

Symposium: BIOLOGY AND CULTURE OF SILVERSIDES (PEJERREYES)

**The Darwin Initiative and the whitefish *Chirostoma estor estor*:
A link between aquaculture, biodiversity and rural livelihoods**

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Key words: *Chirostoma*, México, biodiversity, rural livelihoods, Darwin Initiative

World aquaculture is undergoing a massive expansion, both in quantity and quality of products and this is set to increase over the next few decades especially if aquaculture is to satisfy the world demand for fish products in the face of dwindling fisheries (FAO, 2002). Clearly, the industry needs to be sustainable in the medium to long term and considerable efforts are being made into understanding growing systems so as to achieve this. One aspect of sustainable use of resources is the use of such resources while maintaining biodiversity and a number of concerns have been voiced regarding the effects of aquaculture on aquatic diversity. While there are examples of the negative impact that aquaculture could have on biodiversity, there are fewer examples of its positive effects. This project seeks to link aquaculture development with maintenance of livelihoods and biodiversity.

The Darwin Initiative is a programme financed by the British Government designed to assist conservation work and maintain biodiversity in countries which do

not have sufficient resources of their own to support this type of programme. The Darwin Initiative is a flexible programme based on the principles of the Convention on Biodiversity (CBD) which is an international agreement intended to avoid loss of species of plant and animal and to protect biodiversity. The objectives of the CBD and of the Darwin Initiative are wide and include inventory of species, development of systems of conservation, training in biodiversity management, establishment of reserves, etc. The most important overarching feature of these initiatives is to contribute to the management and use of resources in a responsible and sustainable manner, involving communities with managing their own flora and fauna so as to improve exploitation and at the same time ensure conservation of biotic resources.

In México the national biodiversity strategy is the responsibility of the National Commission for the understanding and use of Biodiversity (CONABIO) which was established in 1997 specifically to implement national strategy. CONABIO has identified and prioritised four themes: a) Protection and Conservation b) Evaluation of Biodiversity, c) Planning and management of information and d) Diversification of use of resources. The components of the latter are: a) Diversification of production, b) Criteria and Indicators for use of re-

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Received on February 2, 2005. Accepted on June 1, 2005.

sources and c) Promotion and commercialization of sustainable “green markets” which favour the natural environment and rural communities.

With the support of the Darwin Initiative from the British Government, we are currently working with the “pescado blanco” (*C. estor estor*), which for decades has been the basis of an artisanal fishery. This species is a member of a genus derived from a migratory stock which was isolated geographically relatively recently. This stock has radiated into the 18 known species which are endemic in the lakes of the Mexican altiplano. *C. estor estor* is presently endangered because of various factors such as over-fishing, environmental degradation and introduction of exotic ichthyofauna. In the last five years we have made considerable advances towards cultivation of the species, including optimum temperature (Martinez-Palacios *et al.*, 2002a) and salinity regimes for production and growth of juveniles (Martinez Palacios *et al.*, 2004), control of early feeding and achievement of a controlled, closed reproductive cycle independent of wild stocks (Martinez Palacios *et al.*, 2002b).

Based on these developments, the Darwin Initiative project is designed to increase the training of indigenous communities in the region and to transfer the culture technology for pescado blanco, principally based upon small scale on-growing systems working with campesinos and semi-intensive hatchery schemes working with small businesses. Currently, we are working with indigenous communities to extend the technology into the field, initially through semi-intensive pond culture. One aspect of great importance is the focus on training programmes designed to improve the sustainability of this activity for the future. This involves not only indigenous communities but also groups from technical support institutions and government departments who have legislative and regulatory responsibility for these activities. To assist this process, we have developed field training manuals specifically for the species and target communities which use highly graphical content and address issues of indigenous language as well as potential illiteracy.

Participative rural appraisal techniques are helping us to understand the social and economic functioning of target fishing communities so that the effects and benefits of introduction of aquaculture can be continuously monitored. As well as introducing aquaculture, a number of parallel projects have been developed to introduce value-added activities such as production of fish leather, smoking of fillets and ensiling of waste fish products. This not only ensures full use of the resources but generates additional income and helps increase and maintain interest in aquaculture.

Alongside the transfer of various technologies, an important aspect of the Project is environmental education at a number of levels to impart ideas and concepts of biodiversity conservation and the problems which exist with management of natural resources. Work has focused on publication of articles in popular periodicals as well as articles in newspapers. Local and international TV articles have also been important in spreading the concepts and benefits of the programme. In parallel with these activities, consultative and advisory work is in progress with state and national governmental bodies so as to contribute to the development of a strategy for conservation of resources in conjunction with their fair and sustainable use.

The Darwin Initiative project is developing small-scale aquaculture in the riparian communities of altiplano lakes which will introduce a new production activity, generate additional income and produce a high quality protein source, while simultaneously reducing pressure on wild fish populations. The objectives of the project comply with the CBD objectives, and especially those prioritized by CONABIO which are to develop a “green” use for resources while assuring a future for the species.

Acknowledgements

The authors are grateful to the Department of Agriculture, Food and Rural Affairs of the British Government for project support under the Darwin Initiative. We are also grateful to many Mexican agencies (CONACyT, SAGARPA, Produce-Michoacan) for substantial financial support for the underlying science and technology.

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