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INFLUENCE OF SOME ABIOTIC FACTORS ON THE DIATOM DENSITIES IN THE MEZAM RIVER (BAMENDA, NORTH-WEST CAMEROON)

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ABSTRACT: *Wetlands of the city of Bamenda are characterized by intense agricultural activities. The resulting consequences are aquatic pollution. The management of these wetlands requires the study of the animal and plant communities found there. Diatoms are known to be good markers of environmental change. The aim of the study was to determine the influence of some abiotic parameters on the diatom densities of the Mezam river. The study was conducted from January to December 2022. Some physicochemical parameters were measured in situ. Water samples were collected and transported to the laboratory for the measurement of nitrates, total phosphorus, carbon dioxide and biological oxygen demand. The diatoms were sampled and analyzed in the laboratory. Factorial axis 2 (0.47%) of correspondence factor analysis opposed the positive variables (conductivity, total dissolved solids and salinity) to the negative variables (water temperature, pH, nitrates, total phosphorus, oxidability, carbon dioxide and alkalinity). Study sites showed a mineralization gradient going from upstream (Site 1) to downstream (Site 3). Total species richness amounted to 4 classes divided in 18 families, 21 genera and 43 species. The most dominating family was Naviculaceae with 10 species. Multiple component analysis showed, in different study sites, the correlation between chemical parameters and density of different genera. The more the site was polluted, the more the density of Navicula, Tabellaria, Melosira and Coscinodiscus increased. On the contrary, the less the site was polluted, the more the density of Cyclotella, Gomphonema, Cocconeis, Gyrosigma, Synedra increased. These results showed that the distribution of diatoms in the different study sites was influenced by a set of conditions related to physicochemical parameters, but more on their densities.*

KEYWORDS: Diatoms, Density, Physicochemical parameters, River.

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INTRODUCTION

Bamenda is identified as a city where wetlands are heavily anthropized. The significant consequences resulting from this are of two types: pollution and flooding (Meva'a et al., 2010). Whether physical or chemical, pollution has two main sources in the city of Bamenda: housing and agriculture (Tita et al., 2012). Indeed, Bamenda has been known for several decades for its strong agro-pastoral activity. However, the practice of these activities involves the excessive use of phytosanitary products (fertilizers and pesticides). These could have consequences on water quality, and lead to profound changes in the composition and structure of the populations of organisms in the hydrosystems of this area (Dibong & Ndjouondo, 2014a). Taking into account the alterations caused by human activities on these wetlands currently appears to be a major concern. The relationship between biodiversity and the functioning of ecosystems is a fundamental ecological question: to understand the structure and functioning of an ecosystem, it is essential to know the different elements that make it up, i.e., the distribution of organisms in time and space (John et al., 2000). From another point of view, if the question is focused on the capacity of ecosystems to resist disturbances (in particular, anthropogenic), it is necessary to rule on the hypothesis according to which the specific richness favors the stability of the communities of producer autotrophs (Li, 1997). However, pollution in urban areas can be determined by analyzing pollutants, using satellite methods or analyzing plant communities (Tchiaze & Priso, 2016). However, notwithstanding the relevance of analytical methods, they remain of little interest in the detection of episodic pollution (Priso et al., 2012). Also, algae, integrating the phenomena experienced by ecosystems, appear as markers of environmental changes (Velez-Agudelo & Espinosa, 2021). The biological analysis makes it possible to identify the disturbances and their effects on the animal and plant communities in place.

The responses of different diatoms or communities of diatoms to pollution and changes in aquatic conditions can manifest themselves in a variety of ways. According to changes in the environment, species of diatoms or communities of diatoms react by: sociological variations such as absolute or relative frequency, diversity, stability, structure of the community, the biomass, and physiological activities (photosynthesis, respiration, nutrition, accumulation of substances and movement). In practice, diatoms are used as reaction indicators in the assessment of water quality. To do this, the characteristics of the communities must be known. The term bio-indication encompasses biological methods that allow conclusions to be drawn about environmental conditions based on the organisms present. For organisms or communities of organisms to be qualified as bio-indicators, their presence, their behavior or their physiological adaptations (reversible changes of state) must be in as simple and close a relationship as possible with ecological factors (factors of stress) (Berne, 2007).

The question that arises is whether the distribution of diatom communities would be related to the physicochemical quality of the waters of the Mezam river. For this, the objective of the study is to determine the influence of some physicochemical parameters on the density of diatoms in the Mezam river.

MATERIALS AND METHODS

Description of Study Area

Bamenda is the headquarters of the Mezam division in the North-West region of Cameroon (Fig. 1). It is made up of three subdivisions (Bamenda I, Bamenda II, Bamenda III) with 391 km of total surface area. Its relief consists of interspersed plateaus with deep valleys and its vegetation is the Guinea Savannah type with moderate temperatures. There are two topographic units separated by a high scarp-oriented NE-SW (Neba, 1999). Above the cliff stands the upper plateau which is mainly Bamenda I and represents 10% of the total area of the city. Altitudes here vary between 1472 m and 1573 m. The climate is the type of humid tropical highland characterized by two seasons: rainy and dry. The temperature here is very cold especially in the morning and evening with the coldest temperature between the period of January to March, with minimum temperature from 14.10-17.80 ^{o}C and maximum temperature from 22.5-28.5 ^{o}C, humidity ranging from 39-90% and rainfall from 0.1-14.1 inches of rain per hour (Climate-Date.org>Cameroon>Northwest Bamenda). The rainy season is generally longer and lasts for 8 months (mid-March to mid-October) with a short dry season of 4 months (mid-October to mid-March) (Tita et al., 2012), and mean annual temperature is 19.93 °C. The town has a rich hydrographical network with intense human activities and high population along the different watercourses in the watershed. Sampling points were located on the map by using Global Positioning System (GPS) coordinates. This study was conducted in three study areas: Site 1 (Upstream) is situated between 5^{o}58’53.9’’N and 10^{o}11’14.9’’E. Site 2 (Middle stream) is situated between 05°56’00’’ N and 10°30’4’’ E. Site 3 (Downstream) is situated between 05°56’00’’ N and 10°30’4’’ E.

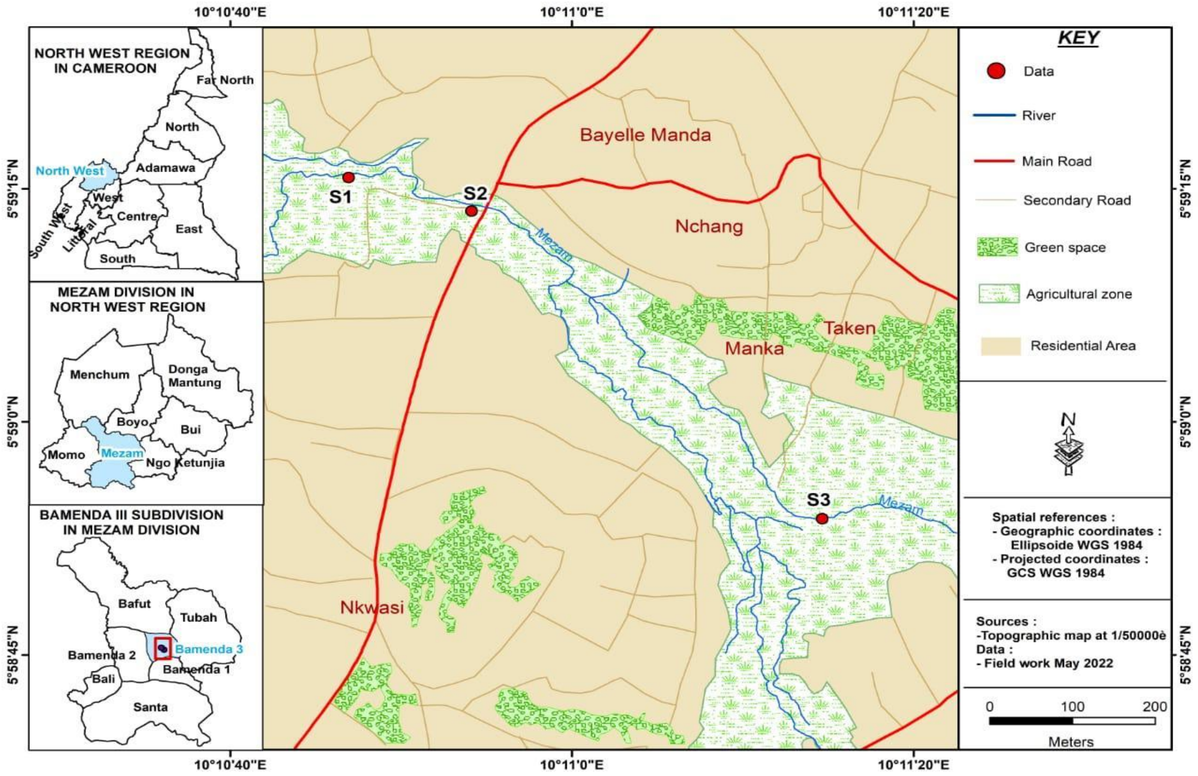

Figure 1: Localization of Study Sites

Period of Sampling and Study Sites

Twelve (12) sampling campaigns were carried out from 08 January, 2022, to 05 December, 2022 in the Mezam river where 3 sites were delimited: upstream (Site 1), middle stream (Site 2) and downstream (Site 3).

Determination of Physicochemical Parameters of Water

Physicochemical parameters were measured between 08:00 and 11:00 at each site using 1 L polyethylene bottles and stored at -4 °C in a cooler for analysis of nitrates, total phosphorus, carbon dioxide (CO_2) and Biological Oxygen Demand (DBO_5) at the laboratory by spectrophotometric methods. Dissolved oxygen was measured in situ by a WTW oximeter. Water temperature, conductivity, total dissolved solids, salinity and water pH were measured by an OAKTON brand pH/TDS/COND/Salt/T multiparameter from HANNA instruments. Water velocity was measured using potassium permanganate, launched into water and a stopwatch for measuring the time travelled by the fluid over a distance of 10 m. Following formula makes it possible to determine the velocity (V): $V = d/t$ with V in m/s, d = distance in m and t = time in s. Average depth was measured at each station using a graduated stick located on both banks and in the middle of the stream. Width of the river was determined using a measuring tape by holding one end at the point where the water meets the bank at one side of the channel, ensuring the tape is not twisted, pulling the tape measure across the river, and measuring to the point where the water meets the bank directly opposite. Water transparency is measured with a Secchi disk. The sediments were estimated by percentage according to muddy and sand found in the study sites.

Sampling of Diatoms

Samples were collected by filtration of water course using plankton net. After harvesting, samples were immediately fixed by addition of formalin at 5% of the sample volume. Periphyton was pressed on aquatic plants and scraped on rocks on a surface of $(30\times30)\ cm^2$ respectively. This was introduced into a 60 ml bottle and then fixed with formalin 5%. Each bottle had been labeled, and samples were introduced into a cooler for dark storage.

Laboratory Procedures

Preparation of Samples for Periphytic Diatoms

Sub-samples were made after homogenization and diluted with distilled water. The coverslips were placed at regular intervals on the heating plate. After stirring, 0.5 ml of the contents of the sub-sample was deposited on the coverslips and heated until evaporation. After drying the material, the temperature was increased to carbonize the organic matter until the gray color was obtained. The coverslips were dipped in distilled water to remove ash. Several preparations were thus made with different dilutions.

Microscopic Observation and Identification

The preparation was mounted between slide and coverslip. This work under the microscope includes determining the species and counting the valves of diatoms, such as the small ornamentations of the valves. The following identification keys were used: Berne (2007) and Camerlo et al. (1997).

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Counting

The counting was carried out according to the method of Berne (2007). After determination of the frequent diatoms in a sample, the counting of the diatom valves was carried out. At least 400 valves were counted. All the valves found during counting were identified, even those of taxa that did not have a D indicator value. The counting was carried out on the entire preparation, taking into account all the intact valves; whole cells were counted as 2 valves. Among the fragments, those with at least half a valve were counted.

Determination of Biological Parameters

Environmental indicators are measures by which a given situation or trend can be quantified. They are qualitative and quantitative values coming from the observations and direct measurements, which facilitate communication in a common referential language, in the research and assessment of the state of the environment (Iojă, 2013). Biodiversity is characterized by three levels: at species level, genetic diversity (variety of species, of populations, of individuals) and eco-systemic diversity (variations in the biological communities) (Velez-Agudelo & Espinosa, 2021). The measurement of biological diversity implies the utilization of certain indicators and indices, such as the richness in species, genes, ecosystems (Margalef index, Menhinick index, Simpson index), their diversity and density, their spatial and temporal distribution and variation, endangering level, habitat fragmentation, specificity, and efficiency of conservation actions (Iojă, 2013). Given the large number of indices, it is often difficult to decide which is the best method of measuring diversity. One good way to get a feel for diversity measures is to test their performance with one’s own data. A rather more scientific method of selecting a diversity index is based on whether it fulfils a certain function’s criteria ability to discriminate between sites, dependence on sample size, what component of diversity is being measured, and whether the index is widely used and understood (Ndjouondo et al., 2017).

Species Richness

This is the total number of taxa (species, family, or class) identified in a sample and is an element that indicates the specific variety of the sites. This property may be a distinctive criterion of the ecosystem or stations studied within a given ecosystem.

Density of Microalgae

Density (D) of diatoms was computed using the following formula: $D_i = [(x_i \times A \times a \times v)/1000 \times c)] \times d$, with d = Diluted factor, v = Sedimented volume in mL, A = Volume of Malasses’s cell, a = Total number of fields, c = Number of counted fields, xi = Number of counted objects.

Statistical Analysis

Microsoft Office Excel 2010 was used for keying and coding data collected during the study. Qualitative and quantitative variables were presented as mean ± standard deviations respectively in charts. Principal Component Analysis was applied to group sampling sites according to their physicochemical similarities. Correlation among physicochemical parameters and diatoms communities was conducted using multiple correspondence analysis

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(MCA). These analyses were performed using XLSTAT software and PAST03 for the dendrograms.

RESULTS AND DISCUSSION

Hydro-morphological Parameters

The hydro-morphological parameters influence the diatom floristic composition (Table 1). These parameters change with the seasons. Temperature, a non-negligible environmental factor for aquatic life, influences all biological processes (reproduction, growth, and thermal preference) linked to a given environment (Aminot, 1983). Generally speaking, the temperature of surface waters is a parameter strongly influenced by climatic conditions. Although the Mezam is a forested region regularly irrigated during the rainy season, the surface water of the Mezam remains at a temperature of 24 °C with considerable variations. This situation is believed to be the result of sampling over two seasons, sunshine due to urbanisation and multiple inputs of water from the catchment effluents, as well as factors external to the hydrosystems which include exposure (Nwamo, 2019). Dajoz (1985) corroborated these findings and concluded from a study that the temperature of river water varies with the weather and also with the months. The temperature of surface waters is directly influenced by climatic conditions. In addition, some species prefer warmer water. In this respect, Groga (2012) also revealed that inflows of water from tributaries, which have a higher temperature than lake water, and frequent winds, can be factors in disturbing the thermal stratification of the water column. He went on to say that temperature is one of the factors involved in the structuring of primary producer assemblages. However, these autotrophic compartments will have a different response to environmental changes in space and time.

Study sites showed a mineralization gradient going from upstream (Site 1) to downstream (Site 3). The width of the river was variable in the study sites from 4.70 ± 3.57 m (Site 1) to 2.25 ± 1.24 m (Site 3). The depth varied from 0.60 ± 0.50 m (Site 3) to 0.28 ± 0.50 m (Site 2). The velocity varied from 0.74 ± 0.25 m/s (Site 3) to 0.38 ± 0.30 m/s (Site 1). Sediments were mostly dominated by muddy (≥90%) in the study sites. Referring to the Berg velocity scale, the waters of the studied water bodies belonged globally to the category of so-called fast current. This was due to the high velocities recorded during the rainy season. Current speed and depth select species and ecomorphological types. Thus, in running waters, the upstream-downstream zonation of diatoms depended on the speed of the current (Dibong & Ndjouondo, 2014a). Hence, while playing an obstacle role with the main effect of slowing the flow, the macrophytes determine a trapping of the solid matter transported. This trapping promotes the sedimentation of particles contributing to their stabilization for the protection of river banks, in particular with the installation and development of helophytes (Dibong & Ndjouondo, 2014b). The speed remains low at site 3 and is favorable to the development of diatoms.

Table 1. Hydro-morphological parameters of Mezam river

Site	Width (m)	Depth (m)	Velocity (m/s)	Sediments (%)	
				Muddy	Sand
1	4.70 ± 3.57	0.50 ± 0.46	0.38 ± 0.30	90	10
2	3.56 ± 2.10	0.28 ± 0.50	0.47 ± 0.15	90	5
3	2.25 ± 1.24	0.60 ± 0.50	0.74 ± 0.25	95	5

Water Mineralization Given by the Principal Component Analysis (PCA)

Correlation circle along the F1×F2 factorial axes (99.97% of inertia) brought together 10 physicochemical parameters of the study sites (Fig. 2). F2 axis (0.47%) opposed the positive variables (conductivity, total dissolved solids and salinity) to the negative variables (water temperature, pH, nitrates, total phosphorus, oxidability, carbon dioxide and alkalinity). The results of the correspondence factor analysis revealed the presence of sites which isolate themselves from others by particularities. These particularities could be linked to the anthropic pressures that this aquatic ecosystem undergoes, as there was a strong presence of inhabitants in the study area. To this end, Malmqvist and Rundle (2002) and Bollache et al. (2004) concluded in their study that anthropogenic actions had negative consequences on the health of watercourses. They negatively influence not only the ecological quality of the hydro-system but also the biological communities in general. Nwamo (2019) revealed that the physicochemical and phytosociological analyses had made it possible to verify the possible effectiveness of the impact of anthropic actions on the water bodies studied. These results were similar to those of Dibong and Ndjouondo (2014a) having worked on the floristic inventory and the ecology of the algae of the Kambo and Longmayagui rivers (Douala, Cameroon). They showed that the distribution of the study sites follows a gradient of organic pollution from upstream to downstream of the river. Mbonwoh (2022) showed similar results on the Nkwen river (Bamenda, Cameroon). Fokou (2015), Siyou (2015), and Millo (2015) found similar results as well. In their work, they showed that the degree of mineralization follows the longitudinal gradient of the river from upstream to downstream. The downstream of the Mezam river is located in more anthropized lowlands where intense agricultural activities are observed, which would help to justify high chemical parameters at Site 3.

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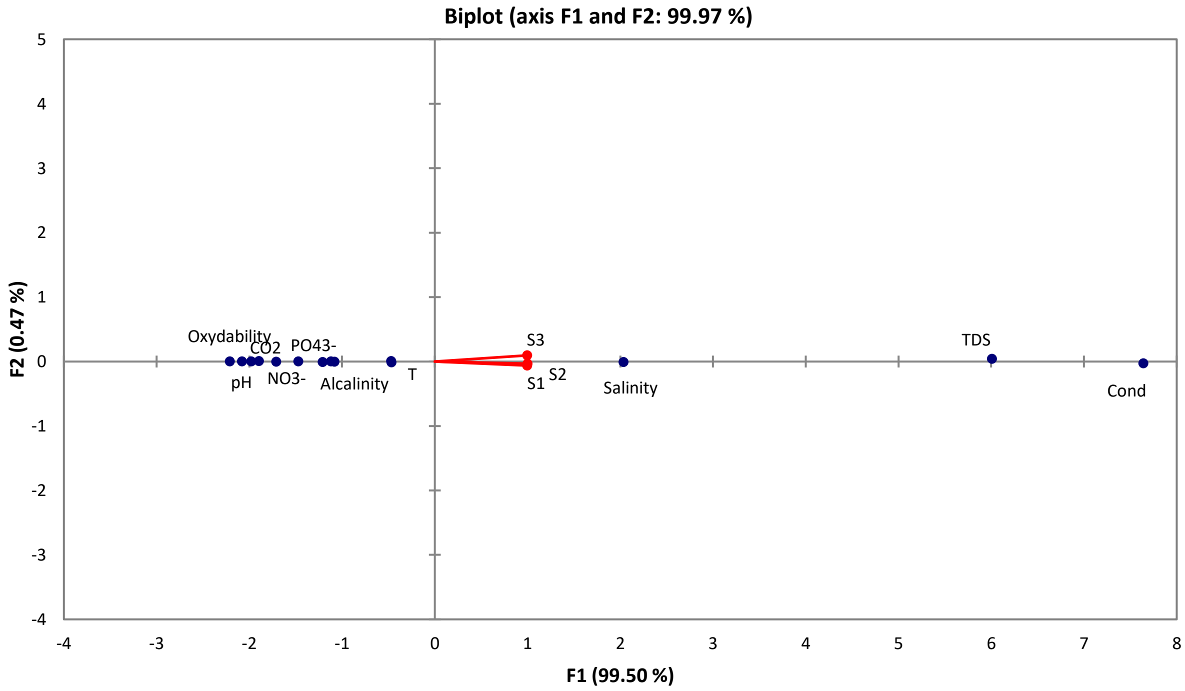

Figure 2: Principal component analysis of 10 parameters in the study sites (TDS = Total dissolved solids, Cond = Conductivity, pH = Hydrogen potential, CO_2 = Carbon dioxide, NO^{3-} = Nitrate, PO_4^{3-} = total phosphorus, T = temperature).

Biological Parameters

Species Richness

The floristic richness of the study sites was low and amounted to 4 classes divided into 18 families, 21 genera and 43 species (Table 2). The most dominating family was Naviculaceae with 10 species, followed by Cymbellaceae and Gomphonemataceae with 4 species each. These results are close to those found by Nwamo (2019) who, during his study on the ecological state of the Kondi and Tongo Bassa rivers in the city of Douala, showed that the Naviculaceae was the most represented family with 12 genera. Raupp et al. (2009) listed 46 species (3 classes, 10 families and 16 genera) at the end of their work on planktonic diatom composition and abundance in the Amazonian floodplain Cutiuaú lake. However, they have instead shown that Eunotiaceae and Pinnulariaceae were represented by the highest number of taxa. In addition, Beraldi et al. (2016) identified 25 diatom genera in three different types of sedimentary facies (porous and moss-algae rich, dense-laminated, and tufa-free gravel). Most diatoms were raphid pennate (class Bacillariophyceae), while a few were centric (class Coscinodiscophyceae) or araphid pennate (class Fragilariophyceae). These results are lower than those found by Safiallah et al. (2020) in the Kashkan river in the Zagros mountains of Western Iran. These authors found 91 taxa belonging to 26 genera, 15 families and three classes. The most dominant genera in the sites were *Navicula* (15 species) and *Nitzschia* (11 species) with the richest species diversity in the Kashkan river. A total of 223 taxa have been observed by Ayça et al. (2020) in the Burdur river basin. Among the genera, *Navicula* (27) and *Nitzschia* (27) were represented with the highest numbers of taxa, followed by *Gomphonema* with a total of 22 species. Menye et al. (2012) also obtained superior results from 237 taxa of epilithic diatoms, mostly cosmopolitan, belonging to 39 genera distributed in 25 families on the Mfoundi river (Yaounde Cameroon). The low diatom floristic richness obtained would be linked to the nature of the almost muddy bottom substrate and a high speed of water flow, making it difficult for the diatoms to attach, also favoring their detachment from the almost organic substrate. The strong agricultural activity pushes the residents to maintain the river during the drainage and the irrigation of the cultivable areas. In this regard, Nwamo (2019) concluded from his study that the changes in the phytoplanktonic biocenosis can be explained by the hydrological changes that occurred and the influence of surrounding anthropogenic inputs.

Table 2: Species richness of diatom communities in the Mezam river

Classes	**Family**	**Genus**	**Species**
Bacillariophyceae	Eunotiaceae	*Eunotia*	*Eunotia* sp.1
			Eunotia sp.2
			Eunotia sp.3
	Naviculaceae	*Navicula*	*Navicula cryptocephala*
			Navicula subrhynchocephala
			Navicula bacillum
			Navicula cuspidata
			Navicula accomoda
			Navicula cruxmeridionnalis
			Navicula nivalis
			Navicula cryptotenelloides
			Navicula lenzii
			Navicula sp.
	Pinnulariaceae	*Pinnularia*	*Pinnularia gibba*
			Pinnularia sp.1
			Pinnularia sp.2
	Surirellaceae	*Cymatopleura*	*Cymatopleura solae*
	Cymbellaceae	*Cymbella*	*Cymbella* sp.
			Cymbella ventricosa
			Cymbella mesodon
		Encyonema	*Encyonema siliciacum*
	Cocconeidaceae	*Cocconeis*	*Cocconeis placentula*
			Cocconeis pediculus
	Achnanthidiaceae	*Achnanthidium*	*Achnanthidium* sp.
	Bacillariaceae	*Nitzschia*	*Nitzschia sigma*
	Diasdesmidaceae	*Luticola*	*Luticola goeppertiana*
	Rhopalodiaceae	*Rhopalodia*	*Rhopalodia* sp.
	Pleurosigmataceae	*Gyrosigma*	*Gyrosigma acuminatum*
	Gomphonemataceae	*Gomphonema*	*Gomphonema olivaceum*
			Gomphonema designatum
			Gomphonema sp.1
			Gomphonema sp.2

Coscinodiscophyceae	Melosiraceae	*Melosira*	*Melosira varians*
			Melosira sp.1
			Melosira sp.2
	Coscinodiscaceae	*Coscinodiscus*	*Coscinodiscus ehrenbergii*
	Thalassiosiraceae	*Thalassiosira*	*Thalassiosira pseudonana*
Fragilariophyceae	Fragilariaceae	*Synedra*	*Synedra ulna*
		Fragilaria	*Fragilaria cruentus*
			Fragilaria sp.
	Tabellariaceae	*Tabellaria*	*Tabellaria floculosa*
		Diatoma	*Diatoma mesodon*
Mediophyceae	Stephanodiscaceae	*Cyclotella*	*Cyclotella ocellata*

Variation of Diatom Densities

Considering annual average density in the study sites, *Navicula* was the densest genus with the highest value obtained in Site 3 of 14,935 Ind./ml (Fig. 3). This was followed by *Melosira* and *Tabellaria*. These results were similar to those found by CIPR (2009) which showed that of the taxa with the greatest regularity and highest densities in the overall dataset; the genus Navicula ranked second with total percentage frequencies across all samples of about 27. Many genera do not appear in all the study sites. The less abundant genera were *Rhopalodia* and *Luticola* each with 5.83 Ind./ml; they were present only in Site 3. *Navicula* was dominant in all the sampling campaigns in the macrophytic flora. In the same sense, *Tabellaria* and *Melosira*, filamentous and epiphytic, would attached to wet plants. The high abundance of *Navicula* would be linked to its habitat. Niamien-Ebrottié et al. (2018) explained that the species commonly encountered in the samples vary according to the type of geological substratum.

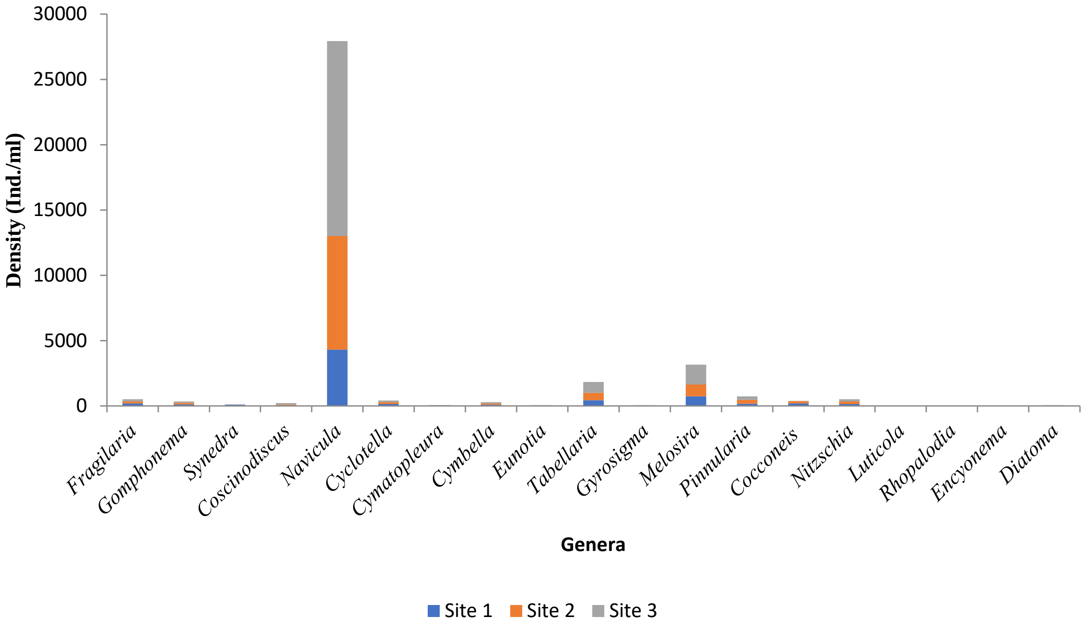

Figure 3: Variation of annual average density of diatoms according to genera

According to monthly evolution, total density of diatoms was variable during the sampling period (Fig. 4). The highest value was 2465 Ind./ml obtained in February and the lowest value is 182 Ind./ml obtained in August. The multiplication of diatoms was closely linked to seasonal variations. According to Nwamo (2019), the significant differences obtained between seasons and the phytoplankton densities obtained support this claim. He went further to conclude that the effect of rainfall regime on phytoplanktonic population shows that in the studied streams, the highest phytoplanktonic densities were recorded in the dry season compared to the flood periods. Nwamo (2019) also concluded from the same work that the highest specific richness is observed in the dry season while the rainy season shows the lowest specific richness. During the dry season, the high temperatures allow the development of phytoplanktonic algae. In contrast, during the rainy season, run-off water transports various zooplankton species that used to live in small water collections (ponds, gutters), and sometimes as cysts in various soils, to the watercourses and thus enriches these watercourses. In addition, according to Kemka et al. (2004), small-sized algae appear at the beginning of the dry season encouraged by the rise in temperature, the drop in the hydrological regime (current speed), and the drop in turbidity favoring the penetration of light in the water course. According to Groga (2012), phytoplankton start to develop in October, at the end of the rainy season, when the thermal stratification that takes place stabilizes the surface layer; the algae at this time of year have an already intense beginning of illumination and a high concentration of nutrient salts, which are brought back into the euphotic zone during the vertical mixing of the waters that takes place during the rainy season.

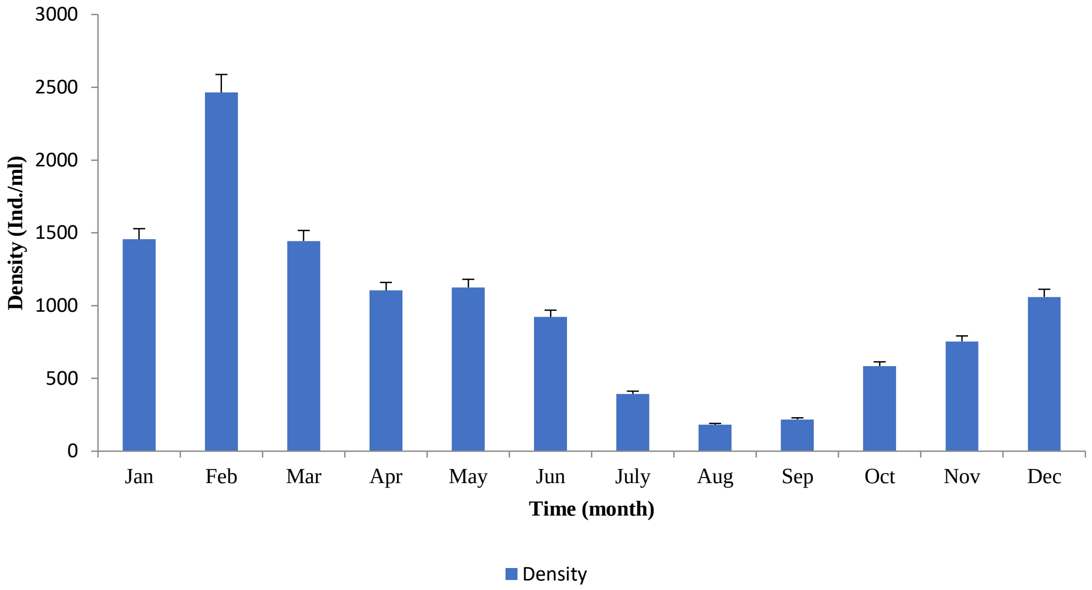

Figure 4: Variation of total density according to the months (Ind. = individual)

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Distribution of Genera and Physicochemical Parameters according to Study Sites

Multiple component analysis showed in different study sites correlation between chemical parameters and biomass of different genera (Fig. 5). The more the site was polluted, the more the biomass of *Navicula*, *Tabellaria*, *Melosira* and *Coscinodiscus* increased. On the contrary, the less the site was polluted, the more the biomass of *Cyclotella*, *Gomphonema, Cocconeis*, *Gyrosigma*, *Synedra* increased. Some genera like *Diatoma*, *Rhopalodia*, *Luticola* and *Eunotia* were present in Site(s) 2 and/or 3 where chemical parameters were high. However, *Cymatopleura* was present only in Site 1 with low chemical parameters. This showed that the distribution of diatom species in the different study sites was influenced by a set of conditions related to physicochemical parameters. These results were like those obtained by Dibong and Ndjouondo (2014b) in the Tongo'o Bassa river and on the Kondi by Nwamo (2019). According to Kouefout (2016), species are distributed in environments with respect to the nature of pollutants and their level of resistance to pollutants. These authors showed that *Navicula* genus were resistant to organic pollution.

The distribution of diatoms is not randomly in the aquatic ecosystem, but grouped in association whose elements substantially have the same ecological requirement (Ndjouondo et al., 2020). Thus, the absence of certain genera in the study sites would be due to the abiotic condition of their biotope. CIPR (2009) explained that epilithic diatoms are sensible to water quality variation.

Each community is adapted to specific conditions of salinity, pH, light and oxygen and to specific concentrations of organic matter and nutrients. The structure of diatom communities, i.e., the relative abundance of each of the species present, thus provides a fairly precise indication of the environmental conditions prevailing in a river. A community of diatoms integrates all the physicochemical variations that an aquatic environment undergoes over a period of a few weeks (Grenier et al., 2018). Algae use, among other things, phosphorus and nitrogen dissolved in river water for their growth. Pollution sources that release phosphorus and nitrogen therefore have a direct influence on the composition of diatom communities. Among these sources of pollution, the most important are the spreading of agricultural fertilizers, soil erosion, municipal or domestic wastewater effluents and certain industries. Diatoms are also sensitive to the enrichment of water in organic matter and to the increase in the concentration of dissolved minerals. They are further affected by metals and pesticides. Indeed, the indicator species of hypereutrophic environments are likely to live in environments with very low dissolved oxygen concentrations, characteristic of advanced eutrophication (Sladecek, 1983; Zebaze, 2008; Liebmann, 1962). In a eutrophic environment, the response time of diatoms is about 5 weeks following variations in nutrient concentrations (Campeau & Lacoursiere, 2020).

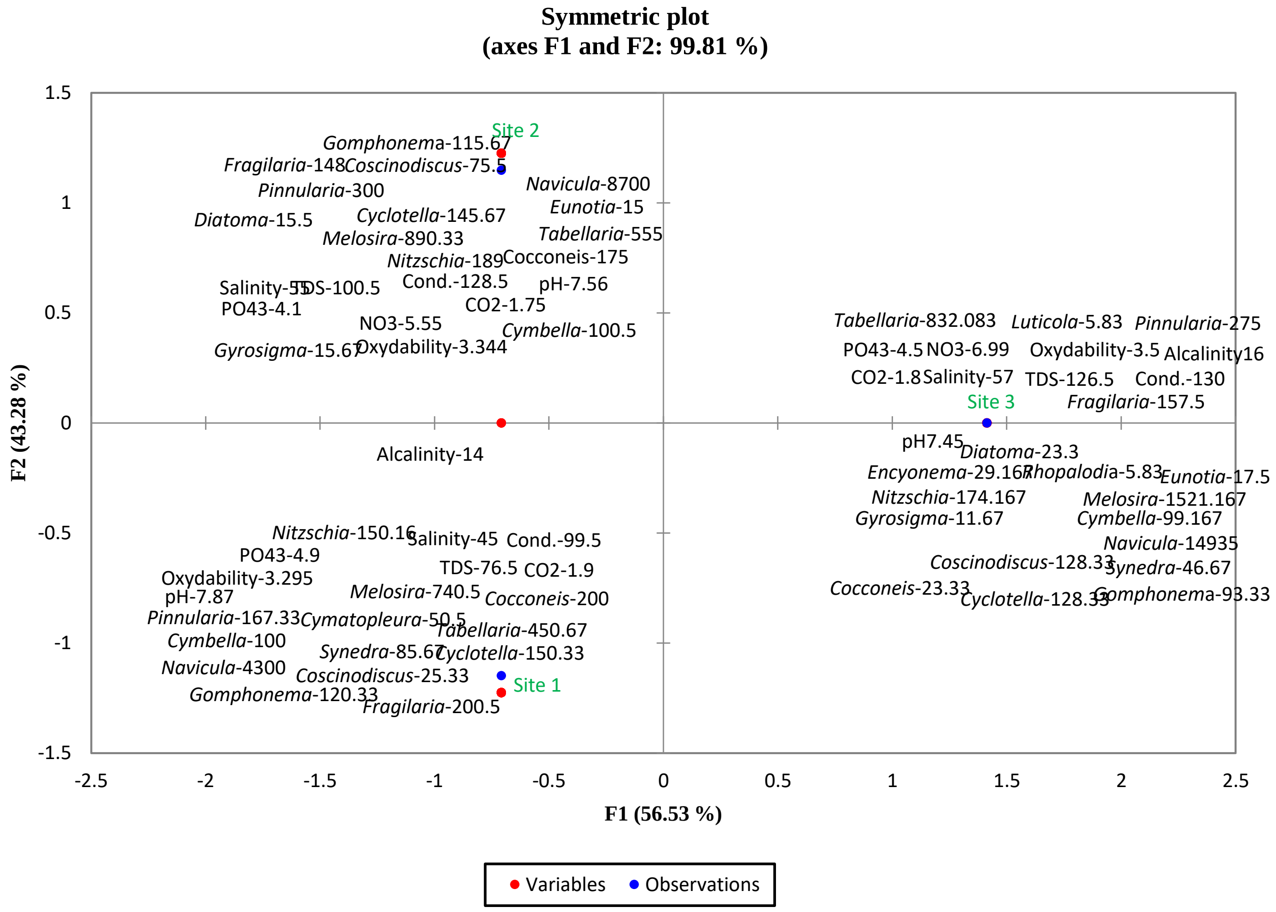

Figure 5. Distribution of diatoms according to physicochemical parameters in the study sites

CONCLUSION

The general objective of the study was to determine the influence of some physicochemical parameters on the diatom densities in the Mezam river (Bamenda, Cameroon). Salinity, conductivity and total dissolved solids varied significantly different from Site 1 to other sites. The species varied very little from one site to another. The only difference was observed at the level of the density for cosmopolitan genera which increased from the less polluted site (Site 1) to the more polluted Site (site 3). The dominant and cosmopolitan genera were *Navicula*, *Tabellaria*, *Melosira* and *Coscinodiscus*. The biomass of diatom communities was influenced by anthropogenic activities. Thus, physicochemical parameters had an influence on density and distribution of diatoms in the Mezam river (Bamenda, Cameroon). Monitoring, based on biological indices of algae, could be developed to prevent the risk of disturbance due to the mode of pollution in the rivers.

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