

when density increased, especially when water flow also decreased, showing that density effects emerge even at very small seed sizes (Zanella et al., 2025). A similar pattern was reported for larval culture, where growth decreased significantly as density rose from 5 to 20 larvae·mL⁻¹, and 5-10 larvae·mL⁻¹ was identified as the optimal range for normal larval growth.

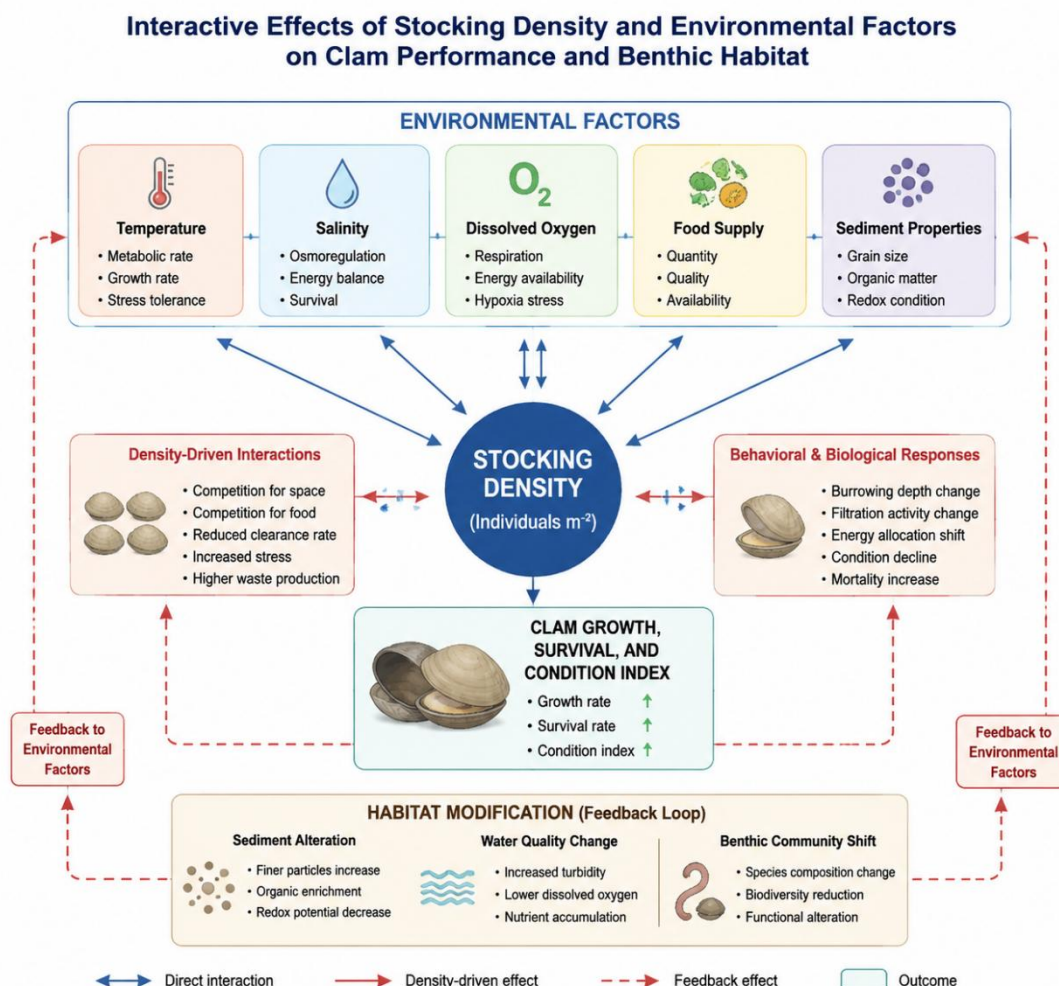


Figure 1 Conceptual framework illustrating the interactive effects of stocking density and environmental factors on clam performance and benthic habitat conditions

The same negative density dependence persists during juvenile and ongrowing phases, although the production optimum is not always the growth optimum. In suspended lantern culture, juvenile shell growth consistently decreased from low or medium densities to the highest density treatments across sites and seed batches, indicating strong crowding effects during pre-fattening (Bordignon et al., 2021). In marine pond ongrowing, the best final size was obtained at 100 clams·m⁻², whereas the highest density tested, 300 clams·m⁻², was considered more suitable for intensive rearing because it better balanced survival and areal yield.

3.2 Effects of density on individual size development

Stocking density has a clear effect on individual size development, particularly shell length, which is one of the most responsive traits to crowding. In suspended lanterns, final shell length decreased stepwise as density increased; for example, B3 juveniles reached 16.1 mm at low density, 14.3 mm at medium density, and 12.7 mm at high density at the western site, with the same overall trend at the northern site (Bordignon et al., 2021). Comparable size depression was also observed in nursery tray culture, where increasing density from 3,019 to 15,094 clams·m⁻² reduced clam growth and condition, indicating that crowding constrains both shell extension and overall individual performance.