J. Black Sea/Mediterranean Environment
Vol. 32, No. 2: 115-132 (2026)

RESEARCH ARTICLE

A recent occurrence signal of *Chrysaora hysoscella* in the northern Aegean Sea and Sea of Marmara: Evidence from citizen science and field observations

İlayda Destan Öztürk

ORCID ID: 0000-0001-8915-6236

Department of Physical Oceanography and Marine Biology, Institute of Marine Sciences and Management, İstanbul University, İstanbul, TÜRKİYE
Turkish Marine Research Foundation (TUDAV), P.O. Box: 10, Beykoz, Istanbul, TÜRKİYE

Corresponding author: destanozturk@istanbul.edu.tr

Abstract

Citizen science provides a valuable complementary approach for documenting jellyfish occurrence across broad spatial scales. This study examined recent records of the compass jellyfish *Chrysaora hysoscella* along Türkiye's coastal waters using photographically verified observations submitted to the platform "YaYakarsa?" (National Jellyfish Monitoring Program) between April and June 2026, together with a targeted shoreline field survey. A total of 29 verified records were documented, with observations concentrated in the northeastern Aegean Sea and the Sea of Marmara. Most records originated from coastal waters (20 of 29), while stranded and offshore observations were less frequent. Reported encounter magnitude was generally low, with 21 records involving fewer than 10 individuals, seven involving 10-100 individuals, and one involving 100-500 individuals. Swimming and coastal walking were the most frequently reported observer activities, highlighting the influence of coastal accessibility and observer effort on the spatial pattern of citizen science records. A targeted shoreline survey conducted at Yıldız Bay, Gökçeada, on 28 May 2026, documented 98 stranded *C. hysoscella* individuals along an approximately 100m shoreline, providing complementary field-based documentation of a localized stranding event. The findings highlight the complementary roles of photographically validated citizen science observations and targeted field surveys in documenting the spatial occurrence of jellyfish and providing detailed evidence of localized stranding events.

Keywords: Scyphozoa, Pelagiidae, jellyfish monitoring, coastal stranding, gelatinous zooplankton, Eastern Mediterranean

Received: 24.08.2026, **Accepted:** 22.10.2026

Introduction

Chrysaora hysoscella (Linnaeus, 1767), a scyphozoan jellyfish species belonging to the family Pelagiidae, is commonly known as the compass jellyfish. The species is native to the northeastern Atlantic Ocean and the Mediterranean Sea (Douek *et al*. 2020). Jellyfish populations can exhibit pronounced seasonal and interannual variability, with periods of low occurrence alternating with episodic aggregations or blooms. Such variability may reflect the combined influence of life-history processes and environmental conditions, making short-term changes in jellyfish occurrence difficult to interpret in the absence of sustained monitoring. The species has been recorded in several temperate marine regions, including British and Irish waters (Houghton *et al*. 2006), the North Sea (Barz and Hirche 2007), and the Mediterranean Sea (D'Ambra and Malej 2015). Within the Mediterranean, the occurrence of *C. hysoscella* has been documented in the northern Adriatic (Kogovšek *et al*. 2010), the eastern Adriatic (Pestorić *et al.* 2021), and Boka Kotorska Bay (Violić *et al*. 2019), as well as along the Mediterranean coast of Morocco, where its occurrence has been reported to be seasonal (Mghili *et al*. 2022). In addition to its broad distribution, *C. hysoscella* can occur at high abundances and form dense aggregations, particularly during spring in parts of the Adriatic Sea (Kogovšek *et al*. 2010; Violić *et al*. 2019; Pestorić *et al*. 2021).

In the waters of Türkiye, *C. hysoscella* has been reported from the Mediterranean Sea, Aegean Sea, and Sea of Marmara. The species was first reported from the Mediterranean coast of Türkiye in Mersin Bay (Bingel *et al*. 1991), and its presence in other coastal areas of Türkiye was subsequently documented (İşinibilir and Yılmaz 2017). A record from the Sea of Marmara was reported from Erdek Bay in 2000 (İnanmaz *et al*. 2002). Subsequent studies confirmed the presence of *C. hysoscella* in the Sea of Marmara and documented the species as a component of the region's gelatinous zooplankton and macrojellyfish fauna (İşinibilir *et al*. 2024). Studies conducted around the Çanakkale Strait have also reported *C. hysoscella* as a component of the local jellyfish community and indicated temporal variation in its occurrence (Alparslan *et al*. 2011). Collectively, records from the coastal waters of Türkiye indicate that the species has been observed across different marine regions and periods.

In the Sea of Marmara, *C. hysoscella* has shown considerable temporal and spatial variability in abundance. Previous studies reported relatively high densities from May to December, with blooms occurring in the southern Marmara between June and October during 2011-2014. In the southwestern Marmara, however, the species was frequently observed without forming large aggregations (İşinibilir and Yılmaz 2017). When dense aggregations occur, jellyfish can have ecological as well as socioeconomic consequences. Contact with *C. hysoscella* can cause skin reactions, including itching, burning, and erythema (Kokelj *et al*. 1989). Jellyfish outbreaks can cause substantial socioeconomic impacts by disrupting

recreational activities in coastal waters and affecting aquaculture and fisheries (Purcell *et al*. 2007; Nunes *et al*. 2015; Tomlinson *et al*. 2018; Rubio Gómez and Gutiérrez-Hernández 2020; Bosch-Belmar *et al*. 2021; Mghili *et al*. 2022; Ruiz-Frau 2023).

The episodic and spatially heterogeneous nature of jellyfish occurrence also presents challenges for conventional monitoring. Aggregations may develop rapidly and persist for relatively short periods, making them difficult to capture through spatially and temporally restricted scientific surveys. Citizen science therefore offers a particularly useful complementary approach for jellyfish monitoring by extending observational coverage across coastal areas and providing records of events that may otherwise remain undocumented. Examples include the Mediterranean-wide CIESM Jellywatch programme and national or local initiatives such as Meteo Meduse (Italy), Spot the Jellyfish (Malta), Observadores del Mar (Spain), Meduzot Baam (Israel), and Meduse.Tunisie (Tunisia) (Edelist *et al*. 2025). Recent assessments have highlighted the growing role of citizen science initiatives in documenting jellyfish occurrence and supporting long-term knowledge of their distribution, while emphasizing the importance of expert validation and standardized data collection (Edelist *et al.* 2025; Morrison *et al*. 2026).

Despite previous records of *C. hysoscella* from different marine regions of Türkiye, information on its recent occurrence remains spatially and temporally fragmented. Existing observations originate from different periods, locations, and sampling approaches and therefore provide limited information on contemporary occurrence across broader coastal areas. In this study, we examined a recent occurrence signal of *C. hysoscella* identified through a citizen science program "YaYakarsa? (What If It Stings?)" using photographically verified observations from April to June 2026. We evaluated the spatial distribution of these records, locality, reported abundance categories, and associated activities. A targeted shoreline survey provided complementary field-based documentation of local occurrence and the magnitude of a stranding event.

Materials and Methods

Citizen science monitoring program

YaYakarsa? - a national jellyfish monitoring program (https://yayakarsa.org/) was established by the Turkish Marine Research Foundation (TUDAV) in 2016 to monitor the occurrence and distribution of jellyfish, such as those shown in the poster (Figure 1). The program was developed to facilitate public reporting of jellyfish sightings and to support long-term monitoring by integrating citizen observations with expert validation. Members of the public voluntarily submitted jellyfish observations together with photographs, the date and location of the sighting, and additional information describing the observation. Submitted reports also included the locality (e.g., coastal waters, offshore waters, stranded

individuals), the estimated number of individuals observed, and the recreational activity being undertaken at the time of the encounter. To ensure data quality, all submitted observations were evaluated by marine biologists with expertise in jellyfish identification. Species identification was confirmed using the accompanying photographs (or videos), while records lacking sufficient diagnostic features or containing uncertain taxonomic information were excluded from the analyses. In addition to taxonomic verification, reported locations and observation details were reviewed for consistency. Observation dates, reported localities, and participant information were compared to identify duplicate submissions. When multiple submissions referred to the same observation event, only one was retained. The retained records were analysed as individual reports.

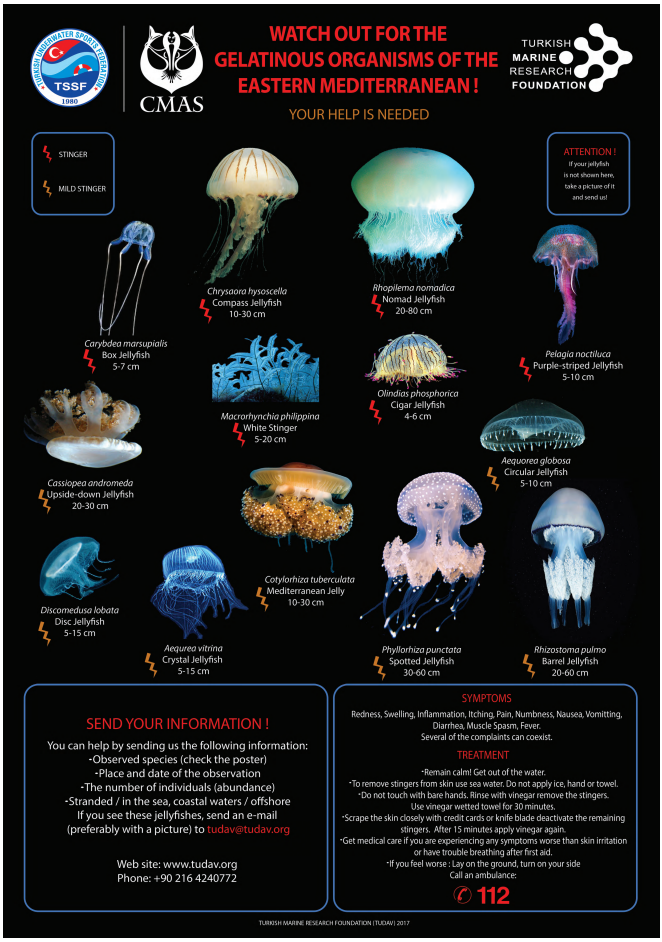


Figure 1. Public awareness and identification poster used within the YaYakarsa? National Jellyfish Monitoring Program. (*Olindias phosphorica* is now unaccepted, currently accepted name is *Olindias muelleri.*)

Shoreline field survey

To complement the observations obtained through the YaYakarsa? citizen science program, a targeted shoreline field survey was conducted at Yıldız Bay, located on the northern coast of Gökçeada in the northeastern Aegean Sea (Figure 2). The survey was carried out on 28 May 2026 along a predefined section of the shoreline extending approximately 100 meters. A single observer walked along the shoreline and visually counted all visible stranded *C. hysoscella* individuals encountered along the survey route. Each individual was photographed separately for documentation and species verification. Photographic documentation was carried out over 61 minutes, from the first observation at (40°14′03″N, 25°54′11″E) to the last observation at (40°14′03″N, 25°54′15″E). Species identification was based on the characteristic morphological features of *C. hysoscella*, including the distinctive compass-like pigmentation pattern on the exumbrella and radiating brown V-shaped markings.

Results and Discussion

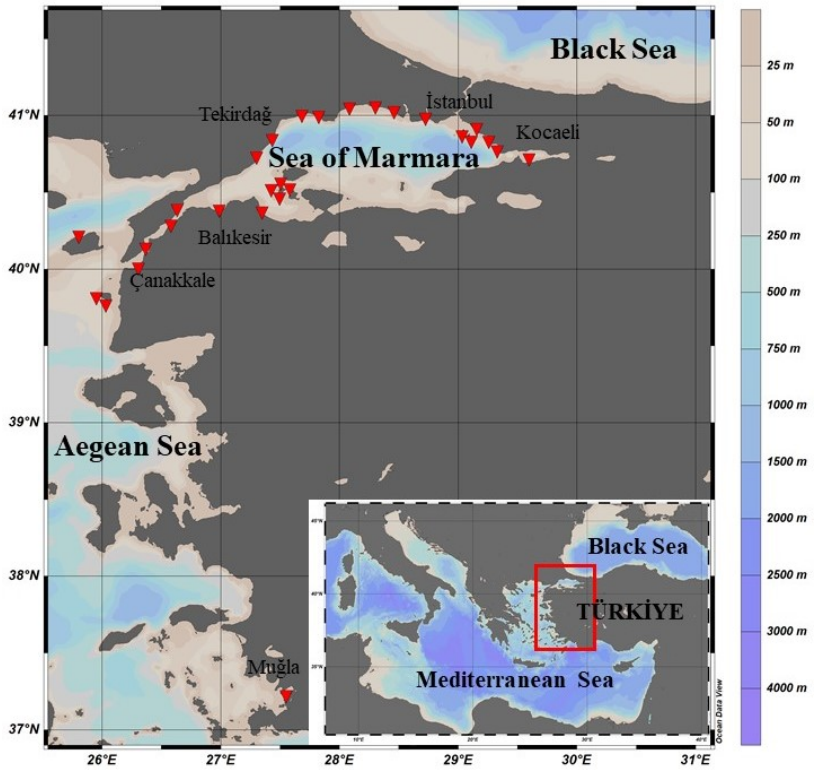


Figure 2. Study area and spatial distribution of *Chrysaora hysoscella* observations (April-June 2026) reported through the YaYakarsa? National Jellyfish Monitoring Program

Through the YaYakarsa? National Jellyfish Monitoring Program, 30 photographically verified submissions of *Chrysaora hysoscella* were received between April and June 2026. One duplicate submission referring to the same observation event on the same date and at the same locality was excluded, leaving 29 records for analysis. The anonymized record-level dataset is provided in Supplementary Table 1. The number of verified submissions does not directly reflect species abundance, as citizen science reporting depends on observer participation and the probability of encountering jellyfish. Nevertheless, photographically verified submissions provide reliable evidence of species occurrence, and citizen science observations can reveal occurrences that might otherwise remain undocumented (Edelist *et al*. 2025). The spatial distribution of observations showed that records were concentrated in the northern Aegean Sea and the Sea of Marmara (Figures 2 and 3). Records were particularly clustered along the northern Aegean coast and around the Çanakkale Strait, with additional observations along the northern coast of the Sea of Marmara.

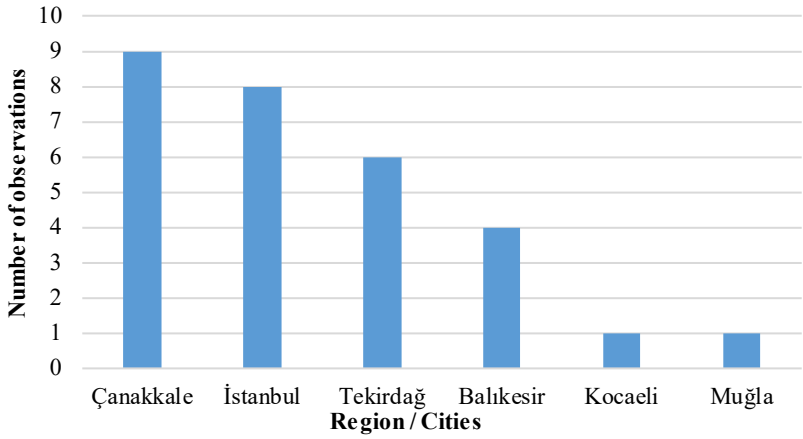


Figure 3. C*hrysaora hysoscella* observations reported through YaYakarsa? by region/cities

Previous studies have documented seasonal occurrence patterns of *C. hysoscella* in different parts of the Mediterranean. Monitoring along the western coast of the Istrian Peninsula in the northern Adriatic recorded *C. hysoscella* from April to October, with encounter frequency increasing from spring to early summer and reaching its highest value in June (13.9 ± 3.7%), followed by relatively high frequencies in July and August (Budiša *et al*. 2024). Along the northwestern Moroccan Mediterranean coast, *C. hysoscella* was reported mainly during July and August (Mghili *et al*. 2022). The April–June 2026 records constitute the first marked spatial and temporal concentration of *C. hysoscella* reports in the YaYakarsa?, centred on the northern Aegean Sea and the Sea of Marmara, with

the absence of reports before April and after June within the period reviewed suggesting seasonality in reported occurrence.

Reports of conspicuous jellyfish aggregations and stranding events were documented along the UK coast during 2026 (Jacobs 2026; Plymouth Marine Laboratory 2026), while pronounced positive sea-surface temperature anomalies occurred across several European marine regions during the same summer. Particularly strong sea surface temperature (SST) anomalies were recorded in the western and eastern Mediterranean, with an attribution analysis indicating a substantial contribution of anthropogenic climate change to the intensity of these SST anomalies (Bergin *et al*. 2026). The records of *C. hysoscella* documented in the present study should not be interpreted as evidence of a direct response to the thermal anomalies reported across European seas in 2026. Future monitoring could combine jellyfish observations with sea-surface temperature, current, and wind data to understand environmental influences on jellyfish occurrence and coastal strandings.

Locality

Most verified records originated from coastal waters (n = 20; Figure 4). Stranded observations accounted for six records, whereas two records were reported from offshore waters. The predominance of coastal observations in the present study is not unexpected, given that citizen science records largely originate from coastal users such as swimmers, beachgoers, divers, and fishers (Edelist *et al*. 2025). This pattern may reflect both the nearshore occurrence of *C. hysoscella* during aggregation periods and, importantly, the distribution and accessibility of observers. In the present dataset, the substantial representation of swimmers among observers (n = 15; Figure 6) further supports the possibility that observer activity contributed to the predominance of coastal records.

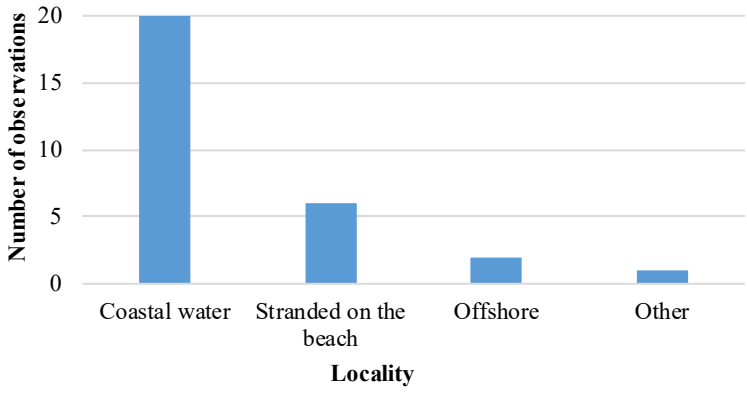


Figure 4. Distribution of *Chrysaora hysoscella* observations according to the locality

The relatively low frequency of stranded records may also reflect the characteristics of the observer network and the temporal variability of beach-stranding events. Although stranded jellyfish can be readily detected in coastal citizen-science programmes, beach-based observations may vary considerably depending on the occurrence of stranding events and the intensity of beach monitoring (Nordstrom *et al*. 2019; Jones *et al*. 2021). Thus, the low number of stranded observations in the present dataset should not necessarily be interpreted as evidence of infrequent stranding of *C. hysoscella* during the study period. Offshore observations were particularly underrepresented, which is likely related to the limited accessibility of open-water environments to citizen observers. Unlike coastal waters, offshore areas generally require access to boats or other dedicated platforms, creating a systematic spatial bias in citizen-science observations. Consequently, the strong predominance of coastal records in the present dataset likely reflects a combination of species occurrence, observer behaviour and accessibility.

Abundance

The use of categorical abundance classes in YaYakarsa? (<10, 10–100, and 100–500 individuals) is well suited to monitoring of jellyfish based on citizen science, where obtaining precise counts is often difficult, particularly when individuals occur in aggregations (Edelist *et al*. 2025). In the present dataset, 21 of 29 verified submissions (72%) fell within the lowest abundance category (<10 individuals), while seven submissions (24%) reported 10–100 individuals and only one submission (3%) reported 100–500 individuals (Figure 5). This pattern should nevertheless be interpreted cautiously because observations were not standardized by sampling area or water volume and abundance was based on visual estimates by observers. Castro-Gutiérrez *et al*. (2022) further demonstrated that ordinal jellyfish abundance categories can be incorporated into predictive ecological models, particularly when observer effort and environmental covariates are considered.

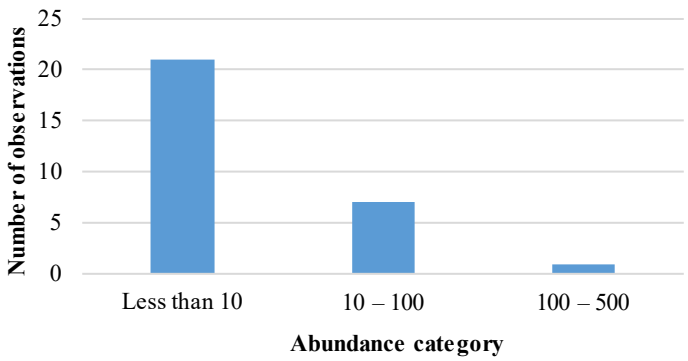


Figure 5. Frequency distribution of reported *Chrysaora hysoscella* abundance categories

This pattern may reflect relatively few individuals encountered by observers, but it may also be influenced by the characteristics of citizen science reporting and observer perception. In particular, categorical estimates inevitably involve some degree of uncertainty, as observers must visually approximate the number of individuals encountered rather than derive counts from standardized sampling procedures. More generally, inter-observer variability is a recognized source of uncertainty in marine citizen-science observations (Earp *et al*. 2022).

The abundance categories provide a standardized representation of the relative magnitude of jellyfish encounters reported by participants, rather than direct measures of population density or absolute abundance. Future monitoring efforts could further improve the comparability and interpretability of these records by systematically recording information such as observer effort, observation duration, and the area surveyed.

Observer Activity

Swimming (n = 15) and coastal walking or trekking (n = 12) accounted for most observer activities, whereas diving and sailing each accounted for only one observation (Figure 6). This activity profile is consistent with the predominance of coastal observations in the dataset and indicates that encounter probability was strongly associated with accessible nearshore environments. Recreational user groups differ in the portions of the marine environment they access, and citizen-science datasets may therefore show spatial biases related to participant activity and accessibility (Goffredo *et al*. 2010; Brewin *et al*. 2015). The limited representation of diving and sailing observations consequently suggests that deeper and offshore environments were less effectively represented in the present dataset.

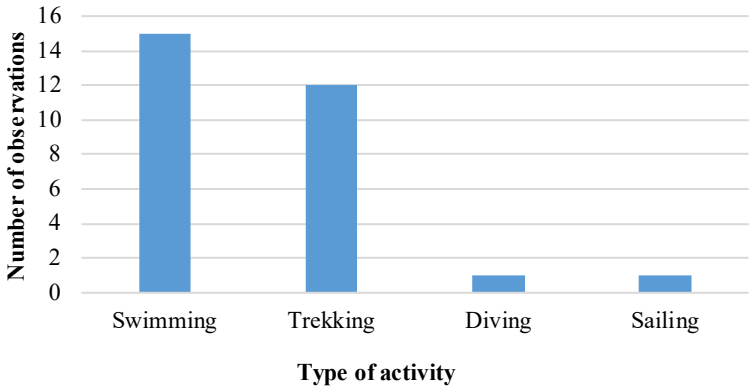


Figure 6. Frequency distribution of type of activity during *Chrysaora hysoscella* observations

Expanding participation among underrepresented user groups, particularly divers and boat-based observers, could improve coverage of deeper and offshore environments and provide a more spatially comprehensive representation of jellyfish occurrences in future monitoring efforts.

Shoreline field survey

The targeted shoreline survey at Yıldız Bay provided complementary field-based documentation of *C. hysoscella* occurrence, with 98 stranded individuals recorded along the approximately 100-m surveyed shoreline (Figure 7) during a single survey on 28 May 2026. One of the 29 citizen science reports was received from Yıldız Bay on 24 May 2026. The individual reported may or may not have been among the 98 individuals counted during the subsequent field survey.

All individuals were identified as *C. hysoscella* based on the diagnostic morphological features described above. Representative individuals documented during the survey are shown in Figure 8. The occurrence of 98 stranded individuals within a relatively short, predefined shoreline section highlights the value of shoreline surveys for documenting localized jellyfish stranding events. Targeted shoreline observations have previously been used to document and quantify localized jellyfish stranding and mass-mortality events in the Sea of Marmara (Öztürk and Sümen 2020).

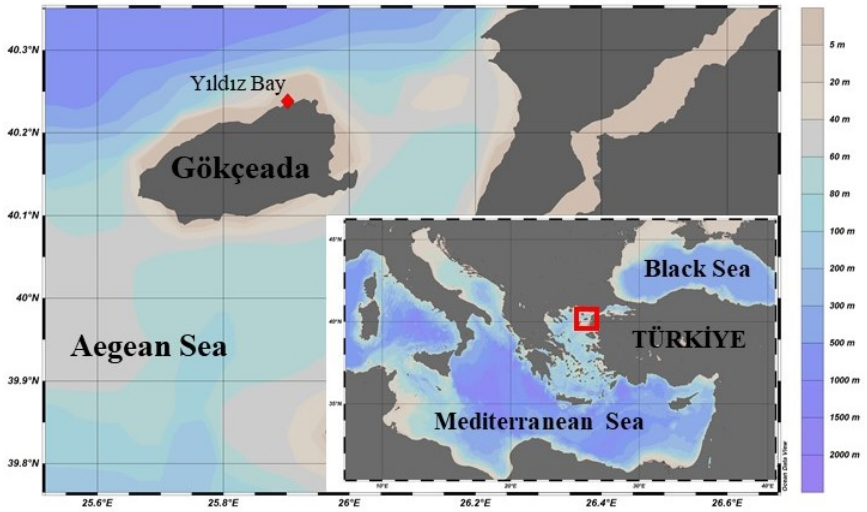


Figure 7. Location of the shoreline field survey site at Yıldız Bay on the northern coast of Gökçeada, northeastern Aegean Sea

More systematic shoreline surveys have been used to document the occurrence and distribution of stranded scyphozoan jellyfish across defined coastal sections

and to characterize spatial and seasonal patterns in stranding events (Doyle *et al*. 2007; Houghton *et al*. 2007; Fleming *et al*. 2013). Long-term citizen-science datasets based on repeated beach surveys have similarly been used to characterize spatial and temporal patterns of gelatinous-organism strandings (Jones *et al*. 2021).



Figure 8. Stranded *Chrysaora hysoscella* individuals recorded during the shoreline field survey at Yıldız Bay, Gökçeada

More broadly, the Yıldız Bay survey illustrates how citizen science records can complement targeted field observations by identifying locations where follow-up surveys may be informative. Citizen science programmes can provide extensive

occurrence signals spatially and temporally that are difficult to obtain through conventional field surveys alone, while targeted field observations can provide more standardized information on local occurrence and encounter magnitude (Edelist *et al*. 2025). This complementary relationship is particularly relevant for jellyfish monitoring, where aggregations and stranding events can be highly localized and temporally variable. However, the present survey represents a single observation on a single date and along a single shoreline section; therefore, the 98 individuals recorded should be interpreted as evidence of a localized stranding event rather than as an estimate of population abundance or a measure of the broader distribution of *C. hysoscella*. Repeated surveys across multiple shoreline sections and dates would be required to determine whether this pattern represents a recurrent local phenomenon or a short-lived aggregation event.

Conclusion

This study demonstrates the value of combining citizen science observations with targeted field surveys to document jellyfish occurrence across different spatial scales. The findings also highlight the potential of the YaYakarsa? National Jellyfish Monitoring Program for documenting jellyfish occurrence along Türkiye's coastal waters. Continued operation of the program, together with repeated targeted field surveys across different locations and periods, will be important for determining the recurrence, spatial extent, and interannual variability of *C. hysoscella* occurrences and for improving our understanding of jellyfish dynamics in the region.

Acknowledgement

We sincerely thank all observers who contributed photographs and occurrence records to the YaYakarsa? National Jellyfish Monitoring Program. Their contributions were essential to documenting the occurrence and distribution of *Chrysaora hysoscella* along Türkiye's coastal waters. We also thank Aysel Alpat for her assistance during the shoreline field survey at Yıldız Bay, Gökçeada.

Competing interest: No potential conflict of interest was reported by the author.
Ethics committee approval: No ethical committee approval was required for this study.
Financial disclosure: The author received no financial support for the research, authorship, and/or publication of this article.

Kuzey Ege Denizi ve Marmara Denizi'nde *Chrysaora hysoscella*'nın güncel kayıtları: Vatandaş bilimi ve saha gözlemlerine dayalı değerlendirme

Öz

Vatandaş bilimi, denizanalarının geniş mekansal ölçeklerde görülmesinin raporlanmasında önemli ve tamamlayıcı bir yaklaşım sunmaktadır. Bu çalışmada, Nisan–Haziran 2026

döneminde YaYakarsa? Ulusal Denizanası İzleme Programı'na bildirilen ve fotoğraflarla doğrulanan gözlemler ile tamamlayıcı bir kıyı saha çalışması birlikte değerlendirilerek pusula denizanası *Chrysaora hysoscella*'nın Türkiye kıyılarındaki güncel kayıtları incelenmiştir. Toplam 29 doğrulanmış kayıt elde edilmiş olup, gözlemler kuzeydoğu Ege Denizi ve Marmara Denizi'nde yoğunlaşmıştır. Bildirimlerin çoğu kıyısal sulardan (29 kaydın 20'si) gelirken, kıyıya vurmuş bireylere ait 6 , açık denize ait 2 bildirim ulaşmıştır. Gözlem başına bildirilen birey sayısı genel olarak düşük olup, 21 kayıtta 10'dan az, yedi kayıtta 10–100 ve bir kayıtta 100–500 birey bildirilmiştir. Yüzme ve kıyıda yürüyüş, gözlem sırasında en sık bildirilen aktiviteler olup; bu durum kıyıya erişilebilirliğin ve gözlemci çabasının vatandaş bilimi kayıtlarının mekânsal dağılımı üzerindeki etkisini ortaya koymuştur. Gökçeada Yıldız Koyu'nda 28 Mayıs 2026 tarihinde gerçekleştirilen tamamlayıcı kıyı saha çalışmasında yaklaşık 100 m uzunluğundaki kıyı kesiminde kıyıya vurmuş 98 *C. hysoscella* bireyi kaydedilmiş ve böylece yerel bir kıyıya vurma olayına ilişkin tamamlayıcı saha verisi elde edilmiştir. Bulgular, denizanalarının görülmesinin belgelenmesinde ve daha sistematik izleme çalışmalarının yararlı olabileceği alanların belirlenmesinde, fotoğraflarla doğrulanmış vatandaş bilimi gözlemleri ile hedefli saha çalışmalarının birbirini tamamlayıcı değerini ortaya koymaktadır.

Anahtar kelimeler: Scyphozoa, Pelagiidae, denizanası izleme, kıyıya vurma, jelimsi zooplankton, Doğu Akdeniz

References

Alparslan, M., Doğu, S., Özalp, B. (2011) Importance of jellyfishes and their distribution around the Çanakkale Strait. In: First National Workshop on Jellyfish and Other Gelatinous Species in Turkish Marine Waters, (eds., Turan, C., Öztürk, B.), Turkish Marine Research Foundation (TUDAV), Publication No: 35, İstanbul, pp. 78-80.

Barz, K., Hirche, H.J. (2007) Abundance, distribution and prey composition of scyphomedusae in the southern North Sea. *Marine Biology* 151(3): 1021-1033.

Bergin, C., Clarke, B., Barnes, C., Gregory, C., Dahl, K., Bouassa, B., Frölicher, T., Bruno, J., Vahlberg, M., Meija, A., Boyer, C., Otto, F. (2026) Climate Change Is Driving Unprecedented European Ocean Temperatures, with Severe Impacts for Marine life. (WWA Scientific Report No. 90) World Weather Attribution. Doi: 10.25560/132103

Bingel, F., Avsar, D., Gucu, A.C. (1991) Occurrence of jellyfish in Mersin Bay. In: Jellyfish Blooms in the Mediterranean. Proceedings of the II Workshop on Jellyfish in the Mediterranean Sea. MAP Technical Reports Series, No. 47, pp. 65-71.

Bosch-Belmar, M., Milisenda, G., Basso, L., Doyle, T. K., Leone, A., Piraino, S. (2021) Jellyfish impacts on marine aquaculture and fisheries. *Reviews in Fisheries Science & Aquaculture* 29(2): 242-259.

Brewin, R.J.W., de Mora, L., Jackson, T., Brewin, T.G., Shutler, J. (2015) On the potential of surfers to monitor environmental indicators in the coastal zone. *PLOS OnE* 10: e0127706. Doi: 10.1371/journal.pone.0127706

Budiša, A., Iveša, N., Burić, P., Millotti, G., Buršić, M., Pustijanac, E., Žunec, A., Kovačić, I., Štifanić, M., Milovan, N., Paliaga, P. (2024) Monitoring gelatinous zooplankton and its dynamics in the eastern Adriatic (2018-2023). In: Tenth International Symposium "Monitoring of Mediterranean Coastal Areas: Problems and Measurement Techniques", (eds., Bonora, L., Catelani, M., Vincenzi, M. De., Matteucci, G.) Firenze University Press, pp. 80-91. Doi: 10.36253/979-12-215-0556-6.06

Castro-Gutiérrez, J., Gutiérrez-Estrada, J.C., Aroba, J., Pulido-Calvo, I., Peregrín, A., Báez, J.C., Bellido, J.J., Souviron-Priego, L. (2022) Estimation of jellyfish abundance in the south-eastern Spanish coastline by using an explainable artificial intelligence model based on fuzzy logic. *Estuarine, Coastal and Shelf Science* 277: 108062.

Çınar, M.E., Açık, Ş., Aker, H. (2024) Diversity of Cnidaria and Ctenophora from the coasts of Türkiye. *Turkish Journal of Zoology* 48(6): 356-378.

D'Ambra, I., Malej, A. (2015) Scyphomedusae of the Mediterranean: State of the art and future perspectives. *Central Nervous System Agents in Medicinal Chemistry* 15: 81-94.

Douek, J., Paz, G., Rinkevich, B.,Gevili, R., Galil, B.S. (2020) First record of anon-native pelagiid jellyfish (Scyphozoa:Pelagiidae: *Chrysaora*) in the easternmost Mediterranean Sea. *BioInvasions Records* 9(3): 482-489.

Doyle, T.K., Houghton, J.D.R., Buckley, S.M., Hays, G.C., Davenport, J. (2007) The broad-scale distribution of five jellyfish species across a temperate coastal environment. *Hydrobiologia* 579: 29-39.

Earp, H., Vye, S., Bohn, K., Burrows, M., Chenery, J., Dickens, S., Foster, C., Grist, H., Lamont, P., Long, S., Morrall, Z., Pocklington, J., Scott, A., Watson, G., West, V., Jenkins, S., Delany, J., Sugden, H. (2022) Do you see what I see? Quantifying inter-observer variability in an intertidal marine citizen science experiment. *Citizen Science: Theory and Practice* 7: 483. Doi: 10.5334/cstp.483

Edelist, D., Canepa-Oneto, A., Azzopardi, J., Ballesteros, A., Bellido, J., Boero, F., Bordehore, C., Deidun, A., Fonfría, E.S., Gauci, A., Gili, J. M., Gueroun, S. K.M., Guy-Haim, T., Kuplik, Z., Leoni, V., Kogovsek, T., Marambio, M., Mangin, A., Moranduzzo, T., Öztürk, İ.D., *et al*. (2025) Citizen science-based jellyfish observation initiatives in the Mediterranean Sea. *Hydrobiologia* 852: 5313-5332.

Fleming, N.E., Harrod, C., Houghton, J.D. (2013) Identifying potentially harmful jellyfish blooms using shoreline surveys. *Aquaculture Environment Interactions* 4: 263-272.

Goffredo, S., Pensa, F., Neri, P., Orlandi, A., Gagliardi, M.S., Velardi, A., Piccinetti, C., Zaccanti, F. (2010) Unite research with what citizens do for fun: "recreational monitoring" of marine biodiversity. *Ecological Applications* 20: 2170-2187.

Houghton, J.D.R., Doyle, T.K., Davenport, J., Hays, G.C. (2006) Developing a simple, rapid method for identifying and monitoring jellyfish aggregations from the air. *Marine Ecology Progress Series* 314: 159-170.

Houghton, J.D.R., Doyle, T.K., Davenport, J., Lilley, M.K.S., Wilson, R.P., Hays, G.C. (2007) Stranding events provide indirect insights into the seasonality and persistence of jellyfish medusae (Cnidaria: Scyphozoa). *Hydrobiologia* 589: 1-13.

İnanmaz, Ö.E., Bekbölet, M., Kıdeyş, A.E. (2002) A new scyphozoan species in the Sea of Marmara: *Chrysaora hysoscella* (Linné, 1766). In: Proceedings of the Second International Conference on Oceanography of the Eastern Mediterranean and Black Sea: Similarities and Differences of Two Interconnected Basins, (ed., Yılmaz, A.), Ankara, Türkiye, pp. 857-859.

İşinibilir, M. (2015) Distribution of *Chrysaora hysoscella* (Linnaeus, 1767) in the Marmara Sea. In: ASLO 2015 Aquatic Sciences Meeting: Aquatic Sciences: Global and Regional Perspectives – North Meets South, Granada, Spain, 22-27 February 2015, p. 97.

İşinibilir, M., Malej, A., Lučić, D., Vodopivec, M., Violić, I., Karakulak, F.S., Kıdeyş, A.E. (2024) Macrojellyfish (Scyphozoa and Ctenophora) in two enclosed marine systems (the Sea of Marmara and Adriatic Sea): A review. In: Ecological Changes in the Sea of Marmara, (eds., İşinibilir M., Kıdeyş, A.E., Malej, A.), Istanbul University Press, pp. 587-633. Doi: 10.26650/B/LSB21LSB37.2024.023.017

İşinibilir, M., Yılmaz, İ.N. (2017) Jellyfish Dynamics and Their Socioeconomic and Ecological Consequences in Turkish Seas. In: Jellyfish: Ecology, Distribution Patterns and Human Interactions, (ed., Mariottini, G.L.), Nova Science Publishers, New York, pp. 51-70.

Jacobs, Z. (2026) Jellyfish bloom: An impact of the marine heatwave or just more people heading to the beach? National Oceanography Centre. Available at: https://www.noc.ac.uk/sites/default/files/2026-07/COMMS1728%20JELLYFISH%20BLOOM%20-%20FINAL%20UPDATED.pdf (accessed 10 Aug. 2026).

Jones, T., Parrish, J.K., Burgess, H.K. (2021) Long-term patterns of mass stranding of the colonial cnidarian *Velella velella*: influence of environmental forcing. *Marine Ecology Progress Series* 662: 69-83.

Kogovšek, T., Bogunović, B., Malej, A. (2010) Recurrence of bloom-forming scyphomedusae: wavelet analysis of a 200-year time series. *Hydrobiologia* 645: 81-96.

Kokelj, F., Del Negro, P., Tubaro, A. (1989) Dermotossicità da *Chrysaora hysoscella*. Presentazione di un caso [Dermatotoxicity caused by *Chrysaora hysoscella*. Presentation of a case]. Giornale italiano di dermatologia e venereologia 124(6): 297-8. (in Italian)

Mghili, B., Analla, M., Aksissou, M. (2022) Medusae (Scyphozoa and Hydrozoa) from the Moroccan Mediterranean coast: abundance and spatiotemporal dynamics and their economic impact. *Aquatic Ecology* 56: 213-226.

Morrison, C., Chauvenet, A.L.M., Kingsford, M.J., Suthers, I.M., Rubio, A., Lucas, C.H., Pitt, K. (2026) Global review of jellyfish monitoring programs to design fit-for-purpose approaches. *Marine Environmental Research* 213: 107696.

Nordstrom, B., James, M.C., Martin, K., Worm, B. (2019) Tracking jellyfish and leatherback sea turtle seasonality through citizen science observers. *Marine Ecology Progress Series* 620: 15-32.

Nunes, P.A.L.D., Loureiro, M.L., Piñol, L., Sastre, S., Voltaire, L., Canepa, A. (2015) Analyzing beach recreationists' preferences for the reduction of jellyfish blooms: Economic results from a stated-choice experiment in Catalonia, Spain. *PLOS OnE* 10(6): e0126681.

Öztürk, İ.D., Sümen, S.G. (2020) Unusual mass mortality of jellyfish *Rhizostoma pulmo* on the coast of the Sea of Marmara in December 2020. *Journal of the Black Sea/Mediterranean Environment* 26(3): 343-351.

Pestorić, B., Lučić, D., Bojanić, N., Vodopivec, M., Kogovšek, T., Violić, I., Paliaga, P., Malej, A. (2021) Scyphomedusae and Ctenophora of the eastern Adriatic: Historical overview and new data. *Diversity* 13(5): 186. Doi: 10.3390/d13050186

Plymouth Marine Laboratory (2026) Hundreds of jellyfish wash ashore southwest beaches – what is causing such large blooms? Available at: https://pml.ac.uk/news/hundreds-of-jellyfish-wash-ashore-southwest-beaches-what-is-causing-such-large-blooms/ (accessed 10 Aug. 2026).

Purcell, J.E., Uye, S.I., Lo, W.T. (2007) Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review. *Marine Ecology Progress Series* 350: 153-174.

Rubio Gómez, A., Gutiérrez-Hernández, O. (2020) Impacto de las medusas en el litoral andaluz. Implicaciones para el turismo de Sol y Playa. *Estudios Geográficos* 81(288): e038. Doi: 10.3989/estgeogr.202053.033.

Ruiz-Frau, A. (2023) Impacts of jellyfish presence on tourists' holiday destination choices and their willingness to pay for mitigation measures. *Journal of Environmental Planning and Management* 66(10): 2107-2125.

Tomlinson, B., Maynou, F., Sabatés, A., Fuentes, V., Canepa, A., Sastre, S. (2018) Systems approach modelling of the interactive effects of fisheries, jellyfish and tourism in the Catalan coast. *Estuarine, Coastal and Shelf Science* 201: 198-207.

Violić, I., Kogovšek, T., Pestorić, B., Mačić, V., Milić Beran, I., Lučić, D. (2019) Recent changes (2013-2017) in scyphomedusan fauna in the Boka Kotorska Bay, Montenegro (Southeast Adriatic). *Acta Adriatica* 60(1): 25-40.

Supplementary Table 1. Information on 29 "Yayakarsa? Jellyfish Monitoring Program" *Chrysaora hysoscella* submissions

No	Submission No	Date	City	Locality	Abundance	Observer activity
1	662	23.06.2026	Kocaeli	Coastal Water	Less than 10	Swimming
2	661	16.06.2026	Çanakkale	Coastal Water	Less than 10	Swimming
3	660	15.06.2026	Çanakkale	Coastal Water	10-100	Swimming
4	659	16.05.2026	Tekirdağ	Coastal Water	100-500	Swimming
5	658	09.06.2026	İstanbul	Stranded on the Beach	10-100	Swimming
6	657	08.06.2026	Tekirdağ	Coastal Water	Less than 10	Swimming
7	656	01.06.2026	Çanakkale (Çınarlı)	Coastal Water	less than 10	Trekking
8	655	06.06.2026	İstanbul	Coastal Water	Less than 10	Swimming
9	654	05.06.2026	İstanbul	Coastal Water	Less than 10	Swimming
10	653	04.06.2026	İstanbul	Coastal Water	Less than 10	Swimming
11	652	04.06.2026	İstanbul	Offshore	Less than 10	Diving
12	651	23.05.2026	Balıkesir	Coastal Water	10-100	Trekking
13	650	01.06.2026	Çanakkale (Gelibolu)	Coastal Water	Less than 10	Trekking
14	649	25.05.2026	Balıkesir	Coastal Water	Less than 10	Swimming
15	648	31.05.2026	Çanakkale	Stranded on the Beach	Less than 10	Trekking
16	647	30.05.2026	Balıkesir	Coastal Water	Less than 10	Trekking
17	645	30.05.2026	Tekirdağ	Stranded on the Beach	10-100	Swimming
18	644	30.05.2026	İstanbul	Stranded on the Beach	Less than 10	Swimming
19	643	28.05.2026	Çanakkale	Stranded on the Beach	Less than 10	Trekking
20	642	26.05.2026	Balıkesir	Coastal Water	10-100	Trekking
21	641	24.05.2026	Çanakkale	Coastal Water	Less than 10	Swimming
22	640	22.05.2026	İstanbul	Coastal Water	Less than 10	Swimming
23	639	17.05.2026	Çanakkale	Coastal Water	10-100	Trekking
24	638	13.05.2026	Çanakkale	Coastal Water	10-100	Trekking
25	636	07.05.2026	Tekirdağ	Offshore	Less than 10	Sailing
26	635	06.05.2026	İstanbul	Coastal Water	Less than 10	Swimming
27	634	25.04.2026	Tekirdağ	Stranded on the Beach	Less than 10	Trekking
28	632	13.04.2026	Muğla	Other	Less than 10	Trekking
29	26 (English Form)	09.05.2026	Tekirdağ	Coastal Water	Less than 10	Trekking