

# THE DISTRIBUTION AND STATUS OF THE INDIANA CRAYFISH, *ORCONECTES INDIANENSIS*, WITH COMMENTS ON THE CRAYFISHES OF INDIANA

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**ABSTRACT:** The Indiana crayfish, *Orconectes indianensis*, is restricted to southeastern Illinois and southwestern Indiana. Because the species has been extirpated from a large portion of its historic range in Illinois and has been reported from very few sites in Indiana, *O. indianensis* has been considered for listing by the U.S. Fish and Wildlife Service as a federally protected species. To determine the historical and present ranges of *O. indianensis*, museum holdings of *O. indianensis* were examined and suitable habitats in southern Indiana and southeastern Illinois were sampled between 18 April 1993 and 26 September 1993. Contrary to earlier indications, the Indiana crayfish is common in southern Indiana and presently is not in need of special protection by the State of Indiana or the federal government. However, the range of the species in Illinois is presently much smaller than the historic range. The Saline River system (the mainstay of the Indiana crayfish in Illinois) is seriously degraded, and protection in Illinois as a state endangered species remains necessary. Seventeen species and subspecies of crayfishes are known from Indiana: *Procambarus acutus*, *Procambarus clarkii*, *Procambarus gracilis*, *Orconectes immunis*, *Orconectes indianensis*, *Orconectes inermis inermis*, *Orconectes inermis testii*, *Orconectes propinquus*, *Orconectes putnami*, *Orconectes rusticus*, *Orconectes sloanii*, *Orconectes virilis*, *Cambarus diogenes*, *Cambarus laevis*, *Cambarus ortmanni*, *Cambarus robustus*, and *Fallicambarus fodiens*. The two rarest crayfishes in Indiana appear to be *Procambarus clarkii* and *Procambarus gracilis*.

**KEYWORDS:** *Cambarus*, Crustacea, *Fallicambarus*, Illinois, *Procambarus*.

## INTRODUCTION

The Indiana crayfish, *Orconectes indianensis*, is restricted to southeastern Illinois and southwestern Indiana (Hobbs, 1989). Page (1985) studied the distribution and status of the Indiana crayfish in Illinois as part of a statewide survey of crayfishes and discussed the recent elimination of the species from a significant portion of its historic range as a result of habitat degradation. Because of the reduction in its range, the Indiana crayfish is protected as a state endangered species in Illinois.

In contrast to our knowledge of the species in Illinois, the distribution of the Indiana crayfish in Indiana has been poorly known, with records published for only two localities: the Patoka River at Patoka in Gibson County (the type-locality of the species) and Huntington in Dubois County (Hay, 1896; Eberly, 1995). Because the Indiana crayfish has been extirpated from a large portion of its historic range in Illinois and has been reported from very few sites in Indiana, the

species has been considered for listing by the U.S. Fish and Wildlife Service as a federally protected species.

The goal of this study was to determine the status of the species throughout its range and its need for protection. Habitat and life history information was summarized because of the potential need for management.

## MATERIALS AND METHODS

To determine the historic range of *Orconectes indianensis*, records were obtained from curators of North American museums known to have collections of crayfishes. Questionable specimens were examined and identified to species.

To determine the present range of *Orconectes indianensis*, suitable habitats in southern Indiana and southeastern Illinois were sampled between 18 April 1993 and 26 September 1993. Small to medium-sized streams in southern Indiana (Crawford, Dubois, Gibson, Orange, Perry, Pike, Posey, Spencer, Vanderburgh, and Warrick Counties) were sampled. Known populations of *O. indianensis* in Illinois were reexamined to evaluate population changes since 1985.

Various collecting methods, including seining, dipnetting, and digging into stream substrate and stream banks were used to find different species of crayfishes. Voucher specimens (at least one individual of each species found at a site) were preserved and returned to the Illinois Natural History Survey for identification and analysis of sex and reproductive condition. At each site sampled, habitat characteristics, including depth, substrate composition, aquatic vegetation, and type of riparian habitat (e.g., presence of trees, grasses, shrubs, or cropland) were noted. Habitats were photographed as sampled for later reference.

## RESULTS AND DISCUSSION

**Distribution and Status in Indiana.** Collections of *Orconectes indianensis* from Indiana (Table 1) were found in the United States National Museum (USNM), The Ohio State University Museum of Biological Diversity (OSUM), and the Illinois Natural History Survey (INHS). In addition to the published records for Gibson and Dubois Counties (Hay, 1896; Eberly, 1955), museum records were found for Perry, Spencer, Posey, and Vanderburgh Counties.

Localities in Indiana where the Indiana crayfish had been found previously were revisited in 1993, and 27 new sites were visited. The additional sites were within the potential range of the species and appeared to have appropriate habitat. The species was found at three of four historic sites and at six of 27 new sites.

The Indiana crayfish is common and widely distributed in extreme southwestern Indiana (Figure 1) in the Patoka River system, a tributary of the Wabash River; in the Black River, a small tributary of the Wabash River in Posey County; and in Ohio River tributaries from Pigeon Creek in Vanderburgh County to Anderson River in Perry County. The species is known from localities in Crawford, Dubois, Gibson, Orange, Perry, Pike, Posey, Spencer, Vanderburgh, and Warrick Counties. In Indiana drainages to the east and north, the Indiana crayfish is replaced by the ecologically similar *Orconectes putnami*.

**Distribution and Status in Illinois.** No unreported collections of *Orconectes indianensis* from Illinois (Page, 1985) were found in museums. All

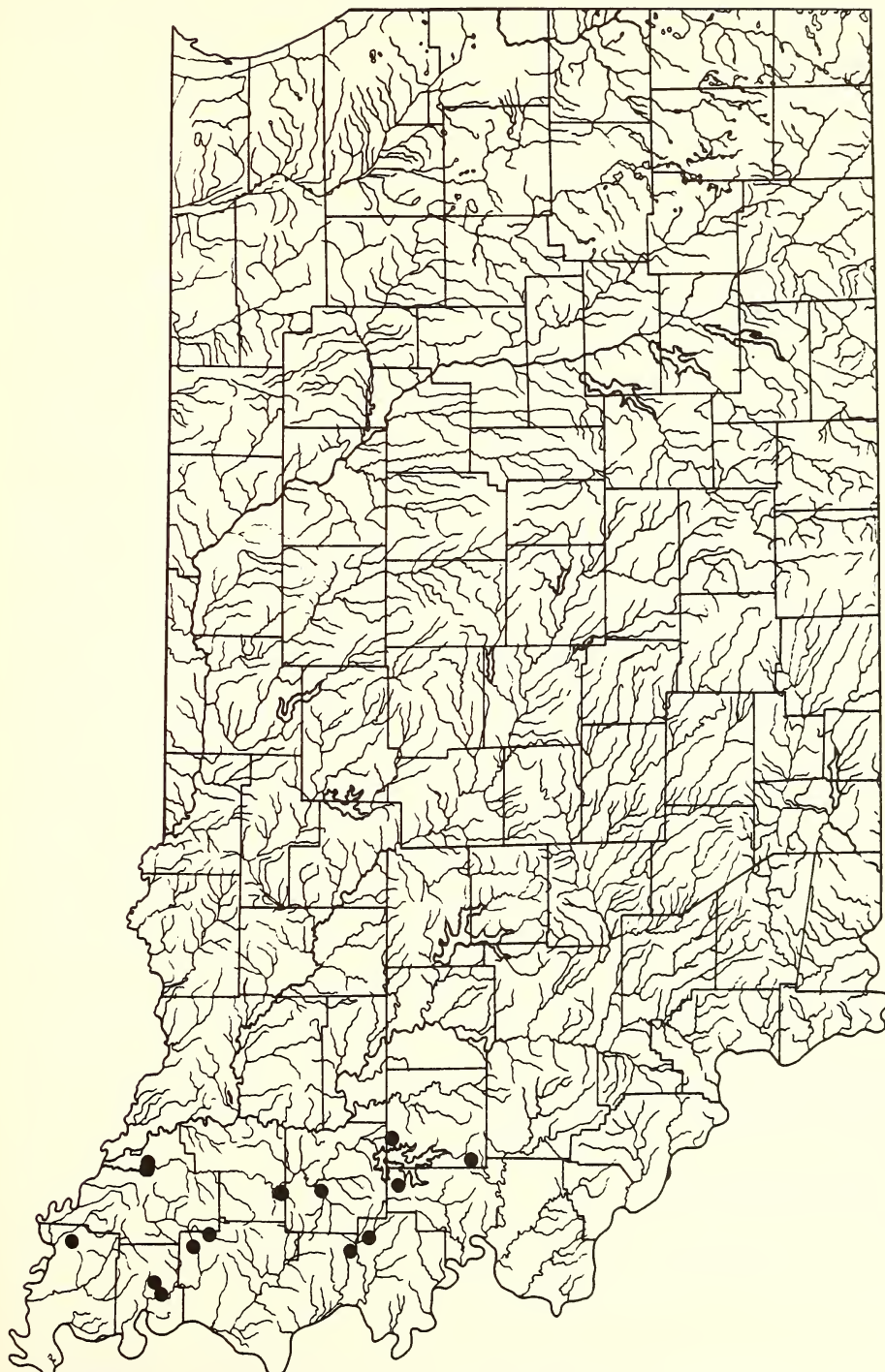


Figure 1. Distribution of the Indiana crayfish in Indiana.

Table 1. Known localities for *Orconectes indianensis*.

County	Stream	Sampling Date	N	Location
<b>ILLINOIS</b>				
Gallatin	Eagle Creek	11 May 1988	2	1.5 miles north of Leamington at defunct bridge crossing (Sec. 10, T10S, R8E)
		26 Sept. 1993	2	
	Robinette Creek	7 July 1974 26 Sept. 1993	1 3	Pounds Hollow (Sec. 25, T10, R8E)
Hardin	Honey Creek	19 Oct. 1972	37	1 mile east of Lamb (Sec. 28, T11S, R10E)
		23 March 1973	51	
		9 April 1981	35	
		18 April 1993	4	
	Sheridan Branch	30 Sept. 1975 26 Sept. 1993	1 1	3 miles north of Cave-in-Rock (Sec. 36, T11S, R9E)
	Rock Creek	16 April 1973	2	3 miles south of Cadiz (Sec. 29, T11S, R9E)
Johnson	Clifty Creek	19 May 1973	12	2 miles east of Burnside (Sec. 12, T11S, R4E)
		15 July 1993	9	
	Sugar Creek	15 June 1993	2	at Parker (Sec. 18NE, T11S, R4E)
	Sugar Creek	16 June 1993	3	2 miles south-southwest of Creal Springs (Sec. 6SW, T11S, R4E)
Pope	Burden Creek	19 May 1973	2	2 miles northeast of McCormick (Sec. 15, T10S, R5E)
		15 July 1993	1	
Saline	Little Saline River	1 August 1973	15	3.5 miles east of Stonefort (Sec. 35, T10S, R5E)
		15 July 1993	2	
	Rock Branch (Battle Ford Creek Drive)	9 Sept. 1975	23	4 miles southwest of Mitchellsville (Sec. 31, T10S, R6E)
White	Brushy Slough	21 July 1987	3	3.25 kilometers east-northeast of New Haven (Sec. 16, T7S, R10E)
Williamson	South Fork Saline River	1954	2	1 mile south of New Dennison (Sec. 3, T10S, R3E)
		28 Oct. 1974	10	
		26 Sept. 1993	3	
	Sugar Creek	1954	1	2 miles northeast of Creal Springs
	Sugar Creek	12 Aug. 1976 9 Oct. 1977 28 Sept. 1989 16 June 1993	8 22 1 22	0.5 mile east of Creal Springs (Sec. 25SE, T10S, R3E)
Sugar Creek	28 Sept. 1989	1	1 mile southeast of Creal Springs (Sec. 36SW, T10S, R3E)	

County	Stream	Sampling Date	N	Location
<b>INDIANA</b>				
Crawford	Tributary of Patoka Lake	14 July 1993	10	1.5 miles south of Wickliffe (Sec. 8, T2S, R2W)
Gibson	Patoka River	23 June 1931	56	Patoka
	Patoka River	14 Sept. 1988	4	Patoka
	Robb Creek (White River-Wabash River Drainage)	8 October 1986	2	3.1 miles north-northeast of Patoka (Sec. 23, White River Township)
Orange	Bacon Creek	14 July 1993	36	Bacon (Sec. 19SE, T1S, R1E)
	Tributary of Patoka River	14 July 1993	22	5 miles southwest of French Lick (Sec. 19, T1N, R2W)
Perry	Anderson River	24 June 1993	1	2 miles south of Siberia (Sec. 34SE, T3S, R3W)
Pike	Tributary of Patoka River	13 July 1993	6	0.5 mile west of Pikeville on Highway 257 (Sec. 30NW, T2S, R6W)
Posey	Tributary of Black River (Wabash River Drainage)	19 July 1974	8	1.5 mile west of Stewartville (Sec. 22NW, T4S, R13W)
		23 June 1993	6	
Spencer	Hurricane Creek	2 June 1943	2	Just east of St. Meinrad
		24 June 1993	5	
Vanderburgh	Tributary to Pigeon Creek	2 June 1943	1	4 miles east of Evansville
	Locust Creek	4 October 1990	1	Laubscher Road at confluence with unnamed tributary (Sec. 36, T5S, R11W)
	Tributary to Locust Creek	4 October 1990 23 June 1993	3 5	3 miles northwest of Evansville at the Mohr Road bridge (Sec. 36, T5S, R11W)
Warrick	Big Creek	24 June 1993	2	2 miles west of Lynnville, Route 68 bridge (Sec. 11NE, T4S, R9W)
	Pigeon Creek	24 June 1993	1	1 mile east of Elberfeld (Sec. 21NW, T4S, R9W)

11 localities in Illinois, where the Indiana crayfish had been found between 1972 and 1982 (Page, 1985), were revisited in 1993, and one additional site was visited. The species was found at all but four of the sites, and the status of the species

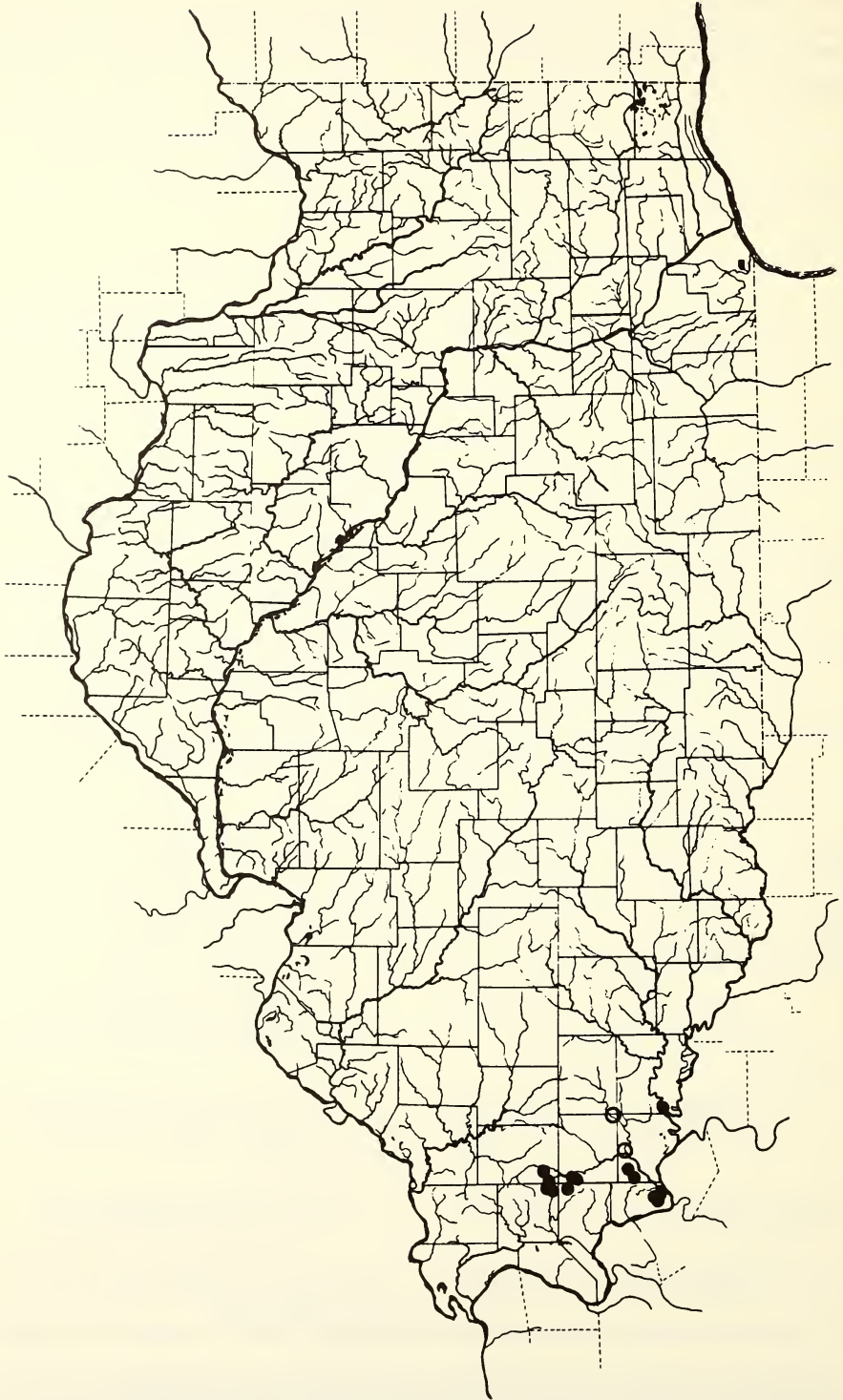


Figure 2. Distribution of the Indiana crayfish in Illinois. Open dots are pre-1912 records; black dots are 1972-1993 records.

appears not to have changed significantly in the past two decades. The four sites where *O. indianensis* was not found did not appear to be particularly degraded, and additional collecting would probably show the species still to be present there.

*Orconectes indianensis* is fairly common in a small portion of the Saline River system in Gallatin, Hardin, Johnson, Pope, Saline, and Williamson Counties and is common in Honey and Rock Creeks, small tributaries of the Ohio River in Hardin County (Figure 2). Although historical records document its earlier presence (Page, 1985), *O. indianensis* is absent in much of the Saline River system, which suffers from pollution related to strip-mining activities.

A collection of *Orconectes indianensis* made in 1987 in Brushy Slough, a tributary of the Wabash River in White County, is the only known locality for the species in the Wabash River drainage of Illinois. Although the presence of the Indiana crayfish at the locality could not be field-verified in 1993, voucher specimens for the 1987 collection are housed at the Illinois Natural History Survey, and the record is considered valid.

**Habitat and Demographic Characteristics.** The Indiana crayfish in our collections were always found among coarse substrate, primarily large rocks or woody debris, and usually in slow to moderate current. Few individuals were found in quiet water or over sand and mud away from rocks or woody debris, and none were found in burrows. All were collected in water less than 50 cm deep; most were found in water less than 30 cm deep. A few individuals were found among or near emergent or submerged vegetation; however, aquatic vegetation was absent or uncommon at most localities.

Most of the streams in which the Indiana crayfish occurs flow through land that is, or was, forested. At most localities where the species was found in 1993, the stream banks remained forested for at least a few meters from the edge of the water. Streams where the trees had been removed to the edge of the water characteristically were more turbid, had muddier bottoms, and had less suitable habitat for *Orconectes indianensis*.

Other crayfishes collected with the Indiana crayfish were *Orconectes immunis*, *Procambarus acutus*, *Procambarus clarkii*, and *Cambarus diogenes* in Indiana and *Orconectes immunis*, *Orconectes virilis*, *Procambarus acutus*, and *Cambarus diogenes* in Illinois. *Orconectes immunis*, *Procambarus acutus*, and *Procambarus clarkii* live in quiet pools over mud and sand. *Cambarus diogenes* is a burrowing species, found most often on shore within a few feet of a stream. *Orconectes virilis* has been introduced into the Saline River system of Illinois, probably as a result of its common use as fishing bait; it does not occur naturally with the Indiana crayfish. The habitat requirements of *O. virilis* are similar to those of *Orconectes indianensis*; i.e., it lives nears rocks and woody debris in the current but prefers slightly quieter water than *O. indianensis*. *Orconectes virilis* may compete with *O. indianensis* and further add to the decline of *O. indianensis* in the Saline River system.

The ecology of the Indiana crayfish is poorly known. The only information available is that on Illinois specimens examined by Brown (1955) and Page (1985). Form I (reproductive, mature) males are known from March, August, September, October, and November. The smallest form I male recorded was 17.7 mm carapace length, and the largest was 33.4 mm carapace length (Page, 1985).

Females carrying eggs have been found in March and April, and a female with young attached was collected in May (Page, 1985). In the 1993 collections, form I males were encountered in June and July. No females with eggs or young attached were found. From these data, it appears that fertilization can occur in spring, summer, or fall, and that eggs are laid the following spring.

Sex ratios varied markedly among samples but, given the small size of the samples, were clearly subject to sampling error. The largest Indiana collection, from Bacon Creek (Patoka River drainage) on 14 July 1993, contained 24 males and 12 females; the second largest collection, from a tributary of the Patoka River five miles southwest of French Creek, contained 10 males and 12 females. Of the 219 individuals of *Orconectes indianensis* collected in Illinois, 104 were males and 115 were females (Page, 1985).

The largest known specimen of *Orconectes indianensis* from Illinois or Indiana is a 35.0 mm carapace-length female; the largest male is a 33.4 mm carapace-length form I male (Page, 1985). Based on size distribution, all individuals encountered were in their first or second year of life; maximum longevity for the species is probably two or three years. The life history of *O. indianensis* is probably similar to that of *Orconectes kentuckiensis* (Boyd and Page, 1978), another inhabitant of small rocky streams in the Shawnee Hills of southern Illinois.

**Recommendations for Protection of the Indiana Crayfish.** Contrary to earlier indications, the Indiana crayfish is common in southern Indiana and is not in need of special protection by the State of Indiana or by the federal government. The populations in Illinois appear to be about as large as they were in 1972-1982 (Page, 1985). However, the present range in Illinois is much smaller than the historic range, the Saline River system (the mainstay of the Indiana crayfish in Illinois) is seriously degraded, and protection in Illinois as a state endangered species remains necessary.

**Crayfishes of Indiana.** Little is known about the distributions of crayfishes in Indiana. The most complete information is contained in checklists for Indiana by Hay (1896) and by Eberly (1955) as well as in the checklist for North America by Hobbs (1989). The following 17 species and subspecies have been reported for Indiana: *Procambarus acutus*, *Procambarus clarkii*, *Procambarus gracilis*, *Orconectes immunis*, *Orconectes indianensis*, *Orconectes inermis inermis*, *Orconectes inermis testii*, *Orconectes propinquus*, *Orconectes putnami*, *Orconectes rusticus*, *Orconectes sloanii*, *Orconectes virilis*, *Cambarus diogenes*, *Cambarus laevis* (synonym of *Cambarus tenebrosus*?), *Cambarus ortmanni*, *Cambarus robustus*, and *Fallicambarus fodiens*.

According to Hobbs (1989), the range of *Orconectes putnami* is uncertain, and he only tentatively listed the species for Indiana. The authors found populations assignable to *O. putnami* to be widespread in southeastern Indiana. However, as has been noted elsewhere (Ortmann, 1931; Rhoades, 1944; Hobbs, 1989), the taxonomy of *O. putnami* and its closest relatives is uncertain, and additional study is needed to determine the correct name of populations in Indiana.

According to Jezerinac (1993), populations of crayfishes in Indiana usually referred to as *Cambarus diogenes* are actually a complex of two species; one is



assignable to *C. diogenes*, and the other is an unnamed species. Recognition of the undescribed species brings the number of species and subspecies of crayfishes in Indiana to 18.

Among the species presently known for Indiana, the two rarest crayfishes are probably *Procambarus clarkii* and *P. gracilis* (although the status of the troglobitic *Orconectes inermis inermis* and *O. inermis testii* is difficult to determine). *Procambarus clarkii* is restricted to extreme southwestern Indiana and may be found only in swampy streams in Posey, Vanderburgh, and Warrick Counties. The species is common elsewhere, especially on the Coastal Plain of the southern United States, where it is harvested for human consumption. *Procambarus gracilis* is known in Indiana only from collections on the Indiana-Illinois State Line (Page, 1985) and may be the rarest crayfish in Indiana. Additional collecting is needed in the Indiana counties bordering Illinois that are drained by the Kankakee, Iroquois, and Wabash Rivers to assess the need for protection of this species in Indiana.

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#### LITERATURE CITED

- Boyd, J.A. and L.M. Page. 1978. The life history of the crayfish *Orconectes kentuckiensis* in Big Creek, Illinois. Amer. Midl. Natur. 99: 398-414.
- Brown, P.L. 1955. The biology of the crayfishes of central and southeastern Illinois. Ph.D. Thesis, Univ. Illinois, Urbana-Champaign, 158 pp.
- Eberly, W.R. 1955. Summary of the distribution of Indiana crayfishes, including new state and county records. Proc. Indiana Acad. Sci. 64: 281-283.
- Hay, W.P. 1896. The crawfishes of the State of Indiana. In: *20th Annual Report of the Department of Geology and Natural Resources of Indiana*, pp. 476-506, Wm. B. Buford, Indianapolis, Indiana, 520 pp.
- Hobbs, H.H., Jr. 1989. An illustrated checklist of the American crayfishes (Decapoda: Astacidae, Cambaridae, and Parastacidae). Smithson. Contrib. Zool. 480, 236 pp.
- Jezerinac, R.F. 1993. A new subgenus and species of crayfish (Decapoda: Cambaridae) of the genus *Cambarus*, with an amended description of the subgenus *Lacunicambarus*. Proc. Biol. Soc. Wash. 106: 532-544.
- Ortmann, A.E. 1931. Crawfishes of the southern Appalachians and the Cumberland Plateau. Ann. Carnegie Mus. 20: 61-160.
- Page, L.M. 1985. The crayfishes and shrimps (Decapoda) of Illinois. Illinois Natur. Hist. Surv. Bull. 33(4): i+vi, 335-448.
- Rhoades, R. 1944. The crayfishes of Kentucky, with notes on variation, distribution, and descriptions of new species and subspecies. Amer. Midl. Natur. 31: 111-149.

