Fish gene banks (Introduction)

- Fish gene banks are much more recent and have a short history (2-3 decades) compared to plant seed banks and/or livestock insemination centers.
- The principal mandate of fish gene banks is almost the same for other gene banks focusing on preserving genetic materials especially for organisms under threat or close to extinction and the use of the preserved material –as required- in bringing a species back.
- Over-fishing, environmental factors (e.g. acid rain, pollution, flood, typhoons), stock enhancement, and fish escapes are among the influencing factors/practices which could threat fishery stocks and may contribute to the degradation of species purity. Domestication, breeding programs, and genetic manipulation are examples of influencing aquaculture practices.
- Without having gene banks, it will be difficult to restore the genuine version of threatened organisms. Also, it will not be possible to determine the negative impact resulting from gene introgression and inbreeding .

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Fish gene banks (Cryopreserved and live)

Types of fish gene banks as sorted according the technology practiced:

- **Cryopreserved (*in vitro*) gene banks:** Fish sperm –and not ova- has been successfully cryopreserved for many fish species. However, eggs of oysters and clams have been cryopreserved. The adoption of cryopreservation technology is much greater than live gene backs. This is related to its high efficiency, easiness in application and its reduced cost. In these banks, liquid nitrogen (-196°C) is used. During storage the samples should be maintained under liquid nitrogen since storage. Therefore, storage facilities should be fitted with alarms to warn when low levels of liquid nitrogen occur.
- **Live (*in vivo*) gene banks:** The main purpose was to establish a living reservoir of genetic material which could be used for the re-establishment or enhancement of threatened stocks. The preservation of live fish in living gene banks is a measure used for the most seriously threatened salmon stocks that are no longer capable of surviving in their natural habitats before the danger is over. Live gene banks could be established in/nearby the natural habitats or in different habitats which are believed safe. The key advantage of live gene banks is the ability to restore the full genome of species in concern, while the challenges related to these banks are the high cost and the special human skills required for the management of these banks. Far important, in long-term live gene banks, the contamination of fish stock is possible.

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Fish gene banks (Examples)

Examples of fish gene banks:

China: Cryopreserved and live gene banks for Chinese carps

India: Cryopreserved gene bank for the Indian major carps (catla, rohu, and mrigal)

Malaysia: Cryopreserved gene bank for indigenous fish species of *Tor* spp., *P. jullieni*, *P. nasutus* and *H. wetmorei*

Norway: Cryopreserved and live gene banks for Atlantic salmon

Philippines: Live and cryopreserved gene banks for tilapia

Russia: Living Gene Banks for the Azov and Black Sea species of sturgeon: Sterlet sturgeon (*Acipenser ruthenus*), and thorn sturgeon (*Acipenser nudiventris*)

USA: The gene banking for Columbia River salmon, Colorado River fishes, and Midwestern and Eastern US sturgeon

Tilapia cryopreserved gene bank – the Philippines
Photo credit: Kevin Fitzsimmons (USA)

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