

Communication

First Record of Pandeid Jellyfish, *Eutiara decorata* Berberian, Michenet and Goy, 2021 (Hydrozoa, Anthoathecata, Pandeidae), from Japan

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Abstract: Two specimens of pandeid species, *Eutiara decorata* Berberian, Michenet and Goy, 2021 were collected from Kumejima Island in Okinawa Prefecture, Japan. These specimens with a small white apical process were not yet fully-grown adults. A hyperiid amphipod, *Brachyscelus crusculum*, was attached to *Eutiara decorata* in situ. *Eutiara decorata* has only been reported in Tahiti Island, French Polynesia, in 2021. This is the first record from Japan and the second record of occurrence since its original description.

Keywords: citizen science; hyperiid amphipod; Kuroshio Current; symbiont

Citation: Watabe, M.; Minemizu, R.; Miyake, H. First Record of Pandeid Jellyfish, *Eutiara decorata* Berberian, Michenet and Goy, 2021 (Hydrozoa, Anthoathecata, Pandeidae), from Japan. *Hydrobiology* **2022**, *1*, 139–145. <https://doi.org/10.3390/hydrobiology1020011>

Academic Editor: Epaminondas D. Christou

Received: 18 February 2022

Accepted: 23 March 2022

Published: 25 March 2022

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1. Introduction

The genus *Eutiara* (Hydrozoa, Anthoathecata, Pandeidae) has four perradial canals, blind centripetal canals alternating with the radial canals, well-developed mesenteries, and a complex gonad similar to the genus *Neoturris* [1]. Three species have been described in this genus, *E. mayeri* Bigelow, 1918, *E. russelli* Bouillon, 1981, and *E. decorata* Berberian, Michenet and Goy, 2021 [1–3]. The ontogenetic development of the medusa stage of *E. decorata* collected in the field was described [2]. However, the polyp stage of this genus has not yet been reported [2,4].

Eutiara mayeri was found in the Atlantic Ocean near Chesapeake Bay [1] and the Virgin Islands, Caribbean Sea [5,6], *E. russelli* was found in the Bismarck Sea, Papua New Guinea, and *E. decorata* was found in Tahiti Island, French Polynesia. *Eutiara decorata* is the only species from the southern hemisphere.

Eutiara decorata is relatively large with eight long tentacles, an exumbrellar spur on each tentacle bulb, and a beautiful pattern of dendritic exumbrella ridges. Some divers photographed and reported a jellyfish matching this description from Okinawa, Philippine, and Palau via a social networking service [7–9]. However, these records lack an appropriate voucher specimen. Two specimens of this species were collected in Okinawa Prefecture, Japan. This is the first scientific record of this species based on voucher specimens in Japan from the northern hemisphere and the second occurrence record since the original description.

2. Materials and Methods

On 5 September 2021, two medusae were photographed and collected by SCUBA diving by boat at a depth of 12 m at off Hate-no-Hama, Kumejima Island, Okinawa, Japan (26.37488° N 126.844861° E; Figure 1). The water temperature was 29 °C and salinity was not measured. These specimens were fixed with 3% seawater formalin.

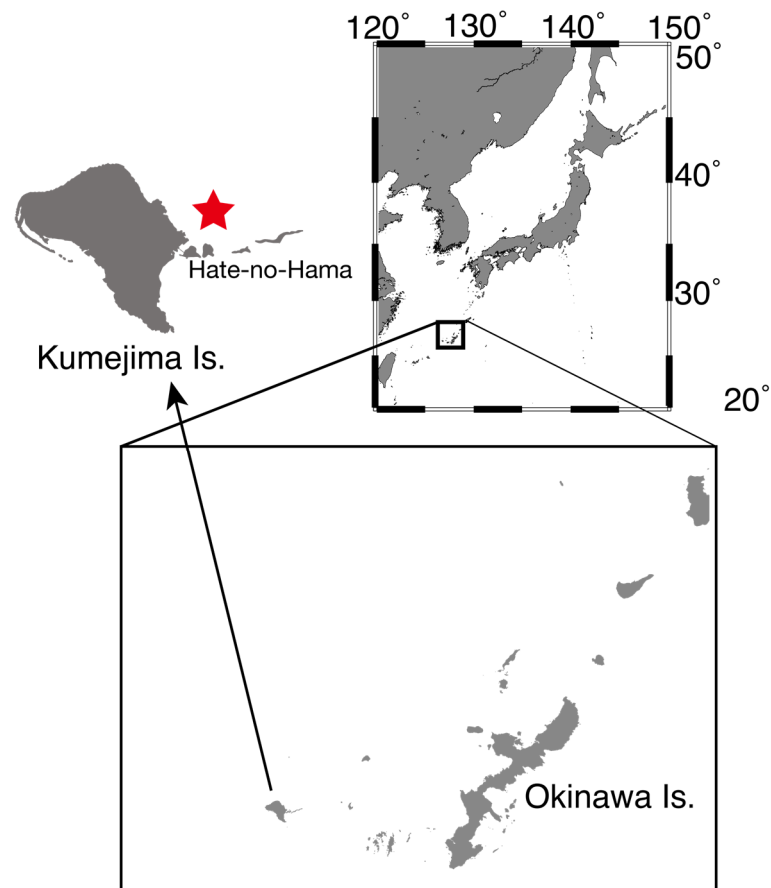


Figure 1. Sampling point (red star) of the two medusae photographed and collected at off Hate-no-Hama, Kumejima Island, Japan.

We observed morphological characteristics under a stereomicroscope (SZX10, Olympus Corporation, Tokyo, Japan) and performed species identification following Bigelow (1918) [1], Kramp (1959, 1961) [5,6], Bouillon et al. (2006) [4] and Berberian et al. (2021) [2]. According to Berberian et al. (2021) [2], the umbrella height (UH), exumbrella height (EUH), subumbrella height (SUH), umbrella diameter (UD), and manubrium length (ML) were measured from specimen photographs using image analysis software, Image J ver. 1.53 [10]. Color description was based on photographs taken at habitat sites when samples were collected. The specimens used in this report were deposited at the School of Marine Life Sciences, Kitasato University (specimen numbers: P02 and P06). Hyperiid amphipod found on the P06 specimens were also fixed in the same bottle of host specimen. The hyperiid amphipod was also identified following Vinogradov et al. (1996) [11], Chihara and Murano (1997) [12], and Mori et al. (2010) [13].

3. Results

3.1. *Hydromedusa*

3.1.1. Systematic Account of Pandeid Species

Phylum Cnidaria Hatschek, 1888

Subphylum Medusozoa Petersen, 1979

Class Hydrozoa Owen, 1843

Subclass Hydroidolina Collins, 2000

Order Anthoathecata Cornelius, 1992

Suborder Filifera Kühn, 1913

Family Pandeidae Haeckel, 1879

Genus *Eutiara* Bigelow, 1918

Eutiara decorata Berberian, Michenet and Goy, 2021

New Japanese name: Kuko-no-Mi Kurage (クコノミクラゲ)

3.1.2. Description of Specimens

Examined material

Sampling date: 5 September 2021

Sampling site: Off Hate-no-Hama, Kumejima-cho, Shimajiri-gun, Okinawa Prefecture

GPS coordinate: 26.37488° N 126.844861° E

Sampling gear: SCUBA

Depth: 12 m

Water temperature: 29 °C

Fixing method: 3% seawater formalin

Voucher number: P02 (Figure 2) and P06 (Figure 3)

Collector: Ryo Minemizu

P02: UH 6.2 mm, UD 3.1 mm, SUH 5.4 mm, ML 3.2 mm

P06: UH 15.0 mm, UD 7.9 mm, SUH 14.1 mm, ML 9.1 mm

These specimens were observed in the bottomless midwater range, which is slightly away from the coral reef drop-offs facing the open ocean. Conversely, this species has never been observed in the inner bay of Kumejima Island. Multiple individuals appeared at the same time under an existing tidal current. Further, many other hydromedusae, copepods, invertebrate larvae, and fish larvae were observed at the same time as the *E. decorata* observation.

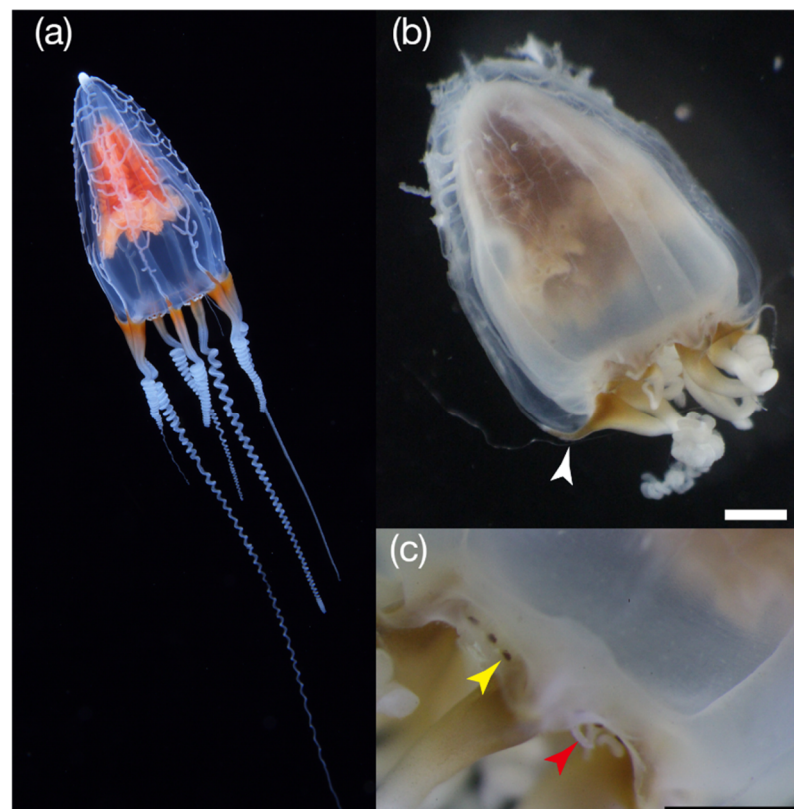


Figure 2. *Eutiara decorata*, voucher #P02: (a) Live specimen in situ; (b) Fixed specimen, white arrow shows exumbrellar spurs; (c) Abaxial ocellus (yellow arrow) and cirrus (red arrow) on the bell margin. Scale bar = 1 mm.

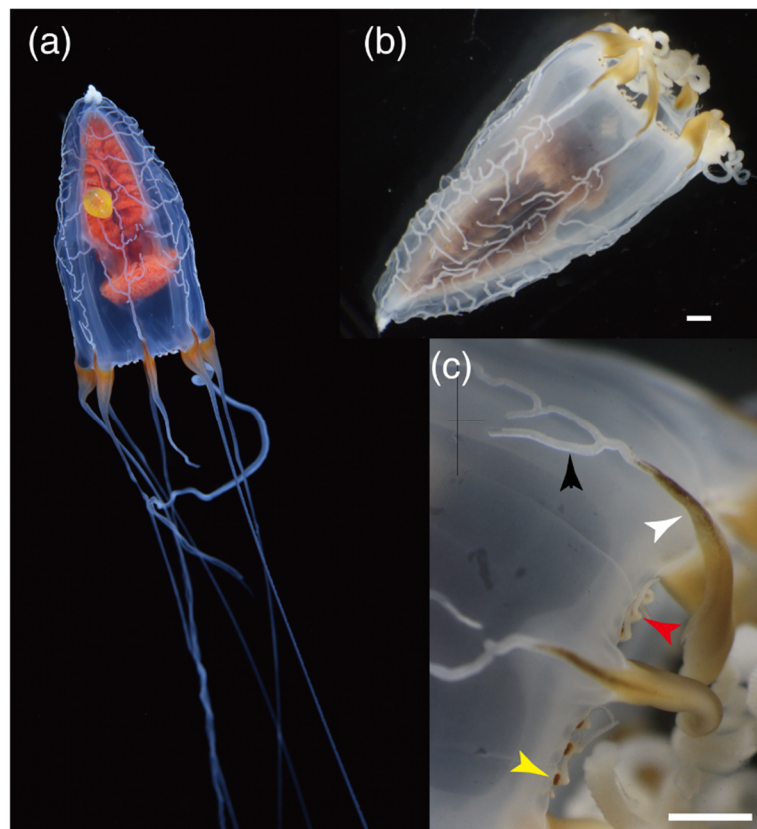


Figure 3. *Eutiara decorata*, voucher #P06: (a) Live specimen with a hyperiid amphipod in situ; (b) Fixed specimen; (c) Exumbrellar spur (white arrow), abaxial ocellus (yellow arrow) and cirrus (red arrow) on the bell margin, and branching blind longitudinal rib (black arrow) on the exumbrella. Scale bar = 1 mm.

These specimens had a bell-shaped umbrella with a very small white hemispherical apical process. The umbrella height was approximately twice the umbrella diameter. The eight tentacles showed basal bulbs that were laterally compressed, with four perradial tentacles and four adradial tentacles. Relaxed tentacles extended straight out and shrunken tentacles were coiled. Exumbrellar spurs without an ocellus extended above the tentacle bulbs. Branching blind longitudinal ribs extended from the exumbrella spurs and covered the exumbrella. The branch of the rib was asymmetric. Three to four marginal bulbs with abaxial ocellus and cirrus were found between each tentacle. Smooth and ribbon-like perradial canals connected the upper part of the manubrium through the mesenteries. Four mountain-shaped short centripetal canals were projected from the interradial part of the marginal ring canal. The marginal ring canal was broad and the velum was well developed. The manubrium was also well developed, but did not extend over the umbrella margin. Gonads with deep folds extended over the stomach wall at the adradial end and many folded gonads showed gaps at the interradial sections. The mouth had crenulated lips. When alive, the color of the ocelli, lips, and gonads were orange to red, tentacle bulbs were reddish-brown, and the tree-like ramified ribs on the exumbrella and apical process were white.

3.2. Symbionts on the *Hydromedusae*

3.2.1. Systematic Account of the Hyperiid Amphipod on *Eutiara decorata*, Voucher Specimen P06

Phylum Arthropoda von Siebold, 1848

Subphylum Crustacea Brünnich, 1772

Superclass Multicrustacea Regier, Shultz, Zwick, Hussey, Ball, Wetzer, Martin and Cunningham, 2010
 Class Malacostraca Latreille, 1802
 Subclass Eumalacostraca Grobben, 1892
 Superorder Peracarida Calman, 1904
 Order Amphipoda Latreille, 1816
 Suborder Hyperiiidea H. Milne Edwards, 1830
 Infraorder Physocephalata Bowman and Gruner, 1973
 Parvorder Physocephalatidira Bowman and Gruner, 1973
 Superfamily Platysceloidea Spence Bate, 1862
 Family Brachyscelidae Stephensen, 1923
 Genus *Brachyscelus* Spence Bate, 1861
 Species *Brachyscelus crusculum* Spence Bate, 1861
 Japanese name: Nokoba-Umi-Nomi (ノコバウミノミ)
 Voucher number: P06-Amphi (Figure 4)

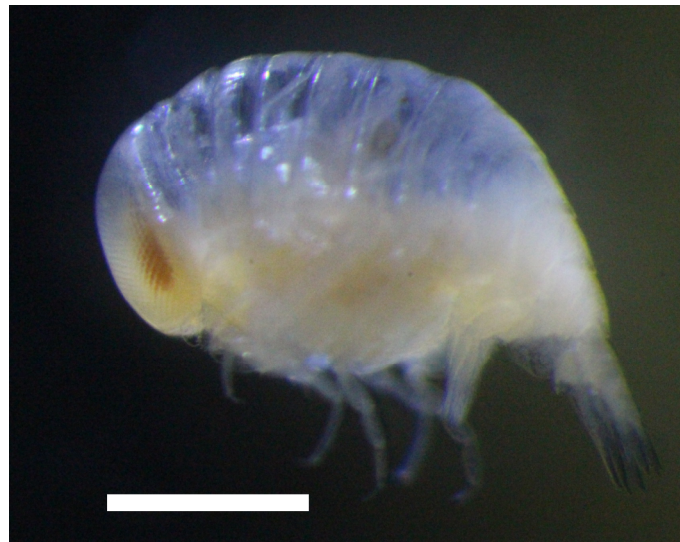


Figure 4. Hyperiid amphipod, *Brachyscelus crusculum*, attached to *Eutiara decorata*. Scale bar = 1 mm.

3.2.2. Description of Specimen

This hyperiid amphipod (Amphipoda: Hyperiiidea) was observed and collected with host specimen P06 (Figure 4). This species was observed holding on to the tree-like ramified ribs of *Eutiara decorata* in situ (Figure 3). The total length of the specimen was 3.7 mm. The head was anteriorly rounded without a rostrum. The subchela of the gnathopods I and II were well developed. The anterior edge of the carpopodite in the gnathopod I protruded forward significantly. The basipodite in pteropods V and VI were relatively broad, but not lid-shaped. The anterior edge of the basipodite in pteropod VI protruded only slightly. Pereopod VII showed all segments completely without degenerate segments. The rami of all uropods were separated from the peduncle; specifically, the rami of uropod III were broad. The telson was longer than its width.

4. Discussion

According to morphological observations, the two specimens collected from Okinawa were identified as *Eutiara decorata*. The growth stage of the specimens was classified as Stage 3 adult according to Berberian et al. (2021) [2] due to the eight tentacles, blind longitudinal branched rims, and a small white apical process. *Pandea conica* (Quoy, 1893), which belongs to the same family as this species, also has a small white apical process and it has been suggested that the white apical process is more prominent in the younger stage [14]. *Eutiara decorata* also has an apical process in the younger stage and no apical process

in the fully-grown adult stage. The small white apical process is a morphological characteristic unique to juvenile and young individuals in this species. In Tahiti, where this species was originally described, the water temperature ranges from 26 °C to 29 °C [2]. The specimens collected in Kumejima Island were also collected at a similar water temperature of 29 °C, suggesting this species is a warm water species and inhabits tropical to temperate regions.

Eutiara decorata was first described from Tahiti Island in the southern hemisphere. This report is the first scientific record of this species from the North Pacific using voucher specimens and the second occurrence record since the original description. One of the authors (R. M.) observed *Eutiara decorata* in the Philippines [9] and Palau [8] in 2019. Another SCUBA diver also observed *E. decorata* at Kumejima Island in 2019 [7]. These three locations were located along the course of the Kuroshio Current and North Equatorial Current, which are important for transporting planktonic animals. Larvae of the Japanese eel, *Anguilla japonica*, were transported to East Asia from the West Mariana Ridge in the North Equatorial Current and the Kuroshio Current [15]. *Eutiara decorata* is also possibly transported by the Kuroshio Current and the North Equatorial Current and distributed Kuroshio area in the northern hemisphere. Cubomedusa *Alatina alata* also has a pantropically distribution [16]. *Alatina moseri*, which is considered a junior synonym of *A. alata* [16], was found in Sagami Bay, Japan [17]. *Alatina moseri* was most likely transported from the Okinawa area to Sagami Bay by the Kuroshio current [17]. Hyperiid amphipod, *Brachyscelus cruscolum*, was attached to the specimen P06. *Brachyscelus cruscolum* is a warm water species distributed in the Pacific, Atlantic and Indian Oceans, and found at depths of 0–400 m in the Kuroshio Current area around Japan [11,12]. The presence of symbionts also suggests that *E. decorata* was in the Kuroshio Current water.

Eutiara decorata was found by SCUBA divers, but not studied until 2021 [2]. This species has beautiful colors, morphology, and is large enough to be photographed. Therefore, when the public find beautiful or mysterious jellyfish, they typically document it. Many photographs and video footage of jellyfishes were uploaded on weblogs, SNS, YouTube, and citizen science platforms, such as iNaturalist and jellywatch. Documented species must be rare, undescribed, non-indigenous, or invading species in the online platforms. Recently, new species descriptions of jellyfish, reports of non-indigenous species, and biogeography and ecology of jellyfish using citizen science have been increasing [18–24]. This study also began by providing photos of pandeid species from a professional underwater photographer. Research with citizen science is extremely useful for taxonomy and biogeography. *Eutiara decorata* has recently been described in 2021. To understand the widespread distribution of this species, it is necessary to clarify its life cycle. Furthermore, genetic information is not yet available. The type locality of this species is approximately 10,000 km away from Kumejima Island across the Equatorial Currents and Equatorial Counter Currents. In addition, an undescribed species that may be closely related to this species has been identified by SCUBA divers. Therefore, comparing the target species morphologically with this species and analyzing its genetic information is important. In the future, it is necessary to develop a protocol to obtain a set of specimens (for morphological observation, genetic analysis, and life cycle study), as well as images and videos (for behavioral analysis).

Author Contributions: Conceptualization, H.M. and M.W.; methodology, H.M., M.W. and R.M.; validation, H.M., M.W. and R.M.; formal analysis, H.M. and M.W.; investigation, H.M. and M.W.; resources, R.M.; data curation, H.M. and M.W.; writing—original draft preparation, H.M. and M.W.; writing—review and editing, H.M., M.W. and R.M.; supervision, H.M.; project administration, H.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The animal experiment in this study was permitted by the animal experiment ethics committee of School of Marine Biosciences, Kitasato University and the approval identification code is MB180510b.

Informed Consent Statement: Not applicable.

Data Availability Statement: All data sets collected and analyzed during the current study are available from the corresponding author on fair request.

Acknowledgments: We would like to express our sincere thanks to Takashi Asahida and Ken-ichi Hayashizaki of Kitasato University and staffs of DIVE ESTIVANT of Kume Island for their assistance and support during this study. We are also deeply grateful to anonymous reviewers for their critical review of our manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Bigelow, H.B. Some medusae and siphonophorae from the western Atlantic. *Bull. Mus. Comp. Zool. Harv.* **1918**, *62*, 365–442.
2. Berberian, A.; Michenet, F.; Goy, J. A New species of *Eutiara*, in the Pandeidae family (Cnidaria: Hydrozoa: Anthoathecata) from Tahiti Island, French Polynesia. *Pac. Sci.* **2021**, *74*, 257–268.
3. Bouillon, J. A new species of the genus *Eutiara*, *Eutiara russelli* n. sp. (Anthomedusae, Hydrozoa, Cnidaria). *Steenstrupia* **1981**, *7*, 233–236.
4. Bouillon, J.; Gravili, C.; Pages, F.; Gili, J.M.; Boero, F. *An Introduction to Hydrozoa*; Publications Scientifiques du Museum: Paris, France, 2006; Volume 194, p. 591.
5. Kramp, P.L. Synopsis of the medusae of the world. *J. Mar. Biol. Assoc. U. K.* **1961**, *40*, 1–469.
6. Kramp, P.L. The hydromedusae of the Atlantic Ocean and adjacent waters. *Dana Rep.* **1959**, *46*, 1–283.
7. Shiga, M. Available online: https://www.instagram.com/p/B01mDqNhx/?utm_medium (accessed on 24 January 2022).
8. Minemizu, R. Available online: <https://www.instagram.com/p/B4TCkPLuh2/> (accessed on 24 January 2022).
9. Minemizu, R. Available online: https://www.instagram.com/ryominemizu/p/B1ZogKlBfQs/?utm_medium (accessed on 25 January 2022).
10. Schneider, C.A.; Rasband, W.S.; Eliceiri, K.W. NIH Image to ImageJ: 25 years of image analysis. *Nat. Methods* **2012**, *9*, 671. <https://doi.org/10.1038/nmeth.2089>.
11. Vinogradov, M.E.; Volkov, A.F.; Semenova, T.A.N.N. *Hyperiid Amphipods (Amphipoda, Hyperiidea) of the World Oceans*; Baba Barkha Nath Printers: New Delhi, India, 1996; p. 632.
12. Chihara, M.; Murano, M. *An Illustrated Guide to Marine Plankton in Japan*; Tokai University Press: Tokyo, Japan, 1997; p. 1574.
13. Mori, M.; Suzuki, Y.; Yamaki, A.; Lindsay Dhugal, J. A checklist of hyperiid amphipods (Amphipoda: Hyperiidea) from Japanese waters, including new records from 1996–2007 for Sagami Bay and outlying areas. *Bull. Plankton Soc. Jpn.* **2010**, *57*, 41–54. (In Japanese with English abstract)
14. Minemizu, R.; Kubota, S.; Hirano, Y.; Lindsay, D. *A Photographic Guide to the Jellyfishes of Japan*; Heibonsha: Tokyo, Japan, 2015; p. 360.
15. Shinoda, A.; Aoyama, J.; Miller, M.J.; Otake, T.; Mochioka, N.; Watanabe, S.; Minegishi, Y.; Kuroki, M.; Yoshinaga, T.; Yokouchi, K.; et al. Evaluation of the larval distribution and migration of the Japanese eel in the western North Pacific. *Rev. Fish Biol. Fisher.* **2011**, *21*, 591–611. <https://doi.org/10.1007/s11160-010-9195-1>.
16. Lawley, J.W.; Ames, C.L.; Bentlage, B.; Yanagihara, A.; Goodwill, R.; Kayal, E.; Hurwitz, K.; Collins, A.G. Box jellyfish *Alatina alata* has a circumtropical distribution. *Biol. Bull.* **2016**, *231*, 152–169. <https://doi.org/10.1086/690095>.
17. Toshino, S.; Kotsuka, H. New record of *Alatina moseri* (Cubozoa, Carybdeida) from Sagami Bay, eastern Japan. *Bull. Biogeogr. Soc. Jpn.* **2020**, *75*, 123–125. (In Japanese with English abstract)
18. Garcia-Soto, C.; Seys, J.J.C.; Zielinski, O.; Busch, J.A.; Luna, S.I.; Baez, J.C.; Domegan, C.; Dubsy, K.; Kotynska-Zielinska, I.; Loubat, P.; et al. Marine citizen science: Current state in Europe and new technological developments. *Front. Mar. Sci.* **2021**, *8*, 621472. <https://doi.org/10.3389/fmars.2021.621472>.
19. Nordstrom, B.; James, M.C.; Martin, K.; Worm, B. Tracking jellyfish and leatherback sea turtle seasonality through citizen science observers. *Mar. Ecol. Prog. Ser.* **2019**, *620*, 15–32. <https://doi.org/10.3354/meps12978>.
20. Langeneck, J.; Crocetta, F.; Doumpas, N.; Giovos, I.; Piraino, S.; Boero, F. First record of the non-native jellyfish *Chrysaora* cf. *achlyos* (Cnidaria: Pelagiidae) in the Mediterranean Sea. *BioInvasions Rec.* **2019**, *8*, 608–613. <https://doi.org/10.3391/bir.2019.8.3.17>.
21. Guerrero, E.; Kienberger, K.; Villaescusa, A.; Gili, J.M.; Navarro, G.; Prieto, L. First record of beaching events for a calycophoran siphonophore: *Abylopsis tetragona* (Otto, 1823) at the Strait of Gibraltar. *Mar. Biodivers.* **2019**, *49*, 1587–1593. <https://doi.org/10.1007/s12526-018-0926-1>.
22. Purcell, J.E. Successes and challenges in jellyfish ecology: Examples from *Aequorea* spp. *Mar. Ecol. Prog. Ser.* **2018**, *591*, 7–27. <https://doi.org/10.3354/meps12213>.
23. Pires, R.F.T.; Cordeiro, N.; Dubert, J.; Marraccini, A.; Relvas, P.; dos Santos, A. Untangling *Veleva veleva* (Cnidaria: Anthoathecatae) transport: A citizen science and oceanographic approach. *Mar. Ecol. Prog. Ser.* **2018**, *591*, 241–251. <https://doi.org/10.3354/meps12266>.
24. Milisen, J.W.; Matye, S.A.; Kobayashi, D.R. Nocturnal visual census of pelagic fauna using scuba near Kona, Hawai'i. *Pac. Sci.* **2018**, *72*, 399–410. <https://doi.org/10.2984/72.4.1>.