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"Unveiling Hidden Drifters: New Records of Colonial Pelagic Tunicates in Lebanese Waters and the Levantine Sea"

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Abstract

Colonial pelagic tunicates play a vital role in marine ecosystems, yet their distribution in the Levantine Basin remains poorly documented. This study presents the first confirmed records of Helicosalpa virgula (Vogt, 1854) (Thaliacea, Salpida) and the Giant Fire Salp Pyrostremma spinosum (Herdman, 1888) (Thaliacea, Pyrosomatida) in Lebanese waters, alongside new occurrences of the Big Salp Salpa maxima Forskål, 1775 (Thaliacea, Salpida). These records were obtained through a citizen-science initiative established by Tyre Coast Nature Reserve (TCNR) and Palm Island Nature Reserve (PINR), which engages fishers, divers, and marine stakeholders in monitoring marine biodiversity by documenting and reporting species encounters via social media platforms, WhatsApp groups, and direct communications with researchers. The findings significantly expand current knowledge of thaliacean diversity in the southern Levantine Sea, underscoring the importance of citizen science in marine biodiversity research and conservation. This study highlights the need for continuous monitoring to better understand the ecological roles and potential impacts of these organisms, particularly as their populations and blooms may influence trophic interactions, fisheries, and biogeochemical cycles.

Keywords: *Colonial pelagic tunicates, Levantine Basin, Marine biodiversity, Citizen science.*

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Introduction

Colonial pelagic tunicates of the class Thaliacea Van der Hoeven, 1850, play a crucial role in marine planktonic ecosystems by contributing to trophic interactions, carbon export, and nutrient cycling in pelagic environments (Romeo et al., 1992; Boero et al., 2013; Hereu et al., 2014; Piraino et al., 2016; Dadon-Pilosof et al., 2019; Karunarathne et al., 2021; Gibbons et al., 2022; Lilly et al., 2023). Among these, *Helicosalpa virgula* (Vogt, 1854), the Giant Fire Salp *Pyrostremma spinosum* (Herdman, 1888), and the Big Salp *Salpa maxima* Forskål, 1775, are widely distributed across the Atlantic, Pacific, and Indian Oceans, as well as various sectors of the Red, and Mediterranean Seas (Van Soest, 1974a, 1998; Godeaux, 1973, 1977, 1987, 1999; Weikert & Godeaux, 2008; Gibbons et al., 2022; Lilly et al., 2023). However, their presence in the Levantine Basin remains poorly documented (Godeaux, 1987, 1999; Weikert & Godeaux 2008; Gibbons et al., 2022).

In Lebanese waters (southern Levantine Sea), several thaliacean species have been previously recorded, including *Doliolum denticulatum* Quoy & Gaimard, 1834, *Pegea confoederata* (Forskål, 1775), *Salpa fusiformis* Cuvier, 1804, *Salpa maxima* Forskål, 1775, *Soestia zonaria* (Pallas, 1774) cited as *Iasis zonaria* (Pallas, 1774), *Thalia democratica* (Forskål, 1775), and *Pyrosoma atlanticum* Péron, 1804 (Lakkis, 2013). Despite these records, the diversity and distribution of Thaliacea, particularly colonial pelagic tunicates, along the Lebanese coast remain largely understudied.

This paper presents the first confirmed record of *Helicosalpa virgula* and the Giant Fire Salp *Pyrostremma spinosum* in Lebanese waters, and the southern Levantine Sea. Furthermore, it provides additional, well-substantiated records of the Big Salp *Salpa maxima* from multiple localities along the Lebanese coastline.

Material and Methods

Observational and photographic records of specimens were obtained through direct contributions from fishers, divers, and NGO members, particularly marine enthusiasts, who reported their findings either directly to the authors or via social media platforms. Reports were primarily submitted through dedicated communication channels, including the Fishers WhatsApp group, the Lebanese Fishers Facebook Page, and the Marine Biodiversity Facebook Page. Upon receiving submissions, including videos and photographs, the authors conducted a verification process by directly contacting the observers to confirm species identification and to collect essential metadata, including the date and location of sightings, depth of occurrence, method of capture, and additional relevant details.

Results and Discussion

Table 1: Records of pelagic tunicates observed in the Lebanese waters. The table presents details of the species identified, including the date of observation, number of individuals recorded, location, depth of occurrence (when available), observer details, and the type of photographic or video evidence provided.

Species	Date	Number of individuals	Location/ Area	Depth (m)	Observers and Data Verification Details	Photos/ Videos
Helicosalpa virgula (Vogt, 1854)	31-01-2025	One	Near Port Beirut, Beirut	3	Fiherman (Minas Geokgeozian) reported via FaceBook Page ©LebaneseFishermen, and directly verified by one of us A.B.	Video
Pyrostremma spinosum (Herdman, 1888)	25-06-2023	One	Enfeh area (North Lebanon) $34^{0}22'05''N$/ $35^{0}43'55''N$	5	Fisherman (Karim Captain) directly reported to one of us S.F.	Video
Salpa maxima Forskål, 1775	16-04-2023	One	Byblos area, north Lebanon	20	Diver (Sahar Lakkis) from ©XiphiasDivingCenter reported via marine biologist ©Laura Khatib, and verified by A.B.	Videos
Salpa maxima Forskål, 1775	30-11-2023	One	Tyre area, south Lebanon		Diver (Youssef Jundi) from ©LebanonDivingCenter, directly reported to A.B.	Photos/ Video

As a result, two species, *Helicosalpa virgula* and *Pyrostremma spinosum*, were recorded for the first time in Lebanese waters and the southern Levantine Sea. Additionally, the presence of *Salpa maxima* was reaffirmed in Lebanese waters (Table 1).

Systematics

Phylum Chordata Haeckel, 1874

Subphylum Tunicata Lamarck, 1816

Class Thaliacea Van der Hoeven, 1850

Order Salpida Forbes, 1853

Family Salpidae Lahille, 1888

Genus *Helicosalpa* Todaro, 1902

Helicosalpa virgula (Vogt, 1854)

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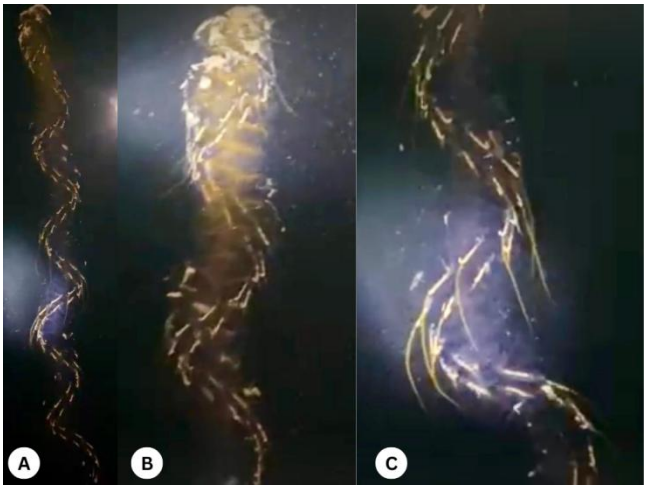

Figure 1. *Helicosalpa virgula* images extracted from a video shared by fisherman ©Minas Geokgeozian. (A) Lateral view of the specimen, displaying its elongated, transparent body and cylindrical shape. (B) Close-up of the anterior region, highlighting the bioluminescent tissue patches along the body. (C) Detailed view of the conical testis, a key diagnostic feature of *H. virgula*.

Characters of the species

Helicosalpa virgula is characterized by its elongated, transparent body, exhibiting a cylindrical shape with distinct anterior and posterior openings (Fig. 1A). A defining trait of this species is the presence of bioluminescent tissue patches along the body (Fig. 1B), which contribute to its unique movement and structural dynamics in the water column. Additionally, aggregate zooids are described as large, and arranged in chains. The testis is conical with a long, thread-like projection (Fig. 1C), a key diagnostic feature distinguishing *H. virgula* from other helicosalp species (Ringvold et al., 2020).

Remarks

Helicosalpa virgula (Vogt, 1854) is one of three recognized species within the genus *Helicosalpa* Todaro, 1902 (Hereu et al., 2014; Ringvold et al., 2020; Garic et al., 2025). Among these, *H. virgula* is the most frequently reported species globally, exhibiting the broadest zoogeographic distribution (Yount, 1958; Hubbard, 1967; Van Soest, 1974a; Hereu et al., 2014; Ringvold et al., 2020). Its presence has been documented across the Indian and Pacific Oceans (Ellis & Garber, 1986; Gibbons et al., 2022), the Atlantic Ocean (Cunha et al., 2021), and the Mediterranean Sea, particularly within its western and central basins (Godeaux, 1999).

In the Mediterranean, *H. virgula* is well-documented in the western basin, with records from Italy, including southern Sardinia (Godeaux, 1987), Naples (Godeaux, 1987), and Tuscany (Gibbons et al., 2022). Additional records exist from France, specifically Villefranche-sur-Mer (Van Soest, 1974a; Godeaux, 1987; Olivier et al., 2015), and Algeria (Alger) (Godeaux, 1987). The species has also been reported from the central Mediterranean**,** notably Malta (Ringvold et al., 2020; Weikert & Godeaux, 2008) and Italy, including the southeastern coast of Salento (Ionian Sea, central Mediterranean) (Micaroni et al., 2022).

Conversely, reports from the eastern Mediterranean remain scarce, and to date, *H. virgula* has not been recorded in the southern Levantine Sea (Godeaux, 1987, 1999). The only known occurrences from the eastern basin are occasional observations from Crete, Greece (Weikert & Godeaux, 2008; Ringvold et al., 2020; Gibbons et al., 2022).

Systematics

Order Salpida Forbes, 1853

Salpidae Lahille, 1888 (22 genus)

Salpa Forskål, 1775

Salpa maxima Forskål, 1775

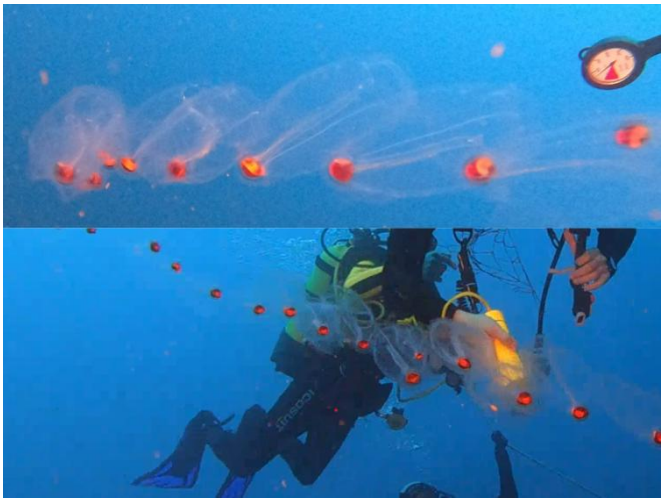

Figure 2. *Salpa maxima* observed in Tyre waters, south Lebanon. ©Youssef Jundi

Characters of the species

Salpa maxima is characterized by its elongated, cylindrical, gelatinous, and highly transparent aggregate chains, which form sinuous structures composed of multiple interconnected zooids arranged in parallel, taking on a barrel-shaped formation (Fig. 2). Each zooid is distinguished by a distinct red-orange stomach, clearly visible through the transparent tunic (Fig. 2), facilitating species identification. This species propels itself by rhythmic contractions, efficiently pumping water through its gelatinous body—one of the most effective examples of jet propulsion in the animal kingdom (Van Soest, 1974b; Madin, 1974; Godeaux, 1999; Piraino et al., 2016).

Remarks

Salpa maxima, commonly known as the Big Salp, is a barrel-shaped, planktonic tunicate with a broad distribution across all three major oceans (Atlantic, Pacific, Indian), as well as the Mediterranean and Red Seas (Madin, 1974; Harbison &Gilmer, 1976; Godeaux, 1977; Post et al., 2002). *S. maxima* has been widely reported from various localities within the Mediterranean Sea. In the western Mediterranean, S. maxima has been recorded in multiple locations, including the Alboran Sea (Madin, 1991), Villefranche-sur-Mer, France (Dadon-Pilosof et al., 2019), and the Ligurian Sea (Nival et al., 2020). Its occurrence has also been noted in the northwestern Mediterranean (Romeo et al., 1992). In the central Mediterranean, records confirm its presence in the Adriatic Sea (Batistić et al., 2018) and along the Ionian and Adriatic coasts of the Salento Peninsula, Italy (Micaronni et al., 2022). Additionally, a salp bloom was observed along the Apulian coast and in the Otranto Channel between March and May 2013, highlighting the potential for large aggregations of S. maxima in this part of the Mediterranean (Boero et al., 2013). In the eastern Mediterranean, *S. maxima* has been reported in the Aegean Sea (Papadopoulou, 1981), the Sea of Marmara, Turkey (İşinibilir et al., 2022), and Turkish coastal waters (Mutlu, 2005). Further records document its presence along the coastal waters of Egypt

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(Abdel-Aziz & Aboul-Ezz, 2003) and in the southern Levantine Sea, including the Syrian coast (Bilecenoglu et al., 2013; Durgham et al., 2016). These widespread occurrences underscore the ecological significance of S. maxima and its potential role in regional planktonic dynamics, trophic interactions, and biogeochemical cycling within the Mediterranean Sea.

Systematics

Order Pyrosomatida Jones, 1848

Family Pyrosomatidae Lahille, 1888

Genus *Pyrostremma* Garstang, 1929

Pyrostremma spinosum (Herdman, 1888)

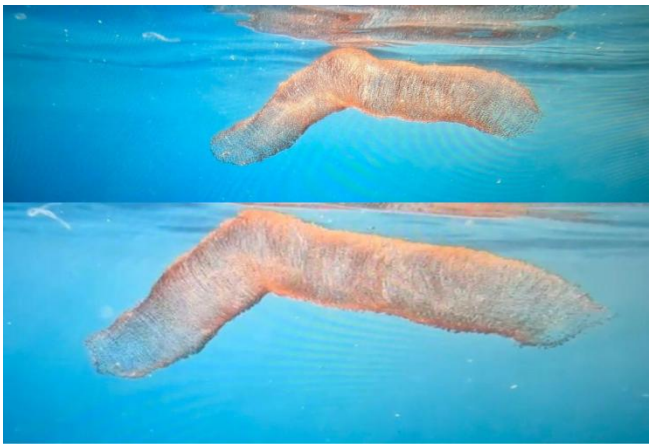

Figure 3. *Pyrostremma spinosum* observed in Enfeh waters, north Lebanon. © Karim Captain.

Characters of the species

P. spinosum is characterized by a free-floating colony with an elongated, tubular, flaccid structure that exhibits a finely structured, net-like appearance (Fig. 3). It tapers from a narrow closed anterior end to a broad open posterior end, sometimes featuring a single long filament (Karunarathne et al., 2021; Gibbons et al., 2022; Lilly et al., 2023). The colony is semi-transparent, with a reddish to pinkish gelatinous body, a morphology that enhances its jet propulsion mechanism for efficient movement and filtration (Karunarathne et al., 2021; Gibbons et al., 2022).

Remarks

Pyrostremma spinosum (Herdman, 1888), commonly referred to as the Giant Fire Salp, is one of two species within the genus *Pyrostremma* Garstang, 1929 (Garic et al., 2025). *P. spinosum* exhibits a broad global distribution, occurring across the Atlantic Ocean, Indian Ocean, and Pacific Ocean (Van Soest, 1998; Griffin Gibbons et al., 2022), as well as in New Zealand waters (Lilly et al., 2023, and references therein), and the Mediterranean Sea (Costello et al., 2001; Weikert & Godeaux, 2008; Karunarathne et al., 2021, and references therein).

The first recorded occurrences of *Helicosalpa virgula* and *Pyrostremma spinosum* in Lebanese waters, along with the reaffirmed presence of *Salpa maxima*, expand knowledge of pelagic tunicate distribution in the southern Levantine Sea and highlight the dynamic nature of regional planktonic communities. Given their ecological and socioeconomic significance, continuous monitoring is imperative, particularly as salp and pyrosome blooms can impact marine food webs by reducing phytoplankton availability and disrupting trophic interactions (*Madin, 1974; Piraino et al., 2016;* Dadon-Pilosof et al., 2019*;* Gibbons et al., 2022; *Lilly et al., 2023*). Additionally, large aggregations of these organisms can negatively impact fisheries and coastal infrastructure, causing operational challenges such as clogging fishing nets and obstructing power plant intake systems (*Romeo et al., 1992; Mutlu, 2005; Boero et al., 2013, 2016; Ringvold et al., 2020*). The increasing frequency of these blooms in the Mediterranean underscores the need for long-term ecological assessments to better understand their drivers and mitigate potential consequences (*Weikert & Godeaux, 2008; Boero et al., 2013; Lilly et al., 2023*).

Citizen-science initiatives play a crucial role in biodiversity monitoring, providing valuable data for tracking ecological changes (Micaroni et al., 2022). In 2022, two Marine Protected Areas (MPAs) in Lebanon—Tyre Coast Nature Reserve (TCNR) in the south and Palm Island Nature Reserve (PINR) in the north—launched a collaborative monitoring program (Fig. 4) involving fishers, divers, and marine enthusiasts. This initiative aims to anticipate the arrival of non-indigenous species (NIS), track established populations, and document ecologically significant taxa.

In conclusion, further research is necessary to investigate the distribution, ecological roles, and biogeographic patterns of colonial pelagic tunicates in Lebanese waters and the Levantine Sea. Strengthening scientific efforts in this domain will be critical for assessing their ecological impacts and managing potential challenges, particularly in the fisheries sector.

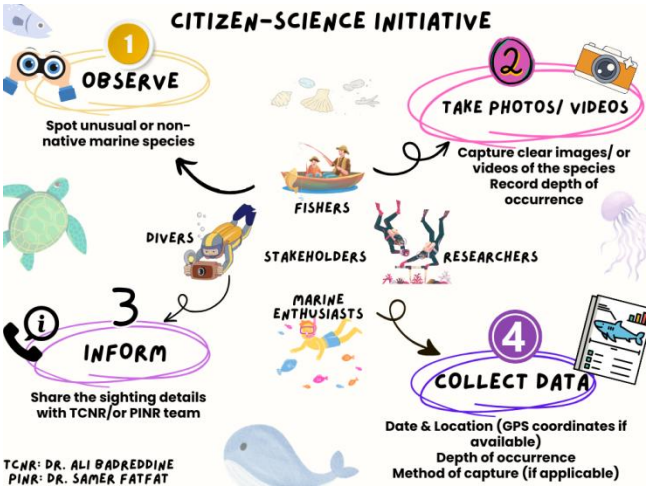

Figure 4. Schema illustrating the citizen-science initiative launched in 2022 by the Marine Protected Areas (MPAs) of Lebanon: Tyre Coast Nature Reserve (TCNR) and Palm Island Nature Reserve (PINR).

References

1. Abdel-Aziz, N., Aboul-Ezz, S. (2003). Zooplankton community of the Egyptian Mediterranean coast. Egypt Journal of Aquatic Biology & Fisheries, 7(4): 91-108.
2. Batistić, M., Garić, R, Jasprica, N., Ljubimir, S., Mikuš, J. (2018). Bloom of the heterotrophic dinoflagellate *Noctiluca scintillans* (Macartney) Kofoid & Swezy, 1921 and tunicates *Salpa fusiformis* Cuvier, 1804 and *Salpa maxima* Forskål, 1775 in the open southern Adriatic in 2009. Journal of the Marine Biological Association of the United Kingdom, 1–10.
3. Bilecenoglu, M., Alfaya, J.E.F., Azzurro, E., Baldacconi, R., Boyaci, Y.Ö., Circosta, V., Compagno, L.J.V.,

DOI: 10.5281/zenodo.14840319

Coppola, F., Deidun, A., Durgham, H., Durucan, F., Ergüden, D., Fernández-Álvarez, F.Á., Gianguzza, P., Giglio, G., Gökoğlu, M., Gürlek, M., Ikhtiyar, S., Kabasakal, H., Karachle, P.K., Katsanevakis, S., Koutsogiannopoulos, D., Lanfranco, E., Micarelli, P., Özvarol, Y., Penarivas, L., Poursanidis, D., Saliba, J., Sperone, E., Tibullo, D., Tiralongo, F., Tripepi, S., Turan, C., Vella, P., Yokeş, M.B., & Zava, B. (2013). New Mediterranean Marine biodiversity records (December, 2013). Mediterranean Marine Science, 14(2): 463-480.

4. Boero, F., Brotz, L., Gibbons, M. J., Piraino, S., & Zampardi, S. (2016). *In*: Laffoley, D., & Baxter, J.M. (editors). Explaining ocean warming: Causes, scale, effects and consequences. Full report. Gland, Switzerland: IUCN. pp. 213-237.
5. Boero, F., Belmonte, G., Bracale, R., Fraschetti, S., Piraino, S., & Zampardi, S. (2013). A salp bloom (Tunicata, Thaliacea) along the Apulian coast and in the Otranto Channel between March-May 2013. F1000Research, 2:181.
6. Costello, M.J., Emblow, C. & White, R.J. (Ed.) (2001). European register of marine species: a check-list of the marine species in Europe and a bibliography of guides to their identification. Collection Patrimoines Naturels, 50. Muséum national d'Histoire naturelle: Paris, 463 pp.
7. Cunha, M.E., Quintela, F. (2021). Assessment of zooplankton at the site of the sinking of the N.R.P. "S. Miguel". v1.4. IPMA - Instituto Português do Mar e da Atmosfera. Dataset/Samplingevent.
8. Dadon-Pilosof, A., Lombard, F., Genin, A., Sutherland, K. R., & Yahel, G. (2019). Prey taxonomy rather than size determines salp diets. Limnology and Oceanography, 64(5): 1996-2010.
9. Durgham, H., Ikhtiyar, S., & Ibraheem, R. (2016). First record of *Pelagia noctiluca* (Forssk ål, 1775) on the coast of Syria. Marine Biodiversity Records, 9: 1-3.
10. Ellis, S. G., & Garber, J. H. (1986). The state of scientific information relating to the biology and ecology of the Gorda Ridge Study Area, Northeast Pacific Ocean: Plankton (Open-File Report 0-86-8). Oregon Department of Geology and Mineral Industries. 50pp.
11. Garic, R.; Madin, L.; van Soest, R.W.M. (2025). World List of Thaliacea. Helicosalpa Todaro, 1902. Accessed through: World Register of Marine Species at: https://www.marinespecies.org/aphia.php?p=taxdetails&id=137228 on 2025-02-01.
12. Gibbons, M.J., Morandini, A.C., Straehler-Pohl, I. & Bezio, N. 2022. Identification guide to macro jellyfishes of West Africa. FAO, Rome. 216pp.
13. Godeaux, J. (1973). A contribution to the knowledge of the thaliacean faunas of the eastern Mediterranean and the Red Sea. *Israel Journal of Zoology*, **22:** 39-50.
14. Godeaux, J. (1977). Thaliacea from off the coasts of Tropical West Africa. Atlantide Report; 12. Including the Mediterranean Sea and Red Sea. 22pp.
15. Godeaux, J. (1987). Thaliacés récoltés en Méditerranée centrale par le N.O. Atlantis II (Woods Hole). Bulletin de la Société Royale des Sciences de Liège, 56(2): 107-123.
16. Godeaux, J. (1999). The thaliaceans, a group of animals refractory to lessepsian migration: an updated survey of their populations in the Levantine basin and the red sea. Israel Journal of Zoology, 45(1): 91-100.
17. Harbison, G. R., & Gilmer, R. W. (1976). The feeding rates of the pelagic tunicate *Pegea confederata* and two other salps 1. Limnology and Oceanography, 21(4): 517-528.
18. Hereu, C. M., Suárez-Morales, E., & Lavaniegos, B. E. (2014). Record of the rare oceanic salp *Helicosalpa komaii* (Tunicata: Thaliacea: Salpida) in the Northeast Pacific. Revista mexicana de biodiversidad, 85(2): 624-629.
19. Hubbard, L. T. (1967). Distribution and occurrence of the Salpidae off the Oregon coast. Thesis. Master of Science. Oregon State University. 28pp.
20. İşinibilir, M., Yüksel, E., Türkeri, E., Doğan, O., Karakulak, F. S., Uzer, U., ... & Piraino, S. (2022). New additions to the jellyfish fauna of the Sea of Marmara. Aquatic Sciences and Engineering, 37(1): 53-57.
21. Karunarathne, K. D., & De Croos, M. D. S. T. (2021). Pelagic tunicates (Appendicularia and Thaliacea) of Sri Lanka: two first records with an annotated checklist. Zootaxa, 5067(3): 352-376.
22. Lakkis, S. (2013). Le zooplancton marin du Liban (Méditerranée orientale). Biologie, Biodiversité, Biogéographie. Aracne ed., Roma. 510pp.
23. Lilly, L. E., Suthers, I. M., Everett, J. D., & Richardson, A. J. (2023). A global review of pyrosomes: Shedding light on the ocean's elusive gelatinous "fire-bodies". Limnology and Oceanography Letters, 8(6); 812-829.
24. Madin, L. P. (1974). Field observations on the feeding behavior of salps (Tunicata: Thaliacea). Marine Biology, 25: 143-147.
25. Madin, L. P. (1991). Distribution and taxonomy of zooplankton in the Alboran Sea and adjacent western Mediterranean: A literature survey and field guide. Woods Hole Oceanographic Institution, Technical Report WHOI-91-26.
26. Micaroni, V.; Strano, F.; Crocetta, F.; Di Franco, D.; Piraino, S.; Gravili, C.; Rindi, F.; Bertolino, M.; Costa, G.; Langeneck, J.; et al., 2022. Project "Biodiversity MARE Tricase": A Species Inventory of the Coastal Area of Southeastern Salento (Ionian Sea, Italy). Diversity, 14, 904. https://doi.org/10.3390/d14110904
27. Mutlu, E., 2005. An intercomparison of the contribution of zooplankton and nekton taxa to the near-surface acoustic structure of three Turkish Seas. Marine Ecology, 26 (1): 17-32.
28. Nival, P., Lombard, F., Cuzin, J., Goy, J., & Stemmann, L. (2020). Zooplankton II. Macroplankton and Long-Term Series. The Mediterranean Sea in the Era of Global

DOI: 10.5281/zenodo.14840319

Change 2: 30 Years of Multidisciplinary Study of the Ligurian Sea, 109-146.

29. Olivier M., Lilley M., Lombard F., Stemmann L. (2015) Temporal evolution of zooplankton, surface observations, in the Northwestern Mediterranean Sea. https://doi.org/10.15468/n0u3vz accessed via GBIF.org on 2022-04-18. accessed via GBIF.org on 2022-04-18. accessed via GBIF.org on 2025-02-05

30. Papadopoulou, C., Yannopoulos, C., & Hadzistelios, I. (1981). The distribution of vanadium in *Salpa maxima* from the Western Aegean Sea. CIESM Congress, Cagliari, 1980, Rapp. Comm. Int. Mer Médit., 27(9): 195–198.

31. Piraino, S., Deidun, A., Fuentes, V., Daly Yahia, N., Daly Yahia, O.K., Marambio, M., Gueroun, S. (2016) Guidelines for the Identification of Mediterranean Jellyfish and Other Gelatinous Organisms with a First Aid Protocol for Possible Sting Treatment. Published with financial support from the European Union under the ENPI CBC Mediterranean Sea Programme through the MED-JELLYRISK project. CoNISMa. 44pp.

32. Post, A. F., Dedej, Z., Gottlieb, R., Li, H., Thomas, D. N., El-Absawi, M., ... & Sommer, U. (2002). Spatial and temporal distribution of Trichodesmium spp. in the stratified Gulf of Aqaba, Red Sea. Marine Ecology Progress Series, 239: 241-250.

33. Ringvold, H., Hatlevik, A., Hevrøy, J., Hughes, M., & Aukan, N. (2020). Encounters with the rare genus *Helicosalpa* (Chordata, Thaliacea, Salpida), using citizen science data. Marine Biology Research, 16(5): 369-379.

34. Romeo, M., Gnassia-Barelli, M., & Carre, C. (1992). Importance of gelatinous plankton organisms in storage and transfer of trace metals in the northwestern Mediterranean. *Marine Ecology Progress Series*, 267-274.

35. Van Soest, R. (1974a). Taxonomy of the subfamily Cyclosalpinae Yount, 1954 (Tunicata, Thaliacea), with descriptions of two new species. Beaufortia, 22(288): 17-55.

36. Van Soest, R. W. M. (1974b). A revision of the genera Salpa Forskål, 1775, Pegea Savigny, 1816, and Ritteriella Metcalf, 1919 (Tunicata, Thaliacea). Beaufortia, 22(293): 153–191.

37. Van Soest, R.W.M. (1998) The cladistic biogeography of salps and pyrosomas. In: Bone, Q. (Ed.), The Biology of pelagic tunicates. Oxford University Press, New York, pp. 231–249.

38. Weikert, H., & Godeaux, J. E. (2008). Thaliacean distribution and abundance in the northern part of the Levantine Sea (Crete and Cyprus) during the eastern Mediterranean climatic transient, and a comparison with the western Mediterranean basin. Helgoland Marine Research, 62: 377-387.

39. Yount, J. L. (1958). Distribution and ecologic aspects of central Pacific Salpidae (Tunicata). Pacific Science, 7:111-130.

DOI: 10.5281/zenodo.14840319