

Genetic Rescue in the Endangered Columbia Basin Pygmy Rabbit

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Introduction

The Columbia Basin pygmy rabbit (*Brachylagus idahoensis*) is a highly endangered mammal in Washington, specialized to live in arid sagebrush habitats in the western U.S. Once thought extinct in Washington, several small rediscovered populations began to rapidly decline during the last 20 years. Numerous factors may have contributed to this decline, including conversion of sagebrush cover to farming and ranching, habitat fragmentation, predators, disease, and the long-term isolation of small populations in Washington from pygmy rabbits elsewhere.

We rescued and attempted to breed in captivity 16 of the last-known survivors of Columbia Basin pygmy rabbits in cooperation with the WA Dept. of Fish and Wildlife and the U.S. Fish and Wildlife Service. As of 2006, there are no known wild pygmy rabbits remaining in Washington.

Objectives

We conducted this emergency rescue to create a captive-breeding population at Washington State University, the Oregon Zoo, and NW Trek, which could be used to reintroduce pygmy rabbits back into suitable habitats in the wild. Our general objectives were to:

- ◆ Develop propagation techniques for a wild rabbit with specialized breeding requirements (e.g., females dig a natal burrow in loose soil in which they give birth and hide kits underground until they grow large enough to emerge on the surface).
- ◆ Describe factors influencing the reproductive performance and behavior of pygmy rabbits.
- ◆ Quantify and model genetic and demographic factors influencing reintroduction strategies and population dynamics of pygmy rabbits.

Methods



We used cattle water tanks, fitted with a wire mesh top, and filled with 1m of soil to house individual rabbits to avoid intraspecific aggression. Tanks were connected with doors which were opened to allow mating between selected individuals during the breeding season.



Pens were filled with semi-natural vegetation and artificial plastic burrows, used by the rabbits until they dug their own burrows. Rabbit behavior was monitored using video cameras, infrared lights for night-time recording, and motion-sensing detectors automatically recording video onto computers.



Pygmy rabbits occupy dense sagebrush habitats containing relatively deep, sandy-loam soils which allows them to dig their own burrows, a rare trait among North American rabbits.



Pygmy rabbits (about 1/4 the size of a cottontail rabbit) are also well adapted to forage on sagebrush, particularly during winter when other forage is unavailable. Photo of young pygmy rabbits in front of plastic burrow in captivity.

The Genetic Rescue Hypothesis

Molecular ecology studies indicate that pygmy rabbits have been isolated in the Columbia Basin of central Washington for at least 10,000 years, and possibly for 40,000 – 100,000 years (Warheit 2001). Consequently, there is a *a priori* reason to believe that these small populations have lost some of their original genetic diversity through genetic drift and inbreeding depression (i.e., matings among closely-related and genetically-similar individuals).

GENETIC RESCUE— occurs when introduction of a few genetically diverse individuals into a small inbred population improves fitness (e.g., increased reproduction or survival).

We compared the breeding behavior and reproductive performance of Columbia Basin pygmy rabbits with that of pygmy rabbits originating from a large population in Idaho. Both groups of animals were housed in the same facilities and bred under the same conditions at WSU.

Key Results

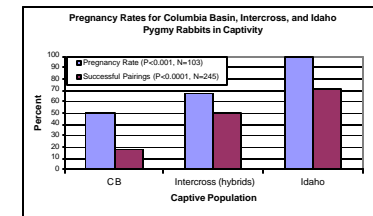
We observed poor reproductive performance among surviving Columbia Basin (CB) pygmy rabbits in captivity, but high reproductive success among captive pygmy rabbits from Idaho (ID). These empirical results indicated that even the captive Columbia Basin pygmy rabbit population faced a high probability of extinction and so by necessity we began an experimental program to mate some Columbia Basin rabbits with Idaho pygmy rabbits.

Reproductive Biology & Behavior

- ◆ Although presented with up to 4 mating partners and up to 6 mating opportunities annually, only 51% of CB females became pregnant each breeding season.
- ◆ Breeding behavior consisted of reproductive chases by males and females, followed by a brief copulation which induced ovulation.
- ◆ 24 days after copulation, females gave birth to 2 – 7 young at the entrance of a natal burrow with a grass and fur-lined nest chamber. Females then covered the burrow entrance with soil and returned 1 - 2 times daily to nurse young, which emerged about 15 days after birth.
- ◆ CB females averaged only 0.7 litters/female/year (max. 2 litters/yr), while ID females averaged 1.8 litters (max. 4 litters/yr).

Reproductive Comparisons: CB vs. Idaho Rabbits

- ◆ CB males took 5 times longer to initiate courtship chases, chased longer and more frequently, and had more apparently unsuccessful copulation attempts during mating sessions than Idaho males.
- ◆ All of 7 measures of reproductive performance (e.g., successful pairings, pregnancies, kits per female), as well as early kit growth rates, were lower for CB than Idaho rabbits.



Conservation Implications

We hypothesize that the low reproductive performance of surviving Columbia Basin pygmy rabbits is more likely explained by inbreeding depression rather than local adaptation to Washington environments. Despite *ad libitum* food and protection from predators, the purebred captive Columbia Basin population is declining to extinction (N=8) and the success of the reintroduction program now depends upon producing intercross (CB x ID) rabbits with at least 75% genetic representation from Washington rabbits.

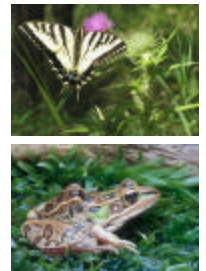
Future of the Columbia Basin Pygmy Rabbit

It is important to restore the Columbia Basin pygmy rabbit in Washington because of their role in the food web and many ecosystem processes. Starting in the fall of 2006, a sample of released rabbits will be fitted with radio transmitters and their survival will be monitored. We will model the population dynamics of reintroduced pygmy rabbits to determine how many separate populations will need to be restored to secure the future of pygmy rabbits in Washington.

Conservation Science at WSU

We are conducting many other studies of declining or threatened and endangered species and ecosystems at WSU, including work on:

- ◆ Badgers and Predator Ecology
- ◆ Northern Leopard Frogs
- ◆ Loggerhead Shrikes
- ◆ Palouse Prairie Restoration
- ◆ Mule Deer and Nutritional Ecology of Mammals
- ◆ Sage Grouse and Neotropical Migrant Birds
- ◆ Butterflies, Pollinators, and other Native Insects
- ◆ Rare Plant Conservation



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