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Migration of Female Crabs

The females of many species undergo long-distance migrations in order to release offspring in areas favorable for proper early development. The risks associated with migrating can be costly for the individual female, including acquiring and allocating energy for both migration and oogenesis (egg development) and increased predatory risk. However, females can often choose from several different strategies (e.g. timing, route, mechanisms) in order to successfully complete migration and maximize survival of offspring. An understanding of migratory movements is key in fully understanding the life history, distribution, population dynamics, and basic ecology of ecologically and commercially important species, such as the blue crab.

[Blue crab mating](#) typically occurs from May to October in lower salinity areas of the Chesapeake Bay. After mating, males remain in these lower salinity areas. However, because blue crab larvae require high salinities for proper development, females will begin moving south to the spawning grounds near the mouth of the Chesapeake Bay and nearshore coastal areas. Periods of peak spawning (larval release) along the Mid-Atlantic Bight have typically been documented from late July through August. After spawning, many females use flood tides to return to the lower estuary, where they may produce subsequent broods, but do not move back into lower salinity zones. Some mature females may also move into nearshore and offshore coastal waters after spawning.



Although the movement of newly-inseminated blue crabs from lower salinity areas to the mouth of the estuary is well documented, several important questions still remain. When do crabs begin the spawning migration and does this vary by location? Do crabs from the upper bay overwinter before, during or after the spawning migration? Which route (i.e. deep channel areas, shallow areas, both) do crabs use to reach the lower Bay? Do crabs spend the majority of time swimming or walking to the spawning grounds?

One way to address some of these questions is to utilize mark-recapture techniques. In the present case, crabs are individually marked and released back in the wild. Therefore, as we already know where and when a particular individual was released, when someone reports a recaptured crab we can then determine how far it moved in what time, the direction of movement, and recapture depth.



For this study, mature female crabs are obtained from local watermen approximately monthly from June



through October. The tags are attached to the dorsal carapace with stainless steel wire wound around the lateral spines. From 1999-2002, thin aluminum tags were used. However, in 2003 these tags were replaced with sturdier plastic tags (see below). The tag number, crab size (carapace width), and molt stage are recorded for each crab and then individuals are

immediately released. From 1999-2002, crabs were released in several locations near the mouths of the Rhode River and South River. In 2003, release sites in the Rhode River proper, South River, upper and lower York River and near Bloody Point were added.

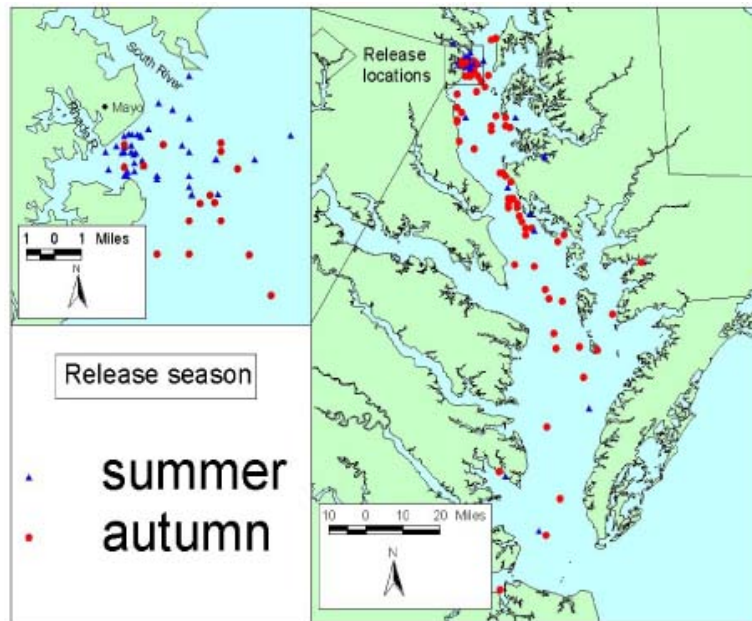
The tags are printed with the Smithsonian Environmental Research Center name, individual tag number, and contact telephone number. All persons reporting tagged crabs are asked the tag number, capture date, capture location, capture depth, and capture gear. Currently, captors receive a \$5 reward for each tag recaptured and entry into several \$200 lotteries. [Click here to learn what to do if you capture a tagged crab.](#)



By the end of 2002, nearly 12% of all tags were reported. All recaptured crabs were caught within the Chesapeake Bay proper except one, which occurred in Flagler Beach, Florida, 1040 km from the release site 234 d after release.

The distance traveled by crabs from release to recapture sites in the Chesapeake Bay ranged from 0.1 km to 213.5 km (mean 35.7 ± 4.06 km). Most crabs (56%) were recaptured < 20 km from release sites. However, the distances traveled by crabs differed significantly among release months. On average, crabs released in September and October moved greater distances than crabs released in earlier months (June-August).

Therefore, it appears that most post-copulatory female blue crabs in the upper Chesapeake Bay appear to begin the spawning migration in the early fall. Furthermore, prior research has indicated that after mating female blue crabs fed extensively in the early summer months, first allocating energy to muscle growth, then to egg development and hepatopancreas reserves. This would enable crabs to build muscle mass required for long-distance migration and produce eggs en route to the spawning grounds.



The Chesapeake Bay is a large estuary and for many crabs the distance between mating areas the spawning grounds can be considerable (> 100 km). Peak spawning typically occurs in the late summer; therefore, crabs beginning to migrate in the early fall may not be able to spawn that year. Furthermore, some crabs may not even arrive on the spawning grounds prior to the onset of winter and must overwinter in upper portions of the estuary. This could have deleterious consequences for mature female blue crabs, especially in extreme winters, as [recent evidence indicates that lower salinity water decreases tolerance to cold temperatures](#).

Crabs were captured at depths ranging from 1.22 m to 21.34 m (mean 6.42 ± 0.37 m). Mature female blue crabs generally appear to use deep channel areas during migration. A comparison among recapture months of recapture depths showed significant differences between months. Recapture depths generally increased in September in comparison with June-August, and peaked in November.