

Asciidaea (Chordata: Tunicata) of Greece: an updated checklist

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Abstract

Background

The checklist of the ascidian fauna (Tunicata: Asciidae) of Greece was compiled within the framework of the Greek Taxon Information System (GTIS), an application of the LifeWatchGreece Research Infrastructure (ESFRI) aiming to produce a complete checklist of species recorded from Greece. This checklist was constructed by updating an existing one with the inclusion of recently published records. All the reported species from Greek waters were taxonomically revised and cross-checked with the Asciidae World Database.

New information

The updated checklist of the class Asciidae of Greece comprises 75 species, classified in 33 genera, 12 families, and 3 orders. In total, 8 species have been added to the previous species list (4 Aplousobranchia, 2 Phlebobranchia, and 2 Stolidobranchia). Aplousobranchia was the most speciose order, followed by Stolidobranchia. Most species belonged to the families Didemnidae, Polyclinidae, Pyuridae, Ascidiidae, and Styelidae; these 4 families comprise 76% of the Greek ascidian species richness. The present effort revealed the limited taxonomic research effort devoted to the ascidian fauna of Greece, which is attributed to the lack of experts and low sampling effort. Therefore, major knowledge gaps on the ascidian diversity of Greece occur and further research in this field is needed.

Keywords

Sea-squirts, Aplousobranchia, Phlebobranchia, Stolidobranchia, Aegean Sea, Levantine Sea, Ionian Sea, eastern Mediterranean

Introduction

The class Ascidiacea (phylum Chordata, subphylum Tunicata) is globally represented by over 2,800 marine species (Shenkar and Swalla 2011, Shenkar et al. 2016b). Ascidians have been identified as a distinct zoological group since the ancient times; Aristotle was the first who described these peculiar animals, "*Téthya*", as the most extraordinary ones having a completely hidden body inside a leathery shell attached on rocks and with two openings some distance apart (Voultsiadou and Vafidis 2007). Their taxonomic classification proved to be challenging for zoologists. As members of the subphylum Tunicata, their close affinity to vertebrates has been recently confirmed by phylogenomic studies (Delsuc et al. 2006). Furthermore, the original classification of Lahille (1886), which classified the ascidian species into the orders Aplousobranchia, Phlebobranchia, and Stolidobranchia according to the structure of the branchial sac, is supported by molecular phylogeny and is currently accepted by most taxonomists (Shenkar and Swalla 2011). However, there are still different views on the placement of several families into orders, and the phylogenetic relationships within the ascidiants remain fuzzy (Turon and López-Legentil 2004, Moreno et al. 2008, Pérez-Portela et al. 2009, Tsagkogeorga et al. 2009, Shenkar et al. 2016a).

The first list of Mediterranean ascidiants (Pérès 1958, Pérès 1967) reported 132 species; since then, the relevant scientific research increased leading to 229 ascidian species at present (Coll et al. 2010, Shenkar and Swalla 2011). Most records are from the western Mediterranean (165 species), where much more effort has been devoted as opposed to the eastern basin, from which only 86 species have been reported (Koukouras et al. 1995). Among Mediterranean ascidiants, 103 exclusive species are included and the entire basin has been recognized as an area of endemism, at least for this specific taxonomic group (Naranjo et al. 1998, Moreno et al. 2014).

In the Greek seas, however, only scattered records of ascidian species were available, either in relevant faunistic accounts (e.g. Hartmeyer 1904, Monniot and Monniot 1974, Koukouras and Siamidou-Efremidou 1978) or in general ecological publications (e.g. Pérès and Picard 1958, Kiseleva 1963, Vamvakas 1971). Koukouras et al. (1995) published the first checklist of the Aegean Ascidiacea, covering also the eastern Mediterranean basin and

the Black Sea. So far, this work was the only comprehensive systematic account on the Greek ascidians, combining primary data with an exhaustive literature review. After this publication, a number of studies have been conducted covering various aspects of ascidian biology, such as population dynamics (Panagiotou et al. 2007, Panagiotou et al. 2008, Vafidis et al. 2008), reproduction (Panagiotou et al. 2008, Vafidis et al. 2008), fisheries (Antoniadou and Vafidis 2008), and ecology in general (Morri et al. 1999, Antoniadou et al. 2006, Antoniadou et al. 2013, Sini et al. 2014) or focusing on ascidian associations with other invertebrates (Voultsiadou et al. 2007, Voultsiadou et al. 2010). This research effort has led to some new records of ascidian species in the Aegean Sea (i.e. Morri et al. 1999, Sini et al. 2014), in parallel with additional biodiversity records (Thessalou-Legaki et al. 2012) and the presence of non-indigenous species (Kondilatos et al. 2010, Katsanevakis et al. 2014).

Therefore, the aim of the present work is to compile an updated checklist of Ascidiacea of the Greek seas. For this purpose, the earlier list compiled by Koukouras et al. (1995) has been extended, updated, and annotated according to the recent literature and taxonomic status.

Materials and methods

The Checklist of Ascidiacea of Greece (Suppl. material 1) was compiled within the context of the Greek Taxon Information System (GTIS). GTIS is an application of the [LifeWatchGreece](#) Research Infrastructure (ESFRI) aiming to produce a complete inventory of the Greek biota, by joining relevant efforts. As a first step, the publication of Preliminary Checklists for each taxonomic group has been suggested (Bailly et al. 2016). The present checklist of ascidians has been based on the key-publication of Koukouras et al. (1995), who had compiled the ascidian species list of the Aegean Sea for the first time. In the course of the current study, all recent primary literature was also thoroughly searched and the relevant data were incorporated into the updated species list. New species additions are annotated in the checklist and cited along with the first literature reference reporting their presence in the Greek seas. Non-indigenous species (NIS) are also marked. A cross-checking of all species names and their higher classification was carried through the [Asciidae World Database](#), AWD (Shenkar et al. 2016b); the classification followed in the present checklist is the one proposed by the AWD, which contains an updated list of all ascidian species, recursively revised by ascidian taxonomy experts (Shenkar and Swalla 2011).

Checklist of Ascidiacea known to occur in Greek waters

Class Ascidiacea

Order Aplousobranchia

Family Clavelinidae

Clavelina dellavallei (Zirpolo, 1825)

Clavelina lepadiformis (Müller, 1776)

Family Didemnidae

Didemnum amourouxi Lafargue, 1976

Didemnum coriaceum (Drasche, 1883)

Didemnum drachi Lafargue, 1975

Didemnum fulgens (Milne Edwards, 1841)

Didemnum granulosum (Drasche, 1883)

Didemnum maculosum (Milne Edwards, 1841)

Didemnum peyrefittense Brément, 1913

Diplosoma listerianum (Milne Edwards, 1841)

Notes: Recorded by Morri et al. (1999)

Diplosoma spongiforme (Giard, 1872)

Lissoclinum perforatum (Giard, 1872)

Notes: Recorded by Thessalou-Legaki et al. (2012)

Polysyncraton bilobatum Lafargue, 1968

Polysyncraton lacazei (Giard, 1872)

Trididemnum cereum (Giard, 1872)

Trididemnum inarmatum (Drasche, 1883)

Family Polycitoridae

Cystodytes dellechiaiei (Della Valle, 1877)

Eudistoma costai (Della Valle, 1877)

Polycitor crystallinus (Renier, 1804)

Family Polyclinidae

Aplidium aegeaensis (Hartmeyer, 1904)

Aplidium albicans (Milne Edwards, 1841)

Aplidium asperum Drasche, 1883

Aplidium conicum (Olivi, 1792)

Aplidium elegans (Giard, 1872)

Notes: Recorded by Sini et al. (2014)

Aplidium nordmanni (Milne Edwards, 1841)

Aplidium pallidum (Verrill, 1871)

Aplidium pseudolobatum (Pérès, 1956)

Aplidium turbinatum (Savigny, 1816)

Aplidium undulatum Monniot & Gaill, 1978

Polyclinella azemai Harant, 1930

Polyclinum aurantium Milne Edwards, 1841

Notes: Recorded by Morri et al. (1999)

***Pseudodistoma cyrnusense* Pérès, 1952**

Order Phlebobranchia

Family Ascidiidae

***Ascidia colleta* Monniot C. & Monniot F., 1970**

***Ascidia mentula* Müller, 1776**

***Ascidia muricata* Heller, 1874**

***Ascidia salvatoris* (Traustedt, 1885)**

***Ascidia virginea* Müller, 1776**

***Ascidia aspersa* (Müller, 1776)**

***Ascidia scabra* (Müller, 1776)**

***Phallusia fumigata* (Grube, 1864)**

***Phallusia mammillata* (Cuvier, 1815)**

***Phallusia nigra* Savigny, 1816**

Notes: Recorded by Kondilatos et al. (2010); NIS

Family Cionidae

***Ciona intestinalis* (Linnaeus, 1767)**

***Ciona roulei* Lahille, 1887**

Notes: Recorded by Thessalou-Legaki et al. (2012)

Family Corellidae

Corella parallelogramma (Müller, 1776)

Rhodosoma turicum (Savigny, 1816)

Family Diazonidae

Diazona violacea Savigny, 1816

Rhopalaea neapolitana Philippi, 1843

Family Perophoridae

Ecteinascidia turbinata Herdman, 1880

Notes: Recorded by Monniot (1983)

Perophora listeri Wiegman, 1835

Order Stolidobranchia

Family Molgulidae

Eugyra arenosa (Alder & Hancock, 1848)

Molgula appendiculata Heller, 1877

Molgula manhattensis (De Kay, 1843)

Molgula occulta Kupffer, 1875

Family Pyuridae

Halocynthia papillosa (Linnaeus, 1767)

Herdmania momus (Savigny, 1816)

Notes: Recorded by Katsanevakis et al. (2014); NIS

Microcosmus claudicans (Savigny, 1816)

Microcosmus nudistigma Monniot C., 1962

Microcosmus polymorphus Heller, 1877

Microcosmus sabatieri Roule, 1885

Microcosmus savignyi Monniot, 1962

Microcosmus vulgaris Heller, 1877

Pyura dura (Heller, 1877)

Pyura microcosmus (Savigny, 1816)

Pyura squamulosa (Alder, 1863)

Pyura tessellata (Forbes, 1848)

Family Styelidae

Botryllus schlosseri (Pallas, 1766)

Botrylloides leachii (Savigny, 1816)

Distomus variolosus Gaertner, 1774

Polycarpa caudata Monniot C. & Monniot F., 1974

Polycarpa fibrosa (Stimpson, 1852)

Polycarpa gracilis Heller, 1877

Polycarpa pomaria (Savigny, 1816)

Styela canopus (Savigny, 1816)

Styela plicata (Lesueur, 1823)

Discussion

A total of 75 species classified, according to AWD, into 33 genera, 12 families and 3 orders, have been reported from the Greek seas. In addition, *Ascidia conchilega*, Müller, 1776 which is included in AWD and WoRMS databases is a doubtful record for the Greek seas because its original reference for the area is missing and thus it was not included in the list by Koukouras et al. (1995). Aplousobranchia and Stolidobranchia are the most speciose orders with 32 and 25 species, respectively. Aplousobranchia reach 36 species, if the families Diazonidae and Cionidae are included therein instead of Phlebobranchia, as suggested by various ascidian taxonomists based on morphological, developmental, and molecular data (Kott 1990, Turon and López-Legentil 2004, Shenkar and Swalla 2011, Shenkar et al. 2016a) but not currently adopted by AWD. The families Didemnidae (14 species), Polyclinidae (12 species), Pyuridae (12 species), Ascidiidae (10), and Styelidae (9 species) comprised the highest number of species, covering altogether 76% of the Greek ascidian species richness. The first two families have been identified as the most speciose ones across most Mediterranean longitudinal bands (Moreno et al. 2014).

Most ascidian species included in the present checklist were already known as elements of the Greek fauna (Koukouras et al. 1995), while 8 new additions were made in the course of this compilation. These additions include: 4 species of Aplousobranchia, namely *Apodium elegans*, *Diplosoma listerianum*, *Lissoclinum perforatum*, and *Polyclinum aurantium*; 2 species of Phlebobranchia, namely *Ciona roulei* and *Ecteinascidia turbinata*; and 2 species of Stolidobranchia, namely *Herdmania momus* and *Phallusia nigra*. Although the latter species may need additional confirmation because of the identification uncertainty between the 3 darkly pigmented *Phallusia* species when based on exclusively external features (Vandepas et al. 2015), we consider its presence as valid since it has been reported from the south sector of the Aegean Sea by multiple authors (Kondilatos et al. 2010, Çınar 2014).

The Greek ascidian fauna is mainly composed by species of Atlanto-Mediterranean origin (44.4%) or by endemic species (40.3%), as previously suggested (Koukouras et al. 1995). Among the newly added species, *C. roulei* is a Mediterranean endemic, whereas *Phallusia nigra* and *Herdmania momus* are considered non-indigenous species (NIS) of circum(sub)tropical and Indo-pacific origin, respectively (Gerovasileiou et al. 2016); both species have been probably introduced through shipping (Galil et al. 2016). Another three species, i.e. *Molgula occidentalis* Traustedt, 1883, *Pycnoclavella nana* (Lahille, 1890), and *Microcosmus exasperatus* Heller, 1878, have been recently reported from the Turkish coasts of the Aegean (Çınar 2014); this may imply their presence in the nearby Greek coasts, since they are part of the same ecoregion, the Aegean Archipelago (Spalding et al.

2007) and also part of the Levantine cluster, i.e. areas highly impacted by Erythraean species migration (Galil et al. 2016). Finally, we should mention the presence of *Symplegma brakenhielmi* (Michaelsen, 1904) in the Turkish levantine coasts (Çinar et al. 2006). Since several non-indigenous ascidians, such as *P. nigra* and *H. momus*, have invaded the Greek waters few years after their first record in Turkish waters, it is reasonable to expect them to be reported from south Greece as well, within next few years.

The present updated checklist of Ascidiacea of the Greek seas summarizes the status of the current knowledge. However, a major gap in our knowledge on ascidian diversity of the Greek seas is obvious when the number of species is compared to those known from the western Mediterranean. This can be attributed to two main reasons: (i) the absence of ascidian expertise in Greece and, (ii) the fact that the entire literature on Greek ascidians refers almost exclusively to the Aegean Sea. The necessity for further research on ascidian diversity becomes therefore obvious and expands to the Ionian and Levantine coasts of Greece, from which the ascidian fauna has practically not at all been studied so far.

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References

- Antoniadou C, Vafidis D (2008) First assessment of *Microcosmus sabatieri* (Tunicata: Ascidiacea) small-scale artisanal fishery in the South Aegean Sea (eastern Mediterranean). Cahiers de Biologie Marine 49: 97-100.
- Antoniadou C, Voultsiadou E, Chintiroglou C (2006) Sublittoral megabenthos along cliffs of different profile (Aegean Sea, eastern Mediterranean). Belgian Journal of Zoology 136: 69-79.
- Antoniadou C, Voultsiadou E, Rayann A, Chintiroglou C (2013) Sessile biota fouling farmed mussels: diversity, spatio-temporal patterns, and implications for the basibiont. Journal of the Marine Biological Association of the United Kingdom 93 (6): 1593-1607. <https://doi.org/10.1017/s0025315412001932>
- Bailly N, Gerovasileiou V, Arvanitidis C, Legakis A (2016) Introduction to the Greek Taxon Information System (GTIS) in LifeWatchGreece: the construction of the Preliminary Checklists of species of Greece. Biodiversity Data Journal LifeWatchGreece: Research infrastructure (ESFRI) for biodiversity data and data observatories: in press.
- Çınar ME (2014) Checklist of the phyla Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (Tunicata, Cephalochordata,

and Hemichordata) from the coasts of Turkey. Turkish Journal of Zoology 38: 698-722.
<https://doi.org/10.3906/zoo-1405-70>

- Çınar ME, Bilecenoglu M, Öztürk B, Can A (2006) New records of alien species on the Levantine coast of Turkey. Aquatic Invasions 1 (2): 84-90. <https://doi.org/10.3391/ai.2006.1.2.6>
- Coll M, Piroddi C, Steenbeek J, Kaschner K, Rais Lasram FB, Aguzzi J, Ballesteros E, Bianchi CN, Corbera J, Dailianis T, Danovaro R, Estrada M, Froglio C, Galil B, Gasol J, Gertwagen R, Gil J, Guilhaumon F, Kesner-Reyes K, Kitsos M, Koukouras A, Lampadariou N, Laxamana E, la Cuadra CLd, Lotze H, Martin D, Mouillot D, Oro D, Raicevich S, Rius-Barile J, Saiz-Salinas JI, Vicente CS, Somot S, Templado J, Turon X, Vafidis D, Villanueva R, Voultsiadou E (2010) The Biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats. PLoS ONE 5 (8): e11842. <https://doi.org/10.1371/journal.pone.0011842>
- Delsuc F, Brinkmann H, Chourrout D, Philippe H (2006) Tunicates and not cephalochordates are the closest living relatives of vertebrates. Nature 439 (7079): 965-968. <https://doi.org/10.1038/nature04336>
- Galil B, Marchini A, Occhipinti-Ambrogi A (2016) East is east and West is west? Management of marine bioinvasions in the Mediterranean Sea. Estuarine, Coastal and Shelf Science in press: 1-10. <https://doi.org/10.1016/j.ecss.2015.12.021>
- Gerovasileiou V, Voultsiadou E, Issaris Y, Zenetos A (2016) Alien biodiversity in Mediterranean marine caves. Marine Ecology 37 (2): 239-256. <https://doi.org/10.1111/maec.12268>
- Hartmeyer R (1904) Tunicaten von Aegina. Ein Beitrag zur Kenntnis der Fauna des östlichen Mittelmeeres. Zoologischer Anzeiger 27: 321-327.
- Katsanevakis S, Acar Ü, Ammar I, Balci BA, Bekas P, Belmonte M, Chintiroglou CC, Consoli P, Dimiza M, Fryganiotis K, Gerovasileiou V, Gnisci V, Gülşahin N, Hoffman R, Issaris Y, Izquierdo-Gomez D, Izquierdo-Muñoz A, Kavadas S, Koehler L, Konstantinidis E, Mazza G, Nowell G, Önal U, Özgen MR, Pafilis P, Pastore M, C. P, Poursanidis D, Prato E, Russo F, Sicuro B, Tarkan AN, Thessalou-Legaki M, Tirabongo F, Triantaphyllou M, Tsiamis K, Tunçer S, Turan C, Türker A, Yapıcı S (2014) New Mediterranean Biodiversity Records (October, 2014). Mediterranean Marine Science 15: 675-695.
- Kiseleva MI (1963) Répartition qualitative du benthos de la Mer Egée. Trudy Sevastopol'skoi Biologicheskoi Stantsii 14: 192-200.
- Kondilatos G, Corsini-Foka M, Pancucci-Papadopoulou MA (2010) Occurrence of the first non-indigenous ascidian *Phallusia nigra* Savigny, 1816 (Tunicata: Ascidiacea) in Greek waters. Aquatic Invasions 5 (2): 181-184. <https://doi.org/10.3391/ai.2010.5.2.08>
- Kott P (1990) The Australian Ascidiacea. Part 2, Aplousobranchia (1). Memoirs of the Queensland Museum 29: 1-266.
- Koukouras A, Siamidou-Efremidou O (1978) Benthic fauna of the North Aegean Sea. I. Cionidae and Ascidiidae (Tunicata, Ascidiacea). Vie et Milieux 28-29: 635-646.
- Koukouras A, Voultsiadou-Koukoura E, Kevrekidis T, Vafidis D (1995) Ascidian fauna of the Aegean Sea with a check list of the eastern Mediterranean and Black Sea species. Annales de l'Institut Océanographique 71: 19-34.
- Lahille MF (1886) Sur la classification des Tuniciers. Comptes Rendus de l'Académie des Sciences Paris 102: 1573-1575.
- Monniot C (1983) Ascidiées littorales de Guadeloupe. II. Phlébobranches. Bulletin du Muséum national d'Histoire Naturelle Paris 5: 51-71.

- Monniot C, Monniot F (1974) Ascidies abyssales de Méditerranée récoltées par le "Jean Charcot" (campagnes Polymède). Bulletin du Muséum national d'Histoire Naturelle Paris 251: 1353-1360.
- Moreno TR, de Faria SB, Rocha RM (2008) Phylogeny of the Aplousobranchia (Tunicata: Ascidiacea). Revista Brasileira de Zoologia 25: 269-298. <https://doi.org/10.1590/s0101-81752008000200016>
- Moreno TR, de Faria SB, Rocha RM (2014) Biogeography of Atlantic and Mediterranean ascidians. Marine Biology 161: 2023-2033. <https://doi.org/10.1007/s00227-014-2483-x>
- Morri C, Bianchi CN, Cocito S, Periano A, DeBiase AM, Aliani S, Pansini M, Boyer M, Ferdegħini F, Pestarino M, Dando P (1999) Biodiversity of marine sessile epifauna at an Aegean island subject to hydrothermal activity: Milos, eastern Mediterranean Sea. Marine Biology 135: 729-739. <https://doi.org/10.1007/s002270050674>
- Naranjo S, Carballo JL, García-Gómez JC (1998) Towards a knowledge of marine boundaries using ascidians as indicators: characterising transition zones for species distribution along Atlantic-Mediterranean shores. Biological Journal of the Linnean Society 64 (2): 151-177. <https://doi.org/10.1111/j.1095-8312.1998.tb01539.x>
- Panagiotou M, Antoniadou C, Chintiroglou C (2008) Population dynamics and reproductive status of *Microcosmus savignyi* Monniot, 1962 (Thermaikos Gulf, Eastern Mediterranean): a preliminary assessment. Journal of Natural History 42: 545-558. <https://doi.org/10.1080/00222930701835522>
- Panagiotou M, Antoniadou C, Krestenitis Y, Chintiroglou C (2007) Stock assessment of the dominant ascidians: *Microcosmus savignyi*, *Styela plicata* and *Phallusia mammillata*, in Thessaloniki Bay (Thermaikos Gulf). Fresenius Environmental Bulletin 16: 1012-1019.
- Pérès JM (1958) Origine et affinités du peuplement en ascidies de la Méditerranée. Rapports et Procès Verbaux de la CIESM 14: 493-502.
- Pérès JM (1967) The Mediterranean Benthos. Oceanography and Marine Biology: An Annual Review 5: 449-533.
- Pérès JM, Picard J (1958) Recherches sur les peuplements benthiques de la Méditerranée nord-orientale. Annales de l'Institut Océanographique Monaco 34: 213-291.
- Pérez-Portela R, Bishop JD, Davis AR, Turon X (2009) Phylogeny of the families Pyuridae and Styelidae (Stolidobranchiata, Ascidiacea) inferred from mitochondrial and nuclear DNA sequences. Molecular Phylogenetics and Evolution 50 (3): 560-570. <https://doi.org/10.1016/j.ympev.2008.11.014>
- Shenkar N, Swalla BJ (2011) Global Diversity of Ascidiacea. PLoS ONE 6 (6): e20657. <https://doi.org/10.1371/journal.pone.0020657>
- Shenkar N, Koplovitz G, Dray L, Gissi C, Huchon D (2016a) Back to solitude: Solving the phylogenetic position of the Diazonidae using molecular and developmental characters. Molecular Phylogenetics and Evolution 100: 51-56. <https://doi.org/10.1016/j.ympev.2016.04.001>
- Shenkar N, Gittenberger A, Lambert G, Rius M, Moreira Da Rocha R, Swalla BJ, Turon X (2016b) Ascidiacea World Database. <http://www.marinespecies.org/ascidiacea/>
- Sini M, Garrabou J, Koutsoubas D, Bouafif C, Langar H, Ouerghi A (2014) Diversity and structure of coralligenous assemblages dominated by Eunicella cavolini (Koch, 1887) in

the Aegean Sea. Proceedings of the second Mediterranean Symposium on the conservation of Coralligenous and other Calcareous Bio-Concretions. RAC/SPA, Tunis

- Spalding MD, Fox HE, Allen GR, Davidson N, Ferdaña ZA, Finlayson M, Halpern BS, Jorge MA, Lombana A, Lourie SA, Martin KD, McManus E, Molnar J, Recchia CA, Robertson J (2007) Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. *BioScience* 57 (7): 573. <https://doi.org/10.1641/b570707>
- Thessalou-Legaki M, Aydogan O, Bekas P, Bilge G, Boyaci YO, Brunelli E, Circosta V, Crocetta F, Durucan F, Erdem M, Ergolavou A, Filiz H, Fois F, Gouva E, Kapiris K, Katsanevakis S, Kljajic Z, Konstantinidis E, Konstantinou G, Koutsogiannopoulos D, Lamon S, Macic V, Mazzette R, Meloni D, Mureddu A, Paschos I, Perdikaris C, Piras F, Poursanidis D, Ramos-Espal AA, Rosso A, Sordino P, Sperone E, Sterioti A, Taskin E, Toscano F, Tripepi S, Tsiaakkios L, Zenetos A (2012) New Mediterranean Biodiversity Records (December 2012). *Mediterranean Marine Science* 13 (2): 312-327. <https://doi.org/10.12681/mms.313>
- Tsagkogeorga G, Turon X, Hopcroft RR, Tilak M, Feldstein T, Shenkar N, Loya Y, Huchon D, Douzery JP, Delsuc F (2009) An updated 18S rRNA phylogeny of tunicates based on mixture and secondary structure models. *BMC Evolutionary Biology* 9: 187. <https://doi.org/10.1186/1471-2148-9-187>
- Turon X, López-Legentil S (2004) Ascidian molecular phylogeny inferred from mtDNA data with emphasis on the Aplousobranchiata. *Molecular Phylogenetics and Evolution* 33: 309-320. <https://doi.org/10.1016/j.ympev.2004.06.011>
- Vafidis D, Antoniadou C, Chintiroglou C (2008) Population dynamics, allometric relationships and reproductive status of *Microcosmus sabatieri* (Tunicata: Ascidiacea) in the Aegean Sea. *Journal of the Marine Biological Association of the UK* 88 (5): 1043-1051. <https://doi.org/10.1017/s0025315408001811>
- Vamvakas C (1971) Contribution to the study of soft substrata benthic biocoenoses of Greek seas area W. Saronikos Gulf. *Hellenic Oceanology and Limnology* 10: 1-152.
- Vandepas LE, Oliveira LM, Lee SS, Hirose E, Rocha RM, Swalla BJ (2015) Biogeography of *Phallusia nigra*: is it really black and white? *Biological Bulletin* 228: 52-64.
- Voultsiadou E, Vafidis D (2007) Marine invertebrate diversity in Aristotle's zoology. *Contributions to Zoology* 76: 103-120.
- Voultsiadou E, Pyrounaki M, Chintiroglou C (2007) The habitat engineering tunicate *Microcosmus sabatieri* Roule, 1885 and its associated peracardid epifauna. *Estuarine, Coastal and Shelf Science* 74: 197-204. <https://doi.org/10.1016/j.ecss.2007.04.003>
- Voultsiadou E, Kyrodimou M, Antoniadou C, Vafidis D (2010) Sponge epibionts on ecosystem-engineering ascidians: The case of *Microcosmus sabatieri*. *Estuarine, Coastal and Shelf Science* 86 (4): 598-606. <https://doi.org/10.1016/j.ecss.2009.11.035>

Supplementary material

Suppl. material 1: Checklist of the ascidian fauna (Tunicata: Ascidiacea) of Greece

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Data type: Taxonomic checklist

Brief description: Taxonomic checklist of Ascidiacea known to occur in Greek waters.

Filename: GTIS_Ascidiacea_Greece_Checklist.xls - [Download file](#) (363.00 kb)