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Original Research Article

Relative Growth and Morphometric Characterization of Mangrove Oyster, *Crassostrea gasar* of the Lagoons Ebrié and Aby (Côte d'Ivoire)

YAPI Jean Noel*[1], BLE Mélecony Célestin[2], ETCHIAN Assoi Olivier[1], KADJO Vincent[1], YAO Kouakou[1]
[1]Formation Unit and Research of Nature Sciences, University Nangui Abrogoua, 02 PB 801 Abidjan, Côte d'Ivoire
[2]Aquaculture Department, Centre of Oceanology Research, B.P.V 18 Abidjan, Côte d'Ivoire

***Corresponding Author:**
YAPI Jean Noel
Email: yapinoel83@gmail.com

Abstract: This work characterizes the growth of mangrove oyster, *Crassostrea gasar* of two lagoons of Côte d'Ivoire: the Ebrié lagoon; on the level of Grand-Bassam and Azito and the Aby lagoon; on the level of Assinie. Thus, a monthly sampling of 30 oysters per site for 12 months (October 2015 at September 2016), during which the physico-chemical parameters of water were recorded. The results of the study show an almost similar evolution of the physico-chemical parameters of the three sites. However, the sites of Assinie and Azito recorded a salinity, although lower than 10‰, high compared to that of Grand-Bassam. The results of morphometric analyses plead in favour of a negative allometry for the two relations in particular, size-sizes relations and size-weight relations. However, the individuals of Assinie present the best values of growth coefficient (b). According to PCA, the individuals of Assinie are identifiable by a weight of flesh and a width of higher bodies. Those of Azito are characterized by a thickness of body, a weight of shell, and a body weight more marked. As for the individuals of Grand-Bassam, they don't present any distinguishing mark making it possible to characterize them. This study shows, the necessity to install a durable strategy of management of oyster stocks of our lagoons. It would be interesting to envision the culture of the oyster which remains an important food product of socio-economic interest.
Keywords: Morphometric Characterization, Mangrove Oyster, *Crassostrea gasar*, Lagoons, Cote d'Ivoire.

INTRODUCTION

The mangrove Oyster *Crassostrea gasar* Dantzenberg is a bivalve mollusc endemic of the West-African coastal zones, of Senegal to Angola [1, 2] and East South-American [3]. It constitutes in certain countries, like Benin and Senegal, a source of animal protein and an important economic resource for the coastal populations [4-7]. Côte d'Ivoire does not make exception. Indeed, localized in the ecosystems called mangrove [8], this oyster is present in Côte d'Ivoire, in the mangroves of the lagoons Ebrié and Aby inter alia, where it has a considerable socio-economic role for the coastal populations [9]. Starting from works made recently, these last authors announced a fall of the captures and a reduction more and more of the size of the specimens. Vis-a-vis this situation which constitutes a threat for the sector of oyster in Côte d'Ivoire, it would be judicious to pose the bases of a durable exploitation of the species for a conservation of the biodiversity. However, that would not be possible without a preliminary knowledge of the bio-ecology of the species. The knowledge of the environmental parameters and the relative growth of oysters of our lagoons, in particular the Ebrié lagoons and Aby, where the activity of gathering is much practised, are to be considered. Indeed, according to Pouvreau and Prasil, the growth constitutes a useful indicator of health of oyster and the suitability of the environment, because it represents the integrated response of all physiological activity of body. In addition, the evaluation and the management suitable of oyster stocks, pass necessarily by the knowledge of the ratios morphometric, inter alia, the relation weight-length [10].

Thus, this work aims at characterizing the relative growth of oysters of the lagoons Ebrié and Aby, starting from oyster samples collected in the localities of Assinie, Grand-Bassam and Azito. That will be based on the determination of the nature of the allometry of growth and the principal component analysis (PCA) of the various morphometric reports or variables.

MATERIAL AND METHODS

Study area

The sampling of this work was carried out in two coastal lagoons of Côte d'Ivoire. In particular, the Ebrié lagoon and the Aby lagoon. Concerning the Ebrié lagoon, two localities were retained: that of Grand-Bassam and Azito. While Assinie was the only locality retained for the Aby lagoon. The Figure 1 gives a glance of the study zone.

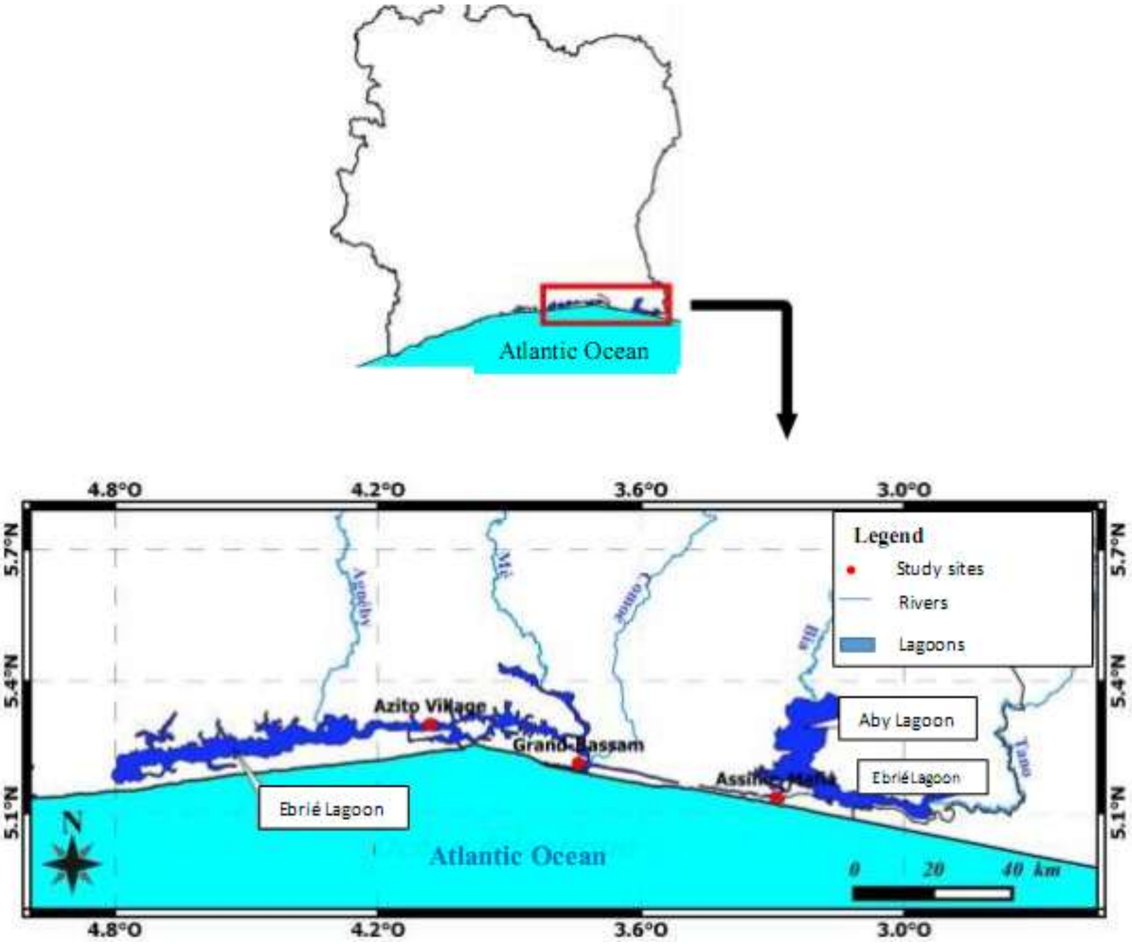

Fig-1: Geographical situation of the study sites (Assinie, Grand-Basszam and Azito) on the level of lagoons Ebrie and Aby

Biological material

The study was carried out on a sample of 1080 oysters because of 360 oysters per site. The size of the individuals varied from 5.3 to 10.9 mm for Grand-Bassam; from 4.1 to 11.2 mm for Assinie and from 4.4 to 10.1 mm for Azito. As for the weights, it varied from 17.65 to 105.22g for Grand-Bassam, 26.11 to 155.25g for Assinie and 17.81 to 129.8g for Azito.

Sampling

The study of the relative growth required a monthly sampling of 30 oysters per site for 12 months, from October 2015 to September 2016. These different samplings were coupled with the measurement of the physico-chemical parameters of water of each site, thanks to a Multiparameter of mark Bante 900P.

Remark

The choice of oysters for this study was made according to whether the oyster is fixed alone on the substrate or, when it was in group with other oysters, the selected oyster should not be a substrate for the other oysters. This sampling procedure finds its explanation in the fact that the oyster, when it is used as substrate for other oysters, presents a delay of growth but also, a morphological irregularity. What could skew the results of linear and ponderal parameters, necessary for a good appreciation of the nature of the allometric relation.

Characterization of the relative growth of oysters

The study of the relative growth required the measurement of the linear and ponderal parameters of the different oysters. Thus, measurements of sizes were taken using a slide caliper of precision 0,01mm, and the weighing, thanks to an electronic scales of SARTORIUS model and 0.01g precision. In addition, in order to establish the allometric relations binding the metric parameters between them on the one hand and the metric parameters to the ponderal parameters on the other hand, a certain number of parameters were determined for each oyster. It is about:

- The total length (L): Dimension which separates the anterior edge from the posterior edge
- The width (l): Dimension which separates the dorsal edge from the ventral edge
- The thickness (E): Dimension which is given by the convexity of the two valves

- The total fresh weight: (Pt): Body weight of the individual after withdrawal of the foreign bodies of the shell
- The weight of the fresh flesh (Pch): fresh visceral weight, drained during at least 30 minutes on filter paper
- The weight of the empty shells (Pc): weight of the two valves after insulation of the visceral mass.

The characterization of the relative growth of the individuals of the different sites was done starting from the principle of simple allometry of Le Cren, which is in the form: $\mathbf{y = ax^b}$ [11]**.** In this equation which is a curvilinear function, (y) is the dependent variable (dimension or weight of the studied body), (x) is the independent variable representing the reference length, (A) is a constant and (b) is the coefficient of allometry, representing the slope in the linearized form of the equation. The linearization of the equation ($y = ax^b$) passes by a logarithmic transformation which brings back it to a new equation of the form: Log y = Log a + b Log x.

It is thanks to this new equation that the coefficient of allometry (b) or coefficient of growth has been determined. The determination of this slope permitted to determine the nature of allometry by the comparison (thanks to the T test of Student with 5% like threshold of error), of the computed value of the slope (b) to the theoretical value 1 in the case of allometric relation binding two linear parameters, or 3 when it was question of relation binding a linear parameter to a parameter de weight. In the case of the use of linear measurements of the species, three cases can arise. When $b = 1$, the growth is isometric. If $b < 1$, the growth is negative and if $b > 1$, the growth is positive. With regard to the relative growth, it was shown that the weight increases in general proportionally to the cube of the length. For the ponderal relation, three cases can also arise. Thus, when $b = 3$, the growth is isometric. When $b < 3$, the growth is negative and when $b > 3$, the growth is positive. In the case of isometry, the proportions of the body evolve in the same way. However, in the last two cases, the growth of a parameter is proportionally inferior or superior to the growth of the character of reference.

Principal component analysis (PCA)

The Principal component analysis (PCA) is a statistical method appropriate to the multidimensional data, when all the variables observed are of numerical type, preferably in the same units and that one wants to see whether there are bonds between these variables. Thus, this technique is a mathematical method used to reduce a complex system of correlation at a smaller number of dimensions. In other words, the PCA is a method of reduction of the number of characters permitting geometrical representations of the individuals and the characters. It builds new artificial variables and geometrical representations which make it possible to visualize relations between variables as well as the possible existence of groups of individuals and groups of variables. The correlations are synthesized in an imaginary circle to two axes or more. Each axis representing a principal component. We look at the position of the variables compared to this axis. If the variables are close to the positive direction of the axis, then they are correlated, on the other hand if they are close to the negative direction of the axis, then they are anti-correlated. The points will be compared between them only if they are close to the circumference of the circle.

Statistical analysis

The software used for the various statistical analyses is xlsat version 2014.5.03. Thus, the different coefficients of growth calculated were compared with the theoretical values of the slope b using a test "t" of Student in order to appreciate if the difference is significant. While, the morphometric reports of the individuals of the three sites and the variances of these reports were the subject of an anova test to one factor. In addition, the characterization of the sites according to the morphometric reports of oysters was made by a principal component analysis with the same software.

RESULTS

Physical and chemical parameters of the Ebrié lagoon on the level of Grand-Bassam and Azito and Aby lagoon on the level of Assinie

The table I presents the physico-chemical parameters of the three sites of study during the 12 months of sampling. These parameters concern the depth, the transparency, temperature, the pH, dissolved oxygen and salinity. These different parameters are in general similar on the level of the three sites, except the salinity which is higher in Azito and Assinie compared to the site of Grand-Bassam.

Table 1: Monthly evolution of the Physico-chemical parameters of the lagoon Ebrié and Aby on the level of the points of samplings (Assinie, Grand-Bassam and Azito)

Month	Sites	Physicochemical Parameters					
		Depth	Trans	Temp	pH	DO	Salinity
October	Assinie	0.73±0.49	0.57±0.21	28.22±0.50	7.45±0.32	5.71±0.28	5.16±0.85
	Bassam	0.90±0.26	0.80±0.10	28.91±0.49	7.44±0.09	5.41±1.10	4.21±0.91
	Azito	0.70±0.17	0.70±0.17	27.91±0.51	7.58±0.09	5.94±0.56	8.89±1.06
November	Assinie	0.73±0.49	0.57±0.21	28.96±0.14	6.84±0.19	5.05±0.56	3.22±0.86
	Bassam	0.90±0.26	0.80±0.10	28.53±0.68	7.44±0.09	5.63±0.58	2.76±0.97
	Azito	0.70±0.17	0.70±0.17	28.43±0.12	7.18±0.07	5.65±0.81	6.88±2.77
December	Assinie	0.73±0.49	0.57±0.21	28.90±0.81	7.11±0.01	6.55±0.18	2.87±0.46
	Bassam	0.90±0.26	0.80±0.10	28.89±0.23	7.25±0.13	5.59±0.54	2.57±0.54
	Azito	0.70±0.17	0.70±0.17	28.61±0.80	7.22±0.02	5.87±0.46	7.04±0.02
January	Assinie	0.73±0.49	0.57±0.21	28.90±0.75	7.39±0.30	5.71±0.28	4.78±0.59
	Bassam	0.83±0.23	0.77±0.12	29.13±0.65	7.30±0.16	5.41±1.10	3.63±0.54
	Azito	0.70±0.17	0.70±0.17	28.70±0.92	6.85±0.14	5.87±0.48	5.62±1.03
February	Assinie	0.66±0.38	0.57±0.21	27.94±0.12	6.89±0.07	6.01±0.22	2.34±0.91
	Bassam	0.90±0.26	0.83±0.15	29.12±0.29	7.26±0.11	5.39±0.93	2.81±1.52
	Azito	0.70±0.17	0.70±0.17	28.41±0.07	7.41±0.05	6.14±0.60	5.75±1.08
March	Assinie	0.63±0.32	0.57±0.21	28.23±0.55	7.45±0.32	6.15±0.13	2.82±0.55
	Bassam	0.80±0.01	0.77±0.06	28.80±0.30	7.44±0.09	5.61±0.80	2.01±0.23
	Azito	0.70±0.17	0.70±0.17	27.67±0.23	7.41±0.15	6.45±0.42	5.56±1.32
April	Assinie	0.60±0.26	0.57±0.21	28.57±0.78	7.45±0.32	6.02±0.40	3.16±1.82
	Bassam	0.80±0.10	0.77±0.06	28.80±0.30	6.44±0.09	5.20±0.67	2.29±1.40
	Azito	0.70±0.17	0.70±0.17	29.30±0.46	7.74±0.09	5.66±0.15	5.41±1.32
May	Assinie	0.57±0.21	0.57±0.21	28.57±0.32	7.45±0.32	5.90±0.23	4.25±0.38
	Bassam	0.80±0.10	0.80±0.10	28.80±0.30	6.91±0.32	5.68±0.30	2.05±0.32
	Azito	0.70±0.17	0.70±0.17	27.67±0.23	7.41±0.30	5.90±0.24	6.55±1.05
June	Assinie	1.10±0.34	0.70±0.00	27.56±0.32	7.15±0.05	5.33±0.51	9.66±1.23
	Bassam	1.13±0.25	0.80±0.10	28.13±0.35	7.14±0.03	5.14±0.29	2.08±0.27
	Azito	1.00±0.10	0.70±0.17	27.20±0.15	7.21±0.08	5.03±0.23	7.26±1.41
July	Assinie	0.97±0.46	0.70±0.10	27.61±0.26	6.97±0.06	6.08±0.30	8.84±1.36
	Bassam	1.13±0.32	0.80±0.17	27.89±0.68	7.38±0.09	5.33±0.42	5.14±1.24
	Azito	0.90±0.10	0.70±0.17	27.70±0.21	7.46±0.08	5.37±0.71	8.59±1.20
August	Assinie	1.10±0.43	0.77±0.12	27.51±0.06	7.51±0.34	6.40±0.77	8.90±1.29
	Bassam	1.10±0.26	0.93±0.15	27.83±0.50	7.36±0.06	5.09±0.76	3.64±0.37
	Azito	1.03±0.35	0.70±0.17	27.51±0.20	7.23±0.07	5.38±0.21	8.43±1.32
September	Assinie	0.90±0.44	0.77±0.21	28.19±0.14	7.45±0.32	5.73±0.53	7.35±1.21
	Bassam	1.07±0.29	0.87±0.12	27.65±0.16	7.44±0.09	5.59±0.92	2.76±0.29
	Azito	0.87±0.15	0.70±0.17	27.67±0.23	7.41±0.15	5.80±0.23	8.93±1.10

Evolution of temperature, pH and salinity of waters of lagoons Ebrié and Aby on the level of study sites from October 2015 to September 2016

The analysis of figure 2 below, shows an evolution constant and similar of the water temperature of the three sites (Assinie, Grand-Bassam and Azito). It is the same for the pH. The average for the three sites being of 28.28±0.22°C for the temperature and 7.28±0.06 for the pH. Salinity alone varied on the level of the three sites. Indeed, the values of salinity on the level of Assinie varied of 2.34‰ to 5.16‰ from October to May, with an average of 3.58 ± 1.02‰ and 7.35‰ to 9.66‰ from June to September, with an average of 8.69 ± 0.32‰. As for Grand-Bassam, salinity varied between 2.05‰ and 4.21‰ during all the period of the study. The average was of 2.99 ± 0.97‰. Lastly, Azito recorded a salinity located between 5‰ and 9‰ during the 12 months of samplingThe average was of 7.08 ± 1.35‰ and the strongest values were recorded during the months going from July to October. However, on the three sites, salinity remained below 10%.

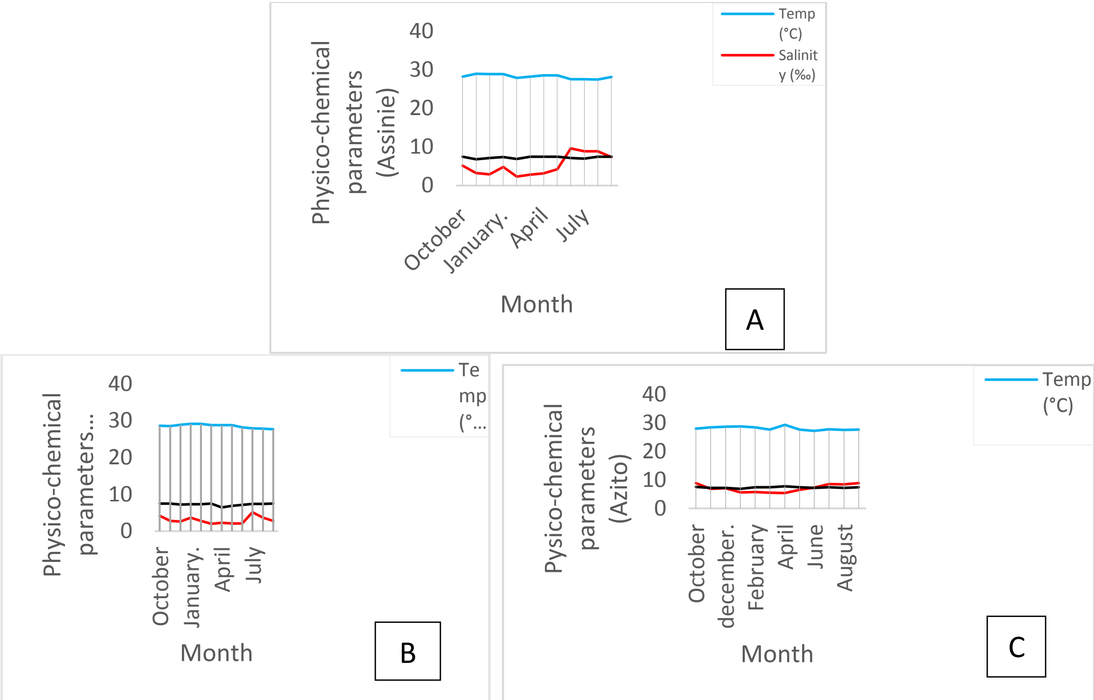

Fig-2: Evolution of the temperature, salinity and pH on the sites of studies: (A) Assinie; (B) Grand-Bassam and (C) Azito

Morphometric characterization of oysters in Assinie, Grand-Bassam and Azito

The table 2 shows coefficients of determinations (R^2) vary from 0.31 to 0.85 in Azito;from 0.08 to 0.5 in Grand-Bassam and 0.26 to 0.90 in Assinie. These values show that of the three sites, Grand-Bassam remainder the site whose existing relations in the reports binding the various linear and ponderal characters to the reference length are correlated slightly, therefore disproportionate. While Azito and Assinie record more or less high correlation of these relations. For the linear relations, the value of the slope (b) varies from 0.21 to 0.75 in Azito, 0.90 to 0.94 with Grand-Bassam and 0.97 to 1.12 in Assinie. However, for the ponderal relation binding the mass to the reference length, the value of this slope (b) varies from 1.13 to 1.77 in Azito; from 1.91 to 2.26 in Grand-Bassam and 2.62 to 2.82 in Assinie. These values of the coefficient of allometry (b) show in their great majority, a negative allometry of the different reports morphometric on the level of the three sites of study ($P < 0.05$). Consequently, this reveals that the oysters present in the lagoons Ebrié and Aby and especially, those of the sites of Assinie, Grand-Bassam and Azito accuse a notable lateness of growth.

Table 2: Relations binding the linear and ponderal characters to the reference length to the level of the three sites

Sites	Morphometric Relation	Equation	R^2	Nature of allometry	P > F
	Pt/L	$Pt = 0.2L^{2.82}$	0.85	negative	***
	Pc/L	$Pc = 0.21L^{2.67}$	0.90	negative	***
Assinie	Pch/L	$Pch = 0.034L^{2.62}$	0.90	negative	***
	l/L	$l = 0.68L^{0.97}$	0.50	negative	**
	E/L	$E = 0.32L^{1.12}$	0.26	positive	***
	Pt/L	$Pt = 0.4061L^{2.47}$	0.5	negative	***
	Pc/L	$Pc = 1.08L^{1.91}$	0.46	negative	***
Grand-Bassam	Pch/L	$Pch = 0.04L^{2.56}$	0.2	negative	***
	l/L	$l = 0.77L^{0.94}$	0.37	negative	**
	E/L	$E = 0.46L^{0.90}$	0.08	negative	***
	Pt/L	$Pt = 2.20L^{1.77}$	0.85	negative	***
	Pcoq/L	$Pc =7.77L^{1.15}$	0.7	negative	***
Azito	Pch/L	$Pch = 1.199L^{1.13}$	0.31	negative	***
	l/L	$l = 3.99L^{0.21}$	0.5	negative	***
	E/L	$E = 0.80L^{0.75}$	0.4	negative	***

E: Thickness, l: width, L: reference length, Pt: body weight, Pc: Shell weight, Pch: flesh weight, R^2: Coefficient of correlation, ***: P, < 0.001**: p < 0.01;

Morphometric relations Analysis

The table 3 presents the averages of morphometric relationships at the level of the three sites of study. The comparison inter site of these average shows that they are statistically different to each other ($P < 0.05$). The reports such as Pt/L, Pcoq/L, E/L and l/L are higher at Azito compared to the two other sites. Indeed, the value of Pt/L of Azito is 1.04 and 1.06 times respectively higher than that of Grand-Bassam and Assinie. That of Pcoq/L of Azito is 1.04 and 1.03 times respectively higher than that of Assinie and Grand-Bassam. The superiority of the value of report E/L of Azito on that of the two other sites is 1.03 at Assinie and 1.05 at Grand-Bassam. This superiority is also noted at the individuals of Azito in the case of the l/L report which is 1.13 and 1.14 times respectively higher than that of the individuals of Assinie and Grand-Bassam. However, as regards the Pch/L report, it is significantly higher at the individuals of Assinie of 1.55 and 1.36 times respectively that that of the individuals of Grand-Bassam and Azito. All things considered, the weight and the volume of the body is higher at the individuals of Azito. While the weight flesh of the oysters of Assinie seems more furnished.

Table 3: Characterization of morphometric reports of the oysters of the three sites (Assinie, Grand-Bassam and Azito)

R/m	Sites	Manpower	Average R/m	t	P > F
	Assinie	360	10.74 ^{c}		
Pt/L	Bassam	360	11.02 ^{b}	*158.72*	***
	Azito	360	11.46 ^{a}		
	Assinie	360	8.35 ^{c}		
Pcoq/L	Bassam	360	8.30 ^{b}	*94.61*	***
	Azito	360	8.59 ^{a}		
	Assinie	360	1.71 ^{c}		
Pch/L	Bassam	360	1.10 ^{b}	*55.48*	***
	Azito	360	1.26 ^{a}		
	Assinie	360	0.71 ^{c}		
l/L	Bassam	360	0.70 ^{b}	*33.89*	***
	Azito	360	0.80 ^{a}		
	Assinie	360	0.39 ^{c}		
E/L	Bassam	360	0.38 ^{b}	*48.78*	***
	Azito	360	0.40 ^{a}		

E: Thickness, l: width, L: reference length, Pt: body weight, Pc: Shell weight, Pch: flesh weight, ***: $P < 0.001$, R/m: morphometric relation

Principal components Analyze (PCA) of the different variables

The characterization of the individuals is based on a principal components analysis (PCA) of morphometric reports, as the figure 3 shows it. Globally, the PCA was carried out on a matrix of data made up of 1080 observations or individuals. The results of the execution of the PCA showed a graph with two axis (F1 and F2). The first axis F1 contributed to 52.45% of the total inertia and the second axis F2 as for him contributed to 23.66% of the total inertia. The two axis F1 and F2 absorbed on the whole, 76.11% of the total variation. The first component (F1) is characterized by a positive contribution for the whole of the variables except that the correlation is narrower with the three variables that are Pt/L, Pc/L and E/L. The second component (F2) presents a negative correlation for the variable Pt/L and Pc/L and a positive correlation for the variables Pch/L, l/L and E/L. However, the contribution of the axis F2 for the variable Pch/L and l/L remain narrower. According to the PCA carried out, the individuals of the three analyzed sites can be classified in two groups. The first group is identifiable by thick individuals with a high total weight and a high shell weight which present a positive correlation with factor 1. The second group is identifiable by individuals broad and furnished in flesh, who present a positive correlation with factor 2.

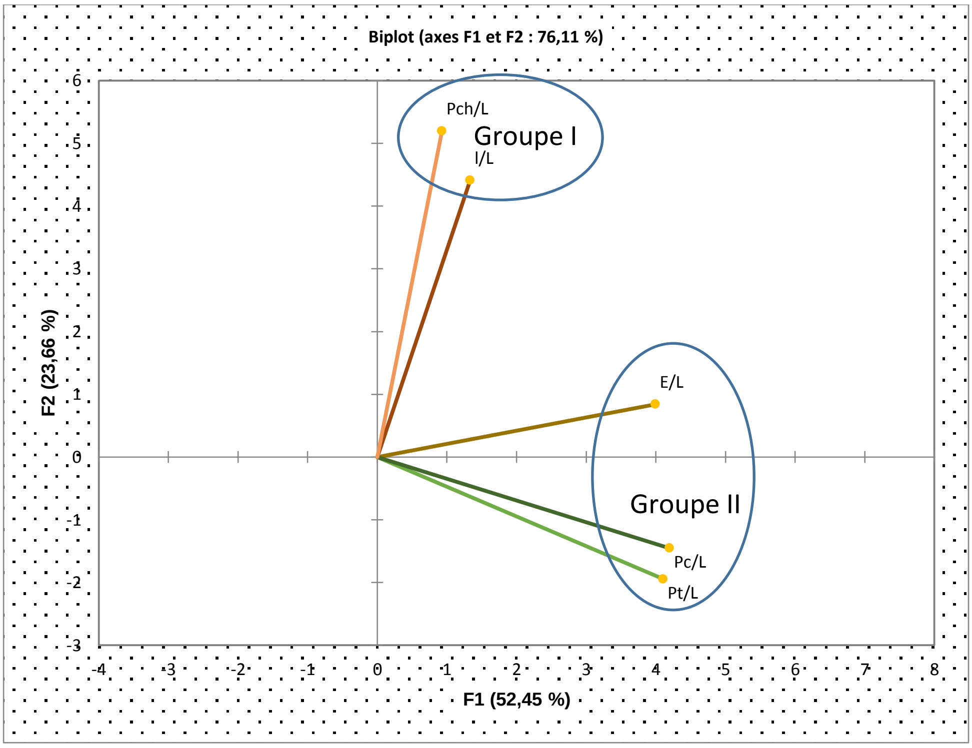

Fig-3: Morphometric characterization of the individuals of the three sites by principal components analysis (PCA)

Characterization of the different sites according to the morphometric reports of sampled oysters

The Figure 4 presents the correlation between the variables and the sites of sampling through a principal components analysis (PCA). In this part, the PCA was carried out on a matrix made up of the averages of the variables characteristic of the individuals presenting a correlation with the two axis (F1 and F2) of the first PCA. Thus, for this present analysis, the first axis contributed to 72.68% of the total inertia while the second axis contributed to 27.32% of the total inertia. That is to say a contribution of 100% for the two axis. On the level of the characterization of the sites, it arises that the site of Azito is characterized by individuals of total weight (Pt/L), shell weight (Pc/L) and body thickness (E/L) important.The site of Assinie is characterized by individuals of flesh weight and body width remarkable. However, the graph shows that the site of Grand-Bassam is not characteristic of any of the five studied variables.

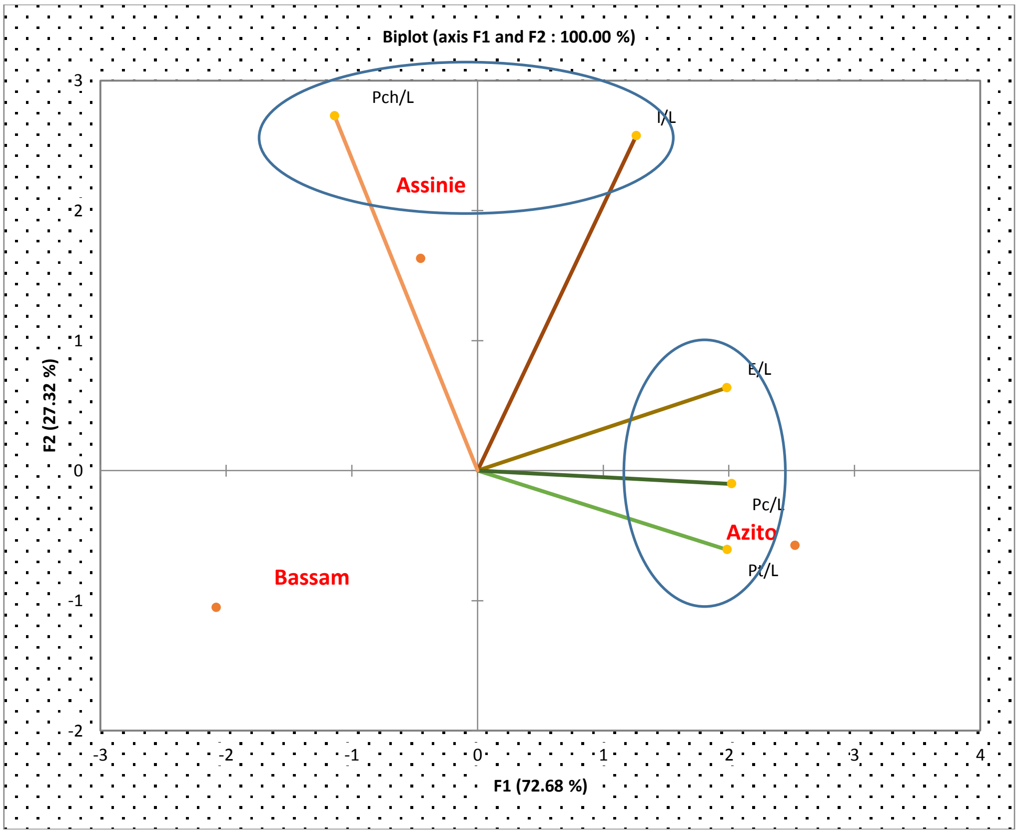

Fig-4: Characterization of the sites according to the morphometric reports of the individuals by principal component Analysis (PCA)

DISCUSSION

The study of the relative growth of oysters required a biometric characterization and a principal component analysis of the variables. Thus, the characterization biometric of *C. gasar* has permitted to observe, for all the sites, allometry coefficients (b) lower than 1 for the model binding the reference length to the various linear variables and lower than 3 for the model binding the reference length to the various ponderal variables. It thus acts, of a negative allometry in its general tendency. In other words, the speed of growth in length is faster than the speed of the growth in width, thickness and weight. Or, the growth of the linear and ponderal parameters is proportionally lower than the growth of the length of the shell, which is regarded as being the reference length. Therefore, the animals sampled on the three sites of study record a growth lateness. This lateness observed in these animals, could be partly due to physico-chemical disturbances, in particular salinity. Indeed, the works of Grizel showed that the mangrove oyster thrived in environments where salinity varies between 10‰ and 60‰ [12]. Whereas, the values of salinity recorded in this test on the level of the three sites of study are below this interval, therefore below 10‰. Moreover, our works corroborate those of certain authors [13-15]. These authors showed that at the bivalve molluscs, the physico-chemical disturbances (temperature, salinity, dissolved oxygen etc.) and the stresses are factors strongly impacting the physiological reaction. In addition, this lateness could be due to a possible pollution and or pathogenic agents present in water. Indeed, according to works of some authors, the coastal lagoons of Côte d'Ivoire and in particular the Ebrié lagoon receive permanently the industrialists rejections and of the great hospitals [9]. The works of different authors had also shown similar results [14, 15]. These authors had shown in their works that pathologies and the toxic efflorescence of phytoplankton have a considerable impact on the physiological response of bivalve molluscs. They have also showed that the pathogenic bacteria and certain protozoa parasitic are often factors limiting the production of bivalves. In Bahrayn, Beaumont and Khamdan showed a significant difference of the morphometric characters of several populations of *Pinctada radiate* [16]. These authors imputed these differences to the environmental conditions, in particular, the abundance of food and factors Physico-chemical like the temperature and salinity. A comparative study undertaken between certain populations of *P. radiata* along the Tunisian coasts, showed the same report [17, 18]. The predominance of total weight and shell weight of Azito individuals compared to those of the two other sites could be due to a higher level of pollution on the one hand and to a low level of oysters gathering of this site on the other hand. Indeed, of the three sites of study, Azito is that which receives more, the urban and suburban rejections [9]. This continuous aggression of its environment would push oyster to a physiological adaptation to maintain its corpulence. Thus, this situation would push it to direct most of its energy to the reconstitution and the maintenance of its physical condition. In addition, the oysters of this site not being under the anthropic pressure have time to develop and solidify their shell. These results go in the same direction as those of Lubet [19]. This author specified that the ponderal growth is influenced, inter alia factors, by the temperature which has a direct action on the kinetics of the gametogenesis whose resultant is the competition between the somatic and germinal compartments inducing a significant ponderal growth of the individuals. It is moreover that which would explain the results of the principal component analysis (PCA), which are in favor of a high value of flesh weight in Assinie and the high values of body weight and shell weight in Azito. The absence of characteristic variable of the oysters of Grand-Bassam would be due to the very low values of salinity recorded during all the duration of the study. Since, the oyster thrives only in environments where salinity varies between 10‰ and 60‰ and the temperature between 27°C and 38°C [12]. Globally, the presence of two groups within the oysters population studied could be explained by the physiological properties acquired for a good adaptation to the environmental conditions of their respective habitat. Thus, these differences between the individuals of the same species could translate an acclimatization to the environmental conditions of the habitat or a genetically established adaptation to the level of the populations of the same environment of life. Indeed, according to other authors, in a given geographical site, each population acquires physiological properties for an adaptation to the conditions of the habitat such as the abundance of food, the temperature, salinity as well as pollution [20].

CONCLUSION

The study of the relative growth of mangrove oyster, *Crassostrea gasar* sampled in the lagoons Ebrié and Aby, precisely, on the level of Assinie, Grand-Bassam and Azito, shows that lagoons of Côte d'Ivoire are characterized by a weak content of salinity during all the year, with values of salinity lower than 10‰. In addition, this study shows that the oysters of these lagoons, on the level of the study sites are characterized by a negative allometry. However, the value of the coefficient of growth (b) is better on the level of the site of Assinie. Also, the oysters of Assinie are characterized by a high flesh weight, while those of Azito are turned towards high total weight and shell weight. The individuals of Grand-Bassam as for them, are characterized by no physical mark. Within sight of these results, the government of Côte d'Ivoire must make provisions for a restoration of physico-chemical quality of its lagoons. The permanent communication of these lagoons with the sea would be an initiative of solution. Also, it would be interesting to push this study by a histopathologic characterization of the oysters of our lagoons.

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