

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

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Received: 28.05.2014

Accepted: 28.06.2014

Published Online: 00.00.2013

Printed: 00.00.2013

Abstract: In this paper, the current status of the species diversity of 13 phyla, namely Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (invertebrates, only Tunicata, Cephalochordata, and Hemichordata) along the coasts of Turkey is reviewed. Platyhelminthes was represented by 186 species, Chordata by 64 species, Nemertea by 26 species, Nematoda by 20 species, Xenacoelomorpha by 11 species, Chaetognatha by 10 species, Acanthocephala by 9 species, Brachiopoda and Phoronida by 4 species, Myxozoa and Tardigrada by 2 species, and Cephalorhyncha and Echiura by 1 species. Two platyhelminth (*Planocera* cf. *graffi* and *Prostheceraeus vittatus*), 2 nemertean (*Drepanogigas albolineatus* and *Tubulanus superbus*), 1 phoronid (*Phoronis australis*), and 2 ascidian (*Polyclinella azemai* and *Ciona roulei*) species are being newly reported for the first time from the coasts of Turkey. Four tunicate (*Symplesma brakenhielmi*, *Microcosmus exasperatus*, *Herdmania momus*, and *Phallusia nigra*) and 1 chaetognath (*Ferosagitta galerita*) species were classified as alien species in the region.

Key words: Miscellaneous, other phyla, diversity, checklist, alien species, Turkey

1. Introduction

The phylum Platyhelminthes comprises free-living and parasitic flatworms. The free-living species were formerly placed into the class “Turbellaria”, which was then shown to be paraphyletic (Ehlers, 1986). The free-living species are now included in the classes Catenuvida (mainly fresh-water species) and Rhabditophora (also includes some parasitic species). The primitive (gutless), small-sized flatworm species that were previously included within an order (Acoela) of “Turbellaria” have recently been transferred to a new phylum, Xenacoelomorpha (Philippe et al., 2011), which also comprises the orders Nemertodermatida and Xenoturbellida (Tyler and Schilling, 2011). The classes of Platyhelminthes that have only parasitic species are Trematoda, Cestoda, and Monogenea. The marine Platyhelminthes and Xenacoelomorpha comprise almost 11,690 and 400 species worldwide, respectively (Appeltans et al., 2012). These 2 phyla are represented by almost 1000 species in the Mediterranean Sea (Coll et al., 2010). The free-living flatworms and the members of the phylum Xenacoelomorpha have been poorly studied on the Turkish

coasts, with some faunistic data mainly derived from the detailed studies performed in the Sea of Marmara, the İstanbul Strait, and the Black Sea by Ax (1959a, 1959b), who described 4 new genera (*Baltalimania*, *Archilina*, *Selimia*, and *Thalassoplanina*) and 23 new species in the region. The first parasitic flatworm on the coast of Turkey was recorded by Forbes (1844), who found the rhabditophoran species *Graffilla parasitica* on the sea slug *Tethys fimbria* Linnaeus, 1767 in İzmir Bay. In a recent review on the parasitic flatworms infecting marine fishes collected from Turkey, a total of 87 species were listed (Öktener, 2005).

The other phyla considered in the present study, such as Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and invertebrate Chordata, have also been poorly studied on the coasts of Turkey. However, thanks to some recent studies, the species richness of Chaetognatha (İşmen et al., 2003; Terbiyik et al., 2007) and Phoronida (Emig et al., 2003) has been relatively well documented in the region. The majority of the species of the phyla Chordata (Tunicata,

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Cephalochordata, and Hemichordata) and Brachiopoda were reported by pioneer researchers such as Ostroumoff (1896), Colombo (1885), and Demir (1952), who identified 50% of the ascidian species (totally 50 species) and 100% of the brachiopod species known from the region. The free-living nematode species have recently been a subject of study in the region, where only 6 species have been reported (Băcescu et al., 1971; Çınar et al., 2006b; Ürkmez et al., 2011; Ürkmez and Brennan, 2013), whereas almost 700 species are known from the Mediterranean Sea (Coll et al., 2010). The phyla of parasitic species such as Acanthocephala and Myxozoa were recently studied in the region (see Öktener, 2005; Özer and Yurakhno, 2013). The diversity of Acanthocephala is also underestimated in the Mediterranean, but the number of Myxozoa species is estimated to be 115 (Coll et al., 2010). Only 1 species of the phylum Cephalorhyncha, which includes the classes Kinorhyncha, Loricifera, Nematomorpha, and Priapulida and comprises 44 species in the Mediterranean, was reported from the pre-Bosphorus region by Băcescu (1961). Meiobenthic species of the phylum Tardigrada, which includes almost 77 species in the Mediterranean Sea (Coll et al., 2010), were only reported from the pre-Bosphorus region (Kharkevych and Sergeeva, 2013). The nemertean species were first studied by Demir (1952), who found 8 species in the northern part of the Sea of Marmara and the İstanbul Strait. The subsequent records were exclusively provided by Băcescu et al. (1971) from the Black Sea coast of Turkey and by Çınar et al. (2006b) from İzmir Bay. Of 6 echiuran species reported from the Mediterranean Sea, only 1 species was identified on the coasts of Turkey (Colombo, 1885).

The present paper is aimed to give an up-to-date species list of the phyla reported from the coasts of Turkey and their distributions in 4 different seas surrounding Turkey. This paper also reports some species new to the Turkish marine fauna.

2. Materials and methods

The checklist of the phyla Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (Tunicata, Cephalochordata, and Hemichordata) has been prepared by compiling all existing literature about these phyla along the coasts of Turkey (Black Sea, Sea of Marmara, Aegean Sea, and Levantine Sea). In addition to the existing inventory, some new species records of Platyhelminthes, Nemertea, and Tunicata are presented here. The first reports of all species and their depth and habitat distributions in the regions are given in the Table. However, data regarding the parasitic flatworms were generally extracted from the review paper by Öktener (2005). The stations at which new records of species were determined are indicated in Figure 1. The station numbers are superscripted above "PS" in the Table. Some notes regarding the previously used names of the species and the host of parasitic species are also given in the Table.

In order to assess the diversity hotspots of Tunicata, Platyhelminthes (only the class Rhabditophora, free-living species), and Xenacoelomorpha, and to identify the areas where weak and intensive research efforts have been performed to date (gap analysis), the coasts of Turkey were divided into grids of 15 × 15 km. All distribution data of species were entered into an Excel file and then imported and digitized through ArcGIS 10.

3. Results and discussion

As a result of a literature search and new data presented here, the phyla Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (Tunicata, Cephalochordata, and Hemichordata) are represented by 340 species along the coasts of Turkey (Table). Of the

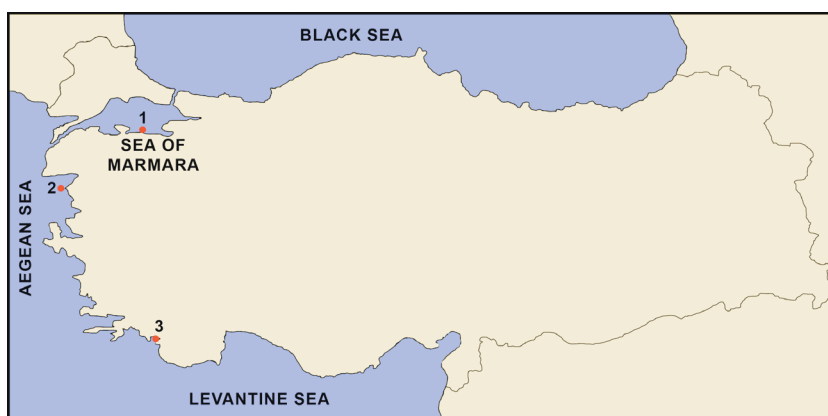


Figure 1. Map of the stations where new records of species were found.

Table. Species list of the phyla Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (Tunicata, Cephalochordata, and Hemichordata) reported from the coasts of Turkey [*: Alien species; BS: Black Sea; SM: Sea of Marmara; AS: Aegean Sea; LS: Levantine Sea; DR: depth range (I: 0–10 m; II: 11–50 m; III: 51–100 m; IV: 101–200 m; V: 201–400 m; VI: 401–600 m; VII: >600 m); H: habitat (Hs: hard substratum – including algae, sponge, mussels, etc.; Ss: soft substratum – including all phanerogams; P: pelagic; Pz: parasite); PS: present study (superscripted numbers indicate station numbers as shown in Figure 1)].

Group/species	BS	SM	AS	LS	DR	H	Remarks
Phylum: PLATYHELMINTHES							
Class: Trematoda							
Subclass: Digenea							
Family: Acanthocolpidae							
<i>Lepidauchen stenostoma</i> Nicoll, 1913	-	-	38	-		Pz	on various fish
<i>Stephanostomum bacatum</i> (Nicoll, 1907)	-	38	-	-		Pz	on <i>Gaidropsarus mediterraneus</i>
<i>Stephanostomum bicoronatum</i> (Stossich, 1883)	-	-	38	-		Pz	on <i>Umbrina cirrosa</i>
<i>Stephanostomum caducum</i> (Looss, 1901)	-	42	-	-		Pz	on <i>Merluccius merluccius</i>
<i>Stephanostomum gaidropsari</i> Bartoli & Bray, 2001	-	42	-	-		Pz	on <i>Gaidropsarus mediterraneus</i>
<i>Stephanostomum minutum</i> (Looss, 1901)	72		63			Pz	on <i>Uranoscobus scaber</i>
Family: Aepheidiogenidae							
<i>Holorchis pycnopus</i> Stossich, 1901	-	-	38	-		Pz	on <i>Lithognathus mormyrus</i>
Family: Bucephalidae							
<i>Bucephalus margaritae</i> Ozaki & Ishibashi, 1934	-	-	63	-		Pz	on various fish
<i>Bucephalus marinus</i> Vlasenko, 1931	-	42	-	-		Pz	on <i>Gaidropsarus mediterraneus</i>
<i>Prosorhynchoides haimeana</i> (Lacaze-Duthiers, 1854)	-	38	-	-		Pz	on <i>Zosterisessor ophiocephalus</i>
<i>Prosorhynchus crucibulum</i> (Rudolphi, 1819)	-	-	59	-		Pz	on various fish
Family: Cryptogonimidae							
<i>Anisocladium fallax</i> (Rudolphi, 1819)	72	38	63	-		Pz	on <i>Uranoscobus scaber</i>
<i>Anisocladium gracile</i> (Looss, 1901)	72	-	-	-		Pz	on <i>Uranoscobus scaber</i>
<i>Anisocoelium capitellatum</i> (Rudolphi, 1819)	72	38	-	-		Pz	on <i>Uranoscobus scaber</i>
<i>Anoiktostoma coronatum</i> (Wagener, 1852)	-	-	63	-		Pz	on <i>Sciaena umbra</i>
<i>Siphoderina aloysiae</i> (Stossich, 1885)	-	-	63	-		Pz	on <i>Sciaena umbra</i>
Family: Faustulidae							
<i>Pronoprymna ventricosum</i> (Rudolphi, 1819)	38	-	-	-		Pz	on <i>Alosa fallax</i>
<i>Bacciger bacciger</i> (Rudolphi, 1819)	-	-	38	-		Pz	on various fish
<i>Bacciger israelensis</i> Fischthal, 1980	-	-	63	-		Pz	on various fish
Family: Fellodistomidae							
<i>Monascus filiformis</i> (Rudolphi, 1819)	-	38	38	-		Pz	on various fish
<i>Steringotrema pagelli</i> (Van Beneden, 1871)	-	-	63	-		Pz	on <i>Spicara maena</i>
<i>Tergestia laticollis</i> (Rudolphi, 1819)	-	-	38	-		Pz	on <i>Trachurus mediterraneus</i>

Table. (Continued).

Family: Gymnophallidae						
<i>Parvatrema duboisi</i> (Dollfus, 1923)	71	-	-	-	Pz	on mussel
Family: Haploporidae						
<i>Dicrogaster contractus</i> Looss, 1902	-	-	38	-	Pz	on Mugilidae
<i>Dicrogaster perpusilla</i> Looss, 1902	-	42	-	-	Pz	on <i>Liza saliens</i>
<i>Saccocoelium obesum</i> Looss, 1902	-	42	38	-	Pz	on Mugilidae
<i>Saccocoelium tensum</i> Looss, 1902	-	-	38	-	Pz	on Mugilidae
Family: Haplospalchnidae						
<i>Haplospalchnus pachysomus</i> (Eysenhardt, 1829)	-	-	38	-	Pz	on Mugilidae
Family: Hemiuridae						
<i>Aphanurus stossichi</i> (Monticelli, 1891)	-	-	38	-	Pz	on <i>Boops boops</i>
<i>Ectenurus lepidus</i> Looss, 1907	-	-	38	-	Pz	on various fish
<i>Hemiurus communis</i> Odhner, 1905	-	-	38	-	Pz	on <i>Boops boops</i>
<i>Lecithocladium excisum</i> (Rudolphi, 1819)	-	45	63	-	Pz	on <i>Scomber scombrus</i>
<i>Lecithochirium grandiporum</i> (Rudolphi, 1819)	-	-	59	-	Pz	on <i>Conger conger</i>
<i>Lecithochirium musculus</i> (Looss, 1907)	72	-	-	-	Pz	on <i>Ophidion rochei</i>
Family: Heterophyidae						
<i>Heterophyes heterophyes</i> (Siebold, 1853)	-	-	38	-	Pz	on Mugilidae
<i>Pygidiopsis genata</i> Looss, 1907	48	-	-	-	Pz	on <i>Neogobius melanostomus</i>
<i>Schikhobalotrema sparisomae</i> (Manter, 1937)	-	38	38	-	Pz	on Mugilidae
Family: Lecithasteridae						
<i>Lecithaster helodes</i> Overstreet, 1973	-	-	38	-	Pz	on Mugilidae
Family: Lepidapedidae						
<i>Lepidapedon elongatum</i> (Lebour, 1908)	-	-	38	-	Pz	on <i>Scomber japonicus</i>
Family: Lepocreadiidae						
<i>Lepocreadium album</i> (Stossich, 1890)	-	-	38	-	Pz	on various fish
<i>Lepocreadium pyriforme</i> (Linton, 1900)	-	-	38	-	Pz	on <i>Trachurus mediterraneus</i>
<i>Opechona olssoni</i> (Yamaguti, 1934)	-	-	38	-	Pz	on <i>Scomber japonicus</i>
<i>Opechona bacillaris</i> (Molin, 1859)	26	45	38	-	Pz	on various fish
<i>Prodistomum polonii</i> (Molin, 1859)	-	38	-	-	Pz	on <i>Trachurus trachurus</i>
Family: Mesometridae						
<i>Elstia stossichianum</i> (Monticelli, 1892)	-	-	63	-	Pz	on <i>Sarpa salpa</i>
<i>Mesometra orbicularis</i> (Rudolphi, 1819)	-	-	63	-	Pz	on <i>Sarpa salpa</i>
Family: Monorchiidae						
<i>Proctotrema bacilliovatum</i> Odhner, 1911	-	-	38	-	Pz	on <i>Mullus surmuletus</i>

Table. (Continued).

Family: Opecoelidae

<i>Allopodocotyle pedicellata</i> (Stossich, 1887)	-	-	38	-	Pz	on <i>Pagrus pagrus</i>
<i>Gaevskajatrema perezi</i> (Mathias, 1926)	-	42	-	-	Pz	on <i>Symphodus tinca</i>
<i>Gaevskajatrema pontica</i> (Koval, 1966)	-	38	-	-	Pz	on <i>Symphodus tinca</i>
<i>Helicometra fasciata</i> (Rudolphi, 1819)	72	38	38	-	Pz	on various fish
<i>Macvicaria alacris</i> (Looss, 1901)	-	42	-	-	Pz	on <i>Symphodus tinca</i>
<i>Opecoeloides furcatus</i> (Bremser in Rudolphi, 1819)	-	-	38	-	Pz	on <i>Mullus surmuletus</i>
<i>Pachycreadium carnosum</i> (Rudolphi, 1819)	-	-	63	-	Pz	on <i>Pagellus acerna</i>
<i>Plagioporus dogieli</i> Pogoreltseva, 1975	-	38	-	-	Pz	on <i>Symphodus tinca</i>

Family: Zoogonidae

<i>Diphtherostomum brusinae</i> (Stossich, 1889)	-	38	-	-	Pz	on <i>Zosterisessor ophiocephalus</i>
<i>Lecithostaphylus retroflexus</i> Molin, 1859	-	45	-	-	Pz	on <i>Belone belone</i>

Class: Monogenea**Family: Ancyrocephalidae**

<i>Ligophorus acuminatus</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Liza saliens</i>
<i>Ligophorus angustus</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Chelon labrosus</i>
<i>Ligophorus chabaudi</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Mugil cephalus</i>
<i>Ligophorus confusus</i> Euzet & Suriano, 1977	-	53	38	-	Pz	on <i>Liza ramada</i>
<i>Ligophorus heteronchus</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Liza saliens</i>
<i>Ligophorus imitans</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Liza ramada</i>
<i>Ligophorus macrocolpos</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Liza saliens</i>
<i>Ligophorus minimus</i> Euzet & Suriano, 1977	-	-	38	-	Pz	on <i>Liza saliens</i>
<i>Ligophorus mugilinus</i> (Hargis, 1955)	-	-	38	-	Pz	on <i>Mugil cephalus</i>
<i>Ligophorus szidati</i> Euzet & Suriano, 1977	-	38	38	-	Pz	on <i>Liza</i> spp.

Family: Axinidae

<i>Axine belones</i> Abildgaard, 1794	65	38	-	-	Pz	on <i>Belone belone</i>
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Family: Capsalidae

<i>Benedenia sciaenae</i> (Van Beneden, 1852)	-	-	39	-	Pz	on <i>Argyrosomus regius</i>
<i>Trochopus gaillimhe</i> Little, 1829	-	38	-	-	Pz	on <i>Eutrigla gurnardus</i>
<i>Trochopus pini</i> (Van Beneden & Hesse, 1863)	-	53	-	-	Pz	on <i>Eutrigla gurnardus</i>

Family: Diclidophoridae

<i>Choricotyle chrysophryi</i> Van Beneden & Hesse, 1863	-	-	38	-	Pz	on <i>Pagellus erythrinus</i>
<i>Diclidophora bellones</i> (Otto, 1823)	-	-	38	-	Pz	on <i>Boops boops</i>

Family: Diplectanidae

<i>Diplectanum aequans</i> (Wagener, 1857)	-	-	38	-	Pz	on <i>Dicentrarchus labrax</i>
<i>Lamellodiscus echeneis</i> (Wagener, 1857)	-	-	38	-	Pz	on <i>Sparus aurata</i>
<i>Lamellodiscus ignoratus</i> Palombi, 1943	-	-	38	-	Pz	on <i>Puntazzo puntazzo</i>

Table. (Continued).

Family: Discocotylidae

Anthocotyle merluccii Van Beneden & Hesse, 1863 - 38 - - Pz on *Merluccius merluccius*

Family: Gastrocotylidae

Pseudaxine trachuri Parona & Perugia, 1889 - - 38 - Pz on *Trachurus mediterraneus*

Family: Gyrodactylidae

Gyrodactylus flesi Malmberg, 1957 50 - - - Pz on *Platichthys flesus*

Gyrodactylus proterorhini Ergens, 1964 48 - - - Pz on *Neogobius melanostomus*

Family: Mazocraeidae

Kuhnia scombri (Kuhn, 1829) - - 38 - Pz on *Scomber japonicus*

Family: Microcotylidae

Aspinatrium trachini (Parona & Perugia, 1889) - - 33 - Pz on *Trachinus draco*

Metamicrocotyla cephalus (Azim, 1939) - - 38 - Pz on *Mugil cephalus*

Microcotyle erythrini Van Beneden & Hesse, 1863 - - 38 - Pz on various fishes

Microcotyle pomatomi Goto, 1891 - 38 - - Pz on *Pomatomus saltatrix*

Solostamenides mugilis (Vogt, 1879) - 38 38 - Pz on Mugilidae

Sparicotyle chrysophrii (Van Beneden & Hesse, 1863) - - 38 - Pz on *Sparus aurata*

Family: Pyragraphoridae

Pyragraphorus pyragraphorus (MacCallum & MacCallum, 1913) - - - 38 Pz on *Trachynotus ovatus*

Family: Tetraonchidae

Ergenstrema mugilis Paperna, 1965 - - 38 - Pz on Mugilidae

Family: Tetraonchoididae

Tetraonchoides paradoxus Bychowsky, 1951 - 38 - - Pz on *Uranoscopus scaber*

Class: Cestoda

Family: Acrobothriidae

Acanthobothrium coronatum (Rudolphi, 1819) - - 62 - Pz on various fish

Didymobothrium rudolphii Nybelin, 1922 - 38 - - Pz on *Solea solea*

Family: Bothriocephalidae

Bothriocephalus scorpii (Müller, 1776) - - 38 - Pz on various fish

Clestobothrium crassiceps (Rudolphi, 1819) - 38 - - Pz on *Merluccius merluccius*

Family: Echinobothriidae

Echinobothrium typus Van Beneden, 1849 - - 38 - Pz on various fish

Family: Eutetrarhynchidae

Tetrarhynchobothrium tenuicolle Diesing, 1850 - - 62 - Pz on *Squalus acanthias*

Family: Gryporhynchidae

Paradilepis scolecina (Rudolphi, 1819) 50 - - - Pz on *Platichthys flesus*

Family: Lacistorhynchidae

Grillotia erinaceus (Van Beneden, 1858) 72 - - - Pz on *Merlangius merlangus*

Table. (Continued).

Family: Onchobothriidae

Acanthobothrium dujardinii Van Beneden, 1849 - - 38 - Pz on *Raja clavata*

Family: Phyllobothriidae

Phyllobothrium gracile Wedl, 1855 - - 38 - Pz on *Raja clavata*

Phyllobothrium lactuca (Van Beneden, 1850) - - 38 - Pz on various fish

Family: Progrillotiidae

Progrillotia dasyatidis Beveridge, Neifar & Euzet, 2004 72 53 - - Pz on various fish

Family: Rhinobothriidae

Echeneibothrium variabile Van Beneden, 1850 - - 62 - Pz on various fish

Class: Rhabditophora

Order: Macrostomida

Family: Dolichomacrostomidae

Cylindromacrostomum mediterraneum (Ax, 1955) 9 9 - - II, III Ss

Paromalostomum dubium (de Beauchamp, 1927) 9 - - - II Ss

Family: Macrostomidae

Archimacrostomum pusillum (Ax, 1951) - 9 - - I Ss

Macrostomum ermini Ax, 1959 9 - - - I Ss

Macrostomum hystricinum Beklemishev, 1951 9 9 - - I Ss

Macrostomum mediterraneum Ax, 1956 - 9 - - I Ss

Family: Microstomidae

Microstomum papillosum Graff, 1882 9 9 - - I-III Ss

Order: Prolecithophora

Family: Cylindrostomidae

Cylindrostoma monotrochum (Graff, 1882) - 9 - - I Hs

Enterostomula graffi (de Beauchamp, 1913) - 9 - - I Hs, Ss

Family: Protomonotresidae

Archimonotresis limophila Meixner, 1938 9 9 - - I Ss

Order: Seriata

Family: Cercyridae

Cercyra hastata Schmidt, 1862 - 5 - - I Hs, Ss

Family: Monocelididae

Archilina endostyla Ax, 1959 9 9 - - I Ss

Archiloa petiti Ax, 1956 - 9 - - I Ss

Duplominona istanbulensis (Ax, 1959) 9 9 - - I-III Ss

Monocelis lineata (Müller, 1774) - 9 - - I Ss

Monocelis longiceps (Duges, 1830) - 5 - - I Hs = *Monocelis bipunctatus*

Table. (Continued).

<i>Pseudomonocelis agilis</i> (Schultze M, 1851)	-	9	-	-	I	Ss	
<i>Pseudomonocelis ophiocephala</i> (Schmidt, 1861)	-	9	-	-	I	Ss	
<i>Promonotus ponticus</i> Ax, 1959	9	9	-	-	I	Ss	
Family: Otoplanidae							
<i>Otoplana bosporana</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Postbursoplana pontica</i> Ax, 1959	9	-	-	-	I	Ss	
<i>Postbursoplana propontica</i> Ax, 1959	-	9	-	-	II	Ss	
Family: Procerodidae							
<i>Procerodes lobata</i> (Schmidt, 1862)	-	5	-	-	I	Hs	
<i>Sabussowia dioica</i> (Claparède, 1863)	16	-	-	-	II	Ss	
Order: Rhabdoceola							
Family: Brysophlebiidae							
<i>Byrsophlebs simplex</i> (Ax, 1959)	-	9	-	-	I	Ss	
<i>Byrsophlebs uncinata</i> (Ax, 1959)	-	9	-	-	II	Ss	
Family: Cicerinidae							
<i>Cicerina eucentrota</i> Ax, 1959	9	-	-	-	I	Ss	
Family: Cystiplanidae							
<i>Cystiplana paradoxa</i> Karling, 1964	9	9	-	-	I	Ss	
Family: Diascorhynchidae							
<i>Diascorhynchus caligatus</i> Ax, 1959	9	-	-	-	II	Ss	
Family: Graffillidae							
<i>Bresslauilla relictata</i> Reisinger, 1929	9	-	-	-	I	Ss	
<i>Graffilla parasitica</i> (Czerniavsky, 1880)	1	-	-	-		Pz	on <i>Tethys fimbria</i>
<i>Paravortex scrobiculariae</i> (Graff, 1882)	-	5	-	-	I	Hs	= <i>Provortex tellinae</i>
Family: Karkinorhynchidae							
<i>Baltoplana valkanovi</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Cheliplana euxeinos</i> Ax, 1959	9	-	-	-	I	Ss	
<i>Cheliplana orthocirra</i> Ax, 1959	-	9	-	-	II	Ss	
Family: Koinocystididae							
<i>Axiutelga aculeata</i> (Ax, 1959)	-	9	-	-	I	Ss	
<i>Itaipusa sophiae</i> (v.Graff, 1905)	-	9	-	-	I	Hs	
Family: Placorhynchidae							
<i>Placorhynchus dimorphis</i> (Karling, 1947)	9	-	-	-	I	Ss	
<i>Placorhynchus octaculeatus</i> Karling, 1931	9	9	-	-	I	Ss	
Family: Polycystididae							
<i>Gyatrix hermaphroditus</i> Ehrenberg, 1831	-	9	-	-	I	Hs, Ss	

Table. (Continued).

<i>Polycystis naegeli</i> Kölliker, 1845	9	9	-	-	I	Hs	
<i>Progyrator mamertinus</i> (Graff, 1874)	9	9	-	-	I	Hs	
<i>Rogneda polyrhabdota</i> Ax, 1959	-	9	-	-	I, II	Ss	
<i>Rogneda tripalmata</i> (Beklemishev, 1927)	-	9	-	-	I	Ss	
Family: Promesostomidae							
<i>Phonorhynchus pernix</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Promesostoma bilineatum</i> Pereyaslawzewa, 1892	-	9	-	-	I	Hs, Ss	
<i>Promesostoma ensifer</i> (Uljanin, 1870)	-	9	-	-	I	Hs, Ss	
<i>Promesostoma maculosum</i> Ax, 1956	-	9	-	-	I-III	Ss	
<i>Paramesostoma neapolitanum</i> (Graff, 1882)	-	9	-	-	I	Hs	= <i>Paramesostoma pachidermum</i>
<i>Tvaerminnea karlingi</i> Luther, 1943	-	9	-	-	I	Ss	
Family: Provorticidae							
<i>Selimia vivida</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Selimia similis</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Vejdovskya helictos</i> Ax, 1956	9	-	-	-			
Family: Schizorhynchidae							
<i>Proschizorhynchus tricingulatus</i> Ax, 1959	9	9	-	-	II	Ss	
Family: Trigonostomidae							
<i>Messoplana falcata</i> (Ax, 1953)	9	9	-	-	I, II	Ss	
<i>Proxenetes angustus</i> Ax, 1951	9	9	-	-	I, II	Ss	
<i>Ptychopera plebeia</i> (Beklemishev, 1927)	-	9	-	-	I	Ss	
<i>Trigonostomum mirabile</i> (Pereyaslawzewa, 1892)	9	9	-	-	I, II	Hs, Ss	
<i>Trigonostomum setigerum</i> (Schmidt, 1852)	9	9	-	-	I	Hs	
<i>Trigonostomum venenosum</i> (Uljanin, 1870)	9	9	-	-	I	Hs	
Family: Typhoplanidae							
<i>Thalassoplanina geniculata</i> (Beklemishev, 1927)	9	-	-	-	I	Ss	
Order: Mediofusata							
Family: Urastomidae							
<i>Urastoma cyprinae</i> (Graff, 1882)	71	-	-	-	I	Pz	on mussel
Order: Polycladida							
Family: Cryptocelidae							
<i>Cryptocelis glandulata</i> Jacubowa, 1909	16	-	-	-	II	Ss	
Family: Discocelididae							
<i>Pseudodiscocelis aegeanensis</i> Bulnes, 2010	-	-	55	-	I	Hs	
Family: Euryleptidae							
<i>Prostheceraeus roseus</i> Lang, 1884	-	-	-	57	II	Hs	

Table. (Continued).

<i>Prostheceraeus giesbrechtii</i> Lang, 1884	-	-	-	57	I	Hs	
<i>Prostheceraeus vittatus</i> (Montagu, 1815)	-	-	-	PS ³	II	Ss	
<i>Stylostomum ellipse</i> (Dalyell, 1853)	-	5	-	PS ³	I	Hs	= <i>Stylostomum variabile</i>
Family: Leptoplanidae							
<i>Leptoplana tremellaris</i> (Müller OF, 1773)	-	5	21	-	I	Hs	
Family: Notoplanidae							
<i>Notoplana alcinoi</i> (Schmidt, 1862)	-	23	-	-	I	Hs	
Family: Planoceridae							
<i>Planocera cf. graffi</i> Lang, 1879	-	-	-	PS ³	I	Hs	
<i>Pseudoplanocera izmirensis</i> Bulnes, 2010	-	-	55	-	I	Hs	
Family: Pleioplanidae							
<i>Izmira cinari</i> Bulnes, 2010	-	-	55	-	I	Hs	
<i>Izmira turkeyi</i> Bulnes, 2010	-	-	55	-	I	Hs	
<i>Pleioplana bosphorensis</i> Bulnes, Kalkan & Karhan, 2009	-	54	-	-	I	Hs	
<i>Pleioplana okusi</i> Bulnes, Kalkan & Karhan, 2009	-	54	-	-	I	Hs	
Family: Prosthlostomidae							
<i>Prosthlostomum siphunculus</i> (Delle Chiaje, 1822)	-	5	-	-	I	Hs, Ss	
Family: Pseudocerotidae							
<i>Pseudoceros maximum</i> Lang, 1884	-	-	-	57	II	Hs	
Family: Stylochidae							
<i>Imogine melihertani</i> Bulnes, 2010	-	-	55	-	I	Hs	
<i>Stylochus argus</i> Czerniavsky, 1881	16	-	-	-	II	Ss	
<i>Stylochus pilidium</i> (Goette, 1881)	-	5	-	-	I	Hs	
<i>Stylochus tauricus</i> Jakubova, 1909	16	-	-	-	II	Ss	
Family: Stylochoplanidae							
<i>Comoplana palmula</i> (Quatrefage, 1845)	-	5	-	-	I	Hs	
Phylum: XENACOELOMORPHA							
Order: Acoela							
Family: Convolutidae							
<i>Convoluta convoluta</i> (Abildgaard, 1806)	9	5	-	-	I	Hs	
<i>Convoluta hipparchia</i> Pereyaslawzewa, 1892	9	9	-	-	I	Hs	
<i>Convoluta variabilis</i> (Pereyaslawzewa, 1892)	16	-	-	-	II	Ss	
Family: Haploposthiidae							
<i>Haplogonaria arenaria</i> (Ax, 1959)	9	9	-	-	I-III	Ss	
Family: Isodiametridae							
<i>Baltalimania kosswigi</i> Ax, 1959	-	9	-	-	I	Ss	
<i>Otocelis rubropunctata</i> (Schmidt, 1852)	-	9	-	-	I	Ss	

Table. (Continued).

Family: Mecynostomidae

Paramecynostomum diversicolor (Örsted, 1845) - 9 - - I Hs, Ss

Family: Nadinidae

Nadina pulchella Uljanin, 1870 9 9 - - I Hs, Ss

Family: Otocelididae

Notocelis subsalina (Ax, 1959) - 9 - - I Hs

Family: Sagittiferidae

Symsagittifera schultzei (Schmidt, 1852) 9 9 - - I Hs

Family: Tauridae

Taurida fulvomaculata (Ax, 1959) 9 9 - - II, III Ss

Phylum: NEMATODA

Class: Chromadorea

Family: Anisakidae

Anisakis pegreffii Campana-Rouget & Biocca, 1955 61 - - - Pz on *Trachurus trachurus*

Anisakis simplex (Rudolphi, 1809) - 45 38 - Pz on various fish

Hysterothylacium aduncum (Rudolphi, 1802) 24 38 38 - Pz on various fish

Hysterothylacium fabri (Rudolphi, 1819) - - 38 - Pz on various fish

Family: Cucullanidae

Cucullanus hians (Dujardin, 1845) - - 59 - Pz on *Conger conger*

Cucullanus longicollis (Stossich, 1899) - - 38 - Pz on *Mullus surmuletus*

Dichelyne minutus (Rudolphi, 1819) 26 - - - Pz on various fish

Dichelyne tripapillatus (Gendre, 1927) - - 38 - Pz on various fish

Family: Cystidicolidae

Spinitectus oviflagellis Fourment, 1883 - 38 - - Pz on *Gaidropsarus mediterraneus*

Family: Gnathostomatidae

Echinocephalus spinosissimus von Linstow, 1905 - - 38 - Pz on *Raja clavata*

Family: Philometridae

Philometra filiformis (Stossich, 1896) - - - 35 Pz on *Pagellus erythrinus*

Philometra globiceps (Rudolphi, 1819) 67 - - - Pz on various fish

Philometra lateolabracis (Yamaguti, 1935) - - - 35 Pz on various fish

Philometra saltatrix Ramachandran, 1973 - - - 35 Pz on *Pomatomus saltatrix*

Class: Adenophorea

Family: Chromadoridae

Prochromadora megodonta Filipjev, 1922 16 - - - II Ss

Family: Comesomatidae

Sabatieria abyssalis (Filipjev, 1918) 16 - - - II Ss

Table. (Continued).

Family: Desmodoridae							
<i>Desmodora pontica</i> Filipjev, 1922	58	-	-	-	I	Ss	
Family: Enoplidae							
<i>Enoplus meridionalis</i> Steiner, 1921	-	-	40	-	I	Ss	
Family: Leptolaimidae							
<i>Halaphanolaimus sergeevae</i> Urkmez & Brennan, 2013	68	-	-	-	III-V	Ss	
Family: Linhomoeidae							
<i>Terschellingia longicaudata</i> de Man, 1907	58	-	-	-	I	Ss	
Phylum: ACANTHOCEPHALA							
Class: Eocanthocephala							
Family: Neoechinorhynchidae							
<i>Neoechinorhynchus (Hebesoma) agilis</i> (Rudolphi, 1819)	67	45	38	-	Pz	on Mullidae	
<i>Neoechinorhynchus (Neoechinorhynchus) rutili</i> (Müller, 1780)	48	-	-	-	Pz	on <i>Aphanius danfordii</i>	
Class: Palaecanthocephala							
Family: Arhythmacanthidae							
<i>Acanthocephaloides irregularis</i> Amin, Oğuz, Heckmann, Tepe & Kvach, 2011	67	-	-	-	Pz	on <i>Scorpaena porcus</i>	
<i>Acanthocephaloides propinquus</i> (Dujardin, 1845)	-	38	-	-	Pz	on various fish	
Family: Echinorhynchidae							
<i>Acanthocephalus lucii</i> (Müller, 1777)	-	-	-	38	Pz	on various fish	
<i>Solearhynchus rhytidotes</i> (Meyer, 1933)	-	38	-	-	Pz	on <i>Solea solea</i>	
Family: Illiosentidae							
<i>Telosentis exiguus</i> (von Linstow, 1901)	-	38	-	-	Pz	on <i>Platichthys flesus</i>	
Family: Pomphorhynchidae							
<i>Longicollum pagrosomi</i> Yamaguti, 1935	-	38	69	-	Pz	on various fish	
<i>Pomphorhynchus laevis</i> (Zoega in Müller, 1776)	-	-	38	-	Pz	on <i>Symphodus tinca</i>	
Phylum: MYXOZOA							
Class: Myxosporae							
Family: Ceratomyxidae							
<i>Ceratomyxa beloneae</i> Lubat, Radujkovic, Marques & Bouix, 1989	65	-	-	-	Pz	on <i>Belone belone</i>	
Family: Myxidiidae							
<i>Myxidium sphaericum</i> Thélohan, 1895	65	-	-	-	Pz	on <i>Belone belone</i>	
Phylum: TARDIGRADA							
Class: Heterotardigrada							
<i>Dipodarctus subterraneus</i> (Renaud-Debyser, 1959)	64	-	-	-	III-IV	Ss	
<i>Tanarctus ramazzotti</i> Renaud-Mornant, 1975	64	-	-	-	III-V	Ss	

Table. (Continued).

Phylum: CEPHALORHYNCHA**Class: Kinorhyncha****Family: Pycnophyidae**

<i>Pycnophyes communis</i> Zelinka, 1908	11	-	-	-	III	Ss
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Phylum: NEMERTEA**Class: Anopla****Family: Lineidae**

<i>Cerebratulus fuscus</i> (McIntosh, 1874)	-	5	-	PS ³	I	Hs
<i>Cerebratulus marginatus</i> Renier, 1804	16	-	-	-	II	Ss
<i>Cerebratulus urticans</i> (Müller, 1854)	-	-	40	-	I	Ss
<i>Lineus bilineatus</i> (Renier, 1804)	16	5	-	-	I	Hs
<i>Lineus longissimus</i> (Gunnerus, 1770)	-	5	-	-	I	Hs
<i>Lineus ruber</i> (Müller, 1774)	16	-	40	PS ³	I, II	Hs, Ss
<i>Micrura aurantiaca</i> (Grube, 1855)	-	-	-	PS ³	II	Hs
<i>Micrura fasciolata</i> Ehrenberg, 1828	16	5	-	-	I, II	Hs, Ss
<i>Micrura tristis</i> (Hubrecht, 1879)	16	-	-	-	II	Ss
<i>Notospermus geniculatus</i> (Delle Chiaje, 1828)	16	-	-	PS ³	II	Hs, Ss
<i>Pussylineus gabriellae</i> Corrêa, 1956	16	-	-	-	II	Ss
<i>Ramphogordius lacteus</i> Rathke, 1843	16	5	-	-	I, II	Hs, Ss

Family: Valenciniidae

<i>Baseodiscus delineatus</i> (Delle Chiaje, 1825)	-	29	-	PS ³	II	Ss
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Class: Enopla**Family: Drepanogigantidae**

<i>Drepanogigas albolineatus</i> (Bürger, 1895)	-	-	-	PS ³	II	Hs
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Family: Drepanophoridae

<i>Drepanophorus spectabilis</i> (Quatrefages, 1846)	-	29	-	-	II	Ss
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Family: Emplectonematidae

<i>Emplectonema gracile</i> (Johnston, 1837)	-	5	51	PS ³	I	Hs
<i>Nemertopsis bivittata</i> (Delle Chiaje, 1841)	16	-	51	-	I, II	Hs, Ss

Family: Malacobdellidae

<i>Malacobdella grossa</i> (Müller, 1776)	16	-	-	-	II	Ss
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Family: Prosorhochmidae

<i>Prosorhochmus claparedii</i> Keferstein, 1862	-	-	51	PS ³	I	Hs
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Family: Tetrastemmatidae

<i>Tetrastemma coronatum</i> (Quatrefages, 1846)	16	5	-	-	I	Hs
<i>Tetrastemma flavidum</i> Ehrenberg, 1828	-	5	-	-	I	Hs

Table. (Continued).

Class: Palaeonemertea

Family: Cephalothricidae

Cephalothrix linearis (Rathke, 1799) 16 - - - II Ss

Family: Tubulanidae

Carinina heterosoma Müller, 1965 16 - - - II Ss

Tubulanus superbus (Kölliker, 1845) - PS¹ - PS³ II Ss

Tubulanus linearis (McIntosh, 1874) - - 51 60 I-III Hs, Ss

Tubulanus polymorphus Renier, 1804 - - 40 60 I, II Hs, Ss

Phylum: ECHIURA

Class: Echiuroidea

Family: Bonellidae

Bonellia viridis Rolando, 1821 - 2 57 PS³ II Hs = *Bonellia fuliginosa*

Phylum: BRACHIOPODA

Class: Rhynchonellata

Family: Kraussinidae

Megerlia truncata (Linnaeus, 1767) - 5 - - II, III Hs

Family: Megathyrididae

Argyrotheca cuneata (Risso, 1826) - 4 - - III Ss

Joania cordata (Risso, 1826) - 4 - - III Ss

Megathiris detruncata (Gmelin, 1789) - 4 - - III Ss = *Megathyrus decollata*

Phylum: PHORONIDA

Phoronis muelleri Selys-Lonchamps, 1903 - - 27 31 I, II Ss

Phoronis hippocrepi Wright, 1856 - - 51 - I Hs

Phoronis psammophila Cori, 1889 31 - 31 31 I, II Ss

Phoronis australis Haswell, 1883 - - PS² PS³ I, II Ss

Phylum: CHAETOGNATHA

Class: Sagittoidea

Family: Sagittidae

**Ferosagitta galerita* (Dallot, 1971) - - - 49 I, II P

Flaccisagitta enflata (Grassi, 1881) - 43 13 32 I-III P

Mesosagitta minima (Grassi, 1881) - - - 32 I, II P

Parasagitta friderici (Ritter-Záhony, 1911) - - - 49 I, II P

Parasagitta megalophthalma (Dallot & Ducret, 1969) - 15 - 32 I, II P

Parasagitta setosa (Müller, 1847) 10 30 28 32 I-IV P

Parasagitta tenuis (Conant, 1896) - - - 32 I, II P

Table. (Continued).

<i>Pseudosagitta lyra</i> (Krohn, 1853)	-	-	-	49	I, II	P	
<i>Serratosagitta serratodentata</i> (Krohn, 1853)	-	-	13	32	I, II	P	
<i>Sagitta bipunctata</i> Quoy & Gaimard, 1828	6	8	-	32	I, II	P	
Phylum: CHORDATA							
Subphylum: TUNICATA							
Class: Ascidiacea							
Family: Ascidiidae							
<i>Ascidia involuta</i> Heller, 1875	-	-	-	57	II	Hs	
<i>Ascidia malaca</i> (Traustedt, 1883)	-	4	-	-	II	Ss	
<i>Ascidia mentula</i> Müller, 1776	20	2	20	PS ³	I, II	Hs	
<i>Ascidia virginea</i> Müller, 1776	14	3	17	PS ³	II, III	Hs	
<i>Asciadiella aspersa</i> (Müller, 1776)	20	2	17	20	I-III	Hs, Ss	= <i>Ascidia cristata</i>
<i>Phallusia fumigata</i> (Grube, 1864)	-	4	12	PS ³	I-III	Hs	
<i>Phallusia ingeria</i> Traustedt, 1883	-	4	-	-	II	Hs	= <i>Ascidia marioni</i>
<i>Phallusia mammillata</i> (Cuvier, 1815)	-	2	17	36	I, II	Ss	
* <i>Phallusia nigra</i> Savigny, 1816	-	-	57	41	I, II	Hs	
Family: Clavelinidae							
<i>Clavelina dellavallei</i> (Zirpolo, 1825)	-	-	57	-	II	Hs	
<i>Clavelina lepadiformis</i> (Müller, 1776)	-	-	34	47	I	Hs	
Family: Clionidae							
<i>Ciona intestinalis</i> (Linnaeus, 1767)	14	20	12	20	I-III	Hs, Ss	
<i>Ciona roulei</i> Lahille, 1887	-	-	PS ²	PS ³	II	Hs	
Family: Corellidae							
<i>Corella parallelogramma</i> (Müller, 1776)	-	4	-	-	II, III	Hs	
Family: Diazonidae							
<i>Diazona violacea</i> Savigny, 1816	-	-	20	36	II-IV	Hs, Ss	
<i>Rhopalaea neapolitana</i> Philippi, 1843	-	2	20	-	II, III	Hs	
Family: Didemnidae							
<i>Didemnum commune</i> (Della Valle, 1877)	-	2	-	-	II	Hs	
<i>Didemnum maculosum</i> (Milne-Edwards, 1841)	-	4	25	57	I, II	Ss	= <i>Leptoclinum dentatum</i>
<i>Diplosoma listerianum</i> (Milne-Edwards, 1841)	-	4	21	-	I, II	Hs	= <i>Diplosoma cristallinum</i>
Family: Molgulidae							
<i>Eugyra adriatica</i> Drasche, 1884	-	4	-	-	I, II	Ss	
<i>Molgula manhattensis</i> (De Kay, 1843)	-	20	20	52	I-III	Hs, Ss	

Table. (Continued).

<i>Molgula appendiculata</i> Heller, 1877	14	70	-	-	II	Ss	
<i>Molgula impura</i> Heller, 1877	-	4	-	-	I, II	Hs	
<i>Molgula occidentalis</i> Traustedt, 1883	-	-	51	-	I	Hs	
<i>Molgula occulta</i> Kupffer, 1875	-	3	-	-	II	Hs	
Family: Polyclinidae							
<i>Aplidium conicum</i> (Olivi, 1792)	-	-	20	36	I, II	Hs	
<i>Aplidium elegans</i> (Giard, 1872)	-	-	57	57	II	Hs	
<i>Aplidium turbinatum</i> (Savigny, 1816)	-	70	-	PS ³	I, II	Hs	
<i>Polyclinella azemai</i> Harant, 1930	-	-	-	PS ³	I	Hs	
Family: Polycitoridae							
<i>Cystodytes dellechiajei</i> (Della Valle, 1877)	-	4	-	-	II	Hs	= <i>Cystodytes cretaceus</i>
Family: Pycnoclavellidae							
<i>Pycnoclavella aurilucens</i> Garstang, 1891	-	-	-	36	I, II	Hs	
<i>Pycnoclavella nana</i> (Lahille, 1890)	-	70	57	47	I	Hs	
<i>Pycnoclavella taureanensis</i> Brunetti, 1991	-	-	-	36	I, II	Hs	
Family: Pyuridae							
<i>Halocynthia papillosa</i> (Linnaeus, 1767)	-	2	20	36	I-III	Hs	
* <i>Herdmania momus</i> (Savigny, 1816)	-	-	-	41	I, II	Hs, SS	
* <i>Microcosmus exasperatus</i> Heller, 1878	-	-	66	PS ³	I	Hs	
<i>Microcosmus polymorphus</i> Heller, 1877	-	-	56	PS ³	II	Ss	
<i>Microcosmus sabatieri</i> Roule, 1885	-	-	-	47	I	Hs	
<i>Microcosmus vulgaris</i> Heller, 1877	-	4	20	47	I-IV	Hs	= <i>Microcosmus sulcatus</i>
<i>Pyura dura</i> (Heller, 1877)	-	-	40	PS ³	I	Hs, Ss	
<i>Pyura microcosmus</i> (Savigny, 1816)	-	4	-	-	II	Ss	= <i>Cynthia scutellata</i>
<i>Pyura squamulosa</i> (Alder, 1863)	-	4	20	-	I, II	Hs	= <i>Cynthia dura</i>
Family: Styleidae							
<i>Botrylloides leachii</i> (Savigny, 1816)	-	-	-	19	I	Hs	
<i>Botryllus renierii</i> (Lamarck, 1815)	-	5	-	-	I, II	Hs	
<i>Botryllus schlosseri</i> (Pallas, 1766)	11	5	19	19	I-III	Hs	
<i>Distomus variolosus</i> Gaertner, 1774	-	4	-	-	II, III	Hs, Ss	= <i>Polycarpa glomerata</i>
<i>Polycarpa pomaria</i> (Savigny, 1816)	-	4	20	-	I, II	Hs	= <i>Polycarpa varians</i>
<i>Styela canopus</i> (Savigny, 1816)	-	4	40	19	I, II	Hs	= <i>Styela partita</i>
<i>Styela plicata</i> (Lesueur, 1823)	-	-	20	19	I-III	Hs, Ss	
* <i>Symplegma brakenhielmi</i> (Michaelsen, 1904)	-	-	-	41	I	Hs	

Table. (Continued).

Class: Thaliacea

Family: Doliolidae

<i>Doliolina (Doliolina) muelleri</i> (Krohn, 1852)	-	4	28	-	I, II	P
<i>Doliolum denticulatum</i> Quoy & Gaimard, 1834	-	-	28	-	I	P

Family: Salpidae

<i>Thalia democratica</i> (Forskål, 1775)	-	7	18	-	I, II	P
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Class: Appendicularia

Family: Oikopleuridae

<i>Oikopleura (Vexillaria) dioica</i> Fol, 1872	6	8	13	-	I-IV	P
<i>Oikopleura (Coecaria) fusiformis</i> Fol, 1872	-	-	13	-	I	P
<i>Stegosoma magnum</i> (Langerhans, 1880)	-	-	28	-	I	P
<i>Oikopleura (Vexillaria) cophocerca</i> (Gegenbaur, 1855)	-	-	-	46	II	P
<i>Oikopleura (Coecaria) longicauda</i> (Vogt, 1854)	-	-	22	-	I	P

Family: Fritillariidae

<i>Fritillaria borealis</i> Lohmann, 1896	-	-	22	-	I	P
<i>Fritillaria pellucida</i> (Busch, 1851)	-	-	18	-	I, II	P
<i>Tectillaria fertilis</i> (Lohmann, 1896)	-	-	18	-	I, II	P

Subphylum: CEPHALOCHORDATA

Class: Leptocardii

Family: Branchiostomatidae

<i>Branchiostoma lanceolatum</i> (Pallas, 1774)	-	4	44	PS ³	I, II	Ss	= <i>Amphioxus lenceolatus</i>
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Subphylum: HEMICHORDATA

Class: Enteropneusta

Family: Spengelidae

<i>Glandiceps talaboti</i> Marion, 1876	-	4	-	37	II-V	Ss
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Family: Ptychoderidae

<i>Balanoglossus clavigerus</i> Delle Chiaje, 1829	-	-	-	37	II	Ss
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1. Forbes, 1843; 2. Colombo, 1885; 3. Ostroumoff, 1894; 4. Ostroumoff, 1896; 5. Demir, 1952; 6. Demir, 1954a; 7. Demir, 1954b; 8. Nalbantoğlu, 1955; 9. Ax, 1959a; 10. Einarsson and Gürtürk, 1959; 11. Băcescu, 1961; 12. Kiseleva, 1961; 13. Ergen, 1967; 14. Kiseleva, 1969; 15. Ören, 1970; 16. Băcescu et al., 1971; 17. Geldiay and Kocataş, 1972; 18. Gökalp, 1972; 19. Pınar, 1974; 20. Uysal, 1976; 21. Kocataş, 1978; 22. Mavili, 1987; 23. Balkis, 1992; 24. Doğanay, 1994; 25. Ergen et al., 1994; 26. Avşar, 1997; 27. Çınar et al., 1998; 28. Tarkan, 2000; 29. Uysal et al., 2002; 30. Yüksek et al., 2002; 31. Emig et al., 2003; 32. İşmen et al., 2003; 33. Akmirza, 2004; 34. Dinçaslan and Öber, 2004; 35. Moravec and Genc, 2004; 36. Öztürk et al., 2004; 37. Çevik and Ergüden, 2005; 38. Öktener, 2005; 39. Tokşen and Gamsız, 2005; 40. Çınar et al., 2006b; 41. Çınar et al., 2006a; 42. Oğuz and Bray, 2006; 43. Svetlichny et al., 2006; 44. Aydın et al., 2007; 45. Keser et al., 2007; 46. Lakkis and Toklu, 2007; 47. Okuş et al., 2007; 48. Özer, 2007; 49. Terbiyik et al., 2007; 50. Öztürk and Özer, 2008; 51. Çınar et al., 2008; 52. Mutlu and Ergev, 2008; 53. Oğuz and Bray, 2008; 54. Bulnes et al., 2009; 55. Bulnes, 2010; 56. Aslan Cihangir et al. 2011; 57. Gözcelioğlu, 2011; 58. Ürkmez et al., 2011; 59. Akmirza, 2012; 60. Çınar et al., 2012; 61. Utuk et al., 2012; 62. Akmirza, 2013a; 63. Akmirza, 2013b; 64. Kharkevych and Sergeeva, 2013; 65. Özer and Yurakhno, 2013; 66. Ramos-Espla et al., 2013; 67. Tepe and Oğuz, 2013; 68. Ürkmez and Brennan, 2013; 69. Akmirza, 2014; 70. Artüz et al., 2014; 71. Özer and Güneydağ, 2014; 72. Tepe et al., 2014.

phyla, Platyhelminthes had the highest number of species (186 species), followed by Chordata (64 species), Nemertea (26 species), Nematoda (20 species), Xenacoelomorpha (11 species), Chaetognatha (10 species), Acanthocephala (9 species), Brachiopoda (4 species), Phoronida (4 species), Myxozoa (2 species), Tardigrada (2 species), Cephalorhyncha (1 species), and Echiura (1 species) (Table; Figure 2).

In the present study, 2 platyhelminth (*Planocera cf. graffi* and *Prosthecaerus vittatus*), 2 nemertean (*Drepanogigas albolineatus* and *Tubulanus superbus*), 1 phoronid (*Phoronis australis*), and 2 ascidian (*Polyclinella*

azemai and *Ciona roulei*) species are being newly recorded for the first time from the coasts of Turkey. Some notes regarding these species follow below.

Planocera cf. graffi Lang, 1879

(Figure 3A)

Notes: Body oval, almost 40 mm long, thin, pale brownish with white specks irregularly distributed on dorsal side of body, translucent; branched intestine visible through body wall, brownish, with white area in mid-dorsum. Two long, slender tentacles located far behind anterior end. Many eyes around tentacle base.

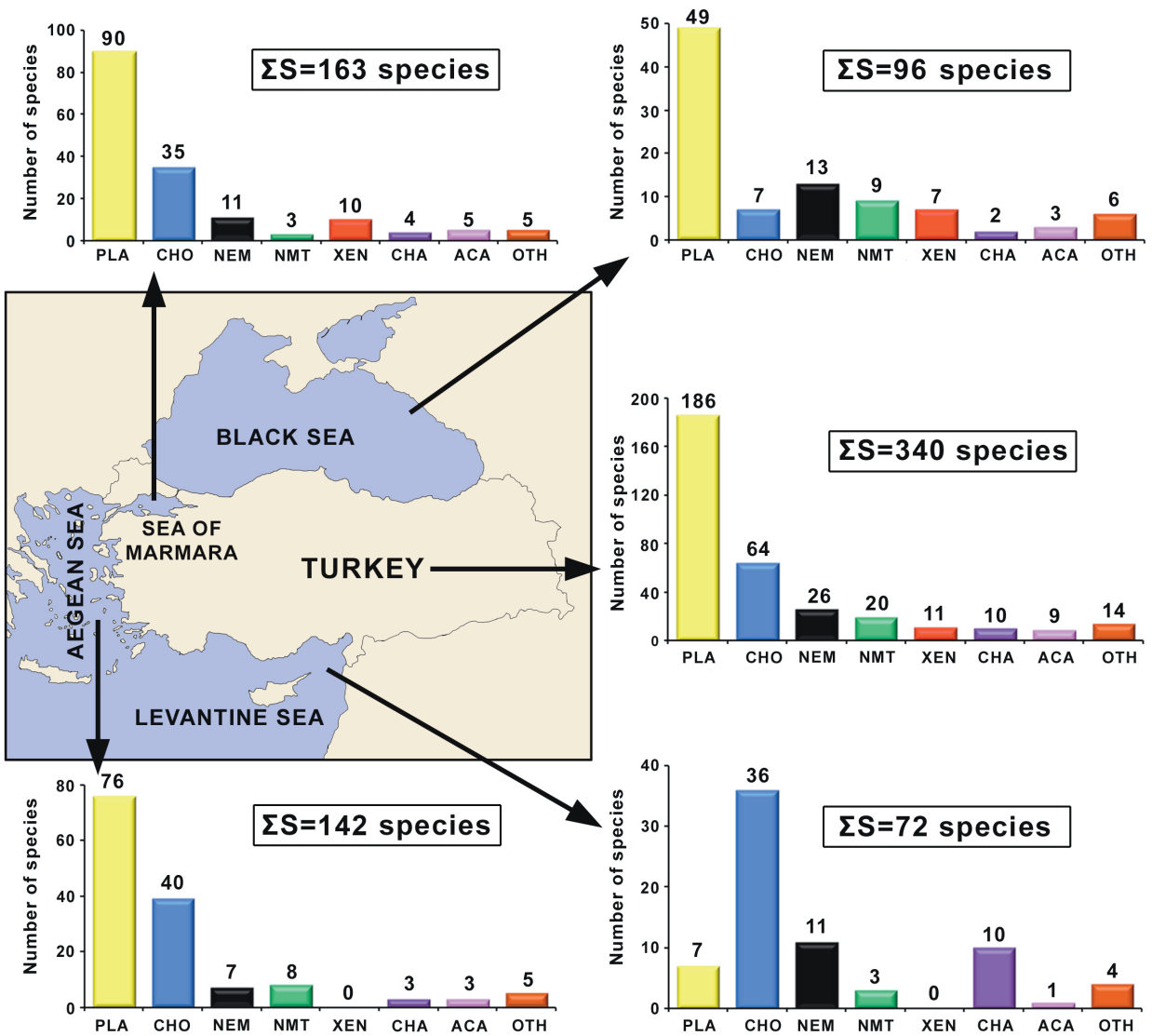


Figure 2. The number of species of the phyla Platyhelminthes (PLA), Chordata (Tunicata, Cephalochordata, and Hemichordata) (CHO), Nemertea (NEM), Nematoda (NMT), Xenacoelomorpha (XEN), Chaetognatha (CHA), Acanthocephala (ACA), and others (OTH, including Echiura, Myxozoa, Brachiopoda, Cephalorhyncha, Tardigrada, and Phoronida) along the coasts of Turkey. ΣS indicates the total number of species.

Distribution: This species was found on and under rocks (2 specimens) at 5 m depth at station 3. It is an Atlanto-Mediterranean species (Hofrichter, 2003).

Prostheceraeus vittatus (Montagu, 1815)
(Figure 3B)

Notes: Body dorsoventrally flattened, 20 mm long, background cream-colored, with 17–18 longitudinal black stripes extending from head to posterior end; a longitudinal stripe in mid-dorsum of body thicker than others; dark pigmentation patches concentrated on bases of tentacles. Head with sharp tentacles; with small eyes at base.

Distribution: This species was solely observed on a *Halophila stipulacea* bed (3 specimens) at 25 m depth at station 3. It is an Atlanto-Mediterranean species (Hofrichter, 2003).

Tubulanus superbis (Kölliker, 1845)
(Figure 3C)

Notes: Body thick, ca. 35 cm long, gradually narrowing behind distinct rounded head to bluntly pointed tail. Color dark reddish brown, marked with mid-ventral, mid-dorsal, and lateral longitudinal white stripes and almost 120 white rings. First 2 and 3 rings widely spaced, the others closer together and somewhat uniformly distributed along body.

Distribution: This species was found on muddy sand bottom (1 specimen) at 50 m depth in the Sea of Marmara (station 1) and at 25 m depth in Fethiye Bay (station 3). It is an Atlanto-Mediterranean species (Gibson, 1994).

Drepanogigas albolineatus (Bürger, 1895)

Notes: Body slender, dorsoventrally flattened, tapering gradually, up to 7 cm long. Head is relatively small, heart-shaped, clearly separated from body. Background color

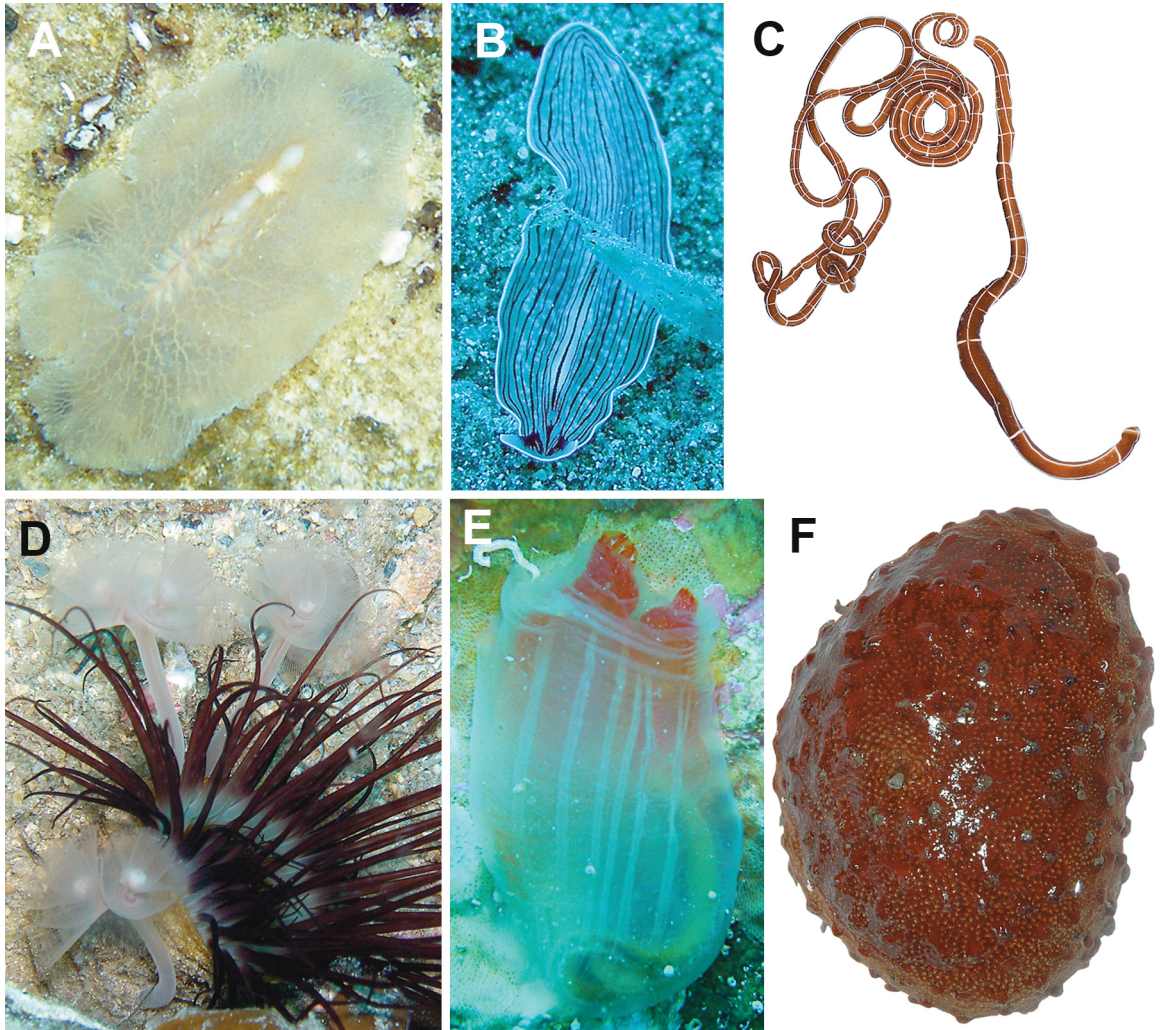


Figure 3. A) *Planocera* cf. *graffi* at station 3, B) *Prostheceraeus vittatus* at station 3, C) *Tubulanus superbis* at station 1, D) *Phoronis australis* at station 2, E) *Ciona roulei* at station 3, F) *Polyclinella azemai* at station 3 (photographed by ME Çınar).

reddish-brown, dorsum with 5 white longitudinal stripes. Eyes large, numerous.

Distribution: This species was only observed on sandy bottom (1 specimen) at 20 m depth at station 3. It is an Atlanto-Mediterranean species (Wirtz, 2006).

Phoronis australis Wright, 1856

(Figure 3D)

Notes: Specimens 30–45 mm in length, 1–2 mm in diameter. Live coloration light pink, while lophophore white and spiraled (2.5–3.4 turns). Tentacles 2–4 mm long, numbering ca. 800–1000 per individual.

Distribution: This species was observed only in association with tubes of *Cerianthus membranaceus* (Spallanzani, 1784) (many specimens) at 10–20 m depths at stations 2 and 3. It is an Atlanto-Mediterranean species (Ocaña et al., 1991).

Ciona roulei Lahille, 1887

(Figure 3E)

Notes: Tunic smooth, 7 cm long. Animal transparent with reddish area around siphons; with 8 buccal lobes. Each side of body having 4 major muscle bundles.

Distribution: It was found under stones (6 specimens) at 15 m at stations 2 and 3. It is a species endemic to the Mediterranean (Harant and Vernières, 1933).

Polyclinella azemai Harant, 1930

(Figure 3F)

Notes: A colonial species, with a ball-like appearance, ca. 3 cm in diameter, brownish-red in color. Surface shining with sand inclusions. Zooids almost 5 mm in length.

Distribution: A colony of this species was only encountered on a rock at 3 m depth near Fethiye Harbor. It is a species endemic to the Mediterranean Sea (Harant and Vernières, 1933).

Three species were excluded from the checklist: 1) Öktener (2005) reported *Scolex pleuronectis* Müller, 1788 (Cestoda) on different fishes collected from the Sea of Marmara and the Aegean Sea, but Bray (2014) regarded the species name as unacceptable as it is in fact a larval name; 2) *Ascidia cretacea* was identified as a new species by Ostroumoff (1896) at 496 m depth in the Sea of Marmara, but as he did not provide a detailed description or figures, this species name was regarded as nomen nudum; 3) the actual status of *Desmodora pontica* Filipjev, 1922, which was reported from the Sinop Peninsula by Ürkmez et al. (2011), is unaccepted (Vanaverbeke and Vincx, 2014).

The phylum Platyhelminthes was represented by 81 free-living species and 105 parasitic species on the coasts of Turkey. Within this phylum, the class Trematoda was represented by 57 species, Monogenea by 33 species, Cestoda by 13 species, and Rhabditophora by 83 species. The class Rhabditophora included all free-living flatworms known from the area, except for *Graffilla parasitica* and

Urastoma cyprinae, the former of which infected the sea slug *Tethys fimbria* in İzmir Bay (Forbes, 1844). The parasitic flatworms were exclusively reported on fishes, but *Parvatrema duboisi* and *Urastoma cyprinae* were only reported on the mussel *Mytilus galloprovincialis* Lamarck, 1819 in the Black Sea (Özer and Güneydağ, 2014).

The highest number of invertebrate Chordata species (36 species) was encountered on the Levantine coast of Turkey (Figure 2). No species of Xenacoelomorpha was reported from the Aegean Sea or Levantine Sea, whereas this phylum was represented by 3 species in the Sea of Marmara and 7 species in the Black Sea. One or 2 species of the phyla Myxozoa, Tardigrada, and Cephalorhyncha were determined only in the Black Sea (Băcescu, 1961; Kharkevych and Sergeeva, 2013; Özer and Yurakhno, 2013). Except for the Black Sea, *Bonellia viridis*, an echiuran species, was reported from all coasts of Turkey. Of the subphyla of Chordata considered in this paper, Tunicata had the highest number of species (61 species), followed by Hemichordata (2 species) and Cephalochordata (1 species).

The majority of the free-living flatworms (class Rhabditophora) were found in muddy or sandy bottoms (48 species), whereas 27 species were only reported on hard bottoms. Only 4 rhabditophoran species (*Promesostoma maculosum*, *Duplominona istanbulensis*, *Microstomum papillosum*, and *Cylindromacrostomum mediterraneum*) were found at depths deeper than 100 m, while the other species were distributed between 0 and 50 m. Almost 50% of the acoel worms within the phylum Xenacoelomorpha reported from Turkey occurred on soft substrata. Of the 20 nematode species present in the marine fauna of Turkey, 6 species are free-living, occurring on the soft substrata at depths ranging from 0 to 200 m, while the others are parasitic on different fishes including *Raja clavata* Linnaeus 1758, *Gaidropsarus mediterraneus* (Linnaeus 1758), and *Mullus surmuletus* Linnaeus 1758. Two tardigrades (*Dipodarcus subterraneus* and *Tanarctus ramazzotti*) were reported on muddy substratum at 88–250 m depth in the pre-Bosphorus region (Kharkevych and Sergeeva, 2013). In Turkey, the nemertean, echiuran, and phoronid species were found only in shallow-water benthic habitats, whereas the brachiopod species generally inhabited depths deeper than 50 m. *Phoronis australis* was always observed in association with the actinarian species *Cerianthus membranaceus* (present study). Except for Thaliacea and Appendicularia, which are zooplankton, the invertebrate Chordata species were generally found on hard substrata in shallow waters.

Since studies on the free-living species of the phyla Platyhelminthes and Xenacoelomorpha are mainly concentrated on the İstanbul Strait and its vicinity (i.e. Ax, 1959a, 1959b), the highest number of species were

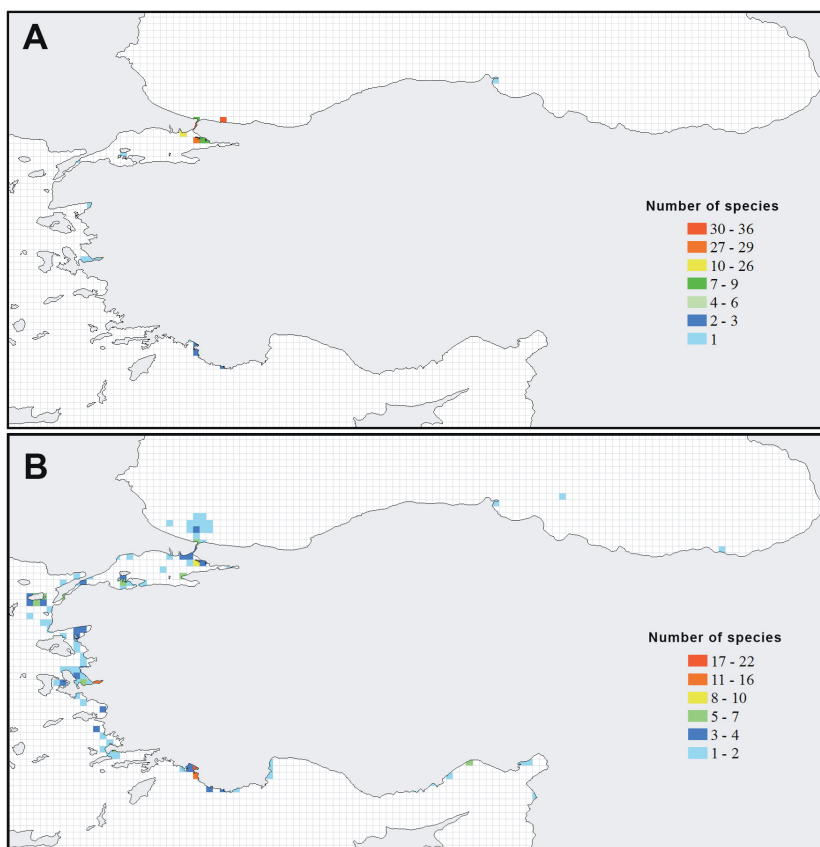


Figure 4. The distribution of the number of free-living flatworm (class: Rhabditophora) and Xenacoelomorpha species (A) and Tunicata (B) species along the coasts of Turkey. Each grid has a dimension of 15 × 15 km.

reported from these areas (Figure 4A). Along the coasts of Turkey, these animals have only been reported in 7 areas. In the Aegean Sea, only 6 polyclad species have been reported from the inner part of İzmir Bay (near Alsancak Harbor), 5 of which (*Imogine melihertani*, *Pseudoplanocera izmirensis*, *Izmira cinari*, *Izmira turkeyi*, and *Pseudodiscocelis aegeanensis*) were described as new to science (Bulnes, 2010). On the Levantine coast of Turkey, 6 flatworm species (*Prostheceraeus roseus*, *Prostheceraeus vittatus*, *Prostheceraeus giesbrechtii*, *Stylostomum ellipse*, *Planocera* cf. *graffi*, and *Pseudoceros maximum*) have been encountered up to date, mainly from Fethiye Bay and Kaş (Gözcelioğlu, 2011; this study).

İzmir Bay and Fethiye Bay can be classified as hotspot areas in terms of the number of tunicate species (Figure 4B). The tunicate fauna of the Black Sea and the Levantine coasts of Turkey is little-known, except for the Black Sea entrance of the İstanbul Strait and Fethiye Bay. However, tunicates were determined in many parts of the Aegean Sea. As for the pelagic class of Tunicata, Appendicularia, it can be seen in Figure 5 that the highest number of species have been reported from the Aegean Sea (specifically

from İzmir Bay, Kuşadası Bay, and off Akköy). Except for İskenderun Bay, where only *Oikopleura (Vexillaria) cophocerca* was reported (Lakkis and Toklu, 2007), the Levantine coast of Turkey remained unexplored for this group of animals. In the Black Sea and the Sea of Marmara, only *Oikopleura (Vexillaria) dioica* was encountered (i.e. Kiseleva, 1969; İşinibilir et al., 2011).

Four alien tunicate (*Symplegma brakenhielmi*, *Microcosmus exasperatus*, *Herdmania momus*, and *Phallusia nigra*) and 1 alien chaetognath (*Ferosagitta galerita*) species were reported from the coast of Turkey. Except for *M. exasperatus*, which was recently reported from İzmir Bay (Ramos-Espla et al., 2013), these species were previously included in the marine alien species list of Turkey (Çinar et al., 2011). All species were introduced to the Mediterranean Sea from the Red Sea via the Suez Canal (Lessepsian migrants).

The present study shed more light on the diversity of the phyla Platyhelminthes, Xenacoelomorpha, Nematoda, Acanthocephala, Myxozoa, Tardigrada, Cephalorhyncha, Nemertea, Echiura, Brachiopoda, Phoronida, Chaetognatha, and Chordata (invertebrates,

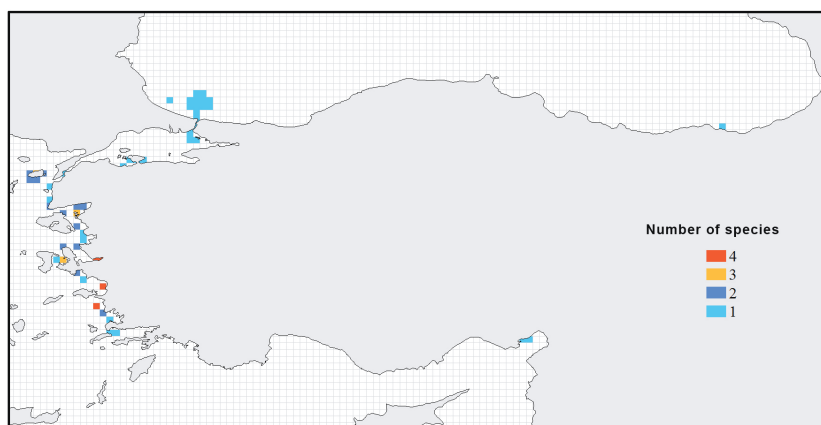


Figure 5. The distribution of the number of Appendicularia (Tunicata) species along the coasts of Turkey. Each grid has a dimension of 15×15 km.

only Tunicata, Cephalochordata, and Hemichordata), the majority of which have not been specifically studied in Turkey. The number of species given in the checklist in fact does not reflect the real diversity of these phyla along the coasts of Turkey since many areas and biotopes, especially deep water and coralligenous habitats, still remained largely unexplored.

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