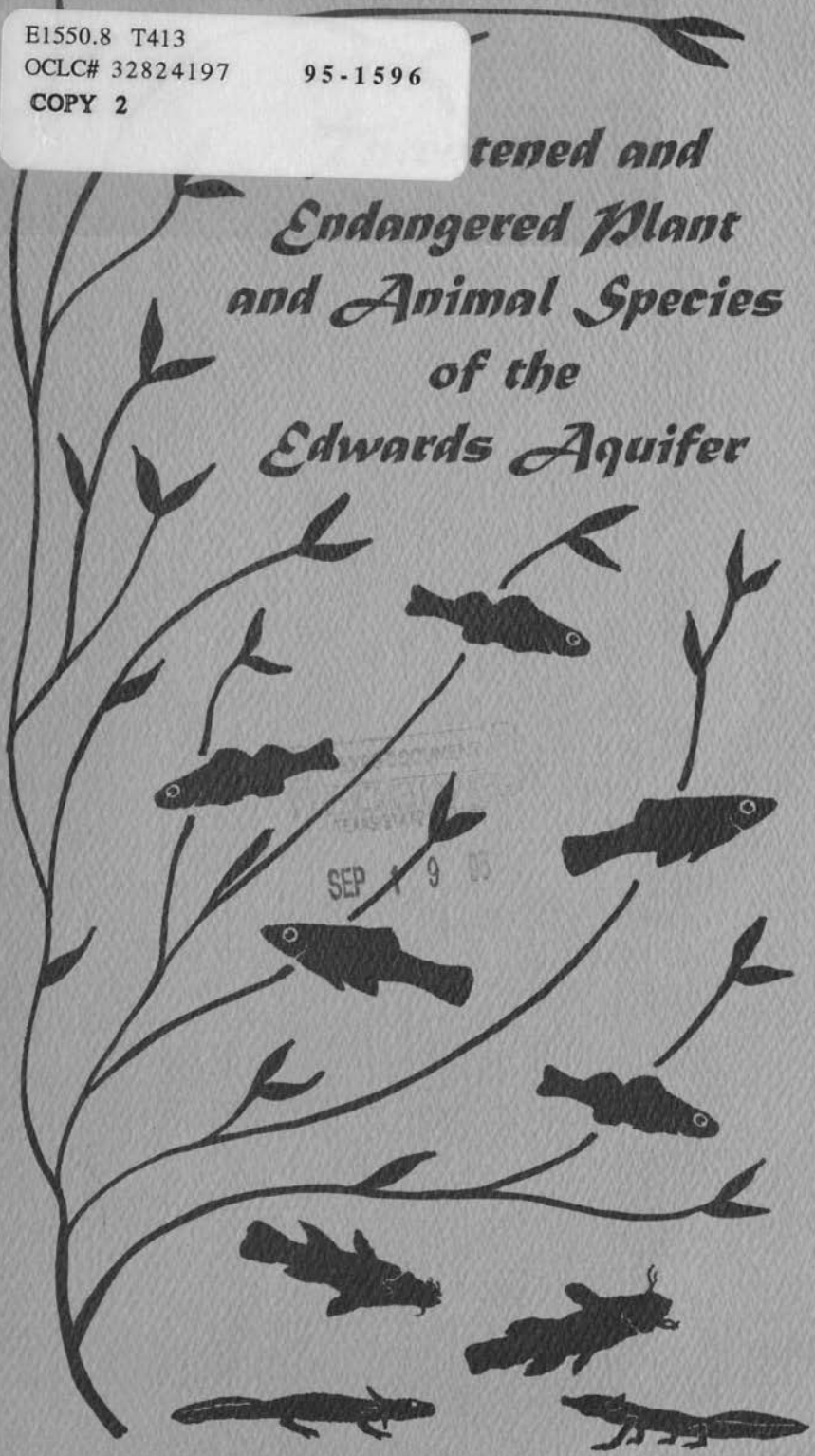
tened and Endangered Plant and Animal Species of the Edwards Aquifer



Threatened and Endangered Plant and Animal Species of the Edwards Aquifer

Spring Species

Fountain Darter (*Etheostoma fonticola*) - San Marcos Springs and Comal Springs - endangered

San Marcos Gambusia (*Gambusia georgei*) - San Marcos Springs - endangered (possibly extinct)

Texas Wildrice (*Zizania texana*) - San Marcos Springs - endangered

San Marcos Salamander (*Eurycea nana*) - San Marcos Springs and Comal Springs - threatened

Subterranean Species

Texas Blind Salamander (*Typhlomolge rathbuni*) - Hays County (San Marcos Springs) - endangered

* Widemouth Blindcat (*Satan eurystomas*) catfish - Bexar County - threatened

* Toothless Blindcat (*Trogloglanis pattersoni*) catfish - Bexar County - threatened

* Listed by Texas Parks and Wildlife Department - not United States Fish & Wildlife Service.

United States Fish & Wildlife Service - USFWS
Texas Parks and Wildlife Department - TPWD
Southwest Texas State University - SWTSU

Edwards Aquifer - Spring Species

San Marcos Salamander

(Eurycea nana)

The San Marcos salamander is a member of the lungless salamander family. It is a neotenic form, meaning that, unlike most salamanders, it maintains external gills even in the adult, sexually-mature stage of its life cycle. In addition, it does not leave the water to metamorphose into a terrestrial form, but becomes sexually mature and breeds in the water. It is listed by USFWS and TPWD as threatened.

Description

The San Marcos salamander is small (about two inches long), light brown with yellowish flecks, and has large eyes with a dark ring around the lens. It has well developed and highly pigmented gills, short narrow limbs, and a slender tail with a well developed dorsal fin. The salamander is capable of altering its dorsal coloration from light tan to dark brown in conformity with the color of the substrate. The external gills of the salamander expand and appear bright red from increased blood flow in cool water of low oxygen content.

Distribution

The San Marcos salamander is restricted to the headwaters of the San Marcos and Comal Rivers, one factor for its being listed as threatened. In 1975, a sampling program was conducted which determined that it occurs abundantly in close proximity to the major spring openings. Salamanders are primarily located on a limestone shelf in the shallow spring areas of Spring Lake, downstream from San Marcos Springs. They have also been found in dense mats of algae along the north side of the San Marcos River's headwaters. In the Comal ecosystem, they occur in the spring openings along Comal Springs Fault.

Habitat, Feeding, and Breeding Requirements

The San Marcos salamander requires: clean, clear, and thermally constant flowing waters; sand, gravel, and rock substrate with little mud or detritus; vegetation for cover; a food supply of small insect larvae,

insect pupae, and small aquatic snails; and protection from floods.

The San Marcos salamander breeds throughout the year with a possible peak about May and June.

Fountain Darter
(Etheostoma fonticola)

Like all darters, the Fountain Darter is actually a member of the family ***Percidae***, the perches. It can be found in both the San Marcos and Comal Rivers and is listed as endangered by TPWD and USFWS.

Description

Fountain darters grow to only about two inches in length. They are mottled brown for camouflage, but a spawning male will show more attractive markings.

Distribution

The present distribution of the fountain darter in the San Marcos River is well established. Their population in the Comal River, however, has been erratic. In 1891, numerous fountain darters were collected in the Comal River, but between 1973 and 1975, biologists were unable to collect any, indicating that the population has been eradicated in this area. The most probable cause for this was the five month Comal Spring flow cessation in 1956 following the prolonged drought.

Following the population decline, fishery biologists with USFWS began captive spawning of fountain darters from the San Marcos River, in an effort to ensure against a catastrophic loss of the species. In addition, biologists from SWTSU released fountain darters from San Marcos Springs into Comal Springs. Although recent surveys have shown that a substantial darter population dwells in Comal Springs, this population now faces the threat of eradication due to the proliferation of the ram's horn snail.

Vegetation

The snail feeds primarily upon the aquatic vegetation which provides the darter with cover from predators. Already, large masses of such vegetation have been stripped in some areas of the Comal River.

Habitat, Feeding, and Breeding Requirements

The fountain darter requires undisturbed, vegetated stream-floor habitats with clean water which is constantly flowing and of consistent temperature. It is often found in areas of riffles and pools, and is rarely found in areas which lack vegetation, which it needs for cover. It also requires protection from severe floods.

Darter diet consists primarily of small, bottom-dwelling invertebrates such as insect larvae. Good vision is important to feeding, and clear water is essential. Fountain darters do not chase their prey, but remain stationary until the prey moves to within a few inches.

Fountain darters lay their eggs in mats of aquatic vegetation throughout the year, most frequently in August and early spring.

San Marcos Gambusia

(*Gambusia georgei*)

This fish lives in the San Marcos River. Like other members of the Gambusia family, it produces live offspring. Only a limited number of ***Gambusia*** are native to the United States, and this species has the most restricted range. Listed as endangered by TPWD and USFWS, this species has not been seen since 1983 and may already be extinct.

Description

The San Marcos gambusia has been described as looking like a drab guppy.

Distribution

If the San Marcos gambusia population still exists, it is restricted to a 1 km portion of the San Marcos River and is extremely sparse.

Habitat and Feeding Requirements, and Other Biological Aspects

The San Marcos gambusia requires water which is clean, clear, and thermally constant. It prefers quiet, shallow waters adjacent to sections of moving water and also needs protection from severe flooding. This species prefers muddy but not silted substrates, and needs shade from overhanging vegetation or bridge structures.

Little is known about the food requirements of the San Marcos gambusia, but it is assumed that insect larvae and other invertebrates account for most of its diet.

Little information on the reproductive habits of the San Marcos gambusia exists.

Hybridization between the San Marcos Gambusia and the mosquitofish (*G. affinis*) was noted in 1969, and the production of hybrid individuals between them continued for many years. Recent collections indicate that hybrids are abundant. Such hybridization may have contributed to the decline of the original San Marcos gambusia by eliminating it from the gene pool. Also, the hybrid individuals may have placed additional stress upon the San Marcos gambusia through competition.

Texas Wildrice
(Zizania texana)

Texas wildrice is an aquatic grass that is presently limited worldwide to a small segment of the San Marcos River. It does not occur naturally in any other springs and was on its way to extinction until a researcher began a restoration project on the species.

Listed as endangered by TPWD and USFWS, this plant is heavily impacted by recreational users of the river, such as tubers, who often uproot the plant.

Distribution

At the time of its discovery, Texas wildrice was abundant in San Marcos River, Spring Lake, and their contiguous irrigation ditches. It grew profusely throughout the upper reaches of the river. Currently, however,

it is restricted to the 2.4 km length of the headwaters of the San Marcos River, where only scattered plants in the extreme upper and lower segments are found. No plants have been found recently in Spring Lake.

Attempts have been made by researchers to transplant the Texas wildrice to other locations to determine if it would grow and produce viable seeds. Plants were grown in Salado Creek in Bell County, Texas, because the habitat there was similar to that in the San Marcos River. The plants grew well and produced seeds, but recreational activities in this area eventually destroyed all the plants and the effort was abandoned.

Habitat Requirements

Texas wildrice requires: thermally constant, flowing waters; undisturbed stream floor habitats; unimpeded light for reproduction; and protection from floods. Wildrice plants form large masses firmly rooted in the gravel bottom of the river. Stalks and leaves are completely immersed in the swift current. Flowering plants are rarely seen, and when present, do not extend very far above the surface. Plants often grow in the swiftest currents of the shallow areas near the middle of the river. Other plants are in deeper water (2-3 meters).

Edwards Aquifer - Subterranean Species

Introduction

The Edwards Aquifer also harbours a variety of unique subterranean, troglobitic - cave dwelling - fauna. These animals have evolved mechanisms which enable them to survive in their extraordinary environments which are void of light and often under great hydrostatic pressure.

Blind Shrimp

Subterranean species include two mollusks, or snails, and crustaceans such as the blind shrimp. The most distinguished of the subterranean animals are the two species of blind catfish and the blind salamander.

One access point to the reservoir is Ezell's Cave, in Hays County, now privately owned by the Nature Conservancy and open only to scientific investigators. From this cave alone, approximately 36 species of animals have been collected.

Widemouth Blindcat

(Satan eurystomas)

The widemouth blindcat is a small, blind catfish which resides in the artesian parts of the Edwards Aquifer, near San Antonio. It is listed by TPWD as threatened. It is of considerable scientific interest since it represents one of only two known troglobitic catfish inhabiting subterranean waters in North America.

Description

The eyes of the widemouth blindcat are completely absent, at least externally. It is without skin pigment, appearing light pink and is a predator with strong jaws and well-developed teeth. It is adapted for living at great depth (610 meters in some locations). This fish, unlike its surface relatives, does not have an air bladder, but has replaced it with generous accumulations of fat in the area where the air bladder would occur.

Distribution

The Balcones Fault Zone and the interface between fresh and saline water is highly faulted with numerous caverns and fissures providing natural habitats for the fish. The blindcat is limited to artesian wells over 300 meters deep. It is probably restricted to the San Antonio pool of the Edwards Aquifer, in an area paralleling IH 35 in the artesian zone underlying Bexar County. The only source of specimen fish has been various artesian wells in the southern part of Bexar County. Although numerous collections of cave aquatic invertebrates have been made, no troglobitic fish have ever been recorded from the caves.

At present, this fish is found in only one location - a large well on a private ranch (O.R. Mitchell).

Feeding, Breeding and Habitat Requirements

Many troglobites have been observed to live for prolonged periods without food. The anatomy of the widemouth blindcat implies that the catfish is a carnivore, probably the top carnivore in its subterranean habitat. It is known to eat decapods, isopods, and amphipods and is probably an opportunistic predator, feeding on any organism that it can get in its wide mouth, including another subterranean catfish, the toothless blindcat.

All the locations producing this fish have a water temperature of 81° F. The temperature of the water is believed by one researcher to contribute to orientation on long or short range movements and may be important in limiting the distribution of the blindcats to the deep artesian wells.

Toothless Blindcat

(Trogloglanis pattersoni)

This blindcat is the most highly specialized catfish known, appearing to be preadapted to a subterranean existence. It represents the second of two troglobitic catfish known in North America, and like the widemouth, is listed as threatened by TPWD.

Description

The toothless blindcat is totally blind with no external indication of eyes. It has a highly specialized sucker-like mouth, no teeth, and paper-thin jaws. There is no pigment in the skin which appears light pink except for the mouth which is reddish. Since the air bladder is absent, it is able to withstand great hydrostatic pressure. Its head is similar to that of a tadpole, as broad as it is long.

Distribution

This catfish occurs in the artesian aquifer near San Antonio. Distribution of the toothless blindcat seems to correspond to that of the widemouth blindcat. Like the widemouth, it is limited to artesian wells over 300 meters deep in an area paralleling IH 35 in the artesian zone underlying Bexar County. It is probably restricted to the San Antonio pool of the Edwards aquifer. Like the widemouth, the only source of the toothless

blindcat has been various artesian wells in the southern part of Bexar County.

Feeding Requirements

Little information is available on the toothless blindcat's feeding preferences. It probably occupies the trophic level just below the top carnivore in this system, the widemouth blindcat. Physical characteristics such as the mouth and digestive tract indicate that it is primarily a herbivore although it may also scavenge dead or dying invertebrates in the sediments. The blindcat is believed to use its lateral line system to aid in the detection of food. It probably senses disturbances such as vibrations from moving objects.

Texas Blind Salamander

(Typhlomolge rathbuni)

The Texas blind salamander is of considerable scientific interest due to its uniqueness. This form is the most advanced troglobitic salamander known in the world today. It shows many adaptations toward total life in a cave, and may also be of considerable value in gauging water quality changes in the Edwards Aquifer. This species is listed as endangered by USFWS and TPWD.

Description

The Texas blind salamander is about three to four inches long. Its skin is smooth, unpigmented, and translucent, and the legs are long and spindly. The head is relatively large with a strongly flattened snout and tiny eyes under the skin. It retains its juvenile form, including features such as gills in the adult, sexually-mature stage of the life cycle.

Distribution

The Texas blind salamander is found in the subterranean waters and caves of the Purgatory Creek system (known also as the San Marcos pool of the Edwards Aquifer) that flow under the city of San Marcos. The only known sources of salamanders which have been collected by researchers are: an artesian well on the SWTSU campus; San Marcos

Springs; Ezell's Cave; and a few other caves throughout the Edwards Aquifer in the San Marcos area.

Habitat, Feeding, and Breeding Requirements

The Texas blind salamander is probably restricted to an area directly beneath the city of San Marcos. The area in caves where they are vulnerable to capture is extremely small in relation to their total range.

This salamander feeds on the snails, blind cave shrimp, and other invertebrates which inhabit the aquifer. It is the top carnivore within its environment, and helps to maintain proper population levels of various aquatic troglobites, including beetles, shrimp, and snails, and is therefore important in maintaining ecological stability.

One researcher observed that the blind salamanders appear to have no food selectivity, but feed on any small organism with which they come in contact. They probe the water using lateral movements of their head. When anything living is encountered, the mouth quickly opens and the food is immediately sucked in. The numerous sharp teeth prevent escape. Small snails are a prevalent food source, indicating that the salamanders are capable of detecting even small amounts of movement.

Although Texas blind salamanders have been maintained in captivity by biologists, nothing is presently known about its breeding behavior.

Credits

The majority of this information in this brochure came from the following two publications:

Longley, Glenn, **Status of the *Typhlomolge (=Eurycea) Rathbuni*, The Texas Blind Salamander**, prepared for the U.S. Fish and Wildlife, 1977, Southwest Texas State University Aquatic Station.

Longley, Glenn, and Henry Karnie Jr., **Status of *Satan eurystomus* Hubbs and Bailey, The Widemouth Blindcat**, prepared for U.S. Fish and Wildlife, 1979, Southwest Texas State University Aquatic Station.