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# Zooplankton Composition and Distribution in Relationship with Environmental Parameters in a Tropical Coastal Lagoon (Ebrié lagoon: Aghien, Côte d'Ivoire)

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## Abstract

*The zooplankton community of Aghien lagoon was studied between October 2014 and April 2015. This study mostly focused on the spatial and temporal distribution, composition and abundance of zooplankton in this lagoon. Fifty-nine zooplankton taxa including 33 Rotifera, 12 Cladocera, 11 Copepoda and 3 others zooplankton taxa were inventoried in Aghien lagoon during this study. Zooplankton community obtained during this study includes 21 families and 33 genuses, in addition to unidentified harpacticoids, copepods nauplii, euphausiacea, chironomid and gasteropods larvae. Aghien lagoon zooplankton community was characterized by Rotifera dominance (Mean: 50.64 % of the total zooplankton abundance), followed by Copepoda (Mean: 43.68 %). Zooplankton community in Aghien lagoon was mainly dominated by taxa of genus Lecane (Mean abundance: 8.22 ind.l$^{-1}$; 15.63 % of zooplankton total abundance) and Mesocyclops (7.98 ind.l$^{-1}$; 15.17 %). Community composition and abundance showed seasonal and spatial variation. Zooplankton richness was significantly (ANOVA, $p < 0.05$) higher more important during the dry season (36-48 taxa) than during the rainy season (26-30 taxa). Total abundance of zooplankton in Aghien lagoon during the dry season (46.26-78.4 ind.l$^{-1}$) was higher than the one of the rainy season (13.51-80.87 ind.l$^{-1}$). Multivariate analyses (RDA) revealed that zooplankton community composition and abundance variations were mainly controlled by Aghien lagoon environmental parameters especially water conductivity, turbidity, pH, temperature and nutrients.*

**Keywords**: Zooplankton, Distribution, density variation, Environmental parameters, Aghien lagoon.

## Introduction

Coastal lagoons are considered as biodiversity "hot spots" and are among the most productive ecosystems in the world. Unfortunately, they are vulnerable and undergo degradation under anthropogenic pressures, with numerous consequences on the riverine populations[1]. Acording to Pastoma[2], raported by Etilé *et al.* [3] Coastal lagoons are currently considered as one of the environments most affected by anthropogenic activities such as domestic, industrial, and agricultural waste dumping; fish, crab, and shrimp catching and farming. It is therefore necessary to protect and rationally manage these valuable coastal ecosystems.

Zooplankton have an important roles in food webs and in biogeochemical cycles in aquatic ecosystem. They are important consumers of nano-and micro-particles and may have important effects on phytoplankton, primary production[4], and protozooplankton[5].

In Côte d'Ivoire, coastal lagoons include Grand-Lahou, Ebrie´, and Aby lagoons. Recent studies of coastal lagoons zooplankton taxonomic composition have been conducted in Aby[3] and Grand-Lahou[3, 6, 7] lagoons. In Ebrié lagoon, recent studies on the lagoonal zooplankton was from following authors[8-13]. In 1987, a pattern of spatio-temporal variations of zooplanktonic communities in Ebrié lagoon was proposed by Arfi and Saint-Jean[8]. The others recent researches on Ebrié zooplankton were primarily focused on biology and ecology of zooplanktonic organisms as *Rhopalophthalmus africana*, *Acartia clausi* and *Pseudodiaptomus hessei*. The only real inventory study of Ebrié lagoon zooplankton was from Rahm [14]. Thus, surveys on the Ebrié zooplanktonic composotion are rare. This study aim was to establish for the first time an inventory of zooplankton community composition and variation in relationship with Aghien lagoon environmental parameters.

## Materials and Methods

The Aghien lagoon is situated in the north-east of the Ebrié lagoon the latitudes 5°22'N and 5°26'N and the longitudes 3°49'W and 3°55'W (Figure-1). It has a surface of 21 Km$^2$, with a maximum depth of 20 m[15]. It communicates directly with the Potou lagoon by a natural channel, and receives water inputs of

the Bété, Djibi and Mé River during them floods. The Bété and the Djibi rivers lead to directly in the Aghien lagoon and whereas the Mé river lead to in the natural channel between the Aghien and Potou lagoons[16].

The Aghien lagoon is located in a tropical area with a climate marked by 2 rainy seasons (April-July and October-November) and by 2 dry seasons (December-March and August-September). In this lagoon, water is all year round almost exclusively of continental origin[16,17].

Environmental parameters (water temperature, turbidity, dissolved oxygen concentration, electrical conductivity, and pH) were measured in surface and botton, with a portable multi-parameter probe (HANNA HI 9829). Nitrients (phosphate, nitrite, nitrate and ammonia) were analyzed from water collected with a Niskin-bottle (near the botton) and directly in the fifty first centimeters. Water sample was preserved at 4°C and analyzed with a Spectrophotometer (model Shimadzu, UV visible), according to the protocols described by Strickland and Parson[18]. Suspended solids were determined according to the protocol described by Aminot and Chaussepied[19]. Biochemical oxygen demand was measured using methods according to standard methods for water analysis[20].

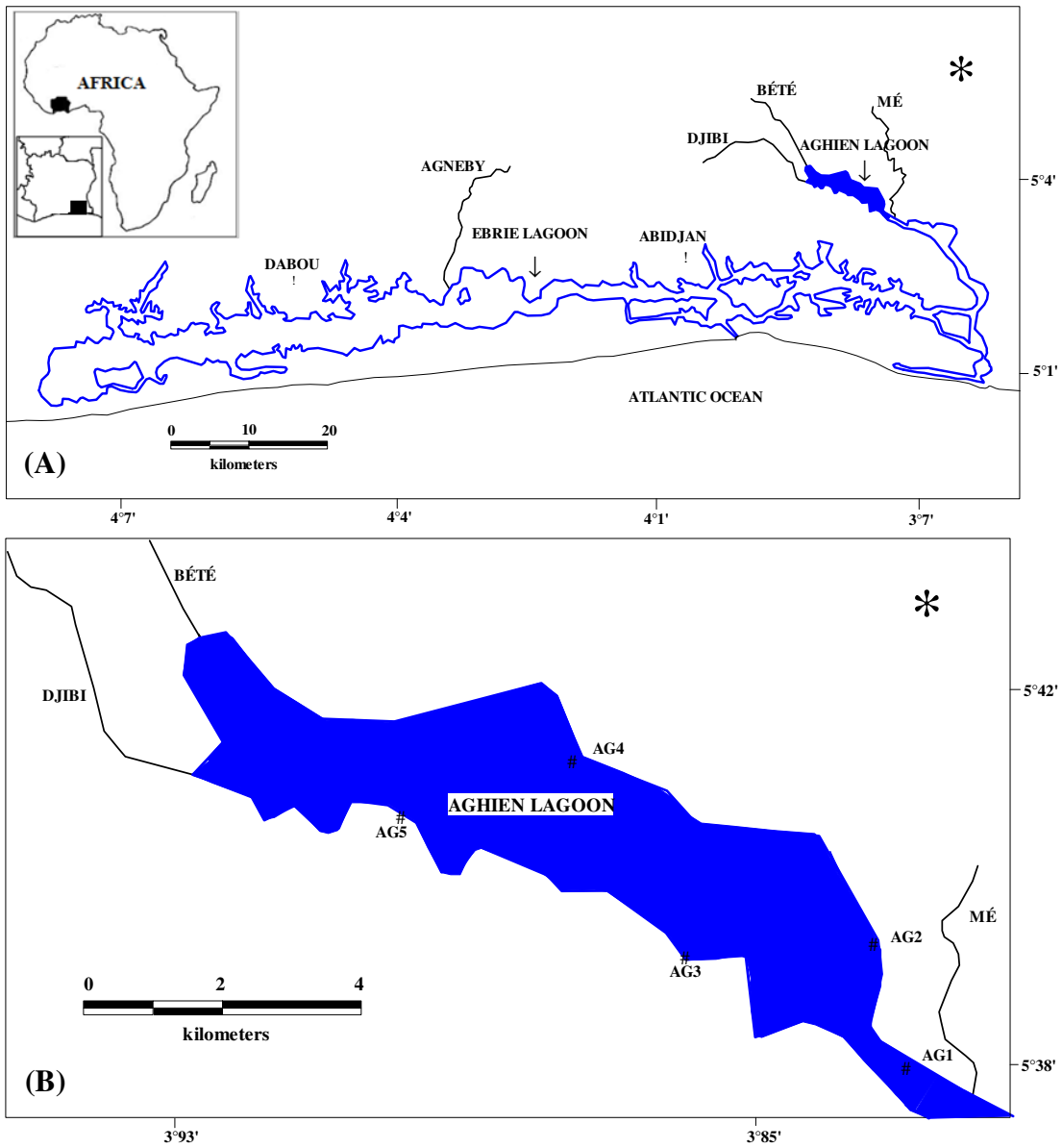


**Figure-1**
**Ebrié lagoon map and Aghien lagoon localization (A) and the sampling stations in Aghien lagoon ( )(B)**

The zooplankton organisms were collected monthly from October to December 2014, and from January to May 2015 at 5 stations in Aghien lagoon, with a cylindro-conical net (64 µm in mesh opening size). Samples were taken during the night (18:30-21:00) minimize effects of diel vertical migrations[21]. Samples were immediately preserved in a buffered solution (lagoon water and formaldehyde at a final concentration of 5 %). Zooplankton was identified according to following authors[22-25].

Environmental influences on zooplankton distribution were studed with a Re Dundancy Analysis (RDA). For this analysis, only taxa whose abundance was ≥ 0.5 % of the total numbers were taken into account. Species richness and ecological diversity indices (Shannon and Equitability) were used to determine structure and ecological dynamics of zooplankton community.

ANOVA were used to test the effects of time (seasons) and series (or stations) on the zooplankton density, species richness and ecological diversity indices. Data have been transformed in $\log_{10}$ (x + 1) prior to analysis to increase normality. For this analysis, Statistica 7.1 computer was used.

## Results and Discussion

**Environmental parameters:** Spatial variations of environmental parameters in Aghien lagoon during the dry (December to April) and rainy (October-November and May) seasons were showed in Figure-2. Aghien lagoon water temperature varied between 25.78-30°C according to sampling site and seasons. In all sampling site, water temperature in the rainy season (28.85-30 °C) were no statistically higher ($p > 0.05$) than in the dry season (25.78-29.38°C) (Figure-2A). The same tendency obtained with turbidity (Figure 2B), dissolved oxygen (Figure 2C), suspended solids (Figure-2D). However significant differences between seasons found for turbidity and suspended solids (ANOVA, $p < 0.01$).

Conductivity shows seasonal variation with dry season values significantly higher (72.38-75.08 $\mu S.cm^{-1}$) than rainy season values (65-69.30 $\mu S.cm^{-1}$) ($p < 0.01$) (Figure-2E). Environmental parameters pH, nitrite, nitrate, ammonium, bio-chemical oxygen demand showed no seasonal pattern (Figure 2E-K). Nevertheless, seasonal differences occurred mostly at sampling site AG5 (near the Djibi and Bété rivers outlet) for the pH, at sampling sites AG3-AG5 for nitrite and ammonium, and at stations AG1 (near the outlet of the Mé river), AG4-AG5 for the nitrate, with slightly higher values during the rainy season.

**Taxonomic composition, and seasonal and spatial pattern:** Fifty-nine zooplankton taxa including 33 Rotifera, 12 Cladocerans, 11 Copepoda and 3 others zooplankton organism were inventoried in Aghien lagoon (Table-1). Zooplankton community obtained during this study includes 21 families and 33 genuses, In addition to harpacticoids, copepods nauplii, euphausiacea, chironomid and gasteropods larvae whose genus have not been determined.

So, Rotifera dominate qualitatively the zooplankton community in the Aghien lagoon (46 % of total diversity) with 13 families and 18 genuses. Brachionidae family presented the highest diversity (14 species and 4 genuses), followed by Filinidae with one genus and 4 species (*Filinia longiseta*, *F. opoliensis*, *F. terminalis* ans *F. pejleri*) and by Asplanchnidae, Lecanidae, Testudinellidae with two taxa each.

The others families are represented by one taxon each. *Brachionus* genus was most diversified with 7 taxa, followed by *Keratella* (5 taxa) and by *Filinia* (4 taxa). Rotifera was followed par Cladocerans (20.34 % of total diversity) belonging to 5 families, 10 genuses and 12 taxa. Chydoridae presented highest diversity (4 taxa), followed by Daphnidae (3 taxa), Bosminidae and moinidae (2 taxa each). The genus Ceriodaphnia presented more diversity with 3 species (*Ceriodaphnia cornuta*, *C. affinis*, *C. dubia*). Copepods were represented by 2 famillies (Cyclopidae and Diaptomidae), 6 genus, 9 taxa plus unidentified copepod nauplii and harpacticoid. Cyclopidae was the most diversified family of copepod group (8 taxa and 4 genuses). Among these 59 taxa obtained during this study, 12 were very frequent (occurrence ≥ 50 %): *Mesocyclops ogunus* (100 %), *M. leukarti* (74.29 %), copepods nauplii (74.14 %), *Moina micrura*, *Lecane luna* (62.86 %), *Collullera* sp. (60 %), *Trichocerca similis* (57.14 %), *hexarthra intermedia* (57.14%), *Asplanchna* sp., *Brachionus falcatus*, *Keratella tropica* and *Ceridaphnia cornuta* (51.14% each). Besides, 33 taxa (56% of total diversity) were observed in all sampling sites whereas 6 taxa (*Halycyclops* sp., *Tropocyclops confinis*, *Tropodiaptomus* sp., *Ceriodaphnia cornuta*, *Platyas quadricornis*, *Filinia terminalis*, chironomid larvae) were obtained in the south part of the lagoon, near of the Mé river outlet (sampling sites AG1 and AG2).

Aghien lagoon zooplankton community species diversity varied according stations and seasons. Seasonal variation of zooplankton richness was marked by significantly difference dry season (36-48 taxa) and rainy season (26-30 taxa) values (Figure-3). During the dry season (December to April), highest species richness (41-48 taxa) were recorded in the south part of the lagoon (sampling sites AG1-AG3), versus 36-37 taxa in the north part (AG4 and AG5), with statistical significant difference ($p < 0.05$). During the rainy season, species richness varied between 26 (sampling site AG2) and 30 taxa (sampling site AG3), with no significant difference ($p > 0.05$). Shannon diversity index seasonal variation was also characterized by dry season values (2.71-2.83 $bit.ind^{-1}$) higher than during the rainy season (2.05-2.51 $bit.ind^{-1}$), but with however no significant difference ($p > 0.05$).

Equitability index showed no seasonal variation in Aghien lagoon. It varied between 0.70 and 0.76 during the dry season and between 0.62 and 0.77 during the rainy season.

**Table-1**
**Zooplankton list, symbols (for the multivariate analysis), distribution and occurrence of the different taxa inventoried in the Aghien lagoon from October 2014 to May 2015 (+ : taxa presence)**

| Groups | Families | Taxa | Symbols | Stations | | | | | Occurrence (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | AG1 | AG2 | AG3 | AG4 | AG5 | |
| **Copepods** | Cyclopidae | *Apocyclops panameensis* | Apana | + | + | + | + | + | 17,14 |
| | | *Halycyclops* sp. | Haly | + | + | | | + | 11,43 |
| | | *Mesocyclops dusarti* | Mdusa | + | + | + | + | + | 22,86 |
| | | *Mesocyclops Leukarti* | Mleuk | + | + | + | + | + | 74,29 |
| | | *Mesocyclops ogunus* | Mogun | + | + | + | + | + | 100 |
| | | *Thermocyclops decipiens* | Tdeci | + | + | + | + | + | 31,43 |
| | | *Thermocyclops neglectus* | Tnegl | + | + | + | | | 14,29 |
| | | *Tropocyclops confinis* | Tconf | | + | | | | 2,86 |
| | Diaptomidae | *Tropodiaptomus* sp. | Trop | + | | | | | 2,86 |
| | unidentified | Harpacthicoids | Harp | + | + | + | + | | 14,29 |
| | | Nauplii | Ncop | + | + | + | + | + | 77,14 |
| **Cladoceran** | Chydoridae | *Allomella* sp. | Allon | | | + | | | 2,86 |
| | | *Alona* sp. | Alona | + | + | + | + | | 17,14 |
| | | *Chydorus* spp. | Chydo | | + | + | + | | 14,29 |
| | | *Camptocercus* sp. | Camp | + | | + | + | + | 11,43 |
| | Bosminidae | *Bosmina longirostris* | Blong | + | + | + | + | + | 34,29 |
| | | *Bosminopsis dietersy* | Bdiet | + | + | + | + | + | 34,29 |
| | Daphnidae | *Ceriodaphnia cornuta* | Caffi | + | + | + | + | + | 51,43 |
| | | *Ceriodaphnia affinis* | Ccorn | + | + | + | + | | 37,14 |
| | | *Ceriodaphnia dubia* | Cdubi | + | + | | | | 34,29 |
| | Sididae | *Diaphanosoma excisum* | Dexci | + | + | + | + | + | 34,29 |
| | Moinidae | *Moinodaphnia macleayi* | Mmac | + | + | + | + | + | 14,29 |
| | | *Moina micrura* | Micru | + | + | + | + | + | 60 |
| **Rotifera** | Aplanchnidae | *Asplanchna* sp. | Asplna | + | + | + | + | + | 51,43 |
| | | *Asplanchnopus* sp. | Asplpus | + | + | + | + | + | 28,57 |
| | Brachionidae | *Brachionus angularis* | Bang | + | + | + | + | | 20 |
| | | *Brachionus brevispinus* | Bbrev | + | + | + | + | + | 20 |
| | | *Brachionus calyciflorus* | Bcaly | + | + | + | + | + | 45,71 |
| | | *Brachionus caudatus* | Bcaud | + | + | + | + | + | 40 |
| | | *Brachionus dichotomus* | Bdich | | + | + | + | + | 14,29 |
| | | *Brachionus falcatus* | Bfalc | + | + | + | + | + | 51,43 |
| | | *Brachionus plicatilis* | Bplic | + | | + | + | + | 20 |
| | | *Keratella cochlealis* | Kcoch | + | + | | + | + | 14,29 |
| | | *Keratella lenzi* | Klenz | + | + | + | + | + | 20 |
| | | *keratella quadrata* | Kquad | | + | + | + | + | 17,14 |
| | | *Keratella* sp. | Kera | + | + | + | + | + | 22,86 |
| | | *Keratella tropica* | Ktrop | + | + | + | + | + | 51,43 |
| | | *Plationus patilus* | Ppati | + | + | + | | | 14,29 |
| | | *Platyas quadricornis* | Pquad | | + | | | | 2,86 |

| Groups | Families | Taxa | Symbols | Stations | | | | | Occurrence (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | AG1 | AG2 | AG3 | AG4 | AG5 | |
| Rotifera | Chonochiloïdae | *Chonochilus* sp. | Chono | | + | + | + | + | 11,43 |
| | Collurelidae | *Collullera* sp. | Collu | + | + | + | + | + | 60 |
| | Epiphanidae | *Epiphane clavulata* | Eclav | | | + | + | + | 11,43 |
| | Filinidae | *Filinia longiseta* | Flong | + | + | + | + | + | 45,71 |
| | | *Filinia opoliensis* | Fopol | + | + | + | + | + | 42,86 |
| | | *Filinia terminalis* | Fterm | + | + | | | + | 14,29 |
| | | *Filinia pejleri* | Fpejl | + | + | + | + | + | 14,29 |
| | Hexarthridae | *Hexarthra intermedia* | Hinte | + | + | + | + | + | 57,14 |
| | Lecanidae | *Lecane bulla* | Lbull | + | + | + | + | + | 71,43 |
| | | *Lecane luna* | Lluna | + | + | + | + | + | 62,86 |
| | Monommatidae | *Monommata* sp. | Mono | + | + | + | | + | 17,14 |
| | Testudinellidae | *Pompholyx* sp. | Pomp | + | + | + | + | | 8,57 |
| | | *Testudinella* sp. | Testu | | | + | + | + | 14,29 |
| | Synchaetidae | *Polyarthra vulgaris* | Pvulg | + | | + | | | 8,57 |
| | Philodinidae | *Rotaria* sp. | Rota | + | + | + | + | + | 20 |
| | Trichocercidae | *Trichocerca chatoni* | Tchat | + | + | + | + | + | 65,71 |
| | | *Trichocerca similis* | Tsimi | + | + | + | + | + | 57,14 |
| Others | Chironomidae | Chironomidae Larvae | Clarv | + | | | | | 2,86 |
| | Unidentified | Gasteropods Larvae | Glarv | | + | | + | | 5,71 |
| | | Euphausiacea | Euph | + | + | + | + | + | 22,86 |
| 4 | 21 | 59 | | 49 | 51 | 49 | 47 | 43 | - |

**Zooplankton community structure and spatio-temporal variation of abundance:** Aghien lagoon zooplankton community, with a mean abundance of 47.63 individuals per liter (ind.l$^{-1}$), was characterized by Rotifera dominance (Mean: 50.64 % of the total zooplankton abundance), followed by Copepoda (Mean: 43.68 %). Cladocerans were relatively rare in Aghien lagoon (Mean: 5.47 %). Zooplankton composition and abundance varied, in Aghien lagoon, according to season and season. Total abundance of zooplankton in Aghien lagoon during the dry season (46.26-78.4 ind.l$^{-1}$) was higher than the one of the rainy season (13.51-80.87 ind.l$^{-1}$) (Figure 4A). During the dry season, zooplankton was mostly dominated by Rotifera (mean: 50.37 %) and Copepoda (mean: 39.88 %) (Figure 4B). Spatial pattern of zooplankton abundance was characterized by progressively increase as one moves away the central part of the lagoon (46.26 ind.l$^{-1}$), to reach the most elevated values in the level of the outlet of the Mé (76.19 ind.l$^{-1}$), Bété and Djibi (78.40 ind.l$^{-1}$) rivers. During the rainy season, zooplankton was principally dominated by Copepoda (mean: 53.35 %) and Rotifera (mean: 44.68 %). During this season, zooplankton abundance of Aghien lagoon was higher in the north part (AG4 and AG5) (35-81 ind.l$^{-1}$) than in the central and south part (AG1 to AG3) (13.51-15.61 ind.l$^{-1}$).

During le dry season, 3 taxa accounted for 47.45 % of rotifers total abundance (36.07 ind.l$^{-1}$): *Lecane luna* (24.42 %), *Monommata* sp. (12.40 %) et *Lecane bulla* (10.64 %). The others taxa (32) constituted 52 % of rotifers total abundance. *Lecane lune* and *Monommata* sp. presented highest abundance in the south part of la lagoon (Sampling site AG1 and AG2) (respectively 10.50-14.51 ind.l$^{-1}$ and 7.28-13.50 ind.l$^{-1}$) whereas *Lecane bulla* presented le most important abundance in the north part (AG4 and AG5) (3.46-6.90 ind.l$^{-1}$). The most abundant copepods taxa were nauplii of undetermined copepods (46.66 %), *Mesocyclops ogunus* (29.92 %), *Mesocyclops leukarti* (7.02 %) and *Thermocyclops decipiens* (5.28 %). These taxa were observed in all sampling site and showed no clear spatial pattern, with abundance no significantly different according stations (> 0.05) accepted nauplii of undetermined copepods. This taxa presented highest abundance in stations AG2, AG4 and AG5 (13.55-19.40 ind.l$^{-1}$) versus 6-7 ind.l$^{-1}$ stations AG1 and AG3.

The most abundant species contributing to Cladocerans abundance (Mean: 4.80 ind.l$^{-1}$) were *Moinodaphnia macleayi* (24.70 %), *Moina micrura* (18.98 %), *Ceriodaphnia cornuta* (18.96 %) and *Bosminopsis dietersy* (14.01 %).

Zooplankton community in Aghien lagoon was mainly dominated by taxa of genus *Lecane* (Mean abundance: 8.22 ind.l$^{-1}$; 15.63 % of zooplankton abundance) and *Mesocyclops* (7.98 ind.l$^{-1}$; 15.17 % of zooplankton abundance).

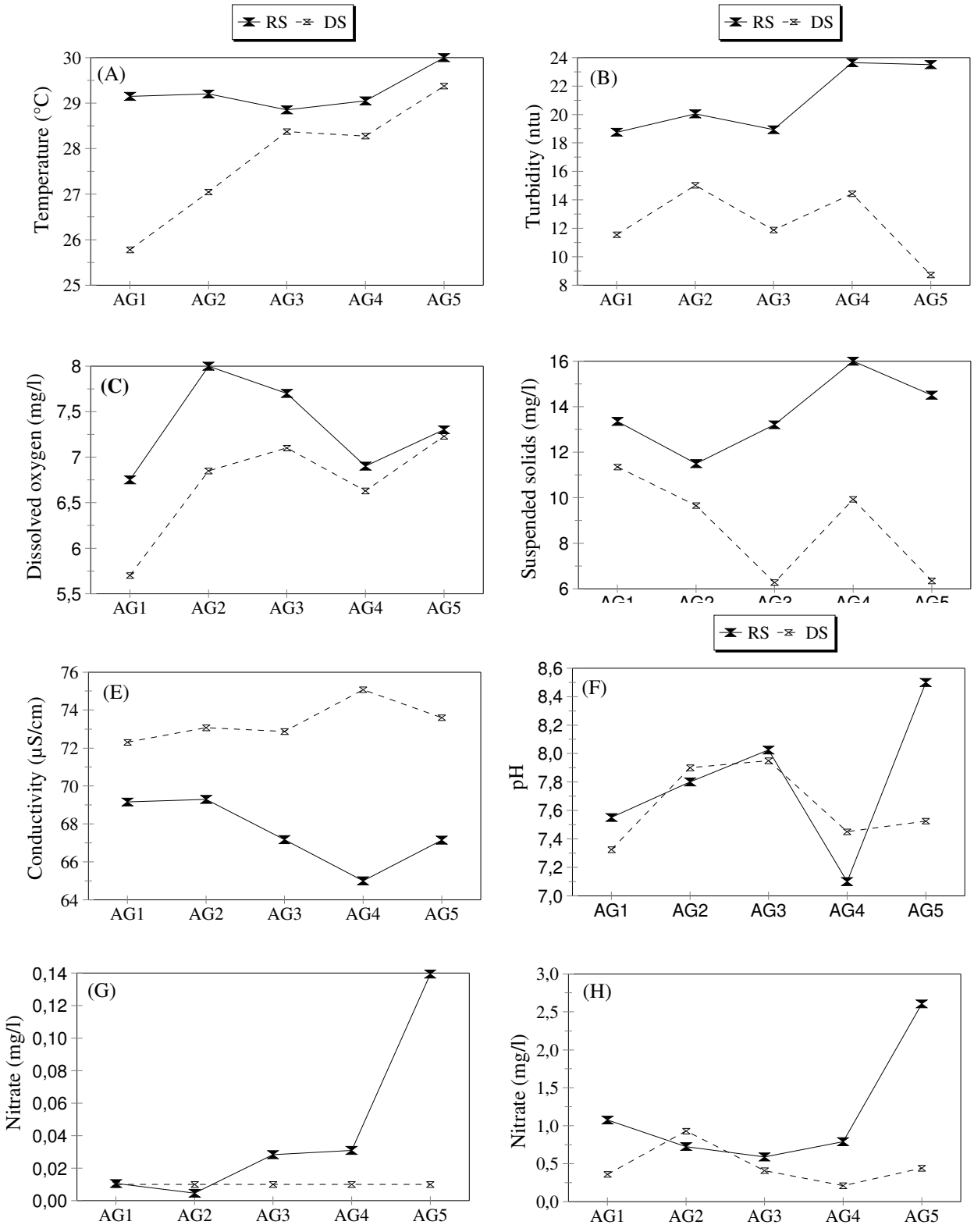


**Figure-2A**
**Space variations of environmental parameters measures in the Aghien lagoon from October 2014 to May 2015 (DS: Dry Season ; Rainy Season: RS)**

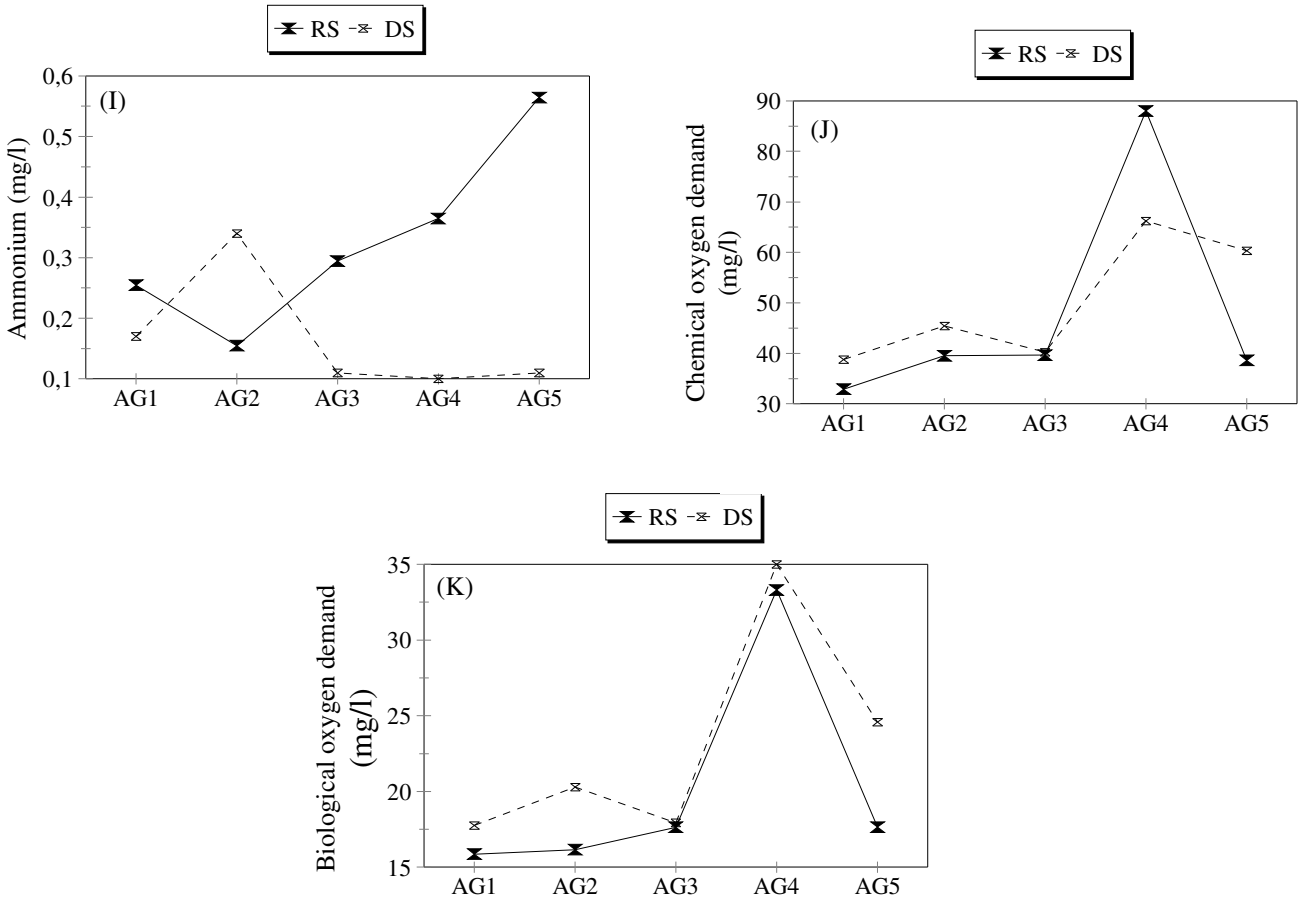


**Figure-2**
**Space variations of environmental parameters measures in the Aghien lagoon from October 2014 to May 2015 (DS: Dry Season ; Rainy Season: RS)**

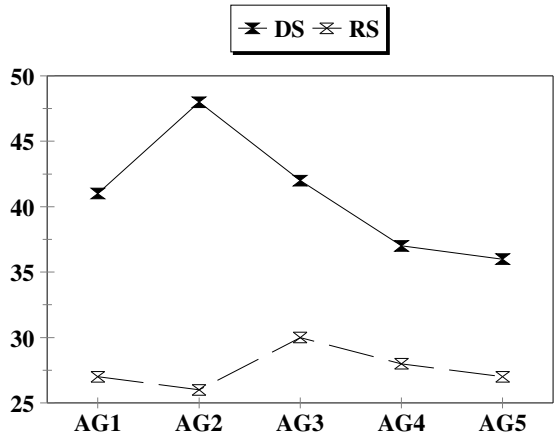


**Figure-3**
**Space variations of the zooplankton taxonomic richness inventoried in the Aghien lagoon the dry season (DS) and Rainy Season (RS)**

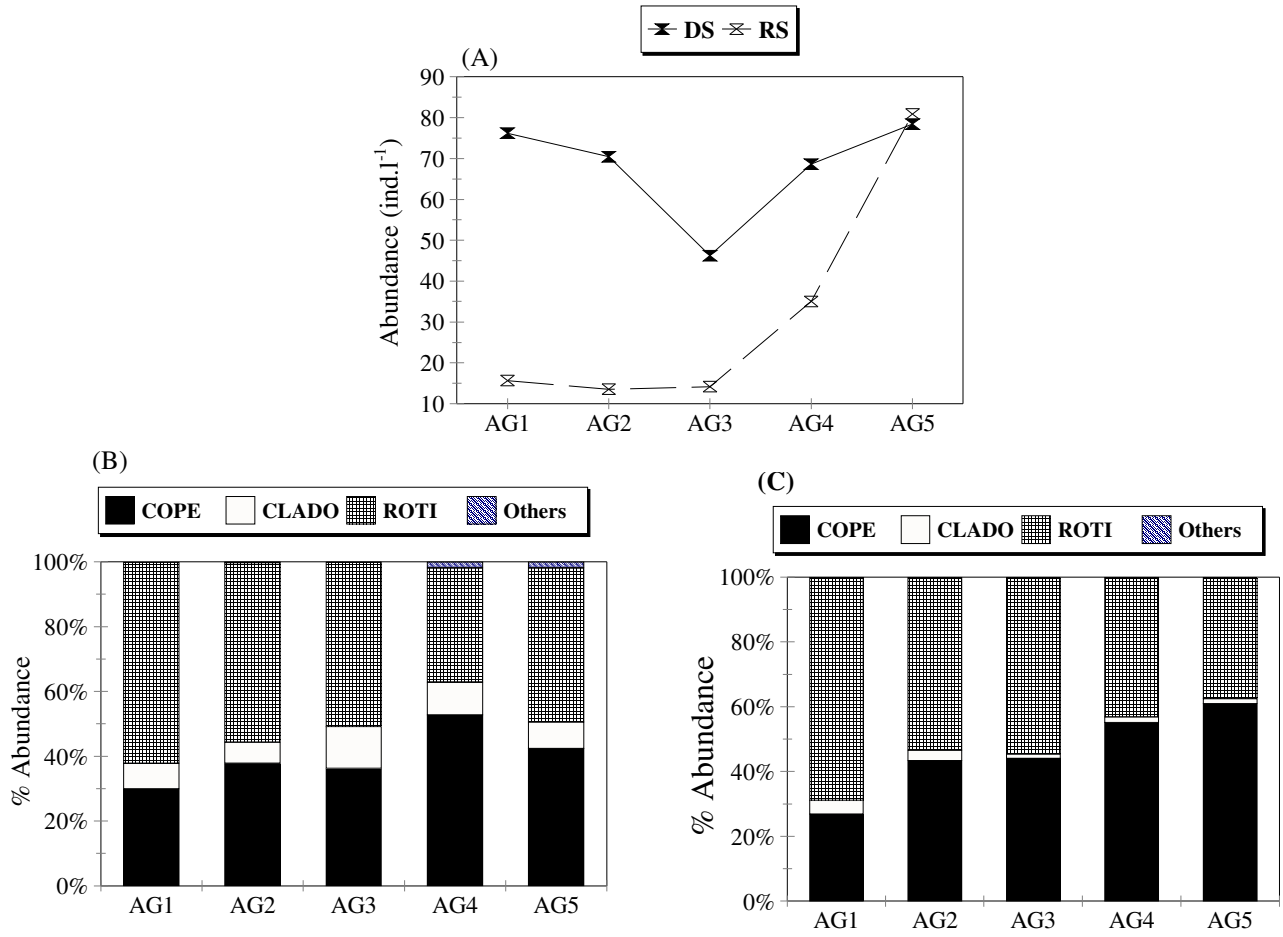


**Figure-4**
**Space variations of the total zooplankton abundance (A) and of relative abundance of the mean zooplankton groups obtained during the dry (B) and the rainy (C) seasons in the Aghien lagoon (DS: Dry Season, RS: Rainy Season, COPE: Copepoda, CLADO: Cladoceran, ROTI: Rotifera, Others: others zooplankton).**

**Relationships zooplankton taxa and environmental parameters:** The plots of the Multivariate analysis (RDA) on zooplankton and environment data collected during the dry season in Aghien are shown in Figure-5A. Three area were distinguished in Aghien lagoon: zone I (south part: AG1 and AG2, near from the channel where lead to Mé river), zone II (central part of the lagoon: AG3) and zone III (north part: AG4 and AG5, near from the outlet of the Djibi and Bété rivers). Zooplankton taxa observed in the south part of Aghien lagoon (copepods *Thermocyclops neglectus*, harpacticoids undetermined, the rotifers *Lecane luna*, *Brachionus brevispinis*, *Monommata* sp., *Platyonus patilus*, *Collulera* sp., *Asplanchna* sp., and the Cladocera *Ceriodaphnia affinis*) were mainly affected by nutrients (phosphate, nitrate and ammonia) and to suspended solids. In the central part (AG3), abundance of main zooplankton taxa (*Hexarthra intermedia*, *Filinia longiseta* and *Ceriodaphnia cornuta*) was controlled by water pH. The zone north (near from the outlet of the Djibi and Bété rivers) was correlated to biological oxygen demand (DBO), chemical oxygen demand (DCO) and conductivity. Taxa associated to this part were *Brachionus falcatus*, *B. caudatus*, *B. calyciflorus*, *Filinia opoliensis*, *Keratella tropica*, *Testudinella* sp., *Lecane Bulla*, *Trichocerca chatoni*, *Mesocyclops leukarti*, *M. ogunus*, *Thermocyclops decipiens*, *Moinodaphnia macleayi*, *Bosminopsis dietersy*.

Three zones were also distinguished in Aghien lagoon during the rainy season (Figure 5B): zone I (south part: AG1, near from the channel where lead to Mé river), zone II (central part: AG3 and AG4) and zone III (north part: AG5, near from the outlet of the Djibi and Bété rivers). In the zone I taxa associated (*Keratella cochlealis*, *Lecane luna*, *Filinia longiseta* and *Moina micrura*) was correlated to conductivity. The central zone taxa *Mesocyclops ogunus*, *Thermocyclops decipiens*, *Lecane bulla*, *Asplanchna* sp. and *collurela* sp.) were correlated to biological oxygen demand (DBO) and chemical oxygen demand (DCO). As for the zone III, it was correlated to nutrients (phosphate, nitrate and ammonia), temperature and pH. It was associated to taxa as *Keratella lenzi* and *K. tropical*.

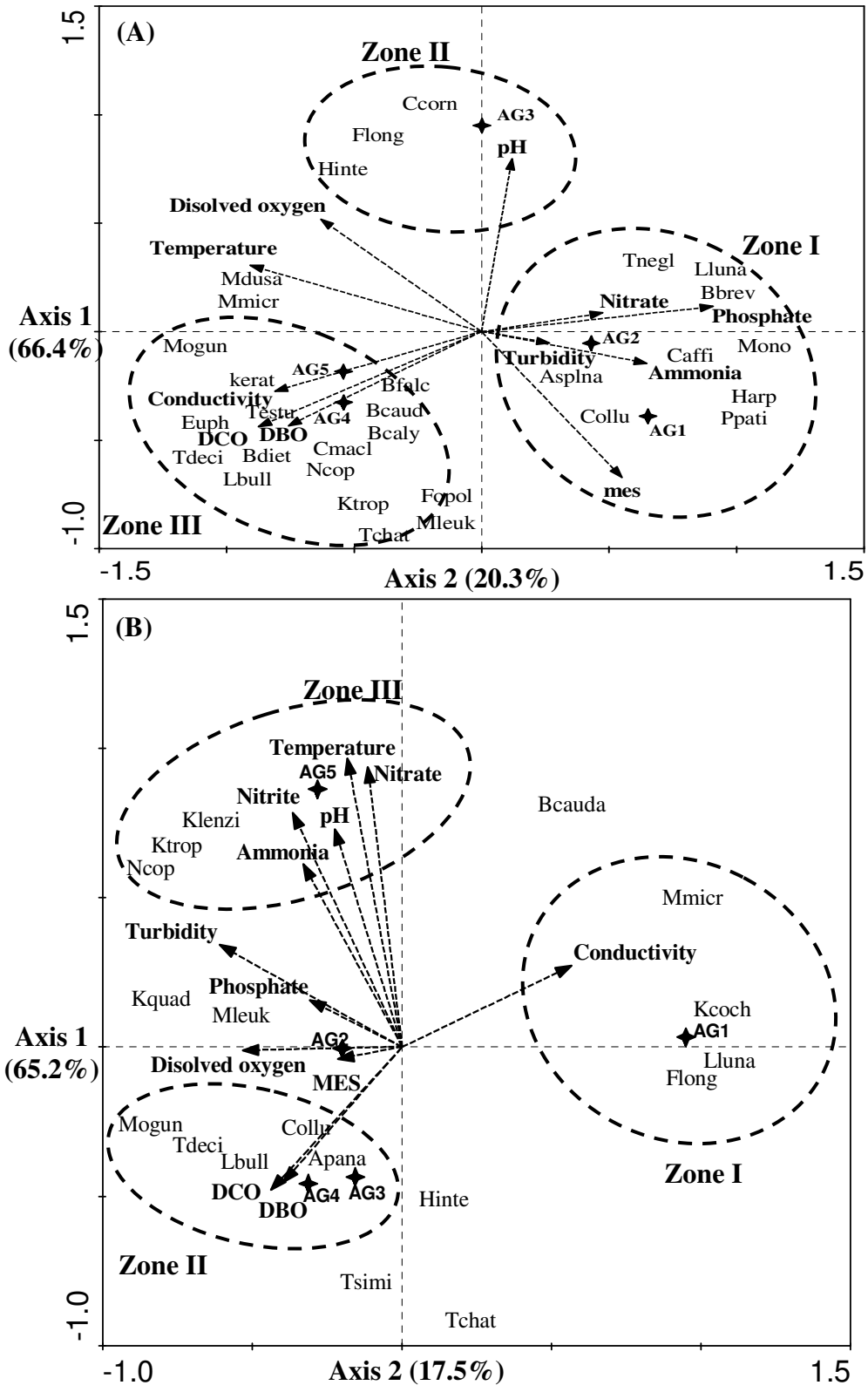


**Figure-5**
**RDA plot showing environmental parameters and zooplankton taxa relationship in the Aghien lagoon (A: Dry Season and B: Rainy Season) (Symbols: see table 1)**

**Discussion:** A total of Fifty-nine taxa were collected in Aghien lagoon during this study, belonging to Rotifera (33 taxa), Cladocerans (12 taxa), Copepoda (11 taxa) and others zooplankton (3 taxa) were identified in Aghien lagoon. Zooplankton community obtained during this study includes 21 families and 33 genuses, in addition to harpacticoids, copepods nauplii, euphausiacea, chironomid and gasteropods larvae whose genus have not been determined. Zooplankton diversity (59 taxa) in Aghien lagoon (present study) is comparable to the diversity observed in Sontecomapan lagoon (Mexcico) by Mirón *et al.* [26] (54 taxa), in Aby-tendo-Ehy lagoon (Côte d'Ivoire) by Monney *et al.* [27] (53 taxa). In contrast, zooplankton diversity in Aghien lagoons is lower than those mentioned by Etilé *et al.* [3] in Grand-Lahou lagoon (Côte d'Ivoire) (65 taxa) and higher than those mentioned by Souza *et al.* [28] in Rodrigo de Freitas Lagoon (Rio de Janeiro, Brazil) (21 taxa), by Almeida *et al.* [29] in Guaraíras lagoon (Brazil) (46 taxa).

Zooplankton community observed in Aghien lagoon, is common to the traditional ones in freshwater ecosystem of Côte d'Ivoire, with highest diversity observed among Rotifera: Buyo hydroelectric dams[30], Bia and Agneby rivers[31], Ehania, Bodoua, Boulo1 and Boulo2 rivers in the South-east[32]. Zooplankton community observed in Aghien lagoon, is also similar to the one mentioned in Aby-Tendo-Ehy lagoon by[27]. In contrast, this community is different from those of the Ebrié[9], Grand-Lahou[3], Rodrigo de Freitas Lagoon (Rio de Janeiro, Brazil)[28], Guaraíras lagoon (Brazil)[29] lagoons where zooplankton community was mainly dominated by estuarine and marine community.

Zooplankton community in Aghien lagoon is dominated qualitatively and quantitatively by Rotifera (33 taxa, 46% of total diversity; and 50.64% of the total zooplankton abundance). Similar situation, with numerical predominance of freshwater taxa in a lagoon was also reported in Aby-Tendo-Ehy lagoon (Côte d'Ivoire) [27], in Imboassica lagoon (Brazil)[33], in Massa lagoon (southern Moroco)[34]. In contrast, zooplankton composition in Aghien lagoon is different of zooplankton community recorded in Grand-Lahou and Ebrié lagoons (Côte d'Ivoire), where numerical dominance of Copepoda was mentioned: respectively 82 % according to Etilé et al. (2009)[3] and 51-99 % according region and authors[9, 36]. Furthermore, zooplankton community in the present study was numerically dominated by taxa of genus *Lecane* (Mean: 8.22 ind.l$^{-1}$; 15.63 % of zooplankton total abundance) and *Mesocyclops* (7.98 ind.l$^{-1}$; 15.17 %) while in Grand-Lahou and Ebrie lagoons, it was mainly dominated by *Acartia clausi* and *Oithonia* brevicornis[3, 9]. Freshwater zooplankton diversity and abundance predominance in Aghien lagoon could be explained by its remoteness of the Ebrié channel which connects the Atlantic Ocean and the Ebrié lagoon and by freshwater inflow from Djibi, Bété and Mé rivers in May to July and October-November. The absence of marine influence in this sector of the Ebrié lagoon and the inflow of Djibi, Bété and Mé rivers confer to Aghien lagoon a freshwater character. According to Etilé *et al.* (2009)[3], In Grand-Lahou and Ebrié lagoons, dominance of *Acartia clausi* and *Oithonia brevicornis* could be explained by the stronger marine influence in these ecosystems where area near the channels were invaded by oceanic waters under the tidal effects, which confers mesohaline character in some zones of these ecosystems lagoons and favours brackish zooplanktonic organisms development as *Acartia clausi* and *Oithonia brevicornis*.

Zooplankton in Aghien lagoon seasonal variation analysis shows that in all sampling sites maximal diversities and densities were observed during the dry season (December-April) versus minimum values during the rainy season (October-November, and May). Similar seasonal variations of zooplankton abundances were also observed the others lagoons of Côte d'Ivoire: Ebrié Lagoon[9, 35], Grand-Lahou lagoon[5], Aby-Tendo-Ehy lagoon[27]. According to Diouf and Diallo[36] reported by Etilé *et al.* (2009)[3], zooplankton abundance increasing during the dry and warm seasons can be explained by the combined influence of high temperatures (which shortens development times) and a high food condition stimulated by elevated primary production (which increases fertility and recruitment rates). One could associate to these factors, the low turbulences condition during the dry season linked to low freshwater flow in lagoon. In addition, low zooplankton density obtained during the rainy season could be linked to the flushing by river flood waters generally poor in zooplankton[37].

## Conclusion

Our study provides the first inventory of the zooplanktonic taxa in Aghien lagoon. Fifty-nine zooplankton taxa were collected in Aghien lagoon during this study. Zooplankton community was principally composed by taxa commonly found in freshwater, with qualitative (33 taxa, 46 % of total diversity, with 13 families and 18 genuses) and quantitative dominance of rotifers (50.64 % of the total zooplankton abundance). Zooplankton community composition and abundance variations were mainly controlled by Aghien lagoon environment parameters as conductivity, turbidity, pH, temperature and nutrients.

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