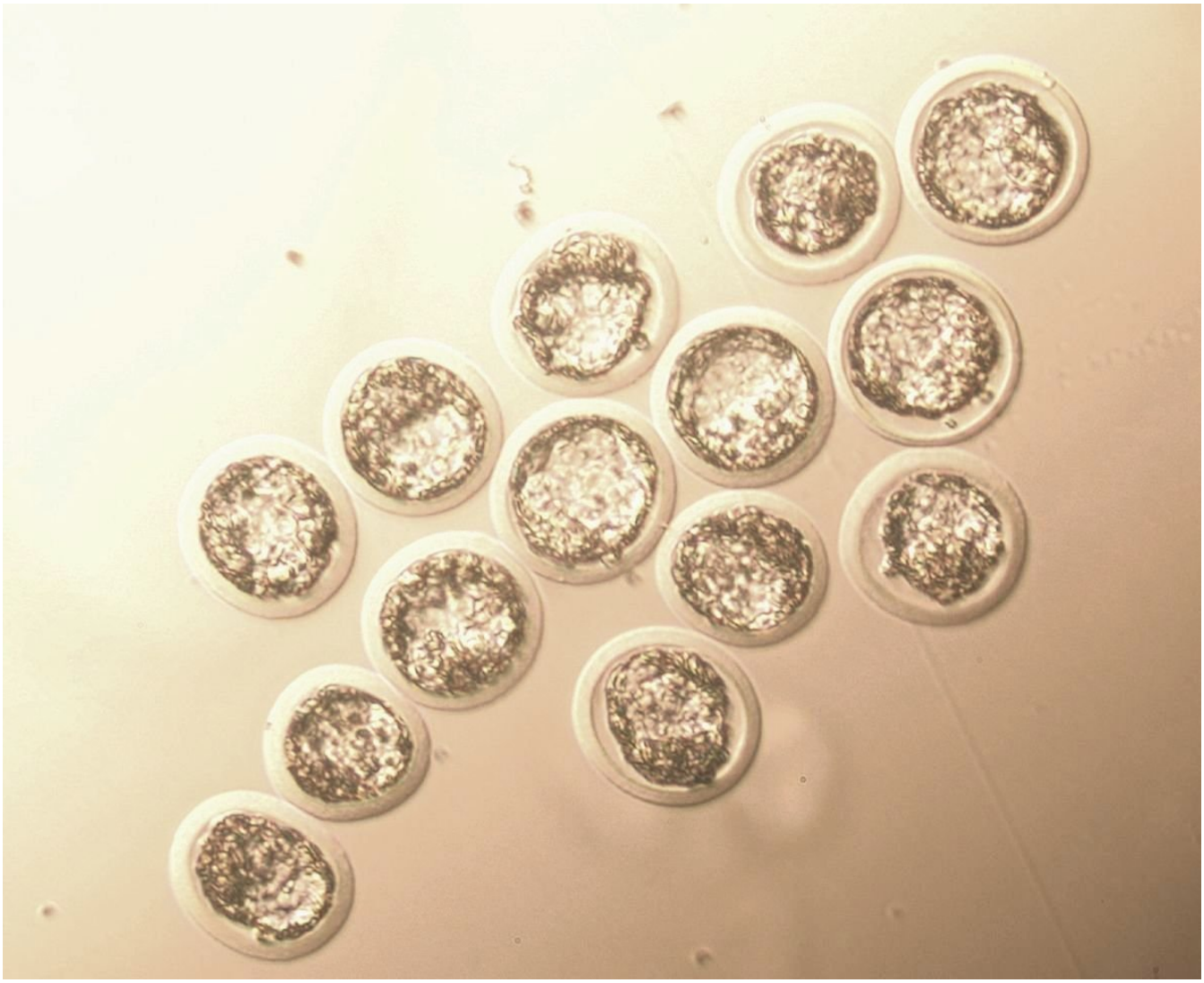
PEROMYSCUS NEWSLETTER

Number Forty-Four



Fall 2009

Cover:
Peromyscus maniculatus bairdii blastocyts generated by harvesting zygotes 68 hours after induced ovulation and after 48 hours of culturing. Photo by G. Szalai.

***Peromyscus Newsletter* Number 44**

Hello, All!

There are several items of particular note for this issue. First, please be aware that the USC biology department has a new email server that is not performing well. So if you send or fail to receive an email from an address with the "@biol.sc.edu" ending, please try again. We apologize for this inconvenience, but our hands are tied on this issue. In particular, this switch has also meant that the former Peromyscus@stkctr.biol.sc.edu is no longer working and may never work again, so instead please email Janet Crossland at crosslan@biol.sc.edu. Further details can be found in the *News, Comments, and Announcements* section.

Also note that the new *Peromyscus* Yahoo!Group has formed but it requires an invitation to join. I sent out invitations last year, but many people did not respond and the invitation expired. I will try sending out new invitations to subscribers in the next few months and I encourage everyone to accept the invitation to this new list-serv as it will be the fastest way for *Peromyscus* researchers to disseminate information in a timely fashion. Alternatively, you may simply email me at mammalogist@yahoo.com and I will make sure you get an invite right away. Please note that this is a private group and cannot be found on a search of Yahoo!Groups, thus you must receive and respond to the invitation in order to join.

Finally, if you have switched email addresses or are about to switch, please let me know so I can update your contact information. And as always, all suggestions to improve the Newsletter are appreciated! Everything related to *PN* should be sent to peromyscusnewsletter@yahoo.com until the server problems are fixed, hopefully in January 2010, after which the original peromyscusnewsletter@biol.sc.edu should work once again. Thanks for your understanding.

Take care and enjoy!

Julie

PEROMYSCUS NEWSLETTER is produced by the

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News, Comments, and Announcements

VERY IMPORTANT: USC SERVER PROBLEMS!!!

The biology department at the University of South Carolina recently switched to a new server which has been problematic. As a result, the long-held email address, Peromyscus@stkctr.biol.sc.edu no longer works and may never work again. If you need to get in contact with Stock Center personnel, please email either colony manager Janet Crossland at crosslan@biol.sc.edu or Associate Director Gabor Szalai at szalai@biol.sc.edu. The server has also not reliably sent out or delivered mail to and from the peromyscusnewsletter@biol.sc.edu account, either. Therefore, until this issue is fixed, hopefully in January, please send all Newsletter correspondence to peromyscusnewsletter@yahoo.com. Thanks so much for your understanding!

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OLD ISSUES OF *PN* ON WEB SITE

All of the old issues of *Peromyscus Newsletter* are now scanned and available on the stock center web site! Thank you Janet Crossland and Shelby Carter for all those efforts!

stkctr.biol.sc.edu/Peromyscus.Newsletter.htm

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RECENTLY PUBLISHED

We are thrilled to announce the long-awaited publication of the *Mammalian Species* account for *Peromyscus boylii*, the brush mouse! Thanks to Matina Kalcounis-Rueppell and Tracey Spoon for all your hard work! The species account is number 838 published in July 2009. The full citation is:

Kalcounis-Rueppell MC, and Spoon TR. 2009. *Peromyscus boylii*. Mammalian Species, 838, 1-14.

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DR. PAUL VRANA AT USC!

We are very pleased to announce that Dr. Paul Vrana, pioneering researcher in the field of genetic imprinting and enthusiastic supporter of *Peromyscus* research, has come to the University of South Carolina! The Stock Center is thrilled to have him so close by where he can interact with us and contribute years of *Peromyscus* experience. We're so happy to have you, Paul!

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OBITUARY

We are sad to report the death of Dr. Terry Yates at the age of 57. He died of brain cancer on December 11, 2007 at the University of New Mexico Health Sciences Center in Albuquerque. Dr. Yates is best known to the *Peromyscus* community for his work identifying the cause of what we now as Hantavirus Pulmonary Syndrome. Dr. Yates' collection of mice housed in the museum of Southwestern Biology was instrumental in tracking down *P. maniculatus* as the carrier of Sin Nombre Virus. So important was this discovery that The National Science Foundation named the Hanta Virus research done by Dr. Yates and his collaborator Dr. Robert Parmenter as one of NSF's Nifty 50 discoveries—projects which have had the greatest impact on the lives of Americans.

Dr. Yates served as Vice Provost for Research at the University of New Mexico in 2001, then served as Vice President for Research and Economic Development from 2004 until his recent death. He was also the Curator of Genomic Resources for the Museum of Southwestern Biology at UNM, a professor of biology and pathology, a member of the Board of Life Sciences of the National Academy of Sciences, and he helped create the Long Term Ecological Research site near Socorro. Dr. Yates was also a former external advisory committee member for the *Peromyscus* Genetic Stock Center. He contributed a great deal toward advancing our knowledge of our favorite mice and he will be greatly missed.

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OBITUARY

We are also sad to report the death of Dr. Betty Horner on her birthday, April 29, 2009 at the age of 93. She received her PhD from the University of Michigan in 1948 but spent her entire academic career at Smith College. Dr. Horner interacted directly with the Stock Center on several occasions and even contributed one of our special coat color strains, golden nugget, which she described with Stock Center founder, Dr. Wally Dawson, in 1993.

In addition to her work on *Peromyscus* coat color, Dr. Horner studied topics that varied from predation on overwintering monarch butterflies to paternal care of young mice. Her interaction with the PGSC was quite close, and over her long and productive career she contributed 600 35mm slides of various *Peromyscus* and related species, many black and white pictures of *P. polionotus leucocephalus*, and detailed annotations in her many notebooks. She also donated three books to the PGSC, all of which are significant to researchers of *Peromyscus*: “Man’s Nature and Nature’s Man” and “The Biotic Provinces of North America”, both authored by Dr. Lee Dice, as well as “Report Upon Natural History Collections Made in Alaska Between the Years 1877 and 1881”. She also contributed a motion picture sequence of climbing behavior in various species and subspecies of *Peromyscus* which she made while working with Dr. Dice at Michigan, as well as a tape showing the waltzing (whirling) behavior in non-agouti *P. maniculatus*, a description of which can be found in PN28.

She was such an inspiration that Dr. Dawson featured her as our *Peromyscus* pioneer in *Peromyscus Newsletter* issue 13. Appreciation for her work, however, extended much further. In 1986 Dr. Horner was honored with a special award from the American Society of Mammalogists for her many contributions to the study of mammalogy. I addition to a certificate, she was presented with a beautifully carved wooden *Peromyscus*. She will be sorely missed.

Photograph by Dick Fish, 1986

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PEROMYSCUS YAHOO! GROUP

In the last issue of PN I mentioned here the formation of a new list-serv in the form of a Google Group. Due to difficulties with that format, the new list-serv is now in the form of a Yahoo! Group, which offers many user-friendly features that I believe subscribers will find helpful, including the ability to search archives. This new groups was created in an effort to improve communication within the *Peromyscus* community. For those of you who are not familiar, this is a list serve complete with searchable archives. So members may post questions to other *Peromyscus* researchers instantly. In order to maintain your privacy I have restricted the group to people who have been invited to join. Only members can post messages, read the archives, view the members list, create pages and upload files. This group and its archives does not appear in public Yahoo! search results or the directory. The only way to subscribe to this new group is by invitation only. I have tried sending invitations to everyone who also receives PN, but many email address are no longer valid, and the invitation expires after one month. If you would like to subscribe, please email me and I will send you an invitation! The preferred email address to use at this time is my personal email account, mammalogist@yahoo.com because the new biology server has been less than reliable and I don't want to miss anyone's message!

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CLASSIC REFERENCE NOW ONLINE!

Osgood's classic reference, "Revision of the mice of the American Genus *Peromyscus*" originally published in 1909, has now been digitized by the University of South Carolina library and can be viewed at

http://digital.tcl.sc.edu/cdm4/document.php?CISOROOT=/naf&CISOPTR=285&REC=4

or as a pdf on the PGSC website (thanks to Paul Vrana) at

http://stkctr.biol.sc.edu/Osgood-1909.pdf

The full citation is:
Osgood WH. 1909. Revision of the mice of the American Genus *Peromyscus*. North American Fauna 28:1-285.

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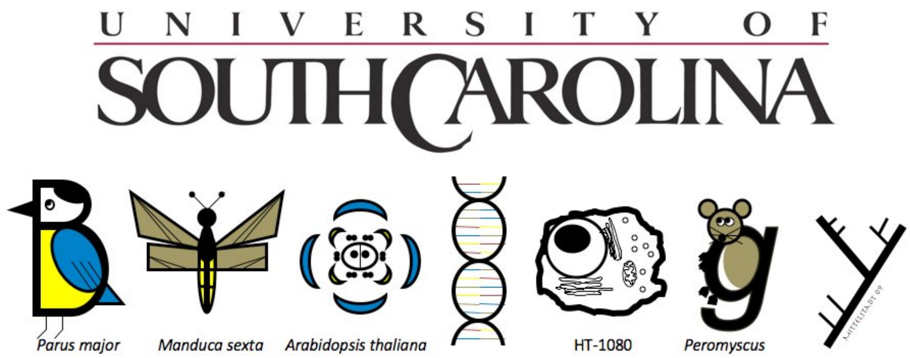
PEROMYSCUS ON NEW USC T-SHIRT!

The Department of Biological Sciences at the University of South Carolina has included a Peromyscus in its new t-shirt design!



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ALABAMA BEACH MOUSE IN NATIONAL GEOGRAPHIC

National Geographic published a beautiful photo spread of 20 endangered and threatened species in the United States, one of which was the Alabama Beach Mouse (*P. polionotus ammobates*). To view the photo go to:

http://ngm.nationalgeographic.com/2009/01/endangered-species/photo-map-interactive

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The 89th annual meeting of the **American Society of Mammalogists** took place June 24-28, 2009 at the University of Alaska, Fairbanks. There were an amazing 30 presentations relating to *Peromyscus*, some of which are included in the contributions section.

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The 2010 annual meeting of the **American Society of Mammalogists** will take place June 11-15, 2009 at the University of Wyoming, Laramie.

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USC ACCREDITATION

Congratulations to the University of South Carolina's Animal Resource Facility for once again passing inspection by the Association for Assessment and Accreditation of Laboratory Animal Care. USC has been accredited since 1984.

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THE *PEROMYSCUS* GENETIC STOCK CENTER

General

The University of South Carolina has maintained a genetic stock center for *Peromyscus* (deer mice and congeneric species) since 1985. The center was established under a grant from the Living Stocks Collection Program of the National Science Foundation and continues to be supported by NSF and the NIH Biological Models and Materials Research Program. It also receives support from the University and from user fees.

The major function of the Stock Center is to provide genetically characterized types of *Peromyscus* to scientific investigators and educators. Continuation of the center is dependent upon significant external utilization, therefore potential **users are encouraged to take advantage of this resource**.

Policies and Procedures

The Stock Center maintains several categories of stocks of living animals: 1) Closed colony random-bred[1] "wild-type" stocks of seven species of *Peromyscus*. 2) Two highly inbred[2] stocks of "wild-type" *P. leucopus*. 3) Stocks of fifeen coat color mutations, mostly in *P. maniculatus*. 4) Stocks of eight other monogenic traits. The Stock Center operates in strict compliance with the Animal Welfare Act and is located in an AAALAC approved facility. All animal care is performed by certified technicians. Stocks are monitored regularly for presence of disease and parasites and are free of hantavirus and 15 murine viruses.

The Stock Center also provides blood, organs, tissues, fetuses, skins and other biological materials from *Peromyscus.* The Stock Center operates a Molecular Bank where selected genomic libraries and probes are available. Other resources include a reference collection of more than 2,500 reprints of articles on peromyscine rodents, copies of which may be provided. The Stock Center is the primary sponsor of ***Pero*Base**, an on-line database dedicated to information regarding *Peromyscus* and closely related species.

Sufficient animals of the mutant types generally can be provided to initiate a breeding stock. Somewhat larger numbers, up to about 50 animals, can be provided from the wild-type stocks. Animals requested in greater numbers frequently require a "breed-up" charge and some delay in shipment.

Orders and Pricing

A user fee is charged for animals or materials provided by the Stock Center. A schedule of fees is shown on the next page. Fees vary with species and type of service provided. User assumes the cost of all shipment. Animals lost in transit are replaced without charge. Tissues, blood, skins, *etc*. are supplied at a modest fee that includes technician time. Arrangements for special orders will be negotiated. Billing will be submitted upon satisfactory delivery. **Write or call for details or special requirements.**

SCHEDULE OF USER FEES

Item	Academic and Government	Commercial
MATURE ANIMALS (each)		
Wild-type Stocks		
Smaller species (*P. maniculatus, P. polionotus, P. leucopus, P. eremicus*)	**$ 25.00**	**$40.00**
Larger species (*P. californicus, P. melanophrys, P. aztecus*)	**33.00**	**45.00**
Mutant and Inbred Stocks	**33.00**	**45.00**
Pregnant females (Smaller species)	**45.00**	**55.00**
(Larger species)	**60.00**	**70.00**
Special Attention (Diet, *etc*.)	**45.00**	**55.00**
F_1 Species Hybrids	**35.00**	**45.00**
TISSUE SAMPLES (Per sample)	Cost of the animal + lab fee + materials	
Solid		
Fluid (Blood, urine, saliva, etc.) per ml		
Flat skins (each)		
MOLECULAR MATERIALS		
Extracted DNA, 10 µg	**20.00**	
PCR Primers (500 µl @ 10 µM)	**10.00**	
Genomic & cDNA libraries	**300.00**	

OTHER CHARGES

Shipping costs = actual shipper's charges plus cost of mouse containers, packaging.

Lab fee for sample preparation ($35.00/hr).

Breed-up fees (for orders exceeding 50 animals) = *per diem* cage charges X cages required.

STOCKS AVAILABLE

WILD TYPE STOCKS	**ORIGIN**
P. maniculatus bairdii (BW Stock) Deer Mouse	Closed colony bred in captivity since 1948. Descended from 40 ancestors wild-caught near Ann Arbor MI.
P. maniculatus sonoriensis (SM2 Stock) Sonoran Deer Mouse	Derived from about 50 animals wild-caught by Jack Hayes in 1995 near White Mountain Research Station CA.
P. polionotus subgriseus (PO Stock) Oldfield Mouse	Closed colony since 1952. Derived from 21 ancestors wild-caught in Ocala Nat'l. Forest FL. High inbreeding coefficient.
P. leucopus (LL Stock) White-footed Mouse	Derived from 38 wild ancestors captured between 1982 and 1985 near Linville NC.
P. californicus insignis (IS Stock) California Mouse	Derived from about 60 ancestors collected between 1979 and 1987 in Santa Monica Mts. CA.
P. aztecus (AM Stock) Aztec Mouse	Derived from animals collected on Sierra Chincua Michoacan, Mexico in 1986.
P. melanophrys (XZ Stock) Plateau Mouse	Derived from animals collected between 1970 and 1978 from Zacatecas, Mexico and bred by R. Hill.
P. eremicus (EP Stock) Cactus Mouse	Originated from 10-12 animals collected at Tucson AZ in 1993.

INTERSPECIFIC HYBRIDS	
P. maniculatus X P. polionotus F_1 Hybrids	Bred by special order.
P. leucopus X P. gossypinus F_1 Hybrids	Sometimes available by special arrangement.

[3]**COAT COLORS**	**ORGINAL SOURCE**
Blonde *bln/bln*	Mich. State U. colony (Pratt and Robbins, 1982)
Albino *c/c*	Sumner's albino deer mice (Sumner, 1922)
Ashy *ahy/ahy*	Wild-caught in Oregon ~ 1960 (Teed et al., 1990)
[4]Brown *b/b*	Huestis stocks (Huestis and Barto, 1934)
California blonde *cfb/cfb*	Santa Cruz I., Calif., stock (Roth and Dawson, 1996)
Dominant spotting *S/+*	Wild caught in Illinois (Feldman, 1936)
Golden nugget b^{gn}/b^{gn}	Wild caught *P. leucopus* (Horner and Dawson, 1993)
Ivory *i/i*	Wild caught in Oregon (Huestis, 1938)
Platinum *plt/plt*	Barto stock at U. Mich. (Dodson et al., 1987)
[4]Silver *sil/sil*	Huestis stock (Huestis and Barto, 1934)
Tan streak *tns/tns*	Clemson U. stock from NC (Wang et al., 1993)
Variable white *Vw/+*	Mich. State U. colony (Cowling et al., 1994)
Wide-band agouti A^{Nb}/a	Natural polymorphism U. Mich. (McIntosh, 1954)

OTHER MUTATIONS AND VARIANTS

Alcohol dehydrogenase negative Adh^0/Adh^0	South Carolina BW stock (Felder, 1975)
Alcohol dehydrogenase positive Adh^f/Adh^f	South Carolina BW stock (Felder, 1975)
Boggler *bgl/bgl*	Blair's *P. m. blandus* stock (Barto, 1955)
Cataract-webbed *cwb/cwb*	From Huestis stocks (Anderson and Burns, 1979)
Epilepsy *epl/epl*	U. Michigan *P. m. artemisiae* stock (Dice, 1935)
Hairless-1 *hr-1/hr-1*	Sumner's hairless mutant (Sumner, 1924)
Hairless-2 *hr-2/hr-2*	Egoscue's hairless mutant (Egoscue, 1962)
Juvenile ataxia *ja/ja*	U. Michigan stock (Van Ooteghem, 1983)
Enzyme variants	Wild type stocks provide a reservoir of variants (Dawson, 1983)

[1] "Random bred" without deliberate selection, sib-sib matings avoided. [2] Inbred lines bred by sib-sib and/or parent-offspring mating for 21 generations or more. [3]Unless otherwise noted, mutations are in *P. maniculatus*.
[4]Available only as silver/brown double recessive.

Other Resources of the *Peromyscus* Stock Center

Highly inbred *P. leucopus* (I_{30+}) are available as live animals or as frozen tissues. Two lines developed by George Smith (UCLA) are currently maintained by the Stock Center.

Limited numbers of other stocks are on hand, but not currently available. Inquire.

Preserved or frozen specimens of types given in the above tables.

Flat skins of mutant or wild-type coat colors of any of the stocks listed above.

Reference library of more than 2500 reprints of research papers, articles and reports on *Peromyscus.* Single copies of individual articles can be photocopied and mailed. Please limit requests to not more than five articles at any given time. There will be a charge of 10 cents per photocopied page after the initial 20 pages.

Photocopies of back issues of *Peromyscus Newsletter* ($5 ea.) or single original back copies, when still available, without charge.

Materials are available through the *Peromyscus* Molecular Bank of the Stock Center. Allow two weeks for delivery. Included is purified DNA or frozen tissues of any of the stocks listed above. Several genomic libraries and a variety of molecular probes are available. (Inquire for more information)

For additional information or details about any of these mutants, stocks or other materials contact: Janet Crossland, Colony Manager,* Peromyscus *Stock Center, (803) 777-3107, e-mail crosslan@biol.sc.edu

PLEASE CALL WITH INQUIRIES

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Spotlight on STARI:
Southern Tick-Associated Rash Illness

Although Lyme disease is not generally considered common in the southeastern United States, another disease with similar symptoms is gaining notoriety. First recognized in the late 1980s, the disease is called Southern Tick-Associated Rash Illness, or STARI for short. Sometimes it is referred to as Masters disease after Dr. Edwin Masters, a Missouri physician who brought the unusual rashes he saw to the attention of the Centers for Disease Control and led to the first descriptions of STARI. Below is a bit of information about this newly recognized disease which, like lyme disease, may infect *Peromyscus*.

Etiologic Agent

Unknown, but thought to be a spirochete like *Borrelia burgdorferi*, the spirochete causing Lyme disease. *B. burgdorferi* is likely not the cause as it has never been cultured from patients showing STARI symptoms, even though it is easily cultured from Lyme patients. However, antibodies to *B. burgdorferi* proteins can be elicited when *B. burgdorferi* extracts are mixed with serum from STARI patients. Thus, the etiologic agent is believed to be very similar to *B. burgdorferi*. One candidate has been *B. lonestari* which has been detected by polymerase chain reaction in the skin lesion of one patient, however, a larger study was unsuccessful in detecting *B. lonestari* in other patients. Thus, the etiologic agent has remained elusive.

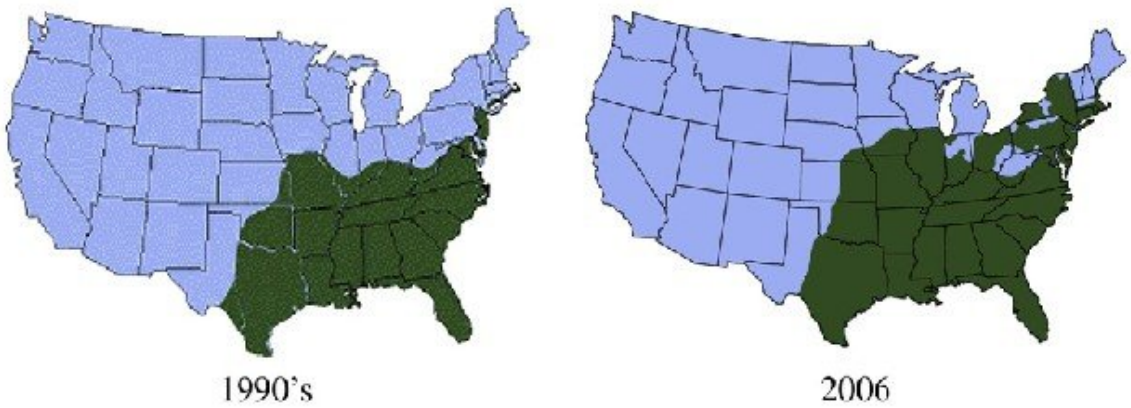
Transmission Vector

Transmission to humans is generally believed to occur via a bite from a Lone Star tick, *Amblyomma americanum*, one of the most common ticks known to feed on humans. This contrasts with Lyme disease which is transmitted from the bite of *Ixodes* ticks (e.g., *Ixodes scapularis*, the deer tick, and *Ixodes pacificus*, the western black-legged tick).

Lone Star tick nymph and adult female

Distribution

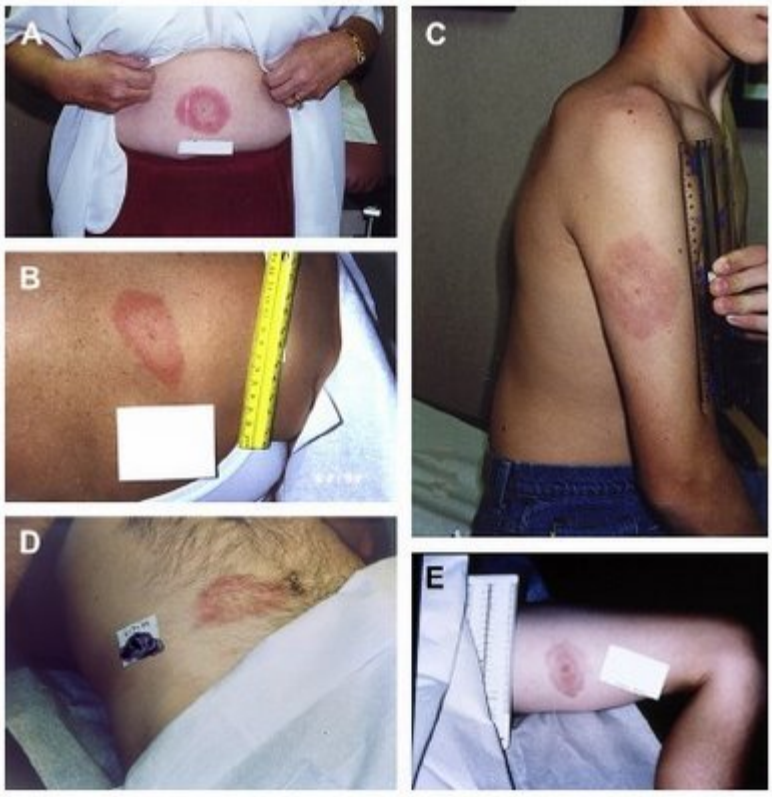
As the range of the Lone Star tick expands northward, so is the presence of STARI. In the northeastern US where Lyme disease is common, distinguishing STARI from Lyme disease has proven difficult.



Distribution of the Lone Star tick (from Masters et al., 2008)

Symptoms

Within seven days of being bitten by a Lone Star tick, patients note an expanding "bulls-eye" skin rash that is similar in appearance to the erythema migrans of Lyme disease (note, however, that not all Lyme disease rashes present as a bulls-eye pattern). Compared to Lyme disease, STARI rashes are generally smaller and less variable in shape with a clearer center, making them appear much more like a bulls-eye than typical Lyme rashes. Patients may also complain of fever, headache, stiff neck, myalgias, and joint pain, however, these complaints are usually less frequent and less severe than in patients diagnosed with Lyme disease. Similarly, although some physicians have noted post-rash neurologic and cardiac problems in STARI patients, these cases are again much rarer than reported for Lyme disease. Because Lone Star ticks are also known to be vectors of Q fever and human monocytic ehrlichiosis there is always the possibility of coinfection, which has already been documented in the scientific literature.



Typical bulls-eye rashes from STARI patients (from Masters et al., 2008)

Diagnosis

Because the etiologic agent of STARI has yet to be cultured from the rash and positively identified, diagnosis is based solely on symptoms, particularly the presence of an expanding circular rash, and ideally a history of a known bite from a Lone Star tick.

Treatment

Currently, patients diagnosed with STARI are treated with antibiotics in a similar fashion as if they had Lyme disease. Doxycycline or amoxicillian administered for 2-3 weeks is commonly prescribed and most patients respond well if treated early.

Relevant Literature

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NOTICE

***PEROMYSCUS NEWSLETTER* IS NOT A FORMAL SCIENTIFIC PUBLICATION.**

THEREFORE…

INFORMATION AND DATA IN THE CONTRIBUTIONS SECTION SHOULD NOT BE CITED OR USED WITHOUT PERMISSION OF THE CONTRIBUTOR.

THANK YOU!

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Population Assessment of Golden Mice in Illinois: Relative Abundance and Sympatric White-Footed Mice

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Abstract

Golden mice (*Ochrotomys nuttalli*) are on the periphery of their range in Illinois where they are a state-listed species because of limited distribution and low population density. This project was initiated to assess relative abundance and distribution of *O. nuttalli* in Illinois in comparison with populations throughout the core of their geographic range. We live trapped small mammals at 24 sites in southern Illinois; each site (7 x 7 grids) was sampled twice for 5-day periods from April-October 2008. Golden mice were trapped on 21 of the sites (mean = 4.13 individuals; range 1-15). White-footed mice (*Peromyscus leucopus*) occurred on all sites (mean = 10.04; range 2-21). We expected an inverse relationship in abundance between the two species because of interspecific competition. However, there was a significant positive relationship considering new animals for each sample period ($F = 16.32$, $df = 46$, $P < 0.0002$) as well as minimum number known alive ($F = 8.69$, $df = 46$, $P < 0.005$). Positive relationships may have resulted from sampling bias that favored golden mice because traps were placed above ground as often as possible. From May through October 2009, 24 sites throughout the southeast U.S will be sampled for comparison with Illinois populations.

Introduction

Golden mice are often locally common in the southeastern United States—the core of their geographic range—where they are considered “secure.” However, in states on the periphery of their range, including Illinois, Missouri, Texas and West Virginia, they are state listed as threatened or an equivalent (Feldhamer and Morzillo 2008). Listings of golden mice may be a result of their actual rarity, or just perceived rarity due to highly elusive behavior, spatial clustering of populations or temporal shifts in overall abundance. The purpose of this project is to determine if the listing of *O. nuttalli* in Illinois is warranted. Populations of golden mice were quantitatively assessed throughout the southern part of Illinois to determine their relative abundance and site occupancy. Results will be compared to populations from the core of the range in the southeast. If results are similar, *O. nuttalli* will be proposed for removal from the threatened list in Illinois. The initial data from trapping in Illinois offered an opportunity to examine relative abundance between golden mice and white-footed mice (*Peromyscus*

leucopus). These sympatric species exhibit a high degree of niche overlap, and are considered by many investigators to be competitors in shared habitats.

Methods

Twenty-four study sites throughout Illinois were selected using GAP analysis and GIS data layers to identify ideal habitat for golden mice. All twenty-four sites were randomly selected on public land (Shawnee National Forest, Crab Orchard National Wildlife Refuge, and Cypress Creek National Wildlife Refuge) and within 0.4 km of a road for easy accessibility.

Live trapping occurred from spring 2008 through early autumn 2008. Traps were set concurrently on 3 grids at a time for 5 consecutive nights—49 Sherman traps in a 70m x 70m grid at each site. Traps were placed in elevated locations when possible in the best available golden mouse habitat. From 30 to 49 traps were elevated on each of the 24 sites. Of 1176 traps (49 per site x 24 sites), 926 were elevated (76.7%). Traps contained fiberfill batting and were baited with sunflower seeds and cracked corn. Captured animals were marked with Monel ear tag and 1.5 mm ear tissue biopsy removed for later genetic analyses. We recorded species, gender, weight, reproductive status, station, and trap location (elevated or ground). Data were analyzed using JMP IN 4.0.2.

Results

Total captures: golden mice = 99 individuals caught 190 times (174 times in elevated traps = 91.6%). White-footed mice = 244 individuals caught 565 times (465 in elevated traps = 82.3%)

Accounting for most traps being elevated, golden mice were caught significantly more often in elevated traps ($\chi^2 = 23.53$, df = 1, $P < 0.00001$), as were white-footed mice ($\chi^2 = 9.91$, df = 1, $P < 0.005$).

For all 24 sites (pooled data): regression of golden mice caught in elevated traps vs. number of elevated traps on site was significant ($F = 5.02$, df = 22, $P < 0.036$). This relationship was still significant when accounting for white-footed mice caught in ground traps [i.e., did more w-footed mice on ground force golden mice to elevated traps? No] ($F = 4.29$, df = 21, $P < 0.027$). The number of golden mice caught in elevated traps was not related to the number of w-footed mice caught in ground traps ($F = 0.18$, df = 22, $P < 0.676$).

There was no relationship between w-footed mice caught in elevated traps and the number of elevated traps ($F = 0.28$, df = 22, $P < 0.600$). There was a significant relationship between number of w-footed mice caught on the ground and the number of ground traps ($F = 5.84$, df = 22, $P < 0.024$). The number of golden mice caught in ground traps was not related to the number of traps on the ground ($F = 1.47$, df = 22, $P < 0.238$). There was still no relationship when

corrected for number of white-footed mice captured in ground traps at same time ($F = 0.84$, $df = 21$, $P < 0.444$).

There was a significant POSITIVE relationship between golden mice and w-footed mice captured in elevated traps during same period (pooled data) ($F = 22.07$, $df = 22$, $P < 0.0001$), and for all sites on a daily basis ($F = 91.22$, $df = 238$, $P < 0.0001$).

Discussion

Over twice as many individual white-footed mice were caught almost 3X more often as golden mice is consistent with the idea that *O. nuttalli* is generally uncommon with population densities lower than sympatric species of *Peromyscus* (Feldhamer and Morzillo 2008; Rose 2008). Nonetheless, the number of golden mice we caught was greater than expected on the periphery of their range. Golden mice are arboreal, but even accounting for the elevated trap bias we caught them even more often than expected above ground. Arboreal captures of golden mice were not affected on our study sites by the number of white-footed mice captured on the ground. We expected an inverse relationship between golden mice and white-footed mice due to interspecific competition. Based on the number of arboreal captures, however, there was no apparent interspecific competitive interaction between these species on our sites. Both species were trapped significantly more often in elevated traps and showed a positive relationship in total captures. It appears that *O. nuttalli* and *P. leucopus* in southern Illinois are both responding to better arboreal habitat versus ground habitat. We can contrast our results with those of Feldhamer and Maycroft (1992) and others who found significant inverse relationships in abundance between these species (see Christopher and Cameron 2008). The role of competition between golden mice and white-footed mice certainly reflects regional and site-specific microhabitat impacts, as well as a mosaic of other interacting factors—as such, generalizations and firm conclusions remain problematic.

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Introduction of Exotic Species on Islands*: Peromyscus* Found on Shemya Island of the Far Western Aleutian Islands of Alaska

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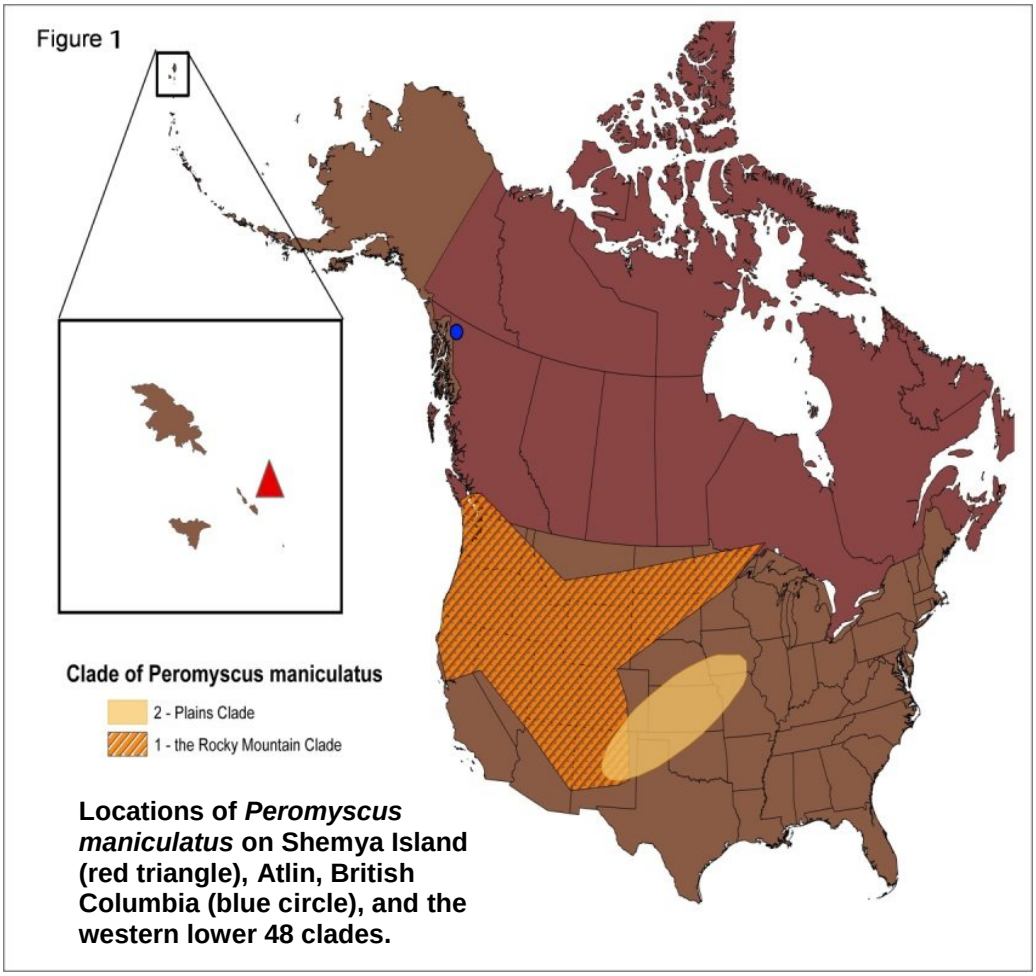
Shemya Island (Fig. 1, red triangle), one of the Semichi Islands of the Near Aleutian Islands group, now harbors an expanding population of deermice, genus *Peromyscus* (MacDonald and Cook 2009). This population was first discovered and a sample taken in 1978 by D. D. Gibson, University of Alaska Museum of the North, during the course of his field work there. Given the monumental conservation issue of island exotics in general, their presence on this remote North Pacific island, far from the known range limits of the genus, has generated questions surrounding their origin and identity.

To begin answering these questions, we collected mitochondrial cytochrome *b* sequence data from 2 individuals from Shemya. For comparison, we obtained 47 additional sequences of *Peromyscus* from GenBank.

Preliminary analysis suggests a closer genetic relationship with the Rocky Mountain States lineage (Dragoo et al., 2006) of putative *P. maniculatus* in the western Lower 48 states (Fig. 1, orange hatched range). The geographically proximate *P. maniculatus* population occurs in Atlin, British Columbia (Fig. 1, Blue circle), however, they, and all other individuals of both *P. maniculatus* and *P. keeni* from elsewhere in Alaska and central and upper British Columbia, appear to be more genetically distant. These findings suggest an anthropogenic introduction of *P. maniculatus* to this island.

The discovery of the introduced *P. maniculatus* population on Shemya Island reinforces the need for more effective plans to prevent undesired transport of exotic animals, particularly to island localities (Ebbert and Byrd 2002).

We plan to collect cyt*b* and nuclear introns sequences from additional individual mice from the Shemya Island population captured over a span of 15 years to further test their origin and assess whether they are derived from a single introduction event. Knowing the origin and number of introductions of the Shemya mice will provide information regarding invasions of this species in the Aleutian Islands and elsewhere.



Locations of *Peromyscus maniculatus* on Shemya Island (red triangle), Atlin, British Columbia (blue circle), and the western lower 48 clades.

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Detecting Natural Selection in Pacific Northwest Deer Mice: An Integrative Approach

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We investigated a previously identified mtDNA genetic break in deer mice, *Peromyscus maniculatus* (Avise 1979a; Lansman *et al.* 1983; Dragoo *et al.* 2006) using both mtDNA sequences and nuclear genomic markers. We analyzed spatial variation in a 491-base-pair fragment of the mtDNA control region from 455 samples distributed across a north-south transect of 2,000 km in Western North America (Figure 1). We localized the extent of the mtDNA break to a 300 km region in southern Oregon (Figure 2). To determine whether the mtDNA break was reflected in the nuclear genome and thus represented reproductive isolation, we then compared spatial variation in 13 nuclear microsatellites of 95 individuals surrounding the mtDNA break. Using a canonical correlation analysis we found that nuclear genomic variation was not correlated with mtDNA differentiation (Figure 3), and thus did not represent reproductive isolation. The contrasting patterns of variation in mtDNA and nuclear DNA are consistent with a hypothesis of historic genetic drift that occurred in isolated Pleistocene refugia combined with recent gene flow between these formerly isolated refugial populations. A Mantel test of genetic vs. geographic distance revealed that recent gene flow between deer mouse populations has been high. Thus, we conclude that past vicariant events associated with Pleistocene climate changes together with recent gene flow have created the observed intra-specific cytonuclear discordance in Western North American *P. maniculatus*. For further detail, please see our article in press in *Molecular Ecology*.

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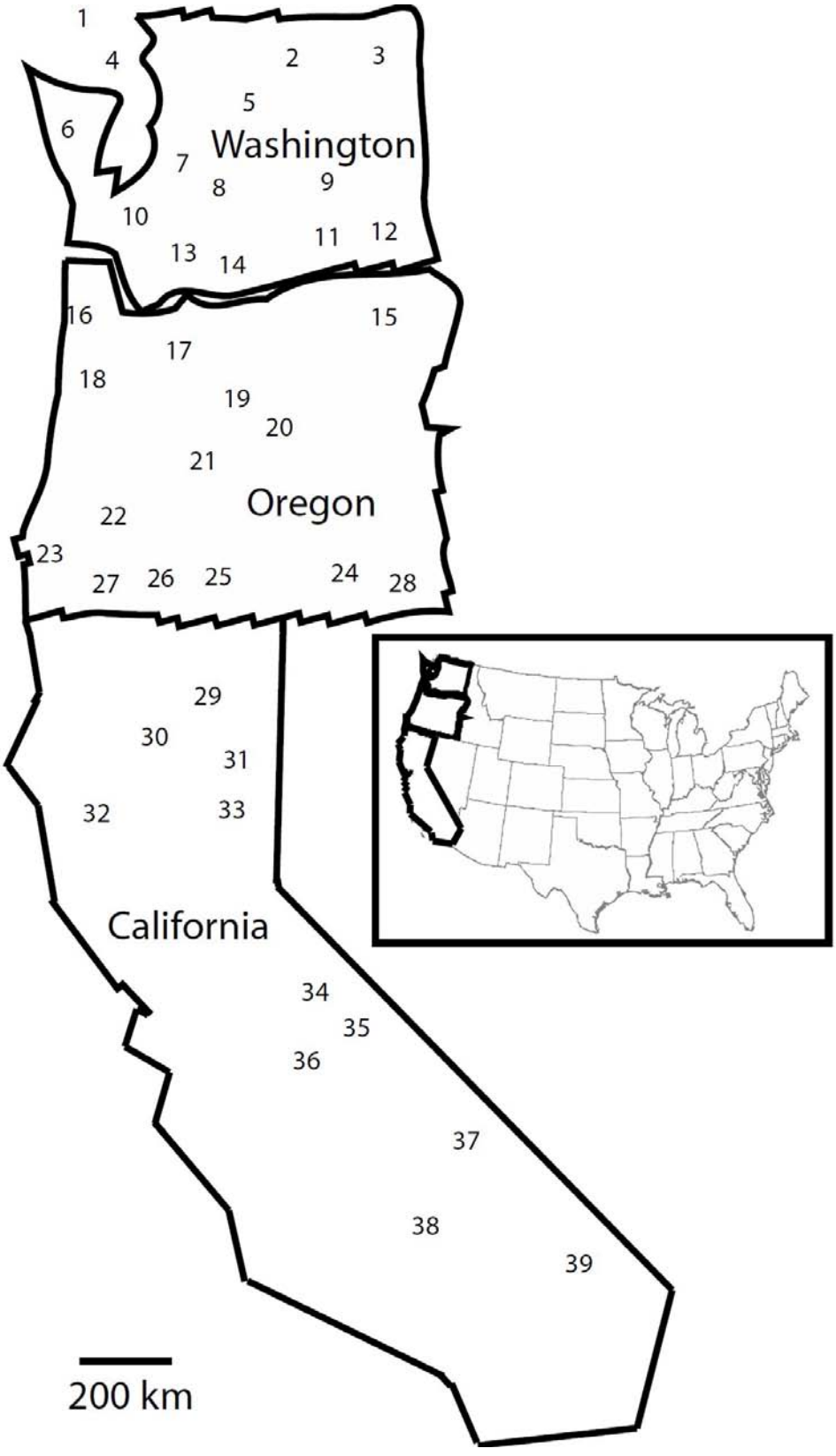
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Figure 1

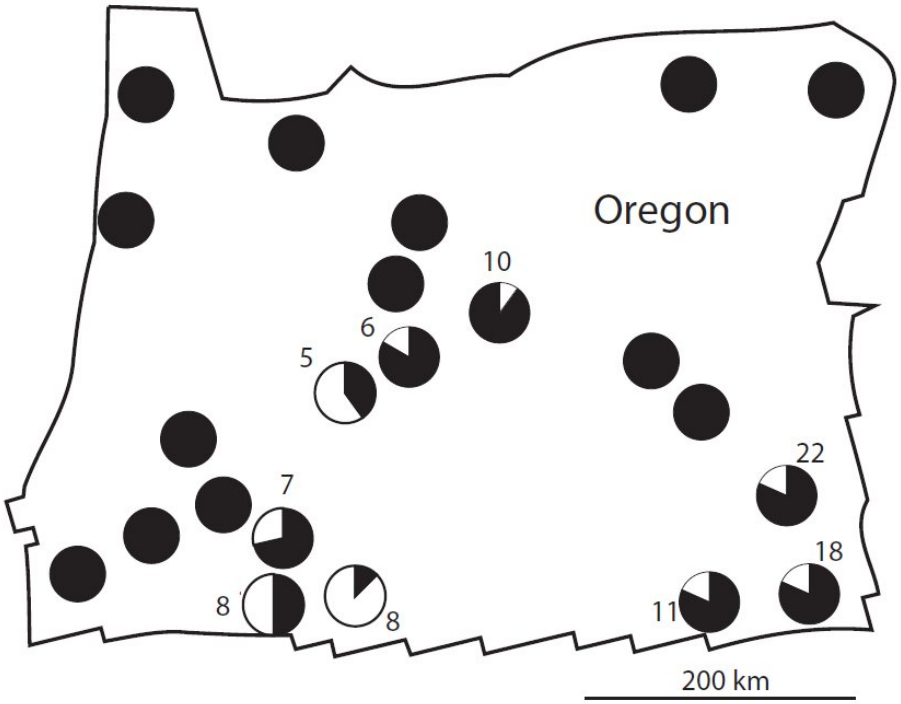

Figure 2

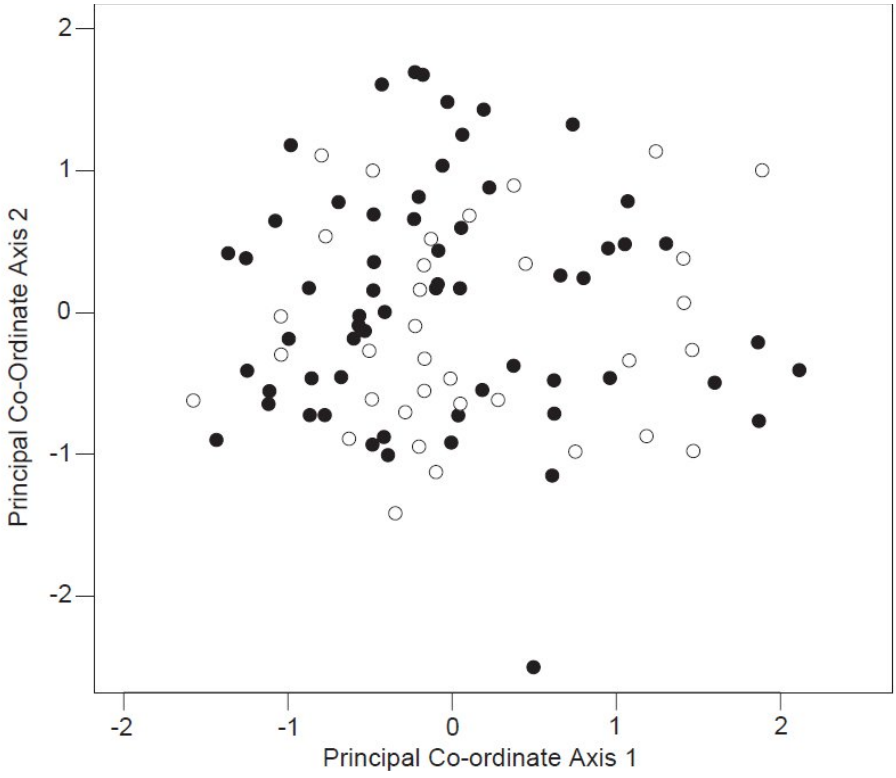

Figure 3

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Call for Data / Collaborators on Rodent Diel Activity Patterns

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In recent times the ecological significance of time as a mediator of interactions has been recognized as important (Kronfeld-Schor & Dayan 2003). To address if an assemblage has more or less overlap in their activities as compared to random expectation I developed a simulation model for time as a resource (Castro-Arellano et al, submitted). Time occurs as an ordered resource that emerges as cyclical phenomena (e.g., diel phases, yearly seasons, etc.) and as such needs a specific randomization procedure. This model has been successfully applied to a series of bat (Castro-Arellano et al 2009; Presley et al 2009a; Presley et al 2009b) and rodent assemblages (Castro-Arellano and Lacher 2009). In a diverse rodent assemblage examined, species show less overlap than expected by random processes, thus pointing to the possible role of time as a means for species segregation. To inquire about the generality of this pattern I am seeking collaborators for the analysis of temporal activity patterns of non-volant small mammals (e.g., rodents, marsupials, insectivores). Historically, few researchers have collected the necessary data to evaluate temporal activity for small mammals, however, with the advent of new technologies (thermal video recording, PIT tagging, video monitoring, etc.) the activity patterns of animals may be recorded while collecting data for other purposes. I am seeking activity data from small mammal assemblages that have 3 or more species from anywhere in the world. All contributors of data would be co-authors on the resulting manuscripts. If enough data is gathered it may be possible to address several questions, including:

1) What is the prevalence of temporal niche partitioning among coexisting species of small mammals?

2) What is the relationship between species richness and degree of temporal niche partitioning among species of small mammals?

3) Is temporal activity a species characteristic or do species change their times of activity based on species composition of local assemblages (i.e. are measured activity patterns representative of fundamental or realized niche space)?

Data could have been collected by different means but as long as it can be assigned to 1 or 2 hr time blocks it would be useful for this type of analysis. Larger sample sizes are better able to characterize activity patterns, therefore, activity patterns based on at least 30 individuals are more reliable and more confidently included in analyses. For more information about the simulation

model you can contact me directly (ivan.castro@uconn.edu) or visit the following website:

http://hydrodictyon.eeb.uconn.edu/people/willig/Research/activity%20pattern.html

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