Volume 8, Issue 2

TWS WILDLIFE DISEASES WORKING GROUP

Summer 2014

The Vector

The Newsletter of The Wildlife Society Wildlife Diseases Working Group

Special points of interest:

- **Call for Board Nominations**
- **Student Travel Grant**
- **Student Article**

The Vector Timeline

Fall (Vol. 8, Iss. 3)	Winter (Vol. 8, Iss. 4)
Submissions Due 2 Sep. 14	Submissions Due 2 Dec. 14
Publication Date 30 Sep. 14	Publication Date 24 Dec. 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 WDWG membership 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 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.

Call for Election Nominations — 3 Positions

The WDWG seeks nominations for candidates to fill **3 board member positions** for the Fall elections. All candidates must be members of the WG. **Please respond ASAP.** Send nominations 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 encouraged to become candidates. For additional information and questions, please e-mail: RBrown@humboldt.edu.

Call for Written Contributions to The Vector

WE NEED YOUR HELP!

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!! 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 need not be long or formal. We encourage you to submit a few photos to accompany your writing.

Inquiries and articles can be submitted at any time to Sam Goldstein (Samuel.M.Goldstein@aphis.usda.gov) or Michelle Rosen (Rosenm@michigan.gov).

$500 Student Travel Grant to National TWS Meeting

WDWG is offering a $500 travel grant for TWS student members presenting at the Annual Conference
Submission Deadline: July 15th 2014

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From the Chair:

"Where Else Would You Rather Be?"

It is an exciting time to be a wildlife professional involved with the surveillance, research, prevention and management of wildlife diseases. For many of us currently in the wildlife disease research and management trenches, we embrace and affirm what former Buffalo Bills Coach Marv Levy said, "Where else would you rather be than right here, right now?" Interest continues to grow among wildlife biologists, pathologists, veterinarians and others to enhance our understanding of the ecology and potential management strategies for tackling wildlife diseases at their source to protect human and animal health, facilitate conservation

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Student Paper:

Prevalence, Burden, and Diversity of Chytrid Fungus in Eastern Hellbender Salamanders

By Alyssa Wetterau

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.

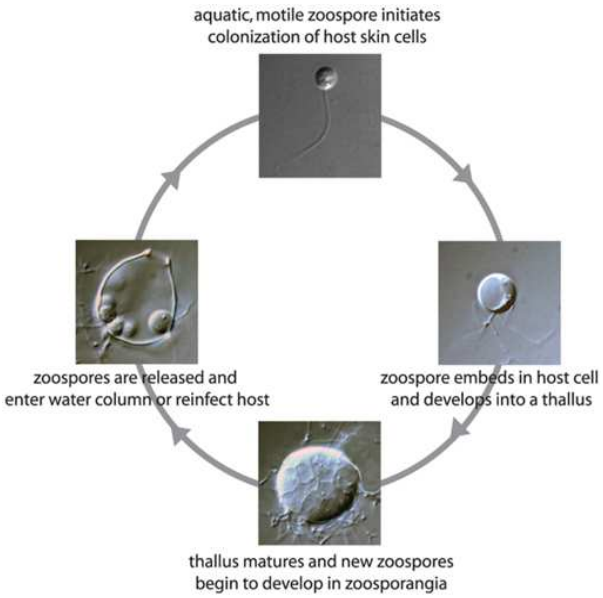
Declines beginning in the 1970s have resulted in the current classification of 517 amphibian species as "critically endangered" by the International Union for the Conservation of Nature (IUCN). Though global warming and human interference are widely accepted contributing factors to the declines, much of the blame is being assigned to the emerging infectious disease chytridiomycosis.

Chytridiomycosis is caused by *Batrachochytrium dendrobatidis* (Bd), a pathogenic chytrid fungus that colonizes the keratinized epithelium of amphibians. Initial exposure and infection occurs when the fungus is in its motile zoospore stage, thus allowing for transmission from individual to individual as well as from environment to individual. Following infection, the zoospore encysts to form a substrate-dependent sporangium, or nutrient requiring reproductive capsule, and completes its life cycle with release of more infectious zoospores into the environment.

Acute chytridiomycosis is characterized by premature skin sloughing, hyperplasia (cell proliferation) and hyperkeratosis (overgrowth of skin). Such epidermal changes inhibit the osmoregulatory function of the epithelium and can eventually lead to severe electrolyte imbalance and cardiac arrest. Recent research has also shown that Bd infection inhibits white blood cell function in amphibians, contributing to the failure of amphibian immune systems to clear an infection. In short, chytrid undermines the immune system and colonizes the skin of its victims. This ultimately causes overgrowth, sloughing, and functional inhibition of the skin while creating and releasing more infectious spores.

Adult hellbender salamander sampled during 2012 field season. Photo credit- Dr. Peter Petokas

For my research, I am studying chytridiomycosis in Eastern Hellbender salamanders (*Cryptobranchus alleganiensis alleganiensis*). This species is classified by the IUCN as "near threatened" due to decreasing abundance. Though hellbenders cohabitate with Bd and infections have been reported, studies to identify connections between infection, morbidity and mortality have been inconclusive. The specific objective of my project was to clarify the characteristics of Bd infections in hellbenders within a routinely monitored population in the Susquehanna watershed of eastern Pennsylvania.



Batrachochytrium dendrobatidis life cycle (Rosenblum et.al 2010)

We quantified the infection burden on 240 hellbenders sampled during the summer of 2012. Sampling was performed using a stream survey technique in which all large, flat rocks in a cross section of stream are lifted and checked for hellbenders. Our sample population consisted of 113 male and 67 female hellbenders of varying size ranging from 120 mm to 386 mm with a mean of 267.88 mm measured from snout to vent. All captured hellbenders were swabbed for Bd on their ventral abdomen, tail, and limbs. They were weighed, measured, sexed, and released at their capture site. We also performed PCR and sequencing of the internal transcribed spacer (ITS) DNA region of a subset of Bd isolates to demonstrate the origin and genetic variation of the pathogen.

DNA was extracted from the cutaneous swab samples and zoospore quantification was performed using a real-time Taqman quantitative polymerase chain reaction (qPCR) assay. By creating a standard curve using reported fluorescence from control samples of known concentration, target samples could be quantified by their location on the standard curve. This enabled us to determine not only whether or not the hellbenders were carrying an infection but also the pathogen burden.

We found 40.4% Bd prevalence overall within the hellbender population. The minimum infection reported was 0.06 zoospores and the maximum infection reported was 145 zoospores. The majority of the Bd positive individuals had zoospore loads between 1 and 20. Though not of statistical significance, we found differences in prevalence

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The **Fifth International Meeting on Emerging Diseases and Surveillance** (IMED 2014) is to be held in Vienna, Austria from October 31 to November 3, 2014. Now established as a fixture for those whose work deals with threats from infectious agents, IMED 2014 will once again bring leading scientists, clinicians and policy makers to Vienna to present new knowledge and breakthroughs and discuss how to discover, detect, understand, prevent and respond to outbreaks of emerging pathogens.

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.

From the Chair: (continued from page 1)

efforts and reduce economic impacts. This is a time of opportunity for students and working professionals alike to seize the moment – get your lab equipment humming and your boots muddy while collaborating with others in true "One Health" fashion. For me, part of building momentum and excitement around wildlife disease issues among wildlife professionals is being driven by the outstanding outreach activities the Wildlife Diseases Working Group (WDWG) has focused on since 2007.

I have been a member of The Wildlife Society (TWS) since 1987 and been part of the WDWG in some capacity since its inception. Since this is my first column as Chair of the WDWG, I want to start out by thanking the past Chairs of the WDWG: Keith Wehner, Scott Hygnstrom and Rick Brown. They each did an exceptional job leading the WDWG over the last few years and putting forth an activist agenda that help cement our reputation as a forward looking, roll up your sleeves and get it done group. The WDWG has helped to significantly raise awareness among the membership by sponsoring symposia and workshops at the annual TWS meeting, creating and distributing The Vector newsletter and writing and shepherding to the TWS council a position statement on wildlife diseases which was approved in July 2012 (http://www.wildlife.org/documents/position-statements/wildlife.disease.pdf). The goals of the WDWG as outlined in our Charter revolve around 5 basic concepts related to wildlife disease research and management to: (1) facilitate communication; (2) facilitate cooperation; (3) enhance the knowledge and technical capabilities of wildlife professionals; (4) increase public awareness, knowledge and appreciation for key issues and; (5) promote undergraduate and graduate student interest and participation.

My pledge as current Chair is really quite simple. I want to continue to focus on those 5 concepts and implement the "meat and potatoes" work of building on the great foundation the WDWG leadership and members have created to date. I will continue to work with and support the WDWG Newsletter Editors Sam Goldstein and Michelle Rosen to produce the best newsletter in TWS. We will continue to sponsor and support workshops and symposia at the annual TWS meeting as well as to provide technical input as requested from the council and others on wildlife disease issues as they arise. I also will continue to explore ways to collaborate with other working groups as well as the Wildlife Disease Association to enhance communication to a broader slice of TWS membership as well as the wildlife profession at large. But I will need your help and support. One of the first orders of business is to seek nominations to fill WDWG board member positions for the fall 2014 elections. All candidates must be members of the WDWG, with priority given to active members (although this is not required). Please send your nominations to Past Chair, Rick Brown at (RBrown@humboldt.edu). The time is now! I strongly encourage you to take advantage of this opportunity to get involved with the WDWG and this new wave of interest around wildlife diseases among your peers and the public. This opportunity is for both students and "old mossy backs" alike. Again, "where else would you rather be than right here, right now" working in support of the WDWG and your professional society?

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$500 Student Travel Grant to National TWS Meeting

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. The award recipient will be notified by the end of July, with the award being presented at the Wildlife Disease Working Group meeting, during the Annual Conference.

To apply submit by July 15th:

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.

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.

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between sex and age classes; males were more frequently infected than females and adults were more frequently infected than juveniles. These high prevalence and low pathogen loads are not characteristic of infections associated with global amphibian die-offs; they are far from fulfilling the "10,000 zoospore rule" introduced by Vredenburg et.al in 2010. This rule states that large mortality events associated with Bd are observed when pathogen loads of 10,000 zoospores are seen and the infection is spreading rapidly. Application of this rule to our findings suggests that Bd infections in the Susquehanna watershed are persistent and of low impact on the hellbender population. Additional support for this hypothesis is provided by the lack of visible lesions seen on any of the captured individuals.

ITS sequencing on eight Bd positive individuals demonstrated a high level of pathogen diversity. Sequencing revealed the presence of 29 different Bd haplotypes within the population sampled. This high level of genetic variability within the Bd population suggests that it has been present within the watershed for some time. It is also possible that the pathogen has been introduced multiple times but the high relatedness of many of the haplotypes makes that a less likely explanation. Haplotypes were variants of five previously reported clones of Bd strain CW34. Strain CW34 was first isolated in 2005 and originated in Namaqualand, South Africa in the host species African Clawed Frog (*Xenopus laevis*). It has previously been found in hellbenders located in the southern United States, indicating Bd's presence in multiple disjunct watersheds in the eastern United States.

With the intention of developing further evidence to support the hypothesis that chytridiomycosis is a persistent, sub-clinical infection in studied populations of hellbenders, we are beginning another phase of research. We will quantify the infection burden in these populations using archived samples up to 5 years old. This will provide us with a more dynamic view of the Bd population and may help us to more explicitly state the impact of chytridiomycosis on the studied hellbender populations.

Alyssa Wetterau is a wildlife technician working on disease tracking in New York State for the Cornell University Animal Health Diagnostic Center (AHDC) in association with the New York State Department of Environmental Conservation (NYSDEC). She is a prospective graduate student interested in studying wildlife conservation with a concentration in infectious disease, in preparation for a career in research. She can be contacted via e-mail at amw268@cornell.edu.

Literature Cited:

Rosenblum EB, Voyles J, Poorten TJ, Stajich JE (2010) The Deadly Chytrid Fungus: A Story of an Emerging Pathogen. PLoS Pathog 6(1): e1000550. doi:10.1371/journal.ppat.1000550

Vredenburg, V.T., R.A. Knapp, T.S. Tunstall, and C.J. Briggs. 2010. Dynamics of an emerging disease drive large-scale amphibian population extinctions. *Proceedings of the National Academy of* Science 107(21): 9689-9694

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

Sushan Han and Kristin G. Mansfield (*2014*) SEVERE HOOF DISEASE IN FREE-RANGING ROOSEVELT ELK (*CERVUS ELAPHUS ROOSEVELTI*) IN SOUTHWESTERN WASHINGTON, USA. Journal of Wildlife Diseases: April 2014, Vol. 50, No. 2, pp. 259-270. Reports of free-ranging Roosevelt elk (*Cervus elaphus roosevelti*) with abnormal hooves and lameness increased significantly in southwestern Washington, USA, during winter 2008. In March 2009 we examined five severely affected elk with clinical lameness from this region to characterize hoof lesions, examine the general health of affected elk, and potentially identify etiologies causing hoof disease. Three clinically normal elk from an adjacent but unaffected region were also collected as normal controls. Grossly, affected elk had deformed hooves that were asymmetrical, markedly elongated, and curved or broken, as well as hooves with sloughed horn. Most affected elk had severe sole ulcers with extensive laminar necrosis and pedal osteomyelitis. Histopathology of normal and abnormal hooves identified acute and chronic laminitis in all affected elk and one control elk. Hepatic copper and selenium levels in all affected and control elk were also deficient, and hoof keratin copper levels were low. No significant underlying systemic or musculoskeletal disease was detected in the affected elk, and attempts to isolate bacterial and viral pathogens were unsuccessful. A primary cause of hoof deformity was not definitively identified in this chronically affected group. Studies to identify infectious hoof disease and to characterize acute and subacute lesions are underway.

Ben T. Hirsch, Suzanne Prange, Stephanie A. Hauver, and Stanley D. Gehrt (*2014*) PATTERNS OF LATRINE USE BY RACCOONS (*PROCYON LOTOR*) AND IMPLICATION FOR *BAYLISASCARIS PROCYONIS* TRANSMISSION. Journal of Wildlife Diseases: April 2014, Vol. 50, No. 2, pp. 243-249. Mammals often use latrine sites for defecation, yet little is known about patterns of latrine use in many common species such as raccoons (*Procyon lotor*). Because raccoon latrines are important foci for the transmission of raccoon roundworm (*Baylisascaris procyonis*), documenting metrics of raccoon latrine use may have public health implications. Although some studies have provided evidence that multiple raccoons visit single latrine sites, exact latrine visitation patterns of raccoons have never been documented. We monitored raccoon latrine usage using proximity-logging collars placed at 15 latrine sites. We found that latrine sites were visited by multiple raccoons (range 1–7), and raccoons visited as many as six latrines during a 2-wk period. No sex differences were found in the number of latrines visited or time spent during visits. We posit that the use of multiple latrine sites by raccoons may lead to the pattern that rates of *B. procyonis* infection at latrines are greater than infection rates found in individual raccoon fecal samples. This in turn could lead to greater transmission of *B. procyonis* to paratenic hosts. Our results support the conclusion that raccoon latrines can be major foci for the infection and spread of *B. procyonis*.