1. INTRODUCTION
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"AMRUTASYA TU JALAHA" is a Sanskrit saying meaning water gives immortality. Water seems to be present only in earth in the universe and is therefore responsible for the existence of life in the earth. The special properties of water help to sustain life in this earth. In nature, water is found in oceans, lakes, ground water table, springs, rivers etc., and it is recycled in biogeochemical cycles. Water absorbs a lot of heat (as latent heat) before changing its physical state. So it acts as a heat buffer. It is the universal solvent. It is also a polar compound and dissolves a lot of organic and inorganic salts, proteins, amino acids, nucleic acids and several other complex molecules.

Aquatic ecosystem covers the two third of the earth surface. It plays a vital role on earth since origin of life. Marine ecosystem covers the major area of aquatic ecosystem. Even though the area covered by freshwater ecosystem is lesser, freshwater plays a major role in all the living beings. Mankind uses the freshwater first for drinking purpose and next for other human activities like cleaning, washing, and for agriculture and aquaculture. Aquatic ecosystem is a source for the production of cheap and quality proteins. The availability of water to the human beings is less than a percent present in the earth (Agarkar, 1998). The ecology of a water body provides significant information about the available resources for supporting life in that ecosystem. The study of ecology of aquatic ecosystems attracted the attention of biologists from the past. Forel (1841-1912) was the pioneer in the field of limnology (Odum, 1971).
In ancient times, the area covered by water bodies was used with sanctity without polluting it. But presently due to over population and greed, these water bodies are used as dumping places of industrial and domestic wastes. Thus, the dynamic balance in aquatic ecosystem is upset and it is getting polluted day by day which has become an obstacle in the normal interaction in aquatic ecosystem. Therefore, hydro biological studies are essential before using any waterbody for aquaculture, agriculture, domestic or industrial purposes. According to NEERI survey, industrial and public wastes pollute 70% of water bodies (Basu, 1986).

Ecosystem is an ever-changing entity and it is the resultant interaction of abiotic and biotic factors. According to Elder (1965) "no two lakes or rivers are identical nor are they static in the biological sense". The physicochemical parameters in the aquatic ecosystem formed within the desirable limit forms the ideal condition for better growth and healthy conditions of it as habitat. The water bodies like rivers, lakes and estuaries are continuously subjected to dynamic state of change with respect to their geological characteristics. This demonstrates continuous circulation, transformation and accumulation of energy and matter through the medium of living things and their activities. Temperature, pH, transparency and other physical properties; dissolved oxygen, alkalinity and other chemical properties; productivity, BOD and other biological characteristics of water mainly rule the aquatic ecosystem.

Freshwater ecosystem is formed either naturally or artificially by human activities for fulfilling his purpose. Before using this ecosystem, its hydro biological
characters should be evaluated to find out its potability and ecological status (level of succession and pollution) for standardizing a possible ecological management strategy and sustainable management of an aquatic ecosystem. If the hydro biological characters are not in optimal conditions, the proportion can be rectified and enriched.


In India, studies on aquatic ecology were started with the pioneering works of Prasad (1916) and Purthi (1916). Following this, studies were carried out by many workers (Iyengar, 1940; Gonzalves and Joshi, 1946; Ganapati, 1949; Chacko and Krishnamoorthy, 1954; Alikuhni, 1957; Chakrabarthy et al., 1959; Phillippose, 1960;
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George, 1961; Jayangoudar, 1964; Sitaramaih, 1966; Chaudhary and Nishith, 1966; Khan and Quajjam, 1966; George, 1966; Zafar, 1967; Vyas and Kumar, 1968; Michael, 1969; Seenayya, 1972; Kant and Kachroo, 1973; Khan and Siddique, 1974; Nasar and Munshi, 1975; Vashisht and Sharma, 1975; Nasar and Nasar, 1976; Ramadhas, 1977; Nasar, 1978; Rai, 1978;Swarup and Singh, 1979; Ayyappan and Gupta, 1980a; Ayyappan and Chandrasekhara Gupta, 1981; Divakaraan et al., 1982; Khatri, 1985; Nair et al., 1985; Ayyappan and Chandra Shekhar Gupta, 1985; Madhu pratap, 1978 and 1987; Bijoy nandan, 1991; Khatri and Amardeep, 1991; Pandey et al., 1992; Khatri, 1992; Khatavkar and Trivedy, 1992; Bahura et al., 1993; Pandey et al., 1993; Vijayakumar, 1994; Sharma and Gupta, 1994; Pushpendra and Madhyastha, 1994; Ebanasar and Jayaprakas, 1994; Sahu et al., 1995; Vareethiah, 1995; Saraladevi et al., 1995; Rasheed et al., 1995; Murleedharan Nair et al., 1995; Asha Nair and Abdul Azis, 1995; Rajeev et al., 1995; Hosetti, 1996; Arif shaikh et al., 1997; Padmavadi and Durgaprasad, 1997; Dey et al., 1997; Singh et al., 1998; Mahajan and Mandloi, 1998; Mohanty, 1998; Rajendran et al., 1998; Sharma and Asha Agarwal, 1999; Krishna Rao et al., 1999; Pande and Sharma, 1999; Seema Johari et al., 1999; Murugavel and Pandian, 2000; Ahirao et al., 2001; Bahura, 2001; Narasimha Rao and Jaya Raju, 2001).

In Tamil Nadu, Ganapati (1949) was the pioneer in limnology. Following him, Sreenivasan (1964, 1965, 1968, 1969, 1970a, 1972, 1976, 1977 and 1996) carried out detailed investigation on limnology of Tamil Nadu. Many works on limnology has been carried out in lentic and lotic habitats.
Reservoir ecology of Mettur dam (Ganapati, 1949 and 1955); Hope reservoir (Ganapati, 1956); Bhavanisagar reservoir (Sreenivasan, 1964a); Amaravathy reservoir (Sreenivasan, 1965); Poondi reservoir (Soundar Raj et al., 1968); Stanley reservoir (Sreenivasan, 1969); Aliyar reservoir (Sreenivasan, 1977); Thirumoorthi reservoir (Sreenivasan, 1977); Sathiar reservoir (Kannan, 1978); Pechiparai reservoir (Sreenivasan, 1996); Kodayar reservoir (Murugavel and Pandian, 2000) were studied in detail and found suitable for aquaculture practices.

Ganapati (1956) carried out studies on river ecology of Thambaparani river at Papanasam, (Tirunelveli District). Studies in Pykara and Moyar (Rajan, 1963), Adyar river (Jeeji Bai and Rajendran, 1980), Cooum (Ouseph et al., 1994), AVM canal (Vumayoru Bhagan et al., 1998) and river Kaveri (Hameed and Sherief, 1999 and Jayaram, 2000) were carried out in Tamil Nadu.

Ecology of ponds also attracted the attention of biologist from the past. In Tamil Nadu, Ganapati carried out pioneering work on pond ecology which includes temple tank with permanent bloom of Microcystis aeruginosa (Ganapati, 1940); chemistry and biology of ponds in Madras city (Ganapati, 1941); ecology of garden pond containing abundant zooplankton (Ganapati, 1943) and hydro biological condition of the Gangadhareswarar temple tank (Ganapati et al., 1953). Sreenivasan (1968) studied Nilgris impoundment and the two ponds in Chengulpet; Haniffa and Pandian (1978) studied the morphometry, primary productivity and energy flow in a tropical pond; Rajalakshmi (1980) also studied Gangadhareswarar temple tank in Madras and Krishnaveni (1980) made limnological studies of Naduvakkarai pond.

Recently, the physicochemical studies of drinking water also attracted the attention of environmentalist (Jain, 1996; Krishnan et al., 1997; Sharma and Pande, 1999; Tiwari, 1999; Pande and Sharma, 1999; Babar and Kaplay, 1999;
Ajaypillai et al., 1999; Sangeetha et al., 2000; Freeda Gnana Rani et al 2001). Ganapati (1940) related quality of water of a water supply reservoir Red Hills Lake with meteorological conditions. Someswara Rao et al., (1999) studied the parameters such as total dissolved solids, calcium, alkalinity, chloride, sulphate, nitrate and iron in drinking water of Kakinada port town, Andhra pradesh.


The parameters like precipitation (Serruya and Berman, 1975; Schindler et al., 1976; Kannan and Job, 1980; Vaas, 1954; Chow, 1958; Tucker, 1958; Haniffa and Pandian, 1978; Carter, 1960; Murugavel and Pandian, 2000), temperature (Ganapati, 1949; Zafar, 1955; Munawar, 1970 a and b; Nasar and Munshi, 1974; Sreenivasan, 1964a; Hussainy, 1967; Sumittra, 1969; Kannan and Job, 1980; and Chandran et al., 1998), transparency (McCombie, 1953; Bamforth, 1958; Rawson, 1960; Larsen and Malueg, 1976; Wetzel,1973; Starling et al.,1974; Chandran et al., 1998
and Dwivedi et al., 2000), pH (Vyas and Kumar, 1968; Sreenivasan, 1964; Sreenivasan, 1970a and 1976; Ouseph et al., 1994; Arvind Kumar, 1997; Chandran et al., 1998; Sharma Asha Agarwal, 1999 and Murugavel and Pandian, 2000) and dissolved oxygen (Ganapati, 1955; Sreenivasan, 1964a and 1970a, b; Sharma, 1980; Kannan and Job, 1980; Sreenivasan et al., 1997; Arvind Kumar, 1997; Pahwa and Mehrotra, 1966; Chandran et al., 1998; Someswara rao et al., 1999 and Murugesan and Manoharan, 2000) were found to be the important parameters influencing productivity and ecological status of ecosystem.

Nutrients play a major role in aquatic ecosystems (Ganapati and Pathak, 1969; Sreenivasan, 1970; Kannan and Job, 1980; Synudeen Sahib and Abdul Azis, 1989; Harikrishnan and Abdul Azis, 1989 and Chandran et al., 1998). Nutrients like phosphate (VollenWider, 1968; Nasar and Sharma, 1990; Jana and Kundu, 1993; Rajeev et al., 1995; Chandran et al., 1998; Murugavel and Pandian, 2000 and Murugesan and Manoharan, 2000), nitrate (Ganapati, 1940a; Sreenivasan, 1965, Munawar, 1970a; Zutsi and Vass, 1978; Nair et al., 1985 and Chandran et al., 1998), sulphate (Nair et al., 1985; Sreenivasan, 1996; Someswara rao, 1999 and Rajakumar, 2000) and Silicates (Chatterjee and Mohanty, 1990; Khatri, 1992; Man Mohan Prakash, 1994; Sreenivasan, 1996; Chandran et al., 1998; Murugesan and Manoharan, 2000 and Ebanasar et al., 2000) are the chief nutrient in regulating the productivity and plankton production in aquatic ecosystems.
In India, many scientists worked on the seasonal variations of physicochemical parameters (Chakrabarty et al., 1959; Khan and Siddique, 1974; Nasar and Munshi, 1974; Arunachalam et al., 1982; Khatri, 1984; Ali et al., 1988; Basis and Agarwal, 1990; Pandey and Verma, 1992; Man Mohan Prakash, 1994; Vijayakumar, 1994; Anil Kumar and Abdul Azis, 1999; Narasimha rao and Jaya Raju, 2001; Datta et al., 2001; Bahura, 2001 and Ahirao et al., 2001), phytoplankton communities (Khatri, 1987; Tasneem Fatma, 1990; Sugunan, 1991; Bhowmik et al., 1993; Singh and Kumari, 1994; Sinha 1960a and b; Singh and Kumari, 1994; Sahu et al., 1995; Singh and Singh, 1996; Unnisankaran et al., 1998; Tarar and Bhodkhe, 1998; Habib et al., 1998; Mahajan and Mandloi, 1998 and Bahura, 2001) zooplankton communities (Nassar, 1978; Singh and Sahai, 1978; Divakaran et al., 1982; Khatri and Amardeep, 1991; Bahura et al., 1993; Pushpendra and Madhyastha, 1994; Kotangale, 1995; Sabu Thomas and Abdul Azis, 1999 and Sivakumar et al., 2001) and primary productivity (Kannan and Job, 1980; Khatri, 1984; Davis and Singh, 1986; Vijayakumar, 1994; Sabuthomas and Abdul Azis, 1995; Sahu et al., 1995, Anilkumar and Abdul Azis, 1999 and Pulle and Khan, 2001) of diverse aquatic ecosystem.

Investigations on primary production in fresh waterbody was carried out by many scientists like Goldman and Wetzel (1963), Sreenivasan (1963 & 1964); Nasar and Nasar (1976), Hussainy (1967), Nasar and Munshi (1975), Gopal et al., (1978), Ayyappan and Gupta, (1981), Murthy et al., (1986), Adoni and Vaishya (1990), Nasar and Sharma (1990),
Bhaskaran et al., (1991), Sahu et al., (1995), Anil Kumar and Abdul Azis (1999) and Dwivedi et al., (2000). The primary productivity of the tropical aquatic system is dependent on many factors. The high temperature range and incident solar radiation makes the tropical waters to be more productive. The factors such as season, water supply, depth, free CO₂, and nutrients also contribute to the rate of aquatic primary production.


Sediment components determine the dynamic nature of physicochemical and biological characteristics of aquatic ecosystem. In India, role of sediments on waterbodies were studied (Ganapati, 1940; Banerjea, 1967; Saha et al., 1971; Rao

Plankton serves as a food for aquatic organisms, plays major role in maintaining the balance of nutrients and in determining the production status of any waterbody. Estimation of plankton production is essential to evaluate the feasibility of any fresh water habitat for aquaculture. Plankton acts as a pollution indicator. It has high economic importance in natural purification of polluted waters. Adequate and accurate information on the nature and fluctuations of plankton in freshwater impoundments is essential for better and scientific way of aquaculture practices (Hora, 1951 and Job, 1951). Plankton diversity and abundance is season dependent and varies in different waterbodies. Plankton is a heterogeneous collection of minute floating organisms. Plankton composition and preponderance of different aquatic ecosystems were studied (Puthri, 1933; Laxminarayan, 1965; Chaudhary and Nishith, 1966; George, 1966; Vyas and Kumar, 1968; Munawar, 1970a, b and c; Sashi and Kachroo, 1973; Vashist and Sharma, 1975; Mandal, 1976; Rai and Kumar, 1977; Nassar, 1978; Mathew, 1978; Rama Rao et al., 1978; Singh and
Swarup, 1978; Jindal and Vashisht, 1981; Reynolds et al., 1981; Rishi and Kachroo, 1984; Harrison et al., 1990; Asoka kumar and Patel, 1990; Sugunan, 1991; Sharma and Sharma, 1992; Kumar and Saha, 1993; Pal and Santra, 1993; Singh and Kumari, 1994; Bairagi and Goswami, 1994; Siddiqui and Ahmed, 1995; Singh and Singh, 1996; Adhikary, 1996; Sen and Gupta, 1998; Habib et al., 1998; Pandey et al., 1998; Murugavel and Pandian, 2000; Bahura, 2001 and Narasimha rao and Jaya Raju, 2001). Depending on size, plankton can be classified into six types viz megaloplankton (1-8cm), macroplankton (1mm-1cm), mesoplankton (0.5-1.0mm), microplankton (0.06-0.5mm), nannoplankton (0.005-0.06mm) and ultraceston (0.0005-0.005mm) (Battish, 1992). According to the mode of nutrition plankton can be categorized into phytoplankton (autotrophic) and zooplankton (heterotrophs). The relationship of phytoplankton and zooplankton was observed by Khan and Siddique (1974), Sumitra (1967) and Ayyappan and Gupta (1980a). Phytoplankton is the major user of dissolved organic matter and solar energy in aquatic environment (Pearsal et al., 1946; Vyas and Kumar, 1968 and Sumitra, 1969). Chlorococcales, desmids, diatoms, euglenoids, dinoflagellates and bluegreen alga represents phytoplankton. Iyengar (1940) studied algal flora on some muddy rainwater pools. Khan and Siddique (1974) and Khatri (1984, 1986 and 1987) studied the seasonal distribution of phytoplankton in lake and reservoir.

Temperature and pH are two major factors influencing the distribution and production of plankton. Singh, (1964 & 1966), Moitra and Bhattacharya (1965), Vasisht (1968) and Rupsingh and Singh (1973) reported the influence of
temperature on distribution of plankton. Gonzalves and Joshi (1946), Das and Srivastava (1956), Banerjee and Roychoudhury (1966), Pahwa and Mehrotra (1966), Ray et al., (1966) and Rupsingh and Singh (1973) observed the coincidence of high pH with blooming of phytoplankton.

Water favoring green algae is chemically distinct from those harboring diatoms and blue greens (Joshua, 1886; Gonzalves and Joshua, 1946; Prescott, 1948; Rao, 1953; Phillipose, 1960; Singh, 1960a and b; Zafar, 1964 a and b; Pandey et al., 1998 and Tarar and Bodkhe, 1998).

Ecology of fresh water diatoms has attracted the attention of many workers. The classical contributions come from Pearsall (1932), Lind (1938), Meloche et al., (1938) and Komarvosky (1953). Indian water has been studied with this point of view by Singh (1960a,b), Phillipose (1960), Zafar (1964), Siddique and Ahmed (1995), Anand and Sharma (1998), Tarar and Bodkhe (1998) and other workers.

The distribution of desmids in ponds was studied by Pearsall (1932), Phillipose (1960), Singh (1960a,b), Zafar (1967), Munawar (1970b and c), Ashok Kumar and Patel (1990); Pal and Santra (1993); and Tarar et al., (1998).

Euglenineae, a very sensitive group of flagellates has studied extensively in India to understand their behavior towards physicochemical factor (Gonzalves and Joshi, 1946; Zafar, 1959; Seenaya, 1971; Munawar, 1970; Shashi and Kachroo, 1973; Hosmani and Bharati, 1975; Rao, 1977; Hegde and Bharathi, 1986; Gupta and Srivastava, 1993 and Shafiq ur-Rehman, 1998).
Zooplankton can be categorized into holoplankton and meroplankton. Holoplankton refers to those organisms which remains as plankton throughout life cycle. Meroplankton is those, which lead planktonic life only during larval period. The zooplankton includes protozoa, larval forms of sponges and coelenterates, rotifers, copepods, cladocerans and larval forms of crustacea, mollusca and echinodermata.

The type of fauna and flora supported by an ecosystem depends on the physicochemical properties of medium and substratum. The diversity of flora and fauna are indicators of level of succession in an ecosystem (More and Gajjar, 1990). Seshavatharam et al., (1982) made an ecological study of the vegetation of the Kolleru Lake, Andra Pradesh. Aquatic flora has been studied by many workers (Unni, 1967; Sharma et al., 1998 and Devi and Sharma, 1998). Baseline studies on aquatic flora and fish fauna around Kakrapur Atomic power station was carried out by Mohini Gadhia et al (1999). Freshwater fish diversity has been studied by many workers (Rao, 1993; Sandhya Jadhav and Bramhadev Bhosale, 1996; Vishwanath et al., 1998; Ajith kumar et al., 1999; Thomas et al., 1999 and Sakhare, 2001).

The process of ecological succession slowly leads to the formation of terrestrial habitats from hydrosere. In recent decades construction of houses by filling paddy fields and ponds also altered aquatic ecosystem to terrestrial ecosystem. While, the mining activities cause a reverse phase in ecological succession i.e. it leads to the formation of aquatic ecosystem from terrestrial ecosystem. Mining activity leads to the formation of large pits. These pits are filled
with rain and ground water in due course. Studies in the waterbody formed in abandoned mine pits is scarce. Anadu et al., (1990) reported water quality and plankton diversity in two contrasting mine lakes in Jos, Nigeria. Edenise Garcia et al., (1998) conducted a limnological survey of six manmade ponds resulted from sand mining, Pariba do sul river basin, Southeastern Brazil.

Ariyalur is known for limestone deposits of cretaceous period. The limestone deposits of this locality covers in area of 2325 square kilometers (Chandrasekaran and Ramkumar, 1994). The limestone deposits are utilized as a raw material for cement industries, which are situated in and around Ariyalur. Due to continuous mining activity large and deep pits of vast area are formed which lead to the formation of waterbodies. These waterbodies are neo ecosystem, which are at the early stages of succession and has low faunal and floral diversity. They do not have edible fishes of their own. Hence they form a threat to human health, because they may form breeding sites of mosquitoes.

Knowledge on the physicochemical characteristics, ecology and nutrient dynamics of these waterbodies are essential to introduce aquaculture practices in these ecosystems. While, there are no reports available with regard to the ecology of such water bodies, except the preliminary survey work done by Ebanasar et al (2000).

With this view in mind, the present investigation was undertaken to evaluate the ecology of five waterbodies formed by limestone mining and located in and around Ariyalur. This also evaluated its suitability of these ponds for aquaculture practices.
The following aspects were studied in detail

1. Seasonal variations in the physicochemical characteristics of these waterbodies.

2. Variations of chemical components of soil during different seasons.

3. Phytoplankton and Zooplankton communities of these waterbodies.

4. Ichthyofaunal and floral diversity.