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## First checklist of free-living marine nematodes from the Israeli coast of the Mediterranean

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### Abstract

This study presents an inventory of free-living marine nematodes from the deep waters of the southeastern part of the Levantine Basin. The meiofauna of this area, particularly the free-living marine nematodes, have been poorly investigated; hence, the present study has regional zoo-geographic importance. To fill this knowledge gap, nematodes were collected from the upper 0-3 cm sediment horizon from a transect located perpendicular to the Israel coast off Tel Aviv, with depths ranging between 76 and 1400 m. Our sampling yielded a diverse assemblage of nematodes representing 65 species belonging to 54 genera and 22 families. About 38% of the species have been previously reported in the Mediterranean; the remaining 62% are reported for the first time. A taxonomic checklist provides information on the worldwide distribution of the encountered species. This checklist provides a baseline for understanding the nematode community in this region and serves as a valuable resource for future studies.

**Keywords:** Free-living marine nematodes; South-east Mediterranean; meiofauna; Levantine Basin; Israeli Mediterranean waters.

### Introduction

Free-living marine nematodes are the most abundant and diverse metazoans found in marine sediments. Their distribution spans from the high-water mark to the deepest oceanic trenches, asserting their dominance in both density and diversity within marine sediment ecosystems (Lambhead, 2004). Hodda's recent taxonomic review (2022) suggested that the phylum Nematoda consists of 3 classes, 8 subclasses, 12 superorders, 32 orders, 53 suborders, 101 superfamilies, 276 families, 511 subfamilies, 3,030 genera and 28,537 species. Hodda (2022) also reviewed a variety of estimates of the total existing number of nematode species, and the obtained range was between half a million and 10 million species. Although larger individuals exist, the free-living marine nematodes are generally considered to belong to the meiofaunal size group. There is no universally accepted size range for meiofauna, and according to Giere (2009), the accepted range is between an upper limit of 500-1000 µm and a lower limit of 44-63 µm.

The Mediterranean is a semi-enclosed water body characterized by constant temperatures at depths below 300-500 m. In the Eastern Mediterranean, the temperature ranges from 13.6°C to 13.8°C. Salinity levels are very high, ranging from 38.7 to 38.8‰, and the oxygen concentration just above the seafloor in the studied area is >175 µM (Kress *et al.*, 2014), indicating a well-oxygenated near-bottom water layer. In addition, the region is characterized as one of the most oligotrophic areas in the world (Berman-Frank & Rahav, 2012; Moore *et al.*, 2013; Siokou-Frangou *et al.*, 2010).

There are several faunistic species-level nematode checklists from the Mediterranean, mainly from relatively shallow waters (Schuurmans-Stekhoven, 1950; Wieser, 1956; Semprucci *et al.*, 2008; Semprucci, 2013 and Jouili *et al.*, 2018, and see also the literature in Table 2). The majority of them concern coastal European ecosystems. Thus our understanding of the eastern, non-European Mediterranean ecosystems is rather poor (Semprucci & Balsamo, 2012). Regarding the eastern Mediterranean, while several studies of free-living marine nematodes do

exist (e.g. see reviews of Lampadariou & Sevastou, 2022; Sevastou & Lampadariou, 2021 and references therein), nematodes have been identified either to genus or, at best, to putative species (i.e. sp.1, sp.2 etc.) in most of them. To the best of our knowledge, nematodes from the deep Levantine Basin have never been identified to species level.

In the present study, nematodes from the Israeli part of the eastern Mediterranean were studied with the aim of providing a list of the nematode species across a deep-sea transect of the coast of Tel Aviv. A species checklist, together with some additional information on the distribution of the encountered species in other parts of the world, is provided. Such information will expand our knowledge of the biodiversity of nematodes in the Mediterranean and can be used as baseline information in future monitoring surveys.

## Materials and Methods

### Survey area

The heterogeneous Israeli continental slope comprises a prominently steep northern section incised by several canyons, a comparatively gentler seabed in its southern region, and two gravitational slumps known as Dor and Palmahim (Fig. 1). The relatively flatter bathyal basin extends westward to Crete, and the studied area in the Israeli waters is its shallow east part, with depths ranging between 1000 and 2000 m (Kanari *et al.*, 2020, and references therein). The specimens under scrutiny in this study were sampled from the southern part of the Israeli

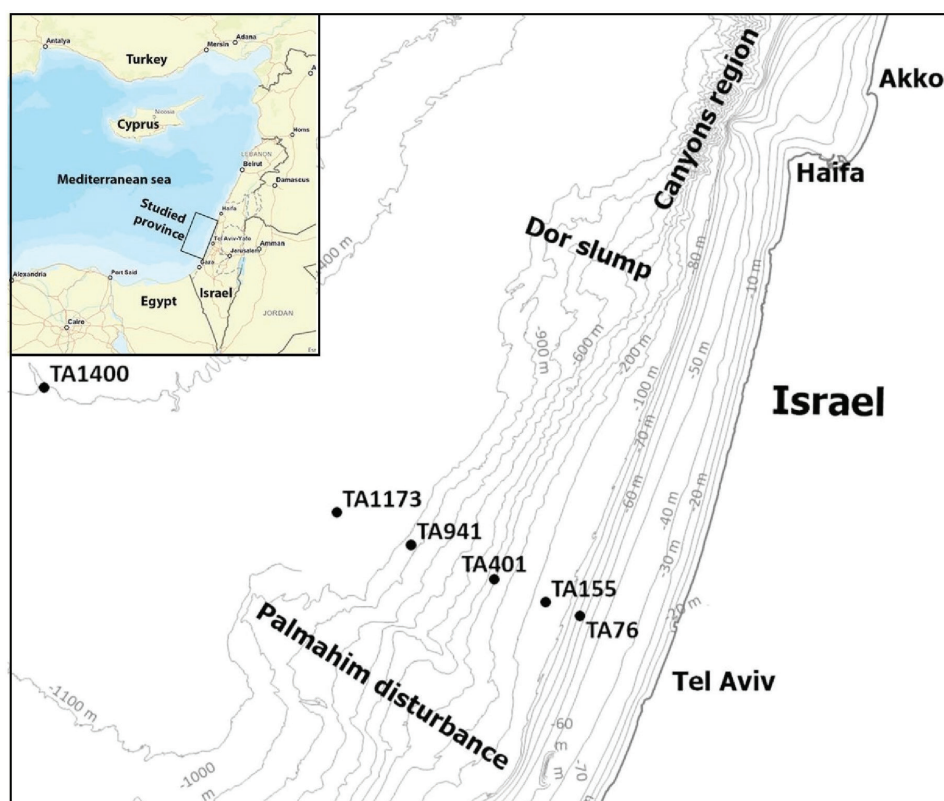
Mediterranean coast along a transect perpendicular to the Tel Aviv shoreline, encompassing a depth range of 76–1400 m (Fig. 1 and Table 1).

Sediment grain size declines gradually from 7 to 5  $\mu\text{m}$  along the 100 to 1900 m depth gradient (Lubinevsky *et al.*, 2017).

### Sampling and sorting

Meiofauna samples were acquired by sub-sampling from 0.25 m<sup>2</sup> box corer (BX-650, Ocean instruments, San Diego, CA) samples, employing a Plexiglas tube with an inner diameter of 9.4 cm. The upper 0–3 cm sediment layer was taken from each Plexiglas tube and preserved onboard in 99% ethanol while applying mild mixing to facilitate the ethanol penetration. The sampling cruise took place during the autumn of 2018 aboard the R/V “Bat Galim”, operated by the Israel Oceanographic and Limnological Research (IOLR). Meiofaunal nematode specimens were separated from the ethanol-preserved sediments according to Harbuzov *et al.* (2022) following Heip *et al.* (1985) and Danovaro (2010), which included two major stages: sieving and density gradient centrifugation. This method revealed a specimen size range of 20–500  $\mu\text{m}$ .

The selection procedure involved randomly choosing ~10 nematode individuals from each sample, combining the liquid containing the entire pool of sampled organisms, and then extracting the specimens using a pipette, ensuring a balanced representation across different stations. No permanent slides were prepared, and identification was conducted from individuals immediately placed in glycerol.



**Fig. 1:** Sampling sites map. TA – Tel Aviv transect; the studied sites are labeled by black dots. The numbers to the right of the station designations depict depth in meters. Palmahim and Dor are two gravitational sediment slumps.

**Table 1.** Geographical coordinates and depths of six sites sampled along the coast of Israel for studying marine nematodes

| No. | Site name | Depth [m] | Longitude | Latitude |
|-----|-----------|-----------|-----------|----------|
| 1   | TA1400    | 1400      | 33.891    | 32.501   |
| 2   | TA1173    | 1173      | 34.310    | 32.322   |
| 3   | TA941     | 941       | 34.415    | 32.277   |
| 4   | TA401     | 401       | 34.534    | 32.226   |
| 5   | TA155     | 155       | 34.607    | 32.194   |
| 6   | TA76      | 76        | 34.657    | 32.174   |

### Morphological identification

The identification process involved utilizing the pictorial keys of Platt and Warwick (1983, 1988) and Warwick *et al.* (1998), as well as the work of Schuurmans-Stekhoven (1950) from the Mediterranean and the NeMys database accessible at Nemys eds. (2023), which contains the up-to-date taxonomic literature on free-living marine nematodes. All observations were conducted under a Nomarski interference contrast microscope employing a  $\times 100$  magnification.

### Results

In total, 182 specimens belonging to 22 families, 54 genera and 65 species were identified. In some cases (25 out of 65), species identification was not possible, and species were ascribed as putative species or morphospecies (i.e. sp.1, sp.2 etc.). Of the 40 named species, 15 (38%) have been previously reported from the Mediterranean. Table 2 displays a detailed list of all species together with additional information on their distribution, synonyms, original description and other sources of references from the Mediterranean (e.g. Schuurmans-Stekhoven, 1950; Wieser, 1956; Semprucci *et al.*, 2008; Semprucci, 2013; Jouili *et al.*, 2018).

As depicted in Table 2, the various families elucidated specific depth distributions. Two families, Aegialoalaimidae and Rhabdolaimidae, were completely absent from the shallow 76–401 m depth range. Chromadoridae, Comesomatidae, and Xyalidae were encountered, with some exceptions, across the entire transect, indicating a wide depth distribution ranging from the shelf down to the bathyal basin. Selachinematidae, Phanodermatidae, Desmodoridae, Desmoscolecidae, Diplopeltidae, Ceraimonematidae, Microlaimidae and Tarvaidae were absent between the 941 and 1400 m depth range. Diplopeltidae, Phanodermatidae and Selachinematidae were found only at the shallowest 76 m station. Finally, species from the Rhabdolaimidae were found only at the deepest 1440 m station.

### Discussion

Twenty-five species out of the 65 identified ones could not be conclusively attributed to known species. This limitation predominantly arose from the absence of adult males, which play a pivotal role in precise taxonomic identification. Juveniles and females often lack the requisite diagnostic features for accurate classification. Furthermore, suboptimal preservation conditions contributed to the challenge by compromising the visibility of the small morphological features essential for species-level identification. This may have been due to the choice of ethanol as a preservation medium, but this was necessary since our initial sampling strategy aimed at combining both morphological identifications and molecular techniques. The preservation method proposed by Yoder (2006), utilizing dimethyl sulfoxide-disodium EDTA in saturated NaCl and abbreviated DESS, was recently applied successfully in our laboratory and provided promising results and is thus recommended when both morphological identifications and molecular techniques are needed.

The 65 different species identified out of 182 individuals confirm previous reports of a rather high species diversity of nematodes in general (Appeltans *et al.*, 2012; Hodda, 2022) and in the deep sea in particular (e.g. Lamshead & Boucher, 2003). It should be mentioned, however, that nematode species-level data, particularly from the deep sea, are generally scarce since most studies are either conducted at the genus level or based on a separation into putative species. Lamshead (1993) provided a comparison of nematode alpha diversity from worldwide deep-sea studies. He reported numbers ranging between 81 and 316 species, although in most of the studies mentioned, a much higher sampling effort was applied. In a more recent compilation derived from various literature sources, Miljutin *et al.* (2010) provided a comprehensive summary of deep-sea nematode species. Their findings revealed considerable variability in nematode species numbers, ranging from 1 to 6 to as high as 175 species, contingent upon the specific geographic region. Notably, instances of lower species counts were predominantly associated with taxonomically focused

**Table 2.** List of Nematoda species found in the studied area of the Israeli coast. V - presence and (—) - absence of species. All the synonyms were taken from the World Register of Marine Species (WoRMS), and the notes refer to the original description of the species in the Mediterranean

| Taxonomy                                                 | Depth [m] |     |     |     |      |      | Geographical distribution                                                                 | Synonymized names                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Notes*              |
|----------------------------------------------------------|-----------|-----|-----|-----|------|------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                                          | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Nematoda                                                 |           |     |     |     |      |      |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Order Chromadorida                                       |           |     |     |     |      |      |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Chromadoridae Filipjev, 1917                             |           |     |     |     |      |      |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <i>Acantholaimus</i> sp.1                                | —         | v   | v   | —   | —    | v    | -                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <i>Chromadorella duopapillata</i> Platt, 1973            | v         | v   | —   | —   | v    | —    | Adriatic Sea, North Atlantic Ocean                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A1, A5, A12, A15    |
| <i>Endeolophos</i> sp.1                                  | v         | —   | —   | —   | —    | —    | -                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <i>Actinonema pachydermatum</i> Cobb, 1920               | —         | v   | —   | —   | —    | v    | Adriatic Sea, Belgium, Gulf of Mexico, Mediterranean Sea, North Atlantic Ocean, North Sea | <i>Actinonema amphidiscatum</i> (Schuurmans Stekhoven & Adam, 1931) Wieser, 1954<br><i>Actinonema fragile</i> (Allgén, 1929) Wieser, 1954<br><i>Adeuchromadora megamphida</i> Boucher & Bovée, 1972<br><i>Euchromadora fragilis</i> Allgén, 1933<br><i>Pareuchromadora amphidiscata</i> Allgén, 1940<br><i>Pareuchromadora amphidiscata</i> Schuurmans Stekhoven & Adam, 1931<br><i>Pareuchromadora fragilis</i> (Allgén, 1934)<br><i>Spiliphora fragilis</i> Allgén, 1929<br><i>Spilophora fragilis</i> Allgén, 1929 | A1, A2, A3, A5, A12 |
| <i>Hypodontolaimus schuurmansstehoveni</i> Gerlach, 1951 | —         | —   | —   | —   | —    | v    | North Atlantic Ocean, North Sea                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <i>Dichromadora geophila</i> (de Man, 1876) Kreis, 1929  | v         | —   | —   | —   | —    | —    | United States, North Atlantic Ocean, North Sea                                            | <i>Chromadora canadensis</i> Cobb, 1914<br><i>Hypodontolaimus geophilus</i> de Man, 1876<br><i>Spiliphora canadensis</i> Cobb, 1914<br><i>Spiliphora spectabilis</i> Allgén, 1929<br><i>Spilophora canadensis</i> Cobb, 1914<br><i>Spilophora geophila</i> de Man, 1876<br><i>Spilophora spectabilis</i> Allgén, 1929                                                                                                                                                                                                 | A6                  |

Continued

| Taxonomy                                                | Depth [m] |     |     |     |      |      | Geographical distribution                                        | Synonymized names                                                                                            | Notes*           |
|---------------------------------------------------------|-----------|-----|-----|-----|------|------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------|
|                                                         | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                  |                                                                                                              |                  |
| Ethmolaimidae Filipjev & Schuurmans Stekhoven, 1941     |           |     |     |     |      |      |                                                                  |                                                                                                              |                  |
| <i>Filitonchus filiformis</i> Warwick, 1971             | v         | —   | —   | —   | —    | —    | Belgium, North Atlantic Ocean, North Sea                         |                                                                                                              | A9, A12, A15     |
| <i>Comesa vitia</i> Warwick, 1971                       | —         | —   | —   | v   | v    | —    | Barents Sea                                                      |                                                                                                              |                  |
| <i>Neotonchus punctatus</i> Cobb, 1933                  | —         | —   | —   | v   | —    | —    | Adriatic Sea                                                     |                                                                                                              | A17              |
| Selachinematidae Cobb, 1915                             |           |     |     |     |      |      |                                                                  |                                                                                                              |                  |
| <i>Choanolaimus psammophilus</i> de Man, 1880           | v         | —   | —   | —   | —    | —    | North Atlantic Ocean, North Sea                                  |                                                                                                              |                  |
| <i>Gammanema fennicum</i> Gerlach, 1953                 | v         | —   | —   | —   | —    | —    | White Sea                                                        |                                                                                                              |                  |
| Cyatholaimidae Filipjev, 1918                           |           |     |     |     |      |      |                                                                  |                                                                                                              |                  |
| <i>Paralongicyatholaimus minutus</i> Warwick, 1971      | —         | v   | —   | —   | —    | —    | North Atlantic Ocean, North Sea                                  |                                                                                                              |                  |
| <i>Maryllynia complexa</i> (Warwick, 1971) Hopper, 1972 | —         | v   | —   | —   | —    | —    | Adriatic Sea, Mediterranean Sea, North Atlantic Ocean, North Sea | <i>Longicyatholaimus complexus</i> Warwick, 1971<br><i>Maryllynia complexus</i> (Warwick, 1971) Hopper, 1972 | A8, A17          |
| <i>Paracanthonchus longicaudatus</i> Warwick, 1971      | —         | v   | —   | —   | —    | —    | Barents Sea, North Atlantic Ocean, North Sea                     |                                                                                                              |                  |
| <i>Metacyatholaimus</i> sp.1                            | —         | —   | v   | —   | —    | —    | -                                                                |                                                                                                              |                  |
| <i>Paracyatholaimus</i> sp.1                            | v         | —   | —   | —   | —    | v    | -                                                                |                                                                                                              |                  |
| <i>Pomponema</i> sp.1                                   | —         | v   | —   | —   | —    | —    | -                                                                |                                                                                                              |                  |
| Order Monhysterida                                      |           |     |     |     |      |      |                                                                  |                                                                                                              |                  |
| Sphaerolaimidae Filipjev, 1918                          |           |     |     |     |      |      |                                                                  |                                                                                                              |                  |
| <i>Sphaerolaimus hirsutus</i> Bastian, 1865             | —         | —   | v   | —   | —    | —    | Belgium, North Atlantic Ocean, North Sea                         |                                                                                                              | A5               |
|                                                         |           |     |     |     |      |      |                                                                  |                                                                                                              | <i>Continued</i> |

| Taxonomy                                             | Depth [m] |     |     |     |      |      | Geographical distribution                                                                                                         | Synonymized names                                                                                                                                                                                                                                         | Notes*       |
|------------------------------------------------------|-----------|-----|-----|-----|------|------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                                      | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                                                                                   |                                                                                                                                                                                                                                                           |              |
| <i>Sphaerolaimus macrocerculus</i><br>Filipjev, 1918 | —         | —   | —   | v   | —    | —    | Adriatic Sea, Black Sea,<br>Mediterranean Sea, North<br>Atlantic Ocean                                                            |                                                                                                                                                                                                                                                           | A5, A10, A12 |
| <i>Doliolaimus agilis</i> Lorenzen, 1966             | —         | —   | —   | —   | —    | v    | North Atlantic Ocean,<br>North Sea                                                                                                |                                                                                                                                                                                                                                                           |              |
| Xyalidae Chitwood, 1951                              |           |     |     |     |      |      |                                                                                                                                   |                                                                                                                                                                                                                                                           |              |
| <i>Daptonema invagiferum</i> Platt,<br>1973          | v         | —   | —   | —   | v    | v    | North Atlantic Ocean,<br>North Sea                                                                                                | <i>Daptonema invagiferum</i> Platt, 1973<br><i>Theristus invagiferum</i> Platt, 1973                                                                                                                                                                      |              |
| <i>Daptonema setifer</i> Gerlach, 1952               | v         | v   | —   | —   | v    | —    | Mediterranean Sea, North<br>Atlantic Ocean, North Sea                                                                             | <i>Theristus setifer</i> Gerlach, 1952<br><i>Trichotheristus setifer</i> Gerlach, 1952                                                                                                                                                                    | A7, A8, A12  |
| <i>Elzalia</i> sp.1                                  | v         | v   | —   | —   | —    | —    | -                                                                                                                                 |                                                                                                                                                                                                                                                           |              |
| <i>Retrotheristus breviseta</i> Juario,<br>1974      | v         | —   | —   | —   | v    | v    | North Sea (the German<br>Bight)                                                                                                   | <i>Paramonhystera breviseta</i> Juario, 1974                                                                                                                                                                                                              |              |
| <i>Scaptrella</i> sp.1                               | —         | —   | —   | —   | —    | v    | -                                                                                                                                 |                                                                                                                                                                                                                                                           |              |
| <i>Amphimonhystrella megastoma</i><br>Timm, 1961     | —         | —   | —   | —   | v    | v    | Bay of Bengal                                                                                                                     |                                                                                                                                                                                                                                                           |              |
| <i>Omicronema</i> sp.1                               | —         | —   | —   | v   | —    | —    | -                                                                                                                                 |                                                                                                                                                                                                                                                           |              |
| <i>Paramonhystera</i> sp.1                           | v         | —   | —   | —   | —    | —    | -                                                                                                                                 |                                                                                                                                                                                                                                                           |              |
| Monhysteridae de Man, 1876                           |           |     |     |     |      |      |                                                                                                                                   |                                                                                                                                                                                                                                                           |              |
| <i>Thalassomonhystera parva</i><br>Bastian, 1865     | —         | v   | —   | —   | v    | —    | Adriatic Sea, Belgium,<br>Black Sea, France, Gulf<br>of Mexico, Mediterranean<br>Sea, North Atlantic Ocean,<br>North Sea, Red Sea | <i>Monhystera heteroparva</i> Micoletzky, 1924<br><i>Monhystera kosnensis</i> Paramonov, 1929<br><i>Monhystera parva</i> (Bastian, 1865) Butschli, 1874<br><i>Monhystera parva meridiana</i> Micoletzky, 1922<br><i>Tachyhodites parvus</i> Bastian, 1865 | A4, A17      |
| <i>Thalassomonhystera venusta</i><br>Lorenzen, 1979  | —         | v   | —   | —   | —    | —    | North Atlantic Ocean,<br>North Sea                                                                                                | <i>Monhystera venusta</i> Lorenzen, 1979                                                                                                                                                                                                                  |              |
| Linhomoeidae Filipjev, 1922                          |           |     |     |     |      |      |                                                                                                                                   |                                                                                                                                                                                                                                                           |              |
| <i>Linhomoeus elongatus</i> Bastian,<br>1865         | —         | v   | —   | —   | —    | —    | France, New Zealand,<br>North Atlantic Ocean,<br>North Sea                                                                        | <i>Eulinhomoeus elongatus</i> Bastian, 1865                                                                                                                                                                                                               |              |
|                                                      |           |     |     |     |      |      |                                                                                                                                   |                                                                                                                                                                                                                                                           | Continued    |

| Taxonomy                                                      | Depth [m] |     |     |     |      |      | Geographical distribution                                                                                                              | Synonymized names                                                                                                                                                                                                                                                              | Notes*                                    |
|---------------------------------------------------------------|-----------|-----|-----|-----|------|------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|                                                               | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| <i>Terschellingia longicaudata</i> de Man, 1907               |           |     |     |     |      |      | Adriatic Sea, Baltic Sea, Barents Sea, Belgium, Gulf of Mexico, Japan, Mediterranean Sea, New Zealand, North Atlantic Ocean, North Sea | <i>Terschellingia antonovi</i> Filipjev, 1922<br><i>Terschellingia gerlachi</i> Inglis, 1968<br><i>Terschellingia heteroseta</i> Schuurmans-Stekhoven, 1950<br><i>Terschellingia longispiculata</i> Wieser & Hopper, 1967<br><i>Terschellingia supplementa</i> Tchesunov, 1978 | A1, A8, A10, A11, A12, A14, A15, A16, A17 |
| <i>Metalinhomoeus filicaudatus</i> Allg n, 1930               | v         | —   | —   | —   | —    | —    | North Atlantic Ocean, North Sea                                                                                                        | <i>Linhomoeus (Metalinhomoeus) filicaudatus</i> Allg n                                                                                                                                                                                                                         |                                           |
| <i>Paralinhomoeus</i> sp.1                                    | —         | —   | —   | —   | —    | v    | -                                                                                                                                      |                                                                                                                                                                                                                                                                                |                                           |
| Order Plectida                                                |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| Aegialoaimidae Lorenzen, 1981                                 |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| <i>Aegialoaimus</i> sp.1                                      | —         | —   | —   | v   | —    | —    | -                                                                                                                                      |                                                                                                                                                                                                                                                                                |                                           |
| Ceramonomatidae Cobb, 1933                                    |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| <i>Metadasynemella</i> sp.1                                   | v         | v   | —   | —   | —    | —    | -                                                                                                                                      |                                                                                                                                                                                                                                                                                |                                           |
| <i>Psilonema</i> sp.1                                         | v         | v   | —   | —   | —    | —    | -                                                                                                                                      |                                                                                                                                                                                                                                                                                |                                           |
| Tarvaidae Lorenzen, 1981                                      |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| <i>Tarvaia angusta</i> Gerlach, 1953                          | —         | v   | —   | —   | —    | —    | Mediterranean Sea, North Atlantic Ocean, North Sea                                                                                     |                                                                                                                                                                                                                                                                                | A8, A12                                   |
| Order Enoplida                                                |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| Enchelidiidae Filipjev, 1918                                  |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |
| <i>Pareurystomina vaughtae</i> Keppner, 1989                  | —         | —   | —   | —   | v    | —    | St. Andrew Bay, Gulf of Mexico, Mexican Bay                                                                                            |                                                                                                                                                                                                                                                                                |                                           |
| <i>Belbolla longispiculata</i> Nasira, Shahina & Shamim, 2014 | v         | —   | —   | —   | —    | —    | Indus River                                                                                                                            |                                                                                                                                                                                                                                                                                |                                           |
| <i>Pareurystomina scilloniensis</i> Warwick, 1977             | v         | —   | —   | —   | —    | —    | North Atlantic Ocean                                                                                                                   |                                                                                                                                                                                                                                                                                |                                           |
| Phanodermatidae Filipjev, 1927                                |           |     |     |     |      |      |                                                                                                                                        |                                                                                                                                                                                                                                                                                |                                           |

*Continued*

| Taxonomy                                                  | Depth [m] |     |     |     |      |      | Geographical distribution                                                            | Synonymized names                                                                                                                                                                                                                                                                                                             | Notes*                     |
|-----------------------------------------------------------|-----------|-----|-----|-----|------|------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                                                           | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Crenopharynx</i> sp.1                                  | v         | —   | —   | —   | —    | —    | -                                                                                    |                                                                                                                                                                                                                                                                                                                               |                            |
| Ironidae de Man, 1876                                     |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Dolicholaimus</i> sp.1                                 | v         | —   | —   | —   | v    | —    | -                                                                                    |                                                                                                                                                                                                                                                                                                                               |                            |
| Oxystominae Chitwood, 1935                                |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Halalaimus</i> sp.1                                    | —         | —   | v   | —   | —    | v    | -                                                                                    |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Oxystomina asetosa</i> (Southern, 1914) Filipjev, 1921 | —         | v   | —   | —   | —    | —    | Adriatic Sea, North Atlantic Ocean                                                   |                                                                                                                                                                                                                                                                                                                               | A12, A17                   |
| Rhabdolaimidae Chitwood, 1951                             |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Syringolaimus</i> sp.1                                 | —         | —   | —   | —   | —    | v    | -                                                                                    |                                                                                                                                                                                                                                                                                                                               |                            |
| Oncholaimidae Filipjev, 1916                              |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Viscosia abyssorum</i> (Allgén, 1933) Wieser, 1953     | v         | v   | v   | —   | —    | —    | Adriatic Sea, North Atlantic Ocean, North Sea, South Atlantic Ocean                  | <i>Oncholaimus abyssorum</i> Allgén, 1933                                                                                                                                                                                                                                                                                     | A15, A17                   |
| <i>Viscosia viscosa</i> (Bastian, 1865) de Man, 1890      | —         | —   | —   | v   | —    | —    | Adriatic Sea, Baltic Sea, Belgium, France, North Atlantic Ocean, North Sea           | <i>Mononcholaimus viscosus</i> Allgén, 1930<br><i>Oncholaimus viscosus</i> Bastian, 1865<br><i>Viscosia viscosa</i> Bastian, 1865                                                                                                                                                                                             | A17                        |
| Order Desmodorida                                         |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| Desmodoridae Filipjev, 1922                               |           |     |     |     |      |      |                                                                                      |                                                                                                                                                                                                                                                                                                                               |                            |
| <i>Desmodora pontica</i> Filipjev, 1922                   | v         | v   | —   | —   | —    | —    | Adriatic Sea, Belgium, Black Sea, Mediterranean Sea, North Atlantic Ocean, North Sea |                                                                                                                                                                                                                                                                                                                               | A1, A8, A12, A12, A14, A17 |
| <i>Desmodora communis</i> (Bütschli, 1874) De Man, 1889   |           |     |     |     |      |      | Belgium, France, North Atlantic Ocean, North Sea                                     | <i>Desmodora gracilis</i> Kreis, 1928<br><i>Desmodora leucocephala</i> Schulz, 1932<br><i>Desmodora problematica</i> Allgén, 1929<br><i>Desmodora serpentulus</i> de Man, 1889<br><i>Desmodora serpentulus suecica</i> Allgén, 1929<br><i>Spiliphora communis</i> Bütschli, 1874<br><i>Spilophora communis</i> Bütschli, 1874 |                            |

Continued

| Taxonomy                                                                   | Depth [m] |     |     |     |      |      | Geographical distribution                                                                    | Synonymized names                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Notes* |
|----------------------------------------------------------------------------|-----------|-----|-----|-----|------|------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                            | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Desmodora</i> sp.1                                                      | v         | v   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Desmodora</i> sp.2                                                      | v         | v   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Metachromadora</i> sp.1                                                 | v         | —   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Pseudonchus</i> sp.1                                                    | —         | v   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| Microlaimidae Micoletzky, 1922                                             |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Microlaimus tenuispiculum</i> de Man, 1922                              | —         | v   | —   | —   | —    | —    | Baltic Sea,<br>North Atlantic Ocean,<br>North Sea,<br>South Pacific Ocean,<br>Southern Ocean | <i>Molgolaimus demani</i> Jensen, 1978                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |
| <i>Microlaimus robustidens</i> Schuurmans Stekhoven & De Coninck, 1933     | v         | —   | —   | —   | —    | —    | Belgium, Netherlands,<br>North Atlantic Ocean,<br>North Sea                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| Order Desmoscolecida                                                       |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| Desmoscolecidae Shipley, 1896                                              |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Desmoscolex</i> sp.1                                                    | —         | v   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Tricoma</i> sp.1                                                        | v         | —   | —   | —   | —    | —    | —                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| Order Araeolaimida                                                         |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| Diplopeltidae Filipjev, 1918                                               |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |
| <i>Neodiplopeltula barentsi</i> (Steiner, 1916) Holovachov & Boström, 2018 |           |     |     |     |      |      | New Zealand                                                                                  | <i>Dipeltis barentsi</i> Steiner, 1916<br><i>Diplopeltis asymmetricus</i> Allgén, 1935<br><i>Diplopeltis barentsi</i> Steiner, 1916<br><i>Diplopeltis ovalis</i> Ditlevsen, 1928 ·<br><i>Diplopeltula cuspidibojia</i> Leduc, 2017<br><i>Neodiplopeltula asymmetrica</i> (Allgén, 1935)<br>Holovachov & Boström, 2018<br><i>Neodiplopeltula cuspidibojia</i> (Leduc, 2017)<br>Holovachov & Boström, 2018<br><i>Neodiplopeltula ovalis</i> (Ditlevsen, 1928)<br>Holovachov & Boström, 2018 |        |
| <i>Comesomatidae</i> Filipjev, 1918                                        |           |     |     |     |      |      |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |

*Continued*

| Taxonomy                                                     | Depth [m] |     |     |     |      |      | Geographical distribution                                             | Synonymized names                                                                                                                                                                                                                                                                                                                        | Notes*            |
|--------------------------------------------------------------|-----------|-----|-----|-----|------|------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|                                                              | 76        | 155 | 401 | 941 | 1173 | 1400 |                                                                       |                                                                                                                                                                                                                                                                                                                                          |                   |
| <i>Dorylaimopsis longispicula</i> Fu, Leduc, Rao & Cai, 2019 | —         | —   | v   | v   | v    | —    | South China Sea                                                       |                                                                                                                                                                                                                                                                                                                                          |                   |
| <i>Laimella longicauda</i> Cobb, 1920                        | —         | —   | v   | v   | —    | —    | Gulf of Mexico, North Atlantic Ocean                                  |                                                                                                                                                                                                                                                                                                                                          |                   |
| <i>Sabatieria armata</i> Gerlach, 1952                       | v         | v   | —   | —   | v    | —    | Mediterranean Sea, North Atlantic Ocean, North Sea                    |                                                                                                                                                                                                                                                                                                                                          | A8, A12           |
| <i>Sabatieria</i> sp.1                                       | —         | —   | v   | —   | —    | —    | -                                                                     |                                                                                                                                                                                                                                                                                                                                          |                   |
| <i>Setosabatieria hilarula</i> de Man, 1922                  | —         | v   | —   | —   | —    | —    | Adriatic Sea, France, Gulf of Mexico, North Atlantic Ocean, North Sea | <i>Comesoma jubata</i> Cobb N.A., 1898<br><i>Comesoma jubatum</i> Cobb, 1898<br><i>Sabatieria chitwoodi</i> Wieser, 1954<br><i>Sabatieria hilarula</i> (Chitwood, 1951) de Man, 1922<br><i>Sabatieria jubata</i> (Cobb, 1898)<br><i>Sabatieria scotlandia</i> Inglis, 1961<br><i>Setosabatieria chitwoodi</i> (Wieser, 1954) Platt, 1985 | A1, A12, A15, A17 |
| <i>Setosabatieria</i> sp.1                                   | —         | —   | v   | —   | —    | —    | -                                                                     |                                                                                                                                                                                                                                                                                                                                          |                   |

## \*Notes

- A1 Ape *et al.*, 2016.  
A2 Boucher & de Bovée, 1971.  
A3 Coomans, 1989.  
A4 De Coninck & Schuurmans Stekhoven, 1933.  
A5 De Smet *et al.*, 2001.  
A6 Gerlach, 1951.  
A7 Gerlach, 1952.  
A8 Gerlach & Riemann, 1973.  
A9 Gheschiere, 2000.  
A10 Jouli *et al.*, 2018.  
A11 Mahmoudi *et al.*, 2008.  
A12 Semprucci *et al.*, 2008.  
A13 Schuurmans Stekhoven, 1943.  
A14 Schuurmans Stekhoven, 1950.  
A15 Semprucci, 2013.  
A16 Thiermann *et al.*, 1994.  
A17 Traversi & Vidakovic, 1997.

publications. Among the regions reported by Miljutin *et al.* (2010), the Mediterranean appears to be among the areas with the most reported species (e.g. 175 species in the Mediterranean vs. 131 in the NE Atlantic and 130 in the CE Pacific). Other more recent deep-sea studies from the Mediterranean where species-level identifications were employed reported similarly high numbers. For example, in the central Mediterranean, Danovaro *et al.* (2013) reported 320 species from 5084 individuals, while Danovaro *et al.* (2009) reported 15 to 82 species from >3000 individuals. Similarly, Gambi *et al.* (2014) reported 182 species from 3562 individuals from the central and western Mediterranean. In the eastern Mediterranean, Lampadariou *et al.* (2013) reported 143 species from >4000 individuals; although this study dealt with chemosynthetic environments, it did include one control station.

As mentioned above, due to the scarcity of species-level identification, a comparison of data and species lists is rather difficult. Nevertheless, 15 of the 40 named species found in the present study have been reported in the Mediterranean (e.g. Nemys *eds.*, 2023; Schuurmans Stekhoven, 1950; Semprucci *et al.*, 2008; Wieser, 1956) while the remaining 25 are reported for the first time. It is expected that with increasing sampling efforts, many new records or new species will be found. In addition, the inclusion of molecular techniques along with morphological data will certainly improve species recognition. In this respect, the present checklist may serve as a starting point for further research on nematodes in this understudied area.

## Conclusions

This study reports for the first time a partial inventory of free-living marine nematodes from the deep waters of the south-eastern part of the Levantine Basin. The families and genera found in this study are typical of deep-sea sediments. Approximately 38% of the species have been previously reported in the Mediterranean; the remaining 62% were mainly known from the Northwestern Europe and the North Atlantic, the two regions where most marine nematodes have been described. This emphasizes the value of this checklist as a baseline for future studies and the need for a larger sampling effort in this region where our current knowledge of the distribution and the biodiversity of marine nematodes is limited.

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