



DESERT TORTOISE HEAD STARTING PROJECT-EARLY PHASE, EDWARDS AIR FORCE BASE, CALIFORNIA

Project #
05-255

Background:

The desert tortoise has been listed as a threatened species under the Endangered Species Act. According to all available data since its listing in 1989, Desert Tortoise populations have continued to decline. Proactive management actions are required to halt the decline and begin recovery of this species. The Headstart Program is a captive breeding program designed to help offset the large population decline of Desert Tortoises (*Gopherus agassizii*). A hatchery program established on Fort Irwin Army National Training Center (NTC) has resulted in encouraging enough results to warrant repetition in a stressed environment such as Edwards Air Force Base (AFB).

Objective:

In 2002 Edwards AFB was selected as an experimental extension of the Fort Irwin's head starting program because of the known presence of Desert Tortoise (both inflicted with upper respiratory disease and disease-free animals) and its large amount of suitable, relatively undisturbed desert habitat. Using enclosures to protect eggs and juvenile tortoises until they are of predator resistant size, the objective of the study was to determine



Hatchling enclosure.

at what age juvenile tortoises after being placed in predator "proof" pens can be released into the wild and become healthy reproductive adults.

The study was also interested in investigating disease transfer in tortoises from mothers to young. Additionally the question was asked if holding tortoises in predator resistant pens is successful in insuring more tortoises make it to reproductive age, can irrigating pens increase

the amount of food available and thus shorten the time that juveniles need to be held in the pens.

Summary of Approach:

In 2002, the predator-resistant portable enclosures, also called head starting pens, along with 5 isolation pens were installed on Edwards AFB. Artificial burrows were constructed in both the isolation pens, as well as the head starting pens to provide shelter for the Desert Tortoises while in captivity.

In 2003, 19 gravid adult female desert tortoises were placed within the enclosures and allowed to deposit their eggs. Once the female tortoises had deposited their eggs, the females were fitted with radio transmitters and released at their original capture locations. The eggs that were deposited were allowed to incubate and develop within the pens, while excluding natural predators that may normally predate on desert tortoise nests.



In addition to placing animals into the head starting pens, a second component of this experimental study was performed which involved artificially watering half of the pens. The

pens were subdivided into four sections and half of the pens were artificially watered using a water truck, hose, and impulse sprinkler head twice per year.

This artificial watering simulated approximately 1 inch of natural rainfall at each application. The hypothesis for the experiment was that applying small amounts of water to annual plants would extend the growing season, extending the forage available to juvenile tortoises, allowing the animals to gain more energy for growth. Artificial water was not applied until the 2004 season, when juvenile animals were present within the pens.

In September 2004, a total of eight yearlings were release from the pens. When neonates emerged in the fall (late August to early October), individuals were marked both on the plastron and carapace; and an individual number assigned to each animal. Also, each individual was carefully weighed and measured. All

hatchlings were held within the pens at least 1 year before they were released.

Of the eight yearlings released, none have survived to date. Two died from predation. Four died from unknown reasons, but were not predated (most likely environmental factors). Of the eight yearlings that were released, only one individual survived more than 10 months. That one died of predation a few months later.

Most deaths occurred within the first 9 months of release. Predation occurred when tortoise activity was high (in the spring) when tortoises are most active. However, predation does not appear to be the only major cause of death. It appears that environmental factors, such as freezing, could also be a major cause of death in juvenile tortoises. However, due to the small sample size used, this experiment should be repeated and a larger sample size used.

The artificial water extended the annual plants' lifespan several weeks, allowing for an extended forage season for juveniles, and also allowed the animals to obtain water if they desired. These waterings did not stimulate germination of any new plants, but only prolonged existing plant species. Waterings were conducted in late spring (one in May and one in early June). Health indices were conducted on all animals, both on the watered side and non-watered side (dry side) of the pens throughout the year.

Data indicates that animals in the half of the pen that received an additional 2 inches of artificial rain had dramatically increased growth rates over non-watered animals

This additional 2 inches of artificial rain increased overall natural precipitation in the pens by 20 percent on the artificially watered side of the pen. Growth rates were more than doubled in the watered side of the pen compared to the non-watered side.

Benefit:

Increased desert tortoise populations could lead to delisting as threatened or endangered species by the US Fish and Wildlife Service or at a minimum reduce the compliance requirements thereby decreasing constraints on military mission. Successful project completion will provide an increase in military mission capability.

This project serves as a model to other installations and federal agencies within the region that contain this dwindling species. As a direct result of this project, 29 Palms Marine Corps Base has developed a similar program and interest in starting similar programs is growing among other federal and state landholders in the area.

Accomplishments:

This phase of the project resulted in the construction of a suite of nursery pens and maternal holding pens that can be utilized in subsequent years. From the data gathered during the yearling release it was determined that a variety of factors (including, but not limited to predation) resulted in the mortality of the juveniles. The artificial watering experiment appears to hold promise. Growth rates more than doubled over the first year of life for individuals in the artificially watered side of the pen.



The project also resulted in refinements to the original design of the enclosures. The project also details reliable methodologies for collecting gravid females, monitoring

hatchlings, tagging and monitoring released animals.

The results of this phase of the project have also resulted in a refinement of the basic questions it was originally intended to answer and to direct further research.

1. If predation is not the only major cause of death in juveniles and environmental factors have an influence on the cause of death, is there anything that can be done to increase survivorship in these animals?
2. Are juvenile offspring from diseased mothers not as fit as juvenile offspring from non-diseased mothers?
3. With artificial watering, it is apparent growth rates increase; however, what are the growth rates over time and how does this effect shell hardness?
4. Also, what is the fitness of animals with increased growth rates?

These questions serve as the basis for the continuing study of the program.

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