

Declining maternal size and changes to embryo quality in the American lobster

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Introduction

- Recruitment in many marine fisheries is disproportionately dependent on the contributions of the largest individuals
- While the positive relationship between fecundity and body size is well documented in American lobsters, maternal size effects on egg quality may also influence recruitment success
- Greater egg energy content, diameter and omega-3 fatty acid content may have positive affect on larval survival
- Average maternal size may be declining in the Bay of Fundy, with the largest size classes becoming increasingly rare (Figure 1, 2)

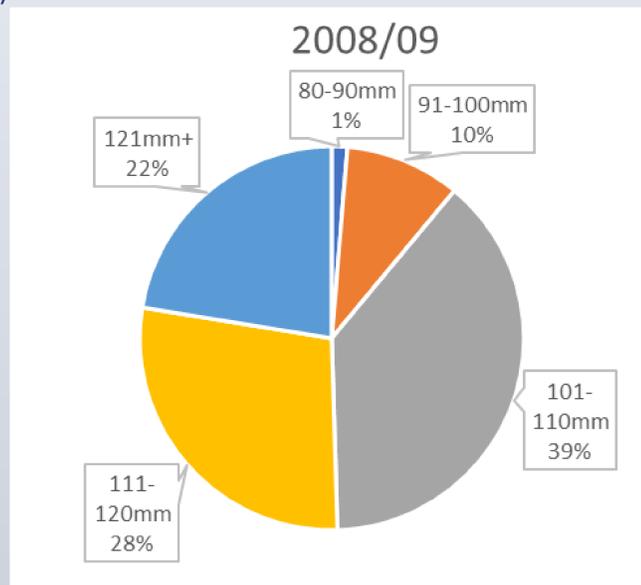


Fig 1. Size distribution of ovigerous lobsters sampled from LFA 38 in fall of 2008 & 2009



Fig 2. Size distribution of ovigerous lobsters sampled from LFA 38 in fall of 2018 - 2020

Results

- Maternal carapace length is positively correlated with joules per egg ($P < 0.001$, Figure 3) and egg diameter ($P < 0.001$, Figure 4)
- Maternal size had a significant effect on FA profiles for 2008-2009 ($P < 0.05$) but had no significant effect on the FA profiles of the recent years (2018-2020) with FA profiles of very large lobsters varying significantly from FA profiles of small and medium size classes ($P < 0.001$)
- The mean reproductive output for 2008-2009 was greater than 2018-2020 ($P < 0.001$)
- Maternal size is positively correlated with reproductive output ($P < 0.001$, Figure 5)

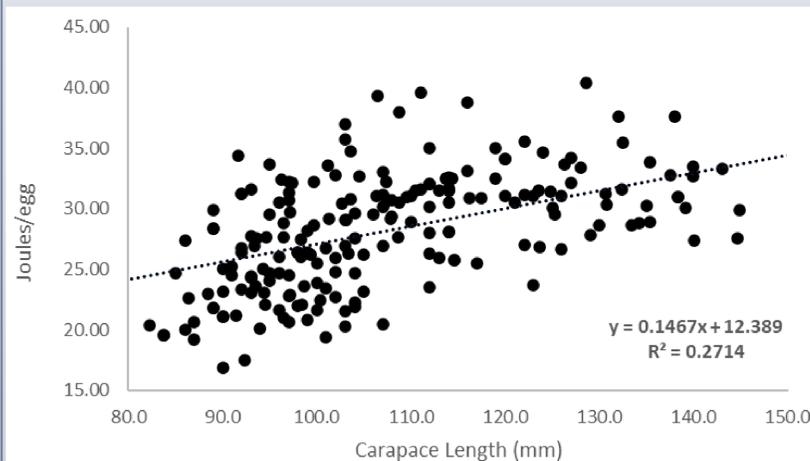


Fig 3. Joules per egg sampled from 2009, 2015, and 2018-2020

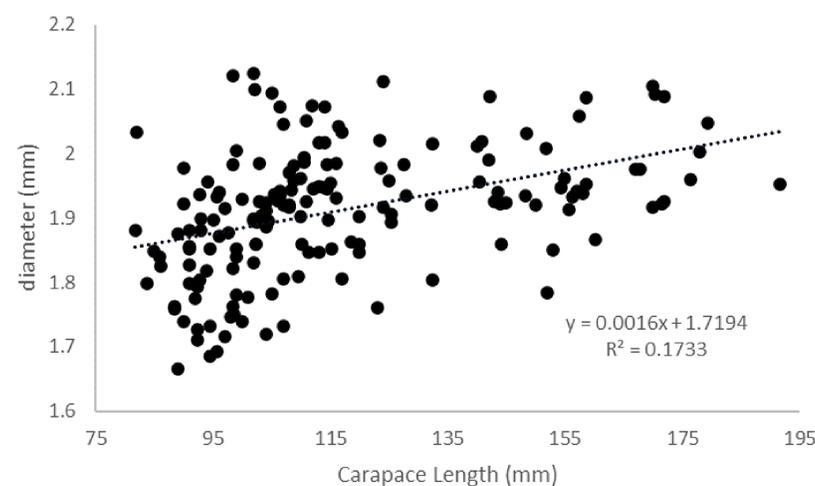


Fig 4. Egg diameter from 2008, 2009, 2011, 2015 and 2018-2020

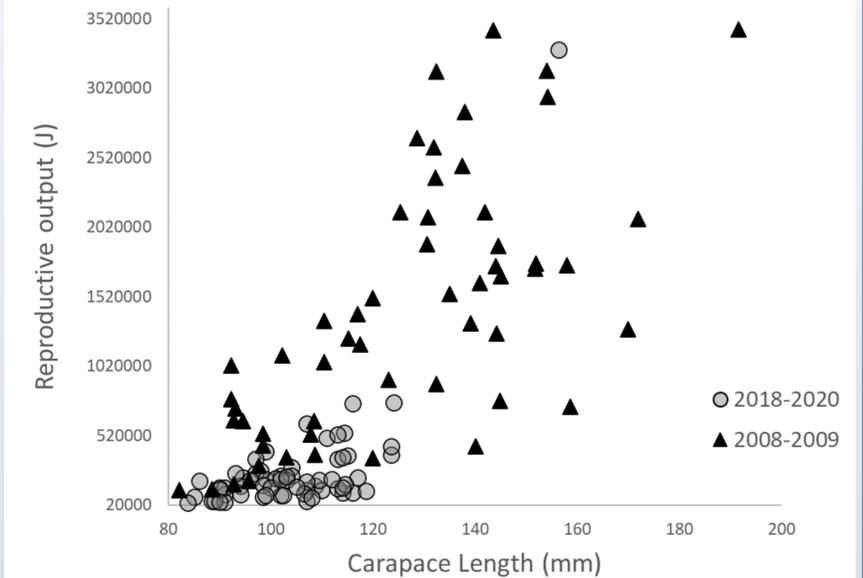


Fig 5. Reproductive comparison over a decade

Conclusions

- **Body size of lobsters affects quality of eggs**
- Larger lobster produce larger eggs with higher energy content
- Total reproductive energy investment increases with maternal size
- Maternal size had a significant effect on FA profiles for 2008-2009 but had no significant effect on the FA profiles of the recent years (2018-2020), possibly due to the absence of very large lobsters
- Declining size of ovigerous lobsters in BoF may have negative impact on reproductive output and recruitment