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A Study on Water Quality Monitoring in Urban Watercourse of Xinli River in Binzhou City

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Abstract This paper aims to explore the pH, COD, ammonia nitrogen, total nitrogen, total phosphorus and other indices regarding Xinli River water in Binzhou City. The results show that the pH of the water quality index is between 7.3 and 7.8, slightly alkaline; the COD content of Xinli River is about 140–163 mg/L, and the COD pollution is serious in some water sections; the ammonia nitrogen content of Xinli River is 0.2–2.17 mg/L, the total nitrogen content is about 0.799–1.3 mg/L, the total phosphorus content is about 0.54–0.92 mg/L, suggesting that the water eutrophication is very serious. Due to the large amount of domestic sewage discharged into Xinli River without treatment, slow circulation of river water and other factors, the eutrophication is serious in the urban watercourse.

Key words Ecological river, Water pollution, Water quality monitoring, Binzhou City

1 Introduction

The ecological river, as an important part of the urban ecosystem, is a river ecosystem in which the river itself, the biological system in the river and the surrounding human activities are in a state of balance and harmony. In terms of natural attributes, it requires the integrity, stability and sustainability of the structure and function of the river water ecosystem, and requires the river ecosystem to have a strong ability to resist the outside interference. The urban ecological river is an indispensable element of urban survival and development. It plays an important role in the economic development and ecological protection of the cities and surrounding areas. The dependence of city on water resources, and flooding may also bring increasingly serious disaster to the cities. People are changing from the concept of traditional water conservancy and drainage to the concept of safe, comfortable and beautiful ecological water environment.

Xinli River is a drainage river excavated in 1975, located in the heart of downtown of Binzhou City, and is the main drainage river in Bincheng District and Development Zone. The river flows from the Yellow River embankment ditch in the vicinity of Lijiakou Village in the south through the city development zone, Shizhong, Shixi, Pengli, Shangji, Binbei and other township offices, into Chaohe River in the northwest of Podu Village, with a total length of 31.9 km, and a watershed area of 136 km². As the project has run for many years and it is seriously dilapidated, it is currently overgrown with weeds and silted up.

The river water pollution and environmental degradation result in reduced discharge capacity and affect the surrounding environment^[1–2]. In recent years, the water pollution of ecological

river is increasingly serious in Binzhou City, and the water environment is deteriorating, causing a certain impact on the industrial and agricultural production and people's life. Currently, there are few studies on the ecological river water pollution in Binzhou City.

Therefore, using the water quality monitoring methods, Xinli River is sampled, to analyze the indices of pH, COD, ammonia nitrogen, total nitrogen and total phosphorus in the water, so as to provide a theoretical basis for the control of water pollution in the study area, and provide a reference for the comprehensive improvement of ecological river.

2 Materials and methods

Six points are set up in Xinli River to collect the water samples; Yellow River 8; Yellow River 7; Yellow River 6; Yellow River 5; Yellow River 4; Yellow River 3. The distance between the sampling points is about 500 m.

In collecting the water samples, the mineral water bottles of a medium size with the same specifications are selected. Before taking the water samples, the bottle and bottle cap are rinsed with the water samples 2–3 times, and the amount of water collected is 3–5 times the amount of test water sample.

The water samples 0.3–0.5 m below the water surface are generally collected, and 3–5 replicates are collected at each sampling point. It is immediately sealed and stored after collection, and the unanalyzed samples are stored in the refrigerator for about 24 hours.

3 Experimental methods

The dissolved oxygen in the water is determined using the classical iodometric method. The ammonia nitrogen is determined using the Nessler's Reagent Spectrophotometry. The chemical oxygen demand (COD) is determined using the potassium chromate method.

The total nitrogen is determined using the potassium persulfate-UV spectrophotometric colorimetry. The total phosphorus is determined using the Mo-Sb Sepetrochrometry^[3].

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4 Results and analysis

4.1 pH In the investigation, it is found that the there is obvious rotten egg smell and odor near the drain outlet of Xinli River, indicating that the sulphide content is high, and the smell is a little light in other river sections. The investigation data show that the salt content of Xinli River is 3% – 9%. From Fig. 1, it is found that the pH of Xinli River is 7.3 – 7.8, changing slightly, and there is a roughly rising trend from Yellow River 3 to Yellow River 8 in Xinli River, from 7.38 to 7.75, and the water is slightly alkaline.

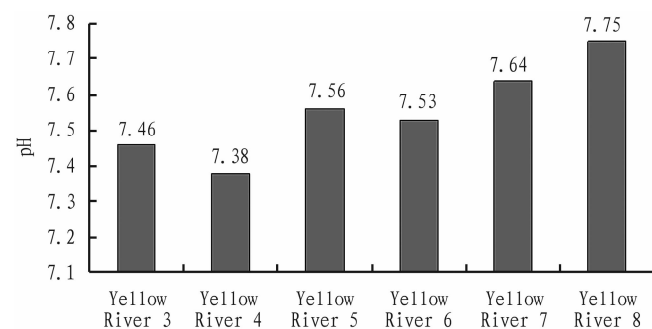


Fig. 1 The pH at each sampling point in Xinli River

4.2 COD content As can be seen from Fig. 2, the highest COD value of Xinli River is 163 mg/L in Yellow River 8, and the lowest COD value of Xinli River is 140 mg/L in Yellow River 6. The COD value gradually decreases from Yellow River 3 to Yellow River 6, but gradually increases from Yellow River 6 to Yellow River 8.

In the national wastewater discharge standard, the wastewater COD discharge standard II of other discharge units is 150 mg/L. It can be drawn from the above analysis that the COD content of river water in Yellow River 3 and Yellow River 8 is well above the standard, and the pollution is serious. The pollution is more serious in Yellow River 8. Through the investigation, it is found that the pollution is mainly due to the discharge of considerable domestic sewage.

In addition, the water system in the downtown can not be circulated naturally, and the water purification capacity is limited, easy to produce a chemical reaction, or emit an unpleasant odor or produce green algae, causing the water pollution and the death of aquatic organism.

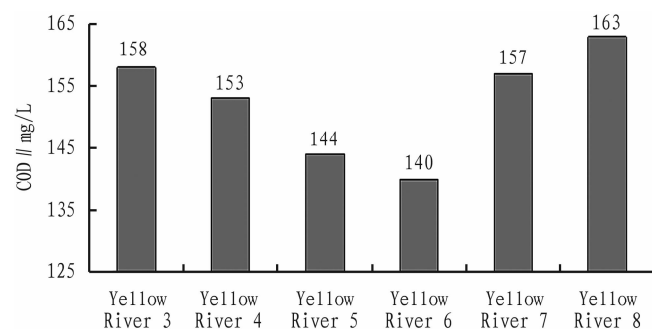


Fig. 2 The COD at each sampling point in Xinli River

4.3 Nitrogen content From Fig. 3 and Fig. 4, it is found that the highest value of the ammonia nitrogen content in Xinli River is

2.17 mg/L, and the ammonia nitrogen content is 0.2 – 0.7 mg/L in other river sections; the total nitrogen content of Yellow River 7 (0.799 mg/L) and Yellow River 3 (0.946 mg/L) is significantly lower than that of other river sections.

It is assessed according to *Surface Water Quality Assessment Standard* (GB3828-2002). As can be seen from Fig. 3 and Fig. 4, the average total nitrogen content of Xinli River is 1.05 mg/L, and although it is lower than the threshold value of water quality standard IV (1.5 mg/L), the nitrogen pollution is still relatively serious.

The reason for this phenomenon may be due to incomplete sewage pipe network construction, which causes a lot of domestic sewage to be directly discharged into the river without being treated by the sewage treatment plant, thus leading to the water pollution.

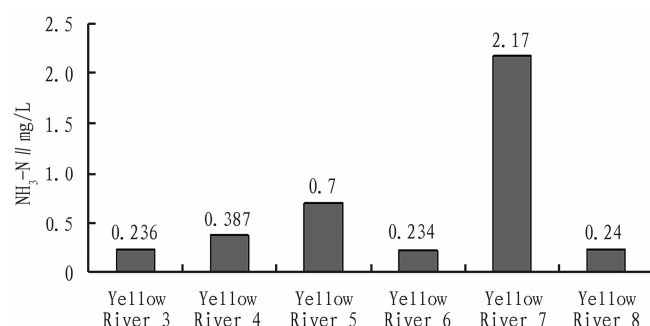


Fig. 3 The ammonia nitrogen content at each sampling point in Xinli River

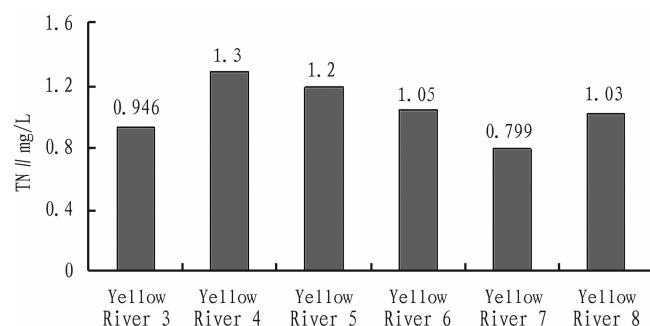


Fig. 4 The total nitrogen content at each sampling point in Xinli River

4.4 Total phosphorus content As can be seen from Fig. 5, the total phosphorus content is 0.54 – 0.92 mg/L in Xinli River, the highest concentration is 0.92 mg/L in Yellow River 6, and the lowest concentration is 0.54 mg/L in Yellow River 7.

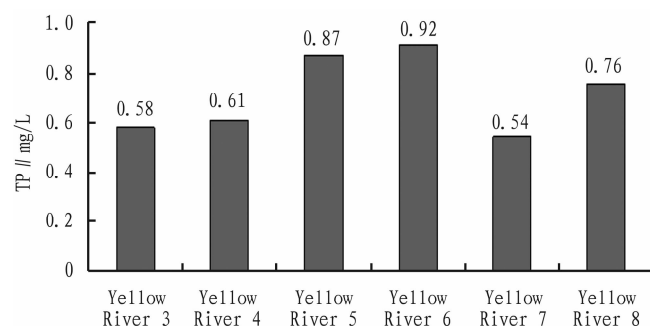


Fig. 5 The total phosphorus content at each sampling point in Xinli River

