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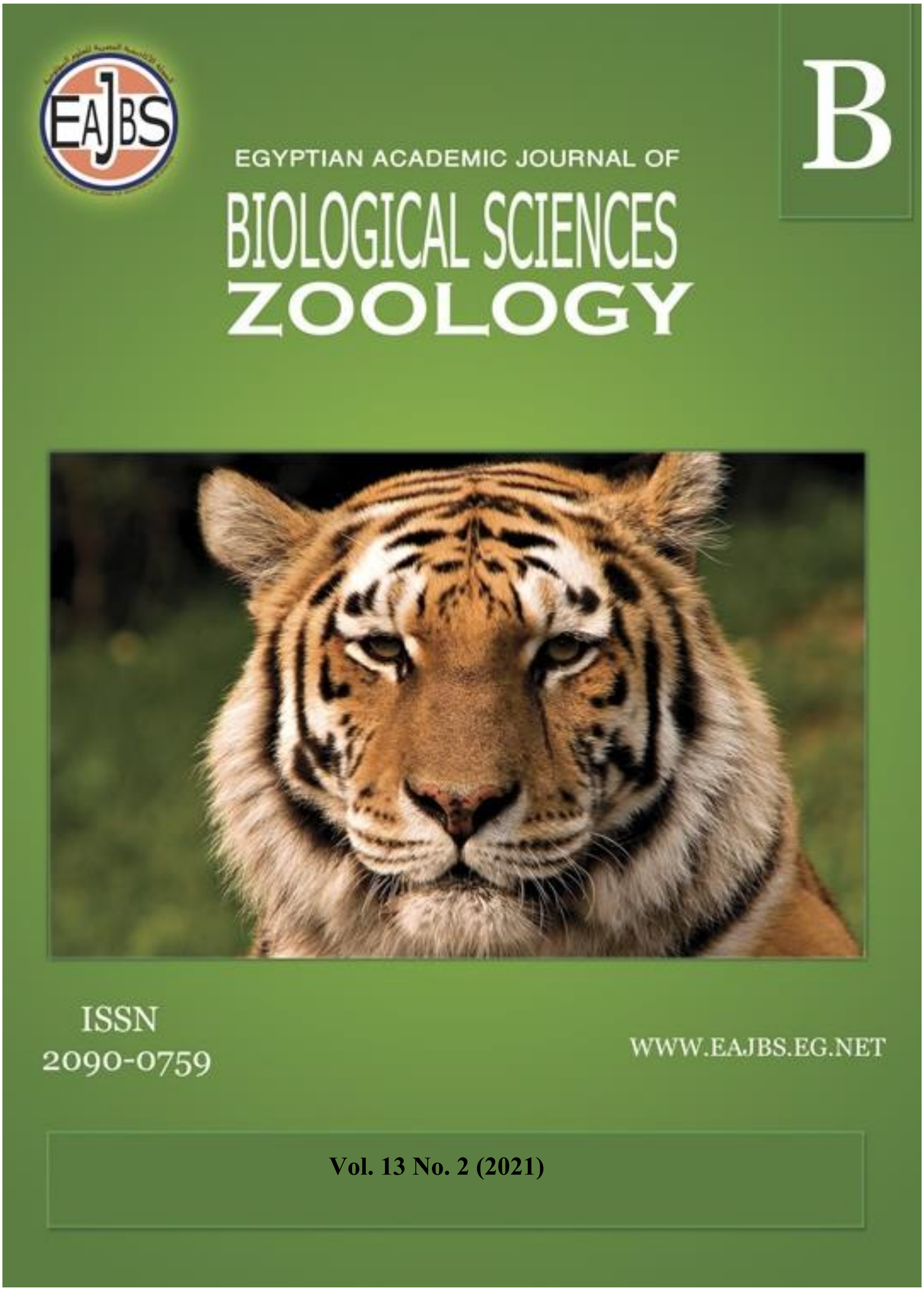

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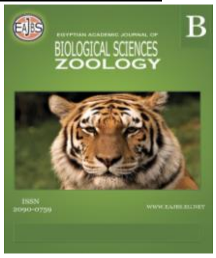

Effect of Variation in Aquatic Environment Type on Biochemical Composition and Protein Quality in Some Fishes

Amr Mohammed Nasef *
Marine Biology Section, Zoology Department, Faculty of Science, Al-Azhar University, Nasr City & ndash; Cairo & ndash; Egypt.
E.mail*: marine@azhar.edu.eg

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ABSTRACT

Fish is an extremely important factor in human food and health, and fish varies in its environment from one species to another. Therefore, the aim of this study was to find out whether this environmental difference had an effect on the difference in the biochemical (food) component of these fish? ; This was done by selecting two types of fish that differ from each other in their aquatic environment in terms of the nature of the water and depth (*Oreochromis niloticus* from the freshwater - the Nile River, and the *Solea solea* from the marine water beds - Suez Gulf) and the approximate composition and components were analyzed seasonally biochemical in the muscle tissue of these two species, the amount of crude protein, fat, carbohydrate, calorific value, moisture and ash were measured. The results showed that despite the apparent difference in the values of the quantitative biochemical analysis, the statistical analysis reported that there were no significant differences between the two environmentally different species in the values of protein, fat and water content, where P values <0.05; While carbohydrates, calorific value and ash values recorded clear significant differences between the two species with environmental differences where P values >0.05, which means that the difference may be qualitative rather than quantitative, and this was confirmed by the qualitative analysis through the application of protein electrophoresis technology as an example, which showed a clear qualitative discrepancy between the two types under study.

INTRODUCTION

The consumption of fish provides an important nutrient to a large number of people worlds wide**.** Although marine waters are the major contributors to the total fish catch of the world, the freshwater ecosystem also plays a significant role as a source of fish protein in the world. Fish provides the most of the gross and essential protein, fat, minerals, and vitamins. It is excellent for the growth and the maintenance of a healthy body (Andrew, 2001 and Agusa, 2007).

Fishes had long been considered a food of excellent nutritional value, providing high-quality protein (FAO, 2003). The regular intake of fish meat has been shown to reduce the risk of heart attacks due to the presence of unsaturated lipids in the diets (Venugopal and Shahidi, 1998).

Even so, different fish species from different groups do not have the same nutrient quality levels for their clients (Takama *et al*., 1999), because the chemical composition of the fish body changes as the environment changes, which could be due to different water quality parameters, different feeding conditions, the species' sex, or maturity (Javaid *et al*., 1992 and Takama *et al*., 1999).

Marine creatures are heavily influenced by environmental variables. In animal species, salinity and tolerances had a higher impact (Davenpart *et al*., 2009). According to Filipuci (2011), numerous markers of aquatic environment Physico-chemical or biological quality have been created.

Tilapia is one of the most significant freshwater fish species, according to Biswas *et al*. (2018). It's a popular fish because of its quick development and toughness, as well as its resistance to illness and environmental changes. It also has little bone and white meat. Tilapia is helpful to humans since it is a large element of the human diet and provides the same amount of protein as meat. The temperature was determined to be the most important abiotic factor impacting fish, while salinity was the most important abiotic factor affecting fish biomass, with temperature also having a large influence, according to Pombo *et al*. (2005). Environmental-biological interactions appear to have a bigger impact on fish distribution than biological interactions, according to the researchers.

According to Velasco *et al*. (2019), the ion concentration of aquatic ecosystems globally fluctuates as a result of global change. Many freshwater habitats are saline due to human inputs, but agricultural runoff weakens many naturally saline ecosystems. This occurs as a result of changes in other stresses. The findings showed that changes in salinity and other significant abiotic stressors are linked to global change (such as temperature, pH, pollution, and so on) at the organism level on many of the physiological processes.

Academics have paid close attention to studies of the chemical composition of fish due to its relevance, and a number of researchers have claimed that the chemical composition may be putting the economic worth of fish in jeopardy (Zenebe, 1998). Abd–Elaziz (2009) stated that marine fish are an essential element of our food since they contribute to our health intake.

In this context, a range of ways to assess the health of ecosystems and organisms has been established, spanning from community level to cellular processes (Gibson, 1994 and Adams, 2002). Salinity stress, for example, affects energy budgets due to natural freshwater imports. As a result, a decline in physiological fitness and biochemical composition related to salinity will be detected by scope-for-growth (SFG) (Fillipuci, 2011).

Laghare *et al*. (2019) investigated *Tilapia Zillii* biochemical composition and nutrient content. They discovered that the range of moisture, protein, fat, and ash content percentages varied from month to month. Also, *Solea solea* was shown to be impacted by runoff as an environmental component that affects salinity, according to Martinhoa *et al*. (2009).

The findings were compared to contemporary climate change forecasts in order to assess their impact on future recruitment levels. Elwasify *et al*. (2021) found that the biochemical composition of *S. solea* varied from season to season. *S. solea* is an important fish species.

Environmental and intrinsic variables, as well as eating patterns, have an impact on fish (Ghanem *et al*., 2015). According to Boeufa and Payan (2001), "internal variables" such as the endocrinological and neuroendocrinological systems influence fish development and growth. They are also highly dependent on environmental factors among animals. Salinity, in particular, has an impact on other variables such as temperature, pH, and oxygen concentration. There are several interconnections.

Among the ecological factors, salinity is specific to the aquatic environment. Many authors have demonstrated the influence of external salinity on growth capacities in fish. This is true for a lot of species, including both marine and freshwater fish. In fact, species not influenced by salinity changes during their development and growth are rare.

So that the aim of this work is to identify the effect of variation in aquatic environment type on biochemical composition and protein quality in two species; *Solea solea* from marine water (benthic) and *Oreochromis niloticus* (nekton) from freshwater.

The present work aimed also to study the effect of variation in the aquatic environment on protein patterns through comparative electrophoresis separation (SDS – PAGE) for this two species.

MATERIALS AND METHODS

Fish Sampling:

A total of 106 specimens; 65 of *Oreochromis niloticus* inhabit freshwater (nekton), collected seasonally from Nile River - Cairo and 41 of *Solea solea* inhabit marine water (benthic) and collected seasonally from along Suez Canal - northwest coast of Suez Gulf (Suez Governorate) during the period from January 2016 to January 2017, specimens stated as XL size were taken fresh from fishermen when they reach the shore or were from different fishing centers. The collected specimens were preserved in the ice box and transported to the laboratory of Marine Biology, Zoology Department, Faculty of Science, Al-Azhar University, Nasr City, Cairo, Egypt for later examinations. In the laboratory, two fish species were examined and identified according to the available literature including (FAO, 1973 and Nelson, 1976). Total length was measured to the nearest millimeters and recorded and also weight-weighted in grams and the following studies were carried out.

Determination of Salinity(S ‰):

The water samples were taken below the water surface (About 30 cm) at each locality and preserved immediately by a few drops of chloroform. In the laboratory, salinity was determined seasonally by using the gravimetric method (APHA, 1985).

Biochemical Analysis:

After the dissection of the fish, a known weight of muscles in *O. niloticus* and *S. solea* were kept under the freezing condition at 4 ^{0}C until the biochemical determination.

Determination of Total Protein:

The total protein was determined using the Folin phenol reagent method described by Lowry *et al.* (1951) with its modification suggested by Ansell and Lander (1967).

Determination of Total Lipid:

Lipids determination was performed according to the method described by Knight *et al*. (1972).

Determination of Carbohydrate Content:

Glycogen was measured according to the method of Carrol *et al*. (1955).

Calculation of calorific value: For the biochemical composition, the calorific content of each sample (stage) was estimated by multiplying each component by the relevant

calorific equivalents (4.2 kcal for carbohydrates; 9.45 kcal for lipids and 5.7 kcal for protein).
The values were calculated in terms of kcal per gram (Phillips, 1969).
Water Content: the water content was determined by weight loss at 105°C until a steady weight is reached according to Ruiz-Roso *et al*. (1998).
Ash Content:

Ash was determined by incineration at 450–500 degrees Fahrenheit to a consistent weight in a muffle furnace, According to the AOAC (1990).
Statistical Analysis:

Statistical tests were carried out using the statistic software, SPSS (2008) for determine (Mean: ẋ, Standard deviation: бx) and F-Test, to measure and analysis the extent of variance in the effective rates, where P values of F-Test mean:
P<0.05: The differences are significant.
P>0.05: The differences are not significant.
Note: All analyses were carried out in triplicate. The results were expressed as mean values ± standard deviation.
Electrophoresis Investigations:

Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS – PAGE): SDS – PAGE (10 %) technique on muscles of *O. niloticus* and *S. solea* was conducted by the method described by Abd-Elaziz (2004).

RESULTS

The results in Table (1) indicated that the biochemical composition of *Oreochromis niloticus* from the freshwater environment (S ‰= < 0.05), fluctuated from one season to another, was as shown in the tables with details.

The results in Table (2) indicated that the biochemical composition of *Solea solea* from the marine environment (S ‰= 40.8), fluctuated from one season to another, was as shown in the Tables with details.

The results in Table (3) & Figure (1) showed that the total annual means of the above-mentioned results, where protein content mean in muscles of *O. niloticus* fish was 20.1 g/100 g with a significant value, while was 21.4 g/100 g in muscles *S. solea* fish. Also, the results showed that lipid content means in muscles of *O. niloticus* fish was 1.7 g/100 g, while recorded 0.34 g/100 g in muscles of *S. solea*.

The results presented in Table (3) indicated that the carbohydrates content mean was 1.2 g/100 g detected in muscles of *O. niloticus* fish. While carbohydrate content in muscles of *S. solea* fish was 1.5 g/100 g.

From the previous results of protein, lipid and carbohydrates can calculate calorific value mean for *O. niloticus* fish and *S. solea* fish which recorded 136.1& 132.3 (K.cal / 100g) respectively.

Although the results indicated that water content means in muscles of *O. niloticus* fish was 78.3 %. While water content in muscles of *S. solea* equals was 77.5 %. At the same time, results of ash content recorded a mean of 1.2 g/100 g in muscles of *O. niloticus* fish, while was 1.4 g/100 g in muscles of *S. solea*.

Table 1: Seasonal variation of biochemical composition in muscles of *Oreochromis niloticus*, collected from Nile River, Cairo during the period from January 2016 to January 2017.

Fish	*Oreochromis niloticus*				Annual Mean ± SD
Seasons / Parameters	Winter	Spring	Summer	Autumn	
Protein (g/100g)	17	23.1	20.4	19.8	20.1±2.1
Lipids (g/100g)	1.4	1.9	1.8	1.5	1.7±0.2
Carbohydrates (g/100g)	0.9	1.6	1.9	1	1.2±0.4
Cal. Value (K.cal / 100g)	113.9	157.6	142.4	130.5	136.1±16
Water content (g/100g)	76.3	80	79.1	78	78.3±1.4
Ash (g/100g)	1.4	1.1	1.3	0.9	1.2±0.2
S ‰	<0.05	<0.05	<0.05	<0.05	<0.05

Table 2: Seasonal variation of the biochemical composition of *Solea solea*, collected from Suez Canal during the period from January 2016 to January 2017.

Fish	*Solea solea*				Annual Mean ± SD
Seasons / Parameters	Winter	Spring	Summer	Autumn	
Protein (g/100g)	21.1	21.8	21.7	21.2	21.4±0.26
Lipids (g/100g)	0.30	0.38	0.35	0.31	0.34±0.03
Carbohydrates (g/100g)	1.1	1.9	1.8	1.2	1.5±0.35
Cal. Value (K.cal / 100g)	130.82	135.83	133.66	128.81	132.3± 2.7
Water content (g/100g)	77.3	77.4	77.9	77.2	77.5±0.27
Ash (g/100g)	1.1	1.5	1.7	1.3	1.4±0.22
S ‰	40	40.5	41.8	40.8	40.8±0.65

Statistical Analysis:

The results of statistical analysis by F- Test analysis reported that there were no significant differences between the two environmentally different species in the values of protein, fat and water content, where P values <0.05. While the values of carbohydrates, calorific value and ash content recorded clear significant differences between the two species with environmental differences, where P values >0.05.

Table 3: Variation of the biochemical composition of *Oreochromis niloticus* & ***Solea solea*** edible portion (g / 100g tissue) with statistical analysis.

Fish / Parameters	*Oreochromis niloticus*	*Solea solea*
Protein (g/100g)	**20.1±2.1**	**21.4±0.26**
Lipids (g/100g)	**1.7±0.2**	**0.34±0.03**
Carbohydrates (g/100g)	**1.2±0.4**	**1.5±0.35**
Cal. Value (K.cal / 100g)	**136.1±16**	**132.3± 2.7**
Water content (g/100g)	**78.3±1.4**	**77.5±0.27**
Ash (g/100g)	**1.2±0.2**	**1.4±0.22**
S‰	**< 0.05**	**40.8**

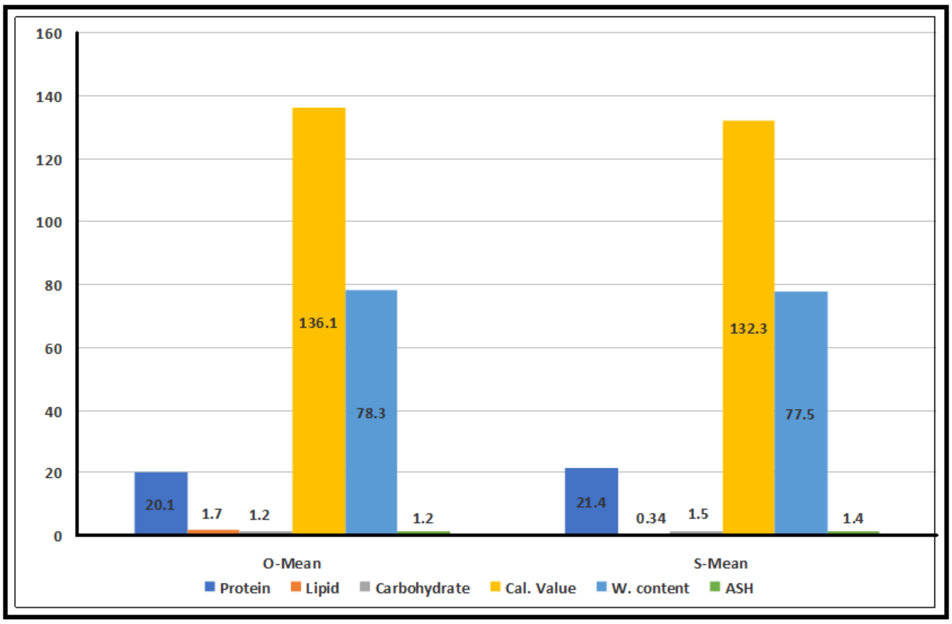

Fig.1: Variation of the biochemical composition of *Oreochromis niloticus* (O) & *Solea solea* (S) edible portion from the different aquatic environment (g / 100g tissue).

Comparative Electrophoretic Studies:

Of muscles proteins for two species; *Oreochromis niloticus* from freshwater (nekton) and *S. solea* from marine water (benthic).

The results in Figure (2) showed electrophoresis analysis of lateral muscles protein for *O. niloticus* (nekton) from freshwater. Which there were 15 protein bands available in their densities, with volumes and molecular weights, which ranged between 200 kDa to 6.5 kDa. Results appeared that there was a difference in the number, thickness, molecular weights and type of protein bands between the two species which were found in different environments and depths.

Also, Figure (2) shows the results of electrophoresis analysis to lateral muscles protein for *S. solea* from marine water (benthic). Shows there were 14 protein bands available in their densities, with different volumes and molecular weights, which ranged between 200 kDa to 6.5 kDa.

The results in Figure (2) showed that the electrophoretic patterns of *O. niloticus* protein which taken from freshwater (nekton), the results showed that the higher molecular weight (MW) protein fraction revolve around 200 kDa - Myosin, 97 kDa - Phosphorylase b, 66 kDa – Albumin : (major), 55 kDa - Glutamic Dehydrogenase, (major) and 45 kDa – Ovalbumin : (major). The electrophoretic patterns of *O. niloticus* protein showed that the low molecular weight protein was revolved around 36 kDa - Glyceraldehyde-3- phosphate Dehydrogenase : (major), followed by 20 kDa -Trypsin Inhibitor:(major), 14 kDa - α-Lactalbumin : (major) and 6.5 kDa - Aprotinin: (major).

The results in Figure (2) showed that the electrophoretic patterns of *S. solea* protein which taken from marine water (benthic), the results showed that the higher molecular weight (MW) protein fraction revolve around 200 kDa – Myosin : (major), followed by116 kDa - β-Galactosidase, 97 kDa - Phosphorylase b : (major), 66 kDa - Albumin : (major), 55 kDa - Glutamic Dehydrogenase : (major) and 45 kDa - Ovalbumin (major). The electrophoretic patterns of *S. solea* protein showed that the low MW proteins were revolving around 36 kDa-Glyceraldehyde-3-phosphate Dehydrogenase (major), and 14 kDa - α-Lactalbumin.

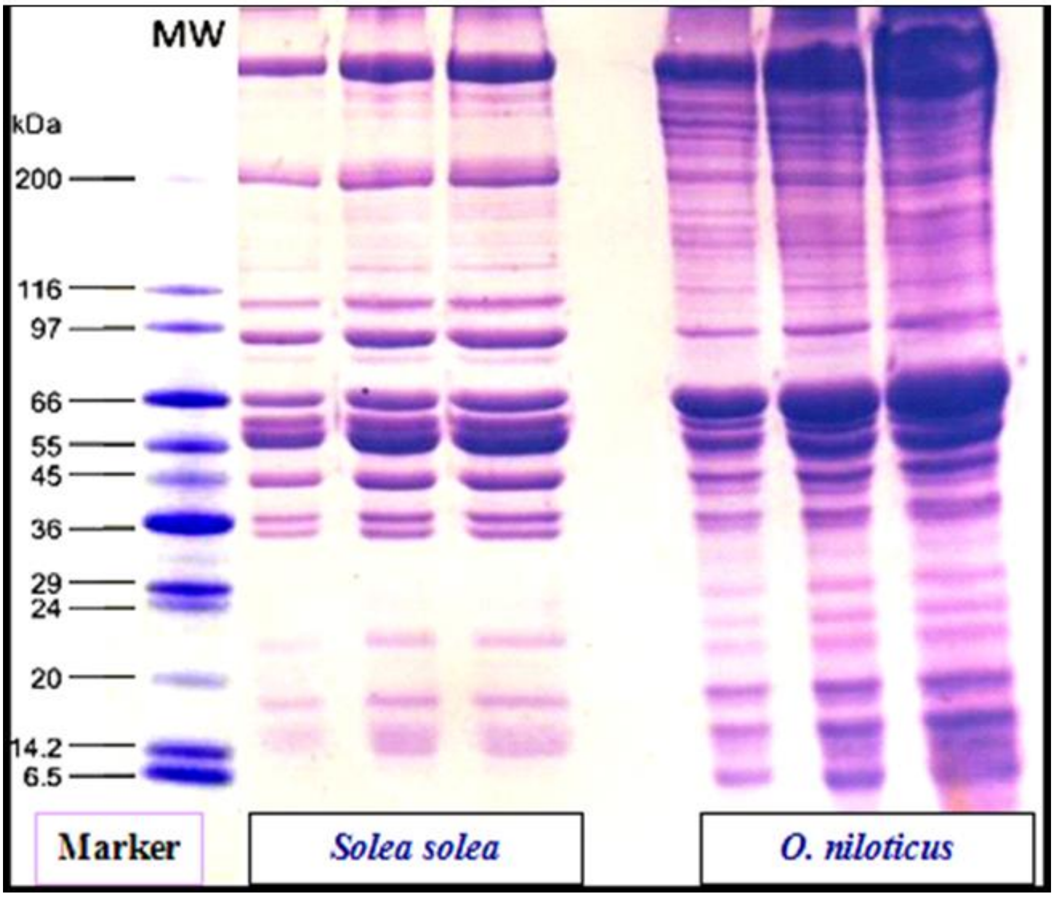

Fig. 2: Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS – PAGE)

DISCUSSION

The identification of elements that impact marine creatures is one of the key tasks of marine ecologists. Due to the intricacy of the natural marine environment, this aim is challenging to attain (Lee, 2008). The chemical composition of fish muscles changes significantly depending on a variety of parameters such as age, sex, habitat, season, and so on (Silva and Chamul, 2000; FAO, 2002).

From a scientific standpoint, understanding the interaction between environmental conditions and fish is critical. As a result, this species has a significant impact on the food chain, food web, marine ecology, as well as human nutrition and health. There is an alteration in the environmental condition of the sea that influences all physical, chemical and biological processes (Snyder, 2004 and Mohamed, 2006). Abd-Elaziz (2009) stated that the alteration of the environmental factors in marine habitat effects on biochemical composition of marine animals.

In the present study, the biochemical composition of *Oreochromis niloticus* and *Solea solea* fluctuated from one season to another. Regarding environmental factors, the fluctuations in the fishes might relate not only to water temperature but also to its indirect influences on another factor (Farina *et al*., 2003). They noticed that the proximate composition in the studied species was changed. These changes are due to fluctuation of temperature or Salinity (Sumpton and Greenwood, 1990), then the changes in the studied species reflect the changes in the availability of food type which affected by environmental factors (Choy, 1986).

The distribution patterns of the major biochemical components in muscle obtained from two different species and two different environments were analyzed, which showed the difference in biochemical composition and also provided information about the variability in the biochemical components associated with those environments and water depths.

The present study appeared that there is differentiation in biochemical composition between two species; *Solea solea* from marine water (benthic) and *Oreochromis niloticus* from freshwater (nekton), which each species represent a different aquatic environment. *Solea*, have high ratios of total protein, water content and ash. While *Oreochromis niloticus* was high in total lipid, carbohydrates and calorific value. This is in agreement with Amer *et al*. (1991), Hashem, (1992), Abd-Elaziz, (2004) and Nasef (2016).

The variation of fat contents among the different fish species is not generally so high in the majority of species because of their common behavior. However, some species showed the variation of fat content much wider, because of the different habitats (Salam, 2002).

Regarding the biochemical composition of studied fishes, the data showed that the biochemical composition differs from one species to another. The mentioned increase in lipids and calorific value of *Oreochromis niloticus* perhaps may be due to owing to the necessity of floating (as nekton) and presence in higher layers of water column and availability of light and abundance of food and producers.

The mentioned decrease in lipids and calorific value of *Solea solea* perhaps may be due to owing to the necessity of floating (as a benthos), presence in lower layers of the water column, unavailability of light, lack of abundance of food and producers.

The variation in other biochemical ratios between the two species studied may be due to variation of other environmental factors such as the presence of light, depth and salinity rate which affect physiological processes such as metabolism and growth.

For example, this is in agreement with Schmitt and Santos (1993). The increase of carbohydrate levels may be due to the high activity (glycogenolysis) and accumulation of carbohydrates in the new tissues, (as in crustaceans). This is in agreement with Siu-Ming *et al*. (1988) and Abd-Elaziz (2009). Also, this is in agreement with Osibona (2011), Job *et al*. (2015) and Tsegay *et al*. (2016) and maybe differ with Naeem *et al*. (2011) and Khan *et al*. (2014).

The changes in lipid levels may be due to the morphological and physiological changes of the studied species.This agree with Akpan (1997) and Abd-Elaziz (2009). Also, the variation in biochemical composition is may be due to enzyme activity which affecting by salinity (Fillipuci, 2011). The changes in the chemical composition of the body (moisture, protein, fat and ash) depended on the type of food, composition, the density of fish and physiological processes (Jassim *et al.*, 2014), which affected by variegation in environmental factors such as temperature and salinity and the different habitats (Salam, 2002).

Also, the variation in biochemical composition is may be due to enzyme activity during catching and handling (Venugopal and Shahidi, 1998). The moisture was the main constituent of fish flesh. Moisture increase might be due to breeding season and availability of more water and more activeness and vigor of fish. Similarly, protein contents were the second-highest contents in fish flesh. The moisture annual mean in the present experiment were 78.3% which fall within acceptable levels of (60%-80%) and the range of present finding supports the stability of the environmental conditions of the area, this agrees with Tsegay *et al*. (2016).

Further, these obtained results are very similar to the results obtained by other researchers such as (Job *et al*., 2015) determined moisture ranges from 77.69 to 79.11%. Khan *et al*. (2014) elaborated moisture levels in *Tilapia nilotica* which were 80.90% and these values are again very near to the levels obtained in the present finding.

The present study recorded the fluctuation in fat content in two species studied. Similar results were also obtained by Job *et al*. (2015) obtained values of a similar range for fat content between 1.20-2.45% displayed nearby values for fat contents ranging from 1.30-2.94%which supports present findings. The levels of ash were within the range of 0.95-1.4%. Alike results were observed by Tsegay *et al*. (2016), elaborated estimations during research investigation ranging from 0.81-1.16% which are in agreement with the present finding. In the female population of *Oreochromis mossambicus*, Naeem *et al*. (2011) found 74.52 percent, 17.61 percent, 2.73 percent, and 5.13 percent water, protein, ash, and fat respectively.

The presence of ash in fish muscle is required for optimal cell physiological activity. The level of mineral content in fish muscle and any other meal is revealed by the proportion of ash in it (Omotosho *et al*., 2011). According to the data, variations in protein content in target organs indicated changes in water characteristics caused by pollution stress, which might have a significant impact on the development rate and quality of fishes that feed on bottom fauna generated by metal bioaccumulation.

From another perspective, this change in total proteins might be owing to greater salt levels, which are unfavourable for them, or it could be linked to food and nutrient availability (James *et al*., 1991 and Vutukuru, 2005). Although Ghanem *et al*. (2015) attributed the decrease in total fat levels in *Solea solea* muscles to a variety of factors, including (1) an increase in metabolic rate due to stress (2) the use of fat for energy production during stress due to pollutants like nitrogen and phosphorous, organic chemicals that impact plants, phytoplankton, and zooplankton (Shaaban *et al*., 1999 and Fayed *et al*., 2001).

They overlooked the impact of natural environmental conditions, the most significant of which is salinity, on this, as well as the amount of their impact on the aquatic organism and its biochemical makeup, which is the topic of this study. It refers to the extent to which environmental variables influence organisms and their chemical makeup. We see no harm in bringing up an important point, despite its simplicity, because it is closely related to the point that this study is trying to make, which is that the percentage of fat in benthic marine organisms is generally low when compared to other swimming organisms because they do not require immediate buoyancy, Because their living habitat is on the bottom, the link between salinity and water density is not hidden.

Fish are dependent on both internal neurological, endocrinological, and neuroendocrine systems, which are impacted by external ecological conditions and govern and synchronies numerous actions or functions, including development capability, according to Boeufa and Payan (2001).

The variations in chemical composition between species confirmed by King *et al*. (1990), Naczk *et al*. (2004) and Nasef (2016), which emphasized that these differences are apparently associated with variations between species, nutrient composition of the diet (Fabris *et al.*, 2006), the surrounding medium, (Kádár *et al*., 2006), and other environmental factors (e.g., season, location, substrate, depth, water salinity, temperature and anthropogenic influence) (Ersoy *et al.*, 2008; Kuçukgulmez *et al*., 2006 and Abd-Elaziz 2009).

With reference to the effect of season biochemical compositions have been studied for some marine animals (Aidos *et al*., 2002; Hamre and Sandness, 2003), but the interpretation is difficult and depends on numerous factors (Özyurt *et al*., 2005). Also, this good agreement with Nasef (2016), which emphasized that seasonal variation, is not the only factor that affects marine or aquatic organisms, although, there is an effect, it was weak.

The oscillations in proximate composition of marine creatures are mostly connected to the food composition and viability rate, which are highly impacted by changes in environmental conditions, according to the findings of this study (Choy, 1986 and El-Sayed, 2004), also the habitat's nature. According to Suzuki and Shibrata (1990), the chemical composition varies slightly due to changes in size, age, and sampling season. Because the elements are many and overlap, this study attempted to determine the magnitude of their influence and which are more significant.

Global environmental change is having quantifiable consequences on the epipelagic realm in marine systems, according to Vicenç *et al*. (2021). Climate change is also causing an increase in the frequency and severity of maritime heat waves (MHWs), according to Oliver *et al*. (2018) and Frölicher *et al*. (2018). These impacts have an impact on the species that live in the epipelagic ecosystem, including those that sustain high-value commercial fisheries, either directly or through trophic interactions.

Although the results of this study provide detailed information about the biochemical composition of two species; *Oreochromis niloticus* from freshwater (nekton) and *Solea solea* from marine water (benthic), which are the most common in Egypt aquatic environments, they also reflect aquatic environmental variation on the biochemical composition, in an attempt to shed light on some environmental issues.

In the current study, despite the apparent difference in the values of the quantitative biochemical analysis; However, the statistical analysis reported that there were no statistically significant differences between the environmentally different species in the values of protein, lipid and water content, where P values >0.05. While recorded clear significant differences between the two species with environmental differences for carbohydrate, the calorific value and ash values, where P values <0.05;

which means that the difference may be qualitative rather than quantitative? This was confirmed by the qualitative analysis by applying the protein electrophoresis technique as an example, which showed the presence of a clear qualitative discrepancy between the two types of understudy (it can be used as a taxonomic feature).

Although we disagree with Mian and Siddiqui (2020), they state that environmental salinity has no negative effects on growth and biochemical changes, nor does it require high levels of protein in the diet at any salinity.

However, this explained what we went to, and what this study clarified, which is that the change is not quantitative as much as it is a qualitative change, and this is confirmed by the results of protein electrophoresis. Our result, through comparative electrophoretic studies of muscles proteins for two Species; *S. solea* from marine water (benthic) and *Oreochromis niloticus* from freshwater (nekton), shows that there was a difference in the number, thickness and molecular weights of protein bands between one this two species which found in the different aquatic environment.

The comparison between the two species showed a variation in the number and locations of the protein bands, although there was agreement in the molecular weight of seven protein bands and types as a following: 200 kDa – Myosin : (major), 97 kDa - Phosphorylase b : (major), 66 kDa - Albumin : (major), 55 kDa - Glutamic Dehydrogenase : (major) and 45 kDa - Ovalbumin (major), 36 kDa-Glyceraldehyde-3-phosphate Dehydrogenase (major), and 14 kDa - α-Lactalbumin .

While differentiated *S. solea* by the presence of 116 kDa - β-Galactosidase, and absence of 20 kDa -Trypsin Inhibitor, and 6.5 kDa – Aprotinin. *O. niloticus* differentiated by the presence of 20 kDa -Trypsin Inhibitor: (major), and 6.5 kDa - Aprotinin: (major), and absence of 116 kDa - β-Galactosidase.

This variation in the shape, size and density of protein pands can be relied upon as a taxonomic characteristic, and also as revealing evidence that shows the extent of the influence and difference of the aquatic environment on aquatic or marine organisms. The differences in the thickness of protein bands for Two Species; *Oreochromis niloticus* (nekton) from fresh water and *S. solea* from marine water (benthic), may be related to differences in food items that were found in investigated areas

This result is similar to Niolson (2004) which refers that the differentiation in food items; Pinoeir *et al*. (2001) refers to the difference in the number of isolated protein bands belonging to the food and feeding habits of the species and its ecological niche? But in another study for Sharaf-Eldeen *et al.* (2012) by using SDS –PAGE the result showed that the total numbers of protein bands to *T. zillii* differed which were taken from three ecologically different localities which different in food and another environment niche.

In general, ecological studies are based on many means and methods of electrophoresis of muscle proteins, which have been widely used in marine biology. These kinds of studies brought about a new look to taxonomical evaluation discrimination of related taxa and different species can be easily made according to their electrophoretic results of proteins (Theophilus and Rao; 1998 and Yilmaz *et al*. (2007).

Unfortunately, there has been no many Ecological studies with marine organisms by muscles protein electrophoresis. Habeeb and Mahdi (2013) conducted comparative electrophoretic studies of muscle proteins in two species of freshwater fish in Iraq, *Tilapia zillii* and *Orochromis aureus* and revealed differences in the number of protein bands between the two species, with four protein bands for *T. zillii* and three for *O. aureus.*

Electrophoretic study of lateral muscle proteins demonstrated that SDS-PAGE may be used as taxonomic criteria to distinguish between fish species. Electrophoresis has been a tool for examining biochemical variation in a fish population because electrophoresis is a simple, rapid and highly sensitive tool to analyze protein (William and Michael, 2000; Diyaware *et al*., 2012).

The results obtained in this study are similar to those mentioned and confirm the results related to various environmental factors and climatic conditions and the extent of their impact, It stresses the need for cooperation between marine biologists and marine ecologists to conserve marine life.

Conclusion

The apparent difference in the values of quantitative biochemical analysis does not mean that there are significant differences between the environmentally different species, which means that the difference may be qualitative and not quantitative, and this was confirmed through this study, where the qualitative analysis by applying the protein electrophoresis technique, as an example, showed a clear qualitative discrepancy between the two types, understudy.

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ARABIC SUMMARY

تأثير التباين في نمط البيئة المائية على التركيب البيوكيميائي وجودة البروتين في بعض الأسماك

عمرو محمد ناصف
شعبة علوم البحار ، قسم علم الحيوان ، كلية العلوم ، جامعة الأزهر ، مدينة نصر ؛ القاهرة - مصر.
marine@azhar.edu.eg

تعد الأسماك عاملا أساسيا بالغ االأهمية في غذاء وصحة الأنسان، وتختلف الأسماك في بيئتها من نوع الى آخر. لذا، كان الهدف من هذه الدراسة هو معرفة هل لهذا الإختلاف البيئى أثر في اختلاف المكون البيوكيميائي(الغذائي) لهذه الأسماك؟ ؛ وقد تم هذا من خلال اختيار نوعين من الأسماك يختلف كل منهما عن الآخر في بيئته المائية من حيث طبيعة المياه والعمق (نوع البلطي النيلي من سوابح المياه العذبة- نهر النيل ، و نوع موسى من قاعيات المياه البحرية - خليج السويس) وتم تحليل التركيب التقريبي والمكونات البيوكيميائية موسمياً في الأنسجة العضلية لهذين النوعين ، تم قياس كمية البروتين الخام والدهون والكربوهيدرات والقيمة الحرارية والرطوبة والرماد موسميا ، حيث أظهرت النتائج أنه علي الرغم من اختلاف قيم التحليل البيوكيميائى الكمي ظاهريا الا أن التحليل الأحصائي أفاد بعدم وجود فروق معنوية بين النوعين المختلفين بيئيا في نسب قيم البروتين والدهون ومحتوي الماء حيث كانت (P >0.05) ؛ بينما سجلت نسب قيم الكربوهيدرات السعر الحرارية والرماد فروقا معنوية واضحة بين النوعين ذوي الأختلاف البيئي) حيث كانت (P <0.05) ، بما يعني أن الأختلاف قد يكون كيفيا وليس كميا ، وهذا ما أكده التحليل الكيفي من خلال تطبيق تقنية الفصل الكهربي للبروتين كمثال ، والذي أوضح وجود تباين كيفي واضح بين النوعين محل الدراسة.