Received: 2 July 2021 | Revised: 30 September 2021 | Accepted: 11 October 2021

DOI: 10.1111/jai.14282

SHORT COMMUNICATION

Journal of Applied Ichthyology | WILEY

First record of the rendezvous fish, *Polymetme corythaeola* (Alcock, 1898), in the Mediterranean Sea

Antoni Lombarte[1] | Marc Balcells[1,2] | Claudio Barría[1] | Ernesto Azzurro[3,4]

[1]Institut de Ciències del Mar (ICM-CSIC), Barcelona, Catalonia, Spain

[2]Direcció General de Pesca i Afers Marítims (DGPAM), ICATMAR, Barcelona, Catalonia, Spain

[3]Institute of Marine Biological Resources and Biotechnologies, CNR-IRBIM, Ancona, Italy

[4]SZN, Stazione Zoologica Anton Dohrn, Napoles, Italy

Correspondence
Antoni Lombarte, Institut de Ciències del Mar (ICM-CSIC), Barcelona, Catalonia, Spain.
Email: toni@icm.csic.es

Funding information
ICATMAR-PESCAT project, Grant/Award Number: ARP/1256/2018

Abstract

The occurrence of the rendezvous fish, *Polymetme corythaeola* (Alcock, 1898) in Mediterranean Sea is here reported for the first time. A single individual of this benthopelagic fish was caught in February 2020 during a scientific trawl survey. The specimen was collected at a depth of 369 m (upper slope) in the Gulf of Roses (Catalonia, north-western Mediterranean). This circumglobal species could have naturally expanded its distribution through the Strait of Gibraltar, but we cannot totally exclude that its Mediterranean occurrence has been overlooked thus far. This finding highlights the importance of continuous monitoring of Mediterranean deep-sea habitats for a better understanding of their diversity and ongoing transformation.

KEYWORDS

first record, Mediterranean, otoliths, *Polymetme corythaeola*

1 | INTRODUCTION

Scientists and managers are becoming increasingly conscious of the importance of biological monitoring of the deep Mediterranean Sea (Danovaro et al., 2020). This also relates to the need to detect and identify species that were previously unrecorded from these environments. Since 60s, a number of deep-water Atlantic fishes, such as *Halosaurus ovenii* Johnson, 1863 (Pais et al., 2009), *Chaunax suttkusi* Caruso, 1989 (Ragonese et al., 2001), *Beryx splendens* Lowe, 1834 (Orsi Relini et al., 1995), *Trachyscorpia cristulata echinata* (Köhler, 1896) (Ragonese & Giusto, 1999), and *Notoscopelus kroyeri* (Malm, 1861) (Keskin & Eryilmaz, 2010), and the benthopelagic *Cyclopterus lumpus* Linnaeus, 1758 (Dulčić & Golani, 2006; Katsanevakis et al., 2020), have been reported from Mediterranean Sea. According to the currently adopted definitions (Olenin et al., 2011), these species cannot be considered nonindigenous and are explicitly excluded from European Union legislation concerning alien species (EU 2014). Moreover, due to the limited information that we have on deep sea environments, it is often impossible to reliably demonstrate is if these species are recent arrivals (which would be through autonomous range-expansion if a human-mediated introduction is considered unlikely) or overlooked native species. Therefore, they are usually assigned to the category 'cryptogenic' (sensu Carlton, 1996).

2 | MATERIAL AND METHODS

On February 12, 2020, a single individual of *Polymetme corythaeola* (Figure 1a) was caught during a trawl survey (ICATMAR project). The specimen was collected in a discard sample from a commercial trawl fishery of Norwegian lobster (*Nephrops norvegicus*) operating at a depth of 369 m (upper slope) in the Gulf of Roses (Catalonia, north-western Mediterranean; latitude: 41°57.777'N; longitude: 3°31.164'E (Figure 2). The individual was frozen on board, and morphometric measurements and meristic counts were performed

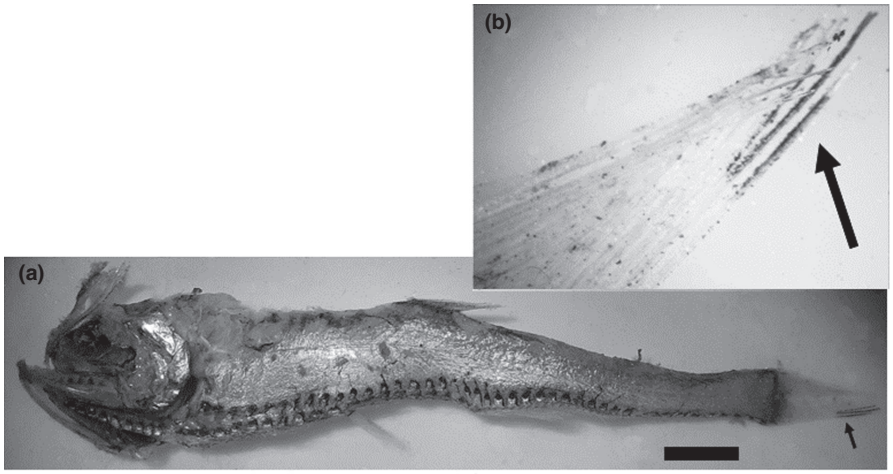

FIGURE 1 (a) Specimen of *Polymetme corythaeola* recorded in Gulf of Roses (Northwestern Mediterranean). (b) Detail of caudal fin with black tip. Scale bar represents 1 cm

following Badcock (1984) in a laboratory on the defrosted individual. Finally, the fish was preserved in 70% ethanol and stored in the Biological Reference Collections (CBR) of the Institut de Ciències del Mar de Barcelona (ICM-CSIC) (Guerrero et al., 2020) under the registration number ICMP001930. As the description and specific identification of otoliths are used in fields such as trophic ecology among others, we also include them in the present study. Otolith sagittae for this species were carefully extracted across the operculum opening without damaging the external structure of the fish. The otoliths were anatomically and biometrically described following Tuset et al. (2008). Otolith images taken under a stereomicroscope were uploaded to the AFORO database of 2370 species, (http://aforo.cmima.csic.es/; Lombarte et al., 2006) and stored in the otolith collection of ICM-CSIC. To compare the *P. corythaeola* otoliths with otoliths of other species in the AFORO database, a contour analysis based on wavelet scales was used (Parisi-Baradad et al., 2010).

3 | RESULTS

The individual from the Gulf of Roses, identified as adult *P. corythaeola*, measured 12.6 cm (TL) and weighed 6.4 g (TW). It displayed a medium-sized, elongated body, with a relatively large mouth and ventral caudal fin with a black tip (Figure 1a,b) and presented photophores on its isthmus, an adipose fin and biserial premaxillary teeth. The following values were obtained using the meristic formula: D, 13; A, 32; P, 9; and V, 7. The number of gillrakers in the first branchiostegal arch was 16. The photophore counts were as follows: SO, 1; OEB, 1 anteroventral; OP (partially lost because the head was partially smashed); BR, 9; IV, 21; VAV, 8; and AC, 24. The otoliths were of pyriform shape, with a crenate ventral margin and a very elongated, narrow and pointed rostrum; the sulcus acusticus was heterosulcoid and had an ostial opening; the cauda was tubular and straight, ending far from the posterior margin; the ostium of the sulcus acusticus was funnel-like; and the cauda and ostium had similar lengths (Figure 3). The biometrics of the left otolith sagitta were as follows: length = 2.57 mm; width = 1.5 mm; area = 2.4 mm^2; perimeter = 7.0 mm; aspect ratio (width/length) = 0.58; and relative length ([otolith length/TL] × 100) = 2.04. An automatic taxon identification system based on otolith contours indicated that otolith specimens of *P. corythaeola* were the most similar to the specimen analysed (Figure 4).

4 | DISCUSSION

Here, we report the first observation of the rendezvous fish, *P. corythaeola* (Alcock, 1898), in Mediterranean waters. This species is a marine benthopelagic fish inhabiting continental and island slopes and seamounts, mainly at depths of 300–500 m. Biological and ecological information is scarce and incomplete for this species (Badcock, 1984; Marques, 2001). Its original distribution encompasses the three major oceans: the Indo-west Pacific, from the Gulf of Aden and East Africa to Japan and the Tasman Sea, the Atlantic and the eastern Pacific. According to Badcock (1984) and Lloris (2015), *P. corythaeola* does not occur in the Mediterranean.

The rendezvous fish, *P. corythaeola*, caught in the Gulf of Roses, displayed well-differentiated taxonomic characters by photophores distribution and meristics from other medium-sized benthopelagic species (Phosischtyidae and Gonostomatidae) occurring in Mediterranean and eastern Atlantic waters (Badcock, 1984; Lloris, 2015). The size, morphological characteristics, meristics and photophore counts of this species perfectly matched those reported in the scientific literature (Badcock, 1984). Likewise, the morphological characteristics, parameter relationships and contours of the otoliths were in agreement with the description of individuals collected from the eastern Atlantic coasts (Assis, 2000; Tuset et al., 2008).

To the best of our knowledge, this observation from the Gulf of Roses represents the first documented record of the rendezvous fish in the Mediterranean Sea (Essl et al., 2019). This species should be listed among the other bathypelagic fishes of Atlantic origin that have been recently documented in this basin, such as *C. lumpus* (Dulčić & Golani, 2006). Taking into account that the rendezvous fish was caught in an area (Gulf of Roses, Catalonia, northwestern Mediterranean) historically exploited by trawl fishing

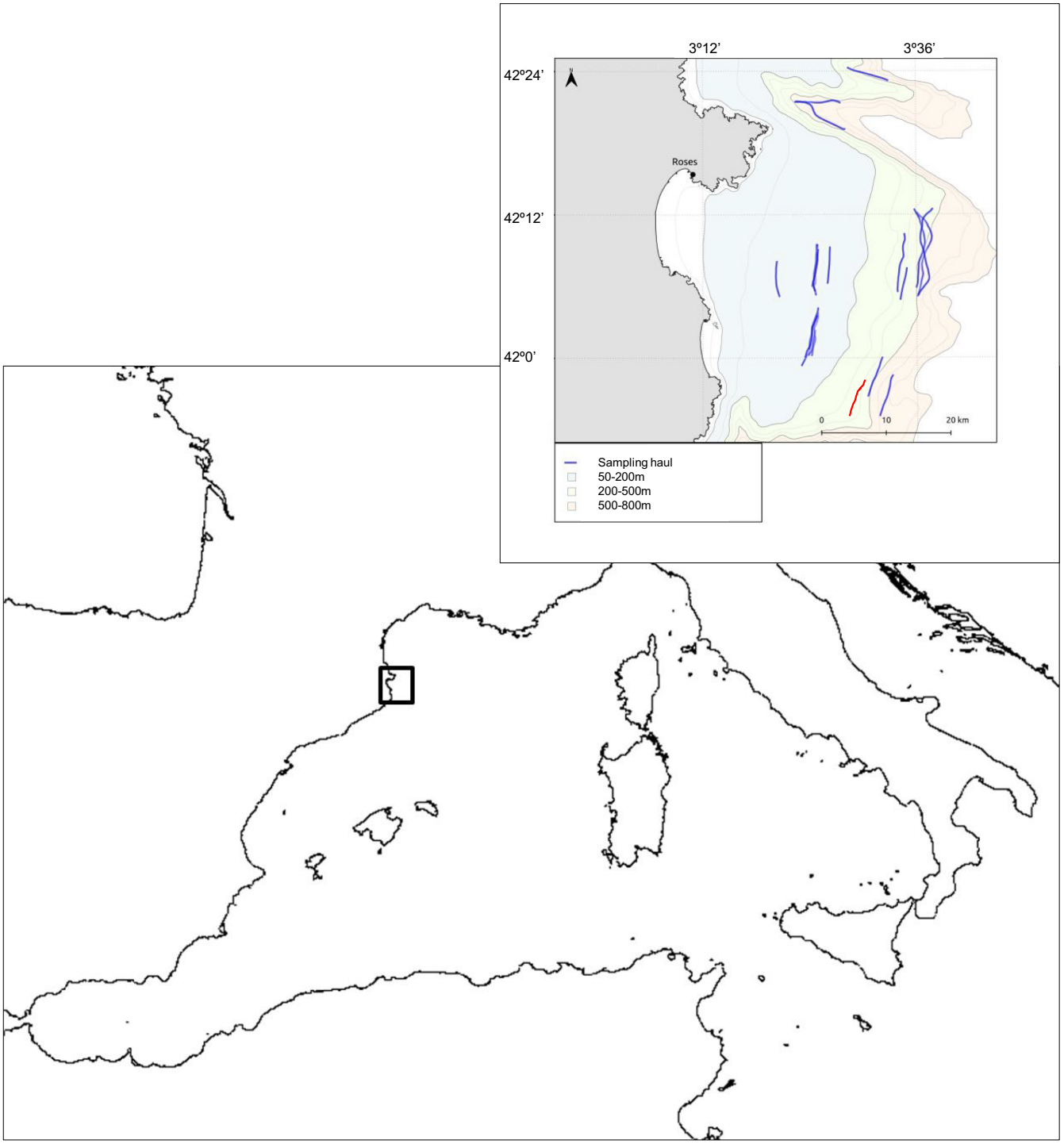

FIGURE 2 Map of the samples in Gulf of Roses of the ICATMAR project (2018–2020). In blue, trawl survey track of the project samplings; in red, track where specimen of *Polymetme corythaeola* was captured

activities (Lleonart & Maynou, 2003) and intensively surveyed by scientific cruises since the 1980s (Cartes et al., 2004, 2015; Massutí et al., 2004; Moranta et al., 2008; Olivar et al., 2012, 2014; Sabatés, 1990; Stefanescu et al., 1992), it is unlikely that its Mediterranean occurrence has been overlooked until now, but we cannot totally exclude this possibility, which would make this species cryptogenic. Moreover, there are no similar species that can be confused with *P. corythaeola*. The other phosichthyid species commonly present in the Mediterranean are smaller than *P. corythaeola*, and even unexperienced observers can easily discriminate this species from the rest of this taxonomic group (Badcock, 1984).

In recent years, *P. corythaeola* has been expanding its northern range limit. In the 1960s, it was reported for the first time in southern Portugal (Saldanha, 1966), and after 30 years, it was considered a common species in this area (Marques, 2001). More recently, *P. corythaeola* has been reported from Galician waters (Bañón,

FIGURE 3 Left sagitta of the specimen of *Polymetme corythaeola* from the medial (inner) side. R means rostrum (anterior side). Scale bar represents 1 mm

2002) and in the North Atlantic up to Greenland (Møller et al., 2010) and Iceland (Valdimarsson et al., 2012). In Iceland, 31 species have been reported for first time since 1996, including mostly bathypelagic species, with a single record of *P. corythaeola*. These distribution shifts have been attributed to the recent warming (in the last 15 years, seawater temperature increased by 1–2°) of the northern Atlantic area (Valdimarsson et al., 2012). Similarly, the influence of climate change, especially in relation to oceanographic processes in the deep sea (Danovaro et al., 2020), could be invoked to explain the occurrence of this species ('neonative' sensu Essl et al., 2019). However, due to the paucity of observations collected so far, these hypotheses remain speculative. Therefore, continuous monitoring of deep habitats (Danovaro et al., 2020), especially through trawl fishing discards (Milisenda et al., 2017), through both scientific surveys and the coordinated use of information provided by professional fishermen (Azzurro et al., 2019), may be essential for a better understanding of deep-sea diversity and the transformation it is currently undergoing.

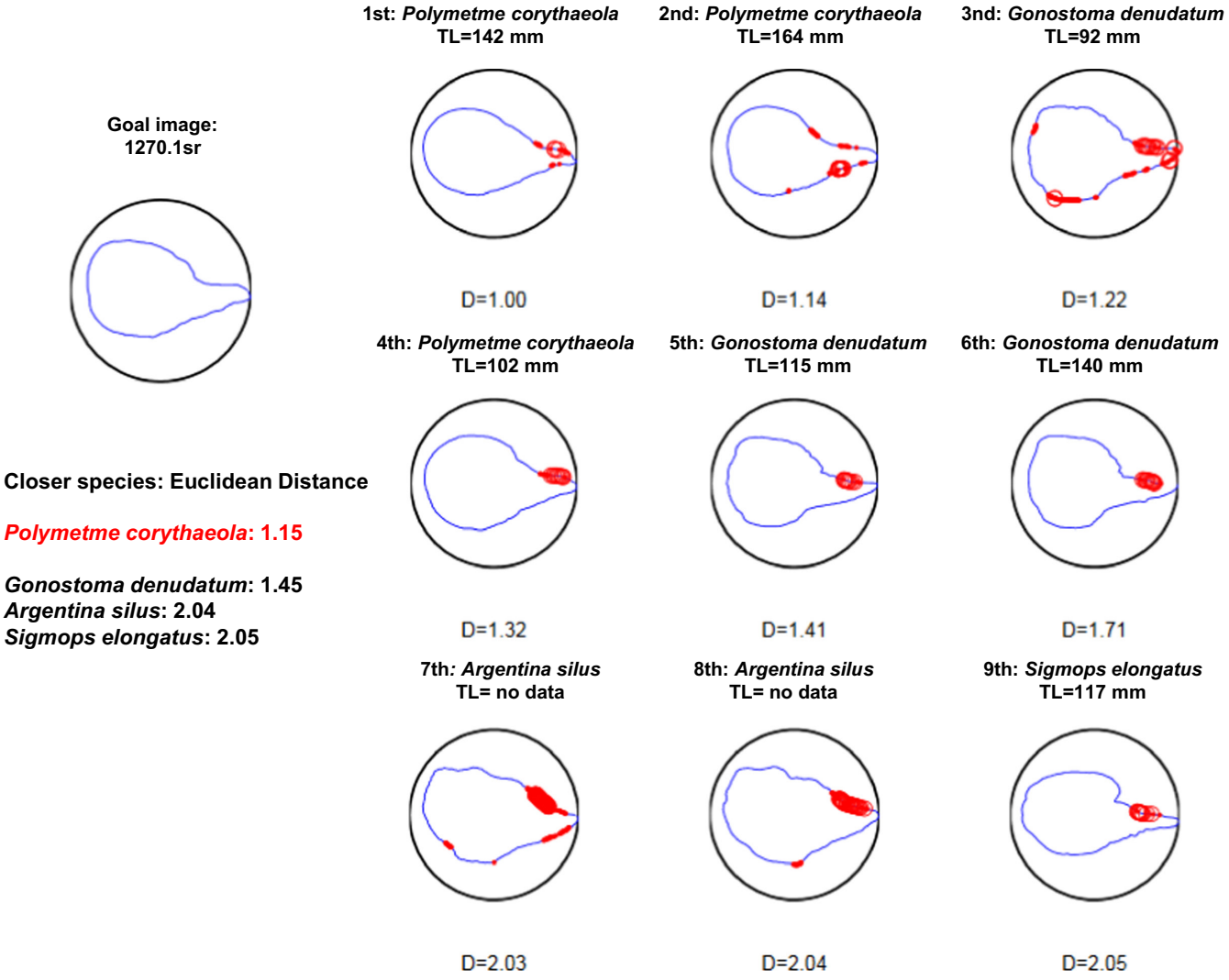

FIGURE 4 Automatic taxon identification of the otolith contour based on wavelet scales. The otolith of Gulf of Roses specimen (1270.1sr) is compared with the information of the AFORO database (http://aforo.cmima.csic.es/). D means Euclidean distance between contours. Red circles indicate points of the contour with remarkable differences with the studied specimen

ACKNOWLEDGMENTS

We thank the fishermen of the vessel Toni-Li Segundo of Roses harbour and the SAP-ICATMAR team for their technical support. The ICATMAR-PESCAT project (ref: ARP/1256/2018) was financed by funding from the Catalan Government and European Union FEMP.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

DATA AVAILABILITY STATEMENT

No data availability statement.

ORCID

Antoni Lombarte https://orcid.org/0000-0001-5215-4587
Claudio Barría https://orcid.org/0000-0001-6769-4578
Ernesto Azzurro https://orcid.org/0000-0002-9805-3164

REFERENCES

Assis, C. A. (2000). *Estudio morfológico dos otólitos sagitta, asteriscus e lapillus de Telósteos (Actinoptergii, Teleostei) de Portugal continental. Sua aplicaçâo em estudos de filogenia, sistematica e ecologia*. University of Lisbon. Phd thesis. https://hdl.handle.net/10451/3716

Azzurro, E., Sbragaglia, V., Cerri, J., Bariche, M., Bolognini, L., Ben Souissi, J., Busoni, G., Coco, S., Chryssanthi, A., Fanelli, E., Ghanem, R., Garrabou, J., Gianni, F., Grati, F., Kolitari, J., Letterio, G., Lipej, L., Mazzoldi, C., Milone, N., … Moschella, P. (2019). Climate change, biological invasions, and the shifting distribution of Mediterranean fishes: A large-scale survey based on local ecological knowledge. *Global Change Biology*, *25*, 2779–2792. https://doi.org/10.1111/gcb.14670

Badcock, J. (1984). Photichthyidae. In P. J. P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen, & E. Tortonese (Eds.), *Fishes of the North-eastern Atlantic and the Mediterranean* (pp. 318–324). UNESCO. ISBN 92-3-002215-2.

Bañón, R. (2002). Actualización del listado faunístico de peces de mar de Galicia. *Nova Acta Científica Compostelana (bioloxía)*, *12*, 119–123. http://hdl.handle.net/10347/6612

Carlton, J. T. (1996). Biological invasions and cryptogenic species. *Ecology*, *77*, 1653–1655. https://doi.org/10.2307/2265767

Cartes, J. E., Maynou, F., Fanelli, E., López-Pérez, C., & Papiol, V. (2015). Changes in deep-sea fish and crustacean communities at 1000–2200 m in the Western Mediterranean after 25 years: Relation to hydro-climatic conditions. *Journal of Marine Systems*, *143*, 138–153. https://doi.org/10.1016/j.jmarsys.2014.10.015

Cartes, J. E., Maynou, F., Moranta, J., Massutí, E., Lloris, D., & Morales-Nin, B. (2004). Patterns of bathymetric distribution among deep-sea fauna at local spatial scale: Comparison of mainland vs. insular areas. *Progress in Oceanography*, *60*, 29–45. https://doi.org/10.1016/j.pocean.2004.02.001

Danovaro, R., Fanelli, E., Canals, M., Ciuffardi, T., Fabri, M. C., Taviani, M., Argyrou, M., Azzurro, E., Bianchelli, S., Cantafaro, A., & Carugati, L. (2020). Towards a marine strategy for the deep Mediterranean Sea: Analysis of current ecological status. *Marine Policy*, *112*, 103781. https://doi.org/10.1016/j.marpol.2020.104182

Dulčić, J., & Golani, D. (2006). First record of *Cyclopterus lumpus* L. 1758 (Osteichthyes:Cyclopteridae)intheMediterranean.*JournalofFishBiology*, *69*, 300–303. https://doi.org/10.1111/j.1095-8649.2006.01077.x

Essl, F., Dullinger, S., Genovesi, P., Hulme, P. E., Jeschke, J. M., Katsanevakis, S., Kühn, I., Lenzner, B., Pauchard, A., Pyšek, P., Rabitsch, W., Richardson, D. M., Seebens, H., Van Kleunen, M., Van Der Putten, W. H., Vilà, M., & Bacher, S. (2019). A conceptual framework for range-expanding species that track human-induced environmental change. *BioScience*, *69*, 908–919. https://doi.org/10.1093/biosci/biz101

EU (2014). Regulation (EU) No 1143/2014 of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species. *Official Journal of the European Union*, *L315*, 35–55.

Guerrero, E., Abelló, P., Lombarte, A., Villanueva, R., Ramón, M., Sabatés, A., & Santos, R. (2020). Biological reference collections ICM-CSIC. v1.28. Dataset/Occurrence. https://doi.org/10.15470/qlqqdx

Katsanevakis, S., Poursanidis, D., Hoffman, R., Rizgalla, J., Rothman, S.B.-S., Levitt-Barmats, Y., Hadjioannou, L., Trkov, D., Garmendia, J.M., Rizzo, M., Bartolo, A.G., Bariche, M., Tomas, F., Kleitou, P., Schembri, P.J., Kletou, D., Tiralongo, F., Pergent, C., Pergent, G., … Zenetos, A. (2020). Unpublished Mediterranean records of marine alien and cryptogenic species. *Bioinva- sions Records*, *9*, 165–182. https://doi.org/10.3391/bir.2020.9.2.01

Keskin, C., & Eryilmaz, L. (2010). Eastern most record of the lancet fish, *Notoscopelus kroyeri* (Actinopterygii: Myctophiformes: Myctophidae), in the Mediterranean Sea. *Acta Ichthyologica Et Piscatoria*, *40*, 79–81. https://doi.org/10.3750/AIP2010.40.1.12

Lleonart, J., & Maynou, F. (2003). Fish stock assessments in the Mediterranean: State of the art. *Scientia Marina*, *67*, 37–49. https://doi.org/10.3989/scimar.2003.67s137

Lloris, D. (2015). *Ictiofauna marina* (p. 674). Ediciones Omega.

Lombarte, A., Chic, Ò., Parisi-Baradad, V., Olivella, R., Piera, J., & García-Ladona, E. (2006). A web-based environment from shape analysis of fish otoliths. The AFORO Database. *Scientia Marina*, *70*, 147–152. https://doi.org/10.3989/scimar.2006.70n1147

Marques, A. (2001). Some data on the biology of *Polymetme corythaeola* (Phosichthyidae), from off the Portuguese South coast, north east Atlantic. *Cybium*, *25*, 100–102.

Massutí, E., Gordon, J. D. M., Moranta, J., Swan, S. C., Stefanescu, C., & Merrett, N. R. (2004). Mediterranean and Atlantic deep-sea fish assemblages: Differences in biomass composition and size-related structure. *Scientia Marina*, *68*, 101–115. https://doi.org/10.3989/scimar.2004.68s3101

Milisenda, G., Vitale, S., Massi, D., Enea, M., Gancitano, V., Giusto, G. B., Badalucco, C., Gristina, M., Garofalo, G., & Fiorentino, F. (2017). Discard composition associated with the deep water rose shrimp fisheries (*Parapenaeus longirostris*, Lucas 1846) in the south-central Mediterranean Sea. *Mediterranean Marine Science*, *18*, 53–63. https://doi.org/10.12681/mms.1787

Møller, P. R., Nielsen, J. G., Knudsen, S. W., Poulsen, J. Y., Sünksen, K., & Jørgensen, O. A. (2010). Checklist of the fish fauna of Greenland waters. *Zootaxa*, *2378*, 1–84. https://doi.org/10.11646/zootaxa.2378.1.1

Moranta, J., Quetglas, A., Massutí, E., Guijarro, B., Hidalgo, M., & Diaz, P. (2008). Spatio-temporal variations in deep-sea demersal communities off the Balearic Islands (Western Mediterranean). *Journal of Marine Systems*, *71*, 346–366. https://doi.org/10.1016/j.jmarsys.2007.02.029

Olenin, S., Elliott, M., Bysveen, I., Culverhouse, P. F., Daunys, D., Dubelaar, G. B. J., Gollasch, S., Goulletquer, P., Jelmert, A., Kantor, Y., Bringsvor Mézeth, K., Minchin, D., Occhiponti-Ambrogi, A., Olenina, I., & Vandekerhhove, J. (2011). *Marine Pollution Bulletin*, *62*, 2598–5604. https://doi.org/10.1016/j.marpolbul.2011.08.011

Olivar, M. P., Bernal, A., Molí, B., Peña, M., Balbín, R., Castellón, A., Miquel, J., & Massutí, E. (2012). Vertical distribution, diversity and assemblages of mesopelagic fishes in the western Mediterranean. *Deep-Sea Research I*, *62*, 53–69. https://doi.org/10.1016/j.dsr.2011.12.014

Olivar, M. P., Sabatés, A., Alemany, F., Balbín, R., Fernández de Puelles, M. L., & Pérez-Torres, A. (2014). Diel-depth distributions of fish larvae off the Balearic Islands (Western Mediterranean) under two environmental scenarios. *Journal of Marine Systems*, *138*, 127–138. https://doi.org/10.1016/j.jmarsys.2013.10.009

Orsi Relini, L., Palandri, G., Garibaldi, F., & Gavagnin, P. F. (1995). First record *of Beryx splendens* (Osteichthyes, Berycidae) in the Mediterranean. *Cybium*, *19*, 317–319.

Pais, A., Merella, P., Follesa, M. C., & Motomura, H. (2009). North-easternmost record of *Halosaurus ovenii* (Actinopterygii: Notacanthiformes: Halosauridae) in the Mediterranean Sea, with notes on its biology. *Acta Ichthyologica Et Piscatoria*, *39*, 33. https://doi.org/10.3750/AIP2009.39.1.0

Parisi-Baradad, V., Manjabacas, A., Lombarte, A., Olivella, R., Chic, Ò., Piera, J., & García-Ladona, E. (2010). Automatic taxon identification of teleost fishes in an otolith online database. *Fisheries Research*, *105*, 13–20. https://doi.org/10.1016/j.fishres.2010.02.005

Ragonese, S., & Giusto, G. B. (1999). Range extension for *Trachyscorpia cristulata echinata* (Pisces: Scorpaenidae) in the western Mediterranean Sea. *Bulletin of Marine Science*, *64*, 329–334.

Ragonese, S., Giusto, G. B., & Caruso, J. H. (2001). Second record of the toadfish *Chaunax suttkusi* Caruso, 1989 in the Mediterranean Sea. *Journal of Fish Biology*, *58*, 291–294. https://doi.org/10.1111/j.1095-8649.2001.tb00515.x

Sabatés, A. (1990). Distribution pattern of larval fish populations in the Northwestern Mediterranenean. *Marine Ecology Progress Series*, *59*, 75–82.

Saldanha, L. (1966). Polymetme corythaeola, espèce nouvelle pour la faune du Portugal (Pisces, Gonostomatidae). *Arquivos do Museu Bocage*, (2ª série) Vol.I, Notas e Suplementos, *7*, 27–32.

Stefanescu, C., Rucabado, J., & Lloris, D. (1992). Depth-size trends in Western Mediterranean demersal deep-sea fishes. *Marine Ecology Progress Series*, *81*, 205–213. https://doi.org/10.3354/meps081205

Tuset, V. M., Lombarte, A., & Assis, C. A. (2008). Otolith Atlas from the Western Mediterranean. *North and Central Atlantic. Scientia Marina*, *72*(S1), 198. https://doi.org/10.3989/scimar.2008.72s17

Valdimarsson, H., Astthorsson, O. S., & Palsson, J. (2012). Hydrographic variability in Icelandic waters during recent decades and related changes in distribution of some fish. *ICES Journal of Marine Science*, *69*, 816–825. https://doi.org/10.1093/icesjms/fss027

How to cite this article: Lombarte, A., Balcells, M., Barría, C., & Azzurro, E. (2022). First record of the rendezvous fish, *Polymetme corythaeola* (Alcock, 1898), in the Mediterranean Sea. *Journal of Applied Ichthyology*, *38*, 551–556. https://doi.org/10.1111/jai.14282