CHAPTER 2

REVIEW OF LITERATURE
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Biological processes are largely dependent on the nutrient release from the surrounding environment. Obviously this aspect drew attention from both
temperate and tropical world. A large number of workers investigated the dependency of the biological factors on the nutrients available (Hutchinson, 1957; Vallentyne, 1957; Goldman, 1960; Michael, 1969; Kerr et al., 1970; Rao & Mohan, 1977; Gopal & Sharma, 1978; Outridge et al., 1989; Saha & Pandit, 1990; Datta Munshi et al., 1993 and Nautiyal et al., 1996). Sreenivasan (1970) and Timms (1970) observed that oxygen was a limiting factor of production while Lasenby (1975) and Wetzel (1983) considered turbulence pattern of water to be associated with the oxygen content in a system.

Various concepts and theories of lotic ecosystems have been put forward by Ward (1989) and Boon (1992) to understand the relationship between river systems and the fisheries they sustain and also the important processes in large rivers. River quality has rapidly degraded as the industrial revolution proceeded in Europe and North America and the falling water quality combined with eutrophication due to high nutrient levels in the rural and domestic wastes has affected most rivers of this region. The spread of industrialization has produced serious water pollution problems in developing countries like India (Robert 1989).

Many of the world's large rivers are affected by multiple abuses and the ability of the lotic ecosystem and fish communities to recover from the increasing changes is obscure despite the capacity of such systems to respond rapidly under natural disturbance regimes. Hydrological survey of various rivers in the different parts of the world has been carried out mostly in the later half of this century.
The most extensive studies carried out so far in the world are in European rivers. Among the significant works made in the last two decades include Backiel & Penezak (1989) on Vistula River; De Sosta and Lobon-Cervia (1989) on River Ebro; Lelek (1989) on the Rhine; Pavlov & Vilenkin (1989) on River Volga; Fruget (1992) on River Rhône; Kajak (1992) on River Vistula; Petts (1989 & 1994), Gastescu (1993), Whitehead & Neo (1995) and Vadineanu et al., (1998) on rivers of Western Europe. Similarly, many workers (Cadwallander, 1986; Mackay & Shafron, 1989; Pollard, 1990; Sharley, 1993; Walker & Thoms, 1993) had worked on the fourth largest river system in the world, the Murray-Darling River system of Australia. This river is characterized by high sediment loads due to erosion of agricultural land which has led to river water degradation.

The African rivers in general have a relatively high water quality with comparatively little industrial pollution (Welcomme, 1976; Cambray et al. 1986; Kassibo, 1988). These rivers are heavily fished and an annual yield of more than 1.5 million tones has been estimated. The fauna including the aquatic invertebrates from certain African rivers were reviewed by Lowe- McConnell (1987).

Latin American rivers are still little exploited relative to African rivers (Welcomme, 1990). Research on the ecology of the rivers of South America (Fink & Fink, 1979; Soares, 1979; Goulding, 1981; Petrera, 1982; Angermeier & Karr, 1983; Junk, 1984; Coates, 1985; Cambray et al. 1986; Saunders & Lewis, 1988; Bonetto et al., 1989; Valderraama & Zarate, 1989; Skelton, 1986) has been carried out especially around Manaus where the backwaters of the Rio
Negro joins the white waters of Solimois from the Amazon proper (Bayley, 1983 & Sioli, 1984). Limnology of the North American rivers was studied by a number of workers (Hesse et al. 1989; Benke, 1990; Baker et al. 1991). Karr (1993) in his extensive review documented rapid depletion of vertebrate and invertebrate, especially molluscan fauna from the North American rivers. River degradation has had severe affects on fish yields and fish stocking and habitat management programmes are being pursued in United States and Canada (Mitchell & Gardiner, 1983; Dodge & Biette, 1992) for the assessment of the ecological conditions and integrity of water resources.

A good number of literatures are also available on the river ecology from the different regions of Asia. Prominent among them are Willey (1910) & Raphael (1976) from Sri Lanka; Smith (1945), Brandt (1964), Hiranyawat (1968) & Boonsom (1976) from Thailand; Ruttner (1931), Vaas et al. (1953) and Prayitno (1976) from Sumatra and Bali; Inger (1955), Inger & Chin (1962) from Borneo; Bishop (1973) & Ji (1976) from Malaysia; Satomi (1976) from Japan; Yeong (1976) from Korea; Qureshi (1976) from Pakistan; Datingaling (1976) from Philippines; Gopalakrishnan (1976) in the Indo-Pacific; and Chowdhury & Bhuiya (1990) from Bangladesh. The hydrography of Asia is dominated by a series of large rivers radiating from the Tibetan plateau. They are all prone to heavy flooding and pollution which has led to a point where substantial changes in fish species composition have occurred (Liao et al., 1989). At the same time, all the Asian river systems are being heavily fished with intensive management through mixed natural and aquacultural techniques. The status of conservation of tropical Asian
rivers was well documented by Dudgeon (1994).

The lateral linkages of river channels and the floodplain were investigated since the beginning of the twentieth century (Antipa, 1910). However, extensive studies on the ecology of floodplains, especially their productivity and fisheries began during 1950's (Welcomme, 1985; Lowe-McConnell, 1987). These studies on tropical rivers and their flood-plains and more recent works on temperate-rivers in the northern hemisphere (Petts, 1989; Copp, 1989 & 1990) and Australia (Gherke, 1991; Walker et al., 1992) confirmed the inter-relationships of river-floodplain complex and the importance of flooding cycles.

There are plenty of published work on the hydrobiology of the rivers and floodplain lakes of the Indian sub-continent. Gulati & Wartz-Schulz (1980) reviewed the limnological literature of India and identified 325 papers up to 1979 but in the following two decades this number has been amplified greatly because of the growing concern in environmental conservation. Among all the rivers, the Ganga received the most attention from Indian workers (Jhingran & Chakraborty, 1958; Jhingran & Tripathi, 1976; Bilgrami & Datta Munshi, 1979, 1985; Singh, 1988; Sinha et al., 1989; Datta Munshi & Singh, 1991; Khanna, 1993; Singh et al., 1994; Khan et al., 1998). The limnological studies on the other important rivers include River Mahanadi (Job et al., 1955); River Godavari (Bhimachar, 1959; Rao & Rajyalakshmi, 1976); River Yamuna (Chakrabarthy et al., 1959); River Gomti (Bhaskaran et al., 1965); River Daha (David & Ray, 1966); River Tapti (Karamchandani & Pisolkar, 1967); River Hoogly (Ghosh et al., 1973);
River Cauvery (Srinivasan, 1976; Sampath et al., 1979); River Bhagirathi (Singh, 1985); River Jhelum (Sundar, 1988); River Sone (Singh & Singh, 1993); River Kosi (Datta Munshi & Datta Munshi, 1995) and river Narmada (Unni & Naik, 1997). During the last two decades, the ecology of the Himalayan rivers have also been studied in detail (Badola & Singh, 1981; Singh et al., 1982; Nautiyal, 1984, 1985 & 1986; Bhatt & Pathak, 1989; Pathak & Bhatt, 1993).

Rivers act as a major habitat for freshwater fisheries. As such, ichthyologists all over the globe have had special attraction for fish and fisheries of the riverine system. Some of the important works reported during the last few decades are mentioned here (Harrel et al., 1967; Banareascu, 1972; Mann, 1972; Rikhter & Efano, 1976; Gorman & Karr, 1978; Evans & Noble, 1979, Pantulu, 1979; Welcomme, 1979; De Silva et al., 1980; Goulding, 1980; Baker & Ross, 1981; Schlosser, 1982; Bonetto, 1986; Lowe-McConnell, 1987; Sparre et al., 1989; Bishop & Forbes, 1991; Capone & Kushlan, 1991; Pusey et al., 1993; Harris, 1995. In India too, the freshwater fishes were studied in some detail in the 19th century (Hamilton, 1822; McClelland, 1839; Bleeker, 1853; Blyth, 1860). The splendid works of Day (1877 & 1889) are still relevant as far as Indian fishes are concerned.

Francis Day, an Assistant surgeon in east India Company took it as hobby of inventorizing fauna found in India and in twenty three years he was in India and studied the fish fauna (1852-1874) and his works was documented in ‘Fishes of India’ (1875-1878). However, earlier works were mostly centered on taxonomy.

The North-eastern region is bestowed with varied physiographical features ranging from snow capped mountains to river valleys and most of the states receive a good amount of rainfall that makes the region rich with water resources, most important being the river Brahmaputra as most of the rivers and rivulet ultimately drain to it. But, most of the works on hydrobiology was concentrated to taxonomical accounts only that too on the Brahmaputra river system, other rivers were scantily studied.

The earliest account of study on the fishes and hydrobiology was available on the Brahmaputra River and its ichthyo fauna by Hamilton (1822). Some of the other important works in the 19th century included those of McClelland (1839), Robinson (1841), Beavan (1877), Hunter (1879) and most remarkable contributions of Day (1877 & 1889). For the first few decades of the present century, several workers studied the taxonomy and distribution of fishes in the Brahmaputra

The state of Arunachal Pradesh is known for its rich biodiversity, but systematic study of faunal diversity barring mammals is fragmentary. The ichthyofaunal study in this part of India is very scarce. The few references on fish fauna are: McClelland (1839) reported 4 species of fishes from Mishmi Mountains (now Lohit district), Choudhury (1912) recorded 21 species of fishes from Abor country (now West Siang District), Hora (1921b) listed 5 species from Abor hills, Jayaram (1963) described a new Sisorid fish from West Kameng district, while Menon (1964) reported *Garra lissorhynchus* from Assam Himalayas (Arunachal Pradesh). Again, Jayaram and Mazumdar (1964) listed 19 species from West Siang district; Srivastava (1966) recorded 32 species and Choudhury & Sen (1977) for 42 species from Arunachal Pradesh. Meanwhile, Dutta & Sen (1977) added new distribution of *Schizopygopsis stoliczae* from Subansiri district (Papum Pare). Other notable works on distribution of fish fauna from the state were made by Jhingran and Sehgal (1978) for 10 species, Choudhury (1978, 1980 & 1981) for 20 species from Lohit, Tirap and Subansiri districts, Ghosh (1979) for 30 species, Dutta & Burman (1985) for 28 species, and Nath & Dey (1985) for 85 species of fish from Arunachal Pradesh. Gurumayum *et. al.* (2000) investigated periphyton communities in the hill streams.

Namdapha National Park was unexplored for its flora and fauna till 1983 when it was declared as 15th Tiger Reserve of the Country and MAB project of UNO and Ghosh (1987) of Zoological survey of India conducted extensive survey for its faunal elements from 1981 to 1985 when they have recorded 76 species of fishes (Annexure-1) from this National park, out of which 5 were new to science.

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