Original Research Paper

OPEN ACCESS

Morphometric characterization and identification of sardines at the Ghazaouet station and Béni-Saf bay

Hattab M. Gaouar S.B.S*.

Laboratory of Physiopathology and Biochemistry of Nutrition, Department of Biology, University of Tlemcen, Algeria.

Corresponding Author: **Gaouar SBS**, *university of Tlemcen, Algeria*; Email: suhelgaouar@gmail.com

Abstract

The seafood products are part of the animal protein resources and a wide variety of mineral salts, among which is produced sardine (Sardina pilchardus) which has a very important commercial and economic interest in the world. In Algeria, although its coastline covers a large area, it has generally apear a decrease in the amount of sardine landed in recent years especially in the west coast. The sardine does not have the same economic value, according to its origin, this species can have prices and or a frequency of sale different, it is the case of our two studied population or the sardine of the Béni-Saf bay is appreciate more than of the region of Ghazaouet. Indeed, we made morphometric measurements of five parameters (weight (W), total languor (LT), length of muzzle to fork (LM), length between anal fin and muzzle (LA), the length between the anal fin and the pelvic fin (LP)) after two samplings at the edge of a sardine boat at two stations, one located at Ghazaouet and the other at the level of Béni-saf with a total number of samples equal to 199 individuals. It appears from the analysis of the results that the weight has a highly significant correlation with the total length at the level of the Béni-saf. The same observation was made in Ghazaouet but with less intensity. The parameter (weight) analyzed showed a clear superiority of the Béni-Saf population to that of the population of Ghazaouet. This work also proved to us that the population of Béni-saf and Ghazaouet are well individualized and therefore justifies their own identity on the market. For more scientific precision blood sampling (50 samples for each population) was carried out for subsequent molecular characterization studies.

Keywords: Morphometric measurements, Sardine and North-West Algeria

Introduction:

Historically, in many parts of the world, seafood is one of the animal protein resources. Increasingly, many people think of fish as a substitute for red meat, which is considered to be better for the health and very digestible with a wide variety of mineral salts, trace elements and vitamins which are constant characteristics of the meat fish and make it unique in the animal world (Martin, 2001 and EFSA, 2018).

The sardine it's highly consumed in Algeria (especially in the coastal regions), is subject to variations that determine its distribution and biomass, particularly the plankton content, the hydrology and the temperature of the water. Each area is characterized by a particular diet that is determined by seasonal differences in temperature, food availability, water column stability, upwelling, currents, winds and bottom topography and coastal configuration, which determines the water circulation pattern thus affecting the environmental and biological gradient (SARDYN Project, 2006). The hydrodynamic environment in which sardine lives is important because this animal lives in water columns located between the surface and 150 m depth in the coastal zone and on the continental shelf (Schwartzlose et al., 1999, Cury et al. 2000). This environmental situation, created, especially in the region (the coasts of the Tlemcen region) of our study an appellations has an economic impact whose foundation is due to confirmed, hence the interest of our study.

Our work is to take samples of Sardina pilchardus, commonly known as sardines. During this study, two trips were made at sea, the month of February and the month of May 2017 at two stations (Ghazaouet and Béni-Saf), whose purpose is to confirm the presence or absence of breed for this species (at the level of the region of the study) which would play an important role in the management of this resource and the confirmation or not of appellations with economic impact.

Materials and methods

Algeria has a large seafront in the heart of the Mediterranean, an integral part of the North African continent, from an ecological point of view, the Algerian coast is rich and diverse. Its long coastline alternates rocky shoreline, sandy beaches and wetlands (Benzohra and Millot, 1995). In this study we chose the coast of Ghazaouet and the Bay of Beni-Saf (Far North-West Algeria).

The commune of Ghazaouet is administratively attached to the wilaya of Tlemcen; it takes its position in the west coast of Algeria on the Mediterranean Sea, crossed by Oued Ghazouana from the confluence of the two wadis, Oued Taima which drains the accident zone of the commune of Djebala and Oued Tlata which drains a large part of Nedroma commune.

Coastal town located in the center of the mountains of Traras, it has a rugged relief and slightly parallel to the coast (PDAU, 1996) and covering an area of 28 km2.

The Algerian industry dominated by the petrochemical, chemical, steel and agri-food industries has been concentrated in the coastal strip, with more than 50% of national industrial units (Grimes et al., 2010), the marine Ghazaouet receives recycled industrial wastewater from the zinc electrolysis unit, which releases heavy metals, is discharged into the marine environment and has participated in the contamination of silt aggravated by the wild storage of waste zinc leaching on the cliff overlooking the sea and the plant (Alzinc) (DPRHT, .2004). A bibliographical summary of the work on marine pollution is carried out by Grimes (2003) in the context of the National Diagnostic reveals in various sectors of the Algerian coast, high levels of metal pollutants often exceeding the accepted standards. The contamination index for zinc, mercury and lead classifies the port of Ghazaouet as a risk zone for the marine environment.

The city of Béni-Saf is also located in the north-west of Algeria (wilaya of Ain Témouchent): between 35 ° 16 'and 35 ° 18 north latitude and between 1 ° 27e and 1 ° 28 west longitude and s' extends over an area of 61.30 Km2, with a coastline stretching over twenty kilometers.

The samples are taken about eight miles north of the Ghazaouet region and six kilometers north-east of the Beni-Saf region where there are adequate conditions for our sampling; like the depth (about 25 meters). For our sampling it is necessary that the following climatic factors (sunny day or night at dark moon and acceptable wind speed to navigate) are brought together.

The samples were taken at the edge of a "sardine", directly after fishing. The catch date is noted each time. The duration of the sampling was spread out between February and May 2017 in the two aforementioned fishing zones. 478 individuals were taken at the Ghazaouet station and 460 individuals at the Béni-Saf station. Measurements were taken for 5 parameters (Table 1) on only 199 individuals (100 Ghazaouet and 99 Béni-Saf).

Table 1. List and description of the parameters.

Abbreviations	Description
LT	Total length
W	The weight
LM	The muzzle length to the fork
LA	The length between anal fin and muzzle
LP	The length between the anal fin and the pelvic fin
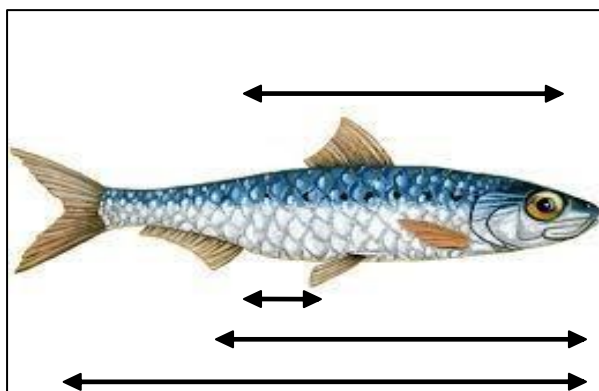
Figure 1. Representation of different measurements on sardines.

Using a precision 1-mm ichthy meter, the total length of the sardine (muzzle to caudal fin) was measured.

Figure 2: Measuring the length of a sardine by an ichthyometer.

Using an electronic scale, we weighed the weight of each individual.

Figure 3: Weight gain of a sardine.

The data is organized and entered into an Excel table, organized by municipalities, rows and variables on the columns for statistical processing using two software packages (XLSTAT and R). Different analyzes are carried out: descriptive analyzes (percentage, average, and standard deviations) as well as the realization of graphs, histograms and comparison of means and percentages, multi-varied analyzes: a principal component analysis (PCA) and Hierarchical ascending classification (CAH).

Results and discussion:

The results of the correlation analysis between the five variables allow to identify two axes of variation which represent the two factors (F1 and F2) with a cumulative variability of 87.88% whose factor F1 represents the greatest variability (79, 51%), followed by the factor F2 with a percentage of variability equal to 8.37%.

The results obtained at the level of the PCA (figure 4) show that all the variables are positively correlated by forming three separate groups according to the degree of relationship with the factor F1. These groups are: group 1; the length between the anal fin and the pelvic fin, group 2 is formed by: weight and total length and group 3 by: The length of the muzzle to the fork and the length between the anal fin and the muzzle.
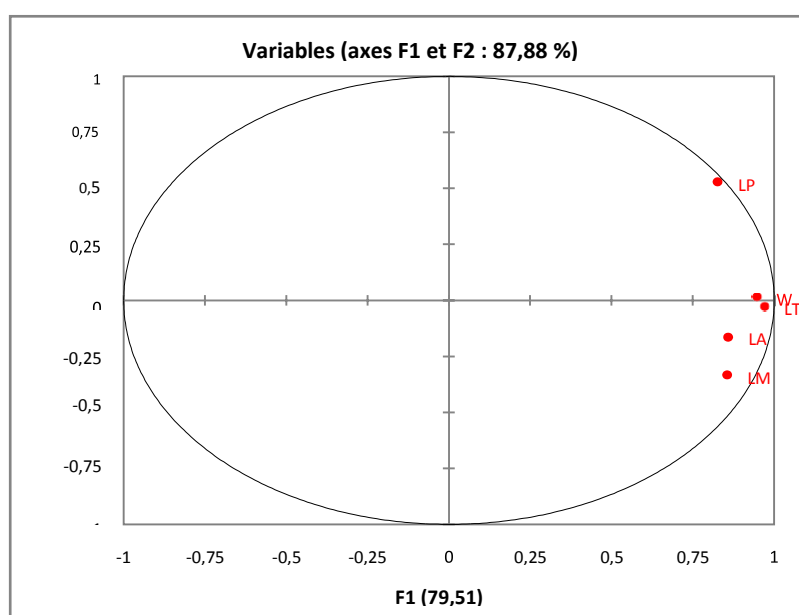
Figure 4: Presentation of the ACP distribution of the parameters studied in Sardina pilchardus at Ghazaouet and Béni-Saf.

At the level of Figure 5 we see that all samples are distributed relative to the two regions studied, in fact the majority of individuals in the region of Béni-Saf are positively correlated with the factor 1 against the majority of individuals of the Ghazaouet region are negatively correlated by contribution to this group.

In general our individuals are distributed in three groups two groups contains the majority of animals from the same region is Béni-Saf where Ghazaouet and a group that is formed by a mixture of fish from the two regions studied. These results might support the existence of partial mixing (limited gene flow) between sardine populations in both regions.
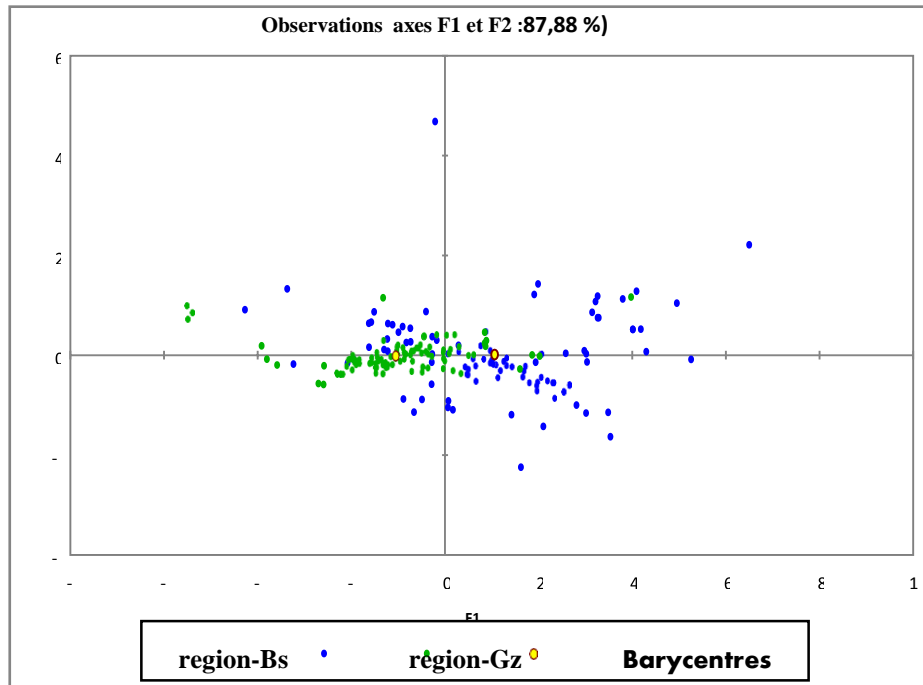
Figure 5: Individual distribution of observations by the two regions.

The hierarchical ascending classification has divided our local population of Sardina pilchardusen into three distinct groups (Figure 6 and 7). These groups (1, 2 and 3) (Table 2) have a population of 68, 78 and 53 animals, respectively.

The class profile has shown that class (1) is the class with the most significant weight and total length values, ie fish in this group have a significant weight of up to 74 g. (Figure 8). On the other hand the weight in groups 2 and 3 is respectively 44g and 30g. These results can be explained by the nature and quantity of food (Forest, 2001).
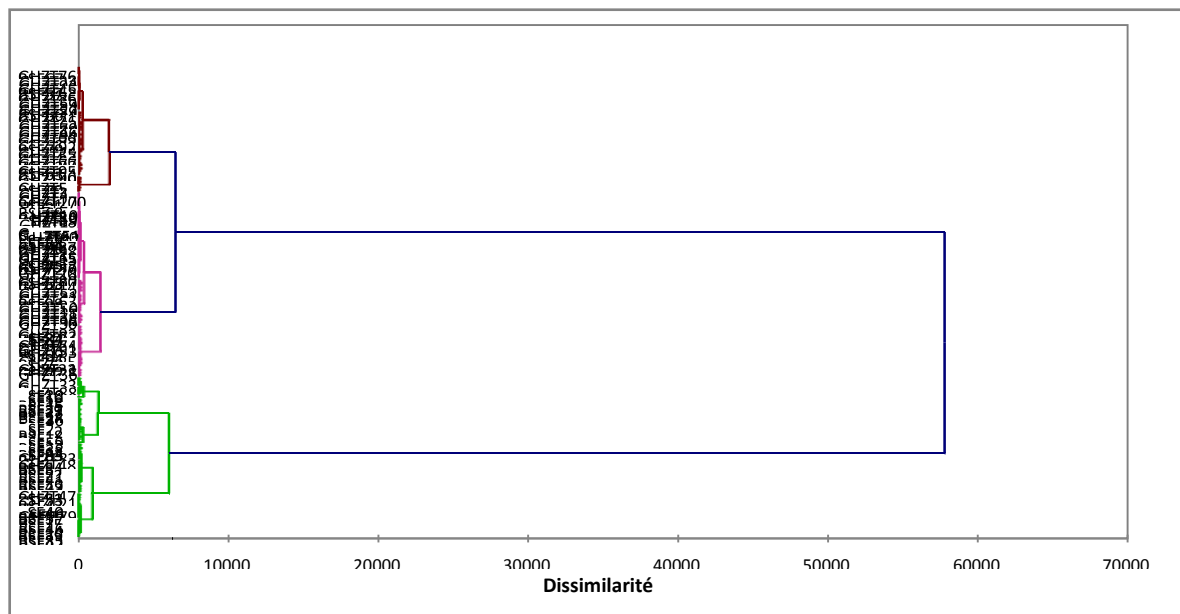

**Figure 6:** Hierarchical ascending classification of nimals to study.

Table 2: Barycenter of classes.

Class	LT	W	LM	LP	LA
1	21,2853	74,6471	17,8647	4,3221	8,9309
2	17,8205	44,8077	15,5269	3,8218	7,9756
3	16,1057	30,7170	14,0396	3,4660	7,0868
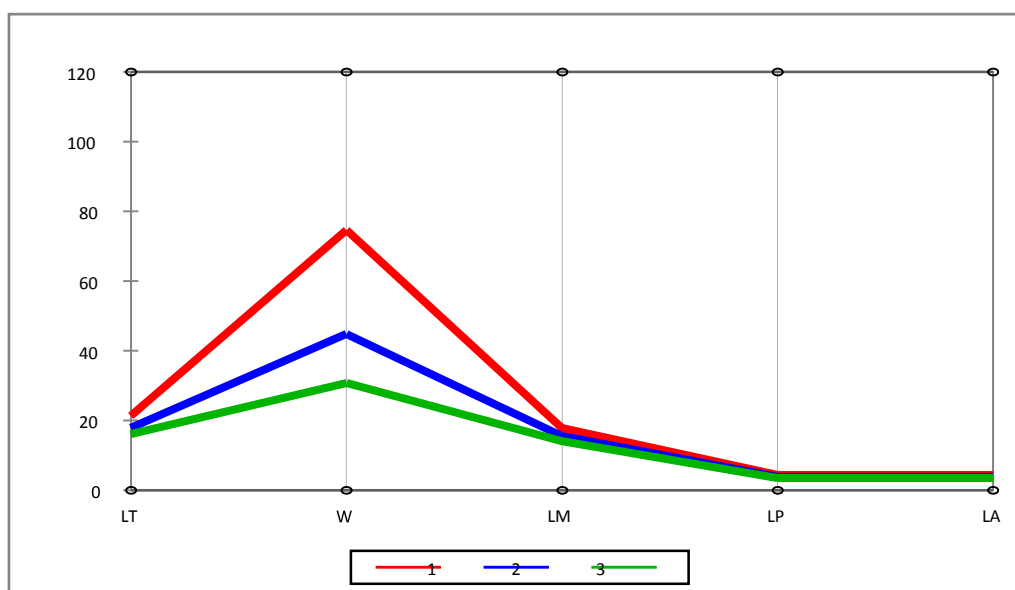
Figure7: The class profile.

The results obtained (figure 8 and 9) clearly show that there is a significant difference between the length of the individuals of the Ghazaouet region and those of Béni-saf. This suggests to us that these results are probably due to a better quality of aquatic environments in the Béni-Saf region, which allows the species to best express its potential.
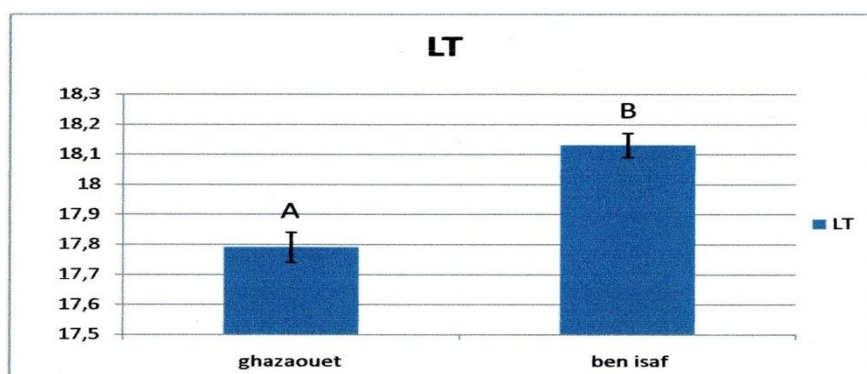
Figure 8: Comparison of the total length (LT) of Sardina pilchardus between fish from Ghazaouet and Béni-Saf.
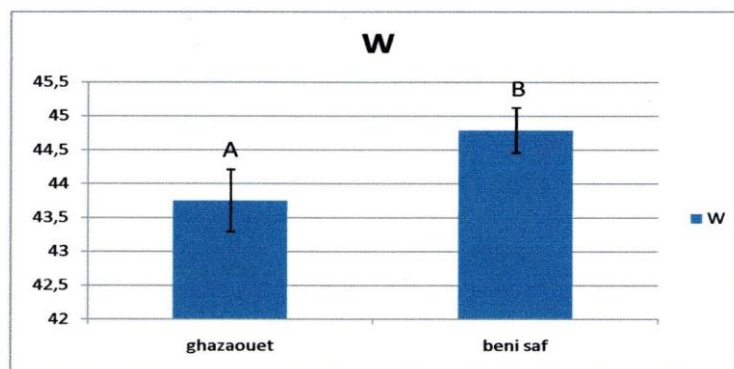
Figure 9. Weight comparison (W) of Sardina pilchardus between fish from Ghazaouet and Béni-Saf.

Conclusion:

The seafood products are part of the animal protein resources and a wide variety of mineral salts, among which is produced sardine (Sardina pilchardus) which has a very important commercial and economic interest in the world. In Algeria, although its coastline covers a large coastline, it has generally experienced a decrease in the amount of sardine landed in recent years especially in the west coast. In our study, it was found that sardines do not have the same economic value, depending on their origin, this species may have prices and / or a different frequency of sale, this is the case of our two populations studied or the sardine of the kiss of Béni-Saf is more appreciated than that of the region of Ghazaouet.

Our study fits into this context; where from biometric measurements we have tried to compare the Béni-saf sardine with that of Ghazaouet to have a fairly precise idea of their probable subdivision into two populations and thus to justify this preference on the market and if the two populations are isolated from each other or not. Indeed, we made morphometric measurements of five parameters (weight (W), total languor (LT), length of muzzle to fork (LM), length between anal fin and muzzle (LA), the length between the anal fin and the pelvic fin (LP)) after two samplings at the edge of a sardine boat at two stations, one located at Ghazaouet and the other at the level of Béni-saf with a total number of samples equal to 199 individuals.

It appears from the analysis of the results that the weight has a highly significant correlation with the total length at the level of the Béni-saf. The same observation was made in Ghazaouet but with less intensity. The parameter (weight) analyzed showed a clear superiority of the Béni-Saf population to that of the population of Ghazaouet. This is probably due to the presence of toxic product discharged by the Alzinc plant at the Ghazaouet coast, which would probably influence the sardine yields qualitatively and quantitatively, directly or indirectly by disturbing its ecosystem. This work also proved to us that the population of Béni-saf and Ghazaouet are well individualized and therefore justifies their own identity on the market. For more scientific precision blood sampling (50 samples for each population) was carried out for subsequent molecular characterization studies. The influence of marine pollution on species in general and sardines in particular is a point to consider in future studies.

References:
Benzohra M. Millot C 1995. Characteristics and circulation of the surface intermediate water masses off Algeria .Deep Seares.42 (10), 1803-1830.

Cury P. Roy C 1989. optimal environmental window and pelagic fish recruitment success in upwelling areas. Canadian Journal of Fisheries and Aquatic Sciences (CAN).46.670-680.

D.P.R.H.T (direction de la pêche et des ressources halieutiques de la wilaya de Tlemcen) .**2004**. le secteur de la pêche et de l'état environnemental du littoral de la Wilaya de Tlemcen, 41P.

European Food Safety Authority, 2018.

Forest A 2001. Ressources halieutiques hors quotas du Nord Est Atlantique : bilan des connaissances et analyse de scénarios d'évolution de la gestion. IfremerEds, tome 2 : 215 pp.

Grimes S 2003. Bilan et Diagnostic National de la pollution marine de la côte algérienne liée à des activités menées à terre. Programme d'actions stratégiques (PAS) destiné à combattre la pollution due à des activités menées à terre et de sa stratégie opérationnelle. Final Report PAM/PAS MED/MEDPOL, 119 pp.

Grimes S. Ruellet T. Dauvin, JC 2010 Ecological Quality Status of the soft-bottom communities from the Algeria coast: general patterns and diagnostic. Marine Pollution Bulletin, 60 1969–1977.

P.D.A.U 1996. Rapport d'orientation et règlements. Phase 3.U.R.S.A. Saïda: 1-27.

SARDYN Project-sardine dynamique and stock structure in the north-eastern Atlantic, Q5 RS-2002-000818.2002-2006

Schwartzlose RA. Alheit J. Bakun A. Baumgardtner TR. Cloete R. Carwford RJM. Fletcher WJ. Green-Ruiz Y. Hagen E. Kwazaki T. Lluch-Belda D. Lluch-Cota SE. Mac Call AD. Matsura Y. Nevarez- Martinez MO. Parrish RH. Roy C. Serra R. Shust KV. Ward MN. Zuzunaga JZ. 1999. Worldwide large- scale fluctuations of sardine and anchovy populations. *South Africa Journal of Marine Sciences* 21 : 289-347.

Scot T. Martin JHH. Hui-Ming H 2001. The size effect of hematite and corundum inclusions on the efflorescence relative humidities of aqueous ammonium sulfate particles. AN AGU Journal. 28 (13), 2601-2604.