

GAMETOGENIC CYCLE OF *MYTILUS* IN GALWAY BAY, IRELAND



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Introduction

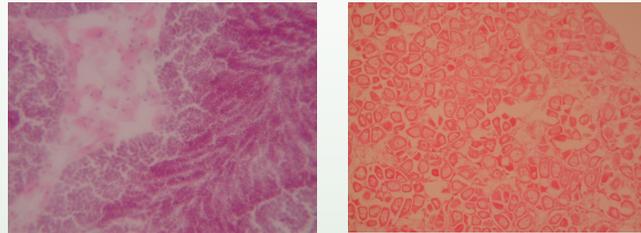
The coastal waters of North West Europe are inhabited by two members of the *Mytilus* genus, *M. edulis* and *M. galloprovincialis*. In areas where the two taxa are sympatric, hybridisation occurs, the extent of which varies depending on locality (Gosling 1992). Using the diagnostic DNA marker *Me15/16* sympatric populations of *M. edulis*, *M. galloprovincialis* and hybrids have been identified on all Irish coasts with the exception of the Irish Sea coast (unpublished data). Frequency of hybrid genotypes is high (> 50%) suggesting that reproductive isolating mechanisms are insufficient to prevent hybridisation. Also there is a possibility that hybrid individuals are fertile, thereby having the ability to backcross to the parent taxa.

Previous investigations (King et al. 1989) have found that Irish mussel populations exhibit seasonal protracted spawning, with peak activity in March/April and July/August. Due to the high degree of morphological similarity between the two taxa it is impossible to separate the types visually. As a result, reproductive studies in Ireland, to date, have treated mussel populations as panmictic populations of *M. edulis* alone.

As there are currently no data on the reproductive cycles of *M. edulis* and *M. galloprovincialis* in Irish waters the aim of the present study was to carry out a histological and stereological analysis of mussels collected from a sheltered rocky shore (Jan-Sep 2006) in Galway Bay. Results obtained for the months March and April are presented here.

Methods

- A sample of 150 mussels was collected monthly from Ballynahown, a sheltered rocky shore in Galway Bay on Ireland's west coast
- Histological analysis was carried out according to the methods of Lowe et al. 1982.
- Animals were identified to species using the nuclear DNA molecular marker *Me15/16* developed by Inoue et al. 1995.
- The stage of gametogenesis for each individual was assessed according to Seed 1974.
- Gonad somatic index for each individual was calculated by dividing the mantle dry weight by the whole mussel dry weight and multiplied by 100.
- The fractional area of tissue composed of gametes (gamete volume fraction) was measured quantitatively using Olympus Dp-soft image analysis software and an Olympus CX-41 compound microscope, following standard stereological methods (Lowe et al. 1982).
- The gamete volume fraction (GVF) of each individual was then multiplied by the whole mantle dry weight to obtain the reproductive output.

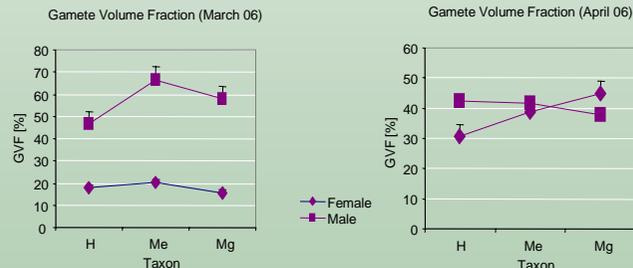


Examples of ripening male (left) and female (right) gametes at 400x.

In the male spermatazoa are arranged in lamellae converging towards the centre of the lumen. Spermatids can be seen along the edge of the follicle.

In the female the oocytes lie packed tightly together in the follicles. The pressure compresses the oocytes into polyhedral forms.

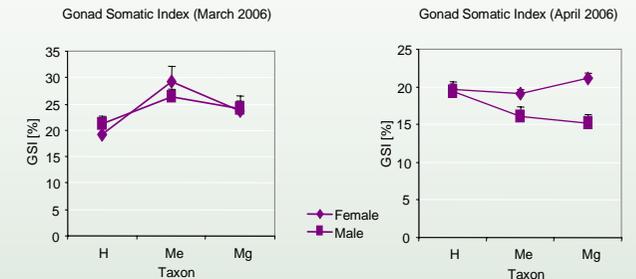
Results



GVF/GSI: H = Hybrid, Me = *M. edulis* Mg = *M. galloprovincialis*

- Two-way fixed factor anova was also carried out on male and females separately.
- No significant difference in reproductive output was observed between taxa (males: $F_{2,15} = 0.13$, $p = 0.875$, females: $F_{2,15} = 0.35$, $p = 0.707$).
- No significant difference in reproductive output was found between March and April for either of the sexes (males: $F_{1,15} = 3.64$, $p = 0.068$, females: $F_{1,15} = 0.02$, $p = 0.883$).

Results



- Two-way fixed factor anova was also carried out for male and female gonad somatic index separately.

- Analysis revealed no significant difference in reproductive output between the three taxa (males: $F_{2,15} = 0.893$, $p = 0.11$, females: $F_{2,15} = 0.57$, $p = 0.575$).

- No significant difference in reproductive output was observed between March and April in either sex (males: $F_{2,15} = 0.11$, $p = 0.893$, females: $F_{2,15} = 1.27$, $p = 0.270$).

*N.B. Reproductive output was calculated using the GVF of stage 3 (ripe) gametes

Conclusions

- Preliminary results indicate that during March and April there was no difference in the gametogenic cycle of the three taxa.

- Gamete volume fractions suggest that *M. edulis*, *M. galloprovincialis* and their hybrids mature synchronously in Galway Bay.

- Comparison of reproductive output indicates no difference in the effort put into reproduction by the three taxa.

Future Research – Work on this project is ongoing. Data has been collected since January of 2006 and will be collected until September 2006. Analysis of the complete data set should reveal whether or not the three taxa continue to develop and spawn in synchrony.

References

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