

FINAL PERFORMANCE REPORT

South Carolina State Wildlife Grant [T-30-R]

Taxonomy, life history, and distribution of the crayfish, *Procambarus echinatus*

October 1, 2007 – September 30, 2008

GRANT OBJECTIVES

The goals of the project were to study the extent of distribution, the abundance, aspects of the life history (especially numbers of eggs on females), and taxonomic status of the crayfish, *Procambarus (Pennides) echinatus* Hobbs, 1956.

ACTIVITY OVERVIEW

Tasks

I. Distribution and habitat

Activity: Surveys were made in the Salkehatchie, Edisto, Ashepoo, and Coosawhatchie river drainages. The distribution of *P. echinatus* in the Salkehatchie River drainage was extended further into lower portions of the drainage. *P. echinatus* is now known to occur in Barnwell, Bamberg, Allendale, Hampton, and Colleton counties. The population in the Edisto River drainage occurs in Aiken, Bamberg, Barnwell, and Orangeburg counties and is considered to be a distinct species, *P. new species* (see below), which is confined to the South Fork Edisto River and its tributaries. All distribution records for the two species were georeferenced. The Salkehatchie and South Fork Edisto rivers are both in very good condition in terms of riparian zone and stream channel integrity and both have strong, steady flow. The habitat for these crayfish is undercut banks with root masses and accumulations of woody and leafy debris in areas of good flow. Low human population and little population growth in the counties containing *P. echinatus* have likely benefited the species, and no immediate threats were found. Development in Barnwell or spills of sewage or other pollutants into the Salkehatchie River are potential threats to *P. echinatus* and other aquatic fauna. In contrast, Aiken County has experienced much more development, and continued human population expansion in that county could impact the South Fork Edisto River drainage crayfish. Also because these crayfish species require streams and rivers with strong flow, excessive withdrawals of groundwater from the aquifer(s) that feed these rivers could reduce flows significantly and have an adverse impact on the crayfishes and other aquatic species. Continued residential and industrial development could result in reduced stream flows in the future. Fortunately, even during a severe drought year like 2008, both rivers had sustained base flows, although low flow problems were noted briefly in June 2008 for the Little Salkehatchie River at US Rt. 601. Associated species of crayfishes included (in order of decreasing abundance) *Procambarus hirsutus*, *P. troglodytes*, *Cambarus latimanus*, and *C. reflexus*, and the shrimp, *Palaemonetes* sp., was common in both river drainages. The non-native species, *Procambarus clarkii*, was collected only in the Edisto River mainstem and was not associated with either of the *Procambarus (Pennides)* species; therefore, it does not appear to be a direct threat to these native species at this time. However, changing climatic conditions, reduced flows, and increased water temperatures might favor *P. clarkii* over some native species, thus, through its presence in the drainage, it remains a potential threat in the future.

Significant deviations: none.

II. Taxonomy – intraspecific morphological variation

Activity: Based on study of morphology of specimens from the Salkehatchie and Edisto river drainages, the PI, W.J. Poly, concluded that the two populations represent distinct species, and he is formally describing the Edisto River drainage specimens as a new species. Among the morphological distinctions between the two populations was the size structure of reproductive adults (see Fig. 1 below).

Significant deviations: Museum material was not examined due to the ample number of specimens collected during the project. Also, one museum from which material was requested was unable to locate the specimens during the project period.

III. Life history

Activity: Females with eggs can be difficult to find in streams; therefore, some adult females were held in cages in streams and others were kept in the lab to await egg deposition. Apparently in the wild females with eggs are sequestered in habitats where they are not accessible, such as deep undercut banks with roots. Only one female with eggs was captured in a stream, one laid eggs in a cage in a stream, and all others laid eggs in the lab. The average number of pleopodal eggs of females from the two populations were 369 (range: 236-433; n = 4 Salkehatchie R. dr., *P. echinatus*) and 350 (326-382; n = 3, Edisto River dr., *P. new species*). Egg laying times were March-August (Salkehatchie R. dr., *P. echinatus*) and May-August (Edisto River dr., *P. new species*). The egg numbers and reproductive seasons agree closely with those known for other species of the subgenus *Pennides*.

Commensal organisms were found on crayfishes from both river drainages and included branchiobdellid worms, entocytherid ostracods, and protozoans.

Significant deviations: none.

IV. Population structure and size

Activity: A detailed study of one population in Jackson Branch (Allendale County) was carried out until a tornado severely impacted the study reach in March 2008, preventing further sampling at the site due to many downed trees blocking the stream channel. Multiple quantitative collections had been made at the site prior to the tornado however. Quantitative collections also were made at sites on the Salkehatchie River and Shaws Creek. The abundance of *P. echinatus* at a site in the mainstem of the Salkehatchie River was 0.55/m², and *P. hirsutus*, a co-occurring species, was 2.2 times more abundant than *P. echinatus* as determined from depletion sampling with 2 backpack electrofishing units and a seine. Sampling a 100-m reach in Jackson Branch with a single backpack shocker resulted in catches of 30, 51, and 41 *P. echinatus* in October-November 2007 and February 2008, respectively (crayfish were returned to the stream after each sampling event). *Procambarus hirsutus* and *Palaemonetes* sp. always outnumbered *P. echinatus*

in these quantitative collections. A 100-m reach in Shaws Creek sampled in June 2008 produced 44 *P. new species*.

Size structure of the populations varied between the two river drainages with *P. echinatus* growing larger than *P. new species* (Fig. 1). Both males and females of *P. new species* reached reproductive mode (form I) at a smaller size than *P. echinatus*. Molt increments of several adults from each drainage were determined from individuals held in the lab, and some of these animals molted multiple times. The range of molt increments for adult crayfish was 2.4-3.8 mm POCL for *P. echinatus* and 2.1-3.3 mm POCL for *P. n. sp.* (POCL = postorbital carapace length).

Significant deviations: none.

Conclusions: *P. echinatus* has been considered a rare species in the past; however, this rarity is considered to be due to the extremely limited sampling for crayfish in these river systems and the difficulty in catching the species. Essentially, almost no sampling has been directed at crayfish in these drainages in the past (especially quantitative sampling), which resulted in few records of the species and apparent rarity in these river systems. In this study, the species were found to be abundant in both river drainages, although with restricted geographic distributions. As long as the floodplains and channels of these river systems retain their present integrity and flow regimes aren't altered due to lower water tables or impoundments, the populations of crayfishes in both river systems should remain stable.

Estimated Federal Cost (grant level): \$8,000. Grant spent out.

Recommendations: It is recommended that the grant be closed.

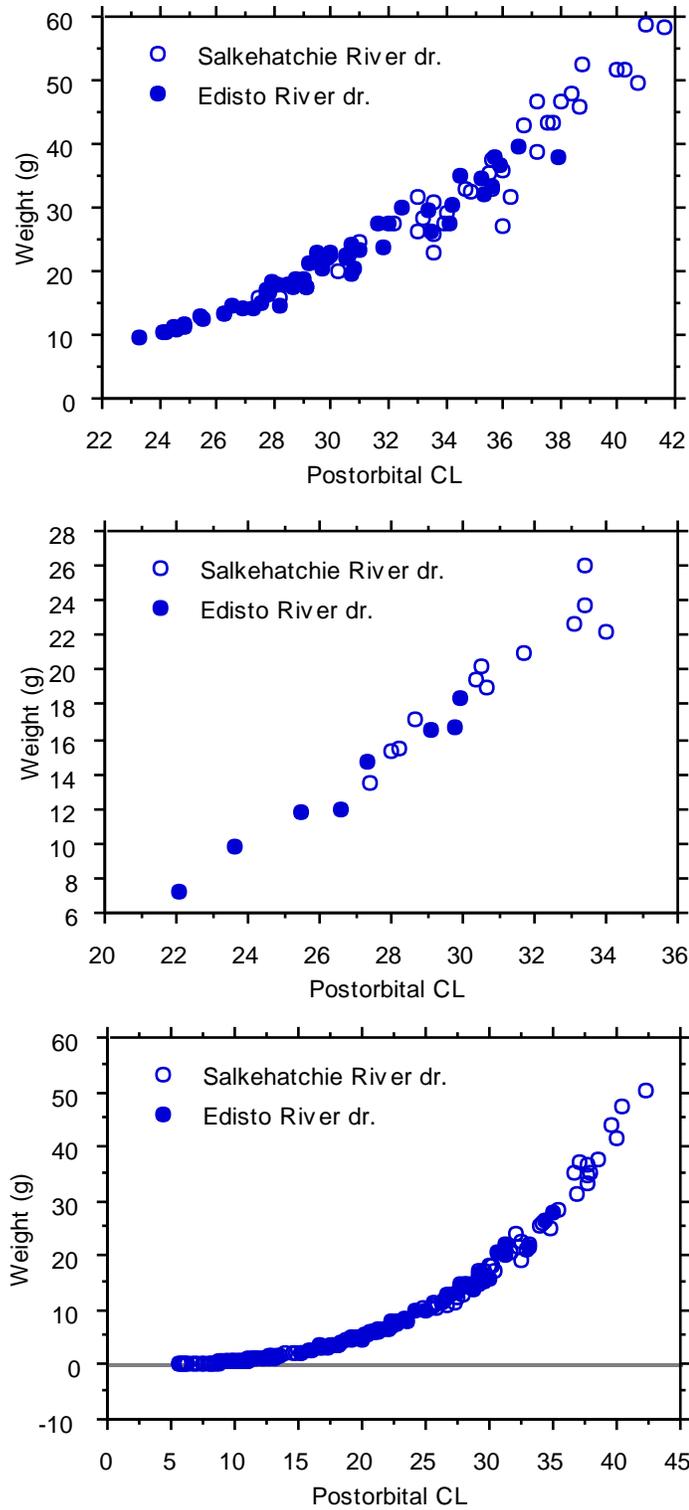


Fig. 1. Size distribution (weight [grams] vs. postorbital carapace length [millimeters]) of *Procambarus* (*Pennides*) spp. Form I males (top), form I females (middle), and form II + juvenile males (bottom).