NOTE FROM THE EDITOR

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Dear Friends, Colleagues and Otter Enthusiasts!

Finally it is a fact. We have recently closed issue 27/2 and hereby start issue 27/3 – the first time ever that we have 3 issues within one year. Issue 27/3 is already completely filled with manuscripts that are either finished, are under revision or are under review. Our current planning is to get all remaining manuscripts online sometime in January, after which we will start immediately issue 28/1.

Over the last 12 months, the usage statistics for the OSG website have been very healthy! For the Bulletin, we have averaged about 5.000 visitors and 18.000 pages per month. For the e-Library (which is only for members), we average 225 visitors and 600 page loads per month. Not bad, since we have only 224 members (but of course, several people visit more than once in a month). It is YOUR website, and it is your contributions that have made it a great success and resource for otter workers.

We have passed another historical landmark, as the last report in the last issue was article 300 that is currently online available. Please also keep in mind that all articles are also available via the Directory of Open Access Journals. Thanks to Lesley we have a steady progress with the work to digitalize the remaining six issues that are not available via the website yet.

Lesley, thanks a lot for all efforts to cope with this increasing flow of manuscripts and your work behind the scenes.

We have not received any information regarding the pending decision by Thompson ISI on whether an Impact Factor will be assigned to the IUCN OSG Bull. We are under evaluation and I will inform all readers as soon as a decision will be made public.

On behalf of Jim, Lesley and I would like to thank all of you that have sent greetings to him. I'm sure you all join us in wishing him a full and speedy recovery.

OSG MEMBER NEWS

ADDY DE JONGH KNIGHTED

During the anniversary of the Dutch Otterstation Foundation on November 2010 Addy de Jongh has been knighted in the Royal Order of Orange Nassau for his long lasting contribution to otter conservation in the Netherlands and abroad. The Royal Decoration is a great recognition for his work and otter conservation in general.

Asha and Addy de Jongh and the
Mayor of Leeuwarden Mr. Ferd Crone

Addy de Jongh started his ‘otter career’ as a student of Hans Kruuk in 1984. Before he was gently brainwashed by Hans into an otter conservationist, he did interesting studies on the functional morphology of the front legs and shoulder of the European mole (*Talpa europaea*), on the ecology and behaviour of ringed Brant geese (*Branta bernicla*) and on the grazing of geese with 3D high-speed cinematography. Hans asked Addy to join the otter research on Shetland using his scuba diving skills. When a tame otter named Penny became available, Addy started to study her swimming and diving behaviour using under water high speed filming. This great experience with Penny made Addy decide to start a Dutch NGO for the conservation of otters and the restoration of otter habitat in the Netherlands. Even after the otter got extinct in 1988, with his Dutch Otterstation Foundation (*in Dutch*: Stichting Otterstation Nederland), he managed to raise a lot of attention, awareness and funds to get hands on for the improvement of otter habitats in the Netherlands. The otter became an important flagship species and was called the Ambassador of the freshwater ecosystem. The otter got anchored in several national policy plans with regards to restoration of nature, eco networks, mitigation measures and improvement of water quality.

Addy and Penny

The Dutch Otterstation Foundation managed also to start a beautiful otter centre in the north of the Netherlands called Otterpark AQUALUTRA. The park was very important with regards to PR, education, research and a breeding program. It received almost 500.000 visitors. It was sold in 2001 and is now a small zoo.

After 13 years of otter absence in the Netherlands, it was time to bring back the otter in the Netherlands. Addy and his foundation had already carefully planned a reintroduction of the otter according to the IUCN reintroduction guidelines. Together with Janis Ozolins and Vadim Sidorovich, Addy and his colleague Tjibbe de Jong were able to trap successfully otters in Latvia and Belarus for a release in the Netherlands. Their trapping success in 2004 was an amazing 12 otters in 14 days. For this a special GSM trap transmitter was developed by Addy to ensure safe and efficient trapping. The reintroduction succeeded. The otter is back now in the Netherlands and is trying to spread all over the country. Addy and his foundation are still very active to get more mitigation measures, get stop grids in fyke nets mandatory and to get more wetlands connected with each other.

Over the last 12 years Addy has been involved more and more in research and education work abroad. The work was not limited to *Lutra lutra*. He did also work on European mink (*Mustela lutreola*) in the Ukraine and discovered with his colleagues that European mink is still surviving in the Dniester delta near Odessa. Addy has also developed a miniature GPS GSM transmitter, which has successfully been used in otter research in Portugal with Lorenzo Quaglietta and with Lughaidh Ó Néill in Ireland for a study on coastal otters in Roaringwater Bay near Cork. It has been the first time worldwide that GPS transmitters were used on otters.

Addy will go on with his work in the Netherlands and abroad. He just returned from South Africa where he is trying to set up a project on Cape Clawless Otter (*Aonyx capensis*).

New Members of OSG

Since the last issue, we have welcomed 1 new member to the OSG: you can read more about him on the Members Only pages.

Wolfgang Gettmann, Germany: I have been the Managing Director of the Aquazoo in Duesseldorf since 1994, and since 1998, I have been very involved in the husbandry and ethology of Asian Small-Clawed Otters. I hand-raised an Otter, "Nemo", who was born in 2005, and he and I give many talks and lectures on otter ecology and behaviour together, and have appeared on television several times. I also supervise students working on otter husbandry and ethology. I intend to expand my knowledge and experient of other species of otters, and will attend the 7th International Sea Otter Conservation Workshop in Seattle, USA in March 2011.

R E P O R T

THE HISTORY AND CURRENT STATUS OF OTTER RESEARCH WITHIN CANADA BASED ON PEER REVIEWED JOURNAL ARTICLES

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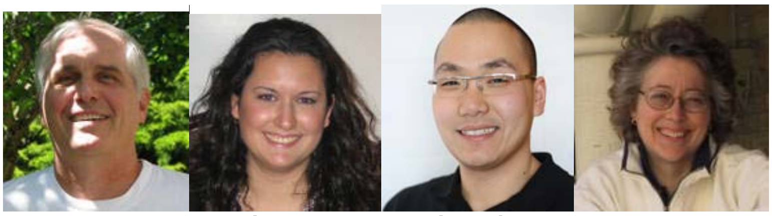

(received June 2010, accepted October 2010)

Abstract: In Canada, there are two species of otters, the river otter (*Lontra canadensis*) and the sea otter (*Enhydra lutris*). The river otter is considered to be plentiful and ranges throughout a large part of Canada. On the other hand, the sea otter is classified as of Special Concern and only small translocated colonies are found along the coastline of Vancouver Island and British Columbia. The scientific literature was reviewed with respect to both river and sea otter research performed within Canada since 1970 to evaluate the number and topics of research papers that had been published dealing with these otter species. Since 1970, 25 papers have been published, most of the research concentrating on contaminants (mercury, organochlorines) in river otters (80%). There is only 1 scientific paper (1978) dealing with the sea otter (4%). Almost half of publications studying river otters were from or in combination from the province of Ontario (48%). Miscellaneous topics made up 16% of the publications. This paper reveals that in Canada very little scientific work has been published dealing with sea otters and that a huge number of the publications deal with river otters found within the province of Ontario. Thus since 1970, there has been a serious lack of research dealing with either otter species and that most of that work has had no structure or focus. It is hoped that government agencies, the scientific community, non government organizations, and interested groups can organize strategies and granting opportunities to increase the amount of scientific studies to further understand and protect future populations of these 2 species in Canada.

Key words: River otter, sea otter, *Lontra canadensis*, *Enhydra lutris*, contaminants

INTRODUCTION

Much of the worldwide research and scientific literature in otters has concentrated on specific species for various reasons. The California and Alaskan sea otter (*Enhydra lutris*) has been studied due to drastic population declines or changes within their environment. The effect of development and the impact on its population numbers has been examined in the European Eurasian otter (*Lutra lutra).* Within the North American otter (*Lontra canadensis*) contaminant levels found within its tissues

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and their possible impact as well as re-introduction efforts have been published (Gallant, 2007).

It must also be recognized that publications or reports issued by several groups dealing with various aspects of otter conservation or protection have increased the overall knowledge base. Groups such as the International Union for Conservation of Nature and Natural Resources (IUCN) and their Otter Specialists Group (OSG) have published action plans and recommendations to help towards the conservation of otters (IUCN OSG, 2009; Gaydos *et al.*, 2007). However, it is left up to the individual countries within which otters reside to establish strategies for conservation or research. This means that research in a country may be well funded or totally neglected based on several factors such as, but not limited to, the status of a species, conservation efforts of NGOs within that country, research funding opportunities, or even the amount of employment created by any specific project (Goldman, 2009; Nelson, 2009).

Canada has rich environments for both sea and river otters to thrive in. As a result, the sea otter population along the coastline of British Columbia has reached sufficient numbers to be gradually downgraded from being Threatened to that of Special Concern. River otters continue to thrive across Canada in a variety of different habitats. However, both are susceptible to sudden changes (human encroachment) or degradation (pollutants) of their environments (Gaydos *et al.*, 2007). Therefore it is critical to establish the type and amount of research that has been done on these two otter species to prevent any duplication or wastage of funds. It is also essential to look at past scientific data to formulate any future research projects to ensure and promote healthy populations of these two otter species.

MATERIALS AND METHODS

The scientific literature was reviewed using the Pub Med search engine with respect to the number of articles published dealing with the two otter species within Canada. Review papers were excluded from this study as they included other species or combined all of their data without specifying the two otter species present in Canada. Search terms such as *otter, Canada*, *sea otter* and *river otter* were used to find and create the appropriate list of publications dealing with these two species within Canada.

These publications were divided into the following areas: by the author, year of publication, general topic and region where the specimens were acquired. The earliest article found was from 1970 and the latest being published in 2010. A simple percentage calculation was used to derive the following percentages of the publications dealing with sea otter versus river otter, the general topic being discussed or the general region where the specimens were found. For example, there were 20 publications or 84% of the total number (25) of found publications dealing with contaminants in river otters.

RESULTS

From 1970 to 2010 there were 25 papers published in the literature dealing with Canadian sea and river otters. (Table 1) There was only one sea otter paper (1978) that dealt with the re-introduction of that species into British Columbia and it represents 4% of the total number of papers. The remaining 24 papers or 96% report data concerned with river otters. The greatest number of papers (20 or 84%) looked at contaminants within otter tissue or their effects on certain organs. The four remaining papers (16%) dealt with a wide variety of topics. Looking at the publications over time, there were only two (8%) papers published in the 1970's, six (24%) during the 1980's, four (16%) in the 1990's and 13 (52%) since the year 2000.

Table 1. Scientific otter articles published since 1970

Author/Year	Species	Topic (Location)
Wobeser/1970	*Lontra canadensis*	Letter to editor concerning a parasite (Ont)
Bigg/1978	*Enhydra lutris*	Transplantation to British Columbia (BC)
Wren/1984	*Lontra canadensis*	Distributions of metals in tissues (Ont)
Wren/1986	*Lontra canadensis*	Mercury, food levels, environmental acidification (Ont)
Somers/1987	*Lontra canadensis*	Organochlorine residues (NE Alberta)
Wren/1987	*Lontra canadensis*	Ra-226 concentrations (Ont)
Stenson/1988	*Lontra canadensis*	Oestrus & vaginal smear cycle (BC)
Wren/1988	*Lontra canadensis*	Levels of lead, cadmium & other elements (Ont)
Wren/1991	*Lontra canadensis*	Linkages between chemicals & populations (Ont)
Evans/1998	*Lontra canadensis*	Spatial variation in mercury levels (Ont)
Harding/1998	*Lontra canadensis*	Heavy & trace metals (BC & Washington State)
Harding/1999	*Lontra canadensis*	Reproductive & morphological condition and chlorinated hydrocarbon contamination (BC)
Evans/2000	*Lontra canadensis*	Inorganic & methylmercury in tissues (Ont)
Fortin/2001	*Lontra canadensis*	Spatial variation in mercury concentrations (Que)
Dewit/2002	*Lontra canadensis*	Ra-226 in bone in Elliot Lake (Ont)
Basu/2005	*Lontra canadensis*	Mercury on neurochemical receptors (Ont, NS)
Basu/2005	*Lontra canadensis*	Mercury inhibition on receptors in the brain (NS)
Yates/2005	*Lontra canadensis*	Mercury levels (NS, NY)
Basu/2007	*Lontra canadensis*	PCBs, pesticides and polybrominated diphenyl ethers in cerebral cortex (Ont, NS)
Basu/2007	*Lontra canadensis*	Mercury cholinesterase & monoamine activity in cerebral cortex (Ont, NS)
Gaydos/2007	*Lontra canadensis*	Cryptospodium & Giardia from the Puget Sound (BC)
Elliot/2008	*Lontra canadensis*	Chlorinated hydrocarbons in feces (BC)
Cote/2008	*Lontra canadensis*	Prey selection in Newfoundland (Nfld)
Klenavick/2008	*Lontra canadensis*	Mercury to age & parasitism (Ont, Que, NS)
Haines/2010	*Lontra canadensis*	Brain mercury & selenium levels (NS)

These papers could also be divided into the various regions where the specimens were taken. The province of Ontario had the majority of papers dealing with river otters (13 or 48%). Nova Scotia was the second province with the second highest number of articles with seven or 29% and British Columbia had four or 21%. The provinces of Quebec, Newfoundland and Alberta each had only one or 4 % of the articles found.

DISCUSSION

There has been a recent recognition of the fact that some species of otters have been studied more than others (Gallant, 2007) and that this lack of scientific knowledge may affect population studies in certain countries (Polednik, 2008). As well, otters have been accepted as top predators that can be used for the conservation of biodiversity and have an impact on public awareness and therefore fund raising opportunities for research projects (Norris, 2009). Therefore it is crucial to understand the research that has been performed and published to better organize conservation efforts. Research that deals with physiology, pollutants, habitat degradation, population status or repopulation efforts are critical in preserving otters worldwide.

Canada is the second largest country after Russia and is composed of approximately 90% land and 10% water (Natural Resources Canada, 2001). Canada also has the longest shoreline of any country (Sebert, 1972). This huge amount of land and coastline allows for large numbers of natural habitats for Canada’s two otter species to thrive in. It is therefore very crucial for any conservation effort dealing with otters within Canada that a large base of information exist that will better direct research into conservation efforts to protect present populations and their environment. There has been a gradual six-fold increase in research work dealing with otters since 1970 (4 in the 1970's and 12 in the 2000's). However with only 25 papers published over 39 years dealing with the two separate species of otters within Canada, it is obvious that there has been and continues to be a serious lack of research programs or projects. As well, most of the research publications have been performed by researchers who have had a specific focus on certain topics such as Wren *et al.* in the 1980's or Basu *et al.* from 2005 to 2007, who concentrated their research on contaminants and their effects on river otters.

Although there are other numerous and rich sources of information on Canadian otters such as governmental or non-governmental organizations reports, books, research posters or graduate thesis’, the scope of this paper was to focus on peer reviewed research that is published and readily accessible. As well, the above mentioned sources such as government reports usually summarize the already published scientific peer reviewed papers to promote their policies and rarely add new data to the overall information base.

With the increased use and spread of information via electronic sources such as the Internet, today most libraries and journal publishers make it possible for nearly everyone with a computer to perform literature searches and obtain the required information. As well, it is still very difficult to locate a student’s thesis or very expensive to find/buy a specific book or obtain the proceedings from a specific conference fully describing the posters or lectures. Therefore, the purpose behind this paper was to give the reader the latest status on the quality and quantity of research having been performed and in which areas has been the focus of Canadian otter research. It is hoped that with this knowledge that sustained research programs that focus more on topics such as baseline physiological parameters, health status, population numbers, and environmental conditions which may have an impact on otter long term survivability, is required to be able to preserve future populations of otters and their habitat within Canada.

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RÉSUMÉ

HISTORIQUE ET STATUT ACTUEL DES RECHERCHES SUR LA LOUTRE AU CANADA SUR LA BASE DE PUBLICATIONS SCIENTIFIQUES

Au Canada, il existe deux espèces de loutres, la Loutre de rivière (*Lontra canadensis*) et la Loutre de mer (*Enhydra lutris*). La Loutre de rivière est considérée comme commune et présente une large distribution dans ce pays. De l’autre côté, la Loutre de mer est classée « préoccupante » sur les listes rouges alors que de petites colonies issues de translocations se répartissent le long des côtes de l’île de Vancouver et de Colombie britannique. La littérature scientifique a été examinée pour ces deux espèces afin d’y extraire les recherches menées au Canada depuis 1970 et évaluer la quantité et la variabilité des sujets publiés. Depuis 1970, 25 articles ont été publiés, la plupart des recherches se concentrent sur les contaminants (le mercure, les organochlorés) dans les loutres de rivière (80%). Il n’existe qu’un article scientifique (1978) traitant de la Loutre de mer (4%). Près de la moitié des publications relatives aux loutres de rivière proviennent ou sont associées à la province d’Ontario (48%). D’autres sujets très divers ont constitué 16% des publications. Cet article révèle qu'au Canada très peu de travaux scientifiques publiés sont consacrés aux loutres de mer et qu'un grand nombre de publications traitent de la Loutre de rivière dans la province d'Ontario. Ainsi depuis 1970, il existe un sérieux manque de recherches portant sur ces deux espèces et la plupart de ces travaux manquent de structure d’accueil ou d’intérêt. Il est à espérer que les organismes gouvernementaux, la communauté scientifique, les organisations non gouvernementales et les groupes intéressés puissent organiser des stratégies et des opportunités intéressantes pour développer les études scientifiques qui permettront de mieux comprendre et protéger au Canada les futures populations de ces deux espèces.

RESUMEN

HISTORIA Y ESTADO ACTUAL DE LA INVESTIGACIÓN SOBRE NUTRIAS EN CANADA, BASADO EN ARTICULOS REVISADOS POR PARES

In Canada hay dos especies de nutrias, la nutria de rio (*Lontra canadensis*) y la nutria de mar (*Enhydra lutris*). La nutria de rio es considerada abundante y se encuentra distribuída a través de una gran parte de Canada. De otro lado, la nutria de mar está clasificada como en Peligro Especial y solamente se encuentran pequeñas colonias trasladadas a lo largo de la linea costera de la isla de Vancouver y Britis Columbia. La literatura científica fue revisada con respecto a la investigación realizada en Canada desde 1970 en nutria de rio y de mar, para evaluar el numero y tipo de publicaciones. Desde 1970, 25 artículos de investigación han sido publicados, principalmente sobre concentración de contaminantes (mercurio y compuestos organochlorados) en nutrias de rio (80%). Hay solamente un artículo (1978) que trata sobre la nutria de mar (4%). Casi la mitad de las publicaciones estudiaron nutrias de rio que priviened exclusivamente de la provincia de Ontario y/o de otras provincias (48%). Temas miscellaneos hicieron el 16% de las publicaciones. Este documento demuestra que hay muy poco trabajo investigativo en Canada sobre nutrias y que la mayor parte del que se ha hecho trata de nutrias que provienen de la provincia de Ontario. Por lo tanto, desde 1970 ha habido una falta seria de investigación sobre nutrias de rio o de mar y que mucho del trabajo realizado no ha tenido estructura o un enfoque claro. Se espera que las agencias guvernamentales y no guvernamentales, la comunidad científica y los grupos de interés puedan organizar estrategias y garantizar oportunidades para incrementar las posibilidades de investigación para comprender aún más y proteger las presentes y futuras poblaciones de estas dos especies en Canada.

S H O R T   N O T E

NEOTROPICAL OTTER (*Lontra longicaudis*) RECORDS IN PUEBLA, CENTRAL MEXICO

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Abstract: This study, presents new historical and actual reports of neotropical otter (*Lontra longicaudis*) confirming its presence in the Sierra Norte, state of Puebla, Mexico.

Keywords: *Lontra longicaudis*, Mustelid, Puebla, Sierra Norte, Otter

The neotropical otter (*Lontra longicaudis*) is a neotropical mustelid that can be found along fresh water rivers from Northern Mexico to Uruguay however; there is little information on this species (Macías-Sánchez and Aranda, 1999). In Mexico it is considered as the most widespread and better known of the three otter species present (Gallo-Reynoso, 1997); as it has been recorded in in 22 states from the 32 in Mexico (Gallo-Reynoso, 1997; López-Wilchis and López-Jardines, 1998; Ramírez-Pulido et al. 2005; Botello et al. 2006; Casariego-Mandorell et al. 2006; Gallo-Reynoso et al. 2008; Monroy-Vilchis and Mundo, 2009). The species is found in all the large and medium size rivers, as well as in coastal plain and mountain rivers (Gallo-Reynoso, 1997) from sea level to 2000 m (Botello et al. 2006). However, an increase in pollution has led to a decrease in populations along the country (Gallo-Reynoso, 1997). It is considered as a threatened species (Maldonado and Lopez Gonzalez, 2003) thus, it is important to determine its presence and distribution.

Otters presence in Puebla has been recorded previously through footprints and scats in the Mixteca area, in the south west and in the Sierra Norte in the northern part of the state (Gallo-Reynoso, 1997). The most recent record is an observation of a pup kept as a pet in the Sierra Norte in the northern part of the state however, its origin was not defined (Ramírez-Pulido et al., 2005). The aim of this note is to present three new records obtained opportunistically while conducting a field survey in August 2010, for the project “The Jaguar in Puebla: Presence and human relations” (Figure. 1). The study area is located in northern Puebla, encompassing an area of 5,709.82 which include 55 municipalities. The records were obtained through interviews with hunters and tanneries in the area.

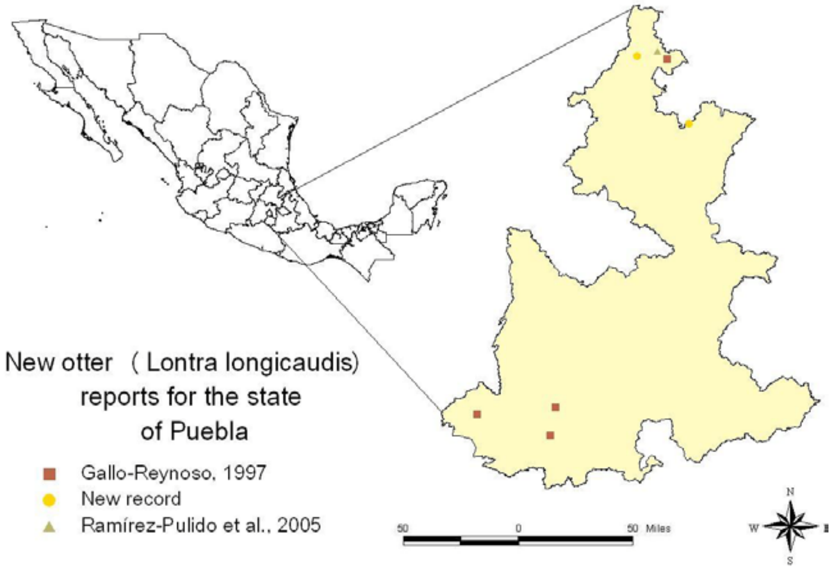

Figure 1. New records for neotropical otter (*Lontra longicaudis*) for the state of Puebla

We obtained two records, consisting in the skins of two otters found in the town of Mecapalapa (20º 31´ 37” N/ 97º 51´ 20” W,) (Figure 2a), the individuals were hunted in the Pantepec River that ends in the Gulf of Mexico. One corresponds to an adult individual of undetermined sex and the other to a juvenile. The interviewed person mentioned that the adult individual was hunted more than 30 years ago and the juvenile 10 years ago but no exact dates were given. However, the same person states that the species can still be seen along the river. The other report corresponds to a stuffed individual that was photographed in the town of Tuzamapan (20º 03´ 52” N/ 97º 34´ 28” W) (Figure 2b). The otter was hunted in the Tecolutla River near the town of Reyes de Vallarta (20º 07´ 06”N/ 97º 30´ 03” W) in March 2010. The skin was bought and then stuffed by a hunter in Tuzamapan. The specimen corresponds to an adult individual of undetermined sex.

(a) (b)

Figure 2a. (left) Otter skin found in Mecapalapa, caught in the Pantepec River: 2b (right) stuffed otter hunted in the Tecolutla River

These reports are important because they fall in the tropical mountainous area, which is considered a priority for otter conservation in Mexico (Gallo-Reynoso, 1997). However, there is no information about connectivity with other populations such as the ones found in Veracruz (Macías-Sanchez and Aranda, 1999). On the other hand, they provide direct evidence about the historical and actual presence of neotropical otter in the state of Puebla. Further development of this study will help to determine the species distribution, status and connectivity in the state.

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RÉSUMÉ
DONNEES DE LOUTRES A LONGUE QUEUE (*Lontra longicaudis*) DANS L'ETAT DE PUEBLA, CENTRE MEXIQUE

Cette étude présente les données historiques récentes ainsi que les travaux actuels sur la Loutre à longue queue (*Lontra longicaudis*) confirmant ainsi sa présence en Sierra du Nord dans l'état de Puebla, Mexique.

RESUMEN
REPORTES DE NUTRIA (*Lontra longicaudis*) EN PUEBLA, MEXICO

En este estudio, se presentan nuevos reportes históricos y actuales de nutria neotropical (*Lontra longicaudis*) confirmando la presencia de la especie en la Sierra Norte de Puebla, México.

R E P O R T

CARBOFURAN - A NEW AND EFFECTIVE METHOD OF ILLEGAL KILLING OF OTTERS (*Lutra lutra*) IN THE CZECH REPUBLIC

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Abstract: Carbofuran - a poison recently used to illegally kill otters - is described from the Czech Republic. Six different cases of illegal poisoning of otters have been discovered since 2006 with a total number of 14 killed individuals. Apart from otters, many other animals - namely raptors and other carnivores - have been poisoned by carbofuran in the Czech Republic as well. The poisoning substance is now banned in the EU, however, it has been widely used in agriculture as insecticide and large supplies are generally available. This fact together with relative ease of using it can pose a threat to otter population, especially in areas with raising conflict between otter protection and fish farming. Therefore, it is important to report any suspicious cases of dead wildlife, to immediately carry out laboratory testing in such cases, and to inform relevant officials including the police. It will help monitor the problem and raise local awareness, and could possibly help to catch some persecutors. Taking these actions should be the first step in trying to stop poisoning wildlife by carbofuran.

Keywords: Lutra lutra, threats, illegal killing, conflict, mortality

ILLEGAL KILLING OF OTTERS IN THE CZECH REPUBLIC

Hunting, habitat alterations and water pollution caused drastic decline of otters in the Czech Republic in the first half of the century (Baruš and Zejda, 1981). Otters became extinct in large parts of their previous distribution range and rare in traditional core areas such as the large-scale pond farming areas in southern Bohemia. Therefore, otters became fully protected in the Czech Republic (highly endangered according to Appendix III. of the Decree No. 395/1992). During the last two decades, the otter population recovered and nowadays it occupies approximately 75 % of the state territory (60 % permanent occurrence, 15 % irregular occurrence; Poledník et al., 2006). An "otter conflict" in the Czech Republic arose by the end of the century,

when damage caused by otters on commercial fish species increased due to otter recovery. Since otters are fully protected, it is illegal to hunt them in the Czech Republic. However, with increasing intensity of the conflict, otters started to be killed illegally. In the central database of otter carcasses collected from the Czech Republic, there are 22 cases of proven deliberate killing since 1990. However, many more have been heard of in stories of local people, but such illegal actions are difficult to monitor and it is usually impossible to find any proof. The most common methods of illegal killing of otters were shooting (3 cases), steel traps (3 cases) and beating to death (2 cases). Shooting and steel traps are not very effective when it comes to otters and are quite time-consuming. Beating to death depends on chance.
It is also difficult to estimate the effect of poaching on mortality of otter population. In the central database of otter carcasses, poaching accounts for 7,7 %, natural death 11,3 % and death due to traffic 81 % of the dead animals (n = 222). Because the probability of finding a dead animal strongly depends on the cause of death, such simple comparison has low informative value. But a comparison among years makes sense and showed a pronounced increase of violent otter deaths over time. From the period 1990 – 2005 (n = 113) to the period 2006 - 2010 (n = 109) proportion of poached otters rose from about 1,8 % to 11 % of found otter carcasses. The reason for the increase is the use of a new effective method to kill otters in the second period. It is the poison carbofuran and it seems to be widely used to eliminate unwanted predators. We are aware that carbofuran is not the only chemical responsible for wildlife deaths. However, we have no evidence of other chemical being used to kill otters in the Czech Republic. Therefore we focused this article only on this substance.

WHAT IS CARBOFURAN AND WHAT IS IT USED FOR?

Chemically, carbofuran is 2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate with the molecular formula (Fig. 1). It is a carbamate pesticide, more specifically it is the active substance of products used in agriculture to control insects, mites and nematodes in a wide variety of field crops (e.g. corn, potatoes, soybeans, sugar and stock beet or sunflowers). Carbofuran exists either in the form of granules that are inserted into the soil, or in liquid form which is applied to the plants by watering or spraying, usually in early developmental stages (Vermouzek and Mrlík, 2009; Cornell University, 1993). It can also be found under the trade names Furadan, Curater, Agrofuran, Carbodan, Carbosip, Chinufur, D 1221, ENT 27164, Fury, Terrafuran, Bay 70143, Yaltox, Furacarb or Rampart (Cornell University, 1993; American Bird Conservancy, 2007; Environmental News Service, 2009).

CARBOFURAN AS A POISON

Carbofuran has acute oral and inhalation toxicity and moderate toxicity by dermal absorption to humans, and is also classified as very highly toxic to birds, freshwater and estuarine/marine fish and invertebrates, and highly toxic to mammals (Andreasen, 2008). The level of toxicity is influenced by many factors, such as chemical composition of the mixture, means and duration of contamination, animal species, age, gender, etc. A lethal dose of LD50 for mammals is typically less than 25 mg/kg of animal. It is therefore strongly toxic substance.

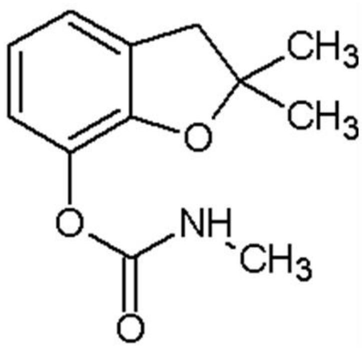

Figure 1. Chemical structure of carbofuran

Carbofuran is a neural toxin. It blocks neural transmission by inhibiting the enzyme cholinesterase, which then leads to an overall paralysis, including respiratory muscles, and eventually to death by suffocation. Carbofuran does not accumulate in the bodies of animals, on the contrary, it is quickly metabolized and the speed of decomposition varies again both intra- and interspecifically (Vermouzek and Mrlík, 2009).

In people, the symptoms of carbofuran poisoning caused by short-term exposure include: headache, sweating, nausea, diarrhea, muscle weakness, chest pain, blurred vision, breathing difficulty, increased blood pressure or incontinence. Long-term effects are much more serious and can end with permanent damage to the nervous and reproductive systems (Cornell University, 1993; Wildlifedirect, 2009a). Most vulnerable to health problems caused by carbofuran are, of course, agricultural workers, who should use protection equipment when manipulating the chemical (Toxikologické informační středisko, 2010). For other people, who do not directly work with pesticides, the only dangers of exposure to carbofuran are residues on foods and contamination of drinking water from farm runoff. Carbofuran has high potential for groundwater contamination and has been detected in aquifers and surface waters (American Bird Conservancy, 2007; Cornell University, 1993).

In animals, toxicity of carbofuran is – as was already mentioned - quite different. Wild animals usually die of carbofuran poisoning after eating bait placed in the environment by people, or after consuming the carcass of another already poisoned animal. Due to this, incidents of accidental deaths of cats or dogs being walked outside by their owners are also quite frequent. Unfortunately, there are no characteristic signs that would help us distinguish whether an animal died of carbofuran poisoning. Usually, what brings the idea of poisoning is the fact that the dead animal is still lying right next to suspicious bait or the presence of multiple dead bodies at one site. With birds, position of the body with saggy wings and head and crampedness in talons can be a clue. While dissecting a dead animal, an indication of carbofuran poisoning can also be excess of blood in internal organs or presence of food in the stomach (Vermouzek and Mrlík, 2009). However, poisoning by carbofuran can be reliably confirmed only by biochemical and chemical analyses. When a carbamate insecticide poisoning is suspected, usually the brain cholinesterase activity is measured to determine the mechanism of death and chemical residue analysis of the gastrointestinal tract or its contents is performed to identify the insecticide responsible for the death (Hill and Fleming, 1982). However, late discovered or reported carcasses may be problematic, since scavenging and decomposition can make the described conventional matrices unsuitable for analysis, and consequently the cause of death cannot be confirmed (Vyas et al., 2005). The half-time of decay for carbofuran is 30 - 120 days depending on conditions (American Bird Conservancy, 2007).

REGULATIONS REGARDING CARBOFURAN

Carbofuran was widely used in agriculture around the world in the past and it was possible to buy it in large amounts. In 2001 carbofuran was banned in the UK (Wildlifedirect, 2009b). In the EU it is not an approved substance for plant protection since December 2008 (Commission Decision of 13 June 2007 concerning the non-inclusion of carbofuran in Annex I to Council Directive 91/414/EEC and the withdrawal of authorisations for plant protection products containing that substance).

In both the US (in 1991) and Canada (in 1998), only the granular forms of carbofuran were phased out from legal use at first because they were the most lethal to birds (estimates of 1-2 million birds killed each year by carbofuran before this ban - American Bird Conservancy, 2007; Cornell University, 1993). Recently, the US Environmental Protection Agency (EPA) has ruled that as of 2010, no carbofuran residue on a food will be deemed acceptable (Environmental News Service, 2009; Wildlifedirect, 2009a,c). Following this decision, Canada is currently also proposing all products containing carbofuran for phase out, stating that they pose unacceptable risks to human health and the environment (Wildlifedirect, 2009d). The revocation of all food carbofuran tolerances in the US should have some international implications as well, because the ban is valid for both domestically grown and imported foods. Therefore, all countries wishing to export foods to the US must now stop using carbofuran on crops grown for that purpose (Wildlifedirect, 2009e).

Unfortunately, the legal situation is quite different in Africa. For example, the use of Furadan is not restricted in East Africa, and it is legal to buy it over-the-counter there (mostly sold in kiosks by non-professionals as “lion killer”). Moreover, users are usually not registered, not trained or warned about the dangers of misuse, spills, or symptoms of poisoning (Wildlifedirect, 2009f).

In accordance with the EU ban, carbofuran was being sold in the Czech Republic only till December 2008, under the name Furadan in form of spray and granules. It seems, however, that due to big purchases in the past, a lot of farmers still have large supplies of the pesticide. The acute oral lethal dose fifty (LD50) for carbofuran is 2 mg/kg for mice and 19 mg/kg for dogs (Cornell University 1993). Doses of Furadan 350F recommended in agriculture for insect control ranged between 0.6 - 3.0 litre per hectare. One litre of this preparation contains 357g of carbofuran substance. Roughly calculated, one litre of this pesticide could kill 3,000 individuals Eurasian otters (more than the whole population in the Czech Republic). Commercial packaging of this preparation for sale was 18 L. It is clear by comparing these numbers that supplies of the pesticide for possible poisoners are probably unlimited.

In the Czech Republic, it is also illegal to set up poisoned baits in general (forbidden by the Game Management Act No 449/2001 Coll. and by the Act No 246/1992 Coll. on the protection of animals against cruelty).

POISONINGS OF OTTERS AND OTHER WILDLIFE IN THE CZECH REPUBLIC

In the last five years, six cases of otter (*Lutra lutra*) poisonings by carbofuran were reported in the Czech Republic, with a total number of 14 poisoned otters found.

The first case was documented in February 2006 when three individuals (two adults and one cub) were found dead in the village of Útěchovice (Pelhřimov district), along with a European polecat (*Putorius putorius*), a least weasel (*Mustela nivalis*) and a stone marten (*Martes foina*). Carbofuran poisoning was confirmed in all these dead individuals. Unfortunately, carbofuran was not found in the suspected bait – remains of carp - probably due to the fact that not all of the bait was collected from the site for analyses and very likely only some of it contained carbofuran.

The second case comes from the village of Ronov nad Doubravou (Chrudim district), where one adult otter was found in water under a mill race by a group of children. It was in April 2006, and tests later confirmed carbofuran poisoning.

The third case happened in March 2007 close to the village of Senotín (Jindřichův Hradec district). Only one otter was found floating on the surface of a pond. The owner of the pond reported with doubt that a neighbour did it. Carbofuran was detected in the carcass.

At the end of January 2008 two otters – their bodies already starting to decompose - were found near the village of Bítovany (Chrudim district), close to a small stream. Carbofuran was later confirmed as the cause of death.

In April 2008 two otters were found dead near Dačice in the Jindřichův Hradec district (Fig.2). They were subadult (one-year-old) females lying next to each other; carbofuran was proven present in their bodies. One day later, another four-year-old female and four-year-old male were found dead in the vicinity (age of the individuals is known from analysis of their teeth), as well as three individuals of American mink (*Mustela vison*) and one common buzzard (*Buteo buteo*). It is therefore assumed that these animals were also victims of carbofuran poisoning. The bait was never found.

Figure 2. Two subadult females lying next to each other on the bank of a pond close to Dačice town.

In March 2009 three subadult one-year-old otter males (two on one day and another one a day later) were found poisoned on the bank of a pond near Dobrnice (Havlíčkův Brod district). High otter activity was visible from spraints and tracks in the area, suggesting that an otter family lived there and was causing damage to the carp stock. Carbofuran poisoning was later confirmed by laboratory analyses.

In all the described cases, a complaint was reported to the police, who investigated it as a crime but always ended up postponing the case because the criminal was not found.

The listed cases show several findings:

- they come from different parts of the Czech Republic – it is a widespread means of killing
- all cases happened in winter or spring, in the period of food limitation; otters seem to be sensitive to poisoning during this period of the year when they often starve and will consume even carcasses
- in two cases the victims were one-year-old cubs, probably just at the beginning of becoming independent, when siblings leave their mother and stay together.

Very likely, the described cases are only a small part of the actual total number of poisoned otters because it is difficult to find the carcasses. There are several proven cases of poisoning animals other than otters, in which the bait was a fish placed close to a water body, indicating that the bait was prepared for otters and other piscivore predators. One such example: in April 2008, close to the village Třeštice (Jihlava district), several individuals of different carnivores (white-tailed eagle, buzzard, marten, three foxes) where found dead together at one place.

Known cases of confirmed or suspected animal poisonings in the Czech Republic (Fig. 3) are collected by a voluntary group of members of the Czech Society for Ornithology (ČSO) and the information is available on their website .karbofuran.. In the last years, approximately 50 birds per year are known to be poisoned, meaning that the actual number could still be much higher. The list of species poisoned by carbofuran in the Czech Republic includes white-tailed eagle (*Haliaeetus albicilla*), golden eagle (*Aquila chrysaetos*), black kite (*Milvus migrans*), red kite (*Milvus milvus*), peregrine falcon (*Falco peregrinus*), common buzzard (*Buteo buteo*), rough-legged buzzard (*Buteo lagopus*), goshawk (*Accipiter gentilis*), marsh harrier (*Circus aeruginosus*), rook (*Corvus frugilegus*), raven (*Corvus corax*), carrion crow (*Corvus corone*), magpie (*Pica pica*), stone marten, European polecat, red fox (*Vulpes vulpes*), Eurasian otter, American mink, least weasel, as well as domestic cat and domestic dog. The poisoners usually kill animals by setting a poisoned bait - either pieces of meat or intestines, entire dead poultry, fish, small mammals, or eggs (Vermouzek and Mrlík, 2009). Fish is often used to kill otters, eagles and other piscivorous predators. The insecticide may be typically applied on the surface of the bait, injected or placed into slits cut in the bait, or soaked into the bait (Vyas et al., 2005). These different treatments of the bait then logically influence the result of the attempted poisoning and also the results of chemical analyses. Sometimes baits are even used to intentionally kill domestic animals. Even though the police have investigated many cases of carbofuran poisonings of wildlife and ČSO is currently offering a reward to anybody who provides information leading to the arrest of persecutors, nobody has yet been convicted for this crime in the Czech Republic.

POISONINGS OF WILDLIFE IN OTHER COUNTRIES

Cases of wildlife poisonings by carbofuran are known from other countries as well. A rapid increase of illegal poisoning incidents in Austria during the 1990's prompted WWF Austria, to initiate the project "Vorsicht Gift!" ("Beware Poison!") (Christian Pichler, pers.com). At the beginning there were about 80 incidents a year. In the last three years there were only between 6 and 8 cases recorded. Most of the cases (60 %) were reported from Lower Austria, 17 % in Upper Austria and 10 % in Burgenland. The victims of poisoning incidents were mostly dogs, cats and common buzzards, but also other species were recorded: stone marten, fox, marsh-harrier, white-tailed eagle, imperial eagle (*Aquila heliaca*), red kite. Despite similar character of landscape and conflict situation there is no record of any poisoned otter in Austria.

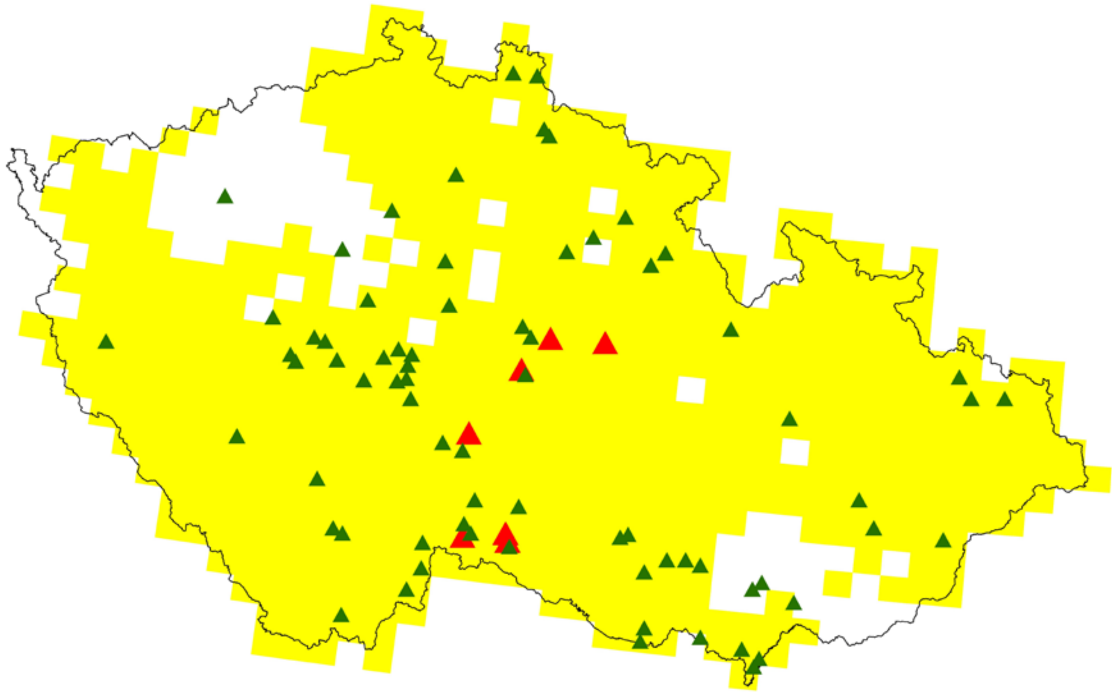

Figure 3. Map of registered cases of carbofuran poisoning of wildlife up to 2009 in the Czech Republic. Red triangles – poisoned otter, green triangles– other poisoned wildlife. Poisoned wildlife cases are marked according to Czech Society for Ornithology with their agreement; actual to date 8.9.2010. Yellow area shows otter occurrence in 2006 (according to Poledník et al. 2006).

It is also frequently used in Netherlands as well to persecute carnivores and raptors, as well as pests (Hugh Jansman, pers. com).

More than 100 species of birds are documented as having died from carbofuran poisoning in the US (American Bird Conservancy 2007). This situation got better for birds after the ban of granulated forms of carbofuran in the US and Canada (liquid form of carbofuran is usually not digested directly by birds, whereas granules resemble seeds and are therefore extremely dangerous). However, even in recent years several cases of carbofuran abuse to kill coyotes, skunks, foxes and other wildlife have been documented in the US and Canada, as well as fatal secondary poisonings of raptors, vultures or domestic dogs (Wikipedia, 2010; American Bird Conservancy, 2007; Wildlifedirect, 2009b).

Currently the biggest problem with carbofuran seems to occur in Africa (Kenya, Tanzania, South Africa, Namibia, Botswana), where local herders buy it over-the-counter and use it to “protect” their cattle from predators, especially lions, but also leopards or hyenas (Wildlifedirect, 2009f). This often leads also to the death of many vultures that feed on the placed bait or on the carcasses of already poisoned lions (Wildlifedirect, 2009g; Wildlifedirect, 2010). The situation is most critical in Kenya, for example: in the Masai Mara Reserve, 75 lions and hundreds of vultures were reported as carbofuran victims in 2009 (Wildlifedirect, 2009g). Environmental organizations are pointing out that the entire conflict originates with local herders grazing their livestock in protected areas, which is not allowed, and are trying to push Kenyan authorities into a serious consideration of carbofuran ban.

CONCLUSION

Carbofuran is an extremely toxic substance that seems to be widely abused to kill wildlife. Due to its only recent bannig and the fact that many farmers still have large supplies of it, it can pose a threat even in countries where its use is already illegal. Since it is much easier and more effective to set poisoned bait than trying to shoot or catch animals in traps, it is tempting to those who want to quickly get rid of their “predator problem”. From the conservation point of view, poisoned baits are extremely dangerous because a wide variety of animals can be affected, as well as many individuals of one socially living species. Another danger of carbofuran lies in the possible and quite frequent secondary poisonings. Last but not least - it is basically impossible to prove carbofuran poisoning except by running analyses on samples of the bait or from the dead animal. Due to scavenging and quick decomposition, samples must be taken and analyzed as soon as possible. In case of raptors with already decomposed carcasses Vyas et al. (2005) recommend trying to detect the insecticide on the birds’ feet, which often stay intact and were probably in contact with the poisoned bait (shown experimentally to be reliable). Therefore, we would like to stress the importance of reporting any suspicious cases of dead wildlife to relevant officials including the police, and the need to immediately carry out laboratory testing in such cases. It will help monitor the problem and raise local awareness, and could possibly help to catch some persecutors. Taking these actions should be the first step in trying to stop poisoning wildlife by carbofuran.
There are several indices that can give a reason to suspect carbofuran poisoning:

1. Usually there will be more dead animals of the same or different species
2. No apparent injuries
3. Presence of bait (not necessarily)

When dissecting: hyperaemia of lungs, hyperaemia of internal organs (e.g. liver, kidneys, intestine), bloody-coloured liquid in chest or abdominal cavity, heart dilatation, absence of injuries, external nodules not enlarged.

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RÉSUMÉ

CARBOFURAN – NOUVELLE METHODE EFFICACE POUR TUER LA LOUTRE (*Lutra lutra*) EN REPUBLIQUE TCHEQUE

Le Carbofuran est un poison récemment utilisé pour tuer illégalement les loutres en République tchèque. Six cas d'empoisonnement illégaux de loutres ont été découverts depuis 2006 pour un total de 14 individus tués. Au-delà des loutres, de nombreuses espèces ont aussi été touchées à savoir des rapaces et carnivores. Cette substance empoisonnante est aujourd’hui interdite dans , elle a néanmoins été largement utilisée en agriculture comme insecticide et des réserves importantes sont toujours disponibles. Ces évènements ainsi que la facilité relative à utiliser le carbofuran constituent une menace pour les populations de loutres en particulier dans les zones de conflit entre protection de la Loutre et piscicultures. Par conséquent, il est important de signaler tout cas suspect d’animaux retrouvés morts afin de procéder immédiatement à des tests de laboratoire et d'informer les autorités compétentes y compris la police. Ceci permettra de suivre le problème, de sensibiliser la population locale et pourra éventuellement aider à attraper les coupables. Mener ces actions devrait être la première étape pour stopper de la faune par le carbofuran.

RESUMEN

CARBOFURAN – UN NUEVO Y EFECTIVO METODO PARA LA CAZA ILEGAL DE NUTRIAS (*Lutra Lutra*) EN LA REPUBLICA CHECA

Carbofuran - un nuevo veneno ha sido descrito en la República Checa. Desde el año 2006, se han contabilizado seis casos diferentes de envenenamiento ilegal de nutrias con un total de 14 individuos muertos. Más allá de estas nutrias envenenadas, se han registrado también envenenamientos en otros tipos de animales como aves rapaces y otros carnívoros en la República Checa. Esta sustancia venenosa esta actualmente prohibida en la Unión Europea, no obstante, ha sido comúnmente usada en agricultura como insecticida y quedan aún grandes reservas de producto disponibles. Este factor junto a la relativa facilidad de uso que tiene esta sustancia la convierten en una amenaza para las poblaciones de nutria, especialmente en áreas donde los conflictos entre la protección de estos animales y la piscicultura son frecuentes. Así pues, es importante informar sobre cualquier caso sospechoso de animales salvajes muertos y llevar a cabo de inmediato pruebas de laboratorio en estos casos para poder informar debidamente a las autoridades oficiales incluyendo la policía . Esto ayudará a hacer un seguimiento del problema y a despertar la sensibilidad de la gente local y podría además, ayudar a atrapar algunos envenenadores. Llevar a cabo estas acciones debería ser el primer paso para intentar frenar los envenenamientos de fauna salvaje por carbofuran.

R E P O R T

THE EURASIAN OTTER (*Lutra lutra*) IN SLOVAKIA – A PRELIMINARY REPORT FROM A SURVEY

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Abstract: The first national survey of otter distribution in Slovakia was carried out in winter 2007/2008. The mapping was done using the modified standard IUCN/OSG methodology. Results were obtained from 275 "Databank of Slovak Fauna (DSF)" quadrates (64 % out of 429 DSF quadrates). The second mapping was carried out in winter 2008/2009 in 54 DSF quadrates (12.6 % out of 429 quadrates). In total, this covered 292 quadrates (88.7% out of checked quadrates; 61% out of all 429 quadrates in the Slovak Republic); in 36 quadrates (1% and 8%, respectively), no otters were recorded. The third one-off otter mapping on the whole Slovak territory (in all 429 quadrates) was carried out in summer 2010 with the “standard” method: 349 quadrates (81.4%) were positive and 80 quadrates (18.7%) were negative. The otter occurs in most parts of the country with the exception of parts of the Western and South-Eastern lowlands of Slovakia. Otter signs were found in all types of water bodies and channels of all sizes and in different types of reservoirs (dams, ponds, fishponds) in various land cover classes.

Key words: *Lutra lutra*, distribution, quadrates, Databank of Slovak Fauna, spraints

INTRODUCTION

The Eurasian otter (*Lutra lutra*) is a large vertebrate charismatic and flagship species for which there is a major concern in conservation biology. Over the past century, the otter underwent a significant decline, resulting in extinction or fragmentation in most of European populations (Mason and Macdonald, 1986). A thriving population survived in Eastern Europe and in the Balkans (Macdonald and Mason,1990; Chanin, 2003; Conroy and Chanin, 2000, 2002; Georgiev, 2005, Poledník et al., 2008). Its core areas of distribution generally coincide with areas of carp farms (Kranz, 2000). Currently the otter population is increasing in most European countries (Conroy and Chanin, 2002; Mason and Macdonald, 2004, Ruiz-Olmo et al., 2008) and this trend is particularly pronounced in Central Europe (Kranz, 2000).

In the past the otter was distributed over the most of the Slovak territory with the exception of the top parts of high mountains. Its occurrence was also indicated by local geographical names of streams (vydra = otter): Vydrovo – left side tributary of the Čierny Hron River, Vydričný (Vydrický) potok brook – right side tributary of the Teplá River, Vydranka; the names of villages: Vydrany (Dunajská Streda district), Vydrná (Považská Bystrica district), Vydrník (Poprad district), Vydrovo, part of the Čierny Balog village (Brezno district), Vydraň, part of Michalovce city (Michalovce district), or valleys: Vydrovská dolina, near the Čierny Balog village (e. g. Hell and Cimbal, 1978). The otter is still present in most of them (situated mostly in central and eastern Slovakia), for example in the Vydrovský potok brook in Vydrovská dolina valley, or in Vydričný potok brook (e. g. Urban et al., 2010a).

The otter is a fully protected species according the present Act No. 543/2002 on Nature and Landscape Protection and Environment Ministry Decree No. 24/2003, which implement EU Habitats and Birds Directives. According to the current Hunting law No 274/2009 and Agriculture Ministry Decree No. 344/2009 the otter is still a game species but fully protected as the hunting season is closed all year round. This species is protected in 91 Areas of European Interest (= Sites of European Importance**)** in both biogeographic regions in Slovakia (Alpine and Pannonian) (Figure 1,2). In the latest Red List of mammals of Slovakia the otter is listed as „Vulnerable“ (VU) (Žiak and Urban, 2001).

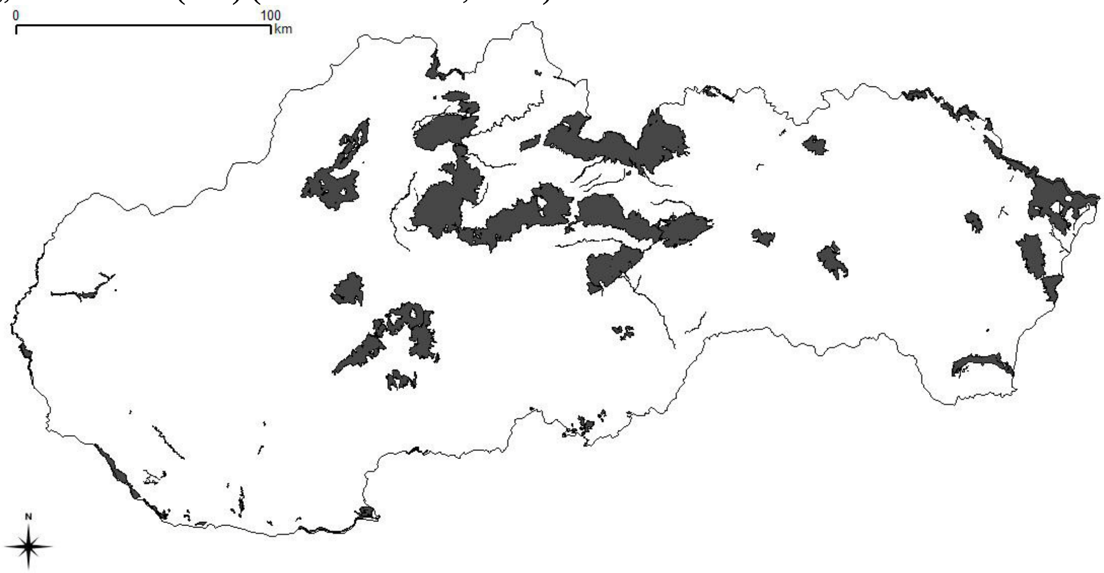

Figure 1. Special Areas of Conservation (Sites of European Importance) in Slovakia, where the Eurasian otter is the subject of conservation (the map author P. Pastorek, State Nature Conservancy of the Slovak Republic - ŠOP SR Banská Bystrica).

The country-wide mapping of the otter was not achieved in the Slovak Republic until 2007. The range of otter distribution was only determined in some regions or river basins. The first one-off otter mapping in Slovakia (in 275 quadrates, i.e. 64.1% from 429 DFS quadrates) was done in winter 2007/2008. The next mapping was carried out in winter 2008/2009 with aims: to gain objective information on otter distribution in some selected quadrates in which the mapping was not realized before, or in 1 quadrate (6780) with negative results during the first mapping. Results were obtained from 54 DFS quadrates (12.6% out of 429 quadrates) (Urban et al., 2010b). The third one-off otter mapping on the whole Slovak territory (in all 429 quadrates) was carried out from in summer and Autumn 2010.

There are two gaps in the mapping grid. In 2007/8, we were unable to map the upper streams of the Topľa, Ondava and Laborec rivers and in the middle part of the Váh, Nitra, Morava and Malý Dunaj river basins in the eastern part of the country due to financial and manpower constraints during the change in status of the State Nature Conservancy of the Slovak republic (SNC SR). In 2010, we did not map a western area (the Podunajská nížina lowland, and Trnavská pahorkatina Hills) because the environment here is so affected by the construction of water power plants, dams, water supply reservoirs, canalisation and other river reclamations, irrigation, pumping of ground water, and overall river basin management affecting water retention and acceleration of runoff which all mean otters are not present. There is also a small area in eastern Slovakia where this is true: the the urban and industrial complex of the city of Košice - otters are, however, present above and below this area on the river Hornád.

The aim of this paper is to summarize the knowledge on the otter distribution in Slovakia.

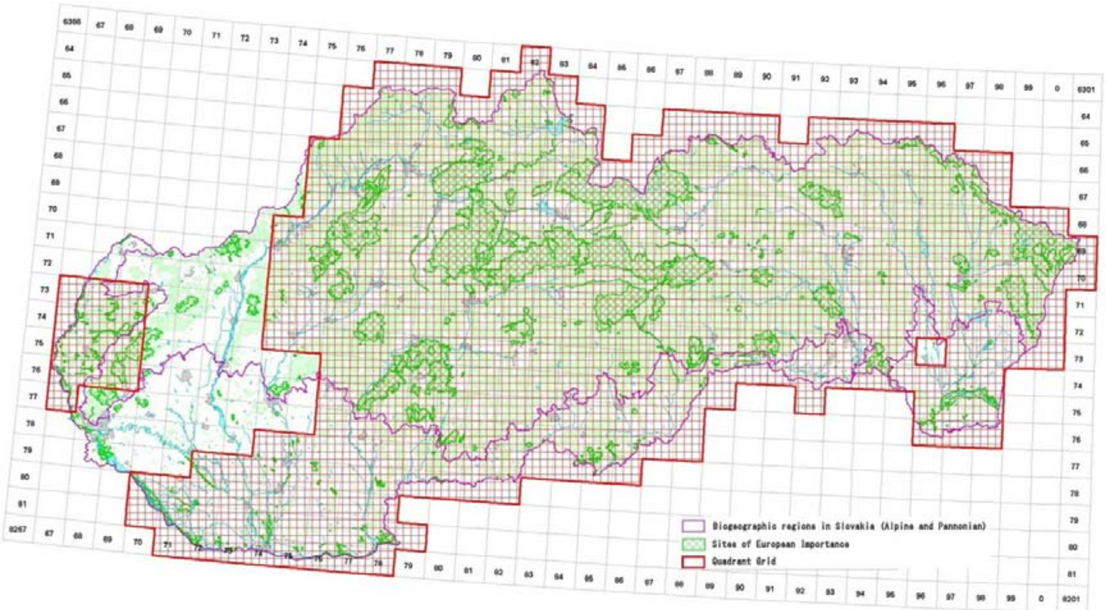

Figure 2. Reference otter range in Slovakia used for reporting (the map author P. Pastorek, ŠOP SR Banská Bystrica).

METHODS

The mapping was carried out from June 2010 to October 2010 with the so-called "standard" IUCN/OSG method for otter population monitoring– searching for signs of presence of the otter (footprints, anal gland secretions, spraints) in a network of UTM-grid quadrates (Reuther et al., 2000). The Databank of Slovak Fauna (DFS) grid (approx. 10x12 km) was used as a reference. In each of the quadrates we checked 4 –6 localities (600 m long river sections visited) for potential otter occurrence, but a survey was usually stopped as soon as the otter signs were found (Urban and Adamec, 2007). Spraints were rated in three categories – fresh (max. up to 5 days); medium (dry but yet, ca 6–14 days) and the old ones (dry, several weeks old, compact or chopped to some components) (Bas et al., 1984, modified by Urban and Topercer, 2001). During each check every spraint discovered was removed. Results were obtained from all 429 DFS quadrates in Slovakia.

RESULTS AND DISCUSSION

During the third survey of its distribution in the Slovak Republic, 349 quadrates (81,4%) of all 429 DFS quadrates were positive and 80 quadrates were negative (Figure 3). So we found that the Eurasian otter (*Lutra lutra*) occurs in most parts of the Slovakia with the exception of parts of the Western and South-Eastern lowlands of the country.

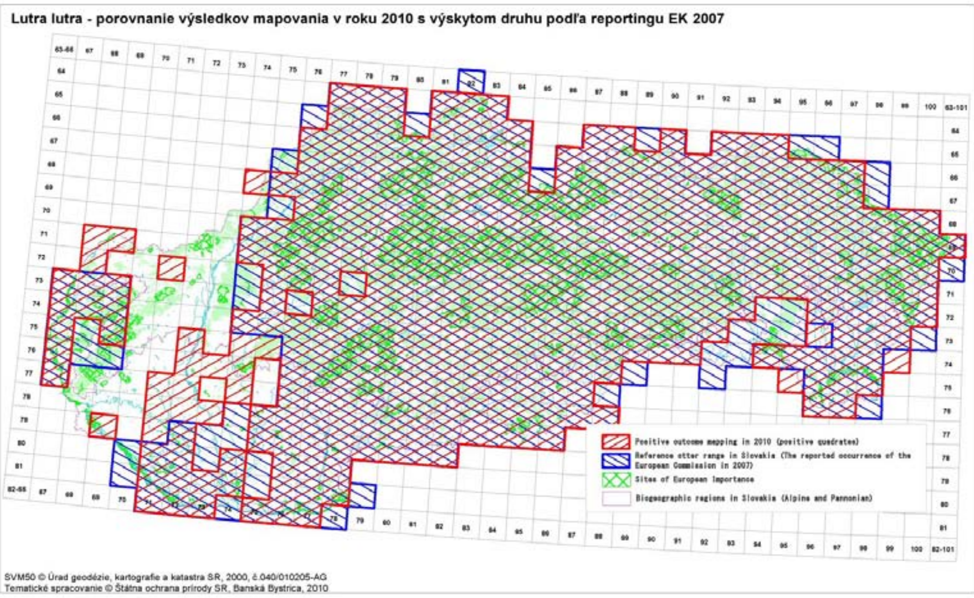

Figure 3. Comparison of results of the Slovak national otter survey in 2010 with reference otter range used for reporting (the map author P. Pastorek, ŠOP SR Banská Bystrica).

During both surveys of otter distribution 328 DFS quadrates (76.5% out of all 429 quadrates in the Slovak Republic) were checked in winters 2007/2008 and 2008/2009. A total of 292 quadrates (88.7% out of the checked quadrates; 61% out of all 429 quadrates in the Slovak Republic) were positive and 36 quadrates (1% and 8%, respectively) were negative (Urban et al., 2010b) (Figure 4).

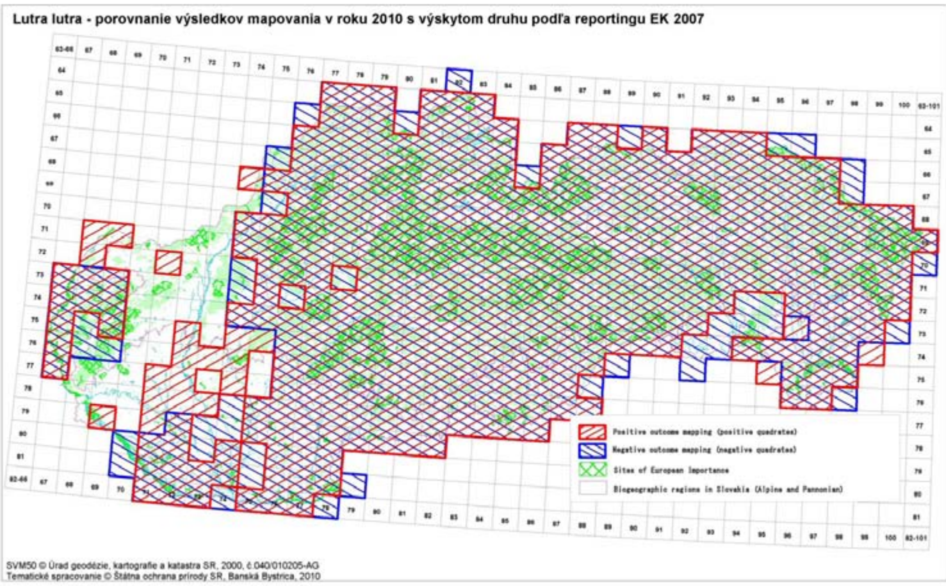

Figure 4. Comparison of results of the Slovak national otter surveys in winters 2007/2008 and 2008/2009 with reference otter range used for reporting (the map author P. Pastorek, ŠOP SR Banská Bystrica).

The otter occurs in most parts of Slovakia with the exception of parts of the Western and South-Eastern lowlands of the country. Its signs were found in all types of water bodies, including large (length over 200 km) and medium-sized (50.1 – 200 km) rivers, streams (10.1–50 km), rivulets (length up to 10 km), and channels of all sizes and in lakes and different types of artificial reservoirs and still waters (dams, ponds, fishponds) in various land cover classes.

The species is more common along sub-mountain rivers of Central, Northern and North-Eastern Slovakia and their tributaries. Otters are missing in some parts of the lowlands and uplands of Western and South-Eastern Slovakia. The vertical distribution reaches from the lowlands to high mountains. The lowest observed altitude of occurrence was in the Východoslovenská nížina lowland, the localities Bodrog near Streda nad Bodrogom (100 m a.s.l.) (Figure 5), Boťany, Latorica (100 m a.s.l.), Somotor, Óbodrog or Zompod (100 m a.s.l.), from banks of the Danube River in the stretch between Gabčíkovo and Štúrovo, the localities Kamenica nad Hronom (103 m a.s.l.) (Figure 6) and Klížska Nemá (115 m a.s.l.); as well as from the downstream stretches of the rivers Váh, Nitra and Hron and from several drainage canals in the Podunajská nížina lowland. The highest altitudes of occurrence in Slovakia were recorded in Nízke Tatry Mts., Západné Tatry Mts., Vysoké Tatry Mts. and BelianskeTatry Mts. The otter is regularly observed in the upstream stretches of water bodies, such as the Vajskovský potok brook, locality Pálenice (1,080 m a.s.l.) (Figure 7) and some alpine lakes, for example Ťatliakovo Pleso Lake (1,360 m a.s.l.) (Figure 8), where it mostly occurs in spring. From the High Tatras, Profus (1999) mentioned an otter crossing over a mountain saddle at an altitude of 1,800 m a.s.l. The otter is an inhabitant of streams, wetlands and lakes, and also their bankside vegetation, where it finds a sufficient food supply the whole year round. In the lowlands of Podunajská nížina, Borská nížina and Východoslovenská nížina, it also inhabits artificial canals that offer sufficient food resources and high herbaceous vegetation providing shelter. Limiting factors for the otter occurrence are sufficient food supply, the amount of water in streams, fluctuation of discharges and the periodic drying up of streams with low discharge and availability of cover and shelters. Large reservoirs or dams with unsuitable littoral zones, fluctuating water table and subterranean outlets are unfavourable.

Figure 5. Bodrog near Streda nad Bodrogom (100 m a. s. l.) (eastern Slovakia) (photo P. Urban)

Figure 6. Hron near Kamenica nad Hronom (103 m a. s. l.) (south-Western Slovakia) (photo P. Urban)

Figure 7. Vajskovký potok brook in Pálenice locality (1,080 m a. s. l.) (central Slovakia) (photo P. Urban)

Figure 8. Ťatliakovo Pleso Lake on the Studený potok brook (1,360 m a. s. l.) (northern Slovakia) (photo P. Urban)

As the availability of water represents the main ecological factor affecting otter occurrence (Beja, 1992; Prenda et al., 1996, 2001; Bo Madsen and Prang, 2001; Bonesi and MacDonald, 2004; Kruuk, 2006), the model was developed on those river stretches that were likely to have water all year round. The Eurasian otter (*Lutra lutra*) occurs in a variety of habitats (Kruuk, 2006) that can be divided into two groups: - permanent (used throughout the year) and temporary (used for restricted periods) (Georgiev, 2005).

Other studies have revealed a positive influence of more wooded land for otter presence (e. g. Lodé, 1993; Baranauskas and Mickevičius, 1995). In Hungary, Kemenes and Demeter (1995) found a positive effect for land cultivation around aquatic habitats. Otters inhabited all of the studied stagnant waters but occurred more rarely in smaller streams (76%) (Lanszki, 2009).

There are a few European countries with otter populations which have no significant land that is higher than 1 000 m above sea level (a.s.l.) (e.g. Norway, France, Slovakia, Slovenia, Croatia, Bosnia, Yugoslavia, Greece, Bulgaria, Rumania andSpain) (Ruiz-Olmo, 1998).

CONCLUSIONS

During the mapping in summer 2010, 349 quadrates (81,4%) of all 429 DFS quadrates were positive and 80 quadrates were negative. The otter occurs in most parts of the Slovakia, especially along sub-montane rivers (large and medium-sized), rivulets and streams and their tributaries in Central, Northern and North-Eastern parts of the country . Most signs of the presence of the otter were found in sections of streams that raced through broad-leaved forests, coniferous forests, mixed forest and pastures with riparian vegetation in highlands, uplands and basin hill lands.

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RÉSUMÉ

LA LOUTRE D'EUROPE (*Lutra lutra*) EN SLOVAQUIE – RAPPORT PRELIMINAIRE ISSU D'ENQUÊTES NATIONALES

La première enquête nationale sur la distribution de la Loutre en Slovaquie a été réalisée durant l'hiver 2007/2008. La cartographie a été élaborée à partir de la méthodologie légèrement modifiée du Groupe des Spécialistes loutres (OSG) de l'UICN. Les résultats ont été obtenus sur 275 cadrans issus de la Base de la Faune Slovaque (DSF) soit 64% des 429 cadrans existants. La seconde cartographie découle de l'enquête menée durant l'hiver 2008/2009 sur 54 cadrans (12.6 % des 429 cadrans). Pour ces deux enquêtes, la Loutre est présente sur 292 cadrans (88.7% des cadrans enquêtés; 61% des 429 cadrans de République slovaque) tandis que sur 36 autres elle est considérée absente (respectivement 1% et 8%). La dernière enquête sur l'ensemble du territoire slovaque (sur les 429 cadrans) a été menée l'été 2010 à partir de la méthode standardisée de l'UICN. Il en découle 349 cadrans positifs (81.4%) et 80 négatifs (18.7%).

La Loutre est présente sur la majeure partie du territoire slovaque à l'exception des plaines de l'ouest et du sud-est du pays. Les indices ont été trouvés sur tous types de cours d'eau, des canaux de toutes tailles, des réservoirs de toutes sortes (lacs, étangs, étangs de pêche) et dans des habitats variés.

RESUMEN

LA NUTRIA EUROASIATICA (*Lutra lutra*) EN ESLOVAQUIA: REPORTE PRELIMINAR DE UN CENSO

El primer censo nacional de distribución de nutria en Eslovaquia fue realizado en el inviernos 2007/2008. El trazado fue llevado a cabo utilizando estándares modificados de la metodología IUCN/OSG. Resultados fueron obtenidos de 275 (64%) de lo 429 cuadrantes del Banco de Datos de Fauna Eslovaca (Databank of Slovak Fauna (DSF)). El segundo trazado fue llevado a cabo en el invierno 2008/2009 en 54 cuadrantes DSF (12.6%). En ambos, la nutria se encontró presente en un total de 292 cuadrantes (88.7% del total de cuadrantes censados y 61% del total de cuadrantes en la República de Eslovaquia); mientras que no se encontró presente en 36 de los cuadrantes censados (1% y 8% respectivamente). El tercer censo en todo el territorio eslovaquia (todos los 492 cuadrantes) fue llevado a cabo en el verano del 2010 con el método "standard". Se encontraron 349 cuadrantes (81.4%) positivos y 80 cuadrantes (18.7%) negativos.

La nutria se encuentra presente en la mayor parte el país con excepción de algunas tierras bajas en el oeste y el sudeste. Sus marcas fueron encontradas en todo tipo de cuerpos de agua y canales de todos los tamaños. Así como en diferentes tipos de reservorios (presas y estanques) con diversas coberturas y usos de suelo.

R E P O R T

AQUATIC MACROPHYTE VEGETATION AND ITS RELATIONSHIP TO THE OCCURRENCE OF THE EURASIAN OTTER (*Lutra lutra*) IN THE HRON RIVER (SLOVAKIA)

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Abstract: The relationship between the presence of the otter, expressed by its sign behaviours (scent marks and spraints making) and the qualitative characteristics of aquatic macrophytes was studied in the Hron River (Slovakia). Based on macrophytes, it was possible to divide the Hron River into two sections. The upper section is relatively poor in species (species number – 3) when comparing it to the lower section (3.5). We suspect that, regarding the dominant influence of food availability, there only exists a very uncertain preference of visiting sections with a higher qualitative and quantitative representation of macrophytes in the watercourse. We found that in the lower section, that had a higher number of macrophytes, there were higher amounts of otter signs. The Hron River otter therefore seems to slightly prefer sections, which have greater macrophyte richness. However, differences in amount of otter signs between mentioned sections are relatively small and with statistically no significance.

Key words: running water, aquatic plants, *Lutra lutra*, macrophytes-otter relationship

INTRODUCTION

As the top predator of the trophic water chain, the Eurasian otter (*Lutra lutra* Linnaeus, 1758) has an important position as a keystone, umbrella and focus species of any given water ecosystems. The main ecological factor, which affects its presence in water biotopes, is sufficient food supply (e.g. Kruuk, 1995, 2006; Jendrzejewska et al., 2001; Clavero et al., 2003). Other factors such as lack of shelter have a significantly smaller influence, but, however, vegetation in the broad sense seems to be frequently studied (O'Connor et al., 1977; Jenkins and Burrows, 1980; Macdonald and Mason, 1983; Bass et al., 1984). Some studies based on spraints have pointed to the importance of the presence of trees, woodland or other cover, as well as the impact of human activities, while others have also demonstrated a relationship with food supply (Macdonald and Mason, 1983; Bas et al., 1984; Prenda and Granado-Lorencio, 1996; Chanin, 2003). Some authors observed a positive correlation between the amount of bank vegetation cover and sprainting activity over large areas (Adrián et al., 1985; MacDonald and Mason, 1985; Delibes et al., 1991; Prenda and Granado-Lorencio, 1996).

The relationship between the presence of the otter, expressed by otter sign behaviour, and the qualitative characteristics of aquatic macrophytes is a scarcely investigated topic. We believe that, due to the strong influence of food availability, otters could show a preference for visiting sections with higher qualitative and quantitative representation of macrophytes in the Hron River. It is well known that submerged macrophytes add to the physical complexity of the environment, creating habitat that algae and invertebrates may colonize and providing refuge for fishes from high flows and predators (Allan and Castillo, 2007). Therefore the sections with richer species composition and with more or less similar or greater cover of macrophytes, are more diverse and more representative of the preferred food of the otter.

The aim of this article is to examine the natural habitat of the Hron River to find out whether i) parts of the river can be classified by species composition of macrophytes, and consequently ii) to find out if the quantity of otter signs differs within various parts of the river based on the various macrophytes present.

METHODS

Study Area

The Hron River (48º 49´ 30″ N – 19 º 00´ 50″ E; 47 º 49´ 08″ N – 18 º 44´ 40″ E) is the second longest river in Slovakia (length 297.4 km; catchment area – 5464.54), and is one of the most important left side tributaries of the Danube River in the country (average flow rate of 56 /s near its outfall into the Danube; Figure 1). The source spring of the river is situated between the Nízke Tatry and Slovenský Raj mountains in a mountain range (altitude 934 m a.s.l.) and reaches the Danube near the village of Kamenica n/Hronom (altitude 103 m a.s.l). From source to outfall, the climate along Hron changes from a moderately cool region to a warm and very dry region (Faško and Šťastný 2002, Lapin et al., 2002). The upper and middle parts of the river lies in the submontane and colline belts of the Carpathian phytogeographical region. The lower part is situated in the planare belt of the Pannonian phytogeographical region, and a major part of the river is regulated and strongly affected by human activity. As a result, the Hron River is one of the the most modified and polluted rivers in Slovakia and only the upstream reaches of the river have relatively clean water (*www.shmu.sk*).

Field Sampling and Data Processing

Research on the aquatic macrophytes was begun in September 2005 and revised at the same time of year in 2009. Nineteen river sections with a standardized length of 500 m were selected with more or less regular distances between sections, and alternating sections with and without apparent industrial or agricultural influence. Each river section was divided into 5 subsections with constant length of 100 m. In each subsection, all aquatic macrophytes (bryophytes, true vascular aquatic plants and macroscopis algae as a category “filamanetous algae”) were sampled and the Plant Mass Estimate (PME) was assessed using a five-level scale (1–rare, 2–occasional, 3–frequent, 4–abundant, 5–very abundant; Kohler and Janauer, 1995). PME data were transformed into “plant quantity” using the function *y*= (y–“plant quantity”, x–PME; cf. Kohler and Janauer, 1995). Based on the transformed Plant Mass Estimate data, Mean Mass Total (MMT; cf. Kohler and Janauer, 1995) were calculated for each river section.

Figure 1. Location of the study area

We used a standard method of controlling for the presence of otter signs (spraints, scent trails and footprints) on 300 m sections to calculate any otter presence. Sprаints were removed while checking each locality. This activity took place in the summer of 2009 at the 48 localities on the main river course of the Hron River (in the gradient from stream to estuary).

Differentiation of the river was decided on the basis of aquatic macrophyte datasets using CANOCO 4.5 for Windows package (ter Braak and Šmilauer, 2002). Detrended Correspondence Analysis (DCA) was used, with rare species (occurrence only in one river section: *Batrachium trichophyllum* (Chaix) Bosch, *Lemna gibba* L., *L. minor* L., *Potamogeton trichoides* Cham. et Schlechtd. and *Spirodela polyrhiza* (L.) Schleid.) being downweighted. The MMT index was used as a species-abundance indicator for the analysis. Quantified numbers of otter spraints for differentiated parts of river based on the above-mentioned analysis were compared using the *t*-test in STATISTICA software (Statsoft, 2001).

The nomenclature used in this paper follows the FishBase (Froese and Pauly, 2010).

RESULTS

Eleven taxa of aquatic macrophytes (including one group – filamentous algae) were found in the Hron River. Along the first DCA axis, there is an apparent shift from relatively mesotrophic species *Batrachium penicillatum* to eutrophic species like *Ceratophyllum demersum* or *Potamogeton trichoides*. Relatively marked variation along the second axis is affected by the position of the outlier *Batrachium trichophyllum* (Figure 2). Cumulative percentages of the variance of species data for the first two axes are 45 and 50, respectively. Based on macrophytes, the river was divided into two basic parts: i) an upper part from the river spring to the confluence of the Slatina and Hron Rivers near the Zvolen town (#1, Figure 1) and ii) the central and lower part from the confluence of mentioned rivers to the mouth of the Hron River to the Danube River (#2; Figure 1). Every stretch is influenced by a different macrophyte group: 1 – *Batrachium penniculatum*, filamentous algae and mosses *Rhynchostegium riparioides*, as well as partially *Fontinalis antipyretica*, 2 – mainly *Myriophyllum spicatum*, *Ceratophyllum demersum* and *Potamogeton pectinatus*. The differences between river sections are in species diversity, expressed by species number (1–3, 2–3.5), while their mean values of MMT are almost the same for both parts (1–4.54, 2–4.38).

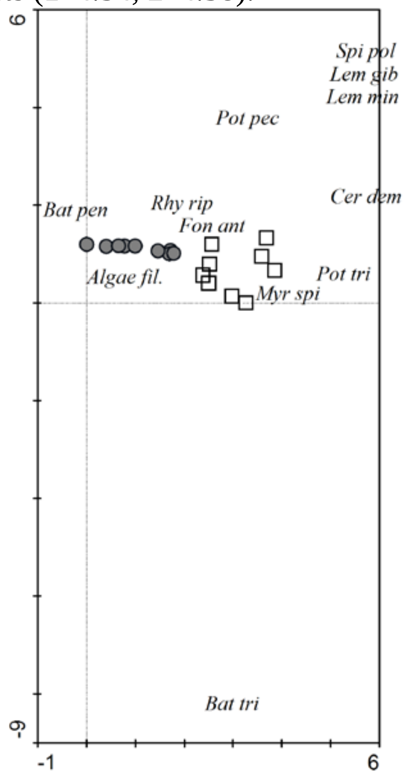

Figure 2. Position of the studied localities and aquatic macrophytes on the first two axis of DCA along the course of the Hron river (*Batrachium penicillatum – Bat pen, B. trichophyllum – Bat tri, Ceratophyllum demersum – Cer dem, Fontinalis antipyretica – Fon ant, Lemna gibba – Lem gib, L. minor – Lem min, Myriophyllum spicatum – Myr spi, Potamogeton pectinatus – Pot pec, P. trichoides – Pot tri, Rhynchostegium riparioides – Rhy rip, Spirodela polyrhiza – Spi pol* and filamentous algae – *Alg fil*). Full circles upper part (1) of the Hron river, empty squares – central and lower part (2) of the river.

The average amount of individual otter signs showed greater or smaller differences between the different sections (Table 1). Compared to section 2, the scent marks and spraints in section 1 have lower average values; footprints were only recorded in section 1. However, all differences between the sections are statistically insignificant (Table 1).

Table 1. Mean and t-values of otter sign behaviours in two studied river parts (ns – not significant, ne – not evaluated)

	Mean 1	**Mean 2**	**t-value**	**P**
Spraints	1.625	2.458	-1.143	0.259ns
Scent marks	0.125	0.25	-1.1	0.277ns
Footprints	ne	ne	ne	ne
Total signs of presence	1.875	2.583	-0.884	0.381ns

DISCUSSION

The results we obtained confirmed the aim of our paper as the upper section of the flow (1) with a lower macrophyte richness showed lower average values of otter signs. The lower section (2), which is richer in macrophytes also had higher values of otter signs (Table 1). The otter therefore probably slightly prefers sections with greater macrophyte richness. This difference is however, relatively small as there were no statistically significant differences. It is likely that the differences can be found in the availability of food, which is sufficient for the permanent occurrence of the otter in both sections of the river.

The main source of food for otters is fish, which differ in composition between the upper and the lower section of the river, yet species richness is similar. Typical species for the upper section are: *Salmo trutta* m. *fario* and *Cottus poecilopus* (mountain zone), *Hucho hucho, Thymallus thymallus, Phoxinus phoxinus*, *Alburnoides bipunctatus*, *Gobio gobio*, *Barbus barbus*, *Leuciscus cephalus*, *Chondrostoma nasus*, *Barbatula barbatula*, *Lota lota* and *Cottus gobio* (submountain zone), *Oncorhynchus mykiss*, *Eudontomyzon vladykovi*, *Leusciscus leuciscus*, *Cottus poecilopus* (Sedlár et al., 1983), which are also present in the lower segments of the upper section. *Esox lucius*, *Rutilus rutilus*, *Scardinius erythrophthalmus*, *Aspius aspius*, *Blicca bjoerkna*, *Ballerus sapa*, *Ballerus ballerus*, *Carassius carassius*, *Cyprinus carpio*, *Cobitis taenia*, *Silurus glanis*, *Anguilla anguilla*, *Sander lucioperca*, *Perca fluviatis*, *Zingel zingel*, *Zingel streber*, *Gymnocephalus cernuus* and *Gymnocephalus schraetser* are typical for lower section of the river. Species as *Proterorhinus marmoratus*, *Barbatula barbatula*, *Carassius auratus* and *Misgurnus fossillis* can be found in canals and river oxbows near the river mouth in the lowland belt of the lower section (Sedlár et al., 1983). The abundance and fish mass in the lowest found parameters is similar in both sections, yet the upper limit is higher in the lower section. The abundance and fish mass were 136–2882 CPUE-individual/ha/hour and 13–264 CPUE-individual/ha/hour for upper section, respectively. Whilst, the abundance and fish mass were 598–18000 CPUE-individual/ha/hour and 5.8–532 CPUE-individual/ha/hour within lower section (Mužík and Beleš, 2009). Fishes are the most important source of otter food, but there are several other sources. For example, increased preying on amphibians during their spring migration (Kožená et al., 1992; Brzezinski et al., 1993; Koščo and Korňan, 1999; Jendrzejewska et al., 2001) and respectively in the winter (Weber, 1990; Ruiz-Olmo et al., 1998) is well known. The most diverse composition of the prey and the highest rate of the non-fish consumption are usually identified in the summer (e.g. Kučerová, 1996; Hájková, 2001). In general, several studies and papers (Kruuk, 1995, 2006; Clavero et al., 2003) have demonstrated that in some areas (Scottish rivers and islands, central Europe, parts of Africa and Asia), the otter populations are limited by their food supply. Food is therefore a key resource for this species. Favourable conditions for the otter can be thus markedly affected by fluctuation in food availability. The otter is a typical food opportunist. When the relative abundance of its various food options change, depending on the character of the environment, the otter will hunt according to the frequency and availability of their prey (e.g. Chanin, 1985; Carrs, 1995).

Mutual connection between both diversity and abundance of the macrophyte vegetation and fauna throughout the different levels of the food chain, with the Eurasian otter as the top predator, can be seen from the obtained data within our paper. The results of our short study show a positive relationship (although not significant) between species richness of macrophytes and the occurrence of the European otter as demonstrated by the quantity of otter signs. In order to understand this relationship better, further studies and broader data material is required.

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RÉSUMÉ

RELATION ENTRE MACROPHYTES AQUATIQUES ET PRESENCE DE LA LOUTRE D'EUROPE (*Lutra lutra*) SUR LA RIVIERE HRON (SLOVAQUIE)

La relation entre la présence de la Loutre et les caractéristiques des macrophytes aquatiques, exprimée grâce au comportement de marquage territorial (marques olfactives et dépôts d'épreintes), a été étudiée sur la rivière Hron (Slovaquie). A partir des macrophytes, il a été possible de diviser la rivière Hron en deux sections. La partie supérieure est relativement pauvre en espèces (n=3) comparée à la partie inférieure (n=3,5). Nous supposons que vue l'importante influence de la disponibilité alimentaire sur la fréquentation de sites par la Loutre, la présence en abondance et en qualité des macrophytes n'a que peu d'impact sur la visite de sites. Nous avons constaté que dans la partie inférieure de la rivière où les macrophytes sont les plus nombreux, les signes de présence de la sont plus importants. La Loutre sur la rivière Hron semble donc préférer un peu plus les sections qui ont une plus grande richesse en macrophytes. Quoi qu'il en soit, le nombre d'indices relevés entre les deux sections étudiées est trop faible et ne présente aucune différence significative.

RESUMEN

VEGETACION MACROFITA ACUATICA EN EL RIO HRON (ESLOVAQUIA) Y SU RELACION CON LA OCURRENCIA DEL NUTRIA EURASIATICA (*Lutra lutra*)

La relación entre la presencia de nutria, expresada por sus señas de comportamiento (marcas de olor y héces), y las características cualitativas de las especies macrófitas acuáticas fue estudiada en el río Hron (República de Eslovaquia). Basada en las macrofitas, fue posible dividir el río en dos secciones. La sección superior es relativamente pobre en especies (“species number”= 3) comparada con la sección inferior (3.5). Sospechamos que, dada la influencia dominante que ejerce la disponibilidad de alimento; la preferencia por visitar seciones del río con una representacion alta de macrófitas en calidad y cantidad, se hace incierta. En la sección inferior del río, con mayor número de macrófitas, se encotraron mayor cantidad de signos de nutria. Por lo tanto, la nutria del río Hron pareciera preferir secciones con mayor riqueza en macrófitas. Sin embargo, las diferencias entre los signos de nutrias entre las mencionadas secciones es relativamente pequeña y sin significado estadístico.

C O N F E R E N C E S

Invitation

We have the pleasure of announcing that the XI INTERNATIONAL OTTER COLLOQUIUM - OTTERS IN A WARMING WORLD - will be held in Pavia (Lombardy Region), Italy, from the 30th August to the 4th of September 2011.
The principal host of the congress is the University of Pavia, in co-operation with the University of Molise and the IUCN/SSC Otter Specialist Group.
The organizers look forward to welcome you to Italy and hope that you will enjoy your stay in Pavia, an attractive town near Milan.

http://www.internationalottercolloquium2010.eu/

The International Otter Colloquia
The first International Otter Colloquium has been held in 1979, and since then they have developed to become one of the more important forum to discuss otter status and conservation around the world. Since that meeting, Colloquia have been held in a number of different continents and countries. For the first time since 1998, the meeting has returned to Europe - to the University of Pavia, in northern Italy.

V I R T U A L   O T T E R S

Baby Otter Playing with Stuffed Walrus

http://icanhascheezburger.com/2010/11/08/funny-pictures-video-otter-walrus/

3 Eurasian Otter Orphans in Addy de Jongh`s House

://www.youtube.com/watch?v=s0gQ5_

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