



**55th Annual Meeting of the
Wildlife Disease Association**



*Advancing Global Health:
Facing Disease Issues at the Wildlife,
Human, and Livestock Interface*

August 6-10, 2006

hosted by the Department of Pathobiology and Veterinary Science

 **University of Connecticut**



**The 55th WDA meeting
is being held in conjunction with the
AAWV Annual meeting.**



Thanks!

SPECIAL THANKS TO OUR GENEROUS SPONSORS & COLLABORATORS

American Association of Zoo Veterinarians

American College of Zoological Medicine

Bio-Rad

Connecticut Department of Environmental Protection

Connecticut Metropolitan District

University of Connecticut Dianne Lieberman Fund

Wildlife Conservation Society, Field Veterinary Program



**Continuing Education co-sponsored by the
American College of Zoological Medicine**

TABLE OF CONTENTS

CONTRIBUTING ORGANIZATIONS & SPONSORS.....	i
WDA 2006 OFFICERS AND COUNCIL.....	iii
PLANNING COMMITTEE.....	iv
WDA 2006 DETAILED CONFERENCE PROGRAM.....	v
ABSTRACTS OF PRESENTATIONS.....	xvi
CARLTON HERMAN FOUNDERS FUND LECTURE.....	1
ADVANCING GLOBAL HEALTH: FACING DISEASE ISSUES AT THE WILDLIFE, HUMAN, AND LIVESTOCK INTERFACE.....	2
WDA GRADUATE STUDENT RESEARCH RECOGNITION AWARD WINNER.....	15
TERRY AMUNDSON STUDENT PRESENTATIONS.....	16
AAWV CUTTING EDGE SPEAKER.....	36
ADVANCING GLOBAL HEALTH: LINKING CAPTIVE AND FREE-RANGING WILDLIFE HEALTH.....	37
AVIAN INFLUENZA EPIDEMIOLOGY AND MANAGEMENT.....	47
DISEASES OF MARINE MAMMALS.....	54
WILDLIFE DISEASE MANAGEMENT AND SURVEILLANCE.....	59
AVIAN DISEASES.....	66
LONG-TERM MONITORING FOR WILDLIFE DISEASES.....	73
WILDLIFE DISEASE TECHNIQUES AND TECHNOLOGY.....	81
DISEASES OF TERRESTRIAL MAMMALS.....	87
POSTER PRESENTATIONS.....	98
NOTES.....	128
INDEX OF PRESENTERS.....	134

WDA 2006 OFFICERS AND COUNCIL

President	Scott Wright
Vice-President	Mike Miller
Secretary	Margaret Wild
Treasurer	Carol Meteyer
Past-President	Torsten Mörner
Executive Manager	Ed Addison
Journal Editor	Elizabeth Howerth
Journal Editor	David Stallknecht
Website Editor	Michael Ziccardi
Supplement Editor	Pauline Nol

Council Members-at-Large

Todd Cornish, Helen Schwantje, Markus Peterson,
Joe Gaydos, Marguerite Pappaioanou, Marcela Uhart

Student Member of Council

Claire Jardine

Section Chairs

Africa	Elizabeth Wambwa
Australasia	Tim Portas
Europe	Marc Artois
Nordic	Erik Agren
Wildlife Veterinarian	Kirsten Gilardi



2006 PLANNING COMMITTEE

Program Co-Chairs

Damien Joly
Ed Addison
William Karesh

Local Hosts

Richard French
Herb Van Kruiningen

Organizing Committee

Todd Cornish
Kirsten Gilardi
Jonathan Sleeman
Lisa Starr
Angela Yang

Session Moderators

Todd Cornish
Shelli Dubay
Elena Garde
Kirsten Gilardi
Damien Joly
William Karesh
Terry Kreeger
Jonna Mazet
Margo Pybus
Helen Schwantje
Jonathan Sleeman
Catherine Soos
Nancy Thomas

Conference Management

Judy Fraunhofer
Bob Seguin

WDA 2006 Detailed Conference Program

Location Information

The Rome Commons Ballroom will host all meetings and receptions unless otherwise noted on the program. Pre-conference meetings for the Editorial Board and the Council will occur at the Nathan Hale Inn.

The South Campus Dining Hall is the designated University Dining Hall during the conference. The dining hall is located on the first level of the Rome Commons Building, downstairs one level from the ballroom. Lunch in the dining hall is included each day for all participants. Breakfast and dinner is available in the dining hall for those that pre-purchased a meal package, or on a cash basis at the door.

Events & Social Activities

Welcome Reception - Sunday August 6

A welcome reception Sunday evening will include hors d'oeuvres and a cash bar. This will be an opportunity to renew old acquaintances and make new ones. In keeping with tradition, this will be a student members only reception from 19:00 – 19:30 and open to all registrants at 19:30.

Picnic - Monday, August 7

The picnic on Monday evening will take place at Mansfield Hollow State Park, a seven minute bus ride from the campus. The excursion will include a meal and an opportunity for informal interaction among colleagues in an outdoor setting. The park is an alcohol-free park. Please bring your running shoes in the event that a volleyball game breaks out following dinner!

Auction - Tuesday, August 8

The auction on Tuesday evening is a major source of entertainment at the meeting. Proceeds from the auction are directed specifically to student awards and other student activities of the WDA. Please be prepared to pay for items by check as we do not have the ability to accept credit cards at the auction.

Banquet - Wednesday, August 9

The Wednesday evening banquet will occur at the Rome Ballroom. Highlights, in addition to the meal will include presentations of major WDA awards. In most years, this includes presentations of the Distinguished Service Award, the Emeritus Award and the infamous Duck Award to the unfortunate recipient recognized to have made the biggest blunder at the conference! If you pre-registered for the banquet, a ticket is included in your conference materials. If you did not sign up for the banquet, but are interested in attending, please check at the registration area to see if there is remaining availability.

Sunday, August 6

Pre-Conference Activities (Nathan Hale Inn - Mansfield Room)

8:30 Editorial Board Meeting (Nathan Hale Inn Mansfield Room)

12:00 Lunch

13:00 Council Meeting

19:00 Student Members' Reception (Cash Bar)

19:30 Welcome Reception (Hors D'Oeuvres & Cash Bar)

Monday, August 7

7:30 **Breakfast**

8:30 **Welcome & Conference Overview**

Herbert Van Kruiningen, Department Head, UConn Department of Pathobiology & Veterinary Science
Richard French, Associate Professor, UConn Department of Pathobiology & Veterinary Science
Scott D. Wright, President, Wildlife Disease Association

Carlton Herman Founders Fund Lecture

9:00 1. THERE ARE NOW A FEW GAPS IN OUR IGNORANCE
Gary Wobeser, University of Saskatchewan

Advancing Global Health: Facing Disease Issues at the Wildlife, Human, and Livestock Interface

9:30 2. IMPEDIMENTS TO INTERPROFESSIONAL COOPERATION TO STUDY AND CONTROL DISEASES IN WILDLIFE
Leonard Marcus, Travelers' Health & Immunization Services
Jeffrey Marcus, North Carolina Wildlife Resources Commission

9:45 3. A HUMAN HEALTH PERSPECTIVE ON WILDLIFE AS SENTINELS
Peter Rabinowitz, Yale School of Medicine

10:00 **Break**

10:30 4. WORMS IN A HARSH WORLD: CONSERVATION BIOLOGY OF HELMINTHS
M.J. Pybus, Alberta Fish and Wildlife Division

10:45 5. A NATIONAL FISH AND WILDLIFE HEALTH INITIATIVE
John Fischer, The University of Georgia

11:00 6. CRYPTOSPORIDIUM IN WILDLIFE, CATTLE, AND HUMANS AT THE WILDLIFE/DOMESTIC INTERFACE OF QUEEN ELIZABETH NATIONAL PARK, UGANDA
Elizabeth Cook, University of London

11:15 7. INTEGRATED HEALTH APPROACH TO GORILLA CONSERVATION
Mike Cranfield, Mountain Gorilla Veterinary Project Team, Inc.

11:30 8. IMPORTANCE OF MINI-LIVESTOCK AND THE RISKS OF DISEASE ASSOCIATED WITH DOMESTICATION: THE CASE OF CRICETOMYS SPP. (RODENT: CRICETIDAE)
Jean Malekani, University of Kinshasa

11:45 9. FROG VIRUS 3 AND AEROMONAS HYDROPHILA IN FREE-RANGING BULLFROG (RANA CATESBIANA) AND GREEN FROG (RANA CLAMITANS) LARVAE
Debra Miller, The University of Georgia

12:00 **Lunch**

13:00 10. RETROVIRUSES FROM INDIAN PRIMATES: IMPLICATIONS FOR EMERGING INFECTIOUS DISEASES
Jayashree Nandi, Lovelace Respiratory Research Institute

13:15 11. EDUCATING ECOSYSTEM HEALTH PROFESSIONALS WORKING AT THE WILDLIFE-LIVESTOCK-HUMAN INTERFACE
Jonna Mazet, University of California, Davis

Monday, August 7

- 13:30 12. CONSEQUENCE OF AVIAN INFLUENZA FOR POULTRY AND MIGRATORY BIRDS IN INDIA AND POSSIBLE REMEDIAL MEASURES.
Hafiz Yahya, Aligarh Muslim University
- 13:45 13. COMPARISON OF PATHOGENS IN BROILER AND BACKYARD CHICKENS ON THE GALÁPAGOS ISLANDS: IMPLICATIONS FOR TRANSMISSION TO WILDLIFE
Catherine Soos, Saint Louis Zoo and University of Missouri, St. Louis
- 14:00 14. HABITAT FRAGMENTATION AND DISEASE EMERGENCE: LANDSCAPE AND COMMUNITY ECOLOGY APPROACHES
Gerardo Suzán, Wildlife Trust, New York

Wildlife Disease Association Graduate Student Research Recognition Award

- 14:15 15. PERSISTENCE OF H5 AND H7 AVIAN INFLUENZA VIRUSES IN WATER
Justin Brown, The University of Georgia

Terry Amundson Student Presentations

- 14:35 16. SEROLOGIC EVIDENCE OF CANINE PARVOVIRUS (CPV) AND CANINE DISTEMPER VIRUS (CDV) AMONG FREE-RANGING RED WOLVES (CANIS RUFUS)
Anne Acton, North Carolina State University
- 14:50 **Poster Break** (*Poster presenters will be available for viewing and discussion.*)
- 15:30 17. VESICULAR STOMATITIS ON OSSABAW ISLAND
Lindsay Fann, University of Georgia
- 15:45 18. HEMATOLOGICAL ANALYSES AND SERUM BIOCHEMISTRIES OF WILD CAUGHT XENOPUS LAEVIS: A FIELD STUDY
Allison Gagnon, Stanford University
- 16:00 19. WEST NILE VIRUS SEROPREVALENCE IN WILD MAMMALS ALONG AN URBAN TO RURAL GRADIENT
Andrés Gómez, Columbia University
- 16:15 20. INVESTIGATING THE HEALTH AND PATHOGEN DIVERSITY OF BACKYARD CHICKENS IN LATIN AMERICA
Sonia Hernandez-Divers, University of Georgia
- 16:30 21. EFFECT OF EXPERIMENTAL ECTOPARASITE CONTROL ON BARTONELLA INFECTIONS IN WILD RICHARDSON'S GROUND SQUIRRELS (SPERMOPHILUS RICHARDSONII)
Claire Jardine, University of Saskatchewan
- 16:45 22. EXPERIMENTAL INFECTION OF DOMESTIC CATS (FELIS DOMESTICUS) WITH A NOVEL CYTAUXZON-LIKE PIROPLASM AND IMPLICATIONS FOR FREE-RANGING WILD FELIDS
Priscilla Joyner, The Wildlife Center of Virginia
- 17:00 23. GENETIC DIVERSITY AND HEMORRHAGIC DISEASE SUSCEPTIBILITY IN WHITE-TAILED DEER
Sabrina McGraw, University of Georgia

- 17:30 **Picnic Dinner at Mansfield Hollow State Park**
(*busses depart from the Rome Commons parking area at 17:30 and will return to campus at 20:30*)

Tuesday, August 8

7:30 Breakfast

Terry Amundson Student Presentations (*continued*)

- 8:30 24. PASSIVE TRANSFER OF IMMUNITY TO WEST NILE VIRUS IN CHICKENS
Nicole Nemeth, Colorado State University
- 8:45 25. EFFICACY OF ORAL AND PARENTERAL BACILLE CALMETTE-GUERIN (BCG DANISH STRAIN 1331) IN PROTECTING WHITE-TAILED DEER (*Odocoileus virginianus*) AGAINST BOVINE TUBERCULOSIS
Pauline Nol, USDA/APHIS National Wildlife Research Center
- 9:00 26. UNDERSTANDING PATTERNS OF WILDLIFE DISEASE: IMPLICATIONS FOR HYPOTHESIS TESTING OF PARASITOLOGICAL DATA
Chris O'Brien, USGS/BRD Sonoran Desert Research Station and University of Arizona
- 9:15 27. RENAL INTERSTITIAL FIBROSIS, PULMONARY FIBROMUSCULAR HYPERPLASIA AND OTHER FINDINGS FROM A HISTOLOGICAL ASSESSMENT OF THE BOWHEAD WHALE (*Balaena mysticetus*)
Cheryl Rosa, University of Alaska
- 9:30 28. FEASIBILITY OF USING COYOTES (*Canis latrans*) AS SENTINELS FOR BOVINE TUBERCULOSIS (*Mycobacterium bovis*) IN WILD CERVIDS IN AND AROUND RIDING MOUNTAIN NATIONAL PARK
Cheryl Sangster, University of Saskatchewan
- 9:45 29. THE INFLUENCE OF CATTLE ON PATHOGEN PREVALENCE IN GREEN FROG (*Rana clamitans*) AND AMERICAN BULLFROG (*Rana catesbeiana*) TADPOLES IN CUMBERLAND PLATEAU WETLANDS
A. Chandler Schmutzer, University of Tennessee
- 10:00 **Poster Break** (*Poster presenters will be available for viewing and discussion.*)
- 10:30 30. ASSESSING THE IMPORTANCE OF CHRONIC WASTING DISEASE IN FREE-RANGING DEER MORTALITIES USING MULTI-STATE MODELS
Krysten Schuler, South Dakota State University
- 10:45 31. FUNGAL RESPIRATORY DISEASES IN RAPTORIAL BIRDS: A RETROSPECTIVE STUDY OF 95 CASES IN A REHABILITATION SETTING
Guylaine Séguin, Université de Montréal, St. Hyacinthe
- 11:00 32. PREVALENCE OF *Bartonella* SPECIES IN RODENTS AND FLEAS ASSOCIATED WITH BLACK-TAILED PRAIRIE DOGS
Bala Thiagarajan, Kansas State University
- 11:15 33. A STUDY OF THE PREVALENCE OF WEST NILE VIRUS IN A POPULATION OF AMERICAN KESTRELS (*Falco sparverius*) IN SOUTHEASTERN OHIO DURING THE NESTING SEASON
Tiffany Wolf, The Wilds
- 11:30 34. PRELIMINARY EVIDENCE OF INTERACTION BETWEEN DOMESTIC SWINE AND PSEUDORABIES- AND BRUCELLOSIS-POSITIVE FERAL SWINE
A. Christy Wyckoff, Texas A&M University, Kingsville
- 11:45 35. THE PREVALENCE OF ROUNDWORMS (*Baylisascaris procyonis*) IN RACCOONS (*Procyon lotor*) IN PORTLAND, OREGON
Jennifer Yeitz, Oregon State College of Veterinary Medicine

Tuesday, August 8

12:00 Lunch

American Association of Wildlife Veterinarians Cutting Edge Speaker

13:00 36. RAPPORT, ALIGNMENT, AGREEMENT, RESULTS
Tom McGinn, Department of Homeland Security

Advancing Global Health: Linking Captive and Free-Ranging Wildlife Health

13:45 37. THE DEFINITION OF A WILDLIFE VETERINARIAN: HISTORY, SEMANTICS, PHILOSOPHIES, AND CULTURES OF THE AAWV AND AAZV
R. Scott Larsen, University of California, Davis

14:00 38. ENVIROVET SUMMER INSTITUTE
Kirsten Gilardi, University of California, Davis

14:15 39. HEALTH MANAGEMENT OF ORPHANED WILD ELEPHANTS AT ELEPHANT TRANSIT HOME
B. A. D. S. Jayawardana, Department of Wildlife Conservation, Udawalawe, Sri Lanka

14:30 40. MEDICAL MANAGEMENT OF COLD STUNNED SEA TURTLES STRANDED ON CAPE COD
E. Scott Weber III, New England Aquarium, Central Wharf

14:45 41. LIPOSOME ENCAPSULATED BUTORPHANOL PROVIDES LONG-TERM ANALGESIA TO PARROTS
Joanne Paul-Murphy, University of Wisconsin

15:00 Break

15:30 42. GENETIC SALVAGE FROM A DISEASED WOOD BISON (BISON BISON ATHABASCAE) HERD THROUGH IN VITRO PRODUCTION AND CRYOPRESERVATION OF EMBRYOS
Jacob Thundathil, University of Calgary

15:45 43. PERIPHERAL AND INTERNAL LYMPHOID INVOLVEMENT IN PRE-CLINICAL CHRONIC WASTING DISEASE IN ADULT MULE DEER (ODOCOILEUS HEMIONUS)
Jenny Powers, National Park Service

16:00 44. TRANSMISSION OF DEER HAIR-LOSS SYNDROME FROM COLUMBIAN BLACK-TAILED DEER (ODOCOILEUS HEMIONUS COLUMBIANUS) TO ROCKY MOUNTAIN MULE DEER (ODOCOILEUS HEMIONUS HEMIONUS)
Colin Gillin, Oregon Department of Fish and Wildlife

16:15 45. INFECTIOUS DISEASES AND THE ILLEGAL TRADE OF WILDLIFE
Andres Gomez, Columbia University

16:30 46. ZOO-BASED WILDLIFE DISEASE SURVEILLANCE
Dominic Travis, Lincoln Park Zoo

17:00 AAWV Business Meeting

18:00 Dinner

19:00 Auction & Dessert Reception (Cash Bar)

Wednesday, August 9

7:30 Breakfast

Avian Influenza Epidemiology and Management

- 8:30 47. THE HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI) EARLY DETECTION DATA SYSTEM (HEDDS)
F. Joshua Dein, NBII Wildlife Disease Information Node, USGS NWHC
- 8:45 48. TOWARD AN INTEGRATED RISK ANALYSIS FOR AVIAN INFLUENZA: A JOINT PROJECT BY CANADIAN AUTHORITIES RESPONSIBLE FOR WILDLIFE, ANIMAL HEALTH, PUBLIC HEALTH AND PUBLIC SAFETY; *Geneviève Trottier, Canadian Food Inspection Agency*
- 9:00 49. ARE SHOREBIRDS A RESERVOIR FOR AVIAN INFLUENZA VIRUSES?
David Stallknecht, The University of Georgia
- 9:15 50. EXPERIMENTAL INFECTION OF LAUGHING GULLS (*LARUS ATRICILLA*) AND NORTH AMERICAN DUCK SPECIES WITH HIGHLY PATHOGENIC H5N1 AVIAN INFLUENZA VIRUSES
Justin Brown, The University of Georgia
- 9:30 51. HIGHLY PATHOGENIC INFLUENZA VIRUS - H5N1 INFECTION IN SWEDISH WILDLIFE: CLINICAL FINDINGS AND EPIDEMIOLOGY
Torsten Mörner, National Veterinary Institute, Sweden
- 9:45 52. HIGHLY PATHOGENIC INFLUENZA VIRUS-H5N1 INFECTION IN SWEDISH WILDLIFE: PATHOLOGY FINDINGS; *D. Gavier-Widén, National Veterinary Institute, Sweden*
- 10:00 53. PRELIMINARY RESULTS OF MONITORING WILD BIRDS FOR AVIAN INFLUENZA IN MARYLAND
Cindy Driscoll, Maryland Department of Natural Resources

10:15 Break

Diseases of Marine Mammals

- 10:45 54. THE ST. LAWRENCE ESTUARY BELUGA: A TALE OF A WHALE.
Lena Measures, Maurice Lamontagne Institute
- 11:00 55. THE BIG PICTURE: WHAT CAN BE DONE ABOUT VARIOUS FORMS OF POLLUTION EFFECTING SOUTHERN SEA OTTERS AND THEIR ECOSYSTEM?
David Jessup, California Department of Fish and Game
- 11:15 56. DERELICT FISHING GEAR AND MARINE WILDLIFE: IMPACTS, SOLUTIONS
Kirsten Gilardi, University of California, Davis
- 11:30 57. PREVALENCE OF ANTI-BRUCELLA ANTIBODIES IN PINNIPEDS INHABITING THE SHIRETOKO PENINSULA, JAPAN; *Kazue Ohishi, Japan Agency for Marine-Earth and Technology*
- 11:45 58. GIARDIA IN HARBOR SEALS FROM THE INLAND WATERS OF WASHINGTON STATE
Joseph Gaydos, University of California, Davis

12:00 Lunch

Wildlife Disease Management and Surveillance

- 13:00 59. HEALTH RISK ASSESSMENT PRELIMINARY DATA IN A FRAGMENTED SCENARIO OF THE EASTERN BRAZILIAN AMAZON – THE TUCURUÍ CARNIVORE PROJECT
Christina Whiteman, Universidade Federal Rural da Amazônia

Wednesday, August 9

- 13:15 60. MULTIPLE STATE QUALITATIVE CHRONIC WASTING DISEASE RISK ASSESSMENT
Jonathan Sleeman, Virginia Department of Game and Inland Fisheries
- 13:30 61. THE EPIDEMIOLOGICAL CHALLENGE OF EVALUATING BRUCELLOSIS SEROPREVALENCE IN FREE-RANGING ROCKY MOUNTAIN ELK IN MONTANA
Mark Atkinson, Montana Fish, Wildlife and Parks
- 13:45 62. EVALUATION OF A CLINICAL DECISION TREE FOR THE MOUNTAIN GORILLA (GORILLA BERINGEI)
Richard Minnis, Mississippi State University
- 14:00 63. NORTH AMERICAN RABIES MANAGEMENT PLANNING: A CONTINENTAL FRAMEWORK FOR SUCCESS
Dennis Slate, USDA, APHIS, Wildlife Services
- 14:15 64. ORAL VACCINATION OF BADGERS (MELES MELES) AGAINST TUBERCULOSIS: IMMUNE RESPONSES AND PROTECTION FOLLOWING BCG DELIVERY VIA THE ORAL ROUTE AND PULMONARY CHALLENGE WITH M. BOVIS
S. Lesellier, University College Dublin
- 14:30 65. SPECIES-SPECIFIC VISITATION AND REMOVAL OF BAITS FOR DELIVERY OF PHARMACEUTICALS TO FERAL SWINE
David Long, USDA APHIS WS National Wildlife Research Center

14:45 **Break**

Avian Diseases

- 15:15 66. EXPOSURE TO SELECTED INFECTIOUS AGENTS IN THREE FLAMINGO SPECIES FROM THE HIGH-ANDES WETLANDS
Marcela Uhart, Wildlife Conservation Society, Puerto Madryn
- 15:30 67. A WORLD-WIDE SUMMARY OF AVIAN POX INFECTIONS BY TAXONOMIC GROUP AND CONTINENT
Charles van Riper III, University of Arizona
- 15:45 68. NATURAL AND OIL-SPILL ASSOCIATED VARIATION IN HEMATOCRIT IN BUZZARDS BAY, MASSACHUSETTS
Florina Tseng, Tufts University
- 16:00 69. DERMAL LESIONS ON WADING BIRD NESTLINGS CAUSED BY DERMESTID BEETLE LARVAE
Stephanie Schmidt, Manomet Center for Conservation Sciences
- 16:15 70. VERTEBRATE HOSTS OF MOSQUITOES INVOLVED IN TRANSMISSION OF WEST NILE AND EASTERN EQUINE ENCEPHALITIS VIRUSES IN THE NORTHEASTERN UNITED STATES
Goudarz Molaei, The Connecticut Agricultural Experiment Station
- 16:30 71. WEST NILE VIRUS SEROPREVALENCE, ANTIBODY PERSISTENCE, AND MOLECULAR SPECIES DIFFERENTIATION OF AMERICAN CROWS AND FISH CROWS
Samantha Gibbs, University of Georgia
- 16:45 72. MOLECULAR CHARACTERIZATION OF BABESIA SHORTII FROM A GYRFALCON (FALCO RUSTICOLUS) AND BABESIA POELEA FROM BROWN BOOBIES (SULA LEUCOGASTER).
Michael Yabsley, University of Georgia

17:00 **WDA Business Meeting**

18:30 **Banquet Dinner & Awards Ceremony (Cash Bar)**
Pre-Registration Required

7:30 Breakfast

Long-term Monitoring

- 8:30 73. NECROPSY FINDINGS AND ARBOVIRUS SURVEILLANCE IN MOURNING DOVES (ZENAIDA MACROURA) FROM THE SOUTHEASTERN UNITED STATES
Richard Gerhold, The University of Georgia
- 8:45 74. WEB ATLAS OF WILD BIRD PATHOLOGY
Romona Haebler, U. S. Environmental Protection Agency
- 9:00 75. DISEASES DIAGNOSED IN RACCOONS (PROCYON LOTOR) OF THE SOUTHEASTERN UNITED STATES
Kevin Keel, The University of Georgia
- 9:15 76. EMERGING INFECTIOUS DISEASES IN MARINE BIRDS AS AN INDICATOR OF CHANGING MARINE ECOSYSTEM HEALTH
Scott Newman, Wildlife Trust, and Consortium for Conservation Medicine
- 9:30 77. THE SEABIRD ECOLOGICAL ASSESSMENT NETWORK (SEANET): LINKING ANIMAL, HUMAN AND MARINE ECOSYSTEM HEALTH.
Mark Pokras, Tufts Cummings School of Veterinary Medicine
- 9:45 78. RELATIONSHIPS BETWEEN AURAL ABSCESES, ORGANOCHLORINE COMPOUNDS AND VITAMIN A IN FREE-RANGING EASTERN BOX TURTLES (TERRAPENE CAROLINA CAROLINA)
Jonathan Sleeman, Virginia Department of Game and Inland Fisheries

10:00 Break

- 10:30 79. CAUSES OF MORTALITY IN THE WISCONSIN GRAY WOLF POPULATION 1979-2003.
Nancy Thomas, U.S. Geological Survey-National Wildlife Health Center
- 10:45 80. FAMPHUR INTOXICATION OF BIRDS AND MAMMALS IN IDAHO, 1999-2005.
Mark Drew, Idaho Department of Fish and Game

Techniques and Technology

- 11:00 81. USE OF REAL-TIME PCR FOR DETECTION OF BRUCELLA SPP. IN MARINE MAMMAL TISSUES
Inga Sidor, Mystic Aquarium and Institute for Exploration
- 11:15 82. RIFT VALLEY FEVER VIRUS: AN EMERGING THREAT TO WILDLIFE, LIVESTOCK, AND HUMANS IN THE U.S. – A REVIEW OF ISSUES AND CONCERNS, AND A GIS EARLY WARNING SYSTEM FOR RVF VECTORS
Seth Britch, USDA-ARS Center for Medical, Agricultural, & Veterinary Entomology
- 11:30 83. “BUT THERE ISN’T AN ANTIBODY AVAILABLE!”: AN APPROACH FOR DEVELOPING ANTIBODIES TO STUDY DISEASE IN WILDLIFE
E.W. Howerth, University of Georgia
- 11:45 84. DEVELOPMENT OF AN ENZYMATIC DIGESTION METHOD TO DECONTAMINATE INFECTIOUS PRIONS
Paul Nash, USDA/APHIS/WS/National Wildlife Research Center

Thursday, August 10

12:00 Lunch

- 13:00** 85. HOW MUCH TELAZOL IS THERE IN THE BOTTLE? INACCURATE LABELING OF TELAZOL FROM 1987-1998 AND THE IMPACT ON PUBLISHED LITERATURE
Keith Amass, Safe-Capture International Inc.
- 13:15** 86. TRANQUILLIZATION OF PRONGHORN FOR LONG DISTANCE TRANSPORT USING HALOPERIDOL (HALDOL).
Mark Drew, Idaho Department of Fish and Game

Terrestrial Mammals

- 13:30** 87. CAN BACTERIAE AFFECT REPRODUCTION OF CHAMOIS (*RUPICAPRA RUPICAPRA*) IN THE ALPS?
Marc Artois, Ecole nationale veterinaire de Lyon
- 13:45** 88. PESTIVIRUS INFECTION IN CHAMOIS (*RUPICAPRA PYRENAICA*): DEMOGRAPHIC COLLAPSE OF THE POPULATION IN THE CATALAN PYRENEES (NE SPAIN)
Ignasi Marco, Universitat Autonoma de Barcelona
- 14:00** 89. AN OUTBREAK OF NECROBACILLOSIS CAUSED BY *FUSOBACTERIUM NECROPHORUM* SUBSP. *NECROPHORUM* IN ELK ON A WINTER FEEDGROUND IN WYOMING
Cynthia Tate, Wyoming Game and Fish Department
- 14:15** 90. OBSERVATIONS OF CLINICAL CHRONIC WASTING DISEASE IN A CAPTIVE SHIRA'S MOOSE
Todd Cornish, Wyoming State Veterinary Laboratory
- 14:30** 91. SEROLOGIC SURVEY FOR PATHOGENS POTENTIALLY AFFECTING PRONGHORN (*ANTILOCAPRA AMERICANA*) FAWN RECRUITMENT IN ARIZONA, USA
Shelli Dubay, University of Wisconsin-Stevens Point
- 14:45** 92. A JAVELINA MORTALITY EVENT IN TUCSON, ARIZONA
Lisa Shender, Arizona Game and Fish Department

15:00 Break

- 15:30** 93. ADVERSE EFFECTS OF PARASITISM AND BOVINE RESPIRATORY DISEASE COMPLEX ON REPRODUCTIVE SUCCESS AND SURVIVAL IN FREE-RANGING CARIBOU
Kimberlee Beckmen, Alaska Department of Fish & Game
- 15:45** 94. POSSIBLE INTRODUCTION OF PARASITES WITH TRANSLOCATION OF WOLVES IN IDAHO.
Mark Drew, Idaho Department of Fish and Game
- 16:00** 95. HELMINTHOLOGICAL INVESTIGATION ON THE ROAD-KILL CARNIVORES: COULD THE RESULTS BE USED AS A HEALTH INDICATOR IN ENDANGERED POPULATIONS?
Gholamreza Mowlavi, Tehran University of Medical Sciences
- 16:15** 96. RABID SKUNK BEHAVIOR DURING AN EPIZOOTIC IN NORTHWESTERN WYOMING.
Craig Ramey, USDA/APHIS, National Wildlife Research Center
- 16:30** 97. SARCOPTIC MANGE OUTBREAK IN SOUTHERN HAIRY-NOSE WOMBATS IN THE MURRAYLANDS OF SOUTH AUSTRALIA
David Schultz, Royal Zoological Society of South Australia

16:45 Closing Remarks

Poster Presentations

Presenters are asked to be available for discussion during the afternoon break on Monday, and the morning break on Tuesday. Posters can remain up all week to allow for additional viewing opportunities.

98. DETECTION OF PREY IN CARNIVORE SCAT BY POLYMERASE CHAIN REACTION-A PROGRESS REPORT
Anne Acton, North Carolina State University
99. A GLOBAL PERSPECTIVE OF THE POTENTIAL HUMAN HEALTH RISKS ASSOCIATED WITH THE CONSUMPTION OF SEA TURTLES
A. Alonso Aguirre, Wildlife Trust
100. WEST NILE VIRUS INFECTION IN A CROCODILE (*CROCODYLUS ACUTUS*) IN MEXICO
A. Alonso Aguirre, Wildlife Trust
101. SEROLOGICAL EVIDENCE OF EXPOSURE TO SELECTED INFECTIOUS AGENTS IN *OTARIA FLAVESCENS* AND *ARCTOCEPHALUS AUSTRALIS* FROM ARGENTINA
Diego Albareda, Acuario de Buenos Aires
102. DISTRIBUTION AND DENSITY OF *SETARIA YEHI* MICROFILARIA IN ALASKA MOOSE
Kimberlee Beckmen, Alaska Department of Fish & Game
103. A COMPARISON OF SERUM CHEMISTRY AND HEMATOLOGY VALUES BETWEEN WILD HARBOR SEAL (*PHOCA VITULINA CONCOLOR*) PUPS AND THOSE ENTERING REHABILITATION AND AGAIN PRIOR TO THEIR RELEASE
Gerard Beekman, University of New England
104. PATHOLOGICAL FINDINGS IN UNUSUAL CETACEAN STRANDING EVENTS IN TAIWAN, JULY –AUGUST, 2005
Jung-To Chiu, University of Saskatchewan
105. HABITAT DETERMINES HOST-FEEDING PATTERNS OF *CULEX SALINARIUS*, A BRIDGE VECTOR FOR WEST NILE VIRUS IN CT.
Maria Diuk-Wasser, Yale School of Medicine
106. KERATOCONJUNCTIVITIS BY *MORAXELLA* SP. IN A VICUNA (*VICUGNA VICUGNA*) KEPT IN CAPTIVITY
Roberto Elias, Universidad Peruana Cayetano Heredia
107. COMMON CETACEAN AND PINNIPED PARASITES FROM WASHINGTON AND BRITISH COLUMBIA
Joseph Gaydos, University of California, Davis Wildlife Health Center
108. LEPTOSPIROSIS IN FELIDS OF THE MIGUEL ALVAREZ DEL TORO REGIONAL ZOO IN CHIAPAS, MEXICO
Sergio Guerrero-Sánchez, Zoológico Regional Miguel Álvarez del Toro, México
109. ANTI-CHOLINESTERASE PESTICIDES AND BIRD MORTALITY: LACK OF BRAIN CHOLINESTERASE-INHIBITION IN BIRDS FROM MAINE AND MASSACHUSETTS
Rebecca Harris, Tufts Cummings School of Veterinary Medicine
110. POISONED URBAN MALLARDS – VICTIMS OF BIRD FLU FEAR?
Marja Isomursu, Finnish Food Safety Authority EVIRA
111. WORKING ELEPHANTS AS POSSIBLE INTERMEDIARIES FOR DISEASE TRANSMISSION BETWEEN DOMESTIC LIVESTOCK AND WILD UNGULATES IN CHITWAN, NEPAL
Gretchen Kaufman, Tufts Cummings School of Veterinary Medicine
112. MORTALITY AND MORBIDITY ASSOCIATED WITH GUNSHOT WOUNDS IN RAPTORIAL BIRDS IN THE PROVINCE OF QUEBEC: 1986 TO 2005
Stéphane Lair, Université de Montréal

Poster Presentations

113. WILD RACCOON DOGS (NYCTEREUTES PROCYONOIDES KOREENSIS) AS SENTINEL FOR ENDEMIC PRESENCE OF SPOTTED FEVER GROUP RICKETTSIOSIS IN KOREA
Chae Woong Lim, Chonbuk National University
114. SPATIAL ANALYSES OF THE DISTRIBUTIONS OF EHRLICHIA CHAFFEENSIS AND ANAPLASMA PHAGOCYTOPHILUM IN THE MISSISSIPPI ALLUVIAL VALLEY.
Jamie Manangan, University of Georgia
115. PARASITIC FAUNA OF THE LIVING FOSSIL MONITO DEL MONTE (DROMICIOPS GLIROIDES MARSUPIALIA: MICROBIOTHERIA) IN A FRAGMENTED TEMPERATE RAINFOREST AT CHILO ISLAND, CHILE.
Paula Marín-Vial, Universidad de Chile
116. DETECTION OF GASTRIC HELICOBACTER SPP. IN WILD RACCOON DOGS (NYCTEREUTES PROCYONOIDES)
Hee Jin Park, Chonbuk National University
117. SWINE KIDNEY WORM(STEPHANURUS DENTATUS) INFECTION IN WILD BOAR (SUS SCROFA COREANUS) IN KOREA
Hee Jin Park, Chonbuk National University
118. DIROFILARIA IMMITIS INFECTION IN WILD RACCOON DOG (NYCTEREUTES PROCYONOIDES)
Hee Jin Park, Chonbuk National University
119. PARASITIC MITES OF NORTH AMERICAN OWLS
James Philips, Babson College
120. CANADIAN RISK ASSESSMENT ON HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1 (EURASIAN STRAIN) AT THE WILD/MIGRATORY BIRDS, ANIMAL HEALTH AND HUMAN INTERFACE
Nancy Rheault, Canadian Food Inspection Agency
121. EXPERIMENTAL INFECTION OF FOX SQUIRRELS (SCIURUS NIGER) WITH WEST NILE VIRUS.
J. Jeffrey Root, National Wildlife Research Center
122. ECOLOGY OF THE GRAY FOX IN RELATION TO ORAL RABIES VACCINATION PROGRAMS IN TEXAS
J. Jeffrey Root, National Wildlife Research Center
123. IMMUNE RESPONSE OF WEST NILE VIRUS-NAIVE REINDEER (RANGIFER TARANDUS) TO WEST NILE VIRUS VACCINATION
Cheryl Rosa, University of Alaska, Fairbanks
124. PREVALENCE OF TRICHOMONAS GALLINAE IN AN EURASIAN COLLARED DOVE POPULATION IN SOUTHERN TEXAS.
Autumn Smith, Texas A&M University, Kingsville
125. CUTANEOUS FIBROMA OF ROE DEER (CAPREOLUS CAPREOLUS) - STILL A “NOVEL” DISEASE IN CROATIA
Kresimir Salajpal, University of Zagreb
126. THE INFLUENCE OF TESTOSTERONE AND MIGRATION ON THE RELAPSE OF PLASMODIUM RELICTUM IN EXPERIMENTALLY INFECTED GRAY CATBIRDS (DUMETELLA CAROLINENSIS)
Amanda Jo Williams, University of Southern Mississippi
127. TREMATODIASIS IN A FREE-RANGING RINGED SEAL (PHOCA HISPIDA HISPIDA) WITH REFERENCE TO HEPATIC MERCURY CONCENTRATION
Victoria Woshner
128. LIPOID LIVER DISEASE AND STEATITIS IN A BLUE DAMSELFISH (POMACENTRUS PAVO)
Jaime Lee Weisman, The University of Georgia
129. SEVERE PYELONEPHRITIS IN AN AGED RED DEER (CERVUS ELAPHUS ELAPHUS) DAM
Ivan Vickovic, Croatian Veterinary Institute

ABSTRACTS OF PRESENTATIONS

CARLTON HERMAN FOUNDERS FUND LECTURE

1) THERE ARE NOW A FEW GAPS IN OUR IGNORANCE

Gary Wobeser, Canadian Cooperative Wildlife Health Centre, Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 5B4

This presentation will look back at the past half century and recall notable changes, events, and people in the evolution of understanding of disease in wild species. Major changes include a broader definition of what constitutes disease, incorporation of epidemiologic techniques, population biology, and theoretical ecology into the study of disease, and effective management of a few diseases.

**ADVANCING GLOBAL HEALTH: FACING DISEASE ISSUES AT THE
WILDLIFE, HUMAN, AND LIVESTOCK INTERFACE**

Moderators: William Karesh, Damien Joly

**2) IMPEDIMENTS TO INTERPROFESSIONAL COOPERATION TO STUDY
AND CONTROL DISEASES IN WILDLIFE**

Leonard C. Marcus, Travelers' Health & Immunization Services, Newton, MA 02465
and Jeffrey F. Marcus, North Carolina Wildlife Resources Commission, Aberdeen, NC
28315.

There is increasing recognition of disease as a factor in wildlife population dynamics, especially in endangered species or isolated populations. The diseases transmissible between wild and domestic animals are economically and socially important. More than 60% of emerging infectious diseases in humans are zoonotic and most of these have a wildlife reservoir. Interprofessional cooperation is essential to study and control wildlife diseases with spillover to domestic animals and humans, but this is difficult to achieve. Wildlife biologists, veterinarians and physicians are trained separately and have little experience working together. Even at the post-graduate level shared continuing education is rare. Few publications (books or journals) are commonly read by all these professions. Other obstacles in achieving cooperation are problems with attitude, funding and bureaucracy. We will discuss examples of successful interprofessional cooperation and also examples where such attempts have failed. Practical measures for furthering interaction will be explored and the benefits of interacting will be detailed.

3) A HUMAN HEALTH PERSPECTIVE ON WILDLIFE AS SENTINELS

Peter M. Rabinowitz, Occupational & Environmental Medicine Program, Yale School of Medicine, New Haven CT, 06510; Zimra Gordon, Rippowam Animal Hospital, Stamford CT, 06905; Dan Chudnov, Yale Center for Medical Informatics, New Haven CT 06520; Matthew Wilcox, Yale School of Public Health, New Haven CT 06520; Lynda Odofin, Yale Occupational & Environmental Medicine Program, New Haven CT, 06510; Joshua Dein, USGS National Wildlife Center, Madison WI 53711.

Wildlife disease and mortality events could be a warning to human populations about shared environmental health hazards. Recent examples include wild bird mortality and West Nile infection, Monkeypox and the exotic animal trade, and wildlife mortality related to Avian influenza.

The human health profession in general is not prepared to deal with the volume of data rapidly accumulating on disease and mortality in wildlife populations. Communication barriers remain between the scientific communities of wildlife biology, veterinary and human medicine. There is an urgent need for “sentinel science” exploring the human-animal disease interface and giving public health professionals and human health clinicians tools to define human health risks.

We report on an interdisciplinary project (<http://canarydatabase.org>) funded by the National Library of Medicine to promote an evidence-based approach to animal sentinel data. The project is searching the scientific literature for evidence that various animal species could fulfill the following “sentinel” criteria:

- 1) Susceptibility: An animal species is more susceptible than humans to an environmental hazard.
- 2) Latency: The time in the animal from exposure to onset of is shorter than in humans.
- 3) Exposure Risk: The animal's exposure is greater than for nearby human populations.
- 4) Epidemiological Evidence: Case reports document animals providing early warning to a human population.

This presentation will demonstrate how the Canary Database can summarize existing evidence for a wide variety of environmental hazards, in order to provide a framework for linking wildlife disease events to human health

4) WORMS IN A HARSH WORLD: CONSERVATION BIOLOGY OF HELMINTHS

M.J. Pybus, Provincial Wildlife Disease Specialist, Alberta Fish and Wildlife Division, 6909-116 Street, Edmonton, Alberta T6H 4P2, Canada.

There is a vast world of animal species rarely seen, seldom noticed, and generally not appreciated: Animals with an astounding breadth of numerical, biological, and ecological diversity uniquely designed by evolutionary selective pressures to occupy mobile habitats often covered with fur and feathers. Rather than being simple animals, these species are challenged by all of the traditional limiting factors ascribed to the health and well being of their habitats, but rarely applied to these animals themselves – factors such as habitat loss or fragmentation, environmental change, inter- and intraspecific competition, and ephemeral patch occurrence. In addition, many of these species have been maligned over centuries of bad press and misinformation. Negative attitudes of the public and wildlife managers may be the primary limiting factors facing a broad range of natural integral components of all functioning ecosystems. Helminths deserve more respect and profile when it comes to current concerns of protecting and conserving global biodiversity.

5) A NATIONAL FISH AND WILDLIFE HEALTH INITIATIVE

John R. Fischer, Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, GA 30602; Rebecca A. Humphries and Stephen M. Schmitt, Michigan Department of Natural Resources, Lansing, MI 48909; Jordan P. Burroughs, Michigan State University, East Lansing, MI 48824; Bruce Morrison, Nebraska Game and Parks Commission, Lincoln, NE 68503; Gary Taylor, Association of Fish and Wildlife Agencies, Washington, DC 20001

The importance of maintaining healthy populations has long been recognized by fish and wildlife managers, and several diseases are of growing concern to natural resource, animal health, and public health professionals. Diseases such as plague, hemorrhagic disease, pasteurellosis, chronic wasting disease, West Nile virus, whirling disease, botulism, and others have been found in wild and farmed fish or wildlife populations in North America and can significantly impact resources. Reservoirs of economically important diseases like bovine tuberculosis and brucellosis have inadvertently become established in native wildlife and threaten livestock industries in some areas. Foreign animal diseases, such as foot and mouth disease, which was eradicated decades ago and highly pathogenic avian influenza, which never has been reported in North American wildlife, also are of concern. The intentional or accidental introduction of these and other diseases could significantly impact fish, wildlife, domestic animal or human populations and would require a coordinated multi-agency response. In response to increasing demand to effectively deal with fish and wildlife health issues, the Association of Fish and Wildlife Agencies is leading a consortium of state, federal, university, tribal, corporate, and nonprofit organizations in the development and implementation of a National Fish and Wildlife Health Initiative for the United States. The Initiative will be a policy framework for interested parties to consult to minimize the negative impacts of disease issues in fish and wildlife, and ultimately will be expanded, in cooperation with Canada and Mexico, to encompass all of North America.

6) *CRYPTOSPORIDIUM* IN WILDLIFE, CATTLE, AND HUMANS AT THE WILDLIFE/DOMESTIC INTERFACE OF QUEEN ELIZABETH NATIONAL PARK, UGANDA

Elizabeth Cook, Masters in Wild Animal Health, Royal Veterinary College, University of London, London, UK; Elizabeth Dobson, Control of Infectious Disease in Animals Masters Student, Royal Veterinary College, University of London, London, UK; James Tumwine, Department of Pediatrics, Makerere University, Kampala, Uganda; Mark Fox, Department of Pathology and Infectious Disease, Royal Veterinary College, University of London, London, UK.

Cryptosporidiosis is a protozoal zoonotic disease found in a wide variety of mammals causing clinical disease in young or immuno-compromised individuals. Transmission of infection may occur within and between different species. This study reports the prevalence of *Cryptosporidium* in an area in Queen Elizabeth National Park, Uganda (QENP) where humans, cattle and buffalo live in close proximity.

Faecal samples were collected from all three groups of subjects in the northern part of QENP. *Cryptosporidium* was detected with light microscopy using a modified Ziehl-Neelsen stain. The overall prevalence of *Cryptosporidium* in cattle was 8.9% (n=274), with a higher prevalence of infection (13.4%) in animals less than six months of age ($P<0.05$). In buffalo, the mean prevalence was comparable (8.8%;n=351), ranging from zero to 17.2% in the three geographical areas visited. The highest prevalence of infection, seen in animals near Lake George, may reflect a contaminated water source. Children in the vicinity of Lake George had a prevalence of 21% (n=375). There was a peak in *Cryptosporidium* infection at 18 months of age however the majority were sub-clinically infected individuals, aged 4-5 years. Sub-clinical *Cryptosporidium* in this age group of children has not previously been reported and may be the result of re-infection or infection with *Cryptosporidium parvum* bovine genotype. The study highlights the need for further investigation into environmental sources of *Cryptosporidium*. There is a significant public health risk through contamination of water supplies and human contact with domestic livestock and wildlife that warrants further investigation.

7) INTEGRATED HEALTH APPROACH TO GORILLA CONSERVATION

Mike Cranfield, DVM For the Mountain Gorilla Veterinary Project Team (MGVP, Inc.)
c/o Maryland Zoo in Baltimore Druid Hill Park Baltimore MD 21217

Conservation medicine exists at the intersection of animal health, human health, and ecosystem health. It differs from classical public health epidemiology in that it aims to protect and improve ecosystem and animal health, in addition to human health. Conservation medicine studies diseases shared between or among species and interactions with environmental variables over long-term biological and spatial scales. Zoonotic diseases and the emergence of new diseases are therefore of primary concern, and are particularly important when threatened and endangered great ape populations are involved. The effective practice of conservation medicine demands an integrated team approach involving wildlife and livestock veterinarians, local physicians, public health professionals, ecologists, politicians and communities. Common interests, improved data collection, and economies of scale argue for combining health surveillance and delivery efforts. This team approach needs to be tailored to the infrastructure and sophistication of the host country's human and livestock health systems, and must also be appropriate for the size and characteristics of the great ape population. Examples from gorilla conservation programs range from small populations with individually identifiable gorillas surrounded by dense human populations, to large unhabituated gorilla populations in areas of very low human density. It is often, by default, the wildlife veterinarian who coordinates the "one health" approach, because of their training in wildlife and livestock medicine as well as zoonotic and emerging disease issues. This talk presents examples of collaborative conservation medicine approaches to gorilla conservation.

8) IMPORTANCE OF MINILIVESTOCK AND THE RISKS OF DISEASE ASSOCIATED WITH DOMESTICATION: CASE OF *CRICETOMYS SPP.* (RODENT: CRICETIDAE)

Jean M. Malekani, Wildlife Farming Project, Department of Biology, Faculty of Science, University of Kinshasa, P. O. Box 218 Kinshasa XI, Dem. Rep. of Congo; Thomas M. Yuill, Environmental Studies, University of Wisconsin, North Park Street 550, Madison WI 53706, USA; Darin S. Carroll, Inger K. Damon, Russell L. Regnery, and Mary G. Reynolds, CDC, Poxvirus Program, Clifton Road 1600, Atlanta GA 30333, USA.

Two rodent species of cricetomas or African pouched giant rats, *Cricetomys emini* and *C. gambianus*, are among the most hunted and eaten wild animals in Africa. Farming these animals would be one of the easiest ways to increase animal production and help to protect them against over-hunting. Cricetomas can naturally harbor ecto- and endoparasites. Parasitic studies conducted in DRC since 1990 on groups of *C. emini* and *C. gambianus* revealed hemintheses with *Capillaria hepatica* (prevalence of 23.3 %), *Meggittina cricetomydis* (prevalence of 20 %), *Cysticercus fasciolaris*, and an opisthorchiid trematode. Further studies on *Cricetomys* spp. trapped in DRC showed cestodes of which *Hymenolepis diminuta*, *H. nana*, *H. microstoma* and nematodes like *Strongyloides ratti*, *Trichuris muris*, *Nematospiroides dubius*, *Nippostrongylus brasiliensis*, *Trichostrongylus affinis*, etc. At least four of those helminthes can become zoonotic with eventual public health implications. Another study of 1975 in Nigeria reports some blood parasites of *Cricetomys* like *Babesia rodhaini*, *Haemobartonella muris* and *Anaplasma* spp. Culture and PCR tests revealed *Orthopoxvirus monkeypox virus* in a group of *Cricetomys* sp. imported in the USA from Ghana in 2003. Human monkeypox has been recorded in Western and Central Africa and in the USA. The monkeypox virus probably occurs in domestic animals in monkeypox endemic areas. Anyway it would be an error to consider the risks of being infected as a reason to abandon minilivestock as wild animals used for meat production are not harboring more diseases than conventional species of husbandry.

9) FROG VIRUS 3 AND *AEROMONAS HYDROPHILA* IN FREE-RANGING BULLFROG (*RANA CATESBIANA*) AND GREEN FROG (*RANA CLAMITANS*) LARVAE

Debra L. Miller, Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, 43 Brighton Road, Tifton, GA 31793; Charles A. Baldwin, Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, 43 Brighton Road, Tifton, GA 31793; Sreekumari Rajeev Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, 43 Brighton Road, Tifton, GA 31793

The iridovirus, FV3, and the bacteria, *Aeromonas hydrophila*, are pathogens that have been documented to be associated with amphibian die-offs. The hypothesized driving force behind these infections is anthropogenically-induced stress, which results in compromised immunity and thus increased susceptibility to pathogens. Free-ranging bullfrog (*Rana catesbiana*; N=104) and green frog (*Rana clamitans*; N=80) larvae collected from farm ponds were humanely euthanized and screened for pathogens using standard viral and microbial isolation techniques with confirmation by the polymerase chain reaction for FV3. One bullfrog was positive for both pathogens and 34 and 4 were positive for only FV3 or *A. hydrophila*, respectively. Similarly, 13 green frogs were positive for both pathogens and 11 and 8 were positive for only FV3 or *A. hydrophila*, respectively. Sixty-five and 48 bullfrogs and green frogs, respectively, were negative for both pathogens. Blood smears revealed intracytoplasmic inclusion bodies in positive individuals. Corresponding histological changes were not observed. This study serves to combine cytological, histological and microbial results for diagnosis of 2 important amphibian pathogens and will serve as a useful diagnostic guide for future studies.

10) RETROVIRUSES FROM INDIAN PRIMATES: IMPLICATIONS FOR EMERGING INFECTIOUS DISEASES.

Jayashree S. Nandi, Lovelace Respiratory Research Institute, 2425 Ridgecrest Drive, SE, Albuquerque, NM 87108, Anil K. Chhangani and Sunder Mal Mohnot, Primate Research Centre, 396 3rd Street, Sardapura, Jodhpur-342003, Rajasthan, India, Sonia Van Dooren, Rega Institute for Medical Research, Leuven, Belgium.

Animals have always been a major source of human infectious diseases. New pathogens emerge from animal reservoirs when ecological changes increase the pathogen's opportunities to enter the human population and results in subsequent human-to-human transmission. Given the religious connotation and historically close interaction between man and NHP in India, its large human and NHP population and increased mobility of people across the world, a likely cross species transmission of simian retroviruses to humans will have a major impact on local and global public health. With increased urbanization, rapid deforestation, and loss of habitat, many common feral primate species are increasingly seen in the rural and urban settings in India, posing a potential threat for emerging infectious diseases and public health concerns due to monkey bites and scratches. Natural infection by 'putative simian immunodeficiency virus, SIV' in feral rhesus monkeys (unpublished) and novel Type D simian retroviruses, SRV-6 and SRV-7 in feral Hanuman langurs and rhesus monkeys from India was reported by us for the first time (Nandi, Bhavalkar-Potdar et al. 2000; Nandi, Tikute et al. 2003, *Virology*: 277(1): 6-13 and 311(1): 192-201). We present additional data due to get published soon (Nandi et al. 2006, *Virus Genes*, in Press).

11) EDUCATING ECOSYSTEM HEALTH PROFESSIONALS WORKING AT THE WILDLIFE-LIVESTOCK-HUMAN INTERFACE

Jonna A.K. Mazet, Gillian E. Hamilton, Wildlife Health Center; School of Veterinary Medicine, University of California, Davis, CA, 95616, USA; Leslie A. Dierauf, National Wildlife Health Center, U.S. Geological Survey, Madison, WI, 53711, USA.

Recent global media attention on emerging diseases has focused student and employer interest on the interrelated factors of land use change, natural resource management (including livestock production), and human population behaviors that alter the inherent ecological balance between zoonotic pathogens and their human and animal hosts. Wildlife and domestic animals are an important part of this public health picture, being integral to the ecology of most of the diseases currently important to the public. In order to address the training needs for this new, well-rounded ecosystem health professional, we prepared and disseminated a survey designed to identify training and educational needs for individuals entering wildlife medicine and ecosystem health fields. Our data revealed that few wildlife veterinarians were satisfied with the training they received in veterinary school. Survey respondents and their employers ranked training in leadership and communication, courses and externships in wildlife health, and graduate education and mentorship as important in preparation for success. Today's ecosystem health professional is a new type of transdisciplinary scientist; they practice medicine in their communities and hold titles in every level of government and academia. Ecosystem health concepts must be integrated into our curricula to ensure that graduates are prepared to excel in this new and complex world in which the health of wildlife, domestic animals, and people are interdependent.

12) CONSEQUENCE OF AVIAN INFLUENZA FOR POULTRY AND MIGRATORY BIRDS IN INDIA AND POSSIBLE REMEDIAL MEASURES.

Hafiz S A Yahya, Professor, Department of Wildlife Sciences, Aligarh Muslim University, Aligarh-202002, India.

Many avian species, wild or domesticated, are prone to various kinds of diseases due to viral, bacterial, parasitic, and neo-plastic diseases that vary from sub clinical to fatal. Toxin effects, poisoning, shock or physical injuries are some other health hazards. Scores of viral diseases have been recorded in birds, and documented more particularly by J.W. Davis *et al* 1971. Recent outbreak of high pathogenic avian influenza H5N1 virus in India has affected the poultry farming alarmingly. Several migratory birds such as Bareheaded Goose (*Anser indicus*), Shovelar (*Anas clypeata*), Coot (*Fulica atra*), etc., are suspected career of this virus in the country but real source of infection has not been ascertained so far. The country has received a great setback and future prospect of many poultry farmers have darkened, several have attempted suicide. Since the spread of H5N1 is a worldwide phenomenon, concentrated local, regional and global effort is needed to combat the problem. As 'prevention is better than cure', it is desirable that poultry farms are given facelift and required hygienic parameters are adopted. Man's ecological unbalancing acts is not only harming our environment but also jeopardizing the natural resources in a big way. In addition of providing jobs to thousands of people the poultry business generates enormous revenue. Besides highlighting the impact of H5N1 on poultry and certain migratory birds, an account of preventive measures will be highlighted in this presentation. The most urgent need is to isolate the domestic ducks and geese from the wild populations prevalent in some bird sanctuaries and wetlands during winters.

13) COMPARISON OF PATHOGENS IN BROILER AND BACKYARD CHICKENS ON THE GALÁPAGOS ISLANDS: IMPLICATIONS FOR TRANSMISSION TO WILDLIFE

Catherine Soos,¹ Saint Louis Zoo, 1 Government Drive, Saint Louis, MO 63110, USA and Charles Darwin Research Station, Puerto Ayora, Galápagos, Ecuador, Department of Biology, University of Missouri – St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121, USA; Luis Padilla,² Oklahoma City Zoo, 2101 NE 50th Street, Oklahoma City, OK 73111, USA; Andrés Iglesias, Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Apartado 17-012184, Quito, Ecuador; Nicole Gottdenker,³ Saint Louis Zoo, 1 Government Drive, Saint Louis, MO 63110, USA; Charles Darwin Research Station, Puerto Ayora, Galápagos, Ecuador; Department of Biology, University of Missouri – St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121, USA; Marylin Cruz, Laboratorio de Epidemiología, Patología, y Genética de Galápagos, Galápagos National Park, Puerto Ayora, Galápagos, Ecuador; Alexandra Ríos, Servicio Ecuatoriano de Sanidad Agropecuaria, Puerto Ayora, Galápagos, Ecuador; Patricia Parker, Department of Biology, University of Missouri – St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121, USA; Saint Louis Zoo, 1 Government Drive, Saint Louis, MO 63110, USA;

With the rapidly growing human population and tourism industry in the Galápagos Islands, local poultry production has grown, causing expansion of the poultry-wildlife interface and an increased risk of spillover of pathogens, which could have negative consequences to threatened endemic avian populations. Here, we begin to characterize the disease risks of different types of poultry farming to endemic Galápagos avifauna, by comparing health status and serosurvey results between broiler and backyard chickens. Clinical signs of disease were more common in backyard chickens, which were also more likely to be seropositive and/or have higher titers to several pathogens compared to broilers (*Mycoplasma gallisepticum*, infectious laryngotracheitis virus, infectious bronchitis virus, avian reovirus, and Marek's disease virus). Seroprevalence for other pathogens (avian paramyxovirus-1, infectious bursal disease, avian encephalomyelitis virus, and avian adenovirus) was relatively high among all chickens. Backyard chickens may pose a more direct threat to Galápagos avifauna as they are more likely to be infectious, have a high seroprevalence for numerous pathogens, and are in direct contact with wild birds or wild bird habitat, with little to no biosecurity measures employed on farms. Main risks posed by the local broiler industry are the potential for importation of pathogens into the Galápagos Islands, and indirect transmission of diseases to wildlife. Our results suggest that the poultry-wildlife interface may be a serious risk to endemic avifauna of the Galápagos Islands. Regulatory and management decisions should focus on minimizing this interface, reducing infectious diseases in backyard chickens, and preventing importation of poultry diseases.

Current addresses: ¹Environment Canada, 115 Perimeter Rd, Saskatoon, SK, S7N 0X4, Canada, ²Department of Animal Health, Smithsonian's National Zoological Park, 3001 Connecticut, Avenue NW, Washington, DC 20008, USA, ³Institute of Ecology, University of Georgia, Athens, Georgia 30601, USA

14) HABITAT FRAGMENTATION AND DISEASE EMERGENCE: LANDSCAPE AND COMMUNITY ECOLOGY APPROACHES.

Gerardo Suzán, Conservation Medicine Program, Wildlife Trust, New York, NY 10001; Andres Gómez, Columbia University, New York, NY 10027; J. Tomasz Giermakowski, Department of Biology, University of New Mexico. Albuquerque, NM, 87131; B. Armién, Instituto Conmemorativo GORGAS, Panamá; Gerardo Ceballos, Instituto de Ecología, UNAM, México; Terry Yates, Department of Biology, University of New Mexico. Albuquerque, NM, 87131; A. Alonso Aguirre, Conservation Medicine Program, Wildlife Trust, New York, NY, 10001.

Habitat fragmentation is often mentioned as a form of environmental alteration associated with increased disease risks for humans and wildlife and its relationship with disease dynamics has important implications for conservation biology. We reviewed published empirical studies that examine the relationship between habitat fragmentation and pathogen prevalence. We found that the former leads to variable patterns in the population dynamics of host species, genetic diversity, community structure, abiotic changes, and changes in connectivity and landscape structure, which in turn produce variable patterns in the latter. In addition, the scale at which observations are performed is important in understanding underlying patterns. For example, in Panama, at coarse regional scales, anthropogenic habitat fragmentation is associated with increased abundance of hantavirus hosts. However, at finer scales other landscape attributes favour reservoir abundances. We used satellite imagery to produce several spatial variables that described landscape; however, only slope was consistently related to abundances of the “Calabazo virus” reservoir. To properly recognize the effect of habitat fragmentation on infection dynamics, including magnitude and direction, future studies should carefully determine the appropriate spatial and temporal scales for the host-pathogen system under study. Landscape and community ecology approaches will provide a better understanding on the dynamics of vectors and reservoirs and will have large implications in the control and management of zoonotic diseases.

WDA GRADUATE STUDENT RESEARCH RECOGNITION AWARD

15) PERSISTENCE OF H5 AND H7 AVIAN INFLUENZA VIRUSES IN WATER

Justin D. Brown, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, Wildlife Health Building, College of Veterinary Medicine, The University of Georgia, Athens, GA 30602; David E. Swayne, United States Department of Agriculture, Agricultural Research Service, Southeast Poultry Research Laboratory, Athens, GA 30602; Robert J. Cooper, Daniel B. Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, GA 30602; Rachel E. Burns and David E. Stallknecht, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, Wildlife Health Building, College of Veterinary Medicine, The University of Georgia, Athens, GA 30602

Although fecal-oral transmission of avian influenza viruses (AIV) via contaminated water represents a recognized mechanism for transmission within wild waterfowl populations, little is known about viral persistence in this medium. In order to provide initial data on persistence of H5 and H7 AIVs in water, we evaluated eight wild-type LPAI H5 and H7 viruses isolated from species representing the two major influenza reservoirs (Anseriformes and Charadriiformes). In addition, the persistence of two HPAI H5N1 viruses from Asia was examined to provide some insight into the potential for these viruses to be transmitted and maintained in wild bird populations. Viruses were tested at two temperatures (17 C and 28C) and three salinity levels (0, 15, 30 parts per thousand sea salt). The wild-type H5 and H7 AIV persistence data to date indicate that: 1) H5 and H7 AIVs can persist for extended periods of time in water, with a duration of infectivity comparable to AIVs of other subtypes; 2) The persistence of H5 and H7 AIVs is inversely proportional to temperature and salinity of water; and 3) A significant interaction exists between the effects of temperature and salinity on the persistence of AIV. Results from the two highly pathogenic avian influenza H5N1 viruses from Asia indicate that these viruses did not persist as long as the wild-type AIVs.

TERRY AMUNDSON STUDENT PRESENTATIONS

Moderator: Todd Cornish

16) SEROLOGIC EVIDENCE OF CANINE PARVOVIRUS AND CANINE DISTEMPER VIRUS AMONG FREE-RANGING RED WOLVES (*CANIS RUFUS*)

Anne E. Acton and Michael K. Stoskopf, Environmental Medicine Consortium, Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606; James S. Guy, Department of Microbiology, Pathology and Parasitology, College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606; Arthur Beyer, USFWS Red Wolf Program, Manteo, NC 27954

It is standard protocol of the US Fish & Wildlife Service Red Wolf Recovery Program to vaccinate wolves opportunistically trapped for management purposes with a polyvalent, modified-live, commercial canine vaccine. Typically, vaccinations are initiated in the fall when juveniles (~6 mo old) are fitted with radio collars and repeated upon subsequent captures if >6 mo have elapsed between vaccinations. A pilot study of archived sera for 8 individuals revealed that in 3 animals with a prior history of vaccination only 1 had detectable canine parvovirus (CPV) antibodies while all 3 had canine distemper virus (CDV) antibodies. Blood collected at the time of initial vaccination in the remaining 5 animals indicated a 20% and 40% seroprevalence to CPV and CDV, respectively, from presumed exposure to field viruses. Preliminary findings suggest that both viruses are naturally present in northeastern North Carolina and that the current vaccination schedule offers questionable protection against CPV for red wolves. A more extensive survey of archived sera from free-ranging red wolves is being conducted and will be evaluated in conjunction with vaccination intervals and pedigrees.

17) VESICULAR STOMATITIS ON OSSABAW ISLAND

Lindsay R. Fann, Southeastern Cooperative Wildlife Disease Study, Department of Infectious Diseases, University of Georgia, Athens, GA 30602; Dave Stallknecht, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, University of Georgia, Athens, GA 30602; Danny Mead, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, University of Georgia, Athens, GA 30602; Elizabeth Howerth, Department of Pathology, University of Georgia, School of Veterinary Medicine, Athens, GA 30602

Vesicular Stomatitis (VS) is a reportable disease affecting livestock, most notably cattle, horses, and swine. In the United States, most outbreaks are associated with Vesicular Stomatitis New Jersey virus (VSNJV) and in the U.S., Ossabaw Island, Georgia is the only known endemic focus of this virus. Research conducted on the island over the last 40 years has demonstrated that VSNJV transmission is seasonal and is spatially restricted to the areas consisting of maritime forests. Additionally, sand flies were identified as the biological vector and feral pigs are suspected to be a potential amplifying host. Long term serologic surveillance (1981-present) of white-tailed deer on Ossabaw indicates that the presence of serum neutralizing antibodies to VSNJV has declined. This decline could be due to a decrease in transmission related to the reduction in the feral swine population, a change in the vector population related to long term vector habitat (tree hole) changes, or may be a sampling bias related to changes in the age or spatial distribution of white-tailed deer samples. The objectives of this study were to use increased serologic surveillance of feral swine populations to support or refute the apparent declining trend in VSNJV activity and to test for potential spatial and age associated bias related to sampling in the white-tailed deer population.

18) HEMATOLOGICAL ANALYSES AND SERUM BIOCHEMISTRIES OF WILD CAUGHT XENOPUS LAEVIS: A FIELD STUDY

Allison Gagnon, Comparative Medicine Department, Stanford University, Stanford, CA 94305; Salih Muhammad, School of Veterinary Medicine, Tuskegee University, Tuskegee, AL 36088; Donna M. Bouley and Sherril Green, Comparative Medicine Department, Stanford University, Stanford, CA 94305

The South African clawed frog, *Xenopus laevis* is used extensively in biomedical research. However, there is little data on the normal clinical chemistries from this species. It is important that we define the basic hematology and serum biochemistry profiles of *Xenopus laevis* to facilitate the diagnosis of disease in both feral and in captive-reared frog colonies. In this study, blood samples were collected from healthy adult *X. laevis* in a thriving feral population in Golden Gate Pond (San Francisco, California) and compared to samples collected from frogs maintained in captivity at our research institution. Total red and white blood cell counts and serum biochemical profiles were determined using methods adapted for species with nucleated red blood cells. Preliminary data indicate minimal differences between the wild and captive-reared frogs. Both populations were free of blood parasites. Hematological and serum biochemical profiles in both groups were remarkably similar to mammalian species.

19) WEST NILE VIRUS SEROPREVALENCE IN WILD MAMMALS ALONG AN URBAN TO RURAL GRADIENT

Andrés Gómez, Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY 10027; A. Marm Kilpatrick and Peter Daszak, Consortium for Conservation Medicine, New York, NY 10001; Laura Kramer, Wadsworth Center, New York Department of Health, Slingerlands, NY 12159; A. Alonso Aguirre, Wildlife Trust, New York, NY 10001

Although several wild and domestic mammal species are naturally infected with West Nile virus (WNV), mammals have historically been regarded as unimportant in its transmission cycle as they are believed to be incidental dead-end hosts. The role of mammal species in the WNV transmission cycle remains largely unknown and is in need of systematic field and laboratory research. We sampled small to medium sized wild mammals for WNV antibodies in seven sites along an urban to rural gradient in the eastern United States from June to September 2005. We found evidence of WNV exposure in seven species; overall WNV seroprevalence in these species ranged from 4.8 to 53.1%. Antibody prevalence in all species and all sites was 30.8% and high WNV activity was detected in two of seven sites along the gradient. We compare our results with those of previous wild mammal seroprevalence studies and with bird and mosquito WNV activity in this gradient. Further research is needed to understand the role of wild mammals in the WNV cycle, but we suggest that systematically targeting mammal communities throughout the transmission season and along a representative spatial design will significantly contribute to our understanding of the ecology of this newly emerging disease.

20) INVESTIGATING THE HEALTH AND PATHOGEN DIVERSITY OF BACKYARD CHICKENS IN LATIN AMERICA

Sonia M. Hernandez-Divers, Institute of Ecology, University of Georgia, Athens, GA 30602; Pedro Villegas, Poultry Diagnostic and Research Center, University of Georgia, Athens, GA 30602; Susan Sanchez, College of Veterinary Medicine, Diagnostic Laboratory, University of Georgia, Athens, GA 30602; Carlos Jimenez Sanchez and Giovanah Hernandez, Escuela de Medicina Veterinaria, Universidad Nacional de Costa Rica, Heredia, Costa Rica; Stephen Hernandez-Divers, College of Veterinary Medicine, University of Georgia, Athens, GA 30602; Ron Carroll, Institute of Ecology, University of Georgia, Athens, GA 30602

In Ecuador and Costa Rica, eco-friendly agricultural landscapes might serve as a focal point of pathogen transmission between domestic and wild birds. While these landscapes have proven advantageous for the maintenance of avian biodiversity, they are managed like agricultural land and contain human dwellings and domestic animals. The objectives of this study were to investigate the health and pathogen diversity of backyard chickens in two rural communities in Latin America 1) as part of a larger ecology research project involving the health of wild birds, 2) to utilize chickens as sentinels of avian pathogens, and 3) to provide preventative medicine recommendations. Flock owners were interviewed, chickens were examined and biological samples were collected to determine disease prevalence information. Chickens were tested for hemo-, ecto- and endo-parasite prevalence and ELISA tests were utilized to test for common poultry pathogens. Antimicrobial resistance profiles were determined for fecal bacteria. Preventative medicine practice was poor, with most owners neither vaccinating nor deparasitizing their chickens. Unregulated use of antibiotics was prevalent. Mortality rates of chickens varied depending on country, but were as high as 50 % per flock. In both countries, owners reported outbreaks with clinical signs consistent with highly contagious diseases. Based on interviews, clinical examinations, serology and pathology results, backyard chickens in rural Latin American communities are infected with pathogens often rigorously controlled by commercial poultry industry and local governments. Given the epidemiological role of backyard domestic birds in scenarios such as avian influenza, it has become paramount to understand the health and pathogen diversity of free-roaming backyard chickens.

21) EFFECT OF EXPERIMENTAL ECTOPARASITE CONTROL ON *BARTONELLA* INFECTIONS IN WILD RICHARDSON'S GROUND SQUIRRELS (*SPERMOPHILUS RICHARDSONII*)

Claire Jardine, Department of Veterinary Pathology, Western College of Veterinary Medicine (WCVM), University of Saskatchewan, Saskatoon, SK; Cheryl Waldner, Department of Large Animal Clinical Sciences, WCVM, University of Saskatchewan, Saskatoon, SK; G. Wobeser, Canadian Cooperative Wildlife Health Centre (CCWHC) Department of Veterinary Pathology, WCVM, University of Saskatchewan, Saskatoon, SK; F. A. Leighton, CCWHC, Department of Veterinary Pathology, WCVM, University of Saskatchewan, Saskatoon, SK

The purpose of this study was to investigate the role of ectoparasites in transmitting *Bartonella* infections in wild Richardson's ground squirrels (*Spermophilus richardsonii*). Richardson's ground squirrels were trapped, examined for fleas and tested for *Bartonella* bacteremia once monthly, at six sites, from April to September 2004. After the initial trapping session in April, burrows at three sites were treated with deltamethrin insecticide. Richardson's ground squirrels trapped on treated sites were less likely to have fleas and had fewer fleas than squirrels on control sites in all months following treatment. We found no difference in the prevalence of *Bartonella* infections on control and treated sites in May, immediately following treatment; however, significantly fewer squirrels were infected with *Bartonella* on treated sites in June and July. We conclude that ectoparasites are a main route of transmission for *Bartonella* infections in Richardson's ground squirrels.

22) EXPERIMENTAL INFECTION OF DOMESTIC CATS (*FELIS DOMESTICUS*) WITH A NOVEL *CYTAUXZOOON*-LIKE PIROPLASM AND IMPLICATIONS FOR FREE-RANGING WILD FELIDS

Priscilla H. Joyner, The Wildlife Center of Virginia, Waynesboro, VA 22980; Mason V. Reichard and James H. Meinkoth, Oklahoma State University, Center for Veterinary Health Sciences, Stillwater, OK 74078; Victoria E. Milne, El Paso Zoo, El Paso, TX 79905; Anthony W. Confer, Alan A. Kocan, and John P. Hoover, Oklahoma State University, Center for Veterinary Health Sciences, Stillwater, OK 74078

Intraerythrocytic piroplasms morphologically similar to *Cytauxzoon felis* found in Mongolian Pallas' cats (*Otocolobus manul*) imported into Oklahoma were subsequently named *Cytauxzoon manul*. The pathogenicity of *C. manul* in North American felids is unknown and the erythrocytic phase of *C. manul* as a potential source of disease in domestic cats was investigated. Six domestic cats received intravenous inoculation with *Cytauxzoon manul* infected Pallas' cat blood. A seventh domestic cat inoculated with sterile water served as a control. Cats were monitored for clinical signs consistent with cytauxzoonosis, and periodically screened for hemoparasitemia. Domestic cats (6/6) that received *C. manul* infected Pallas' cat blood developed a low but detectible parasitemia, yet remained clinically healthy. All domestic cats (7/7) were subsequently challenged with splenic tissue containing the schizogonous phase of *Cytauxzoon felis*, developed clinical signs typical of cytauxzoonosis, were humanely euthanized and confirmed by histopathology to have cytauxzoonosis. While inoculation of domestic cats with *C. manul* infected Pallas' cat blood induced parasitemia, it did not cause disease or provide protection against challenge with *C. felis*. Domestic cats are susceptible to infection with erythrocytic phases of *C. manul*. The existence of a schizogonous phase, the vector, and the pathogenicity of natural infection of *C. manul* in domestic or North American wild felids are unknown. Furthermore, it is unknown if North American wild felids naturally infected with *C. felis* would be protected against challenge by *C. manul*. Further studies are warranted to determine the potential for *C. manul* interspecies transmission and disease in North America Felids.

23) GENETIC DIVERSITY AND HEMORRHAGIC DISEASE SUSCEPTIBILITY IN WHITE-TAILED DEER

Sabrina McGraw, Department of Pathology and the Southeastern Cooperative Wildlife Disease Study (SCWDS), College of Veterinary Medicine, University of Georgia, Athens, GA 30602; Elizabeth Howerth, Department of Pathology, College of Veterinary Medicine, University of Georgia, Athens, GA 30602; Ben Wilcox, SCWDS, College of Veterinary Medicine, University of Georgia, Athens, GA 30602; David Stallknecht, Department of Population Health and SCWDS, College of Veterinary Medicine, University of Georgia, Athens, GA 30602

Hemorrhagic disease (HD), caused by both the epizootic hemorrhagic disease (EHD) and bluetongue (BT) viruses, is the most significant infectious disease of white-tailed deer (WTD) in the United States. Previous surveillance data and experimental infections have shown a consistent geographic pattern of resistance and susceptibility to the virus that does not follow climatic or temperature clines. We hypothesize that the susceptibility of white-tailed deer to hemorrhagic disease is dependant on overall genetic and major histocompatibility complex (MHC) allelic diversity. This study focuses on WTD populations in Georgia, which have consistent geographic patterns of both resistant and susceptible deer based on 23 years of serologic, virologic, and morbidity and mortality data collected by the Southeastern Cooperative Wildlife Disease Study. Tissue and sera were collected from an average of 30 deer from 16 locations (n=460) throughout Georgia for serology for BT and EHD viruses and genetic diversity and heterozygosity evaluation using a panel of 21 microsatellite markers and 2 MHC-DRB gene markers. Serology for EHD and BT viruses on these samples was consistent with previous years, identifying populations of resistant animals. Diversity and population heterozygosity values calculated from PCR results using GENEPOP software are being compared with serologic data to determine if a correlation exists with HD resistance.

24) PASSIVE TRANSFER OF IMMUNITY TO WEST NILE VIRUS IN CHICKENS

Nicole M. Nemeth, Department of Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, CO 80523; Richard A. Bowen, Department of Clinical Sciences, Colorado State University, Fort Collins, CO 80523

Birds are the principle amplifying hosts for West Nile virus (WNV), and while reports of passive transfer of maternal antibody exist, little information exists concerning the variability in transmission of passive immunity to WNV between mother and chick, kinetics of antibody decay, and response to WNV challenge at different chick ages. We used domestic chickens (*Gallus domesticus*) to formulate a model for passive immunity to WNV in birds. Hens were experimentally infected with WNV to induce immunity, and eggs and chicks from those hens, as well as from seronegative hens, were tested to evaluate neutralizing antibody titers. We also evaluated chick response to WNV challenge over time. Additionally, seronegative chicks from 1 day to 8 weeks of age were infected with WNV to compare viremia profiles. All chicks born to seropositive hens were seropositive upon hatch, and antibody titers in yolk and day-old chick sera correlated with those of hens at the time of insemination. Chick antibody levels declined steadily after 1 week post-hatch; most chicks had undetectable antibodies by week 4 post-hatch. However, at 4 weeks post-hatch, previously seropositive chicks challenged with WNV failed to develop detectable viremia, while negative control chicks of the same age had viremias of $\geq 10^{4.1}$ plaque forming units/ml serum by 2 days post-infection. We challenged chicks of 6- and 8-weeks of age (results pending). A decrease in peak viremia occurred as chick age increased. Results are discussed in the context of annual transmission patterns for WNV, and the implications for free-ranging bird populations.

25) EFFICACY OF ORAL AND PARENTERAL BACILLE CALMETTE-GUERIN (BCG DANISH STRAIN 1331) IN PROTECTING WHITE-TAILED DEER (*ODECOILEUS VIRGINIANUS*) AGAINST BOVINE TUBERCULOSIS

Pauline Nol, USDA/APHIS National Wildlife Research Center, Fort Collins, CO 80521; W. Ray Waters and Mitchell V. Palmer, USDA/ARS National Animal Disease Center, Ames, IA 50010; Frank E. Aldwell, University of Otago, Dunedin, NZ; Bryce M. Buddle, AgResearch, Wallaceville Animal Research Centre, Upper Hutt, NZ; Jack C. Rhyan and Mike R. Dunbar, USDA/APHIS National Wildlife Research Center, Fort Collins, CO 80521; Mo D. Salman, Department of Clinical Sciences, Colorado State University, Fort Collins, CO 80523

Bovine tuberculosis poses a serious continual threat to the health and economic well-being of both livestock and humans worldwide. Free-ranging white-tailed deer (*Odocoileus virginianus*) in the state of Michigan (USA) have been shown to be endemically infected with *Mycobacterium bovis*, and serve as a potential reservoir of infection to livestock, other wildlife species, and humans, representing a significant obstacle to that state's disease eradication efforts. An effective vaccination program, involving a mucosal vaccine that can be distributed in the field, would be essential for disease management on a herd-wide level. We investigated the efficacy of oral and parenteral bacille Calmette-Guerin (BCG) in its ability to protect white-tailed deer against disease caused by *M. bovis* infection. Thirty white-tailed deer were divided into four groups. One group was vaccinated with 10^6 colony forming units (cfu) BCG (Danish strain 1331) subcutaneously, one group received 10^9 cfu BCG in culture directly to the oropharynx, one group received 10^9 cfu BCG via a lipid-formulated oral bait, and the last group received a placebo directly to the oropharynx. Blood samples were taken throughout the study in order to investigate levels of cellular and humoral responses in this species to BCG vaccination and *M. bovis* challenge after vaccination. Four months post-challenge, the animals were examined for lesions. Results indicate that both oral forms of BCG offered significant protection against *M. bovis* challenge as compared to placebo.

26) UNDERSTANDING PATTERNS OF WILDLIFE DISEASE: IMPLICATIONS FOR HYPOTHESIS TESTING OF PARASITOLOGICAL DATA

Chris O'Brien and Charles van Riper III, USGS/BRD Sonoran Desert Research Station and University of Arizona, School of Natural Resources, 125 Biological Sciences East, Tucson, AZ 85721

Students of wildlife disease often find it of interest to compare the rate or degree of infection between two *a priori* groups using either prevalence or abundance data. Hypothesis testing of parasitological data call for different statistical techniques; traditionally parasite prevalence data are analyzed using appropriate methods for categorical variables, such as the chi-squared test. In contrast, parasite abundance is often analyzed using standard parametric techniques such as the t-test or ANOVA after an appropriate transformation of the response or by using modern techniques such as generalized linear models (GLMs) that account for the non-normal error structure of the negative binomial distribution. Because many statistical techniques are available to the analyst of parasitological data, we argue that an understanding of the statistical power of such tests can assist in the determination of a preferred method for conducting hypothesis tests. Therefore, in this study we computed the type II error rate (probability of finding a false negative) for competing statistical tests. Findings indicate that the G-test (log-linear regression) provides the lowest type II error rates for prevalence data and a GLM with negative binomial errors produces the lowest error rates for abundance data. Additionally, we found that sample sizes < 50 produce high type II error rates except for samples with the largest effect sizes. Finally, our findings indicate that hypothesis tests on abundance data have a much lower type II error rate than tests on prevalence data, suggesting that, when available, the analyst should always take advantage of abundance data.

27) RENAL INTERSTITIAL FIBROSIS, PULMONARY FIBROMUSCULAR HYPERPLASIA AND OTHER FINDINGS FROM A HISTOLOGICAL ASSESSMENT OF THE BOWHEAD WHALE (*BALAENA MYSTICETUS*)

Cheryl Rosa and Todd M. O'Hara, Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, AK 99775; Matthew J. Gray, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996; John E. Blake, Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks AK 99775

We performed gross examinations and collected tissues for histological assessment during the Inuit subsistence harvest of bowhead whales (*Balaena mysticetus*) in Northern Alaska. Tissue samples were collected for histological analyses from bowhead whales (n=64) hunted during the spring and fall in Barrow and Kaktovik, Alaska (1998-2002). Our objectives were to describe the range of normal histological findings in the species and to define the prevalence of disease in the Bering-Beaufort-Chukchi Sea stock of bowhead whale. We identified and discriminated abnormalities that could be attributed to heavy metal/mineral toxicity, specific disease entities, age, reproductive status or capture. Overall, few pathological changes were observed during gross necropsy or histological assessment. Qualitative observations were made more quantitative through the use of histological staining, digital imaging/measurement and rating profiles, which allowed the assignment of histological observations to a clearly defined scoring system. Abnormalities were few, consisting mainly of hepatic and renal fibrosis and pulmonary fibromuscular hyperplasia. Additionally, pigment was observed in the liver (25/58 whales examined) and extra-medullary hematopoiesis was noted in the spleen (17/45 whales examined). The putative effects of seasonal feeding and fasting on the pancreas and liver were assessed through the evaluation of pancreatic zymogen stores and the degree of hepatic lipidosis observed. Minimal parasitism was noted.

28) FEASIBILITY OF USING COYOTES (*CANIS LATRANS*) AS SENTINELS FOR BOVINE TUBERCULOSIS (*MYCOBACTERIUM BOVIS*) IN WILD CERVIDS IN AND AROUND RIDING MOUNTAIN NATIONAL PARK

Cheryl Sangster, Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK S7N 5B4; Doug Bergeson, Riding Mountain National Park, Wasagaming, MB R0J 2H0; Cyril Lutze-Wallace, Mycobacterial Diseases Centre of Expertise, Canadian Food Inspection Agency Ottawa Laboratory, Fallowfield, Ottawa, ON K2H 8P9; Vince Crichton, Wildlife and Ecosystem Protection Branch, Manitoba Department of Conservation, Winnipeg, MB R3J 3W3; Gary Wobeser, Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK S7N 5B4

Elk (*Cervus elaphus manitobensis*) and white-tailed deer (*Odocoileus virginianus*) in the Riding Mountain National Park (RMNP) region of southwestern Manitoba have been identified as a likely wildlife reservoir of *Mycobacterium bovis*, the causative agent of bovine tuberculosis (TB) in livestock. The feasibility of using coyotes collected from trappers as a sentinel was investigated. A total of 82 coyotes were necropsied and retropharyngeal, mesenteric and colonic lymph nodes and tonsils were examined by bacterial culture, polymerase chain reaction (PCR), and acid-fast histopathology. *Mycobacterium bovis* was not identified in any animal by culture or PCR although *Mycobacterium avium* species were isolated. A single acid-fast organism was identified on histopathology of one animal. Trapper-caught coyotes do not appear to be a sensitive sentinel species of *M. bovis* infection in cervids in and around RMNP.

29) THE INFLUENCE OF CATTLE ON PATHOGEN PREVALENCE IN GREEN FROG (*RANA CLAMITANS*) AND AMERICAN BULLFROG (*RANA CATESBIANA*) TADPOLES IN CUMBERLAND PLATEAU WETLANDS

Chandler Schmutzer and Matthew J. Gray, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996; Debra L. Miller, Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, Tifton, GA 31793

Diseases have been associated with amphibian declines worldwide. It is hypothesized that anthropogenically induced stress may increase pathogen prevalence in amphibian populations by compromising immunity. Cattle grazing in wetlands may induce stress in resident tadpole populations by altering water quality. Therefore, we compared pathogen prevalence in green frog (*Rana clamitans*; $n=80$) and American bullfrog (*Rana catesbiana*; $n=101$) tadpoles residing in eight cattle-access and non-access wetlands on the Cumberland Plateau, Tennessee. Tadpoles were collected during winter, summer, and fall 2005, and were screened for pathogens using standard viral and microbial isolation techniques and PCR for frog virus 3 (FV3) confirmation. Two pathogens (FV3 and *Aeromonas hydrophila*) known to be associated with amphibian die-offs were isolated from both tadpoles species. Frog virus 3 was more prevalent ($P=0.02$) in green frog tadpoles residing in cattle-access (45%) versus non-access (15%) wetlands. No differences were detected ($P=0.78$) between treatments in FV3 prevalence for bullfrog tadpoles. A season trend in FV3 prevalence existed, with prevalence greater ($P<0.02$) in the fall and winter than in summer for both tadpole species. Prevalence of *A. hydrophila* was greater in cattle-access (45%) than in non-access (0%) wetlands for bullfrog tadpoles during fall. Also, prevalence of *A. hydrophila* was greater in fall than in summer for both tadpole species. Our results suggest that cattle use of wetlands may increase prevalence of amphibian pathogens in tadpoles, although this effect may be species and season dependent.

30) ASSESSING THE IMPORTANCE OF CHRONIC WASTING DISEASE IN FREE-RANGING DEER MORTALITIES USING MULTI-STATE MODELS

Krysten L. Schuler and Jonathan A. Jenks, Department of Wildlife and Fisheries Sciences, South Dakota State University, Brookings, SD 57007; Robert W. Klaver, Earth Research Observation Systems Data Center, U.S. Geological Survey, Sioux Falls, SD 57198; R. Terry Bowyer, Department of Biological Sciences, Idaho State University, Pocatello, ID 83209

Estimates of mortality rates are essential for understanding population dynamics of ungulates. Currently, there are few data on how chronic wasting disease (CWD) affects deer populations or the likelihood that deer found dead were positive for CWD. Recovery rates for CWD are important because in some instances, deer positive with CWD at time of death cannot be tested for the disease due to the condition of appropriate tissues. Our objective was to evaluate mortality, transition, and recovery rates for deer infected with CWD residing in Wind Cave National Park, South Dakota. We included 34 monthly encounters of live resightings and dead recoveries for 67 deer (4 white-tailed deer [*Odocoileus virginianus*], 63 mule deer [*O. hemionus*]). Using Program Mark, we conducted a multi-state model within a capture-recapture framework with 3 states: “1= alive,” “A = dead with CWD,” and “B = dead, non-CWD.” Transition probabilities were fixed to 0 for nonsensical transitions. We performed a suite of models and documented similar mortality and recovery rates for CWD-infected and non-infected deer. Transition probabilities to CWD-infected were low. Nevertheless, prevalence rates increased during our study: 2.9% in 2003, 9.1% in 2004, and 15% in 2005. Staggered entry Kaplan-Meier survival analysis and known-fate analysis indicated that survival was constant over time. Therefore, constant survival with increase in prevalence rates could indicate that CWD does not function as an additive source of mortality in deer populations.

31) FUNGAL RESPIRATORY DISEASES IN RAPTORIAL BIRDS: A RETROSPECTIVE STUDY OF 95 CASES IN A REHABILITATION SETTING

Guylaine Séguin, Guy Fitzgerald, Marion Desmarchelier, André D. Dallaire, and Stéphane Lair, Clinique des oiseaux de proie and Centre québécois sur la santé des animaux sauvages, Faculté de médecine vétérinaire de l'Université de Montréal, St. Hyacinthe, Québec, Canada, J2S 2M2

We conducted a retrospective study of cases of fungal respiratory diseases in a raptor rehabilitation program from 1986 to 2005. This condition, usually reported as aspergillosis, was diagnosed in 2% of the 4687 raptors admitted during the study period. These fungal infections were believed to have contributed to mortality in 86% of the cases in which they were diagnosed, and most birds (81%) died within the first 30 days post-admission (median captive time = 11 days). Over half of the affected birds (54%) did not show any premonitory clinical signs, and only one case was treated successfully. Multifocal lesions were observed in 79% of the cases. Lungs, air sacs and trachea were affected in 78%, 71% and 12% of the cases, respectively. Invasion of cerebral hemispheres by fungal elements was detected in one case. The most commonly affected species were hawk owl (4/62), snowy owl (12/201), rough-legged hawk (8/141), osprey (6/125), bald eagle (3/65) and northern goshawk (7/158). Juvenile birds were less frequently affected than adults, and none of the birds admitted as nestling developed this disease. The occurrence of this condition in our rehabilitation facilities has decreased significantly over the years. The improvement in the management of the stress level experienced by hospitalized birds and the increase in the prophylactic use of antifungal drugs, such as itraconazole, are potential explanations for this trend.

32) PREVALENCE OF *BARTONELLA* SPECIES IN RODENTS AND FLEAS ASSOCIATED WITH BLACK-TAILED PRAIRIE DOGS

Bala Thiagarajan, Division of Biology, Kansas State University, Manhattan, KS 66506; Ying Bai, Michael Kosoy, and Ken Gage, Division of Vector Borne Infectious Diseases, CDC, Fort Collins, CO 80521; Thomas Loughin, Department of Statistics, Kansas State University, Manhattan, KS 66506; Jack F. Cully Jr., Kansas Cooperative Fish and Wildlife Research Unit, USGS, Kansas State University, Manhattan, KS 66506

Bartonella species are intracellular hemotropic parasites associated with many zoonotic diseases. They are common on rodents and transmitted by arthropod vectors. In this study, we used the prevalence of *Bartonella* as a surrogate for plague to identify potential rodent reservoirs and their fleas that are important for the maintenance and transmission of bacteria in the prairie dog ecosystem. We tested blood samples and fleas from rodents captured off- and on- prairie dog colonies and evaluated the distribution and prevalence of *Bartonella* in rodents and fleas. Prevalence of *Bartonella* in rodents varied between 37% and 65% among the study areas. Prevalence in fleas was low (6%). Eight rodent species and nine flea species were positive for *Bartonella*. *Peromyscus maniculatus* and *Onychomys leucogaster* were found to be consistently infected with *Bartonella* and had high infection probabilities. These species may play an important role in the maintenance and transmission of diseases. *Bartonella* variants were isolated from rodents and from *O. leucogaster*, we isolated variants belonging to *Onychomys* clade, *Peromyscus* clade and one ground squirrel variant. There were also changes in the genetic variants of *Bartonella* in recaptured *O. leucogaster* between trapping sessions in the same year. Because of the wide diversity of rodents and fleas that were infected with *Bartonella*, there is a high potential for the transmission of *Bartonella* between rodents and fleas. Further analyses on strain differences of *Bartonella* among rodents and fleas would elucidate routes of interspecific transmission.

33) A STUDY OF THE PREVALENCE OF WEST NILE VIRUS IN A POPULATION OF AMERICAN KESTRELS (*FALCO SPARVERIUS*) IN SOUTHEASTERN OHIO DURING THE NESTING SEASON

Tiffany M. Wolf, Department of Wildlife and Conservation Medicine, The Wilds, Cumberland, OH 43732; James L. Dooley, Department of Biology, Muskingum College, New Concord, OH 43762; Barbara Wolfe, Department of Wildlife and Conservation Medicine, The Wilds, Cumberland, OH 43732

Since its arrival in North America in 1999, West Nile virus (WNV) has been a significant health threat for humans, horses, and birds, among other animals. The virus is associated with raptor mortality, although the extent of morbidity and mortality in discrete populations is poorly understood. The American kestrel, *Falco sparverius*, a common resident of southeastern Ohio, is among the raptor species susceptible to the disease caused by WNV. This species has also been implicated as a potential reservoir host, as experimentally infected kestrels have been demonstrated to shed virus from the oral cavity and cloaca, and to transmit circulating virus to feeding mosquitoes. This study examined the prevalence of WNV seropositivity and viral shedding in an American kestrel population in southeastern Ohio during the 2005 and 2006 nesting seasons. Documentation of viral shedding during the breeding and nesting season would support a hypothesis of bird-to-bird transmission in this species. Antibody titers were measured by serum neutralization, and 1 of 11 birds tested (9%) was seropositive in 2005. No viral shedding was found by RT-PCR of oral and cloacal swabs in this year. Mosquito pools tested during the same time period in the locations of the kestrel nesting sites were also negative for WNV by RT-PCR. These preliminary findings indicate non-lethal exposure to WNV in this population of American kestrels. Additionally, trapping in both years has allowed for repeat testing of several individuals which may provide unique insight into the activity of WNV in this species.

34) PRELIMINARY EVIDENCE OF INTERACTION BETWEEN DOMESTIC SWINE AND PSEUDORABIES- AND BRUCELLOSIS-POSITIVE FERAL SWINE

Christy Wyckoff, Scott E. Henke, and David G. Hewitt, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX 78363; Tyler A. Campbell, USDA/APHIS-Wildlife Services, Texas A&M University-Kingsville, Kingsville, TX 78363; Kurt C. VerCauteren, USDA-Wildlife Services, National Wildlife Research Center, Fort Collins, CO 80521

Feral pig (*Sus scrofa*) populations occur in 32 of the 50 US states, and their populations appear to be increasing. In the last fifteen years, the U.S. pork industry has completed a successful national eradication program for economically detrimental diseases, such as pseudorabies and brucellosis. It has been hypothesized that feral pigs are disease reservoirs that could reintroduce pathogens to disease-free domestic swine herds, such as small-scale swine farms or backyard 4H operations. To assess legitimacy of this threat, we trapped and ear-tagged feral pigs (N=241) at sites near domestic swine facilities in eastern and southern Texas. Blood was obtained (N=177) and examined for brucellosis and pseudorabies exposure, and we outfitted all adult pigs with GPS data-logging collars. Overall prevalence of brucellosis and pseudorabies was 23.7% and 33.3%, respectively. To date, 5 GPS collars from a farm site in southern Texas have been recovered with 8, 21, 88, 129, and 237 days of GPS data recorded, respectively. Using a 100-m buffer zone to qualify as an “interaction event,” each feral pig had >1 interaction with domestic swine and >4 interactions with other livestock present. Of the 831 data locations collected from these pigs, 152 (18.3%) locations were tallied as interaction events with livestock and 59 (38.8%) of these were with domestic swine. Our preliminary data indicated that disease-positive feral pigs do visit domestic swine facilities, thus representing a real threat to national disease eradication programs and the health of domestic swine herds.

35) THE PREVALENCE OF ROUNDWORMS (*BAYLISASCARIS PROCYONIS*) IN RACCOONS (*PROCYON LOTOR*) IN PORTLAND, OREGON

Jennifer Yeitz, Oregon State College of Veterinary Medicine, Corvallis, OR 97331; Colin Gillin, Oregon Department of Fish and Wildlife, Corvallis, OR 97361; Nick Kantor, Portland State University, Portland, OR 97201; Rob Bildfell, Oregon State College of Veterinary Medicine, Corvallis, OR 97331; Emilio DeBess, Oregon Department of Health Services, Salem, OR 97301

Baylisascaris procyonis (Nematoda: Ascaridoidea) is a common parasite of raccoons that causes fatal larval migrans in intermediate hosts such as rabbits, ground squirrels, ground-feeding birds, dogs and humans. We investigated the prevalence of *B. procyonis* in raccoons living in the metropolitan area of Portland, Oregon and mapped raccoon distribution in relation to human dwellings. 78 raccoons have been collected to date (data collection will cease in June 2006). Examination included necropsy, harvesting of adult worms from the intestines and fecal analysis by modified double centrifugation technique using a sugar floatation solution. Capture locations for each raccoon were plotted against the demographics of the Portland area using a GIS mapping system. Preliminary results estimate that 48% of raccoons carried *B. procyonis* in their feces with approximately 55% of the animals infested by adults. Our preliminary data suggests that the prevalence of *B. procyonis* is slightly lower in Portland, Oregon than reported for several other U.S. locations. Preliminary distribution maps suggest that larger groups of raccoons inhabit areas with more suburban characteristics, increasing the potential for contamination with *B. procyonis*. It also appears that the risk of transmission to humans and other animals is compounded by factors such as season and the abundance of juvenile raccoons. Under such circumstances, the eradication of communal raccoon latrines near human dwellings and curtailing relocation of raccoons from such areas may help limit the transmission and spread of *B. procyonis*.

AAWV CUTTING EDGE SPEAKER

36) RAPPORT, ALIGNMENT, AGREEMENT, RESULTS

Tom McGinn, Department of Homeland Security

The American Association of Wildlife Veterinarians (AAWV) is a 200+ member, non-profit organization dedicated to the advancement and enhancement of veterinary contributions to the health and sustainability of wildlife populations. For many years, the AAWV has invited and sponsored a Cutting Edge Speaker at the annual conference of one of its affiliate organizations. The purpose of the AAWV Cutting Edge Speaker presentation is to shed light on an emerging wildlife health issue, provide conference attendees with the current state of knowledge about a particular pathogen or syndrome with wide-reaching implications for wildlife, introduce a topic or issue that is well outside our normal frames of reference or comfort zones, or challenge our wildlife health community to tackle a particularly pressing problem.

This year's AAWV Cutting Edge Speaker is Dr. Tom McGinn, DVM, Department of Homeland Security. Dr. McGinn received his veterinary degree from North Carolina State University in 1987. He became Assistant State Veterinarian of North Carolina in 1993, and in this capacity, he pioneered the use of Geographic Information Systems for animal and human health management, working at this time also as a consultant to the World Health Organization in 1994. In 2002, he was appointed Director of the Emergency Programs Division of the North Carolina Department of Agriculture and Consumer Services. He is currently a Sector Specialist at the Department of Homeland Security, in its Infrastructure Coordination Division's Food, Agriculture and Public Health sector. In this role he is working to combine the efforts of the National Infrastructure Plan with the National Response Plan. The Department of Homeland Security leads, integrates, and coordinates national cross-sector infrastructure protection initiatives. His primary role as Medical Advisor is to advise and develop national policy and response capabilities in an effort to protect human and animal health, food and agriculture. On the volunteer front, Dr. McGinn is nationally known for improving human and animal partnerships through his founding of the North Carolina State Animal Response Team (SART). SART now serves a model for state emergency response organizations across the country. McGinn holds an adjunct faculty appointment at the College of Veterinary Medicine at North Carolina State University, and was awarded the NCSU College of Veterinary Medicine's Alumni of the Year Award, 1996, the North Carolina Emergency Management Association's James F. Buffalo Award in 2000, and is a member of the Phi Zeta National Veterinary Honor Society.

With the Department of Homeland Security's current plan for how it works with the wildlife veterinary community to protect the United States from acts of bioterrorism as context, McGinn will present a strategy for creating and maintaining a high degree of cooperation and collaboration among agencies and across jurisdictions, in order to protect the health of domestic animals, wildlife, and people.

ADVANCING GLOBAL HEALTH: LINKING CAPTIVE AND FREE-RANGING WILDLIFE HEALTH

Moderators: Jonathan Sleeman, Kirsten Gilardi



*Hosted jointly by the
American Association of Wildlife Veterinarians and
the American Association of Zoo Veterinarians*



37) DEFINING A WILDLIFE VETERINARIAN: A LOOK AT THE HISTORY, PHILOSOPHIES, AND CULTURES OF THE AAWV AND AAZV

R. Scott Larsen, Wildlife Health Center, School of Veterinary Medicine, University of California, Davis, CA, 95616; Jonathan Sleeman, Department of Game and Inland Fisheries, Commonwealth of Virginia, Richmond, VA 23230; Kirsten Gilardi, Wildlife Health Center, School of Veterinary Medicine, University of California, Davis, CA, 95616; Michele Miller, Disney's Animal Programs, Lake Buena Vista, FL 32830

What is a “wildlife veterinarian”? This would seem to be a very simple question to answer.... a wildlife veterinarian is a veterinarian who works with wildlife. Given the diversity of professional interests found at any meeting of the American Association of Wildlife Veterinarians (AAWV) or the American Association of Zoo Veterinarians (AAZV), it is clear that there is not necessarily a straightforward answer. Both organizations are dedicated to the health of wildlife, with common goals and interests. Traditionally, the members of AAWV are experienced in addressing disease issues in free-ranging populations. They are closely integrated with biologists and resource managers in determining how to address wildlife disease issues. AAWV members work with threatened species, but also with non-native pests and game animals. AAZV members traditionally work with disease issues on an individual or small population basis, with particular attention to free-ranging populations of threatened and endangered species. As AAZV members have become more active participants in conservation of free-ranging populations, the lines between the two organizations have become more blurred. Given their common goals and interests, AAWV and AAZV will continue to partner in issues of wildlife health. A recently signed memorandum of agreement solidifies their relationship. A joint “Committee on Wildlife Health and Conservation” is charged with promoting their shared goals regarding the health, welfare, and conservation of free-ranging wildlife and their ecosystems. In a world that is rapidly shrinking, “wildlife veterinarians” will need to work together, whether they are based out of state agencies, zoological parks, universities, or private practices.

38) ENVIROVET SUMMER INSTITUTE

Val Beasley, College of Veterinary Medicine, University of Illinois, Urbana, IL 61802; Kirsten Gilardi, Wildlife Health Center, School of Veterinary Medicine, University of California, Davis, CA, 95616; Jan Myburgh, Department of Paraclinical Sciences, University of Pretoria, Onderstepoort, South Africa

The seven-week, highly intensive Summer Institute is designed to provide requisite vision, skills and expertise to enable synchronous recovery of biodiversity and gains in wildlife, domestic animal, public and economic health around the world. Faculty members come from academia, government, non-governmental agencies, foundations, and private enterprise across North America and southern Africa. Envirovet provides education to facilitate ecosystems characterized by: Control of chemical contaminants to below threshold concentrations for direct and indirect toxic effects; control of exotic and invasive species introductions with elimination of exotic species when possible and desirable; prevention and control of emerging and re-emerging diseases through education, regulation, renaturalization, and astute management; agriculture and forestry that do not deplete the water of aquifers, streams, or lakes; rehabilitation/restoration of estuaries and coastal zones; harvest of animals only at rates that support recovery of robust biodiversity in the wild; maintenance of natural areas large enough to sustain top native carnivores and other species with large ranges; provision of ample buffers with native plants and animals to offset effects of human activities; re-establishment of connectivity of natural landscapes especially along streams and across uplands; maintaining areas devoted to human activities within small and large fragments surrounded by largely natural habitats and linked by transport systems built in ways that allow wildlife to migrate and interbreed; and ultimately re-establishment of margins of safety for wildlife resources by enabling their evolution without undue interference by anthropogenic environmental change.

39) HEALTH MANAGEMENT OF ORPHANED WILD ELEPHANTS AT THE ELEPHANT TRANSIT HOME

B. A. D. S. Jayawardana, Elephant Transit Home, Department of Wildlife Conservation, Udawalawe, Sri Lanka; G. A. T. Prasad, B. V. P. Perera, Department of Wildlife Conservation, Colombo, Sri Lanka.

Sri Lankan Elephant (*Elephas maximus maximus*) exists as a population of nearly 4000. Human interference in elephant habitats and some natural causes has resulted in orphaned or abandoned young elephants. The elephant transit home (ETH) at Udawalawe, Sri Lanka, started in 1995, and is a facility to raise and subsequently release orphaned elephant calves from the wild back to wild. It is a pioneering attempt of this nature for Asian elephants. The facility has released 46 individuals to the wild in six batches from 1998 to 2006. Bringing up orphaned young elephants with available milk formulae has caused digestive problems. In addition to nutritional problems, wounds (natural & human-caused), gastro-intestinal parasitic problems, skin and musth gland infections, eye infections, and external parasitic infestations among other problems were encountered. Measures taken to reduce stress of the new arrivals, nutritional management, etiology of diseases and routine practices to overcome parasitic problems were analyzed. The etiology of mortality, annual mortality rates and reasons for orphaning were investigated and analyzed using past records. Majority of the cases with milk indigestion were due to milk-fat indigestion and was responsible for 47.61% of the mortality. Over 50% of the mortality due to primary gastro-intestinal parasitism of orphans received was due to *Fasciola jacksoni*. Septic arthritis (naval ill) and gun shot injuries were the main cause of septicemia in orphans. Veterinary practices along with measures to upgrade the health management were implemented. The reduction of annual mortality rate to below 15% revealed the effectiveness of the veterinary care and management adopted at ETH, Udawalawe.

40) MEDICAL MANAGEMENT OF COLD-STUNNED SEA TURTLES STRANDED ON CAPE COD

E. Scott Weber III and Constance Merigo, Animal Health and Rescue/Rehabilitation Departments, New England Aquarium, Central Wharf, Boston, MA 02110

The New England Aquarium (NEAq) has been at the forefront of sea turtle rehabilitation. Over the last decade increasing numbers of stranded sea turtles have occurred annually in the late autumn and early winter in Cape Cod Bay. Most of these animals are juvenile Kemp's Ridley turtles (*Lepidochelys kempii*), but representatives of several other sea turtle species are also recovered. Because the pelagic stage of Kemp's Ridelys turtles is unknown, the reason animals strand on Cape Cod during this time of year can only be conjectured as related to changes in ocean currents, tides, wind trajectory, and weather/storm patterns coupled with the geographical anomaly of the Cape's formation. The Massachusetts Audubon Society transports live animals to the NEAq's Rescue and Rehabilitation Department. From 1999 – 2005, NEA has responded to 563 stranded sea turtles and has had over an 88% survival rate in individuals that are warmed to ambient temperature in an Intensive Care Unit (ICU) over the first three days post arrival. Animals receive an initial health assessment and veterinary care to treat the most immediate and life-threatening conditions of hypothermia, dehydration, bacterial and fungal pneumonia, secondary trauma, flipper tip necrosis, and joint swelling. Using clinical pathology, radiography, nuclear scintigraphy, MRI, CAT-scan, bronchoscopy, and ultrasonography, these conditions have been diagnosed and monitored while undergoing rehabilitation. Biological samples are collected from these animals to evaluate for heavy metal and pesticide exposure, and also microbial flora and antibiotic sensitivity patterns.

41) LIPOSOME ENCAPSULATED BUTORPHANOL (LEBT) PROVIDES LONG-TERM ANALGESIA TO PARROTS

Joanne Paul-Murphy, Kurt K. Sladky, Conservation Health Consortium, Department of Surgical Sciences, School of Veterinary Medicine, University of Wisconsin, Madison, WI 53705; Lisa Krugner-Higby, Research Animal Resources Center, University of Wisconsin, Madison, WI 53706; Timothy D. Heath, School of Pharmacy, University of Wisconsin, Madison, WI 53705 USA

It is now standard of practice to provide pain relief to animals under conditions considered painful in humans. However, treating animal pain for wildlife can be problematic because of distress associated with frequent handling for drug administration, and the short duration of drug efficacy. Evaluating analgesia in species such as birds, small mammals, reptiles, amphibians, and fish is challenging, because objective measures of behavior associated with pain are difficult to define. Analgesia was evaluated in a study in which parrots (n = 11) received LEBT and were tested for withdrawal response to noxious stimuli. After a washout period, the same parrots received liposome vehicle (LV), subcutaneously (SC) and were tested again. All parrots receiving LEBT had significantly increased electrical and thermal foot withdrawal thresholds for 3 consecutive days, compared with control parrots that received LV and had decreased foot withdrawal thresholds, compared with baseline, at all time points. Analgesic properties of LEBT were assessed in the third study using a model of sustained pain, inflammatory monoarthritis, in Hispaniolan parrots (n = 19) and force plate analysis for objective assessment of lameness. Uric acid (0.1 ml 8%) was injected into a single inter-tarsal joint. Birds were randomly assigned to treatment groups in a cross-over design to receive either no analgesia treatment, a single LEBT (15 mg/kg SC) immediately after uric acid injection, carprofen (0.1 mg/kg, intramuscularly) immediately after uric acid injection and every 12 hours for 5 days, or a combination of both butorphanol and carprofen treatments. Birds receiving LEBT, with or without carprofen, placed more weight on the arthritic leg whereas the birds receiving only carprofen or no analgesia treatment had decreased weight load on the arthritis leg at 2, 6, 26 and 32 hours following uric acid intertarsal injection.

42) GENETIC SALVAGE FROM A DISEASED WOOD BISON (*BISON BISON ATHABASCAE*) HERD THROUGH IN VITRO PRODUCTION AND CRYOPRESERVATION OF EMBRYOS

Jacob Thundathil, Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada T2N 4N1; Douglas Whiteside, Calgary Zoo Animal Health Centre, Calgary, AB, Canada T2E 8K2; Brian Shea, Alta Embryo Group, Calgary, AB; Brett Elkin, Wildlife Division, Government of Northwest Territories, Environment & Natural Resources, Yellowknife, NT, Canada X1A 2L9; Darren Ludbrook, Bear Creek Animal Clinic, Grande Prairie, AB, Canada, T8V 6K4; John Nishi, Government of Northwest Territories, Environment & Natural Resources, Fort Smith, NT, Canada X0E 0P0

The Hook Lake Wood Bison Recovery Project (HLWBRP) was a wildlife co-management project initiated jointly in 1996 by the community of Fort Resolution and the Government of the Northwest Territories. One of the main objectives of the project was to salvage genetic diversity from a wild herd of wood bison (*Bison bison athabascaae*) infected with bovine tuberculosis and brucellosis. Unfortunately confirmation of tuberculosis in several animals resulted in depopulation of the HLWBRP herd in spring, 2006. Although assisted reproductive techniques are established to varying degrees in domestic animals, there is little or no experience with them in bison. Therefore, we investigated the potential of in vitro fertilization and embryo culture for the genetic salvage of the HLWBRP herd. Cumulus oocyte complexes (COCs) recovered from ovaries at slaughter were matured in vitro and fertilized with spermatozoa from frozen semen or epididymal spermatozoa. Although frozen-thawed and epididymal spermatozoa resulted in acceptable fertilization (63.3%, n = 45; 89.6%, n = 28, respectively) and cleavage rates (51.8%, n = 120; 92.5%, n = 40, respectively), morulae (10 %, n = 120; 25%, n = 40, respectively) and blastocyst production (6%, n = 120; 10 %, n = 40, respectively) were low. Morulae-and blastocyst-stage embryos were frozen-stored by vitrification. Although the methods used require further refinement to optimize results, our data suggest that these techniques have significant potential for conserving and managing genetic diversity of wild bison, and may also have important management implications for genetic salvage of diseased bison populations in North America.

43) PERIPHERAL AND INTERNAL LYMPHOID INVOLVEMENT IN PRE-CLINICAL CHRONIC WASTING DISEASE IN ADULT MULE DEER (*ODOCOILEUS HEMIONUS*)

Terry R. Spraker, Colorado State University Veterinary Diagnostic Laboratory, Fort Collins, CO, 80523; Jenny G. Powers, Biological Resources Management Division, National Park Service, Fort Collins, CO, 80525; Mary Kay Watry, Rocky Mountain National Park, Estes Park, CO, 80517; Margaret A. Wild, Biological Resources Management Division, National Park Service, Fort Collins, CO, 80525

The exact dissemination mechanism of the chronic wasting disease (CWD) associated prion, PrP^{CWD}, within natural cervid hosts is not completely understood. Strong evidence suggests that the peripheral nervous system is important in this process. In addition, the tropism of PrP^{CWD} for lymphoid tissue has been extensively described. PrP^{CWD} has been demonstrated in various lymphoid tissues of experimentally and naturally infected mule deer (*Odocoileus hemionus*). However, the extent to which PrP^{CWD} is distributed in lymphoid tissues of pre-clinical free-ranging mule deer has not been reported. We describe six, apparently healthy, male and female mule deer, sampled as part of an ongoing test and cull CWD management program at Rocky Mountain National Park, Colorado, USA. Each deer was found to have immunohistochemical staining (IHC) consistent with CWD in a palatine tonsil biopsy sample. Deer were euthanized and full necropsies performed. Numerous tissues were collected to investigate the distribution of PrP^{CWD} during the pre-clinical stages of disease. Five of the animals were considered to be in the early stages of CWD and one was in a mid disease stage. Lymphoid tissues of the head, neck, thorax, and abdomen including peripheral lymph nodes were IHC positive. Additionally, hemal nodes of the neck, thorax and abdomen were positive. The thymus glands were IHC negative in these deer. This report documents the wide distribution of lymphoid tissues where PrP^{CWD} may be found during the early stages of CWD in mule deer. Furthermore, PrP^{CWD} accumulation in hemal nodes suggests the potential for hematogenous dissemination of PrP^{CWD}.

44) TRANSMISSION OF DEER HAIR-LOSS SYNDROME FROM COLUMBIAN BLACK-TAILED DEER (*ODOCOILEUS HEMIONUS COLUMBIANUS*) TO ROCKY MOUNTAIN MULE DEER (*ODOCOILEUS HEMIONUS HEMIONUS*)

Jason Robison, Bruce E. Coblentz, Oregon State University, Department of Fisheries and Wildlife, Corvallis, OR 97330; Jack A. Mortenson, USDA, Veterinary Services, Salem, OR 97301; Douglas F. Cottam, Oregon Department of Fish and Wildlife, Newport, OR 97354; Colin M. Gillin, Oregon Department of Fish and Wildlife, Corvallis, OR 97330; Rob Bildfell, Oregon State University, College of Veterinary Medicine, Corvallis, OR 97331

Deer hair loss syndrome is a condition affecting Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and Columbia white-tailed deer (*Odocoileus virginianus leucurus*) in Oregon and Washington. Typical clinical signs of the syndrome include seasonal alopecia by self mutilation, weight loss, diarrhea, lethargy, and death. It is believed that a species of exotic chewing louse of the genus *Damalinia*, subgenus *Cervicola* causes a hypersensitivity reaction that results in pruritis, excessive grooming and removal of pelage. The potential transmission of *Damalinia (Cervicola)* sp. from affected black-tailed deer to Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) is unknown. Mule deer were both experimentally infested with *Damalinia (Cervicola)* sp., and held in direct contact with infested black-tailed deer in pens at EE Wilson Wildlife Area, Corvallis, Oregon. Grooming behavior, lice numbers, and clinical signs (darkening of hair coat, yellow discoloration, hair-loss, raw skin) were monitored and recorded. Both experimentally infested mule deer and those held in direct contact with infested black-tailed deer showed marked increases in grooming behavior within three weeks of exposure. Lice counts doubled following exposure in both groups and lice samples taken from mule deer held in direct contact with black-tailed deer were identified as *Damalinia (Cervicola)* sp. Small patches of groomed hair were recorded in exposed mule deer, however no extreme hair loss was observed. On the basis of these data, the potential for Rocky Mountain mule deer to develop deer hair-loss syndrome may be high when in direct contact with affected deer, or other modes of *Damalinia (Cervicola)* sp. contact.

45) INFECTIOUS DISEASES AND THE ILLEGAL TRADE OF WILDLIFE

Andrés Gómez, Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY 10027; A. Alonso Aguirre and Gerardo Suzán, Wildlife Trust, New York, NY 10001

Increased global trade is one of the most important drivers of disease emergence, and the trade in wildlife species has been shown to pose a significant health threat. Here we provide a compilation of diseases directly associated with illegally traded wildlife. We identified at least 95 pathogen species in illegally traded wildlife species. The pathogen species identified in this survey spanned the gamut of taxonomic origins, affected most vertebrate taxa and could have negative consequences for human and animal health and the economy at all spatial scales. An important finding in our survey was that published health assessments of illegally traded wild animals were extremely scarce, making the results of this survey an obvious underestimation of the true extent of the problem. We suggest that the severity of the potential health risks stemming from this trade warrant concerted action involving increased awareness of the health risks involved, increased efforts in surveillance and reporting, and further research to alleviate current critical knowledge gaps.

46) ZOO-BASED WILDLIFE DISEASE SURVEILLANCE

Dominic A. Travis, Director, Davee Center for Epidemiology and Endocrinology, Lincoln Park Zoo, Chicago, IL, 60614

The Centers for Disease Control and Prevention (CDC) defines public health surveillance as the ongoing, systematic collection, analysis, interpretation, and dissemination of data, including clinical signs and symptoms, laboratory test results, and prevalence of behavioral and attitudinal risk factors. Epidemiologists use these data to detect outbreaks, describe patterns of disease transmission, evaluate prevention and control programs and prioritize future health care needs. Traditionally, veterinary disease surveillance and monitoring programs have focused on control and eradication of diseases of agricultural significance, although significance has often been defined by the zoonotic potential of the agent. Today, in an expanding global community, animal disease surveillance is largely geared toward establishing national and regional disease status to support international trade in animals and animal products. Recently, diseases spread from wild animals have affected both public health and agricultural disease control programs, significantly draining valuable resources. Since the term ‘emerging disease’ was popularized in the early 1990’s, both usual suspects (rabies, tuberculosis, brucellosis, tularemia, avian influenza and plague), and emerging wildlife diseases (Ebola virus in great apes, severe acute respiratory syndrome (SARS) in civets, monkey pox in rodents, Nipah and Hendra virus in bats and flying foxes, and West Nile virus in hundreds of species), have dominated the popular and scientific literature. The unique role of wildlife in the ecology of these diseases requires special consideration when incorporating them into existing or novel surveillance/monitoring programs. This presentation outlines important considerations for conducting disease surveillance in both captive and free-ranging wildlife.

AVIAN INFLUENZA EPIDEMIOLOGY AND MANAGEMENT

Moderator: Catherine Soos

47) THE HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI) EARLY DETECTION DATA SYSTEM (HEDDS)

F. Joshua Dein, Megan K. Hines, and Christine M. Marsh, NBII Wildlife Disease Information Node, USGS NWHC, 6006 Schroeder Road, Madison, WI 53711

At the request of the White House Policy Coordinating Committee for Pandemic Influenza Preparedness, the U.S. Departments of Agriculture (USDA) and Interior (DOI), along with other partners, developed an early detection plan for highly pathogenic avian influenza (HPAI) in the U.S. The plan calls for the establishment of a national database for use by all agencies, organizations and policy makers. The Wildlife Disease Information Node (WDIN), housed at the U.S. Geological Survey's National Wildlife Health Center (NWHC), has created the HPAI Early Detection Data System (HEDDS), <http://wildlifedisease.nbio.gov/ai>, to meet this goal. HEDDS was developed to manage animal and specimen collection data taken by many groups and individuals, and analyzed by multiple laboratories. Managing data includes ensuring that the resulting data are available for viewing and analysis by all contributors. For this purpose, incorporating appropriate standards into the data system is essential to facilitate information sharing and to improve surveillance strategic planning. Data may be browsed in their entirety, or filtered by various parameters (e.g. species, sex, location). Standardized reports for individual contributors, as well as customized report options are available. The core data fields are used to construct standardized summaries of results in the database (e.g. number of specimens tabulated by location). This presentation will discuss the current status of HEDDS, with views of avian influenza surveillance information held in the system.

48) TOWARD AN INTEGRATED RISK ANALYSIS FOR AVIAN INFLUENZA: A JOINT PROJECT BY CANADIAN AUTHORITIES RESPONSIBLE FOR WILDLIFE, ANIMAL HEALTH, PUBLIC HEALTH AND PUBLIC SAFETY

Geneviève Trottier and Sandra Fry, Science Advice and Biohazards Division, Canadian Food Inspection Agency, 159 Cleopatra, Ottawa, Ontario, K1A 0Y9 (Canada); Nancy Rheault, Animal Health Risk Assessment Unit, Canadian Food Inspection Agency, 3851 Fallowfield, Ottawa, Ontario, K2H 8P9 (Canada); Avian Influenza Risk Analysis Steering Committee, Ottawa, Canada

Canadian authorities responsible for animal health, public health/safety and wildlife are housed in separate federal departments and agencies, each with their own mandate and responsibilities. With rising numbers of Highly Pathogenic Avian Influenza (HPAI) H5N1 cases reported in domestic birds, wild birds, and non avian species including man, it became increasingly evident that wildlife, animal health and human health concerns were converging and close collaboration at the interface was critical. Planning and preparedness for potential H5N1 introduction into Canada required scientific evidence from various disciplines to be gathered, analyzed and communicated. A cross-departmental team led by the Canadian Food Inspection Agency took on the challenge to develop an integrated risk analysis consisting of a joint discussion of public health risks, animal health in the agri-food context and related wildlife issues. Risk analysis is a complex and resource-intensive analytical process which interprets available scientific information, modelled against hypothetical or actual transmission pathways. It lies at the heart of smart decision-making in circumstances of disease outbreak prevention and response. Integration of nationally and internationally available information pertaining to HPAI H5N1 allowed the multi-disciplinary team to describe knowledge gaps, identify required resources and expertise and propose strategies for collaborative research and surveillance. In addition to strengthening our knowledge base across animal species and contributing to a comprehensive understanding of avian and pandemic influenza dynamics, this project highlighted the value of a close-knit network for information sharing beyond professional and organizational boundaries

49) ARE SHOREBIRDS A RESERVOIR FOR AVIAN INFLUENZA VIRUSES?

Britta A. Hanson, David E. Stallknecht, M. Page Luttrell, Virginia H. Goekjian, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens, GA 30602 USA; David E. Swayne, Joan D. Beck, Southeast Poultry Research Laboratory, USDA-ARS, 934 College Station Road, Athens, GA 30605 USA; and Dennis A. Senne, National Veterinary Services Laboratories, Veterinary Services, Animal and Plant Health Inspection Service, USDA, Ames, IA 50010 USA

Surveillance for avian influenza virus (AIV) of species within the order Charadriiformes was conducted at multiple sites in the eastern half of the continental United States, as well as Argentina, Chile and Bermuda during 1999 - 2005. Of more than 9,700 birds sampled, AIV virus was isolated from 311 birds. Although ruddy turnstones (*Arenaria interpres*) accounted for just 24% of birds sampled, they accounted for 86% of the isolates. Only nine AIV isolations were made from birds at three locations outside the Delaware Bay region. Within the Delaware Bay isolates, viruses of the H10 subtype predominated but this subtype was not represented each year. These results suggest that AIV infection among shorebirds is localized and species specific. At this time, Delaware Bay (during May) is the only site worldwide where a high prevalence of AIV has been reported from shorebirds; most isolates at this site are associated with a single species.

50) EXPERIMENTAL INFECTION OF LAUGHING GULLS (*LARUS ATRICILLA*) AND NORTH AMERICAN DUCK SPECIES WITH HIGHLY PATHOGENIC H5N1 AVIAN INFLUENZA VIRUSES

Justin D. Brown, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, Wildlife Health Building, College of Veterinary Medicine, The University of Georgia, Athens, GA, USA, 30602; David E. Stallknecht, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, Wildlife Health Building, College of Veterinary Medicine, The University of Georgia, Athens, GA, USA, 30602; Joan R. Beck, United States Department of Agriculture, Agricultural Research Service, Southeast Poultry Research Laboratory, Athens, GA, USA, 30605; David L. Suarez, United States Department of Agriculture, Agricultural Research Service, Southeast Poultry Research Laboratory, Athens, GA, USA, 30605; and David E. Swayne, United States Department of Agriculture, Agricultural Research Service, Southeast Poultry Research Laboratory, Athens, GA, USA, 30605

Historically, avian influenza viruses (AIV) have not been associated with morbidity or mortality in wild birds and highly pathogenic avian influenza (HPAI) viruses are rarely present in these reservoirs. In 2002, HPAI H5N1 viruses caused mortality in wild and captive birds in two waterfowl parks in Hong Kong, and since that time, HPAI H5N1 viruses have been associated with mortality in numerous wild avian species throughout Eurasia. This study is part of a broader study to evaluate the potential for HPAI H5N1 viruses to be transported by or become established in wild avian populations. In this study, we assessed the clinical response and extent and duration of viral shedding in five species of North American ducks and laughing gulls (*Larus atricilla*) after challenge with two Asian HPAI H5N1 viruses. Birds were challenged at approximately three to four months of age, which is consistent with temporal peaks in AIV prevalence and fall migration. All species were infected, but wood ducks (*Aix sponsa*) and laughing gulls were the only species to exhibit either morbidity or mortality. Infected mallards (*Anas platyrhynchos*), northern pintail (*Anas acuta*), blue-wing teal (*Anas crecca*), and redheads (*Aythya americana*) did not exhibit clinical signs. Viral titers were higher in oropharyngeal swabs than cloacal swabs. The duration of viral shedding (1-10 days) increased with severity of clinical disease. The observed species-related differences indicate that further examination of the susceptibility of various wild avian species to HPAI H5N1 viruses is warranted.

51) HIGHLY PATHOGENIC INFLUENZA VIRUS - H5N1 INFECTION IN SWEDISH WILDLIFE: CLINICAL FINDINGS AND EPIDEMIOLOGY

Torsten Mörner, Erik Ågren, Karin Bernodt, Caroline Bröjer, Desiree S. Jansson, Henrik Uhlhorn, Roland Mattsson, Dolores Gavier-Widén, Department of Wildlife, Fish and Environment, National Veterinary Institute, SE – 751 89 Uppsala, SWEDEN; Marianne Elvander, Ulla Carlsson, Department of Disease Control and Biosecurity, National Veterinary Institute, SE – 751 89 Uppsala, SWEDEN; György Czifra, Peter Thorén, Department of Virology, National Veterinary Institute, SE – 751 89 Uppsala, SWEDEN.

The first wild bird case of highly pathogenic avian influenza H5N1 in northern Europe was observed on February 8 2006 in a Mute swan (*Cygnus olor*) on the island Rügen, Germany in the southern part of the Baltic Sea. The first cases of HPAI H5N1 in Swedish wildlife were diagnosed on February 28 in two Tufted ducks (*Aythya fuligula*) found dead in ice-free waters adjacent to Oskarshamn nuclear power plant by the Baltic Sea, approximately 400 km north of Rügen. Since then the disease has been diagnosed in several species of waterfowl, including Mute swan, Scaup (*Aythya marila*), Goosander (*Mergus merganser*), Smew (*Mergus albellus*), Canada goose (*Branta canadensis*), and Herring gull (*Larus argentatus*). The disease has also been observed in predators of waterfowl; Common buzzard (*Buteo buteo*), European eagle owl (*Bubo bubo*), and in a wild Mink (*Mustela vison*). Neurological signs dominated the clinical picture, the affected waterfowl were observed compulsively swimming around in circles. The majority of the HPAI positive birds were in good body condition, indicating that the highly pathogenic H5 infection is an acute disease. Up to May 15th, 536 tracheal/cloacal swabs, mainly from birds, have been examined virologically with PCR. 64 of them were positive. Conclusions drawn from the outbreak indicate that the transmission rate of this H5N1 virus seems to be low and only very few individuals out of big flocks of many thousand wild birds, were found to be affected. By the middle of May the disease had spread along the Swedish eastern coast, northwards up to the Stockholm area (400 km north of the first found positive cases). By mid-May, and with the arrival of warmer weather, the number of found dead birds positive for HPAI dropped dramatically, indicating that the avian influenza outbreak in Swedish wild birds had waned. Extensive AI testing of avian wildlife will continue in order to monitor the further occurrence of HPAI and LPAI in Sweden.

52) HIGHLY PATHOGENIC INFLUENZA VIRUS-H5N1 INFECTION IN SWEDISH WILDLIFE: PATHOLOGY FINDINGS

Erik Ågren, K. Bernodt, C. Bröjer, D. Jansson, H. Uhlhorn, T. Mörner, R. Mattsson and D. Gavier-Widén. Department of Wildlife, Fish and Environment, National Veterinary Institute (SVA), 751 89 Uppsala, Sweden

An outbreak of highly pathogenic avian influenza-H5N1, was detected for the first time in Sweden in two Tufted ducks (*Aythya fuligula*) in February 2006. Since then, a number of wild avian species, including ducks, geese, swans, gulls and raptors, as well as a wild mink (*Mustela vison*) have died of H5N1 infection. Most birds were in good body condition. Gross lesions, when present, consisted most frequently of necrosis and haemorrhages in the pancreas. Histologically, preliminary observations indicate that non-suppurative meningo-encephalitis with vasculitis and necrosis in the pancreas were consistent findings. Multifocal necrosis with infiltration of heterophils and macrophages, perivascular inflammatory infiltrates and vasculitis were observed less regularly in several organs, such as liver and adrenal glands. Lung congestion and pneumonitis occurred frequently. The organ distribution of the lesions and their severity varied according to the avian-host species. Immunohistochemistry was conducted on formalin fixed tissues, 0.1% protease treated sections, and applying monoclonal antibodies to Influenza A (EVL Hb65 www.evlonline.nl). Abundant disease specific antigen, with both nuclear and cytoplasmic localization was observed in the brain, lungs, pancreas and other organs, in association to the lesions. Macrophages often contained viral antigen. The affected mink showed pulmonary consolidation with areas of hyperaemia/haemorrhages mostly in apical lobes and caudal parts of diaphragmatic lobes. Severe exudative pneumonia with presence of viral antigen was observed. Histopathologic and immunohistochemical investigation of lymphoid tissues and gastrointestinal tract is ongoing.

53) PRELIMINARY RESULTS OF MONITORING WILD BIRDS FOR AVIAN INFLUENZA IN MARYLAND

Cindy P. Driscoll, Fish & Wildlife Health Program, Maryland Department of Natural Resources, Oxford, MD 21654; Larry J. Hindman, Wildlife & Heritage Service, Maryland Department of Natural Resources, Cambridge, MD 21613; Richard D. Slemmons, Department of Veterinary Preventive Medicine, Ohio State University, Columbus, OH 43210; Dennis A. Senne, USDA APHIS, NVSL, Ames, IA, 50014

Avian Influenza (AI) virus infections are commonly found in wild birds in North America, especially waterfowl. Currently, information presented in the media about AI, the disease, is confusing and often misleading. Terms used for the type of influenza virus found in wild birds are not synonymous with terms used for the poultry industry or for the types of seasonal flu found in people. Maryland is a state with a high density of poultry farms and the largest wintering concentrations of migratory waterfowl on the eastern seaboard. Since 2000 the Maryland Department of Natural Resources has cooperated with Ohio State University to determine which subtypes of AI virus circulate in our State's waterfowl. In the summer of 2005, we expanded comprehensive, proactive sampling of wild, free-ranging waterfowl and opportunistic sampling of other bird species throughout the region. Over 800 samples were collected between July 7, 2005 and May 1, 2006. To date, a total of 15 non-H5 and non-H7 low pathogenic AI isolates were recovered from species of great interest including Snow Geese, Long-tailed ducks, Common Scoters, White-wing Scoters. These isolates appear to represent the first recoveries of AI viruses from Common Scoters and Snow Geese and only the second report of recoveries from White-winged Scoters and Long-tailed Ducks. The basic natural history of AI viruses in wild birds will be discussed in the context of broader disease transmission issues with domestic poultry. Also the 2005-2006 influenza A virus surveillance results for wild, free-ranging birds will be presented.

DISEASES OF MARINE MAMMALS

Moderator: Jonna Mazet

54) THE ST. LAWRENCE ESTUARY BELUGA: A TALE OF A WHALE.

Lena N. Measures, Fisheries and Oceans Canada, Maurice Lamontagne Institute, Mont-Joli, Qc, Canada, G5H 3Z4.

The St. Lawrence Estuary (SLE) beluga (*Delphinapterus leucas*) population is estimated at 1000 animals, reduced 11% of estimated pristine population size primarily due to hunting which ceased in 1979. The population was protected in 1983. Recent surveys indicate few signs of recovery. Since 1982 mortalities of SLE beluga have been documented and causes of mortality investigated through dissection of beach-cast carcasses by the University of Montreal, St-Hyacinthe in partnership with Fisheries and Oceans and Parks Canada. From 1983 to 2005, over 335 mortalities have been documented with a mean of 14 (9 - 21) per year which reflects effort rather than true mortality. The mean age of stranded SLE beluga carcasses is 34 years. SLE beluga can live over 80 years, the oldest lifespan documented for this species. Documented causes of death include infectious and parasitic diseases, trauma, perinatal, and neoplasia. Various anomalies and degenerative lesions associated with age have been observed as well. Cause of death could not be determined in a third of the carcasses. SLE beluga, like many marine mammals worldwide, have various chemical contaminants in their tissues but a cause and effect link between contaminants, neoplasia or other diseases is elusive. A number of hypotheses have been proposed to explain the failure of this population to recover in the absence of predators and hunting. The SLE beluga is unique in that disease appears to be playing a large role in this population. Various management measures have been instituted to protect this threatened population.

55) THE BIG PICTURE: WHAT CAN BE DONE ABOUT VARIOUS FORMS OF POLLUTION EFFECTING SOUTHERN SEA OTTERS AND THEIR ECOSYSTEM ?

David Jessup, Melissa M. Miller, Ken Mayer, California Department of Fish and Game, 1451 Shaffer Rd., Santa Cruz, CA 95060. James Estes, Tim Tinker, USGS/BRD-WERC, 100 Shaffer Rd., Santa Cruz, CA 95060. Patricia A. Conrad, Christine Kreuder-Johnson, Jonna A.K. Mazet, Wildlife Health Center, School of Veterinary Medicine, University of California, Davis, CA 95616

The southern sea otter (*Enhydra lutris nereis*) population in California suffers from high adult mortality, approximately 50% of which is due to infectious diseases, parasites and intoxications. There has been little population growth in 10-12 years. Current evidence indicates that oocysts of two protozoal parasites that cause significant fatalities in sea otters are associated with fresh water inputs. Other bacterial and protozoal pathogens may come from sewage or farm run off. Chemical contaminants which may make sea otters more susceptible to disease appear to originate from terrestrial sources and are likely dispersed by run off from various sources. Nutrient pollution also appears to promote harmful algal blooms that result in sea otter deaths. All of these ocean inputs can be seen as forms of non-point source pollution that are difficult to intercept and regulate. Pending State legislation could assist us in better understanding and eventually reducing various forms of non-point source pollution that harm sea otters, other marine species, and jeopardize human health. Changes in animal management practices in coastal areas and better use of existing State and Federal laws, regulation and permitting processes could also help. Several agricultural “best management practices” have been shown to reduce nutrient, sediment, pathogen and contaminant runoff, but are voluntary and thus not widely applied. The aging and inadequate infrastructure in coastal cities must be repaired and upgraded and in areas of “special ecological concern” storm water runoff must be dealt with more effectively. Artificial marshes or reclaimed wetlands may improve sewage treatment and reduce storm water flushing. A new series of marine protected areas (MPA’s) for California are being set aside to assure both fisheries recovery and to protect all marine life forms. In the big picture dealing with the larger issues in more comprehensive ways may be more cost effective than dealing individually each non-point pollutant.

56) DERELICT FISHING GEAR AND MARINE WILDLIFE: IMPACTS, SOLUTIONS

Kirsten V.K. Gilardi, SeaDoc Society, Wildlife Health Center, UC Davis School of Veterinary Medicine, Davis, CA 95616, USA.

Derelict fishing gear is lost commercial and recreational fishing nets, lines, pots, and traps that sit on the seafloor or float in the water column. Because most fishing gear is made of synthetic materials, it remains in the marine environment for decades. Derelict fishing gear negatively impacts marine ecosystem health in many ways, including entanglement and entrapment of marine wildlife, and damage to critical underwater habitats that marine wildlife depend upon. The impacts of derelict fishing gear on marine wildlife can be significant. In Hawaii, derelict gear is the most serious human-related threat to the fragile coral reefs of the Northwestern Hawaiian Islands, and it injures and drowns wildlife, including the endangered Hawaiian monk seal (*Monachus schauinslandi*). Washington State has documented mortality of marine mammals, birds and fish and invertebrates in derelict fishing gear in Puget Sound and the Northwest Straits. As a result, both states have active derelict fishing gear removal programs underway. In order to address the potential threat of derelict fishing gear on living marine resources in California, in July 2005 the SeaDoc Society (UC Davis Wildlife Health Center) established a pilot California Derelict Fishing Gear Removal Project. This presentation will focus on a review of derelict fishing gear as a marine wildlife health issue, and describe derelict fishing gear removal as a practical and effective solution for this problem.

57) PREVALENCE OF ANTI-BRUCELLA ANTIBODIES IN PINNIPEDS INHABITING THE SHIRETOKO PENNINSULA, JAPAN

Kazue Ohishi, Yasushi Kawai, Tadashi Maruyama, Research Program for Marine Biology and Ecology, Japan Agency for Marine-Earth and Technology (JAMSTEC), Natsushima 2-15, Yokosuka 237-0061, Japan and Graduate School of Biosphere Science, Hiroshima University, Kagamiyama 1-3-2, Higashi-Hiroshima 739-8511, Japan; Tsuyoshi Ishinazaka, Rausu Ranger Office, Ministry of the Environment, Yunosawa 388, Rausu, Hokkaido 086-1822, Japan.

Brucellosis is known to cause reproductive disorders or abortion in mammals. The causative agent, *Brucella*, has been recently isolated from a variety of wildlife species including marine mammals. Microbiological and molecular biological studies have shown that *Brucella* strains from marine mammals are distinct from ones from terrestrial mammals. We have already shown serological and pathological evidence of *Brucella* infection in minke whales, Bryde's whales, and pygmy sperm whales inhabiting the western North Pacific. Molecular studies using PCR technique indicated that the *Brucella* from Pacific minke whales is most similar to the Atlantic seal strain. However, *Brucella* infection in pinnipeds around Japan, has remained to be studied. Serum samples from 41 spotted seals (*Phoca Largha*), 20 ribbon seals (*Histriophoca fasciata*), and 17 Steller sea lions (*Eumetopias jubatus*) were collected during January to April, 1999, in the Shiretoko Penninsula, Japan. The serum antibodies were examined by enzyme-linked immunosorbent assay (ELISA) using *B. abortus* as antigen. Significant antibody responses were detected in three spotted seal serum samples, and weak responses were also found in another three spotted seal samples. The antibodies were confirmed by Western blot analysis using the same antigen. These data suggested that sporadic infection had occurred in pinnipeds around Japan. Serologic monitoring is important to understand mechanisms underlying the maintenance and transmission of *Brucella* in these marine mammals.

58) GIARDIA IN HARBOR SEALS FROM THE INLAND WATERS OF WASHINGTON STATE

Joseph K. Gaydos, Woutrina A. Miller, Christine Kreuder-Johnson, Ann Melli, Heather Zornetzer, and Patricia Conrad, UC Davis Wildlife Health Center, School of Veterinary Medicine, 1 Shields Ave., Davis, CA 95616, USA; Steven J. Jeffries, Monique M. Lance, Washington Department of Fish and Wildlife, Marine Mammal Investigations, 7801 Phillips Rd. S.W., Tacoma, WA 98498, USA.

Giardia lamblia can infect humans, domestic animals and wildlife and has the potential to be transmitted between these groups; however very little is known about this protozoan in marine wildlife. Feces of harbor seals (*Phoca vitulina*), a common marine mammal in Washington State's Inland Waters, were examined for *Cryptosporidium* and *Giardia* to determine if genotypes carried by seals could be related to genotypes that commonly infect humans and domestic animals. Using ZnSO₄ flotation and immunomagnetic separation followed by direct immunofluorescent antibody (IMS/DFA) detection, we identified *Giardia*-like cysts in 43% of fecal samples tested (43/99). *Giardia*-positive samples came from 90% of the sites tested (9/10). *Cryptosporidium*-like oocysts were not detected. Amplification of DNA from the IMS/DFA slide scrapings was successful for eleven samples and sequence analysis suggests that the eight isolates appear to be a novel *G. lamblia* genotype. These were isolated from seals in south Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia supporting that this genotype is widespread and could be specific to seals. Three of the eleven sequences originated from one site in south Puget Sound and were most consistent with the *G. lamblia* dog genotype. Domestic dogs and coyotes (*Canis latrans*) inhabit the area and could be the source of the dog genotype of *G. lamblia* infecting seals, suggesting that this pathogen can be transmitted between terrestrial and marine ecosystems.

WILDLIFE DISEASE MANAGEMENT AND SURVEILLANCE

Moderator: Nancy Thomas

59) HEALTH RISK ASSESSMENT PRELIMINARY DATA IN A FRAGMENTED SCENARIO OF THE EASTERN BRAZILIAN AMAZON – THE TUCURUÍ CARNIVORE PROJECT

Christina Wippich Whiteman, The Tucuruí Carnivore Project, Universidade Federal Rural da Amazônia (UFRA), Av. Presidente Tancredo Neves, 2501, Montese, 66077-530, Belém, PA, Brasil; Eliana Reiko Matushima, Universidade de São Paulo (USP), Av. Prof. Dr. Orlando Marques de Paiva, 87, Cidade Universitária, 05508-000, São Paulo, SP; Ulisses Confalonieri, UFRA, Av. Presidente Tancredo Neves, 2501, Montese, 66077-530, Belém, PA, Brasil; Maria das Dores Correia Palha, UFRA, Av. Presidente Tancredo Neves, 2501, Montese 66077-530, Belém, PA, Brasil; Alanna do Socorro Lima da Silva, UFRA, Av. Presidente Tancredo Neves, 2501 Montese 66077-530, Belém, PA, Brasil; Vanessa Conceição Monteiro, UFRA, Av. Presidente Tancredo Neves, 2501 Montese 66077-530, Belém, PA, Brasil

The Eastern Brazilian Amazon is the stage for a complex and severe process of environmental degradation. It mainly involves the fragmentation and loss of habitat caused by a number of factors such as wood extraction, mining, building of dams, among others, aggravated by further anthropogenic impacts related to cattle raising and agriculture practices, building of roads, pollution, and the invasion of alien species and pathogens, among so many other short and long term consequences. In our picture, the building of a dam is the driving force behind the impacts suffered by a 568.667 ha area of native forest in a lake of 2430 km², the Tucuruí Lake Protected Area. The Tucuruí Carnivore Project comes in that picture to assess the health aspects related to the interface generated by the permanence of riparian communities living in the zones of wildlife protection where no human populations should reside, the wildlife from the remnants of forest (islands) that resulted from the flooding event over 20 years ago, and the domestic fauna kept by the local communities. In that context, domestic carnivore sampling has been performed and exposure to a variety of infectious pathogens investigated. Wild carnivore capture has been attempted and preliminary disease testing is being carried out. Community interviews were also done and provided valuable indication of risks for carnivore health and conservation in the Tucuruí Lake Protected Area.

60) MULTIPLE STATE QUALITATIVE CHRONIC WASTING DISEASE RISK ASSESSMENT

Jonathan Sleeman, Virginia Department of Game and Inland Fisheries, 4010 West Broad Street, Richmond, VA 23230; David Kocka, Nelson Lafon, Virginia Department of Game and Inland Fisheries, P.O. Box 996, Verona, VA 24482; W. Matthew Knox, Virginia Department of Game and Inland Fisheries, 1132 Thomas Jefferson Road, Forest, VA 24551; David Steffen, Virginia Department of Game and Inland Fisheries, 6701 Parkway Dr. SW, Roanoke, VA 24018.

Random active surveillance for Chronic Wasting Disease (CWD) in free-ranging populations of cervids is challenging due to low prevalence and heterogeneous distribution of the disease. Furthermore, geographic areas are at different levels of risk for exposure to CWD depending on the presence of various risk factors. Based on the assumption that areas of Virginia in proximity to concentrations of farmed or captive deer or elk are at the highest risk for the introduction of CWD into the free-ranging white-tailed deer population (*Odocoileus virginianus*), the Virginia Department of Game and Inland Fisheries (VDGIF) conducted a qualitative risk assessment that resulted in the stratification of the state into three risk categories (high, medium and low risk) and the application of different surveillance strategies in each region. All captive cervid facilities within Virginia and the neighboring states (Kentucky, Maryland, North Carolina, Tennessee, and West Virginia) were designated a CWD risk category based on species present, movement histories and the state's CWD surveillance program for captive cervid facilities. The highest risk facilities were defined as facilities with known or suspected importations of white-tailed deer, elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), black-tailed deer (*Odocoileus hemionus columbianus*) or moose (*Alces alces*), as well as any subspecies or hybrids, from out of state within the last 5 years, and facilities that moved these species within the state from one of the above facilities within the last 5 years. In addition, any facility of unknown status or without adequate CWD surveillance was considered at high risk. These facilities with 10-mile buffers were mapped using GIS (ArcView, ESRI, Redlands, CA) and the distribution of the high risk facilities was used to stratify the state into the risk categories. Based on a concentration of high risk facilities, we identified a region of northwest Virginia at high risk for exposure to CWD. Subsequent to this risk assessment, West Virginia reported its first CWD-positive case adjacent to the previously defined high risk surveillance area. This risk assessment provided valuable information in delineating an area of highest concern where active surveillance was focused, allowing VDGIF to maximize the use of resources. This study also illustrates the importance of adopting a regional approach to assessing CWD exposure risk factors and designing appropriate surveillance strategies.

61) THE EPIDEMIOLOGICAL CHALLENGE OF EVALUATING BRUCELLOSIS SEROPREVALENCE IN FREE-RANGING ROCKY MOUNTAIN ELK IN MONTANA

Mark W. Atkinson, Montana Fish, Wildlife and Parks, Bozeman, MT 59718; Neil Anderson, Montana Fish, Wildlife and Parks, Bozeman, MT 59718; Ryan Clarke, USDA-APHIS, Belgrade, MT 59714; Keith Aune, Montana Fish, Wildlife and Parks, Bozeman, MT 59718

Brucellosis continues to be a disease of significant concern to the states of Montana, Idaho and Wyoming. The role of bison and elk in the epidemiology of *Brucella abortus* in the Greater Yellowstone Area (GYA) is well documented and the risk of disease transmission between wildlife and cattle continues to influence wildlife management policy in the three-state region. Studies in southwestern Montana resulted in the culture of *B. abortus* biovar 1 from five seropositive elk in 1988, a single animal in 1991 and from an aborted fetus in 2005. Surveillance conducted from 2004-2006 indicated an increase in the seroprevalence of *B. abortus* in elk in the same area from an average of 1.2% in prior surveys (1990–2003) to 6.9% in 2004/05 and 17.5% in 2005/06. These findings were of great concern to wildlife managers, regulatory officials and the cattle industry in Montana. In order to confirm the validity of this increasing trend, serum from positive and suspect samples was retested using Western immunoblot. Results from this test indicated that exposure to *Yersinia enterocolitica* O:9 lead to a high percentage of false positive results in standard serologic tests employed to detect exposure to *B. abortus*. When false positive results were accounted for, mean seroprevalence of *B. abortus* in elk in southwestern Montana during 2004-2006 was recalculated and found to be 1.9%. The epidemiological implications of these findings to elk/brucellosis management approaches in Montana and the GYA are discussed.

62) EVALUATION OF A CLINICAL DECISION TREE FOR THE MOUNTAIN GORILLA (*GORILLA BERINGEI*)

Richard B. Minnis, Mississippi State University, Mississippi State, MS 39762; Michael R. Cranfield, Mountain Gorilla Veterinary Project, Baltimore, MD 21217; Benard Ssebide, Uganda Wildlife Authority, Uganda; Innocent Rwego, Mountain Gorilla Veterinary Project, Uganda; Chris Whittier, Mountain Gorilla Veterinary Project, Rwanda; Dominic Travis, Lincoln Park Zoo, Chicago, IL; Felicia Nutter, Mountain Gorilla Veterinary Project, Rwanda; Lynne Gaffikin, E.A.R.T.H., Baltimore, MD 21217

A syndromic surveillance system was developed by the Mountain Gorilla Veterinary Project to collect standardized data on a consistent basis to understand the ecology of disease within gorillas. The system is based on a hierarchical decision tree where trackers and guides observe animals daily for abnormalities. When abnormalities are observed, MGVP veterinarians verify any abnormalities using standard clinical signs. The decision tree is predicated on the assumption that the trackers and guides and the veterinarians conduct observations in the same standard fashion. This study demonstrates that the percentage of a group observed on any observation varies with group size and whether a veterinarian or tracker and guide is conducting the observation. The probability of observing any individual gorilla varies with the size of the group, observer type and sex/age class of the individual. Adult and subadult females, juveniles, and subadult males tend to be observed less than expected whereas adult males (silverbacks) and infants tend to be observed more than expected. When individual gorillas are observed, the 7 parameters used to assess gorilla health vary with observer type. This indicates that training for both the veterinarians and trackers and guides conducting observations needs to be provided to adjust observation habits. Data suggest that the reactionary observation of the veterinarians to problems detected by the trackers and guides may bias their observation to specific sex/age classes and reduce the number of individuals seen. This paper provides the first attempt to evaluate a syndromic surveillance system to monitor health of mountain gorillas.

63) NORTH AMERICAN RABIES MANAGEMENT PLANNING: A CONTINENTAL FRAMEWORK FOR SUCCESS

Dennis Slate, USDA, APHIS, Wildlife Services, Concord, NH, 03301; Charles E. Rupprecht, Centers for Disease Control and Prevention, Atlanta, GA 30333, Dennis Donovan, Ontario Ministry of Natural Resources, Peterborough, ON, Canada K9J 8M5; Fernando Vargas Pino, Ministry of Health, Mexico D.F.; Ernest Oertli, Department of State Health Services, Austin, TX, 78756-3199; Charles V. Trimarchi, New York State Department of Health, Albany, NY, 12237; Antonio Gomez Mendieta, Ministry of Environment and Natural Resources, Mexico, D.F., Alejandro Jimenez Ramirez, Ministry of Agriculture, Mexico, D.F. , Luis Lecuona, USDA, AHPIS, International Services, Mexico, D.F.

Containment and elimination of rabies in meso-carnivore reservoirs remains elusive. Attaining goals is linked to enhanced rabies surveillance and oral rabies vaccination (ORV) as the principal method that may be complemented by trap-vaccinate-release and local population suppression in an integrated strategy. ORV may also be tiered to natural and human-made features to enhance the “barrier effect.” Evaluation is based on serologic and biomarker indices, and the distribution of rabies relative to ORV zones. Integrated rabies management is conducted in several states and Canada. Mexico has conducted urban dog rabies control with success and is initiating enhanced surveillance along the U.S. border. ORV trials in captive dogs are also being conducted in Mexico. Elimination of canine rabies in coyotes in Texas in 2000 from 166 cases in 1994 illustrates the broader potential for integrated management where ORV is central to the strategy. Successful programs in Texas and Mexico could be jeopardized in the absence of enhanced surveillance in free-ranging dogs, coyotes and gray foxes along the Mexican border with Texas and integrated rabies management initiatives that include ORV. Rabies management goals would be difficult to achieve along the U.S.-Canadian border without internationally coordinated ORV and rabies surveillance. Success is based on preventing virus variants, such as raccoon rabies, from spreading or elimination of cycles, as demonstrated locally with canine rabies in Texas. We discuss progress toward a North American Rabies Management Plan to facilitate planning processes by which mutual goals can be identified and better met among Canada, Mexico and the U.S.

64) ORAL VACCINATION OF BADGERS (*MELES MELES*) AGAINST TUBERCULOSIS: IMMUNE RESPONSES AND PROTECTION FOLLOWING BCG DELIVERY VIA THE ORAL ROUTE AND PULMONARY CHALLENGE WITH *MYCOBACTERIUM BOVIS*

S. Lesellier, School of Agriculture, Food Science & Veterinary Medicine, University College Dublin, Dublin 4, Ireland and TB Research Group, Veterinary Laboratories Agency Weybridge, New Haw, Addlestone, Surrey KT15 3NB, UK; L.A.L. Corner, School of Agriculture, Food Science & Veterinary Medicine, University College Dublin, Dublin 4, Ireland; M.A. Chambers, TB Research Group, Veterinary Laboratories Agency Weybridge, New Haw, Addlestone, Surrey KT15 3NB, UK; F.E. Aldwell, Department of Microbiology and Immunology, University of Otago, Dunedin, New Zealand; E. Costello, Central Veterinary Research Laboratory, Abbotstown, Co. Dublin, Ireland; D.P. Sleeman, Dept. of Zoology, Ecology and Plant Science, University College Cork, Cork, Ireland; R.G. Hewinson, TB Research Group, Veterinary Laboratories Agency Weybridge, New Haw, Addlestone, Surrey KT15 3NB, UK; and E. Gormley, School of Agriculture, Food Science & Veterinary Medicine, University College Dublin, Dublin 4, Ireland.

Tuberculosis, caused by *Mycobacterium bovis*, is endemic in badgers populations in the South-West of the UK and Ireland, and appears to compromise the eradication of bovine tuberculosis in these regions. Badgers are an ecologically important and protected wildlife species, and sustainable strategies, such as targeted vaccination, may be necessary to combat the disease. Currently the only licensed vaccine for tuberculosis is *M. bovis* BCG, and it has already proved protective when delivered to badgers by the intradermal, subcutaneous and intra-nasal/conjunctival routes. In this study, captive badgers were vaccinated orally with BCG delivered in a lipid-based formulation. A non-vaccinated group served as a control. At thirteen weeks post-vaccination all badgers were infected by endo-bronchial challenge with *M. bovis*. At *post mortem* the severity of lesions was reduced significantly in vaccinated badgers compared to the control group. Blood-based immune responses were measured throughout the study. The *in vitro* proliferation of antigen - stimulated T lymphocytes, the production of interferon- γ and of immunoglobulin G were all associated with control of disease progression in the vaccinated animals. These results demonstrate the generation of protective immunity in badgers and support the use of oral BCG vaccination for the control of tuberculosis in badgers.

65) SPECIES-SPECIFIC VISITATION AND REMOVAL OF BAITS FOR DELIVERY OF PHARMACEUTICALS TO FERAL SWINE

David B. Long, USDA APHIS WS National Wildlife Research Center, Wildlife Disease Research Program, Kingsville, TX 78363; Tyler A. Campbell, USDA APHIS WS National Wildlife Research Center, Wildlife Disease Research Program, Kingsville, TX 78363

Few studies have evaluated feral swine oral delivery systems for pharmaceuticals in the United States. Our objective was to assess, through a field trial conducted on the King Ranch, Texas, wildlife and livestock visitation and removal rates of 4 baits intended to deliver pharmaceuticals to feral swine. Our baits consisted of PIGOUT[®] fish-flavored (Bait A), PIGOUT[®] vegetable-flavored (Bait B), PIGOUT[®] fish-flavored plus Get Away[®] (Bait C), and PIGOUT[®] vegetable-flavored plus Get Away[®] (Bait D). From 7 February–13 March 2006 we hand-placed 80 baits of each type (A-D) and monitored visitation and removal by wildlife and livestock with automated camera systems for ≤ 4 nights. Cumulative bait removal rates for Baits A-D were 93%, 97%, 98%, and 97%, respectively. A total of 3,434 photographic observations were made. Species visiting and removing baits included, feral swine, raccoons, cattle, collared peccaries, coyotes, white-tailed deer, eastern cottontail rabbits, rodents, and striped skunks. Photographic data suggest overall removal rates of 46% for feral swine, 21% for raccoons, 17% for cattle, 8% for collared peccaries, 2% for coyotes, and 6% “other”. Chi-squared analyses indicated: 1) cattle removed more of Bait D than expected; 2) coyotes removed more of Bait A than expected; and that 3) no among-bait differences for feral swine, raccoons, and collared peccaries occurred. We found limited evidence that Get Away[®] deterred non-target bait removal. Our data suggest that when targeting feral swine, fish-flavored baits may be most appropriate when non-targets include herbivores, and that vegetable-flavored baits may be most appropriate when non-targets include omni- and carnivores.

AVIAN DISEASES

Moderator: Elena Garde

66) EXPOSURE TO SELECTED INFECTIOUS AGENTS IN THREE FLAMINGO SPECIES FROM THE HIGH-ANDES WETLANDS

Uhart, Marcela, Field Veterinary Program, Wildlife Conservation Society, Puerto Madryn (9120), Chubut, Argentina; Felicity Arengo, Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY 10024; Rodolfo Nallar, Field Veterinary Program, Wildlife Conservation Society, Bolivia; Sandra Caziani, Universidad Nacional de Salta, Argentina; William Karesh, Field Veterinary Program, Wildlife Conservation Society, Bronx 10460, New York and Carolina Marull, Field Veterinary Program, Wildlife Conservation Society, Argentina.

Three species of flamingo use the high-Andes wetlands, the Chilean (*Phoenicopterus chilensis*-CF), the Andean (*P. andinus*-AF) and James' (*P. jamesi*-JF) flamingos. The wetlands and their associated flora and fauna are threatened by increasing human activities, such as mining operations and underground water pumping. These changes in the environment may favor the emergence of pathogens, which could affect the health of flamingos. On the other hand, flamingos are nomadic species with the potential to disperse pathogenic microorganisms, as well as favor horizontal transmission of disease agents when they congregate with other birds at the sites they visit. Samples from 25 adult flamingos (7 CF, 10 AF, 5 JF) and 188 chicks (28 CF, 43 AF, 117 JF) were collected between 1997 and 2006 at several wetlands in Chile and Bolivia. Serological analyses were carried out for *Aspergillus* sp.(n=50), *Clamydophila* sp.(n=50) , *Salmonella* sp.(n=120), avian adenovirus (n=50), avian encephalomyelitis (n=50), avian influenza virus (n=129), avian reovirus (n=95), infectious bursal disease (n=50), avian paramyxovirus type 1 (n=125), type 2 (n=49) and type 3 (n=49), flavivirus (n=22), duck viral enteritis (n=30), infectious bronchitis (n=104), egg disease syndrome (n=75), *Mycoplasma gallisepticum* (n=71), *M. synoviae* (n=73), infectious bursal disease (n=75), avian rhinotracheitis (n=75), avian leukosis virus (n=79), circovirus avian disease (n=79) and infectious laryngotracheitis virus (n=125). Antibodies to thirteen of these 22 infectious agents were found in the animals tested. We present results from this serologic survey and discuss our findings in the context of the ecology and dispersal pattern of these three distinct flamingo species.

67) A WORLD-WIDE SUMMARY OF AVIAN POX INFECTIONS BY TAXONOMIC GROUP AND CONTINENT.

Charles van Riper III US Geological Survey, SBSC/SDRS, University of Arizona, Tucson, AZ 85749; Donald J. Forrester, University of Florida, Gainesville, FL, 32611

Avian pox is a viral disease of birds, caused by one of the larger viruses of the poxvirus group. This widespread avian disease has been reported on every continent except Antarctica in a large number of bird families, with some (e.g., Phasianidae, Emberizidae) appearing more susceptible than others. This relatively slow-developing disease is characterized in birds by discrete, proliferative lesions on the skin of the toes, legs or head, and/or mucous membranes of the mouth and upper respiratory tract. In most birds, avian pox infections are mild and rarely result in death. However, when lesions are on the eyelids or mucous membranes of the oral and/or respiratory cavities, mortality can be high. Avian populations that have been isolated on islands (e.g., Canary Islands, Hawaiian Island chain, Galapagos Islands) are impacted to a greater degree than bird populations in continental situations where the hosts, vectors and viruses have a longer coevolutionary history. Like many other density-dependent diseases, avian pox transmission is enhanced with increasing vector and/or host densities. Therefore, this disease is found to have a greater significance in captive situations such as zoos, bird rehabilitation centers, and game farms, where birds occur at much higher densities than in the wild. In the wild, the warmer and mesic regions of the world support more potential vectors, thus we find higher avian pox prevalence in those regions, and particularly in flocking wild birds.

68) NATURAL AND OIL-SPILL ASSOCIATED VARIATION IN HEMATOCRIT IN BUZZARDS BAY, MASSACHUSETTS

Florina S. Tseng, Department of Environmental and Population Health, Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA,01536; Victor Apanius, Department of Biology, Wake Forest University, Winston-Salem NC 27109; Ian C.T. Nisbet, I.C.T. Nisbet & Co., North Falmouth MA 02556

Anemia induced by ingestion of crude oil or refined products is generally reported in experimental studies but hematocrit measurements in wild populations of seabirds exposed to petroleum have provided equivocal evidence of intoxication. We measured hematological parameters in a population of Common Terns (*Sterna hirundo*) in Buzzards Bay, MA, in two years prior to, immediately after and two years after the *Bouchard No. 120* oil spill. In 1999, hematocrit values were not related to body mass. In 2000, adverse natural conditions significantly reduced mean hematocrit compared to 1999 and hematocrit and body mass were positively correlated. After the spill in 2003, hematocrit values increased with date but the mean hematocrit did not differ compared to 2002. Post-spill hematocrit values were not positively correlated with body mass as in 2002. After the spill, 25% of the hematocrit values were below the 95% confidence bound calculated from the 2002 data (relative risk = 7, 1.5 - 33.0 95% CI). While mean hematocrit may be uninformative due to natural variability, the incidence of anemia (based on reference range outliers) provides more definitive evidence of intoxication and identifies individual animals as candidates for analytical chemistry.

69) DERMAL LESIONS ON WADING BIRD NESTLINGS CAUSED BY DERMESTID BEETLE LARVAE

Katharine C. Parsons, Manomet Center for Conservation Sciences, Manomet, MA 02345-1770, USA ; Stephanie R. Schmidt, Manomet Center for Conservation Sciences, Manomet, MA 02345-1770, USA; Mark A. Pokras, Tufts Cummings School of Veterinary Medicine, North Grafton, MA 01536 USA.

The occurrence of dermal wounds and/or dermatitis in nestling birds has been attributed to a variety of causative agents including ulcerating nest material, bacterial and fungal infection, and parasites. During long-term studies of wading birds in the northeast U.S., we undertook a comprehensive investigation of the prevalence and intensity of lesion occurrence to characterize regional and temporal patterns, and causal factors. We examined dermal lesion occurrence on nestlings at colony-sites in Rehoboth and Delaware Bays (DE), New York Harbor (NY), Nantucket Sound and Boston Harbor (MA). Five wading bird species were monitored: Black-crowned Night-Heron (*Nycticorax nycticorax*), Snowy Egret (*Egretta thula*), Little Blue Heron (*E. caerulea*), Glossy Ibis (*Plegadis falcinellus*), and Cattle Egret (*Bubulcus ibis*). Lesion occurrence was documented for a total of 1021 study nests, 2305 nestlings and 6037 examinations. Lesions were documented on wading bird nestlings aged 1-27 days. Lesions were more prevalent in colonies around Nantucket Sound and Delaware Bay than in urban colonies in New York and Boston. Lesions occurred on five wading bird species, but occurred most frequently and in greatest severity on Black-crowned Night-Heron and Cattle Egret. Annual variation in lesion occurrence was evident in these species. Lesions on Glossy Ibis were essentially non-existent. Lesions were caused by flesh-eating dermestid beetle larvae in all locations. We identified *Dermestes nidum* in several study nests and quantified dermestids in 133 study nests dismantled after the nesting season. We found no evidence of lesions resulting from other parasites, bacterial or viral infections, or from ulcerating materials in nests.

70) VERTEBRATE HOSTS OF MOSQUITOES INVOLVED IN TRANSMISSION OF WEST NILE AND EASTERN EQUINE ENCEPHALITIS VIRUSES IN THE NORTHEASTERN UNITED STATES

Goudarz Molaei, Theodore G. Andreadis, John F. Anderson, Philip M. Armstrong, The Connecticut Agricultural Experiment Station, 123 Huntington St., New Haven, CT; JoAnne Oliver, Arthropod-Borne Disease Program, New York State Department of Health, Diagnostic Laboratory, College of Veterinary Medicine, Cornell University, Ithaca, NY; and John J. Howard, Arthropod-Borne Disease Program, New York State Department of Health, Office of Public Health, Syracuse, NY

West Nile (WN) and eastern equine encephalitis (EEE) viruses perpetuate in transmission cycles involving wild birds and ornithophilic mosquito vectors. To determine if these vector mosquitoes have specific host preferences, blood meals from naturally blood-fed females collected in Connecticut and central New York were identified by nucleotide sequencing of PCR products of the cytochrome b gene of mitochondrial DNA. Analysis of PCR products revealed that *Culex pipiens*, *Cx. restuans*, *Culiseta melanura*, and *Cs. morsitans* exhibiting restricted ornithophilic behavior (86.9% to 100% of identified blood meals were avian-derived), while *Cx. salinarius* and *Aedes vexans* preferred mammalian hosts (53% and 92.4%, respectively). For the *Culex* vectors of WN virus, over 60% of avian blood meals were from four species of passerine birds: American Robin, Gray Catbird, House Sparrow and European Starling. American Crow represented <1% of the blood meals identified despite their abundance and large scale mortality from WN virus infection throughout the region. For the *Culiseta* vectors of EEE virus, over 60% of the avian blood meals were derived from six species of passerine birds: Wood Thrush, American Robin, Song Sparrow, Red-eyed Vireo, Ovenbird and Common Yellowthroat. The most frequent mammalian-derived blood meal for all species tested was from White-tailed Deer. Four species were found with horse-derived blood meals: *Ae. vexans* (11%), *Cs. morsitans* (3.7%), *Cs. melanura* (1.8%) and *Cx. salinarius* (1%). Human derived blood meals were identified only from *Cx. salinarius* (n = 2) and *Cx. pipiens* (n = 1). Our results indicate that specific species of passerine birds may play key roles in the enzootic cycling of WN and EEE viruses in nature.

71) WEST NILE VIRUS SEROPREVALENCE, ANTIBODY PERSISTENCE, AND MOLECULAR SPECIES DIFFERENTIATION OF AMERICAN CROWS AND FISH CROWS

Benjamin R. Wilcox, Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA, 30602; Michael J. Yabsley, Southeastern Cooperative Wildlife Disease Study and Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602; Angela E. Ellis, Athens Diagnostic Laboratory, University of Georgia, Athens, GA, 30602; David E. Stallknecht, Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA, 30602; Samantha E. J. Gibbs, Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA, 30602

Though crows have been the centerpiece of avian West Nile Virus (WNV) research in North America, little focus has been placed on species differences between American and fish crows in response to WNV exposure and infection. The objectives of this study were to: 1) determine if fish crows had higher WNV antibody prevalence than American crows, 2.) determine the persistence of antibodies to WNV in naturally infected crows, and 3.) to develop a polymerase chain reaction technique to distinguish fish crows from American crows based on sequence analysis and restriction enzyme digestion of the mitochondrial DNA fragment. West Nile virus seroprevalence was 16.7 % ($n=96$) in fish crows and 6.1% ($n=49$) in American crows. Antibodies persisted at high titers for 12 months in fish crows. A PCR technique paired with restriction enzyme digestion was able to easily distinguish between American and fish crows using red blood cells from 30 crows.

72) MOLECULAR CHARACTERIZATION OF *BABESIA SHORTII* FROM A GYRFALCON (*FALCO RUSTICOLUS*) AND *BABESIA POELEA* FROM BROWN BOOBIES (*SULA LEUCOGASTER*).

Michael J. Yabsley, D.B. Warnell School of Forestry and Natural Resources and Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, University of Georgia, Athens, GA, 30602; Thierry M. Work and Robert A. Rameyer, U.S. Geological Survey, National Wildlife Health Center, Honolulu Field Station, Honolulu HI; and Walter Tarello, Al Wasl Veterinary Clinic, PO Box 75565, Dubai, United Arab Emirates.

The phylogenetic relationship between avian *Babesia* and other piroplasms remains unclear, mainly because of a lack of objective criteria such as molecular phylogenetics. In this study, our objective was to determine the pylogenetic classification of *B. poelea* from Brown Boobies (*Sula leucogaster*) from the central Pacific and *B. shortii* from a Gyrfalcon (*Falco rusticolus*) from Siberia. Amplification and sequence analysis of the near full-length 18S rRNA gene indicated that these two species were closely related to each other (97% identical) and were placed in a phylogenetic clade with piroplasms previously detected in humans, domestic dogs, and wild ungulates in the western United States. The entire ITS-1, 5.8S, ITS-2, and partial β -tubulin gene sequences of *B. poelea* shared conserved regions with previously described *Babesia* and *Theileria* species. This is the first molecular characterization of avian piroplasms and indicates that they are related to piroplasms in the genera *Babesia* and *Theileria*. With the current classification of avian piroplasms in the genus *Babesia* and the recent classification of the California canine piroplasm as *B. conradae*, members of the genus *Babesia* are now present in three separate phylogenetic clades separated by the genera *Theileria* and *Cytauxzoon*. Detailed life history traits are needed to better understand the relationship of this clade of piroplasms in boobies, falcons, and western US ungulates, dogs, and humans with other piroplasms.

LONG-TERM MONITORING FOR WILDLIFE DISEASES

Moderator: Margo Pybus

73) NECROPSY FINDINGS AND ARBOVIRUS SURVEILLANCE IN MOURNING DOVES (ZENAIDA MACROURA) FROM THE SOUTHEASTERN UNITED STATES

Richard W. Gerhold, Cynthia M. Tate, Samantha E. J. Gibbs, Daniel G. Mead, Andrew B. Allison, and John R. Fischer; Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, Georgia 30602, USA.

Mourning doves (Zenaida macroura) are the most abundant and widespread native member of the columbid family, as well as a major migratory game species, in the United States. However, there is little available information regarding dove mortality factors. Records of necropsy accessions at the Southeastern Cooperative Wildlife Disease Study (SCWDS) were reviewed from 15 southeastern states, from 1971 through 2005. In total, 135 mourning doves were submitted from nine states during the thirty-five year period. Trichomonosis comprised 40% (N=54) of all diagnoses and was the most frequent diagnosis. Toxicoses and avian pox comprised 18.5% (N=25) and 14.8% (N=20) of all diagnoses, respectively. The remaining diagnoses included trauma, suspected toxicosis, Ascaridia columbae infection, suspected tick paralysis, and undetermined. Adults were observed more frequently with trichomonosis (90.7%) and toxicoses (68%) as compared to juveniles, but a gender predisposition was not apparent for either disease. Age and gender predilections were not apparent for avian pox diagnoses. The majority of the trichomonosis and avian pox cases were observed in the spring-summer, whereas the majority of the toxicosis cases were observed in the winter-spring. Additionally, Georgia Department of Human Resources-Division of Public Health and West Virginia Department of Health and Human Resources submitted 809 mourning doves to SCWDS from 2001 through 2005 for West Nile virus (WNV) surveillance efforts. WNV was isolated from 2.1% (N=17) and Eastern equine encephalitis virus (EEEV) was isolated from 0.2% (N=2) of the submitted birds.

74) WEB ATLAS OF WILD BIRD PATHOLOGY

Romona Haebler, Atlantic Ecology Division, National Health and Environmental Effects Research Laboratory, Office of Research and Development, U. S. Environmental Protection Agency, Narragansett, Rhode Island, 02882; Lou Sileo, U. S. Geological Survey National Wildlife Health Center, Madison, Wisconsin, 53711; Mark Pokras, Tufts Cummings School of Veterinary Medicine, Center for Conservation Medicine, North Grafton, Massachusetts, 01536

To provide accurate ecological risk assessments for wild bird health and assess the public health threat of avian diseases, it is necessary to understand the causal agents and mechanisms of infectious and anthropogenic diseases. This Web Atlas of Wild Bird Pathology will provide a scientific resource to facilitate accurate diagnosis of disease in birds, assess temporal and spatial trends of disease occurrence, and identify disease threats to human health. Federal and State agencies, academic institutions, and non-governmental organizations have partnered to share data for the basis of this Atlas. Scientists from these institutions are collaborating to standardize terminology to describe lesions and diagnostic criteria. An Oracle® database was created to manage the data pertaining to individual cases. The types of data include case histories, radiographs, and images of macroscopic and microscopic abnormalities. The database and Web site can be searched by species, location, date, morphological diagnosis, causative agent, potential for transmission to humans, and other single or mixed criteria. Links to pertinent literature citations are provided. EPA and our partners are making the Wild Bird Pathology Atlas available to the global scientific community on the EPA.gov public Web site. Ready access to this information by scientists and educators around the world will facilitate rapid and accurate identification of diseases in wild birds, the first essential step in timely and effective protective measures for both animals and humans.

75) DISEASES DIAGNOSED IN RACCOONS (*PROCYON LOTOR*) OF THE SOUTHEASTERN UNITED STATES

Kevin Keel, William R. Davidson and John R. Fischer, Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, Georgia 30602

Diagnostic findings were reviewed from 621 sick or dead raccoons examined during the period from 1975 through 2005. Most originated from Georgia (n = 397) but smaller numbers came from Alabama, Arkansas, Florida, Kansas, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia. The vast majority of raccoons, 402 (65%), were diagnosed with canine distemper virus. Rabies was confirmed in 62 (10%) of the raccoon submissions. Of the raccoons diagnosed with rabies, concurrent canine distemper virus infection was diagnosed in 7 (11%). Of the raccoons diagnosed with distemper 7 (2%) had toxoplasmosis. Trauma, as a primary diagnosis, accounted for 62 (10%) of the submissions. Poisoning was confirmed in only 3 raccoons during this period and included single cases of aldicarb, carbofuran and ethylene glycol toxicities. Other diagnoses of interest, either real or academic, included: parvovirus (n = 10), mostly among captive raccoons; bacterial abscesses or septicemia (n = 9); metritis or pyometra (n = 5); systemic infection with an uncharacterized herpesvirus (n = 2); granulose cell tumor (n = 1); and tularemia (n=1). Lesions were identified in 32 (5%) raccoons with no identifiable etiology. No significant lesions, or potential causes of morbidity or death, could be identified in 21 (3.4%) raccoons.

76) EMERGING INFECTIOUS DISEASES IN MARINE BIRDS AS AN INDICATOR OF CHANGING MARINE ECOSYSTEM HEALTH

Scott H. Newman¹, Wildlife Trust, 460 West 34th Street, 17th Floor, New York, NY 10001, USA and Consortium for Conservation Medicine, 460 West 34th Street, 17th Floor, New York, NY 10001, USA; Scott Wright and Kathy Converse, USGS National Wildlife Health Center, 6006 Schroeder Road, Madison, WI 53711, USA, A. Marm Kilpatrick, Aleksei Chmura, and Nikkita Patel Consortium for Conservation Medicine, 460 West 34th Street, 17th Floor, New York, NY 10001, USA, Emily Lammers, Wildlife Trust, 460 West 34th Street, 17th Floor, New York, NY 10001, USA, and Peter Daszak, Consortium for Conservation Medicine, 460 West 34th Street, 17th Floor, New York, NY 10001, USA

Aquatic birds face numerous survival threats including oil spills, diseases, net entanglement, garbage ingestion or entanglement, harmful algal blooms, and exposure to metals and pesticides, to name a few. In order to better understand of which threats pose the greatest danger to marine bird populations, we have analyzed 30 years of mortality information collected by the USGS-National Wildlife Health Center from marine birds (seabirds, shorebirds, waders, and seaducks) recovered in the United States. The combined marine bird database included 3,619 unique mortality events representing 633,708 dead birds of 158 marine species. Infectious diseases accounted for the largest proportion of mortality events (2,177 or 60%) and these events represented the largest proportion of dead birds (466,810 or 74%). Specifically, bacterial diseases represented 61% of all dead birds or 52% of the mortality events while fungal, parasitic, and viral diseases comprised smaller percentages of all events (2%, 2%, and 3% respectively). Marine bird mortality attributable to environmental causes (mostly prey-based starvation) were responsible for the 2nd highest number of dead birds (99,706 or 16%). Anthropogenic (human:wildlife) interactions (180) accounted for 5% of the mortality events or 1% (5,580) of the dead birds; toxicosis events (258) accounted for 7% of the mortality events or 3% (17,704) of the dead birds; pathology events (384) accounted for 11% of the mortality events or 4% (22,544) of the dead birds; and events of undetermined origin (343) accounted for 9% of the mortality events or 3% (21,064) of the dead birds.

77) THE SEABIRD ECOLOGICAL ASSESSMENT NETWORK (SEANET):
LINKING ANIMAL, HUMAN AND MARINE ECOSYSTEM HEALTH.

Rebecca Harris, Mark Pokras, Sean Griffin and Florina Tseng, Center for Conservation Medicine, Barbour Wildlife Medicine Building, Tufts Cummings School of Veterinary Medicine, 200 Westboro Rd., North Grafton, MA 01536, USA

Numerous threats contribute to the mortality of seabirds and waterbirds including disease, fisheries operations, organic pollutants and metals, and oil pollution. Some of these threats have broader implications for the health of a broad species including humans as well as ecosystems. While ongoing beach monitoring projects in Atlantic Canada have detected significant chronic oiling problems, the Atlantic coast of the United States has not been monitored recently for seabird mortality. In 2002 we initiated Seabird Ecological Assessment Network (SEANET <http://www.tufts.edu/vet/seanet/>) to implement beached bird surveys in the northeastern US. This large-scale, collaborative program focuses on seabirds as indicators of marine and coastal ecological health, involving wildlife rehabilitators, veterinarians, NOAA Fisheries bycatch observers and other ongoing projects. In addition to collecting data on seabird mortality, the network seeks to develop and compile information on species distribution, ocean contamination, and coastal land use. In order to document causes of mortality undetectable by external observation, necropsies are conducted. Feathers and tissues are preserved for future contaminants testing, cholinesterase assays, and other targeted research projects such as long-term sublethal effects of oil. We are developing a wide network of veterinarians and wildlife rehabilitators to save specimens and conduct necropsies in order to develop our knowledge base about the incidence of such threats as marine debris, oiling, and disease.

78) RELATIONSHIPS BETWEEN AURAL ABSCESSSES, ORGANOCHLORINE COMPOUNDS AND VITAMIN A IN FREE-RANGING EASTERN BOX TURTLES (TERRAPENE CAROLINA CAROLINA)

Jonathan Sleeman, Virginia Department of Game and Inland Fisheries, Richmond, VA 23230; Justin Brown, Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA 30602; David Steffen, Virginia Department of Game and Inland Fisheries, Roanoke, VA 24018; Delbert Jones, John Robertson, Steven Holladay, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Polytechnic and State University, Blacksburg VA 24061

Aural abscesses are a common health problem in free-ranging eastern box turtles (*Terrapene carolina carolina*). Histopathologic findings include squamous metaplasia of the tympanic cavity which is consistent with hypovitaminosis A. In addition, these lesions are associated with high body burdens of organochlorine compounds (OC); known disruptors of vitamin A. The objective of this study was to analyze the relationships between these pathologic changes, and OC compound and vitamin A levels in box turtles to determine whether dose responses exist between variables. A graded scale for the pathologic changes observed in tissue samples collected from abscessed and non-abscessed box turtles over a two-year period was developed and the levels of OC compounds and vitamin A in livers collected from the same turtles were determined through chemical analysis. Sixty-eight turtles (40 with aural abscesses and 28 without) were included in the study. Relationships between variables were analyzed using Spearman's Rank Correlation Test, and a $P \leq 0.05$ was considered significant. Twenty-seven different OC compounds were identified. Mean \pm standard deviation (SD) total OC compound level for all turtles was 0.35 ± 0.83 ppm (range 0 – 5.81 ppm), and mean \pm SD vitamin A level was 72.8 ± 98.6 ppm (range 0 – 535.7 ppm). There was no correlation or dose response between pathologic score, or pathologic severity, and total OC compound body burden ($r = -0.18$, $P = 0.16$). However, pathologic score was positively correlated with DDT_op ($r = 0.25$, $P = 0.05$). Some marginal positive relationships to pathologic score were also observed with DDD_op ($r = 0.23$, $P = 0.06$) and Metolachlor ($r = 0.23$, $P = 0.07$). Vitamin A was positively correlated with pathologic score ($r = 0.32$, $P = 0.01$) which was opposite to the expected result. There was no linear correlation between vitamin A and total OC compound body burden ($r = -0.04$, $P = 0.75$). However, there was a non-linear regression that provided a significant fit ($r^2 = 0.12$, $P = 0.02$) indicating an initial increase in vitamin A as the OC compound burden increased followed by a decline as OC compound levels increased further. This study provides limited support for the role of environmental contamination with OC compounds in the etiology of aural abscesses in free-ranging box turtles.

79) CAUSES OF MORTALITY IN THE WISCONSIN GRAY WOLF POPULATION 1979-2003.

Nancy J. Thomas, Grace S. McLaughlin, U.S. Geological Survey-National Wildlife Health Center, Madison, WI, 53711; Adrian P. Wydeven, Wisconsin Department of Natural Resources, Park Falls, WI, 54552; Rebecca A. Cole, Valerie Shearn-Bochsler, U.S. Geological Survey-National Wildlife Health Center, Madison, WI, 53711

Following extirpation, gray wolves (*Canis lupus*) began re-colonizing Wisconsin (WI) in the mid-1970's. The WI Department of Natural Resources began monitoring wolves in 1979 and in collaboration the U.S. Department of Interior's National Wildlife Health Center initiated a program to examine all wolves found dead or euthanized in the state. The purposes were to determine causes of death and assess health and physical condition. From 1979 until April 1, 2003, when the population status was reclassified from endangered to threatened on the federal listing, wolf carcasses that were not severely decomposed received complete necropsy examinations with additional laboratory tests performed as indicated by the individual case. A total of 182 dead wolves were examined. A majority (52%) of the deaths occurred after 1999, coincident with a rapid increase in the wolf population. Human factors accounted for 66% of the deaths overall, including the most common factors: vehicle collision (35%) and shooting (23%). However, in the subset consisting of radio-collared wolves, deaths due to natural factors equaled deaths from human factors. Deaths attributed to infectious disease (18%) were primarily due to sarcoptic mange, first documented in the population in 1991. Fatal bite wounds from presumed territorial encounters were found in less than 10% of the animals. Accidental trapping in foot-hold traps or snares was not documented after 1992. Disease mortalities increased during the time period, but deaths due to other factors remained proportionately similar. No deaths were attributed to canine heartworm (*Dirofilaria immitis*) infection and this parasite was rare before 2000, but has been found more frequently during necropsy of WI wolves since 2000.

80) FAMPHUR INTOXICATION OF BIRDS AND MAMMALS IN IDAHO, 1999-2005.

Mark L., Drew, Wildlife Health Laboratory, Idaho Department of Fish and Game, Caldwell, Idaho 83607; Patricia Talcott, Veterinary Diagnostic Toxicology Service, Holm Research Center, University of Idaho, Moscow, Idaho 83844.

Organophosphates (OP) are pesticides/insecticides used for a variety of insect pests in agriculture, veterinary medicine and over the counter for home use. Most OP compounds are relatively inert, denature rapidly, but many are highly toxic to birds, mammals and aquatic animals. The inadvertent intoxication of wildlife, especially birds, with organophosphate compounds is well documented. Poisoning by OP in wildlife can present in one of two general forms. Inadvertent secondary intoxication can result from exposure to OP used in a label approved application. Wildlife can be exposed to OP in this manner by overspray or drift during application of these chemicals to crops, orchards and turf grass. Run-off from these applications may be problematic for aquatic animals. Primary or deliberate use/misuse of OP can lead to exposure of wildlife resulting in morbidity or mortality to individuals or large numbers of animals. The deliberate misuse of OP to kill wildlife has been recognized previously in both the US and Canada. Between 1999 and 2005, at least 15 confirmed cases of OP intoxication are known in Idaho. Two of the 15 are secondary intoxications following application of OP to turf grass at golf courses or by private homeowners. Eight of the 15 are primary, deliberate misuse of OP to kill wildlife. The others, generally involving single raptors, are suspected of being deliberate as they occur annually in a specific area of southwestern Idaho. The number of cases in Idaho is high relative to surrounding states, but the reasons are unclear. Enforcement of pesticide application rules is difficult and deliberate poisoning of wildlife is likely to continue despite public education programs.

WILDLIFE DISEASE TECHNIQUES AND TECHNOLOGY

Moderator: Helen Schwantje

81) USE OF REAL-TIME PCR FOR DETECTION OF *BRUCELLA* SPP. IN MARINE MAMMAL TISSUES

Inga F. Sidor, J. Lawrence Dunn, Tracy A. Romano, Jenny Meegan, Jolene Carlson, Mystic Aquarium and Institute for Exploration, Mystic, CT 06355; Salvatore Frasca, Jr., University of Connecticut, Department of Pathobiology and Veterinary Sciences, Storrs, CT 06269

Distinct strains of *Brucella* have been recognized in marine mammals worldwide since 1994. The distribution and potential health effects of these *Brucella* species on marine mammals and humans are under study, but progress is slowed by unreliability of traditional microbiologic and serologic diagnostic tests. Real-time, or quantitative, polymerase chain reaction (qPCR) assays are currently being employed in diagnosis of medical and veterinary cases of brucellosis and this approach shows promise in the marine mammal context. To this end, a multiplex qPCR assay has been developed to screen tissues or blood from a wide range of marine mammals for the presence of *Brucella* spp. bacteria. This Taqman probe-based assay targets a 150 bp amplicon from an outer membrane protein gene (*bscp31*), which has been rigorously tested and reported as specific to the genus *Brucella*. The triplex assay also includes two internal controls: a conserved eukaryotic mitochondrial gene target for DNA quality control and a plasmid-based internal control that detects endogenous inhibitors of PCR. Tests of the assay against a panel of common aquatic bacterial isolates demonstrated 100% specificity for *Brucella*. Assays of DNA extracted from pinniped and cetacean origin *Brucella* isolates show a limit of detection at or below three bacterium. Preliminary results testing field-collected harbor seal (*Phoca vitulina*) tissues show increased sensitivity of this assay compared to culture. Because this assay can be used with both ante-mortem or post-mortem samples, it shows promise as a useful screening tool for detection of marine mammal brucellosis.

82) RIFT VALLEY FEVER VIRUS: AN EMERGING THREAT TO WILDLIFE, LIVESTOCK, AND HUMANS IN THE U.S. – A REVIEW OF ISSUES AND CONCERNS, AND A GIS EARLY WARNING SYSTEM FOR RVF VECTORS

Seth C. Britch, Kenneth J. Linthicum, USDA-ARS Center for Medical, Agricultural, & Veterinary Entomology, Gainesville, FL 32608

Mosquito transmitted infectious diseases, like eastern equine encephalitis (EEE), Rift Valley fever (RVF), and West Nile virus (WNV), pose an international threat to animal and human health. An introduction of RVF into the U.S. would severely impact wild ungulate populations and the beef and dairy industries and cause significantly more human illness than WNV. If not rapidly contained with an integrated vaccine and mosquito control strategy, RVF would spread by various *Culex* species mosquitoes as rapidly as WNV and potentially become established in a cryptic *Aedes* mosquito-transovarial enzootic cycle. However, there is no system in place for detecting the spatial and temporal conditions suitable for an RVF outbreak. In Africa, remotely-sensed environmental data have been used to predict conditions preceding production of large populations of mosquito vectors and thus the earliest stages in a RVF epizootic. We are developing a similar GIS/remotely-sensed early warning system for RVF vectors in the U.S. Using satellite data and mosquito surveillance data, the GIS predicts disease transmission patterns based on the quantitative relationship between mosquito activity and patterns of local and global climate and identifies early warning parameters associated with elevated populations of potential RVF vectors. Linkages between climate and mosquito densities are evaluated with spatial and temporal statistics, generating risk maps to inform control strategies. Mosquito prediction information will be disseminated throughout the U.S., providing several months warning before conditions are suitable for elevated mosquito populations and permitting implementation of control strategies in time to lessen or prevent animal and human disease.

83) “BUT THERE ISN’T AN ANTIBODY AVAILABLE!”: AN APPROACH FOR DEVELOPING ANTIBODIES TO STUDY DISEASE IN WILDLIFE

E.W. Howerth, Department of Pathology, College of Veterinary Medicine, University of Georgia, Athens, GA, 30602; A.B. Allison, Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, Athens, GA, 30602; A.E. Ellis, Athens Veterinary Diagnostic Laboratory, College of Veterinary Medicine, University of Georgia, Athens, GA, 30602.

Studying the response of wildlife to disease is often difficult or seemingly impossible due to the lack of commercially available antibodies that cross-react with proteins from the species of interest. Likewise, immunologic detection of novel diseases or unculturable agents can be hampered by the lack of available reagents. Two examples will be used to illustrate an approach for generating antibodies utilizing synthetic peptides. In the first example, limited genetic sequence of white-tailed deer (WTD) interleukin-6 (IL-6), generated from known sequences of cattle IL-6, was used to develop a synthetic peptide and an antibody. These were used successfully for an immunohistochemistry technique and a direct sandwich ELISA to detect WTD IL-6 in formalin-fixed tissue and serum, respectively. In the second example, a synthetic peptide corresponding to a 17-amino acid sequence of the envelope protein of West Nile virus (WNV) was used to generate an antibody. This antibody was used for WNV immunohistochemistry. These examples demonstrate the use of synthetic peptides to generate antibodies for detection of cytokines and infectious agents for which available reagents may not be available.

84) DEVELOPMENT OF AN ENZYMATIC DIGESTION METHOD TO DECONTAMINATE INFECTIOUS PRIONS

Paul B. Nash, USDA/APHIS/WS/National Wildlife Research Center, 4101 Laporte Avenue, Fort Collins, CO 80521; Terry Arver, Prion Tech, 15 Tyrell, Menomonie, WI; Don Hoglund, Prion Tech, PO Box 37780, Raleigh, NC 27592; John L. Pilon, USDA/APHIS/WS/National Wildlife Research Center, 4101 Laporte Avenue, Fort Collins, CO 80521; Steffen Ernst, Novozymes A/S, Krogshøjvej 36, DK 2880 Bagsvaerd, Denmark; Kurt C. VerCauteren, USDA/APHIS/WS/National Wildlife Research Center, 4101 Laporte Avenue, Fort Collins, CO 80521

Infectious prions (PrP^{res}) can be problematic for decontamination efforts because it is resistant to standard disinfection methods. Decontamination methods currently recommended (e.g., 40% bleach for 1 hr, autoclaving at 134°C, or treatment with 1 M NaOH for two hours) can be damaging to materials, caustic to personnel, and are not possible in many situations. The importance of effective decontamination is underscored by the fact that prion diseases can be transmitted indirectly and are invariably fatal to susceptible species. Even though the species barrier makes transmission between species unlikely, the potential is real as seen by the development of new variant Creutzfeld-Jacobs disease in humans who consumed beef from animals with bovine spongiform encephalopathy. Improved and more versatile disinfection methods are needed. Enzymatic digestion would be a valuable addition to decontamination methods currently available. By definition, PrP^{res} is protease resistant. There are, however, many different proteases with different specificities and conditions for activity. We report on the effects of two proteases with digesting activity that can eliminate *in vitro* (ELISA and Western blot) detectability of chronic wasting disease prions. We also report on the effect of enzyme treatments compared with bleach and autoclaving (134°C) on infectivity in a mouse model of prion disease. Successful decontamination by enzymatic reaction will allow for more practical treatment of waste, instruments, and surfaces; make environmental decontamination feasible; and provide a method for treating some organic materials. These improvements would greatly facilitate management of prion diseases in a variety of settings.

85) HOW MUCH TELAZOL[®] IS REALLY IN THE BOTTLE? INACCURATE LABELING OF TELAZOL FROM 1987-1998 AND THE IMPACT ON PUBLISHED LITERATURE.

Keith Amass, Safe-Capture International Inc., Mount Horeb, WI 53572 ; Mark Drew, Wildlife Health Laboratory, Idaho Department of Fish and Game, Caldwell, ID, 83607.

Telazol is a 1:1 combination of tiletamine and zolazepam supplied in freeze-dried powder. Telazol[®] was labeled to contain 500 mg of active drug per vial, to be reconstituted with 5 ml of sterile water resulting in a solution containing 100 mg/ml. However, this reconstitution technique was confusing since the addition of 5 ml of water resulted in a fluid volume of approximately 5.7 ml. With 500 mg of total drug per vial and a total volume of 5.7 ml, the resulting solution would only contain 87.7 mg/ml. Thus, either the amount of total Telazol[®] labeled to be in the vial was incorrect, or the resulting concentration after reconstitution with 5 ml of diluent was incorrect. In actuality, Telazol[®] was and is produced using 572 mg of Telazol[®] per bottle, which when reconstituted with 5 ml (5.7 ml total volume), accurately contains a concentration of 100 mg/ml. The misconception that Telazol[®] contains 500 mg of total drug per vial persists in the current literature despite label revisions. Those working with remote injection often reconstitute Telazol[®] in a non-standard manner (less diluent added). This non-standard reconstitution produces a higher concentration, affording a smaller injection volume. Published dosages determined using the value of 500 mg total Telazol[®] and *non-standard* reconstitution volumes are inaccurate, with an underestimate of the actual drug dosage by 14.4%. Many publications using Telazol[®] do not provide information on reconstitution techniques and cannot be evaluated without acquiring this information through contact with the author. It is requested that whenever publishing case reports or studies using medications that require reconstitution, authors provide the drug name, manufacturer, production facility location, and a detailed description of the reconstitution techniques utilized.

86) TRANQUILLIZATION OF PRONGHORN FOR LONG DISTANCE TRANSPORT USING HALOPERIDOL (HALDOL®).

Mark L. Drew, Wildlife Health Laboratory, Idaho Department of Fish and Game, Caldwell, ID, 83607.

Pronghorn (*Antilocapra americana*) are commonly captured in drive traps for reintroduction. Pronghorn captures have significant risk of injury to both the animals and humans. In December 2004, the IDFG captured and transported 203 pronghorn in Utah for release in Idaho. The animals were captured in a helicopter drive trap. Pronghorn to be translocated were tranquilized with either haloperidol ($n = 188$; 10 mg for fawns, 12 mg for females and 15 mg for males) or diazepam (Valium®; $n = 15$; 10 mg per animal) IM or IV. A total of 113 animals were loaded into six horse trailers and an additional 90 animals were loaded into a semi-truck trailer. The animals were transported (8–12 hours) and released as quickly as possible. Two animals were dead in the trailers on arrival. Four animals were found to have neck or leg injuries sustained at the capture site – three were released and one was euthanized. Excluding injured animals, 110 and 87 antelope were successfully released after long distance transport. Both haloperidol and diazepam produced visible signs of tranquilization (droopy ears, head, and sawhorse stance) within 12–15 minutes post-administration. The animals that received haloperidol remained tranquilized and largely unaware/uncaring of their immediate environment for 10–12 hours. The animals that received diazepam were tranquilized for only about four hours. The use of a long-acting tranquilizer provided adequate levels of tranquilization to allow the animals to be transported with minimal injuries (6/203; 3%). The use of haloperidol in pronghorn may allow successful transport of large groups of pronghorn in trailers over long distances with minimal morbidity or mortality.

DISEASES OF TERRESTRIAL MAMMALS

Moderator: Shelli Dubay

87) CAN BACTERIA AFFECT REPRODUCTION OF CHAMOIS (*RUPICAPRA RUPICAPRA*) IN THE ALPS?

Maryline Pioz, CNRS, Université Claude Bernard Lyon 1 (UCBL), Villeurbanne, France; Anne Loison, CNRS, Université Claude Bernard Lyon 1 (UCBL), Villeurbanne, France; Dominique Gauthier, Laboratoire Départemental Vétérinaire et d'Hygiène Alimentaire, Gap, France; Philippe Gibert, Office National de la Chasse et de la Faune Sauvage (ONCFS), St Pierre d'Albigny, France; Jean-Michel Jullien, ONCFS, Ecole, France; Marc Artois, CNRS, Ecole nationale veterinaire de Lyon, Marcy l'Etoile, France; Emmanuelle Fromont (CNRS, UCBL).

Microbial infections that affect reproduction usually pass unnoticed in wild animals. However, a slight decrease in productivity may affect population dynamics over the long term. Three frequent bacterial abortive infections, salmonellosis caused by *Salmonella Abortusovis*, enzootic abortion caused by *Chlamydomphila abortus* and Q fever caused by *Coxiella burnetii* have been studied in the chamois population of the Bauges Reserve (North Prealps, France). Here we have analyzed fertility and survival of kids after birth, according to maternal antibody titer against these infections. Our results show that high antibody titer against salmonellosis at year t is linked with a significant risk of reproductive failure the same year. Effect of the two other bacteria remained insignificant: Enzootic abortion and Q fever remained relatively rare so their effect is difficult to show at this scale. If these diseases can reduce population growth rate, the epidemiological role played by sympatric domestic stock has to be explored.

88) PESTIVIRUS INFECTION IN CHAMOIS (*RUPICAPRA PYRENAICA*):
DEMOGRAPHIC COLLAPSE OF THE POPULATION IN THE CATALAN
PYRENEES OF SPAIN.

Ignasi Marco, Servei d'Ecopatologia de Fauna Salvatge, Facultat de Veterinaria, Universitat Autònoma de Barcelona, 08193-Bellaterra, Spain; Rosa Rosell, Centre de Recerca en Sanitat Animal (CRESA), Universitat Autònoma de Barcelona, 08193-Bellaterra, Spain; Gregorio Mentaberre, Encarna Casas, Oscar Cabezon, Roser Velarde, Santiago Lavín, Servei d'Ecopatologia de Fauna Salvatge, Facultat de Veterinaria, Universitat Autònoma de Barcelona, 08193-Bellaterra, Spain.

In 2001 and 2002, a novel pestivirus was isolated from chamois affected by a previously unreported disease at the National Hunting Reserve of Alt Pallars-Aran in the Catalan Pyrenees in northeastern Spain. Sequence and phylogenetic analysis of the virus assigned it to the Border Disease Virus cluster. In January 2005, high mortality of chamois was observed at the National Hunting Reserve of Cerdanya-Alt Urgell, about 40 km from the 2001-2002 outbreak. At the beginning of the outbreak, the only macroscopic lesion was severe pneumonia. However, in the last animals found dead, lesions similar to those of the 2001-2002 outbreak were observed. Those lesions were cachexia and alopecia with skin hyperpigmentation. Microscopically, all the animals had a variable mild to severe inflammatory and degenerative lesions in the brain. A pestivirus was isolated from the spleen of four chamois with pneumonia and two with skin lesions. In June 2005, the disease spread to the National Hunting Reserve of Cadi, an area close to the southern border of the Cerdanya-Alt Urgell Reserve. During the subsequent months, tens of chamois were found dead and a Pestivirus was also isolated from several animals. The census performed in both Reserves revealed a dramatic decrease in the chamois population, with an estimated mortality of more than 90%. At the time of writing this abstract, chamois are continuing to die in the Cadi Reserve and isolated cases are being reported in other areas of the Pyrenees.

89) AN OUTBREAK OF NECROBACILLOSIS CAUSED BY *FUSOBACTERIUM NECROPHORUM* SUBSP. *NECROPHORUM* IN ELK ON A WINTER FEEDGROUND IN WYOMING.

Cynthia Tate, Wyoming Game and Fish Department, Laramie, WY 82070; Todd Cornish, Brian Parrie, and Amy Boerger-Fields, Wyoming State Veterinary Laboratory, University of Wyoming, Laramie, WY 82070; Jill Miller, Wyoming Game and Fish Department, Jackson, WY 83001; and Terry Kreeger, Wyoming Game and Fish Department, Tom Thorne and Beth Williams, Wildlife Research Center at Sybille, Wheatland, WY 82201

Necrobacillosis is a clinical syndrome of ungulates caused by infection with the gram-negative obligate anaerobe bacterium *Fusobacterium necrophorum*. Outbreaks of this disease have been reported in feedground elk from Wyoming since 1944, and significant mortality events associated with this disease are not uncommon. In the winter of 2006, increased morbidity and mortality were observed in elk on a large feedground in Wyoming, with common clinical signs including lameness, lethargy, recumbency, variable loss of condition, and terminally with loss of response to environmental stimuli. Complete necropsies were performed on 20 elk that died or were euthanized. Eight of these elk demonstrated gross and microscopic lesions of classic necrobacillosis (necrotizing stomatitis, necrotizing reticulorumenitis, necrotizing hepatitis, and/or necrotizing interdigital dermatitis or foot-rot with intralesional gram-negative filamentous bacilli), however we were unable to isolate *F. necrophorum* from tissues with lesions. The diagnosis of necrobacillosis was confirmed by PCR performed on formalin-fixed tissues using primers specific for the hemagglutinin-related protein gene of *F. necrophorum* subsp. *necrophorum* (*F. n. necrophorum*). We also are in the process of validating an immunohistochemical technique for the diagnosis of *F. necrophorum* infection in formalin-fixed tissue sections. Both subspecies of *Fusobacterium necrophorum* (*F. n. necrophorum* and *F. n. funduliforme*) have been associated with lesions of necrobacillosis, but *F. n. necrophorum* is considered to be more pathogenic. Necrobacillosis remains a significant cause of morbidity and mortality in wild elk congregated on feedgrounds in winter in Wyoming and potential risk factors and management implications will be discussed.

90) OBSERVATIONS OF CLINICAL CHRONIC WASTING DISEASE IN A CAPTIVE SHIRA'S MOOSE.

Terry J. Kreeger, Veterinary Services Branch, Wyoming Game and Fish Department, 2362 Hwy 34, Wheatland, WY 82201; Will Schultz, Veterinary Services Branch, Wyoming Game and Fish Department, 2362 Hwy 34, Wheatland, WY 82201; Todd Cornish, Wyoming State Veterinary Laboratory, 1174 Snowy Range Road, Laramie, WY 82070; Jean E. Jewell, Wyoming State Veterinary Laboratory, 1174 Snowy Range Road, Laramie, WY 82070

Experimental infection with chronic wasting disease (CWD) of a captive moose was first observed in Wyoming in 2004. Subsequently, the first case of CWD in a wild moose was found in Colorado in 2005. Observations of the clinical manifestations of CWD in moose were not made in either case. In January 2003, a male Shira's moose calf was orally inoculated with a single dose (5 g) of whole brain homogenate prepared from CWD-affected mule deer. In early 2006, approximately 1,132 days post inoculation, the moose was observed coughing with a nasal discharge and salivation. Within the next few weeks, the coughing subsided, but not the salivation. His appetite appeared normal. Following these signs, the moose was observed to have an extremely wet muzzle, presumably from prolonged drinking. He was also observed spending an abnormal amount of time in a creek. The moose then appeared to be unsteady in his gait and was eventually lethargic and unwilling to move and died within 24 hours of this observation (1,157 days p.i.). Upon necropsy, heart, kidney and mesenteric fat were absent. There was serous atrophy of the bone marrow. Aspiration pneumonia was evidenced by ventral lung consolidation that discharged frothy fluid and ingesta when cut. The pericardium was adhered to the sternum. Proteinase-resistant protein (PrP^{res}) was detected by immunohistochemistry of the obex, tonsil, and retropharyngeal lymph node. PrP^{res} was also confirmed by ELISA of the lymph nodes. Aspiration pneumonia, cachexia, prolonged drinking, salivation, and ataxia are hallmarks of clinical CWD in elk and deer. Observations of a CWD-infected moose were consistent with this pattern.

91) SEROLOGIC SURVEY FOR PATHOGENS POTENTIALLY AFFECTING PRONGHORN (*ANTILOCAPRA AMERICANA*) FAWN RECRUITMENT IN ARIZONA, USA.

Shelli A. Dubay, College of Natural Resources, University of Wisconsin-Stevens Point, Stevens Point, WI, 54481; Ted H. Noon, Arizona Veterinary Diagnostic Laboratory, Department of Veterinary Science and Microbiology, College of Agriculture, University of Arizona, Tucson, AZ, 85705; James C. deVos, Jr., Research Branch, Arizona Game and Fish Department, Phoenix, AZ, 85023; Richard A. Ockenfels, Research Branch, Arizona Game and Fish Department, Phoenix, AZ, 85023

During the 1990s, pronghorn (*Antilocapra americana*) populations declined in Arizona, USA. In order to investigate potential causes of decline, we collected blood samples from hunter-harvested male pronghorn from 2001 to 2003 on four Arizona sites to evaluate disease exposure. Sera were tested for antibody to parainfluenza virus type 3 (PI3), bovine viral diarrhea virus (BVD), infectious bovine rhinotracheitis virus (IBR), bovine respiratory syncytial virus (BRSV), epizootic hemorrhagic disease virus (EHD), bluetongue virus (BTV), and *Chlamydia psittaci*. Antibody against PI3 was found in 33% of the samples whereas antibody against BTV/EHD was found in 77% of the samples. Exposure to other pathogens was found at low prevalence rates. Reproductive effects of BTV/EHD and PI3 infection on pronghorn in Arizona are unknown and merit further study, but pronghorn decline is not likely related to disease epizootics. Other potential causes of decline include poor nutrition from drought conditions, lack of adequate fawn hiding cover, and abundance of predators. These factors in concert likely are causing declines in pronghorn in Arizona. Research currently is being conducted to investigate these issues.

92) A JAVELINA MORTALITY EVENT IN TUCSON, ARIZONA.

Lisa A. Shender, Arizona Game and Fish Department, Phoenix, AZ, 85023; Robert D. Glock, Arizona Veterinary Diagnostic Laboratory, University of Arizona, Tucson, AZ, 85705; Terry R. Spraker, Department of Pathology, College of Veterinary Medicine, Colorado State University, Fort Collins, CO, 80523

The javelina, or collared peccary (*Pecari tajacu*), is a pig-like animal found in Arizona, New Mexico, Texas and throughout many Latin American countries. From approximately June 2004 to April 2005, a mortality event occurred in the javelina population in Tucson, Arizona and neighboring areas, in which an estimated 105 javelinas died. Reported clinical signs included emaciation, dehydration, lethargy, and diarrhea, with or without blood. In addition, some animals had labored breathing and hind limb weakness. Gross pathology confirmed cases of diarrhea and showed varying degrees of pulmonary congestion and enteropathology. Histology revealed enteritis, colitis, pulmonary congestion and findings compatible with pneumonia and a gram-negative bacteremia in some animals. Numerous diagnostic assays were performed; the only consistent findings were *Clostridium perfringens* Type A and multiple different *Salmonella* serotypes. Although it is likely that these javelinas ultimately succumbed to salmonellosis, it is unclear what made them susceptible and whether an unidentified underlying factor was involved. This is the first reported case of widespread salmonellosis in free-ranging javelinas.

93) ADVERSE EFFECTS OF PARASITISM AND BOVINE RESPIRATORY DISEASE COMPLEX ON REPRODUCTIVE SUCCESS AND SURVIVAL IN FREE-RANGING CARIBOU

Kimberlee B. Beckmen, Division of Wildlife Conservation, Alaska Department of Fish & Game, 1300 College Road, Fairbanks AK 99701; Lemuel G. Butler, Division of Wildlife Conservation, Alaska Department of Fish & Game, Main Street, King Salmon AK 99613

The Northern Alaska Peninsula caribou herd declined by 88% since 1989 and all hunting including Alaska native subsistence harvest has been eliminated. Past live-capture/release studies noted low calf weights, delayed age of first calving, reduced productivity, low survival, signs of pneumonia and foot rot. In 2005, only 57% of female caribou over 2 years of age were pregnant (vs. 85-87% in healthy herds). Forty-two newborns were radio-collared to determine survival rate and causes of mortality. Additionally, calves and adults were collected for a herd health assessment including diagnostic pathology, hematology, microbiology, toxicology, and parasitology. Twenty-two collared calves were killed by wolves or bears and one drowned in the first 2 weeks. After 8 weeks, 92.5 % had died. Serology on samples from the early 1980's to date demonstrated recent (after 1999) herd exposure to bovine respiratory viral diseases and *Neospora*. Adult caribou were heavily parasitized including the abomasal worm *Ostertagia*. Hematology was consistent with adverse health effects from parasitism. A follow-up study on the potential adverse health effects of parasitism commenced in October 2005. Fifty satellite-collared adult females were examined for health status, body condition, *Ostertagia* infection, serum pepsinogen and conception rates. Thirty caribou were treated with ivermectin subcutaneously. The caribou were re-examined and re-treated in April 2006. Their offspring will be monitored for health and survival and the study will continue through the next calving. The objective is to determine if removal of parasites has a detectable positive effect on body condition, reproductive success, calf health or survival.

94) POSSIBLE INTRODUCTION OF PARASITES WITH TRANSLOCATION OF WOLVES IN IDAHO.

Mark L. Drew, Wildlife Health Laboratory, Idaho Department of Fish and Game, Caldwell, ID, 83607.

Wolves (*Canis lupus*) were reintroduced to central Idaho in 1995. At the time of capture in Canada, all animals were given a complete physical examination, vaccinated and given a series of prophylactic treatments for parasites including Ivermectin and Droncit. Biological samples were collected to complete the health screen. Wolf populations and range in Idaho have expanded greatly in the 10 years since reintroduction and interactions with native ungulates and domestic animals have been well documented. In 2006, an aged mountain goat (*Oreamnos americanus*), an adult cow elk (*Cervus elaphus*), and an adult mule deer (*Odocoileus hemionus*) doe were found to have single to multiple hydatid cysts in the lungs on necropsy. The hydatids were identified as *Echinococcus granulosa* on microscopic examination and hook measurements. In 2006, a single subadult female wolf was killed and found to have alopecia over the dorsal aspect of the thoracic spine. Large numbers of lice, *Trichodectes canis*, were found throughout the hair coat of the animal. Neither of these parasites has been documented recently in wildlife in Idaho. There are a few scattered reports of hydatid cysts in ungulates in Idaho many decades ago, but no documented infestations of lice in wild canids in the state. Both of these parasites are common on wolves in most areas where wolves are found in North America. The potential sources and ramifications of these parasites in Idaho wildlife will be discussed.

95) HELMINTHOLOGICAL INVESTIGATION ON THE ROAD-KILL CARNIVORES: COULD THE RESULTS BE USED AS A HEALTH INDICATOR IN ENDANGERED POPULATIONS?

Gholamreza Mowlavi, Department of Medical Parasitology, School of Public Health, Tehran University of Medical Sciences, Iran; Jaffar Massoud, Department of Medical Parasitology, School of Public Health, Tehran University of Medical Sciences, Iran; Iraj Mobedi, Department of Medical Parasitology, School of Public Health, Tehran University of Medical Sciences, Iran

Road-kill carcasses are a great source of samples for scientists who study animal habitats, behavior, and diseases. In this long-term (1990-2005) parasitological exploration in southwest and northern Iran, we collected our samples from vehicle-caused mortalities. An understanding of the life cycles of many of these parasites may aid wildlife managers by preventing harmful parasitic diseases in endangered species. The occurrence of a parasite in a host organism not only indicates the presence of other organisms that participate in the parasite's life cycle, but also shows the selective pathways in which the hosts participate. Many of these helminths rely on predator-prey relationships to reach the next hosts in their life cycle. Investigating parasitism highlights the fact that parasites are natural biological indicators which supply information on diet, migration, recruitment, demographic characteristics and the phylogeny of their hosts. Numerous parasites have complex life cycles and depend on the presence of various intermediate hosts for transmission, involving numerous members of the ecosystem. Based on our results, different types of carnivores were naturally found to be infected with variety of helminths. Except for few helminths such as *Dioctophyme renale* found in a red fox in the north and *Heterophyids* in cats, dogs and jackals in the south no other statistical differences were observed in the sampling areas.

96) RABID SKUNK BEHAVIOR DURING AN EPIZOOTIC IN NORTHWESTERN WYOMING.

Craig A. Ramey, USDA/APHIS, National Wildlife Research Center, 4101 LaPorte Avenue, Fort Collins, CO 80521-2154 and Marshall Robin (retired), Wildlife Services, Powell, WY 82435.

Striped skunk (*Mephitis mephitis*) are one of the most important reservoirs for the transmission of wildlife rabies to humans. During an epizootic in a previously rabies free zone of northwestern, WY, we studied skunk rabies along the Shoshone River system. Because the area was primarily agricultural, the U.S. Department of Agriculture's Wildlife Services (WS) was asked to cooperate with state and local officials in a rabies monitoring and control program. In 1990, we became part of the program to address the public's concerns about human and domestic animal health and safety. Skunk rabies was limited by its epidemiology, terrain, and WS control efforts, and the epizootic ended in 1993. During the epizootic, an efficacy study was undertaken using the USDA's gas cartridge for coyotes. Twenty two skunks were equipped with radio-telemetry collars, and we followed their movements before using the gas cartridge in a sampling of their dens. Their behavior and movements were monitored along the valley floor mainly in irrigated alfalfa. All skunks were shipped to the Wyoming State Veterinary Laboratory through local veterinarians for confirmation of rabid skunks using immuno-fluorescent testing of brain tissues. Six skunks had rabies and their behavior and movement ecology will be discussed. The gas cartridge was later approved for use by EPA for the selective control of problematic skunks. Our results emphasized the need for a skunk rabies vaccine and some planning ideas for future vaccination program for skunks.

97) SARCOPTIC MANGE OUTBREAK IN SOUTHERN HAIRY-NOSE WOMBATS IN THE MURRAYLANDS OF SOUTH AUSTRALIA.

Laura Ruykys Dept Environment & Heritage, GPO Box 1047 Adelaide 5001; David A Taggart Royal Zoological Society of South Australia, Frome Rd Adelaide 5000; David J Schultz Royal Zoological Society of South Australia, Frome Rd Adelaide 5000

The southern hairy nosed wombat (SHNW), *Lasiorhinus latifrons*, is one of three wombat species in Australia and the closest relative to the critically endangered northern hairy-nosed wombat *L. kreftii*. Wombats live in large warrens, consisting of between 2 – 100 burrows. Burrows vary from 2 - 4.5 m deep and up to 30 m long depending upon the substrate. Sarcoptic mange has been known to affect populations of the common wombat, *Vombatus ursinus*, and while the SHNW was known to be susceptible, mange in the wild was unknown. Recent reports from the Murraylands indicated the possible presence of the mite and therefore a need for further investigation. We captured 108 wombats from 3 properties using a combination of spotlight, stunning, and netting between the hours of 10 pm and 4.30 am. Animals were immobilized with zoletil 100 (250mg Tiletamine HCl and 250mg Zolazepam HCl) , 3mg/kg intramuscularly, with isoflurane/oxygen back up as required. Skin scrapings were taken from rump, shoulder, ventral and lateral abdomen and examined using a compound microscope (X40). Incidence of infection varied among properties from 4% - 86%. Within the most seriously infected population, no juveniles or sub-adults were detected, either the result of increased susceptibility and/or transmission rates. Approximately 71% of all adult animals were male and no evidence of breeding was detected at the most severely infected site. We concluded that this disease has the ability to severely affect local populations of the SHNW.

POSTER PRESENTATIONS

98) DETECTION OF PREY IN CARNIVORE SCAT BY POLYMERASE CHAIN REACTION-A PROGRESS REPORT

Anne E. Acton, Lauren Charles, Stephanie L. Dowell, Michael K. Stoskopf, Environmental Medicine Consortium, Dept. of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC, 27606, USA; Roger A. Powell, Dept. of Zoology, NC State University, Raleigh, NC, 27695, USA

In regions where certain prey species may serve as disease reservoirs for susceptible predator populations, the ability to accurately and reliably detect these species in feces would be a useful tool for assessing exposure risks among top carnivores. This information could be used to estimate contact rates among free-ranging wildlife, an important parameter for modeling disease spread and management strategies in threatened or endangered populations. Molecular assays designed to amplify prey-specific mitochondrial DNA targets that survive GI transit from carnivore feces were developed for this purpose. Food trials were conducted in 2 captive adult red wolves (*Canis rufus*) housed at NC State College of Veterinary Medicine using white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*) or small rodents (*Mus musculus*, *Rattus norvegicus*) as prey sources. Preliminary results from open, monotypic diet trials were reported at the 2004 EWDA Conference (Uppsala, Sweden). Here, we will discuss improvements made to our fecal assays to overcome difficulties experienced during the initial trials and report results from subsequent blinded, mixed prey food trials.

99) A GLOBAL PERSPECTIVE OF THE POTENTIAL HUMAN HEALTH RISKS ASSOCIATED WITH THE CONSUMPTION OF SEA TURTLES

A. Alonso Aguirre, Wildlife Trust, New York, New York 10001, USA; Susan C. Gardner, Centro de Investigaciones Biologicas del Noreste, La Paz, Baja California Sur, Mexico; Jesse C. Marsh, Monterey Bay Aquarium, California, USA; Stephen G. Delgado, University of Wisconsin, Madison, WI, USA; Colin Limpus, Queensland Turtle Research, Capalaba, Queensland 4157, Australia; Wallace J. Nichols, California Academy of Sciences, San Francisco, CA, USA

Despite current international regulations, sea turtle products (e.g., meat, adipose tissue, organs, blood, eggs) remain common food items for many communities worldwide. The consumption of sea turtles, however, may have adverse human health effects due to the presence of bacteria, parasites, biotoxins and environmental contaminants. Reported health effects of consuming sea turtles or their eggs infected with zoonotic infectious agents include diarrhea, vomiting, and extreme dehydration, which in several occasions have resulted in hospitalization and death. Outbreaks of gastroenteritis caused by *Salmonella chester* and *Vibrio mimicus* have been reported. Other zoonotic agents found in sea turtles include *Escherichia coli* and *Cryptosporidium* sp. and these may represent a risk. Human fatalities and illness induced by poisoning from eating marine turtles have been reported throughout the Indo-Pacific region. To the best of our knowledge no studies have been performed correlating sea turtle organic contaminant or heavy metal levels, consumption of meat or eggs and risks to human health. Although contaminant levels vary according to sea turtle species and location, recent research suggests that turtles in Baja California may have elevated contaminant levels, and their consumption is cause for concern. The health data presented in this review provide a compelling argument for the reduction of human consumption of sea turtles. Dissemination of this information may improve public health and simultaneously result in enhanced conservation of these endangered species.

100) WEST NILE VIRUS INFECTION IN A CROCODILE (*CROCODYLUS ACUTUS*) IN MEXICO.

Hector Zepeda, Ana Sandoval, Nayelly Jiménez, Leopoldo Aguilar, Laboratorio Medicina de Conservación, Escuela de Posgraduados, Instituto Politecnico Nacional, Mexico, D.F., Mexico; and A. Alonso Aguirre, Wildlife Trust, New York, NY 10001.

The initial outbreak of West Nile Virus (WNV) in North America was recognized in New York in 1999, with deaths reported in humans, horses, and numerous bird species. Since then, the geographic distribution of WNV has greatly increased, reaching Mexico in 2002, where a vast number of new potential hosts (avian, mammalian, reptilian) have been exposed to the disease. In Mexico, mosquito vectors are available throughout most of the year creating serious, long-term threats to humans, horses and vulnerable avian populations. During May 2003, WNV was isolated from a dead captive raven (*Corvus corax*) from a zoo in Tabasco. Phylogenetic studies indicate that this isolate, the first from Mexico, is related to strains from central United States with a relatively high degree of sequence divergence from the original New York virus. We performed the necropsy of a juvenile crocodile (*Crocodylus acutus*) that died with neurological signs including lethargy and “star gazing”. Viral RNA was extracted from tissues (brain, heart, spleen, liver, kidney, and muscle) and a RT-PCR for WNV was performed. We found histological damage in several organs and specially tropism for the WNV in brain and kidney. We sequenced the RT-PCR product (408 bp) and we found 94% of homology with NY2000Crow/AF404756 strain. We hypothesize that two different sources of WNV were introduced to Mexico bringing two different strains at different locations. The pathways of introduction are unknown; however, migratory birds, the legal and illegal wildlife trade and horse and human movements may have contributing factors for the spread of WNV in Mexico.

101) SEROLOGICAL EVIDENCE OF EXPOSURE TO SELECTED INFECTIOUS AGENTS IN *OTARIA FLAVESCENS* AND *ARCTOCEPHALUS AUSTRALIS* FROM ARGENTINA

Diego Albareda, Acuario de Buenos Aires, Buenos Aires (1425), Argentina; Marcela Uhart, Field Veterinary Program, Wildlife Conservation Society, Puerto Madryn (9120), Chubut, Argentina; Luis Samartino and Félix Capellino, Instituto de Patobiología CICV, INTA Castelar (1712); William Karesh, Field Veterinary Program, Wildlife Conservation Society, Bronx 10460, New York, and Robert Cook, Bonnie Raphael and Paul Calle, Animal Health Center, Wildlife Conservation Society, Bronx, NY 10460.

Exposure to infectious agents in two species of pinnipeds, *Otaria flavescens* and *Arctocephalus australis*, were evaluated. Samples were collected opportunistically from animals entering rehabilitation at the Buenos Aires Aquarium and during field immobilizations of free-ranging individuals at several colonies from Chubut Province, Argentina. From 1998 to 2004, samples were collected from 50 *A. australis* and 3 juveniles *O. flavescens* in rehabilitation, all were found near the Paraná River Delta and Río de la Plata. All sea lions and most fur seals (96%) were under 2 years of age and probably came from the breeding colony at Isla de Lobos (Uruguay). Serology for infectious disease exposure included *Leptospira sp.* (17 serovars), *Brucella sp.*, canine herpes virus (CHV), phocid morbillivirus (PDV), canine morbillivirus (CDV), dolphin morbillivirus and porpoise morbillivirus. Additionally, between 1994 and 2003, 47 free-ranging *O. flavescens* (27 adults, 12 pups and 8 undetermined) were immobilized for ecological studies. Analysis for antibodies to infectious agents in these animals included those mentioned above, in addition to avian influenza virus, calicivirus, San Miguel sea lion virus and vesicular exanthema (VE). Free-ranging adults sea lions had antibodies to CHV (12/47; 1♀–11♂), VE (1/47; ♀), PDV (2/47; 1♂–undetermined) and CDV (3/47; 2♂–1 undetermined), while only one adult female fur seal admitted for rehabilitation was positive to *Leptospira interrogans* (serovar ballico). In all cases antibody titers were low, indicating past exposure but not current disease. Our results highlight the presence of marine mammal morbilliviruses and *Leptospira sp.* in marine mammals from the South-West Atlantic.

102) DISTRIBUTION AND DENSITY OF *SETARIA YEHI* MICROFILARIA IN ALASKA MOOSE

Kimberly Dullen, University of Alaska Fairbanks, Department of Biology, Fairbanks AK 99775; Kimberlee B. Beckmen, Alaska Department of Fish & Game, Division of Wildlife Conservation, 1300 College Road, Fairbanks, AK 99701

Setaria yehi is a filarid nematode identified in the abdominal cavity of Alaskan moose (*Alces alces*) and caribou (*Rangifer tarandus*). The infective L1 microfilaria are found in the bloodstream and transmitted by a biting insect vector such as the moose fly (*Haematobosca alcis*). Between December 2004 and March 2005, nine moose calves in the Fairbanks area died with fibrinous peritonitis lesions associated with migrating *S. yehi* and microscopic evidence of thrombi and severe inflammatory reactions to the massive numbers of microfilaria. During March-April 2006, 279 blood samples from live captured/released moose from 11 areas across the state were examined for microfilaria using a filter test (Difil®). Microfilaria densities ranged up 3530 and 13990 per ml of blood of adults and calves, respectively. Mean and median densities were significantly higher in calves than adults (mean 926 vs. 114; median 33 vs. 0 microfilaria/ml). Microfilarial densities were highest in calves the area of the previous mortalities (mean 1590 microfilaria/ml). Prevalence rates were significantly higher in calves than adults (65% vs. 32%). Prevalence in calves was significantly higher in the Interior which includes Fairbanks (96%) compared to 49% in Southcentral and 17% on the Seward Peninsula. These results support the hypothesis that conditions in Interior Alaska favor transmission of *Setaria* compared to other regions in Alaska. However, why microfilarial densities are so high during a season when no vectors are present is an enigma. Further studies will examine the molecular characteristics of this *Setaria* to elucidate its origin, lifecycle, vectors and pathogenic factors.

103) A COMPARISON OF SERUM CHEMISTRY AND HEMATOLOGY VALUES BETWEEN WILD HARBOR SEAL (PHOCA VITULINA CONCOLOR) PUPS AND THOSE ENTERING REHABILITATION AND AGAIN PRIOR TO THEIR RELEASE.

Gerard K. Beekman, Marine Animal Rehabilitation Center, University of New England, 11 Hills Beach Road, Biddeford, Maine 04005; Lucy W. Keith, Wildlife Trust 1601 Third Street South, Suite F, St. Petersburg, FL 33701

Wild harbor seal pups were sampled in Spring of 2004 as part on an ongoing research project at the University of New England. The values obtained at this sampling were compared with those obtained from pups entering rehabilitation at the University's Marine Animal Rehabilitation Center. Further comparisons were made with those pups that were successfully rehabilitated prior to their release. The purpose of these studies were to establish a working set of normal ranges for harbor seal pups in Maine and to examine the differences between this group and those entering rehabilitation. In addition, comparisons of wild to pre-release animals was examined to determine if successful rehabilitation resulted in "normal" blood chemistry and hematology.

104) PATHOLOGICAL FINDINGS IN UNUSUAL CETACEAN STRANDING EVENTS IN TAIWAN, JULY –AUGUST, 2005

Jung-To Chiu, Department of Veterinary Pathology, 52 Campus Drive, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada; Wei-Chen Yang, Lien-Siang Chou, Ming-Wen Huang, Institution of Ecology and Evolutional Biology, National Taiwan University, Taiwan (R.O.C.); Huey-Ing Chiou, Animal Technology Institute Taiwan, Taiwan (R.O.C.); Gary Wobeser, Department of Veterinary Pathology, 52 Campus Drive, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

During 19 July – 14 August 2005, a series of unusual stranding events occurred in Taiwan. There were 21 cases, including 23 individuals [13 dwarf sperm whales (*Kogia sima*), 2 pygmy sperm whales (*Kogia breviceps*), 2 Longman's beaked whale (*Indopacetus pacificus*), 2 Blainville's beaked whale (*Mesoplodon densirostris*), 1 pantropic spotted dolphin (*Stenella attenuata*), 2 striped dolphin (*Stenella coeruleoalba*) and 1 short-finned pilot whale (*Globicephala macrorhynchus*)]. More than 75% of the stranded cetaceans are deep diving species (15 dwarf /pygmy sperm whales and 4 beaked whales). Of these, 14 individuals were necropsied and tissues from 7 were examined microscopically. Gross findings included: pulmonary edema and congestion, sinusoidal congestion, urolithiasis, fracture of mandible and rib, hemoperitoneum and hydropericardium, gastric ulceration, gastric and renal parasite infestation, icterus, and bite wounds caused by cookie-cutter shark (*Isistius sp.*). There were air bubbles in cerebral and mesenteric vessels, hilar lymph node, muscle, liver, kidney and sinusoids in 3 animals. The following histopathologic findings were recorded: pulmonary emphysema, edema and hemorrhage, bronchopneumonia and parasitic infection; hepatic hemorrhage, congestion, vacuolar degeneration and intralesional cysts; myocardial degeneration, fibrosis and hemorrhage; renal parasitic infection, hemorrhage and intralesional cysts; gastritis, granulomatous enteritis and parasitic infection; lymphadenitis with intralesional cysts, thrombosis and hemorrhage. The causes of this series of stranding events were not determined. However, weather (typhoon, decrease in water temperature), harmful algal bloom, accidental fishery capture and acoustic events (seismic survey, geophysical seismic research and naval exercise) should be taken into account.

105) HABITAT DETERMINES HOST-FEEDING PATTERNS OF CULEX SALINARIUS, A BRIDGE VECTOR FOR WEST NILE VIRUS IN CT.

Maria Diuk-Wasser, Dept. of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT, 06511; Goudarz Molaei, CT Agricultural Experiment Station, New Haven, CT, 06511; Anna Milkowski, Dept. of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT, 06511; Heidi Brown, Dept. of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT, 06511; Theodore Andreadis, CT Agricultural Experiment Station, New Haven, CT, 06511; Durland Fish, Dept. of Epidemiology and Public Health, Yale School of Medicine, New Haven, CT, 06511.

The role of different mosquito species as bridge vectors for West Nile virus transmission from birds to humans is an important epidemiological question. Mosquito bloodmeals obtained from mammals may increase the likelihood that predominantly bird-feeding mosquitoes transmit WNV to humans. On the other hand, higher host diversity, including reservoir incompetent mammalian species, could decrease enzootic WNV transmission among birds and reduce human risk. A recent study in CT showed that *Culex salinarius* obtains a significant proportion of its bloodmeals from both birds and mammals. We investigated whether habitat composition and structure can influence the host composition of *Cx. salinarius* bloodmeals and therefore its potential role as both enzootic and epidemic vector for WNV. We used land use maps to map the composition and landscape structure in a 500m buffer area around 11 light traps where bloodmeals were obtained from *Cx. salinarius*. We found a significant effect of habitat on the host composition of *Cx. salinarius* bloodmeals. For all trap sites, the proportion of mosquitoes feeding on birds increased with the amount of ocean water in the trapping site buffer area and decreased with the number of forest patches. In coastal sites, the percent of mosquitoes feeding on birds decreased significantly with the area of turf/grassland/agriculture and also with wetland area. These findings should help identify zoonotic foci and areas of potential human risk for WNV.

106) KERATOCONJUNCTIVITIS BY *MORAXELLA* SP. IN A VICUÑA (*VICUGNA VICUGNA*) KEPT IN CAPTIVITY

Roberto Elias, Facultad de Veterinaria y Zootecnia, Universidad Peruana Cayetano Heredia, Av. Honorio Delgado 430, Lima 31, Peru; Catalina Hermoza, Parque Zoológico Huachipa, Av Las Torres s/n, Lima 03, Peru; Javier Mamani, Facultad de Veterinaria y Zootecnia, Universidad Peruana Cayetano Heredia, Av. Honorio Delgado 430, Lima 31, Peru

Moraxella is reported as a cause of ocular infections in different species of wild and domestic artiodactyls. This genus of bacteria was described as an etiology of keratoconjunctivitis in a llama; being *M. liquefaciens* the species isolated on the surface of its cornea. The following report is about a wild-origin, adult, male Vicuña (*Vicugna vicugna*) kept in captivity with other four individuals (2 males and 2 females) in a Peruvian zoo; presenting depression, anorexia, ocular secretion and epiphora on the left eye. At the ocular examination, a corneal opacity on the central part of the eye was observed and an empiric antibiotic treatment was started, with gentamicin (Gentalyn oftálmico® 0.3%, Schering Plough, ophthalmic solution) TID for about 4 weeks, without any improvement. On the contrary other signs were developed as blepharospasm, corneal vascularization, corneal ulcer, and conjunctivitis. The treatment was stopped for 48 h and a conjunctival swab sample was taken and sent to the Bacteriology Laboratory of the Faculty of Veterinary Medicine of the Universidad Nacional Mayor de San Marcos from Lima, Peru. The sample was cultured in Blood Agar, McConkey Agar, Trypticase Agar and Brain Heart Infusion broth at 37 °C for three days and 24 h after, bacterial growth was observed. The agent isolated was *Moraxella* sp., and a new treatment was started with ciprofloxacin (Ciprolin® 0.3%, Abeefe, ophthalmic unguent), chosen according to the sensibility test, saline solution and epithelial regenerator (Solcoceryl gel oftálmico®, Solco) TID, getting the recuperation of the eye after 12 weeks.

107) COMMON CETACEAN AND PINNIPED PARASITES FROM WASHINGTON AND BRITISH COLUMBIA

Brynne Kaplan Dau and Joseph K. Gaydos, UC Davis Wildlife Health Center – Orcas Island Office, School of Veterinary Medicine, 1016 Deer Harbor Road, Eastsound, WA 98245; Murray Dailey, The Marine Mammal Center, 1065 Fort Cronkhite, Sausalito, CA 94965-7333; Dyanna M. Lambourn and Steven J. Jeffries, Washington Department of Fish and Wildlife, Marine Mammal Investigations, 7801 Phillips Rd. SW, Lakewood, WA 98498; Michael M. Garner, Northwest ZooPath, 654 W. Main, Monroe WA 98272; William Foreyt, Department of Veterinary Microbiology and Pathology, Washington State University, Pullman, WA 99164; Stephen A. Raverty, Ministry of Agriculture Food and Fisheries, 1767 Angus Campbell Road, Abbotsford, British Columbia V3G 2M3, Canada; Amy Traxler, The Whale Museum, PO Box 945, Friday Harbor, WA 98250; William Walker, National Marine Mammal Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, 7600 Sand Point Way N.E., Seattle, Washington 98115

To date, there have been no systematic surveys of parasite presence, abundance, or diversity in marine mammals from Washington State and British Columbia. Necropsies performed on marine mammals from this region have revealed a suite of parasitic infections of differing pathological significance. Preliminary work suggests that *Anisakis* spp. often cause gastritis and mucosal ulceration in Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*), and harbor seals (*Phoca vitulina*). *Campula* spp. often cause cholangiohepatitis in these species as well. Verminous bronchopneumonia in harbor porpoise and harbor seals often is caused by *Halocercus* spp., and *Otostrongylus* spp. and *Parafilaroides* spp. (including a new species *P. gullandae*), respectively and infection with *Parafilaroides* spp. has been suggested as a route for transmission of *Brucella* harbor seals. In harbor porpoise, *Crassicauda* spp. have been associated with subcutaneous and intramuscular abscessation and *Stenurus* spp. have been associated with peribullar hemorrhage. Protozoal organisms (*Sarcocystis neurona* and another distinct apicomplexan protozoa most similar to *S. neurona*) have caused abortion and encephalitis in harbor seals. These represent early findings in a collaborative regional long-term marine mammal disease monitoring program.

108) LEPTOSPIROSIS IN FELIDS OF THE *MIGUEL ALVAREZ DEL TORO* REGIONAL ZOO IN CHIAPAS, MEXICO

Sergio Guerrero-Sánchez, Elsy A. Cabrera-Baz, Instituto de Historia Natural y Ecología, Zoológico Regional Miguel Álvarez del Toro, Tuxtla Gutiérrez, Chiapas, México; Miguel A. Luna-Álvarez, Guadalupe Socci Escatel, Víctor Manuel Banda Ruiz, Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Centro Nacional de Investigaciones Disciplinarias en Microbiología Animal, Departamento de Leptospirosis, Cuajimalpa, Ciudad de México, México

Chiapas has the 51% of the Biodiversity in Mexico. Also it has a great level of poorness and a high rural population. This has made a great impact in its natural areas: In the habitat decrease and the potential introduction of diseases, topic poorly studied in the state. El Zapotal Ecologic and Recreative Park, which lodges the *Miguel Alvarez del Toro* Zoo (ZooMAT), at the edge of Tuxtla Gutierrez city, is not the exception. In this order, the ZooMAT has started actions for the epidemic carefulness about several epizootic and zoonotic diseases employing its hostess species as pointers. In September 2005 we did a leptospirosis study in 18 felids of six different species using microscopic agglutination test for the serologic diagnostic for 12 *Leptospira interrogans* serovars. $\geq 1:100$ titers were accounted as positive. The bacteriologic diagnostic were done with urine culture in supplied EMJH medium and the molecular diagnostic were made with the PCR test in urine. The serologic study showed the antibodies' presence of eight *Leptospira interrogans* serovars. Of these, six showed $\geq 1:100$ titers. The positive frequency was 88%. *Grippotyphosa* serovar showed 1:1600 titers. It also showed the major frequency (33%), followed by *Icterohaemorrhagiae*-Palo alto (22.22%), *Bratislava*, *Hardjo*-H89 (11.11%), *Hardjo* and *Pyrogenes* (5.56%). Two animals showed antibodies for four strains in $\geq 1:50$ titers. The bacteriologic cultures were negative and the PCR Test showed a 16% frequency. All of these strains are related with dogs and rats, which can be the primary factor for the high prevalence discovered in this study.

109) ANTI-CHOLINESTERASE PESTICIDES AND BIRD MORTALITY: LACK OF BRAIN CHOLINESTERASE-INHIBITION IN BIRDS FROM MAINE AND MASSACHUSETTS

Janine Calabro, Tufts Cummings School of Veterinary Medicine, 200 Westboro Road, North Grafton, MA 01536; Elizabeth Stone, Center for Wildlife Health Research, 24 Goss Lane, Pownal, ME 04096; Rebecca Harris, Tufts Cummings School of Veterinary Medicine, 200 Westboro Road, North Grafton, MA 01536; Mark Pokras, Tufts Cummings School of Veterinary Medicine, 200 Westboro Road, North Grafton, MA 01536; Stephanie Schmidt, Manomet Center for Conservation Science, 81 Stage Point Road, Manomet, MA 02345; Richard Pannbacker, Diagnostic Medicine Pathobiology, Kansas State University, Manhattan, KS 66506; Michael Hooper, Institute of Environment and Human Health, Box 41163, Texas Tech University, Lubbock, TX 79409

Wildlife organizations, rehabilitators and state agencies frequently receive calls reporting dead or injured birds, but these organizations generally do not have the means to determine possible causes of mortality, such as exposure to pesticides or other contaminants. Found-dead birds provide an opportunity to conveniently and economically sample a diversity of species from a broad geographic range. We sought to determine levels of brain cholinesterase and chemical reactivation of the enzyme, indicative of organophosphate or carbamate pesticide exposure, in a variety of species found dead or recovered from wildlife rehabilitators in Maine and Massachusetts. In this study, brain cholinesterase levels were analyzed in 283 dead of 73 species collected between July 2004 and July 2005. Reactivation of the enzyme was performed on a subset of 112 samples. For 14 species (American robin, chimney swift, common eider, common tern, double-crested cormorant, mourning dove, rock pigeon, American goldfinch, herring gull, ring-billed gull, great blue heron, mallard, northern flicker, thick-billed murre) there were over 5 individuals for which cholinesterase levels were measured and with a large enough sample size to assess group means (a total of 181 birds). There was little evidence of organophosphate or carbamate exposure, based on lack of OP- or carbamate-specific reactivation or on cholinesterase inhibition greater than two standard deviations below the mean for the species. Brain ChE activities for con-specific individuals without previous literature-documented activities were generally similar with low coefficients of variation. To our knowledge, there has previously been very limited information in the literature on baseline levels of brain cholinesterase in many of the species we tested and report upon here.

110) POISONED URBAN MALLARDS – VICTIMS OF BIRD FLU FEAR?

Marja Isomursu, Finnish Food Safety Authority EVIRA, Oulu Department, P.O.Box 517, FI-90101 Oulu, Finland; Seija Berg, Finnish Food Safety Authority EVIRA, Department of Chemistry, Mustialankatu 3, FI-00790 Helsinki, Finland; Anita Huovilainen, Finnish Food Safety Authority EVIRA, Department of Virology, Mustialankatu 3, FI-00970 Helsinki, Finland

Mallards (*Anas platyrhynchos*) are among the most common overwintering birds in Finnish towns and they are often generously fed by city dwellers. Mallards are also well-known carriers of multiple strains of avian influenza (AI) viruses. In late February 2006, 22 mallards and one hooded crow (*Corvus corone cornix*) were found dead in and near a pond in Kotka, a small town in the southern coast of Finland. Nine mallards and the hooded crow were submitted to the National Veterinary and Food Research Institute for investigation. All the carcasses were fresh and in normal body condition. Pathological examination revealed no specific signs of illness. Three mallards had hemorrhage in the duodenum. Bacteriological cultures for pathogenic aerobic bacteria and salmonella enrichment were negative. Swab samples from trachea and cloaca were negative for AI virus (studied by real time RT-PCR method). Chemical analysis revealed traces of parathion in the liver samples of all ten birds. Peanuts found in the esophagus and gizzard of one mallard had a high concentration of parathion (2.6 mg/kg). It was concluded that the birds were intentionally poisoned by baiting their feed with parathion. Parathion is an organophosphorous pesticide that was earlier in common use in agriculture but is no longer on sale because of its high toxicity. The incident happened around the time when rapidly accumulating AI cases in wild European waterfowl were the main news topic. Emerging general bird flu fear could have been a possible motive behind the poisoning.

111) WORKING ELEPHANTS AS POSSIBLE INTERMEDIARIES FOR DISEASE TRANSMISSION BETWEEN DOMESTIC LIVESTOCK AND WILD UNGULATES IN CHITWAN, NEPAL

Gretchen E. Kaufman, Tufts Cummings School of Veterinary Medicine, 200 Westboro Rd., N. Grafton MA 01536 ; Sarad Paudel, Institute of Agriculture and Animal Science, Rampur, Nepal ; Kamal Gairhe, Veterinary Officer, HMG Department of National Parks and Wildlife Conservation, Sauraha, Nepal ; Kristi Delaski, Karin Hamilton, Louise Maranda, Christine Jost, and Sean Griffin, Tufts Cummings School of Veterinary Medicine, 200 Westboro Rd., N. Grafton MA 01536.

There are approximately 150 to 200 captive Asian elephants (*Elephas maximus*) in the buffer zone area bordering Chitwan National Park, in the Terai Arc of Nepal. Elephants are used by the tourism industry for jungle rides and by the government for forest management and tourism. A captive elephant breeding center is also operated by the government in the same buffer zone area. These elephants regularly come in contact with domestic livestock in the buffer zone and with wild ungulates in the National Park including gaur, hog deer, barking deer, chital deer, sambar deer, one-horned rhinoceros and wild Asian elephants. A series of animal health and demographic studies were conducted in the Chitwan buffer zone by Tufts University and the Institute of Agriculture and Animal Science, in collaboration with the HMG Department of National Parks and Wildlife Conservation. Health data collection for these studies included location determination using a Garmin global position system (GPS). GPS was also used to establish the captive elephant's ranges by accompanying representative elephants on their grazing and working routes in two seasons, and recording location every 200 meters. A database was constructed with ArcGIS, combining the elephant range data and the health surveillance location data. This database illustrates the potential role that the working elephants could play in transmission of disease between domestic livestock and the wild ungulates protected within the park and establishes a basis for future modeling of disease transmission in the Chitwan region.

112) MORTALITY AND MORBIDITY ASSOCIATED WITH GUNSHOT WOUNDS IN RAPTORIAL BIRDS IN THE PROVINCE OF QUEBEC: 1986 TO 2005

Stéphane Lair, Ariane Santamaria-Bouvier, Guy Fitzgerald, Marion Desmarchelier, Guylaine Séguin, Clinique des oiseaux de proie and Centre québécois sur la santé des animaux sauvages, Faculté de médecine vétérinaire de l'Université de Montréal, C.P. 5000, St. Hyacinthe, Québec, Canada, J2S 2M2

Despite the fact that raptors have been protected for decades in Quebec, these species are still regular victims of illegal shooting. The objective of this study was to characterize cases of shooting of raptors in Quebec over the last two decades. We reviewed clinical files, radiographs and pathology reports from free-ranging birds of prey admitted to the *Faculté de médecine vétérinaire* between November 1986 and June 2005. Evidence of gunshot was detected in 276 birds (6.2% of the 4432 birds admitted and 10.5% of the 2635 radiographed birds). Large birds, such as turkey vultures (12/33), ospreys (37/113), snowy owls (35/191), bald eagles (10/58) and rough-legged hawks (22/137), that often fly in open areas were the most frequently shot species. The percentages of shot raptors have declined steadily over time (1986-1990: 8.8%; 1991-1995: 7.8%; 1996-1999: 4.1%; 2000-2005: 2.8%). Despite potential sampling bias, this suggests a decrease in the intensity of illegal shooting of raptors in Quebec. Potential reasons for this trend include a decrease in the presence of firearms in raptors' habitat (decrease of hunting licenses over the years), and changes in the perception of the population toward raptorial birds. The educational outreach program led by a provincial organization dedicated to raptor conservation (*Union québécoise de réhabilitation des oiseaux de proie*) over this period may have accounted, at least in part, for the improvement observed. Due to the sampling bias, the significance of shooting as a cause of mortality in the general population of birds of prey is difficult to determine.

113) WILD RACCOON DOGS (*NYCTEREUTES PROCYONOIDES KOREENSIS*) AS SENTINEL FOR ENDEMIC PRESENCE OF SPOTTED FEVER GROUP RICKETTSIOSIS IN KOREA

Camer, Gerry Amor, DVM, PhD, College of Veterinary Medicine University of Eastern Philippines, Catarman, Northern Samar, 6400, Philippines; Park, Hee Jin, DVM, MS and Lim, Chae Woong, DVM, PhD, Bio-safety Research Institute, Chonbuk National University, Jeonju City, 561-756, Korea.

Spotted fever group rickettsiosis, a tick-borne zoonosis, has been recently suggested as an emerging arthropod-borne infectious disease in Korea. Epidemiological serosurvey for endemic presence of spotted fever rickettsial infection is usually done on wild rodents, feral and domestic dogs. In this study, wild raccoon dogs (*Nyctereutes procyonoides koreensis*) sheltered at the Korean Society for the Protection of Wild Animals, Chonbuk Branch, Korea were sampled and tested on 2004-2005 to indicate indigenous presence of spotted fever group rickettsial pathogens. Thirty-six serum samples of these animals were examined by indirect fluorescent antibody test (IFAT) using type-specific YH strain *Rickettsia japonica* (spotted fever group rickettsia). A highly endemic 30.5% seropositive rate was read at antibody level of >1: 64. This study is the first to demonstrate rickettsial antibodies in wild raccoon dogs serving as sentinel to indicate endemic presence of rickettsial infecting agents in Korea.

114) SPATIAL ANALYSES OF THE DISTRIBUTIONS OF *EHRlichia CHAFFEENSIS* AND *ANAPLASMA PHAGOCYTOPHILUM* IN THE MISSISSIPPI ALLUVIAL VALLEY.

Jamie S. Manangan, Warnell School of Forestry and Natural Resources, University of Georgia, GA 30602; Michael J. Yabsley, Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, GA 30602, and Warnell School of Forestry and Natural Resources, University of Georgia, GA 30602; Nathan Nibbelink, Warnell School of Forestry and Natural Resources, University of Georgia, GA 30602; Sara H. Schweitzer, Warnell School of Forestry and Natural Resources, University of Georgia, GA 30602; Michael C. Wimberly, Geographic Information Science Center of Excellence, South Dakota State University Brookings, SD 57007

Vector-borne zoonotic diseases offer unique challenges for predicting disease risk because of the complexity of pathogen-vector-host relationships, and influences of numerous environmental and ecological factors on pathogen distribution within the landscape. Human monocytotropic ehrlichiosis (HME), caused by *Ehrlichia chaffeensis*, and human granulocytic anaplasmosis (HGA), caused by *Anaplasma phagocytophilum*, are two emerging tick-borne zoonoses of concern. Factors influencing geographic distributions of these pathogens are not fully understood, especially at varying spatial extents (regional versus landscape) and resolutions (counties versus smaller land units). Serologic testing of white-tailed deer (*Odocoileus virginianus*) provides a convenient method for determining the geographic distribution of these two pathogens because deer are important hosts to both the tick vectors and the bacteria. From 1981-2005, we developed an extensive database of serum samples from white-tailed deer collected from wildlife management areas, national wildlife refuges, national forests, and private lands. We used these data to map the presence of *E. chaffeensis* and *A. phagocytophilum* in the Mississippi Alluvial Valley, a region where deer habitat is greatly fragmented by agriculture. To examine ecological factors and processes affecting distributions of these bacteria, pathogen location data were analyzed within a geographic information system. Spatial analyses indicate that bacteria presence or absence within forest patches is affected by landscape heterogeneity at finer scales than previously documented. Limited dispersal of tick vectors is likely a key process influencing pathogen distributions throughout this fragmented landscape.

115) PARASITIC FAUNA OF THE LIVING FOSSIL MONITO DEL MONTE (*DROMICIOPS GLIROIDES* MARSUPIALIA: MICROBIOTHERIA) IN A FRAGMENTED TEMPERATE RAINFOREST AT CHILOÉ ISLAND, CHILE.

Paula A. Marín-Vial¹, Juan L. Celis-Diez¹, Eduardo Raffo², Fernando Fredes², Santiago Merino³, Javier Martínez⁴ & Rodrigo A. Vasquez¹.

¹Instituto de Ecología y Biodiversidad, Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile, casilla 653, Santiago, Chile. ²Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Santiago, Chile. ³Departamento de Ecología Evolutiva, Museo Nacional de Ciencias Naturales-CSIC, Madrid, España.

⁴Universidad de Alcalá de Henares, Facultad de Farmacia, Departamento de Microbiología y Parasitología, Madrid, España.

Dromiciops gliroides is the only living species of the Order Microbiotheria. This small and rare opossum is endemic of South American temperate rainforests. Given the severe deforestation and population size decline, recently, IUCN categorized *D. gliroides* as a vulnerable species. Nowadays, the biology of “Monito del monte” is poorly known, especially when referring to its infectious diseases. Parasites are an important sanitary indicator. Some ectoparasites are biological vectors of pathogenic organisms (e.g. viruses, bacteria, protozoan and helminths) while digestive endoparasites determine nutritional stress and blood parasites, anemia. The main goal of this study was to describe *D. gliroides*’ internal and external parasites and the influence of sex and age on parasite-host associations. During 2005-2006, we examined 144 *D. gliroides* from Chiloé island. Among digestive parasites, we found the nematode *Pterygodermatites* sp. (Rictulariidae) in the intestinal tract of 75% of the individuals (n=8). Analysis of blood parasites (n=71) showed the presence of a new species of *Hepatozoon* sp.. Phylogenetic mapping places this *Hepatozoon* species apart from the lineage that parasites upon carnivores, but closer to Rodentia. On the other hand 74% of the individuals were positive to ectoparasites (n=141), comprised by *Plocopsylla diana* (Siphonaptera: Stephanocircidae), *Chiliopsylla allophyla* (Siphonaptera: Ctenophthalmidae) and *Ixodes neuquenensis* (Acarina: Ixodoidea) described for the first time in Chile. A 70% were parasitized by fleas and 20% by ticks. Further analysis will determine whether *I. neuquenensis* is the *Hepatozoon* sp. vector. We discuss differences in parasitism frequency between sex and age.

Acknowledgements: ICM P05-002, CONICYT AT-24050068 & FONDAP 1501-0001.

116) DETECTION OF GASTRIC HELICOBACTER SPP. IN WILD RACCOON DOGS (NYCTEREUTES PROCYONOIDES)

Park, Hee Jin, DVM, MS and Lim, Chae Woong, DVM, PhD, Bio-safety Research Institute, Chonbuk National University, Jeonju City, 561-756, Korea.

Helicobacter species had been isolated from the gastrointestinal tracts of broad range of animal hosts. In this study, we compared different methods of detecting gastric *Helicobacter* organism and determined the prevalence of different types of *Helicobacter spp.* in the stomachs of raccoon dogs. The gastric mucosa samples of eight wild raccoon dogs were examined by urease test, brush cytology, histological examination, electron microscopic examination, and PCR assay. The detection rate by urease test, brush cytology, and histological examination are 73.0%, 95.4%, 82.9% in 19 sites from gastrointestinal region and the results show that the fundic region is best sampling site. In scanning electron microscopic examination spirally curved rods were observed in all eight samples taken from urease positive sites. All 8 samples were positive for the *Helicobacter* genus and none were positive with a primer set specific for *Helicobacter pylori*. The 7 sequences of 8 samples were identical and showed relatively high nucleotide similarity with those of *Helicobacter heilmannii*-like organisms type II (*H. felis*, *H. bizzozeronii*, and *H. salomonis*). The no. 6 sequence has shown a relatively highest nucleotide similarity with that of *Helicobacter heilmannii*

117) SWINE KIDNEY WORM(STEPHANURUS DENTATUS) INFECTION IN WILD BOAR (SUS SCROFA COREANUS) IN KOREA

Park, Hee Jin, DVM, MS and Lim, Chae Woong, DVM, PhD, Bio-safety Research Institute, Chonbuk National University, Jeonju City, 561-756, Korea.

This is a case report of *Stephanurus dentatus* infection of a wild boar in Korea. On late April, 2005 near Jeonju City, a wild boar was found trapped in narrow gutter with severely traumatized hind legs. At autopsy, the urinary bladder and the large intestine showed severe congestion and the trace of a presumably migrating worm was found in the edematous kidney. Two adult female parasites were observed from renal pelvis. The sizes were up to 40 μ long and diameters were about 2 μ . The worms were stout, and the internal organs were partly visible through the transparent cuticle. In light and electron microscopic examination, buccal capsule like bell shaped was observed with teeth. The parasite identified as *Stephanurus dentatus* was detected for the second report in Korea.

118) DIROFILARIA IMMITIS INFECTION IN WILD RACCOON DOG
(NYCTEREUTES PROCYONOIDES)

Park, Hee Jin, DVM, MS and Lim, Chae Woong, DVM, PhD, Bio-safety Research Institute, Chonbuk National University, Jeonju City, 561-756, Korea.

In this study, we report the occurrence of *Dirofilaria immitis* infection in wild raccoon dog captured in Korea. Wild raccoon dog (*Nyctereutes procyonoides koreensis*) is sheltered at the Korean Society for the Protection of Wild Animals, Chonbuk Branch, Korea. At autopsy, we observed 4 adult *D. immitis* in the right ventricle of the heart. Blood smear examination likewise revealed the presence of microfilariae. This parasite in wild raccoon dogs was the second report in Korea.

119) PARASITIC MITES OF NORTH AMERICAN OWLS

James R. Philips, Math/Science Division, Babson College, Babson Park MA 02457-0310

Parasitic mites of owls include those which feed on blood, feather oils, feather tissue, skin, and tissue fluid. Host relationships range from monoxenous to polyxenous, and mite geographic distribution ranges from endemic to cosmopolitan. Of 43 species of North American owls, mites are known from 18 species, but records from the Holarctic species are mainly from the Palearctic region. The mite fauna of *Asio otus* is most well known, 16 species, but only 2 species are known from North American Long-eared Owls. The North American mite fauna of *Bubo virginianus* is the best known, 11 species, followed by that of *Athene cunicularia* with 9 species, *Strix varia* with 5 species and *Otus asio* with 4 species. Three or fewer mite species are known from other owls in North America. Data on occurrence on different regions of the host's body, mite populations on healthy and diseased owls, and pathology are largely lacking.

120) CANADIAN RISK ASSESSMENT ON HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1 (EURASIAN STRAIN) AT THE WILD/MIGRATORY BIRDS, ANIMAL HEALTH AND HUMAN INTERFACE

Nancy Rheault, Animal Health Risk Assessment Unit, Canadian Food Inspection Agency, Ottawa, Canada; Clea Coronel, International Affairs Branch, Canadian Food Inspection Agency, Ottawa, Canada

Highly pathogenic avian influenza (HPAI) subtype H5N1 virus outbreaks have been reported in Southeast and Central Asia since 1997, with the first outbreak occurring in Hong Kong. The disease was reported in domestic poultry, but also in dead migratory waterbirds, raising concerns as to their potential role in the dissemination of the virus along their migratory routes (flyways). A qualitative risk assessment process was conducted in Canada to evaluate the likelihood of Eurasian strain HPAI H5N1 virus transmission via wild/migratory birds to domestic birds, mammals and man. The methodology used was in accordance with the approach recommended by the World Organisation for Animal Health (OIE). This risk assessment scientifically characterized the hazard (avian influenza hazard identification) followed by the development of a 'release and exposure' scenario pathway of HPAI H5N1 introduced into Canada into an environment accessible to animals and humans in relation to the associated uncertainties and research gaps. This qualitative risk assessment was evaluated based on: (1) the susceptibility of wild/migratory birds to infection and epidemiology of the virus; (2) the likelihood of introduction of infection into Canada through migratory flyways, wild bird species of concern, their geographic range and overlap with other avian species; (3) the likelihood of infectious contacts with domestic birds, mammals and man, and; (4) the assessment of potential economic consequences associated with direct and indirect impacts of an outbreak in domestic poultry.

121) EXPERIMENTAL INFECTION OF FOX SQUIRRELS (*SCIURUS NIGER*) WITH WEST NILE VIRUS.

J. Jeffrey Root, National Wildlife Research Center, Fort Collins, CO 80521; Paul T. Oesterle, National Wildlife Research Center, Fort Collins, CO 80521; Nicole M. Nemeth, Department of Microbiology, Immunology, and Pathology, Colorado State University, Fort Collins, CO 80523; Kaci Klenk, National Wildlife Research Center, Fort Collins, CO 80521; Daniel H. Gould, Department of Microbiology, Immunology, and Pathology, Colorado State University, Fort Collins, CO 80523; Robert G. McLean, National Wildlife Research Center, Fort Collins, CO 80521; Larry Clark, National Wildlife Research Center, Fort Collins, CO 80521; Jeffrey S. Hall, National Wildlife Research Center, Fort Collins, CO 80521

Tree squirrels (*Sciurus* spp.) have exhibited high seroprevalence rates, suggesting that they are commonly exposed to West Nile virus (WNV). Many characteristics of WNV infections in tree squirrels, such as the durations and levels of viremia, remain unknown. To better understand WNV infections in fox squirrels (*S. niger*), we subcutaneously inoculated fourteen fox squirrels with WNV. Peak viremias ranged from $10^{4.00}$ plaque forming units (PFU) per ml of serum on days 2 post infection (DPI) to $10^{4.98}$ PFU/ml on 3 DPI, although viremias varied between individuals. One fox squirrel with preexisting antibodies to WNV did not develop detectable viremia, suggesting that these antibodies were protective. Oral secretions of some fox squirrels were positive for WNV viral RNA, occasionally to moderate levels ($10^{3.2}$ PFU/swab). Most experimentally infected fox squirrels became antibody positive between 8-10 DPI. All fox squirrels remained healthy throughout the experiment with the exception of one squirrel that exhibited hind limb paralysis on 1 DPI that was likely not associated with WNV infection. All surviving fox squirrels were euthanized on day 12 of the experiment and necropsied. Gross and histological lesions were rare, although one infected squirrel had moderate non-suppurative encephalitis and two had mild, focal myocarditis.

122) ECOLOGY OF THE GRAY FOX IN RELATION TO ORAL RABIES VACCINATION PROGRAMS IN TEXAS

Brian T. Mesenbrink, USDA-APHIS-WS-National Wildlife Research Center, Kerrville, TX 78028; Bruce Leland, USDA-APHIS-WS, San Antonio, TX 78201; Mike R. Dunbar, National Wildlife Research Center, Ft. Collins, CO 80521; Guy Moore, Texas Department of State Health Services, Austin, TX 78756; Randy DeYoung Texas A&M University-Kingsville, Kingsville, TX 79363; Robert G. McLean, National Wildlife Research Center, Ft. Collins, CO 80521; J. Jeffrey Root, National Wildlife Research Center, Ft. Collins, CO 80521

A study examining the ecology of the gray fox to assist oral rabies vaccination (ORV) programs in Texas was initiated in 2005 by National Wildlife Research Center scientists in cooperation with Texas Wildlife Services and Texas Department of State Health Services. A major objective of this study is to document the movements and the potential of long-distance movements of gray fox at three study sites using VHF and GPS collars. One of these study sites is associated with a recent ORV zone break which occurred near Kerrville, TX. To date, we have documented one male gray fox which has moved over 13 km in straight-line distance and other long-distance movements were also noted. An additional objective of this project involves a landscape-genetics approach to assist gray fox ORV strategies in Texas. Specific objectives include: 1) identification of landscape features influencing dispersal and gene flow, 2) estimation of dispersal rates, and 3) examination of sex bias in dispersal. This study will be of great complimentary value to the telemetry study described above. To date, in cooperation with the aforementioned collaborators, we have collected over 300 DNA samples from gray fox and are presently genotyping these foxes. A third major objective, which compliments both genetic and telemetry studies, is the development of GIS habitat layers. These layers are presently being built and will be used to compliment the genetic analyses.

Poster Presentation

123) IMMUNE RESPONSE OF WEST NILE VIRUS-NAÏVE REINDEER (*RANGIFER TARANDUS*) TO WEST NILE VIRUS VACCINATION

Cheryl Rosa, Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, AK 99775; Greg Finstad, Agricultural and Forestry Experimental Station, University of Alaska Fairbanks, Fairbanks, AK 99775

A pilot study assessing the safety and immunogenicity of the equine vaccine for West Nile virus (WNV) was performed in captive reindeer (*Rangifer tarandus*) at the Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Alaska. West Nile virus is a zoonotic pathogen that has caused serious illness and mortality in many species of animals in North America, though it has not yet been known to occur in Alaska. Reindeer demonstrate a susceptibility and relatively high morbidity to the virus. An equine vaccine (West Nile Innovator™) is available for off-label use in non-equid species, but immune response information and guidelines of use have yet to be developed. In this trial, forty-five adult reindeer naïve to WNV were vaccinated and boosted with the equine killed virus vaccine. Eighty-two percent of vaccinated animals responded to the vaccinations with a titer of equal to or greater than 1:10 two weeks post-booster vaccination (week 8). This number dropped to 75% at week 10 and to 37% at week 22. No adverse effects or long term sequelae were noted at the injection site or with respect to animal health in general.

This investigation demonstrates that the killed equine WNV vaccine has the ability to induce neutralized antibodies that may protect reindeer from infection. Primer and booster vaccinations generate moderate seroconversion of a short duration. The length of time reindeer are at risk of contracting WNV in the continental US is significantly longer than is experienced in Alaska. From these data, a single booster vaccine is unlikely to provide reindeer in the lower 48 states sufficient assumed protection from WNV throughout the typical risk period.

124) PREVALENCE OF *TRICHOMONAS GALLINAE* IN AN EURASIAN COLLARED DOVE POPULATION IN SOUTHERN TEXAS.

Autumn J. Smith and Alan Fedynich, Caesar Kleberg Research Institute, Texas A&M University-Kingsville, Kingsville, TX 78363

Trichomoniasis is an important disease of columbids (Columbidae) caused by *Trichomonas gallinae*. This protozoan appears to cause differential morbidity and mortality in columbids, in which white-winged doves (*Zenaida asiatica*) appear least affected and mourning doves (*Zenaida macroura*) the most affected. There is concern that exotic invasive columbids such as the Eurasian Collared Dove (*Streptopelia decaocto*) may be carriers of pathogens such as *T. gallinae* that can negatively impact native columbids. The objectives of this study were to (1) determine if Eurasian Collared Doves are infected with *T. gallinae*, and if so (2) assess prevalence and (3) determine if prevalence varies between years. Thirty-six Eurasian Collared Doves were collected in Kleberg County, Texas, of which 15 were collected in the spring of 2005, and 21 in the spring of 2006. A throat swab was obtained from each dove and inserted into an In-pouch TriTrichomonas Test pouch kit. Test pouch kits were incubated for 24 hours at 37°C and examined with a light microscope at 40x magnification for the presence of *T. gallinae*. *Trichomonas gallinae* was found in 25 Eurasian Collared Doves in which 8 of 15 (53%) and 17 of 21 (81%) occurred in 2005 and 2006, respectively. However, no signs of trichomoniasis were found. Prevalence of *T. gallinae* varied between years ($P = 0.078$). The prevalence of *T. gallinae* in this host should be closely monitored because of the Eurasian Collared Dove's propensity to expand its geographic range into areas traditionally occupied by native columbids.

125) CUTANEOUS FIBROMA OF ROE DEER (*CAPREOLUS CAPREOLUS*) - STILL A “NOVEL” DISEASE IN CROATIA

Kresimir Salajpal, Faculty of Agriculture, University of Zagreb, Svetosimunska 25, Zagreb, Croatia; Branko Sostaric, Ivan Vickovic, Josip Toncic, Croatian Veterinary Institute, Savska 143, Zagreb, Croatia

Although cervid fibromas (often designated as fibropapillomas) are described in a number of species as common neoplasms, findings in roe deer are relatively infrequent and have been extremely uncommon for the territory of Croatia where the Roe deer is omnipresent. The first two recorded cases were seen in 1997 (*Sostaric et. al.*) and although there were unofficial reports of increased incidence after that, here presented case of 2005 is only the fourth such finding. On gross examination numerous circumscribed, firm to soft, grayish-white, resilient skin neoplasm masses with alopecic surface were found in general distribution on the body with head and hind legs being more typical locations. Larger tumor fractions were presented with central ulcerations and necrosis practically without any vasculature on cut surface. On histopathological examination interlacing bundles of collagen and fibroblasts were seen. The covering epidermis showed moderate acanthosis and hyperkeratosis but otherwise of normal appearance. Even though cutaneous fibroma is not a disease new to the Croatian population of Roe deer and apparently has been present for years and also due to its distinct gross appearance it is highly unlikely that it will go overlooked by wildlife-keepers, the disease is still scarce and less than sporadic. Despite proven transmissibility of this tumor the infectivity of the papillomavirus is obviously minimal and the tumors which develop within weeks after inoculation usually regress in about 3 months without causing obvious emaciation or disturbed general health to the affected animals.

126) THE INFLUENCE OF TESTOSTERONE AND MIGRATION ON THE RELAPSE OF PLASMODIUM RELICTUM IN EXPERIMENTALLY INFECTED GRAY CATBIRDS (*DUMETELLA CAROLINENSIS*)

Amanda Jo Williams, University of Southern Mississippi, Hattiesburg, MS 39406; Jennifer C. Owen, University of Southern Mississippi, Hattiesburg, MS 39406; Mary Garvin, Oberlin College, Oberlin, OH 44074

Birds chronically infected with avian malaria often experience relapse in the spring, but the mechanism behind this phenomenon is poorly understood. Two possible triggers of spring relapse are the elevation of testosterone associated with the breeding season and stress from spring migration. To investigate the individual and synergistic effects of these variables, I will use the malaria parasite *Plasmodium relictum* and gray catbirds (*Dumetella carolinensis*). Fifty male hatch year gray catbirds (GRCA) will be infected via jugular inoculation, and ten uninfected birds will serve as negative controls. Spring migration will be simulated by photoadvancing birds in January to induce migratory restlessness. Testosterone will be elevated to levels observed during the breeding season with surgically inserted implants. Birds will be equally divided among the following six treatments: migratory with testosterone implant, migratory with placebo implant, non-migratory with testosterone implant, non-migratory with placebo implant, non-migratory with no implant, and negative controls (non-migratory with no implant). Prevalence and intensity of relapse will be monitored by microscopy of stained blood smears. I predict that relapse will occur at a greater rate in treatments undergoing migration and / or receiving testosterone, with the greatest prevalence and intensity in the treatment receiving both.

127) TREMATODIASIS IN A FREE-RANGING RINGED SEAL (*PHOCA HISPIDA HISPIDA*) WITH REFERENCE TO HEPATIC MERCURY CONCENTRATION

Victoria Woshner, 8607 Bromley Rd., Hillsborough, NC 27278; Debra Miller, The University of Georgia, VDIL, P.O. Box 1389, Tifton, GA 31793; Larissa Dehn, University of Alaska Fairbanks, Institute of Arctic Biology, P.O. Box 757000, Fairbanks, AK 99775; Kathy Burek, Alaska Veterinary Pathology Services, P.O. Box 773072, Eagle River, AK 99577; Murray Dailey, The Marine Mammal Center, 1065 Fort Cronkhite, Sausalito, CA 94965; Charles Brower, Native Village of Barrow, PO Box 1084, Barrow, AK 99723; John Blake, University of Alaska Fairbanks, Institute of Arctic Biology, P.O. Box 757000, Fairbanks, AK 99775; Todd O'Hara, University of Alaska Fairbanks, Institute of Arctic Biology, P.O. Box 757000, Fairbanks, AK 99775

A free-ranging ringed seal (*Phoca hispida hispida*) harvested by an indigenous Alaskan hunter was presented for necropsy because it appeared unthrifty and was easily depilated. The gall bladder was markedly distended and the pancreas was mildly enlarged, pale, firm, and friable. Hepatic bile ducts were distended and prominent, with notably thickened walls. There were copious flukes, (~ 1x5 mm) in ductal lumens of the pancreas, gall bladder and liver. The duodenum and ileum were markedly thickened. Histologically, numerous trematode cross sections were evident within lumens of ducts in the pancreas, gall bladder and liver. The most striking histopathologic findings were: diffuse, severe, chronic cholecystitis; multifocally extensive, moderate to severe pancreatitis; and multifocal, moderate, chronic cholangiohepatitis. Trematodes were identified as *Orthosplanchnus arcticus* (Odhner, 1905), of the family Campulidae, which comprises flukes of marine mammals. Compared to other adult ringed seals included in a study examining tissue metal concentrations in relation to trophic level, the hepatic concentration of methyl mercury (expressed as a percentage of total mercury) was increased in this heavily parasitized seal. Previous research has established that some marine mammals detoxify dietary methyl mercury through a process of demethylation and subsequent binding of inorganic mercury to selenium. Because the resultant mercuric selenide complexes accumulate in the liver throughout life, the *percentage* of hepatic methyl mercury declines with age, even as total mercury increases. The elevated methyl mercury percentage in this seal suggests that heavy parasitism may have compromised mercury metabolism and increased this animal's vulnerability to toxic effects of mercury.

128) LIPOID LIVER DISEASE AND STEATITIS IN A BLUE DAMSELFISH
(*POMACENTRUS PAVO*)

Jaime Lee Weisman, Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, 43 Brighton Road, Tifton, GA 31793; Debra Lee Miller, Veterinary Diagnostic and Investigational Laboratory, The University of Georgia, College of Veterinary Medicine, 43 Brighton Road, Tifton, GA 31793

Blue damselfish (*Pomacentrus pavo*) are native to the Indian and Pacific Oceans but also are popular aquaria species in commercial and private operations, yet, there remains a paucity of information regarding diseases in this species. A captive blue damselfish presented for bloat and was found to be two times normal size on examination. The fish was euthanized and a complete necropsy was performed. Grossly, a brown gelatinous material was found in the coelomic cavity displacing the coelomic organs, and the liver was diffusely pale. Histologic examination of the liver revealed the liver was being replaced by adipocytes. Granulomas were found throughout the liver and coelomic cavity while pigmented macrophages were found throughout the mesentery and organs. Both the granulomas and pigmented macrophages stained positive with PAS stain. A diagnosis of lipoid liver disease, steatitis, and coelitis was made based on the gross and histologic examinations. These findings are consistent with Vitamin E deficiency that can occur in fish due to nutritional imbalances. Rancid feed, low Vitamin E supplementation and chronic stress may have been contributing factors in this case.

129) SEVERE PYELONEPHRITIS IN AN AGED RED DEER (CERVUS ELAPHUS ELAPHUS) DAM

Ivan Vickovic, Branko Sostaric, Josip Toncic, Croatian Veterinary Institute, Savska 143, Zagreb, Croatia

With hundreds of pathomorphologically examined deer carcasses of harvested and animals found dead in the past years we have never come across a case of generalized urinary system disease of such a distribution and severity as described in this paper. To the authors' best knowledge and accessible literature this is first such gross finding in deer in Croatia, and in cervids in general. The suppurative, bilateral pyelonephritis with extensive tubulointerstitial involvement most likely originated as an extension of bacterial infection affecting the lower urinary tract that ascended the ureters and established an infection in the pelvis and inner medulla and was the immediate cause of death of this geriatric dam. The isolation of *Corynebacterium renale* as a common cause of lower urinary tract infection is, nevertheless, indicative of ascending infection. Less often pyelonephritis can result from descending bacterial infection of the kidneys occurring via hematogenous route (i.e. embolic nephritis). Since in this case suppurative glomerulitis, as well as metastatic septic emboli in the myocardium and lungs were observed, the possibility of descending propagation cannot be completely excluded. The papillary necrosis and severe chronic ureterocystitis are considered as secondary lesions to chronic-active pyelonephritis of prolong duration. These findings are of conceivable importance and are discussed here in the context of possible transmission among the fenced-in deer population from which the female originated.

Index of Presenting Authors

Acton, Anne E.	16, 98	Minnis, Richard B.	62
Aguirre, A. Alonso	99, 100	Molaei, Goudarz	70
Albareda, Diego	101	Mörner, Torsten	51
Amass, Keith	85	Mowlavi, Gholamreza	95
Artois, Marcela	87	Nandi, Jayashree S.	10
Atkinson, Mark W.	61	Nash, Paul B.	84
Beckmen, Kimberlee B.	93, 102	Nemeth, Nicole M.	24
Beekman, Gerard K.	103	Newman, Scott H.	76
Britch, Seth C.	82	Nol, Pauline	25
Brown, Justin D.	15, 50	O'Brien, Chris	26
Chiu, Jung-To	104	Ohishi, Kazue	57
Cook, Elizabeth	6	Park, Hee Jin	116, 117, 118
Cornish, Todd	90	Paul-Murphy, Joanne	41
Cranfield, Mike	7	Philips, James R.	119
Dein, F. Joshua	47	Pokras, Mark W.	77
Diuk-Wasser, Maria	105	Powers, Jenny G.	43
Drew, Mark L.	80, 86, 94	Pybus, M. J.	4
Driscoll, Cindy P.	53	Rabinowitz, Peter M.	3
Dubay, Shelli A.	91	Ramey, Craig A.	96
Elias, Roberto	106	Rheault, Nancy J.	120
Fann, Lindsay R.	17	Root, J. Jeffrey	121, 122
Fischer, John R.	5	Rosa, Cheryl	27, 123
Gagnon, Allison	18	Salajpal, Kresimir	125
Gavier-Widén, D.	52	Sangster, Cheryl	28
Gaydos, Joseph K.	58, 107	Schmidt, Stephanie R.	69
Gerhold, Richard W.	73	Schmutzer, Chandler	29
Gibbs, Samantha E.J.	71	Schuler, Krysten L.	30
Gilardi, Kristen	38, 56	Schultz, David J.	97
Gillin, Colin M.	44	Séguin, Guyaline	31
Gómez, Andrés	19, 45	Shender, Lisa A.	92
Guerrero-Sánchez, Sergio	108	Sidor, Inga F.	81
Haebler, Romona	74	Slate, Dennis	63
Harris, Rebecca	109	Sleeman, Jonathan	60, 78
Hernandez-Divers, Sonia M.	20	Smith, Autumn J.	124
Howerth, E. W.	83	Soos, Catherine	13
Isomursu, Marja	110	Stalknecht, David E.	49
Jardine, Claire	21	Suzán, Gerardo	14
Jayawardana, B.A.	39	Tate, Cynthia	89
Jessup, David	55	Thiagarajan, Bala	32
Joyner, Priscilla H.	22	Thomas, Nancy J.	79
Kaufman, Gretchen E.	111	Thundathil, Jacob	42
Keel, Kevin	75	Travis, Dominic A.	46
Lair, Stéphane	112	Trottier, Geneviève	48
Larsen, R. Scott	37	Tseng, Florina S.	68
Lesellier, S.	64	Uhart, Marcela	66
Lim, Chae Woong	113	van Riper, Charles	67
Long, David B.	65	Vickovic, Ivan	129
Malekani, Jean M.	8	Weber III, E. Scott	40
Manangan, Jamie S.	114	Weisman, Jamie Lee	128
Marco, Ignasi	88	Whiteman, Christina Wippich	59
Marcus, Leonard C.	2	Williams, Amanda Jo	126
Marín-Vial, Paula A.	115	Wobeser, Gary	1
Mazet, Jonn A.K.	11	Wolf, Tiffany M.	33
McGinn, Tom	36	Woshner, Victoria	127
McGraw, Sabrina	23	Wyckoff, Christy	34
Measures, Lena N.	54	Yabsley, Michael J.	72
Miller, Debra L.	9	Yahya, Hafiz S.A.	12
		Yeitz, Jennifer	35

PROGRAM OVERVIEW

Sunday	8:30 - 17:00	Editorial Board and Council Meetings
Aug 6	19:00 - 19:30	Student Members' Reception
	19:30 - 21:30	Welcome Reception

Monday	8:30 - 9:00	Welcome & Conference Overview
Aug 7	9:00 - 9:30	Carlton Herman Founders Fund Lecture
	9:30 - 10:00	Advancing Global Health: Facing Disease Issues at the Wildlife, Human, and Livestock Interface
	10:00 - 10:30	Break
	10:30 - 12:00	Advancing Global Health: Facing Disease Issues at the Wildlife, Human, and Livestock Interface
	12:00 - 13:00	Lunch
	13:00 - 14:15	Advancing Global Health: Facing Disease Issues at the Wildlife, Human, and Livestock Interface
	14:15 - 14:35	WDA Graduate Student Research Recognition Award
	14:35 - 14:50	Terry Amundson Student Presentations
	14:50 - 15:30	Poster Break
	15:30 - 17:00	Terry Amundson Student Presentations
	17:30 - 21:00	Picnic Dinner at Mansfield Hollow State Park

Tuesday	8:30 - 10:00	Terry Amundson Student Presentations
Aug 8	10:00 - 10:30	Poster Break
	10:30 - 12:00	Terry Amundson Student Presentations
	12:00 - 13:00	Lunch
	13:00 - 13:45	AAWV Cutting Edge Speaker
	13:45 - 15:00	Advancing Global Health: Linking Captive and Free-Ranging Wildlife Health
	15:00 - 15:30	Poster Break
	15:30 - 17:00	Advancing Global Health: Linking Captive and Free-Ranging Wildlife Health
	17:00 - 18:00	AAWV Business Meeting
	17:00 - 19:00	Dinner
	19:00 - 22:00	Auction & Dessert Reception

Wednesday	8:30 - 10:15	Avian Influenza Epidemiology and Management
Aug 9	10:15 - 10:45	Break
	10:45 - 12:00	Diseases of Marine Mammals
	12:00 - 13:00	Lunch
	13:00 - 14:45	Wildlife Disease Management and Surveillance
	14:45 - 15:15	Break
	15:15 - 17:00	Avian Diseases
	17:00 - 18:00	WDA Business Meeting
	18:30 - 22:00	Banquet and Awards Ceremony

Thursday	8:30 - 10:00	Long Term Monitoring
Aug 10	10:00 - 10:30	Break
	10:30 - 12:00	Long Term Monitoring; Techniques and Technology
	12:00 - 13:00	Lunch
	13:00 - 15:00	Techniques and Technology; Terrestrial Mammals
	15:00 - 15:30	Break
	15:30 - 16:45	Terrestrial Mammals
	16:45 - 17:00	Closing Remarks