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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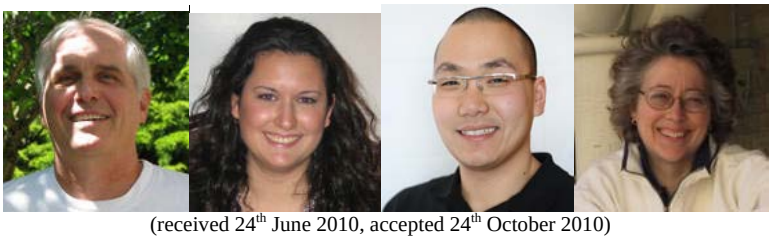

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Abstract: In Canada, there are two species of otters, the river otter (*Lontra canadensis*) and the sea otter (*Enhydra lutris*). The river otter is considered to be plentiful and ranges throughout a large part of Canada. On the other hand, the sea 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

En 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.