

THE STATUS OF *CICINDELA MARGINIPENNIS* (COLEOPTERA: CARABIDAE) IN SOUTHEASTERN INDIANA

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ABSTRACT. The historical range of the state-threatened tiger beetle *Cicindela marginipennis* within the Whitewater watershed was sampled during the summer of 2007 to assess any changes in the species' reported distribution over the past 30 years. We found that the species has now disappeared from two of the three Indiana counties where it had previously been found. We did locate a viable population in Franklin County. Due to the decline of this species in Indiana, its state listing as endangered is still warranted.

Keywords: Tiger beetles, *Cicindela*, endangered species

Tiger beetles are predaceous insects that are important biodiversity indicators (Pearson & Cassola 1992). They are called tiger beetles because many of them are striped, and they are visual predators that pounce on their prey. Tiger beetles are found throughout Indiana (Knisley et al. 1987). The focus of this survey was the Whitewater River riparian corridor in the southeastern portion of the state, with a special emphasis on the Indiana state-endangered species *Cicindela marginipennis* Dejean (1831), commonly called the cobblestone tiger beetle. Knisley et al. (1987) reported this beetle in Dearborn, Franklin, and Wayne counties in Indiana; but its status in Indiana has not been assessed since these earlier surveys.

The cobblestone tiger beetle occurs in two disjunct areas in the eastern United States. A southern population occurs in Alabama and Mississippi; and a larger northeastern population occurs from southeastern Indiana eastward through southern Ohio, southern Pennsylvania, southern New York, and north along the New Hampshire and Vermont border. Isolated populations also have been reported from Erie County, New York and in New Brunswick, Canada (Pearson et al. 2006). *Cicindela marginipennis*' preferred habitat is sparsely vegetated cobblestone and gravel banks along rivers. In New Hampshire, they are most often found near the middle of a sand bar or bank where the upriver cobble is scoured by water and the sand is deposited at the

downriver end (Dunn 1979). *Cicindela marginipennis* is often found near the center of such a sandbar or bank where vegetation is sparse, but it is absent on banks and bars that are devoid of vegetation (Dunn 1979, 1981).

METHODS

Potential sites for the survey were initially identified using Google Earth® imagery. Comparing photographs of known *C. marginipennis* sites with the historical range enabled us to locate potential collection sites and their means of access. Based on this reconnaissance, we surveyed from the confluence of the Whitewater River and the Great Miami River in Ohio north through Dearborn, Franklin, Union, Fayette, and Wayne counties in southeastern Indiana. We further surveyed the East Fork of the Whitewater River up to Richmond, Indiana and the West Fork of the Whitewater River to just north of Cambridge City, Indiana. We also surveyed Tanner's Creek in Dearborn County, Indiana because a Dearborn County environmental assessment (Anonymous 2006) listed *C. marginipennis* as possibly occurring along the creek. Sites were reached on foot or by canoe. GPS readings were taken at all sites where beetles were observed. The occurrence of *C. marginipennis* was documented with photographs. The GPS locations for all the sites have been reported to the Indiana Department of Natural Resources Division of Preserves, but will not be included herein to discourage collecting.

Knisley et al. (1987) reported *C. marginipennis* in three counties of southeastern In-

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diana. We contacted the collectors of those beetles to obtain specific locations, which were also visited. (Knisley & Brzoska pers. commun.).

Cicindela marginipennis is also known from the Great Miami River in Ohio (Kritsky et al. 1996), and a portion of this river was surveyed to determine the status of the species in southwest Ohio, where it was last collected in 1995. This locality is the closest population of *C. marginipennis* to the Indiana records.

If a population of *C. marginipennis* was located, its relative size was estimated by conducting a full-length transect count along the bank. A population was determined to be strong if more than ten beetles were counted and mating pairs were observed. To determine the optimal substrate conditions, a quadrant of one square meter was sampled to determine cobblestone weight in grams and soil texture. Soil texture was determined using sieves that separated the components by particle size. Gravel was defined as particles greater than 4.00 mm in size, granules were 2.0 to 4.0 mm, sand was 0.05 to 2.00 mm, and silt and clay particles were defined as those less than 0.05 mm. The texture was quantified as the percentage by weight of these categories.

RESULTS AND DISCUSSION

We started the survey on 23 May 2007 and continued visiting and revisiting potential sites until 7 July 2007. We surveyed 49 localities along the riparian corridor of the Whitewater River from north of Cambridge City, Indiana south to the Ohio River and observed six species of tiger beetles, including *C. marginipennis*.

Cicindela repanda Dejean (1825) was the most common species encountered, found at nearly every location visited. This species prefers sandy areas near water (Graves & Brzoska 1991). During the hottest days of the survey, it was found on the wet sands adjacent to the river.

Cicindela punctulata Oliver (1790), likely the most common tiger beetle in Indiana, was found at five sites visited. This species is often found at parks and on golf courses, driveways, and dry paths in fields, and it was found at sites that bordered such areas (Graves & Brzoska 1991).

Cicindela sexguttata Fabricius (1775), the green tiger beetle, emerges in the spring and was collected in areas that were bordered by deep woods. It prefers sandy sunlit paths,

normally not staying close to water (Graves & Brzoska 1991).

Cicindela tranquebarica Herbst (1806) is a spring and fall species and was only found occasionally during the survey. It is found in a variety of habitats, including fields, eroded areas, sand dunes, gravel pits, and exposed hillsides. This species, which is one of the first tiger beetles to emerge in the spring, was not expected at many locations due to the extreme heat of the summer (Graves & Brzoska 1991).

Cicindela duodecimguttata Dejean (1825) was collected north of Brookville reservoir, west of Liberty, Indiana. It is often found in areas where vertical banks are present along streams (Graves & Brzoska 1991).

The target species, *C. marginipennis* (Fig. 1) was observed at one location in Franklin County, Indiana. The site is a large flat cobblestone bank approximately 225 m long and 46 m wide, and harbored a strong population with several mating pairs observed. This site matches the description of the optimal *C. marginipennis* site: large and sparsely vegetated, with more sand present at the downriver end of the bank than at the upriver end. The beetles were mostly found from the middle of the bank towards the upriver end, from 5.5 m to approximately 41 m from the water. We did not detect the beetle downriver at adjacent cobblestone banks.

Cicindela marginipennis was not found at Indiana's two historical locations. It was collected along runoff stream at a gravel quarry east of Richmond, Indiana in 1976 and 1977. We visited the location and found that gravel operations have since destroyed the stream, and the beetles were not found.

The other historical Indiana location was near the Interstate 74 bridge at the Whitewater River, where *C. marginipennis* was collected in 1984. This site was visited four times, but only *C. repanda* and *C. tranquebarica* were collected.

Cicindela marginipennis was collected along the Great Miami River in Hamilton County, Ohio, just under 37 km east of the Indiana locality. This population was also strong and the site was similarly large: approximately 117 m long and 24 m wide. The beetles were also concentrated from the middle towards the upriver end of the bank, with *C. repanda* on the sandy downriver portion of the bank. This site is approximately 1 km from the 1995 site (Kritsky et al. 1996).



Figure 1.—*Cicindela marginipennis* in Franklin County, Indiana.

In 2009 *Cicindela marginipennis* was found at a new location along the Whitewater River in Hamilton County, Ohio (William Hull pers. commun.). This location is approximately 37 km from the Franklin County, Indiana location and 11.4 km from the Ohio location. It is also 11.2 km downriver from Indiana's Interstate 74 and Whitewater river collection site where the beetle was collected in 1984. Another potential location, which we surveyed several times in 2007 without observing any *C. marginipennis*, is only 3.5 km downriver. Both locations will be monitored in the future to determine if this beetle is expanding its range.

The substrate analysis (Table 1) suggests that the size of the cobble was not critical for the beetles' ideal habitat. The two *C. marginipennis* sites had different proportions of large and small cobblestones. Indeed, the Ohio site had several very large stones unlike the Indiana site. The historical site where *C. marginipennis* is no longer found had a cobble profile similar to the Franklin County *C. marginipennis* site. One notable difference was the proportion of gran-

ules. The historical site had a much lower granule percentage compared to the two sites where *C. marginipennis* was found. It is unclear if these differences are critical for *C. marginipennis* to be present; but other tiger beetle species, such as *C. hirticollis* Say (1817), are very selective in their preferred substrate. *Cicindela hirticollis* has disappeared from locations where lock and dam construction apparently changed the substrate characteristics (Kritsky et al. 1999a).

Conservation strategies to protect tiger beetles have included transplanting larvae from established areas to new areas (Pearson et al. 2006). This process is expensive and not feasible in Indiana, as the removal of larvae from one site might threaten the donor population. Rather, we suggest the ideal scenario would be to protect the specific locality and the banks 3 km upriver and downriver. Tiger beetles will disperse on their own to hospitable sites if given enough time (Kritsky et al. 1999b). The adjacent banks downriver from the Franklin County site are littered with downed trees, which may interfere with the natural scouring of the cobble and

Table 1.—Substrate analysis of current and former *Cicindela marginipennis* collection sites.

Substrate	Great Miami River site in Ohio	Franklin County site	1984 collection site
Cobble			
Mean cobble weight	208 g	76 g	65 g
%Cobble <100 g	60.2%	82.4%	85.1%
%Cobble 100–2000 g	34.9%	17.6%	14.9%
%Cobble >2000g	04.9%	0.0	0.0
Sifted material			
Gravel	53.9%	39.4%	55.4%
Granules	17.7%	12.2%	08.8%
Sand	22.0%	39.4%	28.7%
Silt and clay	06.4%	09.0%	07.1%

The Great Miami River site in southwestern Ohio and Franklin County in Indiana harbors viable populations of *C. marginipennis*, whereas *C. marginipennis* no longer occurs at the 1984 collection site. Substrate was characterized by cobble weight and sifted material. The cobble was categorized by average cobble weight and percentage of different cobble weights. Sifted material was categorized by particle size with gravel defined as particles greater than 4.0 mm, granules as between 2.0 mm and 4.0 mm, sand as between 2.0 mm and .05 mm, and silt and clay as less than .05 mm.

redepositing of the sand. It is unknown if the removal of these trees would eventually make the sites more suitable for *C. marginipennis*.

Cicindela marginipennis is listed as endangered in Indiana, and the continued decline in its distribution warrants that designation. In Ohio, the distribution of the cobblestone tiger beetle has expanded following the removal of the New Baltimore Bridge and the cessation of gravel removal from the Great Miami River at Dravo Park.

ACKNOWLEDGMENTS

We thank the IDNR Division of Nature Preserves for the opportunity to conduct this study. We also thank the College of Mount St. Joseph for a grant to permit the survey to

extend into Ohio, and Barry Knisley and David Brzoska for their help with the historical records for Indiana, William Hull for informing us of his 2009 collection of *C. marginipennis*, and James Berry and two reviewers for their helpful suggestions.

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Manuscript received 27 February 2009, revised 3 October 2009.