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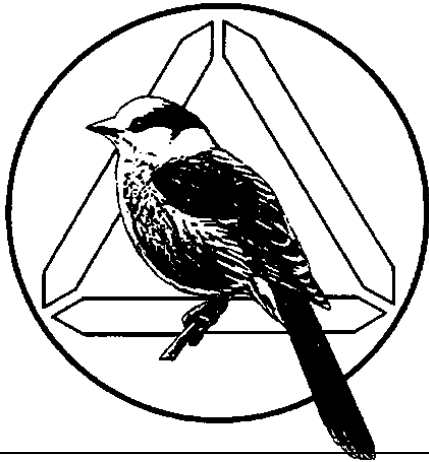


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Canada Takes A Big Step Forward

On October 5th, 2005 the Federal, Provincial and Territorial Resource Ministers Council approved Canada's National Wildlife Disease Strategy (NWDS: <http://www.cws-scf.ec.gc.ca/cnwds/index_e.cfm>). This approval is the culmination of three years of intensive work by a team of some 80 participants, spearheaded by the Canadian Wildlife Directors Committee and the Board of Directors of the CCWHC. The NWDS is a new, broad national framework to deal with wildlife disease issues, and to minimize the damaging effects of wildlife diseases on wildlife, livestock, human health and the economy.

The Strategy, and associated Action Plans to achieve each of its goals, were developed by people drawn from all levels and sectors of government, academics and NGOs. As a test and a proof of principle, the Strategy was applied as a template in 2004-05 to develop both the National Chronic Wasting Disease Control Strategy and Canada's Inter-Agency Wild Bird Influenza Survey (following). Approval by the Ministers Council now signals broad acceptance by government leaders of the principles and the goals articulated in the NWDS, and is a directive to achieve those goals in a timely manner.

The NWDS was approved within the context of the broader development of a Biodiversity Outcomes Framework for Canada, which will better equip federal, provincial and territorial governments to manage, measure, and report on biodiversity conservation. In this context, the Ministers recognized the risks posed by wildlife diseases not only to wildlife, but also to human health and Canada's long-term economic sustainability.

The NWDS calls for a full partnership among government agencies charged with health and disease management in the contexts of human health, domestic animals, fish, wildlife and the environment. The current

CCWHC programs of disease surveillance, information, education, and response and management will be incorporated into the NWDS partnership and enhanced as required to achieve NWDS goals.

The NWDS articulates specific goals with respect to prevention, early detection, rapid response and scientific management of disease issues involving wild animals, and additional goals with respect to education of scientific and technical personnel and communication systems to link together all components of the Strategy and to keep the public accurately informed.

Implementation of the Strategy is a large and complex task, but one that has been well thought out and is fully achievable. Although important components can be implemented quite quickly, other components will require several years to put in place, and resources for the Strategy must be identified and allocated to this purpose. The Ministers' approval of the NWDS has given the green light for the NWDS team to forge ahead.

A Chronic Wasting Disease Control Strategy for Canada

At their October 5th meeting, the Resource Ministers Council also approved the National Chronic Wasting Disease Control Strategy (NCWDCS). At their 2004 meeting, the Ministers Council directed that a national strategy to control Chronic Wasting Disease (CWD) be developed immediately, using the draft NWDS as a template; the CWD strategy was to be completed for review and approval at the 2005 meeting. Development of the NCWDCS was initiated by the Canadian Wildlife Directors Committee which assembled a Technical Working Group of health and wildlife specialists drawn from Federal and Provincial agencies (wildlife, agriculture, public health) and the CCWHC to write the document, and an Inter-agency Oversight Committee, inclusive of all relevant government agencies, to which the Technical Working Group reports.

The goal of the NCWDCS is to eradicate CWD from Canada or to control it so it does not spread to new geographic areas or species. The need for such a national approach has been demonstrated by the recent discovery of CWD cases in Alberta and New York State, and by the expansion of the disease within Saskatchewan. Approval by the Ministers Council is a confirmation to the leadership of the NCWDCS that control of CWD is an urgent matter of high national priority and that implementation of the control program should proceed at once.

Canada's Inter-agency Wild Bird Influenza Survey

Because of growing interest in Influenza A viruses in wild birds around the world, the CCWHC began organizing a national survey of these viruses in wild ducks beginning in October 2004. Using the draft National Wildlife Disease Strategy as a template, the survey was

organized so as to make maximum use of existing government agency programs. These days, government departments and agencies often are depicted in the media as isolated silos or thick-walled fortresses with little or no capacity for inter-departmental or inter-government cooperation. In organizing this Survey, the CCWHC found government agencies to be quite the opposite; there was immediate agreement to work together and share the cost so that this national survey could take place. The Canadian Wildlife Service, assisted by Ducks Unlimited Canada in British Columbia and OMNR in Ontario, collected samples from 500-800 wild ducks in each of 6 different flyways in British Columbia, Alberta, Manitoba, Ontario, Quebec and the Atlantic region. Governments of the provinces in which the samples were collected (variously, departments responsible for agriculture, health or both) agreed to screen all samples for Influenza viruses by PCR and to isolate virus from all positive samples. The Canadian Food Inspection Agency and the Public Health Agency of Canada (PHAC) each agreed to do further work on all of the viruses isolated and to archive the samples for future reference. PHAC also generously provided funds to the CCWHC to cover the cost of database development and management, and other costs associated with organizing and managing the Survey. Thus, this Survey, with a total cost of about \$400,000, is being carried out with in-kind participation by multiple government agencies covering more than 75% of the total cost. This is cooperation and collaboration of the very finest kind, with the 'silos' found to have many functional and cordial connections.

As of November 2005, sample collection and preliminary testing of samples was nearly complete. All results of the Survey will be placed in a national database modelled on the CCWHC West Nile virus database and accessible to participating agencies. A small Federal-Provincial committee has established a communications policy for the survey results and for other non-technical matters of Survey governance.



Update from the Centre for Coastal Health

Located on the campus of Malaspina University-College in Nanaimo, B.C., the Centre for Coastal Health (CCH) has served as a west coast node of the CCWHC for a number of years. The Centre is a non-profit consortium of academic interests focusing on the interaction of human, animal and environmental health. The core staff of three veterinary epidemiologists (Drs. Erin Fraser, Jane Parmley and Craig Stephen) manages and operates projects, networks and research groups as well as a support staff of research assistants and students dedicated to helping people make health decisions at population, community and systems levels.

This year marks the tenth anniversary of the CCH as well as a year that has seen an important increase in the Centre's capacity. First, Craig Stephen was awarded a Canada Research Chair in Integrating Human and Animal Health. The focus of this Chair is to investigate both how animals present health risks to people through emerging disease and how animals, including wildlife and aquatic animals, provide health benefits through safe and secure food and water supplies. Second, the CCH has received funding to build research infrastructure to better support our researchers and visiting students and faculty. Finally, Dr. Jane Parmley joined our scientific staff this June. Jane has recently finished her doctoral work at the university of Guelph focusing on disease surveillance.

Recent CCH projects of interest to the wildlife community include:

- Health management guidelines for species-at-risk recovery planning
- Protocols to deal with chytrid disease and iridovirus in endangered amphibians in BC.
- Transmission ecology of avian influenza in the Fraser Valley
- Ecosystem health assessment for a project examining the effects of decommissioning a hydroelectric dam
- Risk to wildlife from backcountry use of camelids
- Assisting CWS projects examining the impacts of agricultural pesticides on wildlife
- Risk assessments on translocation of fish and wildlife both in Canada and abroad.

The CCH also hosts and directs the Animal Determinants of Emerging Disease Research Unit, a national network of researchers interested in zoonotic diseases, funded by The Michael Smith Foundation.

The CCH is playing an expanding role in CCWHC activities. For more information, please go to the websites listed below.

Centre for Coastal Health: <http://web.mala.bc.ca/cch/>
 Animal Determinants of Emerging Disease Research Unit: <http://web.mala.bc.ca/cch/ADED.htm>



WNV in non-corvid species

Since its detection in New York in 1999, West Nile Virus has spread rapidly and extensively across North America. The virus is now known to affect over 250 species of birds, 35 species of mammals and 2 species of reptiles over a large geographic area that, in Canada, spans from Nova Scotia to Alberta.

Beginning in 2000, the CCWHC, in conjunction with federal, provincial, and territorial agencies responsible for health, agriculture and wildlife, organized and

operated the wild bird surveillance component of the National WNV surveillance program. In addition to the thousands of crows and their close relatives that have been examined under this program (approximately 30,000 to date), the CCWHC has documented disease, due to WNV, in 21 other species through its regular system of wildlife disease surveillance. A search of the CCWHC database revealed approximately 100 confirmed cases from 5 provinces over a 4 year time period (2002-2005 inclusive).

Of these cases Eagles, Hawks and Owls are the most commonly affected species. In addition to these larger birds, positive West Nile Virus diagnoses have been documented in such species as American Robins, Eastern Bluebirds, Cedar Waxwings, Merlins, American Kestrels, Eastern Gray Squirrels, Red Squirrels and the endangered Sage Grouse (Figures 1 and 2).

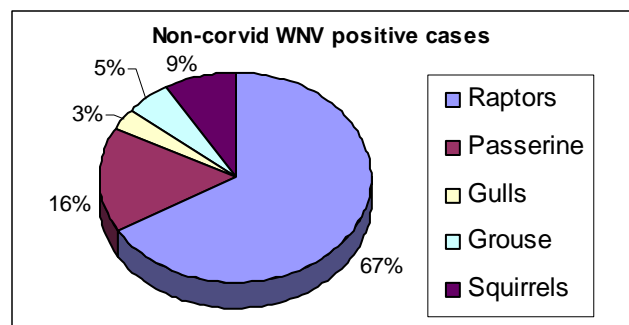


Figure 1 - West Nile Virus infection identified in Canada in the general wildlife disease surveillance program, 2002-2005, by taxonomic group.

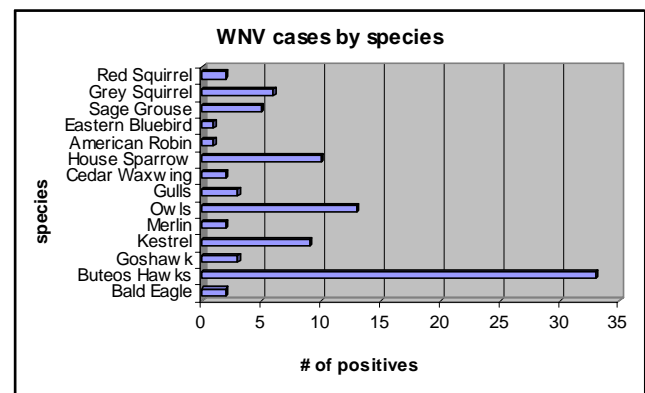


Figure 2 - West Nile Virus infection identified in Canada in the general wildlife disease surveillance program by species.

These cases show that West Nile Virus affects a broad range of Canadian wildlife. The nature and range of its impact remains to be determined. However, having never previously been exposed to the virus, North American wildlife populations are, in general, vulnerable, creating the potential for detrimental population impacts on some species, such as the endangered Sage Grouse. (Patrick Zimmer – CCWHC HQ)

How Many Deer in Canada?

As part of its work on the National Chronic Wasting Disease Control Strategy, the CCWHC assembled population estimates for wild cervids (deer family) from wildlife agencies across the country (Figure 3). Since no national wildlife population statistics are maintained in Canada, the results of the survey provide a unique compilation of national population data for cervids. These data were provided to the CCWHC in the winter of 2004-05, thus census updates that may have become available since that time are not included.

| Province/ Territory | White-tailed Deer | Mule Deer | Elk | Moose | Caribou | Total |
|------------------------|-------------------|----------------|---------------|----------------|------------------|------------------|
| BC | 78,050 | 138,950 | 47,650 | 179,195 | 19,410 | 463,255 |
| AB | 240,000 | 155,000 | 28,000 | 141,000 | n/a | 564,000 |
| SK | 380,000 | 50,194 | 15,211 | 44,089 | n/a | 489,494 |
| MB | 190,000 | 500 | 7,000 | 32,000 | 3,050 | 232,550 |
| ON | 400,000 | n/a | 450 | 115,000 | 21,000 | 536,450 |
| QC | 415,000 | n/a | n/a | 109,879 | 1,100,000 | 1,624,879 |
| NB | 80,000 | n/a | n/a | 22,000 | n/a | 102,000 |
| NS | 46,625 | n/a | n/a | 10,330 | n/a | 56,955 |
| NF/LB | n/a | n/a | n/a | 120,000 | 530,000 | 650,000 |
| YK | n/a | 450 | 350 | 67,500 | 34,000 | 102,300 |
| NT | 1,000 | n/a | n/a | 35,000 | 1,534,000 | 1,570,000 |
| NU | n/a | n/a | n/a | n/a | 650,000 | 650,000 |
| Total | 1,830,675 | 345,094 | 98,661 | 875,993 | 3,891,460 | 7,041,883 |

DISEASE UPDATES

Atlantic Region



Fatal Encounter of a Great Horned Owl With a Porcupine

An adult female Great Horned Owl (*Bubo virginianus*) in very poor body condition was found alive near Saint John, New Brunswick, in October 2004 and was subsequently killed humanely. Its ventral side, literally from head to toes, was covered with large numbers of porcupine quills embedded in the skin (Figure 4).

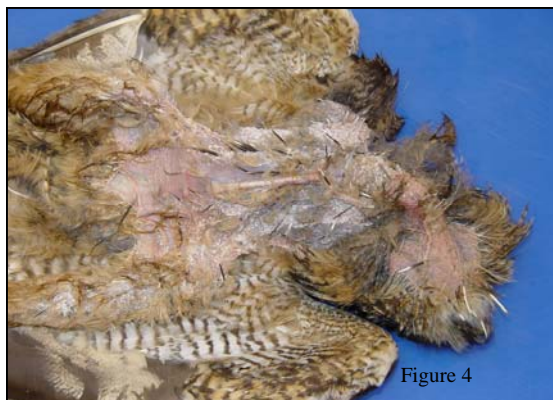


Figure 4

As is typical of porcupine quills, large numbers had migrated into the bird's soft tissues. However, the extent of this migration was remarkable in this case. Numerous quills had penetrated through the flight (breast) muscles and had accumulated on the outer surface of the keel bone. Several quills had also penetrated into the body cavities;

some were lying among the loops of intestine, others were embedded in the liver, and a few were lying in close proximity to the heart. Although numerous quills had penetrated the internal organs and tissues, the damage they caused was comparatively minor. However, damage to the bird's flight muscles likely contributed to its poor body condition by preventing the owl from flying and thus foraging normally.

The Great Horned Owl is widely distributed throughout most of North America and is the largest resident forest owl in Atlantic Canada. Wherever it occurs, its diet is usually broad and composed of small to medium-sized birds, mammals and, more rarely, fishes and carrion. In Atlantic Canada, the most important winter prey are snowshoe hare, red squirrel and, to a lesser extent, ruffed grouse, all of which are patchy and subject to irregular population cycles. Owls found in abundance in semi-rural, agricultural or urban habitats typically are more varied in their diet. In such environments prey species often include Norway rats, rock pigeons, crows and, less frequently, skunks, muskrats, ducks, pheasants, mice and meadow voles.

Great Horned Owls are known to form monogamous pairs, often occupying territories for several years, assuming prey is in good supply. Extreme conditions, however, such as abnormally severe winter weather and low prey abundance can lead to severe energy deficits,

non-breeding, territory abandonment and starvation. Under such conditions, Great Horned Owls have been known to prey upon rather bizarre and sometimes formidable prey species including domestic cats, small dogs, skunks, marten and, as in this case, porcupines. One would speculate that young owls are more subject to misidentification of prey in the absence of experience or refined hunting skills. Starving wintering adults might also be less discriminating in their prey choices and more likely to attempt preying upon non-traditional, potentially harmful food items like porcupine. Instances of Great Horned Owls feeding upon porcupines are documented in the literature (see for example RW Tufts: Birds of Nova Scotia. 1973). Such meals are not necessarily fatal. Museum taxidermists have found porcupine quills deeply embedded in the legs and facial area of Great Horned Owls that died from other causes.

(Pierre-Yves Daoust, CCWHC; Mark Elderkin, Nova Scotia Department of Natural Resources; Joe Kennedy, New Brunswick Department of Natural Resources)



Total Amputation of Extremities in a Raccoon

In March 2005, a young adult male raccoon (*Procyon lotor*) with a very unusual appearance was shot in a barn in southern Nova Scotia. On close examination, this animal was found to have lost all its extremities: ears, nose, upper lip and front teeth, both front limbs from the wrists down, both hind legs from the hock down, and the tail (Figure 5). Most amputated surfaces, including the stumps of the limbs, were well healed and completely covered by skin. Remarkably, this animal was still in moderate nutritional condition, having good muscle mass



Figure 5 - complete amputation of extremities

and a small to moderate amount of fat. The injuries were estimated to have occurred at least a few months previously, i.e. in mid-winter.

The nature and distribution of tissue damage in this raccoon strongly suggested frostbite to the extremities and subsequent dry gangrene. However, it is difficult to

(Aussi disponible en français)

imagine how this could happen in an otherwise healthy indigenous wild mammal, without some other contributing factor. It also is conceivable that a severe infection with a certain bacteria could have caused such a loss of extremities. There are reports of such occurrences in the veterinary and human medical literature. Such bacterial infections can result from injuries sustained during fighting. Such injuries and infection occurring at the coldest time of year could have been enough to cause loss of blood supply to the extremities. We will never know the actual cause in this case. It is remarkable, however, that this raccoon had recovered from such severe injuries, a testament to the amazing resilience of some animals.

(Pierre-Yves Daoust and Andrea Bourque, CCHWC; Peter MacDonald, Nova Scotia Department of Natural Resources)



Foot Gangrene in Northern Gannets

The Atlantic Regional Centre of the CCWHC examined approximately 150 dead Northern Gannets (*Morus bassanus*) between 1988 and 2004. Ten of these birds (nine young of the year, one adult) had completely lost the soft tissues of one or both feet, with tissue death and inflammation usually extending up the leg to the hock joint (Figure 6 - an affected foot on the reader's right).



Figure 6

This type of damage is known as dry gangrene and usually is caused by a loss of blood supply to the feet followed by secondary bacterial infection of the dead tissue. So far, we have been unable to discover a cause for this dramatic abnormality. Some of the possible causes that we have considered include entanglement in fishing line or netting for an extended period of time, toxins, bacteria as discussed in the case of the raccoon above, parasites of blood vessels that might stop blood flow, and constriction of blood vessels from prolonged contact with cold water. However, none of these seems very likely, and we have no observations or evidence to support any one of them. We have not seen a similar condition in other seabird species.

(Pierre-Yves Daoust, CCWHC)



Avian cholera in the St. Lawrence Estuary in the Common Eider (*Somateria mollissima dresseri*)

Approximately 35 colonies of Common Eiders are found in the St. Lawrence Estuary, the total population of which is currently estimated at 25,000 to 30,000 breeding pairs. Historical information indicates that these nesting colonies have supported at least 40,000 pairs, which is the target population established by the Joint Working Group on the Management of the Common Eider (2004). There has been the recurrent loss of breeding eiders due to avian cholera in this population, and this is of considerable concern as it has the potential to significantly limit the size of the population. During the last avian cholera epizootic in 2002, 7,000 birds were found dead on the St. Lawrence islands and it is suspected that as many as 10,000 may have died, of which about 87% were females. This represented one fifth of the estimated St. Lawrence estuary population.

Until recently, the majority of information regarding St. Lawrence Common Eider population trends has been collected by *Duvenor*, a non-profit organization dedicated to the conservation of the St. Lawrence Estuary islands. Since 1984 this organization, which harvests eider down as part of its conservation and monitoring programs, has conducted nest surveys during the harvest and recorded by species and sex the number of birds found dead. Their surveys cover more than 20 islands and islets in the St. Lawrence, which include approximately two thirds of the breeding population of Common Eiders. Another organization, the *Société pour la protection des eiders de l'estuaire*, holds the permit to collect down in the largest colony (approximately 10,000 pairs) located on Ile Bicquette.

Although colonies on the north shore of the St. Lawrence have not been visited as regularly nor for as long a period of time, no major outbreaks appear to have been detected there. In contrast, outbreaks were detected on the south shore colonies in 1984/88, 1994 and 2002. There is also a record of an epizootic dating back to the 1960's on Ile Blanche, located near Rivière-du-Loup.

Avian cholera is a disease of many different species of birds caused by infection with the bacterium *Pasteurella multocida* (unrelated to human cholera). On the St. Lawrence islands, it has been suspected that poor soil drainage along with dense vegetation cover could contribute to the maintenance or recurrence of avian cholera. Poor soil drainage results in the persistence of small freshwater pools contaminated by bacteria throughout the reproductive season. Dense vegetation

cover (Figure 7) may further reduce pool evaporation by blocking the sun and wind, and serve to prevent sunlight UV rays from reaching the stagnant water and killing the bacteria.



Figure 7

Cover also could reduce scavenging, and removal, by gulls and hence of dead or sick birds which can then become potential sources of further infection. However, the Ile aux Pommés colony does not seem to support this theory; the island is dome-shaped and well drained, yet avian cholera occurred there in 2002. Furthermore, on Ile Bicquette, which is heavily wooded in some areas and has poor drainage, only one outbreak (2002) has been detected in the last fifty years. Before 1985, Ile Blanche, which was densely covered by tress and shrubs, supported 4,000 to 5,000 breeding pairs of eiders and experienced several outbreaks. Intensive habitat modification was conducted by Ducks Unlimited Canada on that island in an attempt to eliminate the factors believed to promote outbreaks. Trees and shrubs were cut, piled and burned. Drainage was improved and grass was seeded, followed by the transplantation of small spruce trees and installation of artificial shelters for nesting eiders (Figure 8). Despite these efforts, a major episode of avian cholera took place again on Ile Blanche in 2002, with as many birds found dead as during the major episode in 1985. It appears that the first attempt at eliminating outbreaks by managing habitat was not entirely successful in the long run. The effect of habitat on the epizootiology of avian cholera requires re-evaluation.

Despite intensive management of nesting habitat to alleviate conditions believed to promote avian cholera



Figure 8 - Ile Blanche after habitat alteration

in several colonies of the St. Lawrence Estuary, the population of Common Eiders has not increased. Recurrent epizootics of avian cholera, suspected high duckling mortality and possibly high hunter harvest rates are the most obvious limiting factors, although the relative importance of each on the dynamics on this population is currently unknown. A banding program was initiated in 2003 to determine the relative contributions of hunting and natural mortality, including disease, on the dynamics of this population. However, the epizootiology of avian cholera in Common Eiders of the St. Lawrence Estuary is not completely understood. For that reason, monitoring of the presence of *Pasteurella multocida* was initiated in live birds throughout the colonies. Oral swabs were taken from 103 and 174 nesting females in 2004 and 2005, respectively. Although no outbreak was observed in either year, *P. multocida* was detected in 8.7% and 30.5% of the ducks sampled during these two years. Nine birds were sampled for a second time in 2005. Four were negative in both years, three became positive and two positive birds in 2004 became negative in 2005. To our knowledge, this type of information has never been gathered for eiders and will greatly help to understand the ecology of avian cholera.

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Verminous pneumonia in beluga whales (*Delphinapterus leucas*) from the St. Lawrence Estuary

A retrospective study of cases of pneumonia caused by lung worm (verminous pneumonia) in St. Lawrence beluga whales was conducted in order to better characterize this parasitic syndrome found in this population. *Stenurus arctomarinus* and *Halocercus monoceris* are the two most commonly encountered lung

worms of beluga whales found stranded on the shores of the St. Lawrence Estuary. Adult worms of *H. monoceris* were found during the post mortem examination of 83% of the 117 carcasses included in this study. The probability of being infected by this species of lung worm was significantly higher for male beluga whales than females. Furthermore, parasitic loads of *Halocercus* sp. were, in general, higher in immature belugas compared to other age classes. Adult worms, most likely of the genus *Halocercus* sp., were also seen on occasion in lung sections from beluga calves under 1 year of age. This is suggestive of vertical transmission of this parasite from mother to calf (transplacental or transmammary). However, the relatively low prevalence and parasite load seen in non-weaned belugas strongly suggests that the ingestion of prey animals carrying the larvae of the worm is by far the most common route of infection.

S. arctomarinus was detected in the lungs of approximately 23% of the carcasses examined. This species of parasite was not seen in animals under 1 year of age, and, as is the case for *H. monoceris*, the highest prevalence was seen in immature animals. No significant differences were seen between seasons and years (1983 to 2003) of the study as far as these two parasitic diseases are concerned.

Adults of *S. arctomarinus* are easily seen with the naked eye and are usually found in the spaces within the bronchi of the lungs, associated or not with an inflammatory reaction (bronchitis) (Figure 9). In contrast, adult worms from the genus *Halocercus* sp. are tiny and are very difficult to see upon gross examination. Microscopic examination of lung tissues is usually necessary to diagnose infections of *Halocercus* sp.



Figure 9 - Cluster of *Stenurus* sp. floating in mucus filling the lumen of a secondary bronchus in a beluga whale.

Pneumonia associated with lung worms was considered the cause of death of 14.5% of the belugas examined. Thirteen of these fatalities were due to *Halocercus* sp., two to *Stenurus* sp. and two to a mixed infection (*Halocercus* sp. and *Stenurus* sp.). The majority of the lung worm-associated mortalities were observed in immature animals; over 40% of the mortalities reported in this age class (from 1 to 7 year of age) were due to lung worm infections (Figure 10). This high prevalence suggests that these parasitic diseases are an important cause of mortality in immatures, which represent the

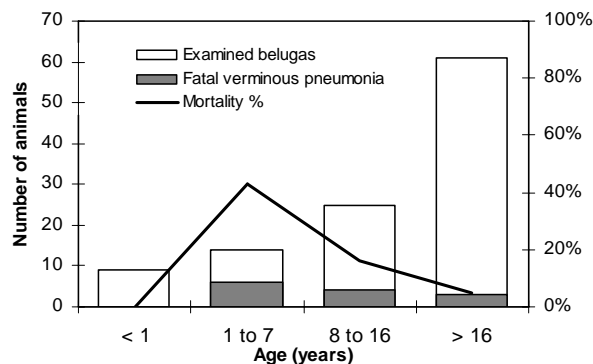


Figure 10 - Fatalities associated with verminous pneumonia in beluga whales from the St. Lawrence Estuary. Presented by age group (n=109).

future of the population. In addition, a negative association was observed between the load of lung worms and indices of body condition. Even if a causal relationship can not be established from the current data, it suggests that the presence of these two parasites may affect the health and survival of belugas in the St. Lawrence.

(Stéphane Lair and Bérengère Wyrzykowski, CCCSF - Québec.)

Ontario Region



Type E Botulism in Lake Ontario 2004 / 2005

Type E Botulism occurred in waterbirds, shorebirds and gulls on eastern Lake Ontario in the summer of 2004. Mortalities began in late July in Presquile and Sandbanks provincial parks, and continued sporadically throughout August before peaking in the first half of September. Birds were tested and found to have died of Type E botulinum toxin. Double-crested Cormorants (DCC) were the primary species affected (Figure 11). Affected birds showed weakness (wing droop, inability to fly) or paralysis, and many birds were



Figure 11 - affected cormorant

found dead. Large numbers of affected DCC were found on Scotch Bonnet Island, a cormorant nesting site. The majority of the DCC examined had fish in their gullets or stomachs, the likely source of the toxin. Mortalities also occurred in Great Black-backed Gulls, Ring-billed Gulls, Herring Gulls, and in a variety of shorebirds. The gulls

likely ingested toxin by scavenging dead cormorants, fish or other species that had died of botulism. A crow from this region that was found dead and initially submitted for West Nile virus testing also tested positive for Type E Botulism, again likely acquired by scavenging.

A second outbreak of mortality developed in mid to late October in the Hamilton and Burlington Beach region, in the westernmost part of Lake Ontario. In this area, Long-tailed Ducks were the primary species affected, with lesser numbers of scoters, gulls and shorebirds. The majority of the affected ducks had ingested large numbers of zebra mussels, the presumed source of toxin in these cases. Type E toxin was identified in approximately 35% of the birds tested, with better detection rates occurring if serum samples were used, or with tissue from freshly dead birds. This high mortality in cormorants and Long-tailed Ducks due to Type E Botulism is a new occurrence, as is the extent of mortality in eastern Lake Ontario. In 2004, over 1,750 bird carcasses were counted. Thus far in 2005, mortality due to botulism in both eastern and western Lake Ontario is occurring in lower numbers than in 2004, but with similar species involvement. Outbreaks of Type E botulism on the Great Lakes generally correspond with regions of zebra and quagga mussel colonization, with toxin apparently moving up the food chain and ultimately affecting fish-eating birds.

(Kate Welch and Doug Campbell - CCWHC)
 Collaborators: Tania Havelka, Cynthia Pekarik, Jeff Robinson, Laird Shutt and Chip Weseloh (CWS), Alastair Mathers and Don Tyerman (OMNR), Don Bucholtz (Sandbanks Provincial Park), Doug McCrae

Pesticide Toxicities in Birds

Avitrol (4-aminopyridine) is a colourless and odourless compound that is marketed as a bird 'deterrent', for the control of populations of birds such as European Starlings and Rock Doves which may be perceived as pests. Regulations limit the sale of this compound to licensed pest control operators. In low doses, which are obtained when the Avitrol bait concentrate (often treated whole corn) is correctly mixed with non-treated bait, it causes excitability and behavioural changes which lead to a 'fright and flight' response in the target birds. However, in higher doses (as would occur with inadequate mixing and dilution), it is acutely toxic, rapidly leading to incoordination, disorientation, convulsions and death. Birds also die of traumatic injuries following disoriented flight into walls or vehicles. We have seen over 20 incidents of mortality (with each incident often involving numbers of birds) thus far in 2005, which is similar to numbers seen in the past several years. The primary species affected are pigeons and starlings, but mortality also has occurred in other, 'non-target' species, including a Trumpeter Swan in 2004. Avitrol can be detected in the stomach contents of affected birds, or as residue in the liver.

Organophosphate (OP) pesticides are another cause of mortality in wild birds in Ontario, with over 20 incidents of mortality thus far in 2005. These pesticides are used especially to control white grubs and other insects in residential lawns and golf courses. In birds and mammals, OP's inhibit cholinesterase, an enzyme which normally acts to break down the neurotransmitter acetylcholine; thus, levels of acetylcholine build up and lead to persistent stimulation of the nervous system. The signs of toxicity include convulsions and respiratory arrest leading to death. The diagnosis is confirmed by finding low levels of brain cholinesterase and identifying OP in stomach contents. The most commonly affected species include Canada Geese, which graze on treated grass, and perching birds such as blackbirds, chickadees, and grackles, which are more likely to ingest granular forms of OP. In Canada, the Pest Management Regulatory Agency has phased out (as of 2004) the non-agricultural outdoor use of the OP's diazinon, which was the pesticide most widely used by homeowners on lawns, and malathion. Other OP's are undergoing re-evaluation.

(Kate Welch and Doug Campbell - CCWHC)



Virus Infections in Gulls and Cormorants on Lakes Erie and Ontario

Since 2000, the Ontario/Nunavut Region of the CCWHC has investigated virus infections (Avian Paramyxovirus 1 [APMV-1], Avian Influenza Virus [AIV] Circovirus [CV] and West Nile virus [WNV]) in gulls and Double-crested Cormorants on Lakes Erie and Ontario.

In 2000, 40 Ring-billed Gulls from three age classes (3 weeks, 5 weeks, and adult) were collected under permit from three colonies; Port Colbourne on Lake Erie and Hamilton Harbour and Leslie St. Spit (Toronto) on Lake Ontario. Serum was tested for AIV and APMV-1 antibodies, and virus isolation was carried out on tissues from the birds collected. Avian Influenza Virus H13N6 was isolated from 53 birds (15% prevalence overall); infection was most prevalent in 3-week-old birds, (up to 70% at Toronto), less common in 5-week-old birds, and was not detected in adults. Mean antibody titres to AIV increased between 3 and 5 weeks of age, reflecting active viral infection in chicks, and were higher than those in adult birds. No APMV-1 was isolated from gulls of any age, but on average, 79% of adult birds, 98% of 3 week-old birds, and 93% of 5 week-old birds had antibody titres to APMV-1 from the 3 collection sites. Mean antibody titres were static between 3 and 5 weeks, but were higher than those in adults.

In 2004, the study was repeated at the two Lake Ontario sites, with the variation that sample sizes were 100 birds of each age class, and virus isolation was attempted only on cloacal swabs, rather than from tissues of sampled birds. In contrast to 2000, AIV was not isolated from any birds. Overall, 80% of adult birds, 48% of 3-week-old birds, and 56% of 5-week-old birds had antibody titres to AIV. Mean titres did not change between 3 and 5 weeks at Toronto, and titres in adult birds were higher than in chicks, suggesting that antibody in chicks, at least at Toronto, may have been acquired through the yolk from antibody positive mothers, rather than in response to active infection. APMV-1 similar to those previously isolated from turkeys on the Niagara Peninsula were isolated from two 3-week-old gull chicks at Toronto. Prevalence of antibody to APMV-1 was 99% in 3-week-old chicks overall, 79% in 5-week-old chicks, and 54% in adults at the two sites.

H13 influenza A viruses are highly adapted to gulls. Shedding of this virus by Ring-billed Gulls seemed to be highly age related, and to varied markedly between years. Although a H13 virus has been isolated from a whale, transmission to mammals and other orders of birds is uncommon, and H13 are not considered to pose a significant threat to gulls themselves, or to domestic animal or human health. The H13N6 isolate obtained in 2000 replicated in chickens, but did not cause overt disease.

Exposure to APMV-1 now seems common in Ring-billed Gulls on the lower Great Lakes, in contrast to the situation in 1992, when antibody was rarely detected. The agent isolated in 2004 differs from the APMV-1 viruses that have circulated periodically in cormorants in Canada and the USA since 1990, but was similar to that isolated from domestic poultry within a radius of about 200 km.

No AIV or APMV-1 was isolated from cloacal swabs collected in 2004 from over 400 adult Double-crested Cormorants from Lake Ontario, while antibodies to APMV-1 were detected at low titre levels in 32/80 birds sampled. These results indicate that exposure of this population of cormorants to APMV-1 has been limited, and likely not recent, given the low titres.

Circoviruses, which in some species are associated with immunocompromise, were detected in lymphoid organs of 17% of 5-week-old Ring-billed Gull chicks sampled in 2000, but in only one 3-week-old chick, and no adult birds. A retrospective survey of tissues from gulls accessioned at Guelph between 1973 and 2001 revealed the first infected bird in 1973. Infections were detected in juvenile Ring-billed Gulls, Herring Gulls and Black-backed Gulls, but not in adult birds, with annual infection rates of up to 67% in substantial samples of juvenile birds in some years. Circovirus infection was significantly more common in birds with bacterial septicemia or aspergillosis than in birds with other diagnoses, but any conclusions regarding immunocompromise associated with circovirus infection in gulls are speculative.

West Nile virus has been diagnosed as a cause of death in a number of Ring-billed Gulls in Ontario, suggesting that they are good hosts for this virus, but none of the gulls sampled in 2004 were shedding WNV in their feces.

(Ian Barker - CCWHC)

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A mortality event in Freshwater Drum (*Aplodinotus grunniens*) from Lake Ontario, associated with viral hemorrhagic septicemia virus (VHSv), type IV.

Over the course of the summer of 2005, large numbers of dead and dying Freshwater Drum were observed by local fishermen within the Bay of Quinte (Lake Ontario) near Belleville, Ontario, and later eastward, towards the St. Lawrence river entrance. Moribund fish appeared lethargic and disorientated, to the extent that they could easily be caught by hand. In addition to Freshwater Drum, other dead fish were observed in the area including; Goby (*Neogobius melanostomus*) and Muskellunge (*Esox masquinongy*) and species of bass. Live fish were submitted by personnel from the Ministry of Natural Resources for examination. Externally, all fish exhibited extensive haemorrhages at the base of the pectoral and pelvic fins. In several of the fish, hemorrhages also extended from the mouth to anus and in some instances in the eye.

After extensive testing, RNA polymerase gene (L) sequence results detected viral haemorrhagic septicemia virus (VHSv), type IV strain, resembling an isolate from Japan (isolation performed by AVC, sequencing performed by CEFAS, Weymouth, England). Subsequent analysis by Fisheries and Oceans Canada has revealed that this virus may be more closely related to strains from wild, clinically normal marine fish from Eastern Canada.

VHS is categorized by the World Organization for Animal Health (OIE) as a 'Notifiable' disease. There is no indication that this virus is a threat to public health, however it is of concern for species of susceptible fish of any age. A wide variety of species can be infected, however clinical impact varies markedly with viral strain. Type IV strains are found in North America and can be isolated from Pacific herring routinely. The isolation of VHSv from the east coast and its similarity to the Ontario drum isolate may indicate the route of entry into the Great Lakes. The significance of the present case is the substantial scale of the mortality (one estimate is several hundred tonnes of drum), and this first isolation from North American fresh water fish. It has been proposed that VHSv in European salmonids (Egtved disease; managed by eradication in many countries) in freshwater originated from strains found in marine fish. The cause of death of large numbers of mature muskellunge that were noted during this mortality event remains to be determined.

(Dr. John S. Lumsden, Fish Pathology Laboratory, OVC)



Tularemia in Deer Mice (*Peromyscus maniculatus*) in West-central Saskatchewan

During the summer and autumn of 2004, very large numbers of deer mice were observed over an extensive area of the grain-growing region of western Saskatchewan. It has been estimated that as many as 1,000 mice may have been present per hectare in some fields causing considerable damage to standing crops in some areas. There also were reports of massive numbers of deer mice killed on highways in the same area during the early spring of 2005. In April 2005, a single dead deer mouse was submitted to the CCWHC by a Pest Control Officer who had observed the mouse to die at a site where “hundreds” of dead mice were evident. Because of the risk of hantavirus carried by some deer mice, the animal was necropsied and all subsequent testing was done within a biosafety cabinet. No gross lesions were observed, but massive numbers of small bacteria within blood vessels were observed microscopically. Upon further testing, the bacterium was confirmed to be *Francisella tularensis* the cause of tularemia. During subsequent investigations in the area, dead mice, from which *F. tularensis* was identified, were found at three additional sites, approximately 11, 12 and 47 km from the original site. Organisms from three of the sites were characterized as *Francisella tularensis* subsp. *holarctica* by the National Microbiology Laboratory, Public Health Agency of Canada, Winnipeg.

The occurrence of very large numbers of deer mice over a substantial geographical area, with extensive crop damage, resembles population irruptions of voles (*Microtus* spp.) described in the USA and Asia, and plagues of house mice (*Mus musculus*) that occur in grain-growing areas of Australia. Based on questionnaires sent to rural municipalities, the affected area in Saskatchewan was greater than 22,000km². Massive irruptions of deer mice of this type have not been reported previously. Although *F. tularensis* has been isolated from healthy deer mice during surveys for plague, this is apparently the first report of wild deer mice dying of tularemia. The total extent of the disease outbreak is unknown, but dead mice were reported over a much larger area than was sampled for disease.

Francisella tularensis is a zoonotic agent, but no human cases were reported from the area. *Francisella tularensis* subsp. *holarctica* is usually associated with microtine rodents, including voles and muskrats (*Ondatra zibethicus*), and is thought to be transmitted through water. It causes type B tularemia, a form less virulent for both humans and animals than is type A, caused by *Francisella tularensis* subsp. *Tularensis*. Type A is associated with rabbits and hares, and with transmission by ticks

and biting insects.

Why the population irruption occurred, where *F. tularensis* originated from, and how it was transmitted among the deer mice are unknown. Tularemia also has been reported during the population decline phase of vole irruptions in the USA.

(Gary Wobeser - CCWHC)



Hibernation-Associated and Early Post-Emergence Mortalities of Vancouver Island Marmots (*Marmota vancouverensis*) in British Columbia, May 2005

The number of Vancouver Island marmots (*Marmota vancouverensis*) in British Columbia has seen a dramatic decline over the last 20 years, from approximately 300 to 350 individuals in 1984 to 30 to 35 animals in 2004. This loss has spurred an intensive program of captive propagation at two British Columbia facilities and at the Calgary and Toronto Zoos. Through these efforts, nine captive-born Vancouver Island marmots were released during the summer of 2004 into natural habitat on Vancouver Island as part of a long-term effort to restore the wild population. Subsequently, between May 7-20 2005, one of the released marmots were found dead shortly after emerging from hibernation and two additional carcasses were recovered from a wild hibernaculum. In addition to these individuals, one wild marmot was found dead shortly after emergence from hibernation and a captive marmot was found dead in his enclosure at the recovery centre on Vancouver Island and another was killed humanely at the Langley, BC site due to a malignant tumour found in its nasal cavity.

Of those animals which succumbed within the hibernaculum, the time between mortality and the discovery of the carcasses could not be determined due to the extent of post mortem decomposition. In each of the four animals collected from the wild, there was profound reduction in body condition. Post mortem examinations disclosed multiple degenerative and, to a much lesser extent, infectious disease processes. Bacterial culture yielded variable growth of *Yersinia enterocolitica* (2 of 4 animals), *Staphylococcus aureus* (1 of 4 animals) and *Corynebacterium kitcheri* (1 of 4 animals). Toxins of *Clostridium difficile* were detected by serology (2 of 4 animals) The contribution of these bacteria to marmot illness is unknown. However, based on extrapolation from other wildlife species, these microbes may pose health threats to marmots and efforts to further characterize the carrier status and potential pathogenicity in captive, wild

and released animals is recommended. The ultimate cause of the increased loss of hibernating marmots is likely multifactorial and still not resolved. In contrast to previous years, compact snow did not accumulate until late February and the possibility of environmental factors or suboptimal body condition at the time of initial hibernation cannot be discounted.

The captive individual that was found dead at the Tony Barrett Mount Washington Marmot Recovery Centre on Vancouver Island had pneumonia, although the ultimate cause of death was a bacterial infection of the intestine. Special cultures and molecular studies of pooled tissues from this marmot also detected the bacterium *Mycoplasma hominis*, the importance of which is not known.

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Post Mortem Findings in Small Cetacean Strandings in the Pacific Northwest, 1999-2004

Within the Pacific Northwest, stranding networks coordinate both the recovery and the subsequent post mortem examination of dead, beach-cast marine mammals. These networks are comprised of a mix of government agencies responsible for fisheries and wildlife, academic institutions and various NGOs. Between 1 January 1999 and 31 December 2004, these networks recovered 104 small cetaceans, and examinations were carried out on 72 Harbour Porpoises (*Phocoena phocoena*), 17 Dall's Porpoises (*Phocoenoides dalli*), 9 Pacific White-sided Dolphins (*Lagenorhynchus obliquidens*), 2 Common Dolphins (*Delphinus delphis*), 1 Northern Right Whale Dolphin (*Lissodelphis capensis*), 1 Bottlenose Dolphin (*Tursiops truncatus*), and 2 unidentified individuals. The age and sex distribution of these animals was 72 adults, 25 juveniles and 7 neonates with 50 males, 47 females and 7 cases of unknown gender.

A proximate cause of death was determined in 40-60% of all examined animals. Prime contributors to morbidity and mortality included infectious disease, trauma (aggression), emaciation, and possible metabolic disturbances. In addition, several bacterial pathogens were isolated, the most common including *Edwardsiella tarda*, *Clostridium difficile* and *Pseudomonas* spp., with sporadic cases of *Salmonella* spp, *Vibrio vulnificus*, *Brucella* spp, and *Enterococcus* spp. The first multispecies outbreak of infection with the fungus *Cryptococcus neoformans gatti* occurred on Vancouver Island and adjoining coastal waters, and included 15 cases in stranded Dall's and Harbour porpoises.

Due to the relative abundance of beach-cast

animals, these marine mammals provide an excellent opportunity to define baseline information on established and potentially emerging disease concerns in the Pacific Northwest. Also, based on these recovery operations, an apparent seasonal stranding pattern has emerged for Harbour and Dall's porpoises. Although solitary animals have been recovered during each month of the year, an increased number of recovered animals occurred from late May to early June, with a second smaller clustering of stranded animals in September and October.

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Avian Cholera in Double-crested Cormorants in Saskatchewan

High mortality of Double-crested Cormorants occurred at the nesting colony on Island A, Doré Lake, Saskatchewan, in August 2005. The colony site was visited on 17 August and a total of 2,350 dead cormorants were counted on this small colony island. Dead cormorants littered the island and were concentrated along the water's edge in layers of dead birds up to five deep. Some had died on tree perches and were held in place slumped against branches while still gripping the perch. Dead cormorants also were found in shoreline reed beds and on the shore of an adjacent island, and probably were widely distributed around Doré Lake (approximately 25 x 35 km in size). Twenty-five American White Pelicans and one each of three species of sandpiper (Western, Semipalmated and Least) also were found dead on Island A. The majority of birds found dead were full-grown hatch-year cormorants fully capable of flight, but some dead adults were also found. *Pasteurella multocida*, the bacterium that causes Avian Cholera, was isolated from tissues taken from both hatch-year and adult cormorants, from one of 2 pelicans that were suitable for examination, and from each of the three species of sandpiper. The Island A colony consisted of 4,740 active cormorant nests as estimated from aerial photographs taken in early June 2005 during incubation. The average rate of nestling survival to 3 weeks of age at Island A (1994-1996) was estimated at 1.38 per nest. Thus, the total population of cormorants at the start of the outbreak was approximately 9,480 breeding adults and 6,541 hatch year birds. Assuming that 90% of the dead cormorants were hatch-year birds, the minimum death toll of hatch-year birds represented by the carcasses counted is 32 % of the total. Actual total mortality remains unknown, but was likely as

Announcements

Change in the Regulatory Status of Ketamine and Its Implications for Wildlife Professionals

Ketamine is a drug used widely in Canada for the capture and restraint of wildlife. It is also increasingly used in this country as a “party” drug and as a “date rape” drug. Health Canada, in an effort to reduce the illegal use of this drug, has removed ketamine from Schedule F of the *Food and Drug Regulations* and instead has listed it in Schedule I of the *Controlled Drug and Substances Act* and in the Schedule of the *Narcotic Control Regulations*. Thus, all offenses and penalties associated with narcotic and controlled drugs are now also applicable to ketamine.

At present, all persons conducting research or wildlife management activities (e.g., problem wildlife control) using ketamine are required to apply for an **Experimental Studies Certificate** and an **Exemption to Use a Controlled Substance for Scientific Purposes** as follows:

Application for an Experimental Studies Certificate (ESC) – The application form for an ESC can be downloaded from the Veterinary Drugs Directorate (VDD) at http://www.hc-sc.gc.ca/dhp-mps/vet/applic-demande/form/esc-cee_08-2002_cp-pc_e.html

With the exception of employees of federal government departments, all applicants must pay an application fee of \$960 for non-food animal species (which would include most wildlife species), \$2,900 for food-producing species, and \$480 for renewal of a previously issued ESC. The application must pertain to a single protocol only, e.g., the use of ketamine with xylazine for the immobilization of problem black bears. If ketamine is to be used for more than one protocol, then separate applications are required for each protocol. Upon submission, the application is reviewed by the VDD and recommendations are forwarded to the Office of Controlled Substances, Healthy Environments and Consumer Safety Branch in Health Canada for the final decision.

Application for an Exemption to Use a Controlled Substance for Scientific Purposes – The application form for an exemption, and instructions to complete it should be requested by e-mail from the Office of Controlled Substances at exemption@hc-sc.gc.ca

Submission of these applications does not guarantee approval. Instead, applications are reviewed on a case-by-case basis, and decisions are made accordingly.

The procedures, as outlined here, are raising significant concern among wildlife professionals across Can-

ada that the accessibility and use of ketamine for wildlife management and research will be greatly restricted by numerous factors, including the cost of applying for an ESC, the burden of paperwork required to complete both applications, and the potential for significant delays in obtaining approval. To address this concern, the Ontario Ministry of Natural Resources has recently formed a working group with broad representation (including the Canadian Cooperative Wildlife Health Centre and Canadian Association of Zoo and Wildlife Veterinarians) to work with Health Canada to develop a mutually acceptable solution.

(Marc Cattet – CCWHC Headquarters)



New Wildlife Disease Position for the Canadian Wildlife Service

The Canadian Wildlife Service (CWS) and its National Wildlife Research Centre have recently created and filled a Wildlife Disease Specialist position. Dr. Emily Jenkins initially will be based at the Prairie and Northern Region branch of the CWS in Saskatoon. In consultation with existing regional, provincial, and national reservoirs of expertise, she will explore the interactions of pathogens and other stressors and their effects on the health of wildlife. In addition to developing a field and laboratory-based research program, she will contribute to existing projects, and collaborate in the development and implementation of new projects with relevance to wildlife health. In collaboration with the CCWHC and other agencies, Dr. Jenkins also hopes to facilitate the dissemination of scientific information and advice to scientists and resource managers on issues pertaining to wildlife disease and health.



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