



Determining Sex and Reproductive Status of Rodents

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When conducting small mammal studies of breeding rodents, identifying the sex and reproductive status of an animal is often crucial. However, most mice and rats do not exhibit obvious differences, such as color or size between males and females. Moreover, determining the reproductive status of individuals can be difficult. This guide illustrates how to sex and determine the reproductive status of mice and rats.

Sexing

Sexing mice and rats usually relies on differences in the genitalia between sexes. Males possess testes and a penis, while females possess mammary glands (sometimes with visible nipples) and a vaginal opening with a noticeable clitoris. Although these features can be easily discernible in reproductively active males and lactating females (Figure 1), they can be more difficult to impossible to distinguish in non-reproductively active animals (Figure 2).

Non-reproductively active females without prominent nipples can be difficult to sex, especially because their clitoris superficially resembles a penis (Figure 2C). When nipples or testes are not prominent and there is no sexual difference in color or size, the anogenital distance can be used to sex animals. The anogenital distance is the distance between the base of the penis and the anus (male) or between the clitoris and the anus (female). The anogenital distance is shorter in females than in males (Figure 3).

Reproductive status

Testes are scrotal (descended) in reproductively active males (Figure 1A) and non-scrotal (undescended) in non-reproductively active males (Figures 2B, 3A).

In females, the reproductive status can be determined by:

- (1) The presence of enlarged nipples (lactating; Figures 1B and 5C);
- (2) Palpating the belly for fetuses (pregnancy; Figure 5B); or
- (3) The presence of a copulatory plug (indicative of recent mating; Figure 6).

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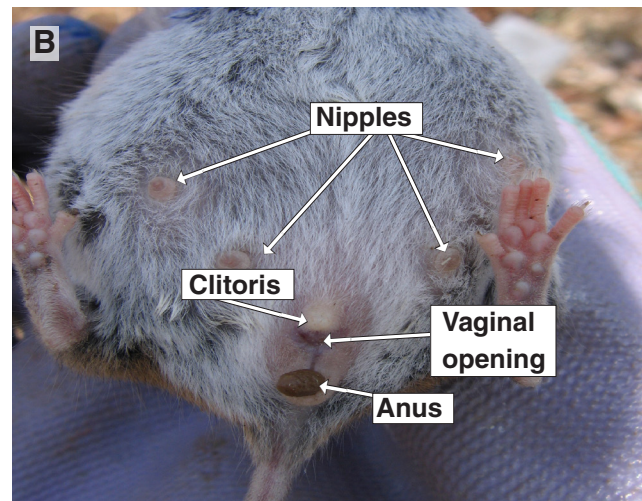
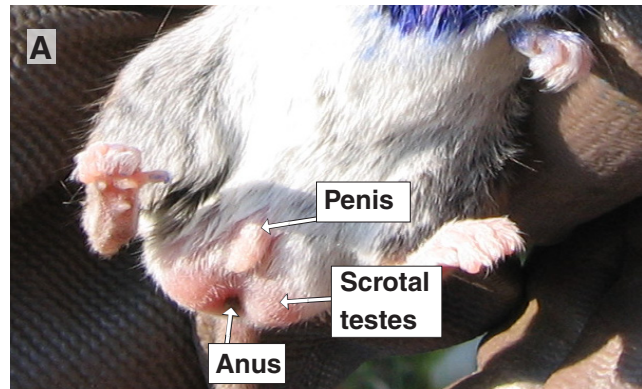


Figure 1. Reproductively active male (A) and lactating female (B) *Peromyscus leucopus* (white-footed mouse). In females, the vaginal opening is a “Y”-shaped slit located directly below the clitoris. Note that rodents can defecate when handled, which makes locating the anus easier.

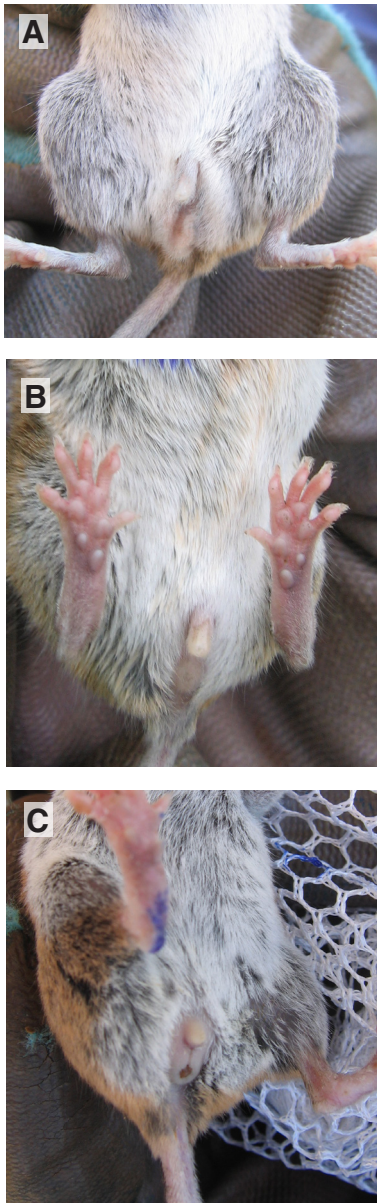


Figure 2. Non-reproductively active *P. leucopus*: male becoming non-scrotal (A), non-scrotal male (B), and non-reproductive females (C).

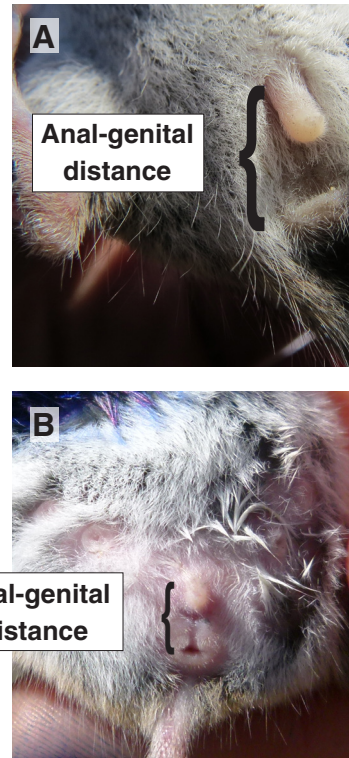


Figure 3. Anal-genital distance in males (A) and female (B) *P. leucopus*.

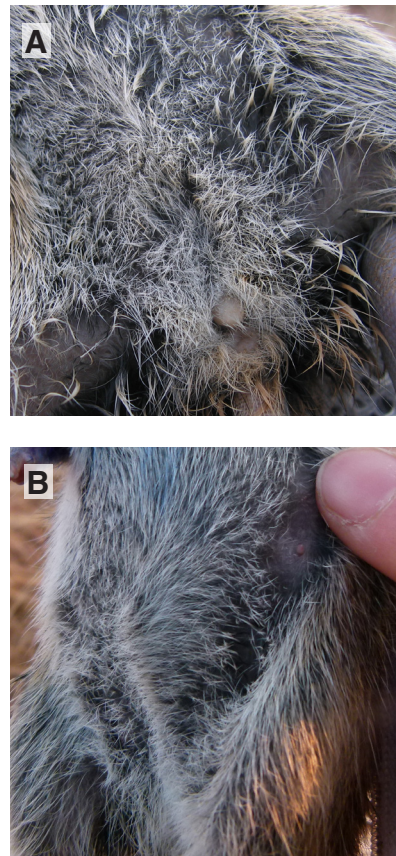


Figure 4. Non-reproductively active (A) and lactating (B) adult female *Sigmodon hispidus* (hispid cotton rat). Note the very short anal-genital distance (A), which would be at least twice as long in males.

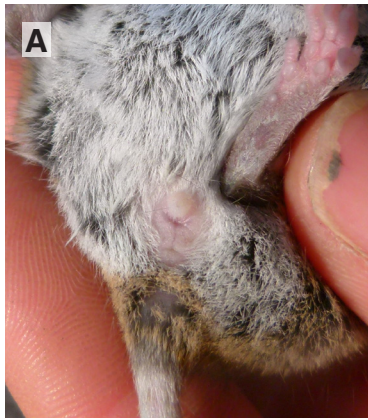


Figure 5. Non-reproductively active (A), pregnant (B), and lactating (C) adult female *P. maniculatus* (North American deer mouse).

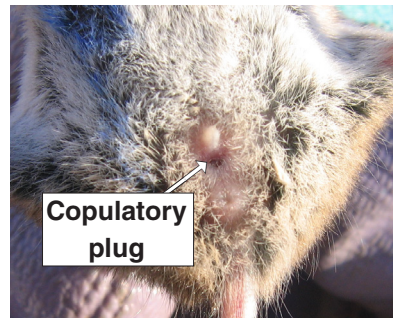


Figure 6. Reproductively active *Reithrodontomys fulvescens* (fulvous harvest mouse) with a copulatory plug.

A copulatory plug is a hardened secretion deposited by a male into the vaginal opening following mating. Figures 4, 5 and 6 show examples of females from different species at various reproductive stages.

Useful Resources

For field methods on small mammal trapping, handling, and monitoring:

Hoffmann, A., J. Decher, F. Rovero, J. Schaer, C. Voigt, and G. Wibbelt. 2010. Chapter 19 - Field Methods and Techniques for Monitoring Mammals. Pages 482-529 in *Manual on Field Recording Techniques and Protocols for All Taxa Biodiversity Inventories and Monitoring* (J. Eymann, J. Degreef, C. Häuser, J.C. Monje, Y. Samyn, and D. VandenSpiegel, editors). *Abc Taxa* 8(2): 482-529.

Wilson, D.E., F.R. Cole, J.D. Nichols, R. Rudran, and M.S. Foster. 1996. *Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*. Smithsonian Institution Press. 409 pages.

For mice breeding guidelines

University of Florida - Institutional Animal Care and Use Committee. 2012. Breeding Guidelines for Mice. 2012. Available online at: <http://iacuc.ufl.edu/policies/Changes%202012/ACS%20Mouse%20Breeding%20Guidelines%20for%20IACUC.pdf>

Photographs

Photographs were taken for a small mammal study approved by the Institutional Animal Care and Use Committee (ACUP AG-12-16). Photo credits: V. Biral, N. Ferreira, M.E. Jacques, R.M. Rahal, and F. Secanho.

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