Temperature and pH Effects on Growth of Four Species of Commercially-Important Bivalves from Tank Experiments

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The Gulf of Maine is a highly productive and economically important sea in the northwestern Atlantic and has undergone rapid warming in recent decades and is susceptible to Ocean Acidification (AO). Marine organisms, such as shellfish as well as keystone fish stocks, such as cod, are vulnerable to warming conditions along with OA and the combined influence may have substantial impacts on local fisheries. Understanding the combined effects of warming and OA to commercially important shellfish is therefore vital. Results of this experiment may potentially guide future planning to safeguard regional ecosystems and fisheries.

To test responses, *mercenaria mercenaria, mya arenaria*, *placTopectin magellanicus* (scallops), and both juvenile and adult *Arctica islandica* were grown in flowing seawater tanks for 20 weeks in controlled pH (7.4, 7.6, 7.8 or ambient) and temperature (6, 9 or 12 °C) conditions at Bowdoin College's Schiller Coastal Studies Center. Temperature effect was a significant contributor in all shell growth metrics (maximum height, dry weight and buoyant weight) in *mya arenaria, placTopectin magellanicus* (scallops), and juvenile *Arctica islandica*. Both temperature and pH effects were significant in all growth metrics of *mercenaria mercenaria* and were suggested in the adult *Arctica islandica* samples. Mortality of specimens was present at all pH and temperature levels. Overall, *mercenaria mercenaria* had the highest mortality rate (24%) and the juvenile *Arctica islandica* had the lowest mortality rate (1.5%). Additionally, differences in final shell condition were noted among the various treatments indicating that, although most of the organisms survived and grew, the harsh temperature and/or pH conditions might not have been ideal for thriving. Different species showed a differential response to the same ocean warming and acidification conditions. The specimens were supplemented with Shellfish Diet throughout the experiment, and as suggested by prior research, the availability of high-quality food may allow certain species to tolerate the future warming and/or OA conditions modeled in this experiment.