

Cave Crayfish, *Crustacea Decapoda Astacidea Cambaridae*

Skip Kendrick, 2007



Photo courtesy of Jen Buhay. *Orconectes (orconectes) incomptus* – Tennessee cave crayfish.

There are more than 605 described species of freshwater crayfishes in the world. They are distributed throughout North America, South America, Asia, Europe, Madagascar, Australia, and New Zealand. Oddly, there are no native crayfishes in Africa. Freshwater crayfish comprise three families: Astacidae (Northwest USA, Western Canada, and Europe), Cambaridae (Eastern USA and Mexico), and Parastacidae (Australia, New Zealand, South America, and Madagascar). Crayfish come in many sizes and colors, but all of them have an exoskeleton that molts as the animal grows, a fused head and thorax, a segmented abdomen, and five pairs of legs, the first pair being armed with large claws used primarily for excavation and defense.

Both the clawed lobster and the freshwater crayfish are believed to have evolved from a common marine ancestor some 245 million years ago. Crayfish fossils and burrows have been found in North America dating to 225 million years ago. This was during the Triassic period when land on Earth formed one large super continent called Pangea. As stream and slow river dwellers, crayfish began to inhabit subterranean environments and to become cave-adapted species. Then, about 66 million years ago, the Chicxulub Comet crashed into Earth, killing the dinosaurs and most of the other land-dwelling life (the K/T Boundary event); the cave crayfish survived. It is believed that modern crayfish evolved from the surviving stocks of cave crayfish in at least two distinct groups, the northern hemisphere families and the southern hemisphere family (by this time Pangea had separated into various continents although it is not until about 23 million years ago during the Miocene age that the continents took on their modern appearance (although Florida was still under water at that time).

At least 15 species of freshwater crayfish are known to exist in very limited localities, and over 50% of the species in North America are endangered or threatened. Tennessee has more crayfish species than any other state (78 species known to date). There are 39 known species of troglobitic crayfish (cave-dwelling) in four genus: *Cambarus*

(Oklahoma, West Virginia, Alabama, Tennessee, Arkansas, Missouri, Florida), *Orconectes* (Tennessee, Alabama, Kentucky, Indiana, and Missouri), *Procambarus* (Cuba, Mexico, Florida, Tennessee), and *Troglocambarus* (Florida). Interestingly, Eagle's Nest, in Hernando County Florida is home to *Procambarus (Ortmannicus) leitheuseri*, locally known as the Coastal Lowland Cave Crayfish. Also, *Procambarus (Ortmannicus) delicatus*, has been found only in Alexander Spring in Lake County, Florida. And *Orconectes (Orconectes) incomptus*, the Tennessee Cave Crayfish, can be found only in Cherry cave in Jackson, Tennessee.

Cave animals are classified as troglonexes (cave visitors), troglaphiles (cave lovers), and troglobites (cave-dwellers). Cave divers are troglonexes, as are bats, perch, and others. Troglaphiles include chub, catfish, and eels. Troglobites include amphipods, isopods, some shrimp, some salamanders, snails, and cave fish and crayfish. In Florida there are 24 troglobitic species, 15 of which are the blind cave crayfish. Cave crayfish have been found over 4,000 feet in and at depths of over 300 feet.

Cave Crayfish are albino, but may have partly colored areas, and they are eyeless, although some retain eye spots. However, opsin, the primary light-detecting chemical found in the retina of eyed animals can also be found in the eyeless cave crayfish, but it's in the tail! Research has shown that shining a white light on a cave crayfish increases its ventilation (breathing) and heart rates, and disrupts ongoing social interactions. So although the cave crayfish can not really "see" you, they do detect the presence of your light and may respond with tail-flips or with defensive use of their chelipeds (claws). The larger the crayfish, the more likely you will see defensive use of chelipeds, while smaller ones tend to escape by tail-flipping. The white light does not necessarily elicit defensive behavior, cave crayfish rely primarily on vibration and chemical detection, so they not only "see" your light, but "feel" your bubbles and movement through the water, and may even "taste" your neoprene! Indeed, the cave crayfish has an abundance of brain neurons dedicated to processing olfactory stimuli, compared to surface crayfish.

Crayfish may live in burrows, but cave crayfish tend to live under rocks. Crayfish typically live from 2-5 years, but cave crayfish may live for several decades. Cave Crayfish are particular sensitive to water pollutants, thus they are excellent indicators of water quality. Mating season is in the fall. Males grab females and deposit sperm packages (spermatophores) in the seminal receptacle on the abdomen of a receptive female. The female then releases the impregnated eggs onto a sticky substance (called glair) secreted on her abdomen and legs. There can be as few as 10 eggs or 100 or more; the female is said to be "in berry." The eggs incubate for several weeks, whereupon the young hatch and cling to mom for 1-3 weeks before venturing out on their own, where they forage for algae, flatworms, amphipods, isopods, copepods, and when larger, even salamanders.



Photo Courtesy of Ed Jackson. Unidentified species of Florida cave crayfish.

Sources

Crandall, K.A. (2006). Applications of phlogenetics to issues in freshwater crayfish biology. *Bulletin Francais de la Peche et de la Pisciculture*, 380-381, 953-964.

Fetzner, J.W., Jr. (1996). Biochemical systematics and evolution of the crayfish genus *Orconectes* (Decapoda; Cambaridae). *Journal of Crustacean Biology*, 16, 111-141.

Hobbs, H.H., Jr., & Barr, T.C., Jr. (1972). Origins and affinities of the troglobitic crayfishes of North America (Decapoda; Astacidae) II. Genus *Orconectes*. *Smithsonian Contributions to Zoology*, 105, 1-84.

Walsh, S.J. (2001). Freshwater macrofauna of florida karst habitats. U.S. Geological Survey, Karst Interest Group Proceedings, Water-Resources Investigations Report 01-4011, St. Petersburg, Florida, February, 78-88.