CAPTIVE PROPAGATION OF ALLEGHENY WOODRATS

Current Status
Third year of a three-year project

Funding Sources and Partners
IDNR Division of Fish & Wildlife, Wildlife Diversity Section; Purdue University

Project Personnel
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Soft-release enclosures were placed next to denning habitat.
Background and Objectives

Allegheny woodrats (Neotoma magister) are a species of conservation concern throughout their range, with population declines attributed to habitat fragmentation, loss of hard-mast resources, mortality as a result of parasitic infection by raccoon roundworm (Baylisascaris procyonis), and loss of genetic diversity and inbreeding depression. Consistent with the range-wide pattern of decline, the abundance of Allegheny woodrats in Indiana has decreased precipitously during the past 30 years. Population monitoring has indicated that between the early 1980s and 2006 woodrat abundance declined by more than 50 percent, while 13 of 19 subpopulations were extirpated.

Recently, extensive management efforts have been undertaken through a partnership between Purdue University and the Indiana Department of Natural Resources to address some of these concerns for woodrat populations in Indiana. As part of these recovery efforts, we distributed medicated baits throughout woodrat habitats to passively deworm resident raccoons, thereby reducing or eliminating the threat of roundworm infection for woodrats. Additionally, woodrat translocations were conducted in 2007 and 2008 in which individuals were captured from genetically diverse populations in Kentucky and Tennessee and released into suitable habitats in Indiana. Specifically, woodrats were either released into: (1) previously occupied but currently vacant habitats to re-establish populations (reintroduction) or (2) genetically and numerically depressed populations (supplementation) to improve levels of genetic diversity and the likelihood of maintaining viable populations.

While genetic diversity improved in response to these supplantations, expansive distances between occupied woodrat habitats inhibited movement of individuals among populations. The isolation of populations creates a situation in which genetic diversity is lost over time, allowing a lack of genetic vigor to threaten the long-term persistence of the species throughout the state. To further address the concerns associated with the loss of genetic diversity among isolated Allegheny woodrat populations, a captive breeding program was established to:

1) Help retain genetic diversity still present within unsupplemented Indiana populations as well as the genetic diversity that was introduced into Indiana through recent translocation efforts.

2) Restore genetic diversity in isolated Indiana populations to levels found within healthy, robust populations. Specifically, we used optimized mate pairings among individuals collected from the variety of isolated Indiana woodrat populations and those collected from Pennsylvania to produce genetically diverse offspring. Later release of captive-reared juvenile woodrats into Indiana populations was used to simulate natural gene flow (the movement of individuals among populations). The interbreeding between captive-reared individuals and members of the wild populations will facilitate restoration of healthy levels of genetic diversity and provide for the long-term persistence of woodrat populations.

Methods

Our captive breeding population was founded in autumn 2009 with nine woodrats (two males and seven females) collected from the various populations in Indiana.
and four woodrats (three males and one female) from genetically diverse populations in southwestern Pennsylvania. In 2010, we released five of the original found-ers into occupied habitats in Indiana and replaced them with six woodrats (two males and four females) from Indiana. We added a final male in autumn 2011.

Captive woodrats were housed independently in wire mesh enclosures (3 feet x 2 feet x 1½ feet) with an external nest box (9 inches x 9 inches x 9 inches). Wood-rats were fed a high-quality diet that consisted of a mix of leafy greens, frozen mixed vegetables, a seed mix, acorns, mealworms, and rodent block. Water and timothy hay were provided ad lib.

Male and female enclosures were joined to one another via wire mesh tubes (referred to as ‘howdy tubes’). One of the two paired individuals had unrestricted access to the howdy tube, which allowed it to interact with the other individual through a wire mesh door. When interactions indicated both woodrats were sexually receptive, the wire mesh door was opened, under the supervision of managers, giving the individuals an opportunity to mate. After approximately a 38-day gestation period, females gave birth to litters ranging from one to three pups. Family groups remained together until the pups were weaned between 45 and 65 days.

After weaning, juveniles were marked with numbered ear tags for later identification once released into the wild. Additionally, all individuals released in 2011 and 2012 were fitted with radio collars. This technology emits a pulse at a radio frequency such that we can use a directional antenna to determine the location of the woodrat and whether it is alive. By comparing survival rates of captive-reared woodrats to a parallel sample of wild-caught young, we could discern how effective captive-reared woodrats were at transitioning from the laboratory to the wild.

Release strategies evolved throughout the project as we gained greater understanding of the challenges woodrats encounter as they transition from a captive environment to natural habitats. In 2010, we placed a wooden nest box similar to the nest boxes used in captivity within the rocky structure of release den sites and protected the nest box from predators with large rocks. To then encourage settlement at release sites, we placed about one pound of rodent block (equivalent to about a one-month food supply) within the rocky den site, near the nest box. In 2011, we released woodrats in the nest boxes they had occupied in captivity, again protecting the nest box within the rocky structure of a den site and providing a large amount of rodent block. In 2012, we adopted soft-release techniques to further ease the transition from captivity to the wild, releasing woodrats into large (4 feet x 7 feet x 2 feet) wire-mesh enclosures placed next to natural denning habitat. Within the enclosures, we placed a corrugated plastic culvert (18 inches in diameter x 4 feet), and within the culvert we placed a clean nest box identical to that used in cap-

Progress to Date

From February 2010 through July 2012, 19 litters comprising 43 pups were born to eight different dams and four different sires. Of the 43 pups, 38 were released into extant populations, three died while still housed socially within family groups, and two independent offspring died while awaiting release. Across the years, eight woodrats were released in 2010, 16 in 2011, and 14 in 2012.

Of the eight captive-reared juvenile woodrats released in 2010, one was captured in 2011 but unfortunately died at the end of the breeding season in 2012. Of the 16 captive-reared juveniles released during the summer months of 2011, radio-telemetry monitoring revealed that four survived through the reproductive season (through the 72-day monitoring period), with three of those surviving into the
fall. All three were recaptured in 2012. Of the 14 released in 2012, four survived through the monitoring period, and we hope they will have over-winter survival similar to those released in 2011. Implementing soft-release techniques in 2012 appeared to reduce the mortality rate through the acute acclimation period (first two weeks post-release) and promote the long-term survival rate of captive-reared woodrats as they transition to natural habitats. We believe implementing soft-release strategies offers great promise for the future of woodrat releases from captivity, and we recommend implementing similar measures for future releases from captivity.

From our tremendous archive of woodrat video imagery, we are nearing the completion of our work on maternal investment and pup development. In sum, we continuously recorded data on eight litters from birth to weaning. We are continuing to evaluate the behavioral repertoire of captive-reared juveniles in response to various husbandry techniques intended to promote foraging behavior and nest construction.

The captive breeding program at Purdue University has now been disbanded after producing 19 of the 24 captive-reared litters documented for the species. Members of our breeding population have now been transferred to Delaware Valley College in Pennsylvania, where their faculty continues our work on the captive propagation and identification of effective release strategies for this imperiled species.

Challenges Encountered

We encountered a number of challenges associated with the captive maintenance of Allegheny woodrats. We learned through each of these experiences, improving the quality of care we provide to maximize the well-being of the captive population. Over the course of the program, we had minimal mortalities, losing the five juveniles described above, two founding males brought into captivity with the establishment of the program, and two adults that had been in captivity for multiple years. With lessons learned through the loss of each individual, we modified our husbandry practices as needed to ensure animals received the best care possible.

Given that woodrats are imperiled in the wild, one of our goals with the establishment of the captive breeding program was to minimize the costs to wild populations associated with the removal of individuals. Accordingly, some of the founders of the captive population had sustained injuries in the wild that likely would have been lethal but could be managed in captivity. This allowed them to make a positive contribution to woodrat recovery. An ongoing challenge was managing the special needs of these individuals. Through the tenure of the captive breeding program, we worked closely with the veterinarians at Purdue’s Lab Animal Programs, and the Small Animal Veterinarian Teaching Hospital to address the health needs of all members of the captive population and maximize their well-being.