TESTING DIFFERENCES BETWEEN WILD AND HATCHERY-REARED BLUE CRABS: MINIMIZING POTENTIAL NEGATIVE INTERACTIONS AT RELEASE

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Successful use of hatchery-reared juveniles to enhance recruitment-limited populations is contingent upon their ability to survive and grow upon release into the wild. Hatchery conditions may produce juveniles that exhibit morphological, physiological, or behavioral characteristics different to their wild counterparts (Hard et al., 2000; Sunstrom and Johnsson, 2001; Davis et al., 2005). Differences may be minimized through conditioning strategies, but managers need to assess whether they translate into performance differences of hatchery-reared versus wild juveniles in the field, or not (Kellison et al., 2000; Davis et al. 2004).

Recently in the recruitment limited Chesapeake Bay blue crab stock, we have been testing the feasibility of stock enhancement by raising juveniles and experimentally releasing them into sub-estuaries. The goals of the study were to test whether: (1) morphological, physiological, or behavioral differences occurred between hatchery-reared and wild juvenile blue crabs of the same age and size; (2) potential differences could be eliminated through conditioning; and (3) potential differences translated into differences in performance of wild versus hatchery-reared juveniles after release. We used a combined array of laboratory and field experiments to test for potential differences in wild versus hatchery juveniles, and field sampling of a multi-year series of hatchery releases to assess potential negative interactions of wild and hatchery crabs.

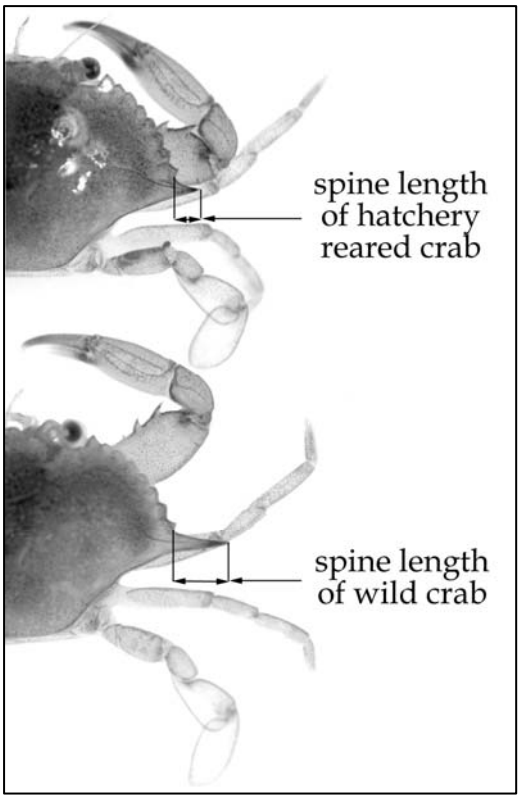

Figure 1: Spine length of hatchery-reared juveniles was significantly shorter than in same-sized wild crabs.

Although hatchery juveniles did not receive natural prey during rearing, hatchery and wild crabs did not differ in feeding rates on natural prey in the lab or in stomach contents in the field. Growth of hatchery and wild juveniles also did not differ in the field. Movement and habitat use did not differ between hatchery and wild crabs in lab and field experiments testing dispersal and distance moved, patterns of bottom use and bathymetry, and use of structural refuges.

Both hatchery-reared and wild crabs showed similar ability to use endocrine control of chromatophores to match their color to background. Brief exposure of hatchery crabs to dark back grounds may be useful in pre-release conditioning to facilitate camouflage of hatchery crabs reared on light backgrounds (Davis et al. 2005).

Hatchery crabs without prior exposure to sediment buried less often than wild crabs. However, 48-hr exposure to sediments altered hatchery crab behavior such that burial frequencies did not differ between hatchery and wild treatments. Although burial may reduce crabs' vulnerability to predators, field tests showed that conditioned hatchery crabs did not differ significantly from unconditioned juveniles in survivorship after release (Davis et al., 2004).

Lateral spines were significantly shorter in hatchery than wild juveniles (Fig. 1), raising concerns about vulnerability to fish predators. However, within ~10 days after release, spine length of hatchery crabs increased to that of wild crabs (Davis et al. 2005). Spine lengths hatchery crabs exposed to chemical and/or visual cues from striped bass increased in some lab experiments (Davis et al. 2005), but not in others (unpublished). In a series of field experiments comparing survival of hatchery and wild crabs using both tethering and simultaneous releases, hatchery juveniles sometimes suffered higher mortality than wild crabs, but the preponderance of field results showed no differences in survival.

Replicated releases of tagged hatchery juveniles at a range of densities in small coves did not appear to displace wild crabs during any season or among multiple years that varied greatly in salinity and weather conditions. Hatchery crabs were observed to mate with wild crabs in the release sites, and mature hatchery crabs departed from nursery habitats at the same seasonal timing as wild crab migration. Thus, both hatchery and wild crabs showed similar performance characteristics and population dynamics in typical nursery habitats of Chesapeake Bay.

Results of this study indicate that hatchery-reared and wild juvenile blue crabs are similar in most characteristics, but showed significant differences in burial rates and spine length. However, differences in these traits were plastic and rapidly changed to match wild populations following either brief laboratory conditioning or release into the field. Performance and dynamics of hatchery and wild crabs in release areas indicate that negative interactions are minimal.

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