



Extension of the Striped Eel Catfish *Plotosus lineatus* (Thunberg, 1787) from the eastern Mediterranean Coast to the Mersin Bay on the western Mediterranean Coast of Turkey

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Abstract

A group of schools of striped eel catfish *Plotosus lineatus* (Thunberg, 1787) was photographed during scuba diving at depths of 10 m and 17 m on 11 July 2022 and on 24 September 2022 from Kızılkalesi and Boğsak regions in the Mersin Bay of the Mediterranean coast of Turkey. With the present study, *P. lineatus* is extending its distribution to the western Mediterranean coastal waters after its first occurrence in 2016 in the İskenderun Bay of Turkish Marine waters.

Keywords:

Alien species, striped eel catfish, *Plotosus lineatus*, westward extension, Mersin Bay

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Introduction

There has been an increasing number of alien species in the Mediterranean Sea due to vectors and factors that facilitate and/or permit the invasion. Apart from the climate change, the opening of the Suez Canal in 1869 connected the tropical Red Sea with the Mediterranean and dramatically affected the biodiversity of the Mediterranean (Golani et al., 2007; Galil, 2008; Yaglıođlu et al., 2014; Turan et al., 2016; Dragičević et al., 2019).

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Currently, numerous lessepsian fish species have established dense populations in the Mediterranean and generated ecological and economic problems (Turan et al., 2017; Stamouli et al., 2017; Turan et al., 2018; Ragkousis et al., 2020). The striped eel catfish *Plotosus lineatus* (Thunberg, 1787) is rapidly becoming a dominant component of the benthic biota of the Levantine Sea. *P. lineatus* was first time recorded in the Mediterranean by Golani (2002) and has colonized population in the entire Israeli coast. The second record of *P. lineatus* was given from the Egypt coast of El-Arish city by Temraz & Ben Souissi (2013). The third record of *P. lineatus* was given from the Syrian coast of Tartous city by Ali et al. (2015). Then it was the first time recorded from the Turkish marine waters by Dođdu et al. (2016). Recently, *P. lineatus* was reported from northern Cyprus (Tiralongo et al., 2022).

This study reports the westward distribution of the striped eel catfish *P. lineatus* to the Mersin Bay along the Mediterranean coast of Turkey.

Material and Methods

One group of *P. lineatus* was photographed from Kızkalesi and the other group was photographed from the Bođsak region in the Mersin Bay at a depth of 16 and 21 m on 11 July 2022 and 24 September 2022, respectively in Mersin Bay (Figure 1).



Figure 1. Aggregation of striped eel catfish *Plotosus lineatus* from Kızkalesi (A) and Bođsak (B) coasts in Mersin Bay

On the bases of underwater observation and pictures taken during scuba diving, all the morphological descriptions and colors agree with the descriptions of Golani (2002) and Dođdu et al. (2016). The habitat of *P. lineatus* seen in scuba diving was lichenous, rocky, and sandy for both Kızkalesi and the Bođsak regions in Mersin Bay.

Results and Discussion

P. lineatus belongs to the family Plotosidae which consists of valid 10 genera and 42 species (Nelson, 1994; Froese & Pauly, 2022). They dwell in reefs, along open coasts in estuaries, and in tidal pools from the Red Sea and east Africa to Japan and Samoa (Golani et al., 2002). Crustaceans, mollusks, worms, and, rarely, fish make up their diet (Fisher et al., 1990). In Iskenderun Bay, *P. lineatus* is sometimes observed in the nets of trawls and discarded of all sizes (Figure 2).



Figure 2. *P. lineatus* and other aliens in a trawl haul in the Iskenderun Bay (Photo by C.Turan)

The highly venomous single serrated spine at the beginning of the first dorsal and each of the pectoral fins of *P. lineatus* have potential risks that can cause severe pain and other health problems (Uysal & Turan, 2020). The first descriptive case of the harmful effect of *P. lineatus* from the Iskenderun Bay, the Northeastern Mediterranean Sea was also reported (Turan et al., 2020). Moreover, numerous observations of dense juveniles schooling in rocky habitats have been also witnessed by personnel observations (C.Turan), swimmers, and Scuba divers in the Iskenderun and Mersin Bays.

The pathway of *P. lineatus* in the Mediterranean starts with the first record of Golani (2002), the second record was given from the Egypt coast of El-Arish city by Temraz & Ben Souissi (2013), and the third record was given from the Syrian coast of Tartous city by Ali et al. (2015), the fourth record was from the Turkish marine waters by Dođdu et al. (2016) and fifth recorded was from

northern Cyprus by Tiralongo et al. (2022) (Figure 3). It is shown that the westward extension pathway of the striped eel catfish in the Mediterranean coasts of Turkey.

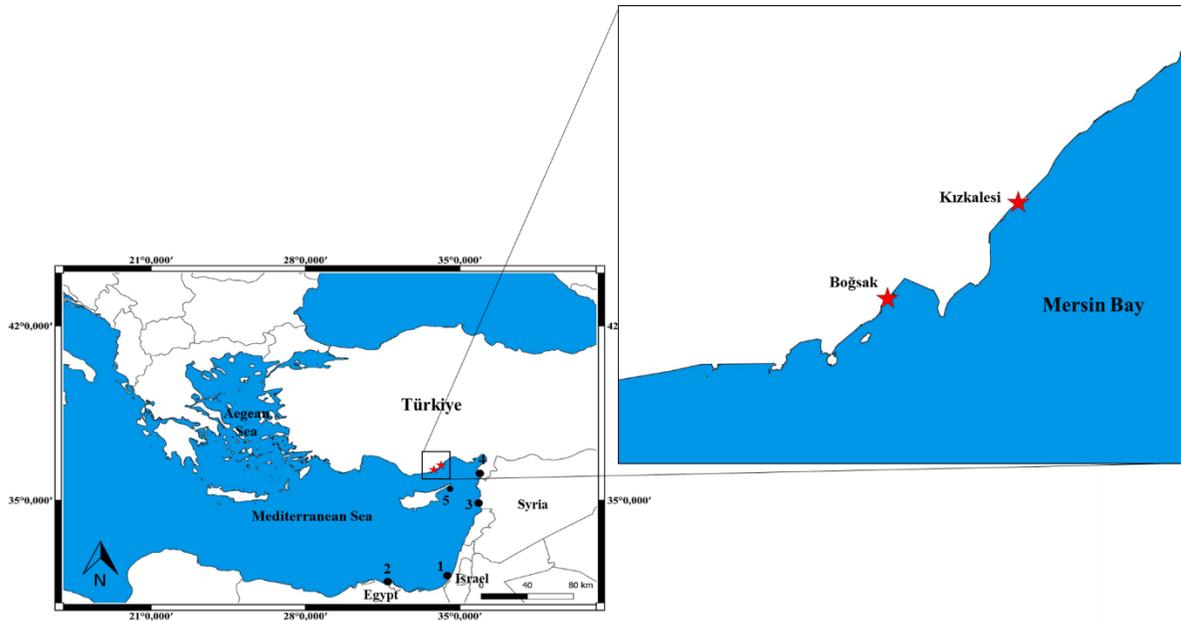


Figure 3. Sampling locations (★) of *P. lineatus* from Kızkalesi and Boğsak coasts in Mersin Bay, and its occurrence range as records in the Mediterranean. ●; Previous (1: Golani, (2002), 2: Temraz & Ben Souissi (2013), 3: Ali et al. (2015), 4: Dođdu et al., (2016), 5: Tiralongo et al. (2022), and ★, Present study)

The number of alien or non-indigenous species has increased dramatically for a few decades in Turkish marine waters (Turan et al., 2015; Gürlek et al., 2016a,b; Turan, 2000). Physicochemical conditions, especially in the Eastern Mediterranean, have changed in the last ten years due to climate changes (Ergüden et al., 2014; Turan et al., 2016). Furthermore, minimum (winter) and maximum (summer) water temperatures are increasing in the Mediterranean Sea, which may facilitate the establishment of thermophilous species in the Mediterranean Sea (Rilov & Treves, 2010; Turan & Öztürk, 2015). As a result, the increase in seawater temperature has been considered the main reason for the increase in the introduction and establishment of tropical species in the temperate Mediterranean Sea (Ben Rais Lasram et al., 2010; Turan, 2010; Öztürk & Turan, 2012).

This study is very important to report the spread of *P. lineatus* toward western Mediterranean waters. The westward extension of *P. lineatus* indicates that it will extend first to the Gulf of Antalya on the Turkish coast in the near future, and then to the island of Rhodes in Greek sea waters.

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Author Contributions

All authors performed all the experiments and drafted the main manuscript text.

Conflict of Interest

The authors declare there is no conflict of interest in this study.

References

- Ali, M., Saad, A., & Soliman, A. (2015). Expansion confirmation of the Indo-Pacific catfish, *Plotosus lineatus* (Thunberg, 1787), (Siluriformes: Plotosidae) into Syrian marine waters. *American Journal of Biology and Life Sciences*, 3(1), 7-11.
- Ben Rais Lasram, F., Guilhaumon, F., Albouy, C., Somot, S., Thuiller, W., & Mouillot, D. (2010). The Mediterranean Sea as a 'cul-de-sac' for endemic fishes facing climate change. *Global Change Biology*, 16(12), 3233-3245. <https://doi.org/10.1111/j.1365-2486.2010.02224.x>.
- Doğdu, S. A., Uyan, A., Uygur, N., Gürlek, M., Ergüden, D., & Turan, C. (2016). First record of the Indo-Pacific striped eel catfish, *Plotosus lineatus* (Thunberg, 1787) from Turkish marine waters. *Natural and Engineering Sciences*, 1(2), 25-32. <https://doi.org/10.28978/nesciences.286245>.
- Dragičević, B., Anadolı, O., Angel, D., Benabdi, M., Bitar, G., Castriota, I., Crocetta, F., Deidun, A., Dulčić, J., Edelist, D., Gerovasileiou, V., Giacobbe, S., Goruppi, A., Guy-haim, T., Konstantinidis, E., Kuplik, Z., Langeneck, J., Macali, A., Manitaras, I., Michailidis, N., Michaloudi, E., Ovalis, P., Perdikaris, C., Pillon, R., Piraino, S., Renda, W., Rizgalla, J., Spinelli, A., Tempesti, J., Tiralongo, F., Tirelli, V., Tsiamis, K., Turan, C., Uygur, N., Zava, B., Zenetos, A. (2019). New Mediterranean Biodiversity Records 2019. *Mediterranean Marine Science*, 20(3), 645-656. <http://dx.doi.org/10.12681/mms.20913>.
- Ergüden, D., Bayhan, Y. K., & Turan, C. (2012). First record of spotbase burrfish, *Cylichthys spilostylus* (Actinopterygii: Tetraodontiformes: Diodontidae), from the marine waters of Turkey. *Acta Ichthyologica et Piscatoria*, 42(2), 137. <http://dx.doi.org/10.3750/AIP2011.42.2.07>.
- Fischer, W., Sousa, I. M., Silva, C., De Freitas, A., & Poutiers, J. M. (1990). Guia de campo das espécies comerciais marinhas e de águas salobras de Moçambique. FAO.
- Froese, R., Pauly, D. (Ed) (2022). Fish Base (www Database). World Wide Web electronic publication. www.fishbase.org. (09/2022).

- Galil, B. S. (2008). Alien species in the Mediterranean Sea—which, when, where, why?. In *Challenges to marine ecosystems*. 105-116). Springer, Dordrecht.
- Golani, D. (2002). The Indo-Pacific striped eel catfish, *Plotosus lineatus* (Thunberg, 1787), (Osteichthyes: Siluriformes), a new record from the Mediterranean. *Scientia Marina*, 66(3), 321-323. <https://doi.org/10.3989/scimar.2002.66n3321>.
- Golani, D., Azzurro, E., Corsini-Foka, M., Falautano, M., Andaloro, F., & Bernardi, G. (2007). Genetic bottlenecks and successful biological invasions: the case of a recent Lessepsian migrant. *Biology letters*, 3(5), 541-545. <https://doi.org/10.1098/rsbl.2007.0308>.
- Gürlek, M., Ergüden, D., Uyan, A., Doğdu, S. A., Yağlıoğlu, D., Öztürk, B., & Turan, C. (2016a). First record red lionfish *Pterois volitans* (Linnaeus, 1785) in the Mediterranean Sea. *Natural and Engineering Sciences*, 1(3), 27-32. <https://doi.org/10.28978/nesciences.286308>.
- Gürlek, M., Erguden, D., Dogdu, S. A., & Turan, C. (2016b). First record of greenback horse mackerel, *Trachurus declivis* (Jenyns, 1841) in the Mediterranean Sea. *Journal of Applied Ichthyology*, 32(5), 976-977. <https://doi.org/10.1111/jai.13159>.
- Nelson, J.S. (1994). *Fishes of the world*. Third edition. John Wiley & Sons, Inc., New York. 600 p.
- Öztürk, B., & Turan, C. (2012). Alien Species in the Turkish Seas. In: *The State of the Turkish Fisheries*. Turkish Marine Research Foundation, Istanbul, Turkey.
- Ragkousis, M., Abdelali, N., Azzurro, E., Badreddine, A., Bariche, M., Bitar, G., Crocetta, F., Denitto, F., Digenis, M., El Zrelli, R., Ergenler, Y., Fortic, A., Gerovasileiou, V., Grimes, S., Katsanevakis, S., Kocak, C., Licchelli, C., Loudaros, E., Mastrototaro, F., Mavric, B., Mavruk, S., Miliou, A., Montesanto, F., Ovalis, P., Pontes, M., Rabaoui, L., Sevingel, N., Spinelli, A., Tiralongo, F., Tsatiris, A., Turan, C., Vitale, D., Yalgin, F., Yapici, S., Zenetos, A. (2020). New alien Mediterranean biodiversity records (October 2020). *Mediterranean Marine Science*, 21(3), 631-652. <https://doi.org/10.12681/mms.23674>.
- Rilov, G., & Treves, H. (2010). Climate change effects on marine ecological communities. In: *Seaweeds and their role in globally changing environments*, 51-68. https://doi.org/10.1007/978-90-481-8569-6_4
- Stamouli, C., Akel, E. H. K., Azzurro, E., Bakiu, R., Bas, A. A., Bitar, G., Boyaci, Y., Cakalli, M., Corsini-Foka, M., Crocetta, F., Dragičević, B., Dulčić, J., Durucan, F., Zrelli, R. E., Erguden, D., Filiz, H., Giardina, F., Giovos, I., Gönülal, O., Hemida, F., Kassar, A., Kondylatos, G., Macali, A., Mancini, E., Ovalis, P., Paladini De Mendoza, F., Pavičić, M.,

- Rabaoui, L., Rizkalla, S., Tiralongo, F., Turan, C., Vrdoljak, D., Yapici, S., & Zenetos, A. (2017). New Mediterranean biodiversity records (December 2017). *Mediterranean Marine Science*, 18(3), 534-556. <https://doi.org/10.12681/mms.15823>.
- Temraz, T., & Ben Souissi, J. B. (2013). First record of striped eel catfish *Plotosus lineatus* (Thunberg, 1787) from Egyptian waters of the Mediterranean. *Rapport de la Commission International pour l'Exploration Scientifique de la MerMediterrane*, 40, 604.
- Tiralongo, F., Akyol, O., Al Mabruk, S. A., Battaglia, P., Beton, D., Bitlis, B., Borg, J. A., Bouchoucha, M., Çinar, M. E., Crocetta, F., Dragičević, B., Jdulčić, J. D., Evangelopoulos, A., Jevans, J., Fortič, A., Gauff, R. P., Georgiadis, C. G., Gökoğlu, M., Daniele Grech, D., Guy-Haim, T., Huseyinoglu, M. F., Lombardo, A., Marletta, G., Mastrototaro, F., Montesanto, F., Nunes, F., Özgül, A., Öztürk, B., Rammou, D.-L., Scuderi, D., Terbiyik Kurt, T., Trainito, E., Trkov, D., Ulman, A., Ünal, V., & Velasquez, X. (2022). New Alien Mediterranean Biodiversity Records (August 2022). *Mediterranean Marine Science*, 23(3), 725–747. <https://doi.org/10.12681/mms.31228>.
- Turan, C. (2010). Status and trend of Lessepsian species in marine waters of Turkey. *FAO-EastMed Technical Document*, 4, 109-118.
- Turan, C. (2020). Species distribution modelling of invasive alien species; *Pterois miles* for current distribution and future suitable habitats. *Global Journal of Environmental Science and Management*, 6 (4), pp. 429-440. <http://dx.doi.org/10.22034/gjesm.2020.04.01>
- Turan, C., & Öztürk, B. (2015). First record of the lionfish *Pterois miles* (Bennett 1828) from the Aegean Sea. *Journal of the Black Sea/Mediterranean Environment*, 20(2), 334-388.
- Turan, C., Erguden, D., Uygur, N., Gurlek, M., Erdogan, Z. A., Sonmez, B., & Doğdu, S. A. (2015). First record of the Indian Ocean twospot cardinalfish *Cheilodipterus novemstriatus* (Rüppell, 1838) from Turkish Mediterranean waters. *Acta Ichthyologica et Piscatoria*, 45, 319-322. <https://doi.org/10.3750/AIP2015.45.3.12>.
- Turan, C., Erguden, D., Gürlek, M. (2016). Climate Change and Biodiversity Effects in Turkish Seas. *Natural and Engineering Sciences*, 1(2), 15-24. <https://doi.org/10.28978/nesciences.286240>.
- Turan, C., Gürlek, M., Ergüden, D., Uyan, A., Karan, S., & Doğdu, S. A. (2017). Assessing DNA Barcodes for Identification of Pufferfish Species (Tetraodontidae) in Turkish Marine Waters. *Natural and Engineering Sciences*, 2(3), 55-66. <https://doi.org/10.28978/nesciences.369538>.

- Turan, C., Gürlek, M., Başusta, N., Uyan, A., Dođdu, S. A., & Karan, S. (2018). A checklist of the non-indigenous fishes in Turkish marine waters. *Natural and Engineering Sciences*, 3(3), 333-358. <https://doi.org/10.28978/nesciences.468995>.
- Turan, C., Gürlek, M., Dađhan, H., Demirhan, S. A., & Karan, S. (2020). First clinical case of the venomous Lessepsian migrant fish *Plotosus lineatus* in the Iskenderun Bay, the Northeastern Mediterranean Sea. *Natural and Engineering Sciences*, 5(1), 50-53. <https://doi.org/10.28978/nesciences.691>.
- Uysal, İ., & Turan, C. (2020). Impacts and risk of venomous and sting marine alien species in Turkish marine waters. *Biharean Biologist*, 14(1), 41-8.699.
- Yaglıoglu, D., Deniz, T., Ergüden, D., Gürlek, M., & Turan, C. (2014). Age and growth of the nakedband gaper, *Champsodon nudivittis* (Ogilby, 1895), from the Iskenderun Bay, Northeastern Mediterranean. *Cahiers de Biologie Marine*, 55(3), 347-351.