Caulleriella mediterranea, a new species of polychaete (Annelida: Cirratulidae) from the central Mediterranean Sea

M. LEZZI

ARPAT, Environmental Protection Agency of Tuscany, A.V. Costa – Laboratory Sector – U.O. Biologia Resp. G. Benedettini, Pisa, Italy

(Received 10 December 2016; accepted 30 May 2017; first published online 6 July 2017)

Abstract
A new species belonging to the genus Caulleriella Chamberlin, 1919 (Polychaeta: Cirratulidae) is described from coastal soft bottom sediments off the northwest Italy coast in fine sand at around 8 m depth. Caulleriella mediterranea sp. nov. is characterized by a slightly biamulate elongate peristomium, bidentate hooks with main fang slightly curved, a long apical tooth, and a narrow wing on the convex side and absence of capillary chaetae in neuropodia. A comparison is made with specimens that fit with the congeneric species C. alata, probably confused in the past with C. mediterranea sp. nov. Morphological characters important for differentiation of these species are discussed. The description of C. mediterranea sp. nov. testifies to an increasing trend of knowledge on cirratulid diversity in the Mediterranean Sea, a family characterized by many species considered early indicators of organic enrichment

http://www.zoobank.org/?lsid=urn:lsid:zoobank.org:act:227C3794-DD91-4747-900F-9308E59C0D33
http://www.zoobank.org/?lsid=urn:lsid:zoobank.org:pub:0F35B814-A61D-4705-AEE0-E5A5D8C69B0C

Keywords: Polychaeta, new species, Tyrrhenian Sea

Introduction
The Mediterranean Sea represents a biodiversity hotspot with approximately 17,000 marine species and with about of 20% endemism. Polychaete species number about 1100, which contribute 10% of worldwide biodiversity, and count 210 endemisms (Coll et al. 2010). Despite the fact that the basin is one of the best-known geographic areas of the world, it contains many regions and habitats that remain insufficiently studied, and several taxonomic groups in deep-sea areas and portions of the southern region are still poorly known (Coll et al. 2010), so the description of new species is still common and a high priority.

The “extinction” of invertebrate taxonomy specialists coupled with material not being properly identified is leading to a underestimation of biodiversity (Boero 2001; Coll et al. 2010), and undescribed invertebrate species may become extinct before we even know of their existence, resulting in the loss of valuable biological information about taxonomic groups subject to anthropogenic threats. In addition, and paradoxically, some common and accessible ecosystems such as beaches, among other habitats in the Mediterranean, have been poorly studied (Coll et al. 2010) despite the growing need for knowledge and monitoring to protect their ecological status (i.e. Water Framework Directive 2000/60/EC and Marine Strategy Framework Directive 2008/56/EC). Polychaetes represent one of the best indicators of environmental disturbance and include both sensitive and tolerant species discerning from pristine to heavily disturbed environments. Among them, Capitellidae, Cirratulidae and Spionidae include species that proliferate after inorganic matter increases, as well as other disturbances. Some authors have typified polluted areas by the presence of species belonging to these families (Bellan 1984; Bellan et al. 1988; Dean 2008). Due to their...
distribution in areas moderately contaminated by organic matter, Cirratulidae are considered early indicators of organic enrichment.

The family Cirratulidae Ryckholt, 1851 has been increasingly documented in recent years (i.e. Chambers & Woodham 2003; Dean & Blake 2007, 2009, 2016; Elias & Rivero 2008, 2009; Činar & Petersen 2011; Magalhães & Bailey-Brock 2013; Magalhães et al. 2014; Blake 2015, 2016; Elias et al. 2016; Lezzi et al. 2016), showing an underestimated diversity of this family in different parts of the world.

We describe herein a new species of the genus Caulleriella Chamberlin, 1919, Caulleriella mediterranea sp. nov. from coastal soft bottom sediments off the Tuscany Region (Italy), which was previously identified as Caulleriella alata (Southern, 1914). The genus Caulleriella is represented by 35 species of which seven were described in the Atlantic and Mediterranean region: Caulleriella alata, Caulleriella acicula Day, 1961, Caulleriella bioculata (Keferstein, 1862), Caulleriella cabbisi Pocklington and Coates, 2010, Caulleriella fragilis (Leidy, 1855), Caulleriella parva Gilliardt, 1979 and Caulleriella viridis (Langerhans, 1881) (Table I). Caulleriella serrata Eliason, 1962 was excluded, because it is likely that upon re-examination Eliason’s species will be referred to Kirkegaardia (Blake 2016).

**Material and methods**

Samples were obtained from the Environmental Protection Agency of Tuscany (ARPAT) monitoring survey under the European Water Framework Directive (2000/60/EC). Benthic macroinvertebrate samples were collected following ICRAM (Istituto Centrale per la Ricerca Scientifica e Tecnologica applicata al Mare) (2001) methods by the Marine Sector of ARPAT from Ansedonia (42°24.915'E, 11°16.400'E, –8 m, Jun. 2016 (NHMUK ANEA 2017.184). Nine paratypes, complete specimens, from same locality and date as holotype (NHMUK ANEA 2017.185, NHMUK ANEA 2017.186, NHMUK ANEA 2017.187, MSNP P/3839, MSNP P/3840, MSNP P/3841, MSNP P/3842, MSNP P/3843, MSNP P/3844 were deposited in the Natural History Museum of Pisa in the Polychaete Collection of the Department of Biology.

**Caulleriella mediterranea** sp. nov.

Figures 2–5

Material examined. Holotype: Tyrrhenian Sea, Sta. MAR_CBU_ZA1, 42°24.915’N, 11°16.400’E, –8 m, Jun. 2016 (NHMUK ANEA 2017.184). Nine paratypes, complete specimens, from same locality and date as holotype (NHMUK ANEA 2017.185, NHMUK ANEA 2017.186, NHMUK ANEA 2017.187, MSNP P/3839, MSNP P/3840, MSNP P/3841, MSNP P/3842, MSNP P/3843, MSNP P/3844).

Other material examined. Caulleriella alata, incomplete specimens from Anzio (Tyrrhenian Sea, Italian Coast), Polychaete Annelid Collection of the Museum of Marine Biology “Pietro Parenzan”, University of Salento.

Comparative material. Caulleriella alata from Belfast Lough, North Ireland.

Description. Holotype complete specimens, 26 mm long and 0.6 mm wide, with 155 chaetigers. Paratypes complete specimens, 10–28 mm long, 0.5–0.8 mm wide and 85–150 chaetigers.

Body elongate, in cross section, anterior end rounded dorsally, flattened ventrally; middle and posterior segments with shallow dorsal groove and cylindrical in cross section, mid-body segments wider than anterior and posterior ones. Pygidium a simple rounded lobe (Figures 4(a) and 5(i)), anus dorsal. Specimens in alcohol white to yellow in color (Figures 2(c) and 4(a)).

Prostomium triangular, elongate and pointed, as long as two anterior chaetigers, with a pair of posterior-lateral rounded nuchal organs resembling eyes (Figures 2(a,b), 3, 4(a,b,e), and 5(j,k)).

Peristomium longer than prostomium (as long as three anterior chaetigers) with two annulations not clearly distinct despite Shirrlastain A staining (Figures 2(a,b), 3, 4(b,e), and 5(j,k)). Second annulation 1.5× longer than the first one. A wide dorsal crest characterizes the peristomium (Figures 3(a) and 5(j,k)).

Dorsal tentacles situated on the posterior margin of the peristomium. Dorsal tentacles yellow in color extending back to chaetiger 25, and thick as a chaetiger followed by a pair of branchiae (Figures 3(a) and 5(j, k)). Branchiae from the anterior margin of the first chaetiger present throughout, even putative presence of the branchiae up to the end of the body, one pair per segment, arising near to notopodial ridge.
Table I. Taxonomic characters species of *Caulleriella* from the Mediterranean Sea and Atlantic Ocean.

| Species                     | Type Locality                                      | Dorsal crest | Environment                  | Prostomium | Eyes                                                                 | Number of peristomial annulations | Position of first pair of branchiae |
|-----------------------------|----------------------------------------------------|--------------|------------------------------|------------|----------------------------------------------------------------------|-----------------------------------|-----------------------------------|
| *Caulleriella mediterranea* sp. nov. | Central Mediterranean Sea, Tyrrenian Sea          | Present      | Fine sand, 10 m depth        | Short, pointed | Subdermal red eyes on the half of the peristomium                   | 2                                 | 1° chaetiger                      |
| *Caulleriella alata* (Southern 1914) | Ireland, Belfast                                   | Absent       | *Laminaria* holdfasts (Southern 1914); shallow gravels (Worsfold 2009) | Long, blunt | Large black or dark brown eyes on the half of the peristomium       | 3                                 | 1° chaetiger                      |
| *Caulleriella acicula* Day 1961 | Central Africa, Cape Coast                         | Absent       | Saldanha Bay at 9 m on a bottom of fine grey sand | Pointed     | Present, subdermal eyes                                             | 3                                 | 1° chaetiger                      |
| *Caulleriella bioculata* (Keferstein, 1862) | North France: Dinard                              | Absent       | *Lithothamnion* and kelp holdfasts and in old shells and dredges (Saint-Joseph 1894) | Rounded distally | Large postero-lateral eyes                                           | 3                                 | 1° chaetiger                      |
| *Caulleriella cabbsi* Pocklington & Coates 2010 | Bermuda                                            | Present      | Tynes Bay, found in the rhizosphere of an extensive manatee grass bed, at 8-9 m depth | Bluntly conical | Lateral on the posterior part of the prostomium                    | 4                                 | 2° chaetiger                      |
| *Caulleriella fragilis* (Leidy 1855) | NW Atlantic, Rhode Island                         | ?            | “Under stones” (Leidy 1855)   | ?          | Present                                                             | ?                                 | 2° chaetiger                      |
| *Caulleriella parva* Gillandt 1979 | North Sea, Helgoland                               | ?            | Subtidal holdfasts            | Bluntly conical | Present                                                             | 3                                 | 1° chaetiger                      |
| *Caulleriella serrata* Eliason, A. 1962 | North Sea, Skagerrak                               | Not considered. Hook absent and *Kirkegaardia*-like chaetae present. | Present | ?                                  | 3                                 | 1° chaetiger                      |
| *Caulleriella viridis* (Langerhans 1881) | Canary Island, Madeira                            | ?            | Cryptofauna                   | Acute but flattened | Present                                                             | 2                                 | 1° chaetiger                      |
| Position of dorsal tentacles | Capillaries in notopodia (number per fascicle and position) | Capillaries in neuropodia (number per fascicle and position) | First appearance of spines (maximum number of spines) | Notopodia | Neuropodia | Winged hooks | Pygidium | References |
|-----------------------------|-----------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------|-----------|-----------|-------------|----------|------------|
| Posterior of the last peristomial annulation | All parapodia (8 anterior/1 fine posterior) | Absent | 10 (3 anterior, 7 posterior) | 1 (10 anterior, 6 posterior) | Winged | Simple, anus dorsal | | This work |
| Posterior of the last peristomial annulation | 4–6 anterior/2–3 posterior | 2 fine capillaries in anterior/1–2 in posterior | 21 (1–2 middle/3 in posterior) | 1 (5–7 anterior/5 posterior) | Winged | Simple, no anal cirri | | Southern 1914; Worsfold 2009; this work |
| Anterior margin of 1° chaetiger | 3/4 capillaries in all fascicles | Absent | 1 (4/6 anterior, 3/4 posterior) | 1 (4/6 anterior, 3/4 posterior) | Winged |  | ? | Day 1961 |
| Posterior end of third peristomial annulus | Present (2 capillaries after the 11/16° chaetiger) | In the first 3–4 chaetigers | 11–16(2) | 3–4(4) | No | Two anal cirri | | Magalhaes & Bailey-Brock 2013 |
| 3° chaetiger | 8 anterior/2–3 middle/1–2 posterior | 8 anterior/2–3 middle/1 posterior | 15–16 (1–2)(3/4 in posterior) | 10 (3–4)(3/4 in posterior) | No | Pygidium small, pointed papilliforms | | Pocklington & Coates 2010 |
| 1° chaetiger | Present (3/5) | Present (3/5) | ? | ? | No | ? | | Leidy 1855 |
| Not considered. Hook absent and Kirkegaardia-like chaetae present. | Present | Present | 7–11 (1–3) | 3 (4–10) | No | ? | | Gillandt 1979 |
| 1° chaetiger | Present (2 capillaries after the 11/16° chaetiger) | In the first 3–4 chaetigers | 7–15(up to 8) | 3–4(up to 8) | No | Simple, no anal cirri | | Langerhans 1881 |
They can be easily lost in the posterior end. Parapodia laterally positioned with notopodia and neuropodia separated in the anterior part of the specimens (Figures 4(a) and 5(h,j)). In the posterior end, the distance between noto- and neuropodia is reduced (Figures 4(a) and 5(i)). Notochaetae of anterior chaetigers, capillaries of two types arranged in two straight-line rows of eight capillaries until 10th chaetiger (Figure 5(a,b)), after that 1–2 thin capillaries are present throughout (Figure 5(c)). Bidentate notopodial hooks with main fang slightly curved, long apical tooth, and with narrow flange or wing on the convex side and boldly curved (Figures 4(b) and 5(d–g)). Bidentate notopodial hooks with companion capillaries from chaetigers 10, up to three hooks arranged in a straight line (Figure 5(e)). On posterior notopodia, 7–8 bidentate hooks (Figure 5(g)). Neuropodial hooks similar to notopodial hooks, shorter and larger with a smaller apical tooth, present from chaetiger 1, numbering 10 per fascicle, arranged in a straight line (Figure 5(d)). Posterior neuropodial hooks similar to notopodial hooks, numbering 6–7 hooks arranged in straight line (Figure 5(f)). No capillary notopodial chaetae are present.

**Figure 1.** Map of the sampling sites.

**Figure 2.** *Caulleriella mediterranea* sp. nov.. (a) Anterior end, latero-dorsal view; (b) anterior end, latero-ventral view; (c) entire worm. (a,b) Holotype stained with Shirlastain A; (c) paratype (NHMUK ANEA 2017.186). Scale bars: a,b = 1.3 mm; c = 7 mm.
Figure 3. *Caulleriella mediterranea* sp. nov. (a) Anterior end, dorsal view; (b) anterior end, ventral view. (a,b) Holotype stained with Shirlastain A. Abbreviations: ps, peristomium; pr, prostomium; I, first peristomial annulation; II, second peristomial annulation; dt, dorsal tentacles. Scale bar: 0.6 mm.

Figure 4. *Caulleriella mediterranea* sp. nov. (a) Anterior and posterior ends; (b) anterior end; (c) bidentate notopodial hooks from anterior chaetiger; (d) fascicle of notopodial hooks from posterior chaetiger; (e) anterior end. (a) Paratype (NHMUK ANEA 2017.186); (b) paratype (MSNP P/3844), (c,d) holotype; (e) paratype (MSNP P/3843). Scale bars: a = 1 mm; b = 1 mm; c = 10 µm; d = 40 µm; e = 400 µm.
Variability. Fascicle of eight capillary notochaetae was present until 11th chaetiger, and bidentate notopodial hooks with capillaries from chaetigers 11 in some paratypes (NHMUK ANEA 2017.187, MSNP P/3839, MSNP P/3840). Up to three notopodial hooks in paratypes NHMUK ANEA 2017.186, MSNP P/3840, MSNP P/3841, MSNP P/3842, MSNP P/3843 and MSNP P/3844. Neuropodial hooks numbering nine per fascicle in paratypes MSNP P/3840 and MSNP P/3841.

Methyl green staining pattern. There is no evident pattern; staining is solid and homogeneous throughout the body.

Remarks. Caulleriella mediterranea sp. nov. belongs to the Caulleriella alata group because the convex side hook is distinctively winged. This character is characteristic, other than of C. alata, of Caulleriella acicula Day, 1961 and Caulleriella tricapillata Hutchings & Rainer, 1979. Moreover, Caulleriella pacifica Berkeley, 1929 and Caulleriella murilloi Dean & Blake, 2007 have a hooded hook but with a different pattern, not present on the convex side (in C. pacifica) or with encircling hood around the distal tooth (in C. murilloi).

Caulleriella mediterranea sp. nov. differs from C. alata, C. acicula and C. tricapillata in the presence of an elongate and weakly biannulate peristomium. The peristomium of C. acicula and C. tricapillata is strongly triannulate. Although the original description of C. alata does not mention the presence of peristomial rings, they are illustrated in the original description plates (Southern 1914, pl. XII, fig. 27). Moreover, the peristomial rings of C. alata are mentioned in the redescription by Fauvel (1927). An examination of specimens from Belfast Lough, on the coast of Northern Ireland, whose traits fit with the original description of C. alata, shows three annulation rings (Figure 6(a,c)).

Differences have been observed in the general aspect of the worms, which appears thick in C. alata and filiform in C. mediterranea sp. nov. Furthermore, the examined C. alata specimens show chaetae with fine neuropodial hooks and companion capillaries (Figure 6(b)) that are mentioned in the original description and are not present in C. mediterranea sp. nov.

The other two species of Caulleriella recorded in the Mediterranean Sea (C. bioculata and C. viridis) differ from C. mediterranea sp. nov. mainly in the presence of capillary neurochaetae in the first chaetigers and the absence of hooded hooks.

Moreover, C. mediterranea sp. nov. has a dorsal crest, and this character is reported from a number of species. For instance, it is present in Caulleriella cabbisi Pocklington and Coates, 2010, Caulleriella bremecae Elias and Rivero, 2008, Caulleriella murilloi Dean and Blake, 2007 and Caulleriella venefica Doner and Blake, 2006.
A comprehensive table of all presently known species of *Caulleriella* from the Atlantic and the Mediterranean Sea has been assembled in order for readers to understand and use the characters to identify species and species groups (Table I).

**Etymology.** The specific epithet refers to the first description of a *Caulleriella* in the Mediterranean Sea.

**Ecology and biology.** *Caulleriella mediterranea* sp. nov. was collected in sandy soft bottom sediments at about 8 m depth. Its occurrence is associated with the tubicolous annelid *Owenia fusiformis* which characterizes a fine sand “facies” (*sensu* Peres & Picard 1964). Other abundant species were *Dialychone usticensis*, *Paradoneis armata*, *Nephtys cirrosa*, the mollusks *Tellina fabula* and *Thracia papyracea* and the amphipod *Periloculodes longimanus*. In some locations the new species was relatively abundant (up to 20 individuals) representing 6% of the benthic community.

Eggs are present in the coelomic cavity of paratypes NHMUK ANEA 2017.186 and NHMUK ANEA 2017.187 (Figure 4(a)). They are yolky eggs measuring 44.3–62.6 µm in diameter (*n* = 50, average = 49.7 µm, standard deviation (SD) = 5.03); each egg had an obvious germinal vesicle. The eggs numbered 5–12 per segment.

**Distribution.** Tyrrhenian Sea, Central Mediterranean Sea.

**Discussion**

The description of *Caulleriella mediterranea* sp. nov. testifies to an increasing trend of knowledge on worldwide cirratulid diversity. In the last few years a relatively large number of papers that describe new cirratulid species have been published (i.e. Chambers & Woodham 2003; Dean & Blake 2007, 2009, 2016; Elias & Rivero 2008, 2009; Çinar & Petersen 2011; Magalhães & Bailey-Brock 2013; Magalhães et al. 2014; Blake 2015, 2016; Elias et al. 2016; Lezzi et al. 2016), evidencing that cirratulid diversity is as yet underestimated. In the Mediterranean Sea, new cirratulid species and genera have been described (Çinar & Petersen 2011; Lezzi et al. 2016) and, until now, no *Caulleriella* endemisms were described in the basin. *Caulleriella mediterranea* sp. nov. represents the first species of the genus described in the Mediterranean Sea. *Caulleriella bioculata* and *C. viridis* were described in Dinard (North of France) and Madeira (Canary Islands), respectively.

Fauvel, in *Faune de France* (1927), a widely used guide for Mediterranean polychaete identification, explains that the winged hook is a characteristic of *C. alata*, causing considerable confusion for the correct identification of the species. The described species *C. mediterranea* sp. nov. is probably widespread in the Mediterranean Sea, and confused with the congeneric *C. alata* which shares the peculiar hooded hooks. In particular, most of the identified *C. alata* from fine sand in the Tyrrenian Sea (Lardicci et al. 1991; Somaschini 1993) and in other Mediterranean localities such as the northeast coast of Tunisia and Cyprus (Çinar 2005; Zaâbi et al. 2012) may be referred to *C. mediterranea*.

Moreover, other records of *C. alata* coming from Lago Fusaro (Naples) coastal lagoon (Sordino et al. 1989), and other biotopes such as rocks, seagrasses and muds from northeren Cyprus and the Aegean Sea, western Turkey (Çinar et al. 1998, 2008; Çinar 2005), require particular attention during the examination as suggested by Dr M.E. Petersen in Çinar et al. (1998), who emphasized that *C. alata* is a complex of species and, despite being described from Ireland, has been

---

**Figure 6. Caulleriella alata** from Belfast Lough. (a) Anterior end, lateral view; (b) neuropodia with hooks and capillary chaetae; (c) anterior end, dorsal view. Specimens stained with Shirlastain A. Scale bars: a = 500 µm; b = 100 µm; c = 1 mm.
reported worldwide (Hartman 1961, 1965; Orensanz 1974; Wolf 1984; Bolivar 1990).

**Key to genus Caulleriella from the Mediterranean Sea and Atlantic**

1. Winged hooded hooks present ................................. 2
   - Winged hooded hooks absent .............................. 4
2. Capillaries in the neuropodial chaetigers ........................ ................................... Caulleriella alata (Southern, 1914)
   - No capillaries in the neuropodial chaetigers .......................... 3
3. Notopodial hooks from 1° chaetiger................................. 6
   - Notopodial hooks from 10°/11° chaetiger .......................... 5
4. Capillaries in neuropodia limited in the first 3–4 chaetigers ................................. 5
   - Capillaries in all neuropodia ................................. 6
5. Pigydium without cirri ........................................... 2
   - Pigydium with two cirri ..................................... 2
   .......... Caulleriella bioculata (Keferstein, 1862)
6. Dorsal tentacles on 3° chaetiger................................... Caulleriella cabbisi Poicklington & Coates, 2010
   - Dorsal tentacles on 2° chaetiger ................................ Caulleriella fragilis (Leidy, 1855)*
   .......... Dorsal tentacles on 1° chaetiger .......................... Caulleriella parva Gillandt, 1979 *

* Caulleriella parva was originally described as C. bioculata parva Gillandt, 1979, and raised to a full species by Hartmann-Schröder (1996). The species may be identical with C. fragilis (Leidy, 1854), described from Rhode Island, eastern USA, and common along the NE American east coast (M. E. Petersen in Hartmann-Schröder 1996). A redescription of C. fragilis is necessary. http://zoobank.org/act:227C3794-DD91-4747-900F-9308E59C0D33

**Acknowledgements**

Thank to the Marine Sector of ARPAT (Environmental Protection Agency of Tuscany Region) for collecting and sorting of the sample. Dr Tim Worsfold kindly sent some C. alata specimens from Ireland.

**References**

Bellan G. 1984. Indicateurs et indices biologiques dans le domaine marin. Ecological Bulletins 15:13–20.
Bellan G, Desrosiers G, Willsie A. 1988. Use of an annelid pollution index for monitoring a moderately polluted littoral zone. Marine Pollution Bulletin 19:662–665. DOI: 10.1016/0025-326X(88)90385-2.

Blake JA. 2015. New species of Chaetozone and Tharyx (Polychaeta: Cirratulidae) from the Alaskan and Canadian Arctic and the Northeastern Pacific, including a description of the lectotype of Chaetozone setosa Malmgren from Spitsbergen in the Norwegian Arctic. Zootaxa 3919:501–552. DOI: 10.11646/zootaxa.3919.3.5.

Blake JA. 2016. Kirkegaardia (Polychaeta, Cirratulidae), new name for Monticollina Laubier, preoccupied in the Rhabdocoela, together with new records and descriptions of eight previously known and sixteen new species from the Atlantic, Pacific, and Southern Oceans. Zootaxa 4166:1–93. DOI: 10.11646/zootaxa.4166.1.1.

Boero F. 2001. Light after dark: The partnership for enhancing expertise in taxonomy. Trends in Ecology and Evolution 16:266. DOI: 10.1016/S0169-5347(01)02133-4.

Bolivar A. 1990. Orbiniiidae, Paraonidiidae, Heterospionidae, Cirratulidae, Capitellidae, Maldanidae, Scalibregmidae e Flabelligeridae (Annelida: Polychaeta) da costa sudeste do Brasil. Tese de Doutorado. Universidade Federal do Paraná. Depto. de Zoologia. 191 pp.

Chambers SJ, Woodham A. 2003. A new species of Chaetozone (Polychaeta: Cirratulidae) from deep water in the northeast Atlantic, with comments on the diversity of the genus in cold northern waters. Hydrobiologia 496:41–48. DOI: 10.1023/A:102616008735.

Çinar ME. 2005. Polychaetes from the coast of northern Cyprus (eastern Mediterranean Sea), with two new records for the Mediterranean Sea. CBM-Cahiers de Biologie Marine 46:143–160.

Çinar ME, Ergen Z, Öztürk B, Kirkim F. 1998. Seasonal analysis of zoobenthos associated with a Zostera marina L. bed in Gulfhace Bay Aegean Sea, Turkey. Marine Ecology 19:147–162. DOI: 10.1111/j.1439-0485.1998.tb00459.x.

Çinar ME, Katağan T, Koçak F, Öztürk B, Ergen Z, Kocatas A, Önen M, Kirkim F, Bakir K, Kurt G, Dağlı E, Açik S, Doğan A, Özcan T. 2008. Faunal assemblages of the mussel Mytilus galloprovincialis in and around Alsancak Harbour (İzmir Bay, eastern Mediterranean) with special emphasis on alien species. Journal of Marine Systems 71:1–17. DOI: 10.1016/j.jmarsys.2007.05.004.

Çinar ME, Petersen ME. 2011. Re-description of Cirratulus dollfusi (Polychaeta: Cirratulidae), and Faunellicirratulus as a new genus. Journal of the Marine Biological Association of the United Kingdom 91:415–418. DOI: 10.1017/S0025554100008956.

Coll M, Piriodi C, Steenbeck J, Kaschner K, Lasram FBR, Aguzzi J, Ballesteros E, Bianchi CN, Corbera J, Dailianis T, Danovaro R, Estrada M, Foglia C, Galis BS, Gasol JM, Gertwagen R, Gil J, Guilhaumon F, Kesner-Reyes K, Kitson MS, Koukouras A, Lampadario N, Laxamana E, Lopez de la Fuente C, Laubier, preoccupied in the genus Monticellina, and raised to a full species by Malme (1878). Zootaxa 1451:41–48.

Day JH. 1961. The Polychaete Fauna of South Africa. Part 6. Sedentary species dredged off Cape coasts with a few new records from the shore. Journal of the Linnean Society of London 44:463–560. DOI: 10.1111/j.1096-3642.1961.tb01623.x.

Dean HK. 2008. The use of polychaetes (Annelida) as indicator species of marine pollution: A review. Revista de Biología Tropical 56:11–38.

Dean HK, Blake JA. 2007. Chaetozone and Caulleriella (Polychaeta: Cirratulidae) from the coast of Costa Rica, with description of eight new species. Zootaxa 1451:41–68.
Dean HK, Blake JA. 2009. Monticellina (Polychaeta: Cirratulidae) from the Pacific coast of Costa Rica with descriptions of six new species. Zoosymposia 2:105–126.

Dean HK, Blake JA. 2016. Apholochota (Polychaeta: Cirratulidae) from the Pacific coast of Costa Rica, with a description of five new species. Zootaxa 4103:101–116. DOI:10.11646/zootaxa.4103.2.1.

Elias R, Rivero MS. 2008. Two new species of Caulleriella (Polychaeta, Cirratulidae) from Argentina. Heringia. Série Zoologia 98:225–230. DOI:10.1590/S0073-47212008000200010.

Elias R, Rivero MS. 2009. Two new species of Cirratulidae (Annelida: Polychaeta) from Mar del Plata, Argentina (SW Atlantic). Zoosymposia 2:139–148.

Elias R, Rivero MS, Orensanz JL. 2016. New species of Monticellina and Chaetoezone (Polychaeta: Cirratulidae) in the SW Atlantic, and a review of Monticellina species. Journal of the Marine Biological Association of the United Kingdom 1–11. DOI:10.1017/S0025315416000771.

Eliason A. 1962. Die Polychaeten der Skagerak-Expedition 1933. Zoologiska bidrag från Uppsala 33:207.

Fauvel P. 1927. Faune de France: Polychètes sédentaires. Vol. 16. Paris: Lechevalier. 494 pp.

Gillandt L. 1979. Zur systematik, autökologie und biologie der Polychaeten des Helgoländer Felslitorals. Mitteilungen aus dem Hamburgischen zoologischen. Museum und Institut 76:19–73.

Hartman O. 1961. Polychaetous annelids from California. Allan Hancock Pacific Expeditions 25:1–226.

Hartman O. 1965. Deep-water benthic polychaetous annelids off New England to Bermuda and other North Atlantic areas. Allan Hancock Foundation Occasional Paper 28:1–378.

Hartmann-Schröder G. 1996. Annelida, Borstenwürmer, Polychaeta [Annelida, bristleworms, Polychaeta]. 2nd revised ed. The fauna of Germany and adjacent seas with their characteristics and ecology, 58. Jena, Germany: Gustav Fischer. 648 pp. ISBN 3-437-35038-2.

ICRAM. 2001. Analisi delle comunità bentoniche di fondi mobili in ambiente marino—In: “Programma di monitoraggio per il controllo dell’ambiente marino-costiero (tripieno 2001-2003), Metodologia analitiche di riferimento”, Benthos–scheda 1. Ministero dell’Ambiente e della Tutela del Territorio. Roma: Lo Studio Editoriale s.r.l. – Giorgio Vitale.

Langerhans PP. 1881. Die Wurmfauna von Madeira. III. Zeitschrift für wissenschaftliche Zoolgie 34:87–143.

Lardicci C, Galassi R, Quagli E. 1991. Il popolamento a Policheti del Golfo di Follonica (Mediterraneo Occidentale). Atti della Società Toscana Di Scienze Naturali B 98:275–291.

Leidy J. 1855. Contributions towards a knowledge of the marine Invertebrate fauna of the coasts of Rhode Island and New Jersey. Journal of the Academy of Natural Sciences of Philadelphia 3:135–152.

Lezzi M, Cinàr ME, Giangrande A. 2016. Two new species of Cirratulidae (Annelida: Polychaeta) from the southern coast of Italy. Marine Biodiversity 46:681–686. DOI:10.1007/s12526-015-0418-5.

Magalhães WF, Bailey-Brock JH. 2013. Bitentaculate Cirratulidae (Annelida: Polychaeta) from the northwestern Pacific Islands with description of nine new species. Zootaxa 3630:80–116. DOI:10.11646/zootaxa.3630.1.3.

Magalhães WF, Seixas VC, Paiva PC, Elias R. 2014. The multi-tentaculate Cirratulidae of the genera Cirriformia and Timarete (Annelida: Polychaeta) from shallow waters of Brazil. PLoS One 9:e112727. DOI:10.1371/journal.pone.0112727.

Orensanz JM. 1974. Los anelidos poliquetos de la Provincia biogeográfica Magallánica. I. Catálogo de las especies citadas hasta 1974. Laboratorio de Comunidades Bentónicas – Gabinete abierto – Sta. Clara del Mar. Contribución Técnica 1:3–76.

Pérès JM, Picard J. 1964. Nouveau manuel de bionomie benthique de la Méditerranée. Recueil des Travaux de la Station marine d’Endoume 31:5–137.

Pocklington P, Coates K. 2010. Three new species of polychaetes (Annelida: Polychaeta) from Bermuda. Proceedings of the Biological Society of Washington 123:220–233. DOI:10.2988/09-24.1.

Somaschini A. 1993. A Mediterranean fine-sand Polychaete community and the effect of the tube-dwelling Owenia fusiformis Delle Chiave on community structure. Internationale Revue der gesamten Hydrobiologie und Hydrographie 78:219–233. DOI:10.1002/(ISSN)1522-2632.

Sordini P, Gambi MC, Carrada GC. 1989. Spatio-temporal distribution of Polychaetes in an Italian coastal lagoon (Lago Fusaro, Naples). Cahiers de Biologie Marine 30:375–391.

Southern R. 1914. Clare Island Survey. Archiannelida and Polychaeta (Annelida: Polychaeta) from the northwestern Paciﬁc Islands with description of six new species. Zootaxa 3630:80–116. DOI:10.11646/zootaxa.3630.1.3.

Wolf PS. 1984. Family Cirratulidae Carus, 1863. In: Ubelacker O, ed. The fauna of Germany and adjacent seas with their characteristics and ecology, 58. Jena, Germany: Gustav Fischer. 648 pp. ISBN 3-437-35038-2.

Worsfold TM. 2009. Progress on the identification of Cirratulidae in British and Irish waters through the NMBAQC scheme: 1996–2009. Utitage Unicomare 114 pp.

Zaâbi S, Gillet P, Chambers S, Affi A, Boumaiza M. 2012. Inventory and new records of Polychaeta species from the Cap Bon peninsula, North East coast of Tunisia, Western Mediterranean Sea. Mediterranean Marine Science 13:36–48. https://doi.org/10.12681/mms.22.