MEDDOCS Open Access Publisher

ISSN: 2640-1223

Journal of Veterinary Medicine and Animal Sciences

Open Access | Research Article

The First Record of Color and Area of *Diplodus vulgaris* by Using Computer-Based Image Analysis

Zayde AYVAZ*; Hasan Huseyin ATAR

[1]*Department of Marine Technology Engineering, Canakkale Onsekiz Mart University, Turkey.*

[2]*Ankara University Agriculture Faculty, Department of Fisheries and Aquaculture, Turkey.*

***Corresponding Author(s): Zayde AYVAZ**

Department of Marine Technology Engineering,

Canakkale Onsekiz Mart University, Turkey.

Tel: +90-218-00-18-16002;

Email: zaydealcicek@gmail.com

Received: Oct 30, 2020

Accepted: Dec 27, 2020

Published Online: Dec 30, 2020

Journal: Journal of Veterinary Medicine and Animal Sciences

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Keywords: *Diplodus vulgaris*; Color; Area; Fish; Computer-based imaging systems.

Abstract

Objective: Determination of the morphological characteristics of fish species is essential for the correct identification. The most important of these morphological features is undoubtedly the color properties. The determination of color characteristics by Computer-Based Image Analysis (CBI) rather than individual identification gives more objective and consistent results. In this study, color and area analysis of *Diplodus vulgaris*, which color and area characteristics have not previously determined by Computer-Based Imaging Systems (CBI), was performed.

Methods: Twelve fresh samples were used for the study. For color and area analysis CBI system was used. A color reference card was put to determine the color, and the *L**, *a**, and *b** values were 66.49, -0.57, and 0.18, respectively. A 16 cm^2 reference square was utilized for area analysis. The two-image method was carried out with computer software (LensEye).

Results and conclusion: According to the results, the mean color parameters of the samples was determined as 59.08 ± 2.23, -0.06 ± 0.31, 3.36 ± 1.33, 8.74 ± 0.81, and 57.73 ± 2.21 for *L**, *a**, *b**, Chroma, and Whiteness, respectively. The average area of the *Diplodus vulgaris* was 101.78 ± 9.58. The ISCC-NBS System of Color Designation color name was determined as medium gray to light brownish gray. For future studies, it is recommended that other fish species can identify by using CBI.

Introduction

Diplodus vulgaris includes the Sparidae, and the living area is Eastern Atlantic, Mediterranean, and Black Sea. According to Mouine et al., [1], these family members have high commercial value. However, there are no data about the world's total production of *Diplodus vulgaris* in the literature. Also, many species in this important Diplodus [1] and the successful differentiation of a species require expertise.

For determining fish species, some researches have been done by using molecular identification [2], DNA-based methods [3] and biomarkers [4]. However, these methods need time, experienced labor, and expensive devices. Before these methods, fish species were identified, named, and classified by their visible properties [4]. All fish species have their color and shape characteristics. These features help them survive in their living

Cite this article: Ayva Z, ATAR HH. The First Record of Color and Area of Diplodus vulgaris by Using Computer-Based Image Analysis. J Vet Med Animal Sci. 2020; 3(1): 1043.

environment. The most important physical property used when determining the type of fish is 'color.' It includes general expressions about color when defining fish species. However, using colors in numbers instead of these expressions offers a more precise and objective approach.

Color is affected by many different factors, such as the angle of light, light intensity, and color blindness when color is evaluated by human appearance. Some instrumental devices are used for color determination. However, some researchers mentioned that the instrumental devices had not analyzed the non-homogenized color surfaces like fish [5,6]). The best results for these surfaces are obtained by Computer-Based Image Analysis (CBI). Many scientific researches have been successfully done about seafood and color determination using computer-based image analyses [7-13] used image analysis for the determination of fish species. This study aimed to determine the color characteristics and area of *Diplodus vulgaris* using CBI analysis for the first time in the literature. Thus, it makes it possible to determine the fish species using these features.

Materials and methods

Fresh samples of *Diplodus vulgaris* from a local fish supplier were landed as soon as they were caught in April 2019 in Canakkale, Turkey. Twelve fish samples with an average length of 21.5 cm and an average weight of 313.16 g were transferred with a foam-box in ice to the laboratory. The samples were washed with tap water and dried with a paper towel before taken pictures.

The samples' pictures with both sides were then taken in a light-box, according to Alçiçek & Balaban, [14]. The light-box was 122 cm high, 61 cm wide, 46 cm deep, and had 2 LED light sources (one up and one bottom) (ForLife FLP-15, India) with color temperature 6500K (D65 illumination). The upper light source surface was covered with a polarizing sheet (Rosco, Stamford, CT, USA). A Nikon D300 digital camera (Nikon Corp., Tokyo, Japan) with an 18-200 mm zoom Nikkor lens with a 72 mm diameter circular polarizing filter attached was used to take pictures in the light-box with a USB cable. The Nikon Camera Control Pro (Nikon Corp., Tokyo, Japan) was used to control camera settings and take pictures by computer. The camera was set to manual mode, with an ISO setting of 200. The pictures (2144*1424 pixels) were transferred to a desktop PC. A color reference (Gretag Color Checker, X-Rite Inc., Grand Rapids, MI, USA) was placed in the box to determine the right color. A reference square (16 cm^2) was used for determining the area of the samples. Lens Eye software (Gainesville, FL, USA) was used to analyze the samples' color and area. The pictures were segmented and then analyzed (Figures 1, 2, & 3). SPSS 23.0 for windows (IBM, IL, USA) was used for the frequency analysis of samples and the determination of mean and standard deviation values.

Results & discussion

The color and area properties of *Diplodus vulgaris* were shown in (Table 1). The frequency area value of the samples was shown in (Figure 4). According to results, a *Diplodus vulgaris* with an average length of 21.5 cm and an average weight of 313.16 g has a 101.78 cm^2 area. These results are consistent with Moune et al [1]. The *L** value of the samples was ranged between 53.26 to 63.49 (Figure 5). This result showed that *Diplodus vulgaris* has a light color and was confirmed by the low *a** and *b** values (Figures 6 & 7). These values were -0.05 and 6.36 for *a** and *b**, respectively. Whiteness frequencies results (Figure 8) compatible with the *L** value, and Chroma frequencies of the samples (Figure 9) with the *b** value. According to the color scheme (NBS) determined by the Inter-Society Color Council [15], *Diplodus vulgaris* was changed between medium gray to light brownish gray. These results are very identical for *Diplodus vulgaris* Because there is no data on this species' color in the literature. It is predicted that the data obtained from this study can be used to determine this species. It is recommended to analyze other fish species' color and area values using CBI as an accurate, fast, and objective identification method for future studies.

Figure 1: The corrected front light image with reference color and reference area square.

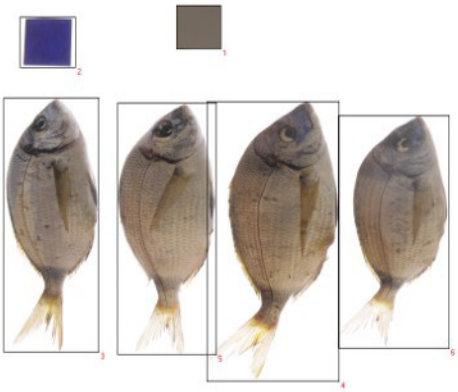

Figure 2: The segmented backlight image with reference color and reference area square.

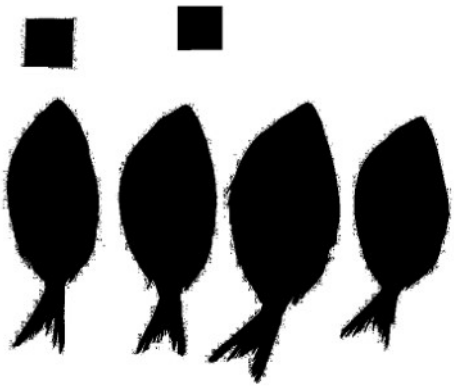

Figure 3: The silhouette of the image with reference color and reference area square.

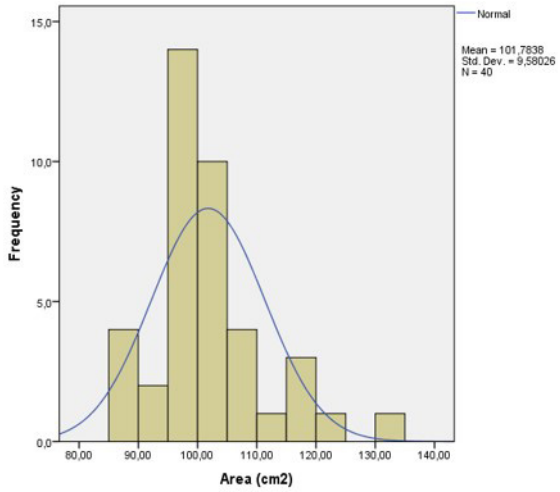

Figure 4: The frequency of the area of *Diplodus* vulgaris samples.

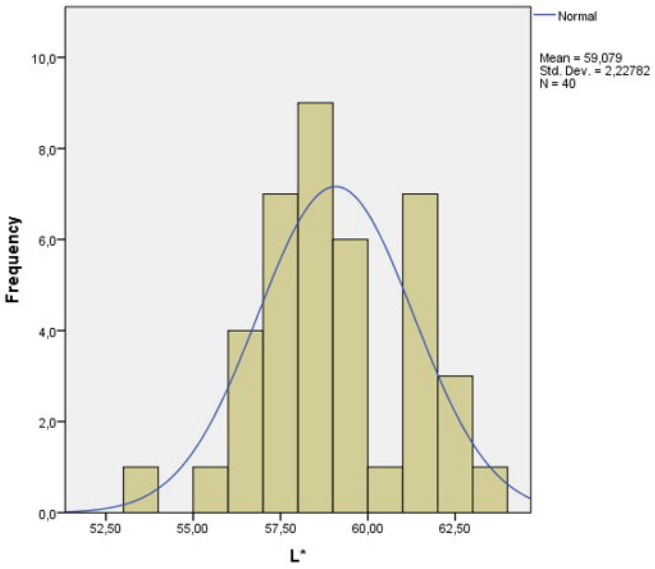

Figure 5: The frequency of L* value of *Diplodus* vulgaris samples.

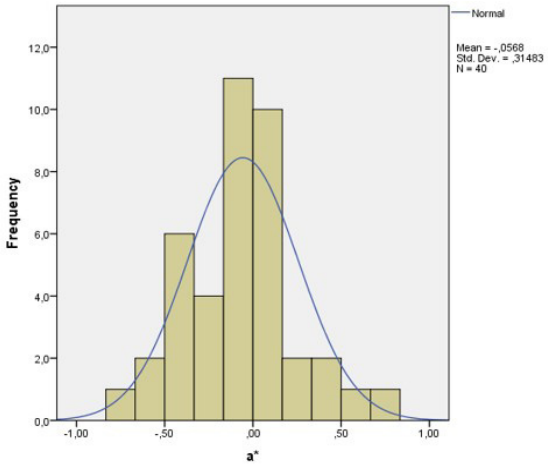

Figure 6: The frequency of a* value of *Diplodus* vulgaris samples.

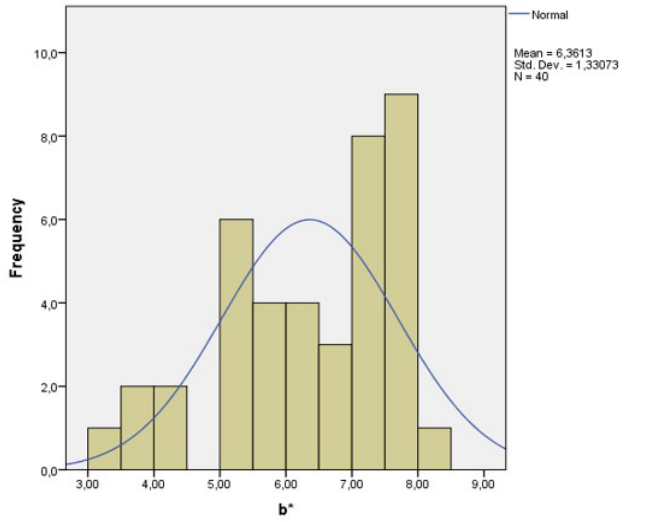

Figure 7: The frequency of b* value of *Diplodus* vulgaris samples.

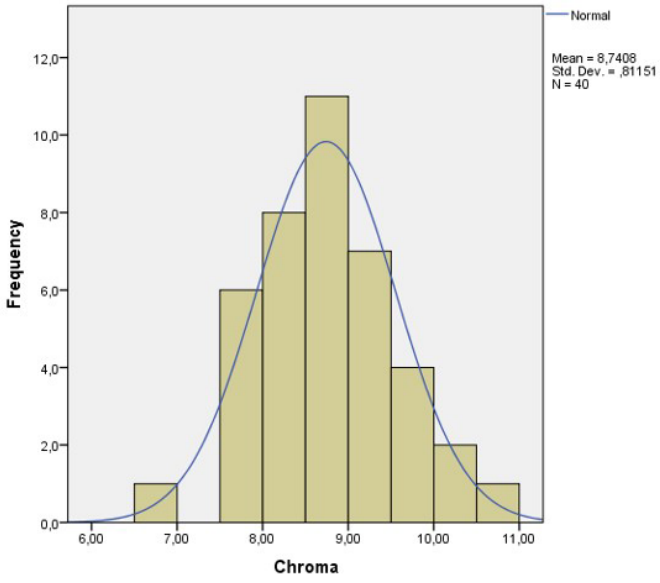

Figure 8: The frequency of Chroma value of *Diplodus* vulgaris samples.

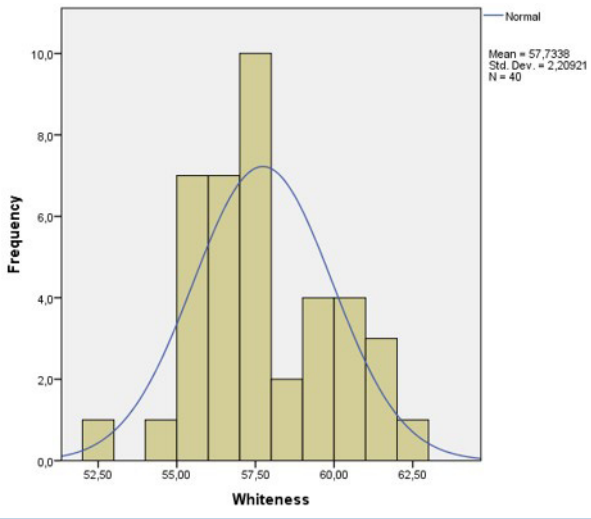

Figure 9: The frequency of Whiteness value of *Diplodus* vulgaris samples.

Table 1: The color and area properties of the samples.

Properties	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Area (cm^2)	40	45.06	85.75	130.81	4071.35	101.7838	9.58026	91.781
*L**	40	10.23	53.26	63.49	2363.16	59.0790	2.22782	4.963
*a**	40	1.44	-0.69	0.75	-2.27	-0.0568	0.31483	0.099
*b**	40	5.01	3.07	8.08	254.45	6.3613	1.33073	1.771
Chroma	40	4.07	6.59	10.66	349.63	8.7408	0.81151	0.659
Whiteness	40	10.32	52.00	62.32	2309.35	57.7338	2.20921	4.881

References

1. Mouine N, Francour P, Ktari MH, Chakroun-Marzouk N. Reproductive Biology of Four Diplodus Species Diplodus Vulgaris, D. Annularis, D. Sargus Sargus and D. Puntazzo (Sparidae) in the Gulf of Tunis (Central Mediterranean)." Journal of the Marine Biological Association of the United Kingdom. 2012; 92: 623-631.
2. Teletchea, Fabrice. Molecular Identification Methods of Fish Species: Reassessment and Possible Applications. Reviews in Fish Biology and Fisheries. 2009; 19: 265-293.
3. Rasmussen, Rosalee S, Michael T, Morrissey. DNA-Based Methods for the Identification of Commercial Fish and Seafood Species. Comprehensive Reviews in Food Science and Food Safety. 2008; 7: 280-295.
4. Ward RD, Hanner R, Hebert PDN. "The Campaign to DNA Barcode All Fishes, FISH-BOL." Journal of Fish Biology. 2009; 74: 329-356.
5. Oliveira ACM, Balaban MO. Comparison of A Colorimeter with a Machine Vision System in Measuring Color of Gulf of Mexico Sturgeon Fillets. Applied Engineering in Agriculture. 2006; 22: 1-5.
6. Yagiz Yavuz, Murat O Balaban, Hordur G Kristinsson, Bruce A Welt, Maurice R Marshall. "Comparison of Minolta Colorimeter and Machine Vision System in Measuring Colour of Irradiated Atlantic Salmon. Journal of the Science of Food and Agriculture. 2009; 89: 728-730.
7. Alciccek, Zayde, Murat Omer Balaban. Development and Application of 'The Two Image' Method for Accurate Object Recognition and Color Analysis. Journal of Food Engineering 2012; 111: 46-51.
8. Alcicek, Zayde,Murat Omer Balaban. Characterization of Green Lipped Mussel Meat. Part II: Changes in Physical Characteristics as a Result of Brining and Liquid Smoke Application." Journal of Aquatic Food Product Technology. 2015a; 24: 15-30.
9. Alcicek, Zayde, Murat Omer Balaban. Characterization of Green Shelled Mussel Meat. Part I: Quantification of Color Changes During Brining and Liquid Smoke Application Using Image Analysis. Journal of Aquatic Food Product Technology. 2015b; 24: 2-14.
10. Ayvaz, Zayde, Fikret Cakır, Hatice Günduz, Mehmet Erdag. The Use of Computer-Based Image Analysis on Colour Determination of Liquid Smoked Trout (Oncorhynchus Mykiss) Treated with Different Dry Salt-Sugar Mixtures. Turkish Journal of Agriculture-Food Science and Technology 2017; 5: 1528.
11. Balaban, Murat O, Kelsie Stewart, Graham C, Fletcher, et al. Color Change of the Snapper (Pagrus Auratus) and Gurnard (Chelidonichthys Kumu) Skin and Eyes during Storage: Effect of Light Polarization and Contact with Ice. Journal of Food Science. 2014.
12. Kim, Min Geun, Zayde Alçiçek, Murat O. Balaban, et al. Image Analysis Method to Quantify the Effect of Different Treatments on the Visual Meat/Shell Ratio of Half-Shelled Green Lipped Mussels (Perna Canaliculus). Journal of the Science of Food and Agriculture. 2014.
13. Hu, Jing, Daoliang Li, Qingling Duan, Yueqi Han, et al. Fish Species Classification by Color, Texture and Multi-Class Support Vector Machine Using Computer Vision. Computers and Electronics in Agriculture. 2012; 88: 133-140.
14. Alcicek, Zayde, Murat Omer Balaban. Estimation of Whole Volume of Green Shelled Mussels Using Their Geometrical Attributes Obtained from Image Analysis. International Journal of Food Properties. 2014; 17: 1987-1997.
15. ISCC. 2016. ISCC-NBS Colour System. 2019.