STUDY OF LIMNOLOGICAL VARIABLES IN NURSERIES OF *Colossoma macropomum* (Cuvier, 1818) AND *Pseudoplatystoma corruscans* (Agassiz, 1829)

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Abstract - Ecosystem's aquatic metabolism comprises three main levels: production, consumption and decomposition. For the aquaculture fundament the knowledge and accompaniment of the biotic and abiotic factors for a sustainable production. The study evaluated the dynamics of variables limnologics in ponds: *Colossoma macropomun* (CM) and *Pseudoplatystoma corruscans* (PC), during a 24hs. The work was accomplished in the Station of Fish farming of Chesf, Paulo Afonso-BA. The variables oxygen (O_2), temperature (T°C) and pH were measured every two hours, shines and transparency. Samples of water were analysis ammonia, nitrite, nitrate, inorganic and organic phosphate, total phosphors, chlorophyll a, identification of the plankton and phytobenthos were collected at 09:00, 15:00 and 21:00hs. All the variables physical-chemistries were inside of the ideal for culture species. The group phytoplankton most frequent no CM was Cyanophyta and Bacillariophyta. while in PC was Xanthophyta. The group phytobentic most frequent no CM was Xanthophyta, while in PC was Bacillariophyta. The group of Copepods was the most evident zooplankton in CM and there was absence of Rotifers in PC.

Key Words: aquaculture, phytoplankton, water, zooplankton

ESTUDO DE VARIÁVEIS LIMNOLÓGICAS EM VIVEIROS DE *Colossoma macropomum* (Cuvier, 1818) e *Pseudoplatystoma corruscans* (Agassiz, 1829)

Abstract - O ecossistema aquático é um sistema que envolve os processos de produção, consumo e decomposição. Em aqüicultura e fundamental o conhecimento e acompanhamento dos fatores bióticos e abióticos para a sustentabilidade da atividade. O estudo avaliou a dinâmica das variáveis limnológicas em viveiros de *Colossoma macropomun* (CM) e *Pseudoplatystoma corruscans* (PC) durante 24 horas. O trabalho foi realizado na Estação de Piscicultura da Chesf, Paulo Afonso-BA. As variáveis oxigênio (O_2), temperatura (T°C) e pH foram mensuradas a cada duas horas. Amostras de água para a análise de amônia, nitrato, nitrito, fosfato inorgânico e orgânico, fósforo total, clorofila "a", identificação do plâncton e fitobentos foram coletadas às 09:00, 15:00 e 21:00hs. Estas amostras foram coletadas em três estações definidas nos viveiros. Todas as variáveis físico-químicas estiveram dentro da faixa ideal para a criação de ambas as espécies. O grupo fitoplânctonico mais freqüente no CM foi Cyanophyta e Bacillariophyta, enquanto que no PC foi Xanthophyta. O grupo fitobentônico mais freqüente no CM foi Xanthophyta, enquanto que no PC foi Bacillariophyta. O grupo dos Copepodos foi o maior representante do zooplâncton para CM e houve ausência de Rotíferos no PC.

Palavras-chave: água, aqüicultura, fitoplâncton, zooplâncton

INTRODUCTION

Ecosystem's aquatic metabolism comprises three main levels: production, consumption and decomposition. Production is carried out by the primary producers which are capable of synthesize organic matter being an important energy source to food webs. Consumption is performed by organisms that obtain energy direct or indirectly from the organic matter synthesized by the primary producers. Decomposition is mainly carried out by bacteria and fungi promoting the nutrient's recycling and the availability of this product to other organisms (SIPAÚBA, 1995; ESTEVES, 1988). Planktonic organisms are on the basis of food webs in aquatic ecosystems, once they serve as food for other trophic levels (BOYD & TUCKER, 1998). Plankton is composed by microalgae (phytoplankton), animals (zooplankton), protists (protozooplankton) and autotrophic and heterotrophic organisms (bacterioplankton). Besides, there are algae and animals living in the substratum called phytobenthos and zoobenthos, respectively. Despite the fast reproduction of theses organisms, they are strongly affected by physical-chemical changes in the aquatic environment, establishing complex intraspecific and interspecific relations and using the spaces and available resources (SIPAÚBA, 2001). Water quality for fishes' reproduction will fundamentally depend on the physical, chemical and biological variables. Among these variables it can be mentioned: temperature, pH, dissolved and saturated oxygen, water transparency, total alkalinity, ammonia, nitrate, nitrite, luminosity, orthophosphate and planktonic organisms as a complex web. The species *Colossoma macropomun*, commonly known as "tambaqui" and native from Amazonas Basin, is omnivorous under natural conditions, ingesting fruits, seeds and insects which fall down the water. This species has been raised in many Brazilian regions due to its features: reaching 1.2 kg in a year and may adapt to temperatures under 20°C (VIDAL & ROSSI, 1998). The species *Pseudoplatystoma corruscans*, commonly known as "surubim" is native from Parana and São Francisco Basins, being carnivorous under natural conditions and feeding of a variety of smaller fishes. This species has presented satisfactory growth in captivity systems where it is fed with high animal protein content ration (INOUE et al., 2003; MARTINO et al., 2003). It is difficult to understand the whole dynamic occurring inside captivity, from its filling to throwing. However, the comprehension of a 24 hour-cycle may ensure the results aimed in the farming, promoting basic knowledge on the processes to development of a efficient manage (SIPAÚBA, 2001). The present work had as objective to evaluate the dynamic of limnological variations in the nurseries of *Colossoma macropomun* (Tambaqui) and *Pseudoplatystoma corruscans* (Surubim).

MATERIAL AND METHODS

Experiment was carried out in the CHESF's Fishculture Station in Paulo Afonso-BA located between the coordinates 9º22'48,26'' S e 38º12'59,97'' W. Nurseries used at this experiment presented areas of 2000 m^2 e 2200 m^2, average depth of 0.80m, biomass of 0,25 Kg/m^2 and 0,20Kg/m^2 of *Colossoma macropomun* (CM) and *Pseudoplatystoma corruscans* (PC), respectively. Samplings were carried out at three nursery stations: supplying, middle and drainage later homogenized and from those a sub sample was performed to analysis. Dissolved oxygen, temperature and pH were measured with a digital multiparameter. Measurements occurred in 2h-intervals in a period of 24 hours. Light intensity was determined through a luximeter (lux) and the water transparency was carried out with a Secchi Disk, both in the periods of solar rays' incidence. Water was collected for chemical analysis at 9:00 AM, 3:00 and 9:00 PM in a layer of 30cm from the surface and stored at plastic bottles (200 ml), being later washed in the laboratory. Sediment and water samples for plankton and phytobenthos' quantification and identification were carried out at 9:00 am, 3:00 and 9:00 pm. A 10L-bucket was used to collect the plankton; it was vertically submersed in the water column with the aperture up-turned in a depth of about 30 cm, being emerged also vertically. This operation was carried out three times at the same station and followed by homogenizations. A volume of 30L was filtered using a plankton's net with mesh of 35 μm, obtaining a final volume of 500 ml, fixed with formol 4% neutralized with borax 1%. Phytobenthos' sampling was carried out using a PVC tube (50 mm diameter) in layers of 7 cm in order to obtain a volume of 400cm^3, material was stored in 500ml-plastic bottles and fixed with formol 4% neutralized with borax 1%. Plankton and phytobenthos' analyses were carried out in the Produce Aliment Live Laboratory (LAPAVI) and the water chemical analyses in the Limnology Laboratory both of them located at the Fisheries and Aquaculture Department (DEPAq),

Pernambuco Federal Rural University (UFRPE). Nutrients: ammonia, nitrate, nitrite, inorganic phosphate, total phosphate, total phosphorus and chlorophyll "a" were analyzed (BENDOCHNELDER & ROBINSON, 1952; GOLTERMAN, 1978; MACKERETH et al., 1978; KOROLEFF, 1976; APHA, 1995; NUSCH, 1988). Plankton and phytobenthos' qualitative and quantitative observations were carried out using a optical microscope and a Sedgewick-Rafter chamber. SIPAÚBA (2001) references were used. Initially a descriptive method was used and after experimental statistic was applied considering test with the "t-student" distribution with $P<0.05$ (MENDES, 1999).

RESULTS AND DISCUSISON

Dissolved oxygen averages concentrations were 5.55 mg/l (CM) and 6.31mg/l (PC), minimum and maximum values were 3.24mg/l (5:00hs) and 7.74mg/l (1:00 pm) for CM, and 3.44mg/l (7:00 am) and 8.44mg/l (3:00 pm) for PC (Fig. 1a). no significant differences were verified among the treatments (Table 1). Oxygen is the most important source in the aquatic ecosystems which comes from primary producers presents variation related to photosynthesis process, respiration and decomposition (VINATEA, 1997; AVNIMELECH 2005). Oxygen minimum levels must be superior to 3.0mg/l (BOYD, 2000; EREZ et al.,1990), in this way the values registered during the investigation period were over the minimum recommended (Figure 1a). The stock of biomass contributes to maintain the oxygen level recommended. Aquaculture's need to know not only what dissolved oxygen concentration is in the end of night and/or in the morning, it is necessary to preview and anticipate with the reading of these variables in the end of the afternoon and/or in the beginning of night, once this reading provides preliminary information about what may occur in the posterior times and then the culture methodology (feeding rates, aeration, and water manage) can be reviewed. Great amplitude in the dissolved oxygen concentration during the 24h-period indicates an excessive phytoplankton concentration which produces much oxygen during the day and there is a high consume at night, in this experiment amplitude can be considered expected. Concerning water temperature (Figure 1b), it was relatively constant during the day, with average of 29.42ºC CM and 28.86ºC PC. It achieved the lowest values at 5:00 am (28.22ºC CM and 27.42ºC PC) and the highest at 1:00 pm for both treatments being adequate for tropical fishes (29°C and 32°C) and for planktonic development (BOYD and TUCKER, 1998: KUBITZA, 2000). Lima et al., 2006 found better performance in the surubim's production at 27ºC than at between 24 and 30°C. The ideal temperature for the tambaqui is between 26 and 28°C. No

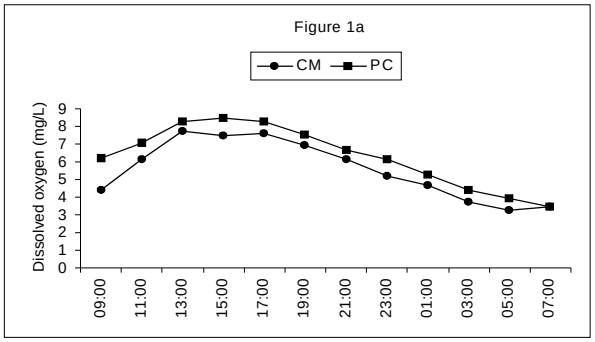
Table 1. Average concentration and shunting line standard of the variable physical and chemical

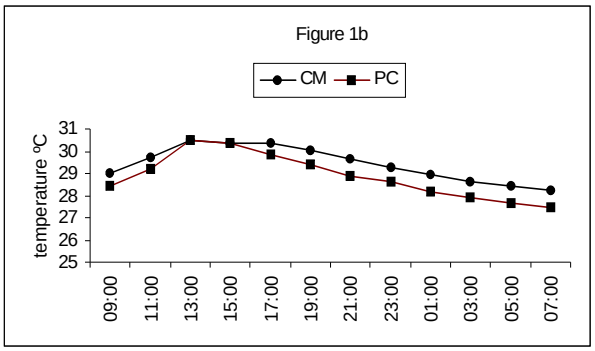
Variable physicist-chemistries (mg/L)	Treatments	
	CM	PC
Ammonia (mg/L) - $NH_3 + NH_4$	$0.0186^a \pm 0.0096$	$0.0286^a \pm 0.0168$
Nitrate	$0.010^a \pm 0.0060$	$0.0120^a \pm 0.0040$
Phosphate inorgânico	$0.070^a \pm 0.0248$	$0.0543^a \pm 0.0092$
Total phosphate	$0.2356^a \pm 0.0243$	$0.2276^a \pm 0.0213$
Total Phosphorus	$0.1459^a \pm 0.1097$	$0.2113^a \pm 0.0320$
Chlorophyll a	$0.1510^a \pm 0.0246$	$0.0863^b \pm 0.0468$
pH	$7.9^a \pm 0.2$	$8.1^a \pm 0.3$
Temperature	$29.4^a \pm 0.8$	$28.8^a \pm 0.9$
Dissolved oxygen	$5.5^a \pm 1.6$	$6.3^a \pm 1.3$
Luminosity	$71737^a \pm 58903$	$72537^a \pm 57436$
Transparency	$36^a \pm 6$	$35^a \pm 3$

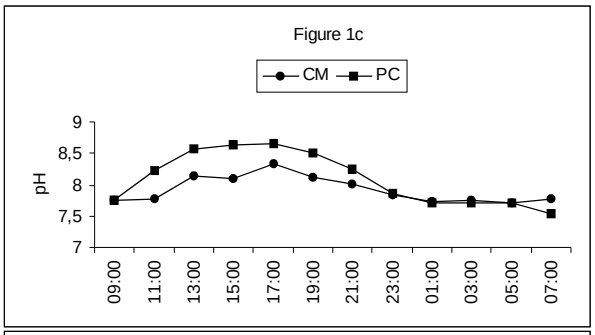
CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans*
Different letters (a, b) among means in the lines indicates differences between treatments by the "t" test ($P<0.05$)

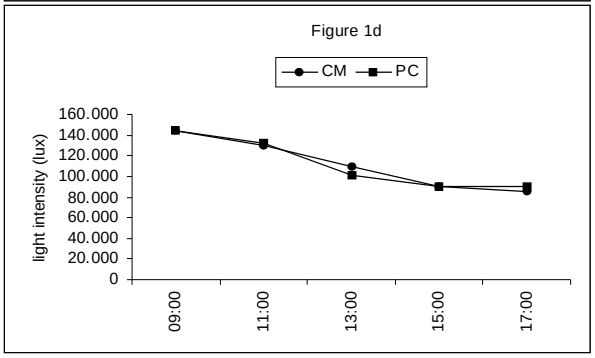
significant difference was observed among the treatments (Table 1). The pH values analyzed in the two nurseries varied between 7 and 8.5 (Figure 1c), being compatible to the values recommended by Boyd (1997) and Aride (2004). The pH can be considered a good environmental condition indicator in an aquatic mean as well as it can interfere on primary productive when the water is acid (BOYD and TUCKER, 1998). According to Vinatea (1997), the pH is a very important variable in the aquaculture once it influences many factors in the physiological and metabolic processes in the aquatic organisms. In the case of phosphorus, depending on the pH value (acid or alkaline), this nutrient can be precipitated by calcium or iron becoming insoluble for the phytoplankton. Besides, the pH influences the ammonia and sulfur acid toxicity. Light intensity values (lux) can be observed at the Figure 1d.

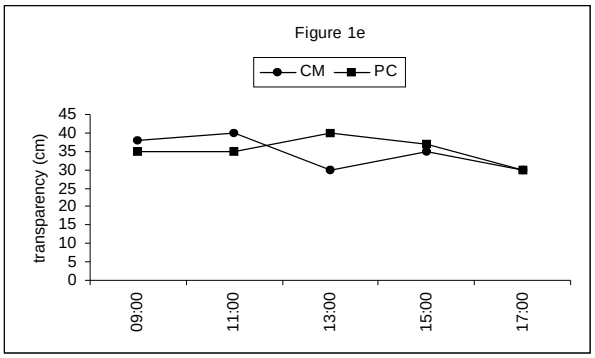
The highest value occurred at 9:00 am (144.000Lux) when chlorophyll "a" values also achieved the maximum value. Light penetration (transparency) can be observed at the Figure 1e, varying between 35cm and 45 cm (CM and PC). In the treatment CM, water presented an intense green color while in the treatment PC the color observed was less intense. According to BOYD (1997), presence of microscopic algae interfere on the water color which can be green, yellow, black or brown, depending on the most abundant planktonic species (Bloom), as well as the suspended particles. Kubitza (1998) states that transparency must be between 40cm and 60cm. Nursery with high transparency means loss of utilization in the natural food produced on the chain's basis in aquatic ecosystem. On the other hand, low transparency values can signifies a imminent risk to the cultured organisms, once the nocturnal oxygen demand can achieve hypoxia levels. The transparency variable is a simple method to be executed and accompanied but it is necessary attention once its interpretation much depends on observer's experience and the sun's incidence angle in relation to the surface, being necessary the combination with other methods such as plankton's counting and identification because turbidity can be occasioned by desirable and undesirable organisms. No significant differences were observed on the luminosity and transparency variables.











Ammonia, nitrate and nitrite values were under the minimum tolerated by the fishes (0.6 to 2.0mg/L for total ammonia, ≤ 5.0mg/L for nitrate, ≤ 0.5mg/L Nitrite (Table 1), like as Sipaúba (1995). According to Boyd & Tucker (1998), the presence of phytoplanktonic communities on a culture system diminishes the ammonia levels on the environment by assimilation process. Higher nitrogenate compounds concentration (non-ionized ammonia and nitrite) results on a higher oxygen consume provoking increase on the production costs due o the necessity of using artificial aeration to maintain organisms alive. Great part of the nitrogen on the water is assimilated by the plants. Later, with their deaths, oxygen is deposited on the sediment composing the organic matter (SIPAÚBA, 1995: ESTEVES, 1998).

On the nurseries, microbial decomposition is the main ammonia source. Decreasing on the pH produces increases in the ammonium ion levels (NH_4) and ammonia (NH_3), being this last one extremely toxic when oxygen concentration is low and the CO_2 concentration is high (SIPAÚBA, 1995). On carnivorous species farming (surubim), a higher nitrogenate compounds concentration in relation to omnivorous species (tambaqui) is expected, once carnivorous rations have higher brute protein percentages. In the present study no differences were observed on the nitrogenate compounds concentrations for both treatments (Table 1). Enough phosphorous concentrations are necessary for phytoplankton's growth, when it is insufficient or in excess phytoplanktonic populations presents no satisfactory growth. For an ideal growth on nurseries, it is recommended phosphorous concentrations between 0.1 – 0.3mg/L; the range observed on the samples were 0.205 mg/l for CM and 0.211mg/l for PC (BOYD, 1997; BOYD & TUCKER, 1998). PC treatment presented phytoplanktonic population inferior when compared to that obtained in the CM, despite presenting higher concentrations of this nutrient on the water. Chlorophyll a concentrations averages were of 0.151mg/l for CM and 0.086mg/L for PC. It is common to use chlorophyll "a" concentration for expressing phytoplanktonic biomass and as a direct indication of the aquatic system's trophic state (ESTEVES, 1998).

There was significant difference between the treatments (Table 1). From the analyzed data, both nurseries presented good biodiversity at all times. For CM the highest density (cel/ml) occurred at 9:00 am (183.000), with the highest light incidence (lux) and the higher dissolved oxygen concentration (mg/l). Among the identificated groups (CM), Bacilariophyta was the one which occurred in greater number, achieving the maximum at 9:00 am (5.000 cel/ml) and the minimum at 9:00pm (800 cel/m.). For the PC, the higher incidence was Xanthophyta with higher density at 3:00 pm (380000 cells/ml) (Table 2). PC treatment presented lower algae densities (1580 cells/ml) in relation to CM (22413 cells/ml), this fact can be related to the aloctone discharge from the fructiferous trees present in the margins of the CM. Significant differences were observed for the Bacillariophyta, Cyanophyta, Chlorophyta and Xantophyta densities (Table 3).

Concerning the values found in the phytoplanktonic community, the CM treatment presented higher frequency of Xanthophyta, especially at 9:00 am (62.857 cells/ml), identifying still lower concentrations in the populations of Bacillariophyta (9:00h pm – 4.571 cells/ml, 3:00 pm – 6.000 cél/ml and 9:00 pm – 2.000 cél/ml), Cyanophyta (3:00 pm – 250 cells/ml) and Chlorophyta (3:00hs). The nursery with the Surubim did not presented great biodiversity, in the identificated populations of Bacillariophyta (9:00 am – 2.875 cells/ml, 3:00 pm – 2.250 cells/ml, 9:00 pm – 2.333 cells/ml) and Xantophyta (9:00 am – 2.000 cells/ml, 3:00 pm – 2.375 cells/ml, 9:00 pm – 2.166 cells/ml), in the Tables 4 and 5. States that the composition and diversity of algae species in the body waters is related to the abiotic and biotic environments characteristics. Water quality values at this study were close on both nurseries but there were population differences (CORDOVA, 1998).

Nurseries presented a sensible difference concerning the microcrustaceans composition: with CM presenting three genera of the ordem Cladocera (*Bythotrephes, Moina* and *Polyphemus*), five genera of the ordem Copepoda (*Cyclops, Eudiaptomus, Heterocope, Macrocyclops, Eucyclops* and Copepoda's nauplius), and one genera of the ordem Rotifera (*Keratella*) (Table 6).In the PC it was observed five genera of Cladocera (*Bythotrephes, Daphnia, Diaphanosoma, Moina* and *Monospilus)*, and two of Copepoda (*Eudiaptomus, Macrocyclops* and Copepoda's nauplius) (Table 7). Qualitatively, the numbers of cladocerans and copepods (org/l) in the two nurseries were well represented, except for the rotifers which were in low diversity in CM and absent in PC.

Table 2. Density (cells/ml) average and shunting line standard of the phytoplanktonic

		Density phytoplanctonic (cells/ml)					
		CM			PC		
GROUP	GENUS	9:00 h	15:00 h	21:00 h	9:00 h	15:00 h	21:00 h
Bacillariophyta	*Amphora*	0	0	0	20	0	0
Bacillariophyta	*Navicula*	400	67	267	20	20	0
Bacillariophyta	*Nitzschia*	4500	1200	1067	20	60	20
Bacillariophyta	*Pinnularia*	0	133	67	0	0	0
Bacillariophyta	*Pleurosigma*	100	0	0	0	0	0
Bacillariophyta	*Surirella*	0	0	0	0	0	20
Bacillariophyta	*Synedra*	0	533	333	0	0	0
Cyanophyta	*Anabaena*	2100	667	467	0	0	0
Cyanophyta	*Anabaenopsis*	300	133	267	0	0	0
Cyanophyta	*Cylindrospermopsis*	100	67	0	0	0	0
Cyanophyta	*Chroococcus*	200	0	67	20	60	0
Cyanophyta	*Gloeocapsa*	200	0	0	0	0	0
Cyanophyta	*Merismopedia*	100	0	0	0	0	0
Cyanophyta	*Microcystis*	200	67	0	0	0	0
Cyanophyta	*Nostoc*	200	267	0	0	0	0
Cyanophyta	*Phormidium*	100	0	0	0	0	0
Chlorophyta	*Chlorella*	400	400	267	60	100	120
Chlorophyta	*Chlorococcum*	100	133	200	0	0	0
Chlorophyta	*Chloromonas*	0	133	0	0	0	0
Chlorophyta	*Cosmarium*	200	200	67	0	0	0
Chlorophyta	*Gloeocystis*	200	0	200	0	0	0
Chlorophyta	*Kirchneriella*	0	0	67	80	80	0
Chlorophyta	*Nephrocytium*	200	0	133	0	20	20
Chlorophyta	*Pediastrum*	100	67	133	0	0	0
Chlorophyta	*Scenedesmus*	300	267	67	0	0	0
Chlorophyta	*Schroederia*	0	67	200	0	0	0
Chlorophyta	*Spirogyra*	0	0	67	0	0	0
Chlorophyta	*Staurastrum*	300	67	0	0	0	0
Chlorophyta	*Tetraedron*	0	13	0	0	0	0
Xanthophyta	*Ellipsoidion*	200	67	67	0	0	0
Xanthophyta	*Isthmocloron*	0	0	0	0	40	0
Xanthophyta	*Tribonema**	1900	133	1067	280	340	160
Pirrophyta	*Gymnodinium*	100	0	0	0	0	0
Pirrophyta	*Peridinium*	100	0	67	0	0	0
Euglenophyta	*Euglena*	0	0	0	20	0	0
TOTAL		18300	5387	7867	520	720	380

CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans*

Table 3. Density (cells/ml) average and shunting line standard of the phytoplankton

Group phytoplanktons (cells/ml)	Treatments	
	CM	PC
Bacillarrophyta	$2888^{a} \pm 1831$ (1.733 - 5000)	$60^{b} \pm 20$ (40- 80)
Cyanophyta	$1833^{a} \pm 1457$ (800 – 3500)	$27^{b} \pm 30$ (0 – 60)
Chlorophyta	$1515^{a} \pm 248$ (1346 – 1800)	$160^{b} \pm 35$ (140 - 200)
Xantophyta	$1144^{a} \pm 950$ (1113 – 2100)	$273^{b} \pm 110$ (160 – 380)
Euglenophyta	0^{a}	$6^{a} \pm 11$ (0 – 20)
Pirrophyta	$33^{a} \pm 57$ (0 – 100)	0^{a}
Total	$10518^{a} \pm 6852$ (5.387 – 18300)	$540^{b} \pm 170$ (520 – 720)

CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans*
Different letters (a, b) among means in the column, indicates differences between treatments by the "t" test (P<0.05)

Table 4. Density (cells/ml) average and shunting line standard of the phytobents organisms

GROUP	GENUS	Density phytobents (cells/ml)					
		CM			PC		
		9:00 h	15:00 h	21:00 h	9:00 h	15:00 h	21:00 h
Bacillariophyt	*Amphora*	142,9	125,0	125,0	625,0	500,0	166,7
Bacillariophyta	*Cymbella*	0,0	250,0	0,0	0,0	0,0	0,0
Bacillariophyta	*Navicula*	428,6	125,0	125,0	1125,0	625,0	500,0
Bacillariophyta	*Nitzschia*	1285,7	1250,0	500,0	1000,0	750,0	833,3
Bacillariophyta	*Pinnularia*	2714,3	4125,0	1125,0	0,0	0,0	833,3
Cyanophyta	*Anabaena*	0,0	125,0	0,0	0,0	0,0	0,0
Chlorophyta	*Chlorella*	0,0	375,0	125,0	125,0	375,0	0,0
Chlorophyta	*Chlorococcum*	285,7	750,0	500,0	0,0	0,0	0,0
Xanthophyta	*Ellipsoidion*	62285,7	22125,0	13125,0	1750,0	2375,0	2166,7
Xanthophyta	*Isthmocloron*	571,4	1125,0	625,0	250,0	0,0	0,0
Total		67714,3	30375,0	16250,0	4875,0	4625,0	4500,0

CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans lossoma macropomum,* PC: *Pseudoplatystoma corruscans*
Different letters (a, b) among means in the column, indicates differences between treatments by the "t" test (P<0.05)

Table 5. Density (cells/ml) average and shunting line standard of the phytobents organisms

Group phytoplanktons (cells/ml)	Treatments	
	CM	PC
Bacillarrophyta	4190[a] ± 2026 (2000 – 6000)	2486[b] ± 339 (2333- 2875)
Cyanophyta	83[a] ± 144 (0 – 250)	0[a]
Chlorophyta	533[a] ± 298 (285 – 875)	0[b]
Xantophyta	33285[a] ± 26.046 (13750 – 62857)	2180[b] ± 187 (2000 – 2375)
Total	26390[a] ± 26390 (16250 – 67714)	4666 [b] ± 190 (4500 – 4875)

CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans*
Different letters (a, b) among means in the column, indicates differences between treatments by the "t" test (P<0.05)

Table 6. Zooplankton found in nurseries of *Colossoma macropomum* and *Pseudoplatystoma corruscans*

GROUP	GENUS	Density Zooplankton (organisms/L)					
		CM			PC		
		9:00 h	15:00 h	21:00 h	9:00 h	15:00 h	21:00 h
Cladocera	*Bythotrephes*	2000	2000	0	1000	0	0
Cladocera	*Daphnia*	0	0	0	0	0	1000
Cladocera	*Diaphanosoma*	0	0	0	0	0	3000
Cladocera	*Moina*	1000	1000	1000	0	0	1000
Cladocera	*Monospilus*	0	0	0	0	1000	0
Cladocera	*Polyphemus*	0	2000	2000	0	0	0
Copepoda	*Cyclops*	9000	6000	2000	0	0	0
Copepoda	*Eucyclops*	0	2000	0	0	0	0
Copepoda	*Eudiaptomus*	12000	4000	2000	3000	2000	1000
Copepoda	*Heterocope*	3000	2000	3000	0	0	0
Copepoda	*Macrocyclops*	3000	2000	3000	0	1000	0
Copepoda	*Náuplios*	2000	0	0	0	0	2000
Rotifera	*Keratella*	5000	6000	3000	0	0	0
TOTAL		37000	27000	16000	4000	4000	8000

CM: *Colossoma macropomum,* PC: *Pseudoplatystoma corruscans*

Table 7. Density of (org/L) average and shunting line standard of the zooplankton organisms

Treatments	Density Zooplankton (organisms/L)			
	Cladocera	Copepoda	Rotifera	Total
CM	$3.666^{a} \pm 471$ (3.000 – 5.000)	$18.333^{a} \pm 9.712$ (10.000 – 29.000)	$4.666^{a} \pm 1.527$ (3.000 – 5.000)	$26.\ 666^{a} \pm 10.503$ (16.000 – 37.000)
PC	$2.333^{a} \pm 1.527$ (1.000 – 5.000)	$3.000^{b} \pm 0$ (3.000 – 3.000)	0^{b}	$5.333^{b} \pm 2.309$ (4.000 – 8.000)

CM: *Colossoma macropomum*, PC: *Pseudoplatystoma corruscans*
Different letters (a, b) among means in the column, indicates differences between treatments by the "t" test ($P<0.05$)

Concerning the quantitative values of CM, the three zooplanktonic groups were well represented as Cladocera (11000 org./l), Copepoda (55000 org./l) and Rotífera (14.000 org./l). In the PC, zooplankton was not so accentuated, being present Copepoda (9000 org./l) and Cladocera (7000 org./l), with Rotifera absent. This fact can be related to the lower density of primary producers (phytoplankton) in the PC which are the basis on the food web (COSTA et al., 2003) complements stating that there is interspecific and intraspecific competition and predation on the trophic webs, and that the period of higher reproduction of rotifers is between December and March. Once the present study was carried out in a different period it is supposed that these organisms were not intensely reproducing (PORCUNA et al., 2004) still relate this fact to the presence of the genera *Daphnia* in the aquatic environment that can eliminate rotifers populations by exploration competition or by mechanic interference, in which rotifers are dragged in the *Daphnia's* branchial chamber. Justifying in this way, the absence of Rotifera in the PC in which representatives of the genera *Daphnia* were identified. While in the CM the present genera was not identified and the Rotifers were present. Concerning the abiotic parameters, no influence was verified over the zooplankton. Abiotic factors did not present marked effects over the cladocerans, from this, it is likely that the same occur with the other zooplanktonic groups (ASHIDATE et al., 2003).

CONCLUSIONS

Low stock density contributed to maintain the good water quality as well as the low existing renewal. In the CM treatment (tambaqui) which receives aloctone material with great frequency, higher chlorophyll "a" concentration was detected. The presence of copepods at this nursery can be related to the high phytoplankton availability in this environment. Aquaculture must control these physical-chemical variables to understand the environments' dynamic and then interfere with sustainable methodologies.

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