# Size Estimate of a Local Population of Brychius Hungerfordi (Coleoptera: Haliplidae)

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# SIZE ESTIMATE OF A LOCAL POPULATION OF BRYCHIUS HUNGERFORDI (COLEOPTERA: HALIPLIDAE)

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## ABSTRACT

Much of the natural history of the endangered crawling water beetle, *Brychius hungerfordi*, is unknown. Population estimates have only been surmised. We have measured, using a mark and recapture technique, a localized population of the beetle in a pool on the East Branch of the Maple River, Emmet County, Michigan. The average population during July 2001 was found to be 1052 individuals with a range of 43 (highest estimate – lowest estimate). A three-year study of the relative abundance of the beetle in the same pool suggests that the population has remained relatively constant.

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The Federally endangered crawling water beetle, *Brychius hungerfordi* (Spangler), is the only *Brychius* species in eastern North America (Strand et al. 1994). It is known from only four sites in Northern Michigan and one in Ontario (Grant et al. 2000 and references therein). Efforts to locate the beetle in the Upper Peninsula of Michigan, Minnesota and Wisconsin have been unsuccessful (Hilsenhoff and Brigham 1978, Brigham 1982, White 1986).

A literature search produced only one reference to a population estimate for the beetle. A visual population estimate at the type locale of 200-500 individuals was reported by D. S. White (pers. comm.). He noted that other areas likely contained fewer numbers.

We report on the use of a mark and recapture technique for estimating a *Brychius hungerfordi* population in a pool located approximately 2.5 km upstream from the type locale.

## MATERIALS AND METHODS

The study site is a pool approximately 219 m$^2$ in area located on the East Branch of the Maple River in Emmet County, Michigan. Beetles were collected using a long-handled D-net (30-cm diameter) from around the perimeter of the pool to a depth of approximately 1.5 m. A uniform sweeping motion with the lip of the net held slightly above the substrate produced strong turbulence that dislodged beetles from the bottom. Quickly returning the net over the same area captured them. The net contents were emptied into a white enamel pan and sorted.

The mark and recapture experiment was conducted from 13-19 July 2001. The beetles were dried by placing them on a disk of filter paper in the bottom of a small petri dish. Once the beetle appeared dry, the petri dish was placed onto the stage of a dissecting microscope and a small dot of Testors paint applied to the elytra using a 26-gauge needle fitted onto a syringe. The paint was allowed to dry for several minutes before the marked beetle was returned to the storage bucket. Captured beetles were re-distributed into the pool at the sampling locations from which they were removed, in approximately the same proportion as they were found. The marked beetles did not exhibit any unusual behavior during their time

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in captivity. Beetles captured on the first sampling day (13 July) were marked with white paint and those on the second sampling day (16 July) with orange. Beetles captured on the final day (19 July) were not marked. Preliminary experiments using *Peltodytes* in an aquarium indicated that a small drop of Testors paint placed on a dry beetle would adhere to the elytra for about seven days. We used both the Lincoln index and the Bailey Triple-Catch methods of estimating population size. Details of the techniques are described in Southwood (1978).

Seasonal relative abundance estimates were determined monthly throughout the spring, summer and fall over a three-year period, from 1999 through 2001. During each sampling interval, the pool was systematically searched for exactly 60 minutes. Relative abundance is expressed as the number of beetles captured per hour.

Assuming relative abundance is proportional to population size, a constant of proportionality can be found by dividing the population estimate, determined using the mark and recapture technique, by the relative abundance data collected during the same time period. Since the sampling effort and collecting area was standardized for all monthly abundance measurements, multiplying abundance estimates by the calibration factor results in a population estimate for the given time period.

## RESULTS AND DISCUSSION

Results for the mark and recapture experiment are shown in Table 1. The Lincoln Index was calculated once using data from days one and two, and a second time using data from days two and three; Bailey's Triple Catch Method was used for samples collected on day three. All three techniques gave good agreement with an average of 1052 individuals and range of 43 (highest estimate – lowest estimate).

Assumptions in the model are that the population is closed, i.*e.*, no immigration or emigration occurs and that there were no births or mortalities during the sampling period. Occasional searches of the river immediately downstream from the pool failed to produce any marked beetles and upstream culverts blocked passage. Given the relatively short time frame of the experiment, it is unlikely that births or deaths significantly affected results.

The relative abundance measurements are shown in Figure 1. Converting the maximum relative abundance measurement for each year into a population estimate shows no clear trend in the beetle population in the pool. During the three years surveyed, peak populations occurred during different seasons but remained fairly constant at around 1100 individuals.

This work represents the first time a *Brychius hungerfordi* population has been estimated using generally accepted measurement techniques. Although only one pool on the East Branch of the Maple was surveyed, it appears that

Table 1. Sampling Data From Mark-Recapture Experiment, 13-19 July 2001

| Day | No. Marked (Color) And Released | No. Recaptured Containing Marks (Color) | % Recaptured |
|-----|---------------------------------|-----------------------------------------|--------------|
| 1 | 81 (White) | 0 | — |
| 2 | 101 (Orange) | 8 (White) | 9.9 |
| 3 | 0 | 8 (White) and 9 (Orange) | 16.8 |

First Estimate (Lincoln Index) = 1023
Second Estimate (Lincoln Index) = 1066
Third Estimate (Bailey's Triple Catch Method) = 1066
Average 1052
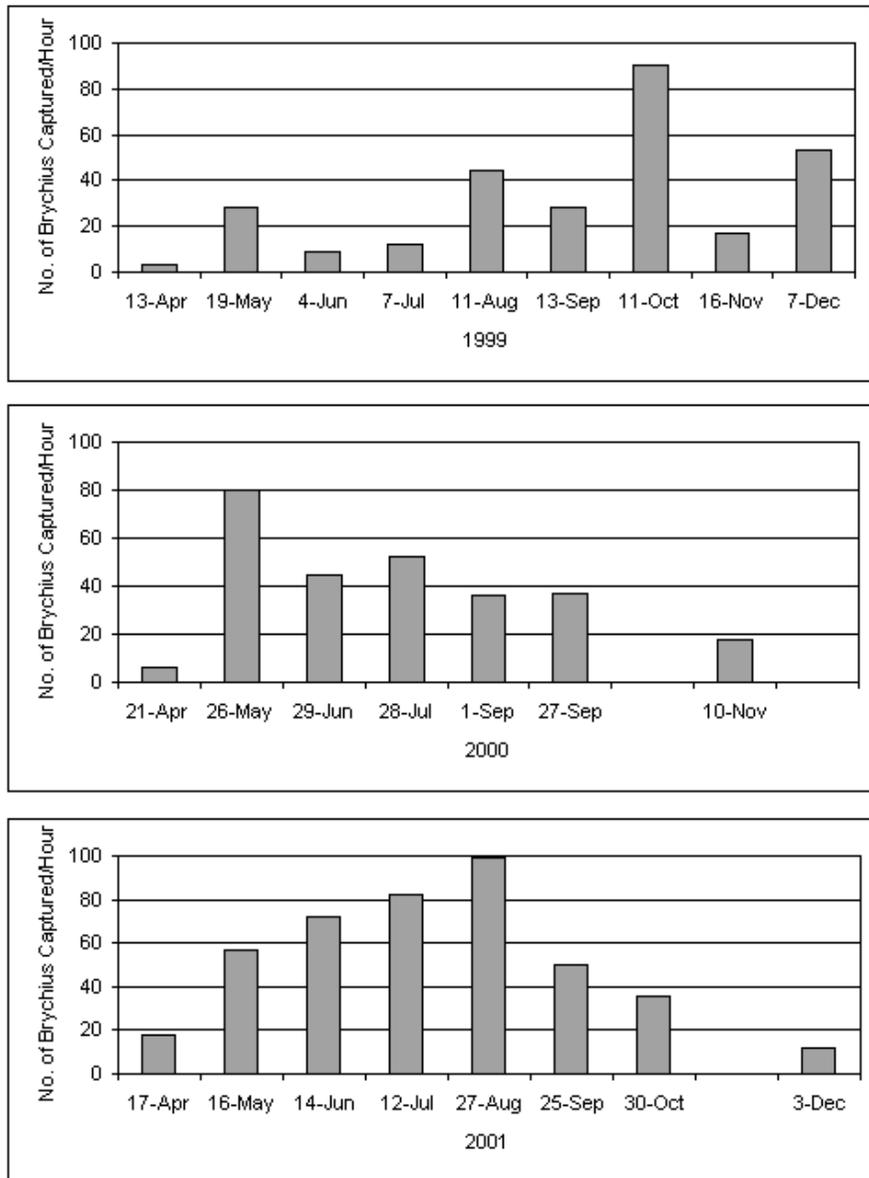Range 43 (highest estimate- lowest estimate)

Figure 1.  Seasonal Relative Abundance Of *Brychius hungerfordi* Study Pool on East Branch of Maple River, Emmet County, Michigan.

the beetle population in this river may be larger than originally estimated and the population relatively stable.

## ACKNOWLEDGEMENTS

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