

The Effect of Dredging on the Water Quality and Fish and
Crustacean Composition of the Lunawa Lagoon

by

P.V. Ishastha Prasith Perera

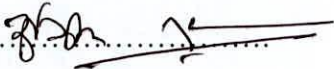
Thesis submitted to the University of Sri Jayewardenepura for the
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Aquatic Resource Management on May 2009.

“The work described in this thesis was carried out by me under the supervision of Dr. Ajantha De Alwis and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree”.

A handwritten signature in black ink, appearing to read 'P.V.I. P. Perera', is written over a horizontal dotted line.

P.V.I. P. Perera

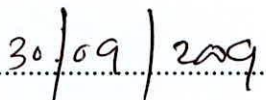
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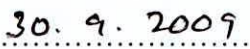
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ABSTRACT

The Lunawa Lagoon situated a few kilometers south of Colombo was once a thriving fishing ground, which supported a significant fishery. Prior to the 1970's the lagoon provided good fish harvests to the fisher folk in the surrounding area. Industrialization of the surrounding areas with little environmental planning resulted in mass degradation of the lagoon over the years, resulting in highly polluted water, loss of species diversity and a total collapse of the fishery by the mid 1990's. In addition to this, the lagoon became a breeding ground for mosquitoes thus causing a health hazard and the stench from the dumping of industrial and domestic wastes made it an unsuitable residential area. In order to combat this problem and revive the lagoon, a massive project was undertaken in 2004, which involved dredging of the lagoon to remove accumulated waste sediments and to improve seawater exchange.

A research study was carried out to determine the present status of the lagoon in terms of its water quality and the fish and crustacean species present after the completion of the dredging activity. In comparison with the status of the lagoon just before the dredging activity and after, results of the study indicate a significant positive change with dissolved oxygen, pH, Biochemical Oxygen Demand (BOD) and phosphate levels all improving to levels within the stipulated standards. Up to 7 species of fish along with 2 shrimp and 1 crab species were identified. The types and numbers of species in

the lagoon had improved distinctly and were now found to support a small-scale fishery. The depth of the lagoon had also increased fulfilling a major objective of the project. However, turbidity, electrical conductivity and salinity levels had not changed significantly, while nitrate levels had increased indicating the existence of continuing pollution. The levels though were not found to be immediately harmful, provided warning signs of a potential threat that needed to be addressed.

In order to safeguard the improvement of the lagoon achieved and enable further recovery, strict monitoring and management is necessary while special focus should be given to verify whether effluents discharged by industries are being treated according to the environmental regulations. Due regard to the environment and the lagoon in particular must be given by all relevant authorities in all future plans for the area especially in the industrial sector.

Overall, the effect of dredging on the water quality and fish and crustacean composition of the Lunawa Lagoon was found to be positive with a significant improvement observed.

1. INTRODUCTION

There are around 89 lagoons ranging from 3 ha to 7,589 ha in extent, of which 8 cover more than 1,000 ha each. The total area of the lagoons is estimated to be about 36,298 ha (CRMP Coastal Habitat Survey, 2002). Lagoons are more abundant along the southern, southeastern and eastern coasts where the littoral drift causes an accumulation of sand to form barriers and spits at river mouths through which the freshwater discharge is low. Sand barrier formation has transformed some basin estuaries into lagoons. Fig. 1 shows the lagoons and estuaries of Sri Lanka.

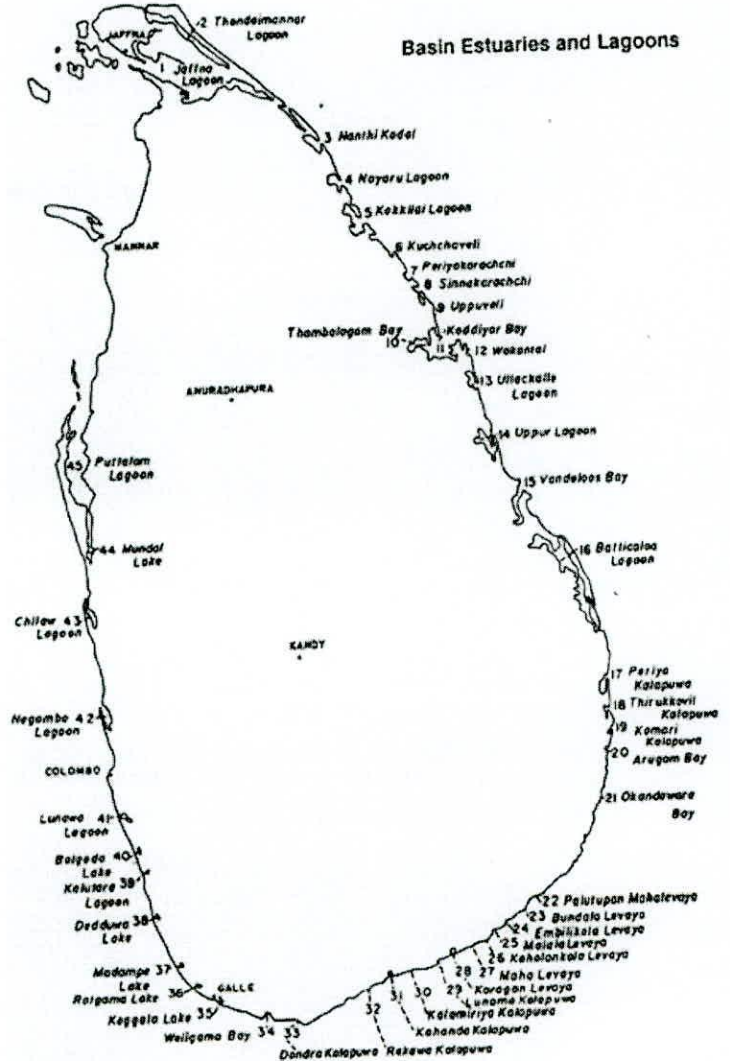


Fig 1: Lagoons and Estuaries of Sri Lanka (Source: NARA)

The lagoons and estuaries are an interface between marine, freshwater and land, being important coastal environments, which are highly productive due to the fact that they receive high loads of nutrients from lands (DFARD, 1994). But this same fact leads the lagoons and estuaries to suffer due to accumulation of excessive concentrations of organic matter and the subsequent increase in bacterial heterotrophic activities leading to a dramatic consumption of dissolved oxygen (Troussellier, 2007). The oxygen depletion allows reduction of sulfate to hydrogen sulfide which accumulates, provoking a large increase in the mortality of macrofaunal species (Troussellier, 2007). Such dramatic events increase both in frequency and extension as a consequence of eutrophication which is mainly related to the increase in population density and activities in the lagoon watershed. (Troussellier, 2007).

Pollution of Sri Lanka's estuaries and lagoons is extensive in terms of organic load given out by domestic and industrial refuse. Very often household refuse collected by municipalities and Pradeshiya Sabhas is directly dumped into rivers. Coliform bacterial counts often exceed the permitted values. Some examples of highly polluted lagoons and estuaries include; Bolgoda and Negombo estuaries and Lunawa lagoon (Ileperuma, 2000).

1.1 Physical Features of Lunawa Lagoon

Lunawa Lagoon is a relatively small lagoon of just over 2 km in length and an average width of 175 m located in the Moratuwa–Ratmalana industrial area approximately 14 km south of Colombo. The lagoon lies in the narrow coastal plain stretching from Dehiwala-Mount Lavinia Municipal Council to the Moratuwa Municipal Council

(CCD, 2005). (Fig. 2). Lunawa lagoon is part of a larger wetland ecosystem with Bolgoda Lake and Attidiya marsh (a bird sanctuary). These three ecosystems which were connected in the past were separated with the construction of the Galle Road.



Fig 2. Location of Lunawa Lagoon

The total water surface area of the lagoon is about 40 ha and the highest water level around 1.5m above MSL (CCD, 2005). The lagoon is divided into the northern and southern sections by a bridge. The mouth of the lagoon lies on the northwest side of the northern section close to the Angulana Railway Station. The mouth is closed by natural formation of a sand bar preventing exchange of water between the sea and the lagoon and the resultant flushing out of pollutants. The sand bar is occasionally breached manually to minimize floods in the lagoon catchment. Lunawa is one of Sri Lanka's

true lagoons. The lagoon has no permanent natural water source to sustain itself and depends mainly on surface runoff and discharged water from residential, commercial and industrial sources. There are 3 main tributaries which feed the lagoon, namely: Lunawa Ela (3.8 km in length), Hemingiya Ela (1.7 km) and Elu Ela (1.3 km) (CCD, 2005). There are also 3 small municipal drains that discharge effluents to the southeastern and southern parts of the lagoon. The lagoon being part of the Bolgoda basin receives basin discharge through the Bellanwila –Attidiya marshes, thus functioning as a water detention area as well (CCD, 2005).

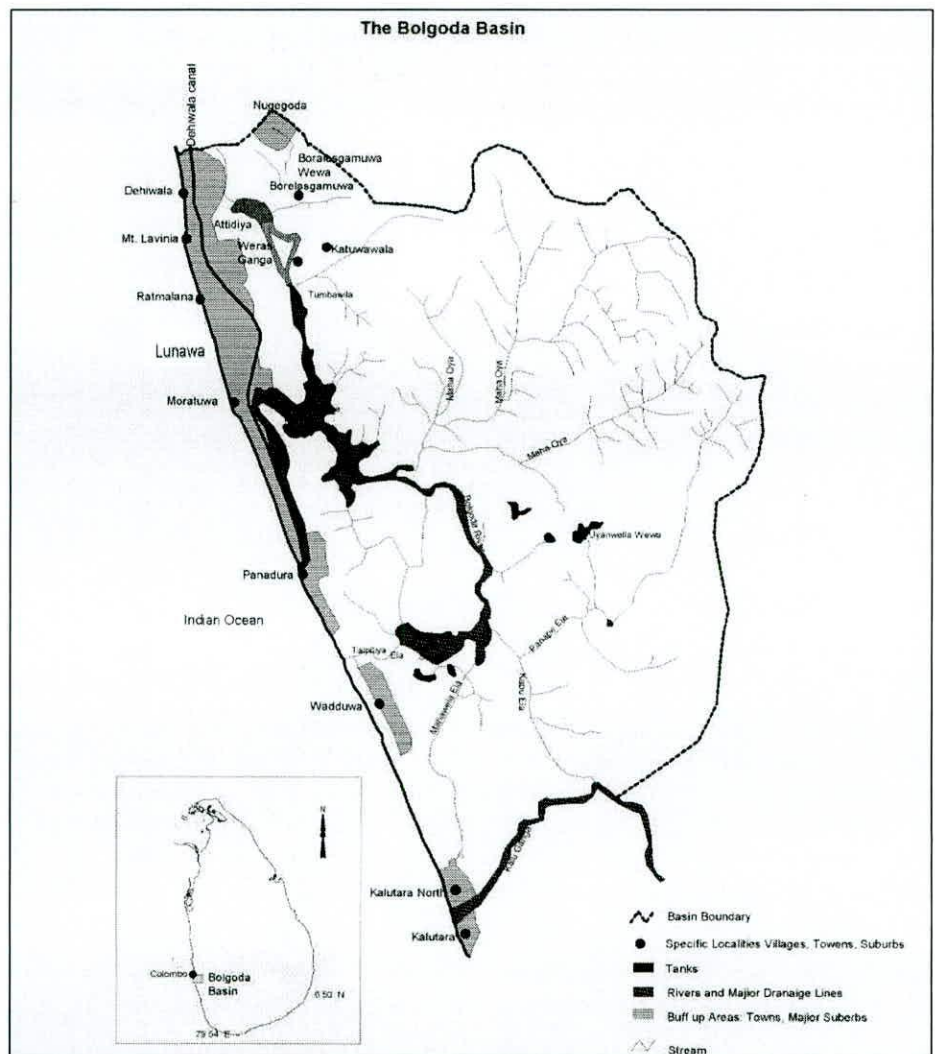


Fig 3: The Bolgoda Basin (Source: CCD, 2005)

A majority of Lunawa lagoon area lies within Moratuwa, which is the heart of the wood industry in Sri Lanka and also a very densely populated city with many saw mills and furniture factories located in the vicinity. A large number of households and industries are present in the lagoon catchment area. The streams entering the lagoon flow from the Dehiwala-Mount Lavinia Municipal Council area which is a very highly industrialized area. According to Dias et al (2004), the major pollution contributor of the Lunawa lagoon is the unmarred discharges of toxic effluents from industries in the Lady Catherine Industrial Estate. Thus, the location of the lagoon has resulted in a very complex environmental situation and interventions.

The lagoon which was once a flourishing ecosystem was known to provide a livelihood for more than 150 fishermen at one time (CCD, 2005). The lagoon was especially famous for its large populations of prawns and fish. The ecological and scenic value presented a recreational amenity. According to reports from locals, a good fishery for “Ahirawa” (*Ehirawa fluviatilis*) existed in the past (UNESCAP 1985). Fishermen state that they were getting good income daily from fish varieties like “batto” (*Tilapia* sp) , “mal koraliya” (*Etroplus suratensis*), “Ahirawa”, crabs and prawns. Nets and crab traps floating on the surface used to cover the lagoon (Punchihewa 1995). According to NARA (1994), at least 22 fish species and 6 species of crustaceans were recorded with the lagoon being a fishing ground for 150 families before 1979 (Table 1).