Acta Nat. Sci. (2020) 1(1): 96-108
DOI: 10.29329/actanatsci.2020.313.11
e-ISSN: 2718-0638

Original Research Paper
info@actanatsci.com
www.actanatsci.com

ACTA NATURA ET SCIENTIA

The Maximum Length Record of the White Seabream (*Diplodus sargus* Linnaeus, 1758) for the Aegean Sea

Şenol Paruğ[1]✉ • Özgür Cengiz[2]

[1] Kastamonu University, Fisheries Faculty, Kastamonu, Turkey, senolparug@gmail.com
[2] Van Yüzüncü Yıl University, Fisheries Faculty, Van, Turkey, ozgurcengiz17@gmail.com

✉ Corresponding Author: senolparug@gmail.com

Please cite this paper as follows:
Paruğ, Ş., Cengiz, Ö. (2020). The Maximum Length Record of the White Seabream (*Diplodus sargus* Linnaeus, 1758) for the Aegean Sea. *Acta Natura et Scientia*, 1(1): 96-108.

ARTICLE INFO

Received: 19.10.2020
Accepted: 01.12.2020

Keywords

Diplodus sargus
White seabream
Maximum length
Saros Bay
Aegean Sea

ABSTRACT

A single specimen of *Diplodus sargus* with 40.5 cm in total length and 1000.00 g in total weight was caught off İbrice Bight (Saros Bay) with handline by a commercial fisherman on 25 June 2018. The mentioned sizes are the maximum length and weight values of the species for the Aegean Sea and the other Turkish coasts; however, it is the second-largest length ever reported in the Mediterranean Basin.

INTRODUCTION

The white seabream (*Diplodus sargus* Linnaeus, 1758) is an important demersal commercial sparid found throughout the Mediterranean Sea (Fischer *et al.*, 1987), eastern Atlantic from Canary Islands and Madeira north to France (Fishbase, 2020) (Figure 1), especially inhabiting rock, sand and seagrass beds (Vigliola & Harmelin-Vivien, 2001). This species congregate in schools of 5-50 individuals and feed mainly on molluscs (Rosecchi, 1987). Juveniles usually live in coastal lagoons and estuaries (<2 m) (Quignard & Man-Wai, 1983; Macpherson, 1998). The white seabream is mostly caught by long lines;

although sometimes it is caught by trammel nets and gill nets (Mahmoud *et al.,* 2010). Because of its economic value, although there are various studies on *Diplodus sargus* all over the World (Girardin, 1978; Man-Wai & Quignard, 1984; Man-Wai, 1985; Wassef, 1985; Rosecchi, 1987; Harmelin et al., 1995; Gordoa & Moli, 1997; Sala & Ballesteros, 1997; Macpherson et al., 1997; Macpherson, 1998; Planes et al., 1999; Gonçalves, 2000; Vigliola & Harmelin-Vivien, 2001; Mariani, 2001; Lanfant, 2003; Morato et al., 2003; Mouine et al., 2007; Abacesis et al., 2008; Benchalel & Kara, 2010; Benchalel et al., 2010; Mahmoud et al., 2010; Benchalel & Kara, 2012; Al-Beak et al., 2017), there is one study about biological parameters of this species (Balık & Emre, 2016), except of its length-weight relationships in the Turkish seas.

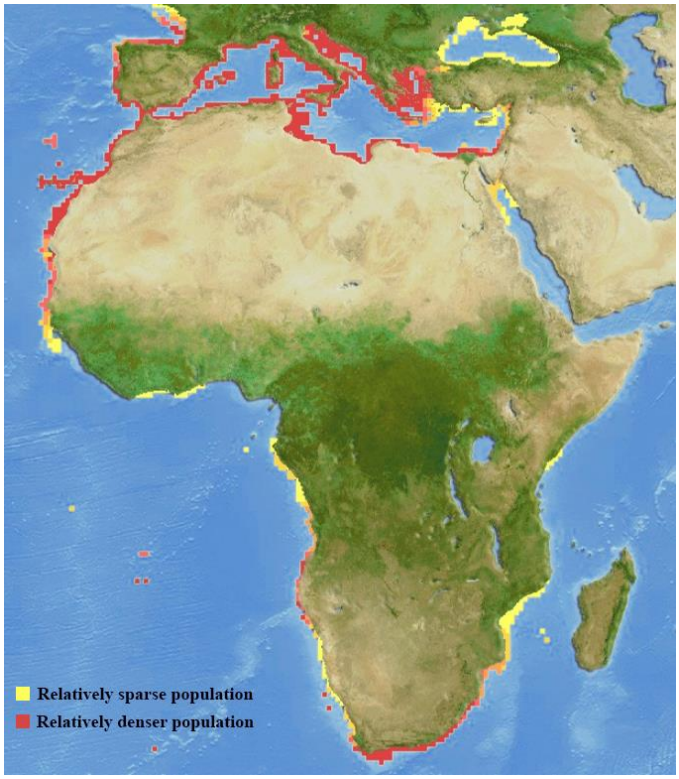

Figure 1. Geographic distribution of *Diplodus sargus* (modified from Fishbase, 2020)

The maximum length and weight are important parameters used in life-history studies and fishery science (Dulčić & Soldo, 2005) and these measurements are applied directly or indirectly in most stock assessment models (Legendre & Albaret, 1991; Borges, 2001). Especially, the size-based analyses of marine animals are becoming increasingly popular methods for improving the understanding of community structure and function (Jennings & Dulvy, 2005) and could be used as a tool for rapid evaluation of growth rates in the absence of primary data (Froese & Binohlan, 2000; Filiz & Sevingel, 2015). Therefore, it is necessary to regularly update the maximum size of commercially important species (Navarro et al., 2012). Accurate estimates of the maximum size of fish in a population are essential for biologists and ecologists because biological rates and ecological functions are size-specific (Peters, 1983; Pope et al., 2005). For example, metabolic rate is inversely related to body size, whereas total food intake is positively related to body size. Size at hatch, size at sexual, maturation and longevity are directly related to the maximum size of fishes (Freedman & Noakes, 2002; Van der Veer et al., 2003). However, the maximum length or weight is a key component in many fishery models, such as the von Bertalanffy and Gompertz growth models (Quinn & Deriso, 1999). The given size is the maximum length and weight values of the species for the Aegean Sea; however, it is the second-largest length ever reported in the Mediterranean Basin.

MATERIAL AND METHOD

Saros Bay, which is situated in the Northeastern Aegean Sea, is connected to the North Aegean with a depth of approximately 600 m to the west. The shelf extends at a water depth of 90-120 m. The length of the bay is about 61 km, and the width at the opening to the Aegean Sea is about 36 km (Eronat & Sayın, 2014). As Saros Bay had been closed to bottom trawl fishing since 2000 (Cengiz et al., 2011; 2019a) and no industrial activity was prevalent in the area (Sarı & Çağatay, 2001), the bay can be considered as a pristine environment (Cengiz et al., 2013).

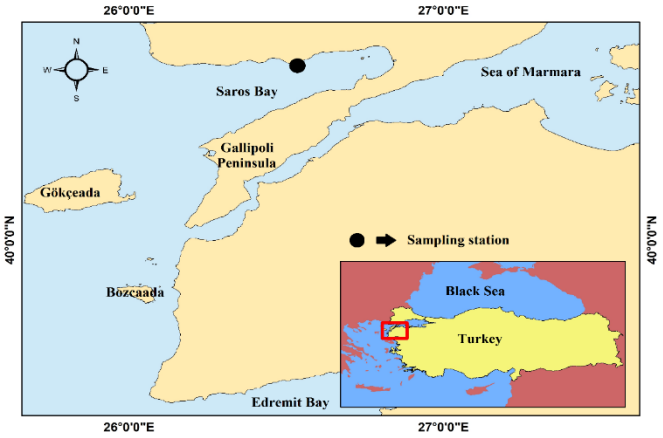

Figure 2. Saros Bay (Northern Aegean Sea, Turkey) and sampling station

A single specimen of *Diplodus sargus* was caught off İbrice Bight (Saros Bay, Northern Aegean Sea) (Figure 2) with handline by a commercial fisherman from a depth of 15 m depth on 25 June 2018. Subsequently, we obtained it from a fishmonger in Çanakkale. Total length is defined as the measurement taken from the anterior-most part of the fish to the end of the caudal fin rays when compressed dorso-ventrally (Anderson & Gutreuter, 1983). Consequently, the total length and weight of the specimen was measured carefully. Additionally, some morphometric characters (according to Figure 3) were measured, and some meristic characters were determined.

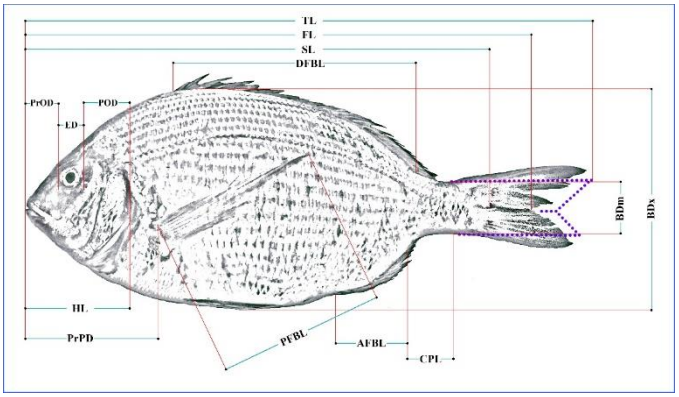

Figure 3. Morphometric measurements of the white seabream (Abbreviations: TL – total length, FL – fork length, SL – standard length, HL – head length, PrOD – preorbital distance, ED – eye diameter, POD – postorbital distance, PrPD – prepectoral distance, DFBL – dorsal fin base length, PFBL – pectoral fin base length, AFBL – anal fin base length, CPL – caudal peduncle length, BDm – minimum body depth, BDx – maximum body depth)

RESULTS

Captured white seabream was 40.5 cm in total length (TL) and 1000.00 g in total weight (TW) (Figure 4). Some morphometric and meristic characters are presented in Table 1. The comparison of the previous maximum length and weight values for *Diplodus sargus* in the Mediterranean Basin is given in Table 2.

Figure 4. The white seabream with 40.5 cm TL and 1000.00 g TW

Table 1. Some morphometric and meristic characters of the *Diplodus sargus* specimen discussed in this study

Morphometric Characters	**Value**
Weight (g)	1000.0
TL (mm)	405.0
FL (mm)	372.6
SL (mm)	342.0
BDm (mm)	33.7
BDx (mm)	158.9
HL (mm)	76.0
PrOD (mm)	26.7
ED (mm)	13.7
POD (mm)	35.6
PrPD (mm)	99.0
DFBL (mm)	169.3
PFBL (mm)	128.9
AFBL (mm)	57.6
CPL (mm)	40.4
Meristic Characters	
Dorsal fin rays	XI - 12
Anal fin rays	III - 11
Pectoral fin rays	13
Lateral line scales	63

DISCUSSION

Size structure and maximum size of individuals within fish populations are influenced by several abiotic, biotic, and anthropogenic factors (VanderBloemen et al., 2020). If a fish population in any ecosystem is exposed to overfishing, fish sizes will gradually be smaller over time. Therefore, individuals who are not subjected to overfishing could reach such a length (Filiz, 2011). However, the factors affecting growth could state as nutrient availability, feeding, light regime, oxygen, salinity, temperature, pollutants, current speed, nutrient concentration, predator density, intra-specific social interactions and genetics (Helfman et al., 2009; Acarli et al., 2018). It follows from these comments that the regional differences in maximum length and weight depend on the ecological conditions and overfishing pressure.

In the Mediterranean Basin, the maximum length and weight values have been reported to be 42 cm (TL) and 1700.00 g (TW) by Man-Wai & Quignard (1984) in the Gulf of Lion. The Mediterranean Sea is considered to be one of the most impoverished marine regions (Mazzocchi et al., 1997). Within the Mediterranean Sea, there exists a west-east gradient (Krom et al., 1991; Dolan et al., 1999; Turley et al., 2000): the Eastern Mediterranean has been identified as one of the most oligotrophic areas of the world (Azov, 1986; Souvermezoglou et al., 1992; Krom et al., 1993; Zohary & Robarts, 1998). The Aegean Sea is a

Table 2. The comparison of the previous maximum length and weight values for *Diplodus sargus* in the Mediterranean Basin

Authors	Area	N	L_{max} (cm)	W_{max} (g)
Man-Wai & Quignard (1984)*	Gulf of Lion	1684	42.0	1700.00
Gordoa & Moli (1997)	Catalan coast, North-Western Mediterranean	184	39.0	-
Moutopoulos & Stergiou (2002)	Cyclades, Greece	19	32.3	-
Karakulak et al. (2006)	Gökceada Island, Turkey	2	15.3	56.20
Ceyhan et al. (2009)	Gökova Bay, Turkey	33	32.3	-
Gürkan et al. (2010)	Candarli Bay, Turkey	22	4.4	1.09
Mahmoud et al. (2010)	Abu Qir Bay, Egypt	-	27.5	-
Bilge et al. (2014)	Southern Aegean, Turkey	83	27.3	-
Altın et al. (2015)	Gökceada Island, Turkey	530	23.1	222.00
Balık & Emre (2016)	Beymelek Lagoon, Turkey	355	28.7	481.00
Al-Beak et al. (2017)	East of North Sinai, Egypt	991	38.0	840.00
Kara et al. (2017)	Gediz Estuary, Turkey	73	12.3	31.90
This study**	Saros Bay, Turkey	1	40.5	1000.00

Note: * maximum length and weight values for the Mediterranean Basin.

** maximum length and weight values for the Aegean Sea and the other Turkish coasts, however, it is second largest record for the Mediterranean Basin.

distinct sub-system of the Eastern Mediterranean Sea due to its geographical position between the Black Sea and the other seas of the eastern basin (Ionian & Levantine Seas) (Siokou-Frangou et al., 2002). The Aegean Sea has a complex topography (Olson et al., 2007), and it displays considerable physiochemical variations between north and south (Zervakis & Georgopoulos, 2002). The nutrient concentrations, plankton and benthos abundance, as well as fish catch densities, have been found higher in the North-Northwest Aegean Sea than in the South-Southeast Aegean Sea (Stergiou et al., 1997). Furthermore, the Black Sea surface outflow in the Northeast Aegean Sea has been found to be enriched in dissolved organic carbon and dissolved organic nitrogen (Polat & Tuğrul, 1996). Therefore, the South Aegean Sea has been recently characterised as one of the most oligotrophic areas of the Mediterranean Sea (Ignatiades, 1998; Gotsis-Skretas et al., 1999; Van Wambeke et al., 2000; Psarra et al., 2000).

CONCLUSION

In broad terms, the information of maximum length, weight, age, growth and weight-length relationships are required to estimate the population parameters as asymptotic length and growth coefficient of fish, which is essential for fisheries resource planning and management (De la Cruz-Agüero et al., 2010). For these reasons, this information is constantly updated both in Turkey [(*Pagellus bogaraveo*, (Paruğ & Cengiz, 2020), *Alectis alexandrina*, (Akyol & Çoker, 2019); *Argyrosomus regius* (Tokaç et al., 2017); *Belone belone* (Acarli et al., 2018); *Boops boops* (Ceyhan et al., 2018); *Chelidonichthys lucerna* (Akyol, 2013; Hasimoğlu et al., 2016; Özdemir et al., 2019); *Diplodus annularis* (Cengiz et al., 2019b); *Diplodus puntazzo* (Aydın, 2019; Cengiz, 2019a); *Diplodus vulgaris* (Cengiz et al., 2019c); *Gonostoma denudatum* (Ayas et al., 2020); *Fistularia commersonii* (Koç et al., 2019); *Lithognatus mormyrus* (Aydın, 2018a; Cengiz, 2019b); (*Mullus barbatus* (Filiz, 2011); *Mullus surmuletus* (Cengiz, 2019c); *Oblada melanura* (Akyol et al., 2014; Cengiz, 2020a); *Phycis phycis* (Filiz & Sevingel, 2014); *Pomatomus saltatrix* (Cengiz, 2014; Bal et al., 2018); *Sardina pilchardus* (Cengiz & Sepil, 2018); *Sciaena umbra* (Cengiz et al., 2019d); *Symphodus melops* (Aydın, 2020); *Solea solea* (Cengiz, 2018a); *Sparisoma cretense* (Filiz & Sevingel, 2015); *Sparus aurata* (Aydın, 2018b; Cengiz, 2018b); *Spicara maena* (Cengiz, 2020b); *Spondyliosoma cantharus* (Cengiz, 2018c); *Stephanolepis diaspros* (Akyol et al., 2018); *Umbrina cirrosa* (Cengiz & Paruğ, 2021)] and in the World [(*Anguilla anguilla* (Tutman et al., 2007); *Ariopsis gilberti*, *Ariopsis guatemalensis*, *Cathorops liropus*, *Cathorops raredonae* (Palacios-Salgado et al., 2018); *Bagarius yarrelli* (Hossain, 2010); *Balistes capriscus* (Dulčić & Soldo, 2005); *Belone belone* (Dulčić & Soldo, 2006); *Corica soborna*, *Mystus bleekeri* (Hossain et al., 2017); *Esox masquinongy* (VanderBloemen et al., 2020); *Mobula cf. hypostoma* (Ehemann et al., 2017); *Macrohamphosus scolopax* (Borges, 2001); *Notarius troschelii* (De la Cruz-Agüero et al., 2010); *Scardinius erythrophthalmus* (Šprem et al., 2010); *Scardinius dergle*, *Scardinius hesperidicus* (Valić et al., 2013); *Scomber colias*, *Scomber scombrus* (Navarro et al., 2012)]. Consequently, this paper provides new data on the maximum observed length of *Diplodus sargus* for the Aegean Sea and the other Turkish coasts, and the second-largest length for Mediterranean Basin. The information presented here may be used to compare the similar parameters in ongoing fishery studies all over the world by providing scientific support to the fisheries scientists.

Compliance with Ethical Standards

Authors' Contributions

Both authors have contributed equally to this paper. Both authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

REFERENCES

Abecasis, D., Bentes, L., Coelho, R., Correia, C., Lino, P. G., Monteiro, P., Gonçalves, J. M. S., Ribeiro. J., & Erzini, K. (2008). Ageing sea breams: A comparative study between scales and otoliths. *Fisheries Research, 89*, 37-48. https://doi.org/10.1016/j.fishres.2007.08.013

Acarli, D., Kale, S., & Çakır, K. (2018). A new maximum length for the garfish, *Belone belone* (Linnaeus, 1761) in the Coast of Gökçeada Island (Aegean Sea, Turkey). *Cahiers de Biologie Marine, 59*(4), 385-389. https://doi.org/10.21411/CBM.A.55A28635

De la Cruz-Agüero, J., Cota-Gómez, V., & Nieto-Navarro, J. (2010). New maximum size record for the chili sea catfish *Notarius troschelii* (Siluriformes: Ariidae) from the Tropical Eastern Pacific. *Marine Biodiversity Records, 3*, e107. https://doi.org/10.1017/S1755267210000916

Akyol, O. (2013). New maximum length of tub gurnard, *Chelidonichthys lucerna* (Linnaeus, 1758) (Osteichthyes: Triglidae) in the Southern Aegean Sea, Turkey. *Journal of the Black Sea/Mediterranean Environment*, *19*(1), 138-142.

Akyol, O., Kara, A., & Sağlam, C. (2014). Maximum size of saddled bream, *Oblada melanura* (Linnaeus, 1758) (Osteichthyes: Sparidae), in the southern Aegean Sea, Turkey. *Journal of the Black Sea/Mediterranean Environment*, *20*(3), 270-273.

Akyol, O., Ceyhan, T., Özgül, A., & Ertosluk, O. (2018). Maximum size of reticulated leatherjacket, *Stephanolepis diaspros* Fraser-Brunner, 1940 (Tetraodontiformes: Monacanthidae), for the Turkish Seas. *Journal of the Black Sea/Mediterranean Environment*, *24*(2), 149-156.

Akyol, O., & Çoker, T. (2019). Maximum size of female alexandria pompano *Alectis alexandrina* (Carangidae) in the Aegean Sea. *COMU Journal of Marine Science and Fisheries*, *2*(2), 142-146.

Al-Beak, A. M., Ghoneim, S. I., El-Dakar, A. Y., Salem, M., & El-Aiatt, A. A. (2017). Fisheries Management of *Diplodus sargus* in the East of North Sinai. *Journal of Aquaculture & Marine Biology*, *6*(2), 00150. https://doi.org/10.15406/jamb.2017.06.00150

Altın, A., Ayyıldız, H., Kale, S., & Alver, C. (2015). Length-weight relationships of forty-nine fish species from shallow waters of Gökçeada Island, Northern Aegean Sea. *Turkish Journal of Zoology*, 39(5), 971-975. https://doi.org/10.3906/zoo-1412-15

Anderson, R. O., & Gutreuter, S. J. (1983). Length, weight, and associated structural indices. In: Nielsen, L., Johnson D. (eds.), Fisheries techniques, American Fisheries Society, Bethesda, Maryland, USA. pp. 283-300.

Ayas, D., Akbora, H. D., & Ergüden, D. (2020). Maximum length report of *Gonostoma denudatum* Rafinesque, 1810 in the Eastern Mediterranean Sea. *Marine Science and Technology Bulletin*, 9(2), 83-86. https://doi.org/10.33714/masteb.690826

Aydın, M. (2018a). The new maximum length of the striped sea bream (*Lithognathus mormyrus* L., 1758) in the Black Sea Region. *Aquatic Sciences and Engineering*, *33*(2), 50-52. https://doi.org/10.18864/ase201808

Aydın, M. (2018b). Maximum length and age report of *Sparus aurata* (Linnaeus, 1758) in the Black Sea. *Journal of Applied Ichthyology*, *34*(4), 964-966. https://doi.org/10.1111/jai.13615

Aydın, M. (2019). Maximum length and weight of sharpsnout seabream (*Diplodus puntazzo* Walbaum, 1792) for Black Sea and East Mediterranean Sea. *Turkish Journal of Maritime and Marine Sciences*, *5*(2), 127-132.

Aydın, M. (2020). First report of *Symphodus melops* (Linnaeus, 1758) with maximum length in the Black Sea. *Marine Science and Technology Bulletin*, 9(2), 125-129. https://doi.org/10.33714/masteb.741985

Azov, Y. (1986). Seasonal patterns of phytoplankton productivity and abundance in nearshore oligotrophic waters of the Levant Basin (Mediterranean). *Journal of Plankton Research*, *8*, 41-53.

Bal, H., Yanık, T., & Türker, D. (2019). A study on morphometric characteristics of otolith for a new maximum length record of the bluefish (*Pomatomus saltatrix*, Linneaus 1766) in the Sea of Marmara. *Journal of the Black Sea/Mediterranean Environment*, *24*(3), 281-287.

Balık, İ., & Emre, Y. (2016). Population structure, length-weight relationship and growth of white seabream, *Diplodus sargus sargus* (Linneaus, 1758), in Beymelek Lagoon, Turkey. *Journal of Applied Ichthyology*, *32*, 602-605.

Benchalel, W., & Kara, M. H. (2010). Biométrie et dimorphisme sexuel du sar commun *Diplodus sargus sargus* des côtes de l'Est algérien. *Bulletin de la Société zoologique de France*, *135*, 149-162.

Benchalel, W., Derbal, F., & Kara, M. H. (2010). Régime alimentaire du sar commun *Diplodus sargus sargus* (Sparidae) des côtes de l'est algérien. *Cybium*, *34,* 231-242.

Benchalel, W., & Kara, M. H. (2012). Age and growth and reproduction of the white seabream *Diplodus sargus sargus* (Linneaus, 1758) off the eastern coast of Algeria. *Journal of Applied Ichthyology*, *29*, 64-70.

Bilge, G., Yapıcı, S., Filiz, H., & Cerim, H. (2014). Weight-length relations for 103 fish species from the southern Aegean Sea, Turkey. *Acta Ichthyologica et Piscatoria, 44*(44), 263-269. https://doi.org/10.3750/AIP2014.44.3.11

Borges, L. (2001). A new maximum length for the snipefish, *Macroramphosus scolopax*. *Cybium*, *25*, 191-192.

Cengiz, Ö., İşmen, A., Özekinci, U., & Öztekin, A. (2011). An investigation on fish fauna of Saros Bay (Northern Aegean Sea). *Afyon Kocatepe University Journal of Sciences*, *11*(1), 31-37.

Cengiz, Ö., Özekinci, U., İşmen, A., & Öztekin, A. (2013). Age and growth of the four-spotted megrim (*Lepidorhombus boscii* Risso, 1810) from Saros Bay (Northern Aegean Sea, Turkey). *Mediterranean Marine Sciences*, *14*(1), 36-44. https://doi.org/10.12681/mms.328

Cengiz, Ö. (2014). A new maximum length record of the bluefish (*Pomatomus saltatrix* Linnaeus, 1766) for Turkey Seas. *Bitlis Eren University Journal of Science*, *3*(1), 113-116. https://doi.org/10.17798/beufen.12734

Cengiz, Ö. (2018a). Weight-length relationship with maximum size record of the common sole (*Solea solea* Linnaeus, 1758) in the Aegean Sea. In: N. Yarpuz Bozdoğan, E. Dönmez, & U. Çoşgun (Eds.), *Innovative approaches in agriculture, forestry and aquaculture sciences* (pp. 7-15). Gece Publishing.

Cengiz, Ö. (2018b). Second maximum length record of gilthead seabream (*Sparus aurata* Linnaeus, 1758) for Aegean costs of Turkey. *Proceedings of the International Eurasian Conference on Science, Engineering and Technology*, Ankara, Turkey. pp. 74-77.

Cengiz, Ö. (2018c). Türkiye denizleri için iskatari balığı'nın (*Spondyliosoma cantharus* Linnaeus, 1758) maksimum boy kaydı. *Proceedings of the International Eurasian Conference on Science, Engineering and Technology*, Ankara, Turkey. pp. 134.

Cengiz, Ö., & Sepil, A. (2018). Maximum length for the European sardine (*Sardina pilchardus* Walbaum, 1792) in Northern Aegean Coasts of Turkey. *Proceedings of the 1. International Agricultural Science Congress*. Van, Turkey, pp. 138.

Cengiz, Ö. (2019a). Maximum size record of sharpsnout seabream (*Diplodus puntazzo* Walbaum, 1792) for Saros Bay, Northern Aegean Sea. *Marine Science and Technology Bulletin*, *8*(2), 55-57. https://doi.org/10.33714/masteb.596481

Cengiz, Ö. (2019b). Weight-length relationships with maximum length record of striped sea bream (*Lithognathus mormyrus* Linnaeus, 1758) for Turkish Seas. *Yüzüncü Yıl University Journal of Agricultural Science*, *29*(3), 382-387. https://doi.org/10.29133/yyutbd.556844

Cengiz, Ö. (2019c). Maximum size record of striped red mullet (*Mullus surmuletus* Linnaeus, 1758) for Turkish Seas. *Selçuk University Journal of Science Faculty*, *45*(1), 32-38.

Cengiz, Ö., Paruğ, Ş. Ş., & Kızılkaya, B. (2019a). Weight-length relationship and reproduction of bogue (*Boops boops* Linnaeus, 1758) in Saros Bay (Northern Aegean Sea, Turkey). *KSU Journal of Agriculture and Nature*, *22*(4), 577-582. https://doi.org/10.18016/ksutarimdoga.vi.516700

Cengiz, Ö., Kızılkaya, B., & Paruğ, Ş. Ş. (2019b). Growth characteristics of annular seabream (*Diplodus annularis* Linnaeus, 1758) for Turkish waters. *KSU Journal of Agriculture and Nature*, *22*(5), 817-822. https://doi.org/10.18016/ksutarimdoga.vi.525929

Cengiz, Ö., Paruğ, Ş. Ş., & Kızılkaya, B. (2019c). Maximum length record of common two-banded seabream (*Diplodus vulgaris* Geoffroy Saint-Hilaire, 1817) for Aegean Sea with Turkish waters. *Alinteri Journal of Agriculture Sciences*, *34*(2), 160-163. https://doi.org/10.28955/alinterizbd.638974

Cengiz, Ö., Kızılkaya, B. & Paruğ, Ş. Ş. (2019d). Maximum size record of brown meagre (*Sciaena umbra* Linnaeus, 1758) for Aegean Sea. *KSU Journal of Agriculture and Nature*, *22*(4), 659-663. https://doi.org/10.18016/ksutarimdoga.vi.515704

Cengiz, Ö. (2020a). A study on maximum length record of saddled seabream (*Oblada melanura* Linnaeus, 1758) caught off Gökçeada Island (Northern Aegean Sea, Turkey). *Marine Science and Technology Bulletin,* 9(1), 58-61. https://doi.org/10.33714/masteb.691478

Cengiz, Ö. (2020b). An observation about maximum size record of blotched picarel (*Spicara maena* Linnaeus, 1758) from Northern Aegean coasts of Turkey. *Marine Science and Technology Bulletin,* 9(1), 71-74. https://doi.org/10.33714/masteb.678829

Cengiz, Ö., & Paruğ, Ş. Ş. (2021). A new maximum size record of the shi drum (*Umbrina cirrosa* Linnaeus, 1758) for Aegean Sea. *Brazilian Journal of Biology*, https://doi.org/10.1590/1519-6984.231643 (*In press*).

Ceyhan, T., Akyol, O., & Erdem, M. (2009). Length-weight relationships of fishes from Gökova Bay, Turkey (Aegean Sea). *Turkish Journal of Zoology*, *33*(1), 69-72. https://doi.org/10.3906/zoo-0802-9

Ceyhan, T., Ertosluk, O., Akyol, O., & Özgül, A. (2018). The maximum size of bogue, *Boops boops* (Perciformes: Sparidae) for the Mediterranean. *Acta Aquatica Turcica*, *14*(4), 399-403. https://doi.org/10.22392/egirdir.463612

Dolan, J. R., Vidussi, F., & Claustre, H. (1999). Planktonic ciliates in the Mediterranean Sea: longitudinal trends. *Deep Sea Research Part I Oceanographic Research Papers*, *46*(12), 2025-2039.

Dulčić, J., & Soldo, A. (2005). A new maximum length for the grey triggerfish, *Balistes capriscus* Gmelin, 1789 (Pisces: Balistidae) from the Adriatic Sea. *Institute of Oceanography and Fisheries-Split Croatia*, *88*, 1-7.

Dulčić, J., & Soldo, A. (2006). A new maximum length for the garpike *Belone belone* (Belonidae). *Cybium*, *30*(4), 382.

Ehemann, N. R., González-González, L. V., & Trites, A. (2017). Lesser devil rays Mobula cf. hypostoma from Venezuela are almost twice their previously reported maximum size and may be a new sub-species. *Journal of Fish Biology*, *90*, 1142-1148. https://doi.org/10.1111/jfb.13252

Eronat, C., & Sayın, E. (2014). Temporal evolution of the water characteristics in the bays along the eastern coast of the Aegean Sea: Saros, İzmir, and Gökova bays. *Turkish Journal of Earth Sciences*, *23*, 53-66. https://doi.org/10.3906/yer-1307-4

Filiz, H. (2011). A new maximum length for the Red Mullet, *Mullus barbatus* Linnaeus, 1758. *BIBAD - Research Journal of Biological Sciences, 4*(2), 131-135.

Filiz, H., & Sevingel, N. (2014). A new maximum length for the forkbeard, *Phycis phycis* (Linnaeus, 1766) in the Mediterranean Sea. *The Black Sea Journal of Sciences*, *4*(11), 43-48.

Filiz, H., & Sevingel, N. (2015). A new maximum length for the parrotfish, *Sparisoma cretense* (Linnaeus, 1758) in the Mediterranean Sea. *Journal of Aquaculture Engineering and Fisheries Research*, *1*(3), 140-143. https://doi.org/10.3153/JAEFR15015

Fischer, M. L., Bauchot, M. L., & Schneider, M. (1987). Fiches FAO d'identification des espèces pour les besoins de la peches, Vol. II, Mediterranèe et mer Noire. Zone de pêche 37. Rome: Commission des Communautès Europèennes and FAO.

Fishbase, (2020). *Diplodus sargus* (Linnaeus, 1758) – White seabream. Retrieved on October 15, 2020 from https://www.fishbase.se/summary/Diplodus-sargus+sargus.html

Freedman, J. A., & Noakes, D. L. G. (2002). Why are there no really big bony fishes? A point-of-view on maximum body size in teleosts and elasmobranches. *Reviews in Fish Biology and Fisheries*, *12*, 403-416. https://doi.org/10.1023/A:1025365210414

Froese, R., & Binohlan, C. (2000). Empirical relationships to estimate asymptotic length, length at first maturity, and length at maximum yield per recruit in fishes, with a simple method to evaluate length frequency data. *Journal of Fish Biology*, *56*(4), 758-773. https://doi.org/10.1111/j.1095-8649.2000.tb00870.x

Girardin, M. (1978). Les Sparidae (Pisces, Teleostei) du Golfe du lion- Ecologie et Biogeographie. Universite des Sciences Techniques du Languedoc, Laboratoire D' Ichthyologie et de Parasitologie Generale, Montpellier, Diplome D'Estudes Approfundies D' Ecologie Generale et Apliquee- Option Ecolo-gie Aquatique, 146 pp.

Gonçalves, J. M. S. (2000). Biologica Pesqueirae Dinamica Populacionalde *Diplodus vulgaris* (Geoffr) e Spondylio soma cantharus (L) (Pisces, Sparidae) na costa Sudoeste de Portugal. Universdado do Algarve, UCTRA, Faro, Ph.D. Thesis, 369 pp.

Gordoa, A., & Moli, B. (1997). Age and growth of the sparids *D. vulgaris, D. sargus* and *D. annularis* in adult populations and the differences in their juvenile growth patterns in the North Western Mediterranean Sea. *Fisheries Research*, *33*, 123-129.

Gotsis-Skretas, O., Pagou, K., Moraitou-Apostolopoulou, M. && Ignatiades, L. (1999). Seasonal, horizontal and vertical variability in primary production and standing stocks of phytoplankton and zooplankton in the Cretan Sea and the Straits of the Cretan Arc (March 1994-January 1995). *Progress in Oceanography*, *44*, 625-649.

Gürkan, Ş., Bayhan, B., Akcınar, S. C., & Taskavak, E. (2010). Length-weight relationship of fish from shallow waters of Candarli Bay (North Aegean Sea, Turkey). *Pakistan Journal of Zoology*, *42*(4), 495-498.

Harmelin, V. M. L., Harmelin, J. G., & Leboulleux, V. (1995). Microhabitat requirements for settlement of juvenile sparid fishes Mediterranean rocky shores. *Hydrobiologia, 300*(301), 309-320.

Hasimoğlu, A., Ak, O., Kasapoğlu, N., & Atılgan, E. (2016). New maximum length report of *Chelidonichthys lucerna* (Linneaus, 1758) in the Black Sea, Turkey. *Journal of the Black Sea/Mediterranean Environment, 22*(2), 149-154.

Helfman, G. S., Collette, B. B., Facey, D. E., & Bowen, B. W. (2009). The diversity of fishes: Biology, evolution, and ecology. Wiley-Blackwell: West Sussex, UK. 720 pp.

Hossain, M. Y. (2010). New maximum size record for the goonch *Bagarius yarrelli* (Sykes, 1839) (Siluriformes: Sisoridae) from the Ganges River. *Sains Malaysiana, 39*(2), 157-159.

Hossain, M. Y., Hossen, M. A., Nawer, F., Khatun, D., Pramanik, M. N. U., Parvin, M. F., & Yahya, K. (2017). New maximum size records and length-weight relationships for two species. *Corica soborna* (Hamilton, 1822) and *Mystus bleekeri* (Day, 1877) from the Ganges River (NW Bangladesh). *Journal of Applied Ichthyology*, *33*(3), 661-662. https://doi.org/10.1111/jai.13342

Jennings, S., & Dulvy, N. K. (2005). Reference points and reference directions for size based indicators of community structure. *ICES Journal of Marine Sciences*, *67*, 397-404.

Ignatiades, L. (1998). The productive and optical status of the oligotrophic waters of the Southern Aegean Sea (Cretan Sea), Eastern Mediterranean. *Journal of Plankton Research*, *20*(5), 985-995.

Kara, A., Sağlam, C., Acarlı, D., & Cengiz, Ö. (2017). Length-weight relationships for 48 fish species of the Gediz Estuary, in İzmir Bay (Central Aegean Sea, Turkey). *Journal of the Marine Biological Association of the United Kingdom*, *98*(4), 879-884. https://doi.org/10.1017/S0025315416001879

Karakulak, F. S., Erk, H., & Bilgin, B. (2006). Length-weight relationships for 47 coastal fish species from the Northern Aegean Sea, Turkey. *Journal of Applied Ichthyology, 22*(4), 274-278. https://doi.org/10.1111/j.1439-0426.2006.00736.x

Koç, H. T., Erdoğan, Z., & Can, S. (2019). The new maximum length of the invasive lessepsian fish, bluespotted cornetfish *Fistularia commersonii* (Syngnathiformes: Fistulariidae) in the Eastern Mediterranean Sea. *Natural and Engineering Sciences*, *4*(Supplement 3), 1-9.

Krom, M. D., Kress, N., Brenner, S., & Gordon, S. (1991). Phosphorus limitation of primary productivity in the eastern Mediterranean Sea. *Limnology and Oceanography 36*, 24-432.

Krom, M. D., Brenner, S., Kress, N., Neori, A. & Gordon, I. L. (1993). Nutrient distribution during an annual cycle across a warm-core eddy from the E. Mediterranean Sea. *Deep Sea Research Part I: Oceanographic Research Papers*, *40*, 805-825.

Lanfant, J. (2003). Demographic and genetic structure of white seabream populations (*Diplodus sargus*, Linnaeas, 1958) inside and outside a Mediterranean reserve. *Comptes Rendus Biologies*, *326*(8), 751-760.

Legendre, M., & Albaret, J. J. (1991). Maximum observed length as an indicator of growth rate in tropical fishes. *Aquaculture*, *94*, 327-341.

Macpherson, E., Biagi, F., Francour, P., Garcia, R. A., Harmelin, J., Harmelin, V. M., Jouvenel, J. Y., Planes, S., Vigliola, L., & Tunesi, L. (1997). Mortality of juvenile fishes of the Genus *Diplodus* in protected and unprotected areas in the Western Mediterranean Sea. *Marine Ecology Progress Series*, *160*, 135-147.

Macpherson, E. (1998). Ontogenetic shifts in habitat use and aggregation in juvenile sparid fishes. *Journal of Experimental Marine Biology and Ecology, 220*(1), 127-150.

Mahmoud, H. M., Osman, A. M., Ezzat, A. A., & Saleh, A. M. (2010). Fisheries biology and management of *Diplodus sargus sargus* (Linnaeus, 1758) in Abu Qir Bay, Egypt. *Egyptian Journal of Aquatic Research*, *36*(1), 123-131.

Man-Wai, R. (1985). Les sars du golfe du Lion, *Diplodus sargus, D. vulgaris, D. annularis* (Pisces, Sparidae). Ecobiologie- Pêche. Thése Docteur, Universitédes sciences et Techniques du Languedoc, pp. 361.

Man-Wai, R., & Quignard, J. P. (1984). The seabream *Diplodus sargus* (Linne 1758) in Gulf of Lion: Growth of the seabream and characteristics of landings from the commercial fishing grounds of Sete and Grau-du- Roi. *Revue Des Travaux De l'Institut Des Pêches Maritimes*, *46*(3), 173-194.

Mariani, S. (2001). Cleaning behaviour in *Diplodus* spp.: Chance or choice? A hint for future investigations. *Journal of the Marine Biological Association of the United Kingdom*, *81*(4), 715-716. https://doi.org/10.1017/S0025315401004490

Mazzocchi, M. G., Christou, E., Fragopoulu, N., & Siokou-Frangou, I. (1997). Mesozooplankton distribution from Sicily to Cyprus (Eastern Mediterranean): I. General aspects. *Oceanologica Acta*, *20*(3), 521-535.

Morato, T., Afonso, P., Lourinho, P., Nash, R. D. M., & Santos, R. S. (2003). Reproductive biology and recruitment of the white seabream in the Azores. *Journal of Fish Biology*, *63*(1), 59-72. https://doi.org/10.1046/j.1095-8649.2003.00129.x

Mouine, N., Francour, P., Ktari, M. H., & Chakroun-Marzouk, N. (2007). The reproductive biology of *Diplodus sargus sargus* in the Gulf of Tunis (central Mediterranean). *Scientia Marina*, *71*(3), 461-469.

Moutopoulos, D. K., & Stergiou, K. I. (2002). Length-weight and length-length relationships of fish species from the Aegean Sea (Greece). *Journal of Applied Ichthyology*, *18*(3), 200-203. https://doi.org/10.1046/j.1439-0426.2002.00281.x

Navarro, M. R., Villamor, B., Myklevoll, S., Gil, J., Abaunza, P. & Canoura, J. (2012). Maximum size of Atlantic mackerel (*Scomber scombrus*) and Atlantic chub mackerel (*Scomber colias*) in the Northeast Atlantic. *Cybium*, *36*(2), 406-408.

Olson, D. B., Kourafalou, V.H., Johns, W.E., Samuels, G., & Veneziani, M. (2007). Aegean surface circulation from a satellite-tracked drifter array. *Journal of Physical Oceanography, 37*(7), 1898-1917. https://doi.org/10.1175/JPO3028.1

Özdemir, S., Özsandıkçı, U., & Büyükdeveci, F. (2019). A new maximum length with length-weight relationship of tub gurnard (*Chelidonichthys lucerna* Linnaeus, 1758) from Central Black Sea Coasts of Turkey. *Marine Science and Technology Bulletin, 8*(2), 85-91. https://doi.org/10.33714/masteb.641702

Palacios-Salgado, D. S., Flores-Ortega, J. R., & Zavala-Leal, O. I. (2018). Length-weight relationship for sea catfishes (Siluriformes: Ariidae) from the southeastern Gulf of California with new records on maximum length. *Journal of Applied Ichthyology, 34*, 700-702. https://doi.org/10.1111/jai.13511

Paruğ, Ş., & Cengiz, Ö. (2020). The maximum length record of the blackspot seabream (*Pagellus bogaraveo* Brünnich, 1768) for the entire Aegean Sea and Turkish territorial waters. *Turkish Journal of Agriculture - Food Science and Technology*, *8*(10), 2125-2130. https://doi.org/10.24925/turjaf.v8i10.2125-2130.3597

Peters, R. H. (1983). *The ecological implications of body size*. Cambridge University Press.

Planes, S., Macpherson, E., Biagi, F., García-Rubies, A., Harmelin, J., Harmelin-Vivien, M., Jouvenel, J. Y., Tunesi, L., Vigliola, L., & Galzin, R. (1999). Spatio-temporal variability in growth of juvenile sparid fishes in the Mediterranean infralittoral zone. *Journal of the Marine Biological Association of the United Kingdom, 79*(1), 137-143. https://doi.org/10.1017/S0025315498000150

Polat, Ç., & Tuğrul, S. (1996). Chemical exchange between the Mediterranean and Black Sea via the Turkish Straits. In: Briand, F. (Ed.), *Dynamics of Mediterranean Straits and* Channels (pp. 167-186). Bulletin de l'Institut Oceanographique, Monaco, Special No. 17, CIESME Science Series.

Pope, K. L., Wilde, G. R., & Bauer, D. L. (2005). Maximum size of fish caught with standard gears and recreational angling. *Fisheries Research, 76*(1), 117-122. https://doi.org/10.1016/j.fishres.2005.05.013

Psarra, S., Tselepides, A., & Ingnatiades, L. (2000). Primary productivity in the oligotrophic Aegean Sea (NE Mediterranean): Seasonal and interannual variability. *Progress in Oceanography*, *46*(2-4), 187-204. https://doi.org/10.1016/S0079-6611(00)00018-5

Rosecchi, E. (1987). Alimentation de *Diplodus annularis, Diplodus sargus, Diplodus vulgaris* et *Sparus aurata* (Pisces, Sparidae) dans le golfe de Lion et les lagunes littorales. *Revue des Travaux de l'Institut des Pêches Maritimes*, *49*(3-4), 125-141.

Quignard, J. P., & Man-Wai, R. (1983). Relations taille-poids et coefficient de condition de Diplodus sargus 0+ et 0++ de deux étangs palavasiens: Prévost et Mauguio. *Cybium*, *7*, 31-41.

Sala, E., & Ballesteros, E. (1997). Partitioning of space and food resources by three fish of the genus *Diplodus* (Sparidae) in a Mediterranean rocky infralittoral ecosystem. *Marine Ecology Progress Series*, *152*(1), 273-283.

Sarı, E., & Çağatay, M. N. (2001). Distributions of heavy metals in the surface sediments of the Gulf of Saros, NE Aegean Sea. *Environment International*, *26*(3), 169-173.

Siokou-Frangou, I., Bianchi, M., Christaki, U., Christou, E. D., Giannakourou, A., Gotsis, O., Ignatiades, L., Pagou, K., Pitta, P., Psarra, S., Souvermezoglou, E., Van Wambeke, F., & Zervakis, Z. (2002). Carbon flow in the planktonic food web along a gradient of oligotrophy in the Aegean Sea (Mediterranean Sea). *Journal of Marine Systems*, *33-34*, 335-353.

Souvermezoglou, E., Hatzigeorgiou, E., Pampidis, I., & Siapsali, K. (1992). Distribution and seasonal variability of nutrients and dissolved oxygen in the northeastern Ionian Sea. *Oceanologica Acta*, *15*(6), 585-594.

Stergiou, K. I., Christou, E. D., Georgopoulos, D., Zenetos, A., & Souvermezoglou, A. (1997). The Hellenic Seas: Physics, chemistry, biology and fisheries. *Oceanography and Marine Biology: An Annual Review*, *35*, 415-538.

Šprem, N., Matulić, D., Treer, T., & Aničić, I. (2010). A new maximum length and weight for *Scardinius erythrophthalmus*. *Journal of Applied Ichthyology, 26*(4), 618-619. https://doi.org/10.1111/j.1439-0426.2010.01391.x

Quinn II, T. J., & Deriso, R. B. (1999). *Quantitative fish dynamics*. Oxford University Press.

Tokaç, A., Akyol, O., Tosunoğlu, Z., Aydın, C., & Kaykaç, H. (2017). Occurrence of a huge meagre, *Argyrosomus regius* in İzmir Bay (Aegean Sea, Turkey). *Turkish Journal of Maritime and Marine Sciences*, *3*(2), 63-66.

Turley, C. M., Bianchi, M., Christaki, U., Conan, P., Harris, J. R. W., Psarra, S., Ruddy, G., Stutt, E. D., Tselepides, A., & Van Wambeke, F. (2000). The relationship between primary producers and bacteria in an oligotrophic sea - The Mediterranean and biogeochemical implications. *Marine Ecology Progress Series*, *193*, 11-18. https://doi.org/10.3354/meps193011

Tutman, P., Glamuzina, B., Bartulović, V., & Dulčić, J. (2007). A new maximum length for *Anguilla anguilla* (Anguillidae). *Cybium*, *31*(4), 485-486.

Valić, D., Vardić Smrzlić, I., Kapetanović, D., Teskeredžić, Z., Pleše, B., & Teskeredžić, E. (2013). Identification, phylogenetic relationships and a new maximum size of two rudd populations (Scardinius, Cyprinidae) from the Adriatic Sea drainage, Croatia. *Biologia*, *68*: 539-545. https://doi.org/10.2478/s11756-013-0179-1

VanderBloemen, S. N., Gorne, J. A., Sass, G. G., & Shaw, S. L. (2020). Influence of cisco (*Coregonus artedi*, Lesueur) on muskellunge (*Esox masquinongy*, Mitchill) mean length, population size structure, and maximum size in northern Wisconsin lakes. *Journal of Applied Ichthyology*, *36*(2), 159-167. https://doi.org/10.1111/jai.13997

Vander Veer, H. W., Kooijman, S. A. L. M., & Van der Meer, J. (2003). Body size scaling relationships in flatfish as predicted by Dynamic Energy Budgets (DEB theory): Implications for recruitment. *Journal of Sea Research, 50*(2-3), 257-272. https://doi.org/10.1016/j.seares.2003.05.001

Van Wambeke, F., Christaki, U., Bianchi, M., Psarra, S., & Tselepides, A. (2000). Heterotrophic bacterial production in the Cretan Sea (NE Mediterranean). *Progress in Oceanography*, *46*(2-4), 205-216. https://doi.org/10.1016/S0079-6611(00)00019-7

Vigliola, L., & Harmelin-Vivien, M. L. (2001). Post-settlement ontogeny in three Mediterranean reef fish species of the genus *Diplodus*. *Bulletin of Marine Science*, *68*(2), 271-286.

Wassef, E. (1985). Comparative biological studies of four *Diplodus* species (Pisces, Sparidae). *Cybium*, *9*(2), 203-215.

Zervakis, V., & Georgopoulos, D. (2002). Hydrology and circulation in the North Aegean (eastern Mediterranean) throughout 1997 and 1998. *Mediterranean Marine Science*, *3*(1), 5-19.

Zohary, T., & Robarts, R. D. (1998). Experimental study of microbial P limitation in the eastern Mediterranean. *Limnology and Oceanography*, *43*(3), 387-395. https://doi.org/10.4319/lo.1998.43.3.0387