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The impact of applying rice straw substrates on periphyton and plankton abundance and community composition

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Abstract

An experiment had been accomplished over a fish culture season which extended from May to December; to investigate the abundance, dynamics and community composition of both phyto and zoo plankton. Six earthen ponds each of 1000 m^2 volume and 1 m in depth were divided into two groups; the 1st one implemented as control (T_1), while dry rice straw introduced to the ponds of the 2nd group (T_2) in the rate of 45 g/m^2. All ponds were fertilized with chicken manure in the rate of 15 kg/pond/week. All ponds received mono sex Nile tilapia fry in the rate of 3 fry/m^2. Abundance, dynamics and community composition of both phyto and zooplankton were monthly detected. Obtained results revealed that the highest total phytoplankton count was during August, and that count in source water was lower than that in T_1 and T_2 treatments. The highest total zooplankton count in source water was at the beginning of the experiment during May, while the 1st achieved peaks of total zooplankton count in source water as well as in the two investigated treatments; were during August. Total zooplankton count in source water was higher than that in T_1 or T_2 treatments. Concerning phytoplankton community composition; Cyanophyta dominated other groups in source water, T_1 or in T_2 treatment, while with respect to periphyton community composition; Chlorophyta dominated other groups on rice straw mats, while copepods dominated the other zooplankton groups in source water and in the two investigated treatments. It's concluded that different management techniques, such as fertilization, type of cultivated species and applying substrates for periphyton growth, influenced the community composition of phyto and zooplankton as well as periphyton organisms.

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Introduction

Periphyton and phytoplankton are dominant producers of organic matter and are responsible for carbon fixation and the sequestration of essential nutrients, such as nitrogen and phosphorus, in the aquatic ecosystem (**Mc Cormick, 2011; Sun *et al.*, 2011**). The periphytic organisms constitute an important food source for many other aquatic organisms (**Uddin *et al.*, 2007; Felisberto and Rodrigues, 2010**). The importance of periphytic organisms as feed for young fish has been reported (**Takami *et al.*, 1997; Asaduzzaman *et al.*, 2009**) such as laboratory food sources or culture systems.

Periphyton has been reported to attach to various substrata and to form various types of biofilm **(Ishida *et al.*, 2008; Dos Santos *et al.*, 2013)**. Because periphyton can remain attached to various substrata for an extensive period, they can be used as a biological indicator to evaluate water quality by monitoring changes in biomass or species composition **(Montuelle *et al.*, 2010)**.

Rice straw is relatively low cost material and has low nutritive value (**Potikanond *et al.*, 1987**). Farmers often burn them in the field instead of using wisely in the fish ponds that may pollute the environment. Rice straw can be used in fish ponds to develop bacterial biofilm and periphyton (**Ramesh *et al.*, 1999; Mridula *et al.*, 2003, 2005**) that eventually enhance the fish production. However, excessive loading of rice straw can cause oxygen depletion and may kill fishes (**Keshavanath *et al.*, 2001; Van Dam *et al.*, 2002**). Hence, prior to applying to the pond, it is prerequisite to identify the appropriate loading level of rice straw that doesn’t degrade water quality.

Fluctuations in plankton communities in fish farms indicate the organisms’ dependence on the physical and chemical conditions and on the management employed, which lead to great oscillations caused by the very dynamics of the fish ponds (**Abu Affan *et al.*, 2005**). In general, different planktonic species can tolerate different ranges of temperature as well as nutrient concentrations. These tolerance levels determine the dominance of different species within different seasons (**Fogg, 1975**). Productivity in meso-oligotrophic farms is positively correlated with the richness of zooplankton species, whereas primary productivity is correlated with changes in the composition of zooplankton species (**Dodson *et al*., 2009**).

Analysis of the plankton community in fish farm systems is an important tool to evaluate water quality conditions, as changes in nutrient concentrations determine changes in species composition (**Sipaúba-Tavares *et al*, 2010**).

The present work designed to investigate to what extent management in earthen fish ponds could influenced abundance, dynamics and community composition of both phyto and zooplankton.

Materials and Methods

Study area and experimental design

An experiment had been conducted during the period from May to December / 2017 in earthen ponds belongs to the world fish center. Six 1000 m^2 were divided into two treatments, each of 3 replicates; all ponds were fertilized with dry chicken manure in the rate of 15 kg/pond/week, received fresh water from El-Ismailia canal which occasionally mixed with well water and cultivated with mono sex Nile tilapia (*Oreochromis niloticus*) fry in the rate of 3 fry/m^2. The 1st treatment received no substrates and kept as control (T$_1$), while the 2nd one (T$_2$) received 45 kg dry rice straw/pond. Rice straw was in the form of bundles; which suspended from vertical pillars which established along the pond sides.

Phytoplankton sample preparation

One litter of water was collected from each selected sites, immediately preserved with Lugol's Iodine solution.

Periphyton sample preparation

Pieces of rice straw was cut from three different places and wrapped in aluminum foil until analysis. Each sample was transferred to an Erlenmeyer flask containing 50 ml distilled water, and shaken in mechanical shaker for about 3 hours to detach periphyton from the straw, and then preserved in 6 % formalin until identification.

Phytoplankton and Periphyton identification

In the laboratory, the samples are transferred into a glass cylinder and left five days for settling. The supernatant siphoned off with plastic tube ended with plankton net 10 mm mesh diameter. Each sample was examined and counted according to **APHA (2000)**. Different species were identified according to **Stirling (1985)**.

Zooplankton sampling and identification

Samples were collected from the selected sites by filtering 30 liters from surface water through a zooplankton net 55 µm mesh diameter. The sediment of samples were kept in plastic bottles with some water, and 4% formalin was added as a preservative **(APHA, 2000)**. The counts of zooplankton were performed using Sedgwick-Rafter cell under a binocular microscope and specimen were identified. The main taxonomic reference used for identification of zooplankton was **Pennak (1953)** and **Edmondson (1966)**.

Statistical analysis

Comparison of treatment means using one-way analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) was performed to compare the different treatment means at 5% level of significance. The software SPSS, version 10 (SPSS, Richmond, USA) was used as described by **Dytham (1999).**

Results and Discussion

As shown in Figure 1; total phytoplankton count started to increase gradually with time, until reached its naximum value ($112.56\ ^{*}\ 10^6$ org./L) during August in T_1 teatment. Another peak ($90.92\ ^{*}\ 10^6$ org./L) recorded during October. The lowest valu was in source water. The increased total count in T_1 could be atributed to fertilization. **Kumara *et al.* (2003)** stated that chicken manure significantly ($P < 0.05$) increased phytoplankton density than control. **Menezes *et al.* (2010)** stated that the Nile tilapia reduced the biomass of large algae and total phytoplankton biomass through direct grazing. Total phytoplankton peak occurred during August in all ponds, when a higher concentration of nutrient coupled with high temperature, pH, and long daytime was available (**Abu Affan *et al*., 2005**).

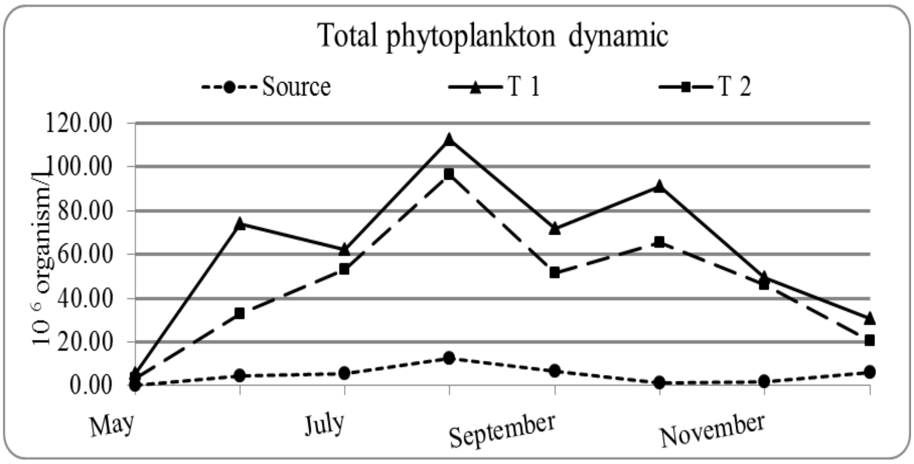

Figure 1: Total phytoplankton dynamic alongside the study period.

Chlorophyta increased gradually with time until October where the highest value (20.16 * 10^6 org./L) which was recorded in T_1 (Figure 2). The lowest values alongside the study period were recorded in source water.

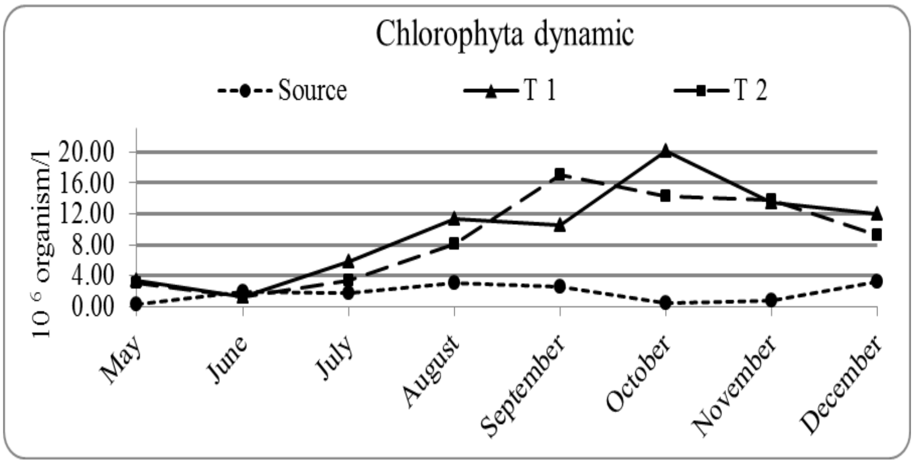

Figure 2: Chlorophyta dynamic alongside the study period.

Figure 3 clarified that Cyanophyta had the same trend as total phytoplankton count, where its count started to increase gradually until August, where reached its maximum value (99.12 * 10^{6} org./L) which was recorded in T_1. The lowest values were recorded in source water alongside the study period.

Bacillariophyta dynamic throughout the study period had two peaks; the 1st (0.91 * 10^{6} org./L) was recorded in T_1 during August, while the 2nd (1.218 * 10^{6} org./L) was recorded in T_2 treatment during November (Figure 4).

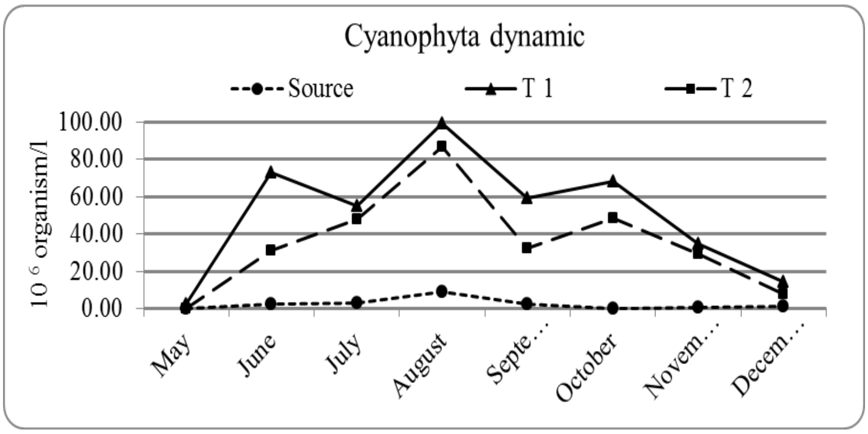

Figure 3: Cyanophyta dynamic alongside the study period.

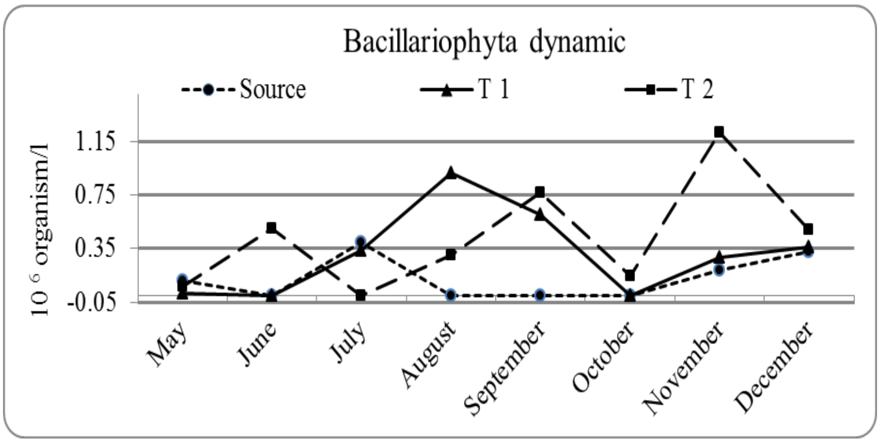

Figure 4: Bacillariophyta dynamic alongside the study period.

Figure 5 showing that the highest Euglenophyta (2.63 * 10^6 org. /L) was recorded in T_1 during October. The lowest values were recorded in source water during most periods of the study.

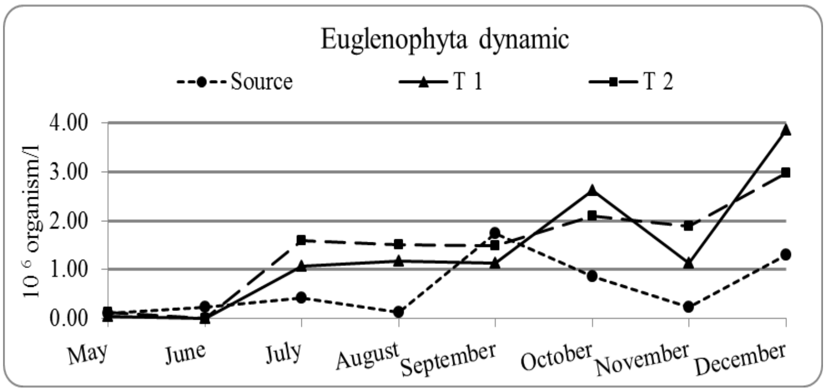

Figure 5: Euglenophyta dynamic alongside the study period.

The highest total periphyton count as well as Chlorophyta and Bacillariophyta groups which grown on the rice straw mats were recorded during November with values of 2725.27, 2084.51 and 170.29 * 10^6 org. / m^2, respectively. The highest Cyanophyta count (590.8 * 10^6 org. / m^2) was recorded during September, while the highest Euglenophyta count (186.76 * 10^6 org. / m^2 was recorded during December (Figure 6).

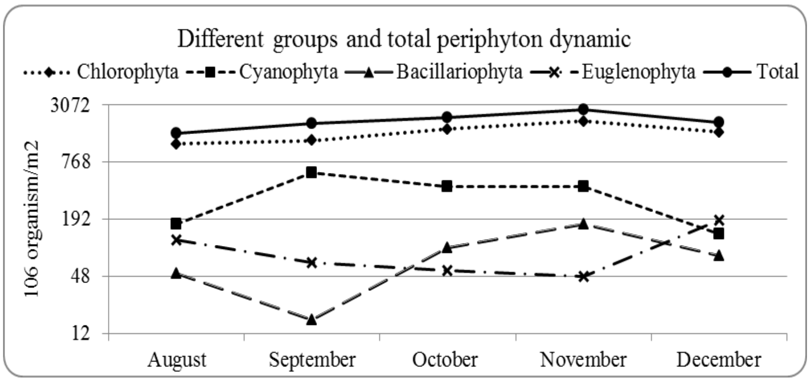

Figure 6: Different groups and total periphyton dynamic alongside the study period.

Figure 7 revealing that among different groups of periphyton ; Chlorophyta recorded the highest mean average, followed by Cyanophyta, Euglenophyta and then bacillariophyta. Concerning phytoplankton, the highest mean average of total, Chlorophyta and Cyanophyta were recorded in T_1, while the highest mean average of Bacillariophyta and Euglenophyta were recorded in the water of T_2 treatment.

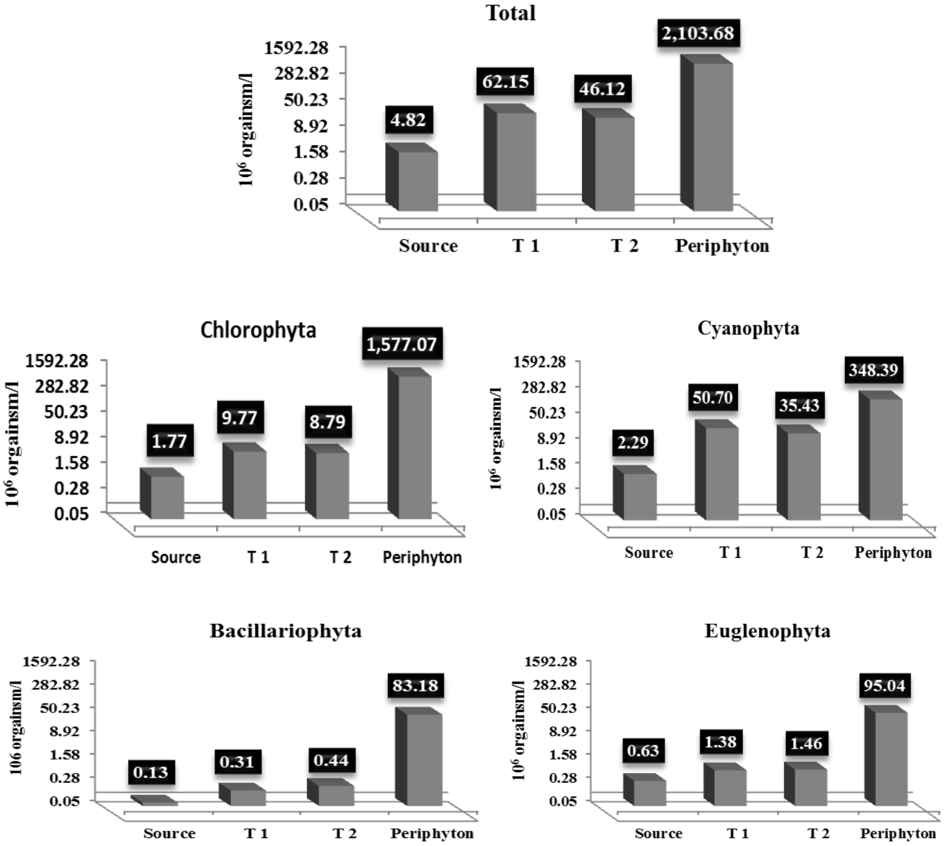

Figure 7: The mean average of different groups and total count of both phytoplankton and periphyton in different sampling sites.

Obtained results revealed that fertilization significantly ($P<0.05$) affected the community composition of phytoplankton in source water and different treatments, as well as the community composition of periphyton which attached to the applied rice straw mats. Fertilization increased Cyanophyta percentage from 37% in source water to 80% and 81% in the water of T_1 and T_2 treatments, respectively (Figure 8). Conversely; Chlorophyta percentage decreased from 37% in source water to 17% and 15% in the water of T_1 and T_2 treatments, respectively. Euglenophyta decreased from 12% in source water to 2% and 3% in T_1 and T_2 treatments, respectively, while Bacillariophyta had the lowest alteration among different phytoplankton groups; from 2% in source water to 1% in both T_1 and T_2 treatments. On the other hand; Chlorophyta dominated other periphyton groups that attached to rice straw mats, where it represented 79% of the community, while Cyanophyta represented only 9% of the community. **Figueredo and Giani (2005)** stated that tilapia influences phytoplankton communities by top-down and bottom-up ecological effects, selecting large algae by filtration (cyanobacteria and diatoms), which leads to a propagation of chlorophytes.

Kibria, *et al*. (1997) revealed that zooplankton are valuable sources of protein, amino acids, lipids, fatty acids and essential minerals and enzymes needed by aquatic organisms for effective normal growth and survival.

On the contrary to phytoplankton; total zooplankton count in source water was higher than the other two treatments. The highest total zooplankton count in source water and in T_1 and T_2 treatments; after the beginning of the experiment, were 82.5, 76.0 and 70.0 $* 10^3$ org./L, respectively (Figure 9). This may be due to the presence of fish in these treatments. **Bwanika, *et al*. (2006)** observed that the consumption of zooplankton by tilapia may be significant, where the percentage of zooplankton in the stomach contents of *O. niloticus* varied from 8 to 13%. This also explained that total zooplankton count significantly ($P<0.05$) decreased with time alongside the study period. **Menezes, *et al*. (2010)** stated that omnivorous filter-feeding fish such as the Nile tilapia can reduce both zooplankton and phytoplankton biomass, instead of indirectly enhancing phytoplankton through predation on zooplankton; it reduced the biomass of large algae and total phytoplankton biomass through direct grazing.

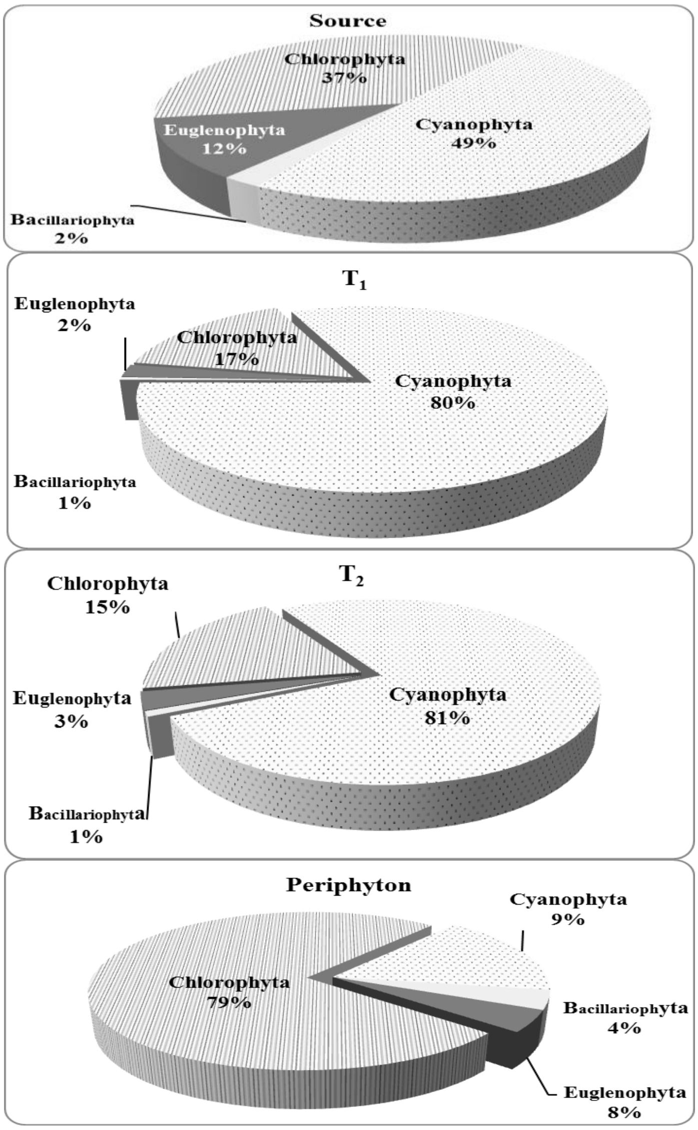

Figure 8: The community composition of both phytoplankton and periphyton in different sampling sites.

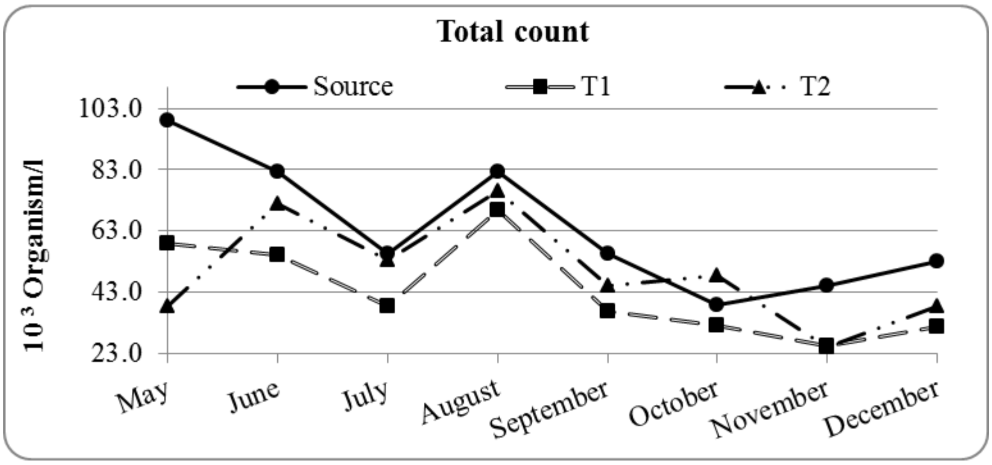

Figure 9: Total zooplankton dynamic alongside the study period.

Figure 10 revealing that rotifer count significantly ($P<0.05$) decreased with time. The highest rotifera count ($40 * 10^3$ org./L) was in source water at the beginning of the experiment during May. It's revealed also that rotifers counts in the two investigated treatments were significantly ($P<0.05$) lower than its count in source water. **Menezes, *et al*. (2010)** stated that rotifera biomass were negatively affected by tilapias.

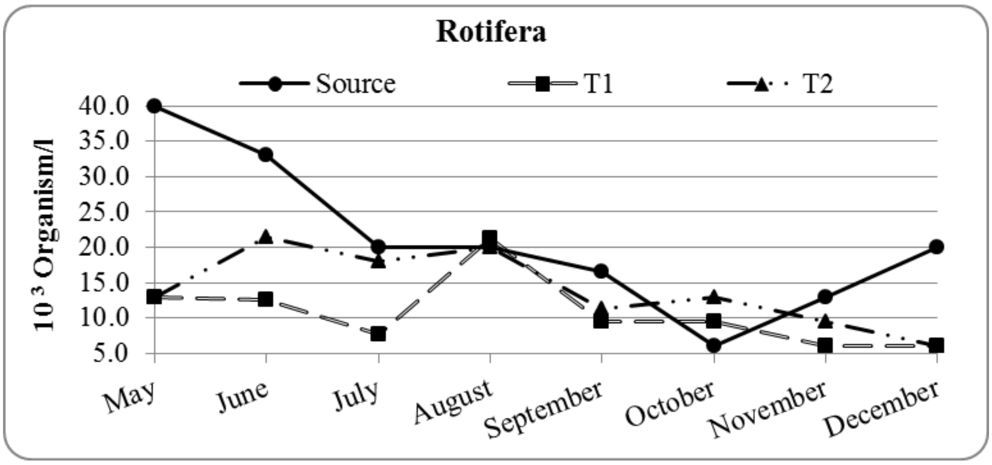

Figure 10: Rotifera dynamic alongside the study period.

Copepoda increased with time in the two investigated treatments; where it's dynamic showed two peaks; the 1st during June, where its average count in T_2 and T_1 treatments were 31.25 and 24.75 * 10^3 org./L, respectively, while the 2nd during August, 33 and 29.5 * 10^3 org./L, respectively (Figure 11). **Pinto-Coelho, *et al*. (2005)** stated that organic fertilization is also known to promote the growth of copepods.

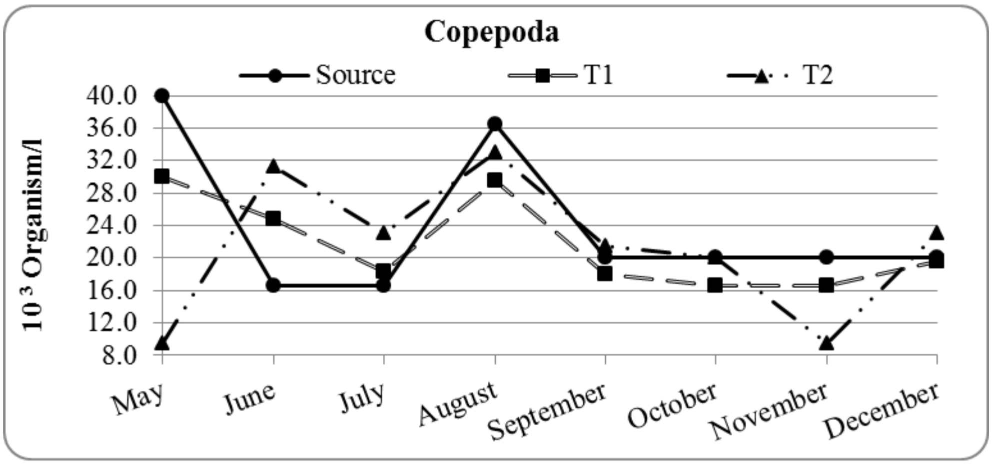

Figure 11: Copepoda dynamic alongside the study period.

Figure 12 revealing that cladocera as both rotifera and copepod decreased to their lowest count during July. The highest cladocera count in source and T_1 water were during June (30 and 16.5 * 10^3 org./L, respectively), while its highest count in T_2 treatment (20 * 10^3 org./L) was during August. **Ibrahim, *et al*. (2015)** confirmed that juvenile Nile tilapia ingest cladocerans, as well as copepods and rotifers, through both visual predation and filter-feeding.

Cladocera started to increase again during August while rotifers continue decreasing until the end of the study which could be explained; according to **Ibrahim, *et al.* (2015)** by the fact that tilapia Adults stop consuming micro crustaceans through visual predation and begin to eat only rotifers, which they catch through filter feeding.

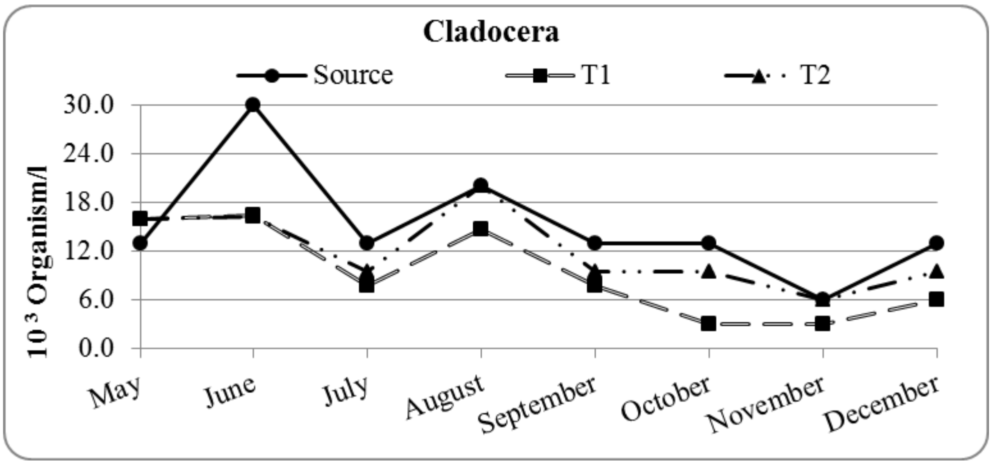

Figure 12: Cladocera dynamic alongside the study period.

As shown in Figure 13, the average count of Ostracoda started to increase with time until July; and then remained constant during the period from July to August in T_1 and from June to September in T_2 treatment, before started to increase again till October. This could be explained by the same explanation which previously mentioned by **Ibrahim, *et al*. (2015)**; that tilapia Adults begin to eat only rotifers.

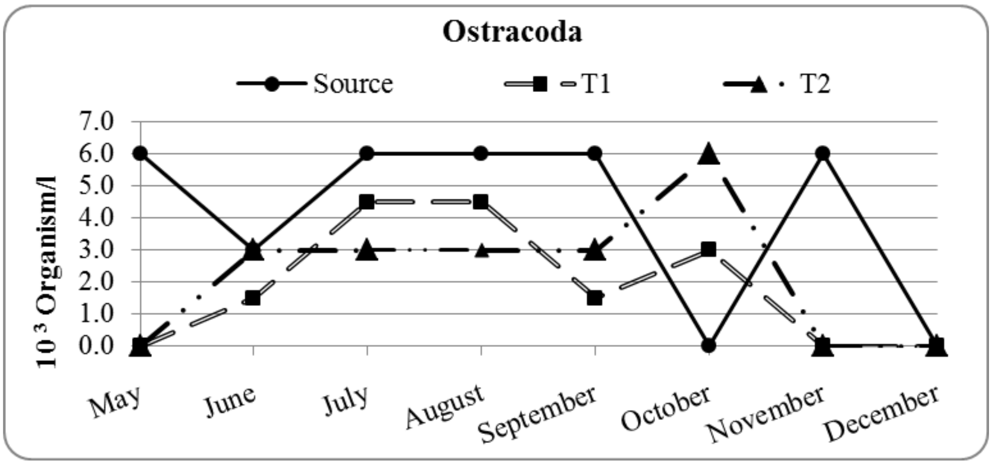

Figure 13: Ostracoda dynamic alongside the study period.

Obtained data revealed that the generic average of total zooplankton in both T_1 and T_2 were significantly ($P<0.05$) lower than in source water (Figure 14), which attributed to the presence of fish in these treatments (**Bwanika *et al*., 2006; Menezes *et al*., 2010**).

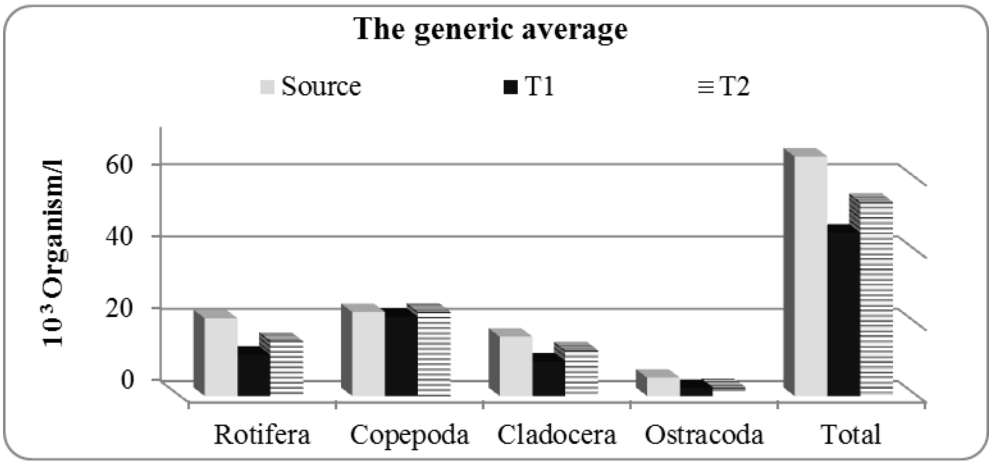

Figure 14: The generic average of different groups and total count of zooplankton in different sampling sites.

Obtained data which illustrated in Figure 15 revealed that the application of organic fertilizer, significantly ($P<0.05$) affected zooplankton community composition. Rotifera percentage decreased from 32 % in source water to 25 and 28 % in T_1 and T_2 treatments, respectively. Cladocera percentage reduced from 25 % in source water to 21 and 24 % in T_1 and T_2 treatments, respectively, while ostracoda percentage decreased from 8 % in source water to 5 % in the two investigated treatments. On the contrary, copepoda percentage increased from 35 % in source water to 49 and 43 % in T_1 and T_2 treatments, respectively. **Okun, *et al*. (2008)** revealed that tilapia selectively consumed large cladocerans, which explains the decrease in its percentages in the investigated treatments than in control. Similarly; the decrease of rotifers in the two investigated treatments could be attributed to the fact that adult tilapias started to ingest small zooplankton through filter feeding besides consuming large zooplankton through visual predation (**Beveridge and Baird, 2000**). **Ibrahim, *et al*. (2015)** stated that copepods, is not ingested at the same rate as rotifers, because they are efficient in escaping from predation; which explain the increase of its percentage in T_1 and T_2 treatments than in source water.

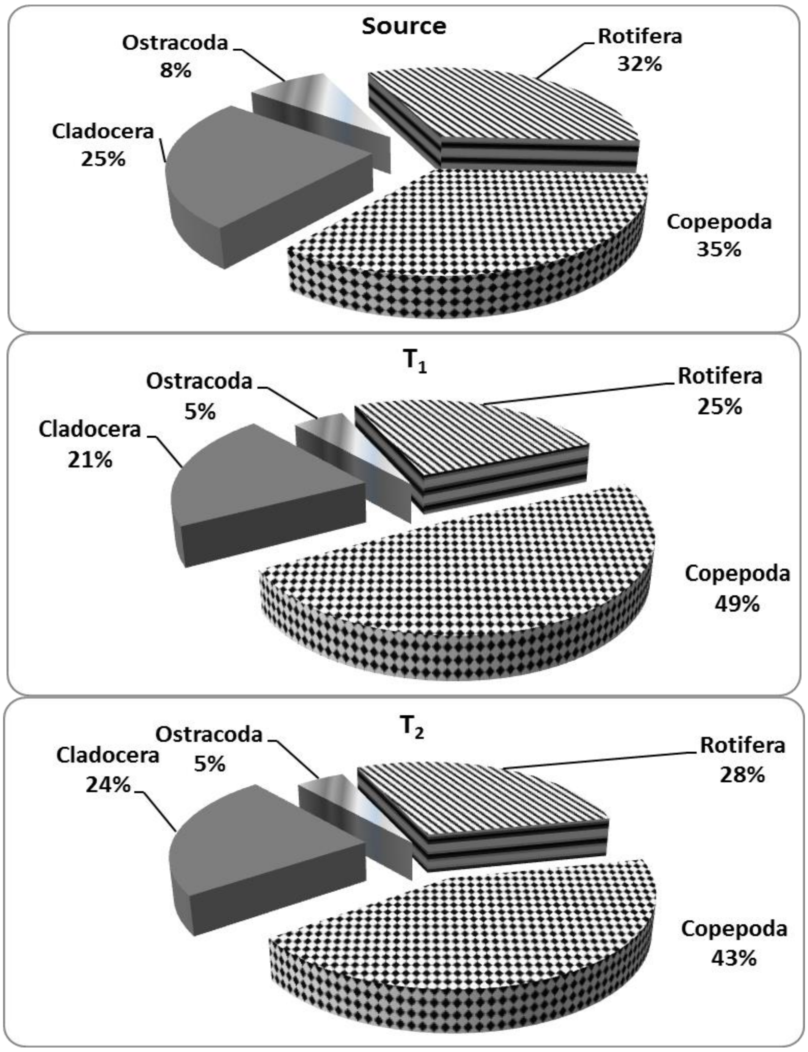

Figure 15: The community composition of zooplankton in different sampling sites.

Conclusion

From the data obtained at the end of the present work; it could be concluded that different management techniques efficiently influence the dominance, dynamics and community composition of phyto and zoo plankton as well as different groups and community composition of the periphytic organisms that grown on the rice straw mats, based upon the adequate management of fish pond could efficiently optimize booth plankton and periphyton different parameters, which consequently maximize the benefit of the fish pond; especially, under the conditions investigated during the present work, especially the application period of rice straw mats which is three months .

References

Abu Affan, M. D.; Abu Syed, J.; Mahfuzul Haque, M. D.; Saleha, K. and Joon-Baek, L. (2005).Seasonal Cycle of Phytoplankton in Aquaculture Ponds in Bangladesh. *Algae.,* **20(1): 43-52.**

Asaduzzaman, M. D.; Abdul Wahab, M. D. and Azim E. (2009). Effects of stocking density of freshwater prawn *Macrobrachium rosenbergii* and addition of different levels of tilapia *Oreochromis niloticus* on production in C/N controlled periphyton based system. *J. Aquacul.,* **286: 72-79.**

APHA (American Public Health Association) (2000). Standard methods for the examination of water and waste water 16 th ed., Washington, D.C.

Beveridge, M. C. M.; Baird, D. J. (2000). Diet, feeding and digestive physiology, p. 59-87. In: Beveridge, M. C. M; McAndrew, B. J. (Eds.) Tilapias: Biology and Exploitation. Stirling, University of Stirling. doi: 10.1007/978-94-011-4008-9_3.

Bwanika, G. N.; Chapman, L. J.; Kizito, Y. and Balirwa. J. (2006). Cascading effects of introduced Nile Perch (*Lates niloticus*) on the foraging ecology of Nile tilapia (*Oreochromis niloticus*). *J. Ecol Freshw Fish*., **15: 470-481.**

Dodson, S. I.; Newman, A. L.; Will-Wolf, S.; Alexander, M. L.; Woodford, M. P. and Van Egeren, S. (2009). The relationship between zooplankton community structure and lake characteristics in temperature lakes (Northern Wisconsin, USA). *J. Plankton Res.,* **31(9): 93-100.**

Dos Santos, T. R.; Ferragut, C. and Bicudo, C. E. M. (2013). Does macrophyte architecture influence periphyton? Relationships among Utricularia foliosa, periphyton assemblage structure and its nutrient (C, N, P) status. Hydrobiologia, **714: 71–83.**

Dytham, C. (1999). Choosing and Using Statistics: A Biologist's Guide. Blackwell Science Ltd., London, UK, **147 pp**.

Edmondson, W. T. (1966). Rotifera in Edmondson, W. T (Ed.), Freshwater Biology, 2nd ed., John Wiley & Sons ,Inc. ,New York ,N Y and London.

Felisberto, S. A. and Rodrigues, L. (2010). Periphytic algal community in artificial and natural substratum in a tributary of the Rosana reservoir (Corvo Stream, Paraná State, Brazil). *Acta Scientiarum, J.Biolo.Sci.,* **32 (4): 373-385.**

Figueredo, C. C. and Giani, A. (2005). Ecological interactions between Nile tilapia (*Oreochromis niloticus, L.*) and the phytoplanktonic community of the Furnas Reservoir (Brazil). *J. Freshw. Biol.***, 50: 1391-1403.**

Fogg G. E. (1975). Algal Culture and Phytoplankton Ecology (2 nd ed.). *The University of Wisconsin Press, Wisconsin,* **175**.

Ibrahim, A. N. A.; Maria, Noll, S. M. and Valenti, W. C. (2015). Zooplankton capturing by Nile Tilapia, Oreochromis niloticus (*Teleostei: Cichlidae*) throughout post-larval development. *J. Zoologia.,* **32 (6): 469–475.**

Ishida, C. K.; Arnon, S.; Peterson, C. G.; Kelly, J. J. and Gray, K. A. (2008): Influence of algal community structure on denitrification rates in periphyton cultivated on artificial substrata. *Microb. Ecol.* **56: 140–152.**

Keshavanath, P; Gangadhara, B.; Ramesh, T. J and Van Dam, A. A. (2001).Use of artificial substrates to enhance production of freshwater herbivorous fish in pond culture. *Aquacult. Res.,* **32 (3): 189-197.**

Kibria G, Nugegoda D, Fairchongh R, Lam P, Bradly A. (1997). Zooplankton, its biochemistry and significance in aquaculture. NAGAICLARM Quarterly, April/June**, 8-14.**

Kumara, A.G.L.; Edirisinghe, U.; and Dematawewa, C.M.B. (2003). Effect of Chicken Manure and Cow Dung on Water Quality, Pond Productivity, and Growth and Survival of Goldfish (*Carassius auratus*) Fry. *J. Trop. Agric. Res.,* **15: 242-255.**

Mc Cormick, P.V. (2011). Soil and periphyton indicators of anthropogenic water-quality changes in a rainfall-driven wetland. *Wetl. Ecol. Manag.*, **19: 19–34**.

Menezes, R. F; Fernandes, R.; Attayde, J. L. and Vasconcelos, F. R. (2010). Effects of omnivorous filter-feeding fish and nutrient enrichment on the plankton community and water transparency of a tropical reservoir. *J. Freshw. Biol.,* **55: 767–779.**

Montuelle, B.; Dorigo, U.; Bérard, A.; Volat, B.; Bouchez, A.; Tlili, A.; Gouy, V. and Pesce, S. (2010). The periphyton as a multimetric bioindicator for assessing the impact of land use on rivers: An overview of the Ardières-Morcille experimental watershed. **Hydrobiologia 659: 123–141,**

Mridula, R. M.; Manissary, J. K.; Keshavanath, P.; Shankar, K. M.; Nandesha, M. C. and Rajesh, K. M. (2003). Water quality, biofilm production and growth of fringe-lipped carp (*Lapeo fimbriatus*) in tanks provided with two solid substrates. *Bioresour. Technol.,* **87: 263-267.**

Mridula, R. M.; Manissary, J. K.; Keshavanath, P.; Shankar, K. M.; Nandesha, M. C. and Rajesh, K. M. (2005). Effect of paddy straw and sugarcane bagasse on water quality, bacterial biofilm production and growth and survival of rohu, *Labeo rohita* (Hamilton). *Aquacult. Res***., 36: 635-642.**

Okun, N.; Brasil, J.; Attayde, J. L. and Costa, I. 2008. Omnivory does not prevent trophic cascade in pelagic food webs**.** Freshwater Biology**, 53: p.129-138.**

Pennak, R.W. (1953). Freshwater invertebrates of the United States. The Ronald press Co., New York, New York.

Pinto-coelho, R. M.; Giani, A.; Junior, C. A.; Carvalho, E. R.; Bezerra-neto, J. F. (2005). The nutritional status of zooplankton in a tropical reservoir: effects of food quality and community structure. *Brazilian J. Biolo.,* **65(2): 313-324.**

Potikanond, N.; Saengchot, I. andCheva-Isarakul, B. (1987). Crop residue from rice- based cropping systems for large ruminant production in ruminant feeding systems utilizing fibrous agricultural residues. Proceedings of the 7th annual workshop of the Australian-Asian fibrous agricultural residues research network, June 2-4, 1987, Chiang Mai University, Thailand.

Ramesh, M. R.; Shankar, K. M.; Mohan, C. V. and Varghese, T. J. (1999). Comparison of three plant substrates for enhancing carp growth through bacterial biofilm. *Aquaculture Engineering,* **19: 119-131.**

Sipaúba-Tavares, L. H.; Millan, R. N. and Santeiro, R. M. (2010).Characterization of a plankton community in a fish farm. *J. Acta Limnol. Bras***., 22(1): 60-69.**

Stirling H. P. 1985. Chemical and Biological Methods of Water Analysis for Aquaculturists. Institute of Aquaculture, University of Stirling, Scotland**, 119 pp.**

Sun, C. C.; Wang, Y. S.; Wu, M. L.; Dong, J. D.; Wang, Y. T.; Sun, F. L. and Zhang, Y. Y. (2011). Seasonal variation of water quality and phytoplankton response patterns in Daya Bay, *China. Int. J. Environ.Res.,* **8:2951–2966.**

Takami, H.; Kawamura, T. and Yamashita, Y. (1997). Survival and growth rates of post-larval abalone *Haliotis discus* hannai fed conspecific trail mucus and/or benthic diatom *Cocconeis scutellum* var. *parva. J. Aquacul.,* **152: 129-138.**

Uddin, M. S. Farazan, A.; Fatema, M. K.; Zaim, M. E; Wahab M. A. and Verdegem, M. C. J. (2007). Technical evaluation of tilapia (*Oreochromis niloticus*) monoculture and tilapia-prawn (*Macrobrachium rosenbergii*) polyculture in earthen ponds with or without substrates for periphyton development. *J. Aquacul.,* **269 (1-4): 232-240.**

Van Dam, A. A.; Beveridge, M. C. M.; Azim, M. E. and Vedegem, M. C. J. (2002). The potential of fish production based on periphyton. *J. Rev. Fish Biol. Fish.,* **12: 1-31.**

تأثير تطبيق ركائز قش الأرز في أحواض الأسماك الترابية علي الشيوع والتركيب المجتمعي لكل من الهائمات الحرة والملتصقة.

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أجريت هذه الدراسة علي مدار موسم إستزراع سمكي من شهر مايو وحتي شهر ديسمبر لبيان إلي أي مدي تؤثر الأساليب المختلفة لإدارة أحواض الإستزراع السمكي علي خصائص الهائمات, سواء الحرة أو الملتصقة من حيث العدد الكلي وعدد المجموعات المختلفة وكذلك ديناميكية تلك الهائمات علي مدار شهور الدراسة والتركيب المجتمعي لتلك الهائمات سواء النباتية أو البحيوانية.

أستخدم في هذه الدراسة ستة أحواض ترابية, تبلغ مساحة كل منها حوالي 1000 م^2 وعمق المياه بها حوالي 1 م, وقد قسمت هذه الأحواض إلي مجموعتان كل منهما بثلاث تكرارات. تم وضع قش الأرز إلي أحواض إحدي المجموعتان (T_2) بمعدل 45 جم/م^2 علي هيئة حزم مدلاة من قوائم ثبتت رأسيا بمحازاة الضلعان الطويلان للحوض لتعمل كركائز لتحفيز نمو الهائمات الملتصقة عليها (بيريفيتون) بينما لم يضاف قش الأرز لأحواض المجموعة الأخري (T_1) لتعمل كمجموعة ضابطة (كنترول). تم إستزراع كل الأحواض بإصبعيات البلطي النيلي وحيد الجنس بمعدل 3 إصبعيات/ م^2 , وتم كذلك تسميد كل الأحواض بزرق الدواجن بمعدل 15 كجم/حوض أسبوعيا. تم أخذ عينات شهرية لكل من الهائمات النباتية والحيوانية حيث تم تقدير العدد الكلي وكذلك عدد بعض المجموعات الرئيسية.

وكان من أهم النتائج المتحصل عليها كالتالي:

- كان أكبر عدد للهائمات النباتية (112.56 مليون كائن/لتر) خلال شهر أغسطس وكان العدد الكلي في مياه المصدر أقل منه في كلا المعاملتان.

- كان المتوسط العام للعدد الكلي للهائمات الملتصقة 2103.68 مليون كائن/ م^2, بينما كان المتوسط العام للعدد الكلي للهائمات النباتية في كل من المجموعة الضابطة (T_1) ومعاملة البيريفيتون (T_2) ومياه المصدر 62.15 و 46.12 و 4.82 مليون كائن/لتر علي التوالي.

- فيما يخص التركيب المجتمعي للهائمات النباتية فقد بينت النتائج سيادة الطحالب الخضراء المزرقة علي باقي المجموعات في كل من مياه المصدر وفي الكنترول (T_1) ومعاملة البيريفيتون (T_2) بنسب 49 و 80 و 81 % علي التوالي بينما فيما يخص التركيب المجتمعي للهائمات الملتصقة التي نمت علي قش الأرز, فقد بينت النتائج سيادة الطحالب الخضراء بنسبة 79 %.

- علي عكس الهائمات النباتية, كان العد الكلي للهائمات الحيوانية في مياه المصدر أكبر منه في المعاملتان الأخرتان حيث كان أكبرعدد للهائمات الحيوانية في كل من معاملة الكنترول (T_1) ومعاملة البيريفيتون (T_2) ومياه المصدر 62.15 و 46.12 و 4.82 ألف كائن/ لتر علي التوالي.

- كان المتوسط العام للعدد الكلي للهائمات الحيوانية في كل من مياه المصدر ومعاملتي البيريفيتون (T_2) والكنترول (T_1) 66.25 و 53.67 و 45.21 ألف كائن/ لتر علي التوالي.

- بينت النتائج الخاصة بالتركيب المجتمعي للهائمات الحيوانية سيادة مجدافيات الأرجل حيث كانت نسبتها إلي العدد الكلي في مياه المصدر وفي كل من T_1 و T_2 35% و 49% و 43% علي التوالي.

- نستطيع أن نخلص في نهاية الدراسة إلي أن أساليب الإدارة المختلفة كالتسميد وإضافة قش الأرز كركائز وإختيار نوعية وكثافة الأسماك المستزرعة تؤثر بصورة فاعلة في كل عوامل الهائمات سواء الحرة النباتية منها والحيوانية أو الهائمات الملتصقة من حيث العدد الكلي أو عدد المجموعات المختلفة وكذلك ديناميكية تلك الكائنات علي مدار شهور الدراسة وكذلك التركيب المجتمعي لها, وبناءا علي ذلك فمن الممكن ومن خلال الإدارة المناسبة لأحواض الإستزراع السمكي تعظيم الإستفادة من الهائمات كما وكيفا للوصول إلي أكبر إستفادة ممكنة من منظومة الإستزراع السمكي.