ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
Wildlife Restoration Grant

Grant Number: W-33 **Segment Number:** 11

Project Number: 18.74

Project Title: Wildlife Health and Disease Surveillance in Alaska

Project Duration: July 1, 2012 – June 30, 2013

Report Due Date: September 1, 2013

Partner:

PRINCIPAL INVESTIGATOR: Kimberlee Beckmen

COOPERATORS: US Department of Agriculture/APHIS, Alaska Department of Environmental Conservation.

WORK LOCATION: Alaska, Statewide

I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

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. Ensure animal welfare considerations in the capture and handling of wildlife by the Division for research or management purposes.

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

JOB/ACTIVITY 1: Maintain the Chronic Wasting Disease Surveillance Program.

- Maps identifying the CWD sampling target zones for FY13 were created and distributed to biologists in regions with sampling zones (RIII, RIV).
- Performed necropsies and collected appropriate tissues on target animals (cervids having signs consistent with CWD, are found dead unexplained, scientific collections or hit by vehicle).

- Samples for CWD testing were collected from 91 cervids (75 moose, 16 caribou) for testing for CWD. Tissues from 36 cervids (22 moose and 14 caribou) were submitted to Colorado Veterinary Diagnostic Laboratory, all results were negative for CWD. The reminder of the samples collected during FY13 will be submitted for analysis during FY14.

- The surveillance results were posted to the ADFG website.

- The final report were submitted to the USDA/APHIS Veterinary Services as the cooperative agreement funding through the agency ended August 31 2012 and will no longer be available.

- Some sample analysis, travel to collect samples, attend meetings, conduct training and a portion of the technician salary prior to August 31 2013, were covered under a cooperative agreement with USDA.

Federal funds were used to pay for salaries, supplies and services on this task.

JOB/ACTIVITY 2: Maintain the blood, serum and tissue banks (archives).

- Accessioned ~3500 blood / serum samples from ~300 individuals animals, including from brown bear, plains bison, caribou (representing 7 herds), red fox, coyote, moose, muskox, and wolves. Other tissues, such as fecal samples or swabs for bacterial or viral culture, were also collected and archived for the many of the above samples.

- Accessioned frozen and/or fixed tissues for 548 new pathology cases (see details under Job 3).

  Nearly 2000 subsamples were accessed from the archived samples and distributed to research collaborators, DWC and non-DWC investigators as well as graduate students to fulfill requests for tissue, blood, serum or carcasses. Research colleagues and investigators from the following institutions were represented: University of Alaska Fairbanks (UAF) Museum of the North, UAF Institute of Arctic Biology, UAF Department of Biology and Wildlife, Colorado State University, University of Calgary, Norwegian School of Veterinary Science, Haartman Institute- Finland, US National Parasite Collections and Animal Research Laboratories/USDA, Princeton University, University of New Mexico Museum of Southwestern Biology, US Fish and Wildlife Service, National Marine Fisheries, National Veterinary Services Laboratory, University of Pittsburg, and Colorado State University, University of Tennessee, and Atlantic Veterinary College Prince Edward Island.

Federal funds were used to pay for salaries, supplies and services on this task.

JOB/ACTIVITY 3: Conduct disease and parasite surveillance and monitor changes in disease patterns.

- **Passive pathogen surveillance**: Conducted post-mortem examinations on 548 accessions of 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.

    - Mammalian Cases: 511 total (167 hoofstock, 316 terrestrial carnivores/furbearers, 7 marine mammals, 10 rodents/lagomorphs, 11 bats).
        - The increase in number of carnivore cases was primarily due to increase surveillance for rabies during an epizootic year and the additional funding for this surveillance received under an RSA/cooperative agreement with the Dept. of Environmental Conservation.
    - Other Cases: 23 birds and 14 ectoparasite only cases.
    - Gross observations and morphometric (on carcasses) data recorded, diagnoses assigned when possible, and samples for ancillary diagnostic testing or research requests were collected. Whenever feasible, parasite identification and definitive diagnoses will be pursued through histopathology (n = 119 cases).
    - Monitored and recorded numerous public and department personnel reports regarding disease and parasites in wildlife. Callers, email correspondence as well as drop-ins occur throughout the year but questions are particularly heavy during the first months of the hunting season and during the calving periods.

    - Identified numerous parasite infections and diseases not previously recognized in Alaska Two particularly notable detections included a lungworm in a wolverine tentatively identified as a member of the Angiostrongylidae and a Lone Star Tick (*Amblyomma americanum*) submitted from a dog in Eagle River.

- **Active pathogen surveillance:** As requested by biologists, there was a continuing investigation into the causes of neonate/fetal mortalities especially the Teshekpuk (n=5) caribou herd, moose (n=17), and muskox (n=5).

- **Serosurveillance:** Submitted serum samples for over 1800 serologic tests; all test results are eventually entered into the DWC Serology Database. Approximately 3300 results produced in previous years were verified and updated to a new, more complete format of data entry into the database. When feasible, test results were reported back to the biologist who requested them.

- **Muskox Health Assessment**: Compiled available historical serologic, trace mineral, and fecal parasite data, and pathology results for muskox for presentation and discussion at the Muskox Management Workshop.

- **Caribou Herd Health Assessments:** Collaborated with a DWC wildlife physiologist to validate body condition indices on 15 caribou as well as provide health assessments of the herds sampled. Two veterinarians were hired as consultants to assist with necropsies while KB was on medical leave. A number of volunteer UAF undergraduate students and one graduate from Princeton also participated in necropsy and sample collection. The Princeton grad student in parasite ecology also is assisting in enumerating parasites collected from the caribou.

- **Rangiferine Brucellosis:** Continued a collaborative research project on *Brucella* with colleagues in the Arctic Section of the Norwegian School of Veterinary Science in Tromsø, Norway utilizing a multi-species indirect ELISA. Many of the ~1400 serum samples have been analyzed and preliminary data results received. A discussion and planning session for data analysis, potential publications, etc. was held during the Wildlife Disease Association conference at which we were all present.

- **Identification of Viral Pathogens in Caribou**: Significant progress on collaborative research project into two viral disease agents in caribou samples was made at the Section of Arctic Veterinary Medicine of the Norwegian School of Veterinary Science in Tromsø, Norway. Two viral groups were of primary interest: alphaherpesvirus and pestivirus.

    - We did a retrospective study examining 30 years of sera from two populations of Alaskan caribou: the Western Arctic caribou herd (contact with reindeer since 1998) and the relatively isolated Denali herd. A total of 358 caribou serum samples were tested using commercial blocking ELISA kits validated for reindeer. A subset of 42 samples was selected for virus neutralization (VNT) against different alphaherpesviruses. Results showed high seroprevalences in both herds across all 3 decades for alphaherpesviruses (WAH 64%; Denali 78%). VNT results showed highest titres against CvHV2 in both herds. These results suggest that CvHV2 has been present in caribou for over 30 years and recent contact with reindeer is not responsible for its introduction. The research identified Cervid herpesvirus 2 (CvHV2) as the endemic alphaherpesvirus in Alaskan reindeer and wild caribou.

    - Additionally to the serologic work described above, nasal and eye swabs were screened by PCR for the presence of CvHV2 in the above mentioned WA caribou herd plus other swabs collected from Mulchatna (prevalence 58%) and Teshekpuk (prevalence 67%) herds. CvHV2 has again been identified in some of these swabs. Further viral characterization will

require cell culture viral isolation will be undertaken in Norway during the next period.

- Concurrent with the alphaherpes study, a serosurvey for the presence of pestivirus circulating in two herds of caribou (Denali and WAH) was carried out. ELISA screening of serum samples (n=359) identified antibodies against pestivirus in WAH (58% seropositive) while Denali animals were all seronegative. While in reindeer samples from the Seward Peninsula analyzed in the same lab in Norway there were no pestivirus positive animals detected before 1994 (n=3) and actually pestivirus only seems to be present in a "stable" way after 2001, in WAH caribou where pestivirus are present throughout the entire year interval studied (1981-2010). The results of virus neutralization tests conducted at the SLU in Uppsala Sweden are currently being evaluated but may be difficult to interpret. High titers are observed both against Bovine Viral Diarrhea type 1 (BVD1) Virus and BDV2 (Norwegian reindeer pestivirus), and a final conclusion will require identification of viral RNA from nasal swabs (currently planned on nasal swabs used previously in the alphaherpes study and stored in Norway).

- **Parapoxvirus:** Hosted the sabbatical of Dr. Morten Tryland, of the Section of Arctic Veterinary Medicine of the Norwegian School of Veterinary Science in Tromsø, Norway. Dr. Tryland participated in collection of samples for parapoxvirus isolation and identification from caribou, muskox, Dall's sheep and mountain goat. He extracted DNA of parapox from tissues of suspected cases of contagious ecthyma in the species listed above. These included the first documented cases of parapox in caribou and a Sitka blacktailed deer in Alaska. It also confirmed some very subtle chronic ulcers and minute intradigital proliferative lesions as parapox. These DNA will be sequenced in Norway and phylogeny determined to compare with other sequences in Genebank in hopes of identify the origin and probably spread of parapox among Alaskan ungulates.

- **Zoonotic fecal parasites of ungulates**: Partially in response to the identification of a moose calf mortality due to a human pathogenic strain of *Cryptospordium* , a large sampling of available moose, caribou and wood bison feces were tested for *Cryptospordium* and the isolates sequenced Colorado State University in order to assess the prevalence and potential risk factors with this zoonotic parasite. The majority of samples were concurrently screened for *Giardia*.

- **Antibiotic Resistence:** Muskox feces were submitted to the Arctic Section of the Norwegian School of Veterinary Science for identification of antibiotic resistance in bacteria to compare with patterns in muskox in Norway.

- **Enhanced Rabies Surveillance**: Using the DRIT method of rabies testing, we tested 617 samples of mammalian brain tissue. Over 300 trapped foxes were subjected to screening to determine rabies prevalence in a 'random' sample. Additional noteworthy results include documenting the first case of rabies in a

wolverine in North America, as well as a second rabies positive wolf in northern Interior Alaska, a non-rabies endemic portion of the state. We also detected the onset of a rabies epizootic in Alaska during the winter of 2012-13 that was not recognized via the screening of human exposure cases submitted to the DHSS. Preliminary results from this work were presented at the Alaska Chapter of The Wildlife Society meeting in Fairbanks, AK during April 2013.

Federal funds were used to pay for salaries, supplies, travel and services on this task.

JOB/ACTIVITY 4: Monitor levels of environment contaminants in species of concern.

- Analyzed 45 new tissue samples from caribou for heavy metals. Entered nearly 1700 results into the Wildlife Clinical Pathology database to expedite interpretation and reporting.

- Both KB and SC attended a Veterinary Toxicology continuing education workshop sponsored by the Interior Veterinary Medical Association, Fairbanks, AK.

JOB/ACTIVITY 5: Assess the nutritional trace mineral status of Dall's sheep, moose, muskox, mountain goat, and caribou.

- Submitted nearly 550 blood, serum, liver, muscle, and/or kidney samples including those from Dall's sheep (n = 3), moose (n = 239), muskox (n = 28), mountain goat (n = 23) and caribou (n = 216) for trace element screening, conducted at the Wyoming State Veterinary Laboratory.

- More than 2000 results generated from these analyses were returned and are ready for entry into the DWC Clinical Pathology database. Over 5000 results were entered or reformatted to a more usable form in the DWC Clinical Pathology database during this segment. However, as with most of the serosurveillance, heavy metal, health assessment and trace mineral status projects, the lack of availability of statistical assistance of a biometrican and little available time to interpret the data, comprehensive analysis and publication of these data is severely impaired.

- Continued development of a laboratory assay to investigate the potential of serum superoxide dismutase (SOD) to serve as an index to liver copper, the gold standard for assessing an animal's copper status. We used paired liver and serum samples from caribou for our preliminary investigations, and are optimistic that our initial results will lead us to estimates of liver copper in live, free-ranging ruminants. Results to date were presented at The Wildlife Society meeting in Portland, Oregon during October 2012.

- Compiled all available trace minerals results from moose blood, serum and tissue, to determine where data gaps exist regarding age/sex/geographical sample sizes.

Searched tissue archive for additional samples to test and requested new sample collection from biologists to increase sample size in these critical areas.

- Compiled all available trace minerals results from Dall's sheep to examine relationship with risk of capture-related mortality as part of a Masters of Conservation Medicine thesis project of a Tufts University student. The student arrived in Fairbanks in May to begin a 12 week internship.

Federal funds were used to pay for salaries, travel, supplies and services on this task.

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

- Progress reports generated for Federal Aid and CWD Surveillance Program.
- Quarterly reports of rabies surveillance testing prepared for the Office of the State Veterinarian (DEC) and Section of Epidemiology (HSS).
- Presented an oral summary report of research projects and disease surveillance at the Region III summer and winter staff meetings.
- Co-authored manuscripts were drafted, prepared for submission or submitted for review *(accepted and published listed in V. Publications section*).
    - ***Submitted for review:*** McGrew, Ashley K., Lora R. Ballweber, Sara K. Moses, Craig A. Stricker, Kimberlee B. Beckmen, Mo D. Salman, and Todd M. O'Hara . **Mercury in gray wolves (*Canis lupus*) in Alaska: Increased exposure through consumption of marine prey.** Science of the Total Environment (accepted 8/16/2013).
    - ***Submitted for review:*** Nadler, Steven A., Eugene T. Lyons, Christopher Pagan, Derek Hyman, Edwin E. Lewis, Kimberlee Beckmen, Cameron Bell, Aurelie Castinel, Robert L. DeLong, Padraig J. Duignan, Cher Farinpour, Kathey Burek Huntington, Thijs Kuiken, Diana Morgades, Soraya Naem, Richard Norman, Corwin Parker, Paul Ramos, Terry R. Spraker, and Bárbara Berón-Vera. **Molecular Systematics of Pinniped Hookworms: Species Delimitation, Host Associations, and Host-Induced Morphometric Variation.** International Journal for Parasitology (accepted August 30, 2013)
- **Co-authored papers and posters presented at meetings:**
    - Poster presentation by Kimberlee Beckmen at the Annual Conference of the Wildlife Disease Association, Lyon France, July 2012. Title: **A Novel Dermatopathy in Alaskan Gray Wolves (*Canis Lupus*). Authors:** Kimberlee B. Beckmen[1,4] **,** Gregory D. Bossart[2], And Kathy Burek[3]

      [1] Alaska Department of Fish & Game, Division of Wildlife Conservation, 1300 College

Road, Fairbanks Alaska, USA;
[2]Georgia Aquarium, 225 Baker Street, NW, Atlanta, Georgia, USA;
[3]Alaska Veterinary Pathology Services, 23834 The Clearing Dr., Eagle River, Alaska

Abstract: We describe a novel dermatopathy in 16 Alaskan gray wolves, grossly characterized by symmetrical alopecia of guard hairs over the trunk and caudal thighs sparing the head, front limbs, dorsal back, and tail. The remaining undercoat was often curly. Histologically, mild to moderate follicular dysplasia and atrophy were present often with varying degrees of orthokeratotic basket-weave hyperkeratosis, epidermal atrophy and less commonly follicular keratosis. Inflammation rarely accompanied these microscopic changes and external ectoparasites were excluded. The etiology of this condition was not determined but the lesions are suggestive of a hormonal or seasonal-based etiology. In domestic canines, various endocrine dermatopathies, cyclic (seasonal) follicular dysplasia and follicular dysplasia and atrophy that occur in a condition termed alopecia X are associated with similar lesions. Alopecia X is an incompletely understood disorder that may be associated with abnormal levels of sex hormones originating from the adrenal glands. Additionally, dysfunctional hormonal receptors on hair follicles may play a role. Alopecia X is seen typically in young adult dogs of plush-coated arctic breeds such as Chows, Keeshonds, Samoyeds, Siberian Huskies, and Alaskan Malamutes. Since the northern breed domestic canines with alopecia X are closely related to wolves, it cannot be ruled out the wolf dermatopathy represents the same condition with a similar pathogenesis. Evaluation of blood for a possible endocrine etiology may prove useful in future studies. Additionally, based on the prevalence and geographic distribution of effected wolves, investigations of a genetic component may shed light on the cause of this unusual dermatopathy.

- Oral Presentation by Kimberlee Beckmen at the Alaska TWS Meeting, April 3-5, 2013, Fairbanks, AK. Title: **Enhanced rabies surveillance in Alaska using the direct rapid immunohistochemistry test (dRIT).** Authors: Crawford, S.G[1], K.B. Beckmen[1], and D.R. Sinnett[2]
  [1]Alaska Department of Fish and Game, Fairbanks, Alaska
  [2]U.S. Department of Agriculture, Wildlife Services, Palmer, Alaska

  Abstract: Previously, rabies surveillance efforts in Alaska have been limited to evaluating intact brains of suspect animals due to behavioral observations or following potential exposure to a human or pet. In 2006, the Centers for Disease Control and Prevention (CDC) validated the direct rapid immunohistochemistry test (dRIT) using brain tissue unsuitable for standard techniques. While the direct fluorescent antibody test (dFA) remains the gold standard for rabies diagnosis, the dRIT has great potential for enhanced surveillance, as it is rapid and doesn't require fluorescent microscopy or opening the skull to retrieve appropriate samples. In 2011, CDC personnel trained and certified staff from agencies within Alaska to conduct dRIT on non-exposure specimens. We have utilized dRIT to test ~1100 brain specimens of free-ranging wildlife, representing 18 endemic species. Our surveillance efforts have identified rabies positive cases in 2.9% of red foxes (n=467, 403 via trappers) and 4.0% of arctic foxes (n=100) tested. Additionally, in 2012 we documented the first case of rabies in a wolverine in North America (2.4%, n=42). Results from dRIT for foxes are highly

accurate and consistent with dFA; our broad investigation suggests occurrence of cross-reactions leading to false positive dRIT results for some other species (e.g. bats). Expanded surveillance has identified the significant risk of rabies transmission to resident trappers within the endemic region and detected presence in new species. Continuing to utilize the dRIT for passive and active rabies surveillance will enhance our ability to rapidly detect rabies outbreaks and changes in species or geographic distribution.

- Poster presentation by Kimberlee B. Beckmen at the Alaska TWS Meeting, April 3-5, 2013, Fairbanks, AK: **Dog ticks introduced and establishing in Alaska: Increased risks for tick-borne zoonoses**. Author: Kimberlee Beckmen
  Abstract: Ticks on small mammals and birds are endemic to Alaska however; dog ticks were not thought to be present. In 18 months, we detected numerous "dog" ticks which are also potential vectors of zoonotic diseases. The ADF&G tick surveillance program was established primarily for the early detection of the Moose Winter Tick (*Dermacentor albipictus*) which is already establishing in the Yukon on elk and moose. We received 28 ticks (identifications by Dr. Lance Durden), of which 18 were from dogs, 1 each from a cat, hare, marten, and 6 on people. Nine were American dog ticks (*Demacentor variabilis)* including from a dog that never left Juneau, and a dog that picked up the tick at Potter's Marsh in Anchorage. The dogs carrying *D. variabilis* resided in many areas of the state including Fairbanks and North Pole. *D. variablis* is a vector of Rocky Mountain Spotted Fever (RMSF) and tularemia. There were three Brown dog ticks *(Rhipicephalus sanguineus*) on resident dogs of Sitka and Anchorage. This tick is a vector of canine ehlichiosis, canine babesiosis, Lyme Disease, RMSF, & Q fever. Two Rocky Mountain Wood ticks (*Dermacentor andersoni)* were identified, which are vector RMSP, Anaplasmosis, tick paralysis, tick fever and Q fever. One Lone star tick *(Amblyomma americanum*) was identified. This tick, a vector of Ehrlichiosis and tularemia, was found on a dog in Eagle River. Our goal is to increase awareness about prevention necessary for pets traveling to Alaska and for practitioners to consider tick-borne diseases in there differential diagnoses.

- Poster Presentation by Stephanie Crawford at the TWS Meeting, October 13-18 2013, Portland OR. Title: **Investigating the utility of serum superoxide dismutase to predict copper status of caribou.** Authors: Crawford, S.G, and C. Pauling, K.B. Beckmen. Abstract: Copper (Cu) deficiency in ruminants can result in adverse health impacts, including morbidity or mortality in free-ranging, wild populations. Copper concentration in liver is the gold standard for evaluating the Cu status in ruminants. Assessing the Cu status in live, free-ranging Cervidae, however, is problematic as serum Cu concentrations are affected by other factors such as inflammation, pregnancy, or parasite load and are not directly correlated with liver Cu stores; assessment of ceruloplasmin demonstrated limited utility in our previous studies. In studies using sheep, rats, and cattle, serum superoxide dismutase (SOD) has been

utilized to evaluate Cu status, as it uses the oxidation and reduction reactions of a bound Cu ion in order to catalyze superoxide radicals. Using a commercially-available ELISA kit, we conducted an assay using serum samples from caribou (*Rangifer tarandus tarandus*) with paired data of liver Cu concentrations (n = 28) to investigate the relationship between liver Cu concentrations and SOD activity. Our results suggest that SOD (U/L) does not correlate directly with liver Cu concentrations for caribou with deficient Cu levels (≤ 5.0 ppm) or geriatric individuals (age ≥ 10 years). Caribou < 10 years old with liver Cu values > 5 ppm, however, did show lower SOD values as liver Cu increased, suggesting that SOD may be a good predictor of copper status on a population basis. Our preliminary observations warrant further investigation into utilizing serum SOD activity as an index to liver Cu concentrations in live caribou and specifically to determine the importance of other covariates, such as pregnancy status.

Federal funds were used to support salary and expenses this task.

JOB/ACTIVITY 7: Perform duties of the attending veterinarian.

- Provided advice, consultation, and services to Division staff related to wildlife capture, disease, mortality, euthanasia, and zoonotic disease risk/diagnosis.

    - Provided multiple training seminars in Animal Welfare Policy, Wildlife Diseases and Parasite, Answering public and staff inquiries about wildlife disease and parasites, and Handling of Controlled Substances. Updated training and informational materials on the Sharepoint website.
    - Prepared capture and sampling supplies for ~10 capture events (including moose, caribou, plains bison, muskox, and wolf) and dedicated 12 personnel days to assisting biologists with captures and/or sample collection.
    - Provided veterinary care and advice for husbandry for the captive animals at the Moose Research Center, Palmer moose and caribou facility and the Alaska Wildlife Conservation Center.

- Provide veterinary capture drugs/supplies to Division staff.

    - Coordinated and completed 6 veterinary drug/supply orders for Divisional staff and dispensed drugs/supplies throughout year.
    - Conducted annual controlled substances inventory (2000+ individual vials of drugs) involving DWC staff that have been dispensed drugs (n = 120 staff) throughout the state (n = 23 area offices).
    - Throughout the year, dispense drugs/supplies, receive and process controlled substance use reports and individual capture records, and empty/partial vials for destruction.

- All data related to controlled substance procurement, dispensing, and use are entered into a drug tracking database.

- Address public concerns about wildlife disease, parasites, and lesions in game meat, zoonotic diseases, and animal welfare. Attended to on a case by case basis (walk-ins, phone calls, e-mails, and public information requests).

- Continued to review staff training and supply preparations for responding to wildlife caused human morbidity and mortalities. Attended the Region III staff meeting regarding response procedures. Performed a necropsy on a bear killed in a human fatality, and received samples from DWC biologists collected in response to an additional human fatality.

- Performed the duties of the Attending Veterinarian for the DWC Animal Care and Use Committee. Provided training to new staff on the Animal Welfare Policy. Consulted on the development of new protocols, reviewed protocols submitted to the committee. Conducted research facility inspections. Responded to DWC personnel calls and reports of capture related morbidities and mortalities.

Federal funds were used to pay for salaries, supplies and services on this task.

III. COSTS INCURRED DURING THIS SEGMENT

Not applicable

IV. SIGNIFICANT DEVIATIONS AND/OR ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

- Frequent monitoring of wildlife disease related reports via the internet and electronic newsletter as well as notifications of outbreaks were conducted. In addition, meetings (phone as well as in person) related to urgent zoonotic, human health or agricultural disease issues were attended.

    - Monitor Promed and Wildlife Health Alerts listservs for disease outbreaks and infectious disease discoveries pertinent to Alaskan wildlife and zoonotic disease risks or introductions of exotic (non-endemic disease). Alert or report pertinent issues to DWC staff via an email list.
    - Participate as a member of the Wildlife Health Committee of AFWA, WAFWA, the Alaska One Health Group and other subcommittees related to wildlife health and zoonotic disease. Report pertinent issues to DWC staff.
- K. Beckmen attended the Joint 61st Wildlife Disease Association/10th Biennial European Wildlife Disease Association Conference, held in Lyon, France July 23-27. The day prior to the conference, she attended the American College of Zoological Medicine Ultra Short Course. This is a day-long continuing education

course added to the following conference to obtain the required education credit hours to maintain the Alaska Veterinary Practice License. Lectures included: Wild bird diseases, Free-ranging carnivore diseases, free-ranging marine mammal diseases, Diseases of sea otters, Diseases of mule deer and black-tailed deer. At the conference, the poster on the wolf dermatopathy was presented leading to contacts with European pathologists. The theme of the conference was "Convergence in wildlife health". There were many highlights but especially thought provoking were the key note speakers' topics including:

  - One Health,
  - Insights into the interplay between environment, stress, health and grizzly bear population performance in Alberta,
  - Migration and infectious disease risk,
  - Costs and benefits of wildlife disease control, and the
  - Effective of multiple pollutants on a free-ranging host.

  Additional opportunities to confer and collaborate with colleagues were exploited. The possibilities and potential candidates for a Fulbright Scholar from Norway to develop new chemical capture protocols were explored.
- K. Beckmen traveled to the Rangifer Health Network collaborators meeting in Egilsstadir Iceland August 22-25, 2012 (travel expenses paid by sponsor) to present current state of caribou management and disease surveillance in caribou. Coordinate and collaborate with other Network members (Norwegian and Swedish colleagues in particular as outline above in section on disease surveillance) on ongoing research projects as well as discuss new research possibilities.
- S. Crawford traveled to the 19th Annual Conference of The Wildlife Society to present our Rabies surveillance program and obtain continuing education/professional development.
- A 1-year college internship of UAF student Elizabeth Goldsmith was satisfactorily completed. The next intern, Karolina Pavic, began in June to overlap and train with Elizabeth. College interns are primarily involved with assisting in necropsy, processing blood/tissues samples, archiving/inventory/shipment of samples and preparing field supplies.

Federal funds were used to pay for salaries, supplies, services, and some travel costs for this work.

V. PUBLICATIONS

1. *Published (Appendix 1):* Verocai, Guilherme, G., Manigandan Lejeune, Kimberlee B Beckmen, Cyntia K Kashivakura, Alasdair M Veitch, Richard A Popko, Carmen Fuentealba, Eric P Hoberg; Susan J Kutz. 2012. **Genetic Defining parasite biodiversity at high latitudes of North America: new host and geographic records for *Onchocerca cervipedis* (Nematoda: Onchocercidae) in moose and caribou.** 2012. Parasites& Vectors. http://www.parasitesandvectors.com/content/5/1/242

2. *Published (Appendix 2):* Castellini, J. Margaret, Lorrie D. Rea, Camilla L. Lieske, Kimberlee B. Beckmen, Brian S. Fadely, John M. Maniscalco, and Todd M. O'Hara 2012. **Mercury Concentrations in Hair from Neonatal and Juvenile Steller Sea Lions (*Eumetopias jubatus*): Implications Based on Age and Region in this Northern Pacific Marine Sentinel Piscivore.** 2012. Ecohealth 9:267-277.

3. *Published (Appendix 3):* Kutz, Susan J., Julie Ducrocq, Guilherme G. Verocai, Bryanne M. Hoar, Doug D. Colwell, Kimberlee B. Beckmen, Lydden Polley, Brett T. Elkin, Eric P. Hoberg. 2012. **Parasites in Ungulates of Arctic North America and Greenland: A View of Contemporary Diversity, Ecology, and Impact in a World Under Change.** Advances in Parasitology. 2012. 79:99-252.

4. *Published (Appendix 4):* Gardner, Craig L., Kimberlee Beckmen, Nathan Pamperin, Patty Del Vecchio. 2013. **Experimental Treatment of Dog Louse Infestation in Interior Alaskan Wolf Packs.** Journal of Wildlife Management 77(3):626-632.

5. *Published:* J.P. Dubey, G.V. Velmurugan, C. Rajendran, M.J.. Yabsley, N.J. Thomas, K.B. Beckmen, D. Sinnett, D. Ruid, J. Hart, P..A. Fair, W.E. McFee, V. Shearn-Bochsler, O.C.H. Kwok, L.R. Ferreira, S. Choudhary, E.B. Faria, H. Zhou, T.A. Felix, C. Su. 2012. **Genetic Characterisation of *Toxoplasma gondii* in wildlife from North America revealed in widespread and high prevalence of the fourth clonal type**. International Journal for Parasitology 41(11):1139-1147.

VI. RECOMMENDATIONS FOR THIS PROJECT

Disease surveillance and veterinary activities have continued to steadily increase in scope and intensity over the course of this performance period. To continue to provide wildlife veterinary services at the level currently expected by Alaskans (and demanded by DWC personnel), veterinary staffing levels and funding for wildlife disease surveillance must be increased as well as a decrease in some less critical tasks. Federal funding of CWD surveillance is no longer available, so we will no longer be able to maintain a significant level of CWD surveillance of free-ranging cervids in Alaska unless allocated additional funding and staff. The hiring of a WBI or II in support of wildlife disease monitoring and veterinary services in southcentral has not been approved but is necessary to carry on the current level of work with the loss of the CWD seasonal non-perm WBII position. These deficiencies in funding and staffing will need to be mitigated by other funding sources including Federal Aid. A cooperative agreement with USDA Wildlife Services or a contact with Alaska Veterinary Pathology Services may provide a temporary but immediate solution to this urgent need. The dedicated assistance of a biometrician or statistician is critical to analyze, appropriately interpret and report the comprehensive, complicated data generated through these surveillance programs. Consultations with colleagues with wildlife epidemiologic expertise are needed to advance the understanding of the role of these potential pathogens on Alaska's wildlife populations and determine if and when there is a need for intervention, mitigation or further study and monitoring for wildlife disease management purposes.

Prepared by: Kimberlee Beckmen, M.S., D.V.M., Ph.D.

Date: 9/1/2013

Attachments: Appendix1-5 : PDFs of publications