

Is reproductive failure responsible for reduced recruitment of intertidal *Mytilus edulis* L. in the western Dutch Wadden Sea?

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Abstract

The mussel *Mytilus edulis* is an abundant bivalve in the Dutch Wadden Sea, both in intertidal areas as well as in subtidal culture plots. From mid 1980's to late 1990's, strong declines in mussel intertidal populations have been observed, both in terms of occupied area and in biomass. Despite the efforts since 1999 to preserve intertidal mussel beds, abundance and biomass of mussels in the Dutch Wadden Sea are at present still much lower than in the 1970's. In the present paper, we tested whether reproductive failure could have been the cause for the low recruitment of *M. edulis* in the western Dutch Wadden Sea. Water temperature is an important factor influencing growth and reproduction in bivalves. The observed increase in mean temperature in the Dutch Wadden Sea during the last decades suggests that an effect of temperature on the population dynamics of mussels might be expected. Nevertheless, no significant relationship was found between body condition and mean winter temperature. Therefore, a decrease in body condition and, consequently, in reproductive output, due to increasing temperature, will not have been a cause for the observed low recruitment in recent years. The seasonal patterns of individual growth supported this view: most adults developed gonads during the spawning season suggesting that reproductive (gametogenic) failure was not a cause for the low recruitment. Nevertheless, reproductive investment by the mussel population studied was not optimal since complete spawning hardly occurred. In addition, the high gonadosomatic ratio at the end of the summer did not result in heavy spawning, suggesting resorption of gonadal tissue due to unfavourable environmental conditions (too high temperature and/or food limitation during summer). Reduced recruitment could be due to poor spawning but other factors that exert their influence after spawning (predation on larvae or postlarvae, lack of settlement substrate) or on the adult population (decrease in number of spawners) are also likely to be involved in the observed low recruitment during the last years.