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Effects of anthropogenic activities on pond ecosystem

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Abstract
An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment, interacting as a functional unit. A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout. Ponds are habitats of great human importance as they provide water for domestic, industrial and agricultural use as well as providing food. In spite of their fundamental importance to humans, freshwater systems have been severely affected by a multitude of anthropogenic disturbances, which have led to serious negative effects on the structure and function of these ecosystems. The biodiversity of lake and pond ecosystems is currently threatened by a number of human disturbances, of which the most important include increased nutrient load, contamination, acid rain and invasion of exotic species. New threats such as global warming, ultraviolet radiation, and invasion by exotic species including transgenic organisms will most likely increase in importance. The aim of the present study is to analyses the current state of three pond ecosystems which are mostly affected by anthropogenic activities like environmental pollution, conversion of ponds into flats (Real Estate) etc. Within five years (2010-2015) the area of the ponds are greatly reduced. The number of producers, consumers and decomposers is also decreased during five years due to the anthropogenic activities. To preserve the ponds and its ecosystems, concern environmental programmes and implementation of new environmental strategies and administrations should be carried out.

Keywords: Biodiversity, anthropogenic activities, environmental pollution and pond ecosystem

1. Introduction
An ecosystem is an ecological system which is described by a habitat, the organisms which live in it and the interactions between the two. Ecosystem processes result from the interactions of populations of plants, animals, and microbes with the abiotic geological features and properties of their environment. The species inhabiting the different habitats belonging to an ecosystem are linked through a food web. All organisms full at least one of these functions: producers, consumers, and decomposers (Nebel & Wright, 1993) [1].

Aquatic ecosystems contain several types of organisms that are grouped by their location and by their adaptations. Three groups of aquatic organisms include plankton, nekton, and benthos. Planktons are the organisms that float near the surface of the water. Two types of plankton are microscopic plants called phytoplankton, and microscopic animals called zooplankton. Phytoplankton produces most of the food for an aquatic ecosystem. Nektons are free-swimming organisms, such as fish, turtles, and whales. Benthos is bottom-dwelling organisms, such as mussels, worms, and barnacles. Many benthic organisms live attached to hard surfaces. Decomposers, organisms that break down dead organisms, are also a type of aquatic organism. Ponds are habitats of great human importance as they provide water for domestic, industrial and agricultural use as well as providing food. In spite of their fundamental importance to humans, freshwater systems have been severely affected by a multitude of anthropogenic disturbances, which have led to serious negative effects on the structure and function of these ecosystems. The biodiversity of lake and pond ecosystems is currently threatened by a number of human disturbances, of which the most important include increased nutrient load, contamination, acid rain and invasion of exotic species. Analysis of trends suggests that older, well known threats to biodiversity such as eutrophication, acidification and contamination by heavy metals and organochlorines may become less of a problem in developed countries in the future.

New threats such as global warming, ultraviolet radiation, endocrine disruptors and, especially, invasion by exotic species including transgenic organisms will most likely increase in importance.

2. Materials and methods

2.1 Study area

In the present study three ponds namely Kanganankulam, Mela Upoorani and Tharuvai were considered as study area. The water sample was collected from these three ponds.

2.2 Analysis of physical parameters

The physical parameters like temperature, turbidity, total dissolved solids and electrical conductivity were calculated by following standard filtration methods.

2.3 Analysis of chemical parameters

The chemical parameters such as pH, alkalinity, total hardness, dissolved oxygen and BOD were calculated by following Winkler's method.

2.4 Analysis of ecosystem components

The percentage of producers, consumers and decomposers were determined by standard quadrate method.

3. Results and discussion

The physicochemical characters of three pond water were analyzed during the year 2010 and 2015. In 2010 the physical and chemical parameters of all the three ponds are in moderate level. The temperature of Kanganankulam, Tharuvai and Mela Upoorani pond is 25, 28, and 26ºC respectively. The turbidity is recorded as 10, 8 and 9 mg/l in three ponds. The calculated dissolved solid was 220, 235 and 250 mg/l in three ponds. Likewise the pH of three ponds is recorded as 7, 8 and 9 respectively. The determined alkalinity was 115, 124, 110 mg/l in three pond. Total hardness of three ponds is calculated as 95, 135 and 90 mg/l respectively. The dissolved oxygen content is determined as 5, 4, and 6 mg/l in three ponds. BOD value of three ponds is 9, 8 and 8 mg/l respectively (Table 1).

In 2015 the physical and chemical parameters of all the three ponds are in high level. The temperature of Kanganankulam, Tharuvai and Mela Upoorani pond is 30, 32, and 35ºC respectively. The turbidity is recorded as 11, 10 and 9 mg/l in three ponds. The calculated dissolved solid was 240, 355 and 300 mg/l in three ponds. Likewise the pH of three ponds is recorded as 9. The determined alkalinity was 135, 114, 140 mg/l in three pond. Total hardness of three ponds is calculated as 97, 125 and 95 mg/l respectively. The dissolved oxygen content is determined as 7, 5, and 9 mg/l in three ponds. BOD value of three ponds is 6, 7 and 6 mg/l respectively (Table 2).

Hence the percentage of producers, consumers and decomposers of three ponds in the year 2015 is greatly reduced when compared with the year 2010 (Table 3&4).

Table 1: Physico-chemical analysis of three pond water in 2010

Parameters	**Name of the ponds**		
Physical parameters	Kanganankulam	Tharuvai	Melaupoorani
Temperature	25.50	28.50	26.40
Turbidity (1-10)	10	8	9
Total Dissolved Solids	220	235	250
Electrical conductivity	310	400	336
Chemical parameters			
P^H	7.50	8.90	7.10
Alkalinity	115	124	110
Total hardness	95	135	90
Dissolved Oxygen	5	4	6
BOD	9	8	8

Table 2: Physico-chemical analysis of three pond water in 2015

Parameters	**Name of the ponds**		
Physical parameters	Kanganankulam	Tharuvai	Melaupoorani
Temperature	30.50	32.95	35.85
Turbidity (1-10)	11	10	9
Total Dissolved Solids	240	355	300
Electrical conductivity	300	410	346
Chemical parameters			
P^H	9.50	9.00	9.10
Alkalinity	135	114	140
Total hardness	97	125	95
Dissolved Oxygen	7	5	9
BOD	6	7	6

Table 3: Ecosystem analysis of three ponds in 2010

Pond ecosystem	**Name of the ponds**		
	Kanganankulam	Tharuvai	Melaupoorani
Producers	80%	75%	85%
Primary consumers	75%	65%	75%
Secondary consumers	65%	55%	70%
Tertiary consumers	40%	35%	55%
Decomposers	20%	10%	25%

Table 4: Ecosystem analysis of three ponds in 2015

Pond ecosystem	Name of the ponds		
	Kanganankulam	Tharuvai	Melaupoorani
Producers	60%	45%	65%
Primary consumers	55%	35%	45%
Secondary consumers	45%	25%	30%
Tertiary consumers	30%	15%	25%
Decomposers	10%	10%	15%

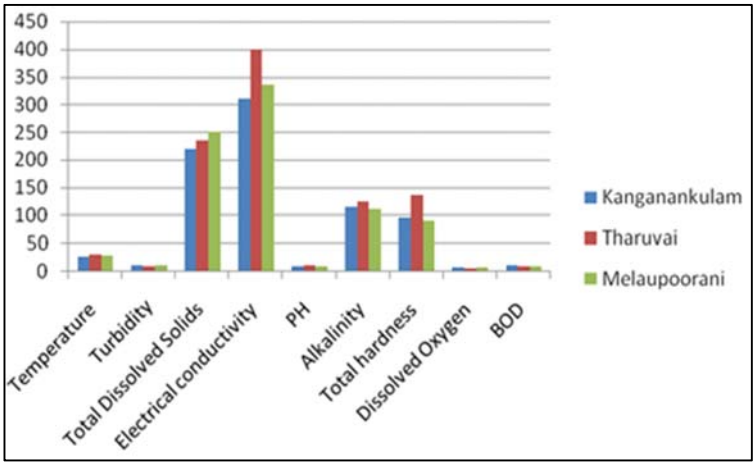

Fig 1: Graphical representation of Physico Chemical analysis of three pond water in 2010

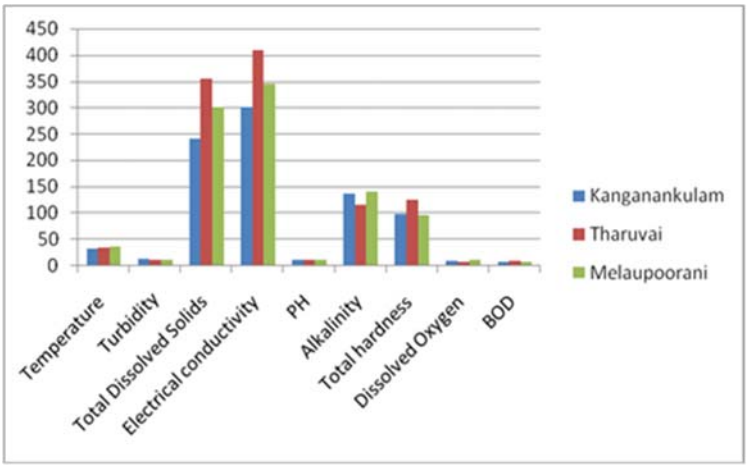

Fig 2: Graphical representation of Physico Chemical analysis of three pond water in 2015

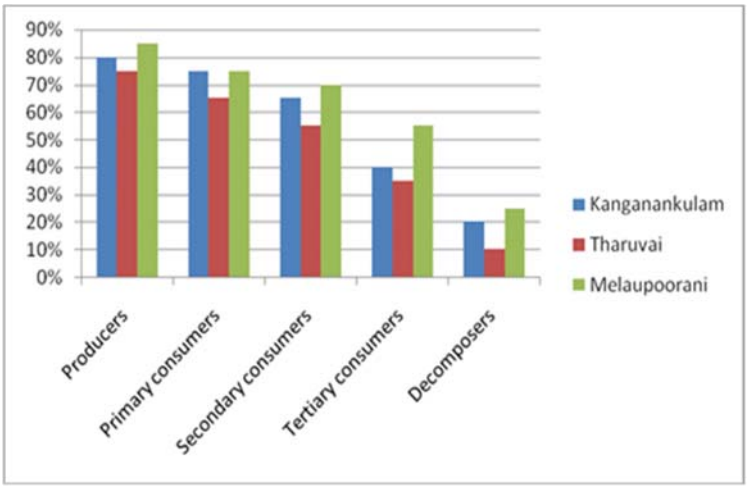

Fig 3: Graphical representation of Ecosystem analysis of three ponds in 2010

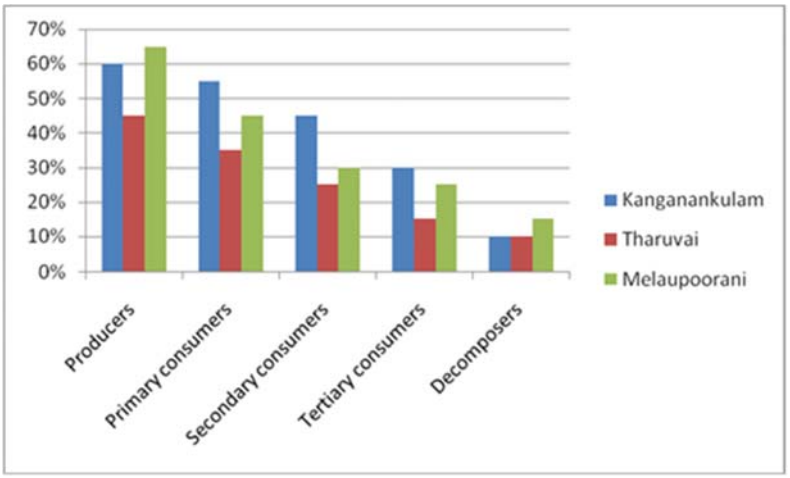

Fig 4: Graphical representation of Ecosystem analysis of three ponds in 2015

4. Conclusions

The level of all the physicochemical parameters in three ponds is increased during five years 2010 – 2015. It is caused by various anthropogenic activities like pollution which leads to eutrophication, contamination, acid rain and invasion of exotic species. New threats such as global warming, ultraviolet radiation, and invasion by exotic species will most likely increase in importance. Within five years (2010-2015) the area of the ponds are greatly reduced. The number of producers, consumers and decomposers is also decreased during five years due to the anthropogenic activities. To preserve the ponds and its ecosystems, concern environmental programmes and implementation of new environmental strategies and administrations should be carried out.

5. References

1. Nebel B, Wright R. Environmental science: the way the world works. Prentice Hall, 1993. Retrieved from http://books.google.com.mx/books?id=4wjxeUeaRnMC