

OUTCOME SUMMARY OF PROJECT BSA 09-009

BSA 09-009: The efficacy of containment methods of abalone in a contained use GM facility.

Project Leader: Dr Helet Lambrechts

Research Institution: Dept. of Animal Sciences, Stellenbosch University, Stellenbosch

Duration: 3 years

EXECUTIVE SUMMARY

Genetic modification of aquatic organisms is being employed for a number of purposes (e.g. to improve yields), but the potential benefits of genetically modifying abalone to improve growth are accompanied by potential risks to both the environment and to human health. Accordingly South Africa has developed a regulatory framework to enable the safe use of GMOs. Currently there are no standardised strategies to ensure containment of GM abalone within commercial production systems. The study investigated the efficacy of biological, chemical, and mechanical containment methods to contain genetically modified (GM) abalone (*Haliotis midae*).

PROJECT OUTCOMES

- Triploid induction as a means of biological containment did not prove 100% effective in rendering the animals sterile. Both male and female triploid *H. midae* exhibited abnormal gonadal development, with spermatogenesis in males tending to be less affected by the technique. Triploid induction did however; result in the production of mosaics. When induced by means of standard methods, the triploid animals failed to spawn. Gametes were subsequently collected by means of a biopsy technique, and fertilization trials (with diploid gametes) resulted in the production of abnormal larvae. Future studies investigating the refining of the triploid induction technique as well as larger sample sizes are required to establish the potential benefit of using triploid induction to improve yields of culture systems.
- Chlorine dioxide tended to provide a more effective form of chemical containment than sodium hypochlorite, with the latter being used in standard hygiene protocols in abalone culture systems. Both chlorine dioxide and sodium hypochlorite resulted in morphological damage of all the respective life stages of abalone. Future studies needs to investigate the use of higher dosage levels at shorter exposure intervals, to ensure the practical incorporation of this form of biocontainment in management programs and to minimize environmental effects.

- The type of mechanical containment of the respective life stages of abalone was influenced by the size of the life stage. Ova, larvae and spat could be effectively contained by using polypropylene filters bags (ranging from 1 micron to 100 micron), whereas sperm could not be contained by the 1 micron filter bags. Weanling abalone could be effectively contained using either Velcro, AstroTurf or standard carpet, affixed to the boundaries of the weaning tanks.

The results presented above, as well as the findings reported in the reports, all indicated that abalone can be effectively contained by using biological, chemical or mechanical means. The efficacy of each method varied between the different life stages, and therefore the containment methods for each life stage must be chosen to provide the optimal form of containment for the specific life stage.