PEROMYSCUS NEWSLETTER

NUMBER TWENTY-EIGHT

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Cover: Two week old sibling **golden nugget** and **wild-type** white-footed mice (*Peromyscus leucopus* (See *J. Hered.* 84:306ff. 1993) Photo by B. Elizabeth Horner.

PEROMYSCUS NEWSLETTER # 28

We want to advise our readers of some changes that are occurring at the *Peromyscus* Genetic Stock Center. In view of my upcoming retirement currently projected for June 30, 2000, my role in directing the Stock Center will change. Effective January 1, 2000 Dr. Michael Dewey will become Director of the Stock Center and PI of the NSF grant that helps support the Center. I will remain as a Co-PI on the NSF grant , and continue, for the present, as PI on the NIH grant that also provides support. I will remain Co-PI on the NSF *Pero***Base** grant and continue to be involved in this project indefinitely. I also expect to continue as editor of *Peromyscus Newsletter*. On page 6 we introduce Dr. Dewey to those of you who are unfamiliar with his background and qualifications.

Another change concerns the external Advisory Committee. At the 1999 annual committee meeting, a recommendation was made to expand the membership of the committee. Members would serve two year terms, subject to re-appointmentment. A number of persons have been suggested as committee members, and these individuals will soon be approached. The Committee is a self-perpetuating body.

The Stock Center animals were moved to the new animal facilities in September. The move into new offices, laboratories and other space is now projected for January.

We expect soon to add several more stocks, including two additional species (*P. boylii* and *P. truei*), to the Stock Center collection.

These and other changes in progress are expected to provide additional options to the users of the *Peromyscus* Stock Center.

Wally Dawson
Editor

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C O N T E N T S

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NEWS, COMMENT and ANNOUNCEMENTS

+ CLEMENT L. MARKERT +

We regret to report that Dr. Clement Markert passed away October 1, 1999 at Boulder, Colorado. Clem was an original member and first Chair of the Peromyscus Stock Center Advisory Committee, serving from 1985 until 1996, and played a crucial role in its establishment. He had a remarkable career and personal history. He served in the Lincoln Brigade during the Spanish Civil War, and also served in the Merchant Marine during WWII. He became a victim of academic persecution during the McCarthy anti-communism epoch. He was the first to recognize the power of electrophoresis to identify isozyme variants and to demonstrate developmental changes in isozyme gene expression in mice. He also was active in allophenic mouse research and he was early to recognize the significance of genomic imprinting. Markert was elected to membership in the National Academy of Science in 1967. He received his doctorate at Johns Hopkins University in 1948. His academic career included appointments to the faculties of the University of Michigan, Yale University and North Carolina State University. Clem had a long-time interest in *Peromyscus* stemming from his association with Lee Dice while at Michigan. Although he primarily utilized laboratory mice (*Mus*) in his research, while at Yale he and his protege, Mary Klein, constructed the first and, to date, only allophenic *Peromyscus* embryos.

Clem Markert was an enthusiastic supporter of *Peromyscus* research and he will be missed.

Deer mouse pin jewelry by William Spear, noted Alaskan wildlife art enamelist, is now available. Attractive lapel pins featuring an enameled deer mouse, with a choice of either buff or gray pelage, can be purchased at $ 8. ea. For additional information and options contact William Spear *dee@wmspear.com*

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A new childrens book, *LUCKY MOUSE*, by Elizabeth Ring, tells the tale of an orphaned deer mouse that is placed with a litter of white-footed mice and reared to maturity. The photography is of exceptional quality. It is published by Millbrook Press (ISBN 1-56294-344-8)

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Rapid evolutionary changes in size of Channel Island, CA deer mice are reported in a recent paper by Oliver Pergams and Mary Ashley (1999. Evolution 53:1573ff)

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Check out Mike Wooten's Beach Mouse InfoPage:
http://www.ag.auburn.edu/~mwooten/main.html

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We thank **Dr. Victor Sanchez-Cordero**, Instituto de Biologia, UNAM, for his recent letter complimenting *PN*. Dr Sanchez-Cordero is one of the authors, along with A.T. Peterson and J. Soberon, of a recent significant article in *Science* (285:1265ff) describing geographical distribution of 37 related species pairs of Mexican birds. The evidence they obtained supported the conservation of ecological niches through time and indicates that geographic speciation precedes ecological differentiation. This work adds to the controversy concerning the ecological niche selection as a major speciation process. We encourage the use of *Peromyscus* to further address this issue.

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NICK POUND, McMASTER UNIVERSITY, HAS RECENTLY PUBLISHED A PAPER IN PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON *B 266:1755FF REPORTING DIFFERENCES BETWEEN* PEROMYSCUS MANICULATUS *AND* P. CALIFORNICUS *MORPHINE INHIBITION OF VAS DEFERENS CONTRACTIONS, AND ITS SIGNIFICANCE WITH REGARD TO SPERM COMPETITION.*

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The Peromyscus Stock Center has been awarded a three-year grant from NIH under the P40 program supporting health-related animal models. Several additional stocks will be added to the Stock Center during the coming year.

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Janet Crossland, Peromyscus Colony Manager, now has an alternate phone number: **1-803-777-1212**, in the new animal facilities.

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MEET MIKE DEWEY :

The *Peromyscus* Genetic Stock Center will begin the Third Millenium with a new Director, Michael J. Dewey. Mike recently accepted appointment to the position in view of the anticipated retirement of Wally Dawson, who has served as Director for the past 14 years. Mike has been a member of the University of South Carolina faculty since 1979 and has chaired the Stock Center Internal Oversight Committee since 1983.

Mike is a native of Rawlins, Wyoming, where he spent his youth. After graduation from Rawlins High School in 1962, he enrolled at the University of Wyoming in Laramie and obtained a BS degree in microbiology. From 1966 to 1968 he served as a Peace Corps volunteer teaching biology and biochemistry at the University of San Carlos in Guatemala City. After leaving the Peace Corps he enrolled in graduate school at the University of Pennsylvania at Philadelphia, where in 1973 he obtained his doctorate in microbiology. His dissertation research was a study of the genetics of bacteriophage DNA metabolism and morphogenesis. He remained at Penn five more years in a postdoctoral appointment with Dr. Beatrice Mintz, well-known for her pioneering work with allophenic mice and tissue specific gene expression. While working in Mintz's lab, Mike published the first attempt to produce mutant mice from embryonic stem (ES) cells, then known as embryonal carcinoma cells.

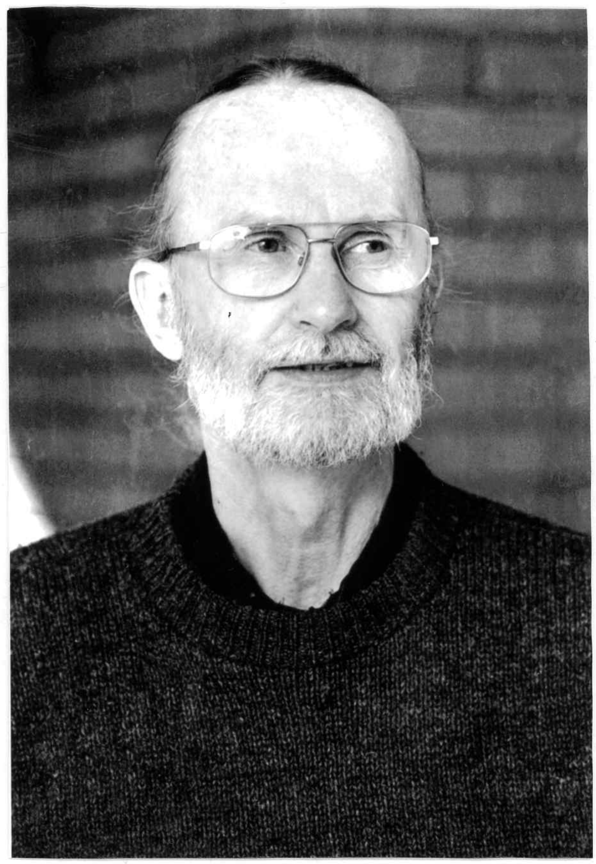
Mike joined the University of South Carolina faculty in 1979 where he initiated a research program in mouse (*Mus*) developmental genetics and immunology. His particular focus was development of animal models to study the genetics of cancer, hemopoiesis and other whole animal processes. He utilizes both natural genetic variation and transgenic modification in his work. Mike, his graduate students and other associates have published extensively in this field. The first transgenic mouse facility at the University was set up by Mike, who directed it for ten years. Dewey currently is using allophenic mice to analyze natural genetic variants affecting hemopoietic stem cell biology and aging, and is also is exploring the use of spermatogonial stem cells as an alternative means of producing transgenic mice.

Mike Dewey has had extensive collaborations over the years with his on-campus colleagues and with collaborators elsewhere. These joint studies involve cancer research, drug development, gene regulation and alcohol metabolism. Personnel of the *Peromyscus* Stock Center also have taken advantage of his expertise, including some help with work on the cataract-webbed mutation in the deer mouse.

Mike has eclectic interests. He is an outdoorsman who enjoys fishing, backpacking and camping. He likes to travel to out-of-the-ordinary places, *e.g.* in 1998 he and his wife, Lorraine, backpacked completely around Iceland. Mexico City is another of his favorites. Authentic Mexican cuisine is his choice fare. History, particularly with a focus on the Civil War or railroads, are also among his interests. He is a do-it-yourselfer - very proud of the stone patio he recently completed at his home.

Mike is anxious to incorporate *Peromyscus* genetics into his research program. His particular interest in this area is to map loci or QTLs relevant to infectious disease resistance and susceptibility, and more generally to contribute to development of a medium density map of the deer mouse genome.

We are confident that our readers and other *Peromyscus* users will find Mike Dewey to be always helpful, sensitive to their needs and ready to share a store of knowledge about rodent genetics, physiology, development, immunology and molecular biology. He plans to attend the 2000 American Society of Mammalogists meeting in New Hampshire, and hopes to meet some of you there.



Michael Dewey

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.

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 SPECIES	ORIGIN
P. maniculatus bairdii (BW Stock)	Closed colony bred in captivity since 1948. Descended from 40 ancestors wild-caught near Ann Arbor MI
P. polionotus subgriseus (PO Stock)	Closed colony since 1952. Derived from 21 ancestors wild-caught in Ocala Nat'l. Forest FL. High inbreeding coefficient.
P. polionotus leucocephalus (LS Stock)	Derived from beachmice wild-caught on Santa Rosa I., FL. and bred by R. Lacy. Approximately 14 generations in captivity.
P. leucopus (LL Stock)	Derived from 38 wild ancestors captured between 1982 and 85 near Linville NC. Approximately 25 generations in captivity.
P. californicus insignis (IS Stock)	Derived from about 60 ancestors collected between 1979 and 87 in Santa Monica Mts. CA. Approximately 15 generations in captivity.
P. aztecus (AM Stock)	Derived from animals collected on Sierra Chincua, Michoacan, Mexico in 1986 Approximately 14 generations in captivity.
P. melanophrys	Originated from a group of animals collected at Zacatecas Mexico during the 1970's. Formerly maintained by R.W. Hill at Mich. State Univ.
P. eremicus	Originated from 10-12 animals collected at Carmel Valley CA in 1993. Approximately six generations in captivity.
P. maniculatus X *P. polionotus* F_1 Hybrids	Sometimes available.

MUTATIONS AVAILABLE FROM THE STOCK CENTER[1]

Coat Colors	ORIGINAL 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 *yel/yel*	Sumner's original mutant (Sumner, 1917)

Other Mutations and Variants	ORIGIN
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).

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[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.

Materials on Deposit in the *Peromyscus* Molecular Bank

Accession Number	Item	Description	Species	Donor	Location[1]
Probes and Clones:					
Pr-01	LINE1	pDK62	*P. maniculatus*	D. Kass	C
Pr-02	LINE1	pDK55	*P. maniculatus*	D. Kass	C
Pr-03	ADH1	pADH F72	*P. maniculatus*	M. Felder	B
Pr-04[2]	Mys		*P. leucopus*	(Requested)	
Pr-05[2]	SAT		*P. leucopus*	(Requested)	
Pr-06	6PGD	pB5 clones	*P. californicus*	S. Hoffman	A
Pr-07	MHC *Pele*I	38dp2	*P. leucopus*	M. Crew	A
Pr-08	MHC *Pele*I	52ap6	*P. leucopus*	M. Crew	A
Pr-09	MHC *Pele*I	40Bgl	*P. leucopus*	M. Crew	A
Pr-10	MHC *Pele*I	53Pv1	*P. leucopus*	M. Crew	A
Pr-11	MHC *Pele*I	37B2	*P. leucopus*	M. Crew	A
Pr-12	MHC *Pele*I	37B4	*P. leucopus*	M. Crew	A
Pr-13	MHC *Pele*II	a3E23	*P. leucopus*	M. Crew	A
Pr-14	MHC *Pele*III	17E2	*P. leucopus*	M. Crew	A
Pr-15	MHC *Pema*I	pr44	*P. maniculatus*	M. Crew	A
Libraries:					
Lb-03	lambda genomic	testis	*P. leucopus*	M. Crew	A
Lb-04	cosmid genomic	testis	*P. leucopus*	R. Baker	A
Lb-05	lambda genomic	liver	*P. californicus*	S. Hoffman	A
Frozen Tissue for DNA:					
S-01	bairdii (BW)	liver, tail, other[3]	*P. maniculatus*	Stk. Ctr.	A
S-02	subgriseus (PO)	liver, tail, other	*P. polionotus*	Stk. Ctr.	A
S-03	leucopus (LL)	liver, tail, other	*P. leucopus*	Stk. Ctr.	A
S-04	wild-caught SC	liver, other	*P. gossypinus*	-	A
S-05	aztecus (AM)	liver, tail, other	*P. aztecus*	J. Glendinning	A
S-06	insignis (IS)	liver, tail, other	*P. californicus*	S. Hoffman	A
S-07	inbred PmH1A	liver, other	*P. maniculatus*	Jackson Lab	A
S-08	inbred PmH8	liver, other	*P. maniculatus*	Jackson Lab	A

[1]Location code: **A** = USoCar SAI 01; **B** = USoCar CLS 603; **C** = USoCar CLS 707

[2]Not currently available.

[3]kidney, spleen, testis, carcass.

OTHER RESOURCES OF THE *PEROMYSCUS* GENETIC STOCK CENTER:

Highly inbred *P. leucopus* (I_{20+}) are available in limited numbers as live animals or as frozen tissues. Several lines developed by George Smith (UCLA) are currently maintained by the Stock Center.

Limited numbers of other stocks, species, mutants, inbreds and variants are on hand, or under development, but are not available for distribution. Currently we can supply up to 10 each of the species *P. eremicus* and *P. melanophrys*.

Preserved or frozen specimens of types given in tables above.

Tissues, whole blood or serum of types given in tables above.

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

Reference library of more than 2400 reprints of research articles and reports on *Peromyscus*. Copies of individual articles can be photcopied and mailed. Please limit requests to five articles at any given time. There will be a charge of 5 cents per photocopied page after the initial 20 pages.

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

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 or peromyscus@stkctr.biol.sc.edu

PLEASE CALL WITH INQUIRIES.

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NOTICE

PEROMYSCUS NEWSLETTER IN 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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Peromyscus as predators of large nestlings

Although *Peromyscus* are noted in the literature as predators of bird nests, it is thought that their impact in this role is limited to being an occasional source of egg loss among some ground and shrub-nesting species (i.e. Maxon and Oring 1978, DeGraaf and Maier, 1996). Recent research, however, suggests that they may be more than occasional predators, and they may be able to prey upon the nests of species previously thought to be immune to nest predation by Peromyscus (i.e. Darveau et al. 1997, Blight et al. 1999, Marzluff et al. 1999).

In 1997, we began a study investigating the potential impact of small mammals, particularly *Peromyscus maniculatus* and *P. keeni*, as nest predators of the marbled murrelet (*Brachyramphus marmoratus*), a federally threatened seabird that nests in the canopy of coniferous forests. This research consists of a field component, where we monitor artificial canopy nests containing live nestlings; and a laboratory component, where we study the predatory behavior of wild-caught *Peromyscus* under a variety of conditions.

Artificial nests were designed to mimic those of the marbled murrelet: placement was on a moss-covered platform 15 – 30m above the ground. A single rock dove (*Columba livia*) nestling was paced at the nest at dusk, and retrieved early the following morning. Nests were monitored using either Sony 8mm videocameras controlled by a Trailmaste® passive infrared trigger system, or a continuous-recording infrared videosystem developed by Christensen Designs. We monitored 29 artificial nests in 10 late-seral stage coniferous forest stands on Washington's Olympic Peninsula. Nests were monitored for up to 30 nights, or until predation. At these 29 nests, we recorded 6 predations of nestlings (see below) and 22 non-fatal interactions with potential predators over 620 nights of observation. We define 'predation' as an interaction with a potential predator that would be fatal to a marbled murrelet nestling.

Simulated nests showed that *Peromyscus* will attack and displace from the nest nestlings of up to 125g. In at least one of these events, videotape indicated the mouse appeared to be attempting to prey upon the nestling by repeatedly climbing on its back and biting on the head and back. Displacement appeared to be a result of defensive action by the nestling, not intentional displacement by the *Peromyscus*. We attributed 3 displaced nestlings to predation attempts by *Peromyscus*, one of which was identified by relative tail length as *P. keeni*.

Captive research with wild-caught *Peromyscus* supported our findings from the artificial nests, showing that individuals of both *P. maniculatis* and *P. keeni* will attack nestlings of up to 150-g. Method of attack was similar to the attacks seen on videotape from simulated nests: the mouse would climb on the back of the nestling and bite repeatedly on the back and head. Captive experiments also showed that predatory behavior of mice is influenced by both hunger level of the mouse and size of nestling. All captive experiments involving nestlings were closely monitored, and attacks were interrupted before the nestling was injured.

This research shows that *Peromyscus* have the potential to prey upon large nestlings, and placement of nests high in the forest canopy will not prevent access to the nest by some *Peromyscus*. Given the widespread distribution and high densities of *Peromyscus*, we suggest that managers consider their potential impact as nest predators when managing for the persistence of bird species that may be limited by nest success.

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Seasonal variation of the genus *Peromyscus* in the vicinity of San Cristobal de Las Casas, Chiapas, Mexico

Increasing fragmentation of natural and seminatural habitats generates changes in the distribution and abundance of many taxa. Small mammals (especially rodents) are particularly sensitive to changes in the quality and quantity of habitat. Here, we provide data on the abundance and number of species of *Peromyscus* (Rodentia: Muridae) in four contrasting habitats of a temperate location of South Mexico.

From July 1998 throughout June 1999, individuals of *Peromyscus* were caught using Sherman traps. Location samples and habitat characteristics were as follow: 1) Huitepec Ecological Reserve (HER), which comprises pine-oak forests (2,340 m); 2) Moxviquil Ecological Reserve (MER) where oak forests predominate (2,314 m); 3) corn-pumpkin crops (C1; 2,153 m) and 4) corn-tomato-bean crops (C2; 2,131 m). Spatial coordinates for our study area as a whole correspond to 16° 35' and 16° 46' N latitude and 92° 27' and 92° 43' W longitude.

To assess species seasonal varation at each location, values of relative abundance and a Margalef's index of species richness were calculated. In addition, we compare diversity of species at each location using Shannon-Wiener's index (H').

One hundred and fifty three records of *Peromyscus* were obtained. This entailed a recording effort of 1980 traps/night. We registered five species at HER (*P. levipes*, *P. mexicanus*, *P. aztecus*, *P. guatemalensis* and *P. zarhynchus*). The most abundant species during the rainy and dry seasons were *P. levipes* and *P. mexicanus,* respectively. Three species were present at MER (*P. levipes*, *P. mexicanus* and *P. aztecus*) being the most abundant species *P. levipes* during both the rainy and dry seasons. Two species (*P. levipes* and *P. mexicanus*) where recorded at location C1. Of these, *P. mexicanus* was the most abundant species during both sampling periods. No species were recorded at location C2 (Table 1).

The highest species richness was found at HER whereas the poorest location correspond to MER both during the rainy season (Table 1). Shannon-Wiener's index indicated that most and less diverse locations during rainy season censuses corresponded to HER and MER, respectively (Table 1). There were not statistically significant differences for all parameters calculated ($p<0.05$).

Table 1. Relative abundance, richness and diversity of species at each location during a year in the vicinity of San Cristobal de Las Casas, Chiapas, Mexico.

		C1		HER		MER	
		Rs	Ds	Rs	Ds	Rs	Ds
Relative abundance in percentage (%)	Species more abundant	2 (75)	2 (81.2)	1 (35.7)	2 (47.2)	1 (90.4)	1 (80)
	Species less abundant	1 (25)	1 (18.7)	3 y 4 (7.1)	3 (11.1)	2 (9.5)	3 (5)
Richness (d1)		0.72	0.36	0.99	0.55	0.32	0.66
Diversity (H´)		0.55	0.47	1.40	0.94	0.12	0.59

C1= corn-pumpkin crops 1; HER= Huitepec Ecological Reserve; MER= Moxviquil Ecological Reserve; Rs= Rainy season; Ds= Dry season; 1= *Peromyscus levipes*; 2= *P. mexicanus*; 3= *P. aztecus*; 4= *P. guatemalensis*.

The composition and abundance of species of *Peromyscus* in four contrasting habitats of this study were directly influenced by antropogenic activities, being farms the poorest diverse locations. Precipitation and the food availability (quantity and quality) throughout the year may play an important role in the abundance, richness and spatial distribution of this genus.

Peromyscus guatemalensis and *P. zarhynchus* were only present in the most complex and heterogeneous habitats such as the Huitepec Ecological Reserve (Horváth, 1997). The Huitepec area not only supports a high diversity of small rodents, but also endemic rodent fauna occurs there (*P. zarhynchus*).

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Fecal corticosteroids in deer mice (*Peromyscus maniculatus*): effects of color morph and sex

Twenty-four hour fecal collections were taken from 45 cages of deer mice housed in same sex groups (n = 25 cages of females, 20 of males) of one to six of two color morphs, agouti (n = 20 cages) and nonagouti (n = 25 cages). The animals were 44 to 1526 days of age with a median age of 2 years. Preliminary analysis of fecal corticicosteroids (performed by J Harper) indicated no effects of age or groups size but that females had higher and more variable steroid concentrations. On a per gram basis agouti and nonagouti deer mice had similar steroid levels but the amount of fecal material collected from agouti animals was ~40% higher than that for nonagouti animals. This suggests that total fecal corticosteroid output might be higher in agouti deer mice.

A more rigorous 24-hour fecal steroid sample collection is underway to determine if fecal output and total fecal corticosteroid production in fact varies between the color morphs.

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Waltzing Deer Mice in New England

Stocks of *Peromyscus maniculatus gracilis* and of *P. leucopus noveboracensis* have long been maintained at Smith College. During that time waltzing behavior has appeared independently in each of two stocks of *P.m. gracilis*. The behavior, inherited as a recessive trait, can in each stock be traced back to field-caught progenitors. The two stocks, one from West Thornton, New Hampshire, and the other from Ashfield, Massachusetts, represent localities separated by approximately 125 linear miles, as well as by the Connecticut River and considerable terrain inhospitable to forest dwelling mice.

In the New Hampshire stock (Horner *et al*, 1980) the carrier of the waltzing trait was traced back to a non-waltzing, non-agouti male trapped January 1, 1975. The fact that this mouse was non-agouti is not necessarily relevant. In the case of the all-agouti Massachusetts colony, waltzing appeared four to six generations following captivity of the mice and can be traced to any one, or possibly more, of six animals trapped during 1985 and 1986.

It should be emphasized that my observations on waltzing were entirely incidental to other studies already in progress. Except for documenting the behavior of the New Hampshire mice on 16mm. motion-picture film, I have only general comments to offer. For the most part, my records reflect chance observations and curiosity rather than a planned study. The following notes refer to waltzing activity recorded by me with reference to the New Hampshire colony: duration of waltzing activity ranged from a few seconds up to seven hours of almost continuous circling; in its periods of most rapid spinning a mouse might reach a speed of more than two complete turns per second (as calculated from film settings); waltzing animals ranged in age from 2 1/2 months to 3 1/4 years; there was no indication of deafness, one mouse remaining acutely sensitive to sound until sacrificed at 3 years; turning took the form of both wide circles (up to the 12-inch diameter permitted by cage size) and tight ones (spinning in place), the two forms of activity often alternating; circling was predominantly counterclockwise in direction, but occasionally clockwise; locomotion appeared normal between bouts of circling. There seemed to be no long-term interference with eating, grooming, or dominance relationships among cage-mates. One caged waltzer actively defended her nest of 5-day-old young against my intruding finger. Later, when I removed the young a short distance from the nest, she waltzed them back again, carrying them one by one. The behavior of the Massachusetts waltzers, although less closely observed, seemed similar to that of the New Hampshire mice.

As observed by me in these two New England stocks, the waltzing trait seems clearly recessive. Especially in the New Hampshire animals, however, inheritance maybe more complex than the "simple mendelian recessive" postulated by Dice (1935) for *P.m. bairdii*. Retrospective study of my New Hampshire lineages corroborates the unexpressed carrying of the waltzing trait by either the agouti or the non-agouti mice. In the few cases where backcrosses of waltzer times non-waltzer were made, the number of waltzers produced fell short of expectation. My only waltzer times waltzer pairing yielded two waltzers and five non waltzers. In the Massachusetts colony, on the other hand, my most informative pairing, in terms of total progeny, produced a total of 7 waltzers and 22 non-waltzers, supporting the simple recessive prediction. My dearth of relevant breeding data leaves many questions unanswered.

Waltzing in *Peromyscus* is not an uncommon mutation,, having been reported in other species of the genus as well as in other subspecies of *P. maniculatus* (Dice, 1935;Watson, 1939; Barto, 1956; Dice, Barto, and Clark, 1963). The present account appears to be the first description of waltzing in *P.m. gracilis*.

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Differences in population dynamics of *Peromyscus levipes* and *P. melanophrys* in two areas with different degree of disturbance in southeastern Morelos, Mexico

Population dynamic of *Peromyscus levipes* and *P. melanophrys* in two areas with different degree of disturbance, (caused by firewood and wood extraction, and the shepherding of the cattle), a not very disturbed area and a very disturbed area, in a tropical dry forest in southeastern Morelos State, Mexico, were studied. The data were obtained from February 1991 to March 1992, in monthly collections of two consecutive nights using Sherman live traps baited with oats, in two plots of one hectarea each one.

Peromyscus melanophrys was abundant in both areas (59 and 26 individuals), while *P. levipes* was the most abundant species in not very disturbed area (319) and we only captured six individuals in very disturbed area. In general, population density was low in dry months and increased in the wet period in both species. In not very disturbed area, the reproductive pattern of two species was continuos polyestrous, with postpartum estrous, while in very disturbed area, the reproductive pattern of *P. melanophyrs* was seasonal polyestrous. In not very disturbed area, *P. levipes* and *P. melanophrys* had significant preferences by the arboreal coverage ($F = 62.62$, $P<0.001$, $n = 305$; $F = 4.90$, $P<0.05$, $n = 134$; respectively) while in very disturbed area, they preferred the shrub coverage. For *P. levipes* and *P. melanophrys*, habitat disturbance was expressed in significant differences in population density, age structure, reproductive activity, biomass and microhabitat preference between the two sites.

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Peromyscus maniculatus body composition model

We are currently developing a *Peromyscus maniculatus* body composition model for non-invasively estimating lean and fat tissue using the EM-SCAN Model SA-2. This methodology relies on the creation of a magnetic field within the device chamber and the detection of lean tissue amounts based upon a measured (unitless) disturbance created by the higher relative cation levels found in lean versus fat tissue. Once this model is established, we will be able to perform additional non-invasive estimates of body composition on *Peromyscus maniculatus* in future research. In addition, we are investigating the change in body composition of wild deer mice under laboratory conditions (stable temperature, *ad lib.* lab chow). Prior research in our lab has show that meadow voles are relatively lean year-round (3-5 % body fat). However, we held under laboratory conditions, they will deposit huge quantities of lipid (25-30 % body fat), while actually losing lean tissue. In addition, voles seem to regulate their body mass and do not continue to get heavier once reaching a certain plateau, therefore not demonstrating diet-induced obesity.

Our estimation model methods will be based on a multiple regression of specimen total body mass, shape (size), and the EM-SCAN reading to total body lipid, and allows us to estimate body fat directly from the EM-SCAN estimate value. A total of 48 specimen will be used with EM-SCAN body estimate readings taken at initial capture, then at 2 week intervals for a period of 6 weeks. At initial capture and each 2 week interval, 12 individuals will be euthanized. A dried homogenate of each carcass will be prepared and body lipids chemically extracted using a modified Soxhlet procedure. This allows us to determine the actual lipid content and will be used in development of our multiple regression model.

Additional information gained from this experiment will be the degree of body composition change associated with rearing wild animals under unnatural laboratory conditions. Similar to meadow voles, we expect deer mice to gain lipid mass, although to what extent is unknown. If this species performs similarly to meadow voles, the change over six weeks could be analogous to a marathon runner changing to a "couch potato". As one can see, inferring research information gathered from individuals undergoing such dramatic morphologic change in a relatively short time could be problematic.

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Parent-of-origin-specific overgrowth of hybrids

In an effort to understand the parent-of-origin-specific overgrowth of hybrids between two species of *Peromyscus*, we analyzed reciprocal maternal and paternal contributions to the dysplasia. These studies reveal that hybrid inviability is due to a genetic incompatibility between a maternally expressed X-linked locus from *P. polionotus* and an imprinted paternally expressed autosomal locus from *P. maniculatus*. In addition, the most severe overgrowth is accompanied by widespread relaxation of imprinting of primarily paternally expressed genes. We also find extreme skewing of X chromosome linked loci, which is likely responsible for the sexually dimorphic phenotypes. *P. maniculatus* alleles appear to be dominant over *P. polionotus* within female F1 and backcross embryos, being expressed at an 85%;15% ratio. Thus, both genetic and epigenetic incompatibilities underlie hybrid inviability in *Peromyscus* and may play a frequent role in the establishment and maintenance of reproductive isolation in mammals.

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Demographic comparison of the white-footed mouse, *Peromyscus leucopus*, in a forest and adjacent habitat fragments

Abstract

A series of demographic characteristics of white-footed mice, *Peromyscus leucopus* were examined in two habitats: a forest and an adjacent 14-year old experimental fragmentation site in northeastern Kansas. *P. leucopus* colonized the fragmented habitat in 1994, and this study describes the demographic differences between the adjacent forest and this recently colonized fragmented habitat. Habitat preference and fitness differences were measured with a series of demographic characteristics, such as longevity, proportion of adults, proportion of breeding adults, population density, and movement patterns between habitats.

The forest habitat appears to be superior to the fragmented habitat by all measures. *P. leucopus* in the fragmentation area had lower population densities, a higher proportion of non-adults, lower adult mass, shorter persistence among resident adult females combined with fewer bouts of reproduction. In addition fragmented adult males were less likely to be scrotal, and adult mice moved to the forest.

White-footed mice living in the forest are more likely to be long-lived adults who reproduce more than once in their life, and do not leave the forest. Forest *P. leucopus* had higher proportions of adults in the population in all years. Resident females in the forest lived significantly longer than resident females in the fragmentation area and these females also persisted longer than forest males. Transient forest mice are typically adult males, whereas transient mice in the fragmented habitat mice are predominantly pre-reproductive.

Based on the patterns of movement and demography, white-footed mice living in the fragmented habitat may be excluded from the preferred forest habitat by dominant forest individuals.

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