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Canadian Cooperative Wildlife Health Centre

Centre Canadien Coopératif de la Santé de la Faune

Newsletter Volume 4 - 2, Winter 1996

In this issue:

CCWHC News

Involvement in Mexico

As part of the follow-up to a waterfowl die-off in Mexico during the winter 1994-95, [WildlifeHealth Centre Newsletter Vol. 3(3)], CCWHC has remained involved with an international working group to implement recommendations of a panel formed by the Commission on Environmental Cooperation. One activity involves CCWHC and the National Wildlife Health Centre, U.S. Geological Service, assisting the Mexican government in presenting a short course on migratory bird diseases, disease investigation and control. This 4 day course is to be held in Leon, Mexico, in November 1996. As part of this course, the Procuraduria Federal de Protección al Ambiente has translated the CCWHC Wildlife Disease Investigation Manual into Spanish. We expect to have copies of the Spanish translation available in the near future.

Feature Articles

New Diagnostic Tools

Improved diagnostic tests are continually being developed, with the objective of having tests that are faster, less expensive, more accurate, sensitive and specific, and that do not require use of experimental animals or involve risk to laboratory workers. Three new tests are described in this issue: serologic tests for nematode parasites of ungulates, an immunologic test for botulism, and use of immunohistochemistry to diagnose tularemia. Each of these has specific advantages; the first will allow much earlier diagnosis of worm infections in game farm animals; the test for botulism replaces one in which it was necessary to kill laboratory mice to diagnose botulism, and the test for tularemia reduces the risk to laboratory workers associated with culturing the causal bacterium Francisella tularensis.

ELISA for botulism

Botulism in waterfowl traditionally has been diagnosed by injecting serum from sick birds into groups of laboratory mice, some of which also receive protective antiserum. In a positive test, unprotected mice develop paralysis and die, while mice protected with antiserum against Clostridium botulinum type C toxin remain healthy. This is a relatively sensitive test, but requires collecting a large amount of blood from sick birds, separating serum prior to testing, and the use of many mice (preferably six per bird tested). The

National Wildlife Health Center (NWHC), U.S. Geological Survey, in Madison, Wisconsin has developed an immunological test called an Enzyme Linked Immunosorbent Assay (ELISA). ELISA kits for diagnosing botulism kindly provided to the CCWHC, Western/Northern Regional Centre by Dr. Tonie Rocke (NWHC) have been tested this summer in several outbreaks in Saskatchewan. Wherever possible, both the traditional mouse inoculation method and the ELISA were used. Our initial assessment is that the methods are of similar sensitivity and require about the same amount of time to perform. However, the ELISA test is preferable because field workers don't have to collect large blood samples and separate serum, and no laboratory animals are required for diagnosis. (Gary Wobeser, CCWHC W/N Region)

Blood Tests for *Elaphostrongylus cervi* and *Parelaphostrongylus tenuis*

Agriculture and Agri-Food Canada is developing simple and reliable blood tests to detect infection in ungulates by the tissue worm Elaphostrongylus cervi and the meningeal worm Parelaphostrongylus tenuis. This is being done by identifying antigens unique to these worms and developing tests based on the reaction between these antigens and antibodies from the blood of infected animals. To obtain worm antigens, third stage larvae (L3, the stage infective to ungulates) were produced. To do this, first stage larvae (L1) from the droppings of deer infected with the parasites 4 or more months earlier were exposed to slugs and snails, the intermediate hosts. Six to eight weeks after exposure, the snails or slugs were digested and L3 worms obtained.

Two types of antigens have been obtained from the L3's. The first type, known as Excretory/Secretory (ES) antigens, are produced by the worm but released into their immediate environment, while the second type of antigens, the Somatic antigens, are located on or inside the worm. We have been able to obtain ample quantities of both types of antigens from E. cervi and P. tenuis. The Somatic antigens are made up of over 30 different subtypes of antigen. The ES antigens also contain a number of components but fewer than the Somatic antigens. The ES product of E. cervi consists of at least 10 different protein bands. Antibodies against three of the ES antigens have been detected in red deer (Cervus elaphus) fawns infected with different numbers (6, 20 and 100) of E. cervi worms. Antibodies against these proteins were detected as early as 23 days after infection. In contrast, the earliest time excreted worms were obtained from these animals by fecal examination was at 123 days after infection. The potential implication of this promising result is that a serological test against E. cervi will make it possible to detect animals infected with very few parasites within the first month of infection. We expect that we will be able to detect antibodies to ES antigens of P. tenuis very early post infection, as we have with E. cervi, when we have completed the parallel work with P. tenuis in white-tailed deer (Odocoileus virginianus). (Alvin Gajhadar, Health of Animals Laboratory, Agriculture and Agri-Food Canada, Saskatoon, SK).

Safer Test for Tularemia

The immunology laboratory of the Department of Veterinary Microbiology, University of Saskatchewan, now offers a test for Francisella tularensis, the bacterium that causes tularemia, that can be applied to tissue samples preserved in formalin. The test employs a technique known as immunohistochemistry (IHC). Since it can be applied to preserved

tissues in which the bacterium is dead, there is no risk of infection to laboratory personnel. Francisella tularensis can be difficult to identify in tissues by more classical methods and the IHC test circumvents this problem as well.

Hook Lake Wood Bison Recovery Project Progress Report - July 1996

The northern diseased bison issue has been the focus of considerable attention in Canada over the last decade. Bison (Bison bison) in and around Wood Buffalo National Park (WBNP) are the last reservoirs of bovine tuberculosis and brucellosis in Canada. The two diseases were introduced when over 6,600 plains bison from Wainwright Buffalo Park in central Alberta were moved to WBNP during the 1920's. Tuberculosis was first reported in WBNP bison in 1937, and brucellosis was confirmed in 1956. Since then, the diseases have been found in all sub-populations within WBNP, and in bison in the Slave River Lowlands northeast of the Park. The total number of bison in infected herds in the area is approximately 2,900. There are six non-infected, free-ranging bison herds in northern Canada: the Mackenzie, Nahanni/Liard, Hay-Zama, Pink Mountain, Aline Lake, and Etthithun Lake herds. In total, there are approximately 3,200 head in these brucellosis- and tuberculosis-free populations. Two-thirds of the region's free-roaming bison exist in populations outside WBNP. Two captive breeding herds of wood bison also have been established in the area.

The Hook Lake wood bison herd, located in the Slave River Lowlands, once numbered 1,700 animals. It declined rapidly during the 1970's and 1980's to about 200 bison. Poor calf production, tuberculosis and brucellosis, wolf predation, and hunting were the main factors contributing to the decline.Tuberculosis and brucellosis are considered to be important factors affecting the health, conservation and recovery of wood bison in the Slave River Lowlands. The Hook Lake area is prime bison habitat, and the Hook Lake bison herd has traditionally been very important to the people of Fort Resolution and surrounding area. In 1991, the Deninu Kue' First Nation (DKFN) published a plan to regenerate a healthy herd of wood bison at Hook Lake through habitat, population and disease management. In 1995, this plan was reviewed and updated by the DKFN's Aboriginal Wildlife Harvesters Committee following extensive community consultation. This initiative was led by Chief Don Balsillie and Sub-Chief Danny Beaulieu, with technical advice and support by Dr. C. Gates, NWT Department of Renewable Resources (GNWTRR). The goals of the plan are:

- To restore a healthy herd of wood bison free of tuberculosis and brucellosis in Hook Lake area
- To preserve the genetic integrity of the Hook Lake wood bison herd
- To salvage healthy bison from the Hook Lake area
- To preserve and enhance the Hook Lake ecosystem
- To develop economic opportunities from the Hook Lake bison herd

This plan has the community of Fort Resolution and the GNWTRR working together to ensure survival and recovery of the herd. The Hook Lake Wood Bison Recovery Project has four progressive phases, with each step to proceed following success-ful demonstration of the feasibility of the previous step: I) Habitat enhancement (prescribed burning) II) Salvage and propagation of a healthy captive breeding herd III) Isolation of the Hook Lake bison range IV) Removal of any remaining infected bison and recovery of the healthy wild herd

Phase I was undertaken in 1992 using prescribed fire to reverse loss of meadow habitat caused by forest succession. Spring burning has since been applied twice more and will continue at intervals until 2002. A significant reduction in shrub and tree cover has been achieved. Phase II was initiated May 10-15, 1996 with the capture of 14 female and 6 male bison calves in the Hook Lake area. The 1-5 day old calves were captured using a helicopter-mounted net gun, and sedated with low dose IV diazepam. Post-capture handling of each calf, including physical examination, condition assessment, weight determination, eartagging, and vitamin E/selenium/antibiotic injections, was supervised by Dr. Brett Elkin (GNWT) and Dr. Sue Kutz (University of Saskatchewan). Calves were moved to a new isolation facility at Fort Resolution, where they adapted well to captivity. The calves were bottle fed high quality milk replacer (24% protein, 22% fat) four times per day. Colostrum was administered for the first 3 weeks to provide local protection against enteric pathogens within the gut.

Salvage of healthy bison from infected herds has been successfully completed in northern Canada on two previous occasions. The approach in this salvage operation is based on a combination of three techniques: isolation of neonatal bison, prophylactic antibiotic treatment, and regular testing and removal of reactors. Calves were removed from their dams as soon as possible after birth to minimize the risk of exposure, and to isolate those that had been exposed while still in the acute stage of infection. The prophylactic antibiotic therapy was developed in consultation with Dr. Bob Rennie (University of Alberta Medical Microbiology and Infectious Diseases). The current protocol includes oral isoniazid for 9 months, oral enrofloxacin for 2 months, dihydrostreptomycin and oxytetracycline by injection for 2 weeks. Tuberculosis and brucellosis testing will be conducted twice yearly. All females also will be tested after first calving at 3 years of age. The calves are isolated in pairs within the facility, and any test reactors will be removed. Calf salvage will be repeated in 1997 and 1998, resulting in capture of 60 bison. This will ensure that the genetic diversity of the Hook Lake population is adequately safeguarded in a captive breeding herd before subsequent management actions are planned for the parent herd. This year's successful calf salvage operation is the first step in an ambitious plan for the salvage and propagation of a healthy Hook Lake wood bison herd.

Disease Updates

Atlantic Region

Conjunctivitis in cormorants - Prince Edward Island

A large colony of tree-nesting double-crested cormorants (Phalacrocorax auritus) averaging 4,000 breeding pairs, was studied on Ram Island, Malpeque Bay, PEI, in 1994 and 1995. During both years, approximately 90 nests were surveyed at weekly intervals. Although starvation was common among nestlings, infectious diseases were not observed. In 1996, suspected harassment of the colony during April caused complete abandonment of the island and relocation of the breeding adults to Little Courtin Island, a low-lying, treeless island, 2.5 km south of Ram Island; the number of cormorant nests on this island jumped to > 4,000 in 1996, from about 300 in the previous 8 years. This island also hosts a large colony of great black-backed (Larus marinus) and herring (L. argentatus) gulls, whereas very few gulls nest on Ram island. In mid-July 1996, severe conjunctivitis (inflammation of the inner eye lid) in one or both eyes was seen in several nestlings on Little Courtin Island, in two newly colonized sites and one that had been occupied in previous years. Twenty of 194 birds examined (10.3%) were affected. However, this proportion is based only on the younger segment of the population of nestlings (up to 3 weeks of age), which remained on the nests when approached. During the next visit, a week later, nestlings with ocular lesions could still be found but, because most young birds left their nests when approached, no attempt was made to determine the prevalence of conjunctivitis.

The lesions varied from accumulation of viscous, slightly opaque fluid in the conjunctival sac to marked distention of this sac by pale orange caseous (cheese-like) material. In most birds, the cornea was intact but, in a few, severe corneal ulceration was found. Routine bacteriological culture of the affected conjunctival sacs of three birds yielded a mixed flora of bacteria which were interpreted as opportunistic contaminants. The conjunctivae of four other birds were cultured for Mycoplasma, and all four were positive; the species of Mycoplasma is currently being determined. The conjunctivae of two birds were cultured for Chlamydia,with negative results. This outbreak of conjunctivitis was unexpected, because no such disease was encountered among approximately 400 nestling cormorants handled on Ram Island in 1994 and 1995. Little Courtin Island has limited vegetation, and wind may cause sufficient sand turbulence to irritate the nestlings' eyes and predispose them to secondary bacterial infection. Experimental inoculations would be required in order to determine the precise role of Mycoplasma in causing the conjunctivitis in these young cormorants. Mycoplasma gallisepticum is the primary cause of an outbreak of conjunctivitis among house finches (Carpodacus mexicanus) in eastern North America. The potential role of gulls as carriers of Mycoplasma also should be examined, since these were in very low numbers on Ram Island but plentiful on Little Courtin Island. (Pierre-Yves Daoust, CCWHC - Atlantic Region).

Tularemia in snowshoe hares - Nova Scotia

In September 1995, three snowshoe hares (Lepus americana) were found dead on private property in Richmond County, Cape Breton Island. Only one, an immature female, was sufficiently well preserved for necropsy. Gross and microscopic examination revealed severe acute inflammation in its lungs, liver, spleen, and bone marrow. The type and severity of inflammation strongly suggested a bacterial infection, possibly tularemia, but routine bacteriological culture was negative. Tissues were forwarded to the Western College of Veterinary Medicine for application of the immunohistochemical diagnostic test decribed on page 2 of this Newsletter. Results were positive.

The form of tularemia found in snowshoe hares is transmitted among animals and from animals to humans mainly through tick bites, whereas that found in rodents, such as beavers and muskrats (Ondatra zibethicus), is usually transmitted via direct contact or water. In humans, tularemia from snowshoe hares is a more virulent form (5-7% mortality, if untreated) than that acquired from rodents (<1% mortality, if untreated). An article in 1982 (Can. J. Microbiol. 28:403-405) reported detection of antibodies to F. tularensis in snowshoe hares from Nova Scotia and Prince Edward Island and in moose (Alces alces) from Nova Scotia. However, occurrence of the disease in these animals has rarely been confirmed in this region. (Pierre-Yves Daoust, Atlantic Veterinary College, and Deborah Haines, Western College of Veterinary Medicine).

Seasonal mortality of terns continues in Kouchibouguac National Park, New Brunswick

In the summer of 1994, several mysterious incidents of mortality occurred on the Tern Islands in Kouchibouguac National Park [CCWHC Newsletter Vol. 3 (2)]. It was speculated that gunshot trauma may have been the cause of death in these cases. Four mortality incidents were investigated on these islands in the summer of 1996. In mid-June, two incidents were identified. Thirty-four adult common terns (Sterna hirundo) in good body condition with traumatic injuries were examined. A few birds had penetrating wounds in the thoracic, head and neck regions, and several had fractured wings. The most remarkable findings were decapitation and unilateral or bilateral wing removal in 83% and 71% of the carcasses, respectively. Mustelids and certain raptors, e.g. great horned owls (Bubo virginianus), are reported to decapitate prey. Mustelids are not known to reside on the islands, although no effort has been made to confirm their absence. There is anecdotal evidence of great horned owls killing birds on tern colonies in the Maritimes, and owls have been observed in the vicinity of the Tern Islands. Gunshot trauma was considered, but lead pellets were not identified by radiography, fluoroscopy or necropsy in any of the birds.

In early August, two other incidents were observed, involving approximately 127 fledging common terns. A sample of 24 decayed and 10 fresh carcasses as well as 2 sick birds were submitted for necropsy. Markedly reduced pectoral muscle mass, lack of internal fat, empty digestive tract, and dehydration were the significant findings in 83% of the birds examined. Tissues from the two live birds and three fresh carcasses were

examined microscopically and bacteriologically. Salmonellosis was identified as the ultimate cause of death in these fledging birds. However, their debilitated physical state likely predisposed them to this infection. Human activity around the Tern Islands increased this past summer, due to regular visitation by boat tours, but it is difficult to determine if this disruption contributed to the mortality incidents. Human disturbance has been documented as a cause of decline in some wildlife populations. In piping plovers (Charadrius melodus), increased predation and decreased feeding activity are factors that may be involved with the population decline and can be directly related to human disturbance. This breeding colony of terns will be monitored closely in the future to determine the potential involvement of ecotourism in mortality incidents. (Scott McBurney, CCWHC - Atlantic Region, and Benoit Richard, Parks Canada - Atlantic Region).

Québec Region

Belugas from the St. Lawrence Estuary

Approximately 500 Beluga whales inhabit the St. Lawrence estuary where there were approximately 5000 at the beginning of the century. Since 1982, 111 dead Beluga whales have been examined at the Faculté de Médecine Vétérinaire of Saint-Hyacinthe. Starting this year, the costs of the program are partially covered by Fisheries and Oceans Canada, to whom we are most grateful. Our findings for 1996 are summarized below.

An adult male stranded at Les Escoumins on April 4, 1996. Major findings consisited of severe inflammation of lymph nodes in the thorax and abdomen, and severe chronic active hapatitis. These lesions contributed to the death of beluga but their cause remains undetermined. An emaciated grey female stranded at Kamouraska on June 18, 1996. The small intestine was distended by tapeworms (presumably Diphyllobotrium sp.) measuring 0.5-2 cm in width and up to 5.5-6.0 m in length. These parasites formed a cord 10-12 cm in diameter and 6 m in length. Additionally, the animal showed severe chronic hepatitis. The parasites and hepatitis contributed to the death of this beluga.

An adult female beluga was seen drifting off the coast of Baie des Sables in the region of Matane on June 2, 1996. A large sigmoid laceration, attributed to a motor boat propeller, perforated the abdominal cavity. The laceration had caused infection and inflammation of the abdominal cavity. The beluga was lactating but the calf was not retrieved. This is the second case of motor boat propeller laceration in the St. Lawrence belugas. The first case was reported in 1995 (see CCWHC Bulletin 3(3)). The CCWHC Quebec region office has alerted the public, through news agencies, to the uncontrolled growth of the whale watching flotilla as an additional threat to the whales.

An adult male beluga was stranded at Bic on July 22, 1996. The animal had a large abscess on the left ureter. Death was attributed to this abscess and to the associated spread of bacteria to the blood stream. This male animal also had rudimentary elements

of a female reproductive tract (a uterine body and 2 well formed uterine horns), and is the first recoginized case of male pseudohermaphroditism in a beluga whale (a case of true hemphroditism was reported previously in a beluga, see Deguise *et al*., 1994, Journal of Wildlife Diseases 30, 287-290).

An adult female beluga whale was found stranded at Saint Joseph-de-la-Rive on July 27, 1996. A perforating cancer (adenocarcinoma) was found in the small intestine. This is the sixth case of cancer of the small intestine in a beluga whale from the Saint Lawerence river. For more information about cancer in Belugas see Martineau *et al*., Science of the Total Environment, 1994, 154: 201-215.

A prematurely born female beluga calf was found stranded at Sainte-Luce on August 11, 1996. A dead adult beluga was seen drifiting the same day at Sainte-Luce but could not be retrieved. The calf showed no gross or microscopic changes which could account for its death (Igor Mikaelian, Daniel Martineau, CCWHC -Quebec Region; Luc Chouinard-FMV, University of Montreal).

Secondary Tyzzar's Disease in a Racoon infected with Canine Distemper

An adult female racoon from a recreational area was noted to be ataxic and to have thick crusts around the eyes and the nosrtils. On pst-mortem exam, there was a diffuse intersitial pneumonia with numerous syncytial cells. Intracytoplasmic and intranuclear acidophilic inclusion bodies compatible with Paramyxovirus infection were present in the bronchial epithelial cell, aveolar macrophages and syncytial cells, as well as in the epithelium of the crypts of the duodenum and colon, bile duct, renal pelvis, and urinary bladder. There were two small areas of coagulation necrosis in the liver, infiltrated by a few macrophages and degenerated neutrophils. A few hepatocytes at the periphery of these lesions contained intracytoplasmic 10-20 um slender bacilli suggestive of Clostridium piliforme the causitive agent of Tyzzard's disease. These bacteria were also present in large numbers in the cytoplasm of the surface epithelium of the colon. Tyzzard's disease has been associated with Distemper in a racoon previously (Journal of Wildlife Diseases, 1986, 22; 55-59). In that report it is mentioned that a wide variety of agents such as Bordetella, E. coli, Salmonella, Pseudomonas, Aspergillosis, Cryptosporidium, and Toxoplasma may occur as secondary infections to canine distemper virus which causes immunosuppression and lypholysis.

Forty racoons have been submitted for post mortem examination to the Quebec regional center of the CCWHC since 1993. The final diagnosis on these submissions were : distemper (8), trauma (7), miscellaneous infectious disease (6), euthanasia (5), no diagnosis (4), parvovirus (3), degenerative disease(3), leptospirosis (2), and emaciation (2), (Igor Mikaelian, Daniel Martineau- CCWHC Quebec Region; Clement Lanthier - Granby Zoo).

Ontario Region

Diazinon poisoning in Geese

In September 1996, following a period of wet weather, Diazinon was applied, according to the manufacturer's instructions, by staff of the town of Simcoe to grass in a municipal park. Within hours, Canada geese (Branta canadensis) in the area were showing erratic behaviour and became listless. Affected birds had mucus streaming from their mouths and some produced blood-stained feces. Ontario Ministry of Natural Resources staff submitted 4 birds that died to the Ontario Regional Centre of the CCWHC. At necropsy, the birds were in good to excellent body condition. Thick mucus was present in the mouth, trachea and esophagus. The lower esophagus and proventriculus contained grass and clover. The small intestines contained blood-tinged fluid. Contents of the upper digestive tract were sent to the toxicology laboratory of the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) where Diazinon was detected in concentrations from 3.7 - 10.0 g/g. While these levels are less than the level reported to be lethal for Canada geese (20 g/g), samples from the digestive tract likely under-estimate the level consumed. Diazinon breaks down quickly in the body, and some would have been absorbed by the time of death. Demonstration of consumption of these quantities may be taken as strong presumptive evidence of Diazinon poisoning. Demonstration of depression of brain cholinesterase levels would confirm the diagnosis, and heads have been retained frozen for this purpose. Diazinon, applied to turfgrass, has previously been reported as the cause of waterfowl deaths. Prevention of poisoning incidents of this kind is dependent upon correct mixing of pesticides before application, adequately drilling granules and treated seeds into the soil, and watering the area after pesticides have been applied. (Doug Campbell, CCWHC - Ontario Region).

Newcastle disease in cormorants

In 1992, mortality, estimated in the thousands, due to Newcastle Disease (ND), which is caused by Avian Paramyxovirus-1 (PMV-1), occurred in colonies of double-crested cormorants on the Great Lakes. This was part of a panzootic that affected cormorant and pelican colonies from northern Alberta through the prairies and Great Lakes to the St. Lawrence River. No epizootics have occurred in Ontario since, but PMV-1 was isolated from cormorants and a caspian tern (Hydroprogie caspia) with neurological signs in August, 1995 [CCWHC Newsletter, Vol. 3 (3)]. In late August, 1996, cormorants unable to fly and with leg paralysis, were brought to wildlife rehabilitation clinics in Bowmanville and Sarnia and subsequently submitted to the CCWHC laboratory in Guelph. Necropsies were conducted and tissues were sent to the avian virology laboratory of the OMAFRA for virus isolation. The bird brought to the Avicare centre in Bowmanville was from the Presqu'ile colony at the eastern end of Lake Ontario, a colony in which affected birds were detected in 1995. PMV-1 was isolated from brain and kidney of this bird. Agriculture and Agri-Food Canada has treated this isolate as positive for ND, placing this facility under quarantine. The colony of origin for the bird sent from Sarnia is not known but PMV-1 has been isolated from it as well, and identified as ND. Both birds were found late in the summer, after juvenile birds had dispersed from the

colonies. Large-scale mortality has not been detected on any of the colonies monitored by the Canadian Wildlife Service, and these birds presumably represent survivors of the disease that have been left with neurological impairment. Surveillance for ND has been achieved by a co-operative effort of biologists, rehabilitators, OMAFRA, CCWHC and Agriculture and Agri-Food Canada. (Doug Campbell - CCWHC Ontario Region; Doug Key, Avian Virology Laboratory, VLS).

Herpesvirus in owls

During the winter and spring of 1995-96, a barred owl (Strix varia) and two great horned owls, all living in urban areas in southern Ontario, were diagnosed with herpesvirus infection. The barred owl had been sighted chasing pigeons in Oshawa some days prior to death. At necropsy, it had multifocal hepatic, splenic, pancreatic and thymic necrosis and herpesvirus was isolated from tissue by the avian virology lab of OMAFRA. The great horned owls were found 2 months apart, in the same neighbourhood in downtown Toronto. Both had multifocal hepatic and splenic necrosis, with typical intranuclear herpesvirus inclusions. Given that all three owls were resident in urban areas and in two cases were known to feed on pigeons, it is tempting to speculate that pigeon herpesvirus, acquired by ingestion, is the cause of disease in these birds. However, further characterization of the virus and cross-species transmission studies would be necessary to investigate this possibility. Fatal herpesvirus infection has been described previously in owls and other raptors, but is likely not a common cause of death. Four cases of herpesvirus infection have been diagnosed by CCWHC - Ontario in raptors,in the past 2 years, 3 of them in great horned owls, and these likely represent the vast majority of cases on record at Guelph since the disease was first described here in 1975 (Sileo et al., 1975, J. Wildl. Dis. 11: 92-96). (Doug Campbell, CCWHC - Ontario Region)

Predator Attacks

In the winter of 1996, a coyote (Canis latrans) was tracked and shot after acting aggressively towards two small children near their home in the North Gower area, south of Ottawa. The brain was tested by Agriculture and Agri-Food Canada for rabies and canine distemper virus; no evidence of either disease was found. No gross lesions were seen at necropsy. Histologically, there was a mild, multifocal non-suppurative encephalitis, with a small number of unidentified protozoal cysts found in association with the inflammatory lesions. An attempt to further identify the cysts by immunohistochemistry and/or electron microscopy is planned. In the summer of 1996, a child was attacked by a wolf (Canis lupus) while sleeping during a canoe trip in Algonquin Park. The wolf was tracked over the following week, during which time it had several other encounters with canoeists, before eventually being shot by Ministry of Natural Resources personnel. The wolf was necropsied at the CCWHC laboratory in Guelph. No gross or histologic lesions were identified, and the brain tested negative for rabies. It is possible that this attack represents some form of aberrant behaviour on the part of the wolf, as it was apparently not a predatory attack, and no organic basis for unusual behaviour was discovered. These two cases, with their contrasting discoveries at necropsy, illustrate the value of performing a complete necropsy as part of the

investigation into predator interactions with humans.(Doug Campbell - CCWHC Ontario Region)

Northern and Western Region

Botulism - 1996

The past summer was another of high losses of waterbirds to botulism, with about 230,000 birds found dead in prairie Canada. The focus shifted from Alberta to Manitoba and Saskatchewan.

Alberta: The only site where botulism was detected was at Pakowki Lake, which was monitored carefully beginning in May. The first carcass was detected July 19, and intensive carcass collection was begun immediately. During the remainder of the summer and early autumn almost 12,000 carcasses were collected for disposal. While this loss is significant, it pales when compared with the massive losses in the previous 2 years, in which > 31,000 and > 100,000 carcasses were collected.

Saskatchewan: Seventeen wetlands were monitored by Ducks Unlimited (DU) and Canadian Wildlife Service (CWS) personnel. From September 6 to 25, 3200 carcasses were collected from Middle Quill (Mud) Lake. A wide range of species was involved but Pintails (Anas acuta) comprised 50% of the dead birds. Between August 22 - September 19, 704 carcasses (81% ducks) were collected on Chaplin Marsh. (This was the first recognized occurrence of botulism on this wetland). A major outbreak was discovered late in September on Old Wives Lake. No overall count was made because of very difficult access to this large lake, and the onset of cooler weather. Based on limited random sampling, the mortality was estimated to be of the order of 100,000 birds, primarily dabbling ducks.

Manitoba: Bird deaths were first recognized near the east end of Whitewater Lake, a 22,000 acre wetland, on July 8. The disease was quickly confirmed to be botulism and an intensive carcass collection program, that included up to 7 airboats, 2 Argos, and 2 ATV's (from DU, CWS and Manitoba DNR) and crews working 7 days a week, was conducted until September 18. Mortality slowed considerably by September 9. In total, 117,052 carcasses were collected, buried and limed, of which about 90,000 were ducks (final species count not yet tabulated).

Adjacent States: Botulism was reported to the National Wildlife Health Center from five national wildlife refuges (NWR) or wetland management districts (WMD) in North and South Dakota. Kulm WMD in southern North Dakota reported mortality at five sites in two counties and botulism was confirmed at four of the sites. The total number of birds collected at the five sites was approximately 6000, the majority being dabbling ducks. Long Lake NWR Complex in Kidder and Burleigh counties, North Dakota, lost more than 8,250 waterfowl, coots, terns, gulls and other waterbirds on four sites. Botulism type

C was confirmed from all four sites. At one site, Dewald Slough, in Kidder County, mortality in nesting western grebes (Aechmorphorus occidentalis) caused by schistosome flukes may have triggered the botulism event. Other mortality sites in the Dakotas include Lake Alice NWR, North Dakota (1300 waterfowl, coots and shorebirds picked up); Waubay NWR, South Dakota (approximately 500 waterfowl found dead on Bitter Lake and the Waubay sewage treatment ponds); Valley City WMD, North Dakota (approximately 150 waterfowl, coots and shorebirds found sick or dead); and Chase Lake Prairie Project, North Dakota (approximately 50 coots and a few ducks). Botulism was confirmed on these latter sites. By the first of October, mortality rates had slowed; however, small numbers of birds continue to be picked up from many of these sites. (Compiled by G. Wobeser, CCWHC Western/Northern Region, information contributed by M. Pybus, Alberta Environmental Protection; G. Brewster, Ducks Unlimited; L. Bidlake, Manitoba Department of Natural Resources; and L. Creekmore, National Wildlife Health Center, Madison,Wisconsin).

Winter Mortality In Peace River Region Ungulates

Severe winters in Western Canada can result in high ungulate mortality due to starvation. Since wildlife integrate positive and negative environmental influences in their body condition, researchers have used mortality as an indicator of range conditions, population quality and density, forage quantity, disease and weather. A joint project, between Alberta Natural Resources Services - Peace River Region and Animal Health Laboratories Branch - Fairview was initiatedin the winter of 1995 to determine body condition and cause of death in winter-killed ungulates. Due to repeated heavy snowfall and vast isolated areas in the Peace River Region, finding and retrieving winter killed animals was difficult. Most submissions were collected in or near known winter feeding areas. When possible, whole carcasses were submitted for post mortem examination. In the case of dead animals spotted by helicopter, scavenged carcasses or carcasses found in remote areas, femurs were collected. Necropsies were performed on whole animal submissions, paying careful attention to body condition and gross lesions as an indication of disease. A total of 57 animals or portions were submitted, consisting of 33 mule deer (Odocoileus hemionus), 9 white-tailed deer, 5 elk (Cervus elaphus) and 10 moose. Femur marrow fat (FMF) was collected and percent fat content determined.

Mule deer FMF ranged from 7% to 94%. Twenty-five of the 33 mule deer examined (76%) had FMF < 25%. This is evidence of significant depletion of marrow fat stores and starvation (2). Three mule deer deaths were attributed to: necrobacillosis (l); road kill - (1); euthanasia due to a leg injury - (1). Cause of death was not determined for the other 5 mule deer. At least 60% of the starvation cases in mule deer were in spring fawns, followed by adult females (28%) and adult males (12%). A lower limb from each mule deer was examined grossly and histologically for the presence of Besnoitia sp. All skin sections were negative for this protozoan parasite. Four of 9 white-tailed deer deaths were attributed to starvation with FMF ranging from 7% to 11%. Three deer died of undetermined causes. The remaining 2 deer deaths were attributed to predator kill and euthanasia due to a broken leg. Only femurs were submitted from elk specimens. FMF ranged from 57% to 93%, indicating starvation was not the cause of death. Ten moose

specimens were examined. Five moose had FMF values between 8% and 18%, indicating death by starvation. Three moose died from undetermined causes. In the remaining two animals, death was attributed to wolf predation and road-kill. A 2 ml sample of bone marrow from each ungulate was collected, frozen and placed in our tissue bank for retrospective use. (Contributed by Ken Dies, Jim Henderson, Henry Gauvreau, AAFRD - Animal Health Laboratory Fairview, Alberta)

Diazinon poisoning of American wigeon

Approximately 150 dead American wigeon (Anas americana) were found in a partly-flooded strawberry field in Surrey, British Columbia on 28 Feb. 1996. Although the majority of carcasses were scavenged, five intact specimens were submitted to the BC Ministry of Agriculture, Fisheries and Food Animal Health Lab for post-mortem examination. The cause of death was attributed to poisoning by the organophosphate insecticide Diazinon, based on brain cholinesterase activity and residues detected in the stomach contents. Brain cholinesterase activity was severely inhibited, indicating exposure to an organophosphate or carbamate insecticide (2.25 mol/min/g, pool of 5 brains; normal levels reported in the literature ranged from 7.21 to 9.62 mol/min/g). Stomach contents were screened for organophosphate and carbamate insecticides; 0.94 ppm Diazinon was detected (pool of 5 stomachs). Agriculture and Agri-Food Canada collected strawberry leaves, soil and water samples from the site; these were found to have up to 63 ppm, 2.2 ppm and 0.15 ppm Diazinon, respectively. The farmer leasing the property reported spraying Diazinon 500EC on a portion of the strawberry field at the label rate of 1.4 litres/acre for weevil control just prior to the incident. Diazinon has been responsible for a number of waterfowl mortalities in the lower Fraser Valley in the past. (Contributed by Laurie Wilson and John Elliott, Canadian Wildlife Service, Delta, BC).

[NOTE: The product label warns against use of Diazinon where waterfowl are expected to inhabit the area or where there are resident populations of waterfowl. - Ed.]

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