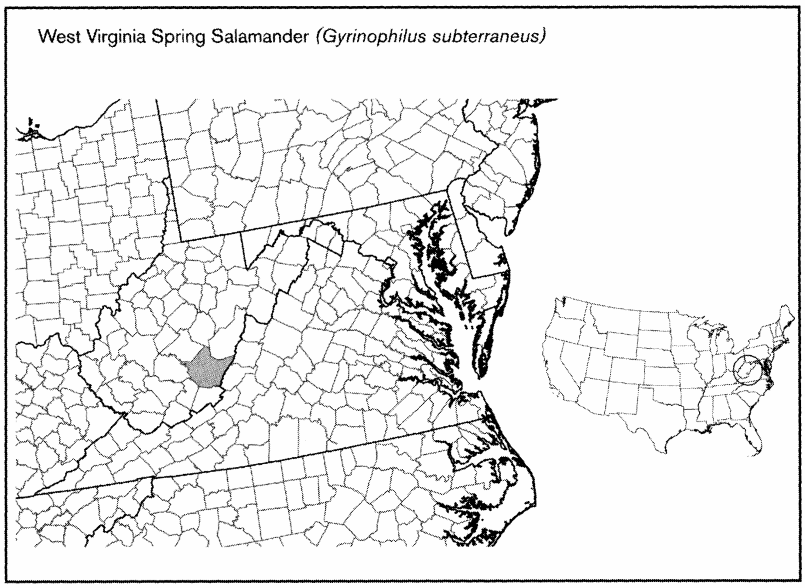

Gyrinophilus subterraneus Besharse and Holsinger, 1977

WEST VIRGINIA SPRING SALAMANDER

Christopher K. Beachy

1. Historical versus Current Distribution. The distribution of West Virginia spring salamanders *(Gyrinophilus subterraneus)* is limited to General Davis Cave, Greenbrier County, West Virginia (Besharse and Holsinger, 1977; but see Blaney and Blaney, 1978, and discussions in Green and Pauley, 1987; Petranka, 1998). It is likely that this species arose in General Davis Cave, and their current distribution reflects the historical distribution, although Besharse and Holsinger (1977) consider the possibility that the current distribution of West Virginia spring salamanders is relictual and reflects the remnants of a much broader distribution.

2. Historical versus Current Abundance. Unknown, but Besharse and Holsinger (1977) note they found 15 *Gyrinophilus* specimens comprising West Virginia spring salamanders and spring salamanders *(G. porphyriticus)* along a 180-m length of cave stream. In these caves, West Virginia spring salamanders outnumbered spring salamanders by about 2:1. Besharse and Holsinger (1977) note that spelunkers have observed West Virginia spring salamanders 1,800 m beyond the cave entrance.

Because of the restricted distribution of West Virginia spring salamanders, Besharse and Holsinger (1977) strongly recommend that future collecting of specimens be done sparingly.

3. Life History Features. Because West Virginia spring salamanders are probably a sister taxon of spring salamanders, they may share certain life history features. In fact, Green and Pauley (1987) state: "Nothing has been discovered about life history or reproductive behavior to indicate that [their] habits are different from those of *Gyrinophilus p. porphyriticus*."

A. Breeding. Reproduction is aquatic.

i. Breeding migrations. Probably do not occur. West Virginia spring salamanders are restricted to General Davis Cave and its vicinity.

ii. Breeding habitat. The aquatic habitats in and near General Davis Cave.

B. Eggs.

i. Egg deposition sites. Unknown.

ii. Clutch size. Unknown.

C. Larvae/Metamorphosis.

i. Length of larval stage. Unknown. Larvae metamorphose at about 95 mm SVL. The largest larvae are either near or have attained sexual maturity.

ii. Larval requirements.

a. Food. Likely to be the small aquatic invertebrates found in the cave system (see "Feeding Behavior" below).

b. Cover. Unknown, other than being troglobitic.

iii. Larval polymorphisms. Unknown, but unlikely.

iv. Features of metamorphosis. Larvae metamorphose at about 95 mm SVL.

v. Post-metamorphic migrations. Unlikely.

vi. Neoteny. The largest larvae are at or near sexual maturity. It is not known whether individuals will reproduce as gilled adults (Petranka, 1998). After a thorough consideration of the morphology of West Virginia spring salamanders, Besharse and Holsinger (1977) note that their "large body size, retention of the larval color pattern and fused premaxillae in transformed adults, and development of mature gonads in large larvae and transforming animals all suggest an evolutionary trend towards paedomorphosis." The massive size of larvae compared with the emaciated appearance of adults suggests a major difference in the ability to obtain food between the two life history stages of these animals, which could lead to a selection pressure for paedomorphosis (Bruce, 1979).

D. Juvenile Habitat. Unknown.

E. Adult Habitat. West Virginia spring salamanders are restricted to General Davis Cave or on the muddy banks along the stream in the vicinity of the cave. Besharse and Holsinger (1977) describe General Davis Cave as a large, stream-passage cave developed along the strike in the Union Limestone of the Greenbrier Group (Mississippian). The entrance is large, at the head of a short ravine. The cave passage floor is damp clay that joins a stream passage 150 m beyond the entrance. This cave is essentially a single, long, stream passage that contains about 4,000 m of surveyed length. The stream usually varies in depth from 15–30 cm, but will flood following rains. The primary source of water is surface flow from a stream that courses down Muddy Creek Mountain (Besharse and Holsinger, 1977).

The banks of the stream are muddy, steep, and contain a large amount of decaying leaf litter occasionally washed into the cave by floods. This leaf litter offers a source of nutrients for the cave invertebrates that West Virginia spring salamanders use as a prey base.

Spelunkers have observed West Virginia spring salamanders almost 2 km into General Davis Cave (Besharse and Holsinger, 1977).

F. Home Range Size. Unknown.

G. Territories. Unknown.

H. Aestivation/Avoiding Desiccation. Unknown and unlikely.

I. Seasonal Migrations. Unlikely.

J. Torpor (Hibernation). Unknown and unlikely.

K. Interspecific Associations/Exclusions. Co-occur with spring salamanders, but interactions between these two species have not been examined.

L. Age/Size at Reproductive Maturity. At about 95 mm SVL, near the time of metamorphosis.

M. Longevity. Unknown.

N. Feeding Behavior. Potential prey have been well documented and include the invertebrate prey base found in the cave. These prey include the following troglobitic species: crayfish *(Cambarus nerterius)*, amphipods *(Gammarus minus; Stygobromus spinatus)*, isopods *(Asellus holsingeri)*, and carabid beetles *(Pseudanophthalmus grandis; P. laldermani)*. Cavernous collembolans *(Pseudosinella gisini)*, millipedes (*Trichopetalum weyeriensis* and *Pseudotremia* sp. [probably *fulgida*]), a pseudoscorpion *(Kleptochthonius henroti)*, and an oligochaete *(Allobophora chlorotica)* also serve as potential prey.

Besharse and Holsinger (1977) note that the head of larval West Virginia spring salamanders is broader than the heads of either spring salamanders or Tennessee cave salamanders *(G. palleucus)*, but does not have the spatulate snout characteristic of Berry Cave salamanders *(G. gulolineatus)*.

O. Predators. Unknown.

P. Anti-Predator Mechanisms. Unknown other than cave dwelling.

Q. Diseases. Unknown.

R. Parasites. Unknown.

4. Conservation.

West Virginia spring salamanders are found only in General Davis Cave, Greenbrier County, West Virginia. Because of their restricted distribution they occur on West Virginia's Rare species list, and every attempt should be made to preserve this habitat and its water sources.