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RESEARCH ARTICLE

WATER QUALITY OF THE HEIROK-WANGJING RIVER

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ABSTRACT

The Physico-chemical and biological analysis of the Heirok-Wangjing River water was carried out over a stretch of 22.5km. Temperature, transparency, pH, dissolved oxygen, bio-chemical oxygen demand, carbon-dioxide, chloride, total alkalinity, acidity, calcium hardness, NO_2 and NO_3 etc. increased slightly from its origin to the end of the river in the valley. This increase in the parameters was the result of human activities. A total of fifteen species of fish and seven groups of aquatic insects and one class of annelids were recorded from the river.

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INTRODUCTION

Water quality of the Heirok river is not healthy. Water bodies are heavily contaminated and river is exposed to domestic and agricultural effluent. Since water pollution is essentially a biological phenomenon, the degree of pollution can be estimated either from physical and chemical properties or from biological characteristics of water. The present paper includes biological estimates, their taxonomic composition along with chemical assessment of the Heirok river. This river is one of the most important one in Thoubal District of Manipur, populated by one fourth population of the district, originates from the "Thongnangband" hills in the form of deep gorges with meandering streams in the hilly regions having a swift flow. In the plain river flows become slower, wider near the mouth of the end, bifurcated at the fifth sampling station of the study area which end at the Kharungpat. (Kharung-*big-earthen pot*, pat-*lake*) and other as khonglambi ends at Ikopat. The river is subjected to various anthropogenic activities for domestic proposes, in bathing including animals, washing clothes and utensils, dumping of household garbage, fishing that may deteriorate water quality. Data on physico-chemical parameters of the river is very scanty. Thus the present study was undertaken.

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MATERIALS AND METHODS

The present study on the Heirok-Wangjing-river stretching of 22.5km was selected and five sampling stations (1) Konaitong lok, (2) Turelmacha, (3) Heirok Part-I, (4) Lamding, (5) Tentha were established. Monthly sampling at interval of every month were done from May to December 2015 in PVC and BOD bottles and the samples were brought to the laboratory in chilled condition. The Physico-chemical characteristics of water were estimated by standard procedures (APHA 1998) Fishes were analysed after Shrestha (1981), Berg (1974) and Vishwanath (2002) while aquatic insects were analysed after Ward and Wipple (1964).

RESULTS AND DISCUSSION

Temperature of water varied from 15-30^{0}C (Table 1) and transparency varied from 6.5-28cm. Water was always found in hazy colour except Konaitong and Turelmacha sampling station 1 and 2 during investigation period. pH was always acidic near to neutral. Dissolved oxygen ranged from 6 to 10.7 mg/l and BOD was found 2.1 to 3.8mg/l during investigation period. The result is supported by Goel (1986).Total alkalinity ranged from 30 to 95mg/l. Increase in alkalinity was recorded during winter. Analogous variation in alkalinity was reported by Mohendra *et al.* (2015). The total acidity ranged from 7 to 26.5mg/l. CO_2 content in water varied from 6 to 20mg/l. Increasing free CO_2 may result in the increasing of alkalinity Singhal *et al.* (1986).

Table 1. Average physic-chemical parameters of water in (gm/l) at the Heirok Wangjing Revier from May to December2015

Parameters	May	June	July	August	September	October	November	December
Temperature °C)	25.3 ±2.5	26.1±2.1	21.8±1.1	25±2.1	26.8±2.1	16.2±1.1	12.6±1.4	10.8±1.9
Transference (CM)	18.3±1.7	19.2±1.4	20.2±6.8	26.4±5.2	16.8±4.10	-	-	-
pH	6.8±0.2	6.6±0.4	6.0±0.7	6.8±0.3	7.5±0	4.9±0.05	7.7±0.2	7.2±0.1
D.O	7.8±1.0	6.8±1.2	6.4±0.9	6.4±0.6	5.5±0.4	8.3±0.7	8.8±0.9	9.0±0.4
B.O.D	1.2±1.2	2.1±1.0	2.1±9	1.6±0.5	1.4±0.6	3.6±1.7	3.3±2.4	3.6±3.3
Total Alkalinity	43.6±22.7	4.6±21.5	43.5±17.0	67.6±14.2	60±22.5	47±18.0	58±16.3	60±2.3
Acidity	14±1	13.5±1.0	9±1.3	9±3.1	10.5±1	17±4.1	18±4.6	18±4.9
Co_2	12.4±1.0	13.3±0.8	8.4±1.0	8.0±2.5	9.7±1	17±4.0	17±4.7	18±4.2
Chloride	5.1±1.3	4.3±1.0	4.7±1.6	12.5±0.9	12.3±0.8	9±1.6	13.7±1.3	13.6±1.0
Total hardness	28.5±2.6	27±2.3	29±18.4	32±19.2	35±28.1	30±15.5	34±17.5	36±1.0
Calcium	8.6±0.8	8.7±0.9	10±1.5	9.8±5.2	8.3±4.3	12.4±7.3	8.8±3.2	7.9±3.2
Nitrite	0.07±0.02	0.7±0.03	0.06±0.02	0.04±0.02	0.01±0.16	0.01±0.13	0.01±0.15	0.4±0.12
Nitrate	0.10±0.01	0.09±0.02	0.04±0.03	0.02±0.04	0.07±0.08	0.12±0.16	0.10±0.16	0.3±0.17

On the basis of macro-invertibdrates and their biotic index the study site can be categorized into two types viz. unpolluted and slightly polluted. The situation analysis showed a community with a high number of groups. The biological analysis showed a community with a high number of groups. This situation is demonstrated by the high scores of chironomus. The pollution study is based on the presence of a big proportion of *Ephemeropterans* and *Coleopterans* at upstream region (Konitong Lok (sampling side 1) and Turelmacha (sampling side 2 area) while presence of Dipterans at downstream region (Wangjing & Tentha area). Snakeheaded fish was also found.

Study area of Heirok-Wangjing river

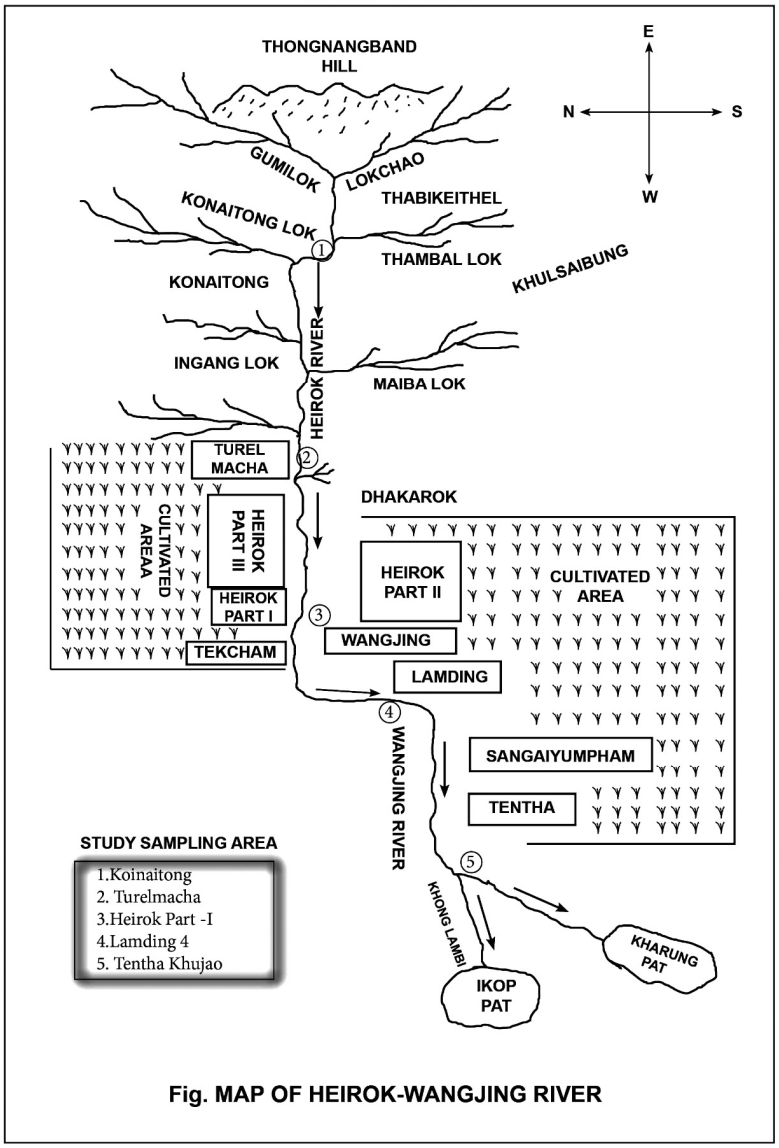

Fig. MAP OF HEIROK-WANGJING RIVER

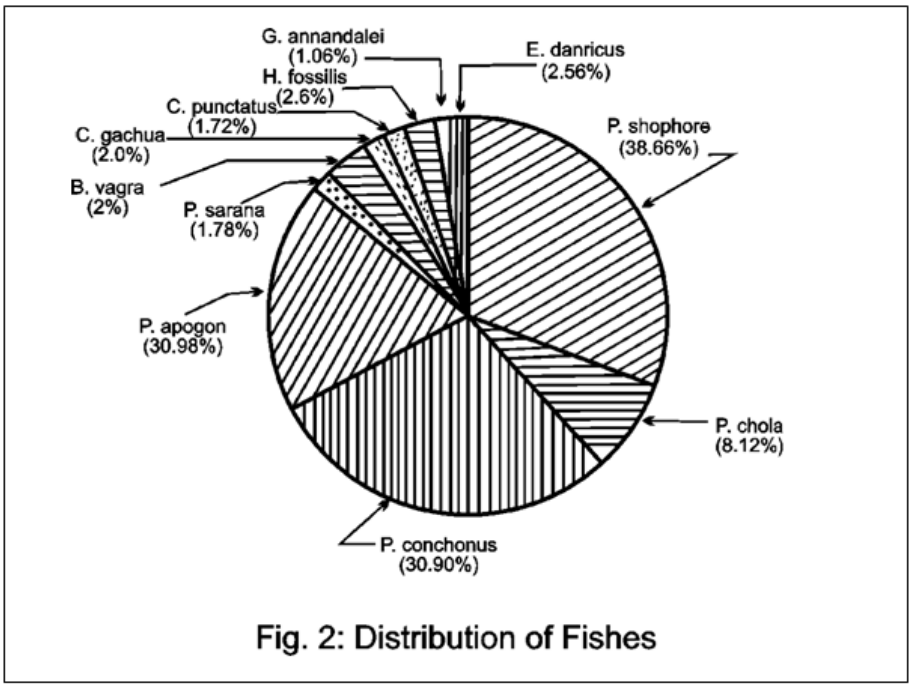

Fig. 2: Distribution of Fishes

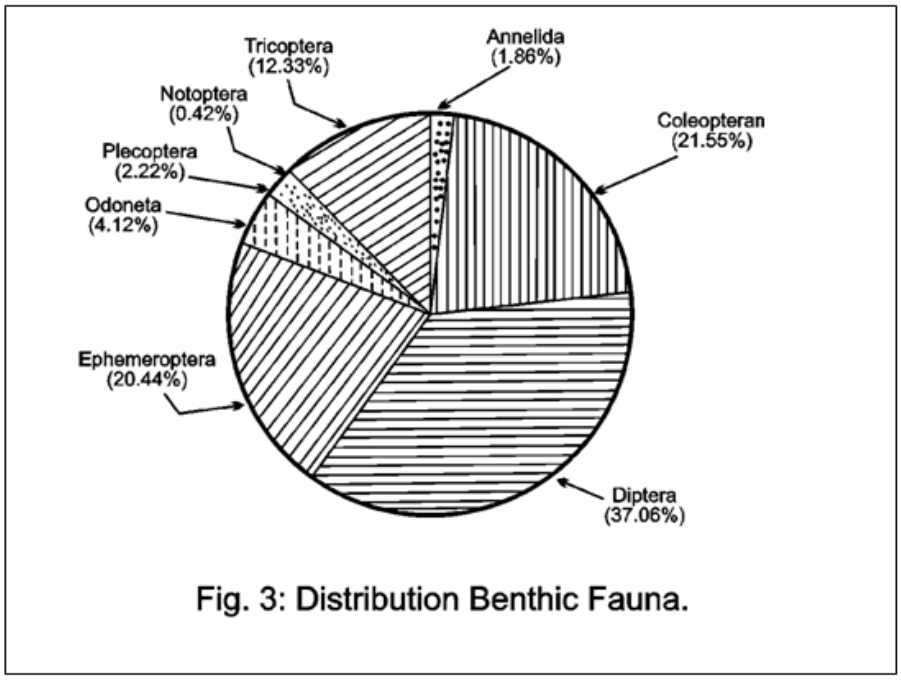

Fig. 3: Distribution Benthic Fauna.

Similarly, chloride content ranged from 4-16.4mg/l. Chloride concentration was higher during post-monsoon at sampling station – 3. High chlorinity would reduce DO content of water which turns harmful for aquatic organisms Koushik *et al.* (1999). According to WHO, maximum limit for chloride is 500mg/l. The value observed in present study is well below this permissible limit. The hardness concentration value fluctuated between 16 to 90mg/l. Calcium hardness value observed in present study was higher during summer than winter. This phenomenon was supported Singh, (1993). According to (Ohle we 1956) the water above calcium value 20mg/l are classified as calcium rich. Thus as per recommendation of owle we, most the water sample of the present study are well below. Most of the water sample in winter rainy season was moderately soft while water in winter, and summer were found to be moderately hard. Generally 20mg/l of hardness concentration of Ca^{++} is considered efficient for fish culture according to Lind (1974) but hardness more than 100mg/l as $CaCO_3$ is common in the country – Nitrite and Nitrate content in water varied from 0.02 to 0.12 and 0.01 to 0.40 gm/l respectively, supported by Mohendra *et al.* (2015).

Aquatic life depends on physico-chemical parameters of water. The fish and other aquatic fauna in the Heirok-Wangjing river were found to be distributed but influenced by combinations of

several physical, chemical and biological factors. The river bed with small stones, gravel and sandy substrate and growing vegetation showed a good diversity of aquatic fauna comprising fifteen Species of fish and seven groups of aquatic insects and one class of annelids were collected. Stony and sandy substrate in the river showed the dominance of *Puntius* spp. which are the indicators of organic pollution. *Garra* spp. and dominating benthos were the members of Tubificidae. *Ephemeropterans, Coleopterans* and *Chironomus* spp. are the indicators of organic pollution. Death fishes were also observed during rainy season, may be the lack of oxygen since high inflow of domestic sewage rich in organic waste in water bodies' fish kill by poison is common in lamding Sangaiyumpham area. Conservation strategies must be adopted by checking the entry of waste into these economically important water bodies.

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