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STATUS OF THE BLUEHEAD SHINER (*Notropis hubbsi*) IN ILLINOIS

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ABSTRACT

Notropis hubbsi, the bluehead shiner, is one of Illinois' rarest animals in terms of numbers of individuals and localities known. A compilation of existing and newly discovered records of the species indicates it is restricted to Wolf Lake, Otter Pond, and perhaps springs along the bluffs in the LaRue-Pine Hills Ecological Area (all Union County). Despite intensive surveys of Wolf Lake and extensive surveys of the area, no specimens have been collected since 1974, and the species may be extirpated from Illinois. A summary of life history information taken from 201 specimens indicates: females are sexually mature at 1 yr (47 mm standard length); spawning occurs from May to July; the one gravid female examined contained 781 mature ova; ova average 0.8 mm in diameter and are orange in color; and the species lives a maximum of 2 yrs and reaches a maximum standard length of 54 mm. We recommend: continued surveys for the species in appropriate habitat in Illinois, retention on the Illinois endangered species list, and future consideration of reintroduction into Wolf Lake of individuals obtained from Arkansas populations.

INTRODUCTION

The bluehead shiner, *Notropis hubbsi*, is one of Illinois' rarest animals in terms of individuals known and numbers of localities of occurrence (Smith 1979). The Illinois population of *N. hubbsi* is also unusual in being disjunct (ca. 443 air km) from the closest population in southern Arkansas. The known range of the species includes populations in Illinois, Arkansas, Texas, Oklahoma, and Louisiana (Bailey and Robison 1978, Miller 1984).

The species was discovered on 14 August 1954 by Gerald E. Gunning who collected four specimens of a minnow from Wolf Lake, Union County, Illinois. Specimens sent to Reeve M. Bailey (University of Michigan Museum of Zoology) were recognized as an undescribed species. On 21 June 1973 Brooks M. Burr and Lawrence M. Page collected two adults of the same minnow from Wolf Lake. A total of 12 adults along with 187 young-of-the-year were collected by Burr et al. during the

following year. The adult specimens were subsequently designated as paratypes in the original description of *N. hubbsi* (Bailey and Robison 1978).

In spring 1974 and 1979, several hundred pounds of an acid compound and a toxic chemical, respectively, were dumped into Wolf Lake as a result of train derailments. Much of the littoral vegetation of the lake was destroyed, and massive fish kills resulted. Several collecting efforts in the lake during 1974-1979 failed to demonstrate the presence of *N. hubbsi* even though the vegetation and populations of other fishes appeared to recover.

To date, virtually nothing is known about the natural history or ecology of *N. hubbsi* in Illinois, or elsewhere, except for some brief observations and data summarized by Smith (1979) and a characterization of its preferred habitat and species associates in Locust Bayou, Calhoun County, Arkansas (Bailey and Robison 1978). Because of its small known range, small population size, and occurrence in a lake that has been periodically polluted, the species has been placed on the Illinois list of endangered species.

This paper summarizes information on *N. hubbsi* in Illinois including: results of a 1.5 yr intensive survey (1981-1982) for the species in Wolf Lake; the discovery of additional Illinois localities; aspects of growth and reproductive biology of the species; and recommendations for further conservation consideration of *N. hubbsi*.

METHODS

Wolf Lake is situated in Union County just south of the LaRue-Pine Hills Ecological Area to which it is connected by bottomland swamp. Burr (1977) provided a description of Wolf Lake and characterized the aquatic habitats in the lake.

Sampling of Wolf Lake was begun in March 1981 and was conducted at least twice a week through August 1981. Occasional visits were made during fall 1981 and spring 1982. One to four sampling trips a year were made from 1983 through June 1985. Sampling gear included seines (6 m bag and 3 m common-sense seines of various mesh sizes), A.C. boat-mounted electroshocker, minnow traps (30, 4-liter plastic Camp Minnow Trap Type IV and one, 1 m × 1 m × 1 m wire minnow trap), and trawling (3 m bag seine) from the stern of a boat.

Forty trips were made to Wolf Lake during 1981-1982 with an average of 6 hr of field work per trip. At least two, but sometimes as many as five people, participated in field work. Approximately 500 man-hr of field time were spent in searching for *N. hubbsi* in the lake. It should be noted that the extensive, dense vegetation and numerous submerged objects in the lake made sampling extremely difficult regardless of the method employed.

Most observations and collections in Wolf Lake were made near the Powder Plant bridge (Fig. 1), the only access by road to the lake. Other portions of the lake were accessed by boat or foot. Both day and night seining to 2 m depths was done regularly along the shoreline in accessible areas. Minnow traps were set in a variety of habitats and depths throughout the lake. Daytime electroshocking was conducted on two occasions in late August for several hours over much of the lake. Trawling was conducted in open water on about every third visit to the lake.

Large predatory fishes (viz., *Amia calva*, *Lepisosteus oculatus*) were returned to the laboratory for examination of stomach contents. Representatives of each fish species collected from Wolf Lake were fixed in 10% formalin, stored in 70% ethanol,

and are now on deposit in the SIUC ichthyological collection. All measurements are expressed as standard lengths (SL) in millimeters (mm). Museum acronyms follow Leviton et al. (1985).

RESULTS

Despite intensive and extensive sampling efforts, using virtually every sampling method except fish toxicants, no specimens of *N. hubbsi* were collected from Wolf Lake during the study period. Thus, the last known collection of *N. hubbsi* from Wolf Lake was 28 March 1974 when two adults were taken (INHS 75028). All 1973-1974 collections of *N. hubbsi* were from both the west and east sides of Wolf Lake, but only near the Powder Plant bridge (Fig. 1).

A 46.6 mm SL gravid female of *N. hubbsi* was discovered in the UL fish collection, was subsequently transferred, and is now deposited as SIUC 8266. This individual was collected by John G. Weise on 9 June 1952 from Pine Hills swamp, Union County, Illinois. Weise apparently collected this specimen while completing a study of the amphipod *Gammarus troglophilus* (Weise 1953) in what is now called the LaRue-Pine Hills Ecological Area. Weise is now deceased, and absolute verification of the Pine Hills locality is not possible. Weise (1953, 1957) indicated that his collecting in Pine Hills was done mostly in the springs along the bluff. These springs and spring runs which enter the swamp several meters from the bluff are characterized by luxuriant growths of submerged aquatic plants. This habitat is similar to that described for the species in southern Arkansas (Bailey and Robison 1978). An additional specimen of *N. hubbsi* was discovered in the herpetology collection at SIUC and is now deposited in the fish collection (SIUC 5081). The specimen was collected in July 1969 by Earl W. Harris in Otter Pond, Union County, at the northeast shore of the pond and is a tuberculate male (54 mm SL). Otter Pond lies between Wolf Lake and the Pine Hills springs collected by Weise (Fig. 1) and is connected to both by bottomland swamp. The discovery of these two specimens suggests *N. hubbsi* may still be present in Pine Hills in the relatively undisturbed springs or in Otter Pond despite considerable recent collecting in these areas that has failed to reveal the species (Boyd et al. 1975).

Specimens of *N. hubbsi* collected in 1973-1974 were all from near shore in water ≤1.8 m in depth. All were collected within 5 m of the Powder Plant bridge (Fig. 1). During the 1973-1974 study only a cursory sampling of the open portion of the lake was conducted, but no *N. hubbsi* were ever taken from that area. Adults were caught singly; young-of-the-year apparently school since large numbers were taken in individual seine hauls during June, July, and August.

The habitat of *N. hubbsi* in Wolf Lake is apparently similar to that of *Lepomis symmetricus* (Burr 1977). The species occurs in the vegetated periphery of the lake over a mud, detritus, and decayed plant bottom, and around debris of standing timber, submerged logs, and stumps in tea-colored water.

Life history aspects of *N. hubbsi* in Wolf Lake-Pine Hills, Illinois, are summarized in Table 1. The 54 mm SL male collected in July 1969 is tuberculate and is the largest known male of the species. The 46.6 mm SL female collected on 9 June 1952 is gravid; the first young-of-the-year were collected in late June 1973. These 26 specimens ranged in SL from 10 to 15 mm and are estimated to be 1-2 weeks old. Thus, spawning of *N. hubbsi* probably occurs during late May and continues

through July. Mature ova in the 1952 specimen numbered 781. Mature ova are orange, and range in size from 0.7 to 0.9 mm in diameter (mean = 0.8 mm, N = 10).

From the size distribution of specimens collected (Fig. 2), it appears that the species lives less than 2 years in Illinois. A 1- to 2-year life span is common among other species of *Notropis* (e.g., Heins and Clemmer 1976).

Potential predators of *N. hubbsi*, six adult spotted gar (*Lepisosteus oculatus*) and five adult bowfin (*Amia calva*), were preserved and their stomachs examined. No *N. hubbsi* were found in the stomachs of either species.

DISCUSSION

The bluehead shiner was recently assigned the second highest overall priority for endangered fish species within Illinois by the Endangered Species Technical Advisory Committee on Fishes (Illinois Department of Conservation 1984). Further, the committee considered *N. hubbsi* as the number one endangered Illinois fish in regard to potential for recovery.

We support retention of *N. hubbsi* on the Illinois endangered species priority list; however, the potential for recovery in the state is contingent on formulation and expedient activation of a comprehensive recovery plan. If extant, the bluehead shiner is afforded a refugium in the U.S. Forest Services' LaRue-Pine Hills Ecological Area (which includes Otter Pond); however, any remaining populations in Wolf Lake continue to be subject to elimination. Based on present collecting data, Wolf Lake appeared to harbor the population nucleus and serve as the primary nursery area. Any future recovery plan should include investigations of the feasibility of purchase by Illinois of Wolf Lake and appropriate riparian buffer zones. Agreements between Illinois and the U.S. Forest Service should also be sought to insure protection of *N. hubbsi* in the future management of the Pine Hills Ecological Area.

The current rarity of *N. hubbsi* and lack of recruitment in former habitats suggests habitat protection alone may not be adequate to insure recovery. Supplemental stockings in the Pine Hills area of individuals from the closest geographic populations of *N. hubbsi* (in Arkansas) should be considered. Evidence based on an electrophoretic analysis of *N. hubbsi* in Arkansas (Dimmick 1984) revealed that the genetic variability of the species is low. If the species is genetically conservative, the consequences of mixing different geographic stocks may be negligible when weighed against the possible loss of the species from the Illinois ichthyofauna.

Immediate priorities concerning *N. hubbsi* include continuation of surveys for native populations, and perhaps, implementation of new collecting methods such as diel sampling. The discovery of specimens from the springs in Pine Hills and Otter Pond dictate future concentration of sampling in those areas.

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Table 1. Summary of life-history information on Wolf Lake-Pine Hills *Notropis hubbsi*.

Characteristics	Life-history Data
Principal habitat	Probably heavily vegetated margins of lake in water 1.8 m or less in depth
Age at reaching sexual maturity	1 year
Size at reaching sexual maturity	Females about 47 mm SL; males unknown
Sexual dimorphism	Adult males have breeding tubercles irregularly disposed on the head, edges of the body scales and fin rays; males and females have azure blue heads, a reddish-orange stripe on the body and reddish fins (Bailey and Robison 1978)
Number of mature ova in a preserved female	781
Description of ovum	About 0.8 mm in diameter, orange in color
Spawning period	May-July
Longevity	1 + years
Maximum size	54 mm SL

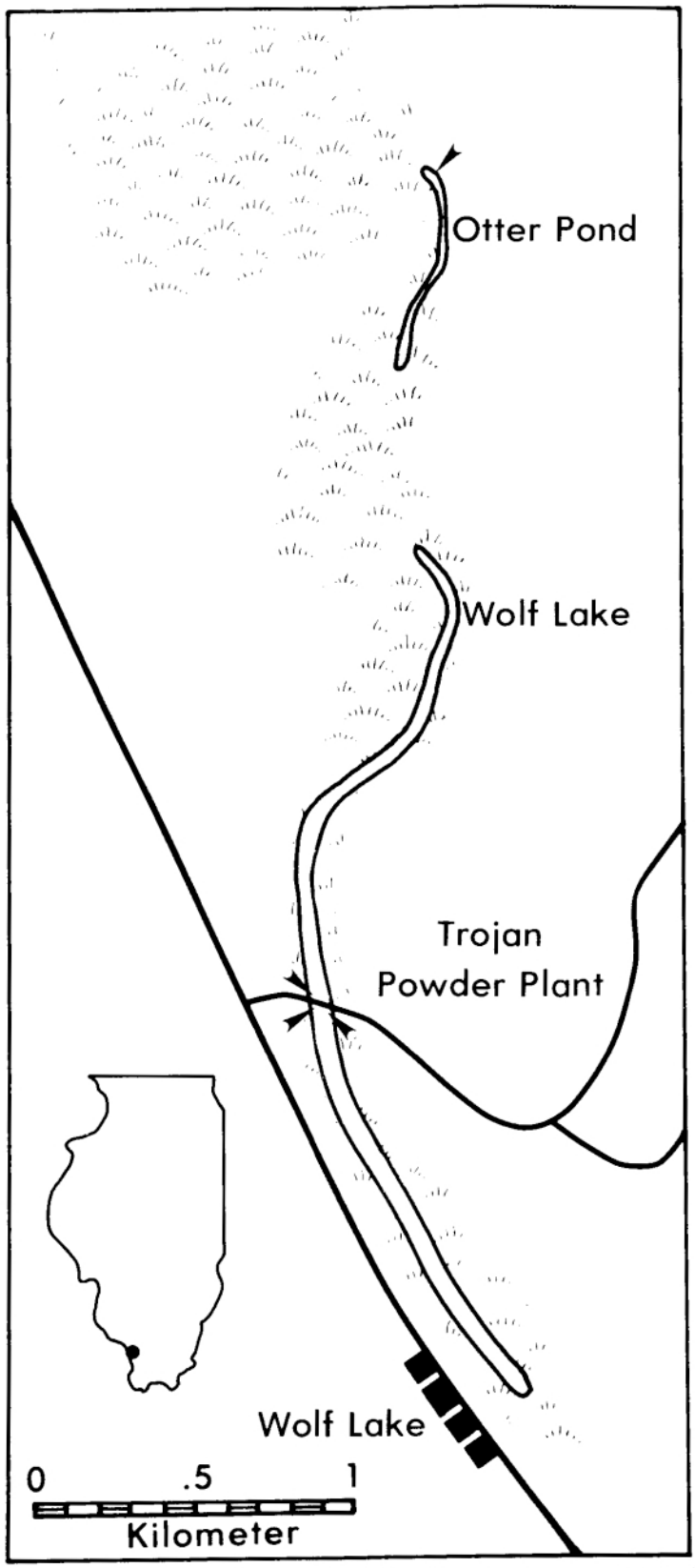

Fig. 1 The distribution of *Notropis hubbsi* by record stations (arrows) in Wolf Lake and Otter Pond, Union Co., Illinois.

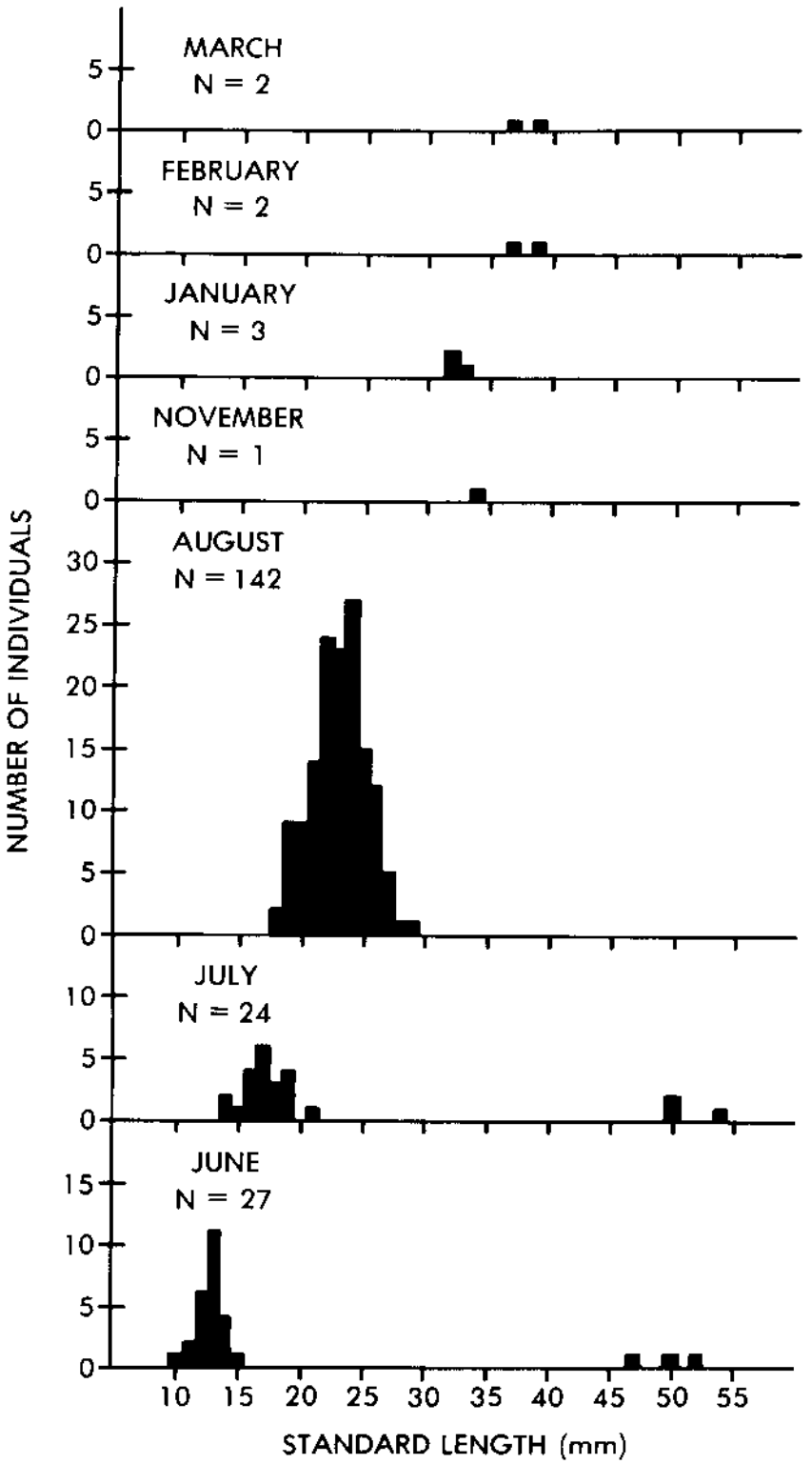

Fig. 2 Length-frequency histograms of 201 specimens of *Notropis hubbsi* from Wolf Lake-Pine Hills, Illinois 1952-1974.