Materials and Methods

Eggs were collected from the beach next to Little Sheepshead Creek Bridge and brought back to the Rutgers University Marine Station (RUMFS) laboratory. In the laboratory, they were kept in aerated containers (200 cm diameter 7 cm deep). After hatching out larvae (1st instars) were pipetted out through containers which were placed in the RUMFS flow through laboratory. Containers were marked with the egg collection date and the hatching date so that length of stage could be monitored. Individuals were measured and classified using the methods of Sekiguchi et al. (1988). The 2nd instars, or individuals that have molted once since hatching, were fed brine shrimp.

Swimming behavior

Swimming experiments were performed with both larvae (1st instars) and 2nd instars. Fifteen trials were run for each stage during the day and another 15 for each stage at night. One individual was dropped into a 200 ml graduated cylinder (Fig. 1) filled to 100 ml, and watched their behavior for a period of 15 minutes.

Experiments to see what influence flow rate had on behavior in the water column were performed in a 10 gallon aquarium. Three trials were run for each larva and 2nd instars during the day, and another three trials for each larva were done at night. Twenty individuals were used for each trial. Each trial consisted of two flow rates: “slow” between 5-10 cm/sec and “fast” 5-20 cm/sec.

Introduction & Objectives

The Atlantic horseshoe crab, Limulus polyphemus, is an ancient species that is important to estuarine ecology, particularly for the food source its eggs are to shorebirds (Karpanty et al., 2006) and fish (Nemerson and Able, 2004), as well as its economic importance; including bait and biomedical industries (Walls et al., 2002). Negative human impacts on the horseshoe crab population from fishery and coastal development, have raised concern over the management of this species (Odell et al., 2005). In order to protect the horseshoe crab population from bait fisheries and coastal development, have raised concern as well as its economic importance; including bait and biomedical industries (Odell et al., 2005). In order to protect the species, scientific studies need to address all aspects of its life cycle including settlement. A majority of the work has been done studying horseshoe crabs in large estuarine systems such as Delaware Bay (Botton et al., 2003; and Karpanty et al., 2006), however, an understanding of the role they play in small estuarine systems is relatively unstudied. The objective of this study is to obtain an understanding of the reproductive seasonality and distribution and abundance of larval horseshoe crabs in the small estuarine system of Little Egg Inlet, Tuckerton, NJ.

LARVAL SAMPLING

Swimming experiments were performed with both larvae (1st instars) and 2nd instars. Fifteen trials were run for each stage during the day and another 15 for each stage at night. One individual was dropped into a 200 ml graduated cylinder (Fig. 1) filled to 100 ml, and watched their behavior for a period of 15 minutes.

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Results

Laboratory observations

Swimming behavior

Larvae were in the water column more than the 2nd instars. On average the larvae were in the water column 19% of the time during the day, and 0.3% of the time at night. This finding is interesting as the literature states that the larvae are more active at night (Botton et al., 2003, and Rudloe 1981). The 2nd instars landed on the bottom and there was no swimming behavior from any of the individuals in either the day or night trials. Larvae were more present in the water column during low flow than the 2nd instars. The 2nd instars were more influenced by the higher flow rate.

Plankton sampling

Seasonal and annual variation

Larval horseshoe abundance data has been collected for the last six years from Little Sheepshead Creek showing that horseshoe crabs have been spawning in this small estuarine system and that peak abundance in the water column is in mid-July (Fig. 6). There is large annual variation in density of larvae (Fig. 6). Some possible explanations include variation in number of spawning adults that enter the estuary system, environmental conditions, and larval availability to sampling gear.

Spatial plankton sampling

In the June spatial plankton samples, no larvae were caught at any of the sites. In July, larvae were found in samples from all three sites. While limited data was collected, it suggests that there could be a spatial relationship as todensity of larvae: Little Sheepshead Creek having the highest density and Jimmy’s Creek having the lowest (Fig. 7).

CONCLUSIONS

• Horseshoe crabs reproduce in Great Bay Little Egg Inlet Estuary.
• Larvae are available to sampling gear; this is supported by laboratory observations.
• In the six years of data, the peak of larval density has been in the middle of July.
• The spatial analysis started in 2010 suggests that larvae are distributed through out the system and as such it is likely that they play a significant ecological role.
• Overall, horseshoe crabs reproduce, survive hatching and early stages of development, and as such may play an important role in small estuaries such as the study site.

REFERENCES