

REVIEW ARTICLE

A check-list of polychaete species (Annelida: Polychaeta) from the Black Sea

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Abstract

Polychaetes from the Black Sea were reviewed based on the available literature. Lists of the valid species, re-assigned species and dubious species (*nomen dubium* or indeterminable species) reported from the region are provided. The checklist comprises 238 valid species belonging to 45 families. Twenty three species belonging to 8 families were considered as *nomen dubium* or indeterminable. Fifty-one species reported from the Black Sea between 1868 and 2011 have been synonymised with other species. Among the Black Sea countries, the coast of Bulgaria is represented by the highest number of polychaete species (192 species), followed by the coasts of Ukrania (161 species) and Romania (115 species). The highest number of species (119 species) were found on sandy substratum, the lowest number of species (7 species) on sponges. Nine alien polychaete species (*Hesionides arenaria*, *Streptosyllis varians*, *Glycera capitata*, *Nephtys ciliata*, *Polydora cornuta*, *Prionospio pulchra*, *Streblospio gynobranchiata*, *Capitellethus dispar* and *Ficopomatus enigmaticus*) were reported from the Black Sea up to now. The most speciose families in the area were Syllidae (32 species), Spionidae (31 species), Phyllodocidae (16 species) and Nereididae (15 species). By presenting a complete overview of the species reported from the area, this work summarises our current knowledge about the diversity of the Black Sea polychaetes and provides a database for future studies.

Keywords: Polychaeta, annelida, check-list, Black Sea

Introduction

The Black Sea is one of the largest enclosed seas in the world, covering an area of about 4.2 x 10⁵ km²; the maximum depth of the sea is 2212 m and the total volume of water of 534.000 km³. Most of this water (423.000 km³ that lies below a depth of 150–200 m) is anoxic and contaminated with hydrogen sulphide. The Black Sea drainage basin covers more than 2 million km² and

more than 160 million people live in this area. The total length of the Black Sea coastline is over 4400 km. Six countries (Turkey, Bulgaria, Romania, Ukraine, Russian Federation and Georgia) border the Black Sea. The large variety of geomorphologic types of these coasts corresponds to different geological environments surrounding the Black Sea (Panin 2005).

The scientific researches concerning polychaetes in the Black Sea were started during the late 1800s. The first detailed studies on polychaetes in the Black Sea were made by Bobretzky (1868, 1870, 1871, 1881) and Czerniavsky (1880, 1881, 1882). Bobretzky performed his studies in the Gulf of Sevastopol and Czerniavsky focused on polychaetes distributed along the coasts of Yalta and Sukhumi.

The polychaete species living along the Turkish coast of the Black Sea were reported in a few papers (Pinar 1974; Bat *et al.* 2000; Çinar and Gönllügür-Demirci 2005; Ağırbaş *et al.* 2008; Gökkurt *et al.* 2008; Gözler *et al.* 2009, 2010; Dagli and Cinar 2011). Polychaetes inhabiting the Prebosphoric region of the Black Sea were studied by Jakubova (1948), Marinov (1959b, 1964), Caspers (1968), Dumitrescu (1960, 1962), Rullier (1963), Gillet and Ünsal (2000) and Uysal *et al.* (2002).

Polychaetes living along the coasts of Bulgaria, Romania and Ukraine were relatively well studied. The Bulgarian polychaeta fauna were analysed by Marinov (1957a, 1957b, 1959a, 1959b, 1960, 1963, 1964, 1966a, 1966b, 1977), Kaneva-Abadjieva and Marinov (1966, 1977), Marinov and Kaneva-Abadjieva (1982), Marinov and Stojkov (1990), Stoykov and Ouzounova (1998), Todorova and Konsulova (2000), Stoykov and Uzunova (2001) and Uzunova (2010). The Romanian polychaetes were studied by Dumitrescu (1957, 1962, 1963, 1973), Dumitrescu and Marcus (1967), Pitis and Lacatusu, (1971), Adriescu (1977), Băcescu (1977), Gutu and Marinescu (1979), Manoleli (1967, 1969, 1973, 1980), Gomoiu (1982), Gomoiu *et al.* (2004), Țigănuș (1972, 1975, 1986, 1988), Surugiu and Manoleli (1998–1999), Surugiu (2000, 2003, 2005, 2005, 2009), Surugiu and Novac (2007), Paraschiv *et al.* (2001, 2007), Teacă *et al.* (2006), Begun *et al.* (2006, 2010), Vorobyova and Bondarenko (2009) and Wenzhöfer *et al.* (2002). The polychaete fauna from the Ukrainian coasts were encountered by a number of researchers [e.g. Jakubova (1930, 1935), Arnoldi (1941), Vinogradov (1949), Vinogradov and Losovskaya (1963), Vinogradov *et al.* (1967), Kisseleva (1981, 1988, 1992a, 1992b, 2004), Moroz (1985), Makkaveeva *et al.* (1993), Losovskaya and Sinigub (2002), Losovskaya and Nesterova (1964), Losovskaya *et al.* (2004), Losovskaya (2008), Grintsov and Murina, 2002, Grintsov *et al.* (2005, 2008), Alexandrov *et al.* (2007), Boltacheva *et al.* (1999, 2006), Revkov *et al.* (2002), Mazlumyan *et al.* (2004), Boltacheva and Lisitskaya (2007), Boltacheva (2008) and Lisitskaya *et al.* (2010)].

The aims of this study is to summarise the available information about the polychaete diversity in the Black Sea and to prepare a database for the Black Sea polychaetes.

Materials and Methods

The checklist for the polychaete species reported from the Black Sea was made following an exhaustive bibliographic review and analysis of the published articles. For the checklist, species names recorded in publications concerning the Black Sea were compiled, checked for their validity and synonyms made evident. The valid species, dubious species (considered as *nomen dubium* or indeterminable) and synonymised species are given in the different tables (Tables 1, 2, 3). The polychaeta diversity in the Black Sea were examined according to the countries (including Prebosphoric region): Turkey, Bulgaria, Romania, Ukraine, Russia and Georgia. In each country, all reports of the species are given as numbers in Table 1 that are indicated in the reference section. When available, ecological data in the papers are also evaluated. All calculations are based on the valid species.

Result and Discussion

Polychaete Diversity

As a result of the compilations of papers on polychaetes reported from the Black Sea between 1868 and 2011, a total of 238 valid species belonging to 45 families were determined (Table 1).

Table 1. Check-list of polychaete species reported from the Black Sea and their reports in countries (including Prebosphoric region). The species marked with an asterisk are alien species for the Black Sea (P= Prebosphoric region, T= Turkey, B= Bulgaria, Ro= Romania, U= Ukraine, Ru= Russia, G= Georgia). Numbers correspond to references.

| | P | T | B | Ro | U | Ru | G |
|---|---|----|----|-----------------|-----------------------------|----|---|
| POLYNOIDAE | | | | | | | |
| <i>Harmothoe extenuata</i> (Grube, 1840) | - | - | 74 | 27,31,71, 95 | 24,43, 52,71, 109-111 | - | - |
| <i>Harmothoe gilchristi</i> Day, 1960 | - | 25 | - | - | - | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|--|--------------|----------|--|--|---|------------------------|----------|
| <i>Harmothoe imbricata</i> (Linnaeus, 1767) | - | - | 46,52,71, 73,74,76, 92 | 27,94,95, 98,100, 113,114 | 15,18, 19,24,43,4 8,49,52,59 .71,79,81, 82,88,109, 111, 113 | 21,48, 52,53 | - |
| <i>Harmothoe impar</i> (Johnston, 1839) | 28,48, 52 | 25 | 46,47,52, 65,67,71, 73,74,76, 91,92,113 | 11,27,28, 31,35,48, 71,61-63, 93-98, 100-103 | 15,18,24, 39-41,43, 48,52,59, 88,109- 113 | 21,48, 52,53, 80 | - |
| <i>Polynoe scolopendrina</i> Savigny, 1822 | - | - | 52,71,74 | 35,84,100 | 15,24,43, 52,71,109 | - | - |
| SIGALIONIDAE | | | | | | | |
| <i>Sthenelais boa</i> (Johnston, 1833) | 28,71 | - | 52,74 | 95 | 43,52,71, 109 | 52 | - |
| PHOLOIDAE | | | | | | | |
| <i>Pholoe inornata</i> Johnston, 1839 | 28,71 | 25 | 46,52,71, 74 | 31,48,95, 100 | 19,24,40, 41,43,48- 50,52,71, 78,82,88, 109,110, 112 | 49,53, 54 | - |
| <i>Pholoe minuta</i> (Fabricius, 1780) | - | - | - | 63 | 12,15 | - | - |
| CHRYSOPETALIDAE | | | | | | | |
| <i>Vigtorniella zaikai</i> (Kiseleva, 1992) | - | - | 113 | - | 51,52,82, 99,113 | - | - |
| PISIONIDAE | | | | | | | |
| <i>Pisone remota</i> (Southern, 1914) | - | - | 46,52,65, 70,71,74 | 28,31,71, 95 | 19,48,52, 71,108, 109 | 48,77 | - |
| AMPHINOMIDAE | | | | | | | |
| <i>Chloeia venusta</i> Quatrefages, 1866 | 52,71, 89 | - | 74 | - | - | - | - |
| PHYLLODOCIDAE | | | | | | | |
| <i>Eulalia clavigera</i> (Audouin & Milne Edwards, 1833) | - | 25 | - | - | - | - | - |
| <i>Eulalia viridis</i> (Linnaeus, 1767) | - | 1 | 52,71, 74, 92, 107, 113 | 11,96, 98, 113 | 12,40,41, 43,48,52, 71,78,109- 112 | 52 | - |
| <i>Eumida sanguine</i> (Ørsted, 1843) | 52 | - | 46,47,52, 65,67,70, 71,73,74, 113,107 | 31,61,62, 95,101, 113 | 12,24,40, 43,52,71, 109,113 | 48,52, 53 | 24 |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|--|----------------------------------|----------|---|--|--|------------------------|----------|
| <i>Nereiphylla paretti</i> Blainville, 1828 | - | - | 74 | 27,71,93 | 52,71,109, 110 | 48,52 | - |
| <i>Nereiphylla pusilla</i> (Claparède, 1870) | - | - | 74 | - | 43,52,71, 109-111 | - | - |
| <i>Nereiphylla rubiginosa</i> (Saint-Joseph, 1888) | 28,52, 71 | 25 | 46,47,52, 65,67,71, 73-75,91, 92,107 | 9, 11, 27,30,31, 61-63,94, 95,97,98, 101,102 | 12,18,19, 40,43,48, 49,52,60, 71,78, 79, 109-111 | 21,48, 52,53 | - |
| <i>Hesionura coineau</i> (Laubier, 1962) | - | - | 46,52,71, 74 | - | - | - | - |
| <i>Hesionura coineau</i> <i>longissima</i> Minichev, 1982 | - | - | - | - | 52 | - | - |
| <i>Mysta picta</i> (Quatrefages, 1865) | 53 | - | 46,47,52, 65,67,70, 71,73-75, 91, 92 | 10,11,27, 30,31,61, 62,71, 95-98, 100,103 | 12,19,24, 40,43,48, 49,52,59, 71,81,88, 109-112 | 21,48, 52,53, 80 | 24 |
| <i>Pseudomystides limbata</i> (Saint-Joseph, 1888) | 33,52 | - | 52,65,70, 71,74,107 | - | 43,52,71, 109 | 52 | - |
| <i>Phyllodoce laminosa</i> Savigny in Lamarck, 1818 | - | - | 74 | 11 | 24,52,71, 109 | - | - |
| <i>Phyllodoce lineata</i> (Claparède, 1870) | - | - | 74 | 11,35,84, 100,112 | 15,18,24, 40,52,71, 109 | 21 | - |
| <i>Phyllodoce maculata</i> (Linnaeus, 1767) | - | - | 52,74 | 11,27,30, 31,48,71, 95,102-104 | 39,48,52, 60,71,78, 82,88,109- 111 | 48,52, 53 | - |
| <i>Phyllodoce mucosa</i> Ørsted, 1843 | 20,28, 33,48, 52,71, 89 | - | 46,48,52, 65,70,71, 74,76,91, 92,113 | 11,113 | 52,59, 88, 113 | - | - |
| <i>Pterocirrus limbatus</i> (Claparède, 1868) | - | - | 74 | 10,11,100 | 52,71,109 | - | - |
| <i>Pterocirrus macroceros</i> (Grube, 1860) | - | - | 46,47,52, 68,70,71, 74 | 28,31,61, 62,71,95, 96 | 24,43,52, 71,109 | - | 24 |
| HESIONIDAE | | | | | | | |
| <i>Hesione splendida</i> Lamarck, 1818 | 106 | - | - | - | - | - | - |
| * <i>Hesionides arenaria</i> Friedrich, 1937 | - | - | 52,65,70, 71,74,92 | - | 4,52 | 77 | - |
| <i>Microphthalmus fragilis</i> Bobretzky, 1870 | - | - | 46,52,65, 70,71,74 | 95 | 13,19,24, 49,52,71, 78,109 | 77 | - |
| <i>Microphthalmus sczelkowi</i> Metschnikow, 1865 | - | - | 46,52,71, 72,74,113 | 29,30,71, 95 | 52,82 | 77 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|--------------|----------|------------------------------------|---|---|-----------------|----------|
| <i>Microphthalmus similis</i> Bobretzky, 1870 | - | - | 46,52,65, 70,71,74 | 63,95 | 13,24,52, 71,109 | 77 | - |
| PILARGIDAE | - | | | | | | |
| <i>Sigambra tentaculata</i> (Treadwell, 1941) | - | - | 48,74 | - | 4,48,52 | 21,48, 52,53 | - |
| SYLLIDAE | | | | | | | |
| <i>Amblyosyllis formosa</i> (Claparède, 1863) | - | 25 | 52,74 | - | 43,52,71, 109 | - | - |
| <i>Autolytus rubrovittatus</i> Claparède, 1864 | - | - | 74 | - | 52,71,109 | - | - |
| <i>Erinaceusyllis erinaceus</i> (Claparède, 1863) | - | - | - | - | 52,78 | 52 | - |
| <i>Exogone naidina</i> Ørsted, 1845 | 28,48, 52 | 25 | 46,47,52,6 5,68,70,71 74,113 | 9,30,31,62, 95,101,102 ,113 | 13,15,19, 23,40,41, 43,48-50, 52,59,71, 78,88,109, 110,112, 113 | 48,52, 53,77 | - |
| <i>Haplosyllis spongicola</i> (Grube, 1855) | - | 25 | 52,68,70, 71,74 | - | 13,15,39, 40,43,52, 71,109 | - | - |
| <i>Neopetitia amphophthalma</i> (Siewing, 1956) | - | - | 52,74 | - | - | - | - |
| <i>Myrianida brachycephala</i> (Marenzeller, 1874) | - | 25 | - | - | - | - | - |
| <i>Myrianida edwardsi</i> (Saint Joseph, 1887) | - | 25 | - | - | - | - | - |
| <i>Myrianida prolifera</i> (O.F. Muller, 1788) | - | 25 | 74 | - | 43,52,71, 109 | - | - |
| <i>Nudisyllis pulligera</i> (Krohn, 1852) | - | 25 | 52,68,70, 71,74 | - | 19,23,52, 71,78,109 | 52 | - |
| <i>Proceraea aurantiaca</i> (Claparède, 1868) | - | - | 74 | - | 52,71,109 | - | - |
| <i>Proceraea picta</i> Ehlers, 1864 | - | 25 | - | - | - | - | - |
| <i>Salvatoria clavata</i> (Claparède, 1863) | - | 25 | 46,51,64, 66,70,73, 75,90,91 | 5,10,11,26 29-31, 34, 60, 61,70, 92-97, 99- 101 | 19,40,47, 48,51,59, 70,77,108 | - | - |
| <i>Salvatoria limbata</i> (Claparède, 1868) | - | 25 | 47,52,65, 71,74,92, 107 | 35,84,100 | 41 | - | - |
| <i>Salvatoria tenuicirrata</i> (Claparède, 1864) | 89 | - | 47,52,71, 74 | 10,35,84, 100 | 15,23,43, 52,71 | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|-----------------|----------|------------------------------------|--|---|-----------------|----------|
| <i>Sphaerosyllis bulbosa</i> Southern, 1914 | 28,33, 52,89 | - | 46,52,68, 70,71,74, 76,113 | 10,11,35, 58,71,85, 95,100- 102,113 | 19,39,48- 50,52,71, 78,88,109, 112,113 | 48,52, 53,77 | - |
| <i>Sphaerosyllis hystrix</i> Claparède, 1863 | 52,71, 89 | 37 | 74 | 35,84 | 15,23,52, 71,88,109 | 48,53, 77 | - |
| <i>Streptosyllis bidentata</i> Southern, 1914 | 52 | - | - | - | - | - | - |
| * <i>Streptosyllis varians</i> Webster & Benedict, 1887 | - | - | 46,52,71, 72,74 | - | - | - | - |
| <i>Syllides fulvus</i> (Marion & Bobretzy, 1875) | - | 25 | - | - | - | - | - |
| <i>Syllides longocirratu</i> (Örsted, 1845) | - | - | 52,68,70, 71,74,113 | 29,31,71, 95,113 | 43,49,52, 71,109, 112,113 | 48,52, 77 | - |
| <i>Syllis cf. compacta</i> Gravier, 1900 | - | 25 | - | - | - | - | - |
| <i>Syllis gerlachi</i> (Hartmann-Schröder, 1960) | - | 25 | - | - | - | - | - |
| <i>Syllis gracilis</i> Grube, 1840 | - | 25 | 46,52,65, 70,71,74 | 29,31,62, 71,85,94- 96,98,100 | 13,15,23, 37,39,40, 43,52, 71,109 | - | - |
| <i>Syllis hyalina</i> Grube, 1863 | - | - | 46,52,71, 72,74 | 85,94,96, 98 | 13,15,23, 39-41,43, 48,60,71, 78, 88,109 | 48,52, 77 | - |
| <i>Syllis krohni</i> Ehlers, 1864 | - | 25 | - | - | - | - | - |
| <i>Syllis monilaris</i> (Savigny, 1812) | - | - | - | - | 23,71,109 | - | - |
| <i>Syllis prolifera</i> Krohn, 1852 | - | 25 | 46,47,52, 65,67,70, 71,74,92 | - | 13,15,23, 39-41,43, 52,71,109 | - | - |
| <i>Syllis variegata</i> Grube, 1860 | - | - | 74 | - | 39-41,52, 71,109 | - | - |
| <i>Synmerosyllis lamelligera</i> (Saint Joseph, 1887) | - | 25 | - | - | - | - | - |
| <i>Trypanosyllis zebra</i> (Grube, 1840) | 89 | 25 | 74 | 63,95 | 23,39,40, 43,52,71, 109 | - | - |
| <i>Xenosyllides violacea</i> Perejaslavzeva in Jakubova, 1930 | - | - | 74 | - | 43,52,71, 109 | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|--|-----------------|-----------------------|---|---|---|-----------------|----------|
| NEREIDIDAE | | | | | | | |
| <i>Alitta succinea</i> (Leuckart, 1847) | - | 25,37 | 46,48,52, 65,67,70- 72,74,76, 91,92, 113 | 10,11,27, 30,31,35, 61,64,71, 81,93-98, 100,103, 104,113 | 39,41,43, 52,55,57, 59,71,79, 81,82, 90, 109-113 | 6,21, 52,80 | - |
| <i>Composetia costae</i> (Grube, 1840) | - | 25 | 74 | - | 52 | - | - |
| <i>Eunereis longissima</i> Johnston, 1840 | 49,53, 72,90 | - | 52,74 | - | 18,48,52, 71,88,109 | 21,48, 53 | - |
| <i>Hediste diversicolor</i> (O. F. Muller, 1776) | 8,89, 106 | - | 48,52,65, 70,71,73, 74,76,93, 107 | 5,9,11,27, 30,31,35, 48,61,64, 71,81,94, 95,102 | 2,15,43,52 59,71,81, 83,109- 111 | 52,80 | - |
| <i>Namanereis littoralis</i> (Grube, 1871) | - | - | - | 95-97 | - | - | - |
| <i>Namanereis quadraticeps</i> Blanchard in Gay, 1849 | - | - | 72 | - | - | - | - |
| <i>Namanereis pontica</i> (Bobretzky, 1872) | - | - | 52,71,74 | 85,100 | 15,43,52, 71,109- 111 | - | - |
| <i>Neanthes caudate</i> (Delle Chiaje, 1827) | - | 37 | - | - | - | - | - |
| <i>Neanthes fucata</i> (Savigny in Lamarck, 1818) | 52 | - | 74 | - | - | - | - |
| <i>Nereis pelagica</i> Linnaeus, 1758 | - | 25,36, 38 | 52,71,74 | 100 | - | - | - |
| <i>Nereis rava</i> Ehlers, 1864 | 89 | 36,38 | 52,71,74, 92 | 10,85,100 | - | 21 | - |
| <i>Nereis zonata</i> Malmgren, 1867 | - | 1,25, 36-38 | 46-48,52, 65,67,71, 74 | 27,31,35, 61,62,71, 93-98,101 | 19,39-41, 43,48,49, 52,71,78, 88,109- 111 | 52,80 | - |
| <i>Perinereis cultrifera</i> (Grube, 1840) | 106 | 25,1, 36-38 | 46,47,52, 65,67,71, 74 | 5,10,27,31 61,62,71, 94,95,100 | 19,39,43, 48,52,71, 78,88, 109-111 | 21,48, 52,80 | - |
| <i>Platynereis dumerilii</i> (Audouin & Milne Edwards, 1834) | - | 1,25, 36-38, 86 | 46,47,52, 65,67,71, 74,107 | 5,10,27,30 31,61,62, 71,93-97, 100,101 | 18,19,12, 39-41, 43, 48-50, 52, 59, 60, 71, 78,88,109, 112,113 | 21,52, 80 | - |
| <i>Websterinereis glauca</i> (Claparède, 1870) | 53,72, 90 | - | 74 | - | - | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|----------------------------------|----------|---|--|---|------------------------|----------|
| NEPHTYIDAE | | | | | | | |
| <i>Inermonephtys inermis</i> (Ehlers, 1887) | 33 | - | - | - | - | - | - |
| <i>Micronephtys stammeri</i> (Augener, 1932) | - | - | 46,52,70, 71,74,75 | 95 | 18,19,50, 52,78 | 52 | - |
| <i>Nephtys caeca</i> (Fabricius, 1780) | 20,52, 71,89 | - | 74 | - | - | - | - |
| * <i>Nephtys ciliata</i> (O.F. Müller, 1776) | 52,71, 89 | - | 74 | - | 4 | - | - |
| <i>Nephtys cirrosa</i> (Ehlers, 1868) | 48,52 | - | 46,52,65, 70,71,74- 76,91,92 | 29,30,35, 71,95,103 | 18,19,43, 48,50,52, 59,71, 78, 88,109- 111 | 48,52, 53 | - |
| <i>Nephtys hombergii</i> Savigny in Lamarck, 1818 | 20,27, 33,49, 52,71, 89 | - | 46,48,50, 52,65,70, 71,73,74, 76,91,92, 113 | 9,11,27,30 35,48,61, 71,95,102, 104,113, 114 | 2,7,15, 18,19,24, 43,48,52, 59,71,78, 79,81,83, 88,109, 113 | 21,48, 52,53, 80 | - |
| <i>Nephtys hystricis</i> McIntosh, 1900 | 20,52, 71,89, 106 | - | 74 | - | - | - | - |
| <i>Nephtys longosetosa</i> Örsted, 1842 | 52,71, 89 | - | 74 | - | - | - | - |
| <i>Nephtys paradoxa</i> Malm, 1874 | 20,52, 71,89 | - | 74 | - | - | - | - |
| SPHAERODORIDAE | | | | | | | |
| <i>Ephesiella abyssorum</i> (Hansen, 1878) | 29,71 | - | 74 | - | - | - | - |
| <i>Sphaerodoridium</i> <i>claparedeii</i> (Greeff, 1866) | 29,52, 71 | - | 74 | - | 52,71,108 | - | - |
| <i>Sphaerodorium gracilis</i> (Rathke, 1843) | 29,52, 71 | - | 74 | - | - | - | - |
| GLYCERIDAE | | | | | | | |
| <i>Glycera alba</i> (O. F. Muller, 1776) | 89 | - | 48,52,65, 70,71,74, 92 | 29-31,95 | 13,23,52, 71,78,109 | 52,80 | 23 |
| * <i>Glycera capitata</i> Örsted, 1843 | - | - | 52,74 | - | 4,52 | 52 | - |
| <i>Glycera fallax</i> Quatrefages, 1850 | - | - | 52,68,70, 71,74 | - | 71 | - | - |
| <i>Glycera tessellata</i> Grube, 1840 | - | - | 52,74 | - | 48,52,71, 109 | 48 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|--|------------------------|----------|------------------------------------|--------------------|---|------------------------|----------|
| <i>Glycera tridactyla</i> Schmarda, 1861 | - | - | 46,52,66, 70,71,74, 75,91,92 | 27,31,61, 71,95 | 7,18,19, 23,43,48, 50,52,71, 78, 81,88, 109-111 | 21,48, 52,53, 80 | 23 |
| <i>Glycera unicornis</i> Savigny in Lamarck, 1818 | - | - | 52,74 | - | 43,52,71, 109 | - | - |
| GONIADIDAE | | | | | | | |
| <i>Goniadella bobretzkii</i> (Annenkova, 1929) | - | - | 46,52,68, 70,71,74 | - | 52,71,78, 109 | 52 | - |
| EUNICIDAE | | | | | | | |
| <i>Eunice vittata</i> (Delle Chiaje, 1829) | - | - | 46,52,68, 71,74 | - | 15,18,43, 48,52,71, 88,109, 110 | 48,52, 80 | - |
| <i>Lysidice ninetta</i> Audouin & Milne Edwards, 1833 | - | 25 | 46,52,65, 70,71,74 | - | 7,12,19,39 -41,43,49, 52,71,109, 110 | 48,80, 82 | - |
| <i>Nematonereis unicornis</i> Schmarda, 1861 | - | - | 74 | - | 19,39,43, 49,52,71, 109 | - | - |
| ARABELLIDAE | | | | | | | |
| <i>Drilonereis filum</i> (Claparède, 1868) | 28,48, 52,68, 71 | - | 74 | - | - | - | - |
| DORVILLEIDAE | | | | | | | |
| <i>Dorvillea rubrovittata</i> (Grube, 1855) | 52 | 25 | 46,52,71, 74 | - | 40,43,48, 52,71,109 | 52,80 | - |
| <i>Protodorvillea kefersteini</i> (McIntosh, 1869) | - | - | 46,48,52, 65,70,71, 74,91,92 | 29,71,95 | 19,43,48- 50,52,71, 78,109 | 52 | - |
| <i>Schistomeringos neglecta</i> (Fauvel, 1923) | 52,68, 71 | - | 74 | - | - | - | - |
| <i>Schistomeringos rudolphii</i> (Delle Chiaje, 1828) | - | 37 | 46,52,74, 91 | - | 19,43,48, 49,52,71, 109 | 21,48, 52,88 | - |
| ORBINIIDAE | | | | | | | |
| <i>Naineris laevigata</i> (Grube, 1855) | - | - | 74 | - | 19,43,52, 71,109 | - | - |
| <i>Orbinia cuvierii</i> (Audouin & Milne Edwards, 1833) | - | - | 74 | - | - | 52 | - |
| <i>Orbinia latreillii</i> (Audouin & Milne Edwards, 1833) | - | - | 46,52,68, 70,71,74 | - | 52,71,88, 110 | 21,52 | - |
| <i>Protoaricia capsulifera</i> (Bobretzky, 1870) | - | - | 74 | - | 13,52,109 | - | - |
| <i>Protoaricia oerstedii</i> (Claparède, 1864) | - | 25 | - | - | - | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|--------------|----------|---|---|--|-----------------|----------|
| SPIONIDAE | | | | | | | |
| <i>Aonides oxycephala</i> (Sars, 1862) | - | - | 46, 74 | 11,35,63, 84,95 | 19,49,52, 71,88,109, 110 | 48,50, 52,53 | - |
| <i>Aonides paucibranchiata</i> Southern, 1914 | 52 | - | 52,65,70, 71,74,76, 91,92,113 | 11,29,35, 71,95,113 | 19,48,52, 71,78,82, 109,112, 113 | 48,52, 53 | - |
| <i>Dipolydora caulleryi</i> (Mesnil, 1897) | 28,52, 71 | - | 74 | - | - | - | - |
| <i>Dipolydora quadrilobata</i> (Jacobi, 1883) | - | - | - | 11 | - | - | - |
| <i>Laonice cirrata</i> (M. Sars, 1851) | 52 | - | 74 | 10,100 | 52,71,109 | - | - |
| <i>Malacoceros ciliatus</i> (Keferstein, 1862) | 52 | - | 52,70,71, 74,75,107 | 11,31 | 19,52,71, 109 | - | - |
| <i>Malacoceros fuliginosus</i> (Claparède, 1870) | 89 | 37 | 74 | - | 23,43,49, 52,71,82, 109 | - | 23 |
| <i>Malacoceros girardi</i> (Quatrefages, 1843) | 52,71, 89 | - | 74 | - | - | - | - |
| <i>Malacoceros tetraceros</i> (Schmarda, 1861) | - | - | - | 95 | - | - | - |
| <i>Microspio mecznikowianus</i> (Claparède, 1869) | - | - | 74 | - | 19,43,48, 49,52,71, 78,88,109- 111 | 48,52, 53 | - |
| <i>Polydora ciliata</i> (Johnston, 1838) | - | 25 | 46,47,52, 65,67,68, 71,73, 74, 76,91, 92, 105,107 | 5,10,11,29 31,35,42, 61,62,64, 71,93-95, 97,100, 102,103 | 19,40,43, 48-50,52, 71,78,79, 82,109, 112 | 48,52, 53 | - |
| <i>*Polydora cornuta</i> Bosc, 1802 | - | - | - | 93-96, 98 | 4,17 | - | - |
| <i>Polydora limicola</i> Annekova, 1934 | - | - | 113 | 81,95,104, 113 | 55-59, 81, 113 | - | - |
| <i>Polydora websteri</i> Hartman in Loosanoff & Engle, 1943 | - | - | - | 94-96 | 54 | - | - |
| <i>Prionospio caspersi</i> Laubier, 1962 | - | - | 52 | - | 52 | 52 | - |
| <i>Prionospio cirrifera</i> Wirén, 1883 | 28,33, 71 | 25 | 46,48,52, 65,67,70, 71,74, 76, 91,92,113 | 11,30,31, 63,71,95, 98,100, 102,113 | 18,19,40, 43,48-50, 52,59, 71, 78,79,88, 109,110, 112,113 | 21,48, 52,53 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|--------------|----------|---|--|--|-----------------|----------|
| <i>Prionospio fallax</i> Söderström, 1920 | - | - | 46,48,52, 65,70,71, 74,75 | 30, 71 | 48,50,52, 71,78,109 | 48,52, 53 | - |
| <i>Prionospio multibranchiata</i> Berkeley, 1927 | - | 37 | - | - | - | - | - |
| * <i>Prionospio pulchra</i> Imajima, 1990 | - | 26 | - | - | - | - | - |
| <i>Prionospio steenstrupi</i> Malmgren, 1867 | - | - | - | 95 | - | - | - |
| <i>Pseudopolydora antennata</i> (Claparède, 1869) | 28,52, 71 | - | 74,113 | 10,100, 113 | 112,113 | - | - |
| <i>Pygospio elegans</i> Claparède, 1863 | 89 | - | 48,52,65, 70,71,74, 76,113 | 10,11,27, 30,31,35, 61,62,71, 85,100, 114 | 19,48,49, 52,71,109- 112 | 48,52, 53 | - |
| <i>Scolelepis tridentata</i> (Southern, 1914) | 33 | - | 52,65,70, 71,74,113 | 11,35,84, 100 | 19,48,50, 52,71,78, 82,109- 111 | 48,52, 53 | - |
| <i>Scolelepis cantabra</i> (Rioja, 1919) | - | - | 74 | 27,30,61, 71,95 | 48,53,71 | 48 | - |
| <i>Scolelepis squamata</i> (O.F. Muller, 1806) | 52 | - | 46,48,52, 65,70,71, 74,75 | 10,11,30, 35,61,71, 95,100 | 19,43,48- 50,52,71, 82,109 | - | - |
| <i>Spio decoratus</i> Bobretzky, 1870 | 33 | 25 | - | 95 | 13,23 | - | 23 |
| <i>Spio filicornis</i> (Müller, 1776) | | 37 | 46,48,52, 65,70,71, 73-76,91, 92,107, 113 | 10,27,30, 31,48,64, 71,81,85, 94,97,100, 103,104, 113 | 19,48,50, 52,59,78, 81,82,88, 109-113 | 21,48, 52,53 | |
| <i>Spio multioculata</i> (Rioja, 1918) | 29,52, 71 | - | 74 | 11 | - | - | - |
| <i>Streblospio benedicti</i> Webster, 1879 | - | - | - | 95 | - | - | - |
| * <i>Streblospio</i> <i>gynobranchiata</i> Rice & Levin, 1998 | - | - | - | - | 16 | - | - |
| <i>Streblospio shrubsolii</i> (Buchanan, 1890) | - | - | 52,65,71, 73,74 | 64 | 81 | 52 | - |
| MAGELONIDAE | | | | | | | |
| <i>Magelona mirabilis</i> (Johnston, 1865) | - | - | 46,52,68, 69,70,71, 72,74,75 | 10,35,95 | 4,52 | 52 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|--------------|----------|-----------------------------|------------------|--|-----------------|----------|
| <i>Magelona minuta</i> Eliason, 1962 | - | - | - | 95 | - | - | - |
| <i>Magelona rosea</i> Moore, 1907 | 48,52 | | 46,52,68, 70,71,74 | 30,71 | 48,50,52, 71,78,82, 88,109, 110 | 21,48, 52,53 | - |
| PARAONIDAE | | | | | | | |
| <i>Aricidea claudiae</i> Laubier, 1967 | 33,48, 52 | - | 48,52,74, 76,105, 113 | 11,64,95 | 19,48,50, 52,78,88 | 48,52 | - |
| <i>Aricidea cerrutii</i> Laubier, 1966 | 28,71 | - | 46,65,70, 71 | 27,28,71, 114 | 71,109, 110 | 21,53, 80 | - |
| <i>Cirrophorus branchiatus</i> Ehlers, 1908 | - | - | 92 | - | - | - | - |
| <i>Levinsenia gracilis</i> (Tauber, 1879) | 28,52, 71 | - | 74 | - | - | - | - |
| <i>Paradoneis harpagonea</i> (Storch, 1967) | - | - | 52,74,91 | - | 19,48,52, 78 | 48,52 | - |
| <i>Paradoneis lyra</i> (Southern, 1914) | 28,68, 71 | - | - | - | - | - | - |
| <i>Paraonides neapolitana</i> (Cerruti, 1909) | 48,52 | - | 74 | - | - | - | - |
| <i>Paraonis fulgens</i> (Levinsen, 1884) | - | - | 46,68,70, 71 | 11,35 | 71,108, 109 | 53 | - |
| CIRRATULIDAE | | | | | | | |
| <i>Caulleriella bioculata</i> (Keferstein, 1862) | - | - | 46,52,65, 70,71,74 | - | 52,71,109 | 53 | - |
| <i>Caulleriella caputesocis</i> (Saint-Joseph, 1894) | - | - | 74 | - | 52,71,110 | - | - |
| <i>Chaetozone setosa</i> Malmgren, 1867 | - | - | 74 | - | - | - | - |
| <i>Cirriformia tentaculata</i> (Montagu, 1808) | 48,52 | - | 52,74 | - | 19,43,48, 49,52,71, 109 | - | - |
| <i>Protocirrieneris chrysotherma</i> (Claparède, 1869) | 89 | - | - | - | - | - | - |
| <i>Cirriformia filigera</i> (Delle Chiaje, 1828) | 20,52, 89 | - | - | - | 12,13,23 | - | - |
| <i>Tharyx multibranchiis</i> (Grube, 1863) | - | - | - | - | 71,109 | - | - |
| <i>Tharyx marioni</i> (Saint-Joseph, 1894) | 52 | - | 52,74 | - | 52,78 | 52 | - |
| CTENODRILIDAE | | | | | | | |
| <i>Ctenodrilus serratus</i> (Schmidt, 1857) | - | - | 74 | 95 | 43,52,71, 109 | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|------------------------|----------|---|--|--|-----------------|----------|
| FLABELLIGERIDAE | | | | | | | |
| <i>Flabelligera diplochaitus</i> (Otto, 1820) | 106 | - | - | - | - | - | - |
| OPHELIIDAE | | | | | | | |
| <i>Ophelia bicornis</i> Savigny in Lamarck, 1818 | - | - | 52,65,70, 71,74 | 95 | 43,48,52, 71,109, 110 | - | - |
| <i>Ophelia limacina</i> (Rathke, 1843) | - | - | 46,52,68, 70,71,74 | 27,95 | 7,15,23,43 48,52,71, 78,109, 110 | 52 | - |
| <i>Polyophthalmus pictus</i> (Dujardin, 1839) | - | 25,37 | 47,52,67, 68,71,74 | - | 23,41,43, 52,71,78, 109 | 52 | 23 |
| CAPITELLIDAE | | | | | | | |
| <i>Capitella capitata capitata</i> (Fabricius, 1780) | 33,52 | 25,37 | 46,48,52, 65,70,71, 74,92,107, 113 | 11,30,31, 35,61,71, 94-97,103, 113 | 19,43,48- 50,52,59, 60,71,78, 79,81,82, 88,109, 110,112, 113 | 23 | - |
| <i>Capitellides giardi</i> Mesnil, 1897 | - | - | 46,52,65, 67,70,71, 74-76,92 | 11,85 | - | - | - |
| <i>Capitomastus minima</i> (Langerhans, 1881) | 71,89 | - | 46,48,52, 65,67,70, 71,74-76, 91,92,107 | 10,11,30, 31,48,61, 62,71, 93- 97,100, 101 | 18,19,40, 41,43,48, 49,52,59, 71,109, 110 | 21 | - |
| * <i>Capitellethus dispar</i> (Ehlers, 1907) | 20,52, 71,89 | - | 74 | - | - | - | - |
| <i>Heteromastus filiformis</i> (Claparède, 1864) | 28,48, 52,71, 89 | - | 46,48,52, 65,70,71, 74,76,91, 92,105, 107,113 | 11,30,31, 35,61,71, 94,95,97, 113 | 2,18,19,43 48,52,57, 59,71,78, 79,81,88, 109-113 | 21,48, 52,53 | - |
| <i>Notomastus latericeus</i> Sars, 1851 | 52,71, 89 | - | 52,74 | - | - | - | - |
| <i>Notomastus lineatus</i> (Claparède, 1869) | 20,52, 89 | - | 74 | 11 | 43,52,71, 109 | - | - |
| <i>Notomastus profundus</i> (Eisig, 1887) | 28,52, 71,89 | - | 52,65,71, 74,76,91, 92,113 | 11,30,95, 114 | 18,43,48, 52,71,79, 88,109- 111 | 48,52, 53 | - |
| ARENICOLIDAE | | | | | | | |
| <i>Arenicola marina</i> (Linnaeus, 1758) | - | - | 52,65,70, 71,73,74 | 27,71,95 | 43,52,71, 109-111 | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|----------------------------------|----------|-------------------------------------|--------------------|--|-----------|----------|
| <i>Arenicolides branchialis</i> (Audouin & Milne Edwards, 1833) | - | - | 46,52,74 | 95 | 7,23,43,52 71,109- 111 | - | 23 |
| <i>Arenicolides ecaudata</i> (Johnston, 1865) | - | - | - | 27 | - | - | - |
| MALDANIDAE | | | | | | | |
| <i>Euclymene collaris</i> (Claparède, 1869) | 52,89 | - | 46,52,70, 71,74,76 | 11,35 | 15,23,39, 40,43,52, 71,109- 111 | - | - |
| <i>Euclymene oerstedii</i> (Claparède, 1863) | 53,71, 89,106 | - | 74 | - | - | - | - |
| <i>Euclymene palermitana</i> (Grube, 1840) | 28,48, 52,71, 89 | - | 74 | - | - | 48 | - |
| <i>Leiochone leiopygos</i> (Grube, 1860) | 28,71 | - | 52,65,70, 71,74,76, 91,92,113 | 11,27,30, 71,95 | 43,48,52, 71,78,88, 109-111 | - | - |
| <i>Macroclymene santandarensis</i> (Rioja, 1917) | 52,71, 89 | - | 74 | - | - | - | - |
| <i>Maldane glebifex</i> Grube, 1860 | 28,48, 52,71 | - | 74 | - | - | 48 | - |
| <i>Micromaldane ornithochaeta</i> Mesnil, 1897 | 29,52, 71 | - | 74 | - | - | - | - |
| <i>Petaloproctus terricolus</i> Quatrefages, 1866 | - | - | 74 | 71 | 43,52,71, 109 | - | - |
| OWENIIDAE | | | | | | | |
| <i>Owenia fusiformis</i> Delle Chiaje, 1844 | 28,52, 71,89 | - | 74 | - | - | - | - |
| <i>Myriochele heeri</i> Malmgren, 1867 | 29,71 | - | 74 | - | 48,82 | 48,53 | - |
| SABELLARIIDAE | | | | | | | |
| <i>Sabellaria spinulosa</i> Leuckart, 1849 | - | - | 65,67,71 | 31 | 43,71 | 53,80 | - |
| <i>Sabellaria taurica</i> (Rathke, 1837) | 52 | - | 46,47,52, 74 | 27,95 | 19,41,43, 48,49,52, 82,109, 110 | 48,52 | - |
| STERNASPIDAE | | | | | | | |
| <i>Sternaspis scutata</i> Ranzani, 1817 | 28,33, 44,45, 48,52, 71 | - | 74 | 71 | 43,109 | 48 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|----------------------------------|----------|---|--|---|------------------------|----------|
| PECTINARIIDAE | | | | | | | |
| <i>Lagis koreni</i> Malmgren, 1866 | 28,71, 106 | - | 46,48,65, 70,71,73, 74,76,91, 92 | 27,30,31, 61,95 | 15,48,49, 71,82,83 | 48 | - |
| <i>Lagis neapolitana</i> (Claparède, 1869) | 52 | - | 52,113 | 102 | 7,18,19,43 52,78,88, 109-111, 113 | 52,80 | - |
| <i>Pectinaria belgica</i> (Pallas, 1766) | - | - | 74 | - | 52,71,110, 111 | - | - |
| AMPHARETIDAE | | | | | | | |
| <i>Amage adpersa</i> (Grube, 1863) | 33 | - | - | - | - | - | - |
| <i>Amphicteis gunneri</i> (M. Sars, 1835) | 52,71, 89 | - | 74 | - | - | - | - |
| <i>Hypania invalida</i> (Grube, 1860) | - | - | 52,71,73, 74 | 27,64,71, 81,95 | 4,71,81, 109-111 | - | - |
| <i>Hypaniola kowalewskii</i> (Grimm in Annenkova, 1927) | - | - | 74 | 27,30,64, 71,81,95 | 4,71,81, 109-111 | 52 | - |
| <i>Melinna palmata</i> Grube, 1870 | 28,45, 48,52, 71,106 | - | 46,48,52, 65,70,71, 74,76,91, 92,105, 113 | 11,27,30, 31,34,35, 48,71,95, 104,113 | 7,18,43,44 48,52,57, 59,71,78, 81,88,109- 113 | 21,52, 53 | - |
| TEREBELLIDAE | | | | | | | |
| <i>Amphitritides gracilis</i> (Grube, 1860) | 28,71 | - | 74 | 11 | 40,41,43, 52,71,88, 109,110 | 21,48, 52,80 | |
| <i>Polycirrus caliendrum</i> Claparède, 1869 | - | - | 74 | - | 40,43,52, 71,109 | - | - |
| <i>Polycirrus haematodes</i> (Claparède, 1864) | 89 | - | - | - | - | - | - |
| <i>Polycirrus jubatus</i> Bobretzky, 1869 | - | - | 46,52,70, 71,74,76 | 11,95 | 12,52,71, 78,88,109 | 52 | - |
| <i>Polycirrus pallidus</i> (Claparède, 1864) | 89 | - | 74 | - | 15,52,71, 109 | - | - |
| <i>Proclea grafii</i> (Langerhans, 1884) | 28,52, 71 | - | 74 | - | - | - | - |
| TRICHOBRANCHIDAE | | | | | | | |
| <i>Terebellides stroemii</i> Sars, 1835 | 20,28, 33,48, 52,71, 89 | - | 46,52,65, 71,74,91, 92,113 | 9,11,27,30 31,35,71, 95,102, 113,114 | 7,12,18,43 48,52,71, 79,88,109- 111 | 21,48, 52,53, 80 | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|---|-----------------|----------|----------------------------------|---|---|------------------------|----------|
| SABELLIDAE | | | | | | | |
| <i>Amphiglena mediterranea</i> (Leydig, 1851) | - | - | - | - | 52 | - | - |
| <i>Euchone rubrocincta</i> (Sars, 1862) | - | - | - | - | 52 | - | - |
| <i>Fabricia stellaris stellaris</i> (O. F. Müller, 1774) | 52 | - | 47,52,65, 70,71,73, 74,107 | 5,29-31, 61,62,71, 93,94, 95, 97,100, 101 | 43,52,59, 71,109- 111 | - | - |
| <i>Fabricia stellaris adriatica</i> Banse, 1956 | - | 25 | - | - | - | - | - |
| <i>Jasmineira caudata</i> Langerhans, 1880 | 52,68, 71 | - | 74 | - | - | - | - |
| <i>Manayunkia caspica</i> Annenkova, 1928 | | - | 52,74 | 27,81,95 | 4,52,71, 109-111 | - | - |
| <i>Megalomma vesiculosum</i> (Montagu, 1815) | 52,71, 89 | - | 74 | - | - | - | - |
| <i>Amphicorina armandi</i> (Claparède, 1864) | 28,48, 52,71 | - | 47,52,71, 72,74,76, 113 | 11,27,35, 71,95,113 | 48,52,71, 79,88,109, 110,113 | 48,52, 53 | - |
| <i>Potamilla torelli</i> (Malmgren, 1866) | 52,71, 89 | - | 74 | - | - | - | - |
| SERPULIDAE | | | | | | | |
| <i>Ditrupa arietina</i> (O. F. Muller, 1776) | - | - | 52,65,71, 74 | - | - | - | - |
| * <i>Ficopomatus enigmaticus</i> (Fauvel, 1923) | - | - | 52,65,69, 71,73,74, 107 | 29,61,62, 71,87,93, 95 | 3, 4, 39, 52, 59,109 | 6, 52, 80 | - |
| <i>Hydroides norvegicus</i> Gunnerus, 1768 | - | - | 52,71,74 | - | - | - | - |
| <i>Salmacina incrustans</i> Claparède, 1870 | - | - | 74 | - | 43,52,71, 109 | - | - |
| <i>Serpula vermicularis</i> Linnaeus, 1767 | 52,61, 68 | 86 | 74 | 62,95 | 52 | - | - |
| <i>Spirobranchus triqueter</i> (Linnaeus, 1758) | 45,52, 71,89 | - | 46-48, 52, 65,70,71, 74,76 | 27,62,63, 71,95,102 | 7,39,40,43 48,50,52, 71,78,88, 109,111, 113 | 21,48, 52,53, 80 | - |
| <i>Vermiliopsis infundibulum</i> (Philippi, 1844) | 52 | - | 52,71,74 | 27,95 | 15,39,40, 43,52,71, 109,110 | - | - |
| <i>Vermiliopsis striaticeps</i> (Grube, 1862) | - | 25 | - | - | - | - | - |

Table 1 Continued

| | P | T | B | Ro | U | Ru | G |
|--|----------|----------|-------------------|---------------------------|--------------------------------|-----------|----------|
| SPIRORBIDAE | | | | | | | |
| <i>Janua (Dexiospira) pagenstecheri</i> (de Quatrefages, 1865) | 52 | 25 | 47,52,71,74 | 11,27,63,93-95,97,100,102 | 39,52,71,109-111 | 52,80 | - |
| <i>Neodexiospira pseudocorrugata</i> (Bush, 1904) | 52 | - | 74 | - | 52,71,109 | - | - |
| <i>Pileolaria militaris</i> Claparède, 1870 | - | 25 | 47,52,71,74 | 27,95 | 43,52,71,109-111 | 52,80 | - |
| POLYGORDIIDAE | | | | | | | |
| <i>Polygordius neapolitanus</i> Fraipont, 1887 | - | - | 46,70 | 95 | 43,50,78,109 | 48 | - |
| <i>Polygordius lacteus</i> Schneider, 1868 | - | - | 52,71,74 | - | 7,52,71,110 | 52,53,77 | - |
| PROTODRILIDAE | | | | | | | |
| <i>Protodrilus flavocapitatus</i> (Uljanin, 1877) | - | - | 52,66,70,71,72,74 | 11,27,30,35,95,102 | 19,22,43,49,52,71,88,109-112 | - | - |
| <i>Protodrilus mirabilis</i> Czerniavsky, 1881 | - | - | - | - | - | - | - |
| <i>Protodrilus purpureus</i> (Schneider, 1868) | - | - | 74 | - | 43,52,71,78,109 | 77 | - |
| SACCOCIRRIDAE | | | | | | | |
| <i>Saccocirrus papillocercus</i> Bobretzky, 1872 | - | - | 52,66,70,71,74 | 27,85,95 | 7,14,19,23,43,44,52,71,109-111 | 77 | - |
| NERILLIDAE | | | | | | | |
| <i>Nerilla antennata</i> O. Schmidt, 1848 | - | - | 52,66,70,71,74 | 10,35,85,94,95,100 | 43,52,71,109 | 52,77 | 23 |
| <i>Nerilla taurica</i> Skulari, 1997 | - | - | - | - | 52 | - | - |
| DINOPHILIDAE | | | | | | | |
| <i>Dinophilus gyrocolitatus</i> O.Schmidt, 1857 | - | - | 52,66,70,71,74 | - | - | 77 | - |
| <i>Dinophilus taeniatus</i> Harmer, 1889 | - | - | - | - | - | 77 | - |
| <i>Trilobodrilus heideri</i> Remane, 1925 | - | - | 52,66,70,71,74 | - | - | 77 | - |
| PARERGODRILIDAE | | | | | | | |
| <i>Stygocapitella subterranea</i> Knöllner, 1934 | - | - | 52,68,70,71,74 | - | - | 77 | - |

In the previous attempts to document the polychaete diversity in the Black Sea, 184 species were reported by Marinov (1977), 191 species by Kiseleva (2004) and 214 species by Surugiu *et al.* (2010). Twenty-three species reported from

the Black Sea coasts are regarded as *nomen dubium* or indeterminable (Table 2). A total of 51 species have been synonymized with other species (Table 3).

Table 2. The species considered as *nomen dubium* or indeterminable in the Black Sea and their reports from the Black Sea coasts (U= Ukraine, Ru= Russia, G= Georgia).

| | U | Ru | G |
|--|-----------|----|----|
| POLYNOIDAE | | | |
| <i>Eunoe mammiloba</i> Czerniavsky, 1882 | 24 | - | - |
| <i>Hermadion truncata</i> (Moore, 1902) | 24 | - | - |
| <i>Paranychia taurica</i> Czerniavsky, 1882 | 24 | - | - |
| PHYLLODOCIDAE | | | |
| <i>Carobia lanceoligera</i> Czerniavsky, 1882 | 24 | - | 24 |
| <i>Carobia tuberculata jaltensis</i> Czerniavsky, 1882 | 24 | - | - |
| <i>Carobia tuberculata kerczensis</i> Czerniavsky, 1882 | 24 | - | - |
| <i>Carobia tuberculata suchumica</i> Czerniavsky, 1882 | - | - | 24 |
| <i>Carobia tuberculata typica</i> Czerniavsky, 1882 | 24 | - | - |
| <i>Eracia virens pontica</i> Czerniavsky, 1882 | 24 | - | 24 |
| <i>Eracia virens sevastopolica</i> Czerniavsky, 1882 | 24 | - | - |
| <i>Eracia virens suchumica</i> Czerniavsky, 1882 | - | - | 24 |
| HESIONIDAE | | | |
| <i>Parapodarke lubrica</i> Czerniavsky, 1882 | 24 | - | - |
| SYLLIDAE | | | |
| <i>Brania atokalis</i> (Czerniavsky, 1881) | - | 23 | - |
| <i>Haplosyllis oligochaeta pontica</i> Czerniavsky, 1881 | 23 | - | - |
| <i>Langerhansia valida</i> (Czerniavsky, 1881) | - | - | 23 |
| <i>Pionosyllis suchumica</i> Czerniavsky, 1881 | - | - | 23 |
| <i>Syllis biocula</i> (Czerniavsky, 1881) | - | 23 | - |
| <i>Syllis pontica</i> (Czerniavsky, 1881) | 23 | - | - |
| NEREIDIDAE | | | |
| <i>Heteronereis crenaticirris</i> Bobretzky, 1868 | 12 | - | - |
| <i>Nereis bipartita</i> (Bobretzky, 1868) | 12 | - | - |
| GLYCERIDAE | | | |
| <i>Glycera taurica</i> Czerniavsky, 1881 | 23 | - | - |
| GONIADIDAE | | | |
| <i>Goniada euxina</i> Jakubova, 1930 | 43,71,109 | - | - |
| CIRRATULIDAE | | | |
| <i>Cirrhineris (Paracirrhineris) pulchra</i> Czerniavsky, 1881 | - | - | 23 |

Table 3. A list of synonymised species in the Black Sea and their valid names.

| Cited Names | Valid Names |
|---|--|
| <i>Harmothoe reticulata</i> (Claparède, 1870) | <i>Harmothoe impar</i> (Johnston, 1839) |
| <i>Polynoe incerta</i> Bobretzky, 1881 | <i>Harmothoe imbricata</i> (Linnaeus, 1767) |
| <i>Pholoe synophthalmica</i> Claparède, 1868 | <i>Pholoe inornata</i> Johnston, 1839 |
| <i>Eulalia limbata</i> Claparède, 1868 | <i>Pterocirrus limbatus</i> (Claparède, 1868) |
| <i>Eulalia pallida sevastopolica</i> Czerniavsky, 1882 | <i>Eumida sanguinea</i> (Örsted, 1843) |
| <i>Eulalia pallida suchumica</i> Czerniavsky, 1882 | <i>Eumida sanguinea</i> (Örsted, 1843) |
| <i>Eulalia viridis ornata</i> McIntosh, 1908 | <i>Eulalia viridis</i> (Linnaeus, 1767) |
| <i>Phyllodoce nana</i> Saint-Joseph, 1906 | <i>Nereiphylla pusilla</i> (Claparède, 1870) |
| <i>Phyllodoce tuberculata</i> Bobretzky, 1868 | <i>Nereiphylla rubiginosa</i> (Saint-Joseph, 1888) |
| <i>Pterocirrus macroceros pontica</i> Czerniavsky, 1882 | <i>Pterocirrus macroceros</i> (Grube, 1860) |
| <i>Hesione pantherina</i> (Risso, 1826) | <i>Hesione splendida</i> Lamarck, 1818 |
| <i>Exogone clavigera</i> (Claparède, 1868) | <i>Exogone naidina</i> Örsted, 1845 |
| <i>Exogone gemmifera</i> (Pagenstecher, 1862) | <i>Exogone naidina</i> Örsted, 1845 |
| <i>Langerhansia valida paucisetosa</i> (Czerniavsky, 1881) | <i>Langerhansia valida</i> (Czerniavsky, 1881) |
| <i>Paedophylax levis</i> Bobretzky, 1870 | <i>Exogone naidina</i> Örsted, 1845 |
| <i>Syllis hamata</i> Claparède, 1868 | <i>Haplosyllis spongicola</i> (Grube, 1855) |
| <i>Syllis oligochaeta</i> Bobretzky, 1870 | <i>Haplosyllis spongicola</i> (Grube, 1855) |
| <i>Syllis mixtosetosa</i> Bobretzky, 1870 | <i>Syllis gracilis</i> Grube, 1840 |
| <i>Syllis nigrans</i> Bobretzky, 1870 | <i>Syllis prolifera</i> Krohn, 1852 |
| <i>Syllis velox</i> Bobretzky, 1870 | <i>Syllis hyalina</i> Grube, 1863 |
| <i>Nephtys cirrosa longicornis</i> Jakubova, 1930 | <i>Nephtys cirrosa</i> (Ehlers, 1868) |
| <i>Ephesia peripatus</i> (Claparède, 1863) | <i>Ephesiella abyssorum</i> (Hansen, 1878) |
| <i>Glycera convoluta</i> Keferstein, 1862 | <i>Glycera tridactyla</i> Schmarda, 1861 |
| <i>Glycera gigantea</i> Quatrefages, 1866 | <i>Glycera fallax</i> Quatrefages, 1850 |
| <i>Glycera rouxii</i> Audouin & Milne Edwards, 1833 | <i>Glycera unicornis</i> Savigny in Lamarck, 1818 |
| <i>Glycera minuta</i> (Bobretzky, 1870) | <i>Glycera alba</i> (O. F. Muller, 1776) |
| <i>G. minuta sevastopolica</i> Czerniavsky, 1881 | <i>Glycera alba</i> (O. F. Muller, 1776) |
| <i>G. minuta suchumica</i> Czerniavsky, 1881 | <i>Glycera alba</i> (O. F. Muller, 1776) |
| <i>Rhynchobolus minutus</i> Bobretzky, 1870 | <i>Glycera alba</i> (O. F. Muller, 1776) |
| <i>Aonides ornatus</i> Perejaslavzeva, 1891 | <i>Aonides paucibranchiata</i> Southern, 1914 |
| <i>Nerine cirratulus</i> (Delle Chiaje, 1831) | <i>Scoelepis squamata</i> (O. F. Müller, 1806) |
| <i>Polydora ciliata limicola</i> Annenkova, 1934 | <i>Polydora limicola</i> Annenkova, 1934 |
| <i>Prionospio malmgreni</i> Claparède, 1869 | <i>Prionospio fallax</i> Söderström, 1920 |
| <i>Aricidea jeffreysii</i> (McIntosh, 1879) | <i>Aricidea cerruti</i> Laubier, 1966 |

| Table 3 Continued | |
|--|---|
| Cited Names | Valid Names |
| <i>Magelona papillicornis</i> Müller, 1858 | <i>Magelona mirabilis</i> (Johnston, 1865) |
| <i>Cirratulus cincinnatus</i> Bobretzky, 1870 | <i>Cirriformia filigera</i> (Delle Chiaje, 1828) |
| <i>Cirratulus viridis</i> Langerhans, 1881 | <i>Caulleriella bioculata</i> (Keferstein, 1862) |
| <i>Ophelia taurica</i> Bobretzky, 1881 | <i>Ophelia limacina</i> (Rathke, 1843) |
| <i>Capitella intermedia</i> Czerniavsky, 1881 | <i>Capitella capitata capitata</i> (Fabricius, 1780) |
| <i>Arenicola cyanea</i> Czerniavsky, 1881 | <i>Arenicolides branchialis</i> (Audouin & Milne Edwards, 1833) |
| <i>Arenicola dioscurica</i> Czerniavsky, 1881 | <i>Arenicolides branchialis</i> (Audouin & Milne Edwards, 1833) |
| <i>Arenicola bobretzkii</i> Czerniavsky, 1881 | <i>Arenicolides branchialis</i> (Audouin & Milne Edwards, 1833) |
| <i>Leiochone clypeata</i> Saint-Joseph, 1894 | <i>Leiochone leiopygos</i> (Grube, 1860) |
| <i>Terebellides carnea</i> Bobretzky, 1868 | <i>Terebellides stroemii</i> Sars, 1835 |
| <i>Fabricia sabella</i> (Ehrenberg, 1836) | <i>Fabricia stellaris stellaris</i> (O. F. Müller, 1774) |
| <i>Manayunkia caspica danubialis</i> Bacescu in Dumitrescu, 1957 | <i>Manayunkia caspica</i> Annenkova, 1928 |
| <i>Janua (Dexiospira) pusilloides</i> (Bush, 1905) | <i>Janua (Dexiospira) pagenstecheri</i> (Quatrefages, 1865) |
| <i>Spirorbis pusilla</i> Rathke, 1837 | <i>Janua (Dexiospira) pagenstecheri</i> (Quatrefages, 1865) |
| <i>Polygordius ponticus</i> Salensky, 1907 | <i>Polygordius lacteus</i> Schneider, 1868 |
| <i>Nerilla rotifera suchumica</i> (Czerniavsky, 1881) | <i>Nerilla antennata</i> O. Schmidt, 1848 |

The occurrences of some species in the Black Sea such as *Eulalia viridis*, *Xenosyllides violacea*, *Protoaricia capsulifera*, *Malacoceros ciliatus*, *Polydora ciliata*, *Polydora limicola*, *Prionospio multibranchiata*, *Streblospio benedicti*, *Paradoneis harpagonea*, *Arenicolides ecaudata*, *Euchone rubrocincta* and *Potamilla torelli* seem to be questionable and require confirmations. For example, the specimens previously identified as *P. multibranchiata* from the Aegean and Mediterranean coasts turned to be *P. maciolekae* (Dagli and Cinar 2011). The re-examination of the specimens previously identified as *P. ciliata* in the polluted soft substratum in the Aegean Sea and Sea of Marmara revealed that they in fact belonged to the alien species *P. cornuta* (Cinar *et al.* 2005a). The molecular and morphological analyses proved that *E. viridis* and *E. clavigera*, which were previously considered as identical, were distinct species (Bonse *et al.* 2006). Çinar and Gönlügür-Demirci (2005) identified the specimens of *Eulalia* collected along the Sinop Peninsula (Black Sea) as *E. clavigera*.

Polychaete families

The most speciose families in the Black Sea are shown in Figure 1. Syllidae and Spionidae are the most dominant families in terms of the number of species (respectively, 32 and 31 species), followed by Phyllodocidae (7%, 16 species), Nereididae (6%, 15 species), Nephtyidae (4%, 9 species) and Sabellidae (4%, 9 species). Thirteen families (Sigalionidae, Chrysopetalidae, Pisionidae, Amphinomidae, Pilargidae, Goniadidae, Arabellidae, Ctenodrilidae, Flabelligeridae, Sternaspidae, Trichobranchidae, Saccocirridae and Parergodrilidae) are represented by only one species (Table 1).

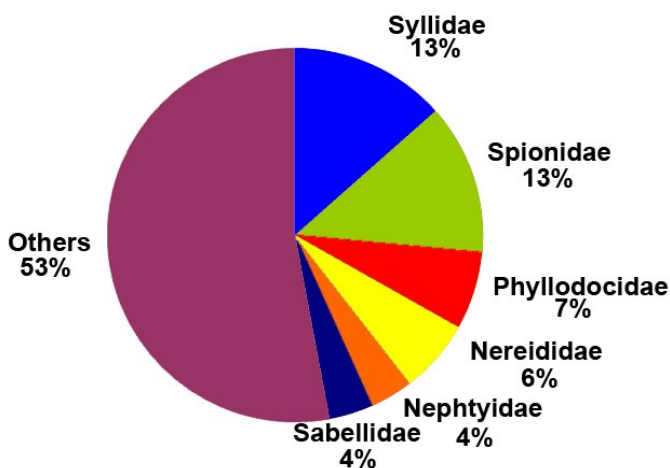


Figure 1. Relative percentages of the families according to the number of species.

The polychaete families represented by the high number of species along the Black Sea countries were Syllidae, Spionidae, Phyllodocidae and Nereididae (Figure 2). However, Spionidae (22%), Nephtyidae (14%), Capitellidae (12%) and Maldanidae (12%) were the most speciose families in the Prebosphoric region, which is greatly influenced by the Mediterranean bottom current and thus had relatively high saline waters in deep waters (36–38‰). The species that were only reported from the Prebosphoric region include *Hesione splendida*, *Streptosyllis bidentata*, *Inermonephthys inermis*, *Paradoneis lyra*, *Protocirrineris chrysotherma*, *Amage adspersa* and *Polycirrus haematodes*.

Number of species along the Black Sea coasts

The highest number of polychaete species were encountered on the coasts of Bulgaria (192 species) and Ukraine (161 species) (Figure 3). On the coast of Turkey, a total of 53 species were found. When the polychaete species found in the Prebosphoric region are taken into account, the number of polychaete

species known from the Turkish coast increases to 135 species. As a limited effort on documenting the polychaete diversity along the coast of Georgia has been made up to date, only 12 species were known from the area.

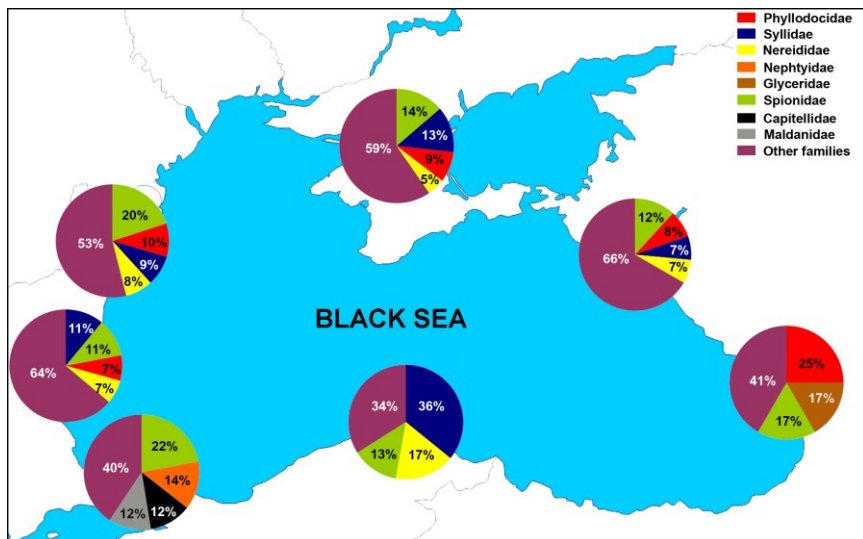


Figure 2. The polychaete families represented by the high number of species along the coasts of the Black Sea.

Habitat and depth preferences of the Black Sea polychaetes

The Black Sea benthic habitats from where polychaete species were reported can be classified into 7 categories: mud (or sandy mud), sand (or sandy mud), hard substrata (rocks and artificial structures), algae (mostly *Cystoseira* spp. and *Ulva rigida*), phanerogames (*Zostera* spp.), sponge (sponge species not indicated in papers) and mussel beds (mostly *Mytilus galloprovincialis*). The highest number of species were found in the soft substrata. Sandy bottom comprised the half of the total number of polychaete species (Figure 4). Ninety-two species were determined on the mussel beds. The lowest number of species were reported on phanerogames (*Zostera marina* and *Z. noltii*) and sponges (Figure 4).

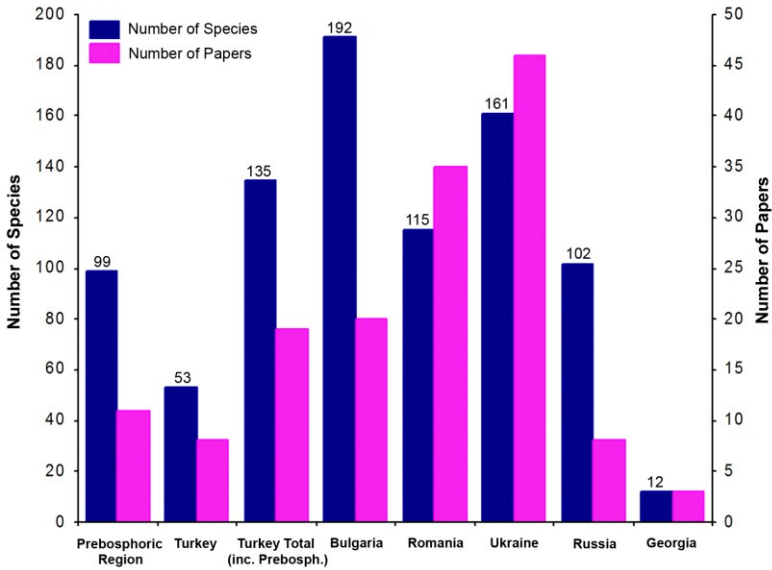


Figure 3. The number of polychaete species reported from the coasts of the Black Sea countries (including Prebosphoric region) and the number of papers published about polychaetes in each area.

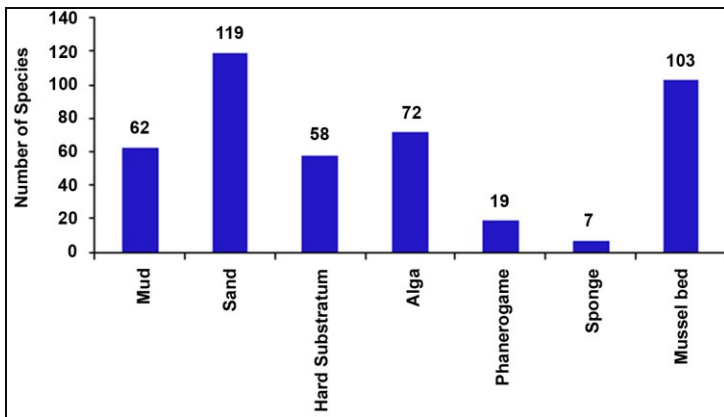


Figure 4. The number of polychaete species found in the Black Sea habitats.

Relative dominances of the polychaete families in habitats are shown in Figure 5. Sandy substratum had the majority of families known in the Black Sea (36 families, 80% of total number of families) and Spionidae ranked first in this habitat in terms of the number of species (17 species), followed by Syllidae (13 species), Phyllodocidae (9 species) and Nereididae (9 species). The relative

dominances of families change according to the habitats: Spionidae and Syllidae are dominant in soft substrata (sand and mud); Syllidae and Spionidae are dominant in hard substrata; Syllidae and Nereididae are dominant in algae; and Phyllodocidae and Nereididae are dominant in phanerogames, sponges and mussel beds.

The majority of the Black Sea polychaetes were determined in the shallow-water benthic habitats (0-25 m depth) (Figure 6). Increasing depth decreases the number of polychaete species. After 150 m depth, no polychaete species was reported from the Black Sea, with an exception of *Inermonephthys inermis* that was found at 480 m depth in the Prebosphoric region by Gillet and Unsal (2002).

Zoogeographic accounts of the Black Sea polychaetes

There are two polychaete species endemic to the Black Sea: *Xenosyllides violacea* and *Vigtorniella zaikai*. The former species was only reported from the Bulgarian (Marinov, 1977) and Ukrainian (Bay of Sevastopol) coasts (Jakubova 1930; Marinov 1964; Vinogradov 1949; Kiseleva 2004). As detailed description of this species (and genus in general) and the type materials are not present, it is very difficult at this stage if this species is valid or not. *Vigtorniella zaikai* was reported from oxic-anoxic layers of the Bulgarian (Vorobyova and Bondarenko 2009) and Ukrainian (Kiseleva 1992b; Murina 1997; Stutterer *et al.* 2009) coasts.

The ponto-caspian relicts of the Black Sea include the species *Hypania invalida*, *Hypaniola kowalewskii* and *Manayunkia caspica*. They inhabit benthic habitats in waters with reduced salinities such as river estuaries or coastal lagoons.

The majority of the polychaetes living in the Black Sea were originated from Atlanto-Mediterranean areas. These species colonize the Black Sea habitats after the opening of the Bosphorus Strait in Holocene (7.5 Ka BP) (Gorur *et al.* 1997; Oguz and Ozturk 2011).

Alien polychaete species in the Black Sea

The alien polychaete species that have been reported from the Black Sea coasts till now are *Hesionides arenaria*, *Streptosyllis varians*, *Glycera capitata*, *Nephtys ciliata*, *Polydora cornuta*, *Prionospio pulchra*, *Streblospio gynobranchiata*, *Capitellethus dispar* and *Ficopomatus enigmaticus*. However, *Sigambra tentaculata*, *Streblospio shrubsolii* and *Magelona mirabilis* were also considered as alien polychaete species in the Black Sea (see Gomoiu *et al.* 2002). These species were thought to have been introduced from the North Atlantic (*S. tentaculata* and *S. shrubsolii*) and Mediterranean (*M. mirabilis*) to the Black Sea by ballast waters of ships in the 1950s, but their distributional features indicate that they could not be alien species.

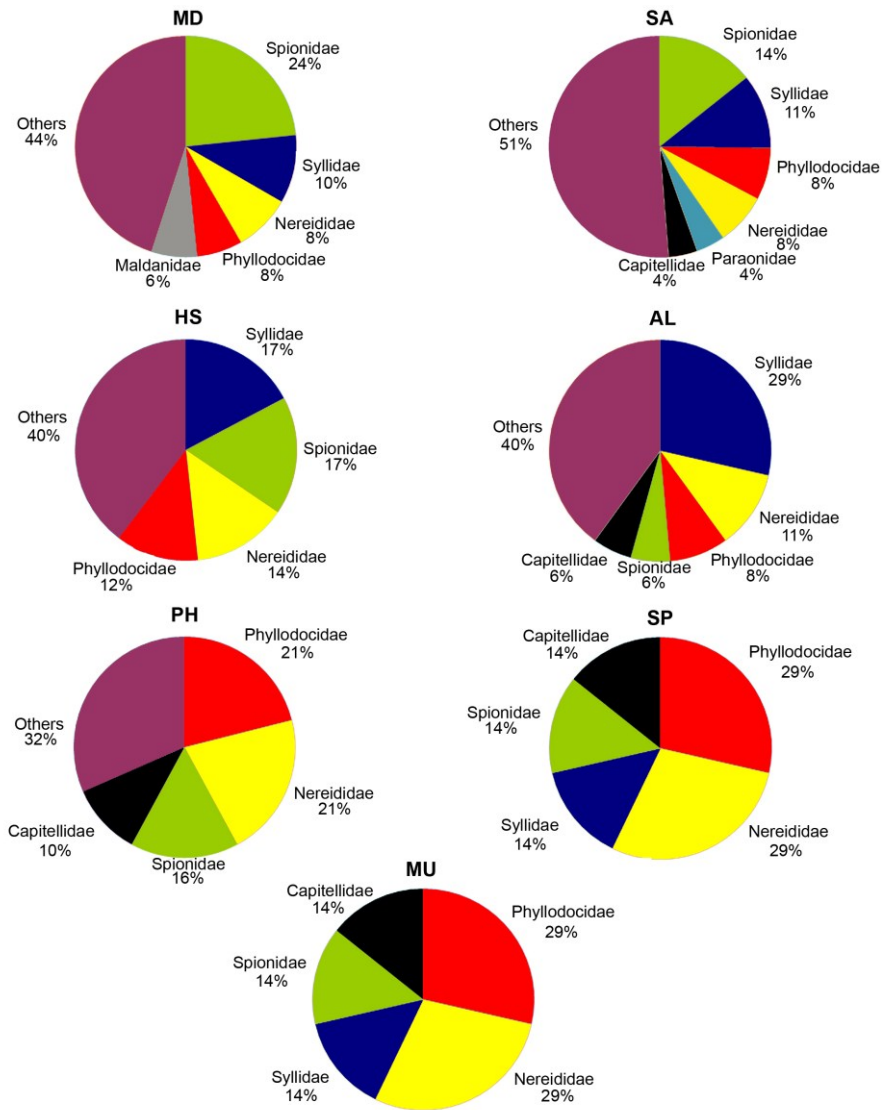


Figure 5. Relative dominances of the polychaete families in the Black Sea habitats (MD: Mud, SA: Sand, HS: Hard substratum, AL: Alga, PH: Phanerogame, SP: Sponge, MU: Mussel bed).

For example, *Sigambra tentaculata* occurs abundantly on muddy substratum in the Aegean Sea (Cinar *et al.* 2006) and the Sea of Marmara (Cinar *et al.* 2011), and therefore it could have been established in the Black Sea due to the ongoing Mediterraneanization process (Oguz and Ozturk 2011). *Magelona mirabilis* was previously cited as *M. papillicornis* in the Black Sea. *Streblospio shrubsolei* is a common species in estuarine areas of the Mediterranean Sea (Ergen *et al.* 2002; Kevrekidis 2005). The alien species *S. varians*, *N. ciliata*, *G. capitata* and *C. dispar* should be classified as questionable as their occurrences in the region need to be verified. Cinar (2010) also considered the report of *C. dispar* in the Sea of Marmara as questionable. Among the alien species, *P. cornuta*, *S. gynobranchiata* and *F. enigmaticus* are known to form dense populations in the recipient areas (Cinar *et al.* 2005b, 2011). *Ficopomatus enigmaticus* takes an important part in the fouling phenomenon in harbors and estuarine areas, causing economic problems for many establishments (Read and Gordon 1991). The established alien species were introduced to the Black Sea via shipping. The donor area for the introduction of the species seems to be the north Atlantic, except for *F. enigmaticus* (probably Indo-Pacific region).

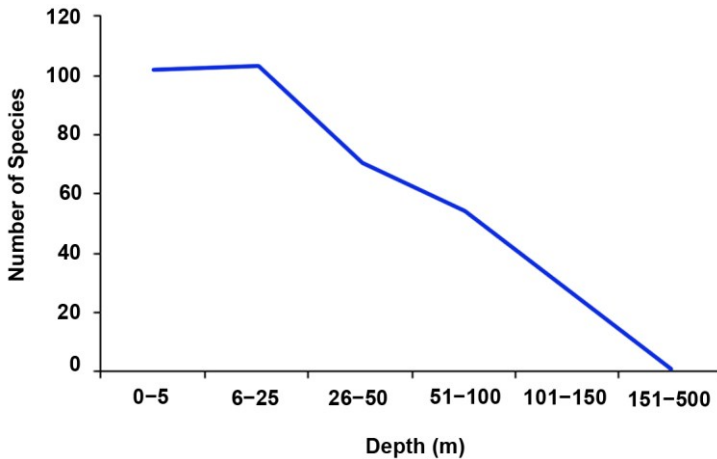


Figure 6. The number of polychaete species found in depth intervals in the Black Sea.

Conclusion

This review study indicates that the eastern and southern parts of the Black Sea have been poorly investigated and therefore the polychaete diversity in the Black Sea is still underestimated. The polychaete studies were mainly concentrated on the coasts of the Bulgaria, Romania and Ukraine. The Prebosphoric region that is considered as a special subunit of the Black Sea

should be studied in detail as it acts as an acclimatization area for the Mediterranean species.

Karadeniz poliket türlerinin (Annelida: Polychaeta) kontrol listesi

Özet

Karadeniz poliketleri mevcut literatürlere dayanılarak derlenmiştir. Bölgeden rapor edilen geçerli, değiştirilmiş ve şüpheli (*nomen dubium* ve tanımlanamayan türler) türlerin listeleri verilmiştir. Kontrol listesi 45 familyaya ait 238 geçerli türü içermektedir. 8 familyaya ait 23 tür *nomen dubium* veya tanımlanamayan tür olarak sınıflandırılmıştır. 1868 ve 2011 yılları arasında Karadeniz'den rapor edilen 51 tür diğer türlerin sinonimi olmuştur. Karadeniz sınır ülkeleri arasında Bulgaristan kıyıları en yüksek tür sayısı (192 tür) temsil edilirken, Ukrayna (161 tür) ve Romanya (115 tür) kıyıları bunu izlemektedir. En yüksek tür sayısı (119 tür) kumlu substratında, en düşük tür sayısı (7 tür) ise süngerlerin üzerinde bulunmuştur. Günümüze kadar Karadeniz'den 9 yabancı poliket türü (*Hesionides arenaria*, *Streptosyllis varians*, *Glycera capitata*, *Nephtys ciliata*, *Polydora cornuta*, *Prionospio pulchra*, *Streblospio gynobranchiata*, *Capitellethus dispar* ve *Ficopomatus enigmaticus*) rapor edilmiştir. Bölgedeki tür sayısı bakımından en baskın familyalar Syllidae (32 tür), Spionidae (31 tür), Phyllodocidae (16 tür) ve Nereididae (15 tür)'dir. Bu çalışma, bölgeden rapor edilen türleri tam olarak gözden geçirerek, Karadeniz poliket faunasının çeşitliliği hakkındaki bilgilerimizi özetmekte ve gelecekteki çalışmalar için bir veri tabanı oluşturmaktadır.

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