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STRUCTURE AND DIVERSITY OF THE VARIOUS ZOOPLANCTONIC GROUPS IN THE BAY OF TABOUNSOU

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ABSTRACT

This survey is about the analysis of 468 samples that aims to determine the structure and the diversity of the different group zooplanktonics in the 13 inshore stations in the bay of Tabounsou. They have been studied in succession during one year, that means the year 2014 (March, April, May, June, July, August, September, October, November, December) and 2015 (January, February). Most species are perennial and their maximal abundance is located to the season of rains, when the enrichments of the coasts make themselves through the presence of the terrigènes. The abundance of the zooplankton reached its peak during the rainy season (July) and the evolution coordinated of several species of zooplankton is confirmed by the specific wealth. The following species are considered constants because, they have been met in each of the 13 stations sampled: *Paracalanus aculeatus; Eriphia spinifrons; Paracalanus scotti; Nannocalanus minor; Paracalanus parvu; Sagitta hispida; Sagitta friderici*. In terms of biomasses the Mysidacés (2433,14mg/m3), and the chaétognathes (1768,38 mg/m3) form the dominant group. Of a station to the other the variations of the biomass can be explained by the presence of the larvas of shrimps of large size.

KEYWORDS: Structure, diversity, copepods, biomass, zooplankton, bay of Tabounsou.

INTRODUCTION

The zooplankton community plays an extremely important role in the ecological balance of marine and coastal ecosystems. The different marine and coastal zooplankton groups have well developed structures and diversity.

These structures are generated and supported by physical processes (upwelling, vortices ...) and biological processes (predation, reproduction, vertical migration) associated with individual behaviors.[1]

In a comparative study of 25 lakes in southern Quebec, defined two specific criteria: the size structure and biomass of zooplankton in these lakes. These criteria are subsequently used to assess the spatial heterogeneity of the zooplankton communities encountered in these lakes.[2]

The meta zooplankton interacts with lower levels feeds on phytoplankton and protozooplankton, it exerts a trophic pressure that will influence the size structure of these communities.[3]

For the heterogeneity of the spatial and temporal distribution of zooplankton is added its biological diversity which can make efficient the ecological system of the environment.

This heterogeneity may be due to physical and biological processes that interact at different scales.

The effects of wind, turbulence and stratification of the water column, and even biological phenomena such as the nycthemeral migration of part of the zooplankton are involved on a small scale.[4]

The spatio-temporal structure is a function of the movements of zooplankton. These movements can be passive or active. The passive movements of plankton are caused by the circulation of water and vary with the stability of the water column. The combination of current and wind, as well as periods of water mixing, are the main culprits for this first type of movement.[5]

But on a large scale, the distribution is related to physiological constraints and will be dependent on temperature and phytoplankton biomass.[6]

In the present work, it is proposed to evaluate the structure and diversity of zooplankton populations in the pelagic ecosystem of Tabounsou Bay through the coastal missions carried out during 2014-2015. The biological indices calculated for the different zooplanktonic groups were used to analyze their structure.

MATERIAL AND METHODS

Material

Study zone

Tabounsou Bay is located southeast of the peninsula of Kaloum. It is bordered by mangroves between cut by estuaries that receive biogenic elements by runoff through the rivers Tabounsou, kountiya, Soumbouya, Kilometer 36, etc. The depth of the zone ranges from 3m to 20m at low tide and from 5m to 25m at high tide.

It ranges from 9°24’ to 9°40’ north to 13°35’ west to the east of the city of Conakry.

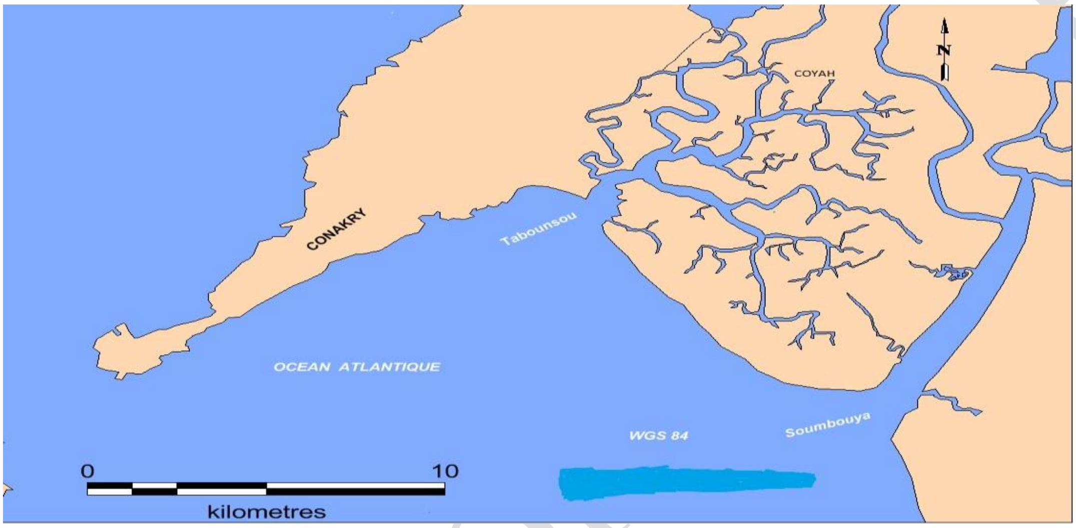

Figure 1: The sampling site.

The collection of water and zooplankton samples was performed at 13 fixed hydro biological stations.

The samples, numbering 468 were taken from the bottom to the surface using the net Djedi ... in the period from March to December 2014 and January, February 2015 aboard a motor boat.

Parallel to the collection of plankton samples, the environmental parameters were measured at the surface. The temperature was measured in situ using the thermometer.

Sampling and data processing

Zooplankton was collected vertically from the seabed to the surface using a plankton net (Hensen 55µ, aperture diameter 70cm); then condensed and fixed at 5% formalin for laboratory analysis. Zooplankton organisms were identified through the keys of.[7,8] and counted under the binocular magnifying glass. The results obtained were translated into taxonomic richness (%), diversity index (Shannon) and expressed in density (ind/ m3) the number of individuals per unit of volume.

RESULTS AND DISCUSSIONS

The zooplankton community is made up of 11 groups among which we can mention: the chaetognaths (11,87%), the copepods (44,13%), the zoés (18,11%), the jellyfish (0,41%), decapods (11.17%), mysidacae (11.74%), Euphausiacae (0.08%), molluscs (0.07%), cladocerans, fish larvae (0.88%) ... (polychaetes and tintinnids) representing 1.43%.

The species of copepods encountered are divided into the following families: Calanidae, Calocalanidae, Paracalanidae, Pseudocyclopidae, Sapphirinidae, Eucalanidae, Temoridae, Ointhonidae, Scolecithridae, Phaenidae and Pseudocalanidae.... etc. (Table 1).

Table 1: List of the main zooplankton species and their characteristics found in Tabounsou Bay.

Zooplankton groups	Families	Species	Abundance (ind/m^3)	Relative species frequency (%)	Diversity Index (H′) (bits)
	Calanidae	*Calanus minor* (Claus, 1863) *Calanus helgolandicus* (Claus, 1863) *Calanoïde carinatus* (Kroyer, 1849) *Calanus gracilis* (Dana, 1849) *Nannocalanus minor* (Claus, 1863)	989,3 26,9 126,9 223,3 1243,2	4,64 0,12 0,59 1,04 5,84	0,0619 0,0036 0,0132 0,0207 0,0720
	Paracalanidae	*Paracalanus scotti* (Fruchtl, 1923) *Paracalanus aculeatus* (Giesbrecht, 1888) *Paracalanus parvus* (Claus, 1863)	1520,95 1836,94 752,72	7,14 8,63 3,53	0,0818 0,0918 0,0513
	Calocalanidae	*Calocalanus pavo* (Dana, 1849)	207,62	0,97	0,0196
	Pseudocy clopidae	*Pseudocyclopia minor* (Scott, 1892)	77,38	0,36	0,0088
	Sapphirinidae	*Sapphirina metallina* (Dana, 1849)	64,49	0,3	0,0076
	Oithonidae	*Oithona hebes* (Giesbrecht, 1891)	38,69	0,18	0,0049
	Eucalanidae	*Eucalanus minor* (Claus, 1863) *Eucalanus pileatus* (Giesbrecht, 1888) *Eucalanus elongatus* (Dana, 1848) *Eucalanus monachus* (Giesbrecht, 1888) *Eucalanus crassus* (Giesbrecht, 1888) *Eucalanus attenuatus* (Dana, 1849) *Mecynocera clausi* (Thompson clausii,1888) *Eucalanus subtenuis*(Giesbrecht, 1888)	82,60 296,08 183,16 21,15 410,26 1,75 410,26 5,26	0,38 1,39 0,86 0,09 1,92 0,008 0,31 0,02	0,0093 0,0258 0,0177 0,0029 0,0330 0,0003 0,0079 0,0008
	Phaenidae	*Xanthocalanus greeni*(Farran, 1905) *Xanthocalanus minor*(Giesbrecht, 1892) *Xanthocalanus propinquus*(Sars, 1903) *Phaenna spinifera* (Claus, 1863)	95,86 63,72 61,94 19,34	0,45 0,29 0,29 0,09	0,0105 0,0075 0,0073 0,0027
	Temoridae	*Temora longicornis* (Müller, 1792) *Temora stylifera* (Dana, 1848)	473,73 98,05	2,22 0,46	0,0367 0,0107
	Scolecithridae	*Undinilla vulgaris* (Dana, 1848)	53,96	0,25	0,0065
	Pseudocalanidae	*Clausocalanus furcatus* (Brady, 1883) *Ctenocalanus vanus*(Giesbrecht, 1888) *Clausocalanus minor* (Sewett, 1929) *Pseudocalanus elongatus* (Boeck, 1872)	72,57 40,85 169,86 65,68	0,34 0,19 0,79 0,3	0,0084 0,0052 0,0167 0,0077
	Chaetognathes	*Sagitta hispida* (Conant, 1895) *Sagitta friderici* (Ritter-Zahony, 1911) *Sagitta enflata* *Sagitta minima* (Grassi, 1881) *Sagitta sp.*	888,06 1098,04 199,14 275,12 66,38	4,17 5,15 0,93 1,29 0,31	0,0575 0,0664 0,0189 0,0244 0,0078
	Cladocères	*Penilia avirostri*	11,1	0,05	0,0017
	Decapodidae	Larve décapode	2107,8	9,9	0,0994
	Zoé (stade de vie)	*Eriphia spinifrons*	3854,64	18,11	0,1344

	Mysidacae	*Lucifer faxoni* (Nobili, 1901) *Schistomysis ornata* Mysidace sp. *Lucifer sp.*	1947,95 75,54 165,66 308,53	9,15 0,35 0,77 1,44	0,0950 0,0086 0,0164 0,0266
	Euphausiacae	Larve euphausiacé	18,87	0,08	0,0027
	Poisson téléostéen	Larve de poisson	188,86	0,88	0,0182
	Mollusques	Larve gastéropode	287,42	1,35	0,0252
	Méduse	Hydroméduse *Podocoryne areolata*	72,15 16,65	0,33 0,07	0,0083 0,0024
	Tintinnidés	Cylindrica Tintinnidium sp	33,3 38,87	0,15 0,18	0,0043 0,0050
	Polychètes	Lopadorhynchus *Temopteris Sp*	66,65 166,66	0,31 0,78	0,0078 0,0164

Quantitative analysis of the samples showed that the maximum value of the density was 21280.4 ind/ m3 for a biomass of 8869.7mg/ m3.

The average annual density of zooplankton during the study period is 1636.9 ind/ m3. This value is related to the contributions of tidal currents on the one hand and the sum of the combined contributions of abiotic factors on the other hand. The dynamics of zooplankton in this bay follow the influence of certain abiotic parameters (salinity, temperature).

Indeed, [9] noted the same observation in Tabounsou Bay, where 56 species of zooplankton belonging to 29 families were identified. Copepods were the most numerous and accounted for nearly 44% of the total number of encounters. They include Calanoids (30 species), Cyclopoids (13 species) and Herpacticoids (4 species). Moreover,[9] showed that Chaetognaths consist of 2 species, one coastal (*Flaccisagitta enflatta*) and one oceanic (*Pterosagitta draco*). These species have been observed only in open sea and in high tide.

Variation of zooplankton density by tidal phase

The analysis of the annual monitoring of the density of the zooplanktonic groups shows a monthly variation of their abundances according to the tides and the seasons. Considering all size groups of all tidal phases, the maximum value of zooplankton density is observed during high tide (9285.477 ind/ m^3) and low density (4998.04 ind / m^3) at the low tide (Figure 2).

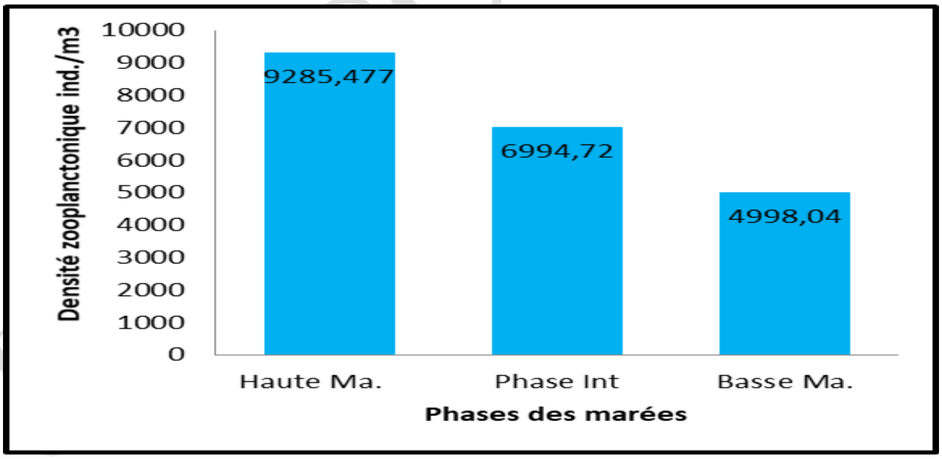

Figure 2: variation in zooplankton density by tidal phase.

The peak of the maximum density of zooplankton is observed during high tide

Variation of the biomass

The biomasses of zooplankton organisms varied from one month to another and from one station to another. In July, the maximum zooplankton biomass is reported before it falls in December. This variation in biomass showed the predominance of some groups in the zooplankton community: Mysidaceae (2433.14 mg/ m^3), Chaetognathes (1768.38 mg/ m^3) and Decapods (1664.98 mg/ m^3) (Figure 3a; 3b).

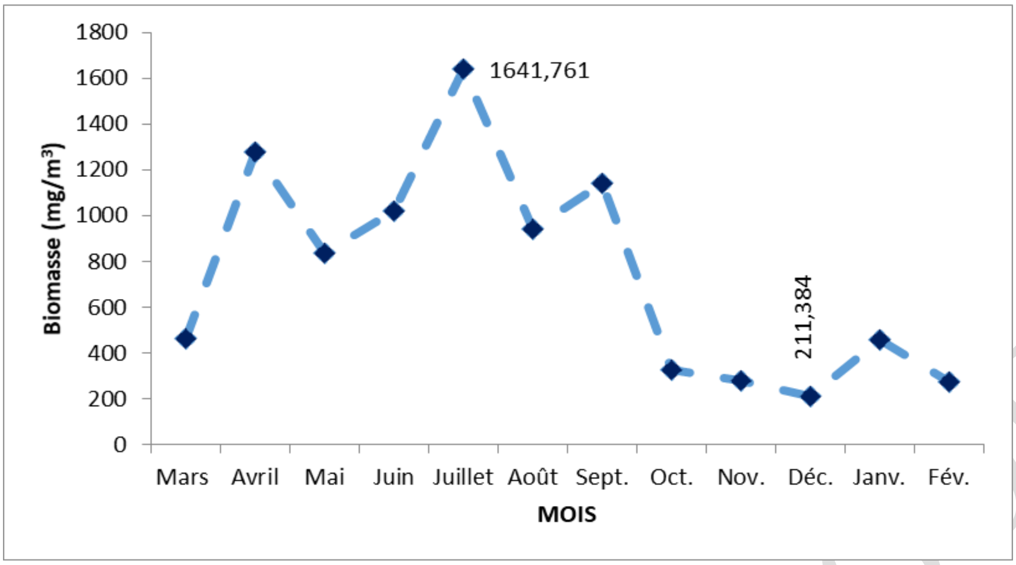

Figure 3a: Variation in seasonal biomass.

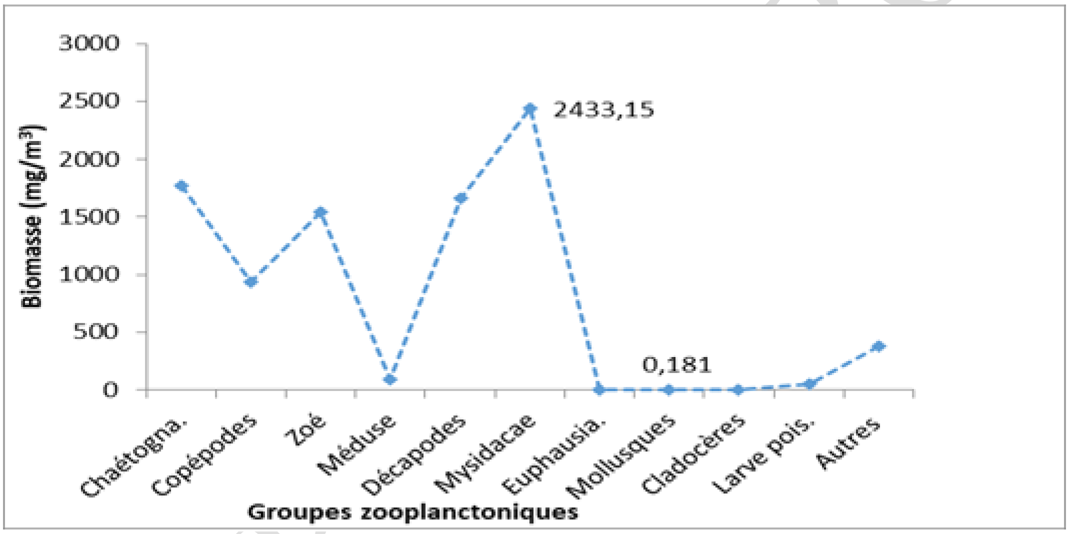

Figure 3b: Variation in zooplankton biomass.

Specific wealth and diversity index

It can express itself in total or average wealth. Total wealth is the total number of species present in a given station. This species richness (S) of zooplankton (Figure 4) and copepods (Figure 5) in its evolution is directly correlated with the spatial evolution of species in general and those of copepods in particular.

The richness of zooplankton reaches its maximum of 20 bits (S = 20) at station 1 compared to that of copepods, which presents its own (11) at stations 9 and 11.

This specific richness is explained by the contributions of the tidal currents on the one hand and the sum of the combined contributions of the abiotic factors on the other hand. It is also related mainly to biomass increase and zooplankton density.

In addition, this increase in biomass could also be explained by the presence of large shrimp larvae as well as jellyfish that abound in the area during the period of the year (rainy season).[10]

[11]Pointed out that species diversity is higher in offshore waters than in coastal waters. The community is less structured near the coast under the strong influence of upwelling and less stable hydrological conditions.

[12]Has shown that species richness increases in mixing waters by vertically superimposing bodies of water.

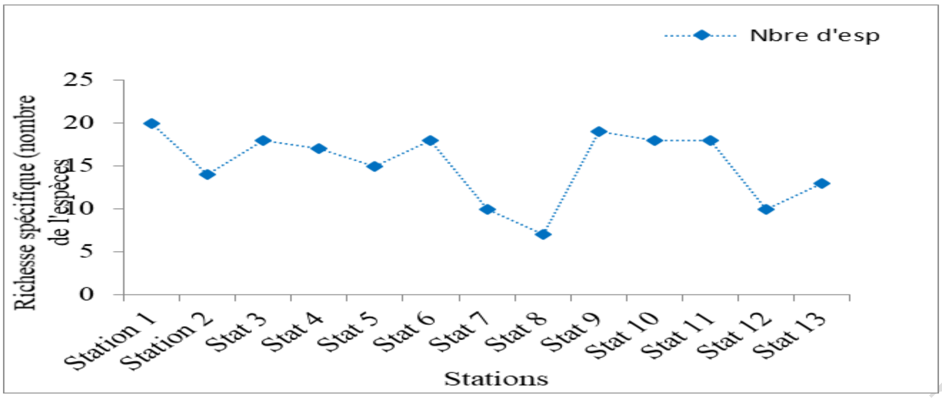

Figure 4: Evolution of the specific Wealth of Zooplankton in Tabounsou Bay.

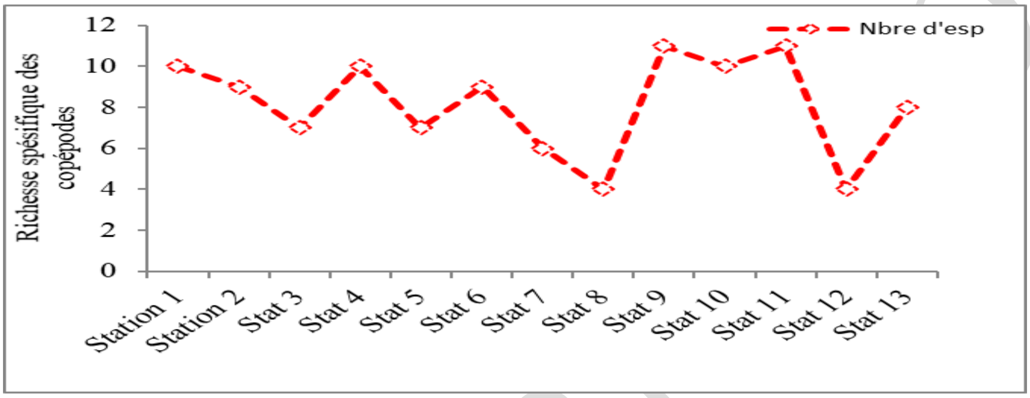

Figure 5: Evolution of the specific Wealth of copepods in Tabounsou Bay 2014-2015.

The diversity index is a function of the species richness of the zooplankton community. It was calculated according to Shannon's formula.

A positive relationship was found between the specific diversity of zooplankton and that of copepods, as follows: Ds = 1.03≈1 for zooplankton, and 0.56 for copepods. To this effect, one can deduce that these diversities are strong because they evolve between 0 and 1. The diversity index (H ') is weak when the individuals met all belong to a single species or when all the species are represented by a single individual therefore H'is more sensitive to rare species.

Seasonal variations in abiotic parameters (temperature and salinity) in Tabounsou Bay are largely related to tidal cycles, impacting on the diversity and abundance of zooplankton in general, and those of copepods in particular.[13]

This statistical analysis revealed the significant presence of Paracalanus aculeatus, P. scotti and Nannocalanus minor (Figure 7).

The Shannon index of the zooplanktonic groups (Figure 6) showed lines ranging from H = 0.16 (copepods) to H = 0.002 (cladocerans) on the one hand, and copepod species on the other hand (Figure 6) the index shows amplitudes of variation ranging from H = 0.14 (Paracalanus aculeatus) to H = 0.0006 (Eucalanus attenuatus).

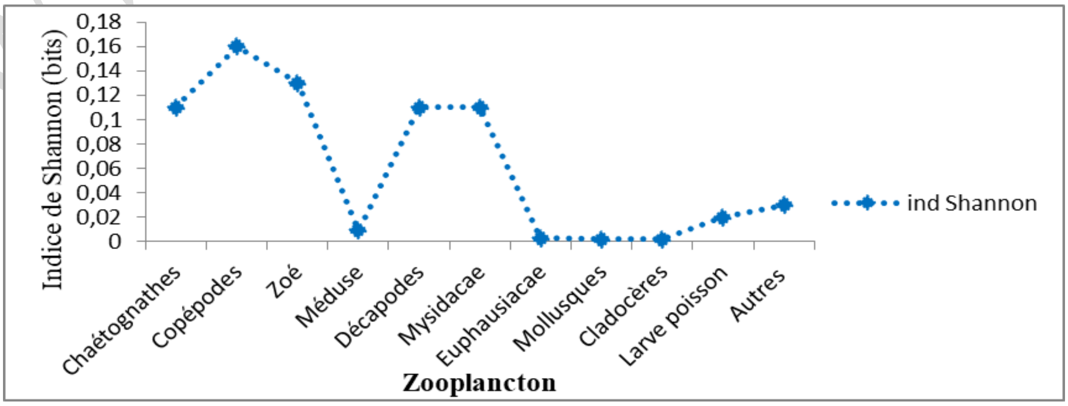

Figure 6: Shannon index of major zooplankton groups in Tabounsou Bay 2014-2015.

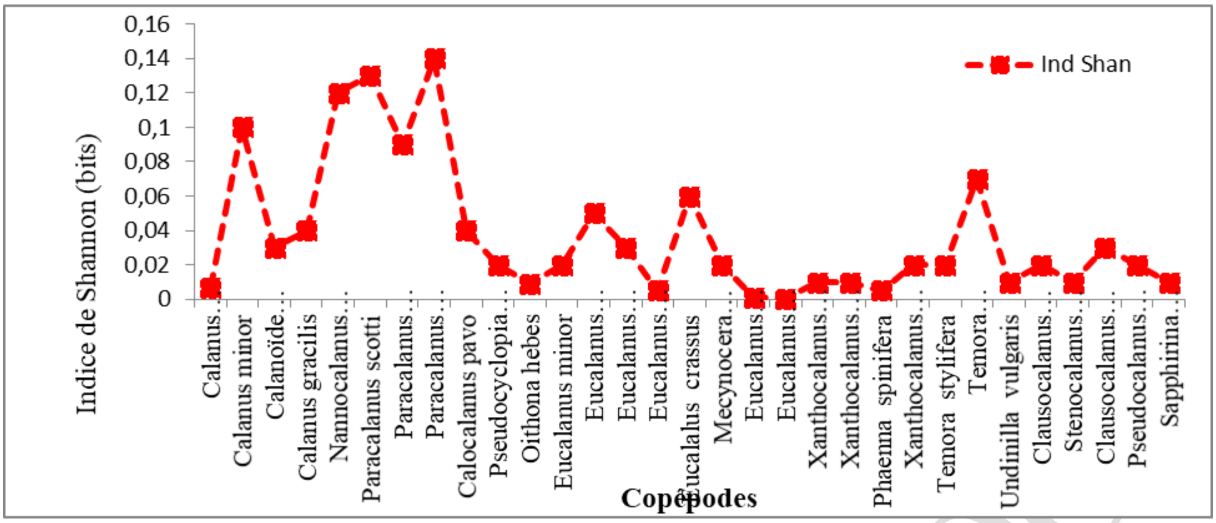

Figure 7: Shannon index of the main copepod species in Tabounsou Bay

CONCLUSION

The results of the analysis of the structure and diversity of the various zooplanktonic groups carried out in Tabounsou Bay reveal that these waters are still favorable for the development of zooplankton organisms through the coexistence of different water bodies (coastal and oceanic).

The zooplankton biomass values are higher during the rainy season, and this may be due to the presence of large decapods larvae (crabs, shrimps) and jellyfish.

The taxonomic composition of the zooplankton in Tabounsou Bay shows that it is the coastal and oceanic species that abound in this watercourse. Thus, it appears that in addition to the large amount of biogenic material drained by streams and runoff, current velocity and tidal dynamics are responsible for the diversity of zooplankton populations in this area. stream.

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