IN SITU, EFFECT OF STOCK DENSITY OF *OREOCHROMIS NILOTICUS* (L.) FRY ON WATER QUALITY AND PLANKTON COMMUNITIES

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Abstract

Nile tilapias; *Oreochromis niloticus* (L.) were selected from River Nile during autumn (2004) to estimate the impact of its stock density on some physicochemical characteristics and plankton assemblage inhabiting the Nile water. Results revealed slight decrease in pH values with increase of incubation time and fish densities. Ammonium-N was higher than nitrite and nitrate concentrations. Total organic nitrogen (TON) and total organic phosphorus (TOP) were much higher than the corresponding values of inorganic forms. Chlorophyceae, Bacillariophyceae and Cyanophyceae were the prevailing algae while Chrysophyceae, Cryptophyceae and Dinophyceae were scarcely occurred. The small zooplankon, like rotifers, especially *Keratella cochlearis* (Gosse) and *K. tropica* (Apstein) were the most dominant organisms in the predation aquaria, Statistical analysis revealed the significant effect of fish densities and incubation time on green algae and diatoms. Also, the current data showed a significant impact of the stock fish density on zooplankton communities. Phytoplankton densities decreased gradually with time in aquaria stocked with 4 and/or 16 fishes and increased with that stocked with 8 or 12 fishes after 48 hours. Also, zooplankton communities increased after 48 hour. Therefore, the stock density of *O. niloticus* (L) should be increase from 0.8 to 1.6 g l^{-1}in fish farms derive its water from River Nile. Also, tilapia culture in fish farms can be depend to a large extent on natural plankton production from Nile water.

Key Words: phytoplankton, zooplankton, *Oreochromis niloticus*

Introduction

Interactions between phytoplankton, zooplankton, and fish populations often have a major role in determining water quality. In Egypt, the demand for fish as a source of protein has progressively increased, to the rapid increase of the Egyptian population. Early, Hrbacek, *et al.*, (1961) demonstrated a fish effect on water quality through zooplankton predation. This processes decline zooplankton grazing capacity followed by algal enhancement. Hall *et al.*, (1970) documented the effect of zooplanktivorous fish predation on lower trophic levels.

The increase in zooplankton body size resulting from fish exclusion could not buffer all effects of nutrient enrichment on total phytoplankton density (Vanni, 1987). Also, Benndorf, (1992) showed that, management of fish stocks, in combination with the control of phosphorus load and/or the physical conditions, seems to be the most

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promising way of controlling biomanipulation effects. Gulati, *et al.,* (1990) reported that, decreasing in phytoplankton biomass coincided with increasing in zooplankton biomass in the eutrophic freshwater lake (Denmark). Findlay, *et al.,* (1994) reported that, phytoplankton flourishing was primarily on indirect result of the abundance of piscivorous fish, which attired internal nutrient cycling. Klinge, *et al.,* (1995) reported that, the increase of small planktivorous fishes leads to heavily predation on zooplankton and an excessive development of algae resulting in increase of phytoplankton biomass in Dutch Lakes.

Perez-Fuentetaja, *et al.,* (1996) studied the effects of fish on planktonic communities. They suggested that, in oligotrophic systems (total phosphorus 6–10 mgl^{-1}), planktivorous fish and zooplankton induced nutrient cycling that have important impacts on planktonic community structure in Wolf Lake, New York. Jeppesen, *et al.,* (1996) stated that, the grazing percentage decreased with increasing density of planktivorous fish in freshwater lake (Denmark). Ocon & Martinez, (2001) pointed out that, Tilapia is a herbivrous fish and highly invasive species that has serious impacts on the ecosystem. Fish food consumption influenced by stocking density, fish size and fish behavior (Houlihan *et al.*, 2001). Piyasiri and Perera (2001) found that tilapia fry feed mainly on larger zooplankton, whereas the adults prefer detritus and sedimented diatoms. Turker, *et al.,* (2003) pointed out that, small tilapia filtered significantly more phytoplankton than larger individuals. Abdel-Tawwab & El-Marakby (2004) stated that Nile tilapia could select Cyanobacteria and Euglenophyceae at all sizes meanwhile Chlorophyceae and Bacillariophyceae were eaten with slight selectivity at large sizes.

This study was carried out to investigate the complexity of the ecosystem response and nutrient mediated effects of *O. niloticus* stocking density in enclosure experiments in River Nile, near Cairo-Egypt.

Materials and Methods

The predation study was carried out in fifteen glass aquaria of 20-liters capacity, filled with the Nile water. These aquaria were divided into five groups in replicates at five treatments. The 1st group represents the control, while the 2nd, the 3rd, the 4th and the 5th groups includes 4, 8, 12, and 16 fishes of *O. niloticus* (L.), respectively. The weight of each fish was about 4 gm. The experiment was carried out under laboratory conditions and persisted for 48 hours. Sampling for water quality, phytoplankton and zooplankton analysis was carried out at zero, 24 and 48 hours. pH and conductivity were measured *in situ* using portable pH meter (Jenway, 3250) and portable Hyrolab Analyzer model 340 i/set, Germany.. The nutrient salts; NH_4-N, NO_2-N, NO_3-N, PO_4-P, total organic phosphorus and SiO_3-Si were measured according to APHA (1995). Total organic nitrogen was measured according to Mckenzie & Wallace (1954).

For phytoplankton counting, 500 ml of water were preserved immediately in 4 % formalin. The preserved samples were transferred in a clean graduated cylinder of 500 ml capacity and few drops of Lugol's Iodine solution were added. The phytoplankton cells were allowed to settle, for 5 days. The supernatant was carefully siphoned off with a small plastic tube ending with a fine net of 20 µm mesh diameter, until the samples were concentrated to 50 ml. The drop method was applied for counting and identification of different algal species as in APHA (1995).

Zooplankton samples were collected through a filtration of 2 L by a plankton net, with 55 μm mesh size. The samples were preserved using 4% neutral formalin solution. In the laboratory, zooplankters were identified, and the number of zooplankton individuals per liter was counted and calculated.

Statistical analysis: Correlation (Pearson) and 2-ways ANOVA analysis were carried out by Minitab Program (12.1).

Results

Results of the water quality variations are shown in Table (1). pH values decreased slightly in fish aquaria with increase of time and fish densities. It reached the lowest (8.16) value after 48 hours in fourth aquaria, while the highest value (8.41) recorded at the beginning of the experiment in the first one. Ammonium values increased substantially with increasing fish densities and time. In all predation aquaria, it increased gradually after 24 and 48 hours, especially with high densities of fish. It attained the highest concentration of 1764.93 μgL^{-1} in the 4^{th} aquaria during the 2^{nd} day. Its lowest value was found in control aquaria at the beginning of the experiment (39.69 μgL^{-1}). Nitrite-N contents had gradually increased with time in all aquaria, particularly with small densities of fish (1^{st} aquaria). Its values increased from 1.75 to 32.30 μgl^{-1}. Nitrate concentrations were usually high in all fish aquaria compared to the corresponding values in control aquarium. Its values varied from 51.80 to 476.10 μgl^{-1}. Total organic nitrogen (TON) exhibited a different pattern in each aquaria, but in general its values at the 2^{nd} day were high in comparison with control aquaria. It attained the maximum value in the 3^{rd} aquaria after 24 hours (4.29 mgL^{-1}), while its minimum value occurred in control aquaria after 48 hours (0.33 mgL^{-1}). Orthophosphate concentrations were often higher after 48 hours from the beginning of this experiment than those observed at zero time. Its values showed a strong variation between the minimum value of 2.95 μgL^{-1} and the maximum of 53.50 μgl^{-1}. Total organic phosphorus (TOP) showed an irregular distribution at most aquaria, but its values were usually high after 48 hours from the beginning of the experiment excluding the values in control one. TOP attained the maximum value of 153.80 μgL^{-1} in the 4^{th} aquaria after 24 hours, while its minimum value of 53.92 μgL^{-1} occurred in the third one at the same time. Silicate concentrations increased after 24 hours either in absence or presence of fish, while after 48 hours its values varied from fish stock to other. Its values fluctuated between 0.32 and 0.80 mgL^{-1}.

Total phytoplankton crops (Table, 2) were generally decreased after 24 hours in all glass aquaria, but they were distinctly increased after 48 hours in the aquaria stocked with 8 and 12 fishes. Chlorophyceae, Bacillariophyceae and Cyanophyceae were the prevailing groups of phytoplankton. Chlorophyceae attained its maximum density of 1576×10^{4} cells L^{-1} at zero time of 4^{th} fish aquarium, while the lowest density of 220×10^{4} cells l^{-1} was observed after 24 hours in the third fish aquarium.

Table (1): Changes of physico-chemical parameters in River Nile water during the predation experiment (2004)

Aquaria	*No. of fishes*	*Time*	*pH value*	*Cond. µScm^{-1}*	*NH_4-N µgL^{-1}*	*NO_2-N µgL^{-1}*	*NO_3-N µgL^{-1}*	*TON mgL^{-1}*	*PO_4-P µgL^{-1}*	*TOP µgL^{-1}*	*SiO_3 mgL^{-1}*
Control	Fishless	Zero time	8.30	422	39.7	1.8	119.0	2.62	4.4	127.90	0.51
		24 hs.	8.38	426	60.0	5.7	118.7	1.34	15.1	66.30	0.52
		48 hs.	8.38	431	86.8	10.4	51.8	0.33	13.4	75.30	0.32
1st aquarium	4 fishes	Zero time	8.41	426	46.5	4.5	151.0	1.07	16.1	54.70	0.49
		24 hs.	8.37	431	182.9	10.7	227.1	2.06	14.5	135.60	0.76
		48 hs.	8.36	436	348.8	32.3	476.1	0.98	11.2	62.20	0.50
2nd aquarium	8 fishes	Zero time	8.40	428	69.5	6.6	202.8	0.63	3.0	120.45	0.39
		24 hs.	8.34	437	281.5	9.4	267.7	2.10	4.9	149.30	0.77
		48 hs.	8.31	451	664.7	15.7	196.5	2.70	20.5	149.20	0.80
3rd aquarium	12 fishes	Zero time	8.29	438	89.0	7.7	133.2	2.71	25.4	93.30	0.41
		24 hs.	8.24	446	467.9	11.8	193.0	4.29	17.1	53.92	0.50
		48 hs.	8.19	457	1017.3	12.5	160.3	2.48	39.1	109.60	0.62
4th aquarium	16 fishes	Zero time	8.26	428	140.4	3.2	174.2	1.26	24.6	82.30	0.55
		24 hs.	8.17	439	759.5	4.7	164.5	1.20	52.5	153.80	0.58
		48 hs.	8.16	456	1764.9	11.2	60.2	2.58	53.5	122.30	0.37

Bacillariophyceae showed a remarkable decrease after 24 and 48 hours in all predating aquarium. Diatoms major peak of 1289 $\times 10^4$ cells L^{-1} was observed at zero time of 8 fish aquarium, but its minor peak of 70 $\times 10^4$ cells L^{-1} occurred after 24 hour of 12 fish aquarium. Highest crops of blue green algae were observed at zero time of all aquariums, its major peak was observed in the third set (1639 $\times 10^4$ units L^{-1}), while its minimum one (104 $\times 10^4$ units L^{-1}) was found in the fourth group of the last day.

Table (2): Phytoplankton crop at different density of *Oreochromis niloticus* (L) in River Nile water during 2004

Fish density	Control			4 Fish			8 Fish			12 Fish			16 Fish		
Phytoplankton	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0. h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.
Chlorophyceae	1392	736	788	1576	814	1004	1218	716	1432	1242	220	854	566	378	472
Bacillariophyceae	1011	578	606	621	227	182	1289	129	316	1128	70	152	704	155	84
Cyanophyceae	626	415	493	336	525	263	1098	600	767	1639	185	176	533	208	104
Chrysophyceae	2	2	6	4	0	0	0	0	0	0	0	0	1	1	2
Cryptophyceae	1	2	0	2	2	0	0	0	0	0	0	0	10	6	0
Dinophyceae	1	2	10	1	4	0	0	0	0	0	0	0	0	0	0
Total crop	3033	1735	1903	2540	1572	1449	3605	1445	2515	4009	475	1182	1814	748	662

The leader species of the phytoplankton are shown in Table (3). Chlorophyceae were dominated by *Dictosphaerium pulchellum* Wood, *Planktonema lauterbornii* Schmidle, *Oocystis parva* W. & G. S. West, *Coelastrum reticulatum* (Dang.) Senn and *Scenedesmus ecornis* (Ehr.). The leader species of Bacillariophyceae were *Melosira granulata* (Ehr.) Ralfs, *Syndra ulna* (Nitzsch) Ehr., *Cyclotella ocellata* Pant, and *Cyclotella operculata* Kutz. The most dominant species among blue-greens were *Microcystis aeruginosa* Kutzing, *M. elachista* (W. & G. S. West) Starmach, and *Cylindrospermopsis raciboroskii* Woloszynska. Chrysophyceae, Cryptophyceae and Dinophyceae were recorded as rare groups.

Table (3): Numerical density (cells or units x $10^4 L^{-1}$) of the dominant phytoplankton in River Nile water during the predation experiment (2004)

Dominant species of phytoplankton	Control			4 fishes			8 fishes			12 fishes			16 fishes		
	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.
Chlorophyceae															
Dictosphaerium pulchellum Wood	222	130	378	756	100	144	158	152	156	514	72	172	158	64	86
Planktonema lauterbornii Schmidle	244	148	108	216	220	238	232	190	304	240	26	224	48	90	72
Oocystis parva W.&G.S. West	50	12	20	40	14	52	10	4	66	16	2	24	12	6	8
Coelastrum reticulatum (Dang.) Senn	184	16	24	48	92	48	200	8	158	12	0	18	80	64	24
Scendesmus ecornis (Ehr.) Chodat	28	2	22	44	46	34	38	26	110	74	16	60	40	46	20
Bacillariophyceae															
Melosira granulata (Ehr.) Ralfs	110	90	144	40	6	12	70	0	0	0	0	0	44	8	8
Syndra ulna (Nitzsch) Ehr.	40	30	60	30	8	0	66	2	2	46	2	2	18	4	0
Cyclotella ocellata Pant	342	290	170	374	120	114	760	68	204	730	46	110	460	104	56
Cyclotella operculata Kutz	356	110	98	80	70	44	194	40	74	172	10	30	34	26	10
Cyanophyceae															
Microcystis aeruginosa Kützing	99	86	61	65	67	0	208	232	142	512	104	85	132	47	37
Microcysti s elachista (W.&G.S.West) Starmach	429	263	306	178	441	224	809	355	551	1029	75	89	322	123	12
Cylindrospermopsis raciboroskii Woloszynska	49	29	25	27	0	0	47	0	0	39	1	0	15	1	0
Chrysophyceae															
Mallomonas acuroides Perty	2	2	6	4	0	0	0	0	0	0	0	0	0	0	0
Mallomonas caudata Lwaneff	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Cryptophyceae															
Cryptomonas ovata Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0
Chromonas acuta Utermohl	1	2	0	2	0	0	0	0	0	0	0	0	8	0	0
Dinophyceae															
Peridinium cinctum O.F.Muller	1	2	10	1	4	0	0	0	0	0	0	0	0	0	0

Zooplankton was represented by Rotifera, Cladocera, and Copepoda as shown in Table (4). Rotifera was the main dominant group during the predation experiments. In control aquaria, the number of total rotifera increased greatly after 24 hours and decreased after 48 hours (735 indiv.L^{-1}). In the 1^{st} aquaria, it decreased after 24 hours and increased again after 48 hours reaching 160 indiv.L^{-1}. In the 2nd aquaria, it decreased gradually with time reaching 50 indiv.L^{-1} after 48 hours. In the 3rd and the 4th aquaria, it decreased after 24 hours and increased again after 48 hours reaching 225 and 235 indiv.L^{-1}. Rotifera is dominated by *Keratella cochlearis* (Gosse). This species increased after 24 hours in control aquaria, decreased again after 48 hours and its maximum density was 550 indiv.L^{-1}. In the 1st and the 3rd aquaria, it decreased after 24 hours and increased again after 48 hours reaching 150 and 220 indiv.L^{-1}. In the 2nd aquaria, it decreased gradually with time reaching 45 indiv.l^{-1} after 48 hours. In the 4th aquaria, it decreased after 24 hours and increased again after 48 hours reaching 220 indiv.L^{-1}. Cladocera was recorded as rare group, dominated by *Bosmina longirostris* (O. F. Muller). In control aquaria, it increased with time reaching 20 indiv.L^{-1} after 48 hours. While in the 1st and 3rd aquaria, it disappeared completely after 48 hours. Also, it disappeared in the 2nd and 4th aquaria. Copepoda was recorded as very rare group during the experiment and observed only in control aquaria at zero time.

Table (4): Numerical density (organism/L) of the dominant zooplankton species in River Nile water during the predation experiment (2004)

Dominant zooplankton species	Control			4 fishes			8 fishes			12 fishes			16 fishes		
	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.	0 h.	24 h.	48 h.
Rotifera															
Keratella cochlearis (Gosse)	555	1565	550	135	120	150	315	45	280	147	50	220	125	15	220
Keratella tropica (Apstein)	35	60	55	5	0	10	10	0	0	25	5	0	0	0	0
Cladocera															
Bosmina longirostris (O.F.Müller)	1	1	10	5	0	0	0	0	0	5	0	0	0	0	0
Total Copepoda	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statistical analysis (correlation coefficient) revealed that, total phytoplankton crop showed a weak negative correlation with the oxidized nitrogen (NO_2 and NO_3), PO_4 and SiO_3 concentrations, and strong negative correlation with NH_4 values (r= -0.59). As well as, 2-ways ANOVA analysis revealed a significant interaction on NH_4-N concentration between incubation time (p= 0.015) and fish densities (p= 0.05). Also, analysis of variance showed an interaction on green algae between incubation period (p= 0.02) and fish densities (p= 0.04). However, incubation time was significantly affect on diatoms crop (p= 0.002). On the other hand, the current data yielded a significant effect of fish densities on zooplankton communities (p= 0.025).

Discussion

Physico-chemical properties changed by changing fish density and incubation time.. pH values ranged from 8.16 to 8.41 and it is suitable for fish life (Stumm and Morgan, 1981). 2-ways ANOVA analysis revealed a significant interaction on NH_4-N concentration between incubation time (p= 0.015) and fish densities (p= 0.05) which play an important role in phytoplankton decline (r= - 0.59, p= 0.04). This finding agrees with Meade, (1985) who reported that, fish excretion and degeneration of nitrogenous organic material represented another ammonium sources in fish ponds. Overall, ammonium ions exist at lower pH values, while the more toxic ammonia is present in more alkaline (pH>9) conditions (Ellis, 1989). Also, incubation time was significantly effect on NO_2-N (p= 0.05), while fish densities on PO_4-P values (p= 0.02), but their levels weren't distinctly effect on phytoplankton communities (r= -0.202, p> 0.05 and r= -0.45, p> 0.05 respectively). This finding may be due to nutrient enrichment excerted by *Oreochromis niloticus* (L.) which compensate grazing pressure on microalgae. (Golachowska, 1986) and Stickney *et al*. (1979) reported that fish release sizable amounts of nutrients to water and the rejected amount sometimes represents from 61 to 87 % of the feed nutrients.

Numerical density of phytoplankton implies that green algae occupied the first dominant position during this experiment due to abundance of colonial forms in River Nile water. 2-ways ANOVA analysis showed an interaction on green algae between incubation period (p= 0.02) and fish densities (p= 0.04). This is denote the preferable of *O. niloticus* (L) to prey on green algal communities inhabiting River Nile. This view agrees with Touliabah (1992) and Mageed and Konsowa (2002) in different fish farms stocked by *O. niloticus* in Egypt. As well as analysis of variance indicated that, incubation period was significantly affect on diatoms crop (p= 0.002). This view is confirmed by the diatoms decrease with time especially at glass aquaria stocked with 16 tilapia fishes compared with the corresponding density in control aquaria. In this connection Elhigazi, *et al.*, (1995) recorded that, Bacillariophyceae dominated in the fishless ponds. Sondergaard, *et al.*, (1990) found that, the removal of about 50% of planktivorous fish was found to be altering the plankton community towards an increase in large-sized diatoms in Lake Sobygird (Denmark).

The small rotifers (especially *Keratella cochlearis* and *Keratella tropica*) were the most dominant zooplankton organisms in the predation aquaria where *O. niloticus* (L) are known to be size-selective predators on largest zooplankton. 2-ways ANOVA analysis confirmed this view whereas the current data yielded a significant effect of fish densities on zooplankton communities (p= 0.025). Also, microzooplankton (rotifers) develops better when predatory pressure by zooplankton crustaceans is reduced. The present data are concurrent with many investigators (Carpenter and Mitchell, 1993), Brett and Goldman, 1996) who found that removing large and more conspicuous zooplankton, lefts back small rotifers. Also, Diana, *et al.*, (1990) tested the trophic cascade hypothesis in aquaculture ponds containing tilapia at different densities, that fish predations affect not only the prey, but also lower trophic levels. They added that zooplankton densities, particularly small zooplankton were reduced in ponds without fish.

Most attempts to improve water quality of eutrophic water bodies through biomanipulation have been based on reduce stock of zooplanktivore fish that lead to increase zooplankton grazing on phytoplankton and thereby reduce phytoplankton biomass and increase water transparency. In the present study, total zooplankton count increased in the presence of high densities of fishes (16 fishes/20 l), partly due to this positive indirect effect of fish excretion but also due to a compensatory increase in small zooplankton biomass following reduction of larger competitively superior zooplankton.

In aquaria stocked with 4 or 16 fishes, total phytoplankton crop decreased gradually with time, while that stocked with 8 or 12 fishes, phytoplankton crop increased again after 48 hours. On the other hand, zooplankton communities were usually decreased after 24 hours and increased again after 48 hours. At the same time, nutrient enrichment exerted by fish, compensates grazing pressure of large zooplankton on phytoplankton. So, phytoplankton proliferation and its evolution were more conspicuous at the aquariums stocked with 8 and 12 fishes.

In summary, the study provided experimental evidence supporting the hypothesis that fish-mediated nutrient recycling has important effects on phytoplankton community structure. Phytoplankton and zooplankton succession were more conspicuous at the aquariums stocked with 8 and 12 fishes (4 g for each fish). Therefore, the stock density of *O. niloticus*, can be increased from 0.8 to 1.6-3.2 gL^{-1} in freshwater fish farms. Also, tilapia culture can depend to a large extent on these plankton communities that can be cultivated in fish farms derive its water from the Nile water.

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تأثير الكثافة العددية لأصبعيات سمكة البلطي النيلى على خصائص المياه ومجموعات العوالق النباتية والحيوانية في الظروف المعملية

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تم إجراء هذه التجربة على أصبعيات سمكة البلطي النيلى (4 جم) عام 2004 وذلك لمعرفة تأثير الكثافة العددية للأسماك على الخصائص الطبيعية والكيميائية وعلى مجموعات العوالق النباتية والحيوانية في مياه نهر النيل.
هذه التجربة تمت على خمس مجموعات من الأحواض الزجاجية كل منها به 20 لتر من مياه نهر النيل بما تحتويه من العوالق النباتية والحيوانية. المجموعة الأولى تمثل الكنترول بينما المجموعات الأربع الأخرى بها كثافة عددية مختلفة من سمكة البلطي وهى كالأتي 4 ، 8 ، 12، 16 على الترتيب.

أوضحت النتائج نقص تركيز الأس الهيدروجين (pH) مع زيادة كثافة الاصبعيات في الأحواض الزجاجية بينما تركيز الأمونيوم يزيد عن تركيز كل من النيتريت والنترات. كما أشارت النتائج زيادة النيتروجين والفسفور العضوي الكلى بشكل واضح عن القيم المقابلة من النيتروجين والفسفور الغير عضوي.
أوضحت نتائج العوالق النباتية إلى أن الطحالب الخضراء والدياتومات والخضراء المزرقة تمثل المجموعات السائدة من الطحالب الدقيقة بينما المجموعات الأخرى من الكريزوفيسى والكريبتوفيسى والدينوفيسى كانت هي الأقل كثافة عددية.
أوضحت العمليات الإحصائية لهذه التجربة نقص الطحالب الخضراء و الدياتومات مع زيادة أصبعيات سمكة البلطي النيلى والتي تفضل التغذية على هذه الأنواع من الطحالب الدقيقة مع زيادة فترة الحضانة بالإضافة إلى اختيار الأنواع كبيرة الحجم من العوالق الحيوانية.

من هذه التجربة يتضح أن الكثافة العددية للعوالق النباتية تقل تدريجيا بعد 48 ساعة في الأحواض الزجاجية التي تحتوى على 4 أسماك أو 16 سمكة بينما تزيد في الأحواض التي بها 8 أو 12 سمكة. وكذلك الكثافة العددية للعوالق الحيوانية زادت مرة أخرى بعد 48 ساعة من بدء التجربة. ولذلك من الممكن زيادة الكثافة العددية لذريعة البلطي النيلى من 0.8 جم / لتر كما هو معروف إلى 1.6 جم / لتر في المزارع السمكية التي تستفيد من مياه نهر النيل بالإضافة إلى إمكانية الاستفادة من التغذية الطبيعية وخاصة الأنواع التي تم تحديدها من العوالق النباتية والحيوانية المنتشرة في نهر النيل.