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New Distributional Records for Illinois Crayfishes (Decapoda: Cambaridae) with Comments on the Continued Spread of Non-native Species

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ABSTRACT

Recent sampling has provided new records for two Illinois crayfish species that dramatically increase their known ranges within the state. The new records for the cajun dwarf crayfish, *Cambarellus shufeldtii*, most likely represent an undiscovered population while those of the red swamp crawfish, *Procambarus clarkii*, represent an introduced population. The records of the latter species illustrate the continual problem of non-native species introductions and the lack of effective regulatory mechanisms.

INTRODUCTION

In addition to providing information for biogeographic analyses, current distributional data for organisms provide the foundation for sound conservation and management decisions. Current data are especially pertinent to the regulation and importation of non-native aquatic species. Once established, non-native aquatic species such as crayfishes are difficult, if not impossible, to eradicate. The threat from non-native crayfishes is more ominous given their ability to displace native crayfishes and diminish ecosystem integrity (Lodge, et al., 2000). The prompt reporting of non-native species' range expansions can be beneficial to various state and provincial natural resource agencies as they grapple with and debate methods to prevent the establishment of such species.

Recent fieldwork by Illinois Department of Natural Resources biologists has resulted in the collection of two crayfish species well outside of their previously known ranges

within Illinois. These two cambarid species, and possible explanations for their range expansions, are discussed in detail below.

Cambarellus shufeldtii

As the vernacular name implies, the Cajun dwarf crayfish, *Cambarellus shufeldtii*, is a small crayfish found natively in the Gulf Coastal Plain of the United States. The species is usually brownish in overall color and has two lengthwise stripes or rows of spots along its dorsum; adult size rarely exceeds 3.3 cm (Page, 1985; Taylor and Schuster, 2004). *Cambarellus shufeldtii* is found in numerous types of shallow lentic habitats including cypress swamps, sloughs, backwaters, and ditches (Penn, 1950; Page, 1985). The species occurs in the Gulf Coastal Plain from east-central Missouri south to the coasts of Texas and Louisiana (Hobbs, 1989; Pflieger, 1996). In Illinois Page (1985) reported the species only from extreme southern Illinois in Alexander, Jackson, Massac, Pulaski, and Union Counties.

On 6 June 2003 three female individuals of *C. shufeldtii* were collected from near a boat ramp at the northern end of Stump Lake (39° 1.12'N, -90° 33.88'W), Jersey County, Illinois. Thirty-eight specimens were again collected from the same site on 18 March 2004. Both collections are vouchered in the INHS Crustacean Collection as INHS 9309 and INHS 9307, respectively. Stump Lake is a complex of backwater floodplain lakes of the Illinois River and is located approximately 13 km upstream of the Illinois' confluence with the Mississippi River (Fig. 1). These collections expand the known range of the species in Illinois by over 185 km to the north.

The collection of *C. shufeldtii* from Stump Lake is not surprising given that Pflieger (1996) reported the species from Mississippi River floodplain lakes in Lincoln County, Missouri. Lincoln County occurs at the same latitude as Jersey County, Illinois and is separated from Stump Lake only by the Mississippi River and an approximately 90-95 m high north to south ridge which forms the drainage divide between the Mississippi and Illinois Rivers. The floodplain habitats favored by *C. shufeldtii* occur commonly along the lower Illinois River and to a lesser extent along the Mississippi River from St. Louis to Cairo, Illinois. These habitat types can be difficult to sample using traditional techniques and this may explain the absence of previous collections of *C. shufeldtii* in the Illinois River drainage. Undoubtedly, more collections of the species along the lower Mississippi and Illinois rivers in Illinois will occur.

Procambarus clarkii

The red swamp crawfish, *Procambarus clarkii*, is one of North America's largest and most economically important species. The large brick red adults of the species frequently exceed 13 cm in total length. *Procambarus clarkii* is commonly consumed by humans in the southern United States and is marketed as a delicacy in other regions of the country and world. Total annual harvest from native and pond–cultivated populations in the United States average between 30,000 and 40,000 metric tons (Huner, 2002). The preferred habitat of *Procambarus clarkii* in its native range is swamps, vegetated ponds, seasonally flooded ditches, and shallow lowland creeks. However, introduced populations of the species have shown a propensity to successfully colonize large lakes and higher gradient creeks and rivers. *Procambarus clarkii* occurs natively in the Gulf Coastal Plain from extreme southern Illinois south and west to northeastern Mexico and east to the

Florida panhandle (Hobbs, 1989). The species has been widely introduced in North America, Europe, Asia, and Africa. In the United States established non–native populations now occur in California, Nevada, Idaho, New York, North Carolina, Ohio, Oregon, and Washington (Taylor and Schuster, 2004). In Illinois the species was formerly known only from lowland habitats in the extreme southern Illinois counties of Alexander, Jackson, Massac, Pope, Pulaski, and Union (Page, 1985) (Fig. 2).

While conducting fish surveys, Illinois Department of Natural Resources biologists collected four adult (one male, three female) *Procambarus clarkii* from the North Branch of the Chicago River at River Park, just downstream of Foster Avenue in Chicago (41° 58.40'N, -87° 42.26'W), Cook County, Illinois on 31 July 2001 (Fig. 2). On a return visit to the same site on 1 September 2004 the first author collected three adult *P. clarkii* and one juvenile. Both collections are vouchered into the INHS Crustacean Collection as INHS 8909 and 9478, respectively. At another site, one adult and one juvenile *P. clarkii* were collected from the same body of water approximately 2.5 km downstream of the River Park site on the same date (INHS 9479). The collection of both adult and juvenile individuals from multiple sites and three-year time lapse between collections at the River Park site indicates that *P. clarkii* is reproducing and now successfully established in the North Branch of the Chicago River.

The establishment of *P. clarkii* in extreme northeastern Illinois is significant in that it illustrates the species' plasticity to climates. The northern limit of the species' native range is extreme southern Illinois where average ambient January air temperature is 0.12 C (32.2°F), whereas average January temperature in Chicago, IL is –5.1 C (22.8°F) (http://www.giss.nasa.gov/data/update/gistemp/station_data). Assuming that lower ambient air temperatures correlate with lower surface water temperatures, the extreme northeastern Illinois climate represents the coldest known temperature at which the species is known to survive. While populations of *P. clarkii* are established in the environs of Zurich, Switzerland and Hamburg, Germany, January temperatures for those regions still average 10.0 to 11.0°F higher than Chicago, IL.

The ability of *P. clarkii* to successfully colonize new habitats after its introduction has been attributed to several of the species' life history traits including its ability to burrow, resistance to air exposure, polytrophism, rapid growth, high fecundity, and disease resistance (Lindqvist and Huner, 1999). A wider tolerance to climate variables such as temperature can now be added to that list. Climate has been suggested as a barrier to the expansion of non-native crayfishes (Lindqvist and Huner, 1999). The example of *P. clarkii* clearly demonstrates that that contention should be re-evaluated, especially by regulatory agencies that review aquaculture permit applications for crayfishes.

The pathway of introduction for the North Branch Chicago River population of *P. clarkii* is unknown. The two most likely are the release of aquarium pets or release of unused fishing bait. Both the pet and bait industry are at best loosely regulated. In Illinois it is illegal to possess live rusty crayfish, *Orconectes rusticus*, because of that species' known dispersal and displacement abilities. However, by not issuing a blanket ban on the possession of any live crayfish as bait, as was done in Wisconsin, Illinois and other states will continue to be vulnerable to introductions of other non-native species.

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Figure 1. Distribution of *Cambarellus shufeldtii* in Illinois with inset indicating global native range in North America. Black star indicates newly discovered Jersey County population, black circles indicate all previously known records for species in the state.

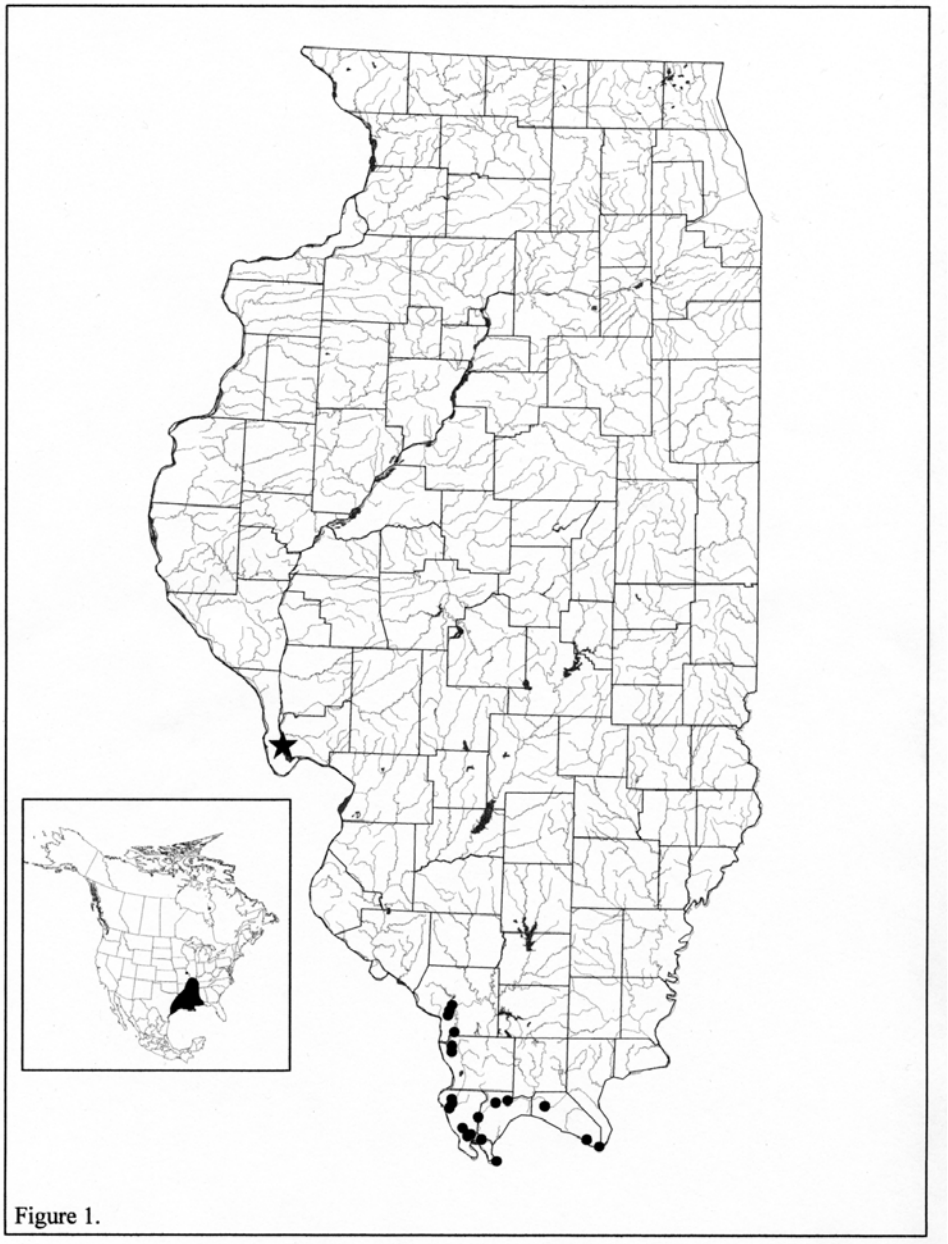

Figure 2. Distribution of *Procambarus clarkii* in Illinois with inset indicating global native range in North America. Black star indicates newly discovered Cook County population, black circles indicate all previously known records for species in state.