Volume 8, Issue 1

TWS WILDLIFE DISEASES WORKING GROUP

Spring 2014

The Vector

The Newsletter of The Wildlife Society Wildlife Diseases Working Group

The Vector Timeline

Summer (Vol. 8, Iss. 2)	Fall (Vol. 8, Iss. 3)
Submissions Due 2 Jun. 14	Submissions Due 2 Sep. 14
Publication Date 30 Jun. 14	Publication Date 30 Sep. 14

The editors of The Vector welcome your contributions. If you wish to submit an article, but suspect you will not quite make the deadline, please contact Samuel M. Goldstein or Michelle Rosen.

Inside this issue:

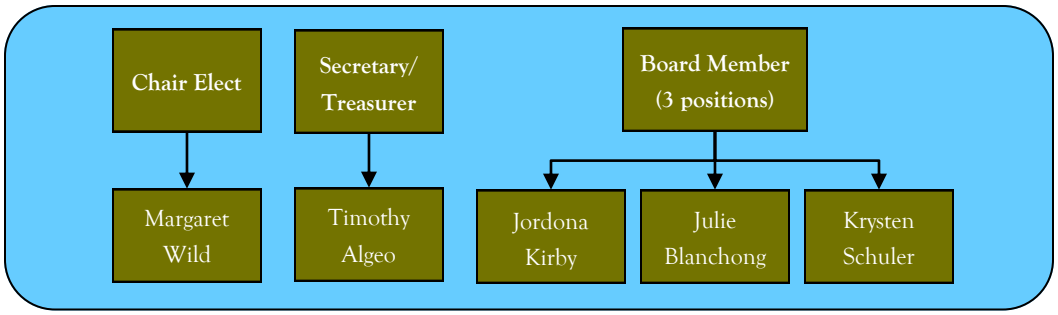
Your membership in the WDWG can only be obtained by joining and renewing your annual TWS Membership each year. At the time that you join simply indicate that you want to be a member of this working group on the TWS application. Membership dues are $5.

With your membership you will receive our quarterly newsletter to keep up-to-date with our group business and the most current disease issues. Your membership also provides an opportunity to work closely with other wildlife disease professionals.

WDWG Board Member Election Results

Congratulations to those who were elected!

And thank you to Collin Gillin, Aaron Hildreth, Barbara Bodenstein, Marcus Gray, Kristin Madden, Michelle Rosen, Stacey Samuelson, Eric Michael Schauber, Nina Schoch, and Kyle Van Why for their willingness to run for a board position and their ongoing commitment to TWS and the WDWG.



Call for Written Contributions to The Vector

The Wildlife Diseases Working Group is just one of 26 other working groups in TWS, but it has one of largest memberships—close to 200!! You should be proud to be part of a group with such a dedicated group of researchers, biologists, managers, students, and others who have a commitment to furthering our mission. That being said, let's share our knowledge and passion with each other!

Each year the WDWG distributes The Vector, our quarterly newsletter, showcasing the wonderful work of our students, ongoing research, and current topics in the wildlife disease realm. We need your help!! With our large and diverse membership each contributing one piece, we would have enough content to fill the newsletter for years! This is an opportunity for you to share information on a topic you find important and valuable to our members.

Please consider providing a short article about your profession or path to becoming a wildlife disease expert, major projects, research findings, or a hot topic in the wildlife disease field. Senior-level professionals may feel free to share lessons learned in their career to benefit students and early career professionals. Please encourage your students or technicians to do the same. Articles are not only a great way to share your current work, but they can also open doors for future collaboration. Articles need not be long or formal, and will go through an editing process by the editors and/or Student Affairs Committee upon submission. We encourage you to submit a few photos to accompany your writing.

Please jump at this opportunity to get involved, give back to your profession, share a little bit about what you do, and help shape your working group for the future. Inquiries and articles can be submitted at any time to Sam Goldstein (Samuel.M.Goldstein@aphis.usda.gov) or Michelle Rosen (Michigan DNR; Rosenm@michigan.gov).

Student Paper:

Exposure of Gray Wolves to Vector-borne Diseases in Wisconsin

by Rocio Jara

Articles are in-progress reports by students & young professionals. If you wish to cite this information, please contact the author directly for a personal communication or formal citation.

In the U.S., concern over canine vector-borne diseases has mainly focused on Lyme disease, anaplasmosis, ehrlichiosis and heartworm. These diseases affect domestic and wild dogs, and the first three can also affect humans. Scientists have assessed the prevalence and geographic distribution of these vector-borne pathogens in both domestic dogs and humans. However, aside from a few reports in wild gray wolves, there are no studies of these vector-borne diseases in wild wolf populations at large temporal and spatial scales. Because wolves are free-ranging they have increased contact with infected vector species, and the probability of being exposed to these pathogens is likely higher in wolves than in humans and dogs. Accordingly, the prevalence of wolf exposure to these pathogens might be greater than for humans and domestic dogs. It is therefore useful to study vector-borne infections in wolves not only to better understand health threats to wolf populations, but also because wolves might serve as a sentinel species for human and domestic dog health. The main aim of my study is to evaluate the temporal and geographic patterns of gray wolf exposure to these four vector-borne diseases in Wisconsin, and compare exposure patterns in wolves to those for humans and domestic dogs.

Rocio Jara taking a blood sample from a gray wolf in Northern Wisconsin. The wolf is under anesthesia and it was captured as part of the annual wolf monitoring program conducted by the Wisconsin Department of Natural Resources (WDNR)

Lyme disease is currently the most common vector-borne zoonotic disease in the U.S. It is caused by the bacterium *Borrelia burgdorferi* and transmitted in the Midwest and Northeast U.S. by the tick *Ixodes scapularis*. White-footed mice are the main reservoir for this agent which is transmitted among wild mammals. Humans and domestic animals are incidental hosts. Anaplasmosis is an emerging tick-borne disease that is caused by the rickettsia *Anaplasma phagocytophilum*. This bacterium is also transmitted by the bite of *I. scapularis*; therefore, coinfections with *B. burgdorferi* may occur. Canine ehrlichiosis is caused by the rickettsial bacterium *Ehrlichia canis* and is transmitted by the brown dog tick *Rhipicephalus sanguineus*. Domestic dogs are the main vertebrate reservoir for this disease, which has a worldwide distribution and also affects wild canids. Heartworm is caused by infection by the nematode *Dirofilaria immitis*. The definitive hosts for this parasite are domestic and wild canids including wolves and coyotes, which are infected via a feeding mosquito. The mosquitoes are simultaneously vector and intermediate host for this parasite; therefore, the presence and distribution of disease depends upon the geographic distribution of the competent mosquito vectors.

Between 1985 and 2011, 387 blood samples were obtained from gray wolves in Wisconsin. The samples came from wolves captured as part of the annual wolf monitoring program conducted by the Wisconsin Department of Natural Resources (WDNR). Wolves captured by the U.S. Department of Agricultural, Wildlife Service (USDA-WS) as part of culling operations for wolf depredation management were also sampled, as well as wolves that are captured as a non-target species during the coyote trapping season and wolves found dead by different causes (e.g., vehicle collision, illegally killed, or diseases). These samples include pups (0-1 year old), yearlings (1-2 years old), and adults (>2 years old). The majority of the samples come from northern and central Wisconsin forests, which are the primary habitats of wolves in Wisconsin. The samples were tested using the SNAP® 4Dx® Test (IDEXX Laboratories, Westbrook, ME) to determine the exposure of wolves to these four diseases. The snap test is a rapid, in clinic, ELISA assay that provides qualitative results for the presence of antibodies to *B. burgdorferi*, *A. phagocytophiulm*, and *E. canis* (indicative of current or past exposure) and the presence of the *D. immitis* antigen (indicative of current infection). Because this test was designed for domestic dogs and not wolves, I first needed to validate its use in wolves. I examined SNAP® 4Dx® Test results from 22 wolf samples previously tested for Lyme, anaplasmosis, and heartworm by Marshfield Medical Center Laboratory ® in Wisconsin. For Lyme disease, I found almost perfect agreement between the two methods (p-value = 1; Kappa = 0.82). There was weak agreement for anaplasmosis (p-value = 0.02), likely because Marshfield Laboratory was testing against (*Ehrlichia equi*) and the SNAP test detects (*Anaplasma phagocytophilum*). There was complete agreement between tests for heartworm, although all samples were negative, precluding statistical treatment.

I found prevalence of exposure was high for Lyme disease (65%) and anaplasmosis (47%), but low for ehrlichiosis (5.7%) and heartworm (8.8%). There was no difference in exposure between males and females to any of the diseases. The pathogens causing Lyme disease, anaplasmosis, and ehrlichiosis are transmitted by ticks which stay in one place while seeking a host. As a result, the probability of exposure to tick-borne pathogens may be influenced by movement of the host. Because pups stay near the den sites and adults move greater distances, I expected tick borne diseases to have a higher prevalence in older animals. In addition, if

(Continued on page 4)

2014 Student Travel Grant to the National TWS Meeting

The Wildlife Disease Working Group (WDWG) is offering a $500 travel grant to a TWS student member presenting a paper or poster at the Annual Conference of The Wildlife Society in Pittsburgh, Pennsylvania.

* The purpose of the travel grant is to promote student interest in the WDWG and to recognize outstanding student research in the area of wildlife diseases.

* Applicants must be students (registered as students at the meeting) and members of The Wildlife Society. Preference will be given to applicants who demonstrate strong interest and research accomplishments in wildlife disease.

To apply, submit:

1. A cover letter requesting an award (maximum 1 page) that explains your interest and experience in wildlife disease research;
2. An abstract of an accepted presentation at the Annual Conference of The Wildlife Society; and
3. A letter of support from a mentor, advisor, or supervisor.

The student travel grant submission deadline is July 1, 2014. The recipient of the award will be notified by July 15th, with the award being presented at the Wildlife Disease Working Group meeting, during the Annual Conference.

For further information, or to submit an application, contact Michael D Samuel, Department of Forest and Wildlife Ecology, University of Wisconsin, Madison, WI at mdsamuel@wisc.edu.

Call for Election Nominations– 3 Board Member Positions

The WDWG seeks nominations for candidates to fill **3 Board member positions** for the Fall 2014 elections. All candidates must be members of the WG, with priority given to active members, but is not required. **Deadline for nominations is June 2nd, 2014** sent to RBrown@humboldt.edu**.** Nominees should prepare a short statement, including how long they have been a member of the WG, related interests, and a photo. Students and new professionals are also encouraged to become candidates. For additional information and questions, please e-mail: RBrown@humboldt.edu.

Call for Student Articles

Interested in learning more?
Contact a member of the WDWG Student Affairs Committee:

We feature a student article in every newsletter, which highlights how students across the country are involved in wildlife disease projects.

As an appreciation for preparing the article, the WDWG is happy to **sponsor a 1-year membership to <u>both</u> TWS and the WDWG** for student and postdoctoral authors!

- Sarah A. Hamer, Texas A&M University: shamer@cvm.tamu.edu
- Michelle Rosen, Michigan DNR: rosenm@michigan.gov
- Graham Hickling, University of Tennessee: ghicklin@utk.edu
- Mike Samuel, University of Wisconsin: mdsamuel@wisc.edu

(Continued from page 2)

SNAP® 4Dx® Test that was used to analyze the blood samples. The blue circles represent the positive control (top left), anaplasmosis positive (top center) and Lyme disease positive (bottom).

antibodies are long-lasting, a positive result in an older animal might represent a life-time exposure. In contrast, current infection with heartworm, a mosquito borne disease, should be less dependent on host movement or age. To evaluate these predictions I compared the prevalence of exposure between different age groups for each disease. Adult exposure was significantly higher (p-value < 0.05, Bonferroni correction) than pups for all the diseases except heartworm. Moreover, exposure to *B. burgdorferi* in yearlings (75%) was also higher than pups (28%), but similar to adults (80%). The high rate of exposure in yearlings indicates that most wolves are infected with *B. burgdorferi* early in life.

Previous studies for Wisconsin reported the prevalence of domestic dog exposure to the pathogens that can cause Lyme disease is 10.2%, anaplasmosis is 10.5%, ehrlichiosis is 0.3%, and heartworm disease is 0.6%; in all cases, domestic dog prevalence was significantly lower than I measured in wild wolves. This might be expected because domestic dogs spend considerable less time outdoors than wolves and also receive preventive care from their owners (vaccination, tick removal).

I plan to continue analysis of the wolf serology data to understand the geographic and temporal distribution of exposure to these pathogens in Wisconsin as well as to compare patterns of exposure in wolves with those in humans and domestic dogs.

I thank Ron Schultz for his guidance in field work and the Wisconsin Department of Natural Resources for providing samples and funding. This research was also supported by funding from the U.S. Geological Survey and the Chilean National Commission for Scientific and Technological Research (CONICYT - Spanish acronym) which provided a graduate fellowship.

Rocio Jara obtained a DVM in Chile in 2010. In December 2013, she completed a Master of Science degree in the Conservation Biology and Sustainable Development program at The University of Wisconsin, Madison. She has recently returned to Chile to start a PhD program. Rocio is interested in disease ecology paying special attention to the interaction with humans and the environment.

TWS 2014 Annual Conference in Pittsburgh, PA

The Wildlife Society 2014 Annual Conference will take place October 25-30, 2014 in Pittsburgh, PA. For more details, check The Wildlife Society webpage at http://www.wildlife.org/ or http://www.wildlife.org/conferences.

You are invited to submit contributed papers and posters on topics of wildlife ecology, management, conservation, education, or policy for presentation. Get the details at http://wildlife.org/abstract2014 and submit your abstract no later than April 25, 2014.

Wildlife Diseases
The Wildlife Society
Working Group

Mission Statement

The mission of the Wildlife Diseases Working Group is to promote better scientific understanding of the causes and consequences of disease in ecosystems and wildlife populations; to apply the principles of wildlife science, ecology, and epidemiology to the prevention and management of diseases in wildlife; to foster education and transfer of information on diseases to wildlife management professionals and the public; and to apply this knowledge to enhance the health and conservation of wildlife populations and their interactions with humans and domestic animals.

Current Research in Wildlife Disease

Luis, A.D., D.T.S. Hayman, T.J O'Shea, P.M. Cryan, A.T. Gilbert, J.R.C. Pulliam, J.N. Mills, M.E.Timonin, C.K.R. Willis, A.A. Cunningham, A.R. Fooks, C.E. Rupprecht, J.L.N. Wood, and C.T. Webb. 2013. A comparison of bats and rodents as reservoirs of zoonotic viruses: Are bats special? Proceedings of the Royal Society of London, B. Biological Sciences 280: 20122753. doi: 10.1098/rspb.2012.2753. Bats are the natural reservoirs of a number of high-impact viral zoonoses. We present a quantitative analysis to address the hypothesis that bats are unique in their propensity to host zoonotic viruses based on a comparison with rodents, another important host order. We found that bats indeed host more zoonotic viruses per species than rodents, and we identified life-history and ecological factors that promote zoonotic viral richness. More zoonotic viruses are hosted by species whose distributions overlap with a greater number of other species in the same taxonomic order (sympatry). Specifically in bats, there was evidence for increased zoonotic viral richness in species with smaller litters (one young), greater longevity and more litters per year. Furthermore, our results point to a new hypothesis to explain in part why bats host more zoonotic viruses per species: the stronger effect of sympatry in bats and more viruses shared between bat species suggests that interspecific transmission is more prevalent among bats than among rodents. Although bats host more zoonotic viruses per species, the total number of zoonotic viruses identified in bats (61) was lower than in rodents (68), a result of there being approximately twice the number of rodent species as bat species. Therefore, rodents should still be a serious concern as reservoirs of emerging viruses. These findings shed light on disease emergence and perpetuation mechanisms and may help lead to a predictive framework for identifying future emerging infectious virus reservoirs.

Williams, B.M., A. Berentsen, B.C. Shock, M.Teixiera, M.R. Dunbar, M.S. Becker, and M.J. Yabsley. 2013. Prevalence and diversity of *Babesia, Hepatozoon, Ehrlichia,* and *Bartonella* in wild and domestic carnivores from Zambia, Africa. Parasitology Research online. doi: 10.1007/s00436-013-3722-7. A molecular survey was conducted for several hemoparasites of domestic dogs and three species of wild carnivores from two sites in Zambia. Three *Babesia* spp. were detected including *Babesia felis* and *Babesia leo* in lions (*Panthera leo*) and a *Babesia* spp. (similar to *Babesia lengau*) in spotted hyenas (*Crocuta crocuta*) and a single lion. All wild dogs (*Lycaon pictus*) and domestic dogs were negative for *Babesia*. High prevalences for *Hepatozoon* were noted in all three wild carnivores (38–61 %) and in domestic dogs (13 %). Significantly higher prevalences were noted in hyenas and wild dogs compared with domestic dogs and lions. All carnivores were PCR negative for *Ehrlichia canis*, *Ehrlichia ewingii*, and *Bartonella* spp. Overall, high prevalences and diversity of *Babesia* and *Hepatozoon* were noted in wild carnivores from Zambia. This study is the first molecular characterization of *Babesia* from any hyena species and is the first report of a *Babesia* spp. closely related to *B. lengau*, a parasite previously only reported from cheetahs (*Acinonyx jubatus*), in lions and hyenas. Although usually benign in wild carnivores, these hemoparasites can be pathogenic under certain circumstances. Importantly, data on vectors for these parasites are lacking, so studies are needed to identify vectors as well as determine transmission routes, infection dynamics, and host specificity of these hemoparasites in wildlife in Africa and also the risk of transmission between domestic animals and wildlife.