

The Influence of Water Quality Changes on the Fish Fauna Stabilization of Urban Stream in Seoul, Korea

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서울의 대표적 도시하천인 중랑천의 수질 변화에 따른 어류군집의 장기적 변동과 군집의 안정성에 대해 1990년부터 2001년까지 조사하였다. 중랑천은 1980년대와 1990년대초까지는 수질악화, 수변대 훼손으로 물고기가 서식하지 못하였으나 1990년대 초반이후의 수질개선으로 잉어 및 붕어와 같이 오염에 강한 종들부터 서식하기 시작하여 현재까지 18종의 서식이 확인되고 있다. 연도별 출현종수는 1990년에는 어류의 서식을 확인할 수 없었으며, 1996년 6종, 1998년 9종, 2000년 11종, 2001년 14종으로 증가하는 추세다. 그러나 출현종 및 개체수 증가에 따라 갈수기인 봄철과 이른 여름철에는 산란장소를 찾는 잉어, 붕어 등이 한강에서 중랑천으로 대거 이동하는 과정에서 대량폐사가 발생하기도 하였다. 2000년 4월 및 6월, 2001년 6월에는 중랑하수처리장 하류와 수중보 정체구역에서 소량의 소나기성 강우 이후 발생한 일시적 용존산소 고갈로 대량의 잉어류폐사가 발생하였다. 수질사고 이후, 수중보 및 하상 저니 등에 관련된 중랑천 생태계의 구조와 기능에 대해 많은 연구와 개선이 이루어졌으나 본래의 자연성을 아직까지 회복하지 못하고 있다. 특히 중랑천은 2005년 9월에 하천 복원이 완료되는 청계천의 한강어류 이동통로 역할이 중요시되고 있는 하천이다.

I. INTRODUCTION

Stream ecosystems show a continuous gradient of physical conditions from upper region to mouth. Those also elicit a continuum of biotic adjustment and abiotic characteristics of loading, transport, utilization and storage of organic matter(Hynes, 1970; Allan, 1995). But, biota of urban streams in Seoul according to the cityward tendency of the population

have been greatly damaged since 1960s(Bae *et al.*, 1997). The Jungrang Stream is a typical urban stream and discharges into the lower parts of the Han River with the heavy pollutants. Fishes were not founded at the Jungrang Stream because of water pollution and habitat destruction since 1980s. And then, fishes started to inhabit in the Jungrang Stream from the early 1990s. Thereafter, mass floating and death of fishes happened every year. In particular, many fishes from the main course of the Han River migrate to the upper part of the Jungrang Stream during the spawning season from April to June. When they migrate, a large number of fishes frequently died at the deficient zones of dissolved oxygen. Therefore, we had surveyed on the influence of water quality changes on the fish fauna stabilization of Jungrang Stream polluted with domestic sewage and industrial wastewater.

II. MATERIALS AND METHODS

The surveyed sites were Nowon Br.(St. 1), Jungrang Br.(St. 2), Jangan Br.(St. 3) and Seongdong Br.(St. 4) in Seoul. Fishes were seasonally surveyed in 1990, 1996, 1998, 2000 and 2001 at the sampling sites. Fishes were collected by a catch-net with 3 mm mesh size and preserved in 10% formalin. Water quality was monthly checked 3 sites (St. 1, 2, and 4) for the study period.

III. RESULTS AND DISCUSSION

1. Water quality

The water qualities of the Jungrang Stream have been gradually improved since 1980s. BOD has decreased since 1990. Total nitrogen and total phosphorus have increased since 1980s. Annual mean values of T-N at the lower site(St. 4) have greatly increased from 8.66 mg/l in 1990 to

19.13 mg/l in 2000. Also, annual mean values of T-P at site 4 has gradually increased from 0.98 mg/l in 1990 to 1.46 mg/l in 2000. Therefore, high level treatment of sewage at Jungrang and Euijeongbu sewage treatment plants are needed.

2. Fish fauna and community

Fishes had not been found at the Jungrang Stream in the 1980s, but tolerant species *Cyprinus carpio* and *Carassius auratus* (Cyprinidae) were first occurred in the early 1990s when the water quality improved because of enforcement of the water quality improvement policy of Seoul metropolitan government. The fishes collected during the whole survey period was classified into 18 species. Fishes were appeared more abundant at the mid-Stream section than the upper region or mouth of the Stream. It appears that most fishes of the lower and middle areas of the Stream could not migrate to the upper site by the obstacles such as weir and water pollution. Species number of fishes has gradually increased 6 species in 1996, 9 species in 1998, 11 species in 2000 and 14 species in 2001. Species number of fishes in the Jungrang Stream has gradually increased from 6 species in 1996 to 14 species in 2001. But mass floating of fishes on the water surface in dry season has frequently occurred at stagnant spot by weir and discharging point of the Jungrang sewage treatment plant because of DO depletion. The water quality of the Jungrang Stream has been gradually improved since 1990, but the level of the improvement was not sufficient for the fish spawning and habitation. For ecosystem restoration of Jungrang Stream, more advanced level of the treatment of urban sewage, self purification ability, and habitat restoration of Stream bed are needed.

IV. CONCLUSION

The spatial and long-term influence of water quality changes on the fish faunastic and community characteristics in the Jungrang Stream was evaluated from 1990 to 2001. Fishes in the Jungrang Stream were seasonally surveyed in 1990, 1996, 1998, 2000, and 2001. Water quality was monthly checked for the study period. Fishes in the Jungrang Stream had not been distributed in the 1980s and 1990 because of heavy water pollution as well as environmental damages in the beds and riparian areas. However, species numbers gradually increased to 6 species in 1996, 9 species in 1998, 11 species in 2000, and 14 species in 2001. Individual numbers rapidly increased to 164 individuals in 1996, 146 individuals in 1998, 108,094 individuals in 2000, and 2,380 individuals in 2001. But, mass fish floatings were occurred on the April 21st, June 11th, 2000 and June 2nd, 2001 due to DO depletion at the lower site of discharging point of Jungrang sewage treatment plant and stagnant sites. Major dominant and subdominant species were *Cyprinus carpio*, *Carassius auratus* and *Carassius cuvieri* (Cyprinidae). Species diversity and richness indices were slightly higher at the middle reaches than the upper reaches and the mouth of Jungrang Stream, and these indices were relatively low. The fish fauna of the Jungrang Stream was very poor and its community structure was very unstable conditions. This research data will be utilized for the preservation and protection of fish fauna and urban Stream ecosystem in Seoul, Korea.

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