International Journal of Fauna and Biological Studies
Available online at www.faunajournal.com

IJFBS
International Journal of Fauna And Biological Studies

ISSN 2347-2677
IJFBS 2013; 1 (2): 8-12

Received: 23-10-2013
Accepted: 04-11-2013

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Biodiversity of Aquatic Insect Population in Two Permanent Ponds of Kanyakumari District

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ABSTRACT
The present study deals with aquatic insects of two permanent ponds of Kanyakumari District. The survey conducted from August 2012-June 2013, enumerated 25 different species belonging to 11 families and 4 orders. Aquatic insects are probably best known for their ability to indicate about the water quality in a particular environment. If a sample of the aquatic insects in a particular place is analyzed, in terms of the sensitive kind versus tolerant kinds, one can get a good measure of the environment.

Keywords: Aquatic insects, Permanent ponds, Entomology, Water Quality.

1. Introduction
Science of aquatic entomology embraces odonata, plecopterans, ephemeropterans. Trichopterans, Dipterans, Heteroptera and such others. They spend a part of (or) their whole life in aquatic system. There are many different kinds of aquatic insects and almost every type of freshwater environment will have some kind of aquatic insect living in it[12]. One of the most fascinating characteristics of the aquatic insect population is their diverse pattern of distribution in aquatic habitat coupled with their adaptability. These aquatic insects are sufficiently flexible to withstand the often severe and sometimes unpredictable environments[10]. One of the vital factors that govern the population dynamics of the aquatic insect is the substratum upon which the drama of its ecology is acted out. It is the medium upon which the bugs and beetles move, rest find shelter and seek food[1]. The micro environmental conditions include the water temperature and it affects the emergence of aquatic insects[3, 8, 9]. Aquatic insects exhibits the ability to use wide variety of food resources, exploit and develop them into a variety of macro and micro feeders that operate from deep within the substrata to the top of the surface film. Due to the eutrophic nature of dipteran larvae, they have been used as reliable bioindicators of aquatic pollution and related perturbations. The micro-environmental conditions include water temperature and is one of the important factors affecting life histories of aquatic insects[13].

2. Materials and Methods
Two permanent ponds were selected in Karavilai near Marthandam to study the aquatic insect population for a period of 10 months from August 2012– June 2013. Monthly collections were made for the entire period of study in three stations in the pond.

- First pond has an area of about 15 ha and an average depth of one meter.
- Second pond has an area of about 20 ha and an average depth of two meters.

2.1. Description of Stations
Station-I : Dense with floating and submerged vegetation.
Station-II : Open water area completely devoid of vegetation and used as a bathing ghat.
Station-III : Open water area with sparse vegetation and the deepest area of the pond.

2.2. Collection Methods
According to Menke[7] the aquatic bugs in particular are to be collected differently according to their behaviours and dragged through the organic debris, floating vegetation, tangled roots and other objects. Insects clinging on the vegetation were handpicked.

Some insects were collected by splashing water on the bank to flush them out of the crevices and small insects that hide in mosses and floating vegetation were exposed by pressing the plant under water. The aquatic insects in open area were collected with the help of a pond net. The insects were collected by filtering forty liters of water with the help of a pond net. Habitat sampling of the insects and water were made during early hours of the day (6 am – 9 am) since many aquatic insects migrate to deeper water during late hours of the day. The insects collected were categorized, recorded and stored in 10% of formalin.

Water sampled from the pond during the collection of insects were brought to the laboratory to determine the temperature, pH, Electrical conductivity, Dissolved Oxygen was determined by the Winkler's method. The phosphates, nitrates and nitrites were estimated by standard method.

2.3. Parameters Recorded In Two Ponds

- Temperature
- pH
- Conductivity
- Total Dissolved Solids
- Electrical Conductivity
- Dissolved Oxygen
- Organic Carbon
- Calcium Carbonate
- Phosphate
- Nitrate
- Nitrite

Table 1: List of species collected from the two permanent ponds (August 2012 –June 2013)

Serial Number	Insects	Family	Order
1	*Ranatra*	Nepidae	Hemiptera
2	*Hydrometra*	Hydrometridae	Hemiptera
3	*Platythemis*	Platycnemididae	Odonata
4	*Cybister*	Dytiscidae	Coleoptera
5	*Cybister Larva*	Dytiscidae	Coleoptera
6	*Prodasineura*	Libellulidae	Odonata
7	*Diplonychus*	Belostomatidae	Heteroptera
8	*Acisoma*	Libellulidae	Odonata
9	*Libellula*	Libellulidae	Odonata
10	*Macrodiplax*	Libellulidae	Odonata
11	*Sympetrum*	Libellulidae	Odonata
12	*Aquarius*	Gerridae	Heteroptera
13	*Epitheca*	Cordulidae	Odonata
14	*Hydrobia Larda*	Hygrobiidae	Coleoptera
15	*Brachythemis*	Libellulidae	Odonata
16	*Hydrobasileus*	Libellulidae	Odonata
17	*Orthetrum*	Libellulidae	Odonata
18	*Macromida*	Macromiidae	Odonata
19	*Limnogonus*	Gerridae	Heteroptera
20	*Nepa*	Nepidae	Heteroptera
21	*Corixa*	Corixidae	Hemiptera
22	*Labrogonphus*	Gomphidae	Odonata
23	*Cordula*	Cordulidae	Odonata
24	*Somatochlora*	Cordulidae	Odonata
25	*Stylurus*	Gomphidae	Odonata

3. Results

3.1. Rainfall

The rainfall in the study is recorded. Kanyakumari experiences rainfall both during the south west and north east monsoons. During the south west monsoon there was heavy rain during June and declined during August. The north east monsoon was very heavy and the highest rainfall was noticed during November, the north east monsoon continued up to January with less intensity.

3.2. Insect population

The population of insects was studied in the pond ecosystem from August 2012-June 2013. The list of species collected from the pond was given in the table. The insect population was very high in the month of June due to the onset of south west monsoon in station 1 and 2 of pond-1. But the insect population was very high in the month of the December in station-3 of the pond-1. The insect population seemed to be very high in the month of December in station-1 and station-2. Because this year during the month of November and December there was a heavy rainfall. The insect population seemed to be high in the permanent ponds from August - 2012 to June - 2013 and yielded 25 different species belonging to 11–families and 4-orders. The insect population was studied in the two permanent ponds during a period of 11 months from August – 2012 to June - 2013. Pond-1 and pond-2 yielded 25 species of insects. They are tabulated.

Figure: 1

Regression analysis depicting the relation between the Dissolved Oxygen and Insect population in pond-I

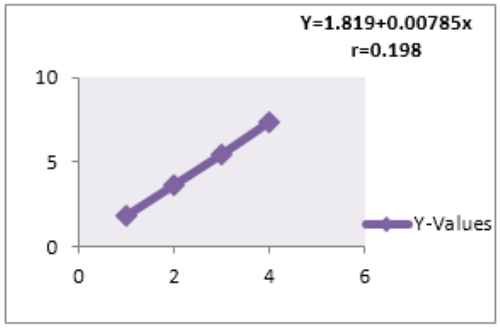


Figure: 2

Regression analysis depicting the relation between the Phosphate content And Insect population in pond-I

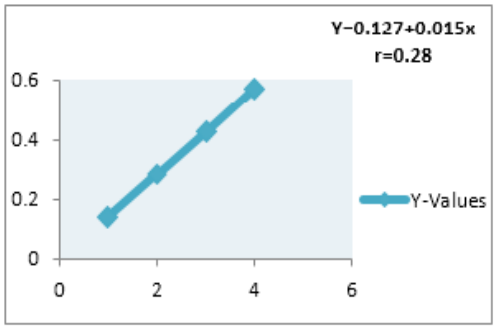


Figure: 3

Regression analysis depicting the relation between the Nitrite content and Insect population in pond-1

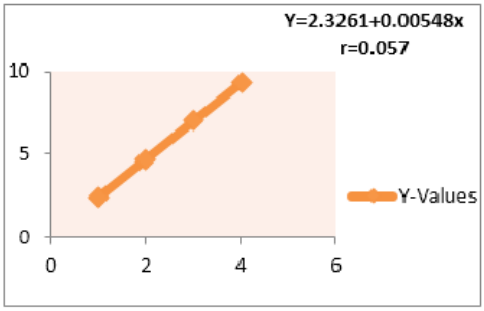


Figure: 4

Regression analysis depicting the relation between the Nitrate content and Insect population in pond-1

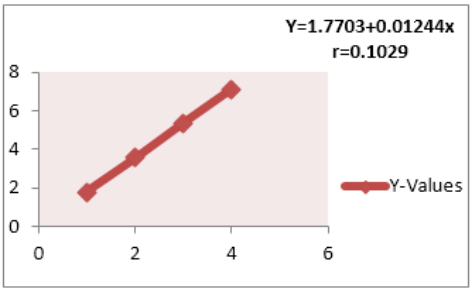


Figure: 5

Regression analysis depicting the relation between the Organic Carbon and Insect population in pond-1

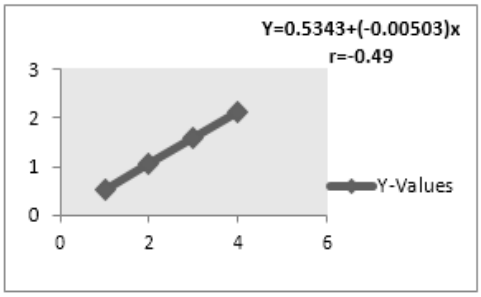


Figure: 6

Regression analysis depicting the relation between the Calcium Carbonate and Insect population in pond-1

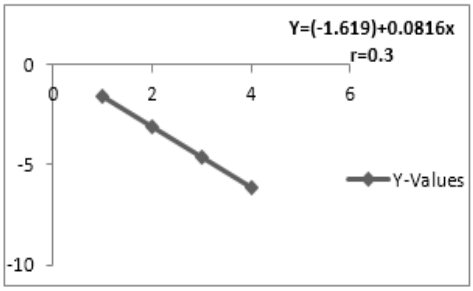


Figure: 7

Regression analysis depicting the relation between the Dissolved Oxygen and Insect population in pond-2

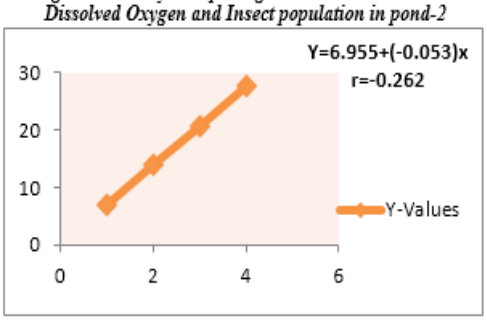


Figure: 8

Regression analysis depicting the relation between the Phosphate content and insect population in pond-2

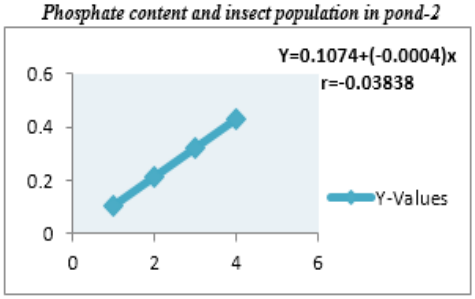


Figure: 9

Regression analysis depicting the relation between the Nitrite content and Insect population in pond-2

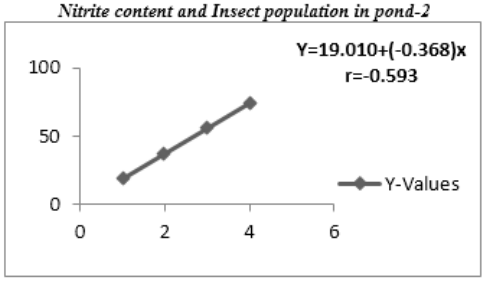
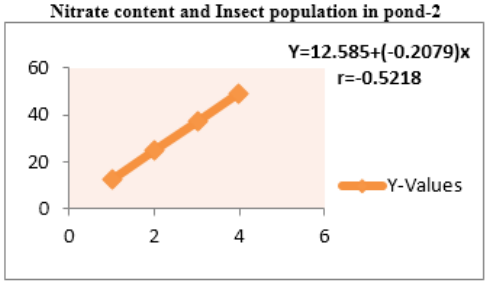
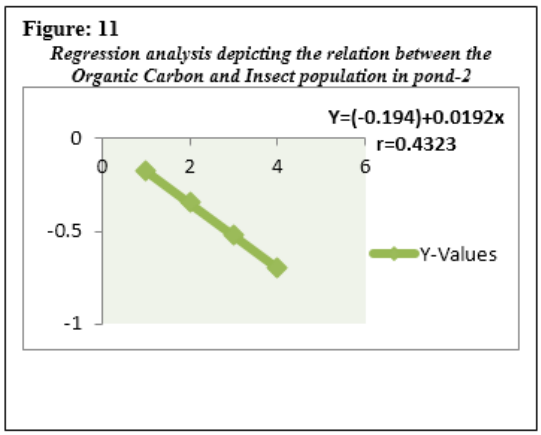
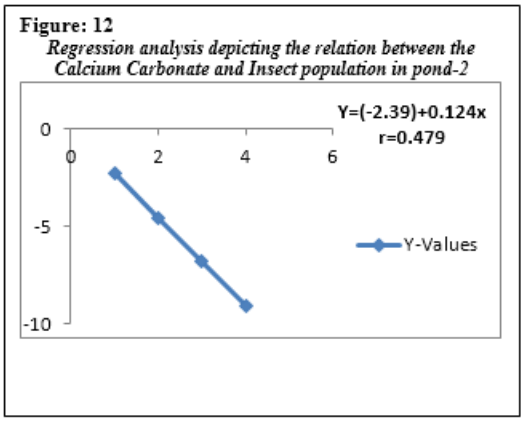


Figure: 10

Regression analysis depicting the relation between the Nitrate content and Insect population in pond-2







4. Discussion

The study of population of the aquatic insects in two perennial ponds revealed the fact that the aquatic insect population was regulated and governed by abiotic and biotic factors. Abiotic factors such as rainfall, moderate or optimum air and water temperature, dissolved oxygen, pH, soil factors like phosphate, nitrite, nitrate and silt, clay and sand were governing the population levels of aquatic insects in the two ponds. During April, May there was heavy rainfall due to the south west monsoon. Most of the predators like *D. indicus* and *R. filiformis* are voracious feeders on mosquitoes. According to Rao[11] in *Nepidae*, the abiotic factors such as rainfall, temperature together with abundance of food have an augmentative effect on their population. The bugs population was observed in the hotter months of the year and this might be due to the better adaptation of the bugs to withstand the higher temperatures. However the population of aquatic insects especially D. *indicus* and R. *filiformis* maintained a good population even at higher ph. Dissolved oxygen had a positive correlation with the insect population in pond-1. But Thirumalai and Raghunathan[14] found that dissolved oxygen apparently had no effect on the population of aquatic insects. Moreover changes in water temperature had a profound influence on the population density and nymphal development of D. *indicus*. In the present study dispersal was minimum. This was in agreement with the studies of Knowles[5] and Dechaine and Martin[2]. Moreover strong dispersal barriers control the dispersal of insects[4].

5. Conclusion

One of the most fascinating characteristics of the aquatic insect population is their diverse pattern of distribution in habitats coupled with their adaptability. The Study of the aquatic insect population has assumed importance in the context of pollution to water bodies and the potentialities of many aquatic bugs in controlling vector population especially culex mosquitoes. Aquatic insects are probably best known for their ability to indicate about the water quality in a particular environment. If a sample of the aquatic insects in a particular place is analyzed, in terms of the sensitive kinds verus tolerant kinds, one can get a good measure of the environmental health. Healthy aquatic environments have a lot of different sensitive kinds, while polluted environments have only a few kinds of aquatic insects. This process is called biological monitoring. A detailed study of the population of the aquatic insect in two perennial ponds yielded the following insects. In pond-1 and Pond-2 population included. Ranatra, Hydrometra, Platythemis, Cybister, Cybister Larva, Prodasineura, Acisoma, Libellula, Macrodiplax, Sympetrum, Aquarius, Epitheca, Hydrobia, Larda, Brachythemis, Hydrobasileus, Orthetrum, Macromida, Limnogonus, Nepa, Corixa, Labrogonphus, Cordulla, Somatochlora, Stylurus belonging to 11 families and 4 orders. The Study of insect population indicated the fact that their population was governed by biotic and abiotic factors. Among the abiotic factors, rainfall, temperature, dissolved oxygen influence the population. In pond-1 Dissolved oxygen is low than pond-2 and it may be due to the polluted water and due to eutrophication. There was positive correlation between the dissolved oxygen, Nitrite, Nitrate, Phosphate and Calcium Carbonate and insect population and Negative Correlation between Organic Carbon and insect population in pond-1. Eutrophication in the pond is evidenced by the presence of higher phosphates, nitrites and nitrates. In pond-2 there was positive correlation between dissolved oxygen, Phosphate, nitrite, nitrate and insect population. And negative correlation between organic carbon, calcium carbonate and insect population in pond-2. Based on the Shannon Wiener index it was found that pond-I have the rich diversity of aquatic insects.

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