

Bioenergetics of the common seastar *Asterias rubens*: a keystone predator and pest for European bivalve culture.

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MATERIAL AND METHODS

Assessing seastars performance as function of food and temperature

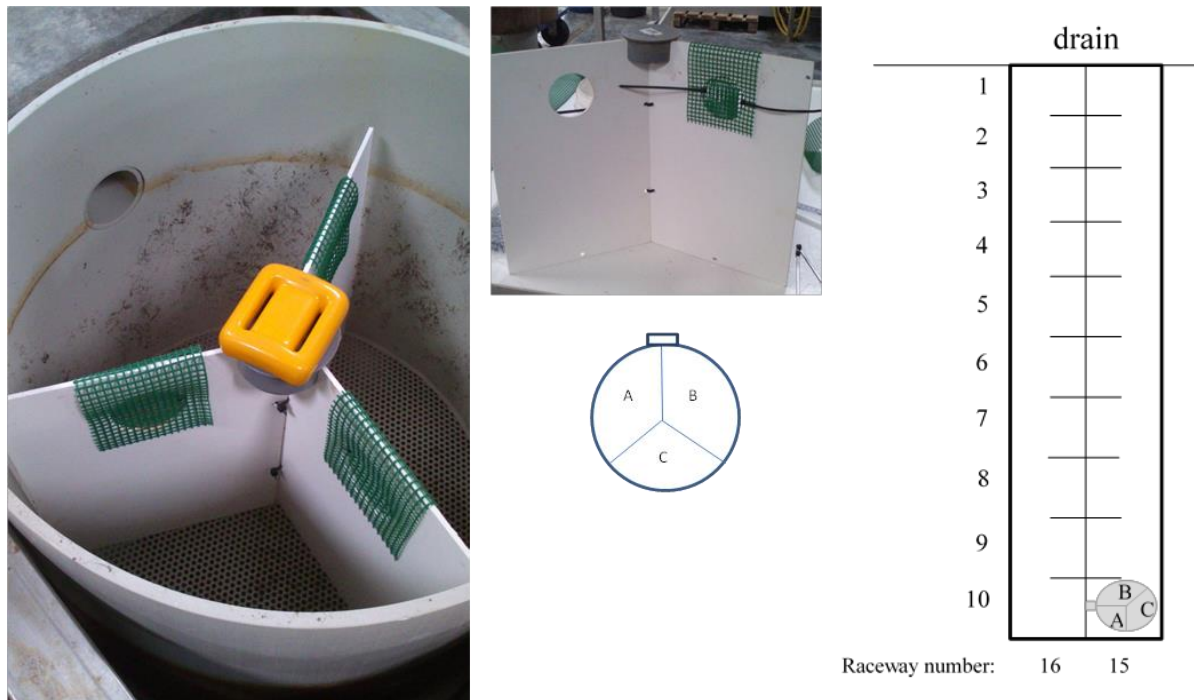
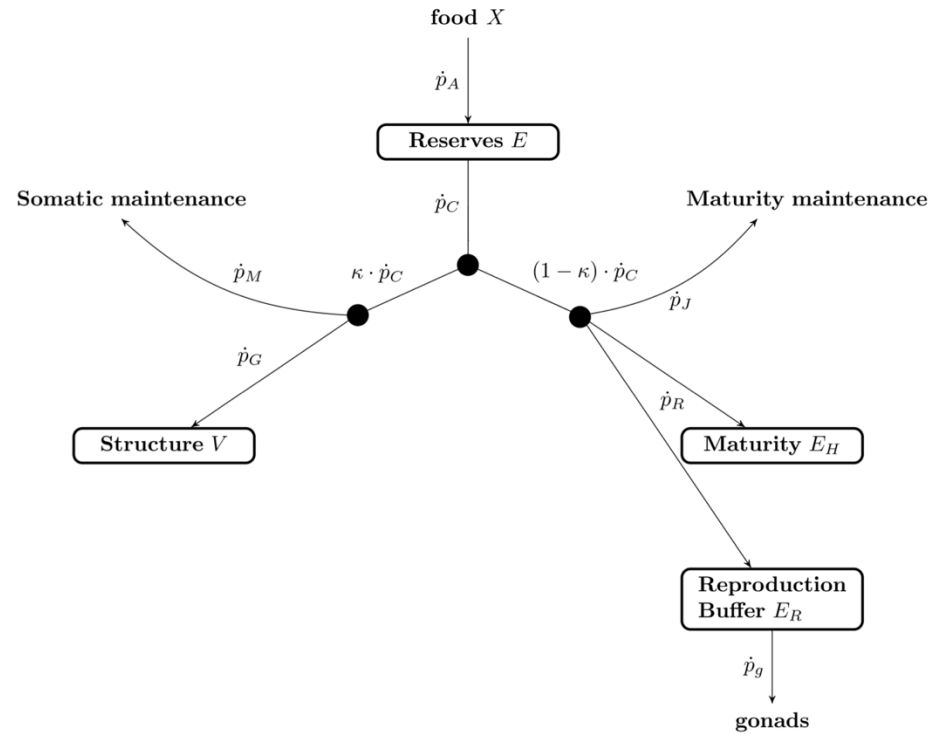
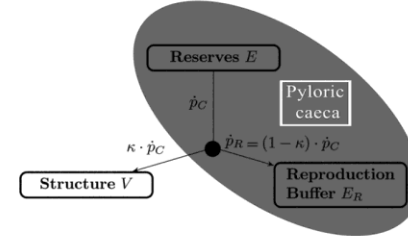


Figure S1. Details of the experimental set-up. From left to right: Containers with dividers in place at the raceway. Dividers and diagram of the sections within a container. Diagram showing raceway with a container. The raceway receives a constant flow of water directly pumped from the adjacent fjord. This water enters into each container from the gridded bottom, the containers overflow directly into a drain system that takes the water out of the raceway and back to the fjord. Water flow within each container is independent.

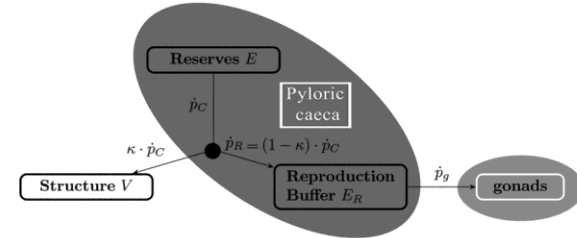
The DEB model for *Asterias rubens*



A Gonad resting stage



B Gonad exponential



C Spent reproduction buffer and spawning stages

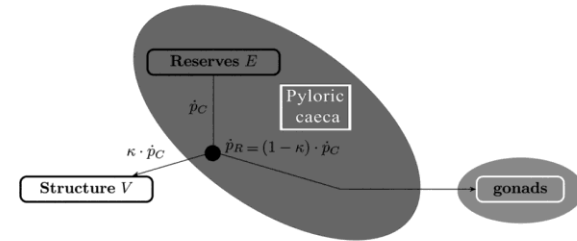


Figure S2. Schematic representation of the DEB model for *Asterias rubens*. Left: Arrows represent energy fluxes ($J\ d^{-1}$) that drive the dynamics of the four state variables (boxes). Energy enters the organism as food (X), which is assimilated at a rate of $\dot{p}_A$ into reserves (E). Mobilization rate ($\dot{p}_C$), regulates the energy leaving the reserves to cover somatic maintenance ($\dot{p}_M$), structural growth ($\dot{p}_G$), maturity maintenance ($\dot{p}_J$), maturation ($\dot{p}_R$) (immature individuals) and reproduction ($\dot{p}_R$) (mature individuals). κ is the proportion of the mobilised energy diverted to $\dot{p}_M$ and $\dot{p}_G$, while the rest is used for $\dot{p}_J$ and $\dot{p}_R$. Right: Schematic representation of the links between *A. rubens* organs and the store and handling of the reproductive buffer (E_R): **A** gonad resting stage, the pyloric caeca contains the reserves (E) and the reproductive buffer (E_R). **B** Gonads development season. Gonads grow exponentially by the mobilisation gonad flux ($\dot{p}_g$) from energy stored in (E_R) in the pyloric caeca. **C** Mobilisation from the pyloric caeca continues until E_R is exhausted, after that and while spawning last the reproduction flux ($\dot{p}_R$) is directly used for the continued production of gonad tissue. Adapted diagrams from Agüera & Byrne, 2018.

RESULTS

Experiments assessing seastars performance as function of food and temperature

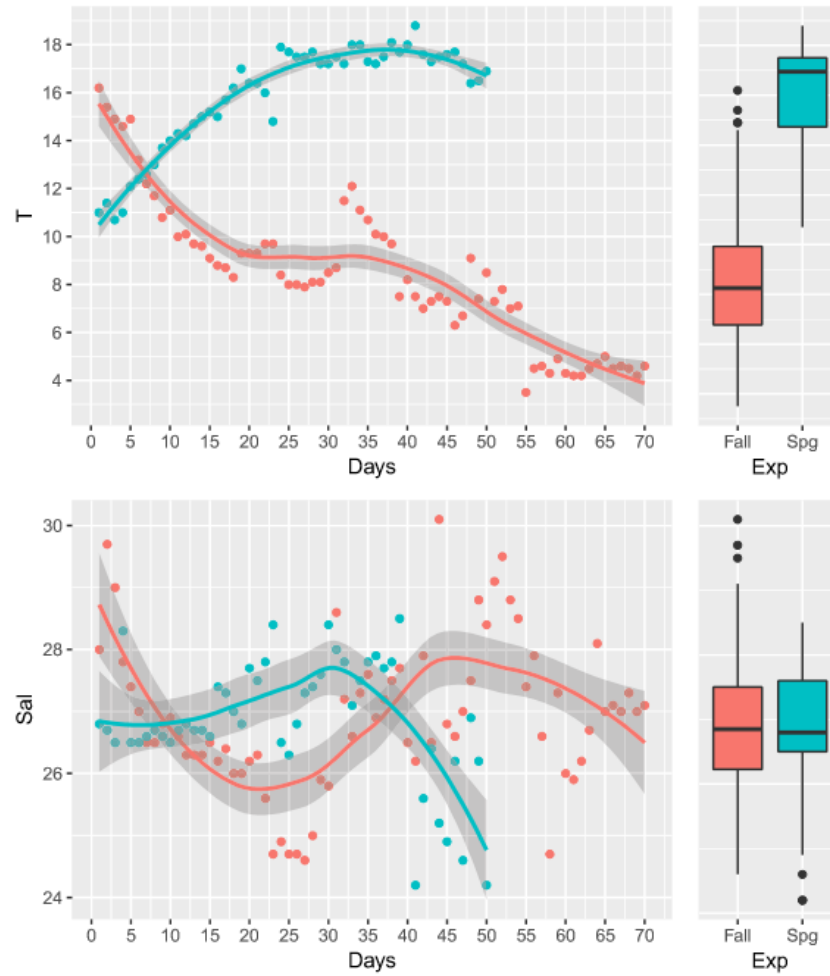


Figure S3. Temperature and salinity during the mesocosm experiments in autumn 2016 and spring 2017. Points are observations lines are LOESS smoother with 95% confident intervals (shaded area).

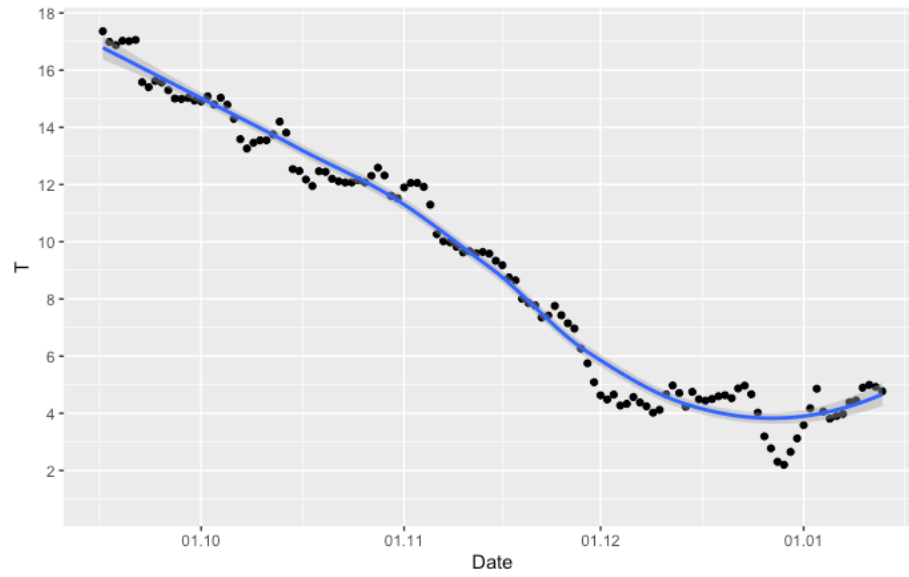


Figure S4. Temperature during the mesocosm experiments in 2014-2015. Points are observations, line is a LOESS smoother with 95% confident intervals (shaded area)