

# THE "CATFISH ASIA" PROJECT: BACKGROUNDS, AIMS AND PROSPECTS

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## Abstract

Catfishes, and in particular Clariidae and Pangasiidae, are important aquatic resources in Asia, where their culture represented an annual production of about 124,000 t in 1993. In the clariids, this production results mostly from the use of F1 hybrids between the introduced African catfish (*Clarias gariepinus*) and various local clariid species. In the pangasiids, various culturing techniques were empirically developed for some native species, whose juveniles are most often captured in the wild. Further development of this catfish culture industry faces serious problems related to the poorly known systematic of these fish groups, the scarce knowledge of the biology and aquaculture potential of autochthonous species, the limitation of seed supply and the declining performances reported in some cultivated stocks.

In this context, the "Catfish Asia" project which deals with the two catfish families, Clariidae and Pangasiidae, has the main following goals:

- To acquire a stronger knowledge of the biological diversity of SE Asian catfishes and to enhance its utilisation through a correct identification and characterisation of valuable species, populations and strains of aquaculture interest. This approach represents an important precondition to the sustainable management of cultivated and natural stocks and to guide conservation efforts of these economically important resources. It will also contribute to a better knowledge of their phylogeographic relationships.
- To acquire sound biological bases for the development of catfish culture in the SE Asian region. The evaluation of the aquaculture potential of the autochthonous species (diversification) and the optimisation of their rearing cycle (artificial propagation) through technologies adapted to the local conditions are essential elements for a better production in the future.

The research work associates six institutes and laboratories from Indonesia, Vietnam, France and Belgium. The specific objectives, general methodologies, first results and prospects of the project are presented.

## INTRODUCTION

Among the freshwater fish, the Siluriformes (including both autochthonous and exotic species) represent an important group in Asia. Several species are actively exploited by fisheries and in a variety of aquaculture production systems. Although ranking beyond carps and tilapias, the total volume of cultured catfishes in Asia has shown fast increase during the last 20 years and was estimated around 124,000 t in 1993 (Csavas, 1994). In the Lower Mekong Basin, catfishes of the clariid and pangasiid families are of particular significance for aquaculture. In 1993, they represented an estimated annual production of about 21,000 t in Vietnam, 36,000 t in Thailand and 6,000 t (75 % of the total freshwater cultivated

fish production) in Cambodia. In Indonesia, clariids are the main cultivated catfishes (4,000 t in 1992) but pangasiids present also a high potential for aquaculture, particularly in Sumatra and Kalimantan (Sudarto and Sumastri, 1994).

Indigenous culture techniques were developed for native species that are generally preferred by local consumers. However, in clariids, the actual trend is to cultivate F1 hybrids between the introduced African catfish (*Clarias gariepinus*) and various local species (*C. macrocephalus* or *C. fuscus* in Thailand or Vietnam, *C. meladerma* in Indonesia). These hybrids appear to combine the estimated flesh quality of local species and the faster growth rate and disease resistance of the introduced one. Because of the presence of a variety of pangasiid species and their omnivorous

nature, culture techniques can be adapted to the local conditions. Pangasiids are used both in small-scale or industrial production systems and can be reared in high-density cage culture, low input polyculture systems, integrated livestock/fish farming or with human waste utilisation (Peignen, 1993; Cacot, 1994; Csavas, 1994). The ability of some of these catfishes to undergo aerial respiration allows their use for a valorisation of poorly oxygenated aquatic environments.

However, major constraints for further development and sustainable management of cultivated and natural catfish resources still remain. A part of the encountered problems is listed below, as they were identified in 1996.

- Aquaculture has often been based on the utilisation of introduced species while the knowledge on the biology and the potential of autochthonous species remains scarce. As an example, the African catfish *Clarias gariepinus* has been spread all over SE Asia where it is cultured either as such or after hybridisation with local *Clarias* species. In Indonesia, although more than 10 pangasiid species were listed from the ichthyofauna, the only *Pangasius* cultured in this country remained *Pangasius hypophthalmus*, which was initially introduced from Thailand.
- Diversification of the cultivated species is required both for a better response of fish culturists to market demands, and for a better fit with the diversity of habitats and consumer preference. However, main limitations are the followings.
  - The systematic of Siluriformes remains poorly known in this region and information on their genetic structure (species, populations) is very limited. In the pangasiid family, despite a systematic revision of the group (Roberts & Vidthayanon, 1991), numerous discrepancies were found in recent descriptions of the fish fauna. This was particularly the case for the Mekong delta where the available information relative to taxonomy and even the number of represented species was still inconsistent (Khoa & Huong, 1993; Lenormand, 1996). In Indonesia, the only local pangasiid species tested for aquaculture was misidentified as *P. pangasius* and remained to be correctly named. For SE Asian clariids, the situation was even more confusing as the most recent revision was made by David in

1935. In the absence of reliable identification keys, cultured species are often misidentified. This situation impairs a comprehensive view of the culture potential of these fishes and a correct interpretation of the information published on their biology and culture.

- In most cases seed supply is impaired by the absence of reproductive control in captivity and by fluctuating or limited natural wild juvenile resources (Csavas, 1994; Cacot, 1994).
  - Declining performances in cultured fishes have been reported in several areas in SE Asia (Main and Reynolds, 1993).
  - Introductions of exotic species for pure culture or hybridisation with native species could induce diseases due to parasites (Welcomme, 1988; Kottelat, 1990) and genetic impacts on native gene pools (Hindar *et al.*, 1991).
- Therefore, the precise description and characterisation of species, populations and strains in these fish groups represent a condition *sine qua non* to the sustainable management of their cultivated and natural stocks and to guide conservation efforts of these economically important resources. They should also contribute to a better knowledge of their phylogeographic relationships.

The sound evaluation of the aquaculture potential of the autochthonous species (diversification) and the optimisation of their rearing cycle (particularly artificial propagation) through technologies adapted to the local conditions appears as essential elements for a better production in the future.

These topics were retained has the main goals of the "Catfish Asia" project, which focuses on the two main catfish families of economic importance, the Clariidae and Pangasiidae. The genesis, specific objectives, general methodologies, first results and expected outcomes of the project are presented in the present paper.

## GENESIS OF THE PROJECT AND PARTNERSHIP

The first contact between the European and Asian partners today associated in the "Catfish Asia" project took place in 1992 during a prospective mission of two of us in the Southeast Asian region (Lazard & Legendre, 1993). This first

contact allowed the identification of research fields related to fish biology and culture, and partner institutions to develop collaborative programmes. The cooperation was initially engaged by exchange of scientists and students between France, on one side, and Vietnam and Indonesia, on the other side.

In Vietnam, inquiries were made on catfish production systems (Peignen, 1993; Bazir, 1994; Cacot, 1994) and a preliminary study on the systematic, biology and aquaculture potential of pangasiid species from the Mekong Delta was carried out (Lenormand, 1996). Starting from 1994, the French Ministry of Foreign Affairs supported a collaborative programme on the control of reproduction of *Pangasius bocourti*, associating two French (CIRAD and IRD) and three Vietnamese institutions (the Can Tho University (CTU), the University of Agronomy and Forestry (UAF) and the AGIFISH Company). This programme led to the very first spawn of this species in captivity, obtained in May 1995. It represented an important success as, until this date, the millions of *P. bocourti* juveniles necessary to sustain the 15,000 tonnes of annual aquaculture production of this species in the Mekong delta were entirely dependent on captures from the wild.

The study of populations genetic of SE Asian *Clarias* species was also started in 1995 in a cooperation between IRD, the Central Research Institute for Fisheries (CRIFI-RIFF) based in Jakarta, Indonesia, and the University Montpellier II.

These different activities and their results provided a solid basis and motivated the preparation of a more ambitious collaborative research programme on the biodiversity and aquaculture of catfishes in SE Asia. Since November 1996, this programme, abbreviated as "Catfish Asia"<sup>1</sup>, is coordinated by IRD and supported by the European Commission. It associates 6 research institutions, from France (IRD and CIRAD), Belgium (Musée Royal de l'Afrique Centrale and Katholieke Universiteit Leuven), Indonesia (CRIFI-RIFF) and Vietnam (CTU) (Fig. 1).

A part of the research is also conducted in close cooperation with the AGIFISH Company in Vietnam and the services of the Directorate General for Fisheries in Indonesia, allowing real

possibilities for a rapid and efficient transfer of results from research to the production sector and fish farmers.

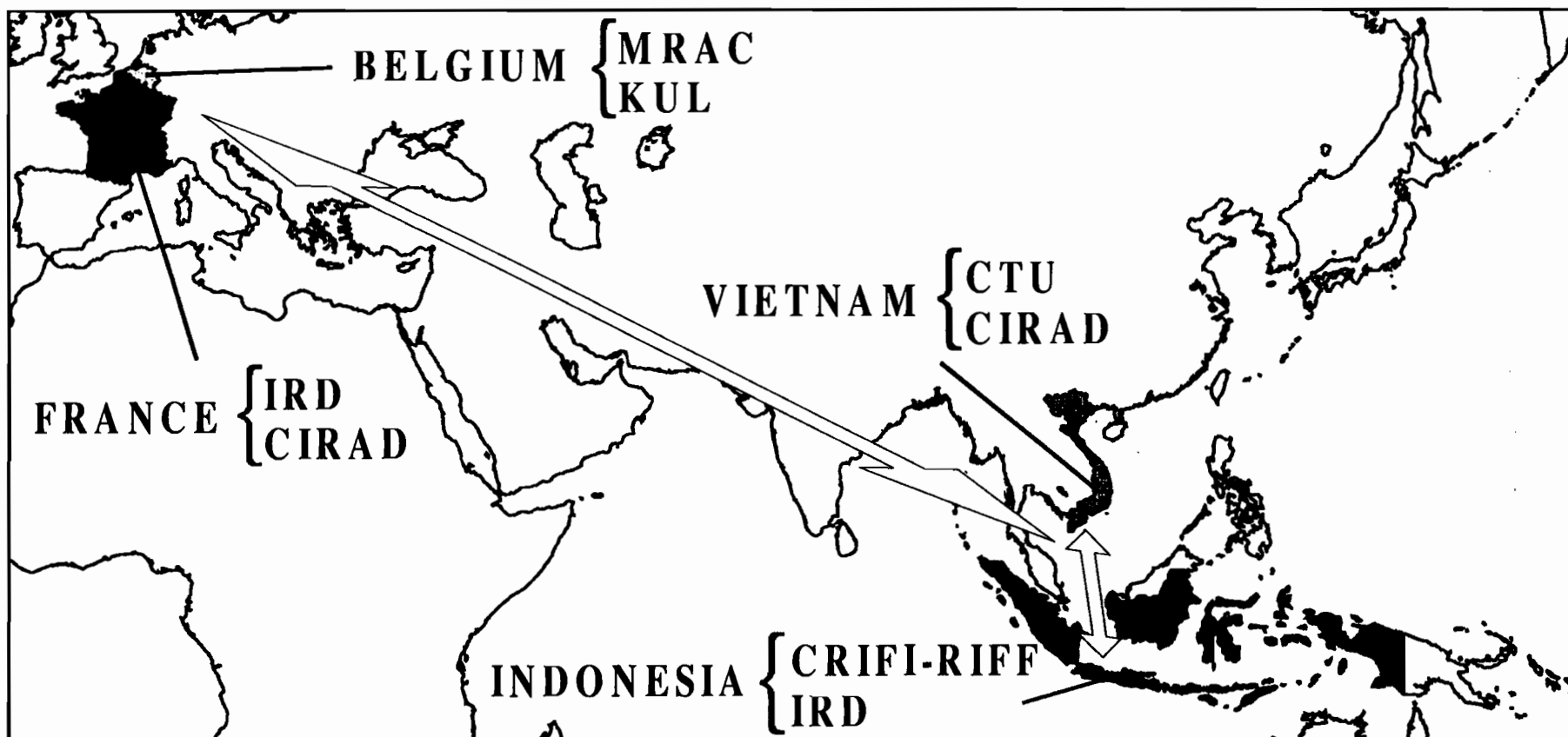
## OBJECTIVES OF THE "CATFISH ASIA" PROJECT

In order to enhance the **utilisation of the biological diversity** of the local freshwater ichthyofauna, acquire **sound biological bases** for the development of aquaculture, provide an appraisal of the present situation in order to **guide sustainable management** of cultivated and natural fish resources, and strengthen North-South-South cooperation between the European Union, Indonesia and Vietnam by the **transfer and exchange of technology**, the project aims at the following specific objectives:

- To characterise species, populations and strains of autochthonous Clariidae and Pangasiidae catfishes for:
  - A thorough knowledge of their taxonomy and appraisal of their phylogeny and zoogeography.
  - A general inventory of available resources that could be used for culture.
- To contribute to the knowledge of their life history.
- To implement monitoring tools that could be used for the analysis of population microstructuration and monitoring of genetic diversity in cultivated fish stocks (i.e. development of DNA microsatellite loci).
- To assess and compare the aquaculture potential of species, populations and hybrids in the Pangasiidae and Clariidae.
- To develop artificial propagation and culture techniques adapted to local conditions for some target species for which captive broodstock can be available:
  - Identification of the environmental requirements to attain full sexual maturity under rearing conditions and optimisation of induced breeding and artificial fertilisation procedures.
  - Assessment of some nutritional, behavioural and environmental requirements of larval and juveniles stages and optimisation of larval rearing methods.

<sup>1</sup> Full title of the project : *Characterisation, utilisation and maintenance of biological diversity for the diversification and sustainability of catfish culture in South-East Asia.*

Figure 1 : Institutions involved in the Catfish Asia project and their localisation.



**IRD** : Institut de Recherche pour le Developpement (Coordinating Institute)

**CIRAD** : Centre de Coopération Internationale en Recherche Agronomique pour le Developpement

**RIFF** : Research Institute for Freshwater Fisheries

**CTU** : Can Tho University

**MRAC** : Musée Royal de l'Afrique Centrale

**KUL** : Katholieke Universiteit Leuven







aquaculture and are always fascinating to produce, evaluation of their performances should be reserved to research station with closed facilities. Uncontrolled hybrid production trials on fish farms have been made both in Vietnam and Indonesia between various pangasiid species. The risk that individuals could escape from fish farms is high and may have serious impacts on the native gene pools. Therefore the production of hybrids in aquaculture should be considered only after a full evaluation of their performances in comparison to those of their parental species and an assessment of their possible fertility. The possibility or not of making hybrids between two species is also a good indication of their genome compatibility. The fact that the hybridisation between *C. gariepinus* and *C. batrachus* was successful in Bangladesh and neither in Indonesia nor in Vietnam, suggests that the nominal species *C. batrachus* corresponds to a species complex. It should be noticed that high genetic divergences were also observed between the low and highlands *C. batrachus* populations of Sumatra. Therefore the actual status of this important species for aquaculture clearly requests further investigations.

The final workshop of the "Catfish Asia" project is planned in May 2000 and will be organised in Bogor, Indonesia. A full synthesis of the results obtained during the 4 years of this collaborative programme will be presented at this occasion.

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# THE BIOLOGICAL DIVERSITY AND AQUACULTURE OF CLARIID AND PANGASIID CATFISHES IN SOUTH-EAST ASIA



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