A Tale of Two Cities: Conservation Focused Cave Bioinventories by The Nature Conservancy in the Karst Areas of Louisville and Saint Louis

Julian J. Lewis
Biological Consultant to The Nature Conservancy
217 W. Carter Avenue
Clarksville, IN 47129

F. Allen Pursell &
Matt Nelson
The Nature Conservancy

Abstract

In 1995 The Nature Conservancy (TNC) of Indiana initiated a three year bioinventory of caves in the Blue River basin of southern Indiana. The character of the area, located about 25 miles from Louisville, Kentucky, is changing from rural to suburban. The bioinventory surveyed about 200 caves, from which a list of over 100 globally rare invertebrate species was produced, many of which were endemic to the area. In 1998-1999 a bioinventory was conducted in a similar karst area in western Illinois, just south of St. Louis, Missouri. The bioinventory surveyed nearly 70 sites and resulted in a list of about 35 globally rare species.

Rather than discussing the caves or fauna, the focal point herein is the way in which the results of these bioinventories were managed to further conservation management goals. TNC practices conservation as a data-driven process. To this end all troglobites collected were identified to the species level, given a global rank of rarity, and annotated to justify the rank. Common names were coined to further communication with non-zoologists. Many undescribed species were found and funding was arranged to encourage taxonomists to publish descriptions.. The caves surveyed were rank-ordered by the number of significant species present to prepare "shopping lists". TNC and state heritage programs are proceeding in securing these caves through acquisitions, conservation easements, and donations of property.

In 1995 The Nature Conservancy of Indiana initiated a three-year biological inventory of caves in the Blue River basin of southern Indiana. This karst area contains over 1,000 caves, including the Binkley Cave System, which, at over 20 miles of surveyed passageway, is the most extensive cave known in Indiana. The character of the area, located about 25 miles from Louisville, Kentucky, is changing from rural to suburban. During the course of the inventory nearly 200 caves in Harrison, Crawford, Washington and Orange Counties were surveyed for subterranean invertebrates (Lewis, 1998).

In 1998-1999 another cave bioinventory was conducted in a similar karst area in western Illinois, just south of Saint Louis, Missouri. The area, although geographically smaller than the Blue River karst, was very reminiscent of that found in Indiana. Hundreds of caves were known in this well-developed sinkhole plain, including Fogelpole Cave, the largest cave in Illinois at 14 miles in length. The bioinventory surveyed nearly 70 sites (Lewis, Moss, & Tecic, 1999).

A much greater faunal diversity was found in the caves of the Blue River area as compared to the fauna of the western Illinois karst. In the Indiana area were found 56 troglobites and more than 100 globally rare invertebrate species, many of which were endemic to the area. The Illinois area produced about 25 troglobites

and 41 species of global rarity. Part of the reason for the larger numbers found in the Indiana karst was the larger geographic area surveyed there when compared to the relatively small region inventoried in Illinois. However, a significant part of the reason is that the fauna is inherently more diverse in southern Indiana.

For example, the millipeds of the genus *Pseudotremia* are ubiquitous in caves of the Appalachians and Interior Low Plateaus. However, the genus is represented in Illinois by a single species in the southeastern tip of the state (Cave Spring Cave, Hardin County, Peck & Lewis, 1978). A total of seven species of *Pseudotremia* were found in caves of the Blue River area, as well as *Scoterpes sollmani*. Likewise, the carabid beetles of the genus *Pseudanophthalmus* have a nearly identical distribution, again extending only from the east only into Hardin County, Illinois. There are four troglobitic species of *Pseudanophthalmus* in the Blue River area, but none in western Illinois. The faunas of the two areas are summarized in Table 1.

This is not to say, however, that there are no interesting components to the fauna of western Illinois. To the contrary, the only troglobitic species of *Gammarus*, *G. acherondytes*, is endemic to the western Illinois karst. Likewise, the nearctodesmid milliped *Ergodesmus remingtoni* found in caves of western Illinois is the only representative of this family not occurring in the western part of North America.

One of the focal points herein is the way in which the results of these bioinventories were managed to further conservation management goals. The Nature Conservancy practices conservation as a data-driven process. To this end all troglobites collected were identified to the *species* level, given a preliminary global rank of rarity if one did not already exist, and annotated to justify the new rank. Common names were coined so the conservation of these species can become more meaningful to the public at large. Many undescribed species were found and funding was arranged to encourage taxonomists to publish descriptions.

The caves surveyed were then rank-ordered by the number of significant species present to prepare "conservation shopping lists." The Nature Conservancy and state heritage programs are now planning to conserve many of the most significant caves through acquisitions, conservation easements, and donations of property where possible. In other cases these "traditional" conservation methods are not entirely appropriate. There are instances were the threats to particular sites are not ameliorated through owning or managing a specific piece of ground containing a karst feature. Several sites in each area are in fact under some form of legal conservation status, but threats may still persist. Many times the threat to significant

Table 1

	Blue River Karst, Southcentral Indiana	**Sinkhole Plain Karst, Southwestern Ill**
Aquatic Fauna:		
snails:	*Fontigens cryptica*	*Fontigens antroecetes*
	Antroselates spiralis	
flatworms:	*Sphalloplana weingartneri*	*Sphalloplana hubrichti*
	Sphalloplana chandleri	
ostracods:	*Sagittocythere barri*	
	Pseudocandona marengoensis	
	Pseudocandona jeanneli	
copepods:	*Diacyclops jeanneli*	
	Megacyclops donnaldsoni	
	Cauloxenus stygius	
	Rheocyclops indiana	
amphipods:	*Crangonyx packardi*	*Gammarus acherondytes*
	Crangonyx undescribed sp. 1	*Bactrurus brachycaudus*

Table 1		
	Blue River Karst, Southcentral Indiana	**Sinkhole Plain Karst, Southwestern Ill**
	Crangonyx undescribed sp. 2	
	Stygobromus undescribed sp. 1	*Stygobromus subtilis*
	Stygobromus undescribed sp. 2	
isopods:	*Caecidotea stygia*	*Caecidotea packardi*
	Caecidotea jordani	*Caecidotea spatulata*
bathynellid:	bathynellid undescribed sp.	
crayfish:	*Orconectes inermis*	
Terrestrial fauna:		
isopods:	*Miktoniscus barri*	
spiders:	*Phanetta subterranea*	*Phanetta subterranea*
	Bathyphantes weyeri	*Porhomma cavernicola*
	Islandiana cavealis	
pseudoscorpions:	*Kleptochthonius packardi*	*Mundochthonius cavericola*
	Hesperochernes mirabilis	
mites:	*Veigaia bakeri*	
	Veigaia wyandottensis	
millipeds:	*Pseudotremia indianae*	*Ergodesmus remingtoni*
	Pseudotremia conservata	*Chaetaspis* undescribed sp.
	Pseudotremia purselli	
	Pseudotremia blacki	
	Pseudotremia cookorum	
	Pseudotremia burnsorum	
	Pseudotremia salisae	
	Scoterpes sollmani	
Springtails:	*Sinella cavernarum*	*Arrhopalites carolynae*
	Sinella alata	*Arrhopalites hirtus*
	Sinella undescribed sp.	*Oncopodura iowae*
	Pseudosinella fonsa	*Pseudosinella* undescribed sp.
	Arrhopalites lewisi	*Arrhopalites lewisi*
	Arrhopalites ater	*Arrhopalites ater*
	Arrhopalites undescribed sp. 1	*Arrhopalites* undescribed sp. 2
	Tomocerus missus	*Tomocerus missus*
	Onychiurus undescribed sp. 1	*Onychiurus* undescribed sp. 2
	Hypogastrura lucifuga	
	Isotoma undescribed sp.	

Table 1		
	Blue River Karst, Southcentral Indiana	**Sinkhole Plain Karst, Southwestern Ill**
Diplurans:	*Eumesocampa* undescribed sp. 1	*Eumesocampa* undescribed sp. 2
	Litocampa undescribed sp.	*Eumesocampa* undescribed sp. 3
		Haplocampa undescribed sp.
Beetles:		
	Pseudanophthalmus tenuis	
	Pseudanophthalmus eremita	
	Pseudanophthalmus stricticollis	
	Pseudanophthalmus youngi	
	Batrisodes undescribed sp.	
Flies:	*Spelobia tenebrarum*	*Spelobia tenebrarum*

sites originates elsewhere. Examples would include faulty septic tanks that leach into the site, aquifer drawdown or modification by nearby land users, improper disposal of toxic materials in sinkholes, agricultural or suburban runoff, and the like.

In these instances it may not be necessary to secure the site through acquisition but rather address the source of threat instead. This may include landowner education, assistance in implementing best management practices for forestry or agriculture, improvements in wastewater treatment, or better land use planning with sufficient tools for implementing compatible land use on larger scale.

Because the threats to karst communities can be so variable, it is necessary to thoroughly evaluate each conservation target site to assess the source and degree of threats, if any are present, and approach them accordingly. In every case, a site conservation plan should be created for each site to document its biological significance, identify threats, and include recommendations as to how The Nature Conservancy and its conservation allies should approach the conservation of each site. For the Blue River basin this would represent the creation of approximately 35 individual site conservation plans for sites evaluated during the bioinventory and found to include significant occurrences of globally-rare species or communities. For the western Illinois area approximately 15 sites were similarly identified and need well-crafted site conservation plans with conservation methods that are likely to be carried out in the foreseeable future. It seems feasible that if all of the significant subterranean sites in each area are sufficiently secured through what is likely to be a range of conservation approaches, then the fauna of these habitats has a reasonable chance of persisting into the future.

Literature Cited

Lewis, Julian J. 1998. "The subterranean fauna of the Blue River area." Final report to The Nature Conservancy, 267 pages.

Lewis, Julian J., Philip Moss, and Diane Tecic. 1999. "A conservation focused evaluation of the Imperilled troglobitic fauna of the sinkhole plain karst of southwestern Illinois." Final report to The Nature Conservancy, 97 pages.

Peck, Stewart B. and Julian J. Lewis. 1978. "Zoogeography and evolution of the subterranean invertebrate fauna of Illinois and southeastern Missouri." *NSS Bulletin*, 40: 39-63.