Preliminary Report on Investigation of Fish Mortality in a Water Body at Wallampitiya

National Aquatic Resources Research and Development Agency (NARA)

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Contents

List of Figures

List of Tables

1. INTRODUCTION

The study was conducted on 18th March 2019 by NARA, as per the request done by Central Environmental Authority. Fish species started to dying unexpectedly since a two, three days ago at a water body situated at Wallampitiya "Kalu Palama" area and Mr. Nuwan Punsara who is living nearby has complained to the CEA to do a investigation regarding the above matter. Thereafter, CEA has forwarded the request to the NARA to do a proper investigation and to provide recommendations to required authorities. This preliminary report is based on the results of initial field investigation and laboratory tests carried out by a team of officers from Environmental Studies Division (ESD) and Inland Aquatic Resources and Aquaculture Division (IARAD) of National Aquatic Resources Research and Development Agency (NARA).

2. OBJECTIVES

1. To investigate the causes for fish mortality and understand the prevailing condition of the environment.
2. To provide recommendations of future remedial actions in order to avoid such situations.

3. SITE DESCRIPTION

The water body was located near the "Kalu Palama" next to the Keels Supper, Wallampitiya and was surrounded by a residential area. And also there was a new bridge construction on going to replace the Kalu Palama. The location can be accessed via Awissawella road, Wallampitiya.

Figure 1: Water body covered with aquatic plants

Figure 2: Dead fish in the bank of the water body

Figure 4: Soil piling

Figure 5: Bridge construction area

There was a new bridge construction ongoing in the site to replace "Kalu Palama" by Sri Lanka pilling as a sub contractor under Sierra constructions. People were repeatedly complaining that the main reason for this sudden fish kill was due to the usage of chemical named "Benthonite" in soil pilling. For the construction of bored piles and diaphragm walls, fluids are often used to support the excavation side walls in unstable strata until concreting. Bentonite clay slurries have been used for this purpose in such construction activities.

4. Sample Collection

The method of sample collection, transport, storage and analysis of physico-chemical parameters were in conformity with the Standard Methods for the Examination of Water and Waste Water (APHA, 2012). Table: 1 shows the parameters studied and methods used.

Table 1: Parameters studied and methods used

PARAMETER	PRINCIPLE	METHOD
Water Temperature	Thermometric	Eutech Instruments PC 650 Portable pH
pH	Potentiometric	Eutech Instruments PC 650 Portable pH meter
Dissolved Oxygen	Electrometric	YSI ProODO handheld Optical Dissolved Oxygen Meter
Electrical Conductivity	Electrometric	Hanna portable multi range Conductivity meter HI 8733
Turbidity	Nephelometric	Hach 2100P portable turbidity meter
Total Suspended Solids (TSS)	Gravimetric	Method 2540 D, APHA-2012
Bio-chemical Oxygen Demand (BOD)	Titrimetric	3-Day BOD Test Method 5210 B, APHA-2012
Ammoniacal nitrogen	Colorimetric	Phenate Method (4500- NH_3, APHA) 2012)
Nitrate nitrogen	Colorimetric	Cadmium Reduction Method (4500-NO_3^-, APHA-2012
Nitrite nitrogen	Colorimetric	Colorimetric (4500-NO_2^-, APHA-2012)
Dissolved Phosphate	Colorimetric	Ascorbic Acid Method (4500-P, APHA-2012)
Chlorophyll a	Colorimetric	10200 H Chlorophyll (APHA, 2012)

5. RESULTS

Table 2: Results of the In-situ water quality analysis are as below.

Parameter	Reading	Tolerance Limit (CEA, (2001)
Sampling Time	11.30 am	-
Water Temperature (^oC)	29.1	-
pH	6.80	6.5-8.5
Dissolved Oxygen (mg/l)	**0.68**	**3 mg/l, min at 25 ^0C**
Electrical Conductivity (µS/cm)	843	-
Turbidity (NTU)	53	
Total Dissolved Solids (ppm)	478	-
Bio-chemical Oxygen Demand (BOD) (mg/l)	1.8	4 mg/l, max
Ammoniacal nitrogen (mg/l)	**3.410**	**0.94 mg/l**
Nitrate nitrogen (mg/l)	0.029	5 mg/l, max
Nitrite nitrogen (mg/l)	0.082	
Dissolved Phosphate (mg/l)	0.236	0.4 mg/l, max
Chlorophyll a (mg/l)	3.63	-

Fish Diseases

At the time of the visit, dead fish were observed on the edges and dead fish species included only *Oreochromis* spp (Thilapia). Most of the fish were moderate to large in size. Dead fish were decomposed and post-mortem investigations were not possible. According to the people in the vicinity fish kill has observed in the early hours of the day. The dead fish were shown their mouth wide opened. And also, only large fish species only observed as dead animals and there were no other died aquatic animals could be seen in the water body. Therefore, if there were some effects from Benthonite chemical, certainly there was some other aquatic animals should die due to the chemical toxicity. From these evidences it could be speculate that oxygen depletion may one of the reasons for this fish mortality.

Water Quality

According to the Proposed Ambient Water Quality Standards for fish and aquatic life by CEA, (2001), the minimum of amount of dissolved Oxygen in water should be 3 mg/l. Therefore, dissolved Oxygen level was very low (0.68 mg/l) for fish in this water body. Pond was completely covered by aquatic plants i.e. *Nelumbo nucifera* thus, dense plant growth can deplete oxygen in water during night time.

In this case, more fishes had died at night and collected to the bank in the early morning. The reason is that, dissolved oxygen availability in water at night is lower than that of the daylight. The primary sources of oxygen for small water body like pond is from phytoplankton or submerge plants. In the presence of sunlight, plants photosynthesize and oxygen is released into the pond water as a by-product (The Agrilife Extension, 2018). At night, these plants and phytoplankton remove oxygen from water for respiration and cause low oxygen levels. Therefore, dissolved oxygen available for fish and other aquatic organisms is further reduced and they are killed.

Furthermore, according to the water quality results, the ammonical nitrogen concentration in water was very high (3.41 mg/l) compared to the acceptable level (0.94

mg/l). High levels of ammonia is toxic and is lethal to fish and other aquatic life since it causes respiratory problems.

6. CONCLUSION

The main reason for the fish kill was assume that due to the lack of oxygen for fish at night caused by dense aquatic plant growth and high population density of fish in the pond.

7. RECCOMENDATIONS

1. Remove all dead fish and other animal carcasses from the water body before decomposition.

2. Aquatic plants grown along the boundary and inside the water body should be removed.

3. Water body should be cleaned and cleared completely and the out flow of water should be repaired in order to avoid stagnation.

4. Relevant government authorities and neighboring community should be well aware of the construction activities ongoing and their effects to aquatic animals of the water body in long term.

5. In addition, mechanical aeration of water can save fish during oxygen depletion.

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