

Procambarus (Ortmannicus) hayi (Faxon) 1884

Straightedge crayfish



Photo by C. Lukhaup

Distribution, Habitat, and Behavior

Procambarus hayi occurs in the Tallahatchie, Hatchie, and Tombigbee river basins in Mississippi, Alabama, and Tennessee (Payne 1972, Hobbs 1989, Schuster et al. 2008). The species prefers lentic situations, tolerating only very sluggish flow, and is especially common in vegetation and detritus in small ponds (Bouchard 1972, Payne 1972). We have collected low densities of *P. hayi* from moderately flowing, small streams, but the highest densities we found in streams were in reaches immediately upstream or downstream of small impoundments (unpublished data). In streams, we find very small juveniles in masses of fine roots along stream margins. In ponds, adults used deeper waters by day, moving into shallower waters or even terrestrial habitats at night (Payne 1972).

Procambarus hayi is a secondary burrower (Bouchard 1972). In Payne's (1972) study, adults entered burrows in mid-April. Individuals hatched the previous year entered burrows upon reaching maturity in July or August. Typically a form I male and a female would occupy one burrow, with the male closest to the entrance. Males left the burrows for open water before the time of oviposition, beginning in late August. Females remained in burrows until late November. Therefore, for approximately two months in mid-summer, nearly all of the population was in burrows. In stream sites in north Mississippi, we found that numbers of adult females in open water peaked in June, declining through August, and increasing again in March (unpublished data). Adult or nearly-adult males were captured throughout the summer, but only one was captured from November through January.

For pond-dwelling populations, Payne (1972) found that burrows were typically constructed within several meters of pond shorelines and were relatively simple, with one or sometimes two entrances and a terminal chamber. Most burrows reached groundwater within 10-20 cm, and the deepest extended 85 cm below the water table (Payne 1972).

Life Colors and Distinctive Characters

Coloration of *P. hayi* is typically brown to orangish-brown on the lateral surface of the carapace, with a dark line below, under which the base color tends to have a hint of pink. The abdomen has a dark triangle dorsally and a broken dark line laterally, extending from the line on the side of the carapace. Chelae are brown to orange-brown with dark brown tubercles dorsally. Fingers are brown, grey, or blue-grey. Juveniles are more mottled and have orange to red finger tips.

Procambarus hayi has a broad, triangular, excavated rostrum with a short acumen and moderate marginal spines. The areola is moderately narrow, and one small (larger in juveniles) cervical spine occurs on each side of the carapace. The antennal scale is subtriangular, widest at the midpoint, and extends to the end of the rostrum. Chela are long and slender, with fingers longer than the palm. The mesial margin of the palm has a row of blunt, spiniform tubercles. Opposable margins of the fingers are ciliate with one or two small spinous teeth. Chelae are much longer in form I than form II males. Males have hooks on the 3rd and 4th pereopods (legs). The form I gonopod is blunt, with the distal portion directed caudodistally at an angle of about 25 degrees to the main shaft. The cephalic process is blunt. The central projection and caudal process are both short, not extending beyond the cephalic process. The mesial process is spiniform, prominent, and directed at angle of about 65 degrees to the main shaft. The caudal knob is prominent on the caudolateral surface of the gonopod and terminates in a tuft of setae. The female's annulus ventralis is subtriangular and has relatively simple topography. The sinus originates near the center of the annulus and traces a shallow curve, ending in an elevated tubercle that creates a small protuberance in the mid-caudal margin. The antecedent sternite has a pair of tubercles extending caudally and overhanging the cephalic margin of the annulus. The post-annular sclerite is semi-ovoid.

Size:

The type specimen was 100 mm total length with a carapace length of 51 mm (Faxon 1884). The largest specimen I captured in north Mississippi streams was a form II male with a carapace length of 49.9 mm (unpublished data). Maturity is reached at carapace lengths of 36-45 mm (Payne 1972).

Most Like

Procambarus hayi belongs to the Blandingii Group of the subgenus *Ortmannicus* and is similar to *P. acutus*, *P. acutissimus*, and *P. lecontei* in Mississippi (Hobbs 1962, 1972). It is easily distinguishable from *P. acutus* by both the form I gonopod and the annulus ventralis. In *P. acutus*, the mesial process is directed at an angle of about 45 degrees to the main shaft, the caudal and mesial processes and the central projection all sweep laterally in the ventral view, and the tuft of setae originates on the cephalic surface of the

gonopod. The annulus ventralis in adult *P. acutus* has a long sinus, originating near the cephalic margin and has a deep fossa near the center. The antecedent sternite lacks distinct lobes that protrude caudally over the annulus. In juvenile *P. acutus*, the annulus lacks the deep fossa and, thus, is more difficult to distinguish from *P. hayi*. In *P. lecontei* and *P. acutissimus* males, the mesial process is directed at roughly the same angle as, but is much longer than, that of *P. hayi*, and the gonopods lack the prominent caudal knob of *P. hayi*. In *P. lecontei* and *P. acutissimus* females, the sinus of the annulus ventralis originates at or near the cephalic margin rather than near midlength as in *P. hayi*.

Life History

Payne (1972) reported on the life history study of pond-dwelling *P. hayi* near State College, MS. Breeding occurred in spring and summer, apparently in open water or burrows. Form I males were found in all months but peaked from March to September. Oviposition and hatching occurred in burrows from late summer through autumn. Mean abdominal egg diameter was 2.2 mm. Juveniles typically appeared in open water during their 3rd instar, with a continuous influx of hatchlings to open water from August through December, peaking from mid-October to mid-December. Most individuals reached maturity by May or June of the following summer, reproduced again the next summer, and then died. Payne (1972) presumed that some individuals survived to reproduce in their third year. Adult males molted from form II to form I in spring and back again in fall, after leaving burrows. Adult females molted during winter, after oviposition.

Bouchard (1972) reported form I males in Mississippi from April to August. In northern Mississippi streams, we found form I males from June through August, and one in April (unpublished data). We observed only one female with active glair glands, and that was in August. Juvenile *P. hayi* smaller than 5 mm postorbital carapace length appeared in streams from July through November.

Crayfish Associates

Orconectes mississippiensis and *Hobbseus orconectoides* occupied the same pond as *P. hayi*, and *P. hagenianus* was abundant in surrounding pastures (Payne 1972). In collections from Mississippi streams, *P. hayi* has been found with *Cambarus diogenes*, *C. striatus*, *Hobbseus petilus*, *H. yalobushensis*, *P. acutus*, *P. lylei*, *P. ouachitae*, and an undescribed *Orconectes* species (Fitzpatrick and Hobbs 1971, Fitzpatrick 1977, Busack 1988, Fitzpatrick and Busack 1989, Fitzpatrick and Suttikus 1992) and from ponds with *H. orconectoides* (Fitzpatrick and Payne 1968). It has also been collected with *O. chickasawae* (Cooper and Hobbs 1980), *O. palmeri*, *P. ablusus*, and *P. clarkii* (Bouchard 1972). Out of 42 collections of *P. hayi* from standardized sampling of streams on National Forests of Mississippi, the following species were collected with *P. hayi* in order of decreasing frequency (number of collections with both species): *O. chickasawae* (33), *P. vioscai* (13), *C. striatus* (7), *P. acutus* (6), *P. ouachitae* (3), and *P. clarkii* (1) (unpublished data).

Conservation Status

American Fisheries Society ranking: Currently Stable

Heritage global ranking: G5 (demonstrably widespread, abundant, and secure)
See (Taylor et al. 2007) for further explanation of these rankings.

Notes

Steele (1902) reported *P. hayi* from the James River, Missouri, but there have been no subsequent reports from the state, and Pflieger (1996) was unable to assign the report to any species known to occur in the state.

Species Description

Originally described as *Cambarus hayi*.

Faxon, W. 1884. Descriptions of new species of *Cambarus*; to which is added a synonymical list of the known species of *Cambarus* and *Astacus*. Proceedings of the American Academy of Arts and Sciences **20**:107-158.

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