Lobsters – Special Feature (SOOE Extended)

Question:
To what extent do American lobsters use Great Bay Estuary as habitat?

Short Answer
Although lobsters (Figure L-1) are not as abundant in Great Bay Estuary as they are along the ocean coast of New Hampshire and Maine, they are abundant enough to support a significant fishery. Some lobsters migrate into and out of the estuary on a seasonal basis (Howell et al. 1999; Watson et al. 1999; Jury et al. 2018) and in response to storms that create a large freshwater runoff (Jury et al. 1995). There also is a resident population that reproduces, overwinters, and releases larvae in the Estuary (Goldstein 2012; Moore et al. 2020). Given the recent and large increase in the European green crab population, and signs that blue crabs might be expanding their range into northern New England estuaries as well (Stasse et al. 2023), it is important to understand how these invasive species might impact the commercially and ecologically important lobsters.

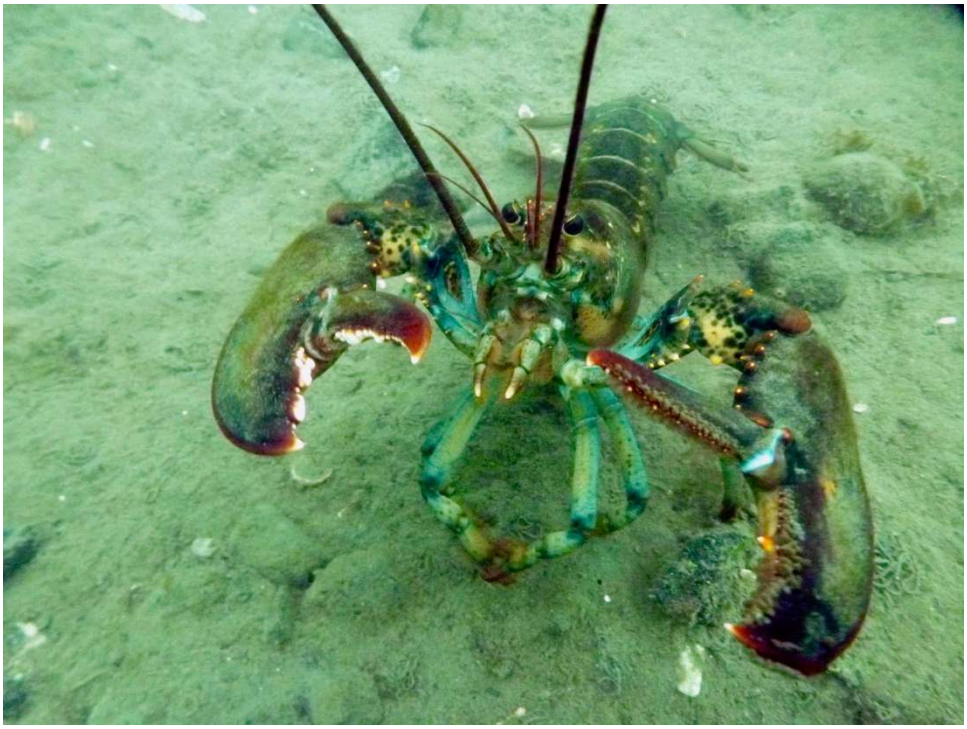

Figure L-1. An American lobster (*Homarus americanus*) in the Piscataqua River. (Photo credit: Ben Gutzler)

Why Monitor Lobsters in Great Bay Estuary?

American lobsters are the most valuable single species fishery in the USA and still support a viable fishery within Great Bay Estuary. Data collected over the past 40 years have demonstrated that, although there is exchange of adults and larvae with New Hampshire coastal habitats (Goldstein 2012; Moore et al. 2020) there also are lobsters in Great Bay Estuary that reproduce

and likely contribute new recruits (Figure L-2, Moore et al. 2020). Furthermore, a certain portion of these new recruits might also be transported to, and settle along, the coast. Therefore, Great Bay Estuary is an important overall component of the New Hampshire lobster habitat.

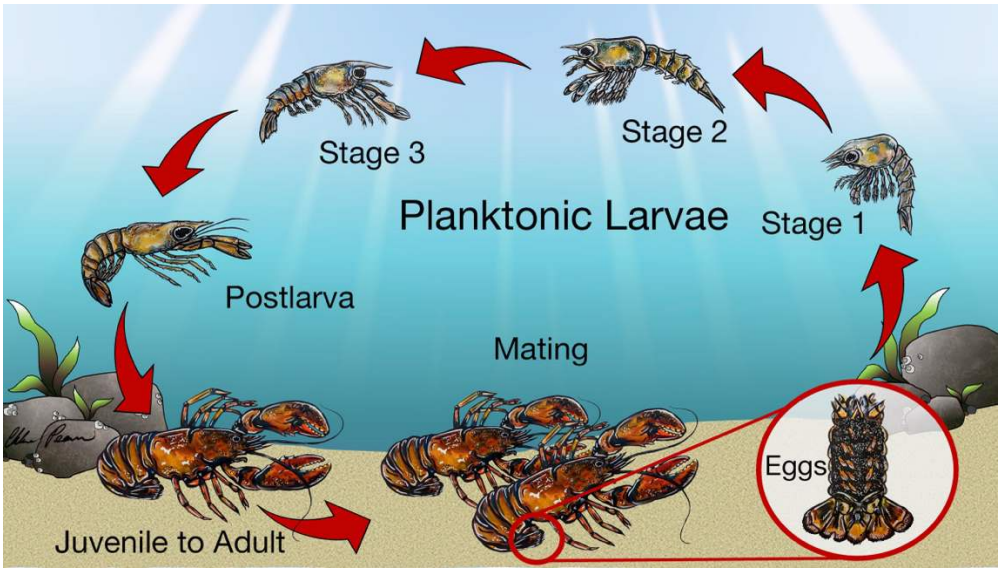

Figure L-2. The life cycle of an American lobster. It takes roughly one month for the planktonic larvae to develop through all four stages and settle to the bottom. It then takes juveniles about 5-7 years to reach sexual maturity. As adults, they can live for more than 10 years. (Artwork used with permission of Chloe Pearson).

In the last 10+ years, the population of the invasive European green crab (*Carcinus maenas*) has steadily increased in Great Bay Estuary (Fulton et al. 2013; Goldstein et al. 2017) and it would not be surprising if they outnumber all the other crustaceans (Figure L-3). When comparing Little Bay sites (Goat Island and Fox Pont) to Great Bay sites (Adams Point and Nannie Island), there are significantly more lobsters in Little Bay during both years ($W = 56.36$, $P < 0.0001$). During 2014 (but not in 2013), more green crabs were captured at Great Bay sites than Little Bay ($W = 33.734$, $P = 0.0001$). Generally, there was a higher relative abundance of crab than lobster.

Whether green crabs impact lobsters is uncertain at the present time, but it is worth investigating. In addition, there are also sporadic reports of blue crabs (*Callinectes sapidus*) in the estuary, and their sustained presence may have interesting impacts on lobsters and green crabs. To maintain a sustainable lobster population in Great Bay Estuary, it will be important to learn more about how these three large crustaceans interact with each other and how they impact the overall estuary system.

The first studies of lobsters in Great Bay Estuary were published in the 1990's. These investigations documented their seasonal migrations and environmental factors, such as water temperature and salinity, that likely influence their movements (Jury et al. 1994a, b; Jury and Watson 1995; Crossin et al. 1998; Howell et al. 1999; Watson et al. 1999; Jury and Watson 2000; Dufort et al. 2001). More recently, studies of mature females carrying eggs (a.k.a. ovigerous or "berried" lobsters) showed that they overwinter in the Estuary and, because the Estuary warms up faster than the coast, their eggs hatch in the spring (Figure L-4), about a month earlier than the eggs from coastal lobsters (Moore et al. 2020). Some of these larvae are likely retained in the Estuary, but some probably make their way to the New Hampshire coast as well.

Given that female lobsters in Great Bay Estuary reach sexual maturity at a smaller size than those along the coast (Little and Watson 2003), more of them are able to reproduce before they can be taken by the fishery, and thus the Estuary may be an important source of recruits to New Hampshire waters.

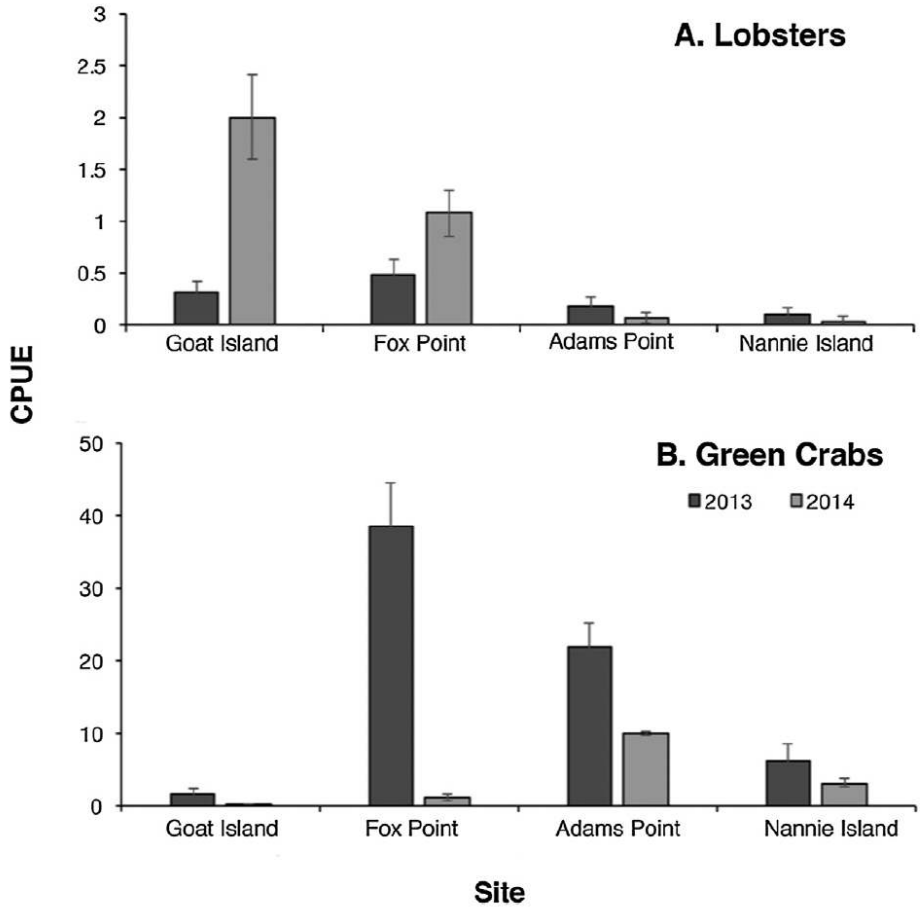

Figure L-3. Catch-per-unit-effort (CPUE) for lobster (top graph) and green crab (bottom graph) in each of two surveyed years (2013 and 2014); here, CPUE refers to the numbers of animals present in a pulled trap. Note difference in scale between Lobsters and Green Crabs figures. Data from Goldstein et al. 2017.

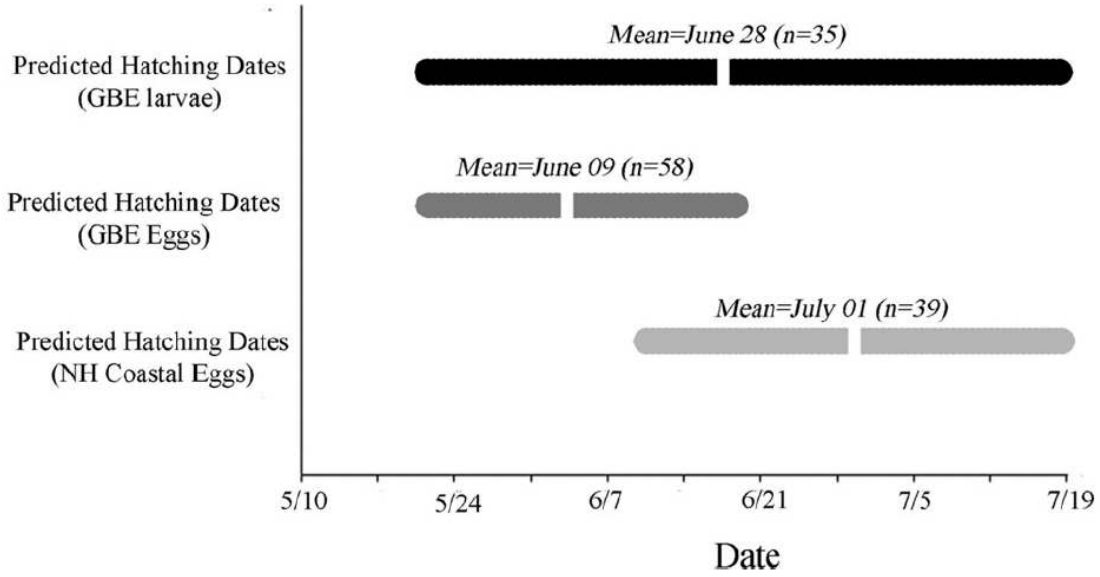

Figure L-4. The predicted hatch dates of eggs collected in 2015 from ovigerous lobsters (black bars) captured during sea sampling trips in Great Bay Estuary (black bars) and the coast (light gray bars), compared with the predicted hatch dates of larvae captured in plankton tows in the Estuary (dark gray bar). Data from Moore et al. 2020.

Data Sources

The dominant sources of information for this summary were publications by UNH faculty members and their graduate and undergraduate students (Watson, Howell, Fairchild, Brown). The work was funded primarily by NH Sea Grant and NHAES.

Acknowledgements and Credit

Win Watson (UNH). Reviewers: Bonnie Brown (UNH), Jason Goldstein (Wells National Estuarine Research Reserve), and Chris Peter (Great Bay National Estuarine Research Reserve).

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