Aquaculture

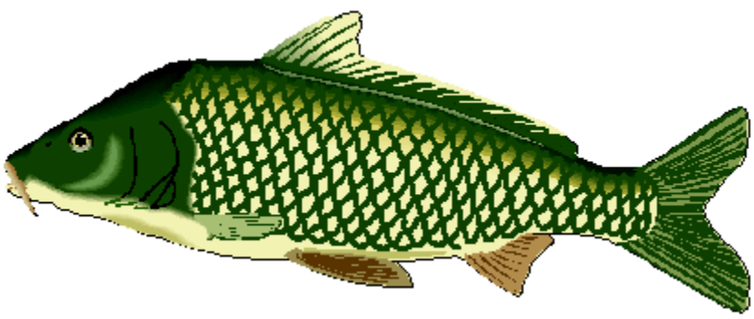
Biotechnology

Symposium

Proceedings

Edward M. Donaldson

Don D. MacKinlay



International Congress on the Biology of Fishes

San Francisco State University July 14-18, 1996.

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PREFACE

Aquaculture now accounts for over 20% of the world production of fish for human consumption. The Consultative Group on International Agricultural Research has recently predicted that "within 15 years fish farming and sea ranching could provide more than 40% of all fish for the human diet and more than half of the value of the global fish catch" (CGIAR 1995). The world is in a state of transition from the hunting and gathering of fish to the production of fish by aquaculture. A number of factors including the continued inexorable growth in world population and advances in fishing technology have placed unsustainable pressures on wild fish stocks. Recent data from the Food and Agriculture Organization of the United Nations provides clear evidence that the global wild fishery reached a maximum level in 1989 and has since declined.

The shift to increased dependence on aquaculture to provide high quality fish for human consumption places an onus on governments, researchers and farmers to develop efficient, economic and sustainable aquaculture production systems for a wide variety of species which are adapted to specific aquatic conditions. It is unlikely that finfish production will ever be narrowed down to the 4 or 5 mammalian or avian species that dominate agricultural production; in fact the number of finfish species under cultivation continues to expand and species - specific research and development is required in each case.

Biotechnology has played an important role in the growth of aquaculture to its present state of development, and we can anticipate that biotechnology has the potential to revolutionize fish culture as we know it over the next decade or so. Biotechnology has two major roles in aquaculture: it can improve the economic efficiency of aquaculture and it can also contribute to the sustainability of aquaculture and the protection of wild stocks. The responsible and appropriate application of biotechnology will enable the development of sustainable aquaculture and facilitate the concurrent maintenance of wild stocks for their commercial, recreational and inherent aesthetic value.

In this Aquaculture Biotechnology Symposium of the American Fisheries Society Physiology Section, we have brought together a series of papers from the Americas, Asia and Africa which cover several aspects of current research on aquaculture biotechnology. The papers have been grouped by topic. The first is the key topic of gamete quality and cryopreservation. Sperm cryopreservation technology is of importance for the development of gene banks both as an insurance policy for the conservation of biodiversity in wild stocks and also as a means of assisting aquaculture by: storage of valuable sperm (e.g. monosex) for future use, transport of sperm, allowing hybridization between species with differing spawning seasons, etc. The second and largest group of papers covers the topics of sex differentiation, sex control and chromosome set manipulation. It is increasingly recognized that in a given species either one sex or the other offers advantages for aquaculture through such characteristics as increased growth, higher market value, or later sexual maturation. In other species or situations it may be desirable to produce sterile fish through the development of monosex female triploids. This technology will be of particular importance for the reproductive containment of genetically-modified aquatic organisms such as transgenics.

In the section on reproduction and growth, there is a single paper on changes in gonadotropin and somatotropin during reproductive development in a catfish. This is followed by a section on

transgenics. Transgenic fish promise to revolutionize both cold water and tropical aquaculture in the early part of the third millennium as early progress in salmonids is being followed by technology development in species such as tilapia. Another key area both for aquaculture and for the management of wild fish stocks is the development of molecular techniques for stock and species identification and for the tracing of offspring to parents in selection programs.

The volume closes with several papers on molecular biology, including a paper on the DNA based immunization of salmon and a paper on major histocompatability complex genes in rainbow trout.

We wish to to thank Francesc Piferrer for serving as a contact person for the Symposium.

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CONGRESS ACKNOWLEDGEMENTS

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Don MacKinlay

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