16 Mio DM (about 10,5 Mio. US \$) was granted last year.

A report on the investigation of the river system has been published in German (Prauser et. al. 1990). And last, but not least, we are glad that again more than 100 000 people visited the OTTER-ZENTRUM last year. Thus the interest in our environmental education programme remained as high as the year before.

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SHORT COMMUNICATION

FORMATION OF THE CHILEAN OTTER GROUP

Gonzalo Medina-Vogel

Casilla 191, Valdivia, Chile

News from Chile in that CODEFF (National Committee for the protection of fauna and flora), with the support of the Frankfurt Zoological Society, has created the Chilean Otter Group and started a project on otters.

The project will last for 18 months. During that period I will undertake a survey on the status of the southern river otter *Lutra provocax* in central south Chile. Information will also be collected on *L. felina*.

Initial results indicate that the habitat of the southern river otter has been greatly altered by agriculture and forestry activities - some areas are now devoid of vegetation. To date 11 areas along lakes and rivers have been surveyed : 340 km in total. Signs of otters were recorded in five of the 11 survey

areas. Education programmes have been started among the people living in those areas in order to promote habitat conservation. The project has also started a local newsletter.

By this time next year I will be able to report on findings and conservation progress. For more information contact me at the address above

SHORT COMMUNICATION

SOUTH AMERICAN MARINE MAMMALS MEETING

Gonzalo Medina-Vogel

Casilla 191, Valdivia, Chile

Between 12 and 15 November 1990, in Valdivia, Chile, the 4th Meeting of Experts in Aquatic Mammals of South America took place. This forum (previous ones were held in Buenos Aires, Rio de Janeiro and Montevideo) has been, during the recent years, a natural place for presentations of work, discussion about otters, and recommendations about action.

In the Valdivia Meeting (organized by Jorge Oporto, of the Centre for Research and Management of Marine Mammals), three South American workers on otters were present:

- **Elton Pinto Colares**, from Brazil, who presented three works: Aspects of food habits of giant otter *Pteronura brasiliensis* in Brazilian amazonia; *Pteronura brasiliensis* in Maraca Island, Roraima, Brazil; and Blood parameters of Amazonian otters.
- **Anibal Parera**, from Argentina, with two presentations: Situation of *Pteronura brasiliensis* in Argentina: and Quantitative characterization of fresh-water-mussels feeding-sites produced by *Lutra longicaudis* in Curuzu-Cuatia stream, Corrientes, Argentina.
- Gonzalo Medina-Vogel, Chile: New data about distribution and ecology of huillin, *Lutra provocax*, in southern Chile.

Besides the presentation of these works, the otter-experts made some fruitful discussions and interchange of experiences, concerning otter conservation. They considered it very convenient that the next world-meeting of the OSG be in South America.

SHORT COMMUNICATION

NEWS FROM ARGENTINA

Claudio Chehebar

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Searching for the Giant Otter in Northeastern Argentina

The giant otter *Pteronura brasiliensis* is perhaps the most endangered species of mammal in Argentina. Locally known as "lobo gargantilla". "arirai" or "nutria gigante", the species has suffered a dramatic reduction in geographic range. Formerly recorded in several locations in both Uruguay and Parano river systems, including sites in the humid Chaco and Ibera region, today is confirmed only in two rivers and tributaries in the northernmost narrow part of the Misiones Province.

Anibal Parera is working there through January and February 1991, searching for any evidence of giant otters and trying to evaluate the status of these tiny and thinly distributed population remnants He is

working in the first stage of the project in the Inguazu and Uruguay Rivers, which run through sub tropical jungles (continuation of the south -brazilian Atlantic forests).

The project has the financial support of the Argentinean FUCEMA (Foundation for the conservation of Species and the Environment). Additional support is vital - and welcome - for continuation of this project.

Otter skins : Illegal traffic being fought in Argentina

The Direction Nacional de Fauna Silvestre (DNFS) - (Wildlife Service) of Argentina has been active during the last months in some important operations against illegal traffic. In the course of these operations, it has become apparent that a certain amount of otter-skins illegal traffic still persists in Argentina. According to information provided to the OSG by DNFS authorities, and to newspaper releases, otter skins were found in three warehouses in Buenos Aires city, in 1990 and late 1989. In two of them, were found crude and tanned skins of *Lutra longicaudis*. In the other, were found 240 skins of giant otter *Pteronura brasiliensis* (presumably from some neighbouring country, since no large population remains in Argentina); 71 skins of *Lutra longicaudis*; 2 coats of *Lutra longicaudis* and 1 coat of *Pteronura brasiliensis*.

Worrying as these finds are, at the same time there is some hope now because - after many years of inaction - official authorities seem to battle against illegal traffic.

SHORT COMMUNICATION

STATUS OF SOUTH AFRICAN RIVERS

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The results of preliminary surveys on the conservation status of South African rivers were published by O'Keeffe (1985). The publication took the form of a map in which the rivers were colour-coded according to their status.

Most of the rivers, or at least sections of rivers, appear to have deteriorated as a result of human activities, either riparian or in the catchments. For example, in the province of Natal which is on the moist, eastern side of the country, only 10 % of the rivers on the coast were in an almost pristine condition, 60 % showed slight to severe changes, and 30 % were badly degraded. In the highlands the position was better: 50 % were pristine, 40 % showed signs of modification, and 10 % were degraded.

Funds have currently been made available for undertaking further river assessments, and for the updating of the 1985 data.

The future of otters in Natal appears to be safe with the establishment of contiguous protected areas covering 210 000 ha of catchments along the Drakensberg range. In this conserved mountain area, 150 km long and on average 16 km wide, it would appear that there is sufficient habitat to support viable populations of the two freshwater otters *Aonyx capensis* and *Lutra maculicollis*. Until more is known about their area requirements in the small mountain streams which are rich in crabs, but poor or devoid of fishes, this statement cannot be made with confidence. These streams flow across the width of the protected catchments.

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REPORT

LEAD IN SEA OTTERS

Donald R. Smith, A Russel Flegal and James A. Estes¹

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Abstract: As yet there is no direct evidence that environmental pollutants affect sea otter populations. However, this may be from lack of looking. The first steps in these investigations are to measure levels of potential environmental contaminants in sea otters, determine whether these levels vary among populations, and compare the findings with those from other mustelids/otters for which there is a known or suspected impact. Our approach is to compare measurements between Alaska, where sea otter populations are thriving, and California where the otter population is at best showing a sluggish increase.

As yet there is no direct evidence that environmental pollutants affect sea otter populations. However, this may be from lack of looking and an interest is developing in the environmental toxicology of sea otters for three main reasons. First, other mustelids are known or thought to be adversely affected by certain environmental toxicants. The decline or local extinction of *Lutra lutra* from much of Europe and *L. canadensis* from parts of North America are believed to be largely the result of PCB contamination (Foster-Turley et al. 1990). Second, a number of environmental pollutants occur at alarmingly high levels in the eastern North Pacific Ocean. And third, population growth of the California sea otter population has been less than one-third that measured in other sea otter populations (Estes 1990).

The first steps in these investigations are to measure levels of potential environmental contaminants in sea otters, determine whether these levels vary among populations, and compare the findings with those from other mustelids/otters for which there is a known or suspected impact. Our approach is to compare measurements between Alaska, where sea otter populations are thriving, and California where the otter population is at best showing a sluggish increase.

In this report we summarize initial results from measurements of lead in the teeth of sea otters from Amchitka Island in the western Aleutian archipelago, and central California. Lead is preserved in bone and teeth because it competes with calcium in the biosynthesis of calcified tissues, and is retained in the calcified tissue matrix. Lead also occurs as one of several stable isotopic forms that can be accurately detected and quantified by using ultra-clean trace metal techniques. Because isotopic ratios vary in natural leads from different geographic regions, and because local leads with distinctive isotopic signatures are used in different regional petroleum refineries, it is possible to identify both the level and source of lead in sea otters. Teeth were collected from extant populations and aboriginal middens at Amchitka Island (western Aleutian Islands) and central California. The midden teeth provide background levels and isotopic signatures from before the industrial revolution. Results from the Aleutian Islands are summarized from Smith et al 1990: those from California are presently being written up for publication by Smith et al. (unpubl. ms.).

Aleutian Islands

Carbon-14 dates indicated that midden teeth from Amchitka Island were about 1900±230 years old, predating the Industrial Revolution by a substantial margin. We were surprised initially to find that total lead burdens had not changed significantly from pre-industrial revolution times (on average, teeth from extant animals contained about 1.5x more lead than did the midden teeth), contrasting with 10-100x increases in many other marine organisms. The explanation for low lead levels in present-day sea otters is not simply that ambient lead levels are low in the remote Aleutian Islands since lead has been broadly and rapidly dispersed on global scales via winds and ocean currents. Rather, it is probably due largely to biodepletion at higher trophic levels owing to the abundance of marine calcium and lead replacement as tissues are reprocessed by consumers. Despite this low increase in total lead, the isotopic ratios indicated a marked change in the source of lead between prehistoric and present times.

Lead in the preindustrial sea otters was derived from natural deposits in the Aleutian arc, presumably having arisen from plio-pleistocene volcanic material. In contrast, contemporary otters contained a mixture of Asian and Canadian industrial leads with less than 10 % having been derived from natural Aleutian arc materials. The presence of Asian and Canadian leads, and the virtual absence of U.S. industrial leads in contemporary Aleutian Island sea otters, is explainable through transport via ocean currents. Asian lead presumably is picked up by the northward flowing Kuroshio Current, which swings eastward well south of the Aleutian Islands to form the Subarctic Current. This, in turn, swings northward to form the Alaska current along the coast of British Columbia, then westward bathing the Aleutian Islands.

In addition to demonstrating that total lead burdens in Aleutian Islands sea otters have not increased markedly from prehistoric times, these results indicate that total lead measures by themselves can be highly misleading indicators of anthropogenic lead input to marine systems. The relatively low lead levels in contemporary sea otters was likely due to biodepletion in a system that undoubtedly contained markedly increased lead levels from contemporary industrial sources.

California

Similar methods and comparisons were made for lead levels in California sea otters. All materials were from the Big Sur/Monterey Bay coast and the midden teeth were radiocarbon dated at 800-3000 years old. On average, midden teeth in California contained about twice as much total lead as those from the Aleutian Islands. Isotopic ratios indicated that these older leads were derived mainly from natural continental-derived sources. Contemporary specimens varied broadly in total lead burden, from about 2x to > 10x average levels in the midden teeth and contrasting markedly with the similar lead burdens found between pre-industrial revolution and contemporary teeth in the Aleutian Islands. The explanation for the difference between California and the Aleutian Islands remains uncertain, although the broadly elevated lead burdens in teeth of contemporary sea otters probably results from ambient lead levels in the modern California environment, that are sufficiently high to override biodepletion at increased trophic levels. The high variation among individuals is also puzzling, although it may result from variable lead inputs associated with individual dietary patterns or the possibility that the home ranges of some of these animals were centered near local lead "hot spots". Lead isotopic ratios again indicated a change in source of accumulated lead, from natural continental-derived lead in the preindustrial animals to industrial sources dominated by particulate aerosol leads in the contemporary animals. One exception was a single contemporary animal from Monterey Bay which contained high levels of lead derived from an industrial waste lead deposit in Monterey Harbor.

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REPORT

OTTER DISTRIBUTION, STATUS AND CONSERVATION PROBLEMS IN HUNGARY

Ildiko Kemenes

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Abstract: : The river otter *Lutra lutra* has been protected in Hungary since 1974 and became strictly protected in 1978. However, the first and so far only survey of its distribution was carried out by me in 1987-88. I now report the results of this survey and discuss the present status and conservation problems of otter in Hungary. Otters are most plentiful in the south west. Because of contamination of many water courses, otters are dependent on fish farms of various sizes. Until now, these were subsidised, but now they are in private hands, but no compensation for otter-related losses are available, owners on low incomes cannot afford expensive mitigation measures. They would welcome the live-trapping and removal of problem otters, but the government would need to sponsor suitable areas for release of these animals. Conservationists in Hungary are seeking support for such a scheme. We think that it would be in the interest of the conservationists of Europe to help to maintain Hungary as one of the strongholds of otter and we are inviting suggestions and ideas on how to achieve this.

The river otter *Lutra lutra* has been protected in Hungary since 1974 and became strictly protected in 1978. However, the first and so far only survey of its distribution was carried out by me in 1987-88. I now report the results of this survey and discuss the present status and conservation problems of otter in Hungary

Methods

The sampling method was the same as the one used for the British survey, described by Macdonald (1983). It was based on the 10 km square national grid, with 369 sites visited throughout Hungary. The sample points were scattered more or less evenly in places with suitable otter habitats. During the survey, data on the characteristics of different habitat types were also collected.

Results

The results of the survey are presented in Fig. 1. In areas shaded by + symbols signs of the presence of otter were found in each grid. In areas shaded by - symbols, no signs of otter were found in any of the grids, despite the presence of habitats judged to be suitable for otters. Areas with neither + nor - symbols were obviously unsuitable for otters (i.e. high hills and dry sand plains with no water, or the immediate environs of large cities). On the whole, I found signs of otters in 174 of the 201 grids visited (86 %). Of the total of 369 sites visited, I found signs of otter at 193 (52 %).

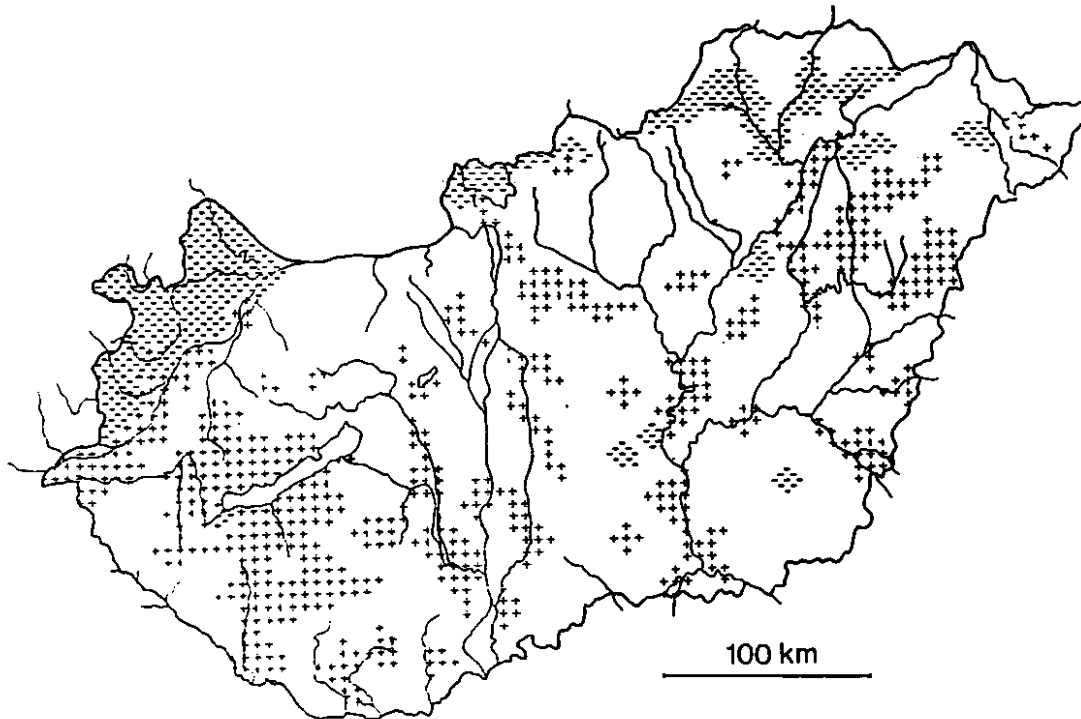


Figure 1: The distribution of otters in Hungary, based on the 1987/88 survey

+ Otter signs found

- No otter signs found

The species was found to be rare on the northern part of the country. The lowest number of positive sites was recorded from county Győr-Sopron and county Zemplén. Two sides of the former are surrounded by the Austrian and Czechoslovakian borders, while the latter is situated near the Czechoslovakian and the Russian borders. On the Austrian side Lake Fertő, while along the Czechoslovakian border the River Danube could, in theory, provide suitable habitats but no signs of otters were found in either of them.

The highest number of positive sites were recorded in the south-west. Numerous small pond cultures and some larger fish-farms can be found in this part of the country. The usually dense vegetation around these ponds provides good cover for the otters, so even in ponds frequently used by anglers, otters can survive. In the middle part of the country, on the great Hungarian plain land, thriving populations can be found only around large fish farms. With the exception of the surroundings of these ponds, the area is mostly dry. On the eastern part of Hungary otter signs seem to be connected with the river Tisza and the most frequented sites were found at pond cultures near Debrecen.

Discussion and suggestions

The results of the survey show that the otter is still common in most parts of Hungary. However, with the exception of a few strongholds, the population density is low. There are some areas where despite the presence of suitable habitats no signs of otters were found. No exact data were available on the water quality in these areas, but it is clear that all these waters qualified as second class or worse, and the main pollutants found in them were oil, nitrite, and ammonium carbonate.

Other factors in the habitat, such as human disturbance and type of bank vegetation appear to have only secondary influence on the distribution of otters, while availability of food seems to be the most important factor. In Hungary, like in Finland (Skarén 1990), the population density is highest around fish farms.

Comparing my data with those from other surveys it seems that the situation of otters in Hungary is worse than in Ireland (Chapman & Chapman 1982) or in Scotland (Green & Green 1987), where otter signs were found at 92 % and 79 % of the visited sites, respectively. However, the proportion of positive sites was much higher than in England (6 %) (Lenton, Chanin & Jefferies 1980) or Wales

(Crawford, Jones & McNulty 1979), or in most parts of central Europe (for a review see Mason & Macdonald 1986). According to the information on the situation of otters in Central and Eastern Europe, the Hungarian otter populations still represent the best strongholds of the species in the region.

Until the recent political changes, in Hungary, like in all eastern European countries, most of the fields have been cultivated by large agricultural cooperatives and only a small percentage of animal husbandry was in private hands. Accordingly, the largest fish-farms were owned by state organisations and most of the smaller ponds were cultivated by anglers' associations. With the help of governmental subsidies these huge farms and pond cultures could survive despite financial deficits. Without these subsidies lots of them will not be able to survive any longer. The destruction of such fish-ponds will inevitably lead to the decline or even extinction of local otter populations. Some of these ponds will be maintained by private owners. With the increase of unemployment, especially in the countryside, and with the ever-increasing inflation rate such family investments are becoming more and more popular in Hungary, even if they have to work very hard and risk the future of the family. Since they can get no compensation for the damage caused by otters they will kill the otters on their ponds even if it is illegal. I received letters and know from personal communications that most of them are looking for other solutions or they can be convinced to do so if it costs no extra money for them. Most of the times their income is hardly enough to live on so they will not accept costly solutions such as electric fences. On the other hand, they would be willing to allow conservationists to capture otters alive on their lands. A good solution would be if the conservation authorities or organisations could themselves cultivate a number of fish-ponds, to which such captured otters could be transferred. With the maintenance of such suitable habitats, not only the otters could survive, but it could also protect the waterfowl and other wildlife of the area. These ponds could function as gene-pools and sanctuaries for otters. Unfortunately, this solution is costly both in terms of manpower and money, and Hungarian conservationists, like myself, are desperately seeking support from national and international organizations. We think that it would be in the interest of the conservationists of Europe to help to maintain Hungary as one of the strongholds of otter and we are inviting suggestions and ideas on how to achieve this.

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REPORT

PROGRESS ON CALIFORNIAN OTTER RESEARCH

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Abstract: : My study has progressed well since some of us met at the International Otter Colloquium in September 1989. Occurrences of note are a 48-month-old female gave birth to her first offspring, while that female's sister remained nulliparous (and still cohabitating with her mother) after her second complete reproductive cycle; 2 matrilineally-related family units merged into a cooperative "Superfamily" comprising 3 generations; a copulation during which the male was in continuous intromission for 63 min., and during which the coupled pair came up on land 7 times; a single observation that finally disproved my oldest unmodified working null hypothesis (i.e. "adult males display no territoriality"); my ethogram now describes over 100 behaviors and action patterns that mediate intraspecific communication; and, some little-known literature references and personal communications that suggest the apparent behavioral anomalies I've documented at Trinidad Bay also occur in other marine coastal populations of *L. canadensis*. I also review the contribution of David Solf to otter observation. Finally I pose a question of scientific morality.

This is the first of an annual series of letters that will update my ongoing study of the marine coastal otters (*Lontra canadensis*) at Trinidad Bay, California (41°3'N, 124°8'W). The letter presents several new findings, rethinkings of old findings, and concludes with a question of ethics that I wish to direct toward my colleagues for their considered response.

My study has progressed well since some of us met at the International Otter Colloquium in September 1989. Occurrences of note:

- a 48-month-old female gave birth to her first offspring, while that female's sister remained nulliparous (and still cohabitating with her mother) after her second complete reproductive cycle;
- 2 matrilineally-related family units merged into a cooperative "Superfamily" comprising 3 generations;
- a copulation during which the male was in continuous intromission for 63 min., and during which the coupled pair came up on land 7 times;
- a single observation that finally disproved my oldest unmodified working null hypothesis (i.e. "adult males display no territoriality");
- my ethogram now describes over 100 behaviors and action patterns that mediate intraspecific communication; and,
- some little-known literature references and personal communications that suggest the apparent behavioral anomalies I've documented at Trinidad Bay also occur in other marine coastal populations of *L. canadensis*.

Before I review these subjects in more detail, I'll describe my study briefly and summarize its principal findings, some of which were presented previously in Shannon (1989). I have observed the Trinidad Bay otter population since June 1983, and have studied it formally as a graduate research project since May 1986. The population is of relatively recent origin (circa 1955), and has never been the object of exploitation or deliberate harassment. As a result, the 12+3 otters at Trinidad Bay are sufficiently habituated to the presence and activity of people that they can be observed during daylight hours at relatively close distances (usually 5-100 in.). With an attentive eye and repeated observation, most

individuals can be identified by their own unique physical characteristics (particularly facial markings.); behavioral peculiarities may also "mark" individual otters. From May 1986 - December 1990, I conducted 1,082 sessions, and recorded more than 5,000 otter hours of direct observations.

The focus of my research has been to chronicle the behavioral development of wild otter pups from the nursery den to self sufficiency and independence, to sexual maturity, and on to those offsprings' own parenthood. To date, I have followed the development of 5 litters of pups (n=19) from the same mother, and 1 litter (n=2) from that mother's primiparous 4-year-old daughter. Summing both mothers' reproductive output to date, 10 pups were males, 8 were females, and 3 died before their gender could be determined.

Besides pup development, I have also studied the social organization of this marine coastal population. The otters at Trinidad Bay are conspicuously social, but not all adult members of this population interact freely. At Trinidad Bay, adult otters are segregated into 2 distinct social groups with mutually exclusive memberships: a maternal "Family" group that includes the elder female offspring of the dominant mother otter, and a "Clan" of socially-bonded, cohabiting males. My most general finding concerning the social behavior of this population is that adult members of 1 social group consistently avoid direct and prolonged mutual interaction with adult members of the other social group. Because all of the adult females are members of the Family, and all of the adult males are members of the Clan, their mutual avoidance results in a social segregation of the sexes. The strength of this segregation is remarkable. For example, as of the end of December 1990, it had been 1,017 sessions (9/9/86) since I saw an adult male forage and cohabit with the Family, and 685 sessions (9/6/88) since I saw an adult male and adult females interact playfully (play is a daily occurrence within a social group).

In Shannon (1989) and in my poster for the Otter Colloquium, I described this avoidance phenomenon nominally as "sexual segregation", but I now favor the more precise phrase: "a social segregation of the sexes". An otter's sex is not necessarily the sole determinant of social relationships at Trinidad Bay. Essentially, it is the presence or absence of a social bond between individuals that determines whether they interact amicably, agonistically, or simply avoid each other mutually. The basic "rule" of social interaction in this population appears to be: adult group members interact freely, and adults that are not members of the same social group do not interact freely. Although males at Trinidad Bay do indeed appear to bond preferentially with other males, regardless of familial relationship, a female will not bond socially with another female unless the other is her immediate matrilineal relative (i.e. her mother, sister, or daughter). Additionally, although it is very uncommon, adult females in this population have been observed to maintain both intermittent and long-term social bonds with individual adult males. That being said, I think this is the appropriate time to reveal that, during 1983 and 1984 (when there was a different resident mother, and the population was only half its current number), a very old adult male was a cohabitant member of the Family, and it was obvious that the male and the old female were permanently pair-bonded. Clearly, then, social bonding may be determined by factors other than gender, although the current gender "borderline" between the 2 social groups is, with few exceptions, strikingly rigid. Concerning dominance relationships, adult males are usually subordinate to the resident adult females, and the eldest maternal female is the *alpha*-otter of the population.

The Clan is an egalitarian confederation of 5-8 gregarious, cohabiting males. This year, I coined the term "egalitarian confederation" to phrase succinctly the essential social dynamic of this very interesting group: "confederation" defined here as "a body of independent entities united for joint action", and "egalitarian" referring to the apparent absence of social ranking among Clan members. Clan males den together, travel together, forage together, sometimes share food, and regularly engage in reciprocal comfort behaviors, such as mutual grooming and group play. Except for fights during the females' estrus, and brief squabbles over food, members of the Clan are remarkably unaggressive.

In 1990, all but 1 Clan member were adults, and only 2 were known to be related familiarly. Although I don't know the genealogy of most Clan members, the wide range of phenotypic variation displayed by these males makes it difficult for me to conclude that the Clan, as a group, is made up of close familial relatives. However,

I do have indirect evidence that 1 of the older males is the father of 2 of the younger males.

Until this April, I also referred to the Clan males as "non-territorial", because they appeared to cohabit year-round, even during the females' estrus. While it is true that some males do continue to cohabit during estrus, this season at least 2 older males established their own den quite separate from the other males, and adjacent to the females' rendezvous site (I define "rendezvous site" as "a

prominent physical feature in the population's core area where an estrous female waits for a potential partner"). On 13/4/90, during estrus proper, I saw an unambiguous demonstration of site-specific territoriality, when 1 of those self-isolated males excluded another male aggressively from a female's rendezvous site (the female was not there at the time). What made this encounter so unambiguously territorial was that, just 5 min. before, these same males were sharing food amicably at an apparently neutral location just a few meters from the rendezvous site. When both subsequently tried to occupy the rendezvous site, however, the male who got there first screamed and ran at the other and chased him away, ostensibly to monopolize the site for his own reproductive advantage.

Now to describe that marathon copulation. As I mentioned, the pair stayed coupled for 63 min., and the female dragged the clinging male up on land 7 times. Another noteworthy aspect of this mating was that it took place only 20-30 m. from my observation point, so I was able to identify both partners positively, something I'd not been able to do before. Also of interest: this was, at minimum, the pair's second copulation of the afternoon (the earlier episode began at 15:54:, and ended at 16:12:). And, as with every other mating I've observed thus far, both copulations were terminated by interference from a third otter, resulting in a fight.

During the entire copulation, the male maintained a biting hold on the top of the female's neck near the back of her head, and he clasped her flanks tightly with his forelegs. During thrusting in the water, the male "rode" atop the usually passive female. The head of the female was submerged most of the time, and she raised her head for air only a few times per minute. The basic aquatic copulatory sequence was as follows. From the vertical, the male would roll the female and himself over to their left side until both their heads were submerged, emit 1-5 thrust-bursts, then roll himself and the female back up and over to their right side until both their heads were submerged, emit 1-5 thrust-bursts, then roll over to the left, thrust, over to the right, thrust, etc. Although the male continued thrusting during the entire copulation, there were 2 distinct "phases" of pelvic thrusting (cf. Liers 1951): a "quiescent" phase where intromission was maintained but thrusts were relaxed, and an "active" phase characterized by vigorous thrust-bursts, the force of which produced conspicuous splashing. Active thrusting occurred in bursts of 5 or 6 very rapid pelvic quivers, each burst lasting only about 1-1.5 seconds.

At 16:33: on 14/4/90, the estrous female, "Mama junior", was eating at her rendezvous site, when an older adult male, "Single-Lobe", approached from the rear. Junior saw Single-Lobe swimming toward her, and she torpedoed into the water away from him. Close to the headland, Junior fortuitously met her mate of the earlier encounter, "Complainer", a young adult male. They dove simultaneously, and surfaced coupled. (Instead of pursuing the estrous female, Single-Lobe simply sat down and ate the fish that she had just abandoned. Unless he was anosmic, he must have smelled the receptive female, but he did nothing about it.)

The copulation began at 16:35:25 with quiescent thrusting. At 16:44:41, the male began, his first active phase, which lasted until 17:00:12. At 17:06:53, the female dragged the male, still intromitted, up onto land. On land, the male was wrapped around and under the posterior of the female in what looked like an extremely uncomfortable posture; his scrotum was rubbing in direct contact with the rocks (the female exhibited little or no lordosis). The pair re-entered the water briefly from 17:07:13-17:07:32, then the female dragged the male back up on the rocks.

Soon after landfall, at 17:07:42, the male began his second active phase with a series of 10 extremely vigorous thrust-bursts about 3-6 sec. apart. The pair re-entered the water at 17:08:16, and the male continued his active thrusting until the female climbed up on land again at 17:19:07. Active thrusts stopped, but the male maintained intromission. During this landfall, the female made her first struggle to escape. At 17:19:36, they re-entered the water and the male resumed his active thrusting. At 17:21:03, they came back up on the rocks. Again, the female tried to escape. Back into the water at 17:21:14, active thrusting resumed, then back up on the rocks at 17:22:09. This time the female made a serious attempt to escape, jerking her head from side to side and turning to pull the male off balance. Into the water again at 17:23:37, the male resumed active thrusts. At 17:25:48, the male entered quiescence. Two more landfalls took place at 17:26:48-17:27:06 and 17:27:56-17:28:30. During the latter, the female vocalized for the first time: a brief scream. The copulation continued in quiescence until 17:38:30, when another adult male, "Moustache", interfered and terminated the copulation. A fight ensued.

Incidentally, it was only after the fight ended that I heard the "caterwaul" reported by others (e.g. Liers 1951). The female caterwauled, apparently to discourage another copulation. In fact, I have yet to hear any caterwauling during actual intromission; I have only heard this unmistakable vocalization after copulation ended, or to deter a unwanted suitor.

A footnote on Complainer's admirable stamina: keeping in mind what I wrote earlier about that being at least his second mating of the afternoon, believe it or not, Complainer returned for "thirds" at 18:08: Junior bolted from her rendezvous site and dove away, not to be seen again!

Now for news of the Family, or rather, the families, as there are now 2 mother otters at Trinidad Bay. At this point, let me introduce the 3 resident adult females. The dominant female is F2, a.k.a. "Old Mama", referred to as "F-prime" in Shannon (1989). In 1990, F2 was approx. 8 years old, and she's produced 1 litter here every Spring since 1986. (I have evidence that F2 had at least 1 litter prior to her residency at Trinidad Bay.) Mama's litter size was 4 every year except 1988, when she had 3. Thus far, of her 19 pups studied, only 2 females and 2 males have survived to sexual maturity. The 2 surviving females were born to Mama in 1986: F86A ("Mama Junior") and F86B ("Scarnose"), a.k.a. "The Two Sisters". Although both are reproductively-active adults (age 56 months in Dec. 1990), the Sisters have returned every Spring to live with their mother and her new pups.

This Spring (circa 1-3/4/90), Junior birthed her first pups (1 male, 1 female), and as expected, Junior's new motherhood produced noticeable changes in her behavior and in her relationship with the other females. After mating with Complainer on 14/4, I did not see Junior again until 5/5. After her return, Junior displayed the postpartum intolerance typical of maternal carnivores. How ever typical, it was nonetheless a genuine novelty to see Junior avoid or drive away her life-long companion, Scarnose. Junior's period of intolerance toward Scar did not last long, however: Scar started cohabitating with Junior and her only surviving pup, m90', when the pup was 11 weeks old. (In years past, Mama wouldn't let the Sisters cohabitate with the Family until her pups were 13 weeks old.)

On 6/6/90, Mama returned to the core area with her 4 10-week-old pups after a record absence of 89 days. At first, as in previous years, Mama shunned both daughters, but by the time Mama's 3 surviving pups (all females) were 12 weeks old, Scar was being tolerated. The 2 mothers, however, continued to avoid each other and each other's pup(s). It was not until week 14, when the pups' weaning was almost completed, that Junior and her pup began to cohabitate and forage with Old Mama's family. During this period that the 2 families were bonding together, I began to see something entirely new: sometimes Junior provided food for the exclusive use of Mama's pups! In years past, the Sisters occasionally *shared* their food with Mama's pups, but they almost never *gave* them food. Even more surprisingly, sometimes Old Mama reciprocated and provided Junior's pup with food (as the weeks went by, however, each mother tended to avoid providing food for other than her own offspring). By the end of week 17, the 2 families had completed their merger into a unified, cohabitating, cooperative "Superfamily": a matriarchal maternal social group comprising 3 generations, 2 mothers, and 2 sets of offspring that were matrilineal grandsiblings. Old Mama maintained her dominant status as leader of the Superfamily, and Scarnose resumed her semi-alloparental role of "older sister" to both mothers' pups.

Comparing the maternal behavior of the naive mother. Junior, with the experienced, multiparous Mama, the most noticeable difference was that Junior allowed her pups to follow her out of the nursery den in their 9th week, while Mama kept hers inside until their 11th week. After seeing Junior's tiny, barely-ambulatory pups tumble repeatedly down the steep, rocky cliffs of the headland, it was clear that Junior allowed her pups to venture out much too soon (the little female, f90', apparently did not survive this severe battering).

By now, I'm sure the question has arisen: how do I know how old these pups are? Obviously, I cannot know the actual date of birth, but I have found it can be estimated behaviorally with some accuracy. Hamilton and Eadie (1964) stated "adult females mate not long after parturition", but that is not an operationally-useful statement. For my previous paper (Shannon 1989), I guesstimated that about a week elapsed from birth to the onset of copulatory behavior. Last Spring, I discussed this with Lee Roy Sevin, an expert on the husbandry of *L. canadensis*. He told me females come into heat "a week to a month after giving birth", with "10 days being about average." Adding a few days for the female to reach maximum receptivity, I changed my behavioral birth date estimator to "10-14 days prior to the onset of copulatory behavior." This has proven to be a very satisfactory criterion: if 4-5 days are added

to my daily development chronologies from 1988 and 1989, consistency with my 1990 chronology is reassuringly close.

The following is a brief summary of my pup development data from the litters of 1988, 1989 and 1990. Pups became aquatic during their 10th or 11th week of life, attained efficient coordination of their basic swimming movements by the end of week 14, possessed the complete adult repertoire of swimming behaviors by 16 weeks of age, and swam as proficiently as adults by week 19.

Although proficiency in aquatic locomotion is attained only 9 weeks after leaving the natal nest, proficiency in aquatic hunting requires almost a year of learning. The mother began presenting live fingerlings to pups in week 11; active interest in exploring for fishes increased markedly during the next 2 weeks. (Pups appear innately predisposed to seek and chase fishes, and will often continue in such exploration even after sated.) Last suckling was seen during week 14. As early as week 15, pups were taken on their first group foraging trip out of the core area. The earliest recorded solo* (sessile) fish capture took place at the beginning of week 17; earliest solo capture of a free-swimming fish occurred at the beginning of week 19. (*In Shannon (1989), I stated that first solo fish captures took place during weeks 14-15. This Summer, the waters of Trinidad Bay were unusually clear, and I could see that these early "solo" captures were actually instances in which the mother caught the fish underwater, and the pup had taken it out of her mouth as both swam up to the surface. Noting this, I revised my criterion so that only fish captures that took place at a reasonable distance from the mother were counted as solo captures.) Despite possessing adult-like swimming abilities at 19 weeks, however, pups' foraging efficiency remained functionally nil for several weeks thereafter. Even at 6 months, although pups had become active, agile fish-chasers, they remained noticeably inefficient at actually capturing fishes, and the mother still provided almost all the pups' food. During their 7th month, however, multiple prey captures became daily occurrences. The earliest recorded "competent" solo foraging excursion by a pup took place at the end of week 29 (sessile prey only). By the end of week 36, pups had become noticeably efficient capturers of small fishes (<25 an.), although they still relied upon food shared by the mother. Pups attained self sufficiency between weeks 37-42. (Instead of devising an artificial numerical criterion to define the period of self sufficiency, I let the mother define it behaviorally. Although she will continue to share some of her food with pups for as long as she remains with them, the mother stops providing food for the *exclusive* use of pups after week 37-38. After weeks 41-42, a mother might actually bite a pup that took food from her, and I have interpreted such unambiguous punishment as a clear indication that basic self sufficiency had been attained.) After self sufficiency, it became common to see pups and adults forage separately. The earliest observed killing of a seabird (Western Grebe *Aechmophorus occidentalis*) by a pup took place during week 43, and in week 45, the first large fish (>25 cm.) was seen captured by a pup. Although pups can satisfy their own food needs adequately by this time, they do not attain optimum efficiency in food procurement and habitat utilization until after they are abandoned by their mother at 48 weeks of age. Independent yearlings do not disperse from Trinidad Bay; after abandonment, males join the Clan (even yearling females may cohabitate with the Clan occasionally), but females rejoin their mother when she returns in late Spring with her new litter of pups.

After the Otter Colloquium, I began writing my thesis, and I made good progress until my mother passed away in February. Since that sad event, I've been preoccupied with estate matters, although I have managed to keep up with my field work.

I've also continued to add new behaviors to my ethogram (e.g. "run on water" , "emotional lacrimation", "cruciform mounting", etc.), and my ever-growing list of communicative behaviors finally topped 100 (114 described to date; 65 of which are mediated, in whole or part, by *vision*).

My continuing literature search also produced some rare gems. Actually, 2 of the more exciting finds I didn't find at all, they were given to me by friends. Pat Foster-Turley sent me a very interesting manuscript (Reid, Reid and Code, 1989) that described a cooperative social grouping of adult males in a bog habitat in boreal Alberta! (This reference, in particular, makes me suspect that male clans might be more common in *L. canadensis* than anyone might've expected. After all, I can think of few areas with less in common ecologically than a boreal bog mid a rocky seacoast! And yet, Jim Conroy has studied *Lutra lutra* in coastal habitats in Shetland that are, at least superficially, very similar ecologically to Trinidad Bay, but male groups are unknown from Shetland. Unpredictable creatures, these lutrines. But, after all, that's why they're so intriguing to work with, isn't it?)

Another interesting account (Osborne, Calambokidis and Dorsey 1988) was called to my attention by Alan Baldrige at Hopkins Marine Station. In this guide to marine mammals of Puget Sound, Washington State, the chapter on the river otter contained a statement that grabbed my attention immediately: "...in the San Juan Islands, some preliminary research suggests that males will occasionally band together to form bachelor groups of up to 10 or 15 individuals." - Male clans! No authorship was ascribed to the chapter, but its accompanying photographs were credited to Timothy Ransom, a former correspondent of mine. I recalled the last time Dr. Ransom and I spoke in 1985, he'd mentioned his intention to spend more time studying the otters in the San Juans, and after seeing his name associated with the chapter in Osborne, et al. (1988), I wondered if this "preliminary research" might be his. It was! Turns out his ideas about "bachelor groups" evolved over 10 years ago to account for his observation that adult males are not usually found in company with the females (sound familiar?), and occasional sightings of large groups of otters ("13+") moving through the ranges of smaller family groups. According to Ransom, assuming equal sexual mortality in young otters, and the apparent absence of males from family groups, where do they all go? These large, mobile groups seemed to offer the logical answer for the males' collective absence.

I spoke with some of you at the Otter Colloquium about the fascinating unpublished work of a biologist, J. David Solf, who studied the marine coastal *L. canadensis* at Eshamy on Chenega Island in Alaska's Prince William Sound from 1958-1974. During his years tracking otters, Solf logged, by his own account, "approximately 15,000 hours" of field observations (Solf 1969). The only printed summary of his work was Solf (1972), a deceptively ordinary-appearing general information pamphlet, that, for its time, contained more new findings on the behavior of *L. canadensis* than any published account since Liers (1951). Most notably, Solf (1972) first described the existence of "group(s) of bachelor males", the members of which "travel together and operate as a social unit", "have no apparent leader", "have no exclusive territories", and among which "fighting...is extremely rare." Additionally, "male groups usually consist of fewer than 10 individuals. Larger numbers that are occasionally seen together may represent a temporary association of neighboring groups."

Excited by the similarity of Solf's observations and my own, I tried to contact him through Alaska Dept. of Fish & Game. I was disappointed to learn that Mr. Solf died in 1974, but fortunately, an old college friend of his at Fish & Game helped me get in touch with Solf's family. Thanks to the gracious cooperation of his sister, Bettijane Solf Boltmann, I was given copies of David's transcribed field journal (Solf 1954-1967), and 4 personal letters (Solf 1969, 1970a, 1970b, no date), 3 of which were written to C. J. Harris (author of the reference, *Otters: a study of the Recent L. uirinae*), that described in greater detail the social and reproductive behavior of the otters at Eshamy.

Solf's writings comprise a wealth of findings never reported previously for *L. canadensis*, and on almost every page, I found more affirmation that the behavior patterns I'd documented at Trinidad Bay were not local anomalies.

Here are a few highlights from Solf's writings. Perhaps you might think my 63 min. copulation is a record? From Solf (1969): "on the 5 occasions I've seen the complete performance, it has lasted from 65 to 73 minutes." Also, Solf (no date) described a copulation with a total on-land time of :36:50. Or perhaps you might think Ransom's bachelor group of 13+ is the largest male clan documented? From Solf 1970a: "the largest of these groups I have seen was of 17 animals."

Truly, David Solf was an unheralded pioneer in our field, and one of the keenest, most knowledgeable, and most dedicated observers of wild otters ever. Ironically, and tragically, Solf paid the ultimate price for his dedication, for he lost his life while tracking his "critters". Solf was following otter tracks at a frozen stream when he fell through thin ice. Although he managed to climb out, and his companions tried to warm him, he succumbed to hypothermia. John David Solf was 39 years old.

In closing, I'd like to discuss a question of ethics with you, my colleagues and friends. This might come as a surprise, but I have serious misgivings about publishing many of my findings formally, particularly those describing social groupings, patterns of cohabitation and den usage. I am concerned that what I have learned could be employed to the detriment of other populations of marine coastal otters. It seems to me that it would be very harmful to disseminate the knowledge that, for example, a dozen or more otters might share 1 den, or that all of a population's reproductive females might do likewise. Consider this sobering thought: if I wanted the pelts of the Trinidad otters, knowing their secrets as I do, be assured, my friends, that I could take them all with thoroughly lethal efficiency. A trapper could make

very profitable use of what I've learned. How do we handle such sensitive knowledge responsibly? Must the scientific community's "right to know", or a researcher's "duty to publish", always take precedence over the better interests of one's subjects?

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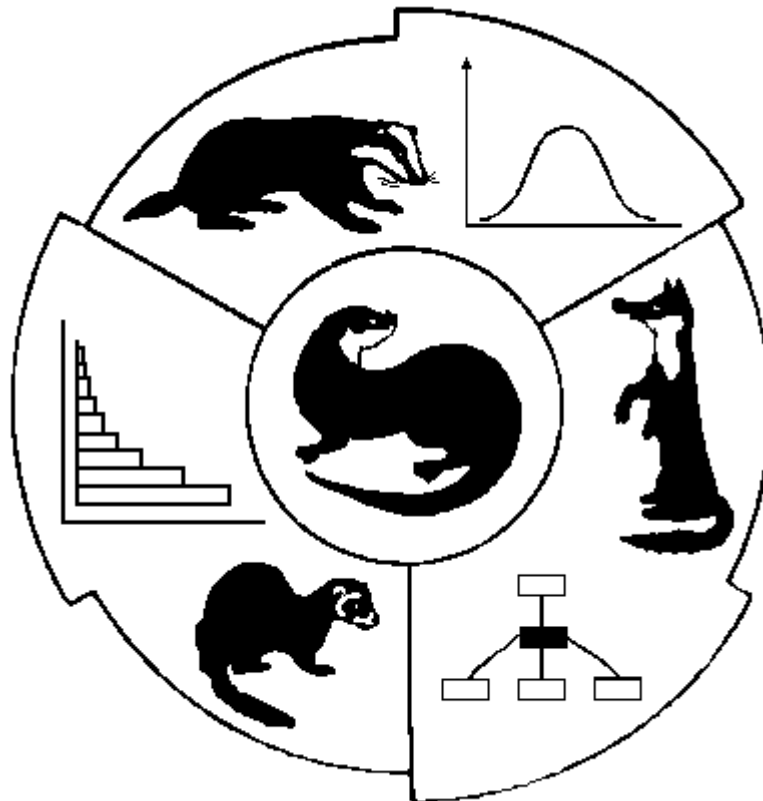
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PROCEEDINGS

PROCEEDINGS: POPULATIONSOKOLOGIE MARDERARTIGER SAUGETIERE

Edited by Michael Stubbe (see reference in "Recent Publications").



Volume 1 contains the following papers on otters:-

M. Stubbe, Verbreitung und Okologie des Fischotters *Lutra lutra* (L, 1758) in der DDR, 13 - 34

St. Sikora Des Vorkommen von *Lutra lutra* (L.) im polnischen Fließgebiet. 35 - 43

K. Wlodek, W. Kapiniski, M. Gielo, H. Sobolewski, A. Rusler. Expansion des Fischotters *Lutra lutra* (L, 1758), in Polan. 44-54.

V. Hlavac und A. Toman. Das Fischotterprogramm in der Tschechoslowakei. 55-58.

N. Laanetu. Zur Okologie des Fischotters *Lutra lutra* (L, 1758) in Estland. 59-70.

M. Stubbe, N. Chotolchu und N. Dawaa. Der Fischotter *Lutra lutra* (L, 1758) in der Mongolischen Volksrepublik. 71-76.

I. Kemenes. A comparative study on the food composition of otters (*Lutra lutra* L.) at lakes and fish-ponds in Hungary. 77-88.

U. Binner, W. Kohler und R Labes. Zur Situation des Fischotters (*Lutra lutra* L.) in

Westmacklenburg (Bezirk Schwerin). 89-110.

R. Labes, H. Labes, W. Kudla und U. Binner. Zur Besiedlung des Kreises Schwarin durch den Fischotter (*Lutra lutra* L.). 111-120.

D. Dolch. Die aktuelle Verbreitung des Otters *Lutra lutra* (L., 1758) im Bazirk Potsdam der DDR. 121-130.

A. Hundrieser und G. Seeger. Der Fischotter *Lutra lutra* (L., 1758) im Kreis Oranienburg. 131-142.

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G. Weise und W. Jorga. Okotechnologische MaBnahman in Fischottergebieten. 243-262.

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O. Maerz und R. Meyer. Fischotterschutz In der Reusenfischerei. 283-287.

Kl. Schierhorn. Helminthenfunde bei Fishottern *Lutra lutra* (L., 1758) in der DDR. 288.

M. Stubbe, S. Waurisch und S. Bruchholz. Raubwildbewirtschaftung in Fischottergebieten. 289-302.