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Geographic expansion of the blackbellied angler (*Lophius budegassa*) towards the east along the Turkish coast of the Black Sea

Mehmet AYDIN[1], **Uğur KARADURMUŞ**[2]

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[1] Ordu University, Fatsa Faculty of Marine Sciences, Department of Fisheries Technology Engineering, Ordu 52400, Türkiye

[2] Bandırma Onyedi Eylül University, Maritime Vocational School, Department of Underwater Technology, Balıkesir 10200, Türkiye

ORCID IDs of the author(s):

M.A. 0000-0003-1163-6461

U.K. 0000-0002-5827-0404

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Correspondence:
Mehmet AYDIN
E-mail: maydin69@hotmail.com

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ABSTRACT

The natural range of *Lophius budegassa*, originating from the Atlanto-Mediterranean region, extends from the Mediterranean Sea basin to the Sea of Marmara. However, its occurrence along the Turkish coast of the Black Sea has previously been limited to the Sinop coast in the Western Black Sea. This study provides the first scientific evidence of *L. budegassa* extending to the easternmost part of the Black Sea, based on capturing two specimens under different circumstances. This observation underscores the dynamic nature of marine ecosystems and the interplay of ecological and anthropogenic factors. The congruence between species temperature preferences and actual water temperatures in the Black Sea suggests suitable environmental conditions for *L. budegassa*. However, the absence of an established stock and the discovery of only two large-sized adult individuals suggest a potential isolated event rather than a significant range expansion. Factors such as navigation errors, food availability, or reproductive behaviour may contribute to the presence of *L. budegassa* in this region.

Keywords: Anglerfish, Lophiidae, First record, Range expansion, Türkiye

Introduction

The Lophiidae family encompasses around 30 species spread across four genera globally (Fricke et al., 2024). The family is represented by two prominent species in Turkish territorial waters (Bilecenoğlu et al., 2014): blackbellied angler (*Lophius budegassa* Spinola, 1807) and angler (*L. piscatorius* Linnaeus, 1758). *L. budegassa* is distributed primarily in the eastern central Atlantic region, spanning from the British Isles to Senegal (La Mesa & De Rossi, 2008), and also extends its presence from the Mediterranean Sea to the Black Sea (Sümer et al., 2016). They are commonly found between depths of 100 and 500 meters, with occurrences documented at depths reaching 1000 meters (Ungaro et al., 2002). *L. budegassa*, being a benthic species, thrives across various habitats, including muddy, sandy, and rocky environments. It has the potential to reach a maximum age of 25 years and a standard length of up to 100 cm (Vakily et al., 2002). Predominantly feeding on teleost fish and decapod crustaceans, *L. budegassa* demonstrates a diverse dietary spectrum (Şenbahar & Özaydın, 2021), establishing its role as an opportunistic apex predator (Ainouche & Nouar, 2018). *L. budegassa*, being a commercially significant species, is actively targeted by trawl and gill net fishing fleets (ICES, 2013). However, anglerfishes are also frequently caught incidentally as a non-target species in beam trawl fisheries (Karadurmuş, 2022). Anglerfishes, including *L. budegassa*, are increasingly valued in the fishing industry, leading to a rise in demand within Turkish fish markets (Şenbahar & Özaydın, 2019). According to the latest stock assessments reported from FAO catch statistics, *L. budegassa* is generally considered overfished in the Mediterranean Sea basin. This species is listed among the rare species in the Black Sea Red Data Book and classified as a vulnerable species in Türkiye due to the high risk of endangerment in the wild.

The distribution of the *L. budegassa* of Atlanto-Mediterranean origin in the Mediterranean Sea basin extends to the Ionian Sea (Barcala et al., 2019), the Aegean Sea (Yığın et al., 2015), and even the Sea of Marmara (Daban et al., 2021). The first scientifically supported evidence of the existence of *L. budegassa* in the Black Sea was reported by Sümer et al. (2016) with a single individual caught off Sinop province. After this record, to date, there is no evidence in scientific or media databases for the existence of species on the Turkish coast of the Black Sea. This paper documents that the geographical range of the *L. budegassa* extends to the easternmost part of the Black Sea.

Materials and Methods

During the study, two anglerfish individuals were captured (Figure 1), each under different circumstances. The General Fisheries Commission covers both sampling points for the Mediterranean Geographical Sub-Area 29, Division 37.4.2. Detailed information regarding the captures is as follows:

The first specimen (Sp1) was captured on July 20, 2018, using a trammel net at a depth of 35 meters off the coast of Hopa, Artvin (41°25'31"N - 41°21'24"E), situated in the easternmost part of the Black Sea.

The second specimen (Sp2) was caught on January 4, 2024, by a trammel net at a depth of 18 meters off the coast of Perşembe, Ordu (41°04'42"N - 37°48'36"E).

Taxonomic identification of both specimens was conducted according to the fish identification key (Fischer et al., 1987). Furthermore, the scientific name verification was checked from FishBase (Froese & Pauly, 2024). Both species, *L. budegassa* and its congener *L. piscatorius*, belonging to the *Lophius* genus, are very similar, with *L. budegassa* being characterised by 9-10 soft rays on the second dorsal fin, 8-9 rays on the anal fin, and dark peritoneum (Fischer et al., 1987). Total length (TL) was measured using an ichthyometer with a precision of 0.1 cm, while body weight (W) was recorded using an electronic scale accurate to 0.01 g. Sex identification was performed based on gonad colour and shape (Gunderson, 1994).

Results and Discussion

This study documented the sex, size, and weight information for two *L. budegassa* specimens captured during the long-term period. Sp1 was identified as a female, measuring a TL of 39.05 cm and weighing 930.56 g. Sp2 was classified as a male, exhibiting a TL of 40.50 cm and a W of 993.27 g. These size ranges are smaller than previously reported size (with 51.8 cm in TL) from the Sinop coast in the Black Sea (Sümer et al., 2016).

The recent discovery of new L. budegassa individuals in the easternmost part of the Black Sea raise questions about the potential spread and adaptation of the species to this region. This expansion is a compelling phenomenon that reflects the dynamic nature of marine ecosystems and the intricate interplay of various ecological and anthropogenic factors over time. Shifts in water temperature, salinity levels, and nutrient availability, possibly influenced by climate change and anthropogenic activities in the Black Sea (Oral et al., 2013;

Zengin, 2019), may have created favorable conditions for the *L. budegassa* to establish populations in new habitats. This phenomenon, defined as the Mediterraneanizing of the Black Sea (Oral et al., 2013), has resulted in the entrance and adaptation of many new fish species of Atlanto-Mediterranean origin to the Black Sea (Yankova et al., 2013; Aydın & Karadurmuş, 2023). The annual average surface water temperature of the Black Sea, approximately 16°C (Bengil & Mavruk, 2019), aligns closely with the preferred habitat temperature range of *L. budegassa*, which falls between 16.5°C to 17.5°C (Barcala et al., 2019). This indicates that the temperature conditions in the Black Sea are generally conducive to the species' existence in the region. The close match between the preferred temperature range of the anglerfish and the actual water temperatures suggests that the Black Sea provides suitable environmental conditions to support the presence and potential proliferation of *L. budegassa*.

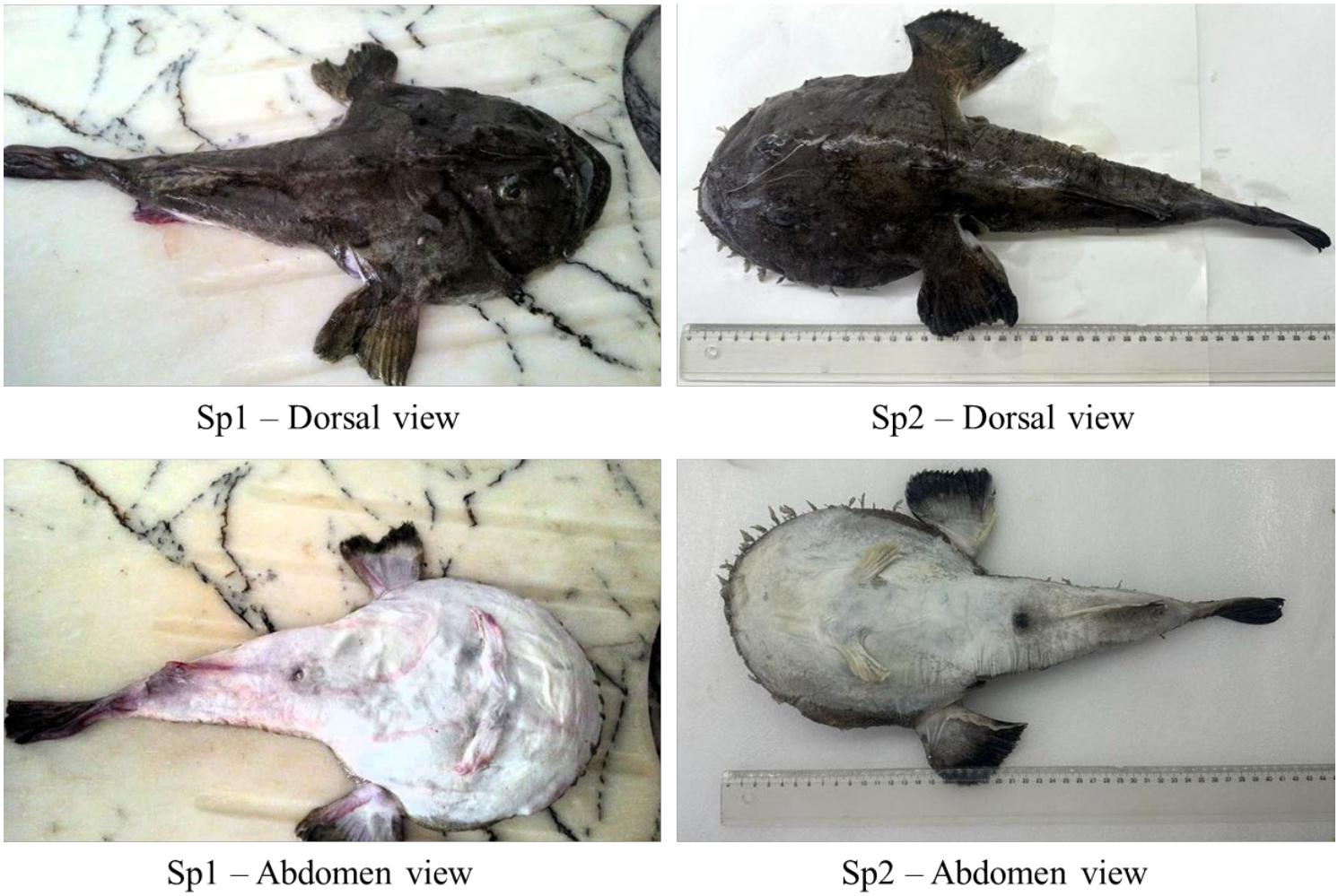

Figure 1. The female specimen of *Lophius budegassa* with 39.05 cm total length was captured from the Hopa, and the male specimen of *Lophius budegassa* with 40.50 cm total length was captured from the Perşembe

The absence of natural predators and competitors in the Black Sea ecosystem may have further facilitated the spread of *L. budegassa* populations. The main diet of the species consists of more than 80% of local fish species, such as whiting and mackerel (Negzaoui-Garali et al., 2008; Şenbahar & Özaydın, 2021). The abundance of target species in the Black Sea could likely support the development and distribution of the *L. budegassa* by providing a readily available food source. A consistent food supply allows individuals to meet their nutritional needs and allocate resources towards growth, reproduction, and survival. It is plausible that the captured specimens may be immature, considering the variability in maturity thresholds reported across different regions (Colmenero et al., 2013; Yığın et al., 2015). The relatively high reproductive capacity of the species, as indicated by the average potential fertility of around 80,000 oocytes per kilogram of mature female (Colmenero et al., 2013), suggests that individuals with immature reproductive organs may still possess the potential for significant reproductive output once they reach maturity. The long lifespan, late maturation, and slow growth rate of *L. budegassa* (Knudsen, 2015) render it vulnerable to overfishing. These traits increase their vulnerability to exploitation and make it challenging for the population to replenish itself under intensive fishing pressure.

Conclusion

This study sheds light on the geographical expansion of *L. budegassa* to the easternmost region of the Black Sea. The absence of an established stock and the discovery of only two large-sized adult individuals suggest that *L. budegassa* in the easternmost part of the Black Sea may be an isolated event rather than a significant range expansion. Specimens may have strayed from their typical habitat due to various factors such as navigation errors, food availability, or reproductive behaviour. Further research, including monitoring the area and population assessments, would be necessary to determine the long-term implications of this discovery and whether the species has spread and adapted to the region.

Compliance with Ethical Standards

Conflict of interest: The author(s) declare no actual, potential, or perceived conflict of interest for this article.

Ethics committee approval: This study does not require ethics committee permission or any special permission.

Data availability: Data will be made available on request.

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Disclosure: -

References

Ainouche, N., Nouar, A. (2018). Trophic behaviour and diet composition of the black anglerfish *Lophius budegassa* (Spinola, 1807) of the Algerian coast (Southwestern Mediterranean Sea). *Cahiers de Biologie Marine*, 59, 441-449. https://doi.org/10.21411/CBM.A.DD2BCA98

Aydın, M., Karadurmuş, U. (2023). First record of the benthopelagic fish John dory *Zeus faber* (Linnaeus,1758) in the Black Sea coast of Türkiye. *Aquatic Research*, 6, 159-165. https://doi.org/10.3153/AR23016

Barcala, E., Bellido, J.M., Bellodi, A., Carbonara, P., Carlucci, R., Casciaro, L., Esteban, A., Jadaud, A., Massaro, A., Peristaki, P., Meléndez, M.J., Pérez Gil, J.L., Salmerón, F., Pennino, M.G. (2019). Spatio-temporal variability in the distribution pattern of anglerfish species in the Mediterranean Sea. *Scientia Marina*, 83, 129-139. https://doi.org/10.3989/scimar.04966.11A

Bengil, F., Mavruk, S. (2019). Warming in Turkish seas: comparative multidecadal assessment. *Turkish Journal of Fisheries and Aquatic Sciences*, 19, 51-57. https://doi.org/10.4194/1303-2712-v19_1_06

Bilecenoğlu, M., Kaya, M., Cihangir, B., Çiçek, E. (2014). An updated checklist of the marine fishes of Turkey. *Turkish Journal of Zoology*, 38, 901-929. https://doi.org/10.3906/zoo-1405-60

Colmenero, A.I., Tuset, V.M., Recasens, L., Sánchez, P. (2013). Reproductive biology of Black Anglerfish (*Lophius budegassa*) in the northwestern Mediterranean Sea. *Fishery Bulletin*, 111, 390-401. https://doi.org/10.7755/FB.111.4.8

Daban, B., İşmen, A., Şirin, M., Yığın, C.Ç., Arslan İhsanoğlu, M. (2021). Analysis of demersal fish fauna off the Sea of Marmara, Turkey. *Çanakkale Onsekiz Mart University Journal of Marine Sciences and Fisheries*, 4, 20-31. https://doi.org/10.46384/jmsf.912403

Fischer, W., Schneider, M., Bauchot, M.L. (1987). *Méditerranée et Mer Noire (Zone de Pêche 37)*. Rome: Fiches FAO d'identification des espèces pour les besoins de la pêche Rev 1. (in French).

Fricke, R., Eschmeyer, W.N., Van der Laan, R. (2024). Eschmeyer's Catalog of Fishes: Genera, Species, References. World Wide Web electronic publication

(http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp) (accessed 10.03.2024).

Froese, R., Pauly, D. (2024). FishBase. World Wide Web electronic publication, version (02/2024). www.fishbase.org (accessed 10.03.2024).

Gunderson, D.R. (1993). *Surveys of fisheries resources*. New York: John Wiley, p. 256, ISBN 978-0-471-54735-8

ICES, (2013). Report of the working group on the assessment of Southern Shelf Stocksof Hake, Monk and Megrim (WGHMM). ICES CM 2013/ACOM:11 A, 1-727.

Karadurmuş, U. (2022). Length-weight relationship and condition factor of sixteen demersal fish species from the southern part of the Marmara Sea, Turkey. *Journal of Ichthyology*, 62, 543-551. https://doi.org/10.1134/S0032945222040105

Knudsen, S. (2015). *Lophius budegassa*. The The International Union for Conservation of Nature Red List of Threatened Species 2015: e.T198609A21911220. http://doi.org/10.2305/IUCN.UK.2015-4.RLTS.T198609A21911220.en

La Mesa, M., De Rossi, F. (2008). Early life history of the black anglerfish *Lophius budegassa* Spinola, 1807 in the Mediterranean Sea using otolith microstructure. *Fisheries Research*, 93, 234-239. https://doi.org/10.1016/j.fishres.2008.05.004

Negzaoui-Garali, N., Salem, M.B., Capapé, C. (2008). Feeding habits of the black anglerfish, *Lophius budegassa* (Osteichthyes: Lophiidae), off the Tunisian coast (central Mediterranean). *Cahiers de Biologie Marine*, 49, 113-122. https://doi.org/10.21411/CBM.A.293C451D

Oral, M., Bat, L., Uysal, İ., (2013). Species Sheets Part VI. Fish. In: Öztürk, B., Oral, M., Topaloğlu, B., Bat, L., Okudan Arslan, E.Ş. et al. (Eds.), Red Data Book Black Sea, Turkey. Turkish Research Foundation (TUDAV), İstanbul, pp. 118-283.

Sümer, C., Bilgin, S., Bektas, S., Satilmis, H.H. (2016). About the record of the black-bellied angler, *Lophius budegassa* Spinola, 1807, from Sinop coast in the Black Sea, Turkey. *Cahiers de Biologie Marine*, 57, 167-170.

Şenbahar, A.M., Özaydın, O. (2019). Occurrence of an abnormal one-eyed black anglerfish *Lophius budegassa* (Spinola, 1807) from Central Aegean Sea, Turkey. *Ege Journal of Fisheries and Aquatic Sciences*, 36, 401-403. https://doi.org/10.12714/egejfas.36.4.12

Şenbahar, A.M., Özaydin, O. (2021). Feeding ecology of black-bellied anglerfish *Lophius budegassa* in the Central Aegean Sea, Turkey. *Journal of Ichthyology*, 61, 881-890. https://doi.org/10.1134/S0032945221060151

Ungaro, N., Marano, G., Auteri, R. (2002). Distribution, abundance and biological features of anglerfish (*Lophius piscatorius* and *Lophius budegassa*) (Osteichthyes: Lophiiformes) in the Mediterranean Sea. *Scientia Marina*, 66, 55-63. https://doi.org/10.3989/scimar.2002.66s255

Vakily, J.M., Camara, S.B., Mendy, A.N., Marques, V., Samba, B., Santos, A.J. dos., Sheriff, M.F., Ould Taleb Sidi, M., Pauly, D. (2002). *Poissons marins de la sous-région nord-ouest africaine*. Brussels: European Commission, p. 124. (in French).

Yankova, M., Pavlov, D., Ivanova, P., Karpova, E., Boltachev, A., Bat, L., Oral, M., Mgeladze, M. (2013). Annotated check list of the non-native fish species (Pisces) of the Black Sea. *Journal of the Black Sea/Mediterranean Environment*, 19, 247-255.

Yığın, C.C., İşmen, A., Arslan, M. (2015). Reproductive biology of *Lophius budegassa* (Lophiidae) in the North Aegean Sea. *Cybium*, 39, 31-36. https://doi.org/10.26028/cybium/2015-391-004

Zengin, M. (2019). A general approach to centurial history of Turkish Black Sea fisheries. *The Journal of Institute of Black Sea Studies*, 5, 31-67. https://doi.org/10.31765/karen.584037