CHAPTER II

REVIEW OF LITERATURE
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Hydrological survey of various rivers in the different parts of the world has been carried out mostly in the latter half of the twentieth century. Probably the most extensively studied rivers of the world were the rivers in Europe. Significant works among them include Backiel & Penczak (1989) on River Vistula; De Sostoa & Lobon-Cervia (1989) on River Ebro; Lelek (1989) on River Rhine; Pavlov & Vilenkin (1989) on River Volga; Kajak (1992); Fruget (1993) on River Rhone; Petts (1989 & 1994); Vadineanu et al., (1992); Gastescu (1993) and Whitehead & Noe, (1995) on rivers of Western Europe. Similarly, the Murray-Darling River system of Australia, the fourth longest in the world, has also been extensively studied by a large number of workers (Cadwallander, 1986; Mackay & Shafron, 1989; Pollard, 1990; Sharley, 1993 and Walker & Thomas, 1993). Rivers in Australia generally have a relatively high water quality with comparatively little industrial pollution (Cambray et al., 1986; Kassibo, 1988). The fauna including the aquatic invertebrates from certain African rivers were reviewed by Lowe-McConnell (1987). Limnology of the North American rivers was a matter of attraction for a number of workers (Hesse et al., 1989; Benke, 1990). Karr (1993) in his extensive review documented rapid depletion of vertebrate and invertebrate, especially molluscan from the North American rivers. Rivers degradation has 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, 1993) for the assessment of the ecological conditions and integrity of water resources.

In Indian context, among all the rivers, the Ganga received the most attention from Indian workers (Jhingran & Chakravorty, 1958; Rai, 1974; Jhingran & Tripathi,
The limnological studies on the other important rivers include River Mahanadi (Job et al., 1955); River Godavari (Bhimachar, 1959; Ganapati, 1964); River Yamuna (Chakrabarty et al., 1959; Chandraprakash et al., 1978; Bhargava, 1985; Saxena & Chauhan, 1993; Sharma et al. 2000); River Gomati (Bhaskaran et al., 1965; Arora et al., 1973); River Daha (David & Ray, 1966); River Tapti (Karamchandani & Bisolkar, 1967); River Hoogly (Ghose & Sharma, 1989); River Cauvery (Sampath et al., 1979 and Somashekar, 1984); River Jhelum (Sundar, 1988); River Sone (Singh & Singh, 1990); River Kosi (Datta Munshi, 1995) and River Narmada (Unni & Naik, 1997). During the last three decades, the ecology of the Himalayan Rivers has also been studied in detail (Badola & Singh, 1981; Singh et al., 1982; Nautiyal et al., 1986; Bhatt & Pathak, 1989; Pathak & Bhatt, 1993). There are plenty of published works on the hydrobiology of the rivers and floodplain lakes of the Indian subcontinent and these were reviewed by Gulati & Wartz-Schulz (1980) and Michael (1980). The study of rivers and river basins from hydrologic, hydraulic and fluvial geomorphic point of view gained due importance through the pioneer works of Knighton (1984); Borah & Goswami (1988); Basu et al. (1996); Goswami (1996); McCully (1996) and Kar & Goswami (1997).

Many other Indian rivers have also been extensively studied for physico-chemical aspects. For example, Ganapati (1956) on the River Thamparaparani; Abraham (1962), Jebasnesan et al. (1987) on the River Cooum, Desmukh et al.

The richness and structure of fish and macro invertebrate assemblages in streams and rivers are strongly associated with local habitat characteristics, with spatial heterogeneity and structural complexity among the most prominent aspects (Angermeier & Karr, 1984; Brown & Warburton, 1997; Brooks et al., 2004; Scott & Angermeier, 1998; Shields et al., 2006; Willis et al., 2005).
Ganges River dolphins (*Platanista gangetica gangetica*) were historically distributed throughout the Ganga, Meghna, Brahmaputra and Karnaphuli river systems of India, Nepal and Bangladesh (Jones, 1982; Reeves & Brownell, 1989; Shrestha, 1989; Baruah, 2005). However, with the construction of hydel projects and other irrigation-related projects, the dolphins are threatened by population fragmentation and isolation, pollution of their habitat, drowning in fishing nets or deliberate removal for trade and prey depletion (WWF, 2006). As a result, the ranges and abundance of dolphins have reduced in and/or many areas (Reeves & Leatherwood, 1995). Burgeoning human population and rapid economic development threaten the survival of cetaceans in much of the world but nowhere more than in Asia (Smith, 1993).

Preferred habitat of dolphins in Asian rivers is generally located in deep pools downstream of channel convergences and sharp meanders, and upstream and downstream of mid-channel islands (Kasuya & Haque, 1972; Pilleri & Zbinden, 1974; Bhatti & Pilleri, 1982; Chen & Hua, 1989; Smith, 1993; and Smith et al., 1997 & 1998).

Rivers are open systems which should be considered in four dimensions: longitudinal (headwater - river - estuary), lateral (river – riparian/floodplains), vertical (river – groundwater) and temporal (Ward & Stanford 1989). The term river health is best understood by concept of biological or ecological integrity as conceived by Karr (1981). A substantial work has been done on ‘river health’ and some of the well known works on this aspect are as follows: Murray Darling basin (Geddes, 1990; Walker et al. 1994; Norris et al., 1993; Maheshwari, 1995; Sheldon & Walker, 1997; Harris & Gehrke, 1997; Humphries et al., 1999; Norris & Thomas, 1999; Koehn et al., 2000 Gehrke et al., 2003).

Dams fragment rivers by altering flow patterns, limiting downstream movement of sediment and upstream and downstream movement of biological materials (Williams & Wolman, 1984; Johnson, 1992). Fluctuations of stream flow due to hydroelectric facilities may cause increased or decreased downstream cover (Pelzman, 1973; Turner, 1974; Turner & Karpiscak, 1980; Nagel & Dart, 1980), changes in species composition (Turner & Karpiscak, 1980), changes in growth rate or mortality rate of riparian species (Sackett, 1977; Franz & Bazzaz, 1977; Reily & Johnson, 1982), reduced the effectiveness of plant hydrochory (Merritt & Wohl, 2002) and disruption of riparian areas (Faber & Holland, 1988).