Genetically pure indigenous carps are becoming rare in the rivers of Central Europe, where exotic species and various hybrids are spreading as a direct or indirect effect of the introduction of exotic species for aquaculture. The author who is attached to the Fish Culture Research Institute in Szarvas, Hungary, describes the situation and offers some practical ideas on how to rectify the situation there, and in other parts of the world.

Each natural water is characterised by its own native fish fauna which have developed for a long time in the respective large river systems, lakes and other water bodies and its species and quantitative composition have adapted to local ecological conditions. Thus in North America the Salmons and Catfish species have become predominant, and likewise, in Europe the Cyprinids, including the common carp. The Chinese carps are the major native species in the Rivers Jangce and Huangho of Central Asia, the Indian carps in large rivers of India, the Tilapia and Catfish species in Africa and the Puntius, the Pangasius and Channa species in the rivers of South-East Asia, including the Mekong River. In isolated or sometimes closed river systems, biological and population dynamics equilibrium have developed among the local fish species.

Exotic Species Spread Through Aquaculture

At the beginning of the 1950s development of intensive fisheries and aquaculture induced the initiation of significant fish culture activities all over the world. Introduction of artificial reproduction of fish, elaboration of polyculture stocking structures and starting genetic manipulations required a greater number of fish species, including foreign fish species. The introduction of common carp (Cyprinus carpio L.) to rivers of India and South-East Asia was carried out at this time. Later the silver carp (Hypophthalmichthys molitrix), bighead carp (Aristichthys nobilis) and grass carp (Ctenopharyngodon idella) were introduced in Europe, India and South-East Asia, then the Indian carps, Catla catla, Labeo rohita and Cirrhinas mrigala enlarged the species composition of aquaculture in Asia. Although the mentioned fish were stocked exclusively to develop aquaculture, in a short time the exotic species appeared in the rivers and lakes of the given regions. Their appearance might have been either the result of intentional human activity, e.g., stocking of fish or uncontrolled escape of fish from ponds, rice fields, effluent water of hatcheries or cages of intensive fish culture farms, which were kept in the rivers.

Artificially produced hybrid of Chinese silver carp and bighead. The fertile hybrid presumably would be able to reproduce under natural conditions.
Exotic species Replace Local Ones

Even though the introduction of exotic fish species for aquacultural purposes effectively increases fisheries production, this action is not always without risks. If the reproduction is managed by specialists, the risk of overpopulation may be minimised.

However, it is impossible to control the propagation of new fish species in natural waters. Before the introduction of Chinese carps into European rivers, the scientists were sure that the new species would not reproduce in the new niches because the environmental conditions were unsuitable for them. Yet thirty years after the introduction of these fish, which means about five to six generations in the life of the species, natural reproduction of these species was observed. This can be explained by their extremely good adaptability.

In general, the reproduction and over-population of introduced exotic fish species continues at the expense of local fish. Sometimes, however, it is only apparent because the decrease in population of local species may be caused by over-fishing, disappearance of spawning places and construction of dams on large rivers and tributaries. Thus, the exotic species fill the emptied place of local fish species by utilising their better adaptability.

Hybrids of Silver and Bighead Breed in Nature

From the end of the last century up to the present, about ten exotic fish species have been introduced. The purpose of this activity was partly for enlarging the species for both pond fish farming and sports fisheries and partly for scientific considerations.

Good results were achieved in the acclimatisation of Chinese silver carp, grass carp, black carp and bighead carp (1963), as these species contributed significantly to the increase of fisheries production in fish ponds, rivers and reservoirs because of their diversified nutritional habits. Although they are reproduced in fish hatcheries, nowadays their natural spawning is also observed in several niches. In spite of this, the possibility of experiencing overpopulation of these species in Hungary is very low because the conditions for hatching of eggs and survival of larvae are unfavourable. But since artificial crossing of Chinese carps in hatcheries is easy and so is often carried out, the hybrids of silver carp and bighead carp are found in rivers and, as they are fertile, they can naturally reproduce. However, because the artificial hybrids of grass carp and bighead carp as well as of silver carp and common carp are sterile and cross-breeding is practised in pond fish farming, spontaneous hybridisation of the mentioned Chinese carps has not been observed in the wild. These fish may grow up to 40-50 kilos when stocked in rivers and reservoirs and thus are difficult to catch if suitable fishing gears are unavailable.

In this context other examples, such as brown bullhead (Ictalurus nebulosus La Suer) and goldfish (Carassius auratus L.), can be mentioned, since after their introduction in 1902 and 1954, respectively, they have become so abundant that they have limited the reproduction and growth of several native fish species.

Rehabilitation of Indigenous Stocks

The increase and rehabilitation of local fish, including some endangered species, may be carried out by using the methods of artificial reproduction which are characterised by the following processes:

- Collection and skilful maintenance of broodstock
- Elaboration of methods of artificial reproduction
- Hatching of eggs and monitored rearing of larvae
- Stocking of feeding larvae or nursed fry into rivers and lakes

The construction of fish hatcheries could be an important part of the Research and Development Programme of the Mekong River Commission along the river near the large natural spawning and nursing places in Cambodia, Laos, Thailand and Viet Nam. In these areas the broodstock of the local fish species could be collected and millions of artificially hatched larvae could be stocked into the Mekong River. On one hand the construction of fish hatcheries would offer good possibilities for reproducing endangered fish species, such as Probarbus juliieni, Giant catfish and Catlo carpio siamensis, and on the other hand, it would offer the possibility of reproducing so-called Mekong species which lost their spawning places for different reasons. The nursing areas should be declared as fish conservation zones where fishing is prohibited. For this work the help of leaders of the local government offices, fisheries development and environment management projects should be employed.

Check Well Before Stocking

Introduction of new, exotic fish species should always be started with research and detailed surveys of the relevant conditions, such as hydro-ecology, fish fauna, quality and quantity of natural food, possible consequences of stocking and reproduction, and finally the economic factors affecting the fisheries.

Parallel to stocking of fish, it is advisable to collect data to make it easier to observe the effects of new fish species and to register the resulting changes for the prognosis of the expected situation for fisheries.