PEROMYSCUS NEWSLETTER

NUMBER THIRTY-TWO

SEPTEMBER 2001

Cover: A pink-eye dilution-like mutant
Peromyscus eremicus. See p. 18
(Photo courtesy of Cheryl Brehme)

Welcome to PN Number 32 ---

PEROMYSCUS NEWSLETTER is now in its sixteenth year and remains a viable vehicle for sharing information among those interested in deer mice, white-footed mice and other peromyscines whether that interest is professional or amateur. Here at the Stock Center we hear from a surprising number of lay hobbyists that keep deer mice as pets or in displays. While we neither encourage nor discourage this activity, from time to time the Stock Center is contacted for information, and some lay readers subscribe to the Newsletter. We often have inquiries regarding husbandry of pet peromyscines that we are always pleased to provide. Several years ago a person obtained one of each of the coat color mutant animals from us, presumably to form a small terrarium display. The word we often hear used to describe *Peromyscus* vis-à-vis "white" or house mice (*Mus*) is "cute". Occasionally, a lay person will send an entry for inclusion in *PN*, and we are happy to include it.

Nevertheless, the primary purpose of *PN* is to serve as an informal means of communication among biologists using peromyscines in research. We hear repeatedly that our list of "Recent Publications" is widely used as a quick overview of current research. Each issue also contains a list of the resources available from the Stock Center. And our "News and Comment" section receives wide readership among our 900 plus subscribers. We always hope that copies of *PN* fall into the hands of grad students, and, if they are working with *Peromyscus,* that they will share their preliminary findings with our readers.

While there is a certain amount of redundancy between *PN* and *Pero***Base,** our on-line database, one does not replace the other.

We welcome and look forward to your research contributions to *PN* and your notifying us of any news, making relevant comments, correcting our mistakes, or providing anything else of interest. ***PEROMYSCUS NEWSLETTER*** is for you, and best of all, it is free!

Deadline for entries in the next issue is **15 Mar 02**.

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PEROMYSCUS NEWSLETTER is produced by the

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with support, in part, from
National Science Foundation Grant # DBI-99816613
National Institutes of Health Grant # P40 RR14279
The Stock Center sponsors *Pero***Base**, a comprehensive database for peromyscine rodents.
*Pero***Base** is supported, in part, by National Science Foundation Award # DBI-9807881.

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CONTENTS

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News, Comment and Announcements

Dr. David Gubernick has numerous used **polypropylene mouse cages available** for purchase. They are in two sizes: (1) 5X7x11.5 and (2) 6.2X10.5X19 in. He also has bar-style steel lids to fit these cages. Water bottles, stoppers and stainless drinking tubes are also available. Dr. Gubernick is offering these items at a **significant discount when compared with the purchase prices of new cages and lids.** For prices and other information, **please e-mail him at *david@rainbowspirit.com***

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Calling attention to *Deer Mouse at Old Farm Road* a children's book packaged with a stuffed *Peromyscus* available from Smithsonian Institution gift shops. The booklet is authored by **Laura Gates Galvin** and illustrated by **Katy Bratun**. There are several books for children that feature deer mice and other peromyscines. We plan to review these in a forthcoming issue of *PN*.

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The URL for the *Peromyscus* on-line database is now *http://wotan.cse.sc.edu/perobase/* Please disregard earlier versions of ***Pero*Base** that may yet reside in some search engines.

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A new on-line newsletter, **Mouse Genome Monthly Newsletter,** has recently been initiated. The production phase of the public mouse (C57BL/6J) genome sequence effort has been underway for about a year and is advancing rapidly. The new newsletter will keep the research community updated on mouse (*Mus*) genome sequencing progress. The first issue can be downloaded from ***http://mouse.ensembl.org/newsletter***

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Dr. K. Moriwaki, Director of the BioResource Center, RIKEN Tsukuba Institute, Koyadai, Japan, has moved to his present location, a national center for bioresources, specializing in mice, cell cultures, DNAs and *Arabidopsis.* Dr. Moriwaki became interested in small mammals while working at the University of Michigan Mammalian Genetics Center at Ann Arbor. He is a longtime subscriber to Peromyscus Newsletter.

The June 2001 issue of Genesis, the Journal of Genetics and Development, features a *Peromyscus gossypinus* on the cover.

PEROMYSCUS STOCK CENTER

What is the Stock Center? The deer mouse colony at the University of South Carolina has been designated a genetic stock center under a grant from the Living Stocks Collection Program of the National Science Foundation. The major function of the Stock Center is to provide genetically characterized types of *Peromyscus* in limited quantities to scientific investigators. Continuation of the center is dependent upon significant external utilization, therefore potential **users are encouraged to take advantage of this resource**. 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.

A user fee of **$17.50 per wild-type animal and $25 per mutant or special stock animal** is charged. The user assumes the cost of air shipment. Animals lost in transit are replaced without charge. Tissues, blood, skins, *etc.* can also be supplied at a modest fee. Arrangements for special orders will be negotiated. Write or call for details.

Stocks Available in the Peromyscus Stock Center

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. polionotus leucocephalus (LS Stock) Beach Mouse	Derived from beachmice wild-caught on Santa Rosa Island FL and bred by R. Lacy.
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 F1 Hybrids	Available upon request.
P. leucopus X P. gossypinus F1 Hybrids	Sometimes available by request.

MUTATIONS AVAILABLE FROM THE STOCK CENTER[1]

COAT COLORS	ORGINAL SOURCE
Albino *c/c*	Sumner's albino deer mice (Sumner, 1922)
Ashy *ahy/ahy*	Wild-caught in Oregon ~ 1960 (Teed et al., 1990)
Black (Non-agouti) *a/a*	Horner's black mutant (Horner et al., 1980)
Blonde *bln/bln*	Mich. State U. colony (Pratt and Robbins, 1982)
[2]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} [in *P. leucopus*]	Wild caught in Mass. (Horner and Dawson, 1993)
Gray *g/g*	Natural polymorphism. From Dice stocks (Dice, 1933)
Ivory *i/i*	Wild caught in Oregon (Huestis, 1938)
[3]Pink-eyed dilution *p/p*	Sumner's "pallid" deer mice (Sumner, 1917)
Platinum *plt/plt*	Barto stock at U. Mich. (Dodson et al., 1987)
[2]Silver *sil/sil*	Huestis stock (Huestis and Barto, 1934)
Tan streak *tns/tns*	Clemson U. stock from N.C. (Wang et al., 1993)
Variable white *Vw/+*	Michigan State U. colony (Cowling et al., 1994)
White-belly non-agouti a^w/a^w	Egoscue's "non-agouti" (Egoscue, 1971)
Wide-band agouti A^{Nb}/a	Natural polymorphism. U. Mich. (McIntosh, 1954)
Yellowish *y/y*	Sumner's original mutant (Sumner, 1917)

OTHER MUTATIONS AND VARIANTS

Alcohol dehydrogenase negative Adh^{o}/Adh^{o}	South Carolina BW stock (Felder, 1975)
Alcohol dehydrogenase positive Adh^{f}/Adh^{f}	South Carolina BW stock (Felder, 1975)
Boggler *bg/bg*	Blair's P. m. blandus stock (Barto, 1955)
Cataract-webbed *cwb/cwb*	From Huestis stocks (Anderson and Burns, 1979)
Epilepsy *ep/ep*	U. Michigan artemisiae stock (Dice, 1935)
[3]Flexed-tail *f/f*	Probably derived from Huestis flexed-tail (Huestis and Barto, 1936)
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 given above provide a reservoir for several enzyme and other protein variants. (Dawson *et al.*, 1983)

[1]Unless otherwise noted, mutations are in *P. maniculatus*
[2]Available only as silver/brown double recessive
[3]Available only as pink-eye dilution/flexed-tail double recessive

Other Resources of the Peromyscus Genetic 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 or wild-types 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 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 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

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PEROMYSCUS PIONEER

DONALD F. HOFFMEISTER

Among those individuals who have made significant contributions to the biology of *Peromyscus* is Donald Hoffmeister, now retired after a distinguished career as a mammalogist, faculty member and museum director at the University of Illinois at Urbana. Don became the foremost authority on systematics of the *Peromyscus truei* species group, and his 1951 comprehensive taxonomic and evolutionary review of *P. truei* is a landmark work in peromyscine biology.

Donald Hoffmeister was born in 1916 at San Bernardino, California, where he spent his youth and attended local elementary and high schools. He received his A.B., M.A. and Ph.D degrees from the University of California at Berkeley, finishing the latter in 1944. At Berkeley both his master's and dissertation research were directed by the prominent mammalogist, E. Raymond Hall. These were morphological and taxonomic studies of pinyon mice and canyon mice, respectively, and centered primarily on specimens from California and Nevada. The work on *P. truei* was amplified with many additional specimens to form the basis of the monumental study noted above.

Upon completion of his doctorate, Don joined the faculty of the University of Kansas for two years, then, in 1946, moved to the University of Illinois where he remained until his retirement. It was at Illinois, as he rose through the academic ranks, that he established himself as one of the leading American mammalogists. Don's work was far from limited to *Peromyscus*. He was a general mammalogist whose research encompassed native carnivores, rabbits and bats, as well as numerous non-peromyscine rodents. He also had an interest in mammalian paleontology. Over the course of his career he published more than 120 research articles, reviews, contributions to field guides and textbooks, as well as several books and monographs.

In many respects Don Hoffmeister is a "mammalogist's mammalogist." During his active career he was equally competent as both a field and museum biologist. He directed 14 Ph.D and 18 M.S. students, many of whom became prominent academicians and field biologists in their own right. As a field biologist Don is known for the meticulous skills of trapping and specimen preparation that he demonstrated and passed on to his students and peers. As a natural history museum curator (and subsequently, as Director) at the University of Illinois he was responsible for greatly expanding the mammal holdings and organizing the extensive collections such that it ranked among the top five university natural history museums in the country.

Don has long been active in the American Society of Mammalogists, and served as president of that organization from 1964 until 1966. He had previously been secretary and vice-president, and served for many years on the Board of Directors. In 1987 he received the Hartley T. Jackson Award for distinguished service to ASM and was awarded honorary membership. Don was also a member of several other professional societies including the Association of Science Museum Directors, the Society for the Study of Evolution, and the Society for Systematic Zoology. During the course of his career he received grants from NSF, NIH and various conservation and wildlife organizations.

Of Don Hoffmeister's numerous publications, 14 dealt specifically with *Peromyscus*. Among these was a 1942 paper co-authored with E. R. Hall. "Geographic variation in the canyon mouse, *Peromyscus crinitus*" (J. Mamm. 23:51-65), an outgrowth of Hall's *Mammals of Nevada*. Published while he was still in graduate school, this was Don's first major publication on *Peromyscus*. This paper is a traditional morphological and systematic study of this species and extends the earlier work of Osgood. They examined 1214 specimens available to them and refined the known distribution of various subspecies of canyon mice. In general, their interpretation remains accepted today.

As noted previously, Hoffmeister's 1951 monographic treatment of *P. truei* (Illinois Biol. Monogr. 21:ix-104) stands as his most noteworthy contributions to the peromyscine literature. Wilfred Osgood had circumscribed the *P. truei*-species group in 1909. The revision by Hoffmeister is based on examination of more than 2600 specimens of *P. truei*, more than double the number Osgood had examined. Several hundred examples of *P. difficilus* and *P. nasutus* were also included. The survey represented most of the range of these species in the U.S. and Mexico. Hoffmeister recognized 12 subspecies of *P. truei*. In addition to strictly morphological data, ecological and physiological factors were also considered. In defining the *P. truei*-species group he addressed the experimental studies of Lee Dice in which F1 interspecific hybrids could be produced in captivity under certain conditions.

A subsequent 1961 paper co-authored with Luis de la Torre "Geographic variation in the mouse *Peromyscus difficilus*" (J. Mamm. 42: 1-13) maintained that *P. difficilis* and *P. nasutus* are not specifically distinct and reduced *nasutus* to a subspecies of *P. difficilis*, inasmuch as the ranges are complimentary, corresponding roughly to the U.S.- Mexican boundary, and they intergrade for color and other characters. Not all mammalogists (*e.g* Carleton, 1989) have concurred in this interpretation.

Following his retirement Don and his wife continue to reside in Champaign IL. Don enjoys good health and remains active gardening, following college sports and traveling, often to visit sons, Robert who is a physician in Bellingham WA, and Ronald, who is on the Business School faculty at Arizona State University. Don continues to participate in the annual meetings of the American Society of Mammalogists as often as he can.

Donald Hoffmeister

[Many thanks to Bill Lidicker, Dave Schmidley, George Batzli, Lowell Getz, Joyce Hofmann and Ronald Hoffmeister who provided information for this account]

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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Development of a Medicated Bait for White-footed Mice, *Peromyscus* to Prevent Feeding of Immature Ticks

We have developed a medicated bait for consumption by wild white-footed mice and other rodents. Consumption of one medicated pellet by an individual rodent will prevent tick parasitism for approximately 30 days (Figure 1). We determined the seasonal activity of immature life stages for the four most prevalent tick species in Oklahoma that attack human beings and major domestic livestock (Table 1).

The American dog tick, *Dermacentor variabilis* (Say), is the principal vector of Rocky Mountain spotted fever to human beings throughout the central and eastern U.S. Immature life stages of this tick are active on rodents from January through October. The lone star tick, *Amblyomma americanum (L.)*, is the most numerous tick species in Oklahoma and is the principal vector of human ehrlichiosis. Immature life stages of this tick are active from March through November. The black-legged tick, *Ixodes scapularis Say,* is the primary vector of Lyme disease in the U.S. and its immature life stages are active from June through August. The Gulf Coast tick, *Amblyomma maculatum* Koch, is not a vector of disease to human beings, but in the adult life stage is a major parasite of cattle and other large hoofed animals. It is an intermediate host for a debilitating protozoan pathogen of domestic and wild canids.

Knowledge of the seasonal occurrence of these tick life stages is extremely important to the timed application of the medicated baits for the various tick species. Based on the information obtained in this study, application of medicated bait to *Peromyscus* habitat to prevent tick parasitism could begin as early as January and continue through November.

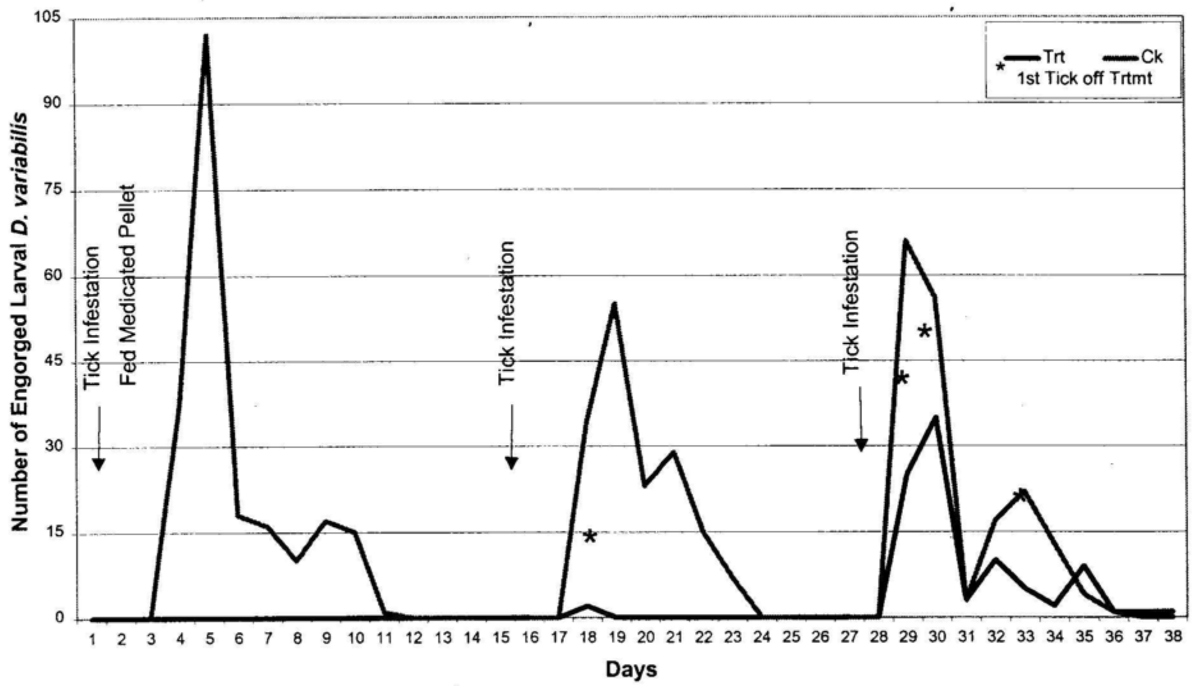
The practical application of this technology is readily apparent when one considers that many small mammals such as *Peromyscus* and *Sigmodon* spp. are proven reservoirs of pathogens that are zoonotically transmitted to human beings and other animal species by parasitic immature tick life stages. The greatest benefit of this technology would be the application of medicated bait containing fipronil in areas of high human activity such as state parks, recreation areas, and suburban housing adjacent to habitats that support high rodent and tick populations. We anticipate the end result of this research would be a commercial product that could be used by the private sector, state and federal government agencies to prevent immature ticks from completing their life cycle, reducing their survivability, and secondly, reducing the population of ticks that can serve as vectors of disease pathogens to human beings and other animals.

Table 1. Seasonal occurrence of tick species on white-footed mice in central Oklahoma, 2001.

Ectoparasite	Months											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	White-footed Mice											
Amblyomma americanum			N	N	L&N	L&N	L&N	L&N	L&N	L&N	L	
Dermacentor variabilis	L&N	L&N	L&N	L&N	L&N	L&N	L&N	L&N	N	N		
Amblyomma maculatum						L	L&N	L&N	L&N			
Ixodes scapularis					N	L&N	L&N	N				

L = larva

Medicated Pellet fed to four White-footed Mice



N = nymph

Figure 1: First engorged larva collected from each white-footed mouse fed a medicated pellet on days indicated (*)

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Genetic Differentiation Among Three Species of the *Peromyscus mexicanus* Group in Chiapas, Mexico

The *Peromyscus mexicanus* species group is among the most diverse species group in the subgenus *Peromyscus*, and consists of 14 species, all of which occur in tropical or subtropical habitats in Middle America (Rogers and Engstrom, 1992). *Peromyscus guatemalensis*, *P. zarhynchus*, and *P. grandis* were formerly considered as fragmented populations of a single species (*P. zarhynchus*). However, these species were maintained among *P. guatemalensis*, *P. zarhynchus* and *P. mexicanus* were unresolved, and each separated mainly because it phyletic origin is unknown (Carleton, 1989). The phylogenetic relationships differed from other only in the distribution of autapomorphic alleles (Rogers and Engstrom, 1992). Our objective was to examine allozymic data to gain insight into the phylogenetic relationships of three species of the *Peromyscus mexicanus* species group (*P. guatemalensis*, *P. zarhynchus* and *P. mexicanus*), and determine the within and among genetic variation of these taxa.

From February 2000 to July 2001 individuals of *Peromyscus* were caught using Sherman traps. Samples of heart, kidney, and liver were removed, immediately frozen in liquid nitrogen, and transported to the laboratory. All specimens were deposited in the mammalian collection (Colección Maztozoológica) of EL Colegio de la Frontera Sur, in San Cristóbal de Las Casas, Chiapas, México. Collecting localities are listed by species as follows (samples sizes in parenthesis). *P. mexicanus*: San Cristóbal de Las Casas, (12). *P. zarhynchus* (sample 1): Reserva Ecológica Huitepec, (21); *P. zarhynchus* (sample 2): Parque Nacional Lagos de Montebello, (7). *P. guatemalensis*: Reserva de la Biósfera El Triunfo, (3).

We prepared heart and kidney samples and then we analyzed homogenate for protein variation through horizontal starch gel electrophoresis. A total of 16 presumptive loci were examined (Harris and Hopkinson, 1976). Alleles at each locus were designated by mobility relative to the most common allele at that locus (May, 1998).

The allozymic data indicated that nine loci were polymorphic for all three species (ICD-1, ICD-2, LDH, ESTER, SOD-2, SDH-2, 6-PGD, XDH and ME-1; Table 1). There are two fixed alleles for *P. zarhynchus* (sample 1): SOD-2 y 6PGD; two for *P. mexicanus*: Esterase and SOD-2 and one for *P. guatemalensis*: ME-2. *Peromyscus zarhynchus* (sample 2) had the lowest levels of polymorphism (18.8) and heterozygosity (0.054), but *Peromyscus zarhynchus* (sample 1) showed the highest number of polymorphic loci (43.8) and heterozygosity (0.071) of all species (Table 1). The dendrogram based on a Cavalli-Sforza and Edwards' distance (1967) clumps the rodents together in two groups: the first group included to *P. zarhynchus* (sample 1) and *P. mexicanus*, and the second group included to *P. zarhynchus* (sample 2) and *P. guatemalensis*. The average Wright's (1965) F-st for all three species was 0.406, with a estimation of the F-st significance indicated by a X^2 of 263.646. The F-st values for the nine loci were statistically different to the expected values (significance level = 95%). Our results indicated that the two populations of *P. zarhynchus* (samples 1 and 2) are genetically different. Although both populations shared some morphological characters, their values of genetic variability (heterozygosity and polymorphism) were contrasting. Probably, *P. zarhynchus* has been fragmentated by genetic drift into different populations, which may have evolved into different taxa which are morphological and genetically distinctive. Our allozymic data in both populations (sample 1 and 2) of *P. zarhynchus* in Chiapas could mirror the speciation events and the divergence time within this species. Additionally, *P. zarhynchus* from Reserva Ecológica Huitepec, and *P. mexicanus* are genetically more related between them than either is to any other taxa. This result is different from that reported by Rogers and Engstrom (1992), since they clumped together *P. guatemalensis* and *P. mexicanus*.

We thank F.A. Cervantes, and E. Naranjo for their helpful comments on an earlier version of this manuscript. We also thank F. Barragán, J. Bolaños, L. E. Cruz, E. Santíz, L. E. Mirón, and N. Peñaloza for assistance in the field.

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Table 1. Alleles (A-C), allele frequencies, average sample size (N), average number of alleles per locus (AVERAGE), percentage of polymorphic loci (POLYMOR), observed average individual heterozygosity (direct count; OB HETER), and expected average individual heterozygosity (from Hardy-Weinberg equilibrium; EX HETER) for *P. zarhynchus* from Huitepec (*P.z.* sample 1), Lagos de Montebello (*P.z.* sample 2), *P. mexicanus* (*P. m.*) and *P. guatemalensis* (*P.g.*) from Chiapas. Only polymorphic loci (9 out of 16) are listed; monomorphic loci were: GOT-1, GOT-2, MDH-1, MDH-2, SOD-1, ME-2 and SDH-1. The estimate of POLYMOR includes only those loci for which the dominant allele has a frequency lower than 0.95. The asterisk (*) means species with a significant ($p<0.05$) deficiency of heterozygotes.

Locus	Number of alleles per locus	*P. z.* sample 1	*P. z.* sample 2	*P. m.*	*P. g.*
ICD-1	3	* n= 21 A (.071) B (.762) C (.167)	n= 7 C	n= 12 A (.042) B (.958)	n= 3 C
ICD-2	2	* n= 12 A (.250) B (.750)	n= 7 A	n= 12 B	n= 3 A
LDH	2	* n= 21 A (.500) C (.500)	n= 7 A (.429) B (.571)	* n= 12 A (.500) C (.500)	n= 3 A (.500) C (.500)
ESTER	3	* n= 21 B (.810) C (.190)	n= 2 B	* n= 11 A (.545) B (273) C (182)	* n= 3 B (.667) C (.333)
SOD-2	3	* n= 17 B (.882) C (.118)	n= 7 B	* n= 10 A (.200) B (.800)	n= 3 B
SDH-2	2	n= 2 B (.625)	* n= 6 A (.500) B (.500)	n= 3 B	* n= 3 A (.667) B (.333)
6PGD	2	* n= 13 B (.923) C (.077)	n= 3 B	n= 5 B	n= 2 B
XDH-1	2	* n= 17 B (.882) C (.118)	* n= 7 B (.143) C (.857)	* n= 10 B (.700) C (.300)	* n= 3 B (.333) C (.667)
ME-1	2	n= 11 C	n= 7 C	* n= 11 B (.182) C (.818)	n= 3 B
N AVERAGE POLYMOR OB HETER EX HETER		16 1.5 43.8 0.071 0.137	6 1.2 18.8 0.054 0.084	10 1.4 31.3 0.068 0.145	3 1.3 25.0 0.063 0.137

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Pink-eyed Dilution Mutant Phenotype found in Wild Caught *Peromyscus eremicus*

Two individuals of *Peromyscus eremicus* matching the pink-eyed dilution mutant phenotype were recently captured near Jamul, California (32.67670°N Latitude/ 116.83914°W Longitude, NAD83). A juvenile female (TL 148, T 88, HF 19, E 15, Wt 12g) was captured on September 22, 2001, followed by a juvenile male (TL 150, T 88, HF 19, E 16, Wt 12g) on October 19, 2001. Both animals were captured at the same location in a five-gallon pitfall trap placed approximately one meter from the edge of a rural highway. The site contains a mixture of light and dark orange clay soils with coastal sage scrub vegetation. In addition, the area is disturbed by non-native plants, with a considerable amount of trash littering the ground within five meters of the road. The site has been monitored every other week since April 2001, as part of a thesis project studying responses of small vertebrates to roads. Rodent species regularly found at this site *are P. eremicus, P. maniculatus*, and *Chaetodipus fallax*.

The juveniles were characterized by dark pink eyes, pale neutral-gray dorsal coat, white ventral hairs, with unpigmented ears and tail. The female has since acquired adult pelage, a uniform pale buff dorsal coat with a pale buff triangular patch on the upper chest. The rest of the body and hair remain unpigmented. Wild *Peromyscus eremicus* caught in the area typically have darker buff to brownish-gray dorsal pelage with black eyes.

The pink-eyed dilution phenotype was first described for *Peromyscus maniculatus* by Sumner in 1917. It is caused by a recessive gene (*p*) on chromosome 7. The double recessive (*pp*) genotype results in drastic reduction of pigment in all body hair and the iris of the eyes, resulting in pink eyes and diluted coat coloration. At least two independent recurrences of this mutation in wild deer mouse populations have been recorded. To my knowledge, this mutation has not been reported to date in wild populations of *Peromyscus eremicus*.

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Effects of Exotic Plant Invasions and Introduced Biological Control Agents on Deer Mouse Ecology

Exotic plant invasions have dramatically altered native plant communities in North America, but little is known about the impacts of these often-radical vegetation changes on native fauna. This situation is further complicated when the release of exotic insects as biological control agents results in the establishment of an additional exotic component within the system. We studied small mammal communities in a spotted knapweed- (*Centaurea maculosa*) invaded grassland adjacent to Missoula, MT where gall flies (*Urophora* spp.) have become an established biological control agent. Live and snap trapping results indicated that deer mice dominated the small mammal community followed by montane voles (*Microtus montanus*), which were uncommon, and vagrant shrews (*Sorex vagrans*), which were rare. Examination of deer mouse stomach-contents revealed that gall fly larvae have become a significant component of deer mouse diets in knapweed-invaded grasslands. Gall fly larvae were the primary food item in deer mouse diets for most of the year and comprised 84 to 86% of the diet during winter, a time when resources are normally scarce to deer mice at this latitude. Stomach contents indicated that wild-caught mice consumed on average up to 247 gall fly larvae/mouse/day, whereas feeding trials revealed that deer mice could depredate nearly 5 times as many larvae under laboratory conditions. In feeding trials, deer mice selected knapweed seedheads with greater numbers of galls while avoiding uninfested seedheads, indicating that deer mice were employing search images, which greatly facilitated their predation on gall fly larvae. During the summer, deer mice switched to other insects and seeds after gall fly emergence rendered larvae unavailable. Habitat selection results revealed that deer mice exhibited habitat switching that facilitated this prey switching behavior. When gall fly larvae were present in knapweed seedheads, deer mice selected microhabitats with moderately high (31-45% cover) and high knapweed infestations (46% cover). After gall flies emerged and larvae were unavailable to deer mice, mice reversed habitat selection to favor native-prairie dominated sites with low knapweed infestation (0-15%). Establishment of the biological control agent, *Urophora* spp., has dramatically altered deer mouse ecology. Gall fly-induced changes in deer mouse ecology may affect deer mouse densities, population dynamics, small mammal community composition, small mammal dependent predators, and hantavirus prevalence in knapweed-invaded landscapes. Studies are currently underway to examine each of these questions.

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Microevolution in Island Rodents

Abstract
We perform a meta-analysis on morphological data from four island rodent populations exhibiting microevolution (<100 years). Data consisting of incidences of skeletal variants, cranial, and external measurements are from house mice (*Mus musculus*) on one Welsh and one Scottish island, black rats (*Rattus rattus*) on two Galapagos Islands, and deer mice (*Peromyscus maniculatus*) on three California Channel Islands. We report extremely high rates of microevolution for many traits; 60% of all mensural traits measured changed at a rate of 600 d or greater (max. 2682 d). The proportion of all mensural traits evolving at 600-800 d (23%) was idiosyncratic and departed from an expected negative exponential distribution. We argue that selection, rather than founder events, is largely responsible for the substantial shifts in morphology seen among insular rodents. Examining individual traits, there is a trend towards the nose becoming longer and wider, while the skull becomes shallower, shown by both rats and mice on five different islands. We found a significant correlation between island size and degree of skeletal variant evolution and between island distance from the mainland (or nearest island) and degree of cranial and external character evolution. Thus, microevolution of rodents is greater on smaller and more remote islands.

(This one will be published in Genetica at the end of '01 or the beginning of '02, as well as in a book published by Kluwer later on.)

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Museum Collections of Mammals Corroborate the Exceptional Decline of Prairie Habitat in the Chicago Region

Abstract:

The prairie deer mouse (*Peromyscus maniculatus bairdii*) was more common than the white-footed mouse (*P. leucopus*) in museum collections from the 6 Illinois counties of the Chicago region before 1920 but constitutes only 5% of specimens deposited since 1970. Because the white-footed mouse prefers woody vegetation and the prairie deer mouse is limited to prairie or large open habitats, the change in proportion is likely driven by a disproportionate loss of prairie among remaining natural habitat and increases in woody vegetation within grasslands. The decline of the prairie vole (*Microtus ochrogaster*) relative to the meadow vole (*M. pennsylvanicus*) and the lack of recent specimens of Franklin's ground squirrel (*Spermophilus franklinii*) corroborate the hypothesis that prairie habitats have declined much more so than wooded habitats in the Chicago region. Based on extinction models using museum records, it is probable that *S. franklinii* is already locally extirpated. Regression analysis suggests the white-footed mouse will be the only local *Peromyscus* in 0-140 years. (This one will be published in the November '01 Journal of Mammalogy.)

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Small Mammal Survey of Prairie and Former Prairie in the Chicago Area

Abstract:

We conducted a small mammal survey of prairie and former prairie in the Chicago area. We found much higher catch rates and numbers of species in areas with native, relatively undisturbed vegetation than in areas with non-native/disturbed vegetation or wetlands. We found a correlation (88.0%, $P < 0.0005$) between numbers of individuals of each species that we caught and in museum collections, indicating museum collections to be generally representative of frequency in the wild in our study area. However, we found prairie mammals, especially the prairie deer mouse (*Peromyscus maniculatus bairdii*), to be dramatically under-represented in our catch when compared to museum collections. We found a correlation (-77.1%, $P < 0.0005$) of habitat areas and catch rates, indicating greater densities of small mammals in smaller sites. (This work is in preparation.)

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