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An Occurrence of Intergeneric Hybrid Cross, *Pungtungia herzi* X *Pseudopungtungia nigra* from the Ungcheon River, Korea

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A suspected intergeneric hybrid cross between *Pungtungia herzi* and *Pseudopungtungia nigra* was collected at the Ungcheon River. Overall hybrid index did not show the hybrid connection clearly, but the most striking key character between two genus, pigmentation on the all fins except pectoral, the shape and position of the mouth part appeared to show the intermediary. So this specimen was thought to be an intergeneric natural hybrid which merits further study.

Introduction

Many hybrids among the teleost fishes have been artificially produced and considerable number of natural hybrids have been also discovered especially in freshwater fishes (Trautman, 1981). In Korea, there have been reports on the occurrence of hybrid in cobitid fishes in the Dong-jin River (Kim, 1985) and on the subspecies of the genus *Pungitius* (Chae and Yang, 1990).

During the environmental survey at the lower parts of the Ungcheon River, locating in mid-western Korea Peninsula from June to August, 1988, one suspected intergeneric hybrid specimen was collected. Subsequent examination revealed that it could be a probable hybrid cross of *Pungtungia herzi* and *Pseudopungtungia nigra, Pungtungia herzi* is widely distributed in almost all rivers and lakes of the Sourthern Korea, while *Pseudopungtungia nigra,* an endemic species, is restricted to the Kum River, the Mankyung River and the Ungcheon River (Choi, 1973). These two species become particular interest as they appear to have close phylogenic affinity for their morphological similarities and rather distinctive zoogeographic distributional patterns.

The occurrence of this hybrid prompted us a study to verify its systematic status and to provide a morphometric, meristic and descriptive analysis of this hybrid.

Material and Methods

The single hybrid (82.5 mm, TL) specimen was collected in the Ungcheon River, Ungcheon-

myon, Boryung-gun, Chungnam-do, Korea. The suspected hybrid brought in the laboratory and fixed in 10% formalin solution. To examine the character expression of the hybrid, 32 characters were selected for analysis, all of which are generally used to describe the morphology of cyprinids. Methods for counting were followed Hubbs and Lagler (1958). Measurements of specimen were made using vernier calipers (0.05 mm) and were estimated to nearest 0.1 mm.

Identification of the hybrid was based on the criterion of Hubbs (1955), i.e. the morphometric and meristic intermediary of the hybrids in most characters with respect to the parental species. Although individual characters were not always intermediated between the parental values, intermediary of the typical characters of the putative parent species which are the key generic and species characters, was the primary evidence for indentifying natural hybrid. Hybrid specimen is deposited in the Department of Biology, Chonbuk National University.

Results

Fish fauna from the studied area : A total of 134 fish specimens were collected which were composed of 3 family, including 12 species (Table 1). Among the 12 species, 10 species were the Cyprinidae, and others were Plecoglossidae and Gobiidae. The dominent species was *Tridentiger obscurus*, which comprised 39% of the all collected specimens.

Table 1. Fish species collected at the Ungcheon River, August 1988

species	number of individuals
Plecoglossus alttivelis	1
Acheilognathus intermedia	2
Acheilognathus yamatsutae	3
Cobitis striata	2
Carassius auratus	1
Zacco platypus	24
Zacco temmincki	14
Pseudogobio esocinus	6
Squalidus majimae	15
Pungtungia herzi	12
Pseudopungtungia nigra	2
Tridentiger obscurus	52

Cyprinids other than *Pungtungia herzi* and *Pseudopungtungia nigra* were ruled out as possible parents by examining the key generic and species characters and constructing preliminary hybrid indices. The suspected parents, *Pungtungia herzi* and *Pseudopungtungia nigra* accounted for 9% and 1% of the all specimens, respectively.

Description : Data for 18 morphometric and 3 meristic characters are summarized in Table 2. Hybrid in dices were intermediated for four characters, closer to *Pungtungia herzi* in four characters and closer to *Pseudopungtungia nigra* in four characters. Some hybrid characters were within the range for both parents, while some mean characters were considered to be extreme and thus outside the range. Body depth (expressed as proportions of the standard length, SL) and eye diameter (as proportions of the head length) were greater than the mean for either parent while caudal peduncle length (as proportions of the head length), interorbital width (as proportions of the eye diameter) were lower than the mean for either parents. The

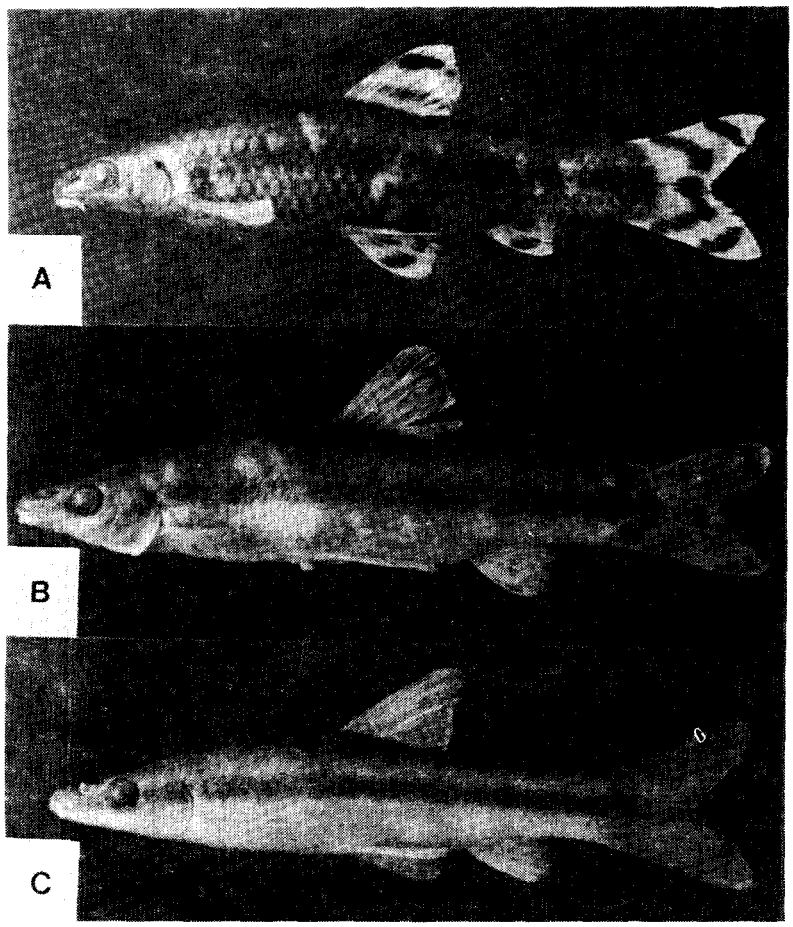

Fig. 1. A. *Pseudopungtungia nigra,* 85.0 mm TL
B. Hybrid, 82.5 mm TL
C. *Pungtungia herzi,* 74.6 mm TL

intermediated hybrid indices (30-70) were head length, distance from the snout to pectoral fin and caudal peduncle length/caudal peduncle depth and the numbers of lateral line scale. The others were same mean value as their parents.

Above all, the most striking intermediate characters occurred in the aspects of the pigmentation on the all fins except pectoral (Fig.1), and the morphology and position of the mouth (Fig.2), which are the key generic and species characters. That is, the genus *Pseudopungtungia* having inferior and horse-shoe shaped mouth, and all fins except pectoral with distinct broad black cross bars while the genus *Pungtungia* have terminal mouth, well developed flesh substance around the mouth part and no pigmentation on the fins. However the hybrid have intermediate type mouth and diffusely pigmented cross bars on the fins.

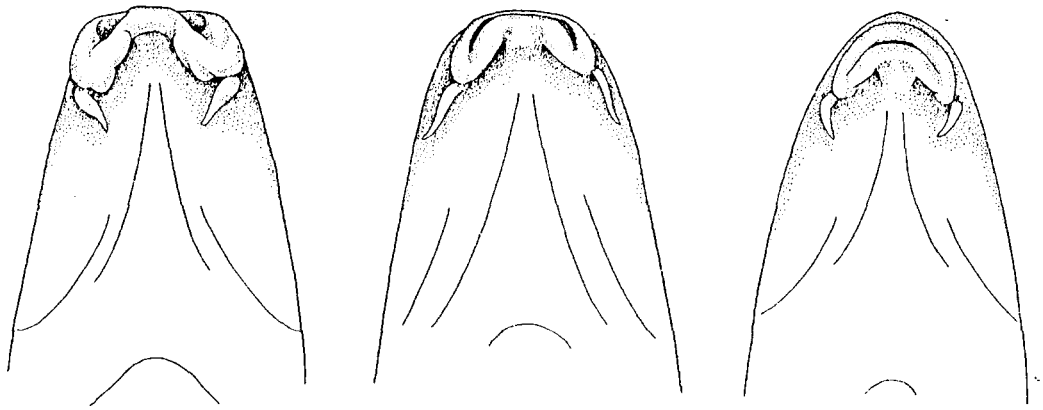

Fig. 2. Ventral view of the mouth parts
A. *Pseudopungtungia nigra* B. Hybrid C. *Pungtungia herzi*

Discussion

A single suspected hybrid (Fig.3) collected at the Ungcheon River was considered to be a hybrid between *Puntungia herzi* and *Pseudopungtungia nigra*. Although the overall hybrid index did not indicated the hybrid connection clearly, the most striking intermediate characters, pigmented black cross bars on the all fins except pectoral, the shape and position of mouth part which are the key generic characters showed the intermediate form.

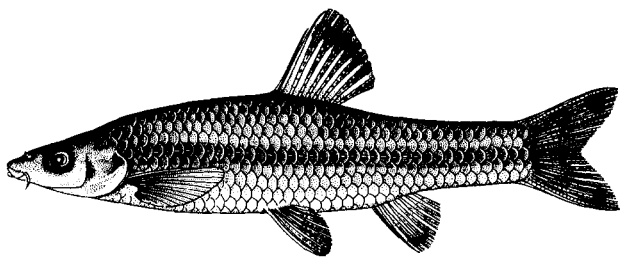

Fig. 3. Hybrid specimen, bar 5 mm

The probability of hybridization between fish species is increased by crowding of spawning fishes, removal of isolating barriers, environmental stress or a scarcity of one species relative to a related abundant species (Hubbs, 1955). It is thought to be that the latter two circumstances may have aided the principal causative agent of hybridization between the two species.

The hybrid was originally described as a species by Goldsborough and Clark (1908, cited in Stauffer *et al.*, 1979) and subsequently redefined as a hybrid by Raney (1940). This situation is not unique in the ichthylogical literatures. Wagner (1969) listed several differences between hybrids and species, including the duration of the taxon and the number of generations. Hubbs *et al.* (1943, cited in Stauffer *et. al.*, 1979) also addressed this problem and indicated that hybrids are usually too few to represent an estabilished species, and have characteristics which are

Table 2. Comparison of proportional measurements of the hybrid *P. herzi*×*P. nigra* with parental type

Characters	*P. herzi*		Hybrid	*P. nigra*		Hybrid Index
	Range	Mean		Mean	Range	
Standard length, mm	55.3–79.9		82.5		52.5–80.7	
Proportions of standard L. :						
Body depth	4.0– 4.6	4.4	4.5	4.3	4.2– 4.4	−100
Head length	3.4– 3.8	3.7	4.2	4.6	4.6	56
Dorsal fin	1.8– 2.0	1.9	1.9	1.9	1.9	–
Pectoral fin	3.2– 3.7	3.5	3.8	4.1	4.0– 4.1	50
Ventral fin	1.8– 1.9	1.9	2.0	2.0	1.9– 2.0	100
Anal fin	1.3– 1.4	1.4	1.4	1.4	1.3– 1.4	–
P–V	4.0– 4.4	4.2	4.1	3.8	3.7– 3.9	25
Caudal peduncle length	4.6– 5.6	4.9	4.8	5.3	5.0– 5.6	−25
Caudal peduncle depth	7.8– 8.7	8.4	7.7	7.7	7.5– 7.8	100
Proportions of head length :						
Caudal peduncle length	1.2– 1.6	1.4	1.1	1.2	1.1– 1.2	150
Caudal peduncle depth	2.1– 2.5	2.3	1.8	1.7	1.6– 1.7	83
Snout length	2.3– 2.7	2.5	2.5	2.3	2.3	0
Eye diameter	4.2– 4.6	4.4	4.7	3.9	3.7– 4.1	−60
Inter-orbital width	2.8– 3.1	3.0	2.8	2.8	2.6– 2.9	100
Barbel length	5.1– 6.5	5.8	7.5	13.7	11.5–15.8	22
Proportions of eye diameter :						
Inter-orbital width	0.6– 0.8	0.7	0.6	0.7	0.6– 0.8	–
Barbel length	1.1– 1.6	1.3	1.6	3.5	3.1– 3.8	14
CPL/CPD	1.6– 1.9	1.7	1.6	1.5	1.4– 1.5	50
No. dorsal fin rays		7	7	7		
No. anal fin rays		6	6	6		
Lateral line scales	37–38		38		38–39	

clearly intermediate between the putative parents. Probably the best evidence of the role of hybridization in the process of evolution of fishes was demonstrated by Hubbs and Hubbs (1932) when they reported apparent parthenogenesis in a hybrid Poeciliidae. Hubbs(1961) also hypothesized that the genus *Carassius* may have been of hybrid origin between carp and goldfish. It is suggested that hybridization may be a viable mode of speciation.

In spite of subsequent several trials at the studied area, we could not find out any more hybrid specimens. Therefore, we tentatively concluded the studied specimen as a intergeric natural hybrid. Further study with more hybrid samples is needed to determine the exact status of hybrid.

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돌고기 *Pungtungia herzi*와 감돌고기 *Pseudopungtungia nigra* (Pisces ; Cyprinidae)의 屬間 自然雜種의 發生

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1988년 6월에서 8월 사이에 충남 보령군 웅천면 웅천천에서 어류상을 조사하던 중 돌고기 *Pungtungia herzi*와 감돌고기 *Pseudopungtungia nigra* 사이의 屬間 雜種이라 의심되는 개체를 채집하였다. 形態形質과 計測形質의 비교조사 결과, 두 屬間의 key character인 지느러미 반문의 pigmentation, 그리고 입의 모양과 위치등에서 중간형질 (intermediary)을 보여주고 있어서 본 개체는 두 屬間의 自然雜種이라 생각되었다.