Common carp genetics and breeding in China

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Common carp in China

- China is a country vast in territory, where the complex of climatic and geographical conditions has led to the evolution of a multiplicity of common carps (*Cyprinus carpio*), both in form and in genetic characters.
- Common carp culture has a long history (more than 2500 years) and common carp has a lot of morphological variations through artificial breeding and natural selection.

Local common carp

Cultured production in China

- Common carp ranks the 3rd in the production of cultured species and plays very important role in fish culture.
- In 2007, the national culture production of common carp reached 2,228,585 tons, covered 12.73% of total production of freshwater fishes.

Genetic improvement and breeding

- Selection
- Hybridization: Economical crossing
- Polyploid: Triploid/tetraploid induction
- Gynogenesis/Sexual control: All-female seeds
- Gene transfer
- Introducing exotic varieties

Genetically improved varieties/Hybrids

- Selected varieties : 11
- Hybrid: 6
- Triploid: 1
- Exotic varieties: 3

(Authorized by the national committee for fishery breed)

Artificial selected varieties

C. carpio var. *wuyuanensi*

C. carpio var. *singuonensis*

C. carpio haematopterus

Cyprinus carpio: songpu carp

Hybrids

- Feng carp: (*C. carpio* var. *singuonensis*♀ x Scattered mirror carp♂)
- Heyuan carp: (*C. carpio* var. *wuyuanensis*♀ x *C. carpio var. yuankiang*♂)
- Yue carp: (*C. carpio* var. *wuyuanensis*♀ x *C. Carpio*♂)
- Lotus carp: (Scattered mirror carp♀ x *C. carpio* var. *singuonensis*♂)
- Tri-crossed carp: (Heyuan carp♀ x Scattered mirror carp♂)

The triploid Xiangyun carp

- Hybrid of tetreaploid and a native diploid common carp.
- The tetreaploid was induced from the hybrid of a common carp and a crucian carp.
- It shows fast growth, good meat quality and strong disease resistance.

All-female common carp

- Hybrid of normal XX female Xinguo red carp and sex reversed XX male scattered mirror carp.
- Before sex-reverse, the scattered mirror carp was induced gynogenetic diploid.
- All-female common carp grows faster than that of male fish and mixed group.

The nuclear-cytoplasmic hybrid *CyCa*

- *CyCa*: common carp nuclei transplanted into crucian carp cytoplasm.
- Used as parent fish of the hybrid.

CyCa

hybrid

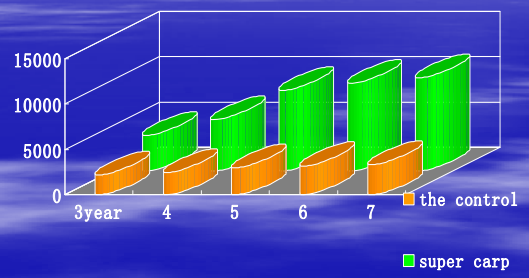
Super carp. 48 months old. Above: control,4300 g. Below: transgenic, 7800 g.

transgenic common carp

Growth performance of super carp F1

15Months Old. 4900 g and 1200 g.

Growth performance of super carp



The exotic carp species

Germany mirror carp

scattered mirror carp

Russian scale carp

Jian carp (*Cyprinus carpio* var. *jian*)

C. carpio wuyuanensis

C. carpio yuankiang

Cyprinus carpio var. *jian*

Jian carp

- First artificial fish breed in China.
- Combined breeding technique: family selection, inter-line cross and gynogenesis.
- Fast growth, long body shape, grayish color, strong disease resistance, wide adaptability, convenient for different culture ways.
- Weight increment is higher than other native and introduced breeds by 30%.
- Culture production is over 1,000,000 tons annually in China.

Carp genetic improvement with ADB, ICLARM 1997-2000

- The selected group of Jian carp is higher in individual weight increment than the control by 6.6%-11.6%.
- Jianghuang (Jian carp ♀ × Huanghe carp ♂) grows 9.2%-11.7%, 26.7%-31.8% faster than Jian carp and Huanghe carp.

Carp genetic improvement with WFC

Genetic group for common carp in FFRC

Research progress

- Family selection of Jian carp.
- PIT tagging.
- Quantitative genetics.
- Finished 2 generations selection.
- Apr.08, breeding of G3, mated for 90 selected family and 20 control with breeding value and family background.
- G3 family: 101，selected family: 84，the control: 17.

PIT tag

Quantitative genetics

Molecular marker assisted selective breeding

- Molecular biological techniques are used and/or developed for analyzing and collecting molecular information from the breeding materials

  AFLP, RFLP, SSR,

  mtDNA, microsatellite

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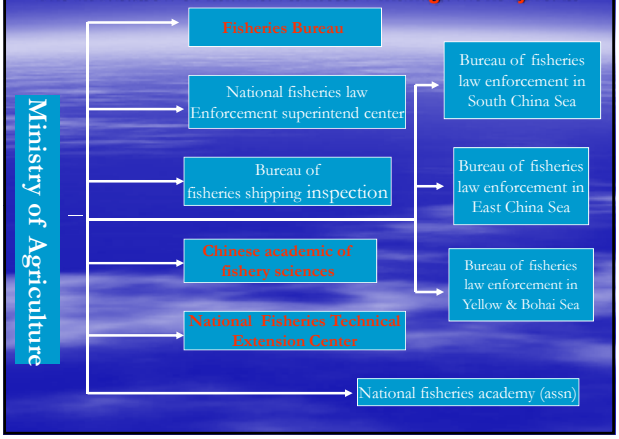
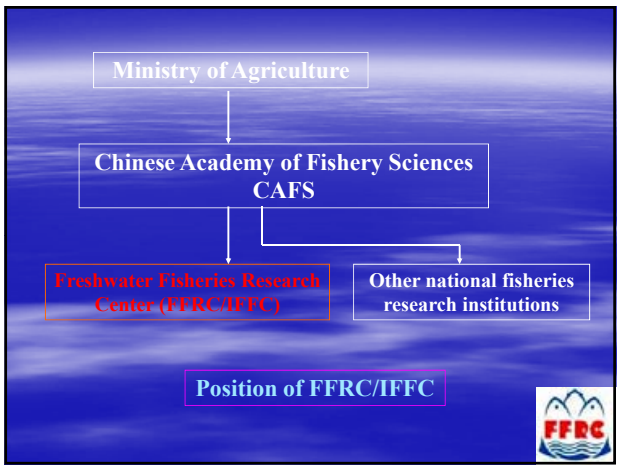
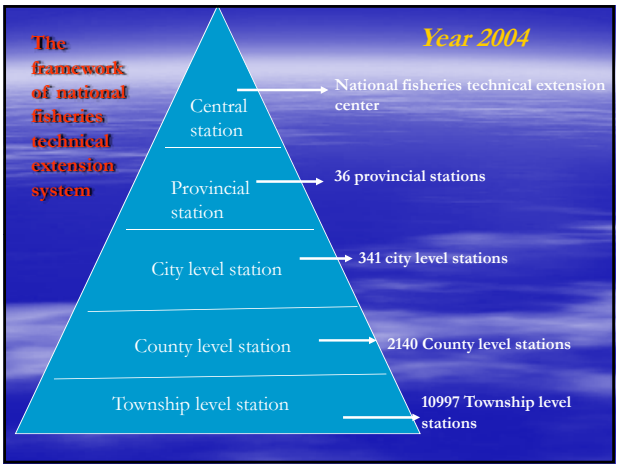
Genetic resource collection and conservation

Organization and management of aquaculture

The institution of national fisheries management system







The main functions of fisheries technical extension system

1. Supervising and establishment of local fisheries technical extension stations , extension working team and extension system.
2. Organizing and put forward the implement of the "5 years planning of national fisheries technical extension work "
3. Technology transfer, extension and demonstration of advanced technology.
4. Professional skill appraisal, technical training and technology counseling .
5. With the responsibility for disease observation and prediction, disease and epidemic prevention works.
6. Supervising on fish medicine and medicating
7. Supervising and build up a seedling system and do the breed examination and approbation
8. Development of international cooperation and exchange on fisheries technology
9. Development of fisheries information services.