

On the Behavior of Carp-goldfish Hybrids

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It has been reported by many investigators that the carp-goldfish or carp-funa hybrids can be reared to the adult stage and they are morphologically and biochemically intermediate between their parental forms (ISHIHARA and MISAO, 1929; MATSUI, 1931, 1933; KOBAYASI, 1951; SUZUKI, 1957a, 1957b; OJIMA, 1957; MAKINO, OJIMA and MATSUI, 1958). In the present study, hybrids are also artificially produced from the carp, *Cyprinus carpio*, ♀ × the goldfish, *Carassius carassius auratus*, ♂ and the reciprocal, in order to observe the hybrid behavior. Four cement aquaria being 31 cm. deep, 98 cm. wide and 120 cm. in length were kept under the same condition and then ten individuals of hybrids or controls reared in respective aquarium. Unless otherwise stated, the tiny earthworms and the rice bran are used as food material.

Experiments and observations

1) *Jumping behavior.* There are some habitual wide differences between the carp and the goldfish. As is well known, the carps often jump upon the water surface when their environment is suddenly changed. Sometimes the jump is also caused by merely playful mood. But no such behavior is observed in the goldfishes. To ascertain whether the jump is observed or not in hybrids, a board is obliquely stood in one side of an aquarium and then advanced slowly toward the fish school as shown in Fig. 1. Thereby, the carp controls of one-year old jump up actively 10 to 30 cm. in height on the surface. No jump of the goldfish, however, is caused by the same way as the case of the carp. On the other hand, although hybrids from the carp female and the goldfish male usually do not jump, they flounce under just surface splashing the water. Few of them, on rare occasions, jump up 1 to 3 cm. The quite similar behavior to the hybrids described above is also observed in the reciprocal hybrids. This intermediate behavior is not observed in about one-month old hybrids, though in just two-month old, being about 30 mm. in body length.

2) *Feeding behavior.* Next, to observe the feeding behavior, hybrids or controls are reared in each aquarium in which set a lot of the aquatic plant, *Hydrilla verticillata*, instead of the rice bran. The carp controls actively eat leaves or young stems of the plant, so that after five days only tough stems rest (Fig. 2A). But the goldfish controls scarcely eat them so far as for five days. The material, therefore, rests under the intact form (Fig. 2D). One-year old hybrids from the

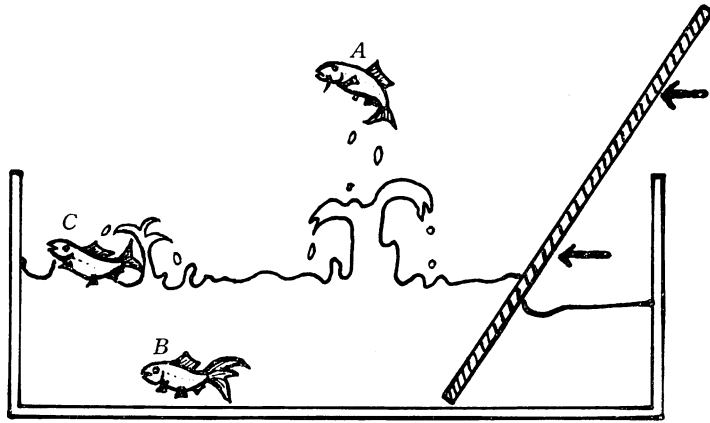


Fig. 1. A half-diagrammatic figure showing the behavior of the carp-goldfish hybrids and the controls, when a board is advanced slowly toward the fishes. A; *Cyprinus carpio* control. B; *Carassius carassius auratus* control. C; *Cyprinus carpio* ♀ × *Carassius carassius auratus* ♂ or the reciprocal.



Fig. 2. Aquatic plants, *Hydrilla verticillata*, which were eaten by *Cyprinus carpio* control (A), *Cyprinus carpio* ♀ × *Carassius carassius auratus* ♂ (B), *Carassius carassius auratus* ♀ × *Cyprinus carpio* ♂ (C) and *Carassius carassius auratus* control (D).

carp female and the goldfish male eat the plant, though is not so extreme as the carp control (Fig. 2 B). The similar phenomenon to the case of hybrids described above is also observed in the reciprocal hybrids (Fig. 2 C). Namely, the feeding behavior of hybrids is intermediate between those of the both parents. This behavior does not be observed in three-month old hybrids, but in four-month old.

Summary and conclusion

Intergeneric hybrids are artificially produced from the carp, *Cyprinus carpio*, ♀ × the goldfish, *Carassius carassius auratus*, ♂ and the reciprocal. Their jumping and feeding behaviors are intermediate between those of two parents being observed in one- or four-month old after hatching.

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