POPULATION GENETICS FOR MANAGEMENT AND CONSERVATION OF AQUATIC RESOURCES AND DNA FINGERPRINTING IN FISHES: RIVER CATFISH AND TILAPIA

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Introduction

The river catfish *Mystus nemurus* is widely distributed in mainland and archipelago Southeast Asia. Due to its good flesh quality it is a popular fresh water fish food and is therefore of interest to aquaculturalists. Not much genetic information is available on this fish thus far. Tilapia, *Oreochromis niloticus* is an important aquaculture fish in Malaysia although it is an introduced African fish. Our studies aimed to define and characterize through the use of DNA level genetic markers species, stocks and populations of *Mystus* and *Oreochromis* before they are used in breeding programmes. Choices of stocks to be used in crosses should be made with the knowledge of the genetic structure of the stocks and the genetic distances between them (Ferguson, 1994). Genetic markers can also be used to help monitor crossing experiments. Tests were done to find possible associations between molecular markers and traits of economic importance.

Materials and Methods

River catfish samples from Perak, Kedah, Johore, Selangor in Peninsular Malaysia and Sarawak on Borneo island were collected and brought back to our laboratory. Sample sizes ranged from 25 to 50 fish from each location. They were typed for DNA markers by using the Randomly Amplified Polymorphic DNA (RAPD) and the Amplified Fragment Length Polymorphism (AFLP) techniques. RAPD analyses were done using agarose gel electrophoresis while AFLP typing were done using polyacrylamide gel electrophoresis (Chong et al. 1998). In the case of tilapia, thirty fishes each from five stocks namely Taiwan A, Taiwan B, Thailand, Philippines and Mossambicus being maintained by an interrelated breeding project at the Institute of Advanced Studies research farm at the University of Malaya were typed using the DNA micosatellite technique adapted for use on agarose gel electrophoresis (Bhassu et al. 1998). Analyses of data were done using suitable statistical packages such as NTSYS and MICROSAT (Goldstein et al. 1995).

Results and Discussion

For the river catfish among the five populations both RAPD and AFLP markers revealed high genetic variability within the Selangor and Sarawak populations with similarity index values (SI) ranging 0.5556-0.8936 and 0.6667-0.9412 respectively in RAPD analysis and 0.5529-0.9321 and 0.4925-0.9595 respectively in AFLP analysis. The Sarawak population clustered by itself thus isolated from the Peninsular populations. Three subgroups, one each from Kedah, Perak and Sarawak populations were revealed by AFLP but not RAPD. In our studies nine RAPD primers revealed 42 and four AFLP primers revealed 158 polymorphic markers. Unfortunately, our family studies showed that for both RAPD and AFLP only dominant markers were observed in this species. While these markers are excellent for genetic characterisation of populations they are not efficient for testing for possible associations between quantitative trait loci of economic importance such as growth rates and disease resistance and molecular markers. Thus we have now initiated a study using a technique recently developed by Desmarais et al. (1998) called Direct Amplification of Length Polymorphisms (DALP) in order to obtain codominant DNA markers for this species in the absence of DNA sequence data. We have thus far identified five such codominant markers (Usmani et al. 1998) and this study is being continued. For tilapia eleven codominant microsatellite loci were found to be polymorphic both between and within the five stocks that were studied. Cluster analysis based on the genetic distances showed that the Philippines and Thailand strains were grouped together while Mossambicus formed another group and the two Taiwan strains formed another cluster (Bhassu et al. 1998). Studies to find associations between the microsatellite loci and economic traits are in progress.

Conclusions

The results of our studies revealed high levels of interpopulation genetic variation in the river catfish *Mystus nemurus* especially between the Peninsular and Sarawak populations and that AFLP showed greater resolving power than RAPD. Similarly for the five tilapia stocks that we studied, sufficient heterogeneity exist among them to expect hybrid vigour to result from suitable crosses. Natural populations of the Malaysian river catfish should be conserved to enable the rich genetic diversity of this species to be sustainably utilised to improve our aquaculture industry.

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