

Crawfish harvested in Louisiana for the capture fishery, largely from the 4,662 km² area of the Atchafalaya River basin in south-central Louisiana, and from the 5,200 ha of culture ponds are composed of two species. The red swamp crawfish (*Procambarus clarkii*) predominates in both industries and is preferred for the marketplace, but the related white river crawfish (*Procambarus zonangulus*) is of similar size, is similar in its biology, and often is similar in appearance to untrained persons. The white river crawfish are found in higher numbers in flowing water habitats, while the red swamp crawfish are found more in static waters; hence, their common names, but both can be found in all habitats. The white river crawfish are distinguished by more of a brownish, sometimes whitish appearance when fully mature, whereas the red swamp



Rare blue and white color variations of the Louisiana red swamp crawfish as seen alongside one of normal coloration. All specimens were female, and both the blue and white individuals were captured in commercial crawfish ponds near Crowley, Louisiana in 2004. Photo by John Sonnier.

crawfish are usually darker, often reddish. However, when boiled, the white river crawfish do not turn the deep red hue as do the red swamp crawfish; rather, they remain paler, almost pink in color, and the walking legs, especially the upper portions, remain white and stand out when the two species are presented together on a platter at the table.

Color expression in crawfish is regulated largely by special pigment containing cells (chromatophores) located beneath the exoskeleton, and color is normally a function of two factors, developmental stage and the environment. Most crawfish species are generally greenish or brownish as immature animals and began to take on their characteristic color as they approach maturity. Color manifestation is intensified in sexually mature individuals. The aquatic environment and diet also influence color. Animals living in clear or dark stained waters will be darker in appearance, while those from muddy water will be lighter in color. Pigments, or lack thereof, in the crawfish's diet can influence their color over time, as evident in some aquaria-raised individuals fed diets insufficient in required pigments.

Individual specimens of crawfish are sometimes found

that vary in color from the normal population. Color variants are almost endless with respect to degree and/or pattern of expression. Perhaps the most outstanding color variants found in red swamp crawfish are the rare blue color phase, and the even more rare white variation. It should be noted that the white specimen (as well as the blue one) in the accompanying photo is actually a red swamp crawfish and not of the white river species. The blue and white color phenotypes are a result of an inherited, recessive trait

resulting from a mutation in the gene that is responsible for pigment formation. In normal colored crawfish, the carotenoid pigment, astaxanthin, combines with a protein to form the characteristic red coloration. If the pigment-protein complex is not formed properly, then commonly a blue color variation occurs, and if that complex is lacking (thought to be related to a hormonal deficiency), then the albino-like condition occurs. Because the shell or exoskeleton is basically colorless, the lack



*White river (*Procambarus zonangulus*, top) and red swamp crawfish (*P. clarkii*, bottom) found in the capture fishery and aquaculture ponds of Louisiana. Photo by W. Ray McClain.*

of pigmentation causes a white appearance. Although the reason is not fully understood, in some blue colored crawfish, blue pigmentation is also found within the exoskeleton.

There are two distinctions of natural (as opposed to diet induced) blue colored phenotypes observed in red swamp crawfish: a pale blue and a darker "French" blue. The latter is found mostly in females, and is thought to be a fatal trait in many males. The blue specimen in the photo is the French blue phenotype. It should also be noted that the white specimen in the photo possesses the normal black pigmentation in the eyes. The frequencies of which these two color variations occur in nature has not been determined, but several large scale buyers or processors of crawfish have indicated that weekly observations of blue crawfish are not uncommon. Sightings of stunning white individuals are very rare however.