

**FEDERAL AID
ANNUAL RESEARCH PERFORMANCE REPORT**

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Wildlife health and disease surveillance in Alaska

PRINCIPAL INVESTIGATOR: Kimberlee B. Beckmen

COOPERATORS: US Department of Agriculture, Alaska Department of Environmental Conservation, National Marine Fisheries, Auke Bay Laboratory, National Marine Mammal Laboratory, Alaska Department of Health and Human Services, US Geological Survey, US Fish and Wildlife Service, Alaska Bird Observatory, and other federal, state, and local entities.

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR: W-33-2

PROJECT NR: 18.73

WORK LOCATION: Statewide

STATE: Alaska

PERIOD: 1 July 2003–30 June 2004

I. PROGRESS ON PROJECT OBJECTIVES SINCE PROJECT INCEPTION

PROJECT OBJECTIVE: Document, evaluate, and monitor the incidence of diseases in free-ranging wildlife as well as the potential impacts of disease on wildlife populations in Alaska.

OBJECTIVE 1: Implement the Chronic Wasting Disease Surveillance Program.

The CWD Task Force, under the leadership of Dr. Beckmen, designed and implemented a program for Chronic Wasting Disease (CWD) surveillance on free-ranging cervids in Alaska. A cooperative agreement with the US Department of Agriculture was established and the program officially began with the commencement of the deer hunting season in GMU8. A wildlife veterinarian from the CWD endemic area in Wyoming traveled to Kodiak to train area biologists/technicians and veterinary staff on the proper sample collection techniques. Dr. Beckmen subsequently trained 25 biologists and technicians statewide. From Sept 2003 to June 2004, 190 samples were collected and 183 were suitable for testing. This included 127 Sitka black-tailed deer, 8 elk, 18 moose from the Interior and

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Please note: This is a progress report and the information contained within may be further analyzed and refined.

Southcentral, and 12 caribou from the Interior and North Slope. All specimens were negative for CWD.

OBJECTIVE 2: Coordinate the West Nile Virus surveillance of wild birds in Alaska.

ADFG took the lead in the collection and submission of dead wild birds for West Nile Virus (WNV) surveillance. 28 birds were submitted for testing and all but 5 were collected by ADFG personnel. Almost all of those underwent full necropsy and collection of brain for WNV testing by Dr. Beckmen. All specimens were negative for WNV. Dr. Beckmen compiled the submissions and results for a report to the Alaska WNV Working Group.

OBJECTIVE 3: Maintain the blood, serum and tissue banks.

Blood and/or serum was accessioned into the archive from 186 caribou, 66 moose, 49 wolves, 34 black bears, 19 grizzly bears, 13 seals, 8 bison, 5 muskox, 4 Dall sheep, 1 beaver, and 1 porcupine. Samples were accessed by six outside investigators and graduate students, mostly from the University of Alaska Fairbanks (UAF) who are working on collaborative projects with ADFG. Various types of tissues were collected from approximately 75 animals (at necropsy or during biopsy of live animals captured for other purposes). Tissues were mainly for minerals analysis and genetics. Subsets of tissues from rare or endangered species were archived at the UAF museum. Over 200 serum samples from the archive were utilized for disease surveillance. A computerized database was designed so records of archived samples can be accessed electronically. An inventory of the serum and blood stored in the ultra cold freezers was begun. One ultra cold freezer broke down; samples were redistributed before thawing occurred. The freezer was repaired.

OBJECTIVE 4: Conduct disease and parasite surveillance and monitor changes in disease patterns.

No animals were killed purposefully during the study period specifically for disease studies. One severely ill moose (emaciation, chronic diarrhea) in Fairbanks was euthanized for humane reasons and subsequently necropsied. Tissues, parasites, or whole carcasses presented by the public, as well as incidental takes such as road-kill, capture mortalities of other investigators, and animals found dead were examined. During the study period there were 99 accessions into the necropsy/pathology database. Gross diagnoses were assigned when possible and parasite identification or histopathological diagnoses were pursued on unusual cases. Among the significant or interesting findings were: two parasites of moose not previously documented in Alaska were detected, the first case of avian tuberculosis in a free-ranging bird (a swan) in Alaska was diagnosed, an outbreak of tularemia detected, mineral deficiencies contributing to death were found in 2 Dall sheep and 1 moose, and a cancer in a moose was described (malignant melanoma). Additionally, several die-offs were investigated including moose in 20D and Teshepuk caribou. The possible role of disease in the decline in bison was investigated through a large serosurvey (over 200 animals tested for 6 infectious diseases). Fecal samples from 24 moose and 19 bison were submitted for Johne's disease surveillance (all negative). Two multi-day workshops were held (in Fairbanks and Anchorage) to train 25 wildlife biologists and technicians on necropsy

technique and proper sample collection. Dr. Beckmen attended a 1-day workshop on recognition and diagnosis of foreign animal diseases.

OBJECTIVE 5: Monitor levels of environment contaminants in species of concern.

Hair for mercury and other heavy metal determination were collected (at the request of Dept of Environmental Conservation and UAF faculty) from bears, wolves, coyotes, Steller sea lions, marten, lynx, moose, and caribou. Fat biopsies were collected via biopsy from black bears, grizzly bears and Steller sea lions for organochlorine analysis. Samples were submitted to UAF and the Northwest Fisheries Science Center. Assays are currently in progress.

OBJECTIVE 6: Review literature; prepare annual progress reports, a final report, and manuscripts for publication in refereed literature.

Progress reports were generated for Federal Aid and Chronic Wasting Disease Surveillance program as well as monthly reports on disease surveillance activities. No final reports were due during the period. One manuscript was submitted and is in revision. I attended two major international meetings (Wildlife Disease Association and the Society for Marine Mammalogy) and presented research findings.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB 1 : Implement the Chronic Wasting Disease Surveillance Program.

CWD surveillance successfully implemented according to plans. Sitka black-tailed deer, elk, caribou and moose were tested and all samples (183) were negative.

JOB 2: Coordinate the West Nile Virus surveillance of wild birds in Alaska.

Wild bird surveillance conducted as planned. All birds that were tested in the state with the majority collected by ADFG and necropsied by Dr. Beckmen. Collection, submission and testing coordinated and reported satisfactorily.

JOB 3 : Maintain the blood, serum and tissue banks.

A large number of blood, serum, and tissues samples were collected by ADFG biologists and collaborative researchers were accessioned into the archive. ADFG biologists as well as collaborators utilized archived samples. A computerized database was designed so sample records can be accessed electronically in the future.

JOB 4 : Conduct disease and parasite surveillance and monitor changes in disease patterns.

Tissues, parasites, and carcasses were examined and subsets were submitted for definitive diagnoses. Serum, tissue, and fecal samples collected from live-captured as well as dead animals were utilized in disease surveillance. A major study of infectious disease problems in bison was undertaken. New and novel disease conditions and parasites were recognized through the surveillance efforts.

JOB 5 : Monitor levels of environment contaminants in species of concern.

Hair and tissues were collected and submitted to monitor heavy metals such as mercury and organochlorine compounds as part of ongoing monitoring as well as research projects.

JOB 6 : Review literature, prepare annual progress reports, a final report, and manuscripts for publication in refereed literature.

Progress reports were submitted as required. Research results were presented at two major international conferences.

III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

IV. PUBLICATIONS

Abstracts for two oral conference presentations were published in the meetings proceedings (see appendix).

V. RECOMMENDATIONS FOR THIS PROJECT

VI. APPENDIX

BECKMEN, K.B., BUREK, K.A., AND YLITALO, G.M. 2003. The Potential Effects of Environmental Contaminants on Immune Function and Health in Free-Ranging Pinnipeds in Alaska. Proceedings of the 15th Annual Conference on the Biology of Marine Mammals. Greensboro NC Dec 14-19, 2003.

Abstract: A number of marine mammal populations in Alaska have decreased in recent decades including the western stock of the Steller sea lion (*Eumetopias jubatus*) and the northern fur seal (*Callorhinus ursinus*). The cause(s) of these population declines have not been discovered and several areas of investigation have yet to be thoroughly explored, including the role of environmental contaminant exposure. Organochlorine (OC) contaminants have recently been identified in the tissues of Alaskan marine mammals at concentrations higher than expected and similar exposures have been linked to immune suppression and reproductive dysfunction in marine mammals.

During live-capture field studies conducted from 1995 to 2001, we investigated OC contaminant along with the health and development of immune function in juvenile northern fur seals (NFS) and Steller sea lions (SSL). We optimized and validated multiple immune functional assays for use in these species. We evaluated immune function with lymphocyte function assays (lymphoproliferative assays, immunoglobulins, and specific antigen stimulation), white blood cell differential counts and haptoglobins. By examining multiple cohorts of SSL from different stocks as well as repeat sampling of NFS from birth to weaning, we documented variation in immune responses in growing animals. We established reference ranges for leukocytes

subpopulations for different age groups. Additionally, we conducted expanded health surveys in SSL including serology, parasitology, microbiology, and detailed physical examinations.

BECKMEN, K.B., BUREK, K.A., AND YLITALO, G.M. 2003. The Potential Effects of Environmental Contaminants on Immune Function and Health in Free-Ranging Pinnipeds in Alaska. 52nd Annual Wildlife Disease Association Conference. Saskatoon, SK, August 11-14, 2003.

Abstract: A number of marine mammal populations in Alaska have decreased in recent decades. The western stock of the Steller sea lion (*Eumetopias jubatus*) has undergone a severe decline resulting in listing as an endangered species. The northern fur seal (*Callorhinus ursinus*), with 80% of the world population breeding on the Pribilof Islands, has been designated as a depleted stock. The cause(s) of these population declines have not been discovered and several areas of investigation have yet to be thoroughly explored including the role of environmental contaminant exposure on health. Organochlorine (OC) contaminants have recently been identified to be present in the tissues of marine mammals in Alaska at concentrations higher than expected. Organochlorine contaminant exposures have been linked to immune suppression and reproductive dysfunction in marine mammals.

In field studies conducted during live-capture operations from 1995 to 2001, we investigated OC contaminant and mercury exposure along with the general health and development of immune function in juvenile northern fur seals and Steller sea lions. We optimized and validated multiple immune functional assays for use in these species, starting with the northern fur seal. These assays were then used to define each of the components of the immune system quantitatively and qualitatively in relation to age. Our approach included lymphocyte function assays [lymphoproliferative assays (specific T-cell and B-cell function), flow cytometry, IL-2 receptor expression, immunoglobulins, and specific antigen stimulation (B-cell function)]; and less specific white blood cell differential counts to demonstrate perturbations in leukocyte subpopulations and inflammatory/stress responses. These assays mainly utilized peripheral blood of free-ranging animals live-captured in Alaska, complemented with some captive animal validation.

By examining multiple cohorts of Steller sea lions from different stocks as well as repeat sampling of fur seals from birth to weaning, we documented baseline individual, stock, age-related, and stress-induced variation in responses in immune function in growing animals over time; thereby validating the use of these assays to assess the health of free-ranging otariids. We established reference ranges for normal leukocytes subpopulations for different age groups of free-ranging juveniles. Additionally, in Steller sea lions, we conducted expanded health surveys including serology, parasitology, bacterial cultures, viral cultures and viral PCR, fungal cultures, testing for Chlamydia by culture and PCR as well as detailed physical examinations. These investigations detected significant correlations between OC exposure and impaired immune function at several levels including T-cell-mediated B-cell responses. Antibody production responses in fur seal pups to primary and secondary tetanus toxoid vaccinations were negatively correlated to circulating blood levels of selected polychlorinated biphenyl congeners at the time of vaccination. Developmental age could not explain this effect. Responses to mitogen stimulation using lymphoproliferative assays in fur seals and Steller sea lions were negatively correlated to PCB levels but the effects of developmental age had an impact on these results in fur seals.

VII. PROJECT COSTS FOR THIS SEGMENT PERIOD

FEDERAL AID SHARE \$52,676 STATE SHARE \$17,559 = TOTAL \$70,235

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