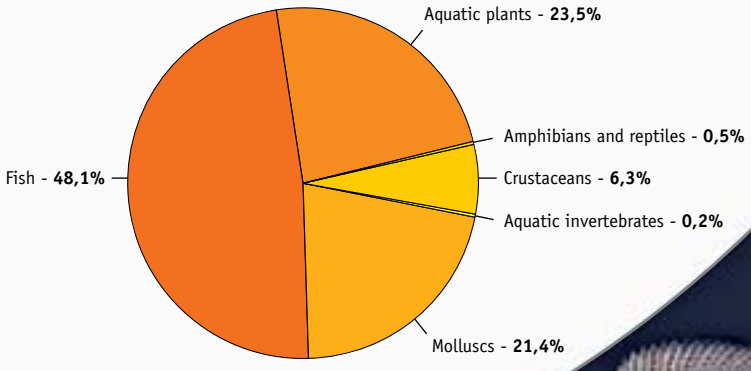
GENETIC BIODIVERSITY IN AQUACULTURE

Genetic biodiversity helps produce the variety of shapes, sizes, behaviour, and colours that make aquatic species valuable and interesting. It also allows species to adapt to new farming systems and new habitats. Without genetic biodiversity there would be no special varieties or breeds of aquatic species; eventually species would go extinct as they would be unable to cope with climate change and other changes to their environment. The FAO addresses these issues through its Committee of Fisheries and its Commission on Genetic Resources for Food and Agriculture.

BIODIVERSITY AT THE SPECIES LEVEL

Over 440 species of fish, invertebrates and plants are farmed around the world. This represents a wealth of genetic diversity both within and among species that helps make aquaculture one of the fastest growing food production sectors. However, most of these farmed species have not been genetically improved or domesticated to the extent that livestock and crops have been. Thus, there is tremendous potential to create improved breeds and better domesticated farmed aquatic species.

Biodiversity in aquaculture



Source: FAO FishStat

MANAGEMENT OF GENETIC BIODIVERSITY IN AQUACULTURE

The FAO Code of Conduct for Responsible Fisheries recognizes in Article 9.3 that genetic diversity of both farmed and natural populations must be managed responsibly. Genetic biodiversity provides the raw ingredients that allows breeders to improve the production, efficiency and marketability of animal and plant species in aquaculture. Genetically improved plants and animals can grow faster and use food more efficiently. Thus less inputs are required and less waste products are produced. Genetic improvement can help breeds grow in diverse salinities or temperatures or under low oxygen conditions. Disease resistant varieties require less pharmaceutical treatments. Broodstock management can help avoid inbreeding while allowing for genetic improvement of farmed species.

GENETIC TECHNIQUES
USING GENETIC BIODIVERSITY

Selective breeding, a traditional animal breeding technique, has only been applied to a small percentage of the hundreds of farmed aquatic species. Thus, there is tremendous scope for increased production from those unimproved species. Gains from selective breeding programmes can be on the order of 8% per generation.

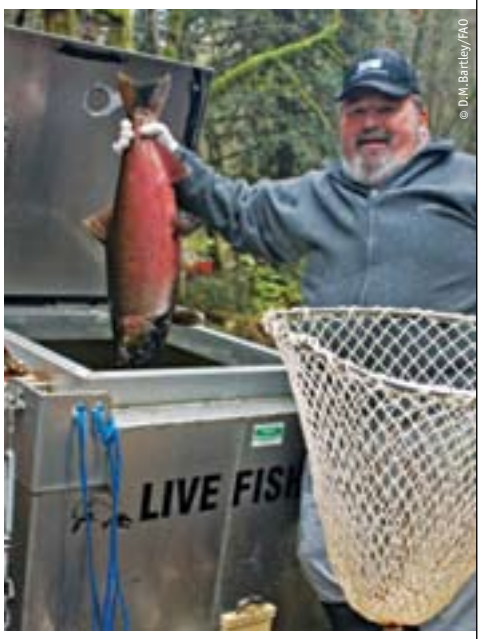
Many aquatic species are easily hybridized. This technique can be used to produce sterile organisms as in certain tilapia crosses, or to combine positive traits from two different species into one hybrid as is done in crosses between species of catfish. Hybridization depends on maintaining the genetic biodiversity of each of the original pure species; uncontrolled hybridization could endanger the pure species.

The chromosome-set number of many aquatic species can be increased. This is often done to produce sterile organisms. Sterility in farmed species is often desirable to reduce the chance of unwanted reproduction and to improve growth efficiency; sterile organisms do not spend as much energy on reproduction and therefore can use it for growth. Temperature, pressure, and chemical treatments, as well as hybridization have been used in carps, salmon, trout, and oysters to mass produce organisms with extra chromosomes.

NATURAL GENETIC BIODIVERSITY
A RESOURCE FOR SUSTAINABLE FISHERIES AND AQUACULTURE

Natural genetic biodiversity is a resource that aquaculturists can draw on periodically in genetic improvement programmes. However, aquaculture and the use of genetically altered breeds could pose a risk to wild relatives through interbreeding and other adverse ecological impacts. Better Management Practices and the use of sterile organisms will reduce this risk; other measures such as limiting the use of aquaculture to areas that do not contain valuable wild resources would reduce the risk even further.

Conservation hatcheries can be developed that will match genetically and behaviourally wild populations that have become threatened or endangered. By following strict breeding protocols and culture methods, conservation hatcheries in conjunction with an overall species recovery programme can help rebuild wild populations.



Learn more:
www.fao.org/fishery

Further information about the work of FAO on biodiversity is available at:
www.fao.org/biodiversity

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