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Plankton Diversity in a Tropical Traditional Fish Farming "Whedos" in the Oueme River (Benin, West Africa) During an Experience of Compensatory Overeating Essay on *Clarias gariepinus* and *Oreochromis niloticus*

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***Abstract* – The objective of this study is to assess the diversity of plankton community in a tropical traditional aquaculture system "*whedos*" in the Oueme river delta during experiences of compensatory overeating essay on *Clarias gariepinus* and *Oreochromis niloticus*. During this study, Planktonic organisms were collected between 16: 00 and 18: 30 on 12, 19 and 26 August 2014 in experimental and witness *whedos*. A total of 28 taxa of phytoplankton belonging to 4 phylums and 17 families were recorded during this study. Phytoplankton community recorded was marked by numerical dominance of Bacillariophyta and Chlorophyta, respectively 53.57% and 39.28% of total diversity.**

For the zooplankton, 29 taxa were registered, with numerical dominance of rotifer (15 taxa, 52% of zooplankton total diversity). Brachionidae family presented the highest diversity, with nine species belonging to three genera (*Brachionus*, *Epiphanes* and *Keratella*). *Brachionus* presents the most important diversity with six species, followed by *Keratella* (two taxa). Our study reveals that in plankton community, highest diversity was registered in *whedo* of compensatory overeating essay on *Clarias gariepinus* and *Oreochromis niloticus* while control *whedo* presented the lowest diversity.

***Keywords* – Plankton Diversity, Fish Farming, Tropical Zone, Oueme River, Benin.**

I. Introduction

Fish is sometimes the most financially affordable protein source in poor households in urban and suburban areas. It is considered as « a rich food for the poor people ». The fish has an interesting biological value and constitute an excellent source of essential amino acid. Its protein level (17-21.6%) is equivalent of cow meat (18.2-20.6%) and greater than that of poultry egg (11%) and cow whole milk (3.8%) [1]. Despite the primordial role of fish in human diet, in Benin fish consumption is very low (9.4 kg/habitant/year) versus 15 to 18 kg/habitant/year recommended by the Food and Alimentation Organization [1]. One of solution of this situation is fish-farming development. In this context, the current study has been carried out on *whedos* (traditional fish hole) in the high delta of Oueme River (Benin, West Africa). In these artificial ecosystems, an extensive fish breeding systems was experienced on *Clarias gariepinus* and *Oreochromis niloticus*: compensatory overeating essay, with the use of an imported food «*Skretting*» (45% of protein). In extensive aquaculture system, the overall objective of organic and inorganic fertilizers is to increase fish farm productivity through algae growth stimulation and promotion of zooplankton production suitable for fish larvae [2]. Plankton communities are two important biological components, form the basis of the food web in aquatic ponds and affect fish production [3]. Indeed, plankton communities exhibit an essential role in biomass production and energy transfer in aquatic environments by including organisms of different trophic levels, from the base (phytoplankton) to consumers of high levels (zooplankton) of food web [4] in [5]. 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. Additionally, plankton communities play a major role in the biogeochemical cycles of many important processes such as the carbon cycle, nitrification, denitrification, remineralization, and methanogenesis. Plankton responds quickly to environmental changes because of their short life cycle. Of this fact hence, their species composition is more likely to indicate the quality of the water which they are found. Diatomic species such as *Nitschia*, *Gyrosignma* and *Epithemia* are known to avoid acid water and very low concentration of calcium and magnesium [6]. Besides, zooplankton species as *Thermocyclops decipiens* can be used as biological indicators for pollution, water quality, and eutrophication [7]. It is also broadly admitted that of Brachionidae family and the genus *Brachionus* taxa are majorly and regularly met in eutrophics tropical waters [8] while *Trichotria tetratis* is considerate as the pollution indicator as they were found in the lake which was rich in phosphorus and other heavy metal ion [9]. Knowledge of physico-chemical parameters and plankton of any body of water is not only useful in assessing its productivity, but would also allow for a better understanding of its biota [6].

The aim of this study is to estimate plankton community diversity in an experiment of compensatory overeating essay of *Clarias gariepinus* and *Oreochromis niloticus*, with the use of an imported food « *Skretting* » (45% of protein) and to monitor water quality, and establish the status of pollution in *whedos* in Oueme River High Delta (Benin, West Africa) using bio-indicator species.

II. Materials and Methods

During this study, two sites were used for an experiment in the Oueme delta: Ouebossou and Ayze sites (Figure 1) where a *whedo* (157 m^2) has been used with 12 happas for compensatory overeating essay respectively on *Clarias gariepinus* and *Oreochromis niloticus.* In Ayize site, another *whedo* was used as witness (or control) *Whedo*. During these experimences, an imported food « *Skretting* » (45% of protein), was admitted for feeding *C. gariepinus and O. niloticus*. No food was admitted to fishes of the control *Whedo*.

A HANNA multi parameter type was used for measuring *whedo's* physico-chemical parameters like pH, temperature, conductivity and the rate of dissolved solid. Nutrient salt (PO_4^{3-}, NH_4^+, NO_3^-) were determined by molecular absorption spectrophotometric with a DR 2800 spectrophotometer.

Planktonic organisms were collected between 16: 00 and 18: 30 on 12, 19 and 26 August 2014 in the experimental *whedos* and in the witness *whedo* (without treatment). During the sampling, 50 Litres (5 times a tranparent bucket 10 Litres capacity) of water fetched from different happas of experiment *whedos* are filtered with a sieve of 50 µm empty mesch for zooplankton and 20 µm for phytoplankton.

Filtered water is been collected in a bowl to avoid *whedo* water troubling. Plankton samples were preserved in a mixture of *whedos* water and borax neutralized formalin at a final concentration of 5%.

A total of 144 samples were selected and the zooplanktonic organisms therein were identified and counted while phytoplankton is only identified. The zooplanktonic organisms were identified using the following works: [10], [11], [12]. Taxa were identified and counted in a Dollfuss vat under a dissecting microscope (magnification: 160, 250 and 400) of Leica WILD M3c type. Before identification, the sample was put to a volume of 50 ml in a graduated test-tube. It was then homogenized through successive decanting in two beakers, and two bore piston Eppendorf pipette equipped respectively with broad open (1 and 5 ml) are used for subsampling. One or several subsamples were examined until numbering a minimum of 100 individuals per taxa. For the least abundant taxa, (< 100 individuals), entire sample was explored. Obtained results were converted to density (expressed as number of individuals per liter) by dividing the number of organisms obtained in each sample by the filtered water volume (50 liters). Zooplankton taxonomic richness, Shannon and Equitability indices were used to determine the structure and ecological dynamics of zooplankton community in the *whedos*.

Phytoplankton identification up to species level (if possible) was performed by using photonic microscopy and identification key as [13], [14], [15], [16], [17]. For phytoplanktonic organisms identification, several aliquots of every sample were analyzed by taking, after homogenization, 1 ml of water sample (1 ml pipette fixed).

III. Results

A. Physico-Chemical Parameters

The average values of physico-chemical parameters in *whedos* are summarized in table 1. Registered temperatures during this study vary between 26.13 and 28.05°C. Dissolved oxygen concentration is low, < 5mg/L (3.75 - 4.02), idem for transparence (28.55 - 43.94 cm). The pH varies between 6.26 and 7.24. The pH is relatively acid in compensatory overeating essay *whedos* (6.28 – 6.69) and is slightly above neutral pH (7.24) in witness *whedo*. The rate of dissolved solid and the conductivity reveal the same tendency, with values in compensatory overeating essay *whedos* (respectively 28.13 - 52.5 ppm and 73.44 - 120.63 µS/cm) lowest than those of registered in the witness *whedo* (respectively 81.55 ppm and 166.25 µS/cm). The concentration of orthophosphate varies from 0.23 a 0.28 mg/L while that of ammonium oscillate between 0.56 and 0.67 mg/L. Nitrate concentrations is 0.01 in all *whedos* studied.

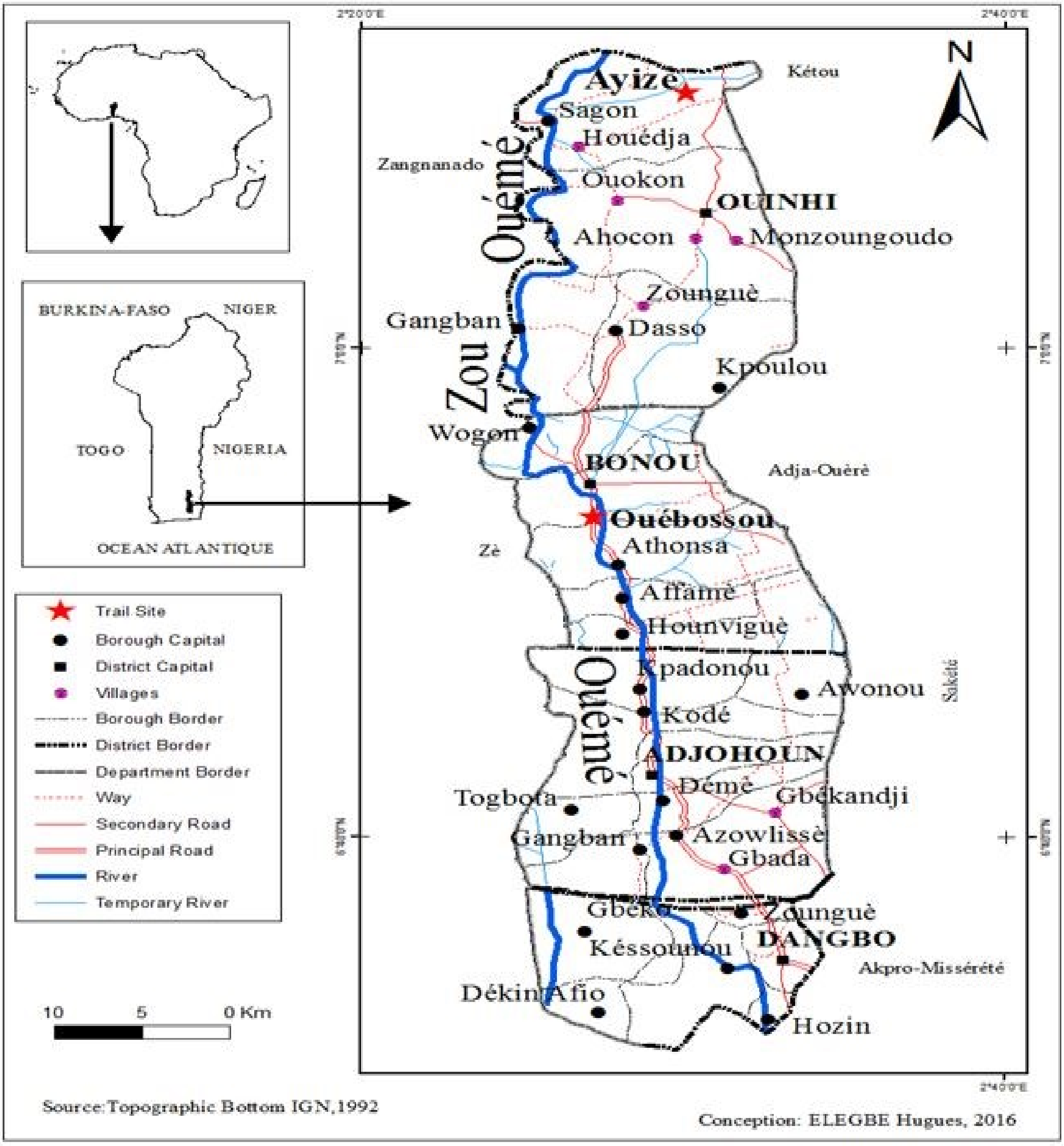

Fig. 1. Localization of sampling site in the Oueme river delta

Table 1. Summary of physico-chemical parameters in witness and all studied experiment *whedos* of the high delta of Oueme river (Benin)

	Witness *Whedo*	***Oreochromis niloticus* experimental *whedo***	***Clarias gariepinus* experimental *whedo***
Temperature (°C)	26.85	28.05	26.13
Dissolved oxygen (mg/L)	3.75	3.76	4.02
Transparency (Cm)	28.55	34.75	43.94
pH	07.24	06.69	06.28
Rate of dissolved solid (ppm)	81.55	28.13	52.5
Conductivity (µS/cm)	166.25	73.44	120.63
Orthophosphate (mg/L)	0.23	0.28	0.23
Ammonium (mg/L)	0.67	0.56	0.64
Nitrate (mg/L)	0.01	0.01	0.01

B. Plankton Composition Analysis

Phytoplankton Composition and Community Structure

A total of 28 taxa of phytoplankton were recorded belonging to 4 phylums and 17 families (Table II). Bacillariophyta with 15 taxa belonging to 7 families were found to be dominant in the *whedos* studied followed by Chlorophyta (11 taxa belonging to 7 families). Euglenophyta and Cyanoprocaryota are less represented with one taxon each. In these *whedos*, Gomphonemataceae family presented the highest diversity (5 taxa), followed by Selenastraceae (4 taxa), Naviculaceae (3 taxa), and by Fragilariaceae and Closteriaceae (2 taxa each). The others families were monospecific (Table II).

Table II. Phytoplankton composition in witness and compensatory overeating essay *whedos* in the Ouemé delta (Benin)

Phylums	Famillies	Taxa	Witness *whedo*	*Oreochromis niloticus* experimental *whedo*	*Clarias gariepinus* experimental whedo
Bacillariophyta	Fragilariaceae	*Fragilaria* sp.$_1$	+	+	+
		Fragilaria sp.$_2$	+		+
	Gomphonemataceae	*Gomphonema kobayasii*	+	+	+
		G. louisiananum	+	+	+
		G. mexicanum	+	+	+
		Gomphonema sp.$_1$	+	+	+
		Gomphonema sp.$_2$			+
		Gomphonema sp.$_3$	+		+
	Naviculaceae	*Gyrosigma* sp.	+		+
		Navicula sp.$_1$	+		+
		Navicula sp.$_2$			+
	Stauroneidaceae	*Stauroneis* sp.	+		
	Bacillariaceae	*Pinnularia* sp.			+
	Pinnulariaceae	*Nitzschia* sp.		+	
	Tabellariaceae	*Meridion* sp.			+
Chlorophyta	Selenastraceae	*Ankistrodesmus* sp.$_1$		+	
		Ankistrodesmus sp.$_2$		+	
	Scenedesmaceae	*Scenedesmus* sp.$_1$		+	
		Scenedesmus sp.$_2$		+	
	Chlorellaceae	*Actinastrum* sp.		+	
	Ulotrichaceae	*Ulothrix* sp.	+	+	+
	Zygnemataceae	*Spirogyra* sp.		+	+
	Oedogoniaceae	*Oedogonium* sp.		+	
	Closteriaceae	*Closterium kuetzingii*	+	+	
		Closterium sp.		+	
	Desmidiaceae	*Euastrum* sp		+	
Euglenophyta	Phacaceae	*Lepocinclis* sp.		+	
Cyanoprocaryota	Oscillatoriaceae	*Oscillatoria* sp.		+	
04	**17**	**28**	**12**	**19**	**15**

At genus level, *Gomphonema* presents the most important diversity in the *whedos* studied, with six taxa, followed by *Fragilaria*, *Navicula*, *Ankistrodesmus*, *Scenedesmus*, and *Closterium* (two taxa each). On the total taxa, six (*Gomphonema kobayasii, Gomphonema louisiananum, Gomphonema mexicanum*, *Gomphonema* sp.$_1$ and *Ulothrix* sp.) were obtained in the experimental and witness *whedos*. Two taxa were specifics in the witness *whedo* (*Stauroneis* sp. and *Closterium kuetzingii*) while five (*Gomphonema* sp., *Navicula* sp., *Pinnularia* sp., *Meridion* sp., and *Spirogyra* sp.) were specific to the compensatory overeating essay *whedos* on *Clarias gariepinus* and 12 (*Gomphonema* sp.$_2$, *Gomphonema* sp.$_3$, *Gyrosigma* sp., *Navicula* sp.$_1$, *Navicula* sp.$_2$, *Stauroneis* sp., *Pinnularia* sp., *Oedogonium* sp., *Closterium* sp., *Euastrum* sp., *Lepocinclis* sp. and *Oscillatoria* sp.) were specific to the compensatory overeating essay *whedos* on *Oreochromis niloticus*. Phytoplankon diversity varied according experimental studies, with highest diversity in *whedo* of compensatory overeating essay (15-19 taxa). Control or witness *whedo* presented the lowest diversity with 12 taxa.

Zooplankton Composition and Community Structure

A total of 29 fresh water zooplankton taxa belonging to Copepoda (6 taxa), Cladocerans (5 taxa), Rotifera (15 taxa) and other zooplankton (3 taxa) and 15 families were identified in the three *whedos* studied (**Table III**). Copepods were represented by six taxa including two families (Cyclopidae and Diaptomidae) and five genera. Cyclopidae family presented the highest diversity (four taxa belonging to 4 genera). Cladocerans taxa (five) were belonging to five monospecifics genera. Rotifera was the most diversified group recorded in the *whedos* studied. They are represented by 15 taxa belonging to seven families and nine genera.

Brachionidae family presented the highest diversity, with nine species belonging to three genera (*Brachionus*, *Epiphanes* and *Keratella*). *Brachionus* presents the most important diversity in the *whedos* with six species, followed by *Keratella* (two taxa). Other zooplankton organisms were represented by insect larvae and ostracods.

This study reveals that lowest taxonomic richness (13 taxa) was recorded in the witness *whedo* while highest richness (17 and 22 taxa) was obtained in the experimental *whedo* treated with « *skretting* » in the compensatory overeating essay on *Oreochromis niloticus* and *Clarias gariepinus*.

C. Zooplankton Quantitative Analysis

Zooplankton Structure and Abundance Variation

The zooplankton collected in the experimental and witness *whedos* is characterized by Rotifera and Copepoda dominance (respectively 37.70 and 33.95 % of the total zooplankton abundance), followed by other organisms (15.10 %) and Cladocerans (13.25%). This general tendency (Rotifera and Copepoda dominance) was also observed in the witness *whedo*. In the *whedo* of compensatory overeating essay on *Oreochromis niloticus*, the zooplankton community was dominated by the Rotifera (53.92%) and other organisms (37.45%). On the other hand, in the *whedo* of compensatory overeating essay on *Clarias gariepinus*, the zooplankton population

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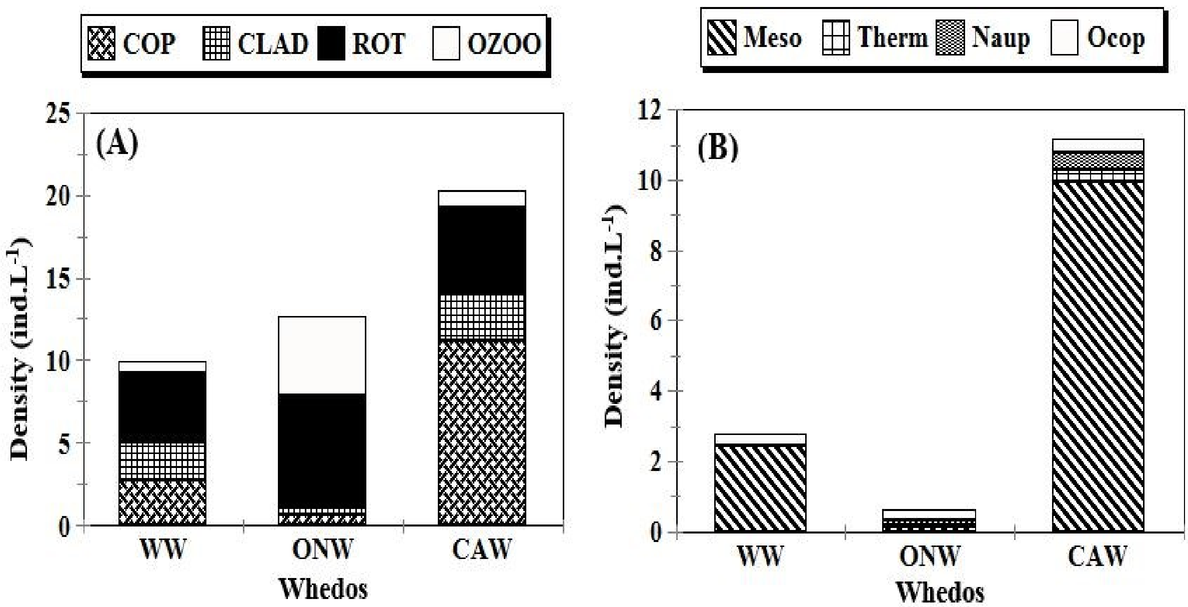
was marked by numerical dominance of Copepoda (54%), followed by rotifer (25.54%).

Table III: Taxonomic list and composition of zooplankton community obtained in witness whedo and in the *whedos* of compensatory overeating experiments on *Oreochromis niloticus* and *Clarias gariepinus*.

Groups	Families	Taxons	Witness *whedo*	*Oreochromis niloticus* experimental *whedo*	*Clarias gariepinus* experimental *whedo*
Copepoda	Cyclopidae	*Thermocyclops* sp.		+	+
		Mesocyclops sp.	+	+	+
		Halycyclops sp.	+		+
		Ectocyclops sp.	+		
	Diaptomidae	*Thermodiaptomus* sp.		+	
	Unidentified	*Nauplii*		+	+
Cladocerans	Sididae	*Diaphanosoma excisum*	+	+	+
	Bosminidae	*Bosmina longirostris*			+
	Daphnidae	*Ceriodaphnia cornuta*	+		+
	Moinidae	*Moina micrura*	+	+	+
	Chydoridae	*Chydorus* sp.		+	+
Rotifera	Brachionidae	*Brachionus angularis*		+	
		Brachionus calyciflorus			+
		Brachionus caudatus			+
		Brachionus falcatus			+
		Brachionus plicatilis	+	+	
		Brachionus brevispinus			+
		Epiphanes clavulata		+	
		Keratella tropica			+
		Keratella sp.		+	
	Testudinellidae	*Hexarthra* sp.			+
	Trichocercidae	*Trichocerca* spp.	+	+	
	Conochiloïdae	*Chonochilus* sp.			+
	Asplanchnidae	*Asplanchna* sp.		+	+
	Euchlanidae	*Collulera* sp.	+		+
	Lecanidae	*Lecane* spp.	+	+	+
Others	Chironomidae	Larvae of Chironomidae	+	+	+
	Unidentified	Other insects' larvae	+	+	+
	Unidentified	Ostracods	+	+	+
04	**16**	**29**	**13**	**17**	**22**

Total abundance of zooplankton community varies according to the *whedos* (**Figure 2**). The lowest densities were recorded in the witness *whedo* (10 ind.L^{-1}) while highest abundances were observed in experimental *whedo*, with respectively 12.63 ind.L^{-1} and 20.24 ind.L^{-1} in *whedo* of compensatory overeating essay on *Oreochromis niloticus* and *Clarias gariepinus*.

Mesocyclops sp. was the main copepod species (mean: 86.16%). It was the main taxa in the witness *whedo* (89.11%) and in the *whedos* of compensatory overeating essay on *C. gariepinus* (89.37%) and was recorded with highest densities in *whedos* of compensatory overeating essay on *C. gariepinus* (9.98 ind.L^{-1}).



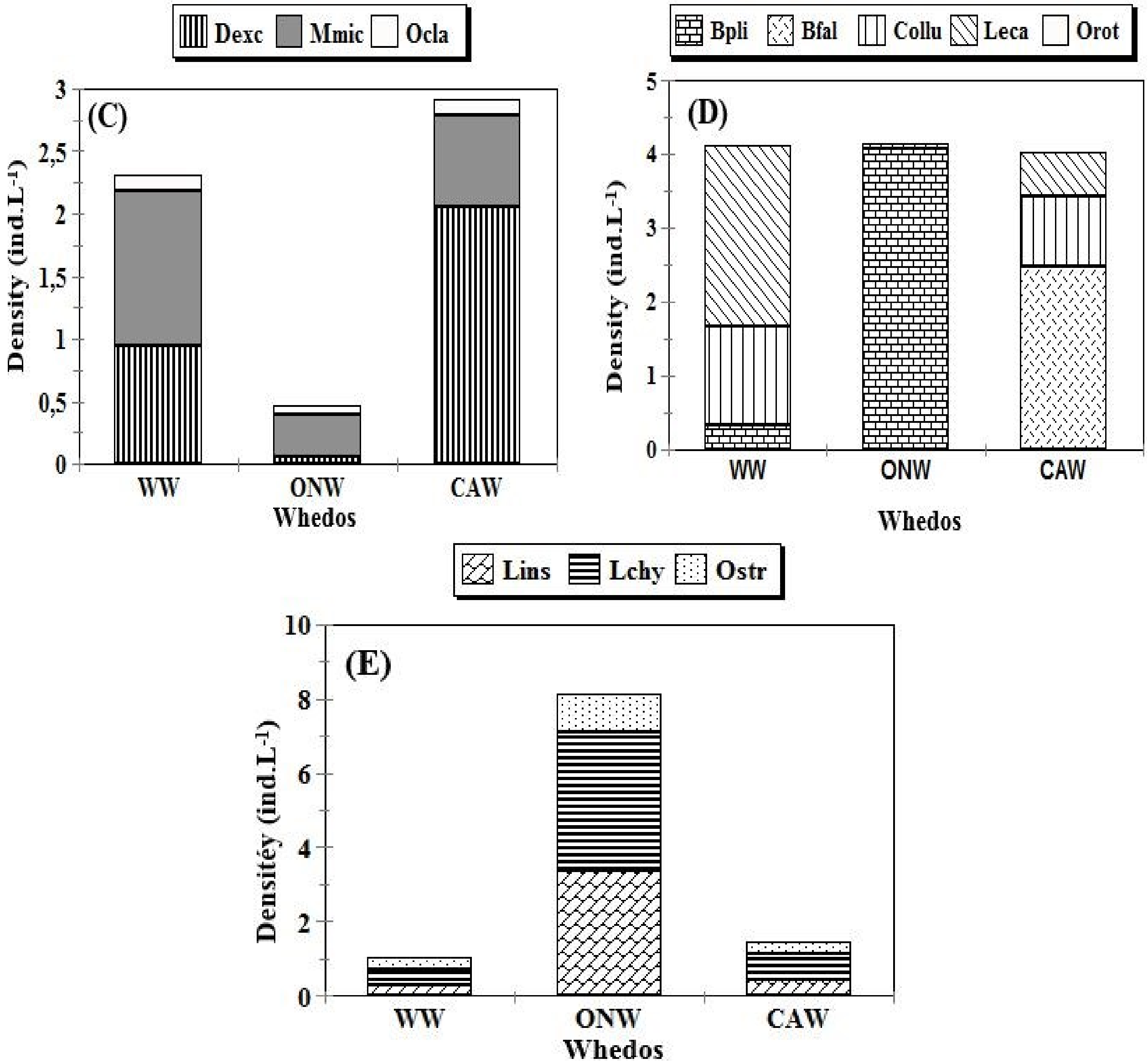


Fig. 2. Densities of total zooplankton (A) and the main taxa of Copepoda (B), Cladocerans (C), Rotifera (D), and other organisms (E) in experimental *Whedos*. (ROT : Rotifera, COP : Copepoda, CLA : Cladocerans, OZOO : Other zooplankton, Dexc : *Diaphanosoma excisum,* Mmic : *Moina micrura*, Ocla : Other Cladocerans, Leca : *Lecane* spp., Bpli : *Brachionus plicatilis*, Bfal : *Brachionus falcatus*, Collu : Collulera sp., OROT : other Rotifera, Meso : *Mesocyclops* sp. , Therm : *Thermocyclops* sp., Naup : Nauplii of Copepodes, Ocop : Other Copepods, Lins : larvae of Insects, Lchi : Larvae of Chironomidae, Ostr : Ostracoda, WW: Wetness Whedo, ONW: *Oreochromis niloticus* experimental whedo, and CAW: *Clarias gariepinus* experimental whedo.

At the Cladocera, *Diaphanosoma excisum* and *Moina micrura* constituted the mains taxa (mean 53.81% and 40.38 % respectively) showed the most important densities in the witness *whedos* (2.31 ind.L^{-1}) and in the *whedos* of compensatory overeating essay on *Clarias gariepinus* (2.91 ind.L^{-1}). Rotifera was dominated by four taxa (*Brachionus plicatilis*: 35.87%, *Lecane* spp.: 25.36%, *B. falcatus*: 20.24% and *Collulera* sp.: 18.53%). *B. plicatilis* constitutes the main species in the *whedo* of compensatory overeating essay on *Oreochromis niloticus* (98%, 4 ind.L^{-1}). *Lecane* spp. Presents the highest density in witness *whedo* (2.45 ind.L^{-1}) while *B. falcatus* showed highest abundance in of compensatory overeating essay on *Clarias gariepinus* (2.48 ind.L^{-1}). Insect' larvae were mainly registered in *whedo* of compensatory overeating essay on *Oreochromis niloticus*, with < 8 ind.L^{-1}.

D. Correlation Plankton Taxa, Environmental Variables and Studied Whedos

The RDA results reveal that correlation between environmental factors and plankton taxa are explained by the two first axis (100% of total variance), with more than 70% for the first axis (**Figures 3 and 4**). Canonical analysis reveals that the witness *whedo* was mainly under pH, dissolved solids rate (TDS), conductivity and ammonium. On a biologic level, phytoplankton taxa as *Gomphenema* spp., *Stauroneis* sp., *Ulothrix* sp., *Gyrosigma* sp., *Navicula* sp. and *Fragilaria* are well represented in this witness *whedo*. Zooplankton taxa associated to this *whedo* are mainly *Moina micrura*, *Lecane* spp. and *Collulera* sp..

The *whedo* of compensatory overeating essay on *Oreochromis niloticus* are under temperature and phosphates concentration influence. Phytoplankton taxa associated to this *whedo* are *Oscillatoria* sp., *scenedesmus* spp., *Clusterium* sp., *Nitzschia* sp., *Lepocinclis* sp., *Ankistrodesmus* spp., *Euastrum* sp., *Actinastrum*, *Oedogonium* sp.. To the level of the zooplankton, *Brachionus plicatilis*, Ostracods and insects larvae are the main taxa observed in this *whedo*.

In the *whedo* of compensatory overeating essay on *Clarias gariepinus*, the main phytoplankton taxa registered are *Gomphenema* sp., *Navicula* sp., *Meridion* sp., *Pinnularia* sp. while to the level of the zooplankton, *Brachionus falcatus*, *Diaphanosoma excisum* and *Mesocyclops* sp. are the main taxa collected during this experience. These planktonic taxa were correlated positively and significantly with water transparency, nitrate and dissolved oxygen concentrations.

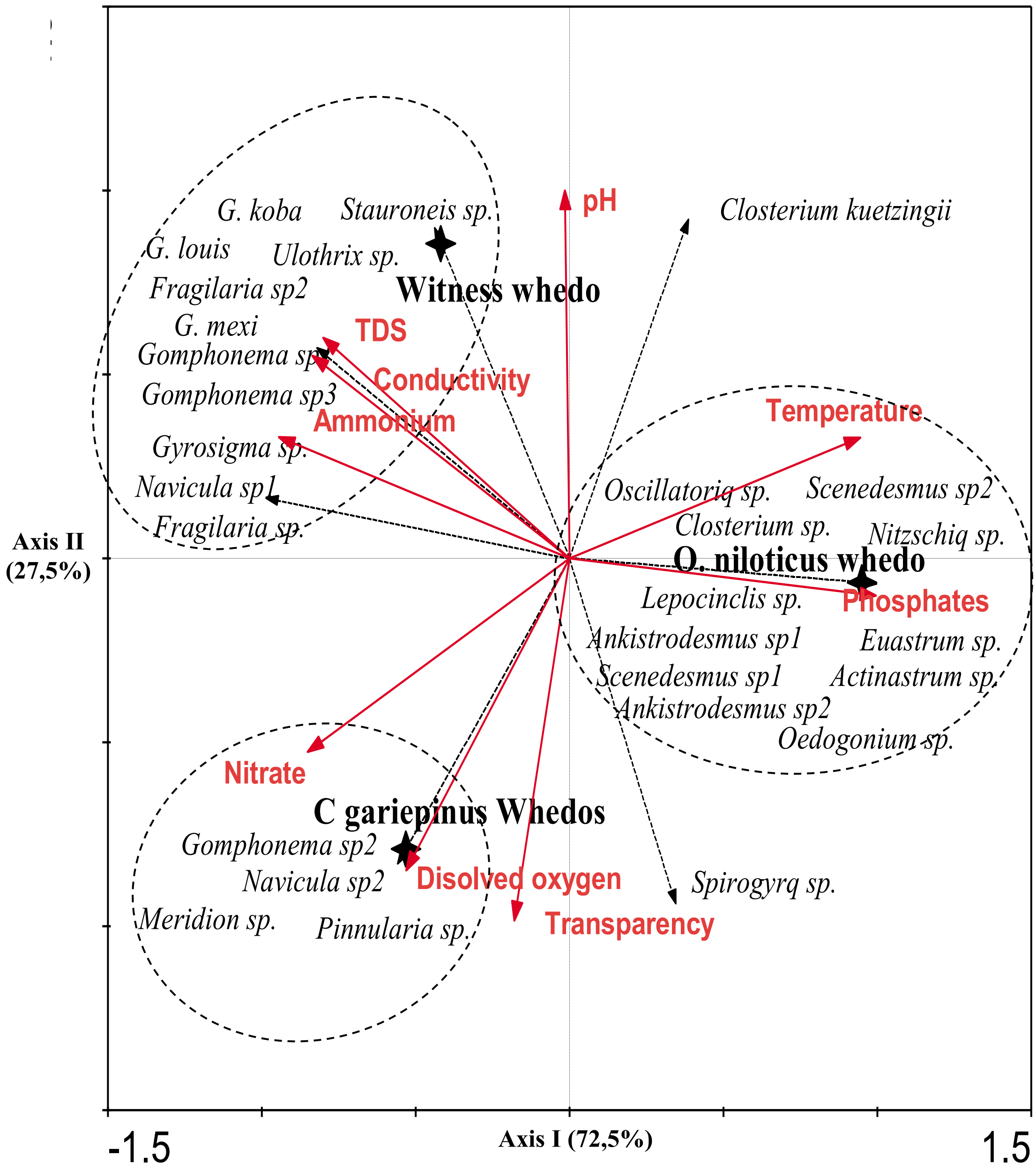


Fig. 3. Triple projection graph (triplot) of RDA showing the two first axis of phytoplankton taxa ordination, environmental variable (red arrow) and experimental studied and witness *Whedos*. (G. mexi: *Gomphonema mexcicanum*, G. Louis: *Gomponema louisiananum*, G. koba: *Gomphonema kobayasii*).

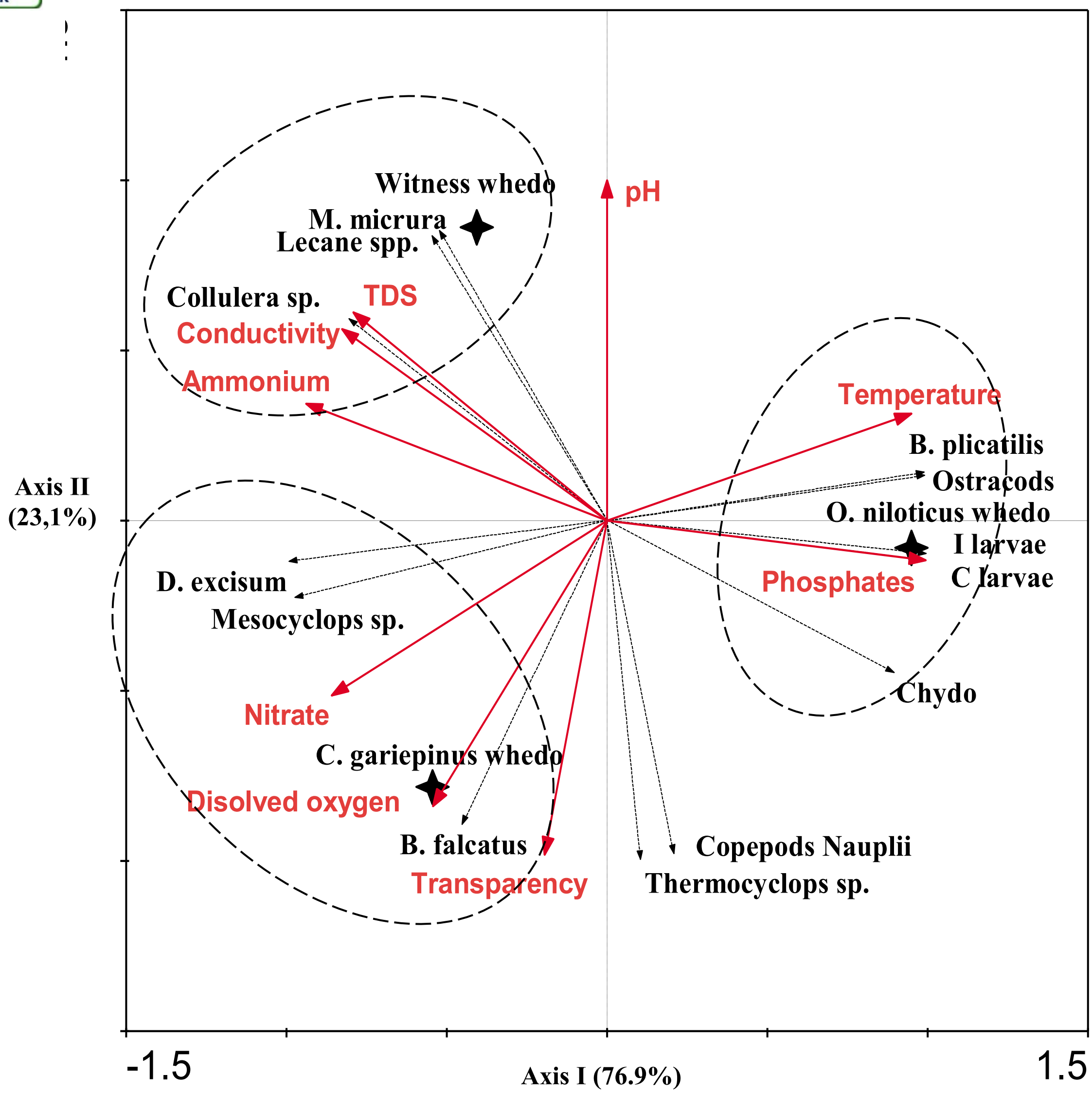


Fig. 4. Triple projection graph (triplot) of RDA showing the two first axis of zooplankton taxa ordination, environmental variable (red arrow) and experimental studied and witness *Whedos*. (D. excisum : *Diaphanosoma excisum,* M. micrura : *Moina micrura*, O. niloticus: Oreochromis niloticus, B. plicatilis : *Brachionus plicatilis*, B. falcatus : *Brachionus falcatus*, I larvae: insect larvae, C larvae : Larvae of Chironomidae).

IV. Discussion

During this study, a total of 28 taxa of phytoplankton were recorded belonging to four phylums and 17 families, with Bacillariophyta and Chlorophyta as embranchments the most diversified (respectively 15 and 11 taxa). Euglenophyta and Cyanoprocaryota were less represented with one taxon each. Phytoplankton taxa diversity in present study is relatively lower in comparison to the taxonomic richness obtained by [18] in the lake Azili (smol lake of the pond of River Oueme, Benin) (51 species), [19] in Three tropical lakes (Ejagham lake, Obubra Lake and Ikot Okpora Lake) (46 taxa) located along the floodplain of Cross River (Nigeria), [20] in Ndop wetland plain (Cameroon) (53 species), [21] in a Nangal wetland (Punjab, India) (49 genera), [6] in an open pond in town deep (Rajasthan, India) (36 taxa). Lowest diversity registered in the present study may be link to diver's factors as hydro systems area, sampling effort.

In the present study, result showed that phytoplankton community composition is belonging to four phylums, with qualitative dominance of Bacillariophytae (15 taxa, 53.57% of total diversity). Similar result on phytoplankton composition, with Bacillariophyta dominance was also reported by [18] in the lake Azili (lake of the pond of River Ouémé, Benin). On the other hand our result contrasts with those returned by several authors in tropical zone, marked by Chlorophyta qualitative dominance in lakes, ponds, wetlands: e.g. ([6], [19], [20], [21], and [22]). According to [23] reported by 20, the successful development and maintenance of a population of phytoplankton organisms depends upon harmonious ecological balance between environmental conditions and tolerance of the organisms to variations in one or more of these conditions. So, bacillariophyta abundance is a characteristic feature of a eutrophic environment [17] while acidic and alkaline conditions favor Chlorophyta (green algae), and Cyanoprocaryota [24].

For example, according to [18] *Microcystis aeruginosa*, *Chlorococcus disperses*, *Nitzschia seriata* and *Chlorella* sp. were indicated as eutrophic environment species while *Oscillatoria* sp. indicates the presence of high concentrations of organic matter and low oxygen content [6]. On the other hand, according to [25] selective feeding on the algae by zooplankton and fish fingerlings could also have an impact on phytoplankton community composition by suppression some algal taxa and favouring growth of another. Besides, the presence of species of genera such as, *Microcystis*, *Phacus*, *Oscillatoria*, *Surirella*, *Closterium*, *Aphanocapsa*, *Anabeana* and *Euglena* in a hydrosystem shows that it is likely polluted [6].

According to the same author, the presence of *Oscillatoria* is linked to the high concentrations of organic matter and low oxygen content. In this study, Bacillariophyta qualitative dominance and presence of taxa as Nitzschia, *Gomphonema*, *Navicula*, *Pinnularia*, *Clusterium* and *Oscillatoria*, considered as Bio-indicators of polluted environmental ([18], [6]) shows that studied *whedos* constitute agro-ecosystem perturbed and rich in organic elements. This status of environment perturbed and polluted would explain the weak values of dissolved oxygen recorded during this study (Mean: 3.75-4.02 mg/l). This may due to the fact that *whedos* are ecosystem with important vegetation cover (24 species) with *Pistia stratiotes*, *Ipomea aquatica*, *Phyllanthus niruri* and *Salvinia* sp. always observed in the *whedos* (26). Surrounding vegetation favors low transparency of water and weak photosynthetic activity, with weak oxygen production. Beside decomposition and mineralization of these aquatics plants contributes to reduce dissolved oxygen concentration in *whedos* waters.

Regarding zooplankton community, a total of 29 taxa were identified in the studied *whedos* during this study, with richness in *whedo* of compensatory overeating essay on *Oreochromis niloticus* and *Clarias gariepinus* higher (17-22 taxa) than in witness *whedo* (13 taxa). The analysis of zooplankton population composition in the *whedos* shows that, in qualitative level, Rotifera constitutes the most diversified group (16 taxa belonging to eight families and 10 genuses). Besides, the Brachiomidae represents the most diversified family, with nine species and three genuses while the *Brachionus* presents the most representative diversity (six species), followed by *Keratella* (two taxa). Zooplankton composition in *whedos* presents the same tendency as the one observed in the lake Azili in Benin by [18] (Brachionidae dominance: eight species and three genuses, with *Brachionus* as genus the most diversified (five taxa)). The results of this study marked by quality the dominance of Rotifera, Brachionidae, *Brachionus* and *Keratella* are similar to those commonly reported in ponds, wetlands, inland valleys and fresh water reserves in tropical zone, as in the three inland valleys studied in Cote d'Ivoire [27], in the a ponds of Bihar (India) [28], in the Railway pond of Sasaram (Bihar, India) [29], in Isinla Fish Farm (Ado-Ekiti, Nigeria) [30], in the Bhoj wetland in Bhopal (India) [31], in the five research fish ponds in northwest Amhara region, Ethiopia [32]. On the other hand, this result contrasts with those reported by previous studies in ponds and reservoirs in tropical region, marked by copepod richness dominance ([33], [34], [35]). Many assumptions can explain the qualitative preeminence of Rotifera, Brachionidae and *Brachionus* in these *whedos*.

One of the assumptions could be that the *whedos* become eutrophic with the supply of « *skretting* ». This could explain the low oxygen concentration recorded during the study (< 5 mg/L). Besides, it is broadly admitted that of Brachionidae family and the genus *Brachionus* taxa are majorly and regularly met in eutrophics tropical waters [8]. Moreover, some species of the Brachionidae family show a great tolerance to eutrophication that they are associated hyper-eutrophics waters and are considered like good bio-indicators of eutrophication. According to [36], the Rotifera dominance in freshwater aquatic ecosystems could be assigned to the fact that it is opportunist organisms that ingest bacteria and organic detritus dominating in eutrophics areas aquatic ecosystem. Besides, their dominance in the lakes and in fresh water reserves can be assigned to the fact that those zooplanktonic organisms are opportunist, with a short life cycle and have a great tolerance to various environmental conditions ([37], [38]).

Quantitative analysis of zooplankton community showed highest proliferation of *Mesocyclops* sp. (10 ind.L^{-1}) in the *whedos* of compensatory overeating essay on *Clarias gariepinus* and highest development of *Brachionus plicatilis* (4 ind.L^{-1}) and Insects larvae (≈ 8 ind.L^{-1}) recorded in *whedo* of compensatory overeating essay on *Oreochromis niloticus*. Insect's larvae and other forms of fish food organism abundance growth in fish farm fertilized by organic and inorganic matters were also reported by [39]. According to [40] reported by [2] ponds fertilization by organic matter increases the growth of smaller sized zooplankton as Rotifera while inorganic fertilizer favors growth of bigger sized zooplankton as Copepoda.

V. Conclusion

The present study show for the first time the impact of fish farm fertilization (treatments with an imported aliment "*Skretting*") on plankton composition and population structure in the *whedos*. The experiences of compensatory overeating essay on *Oreochromis niloticus* and *Clarias gariepinus* reveal that treatment of ponds by the *Skretting* promotes plankton diversity and abundance, with highest diversity of Bacillariophyta, Chlorophyta (phytoplankton) and Rotifera (zooplankton).

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