SOUTH CAROLINA STATE REPORT (SCDNR Marine Resources Division)

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Investigating hybridization between the invasive red swamp crayfish (*Procambarus clarkii*) and its sister species the eastern red swamp crayfish (*Procambarus troglodytes*).

The red swamp crayfish, *Procambarus clarkii*, which is invasive to South Carolina, is nested within the subgenus *Scapulicambarus*, which it shares with only four other species, including the native eastern red swamp crayfish, *Procambarus troglodytes*, which Busack (1989) showed to be the species most closely related to *P. clarkii*. The eastern red swamp crayfish, *P. troglodytes* is the most abundant native crayfish species in South Carolina, where much of its range overlaps with known locations of invasive *P. clarkii*. Hybridization is common among crayfish species, however, the majority of the research to assess hybridization of non-native crayfish with native species has focused on the genus *Faxonius* (Perry *et al.*, 2001; Arcella *et al.*, 2014), with little data currently available for hybridization within the genus *Procambarus*.

Researchers at the SCDNR MRRI have been applying molecular tools to test whether hybridization is occurring within wild populations of the *Scapulicambarus* subgenus of crayfish. Baited minnow traps and dip netting were the primary techniques used to locate *P. clarkii* and *P. troglodytes*. Microsatellite markers were used to genotype *P. clarkii*, *P. troglodytes* and any potential hybrids collected in the field. The resulting genotypes were subjected to the model-based Bayesian clustering methods implemented in STRUCTURE to estimate and visualize potential shared ancestry that would be expected if hybridization is occurring between these two species. A total of 259 samples, 127 *P. clarkii* and 132 *P. troglodytes*, are included in the final STRUCTURE analysis estimating shared ancestry between the two species. These analyses are nearing finalization but remain ongoing.

Assessing potential transmission pathways for the transmission of white spot syndrome virus (WSSV) to native crustaceans.

White spot syndrome virus (WSSV) is highly pathogenic (Escobedo-Bonilla *et al.*, 2008), infects many crustacean species, and was recently associated with both wild and farmed red swamp crayfish, *Procambarus clarkii* in Louisiana. Since Louisiana exports live *P. clarkii* to South Carolina (SC), the potential presence of WSSV in these specimens raises concerns over WSSV threats to commercially- and recreationally-important native crustacean species in SC, such as the white shrimp (*Penaeus setiferus*) and blue crab (*Callinectes sapidus*) that are known to be susceptible to WSSV. Researchers are conducting experimental trials to investigate the potential pathways of WSSV transmission from *P. clarkii* to estuarine crustaceans. These trials will focus on the relationships between environmental conditions and WSSV transmission dynamics, including the rate of initial transmission, infection intensity, and mortality rate.

Surveying the distribution of Island apple snails (*Pomacea maculata*).

SCDNR and USGS continue to receive reports of Island apple snails from the public. The majority of these recent observations have been in areas where Island apple snails were previously documented by SCDNR MRRI's Shellfish Research Section staff; however, the SCDNR received one observation of Island apple snails near the Santee Cooper resort on Lake Marion, SC, which would represent a new location for these snails. Staff verified these observations and collected egg samples for future genetic analysis. Staff also received two recent reports of Island apple snails on the Waccamaw River in Socastee, SC. Staff previously conducted surveys in this area in 2016 and found Island apple snails present. Reports from Lake Marion and the Waccamaw River have been sent to the USGS for documentation in the NAS database, along with additional reports from members of the public. SCDNR staff have also been in contact with and provided information to US Fish and Wildlife staff conducting research on the link between gastropods (including the non-native Island apple snail) and limpkins in South Carolina.

Assessing abundance trends for non-native portunid crabs (family Portunidae).

Commercial and recreational crabbers have increasingly reported the occurrence of invasive portunid crabs in South Carolina. This includes the Indo-Pacific swimming crab, *Charybdis hellerii* and the bocourt swimming crab, *Callinectes bocourti*. To manage any potential ecological and fisheries impacts, researchers with SCDNR MRRI's Shellfish Research Section are interested in understanding the distribution and occurrence of these invasive portunid species. During the current reporting period, staff from SCDNR's Environmental Research Section staff collected one *Charybdis hellerii* during sampling near the Folly River, SC. A second *C. helleri* was caught by a commercial shrimper near Fripp Island, SC, however they were unable to keep the specimen. A tissue sample was collected from the one specimen and sent off for genetic analysis. Staff will continue to accept specimens from commercial and recreational crabbers.

Portunid crabs are often difficult to identify at the juvenile stage leading to a lack of life history information for many portunid species in this age class. Therefore, researchers at the MRRI are using a combination of morphological and genetic approaches to facilitate greater taxonomic resolution for juvenile portunid species. Specimens were collected and retained from the SCDNR Estuarine Trawl Survey, which includes 26 statewide sampling locations. Sampling for this project has been completed, resulting in the collection of over 700 juvenile portunids from the *Callinectes, Arenaeus,* and *Achelous* genera. Genetic samples have been sent for analysis and the genetically

verified identifications will be used to develop a guide to increase the accuracy of native and non-native portunid identifications in the field.

Increased observations of the Caribbean blue land crab, *Cardisoma guanhumi*.

The Crustacean Research and Monitoring Section is currently working on a new project to better understand the distribution of the non-native blue land crab, *Cardisoma guanhumi*, in South Carolina. Staff received multiple reports of the species from the public in September and, with the help of staff at the Natural Heritage Program, created a public sightings database for the species (found here). CRMS staff worked with Erin Weeks to issue a press release to encourage the public to report any sightings to the new database. To date, there have been 60 confirmed reports of blue land crabs in South Carolina, ranging from Beaufort to Myrtle Beach. The blue land crab is semi-terrestrial and native along the Atlantic coast of the Americas, from Brazil to Southern Florida, and throughout the Caribbean, Gulf of Mexico, and the Bahamas. It is not known whether the species arrived here through natural expansion or human-mediated sources or what/if any impact the blue land crab may have on ecosystems in South Carolina. Adult blue land crabs live in terrestrial habitats, sometimes as far as five miles from the nearest coastal waterway, and dig burrows up to six feet deep. They are considered pests in some areas due to their extensive burrowing. Adults can vary in color from blue/purple to ash-gray while juveniles are typically orange/dark-brown. CRMS staff hope to gain a better understanding of the distribution and extent of this species in coastal South Carolina through data collected by the public reporting website.

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