

Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management

HORSESHOE CRAB

(Full Citation: Atlantic States Marine Fisheries Commission. 2013. Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management. Special Report # 89. ASMFC, Arlington, VA. 58pp.)

Fishery-Dependent Priorities

Moderate

- Characterize the proportion of states' landings that comprise crabs of Delaware Bay origin. This can be done through a directed tag/release study, genetics/microchemistry study, or both.
- Improve measures to characterize landings and bycatch in the commercial fisheries by life stage.
- Estimate fishing discard numbers and associated mortality rates.
- Investigate supplemental bait and alternative trap designs to reduce the commercial fisheries need for horseshoe crabs.

Fishery-Independent Priorities

High

- Expand or implement fishery-independent surveys (e.g., spawning, benthic trawl, tagging) to target horseshoe crabs throughout their full range including estuaries. Highest priority should be given to implementing directed surveys in the New England and New York regions.¹
- Estimate catchability for gear used in benthic trawl surveys and determine effect of size, sex, substrate, topography, timing, and temperature.
- Investigate factors (habitat, harvest, sampling methods, etc.) that might be causing the large discrepancies between Delaware and New Jersey in egg survey numbers.

Moderate

- Estimate the proportion of the Delaware Bay population that is available in time and space within existing VT benthic trawl survey area. Estimate the selectivity of gear used in the survey. These estimations should take into account age class (i.e., primiparous, multiparous).
- Ground truth sub-sampling method used in Delaware Bay spawning survey for calibration to the "population" scale.

Modeling / Quantitative Priorities

High

- Estimate age/size specific survival of all life stages (e.g., age 0 to adult) and growth rate by instar within Delaware Bay.
- Estimate size specific fecundity of Delaware Bay females.

¹ Some survey design work done by Landi (2011).

- Model relationship between egg availability and spawning biomass/abundance.

Moderate

- Further develop catch-survey analysis and apply assessment modeling beyond the Delaware Bay region.
- Continue to conduct additional stock assessments and determine F. Use these data to develop a more reliable sustainable F.
- Estimate mortality from the entire biomedical collection process, from capture to post-return.²

Life History, Biological, and Habitat Priorities

High

- Assess horseshoe crab prey availability and determine whether horseshoe crab population growth will be/is limited by prey availability.
- Evaluate the impacts of beach nourishment projects on horseshoe crab populations.

Moderate

- Characterize essential horseshoe crab habitat, other than spawning habitat, in different regions.
- Further evaluate life table information including sex ratio and population age structure.
- Estimate the proportion of sub-tidal spawning and determine if this affects spawning success (i.e., egg survivability).
- Conduct tagging studies and analyze tagging data to identify coastal populations, population abundance, mortality rates, migration, and other movements.³
- Characterize abundance and size structure of juveniles coastwide as indicators of recruitment to adulthood.
- Evaluate the effect of mosquito control chemicals on horseshoe crab populations.
- Evaluate the importance of horseshoe crabs to other marine resources such as sea turtles.
- Conduct risk assessment for the effect of oil spill (timing, location, and amount) on horseshoe crab and shorebird populations and determine best practices to reduce risk.

Notes:

Several priority research needs are currently being addressed through the following surveys:

Delaware Bay spawning beach survey:

- a) Determine sampling frame or list of beaches in the Bay with a nonzero probability of being sampled in a given year.
- b) Determine how many beaches need to be surveyed on how many days to meet survey objectives.
- c) Determine whether subsampling effort (no. of quadrats per beach) was adequate.
- d) Consider a survey design that includes both fixed and random beaches.

Delaware Bay egg count survey:

- a) Set primary objective of egg count surveys to be shorebird food availability and focus on density of eggs at the surface (< 5cm).

² Tagging work has been done by DeLancey and Floyd (SC DNR) in South Carolina to evaluate mortality from the biomedical bleeding process.

³ United States Fish and Wildlife Service tagging program in progress.

- b) Determine survey frequency (i.e., survey eggs annually, every 3 years, every 5 years, or other?).
- c) Determine where, along the beach profile, eggs should be sampled.
- d) Determine sample size for sampling eggs on a beach.
- e) Determine the relationship between spawning activity and density of eggs at the surface (<5cm). Is there a threshold of spawning activity below which eggs remain buried and unavailable to shorebirds?

Offshore benthic survey:

- a) Design comparative surveys or experiments to determine gear efficiencies.