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Range Extensions of Three Crayfishes (*Faxonius yanahlindus*, *F. placidus*, and *F. erichsonianus*) into Mississippi

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Abstract - We report 3 new state crayfish records from the Tennessee River drainage in Tishomingo County, Mississippi: 1 is a re-identification of previously published material, and 2 are from unpublished collections. *Faxonius yanahlindus* (Spinywrist Crayfish), recently described from the middle Tennessee River drainage in northwest Alabama and southern Tennessee, is closely related to *F. spinosus* (Coosa River Spiny Crayfish) and *F. putnami* (Phallic Crayfish). In light of the new species description, we re-examined crayfish collected in southern tributaries of the Tennessee River in northeast Mississippi that were previously identified as *F. spinosus* or *F. putnami.* We reassigned the specimens to *F. yanahlindus,* extending the species' range into northeast Mississippi. We also report new state records of 2 other crayfishes. *Faxonius placidus* (Bigclaw Crayfish) was collected from Whetstone Branch, a tributary of Pickwick Reservoir on the Tennessee River, and *F. erichsonianus* (Reticulate Crayfish) was collected from Cedar Creek, a tributary of Bear Creek in the Tennessee River basin.

The small portion of the Tennessee River drainage that extends into northeast Mississippi contains numerous examples of aquatic fauna more typical of northern Alabama and Tennessee than of the remainder of Mississippi (e.g., Ross 2001). Within Mississippi, several crayfishes, including some *Cambarus* and *Faxonius* (formerly *Orconectes*) species, are restricted to this corner of the state but have larger distributions extending into Alabama or Tennessee (Adams et al. 2010). *Faxonius yanahlindus* (Taylor, Rhoden, and Schuster) (Spinywrist Crayfish) was recently described from the Tennessee River drainage in northwestern Alabama and southwestern Tennessee (Taylor et al. 2016). The crayfish belongs to the *F. juvenilis* (Hagen) species complex in the subgenus *Procericambarus*. Specimens from the new species' range and the current study area were previously classified as *F. putnami* (Faxon) (Phallic Crayfish) (Taylor 2000) or *F. spinosus* (Bundy) (Coosa River Spiny Crayfish) (Adams et al. 2010). Crayfish belonging to the *F. juvenilis* species complex had been collected from southern tributaries to the middle Tennessee River drainage in northeast Mississippi (Adams et al. 2010) but were not included in the description of *F. yanahlindus* (Taylor et al. 2016). Therefore, we re-examined the specimens to determine whether or not they should be assigned to *F. yanahlindus*.

All morphological characters and measurements on the Mississippi specimens are consistent with those described for *F. yanahlindus* (Taylor et al. 2016). All specimens either lacked a carina or had a very weak carina on the dorsal surface of the rostrum, had a distomedian spine on the ventral surface of the carpus, and had dentate incisor regions of the mandibles. Areola lengths were close to or greater than 30% of the total carapace length (TCL) (Table 1). On form I males (MI), total lengths of the gonopods (GL) were ≤45% of the TCL, and the central projection (CP) lengths were >50% of the GL (Table 1). Therefore, we reassigned the specimens to *F. yanahlindus*, extending the species' range into extreme northeast Mississippi.

A collection of *F. yanahlindus* made 24 June 2007 contained 3 MI, 2 form II males (MII), and 2 females (F). The largest individual was an MII (TCL = 40.8 mm; postorbital carapace

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length = 31.7). All except 1 MII and 1 F appear to have molted 1–2 weeks before collection. The crayfish were collected by hand from a highly modified stream reach with rip-rap in the streambed and vegetation along the margins.

Faxonius placidus (Hagen) (Bigclaw Crayfish), including 2 MI, were collected by hand from beneath rocks in 2009 from Whetstone Branch, a tributary of Pickwick Reservoir (an impoundment of the Tennessee River), and identified as *Orconectes* sp. in the Mississippi Museum of Natural Science (MMNS; Jackson, MS) collection. The long, nearly straight terminal elements of the form I male gonopods place them in the *Procericambarus* subgenus, but 2 characteristics distinguish them from the *F. juvenilis* species complex (Taylor et al. 2016): gonopods lacking a shoulder at the base of the central projection and CP:GL ratios <45% (Table 1). Also, compared to *F. yanahlindus*, the specimens have relatively longer chelae and more widely gaping fingers. Adams et al. (2010) hypothesized that the following additional *Faxonius* (*Procericambarus*) spp. present in northwest Alabama may also occur in Mississippi: *F. durelli* (Bouchard and Bouchard) (Saddle Crayfish), *F. forceps* (Faxon) (Surgeon Crayfish), and *F. mirus* (Ortmann) (Wonderful Crayfish). However, the Whetstone Branch specimens differ from each of those, having well-developed cervical spines, which *F. mirus* lacks (Ortmann 1931, Wetzel et al. 2005); distomedian spines on the ventral surface of the carpus, which *F. forceps* lacks (Poly and Wetzel 2003); and long fingers on the chelae, unlike the relatively stocky chelae with short fingers found on *F. durelli* (Taylor and Schuster 2004).

Similar specimens were collected from Pickwick Reservoir in Alabama (US Forest Service, Center for Bottomland Hardwoods Research, Oxford, MS [CBHR] 5476, unpubl. data), and their identification as *F. placidus* was confirmed by Guenter Schuster (Eastern Kentucky University, emeritus, Richmond, KY, pers. comm.). In Alabama, the species has been documented only from the Tennessee River drainage, but the range extends north into Illinois (Hobbs 1989).

Four collections from Cedar Creek, a tributary of Bear Creek in the Tennessee River drainage, contain *Faxonius* (*Crockerinus*) *erichsonianus* (Faxon) (Reticulate Crayfish). Crayfish were collected in seines during fish sampling from 1999 to 2015. In Alabama, the species is abundant in Cedar Creek farther upstream (Z. Barnett, US Forest Service, Oxford, MS, unpubl. data) and is present in Bear Creek downstream of the confluence with Cedar Creek (J. Simmons, Tennessee Valley Authority, Chattanooga, TN, pers. comm.), but it has

Table 1. Measurements (mm) of form I male *Faxonius* (*Procericambarus*) spp. from the Tennessee River drainage in Mississippi. Total carapace length (TCL), areola length (AL), total gonopod length (GL), and central projection length (CP) were measured as in Taylor et al. (2016) using dial calipers.

Catalog number	TCL	AL (% of TCL)	GL (% of TCL)	CP (% of GL)
F. yanahlindus (Taylor, Rhoden, and Schuster) (Spinywrist Crayfish)				
USNM 148759	30.7	9.0 (29.3)	13.7 (44.6)	7.8 (56.9)
CBHR 987_01	38.1	11.3 (29.7)	16.7 (43.8)	8.9 (53.3)
CBHR 987_02	37.4	11.0 (29.4)	15.4 (41.2)	8.4 (54.5)
CBHR 987_03	-[A]	11.6	16.7	8.9 (53.3)
MMNS 3300	38.9	12.8 (32.9)	16.9 (43.4)	9.0 (53.2)
F. placidus (Hagen) (Bigclaw Crayfish)				
MMNS 2326_1	34.9	12.4 (35.5)	11.0 (31.5)	4.6 (41.8)
MMNS 2326_2	29.9	10.5 (35.1)	10.2 (34.1)	4.4 (43.1)

[A]Deformed rostrum prevented obtaining accurate CL.

not been reported from Mississippi. It occurs in numerous river systems in Alabama and extends northeast into southwestern Virginia (Hobbs 1989, Schusteret al. 2008).

Specimens examined. All collections were from the middle Tennessee River drainage in extreme northeastern Mississippi, Tishomingo County. Abbreviations not previously defined include: US National Museum of Natural History, Washington, DC (USNM); juvenile male (JM), and juvenile female (JF).

Faxonius yanahlindus. We examined specimens from 2 published and 5 unpublished crayfish collections from Mississippi previously identified as *F. spinosus*: (1) Robinson Creek, 3.2 km (2 mi) S of Crossroads (S.B. Adams added: junction of highways 365 and 25), 1 mile W of State Route 25] 34.8997, -88.2611 (georeferenced by S.B. Adams), 1-MI, 18 October 1974, G. Clemmer (USNM 148759); (2) Same locality as USNM 148759, 1-F. 1-JM, 5 October 1975, G. Clemmer (MMNS 1570); (3) Robinson Creek, 1 mile east of Hwy 25, one mile south of Crossroads, 34.91090, -88.25940 (georeferenced by R.L. Jones), 1-F, 23 September 1977, G. Clemmer (MMNS 1568); (4) Robinson Creek at County Road 982, two miles south of Crossroads, 34.90189, -88.26126, 1-MII, 1-F, 22 September 2000, R.L. Jones, W.T. Slack, R. Weitzell, and T. Majure (MMNS 2680); (5) Robinson Creek at TennTom Waterway between closed bridge and control structure at mouth, 34.91128, -88.25878, 3-MI, 2-MII, 2-F, 24 June 2007, S.B. Adams, C. Lukhaup, and C.A. Quinn (CBHR 987); (6) Martin Branch at County Road 321, T2S R10E SE4 Section 10, 34.91807, -88.23217, 1-MI, 2-JM, 5-JF, 25 September 2012, R.L. Jones and S. Peyton (MMNS 3300); (7) Same locality as MMNS 3300, 4-MII, 1-F, 14 June 2012, S. Peyton and H. Sullivan (MMNS 3141). In addition, we changed the identification of the following specimen to *F. yanahlindus* without examining it: same locality as USNM 148759, 1-JM, 10 October 1975, G. Clemmer (USNM 178261: identified as *F. putnami* by J.F. Fitzpatrick, Jr. in 1982, changed to *F. spinosus* by S.B. Adams in 2010).

Faxonius placidus. Whetstone Branch below Brogdan Hollow, 34.95481, -88.18891, 2-MI, 30 March 2009, A. Francois, A. Sanderson, and M. Stegall (MMNS 2326).

Faxonius erichsonianus. (1) Cedar Creek at county road bridge east of Mingo, T5S R11E Section 21, 34.62750, -89.14181, 3-MII, 2-F, 15 September 1999, R.L. Jones and W.T. Slack (MMNS 2378); (2) Same locality as MMNS 2378, 2-JM, 1-JF, 30 August 2011, T. Stubbs (MMNS 3160); (3) Same locality as MMNS 2378, 4-MII, 3-F, 3-JM, 2-JF, 25 September 2012, R.L. Jones, W.T. Slack, and S. Peyton (MMNS 3289); (4) Same locality as MMNS 2378,1-MII, 14 August 2015, M.D. Wagner and H.N. Thompson (MMNS 5559).

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