Laboratory study of wild rats*

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Two wild rat species, cotton rats and black rats, have proven quite suitable for laboratory behavioral research. Other than using heavy gloves for handling, maintenance and housing practices are similar to domesticated rats. Both species can be bred in captivity. Several sources for obtaining specimens are discussed.

Boice (1971) has recently described procedures for trapping, maintaining, and studying wild Norway rats (*Rattus norwegicus*) in the laboratory. He suggests that a major reason for studying wild Norway rats is to determine how the process of domestication has influenced the behavior of this species. There are other reasons for the laboratory study of wild animals, one of the most important being the establishment of behavioral principles and laws which extend over many species. In his recent provocative article, Lockard (1968) cast doubt upon the validity of results obtained from domesticated rats in relation to species which are products of a natural environment. This criticism can be met by the study of nondomesticated species, particularly those which are closely related to domesticated rats, for greater generality should be observed the closer the relationship between species.

The procedures described by Boice (1971) for trapping, maintaining, and handling wild Norway rats are quite elaborate, and could discourage some researchers. This paper is intended to provide information on three wild rat species studied in my laboratory which do not require handling and maintenance procedures different from those employed with domesticated rats. Black rats (*Rattus rattus*), cotton rats (*Sigmodon hispidus*), and wood rats (*Neotoma floridana*) (Powell & Morris, 1968; Powell & Mantor, 1970; Powell, 1971) have been studied in this laboratory. The first two species appear quite suitable for conditioning experiments, but wood rats have adapted poorly to captivity. Some members of this species appear to go into a state of shock when trapped; some do not eat in captivity, and, consequently, I have experienced a mortality rate of 70% to 80% within 10 days following capture. For black rats and cotton rats, mortality rates over the same period have been practically zero. This difference in adaptability between species is, of course, an interesting topic in itself for research.

TAXONOMY AND NATURAL HISTORY

Black rats belong to the family Muridae (Old World rats and mice) which also includes the Norway rat (*Rattus norwegicus*). Thus, black rats are closely related to the species which is the ancestor of all domesticated rat strains (Barnett, 1963). Black rats are found in every state in the continental US but are most common in the southern states and along coasts and waterways. Black rats are similar in appearance to Norway rats but can be differentiated by the presence of a longer tail and a smaller body size in the former species. Adult black rats in the wild weigh from 115 to 350 g, while those raised in the laboratory ranged from 190 to 280 g. Black rats are remarkable climbers and tend to be arboreal, especially in areas where they compete with Norway rats. Favorite habitats include attics and old buildings, such as barns, especially where trash is abundant.

Cotton rats and wood rats are both long-tailed members of the family Cricetidae. Boice mistakenly identified cotton rats as members of the vole group or *Microtines*. Cotton rats are very common throughout the southern US, with a range extending as far west as southern California and as far north as Kansas and Virginia. They prefer open grassy areas, where ground cover is fairly dense. Adult cotton rats in the wild weigh from 80 to 200 g, while some of those raised in our laboratory have attained weights of 220 g. Cotton rats show very rapid development and are able to leave the nest after only 10 to 12 days (Meyer & Meyer, 1944). Thus, they would be suitable for research where it was desired to limit the duration of parental contact. Cotton rats are also one of the few New World species demonstrated to display extreme yearly population cycles (Odum, 1955), for which the Lemming is known best.

Detailed information on the wood rat will not be given because of the problems previously mentioned.

COLLECTION TECHNIQUES

Boice suggests that trapping of Norway rats from land-fill refuse dumps is the most suitable method for psychologists to obtain wild specimens, and he lists several traps suitable for this purpose. For the species mentioned here, I recommend the Sherman live trap, which is obtainable from H. B. Sherman Co., DeLand, Florida at $2.50-$3.00 each. This trap is less expensive than those listed by Boice and is favored by a number of zoologists because of its cost, ease of transport, and simplicity of use.

While black rats and cotton rats can also be trapped from suitable habitats, I suggest several other approaches to this problem to save time and effort. One can solicit help from one's colleagues in zoology, who often conduct population studies where animals are simply trapped, measured, marked, and released. Consequently, they are usually not adverse to contributing some of

*I thank Larry Brown, Department of Zoology, University of South Florida, for his many helpful comments on this paper.

their specimens for laboratory use. I have obtained many animals in this way. Similarly, entomological research stations, such as those operated in Florida by the State Division of Health, frequently engage in the live trapping of rodents in order to study ectoparasites carried by these animals. I have found agencies of this type to be quite cooperative in supplying animals. Commercial exterminators would appear as another possibility, although I have never tapped this source. While these companies usually do not live trap animals, a small bounty, or an appeal based on the "interests of science," might induce cooperation.

Should the psychologist decide to do his own trapping, two of the best baits for black rats and cotton rats are sunflower seeds and rolled oats.

HANDLING AND MAINTENANCE

Boice describes elaborate procedures for handling wild Norway rats, but these procedures are not necessary for either cotton rats or black rats. A pair of heavy work gloves of the type used by welders is used to transport the animals from the home cage to the experimental chamber and back. Gloves sold under the trade name Double Check by the Indianapolis Gloves Co. are heavy enough to permit easy handling of the animals. This handling does not appear to disrupt performance in the test situation. The analysis of performance during avoidance conditioning has shown that the rats avoid as effectively early in the session as at any other time (Powell, 1971, 1972).

Recently trapped animals are the most difficult to handle, but rats of each species show slow but definite adaptation to continued handling. Cotton rats and black rats raised in the laboratory are much easier to handle, usually being no more difficult than domesticated rats. I can give further confirmation to statements by Rasmussen (1939) and Barnett (1958) concerning the taming of wild rats through early and frequent handling, as this has been accomplished with several black rats. When mature, these rats make no attempt to bite or to escape from the handler.

A diet of Purina Lab Chow and water is quite adequate to maintain black rats and cotton rats in a state of apparently excellent health. Both species are less susceptible to disease than domesticated rats in my laboratory, with a mortality rate of less than 10%.

HOUSING AND BREEDING

Standard rack-type cages are suitable for housing black rats and cotton rats. Somewhat larger cages are preferred for breeding black rats. I have been successful with rack-type cages which are 8 x 16¼ x 9½ in. (203 x 413 x 238 mm). The cages I have used are Model HB-15B, manufactured by the Hoeltge Co., 5242 Crookshank Rd., Cincinnati, Ohio 45238. As Boice observed with Norway rats, the provision of nest material seems to have little influence on breeding by black rats.

Cotton rats are somewhat more difficult to breed in captivity, and I have had little success in the types of cages described above. Cotton rats have been induced to breed by providing them with a much larger area (at least 2 ft sq) in which a large amount of nesting material was provided. I have also found it advantageous to place these "breeding boxes" in remote areas of the laboratory, where they will be disturbed as little as possible.

In summary, I have found the laboratory study of nondomesticated rats to require only slightly more effort than domesticated rats. Obviously, comparative psychologists must extend their research to include a much larger and more meaningful sample of different species. The rodent group in itself includes fully one-third of all mammal species, and the experimental psychologist has devoted almost all of his efforts to only one of these. It is small wonder that critics have sometimes questioned whether comparative psychology is any longer a viable enterprise (Bitterman, 1960; Lockard, 1971).

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(Received for publication November 6, 1972.)