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Polychaete-parasitizing copepods from the deep-sea Kuril–Kamchatka trench (Pacific Ocean), with the description of a new *Ophelicola* species and comments on the currently known annelidicolous copepods

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ARTICLE INFO

Keywords:
KuramBio
Pacific Ocean
Deep-sea
Copepoda
Ophelicola
Parasitic
Polychaeta
Opheliidae

ABSTRACT

The annelid associated copepods, collectively called annelidicolous, were placed in 21 families. Some genera, such as *Ophelicola*, are considered phylogenetically isolated and are placed into the order Cyclopoida as *incertae sedis*. In this paper, we describe *Ophelicola kurambia*, the second species recorded for the genus and the first for the Pacific Ocean. The single known specimen, a female, was found during the German–Russian deep-sea expedition KuramBio at the deep-sea Kuril–Kamchatka trench. The new species differs from *Ophelicola drachi* (known from the Gulf of Biscay, Atlantic Ocean) in being attached to the host through the mandibles instead of maxillae and, specially, in the formula of the antennular armature. The study of the new species contributes to clarify the diagnosis of the genus, which clearly differs from *Notomasticola* (another *incertae sedis* genus), and resembles both the most modified clausiids (in the mandibular shape and antennular segmentation) and the clausidiids (in the shape of maxilla). However, it does not contribute to clarify the position of *Ophelicola* within the order Cyclopoida. The paper includes a list of the known annelidicolous copepods (excluding Monstrilloidae) and summarises the main trends shown in terms of diversity, distribution and relationships. Currently, 168 species of copepods from to 74 genera and 22 families and 7 *incertae sedis* (excluding Monstrilloida) are known to be involved in 235 parasitic relationships (mostly ectoparasitic) with polychaetes. Host polychaetes include 156 species belonging to 104 genera from 22 families (plus 14 unknown). About 50% of these relationships are known from European waters, mainly from shallow depths.

1. Introduction

More than 120 species of Copepoda belonging to at least 21 families, the so called annelidicolous copepods, were reported to be associated with annelids, most of them being external or internal parasites of polychaetes. Some families include annelid symbionts together with free-living members and/or associates of other invertebrates. However, some others are known as exclusive parasites of polychaete hosts (Boxshall and Halsey, 2004; Humes, 1994).

The symbiotic relationships with polychaetes might have evolved independently from various copepod ancestors (Björnberg and Radashevsky, 2011). A comprehensive hypothesis about the relationships involving parasitic copepods has not yet been developed and therefore, placing annelidicolous species into genera and even families is often problematic (Kim et al., 2013). In fact, the definition of some families is rather nebulous and the boundaries among families are sometimes poorly defined, such as those among Clausidiidae Embleton, 1901, Clausiidae Giesbrecht, 1895 and Anomoclausiidae Gotto, 1964 (Boxshall and Halsey, 2004; Humes and Ho, 1967; Kim et al., 2013). This also caused some genera to be phylogenetically isolated due to their unusual features.

In 1978, Laubier described a new genus of annelidicolous copepod collected from an unidentified ophelid polychaete found between 4706 and 4475 m depth in the Atlantic coast of France. The genus *Ophelicola* Laubier, 1978 was considered as phylogenetically isolated due to its unusual features. Thus, it was placed into the order Cyclopoida as *incertae sedis* (Boxshall and Halsey, 2004).

During the German–Russian deep-sea expedition KuramBio (Kuril–Kamchatka Biodiversity Study) to the Kuril–Kamchatka trench and abyssal plain, two specimens of moderately transformed copepods associated with polychaete worms were collected. Parasitic

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http://dx.doi.org/10.1016/j.dsr2.2014.08.018
0967-0645/

copepods from polychaete hosts are seldom reported, likely because their very low prevalence. Usually, these parasites are found only after observing large numbers of potential hosts (Kim et al., 2013), which is a particularly difficult task in the deep-sea. Accordingly, in this paper we describe one of the specimens as a new species of *Ophelicola,* despite having found a single female, and discuss whether this new discovery provides new insights in the relationship of *Ophelicola* within the cyclopoid families. Unfortunately, the second annelidicolous copepod, belonging to the genus *Anomopsyllus* G.O. Sars, 1921, was in very poor conditions and, thus, it could not be formally described. This paper also includes a list of the known annelidicolous copepods (excluding Monstrilloidae) and summarises all known characteristics in terms of diversity of both the symbionts and the hosts, type of relationship and bathymetrical and geographical distribution.

2. Material and methods

The polychaete hosts were collected during the KuramBio Expedition 2012 to the Kuril–Kamchatka trench and abyssal plain, with the help of the supranet of the epibenthic sledge EBS-S or the box corer GKG, both operated from the R/V *SONNE*-223. Infested host were extracted from sediments collected in stations 223-3-9 (4987–4991 m depth) and 2–5 A (4869 m depth), carefully washed on board, photographed alive, and then fixed in 70% ethanol.

In the laboratory, the copepods were extracted from the hosts, dissected in lactic acid prior to staining with Chlorazol black E (Sigma® C-1144), examined as temporary mounts in lactophenol, and finally sealed with Entellan as permanent mounts. Drawings were made with the help of a *camera lucida* attached to a Leica DMLB differential interference microscope. Body length was measured from the anterior margin of the rostrum to the posterior margin of the caudal rami. All appendage segments and setation elements are named and numbered according to Huys and Boxshall (1991).

The dissected holotype is deposited in the Museo Nacional de Ciencias Naturales of Madrid (MNCN), Spain.

3. Results and discussion

3.1. Taxonomic account

Subclass Copepoda
Order Cyclopoida
Incertae sedis
Genus *Ophelicola* Laubier, 1978

Diagnosis (redefined): Body of adult female transformed by swelling and fusion of free pedigerous somites. Prosome comprising cephalothorax incorporating 1st pedigerous somite and swollen 2nd to 4th pedigerous somites. Urosome distinct, comprising partly swollen 5th pedigerous somite fused to genital somite, and 4 free abdominal somites. Genital apertures paired, located posterolaterally on genital somite. Caudal rami with 6 setae.

Rostrum weakly developed. Antennule 5-segmented, distal 3 segments homologous, with XXI–XXIV, XXV and XXVI–XXVIII; armature 4(5), 16(14), 4+aesthetasc, 2+aesthetasc, 7+aesthetasc. Antenna uniramous, 4-segmented with coxa and basis fused to form coxobasis bearing single seta; 1st endopodal segment with 1 mid-margin seta, 2nd with 4 elements sometimes including 1 claw, 3rd with 7 elements; exopod lacking. Entognathous, with mouthparts arranged in perioral depression. Mandible small, consisting of a strongly scleroterized gnathobase with articulated distal portion denticulate or plumose. Maxillule lobate, with 5–9 setae.

Table 1
Genus *Ophelicola* (redefinition). Armature formula of legs 1–4.

	Coxa	Basis	Exopodal segments	Endopodal segments
Leg 1	0-0	1-0	I-0;I-1;III,I,4	0-1;0-1;II,4
Leg 2	0-0	1-0	I-0;I-1;III,I,5	0-1;0-2;II,4 (I,II,3)
Leg 3	0-0	1-0	I-0;I-1;III,I,5	0-1;0-2;II,4 (I,II,3)
Leg 4	0-0	1-0	I-0;I-1;III,I,5 (4)	0-1;0-2;III,2 (I,III,1)

Maxilla 2-segmented, comprising large unarmed syncoxa and basis; basis with basal naked seta, produced into trifid claw-like process and articulated bifid claw. Maxilliped reduced, sometimes located in transverse groove on surface of cephalothorax, indistinctly 3-segmented, 1st segment unarmed, 2nd with setulose seta, and 3rd smallest, bearing short naked seta and small spine.

Swimming legs 1–4 ventrally on somites. Intercoxal sclerite in leg 1 only. Legs 1 to 4 biramous, with 3-segmented rami. Spine and seta formula as in Table 1.

Inner basal seta absent on leg 1. Inner coxal setae absent in all legs. 5th leg small, located laterally on somite; 2-segmented with protopodal segment more or less separate from somite and bearing outer seta: exopodal segment with 3 setae. 6th legs represented by paired opercula in female, sometimes with 1 seta. Egg sacs unknown.

Type species: *Ophelicola drachi* Laubier, 1978.

Remarks: The original description of *Ophelicola* pointed out the similarities with the family Clausidiidae in the general structure of the maxillae and swimming legs. However, *Ophelicola* lacks armature in the maxillar syncoxa, which is armed in clausidiid genera (except for *Conchyliurus* Bocquet & Stock, 1957 and *Hippomolgus* G.O. Sars, 1917). Except for *Hyphalion* Humes, 1987, *Conchyliurus*, and *Hermadona* Ho and Kim, 2004, most female clausidiids have well-developed 4-segmented maxillipeds (Ho and Kim, 2003), contrarily to the rudimentary limbs of *Ophelicola* females. Furthermore, the antennules of the Clausidiidae, with the exception of *Hermadona, Conchylirius*, and *Hersilioides* Canu 1888, are 7-segmented (Boxshall and Humes, 1987; Ho and Kim, 1990, 2003, 2004). Moreover, the derived structure of the mandible excludes *Ophelicola* from the Clausidiidae and indicates a possible relationship with the Clausiidae (Boxshall and Halsey, 2004). In fact, the mandible and the antennule segmentation of *Ophelicola* resemble that of the most modified genera of this family (such as *Boreoclausia* Kim et al., 2013, *Vivgottoia*, Kim et al., 2013, and *Sheaderia* Kim et al., 2013). However, these genera have also very reduced and modified legs 1–4, present the typical clausiid maxillule and maxilla, and have a single free abdominal segment. The clausiid genus *Spionicola* Bjornberg & Radashevsky, 2009 shares the 5-segmented antennules with *Ophelicola* (Björnberg and Radashevsky, 2009), but clearly differs in all remaining characteristics. *Ophelicola* resembles the clausiid genus *Rhodinicola* Levinsen, 1878 in having 3-segmented rami of legs 1–4 and in lacking posterior median element at the basis of leg 1 (Björnberg and Radashevsky, 2011). However, most oral appendages of *Ophelicola* (i.e. mandible and maxilla) differ from the typical clausiid form (Boxshall and Halsey, 2004).

Finally, the *incertae sedis* genus *Notomasticola* Kim et al., 2013 clearly differs from *Ophelicola* in having 1-segmented abdomen, 4-segmented antennule, antennal armature, reduced oral appendages lacking maxilliped, 2-segmented rami of legs 1–3, reduced leg 4, and 2-segmented leg 5 (Kim et al., 2013).

Therefore, nearly forty years later from its description, the genus *Ophelicola*, cannot be placed with confidence in any existing family, and should still be considered as *incertae sedis* within Cyclopoida until a full cladistic analysis of the annelidicolous

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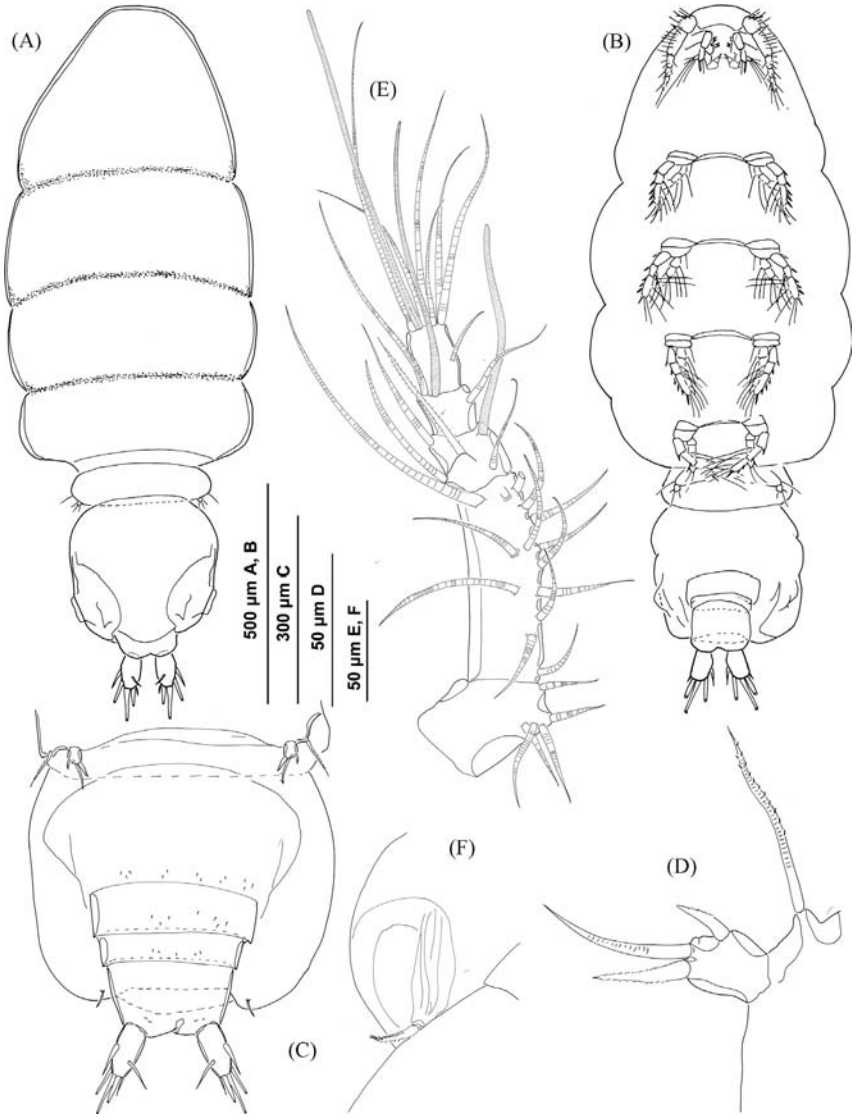

Fig. 1. *Ophelicola kurambia* sp. nov. (female) (A) habitus dorsal; (B) habitus ventral; (C) urosome ventral; (D) leg 5; E, antennule; (F) genital area.

families, ideally incorporating molecular data as they become available, could be carried out.

Ophelicola kurambia sp. nov.

(Figs. 1–4)

Material examined: MNCN 20.04/10007: 1 female holotype from KuramBio, r/v *SONNE*-223, station 223-3-9, gear EBS-S, date: 05-08-2012, depth 4987–4991 m, 47°14.6′N 154°42.88′E, 47°14.86′N 154°43.18′E.

Female: Body slightly transformed cyclopiform, by swelling and partial fusion of prosomal somites (Fig. 1A and B). Total body length of female 1557 µm (measured from anterior margin of cephalic somite to posterior margin of caudal rami on holotype in lactic acid), maximum width 586 µm. Prosome typically comprising cephalothorax incorporating first pedigerous somite and free 2nd to 4th pedigerous somites. Prosome length/width ratio = 1.78:1 Prosome/urosome length ratio = 2.25:1. Urosome 5-segmented (Fig. 1C) comprising 5th pedigerous somite, genital double-somite, and 3 free abdominal somites. 5th Pedigerous somite much smaller than preceding pedigers, wider than long 92 × 304 µm. Genital double somite (Fig. 1A and C) nearly rounded and somewhat inflated, 453 µm × 489.6 µm, wider in middle. Genital areas located ventrolaterally at end of genital double somite. Each genital area (Fig. 1F) with 1 short plumose seta. Egg sacs not seen. 3 Free abdominal somites, each wider than long, 79 × 263, 45 × 226.4, 124.4 × 187 µm (Fig. 1C). Caudal ramus (Figs. 1A and C), 85 µm long, twice longer than wide, with 6 terminal setae. Outer lateral and dorsal setae naked, similar in length. Outermost and two median terminal setae broken; innermost terminal seta very small, naked. Urosome with minute setules (Fig. 1C).

Rostrum (Fig. 2B) broad, with truncate anterior margin. Antennule (Fig. 1E) about 220 µm long, with 5 segments measuring (along posterior, non-setiferous margin): 32 (68 µm along anterior margin), 99, 29, 22, and 34.6 µm, respectively. Formula for armature: 5, 14, 4 + aesthetasc, 2 + aesthetasc and 7 + aesthetasc. Except for 1 barbed seta on third segment, all setae naked.

Antenna (Fig. 2A) uniramous and 4-segmented, 184 µm long (terminal setae excluded), with 1st segment longest. 1st Segment with 1 long seta, spinulose on inner margin and setulose on outer. 2nd Segment with 1 weakly setulose seta, 3 setules and tiny setules close to insertion of 3rd segment. Outer corner of 3rd segment with patch of setules, inner corner with 5 elements: 1 setule, 1 barbed spine, 1 naked seta, 1 strong claw with strong curved spines near tip, and 1 long naked seta. Segment 3 smaller, articulating with segment 2 proximally, somewhat displaced on

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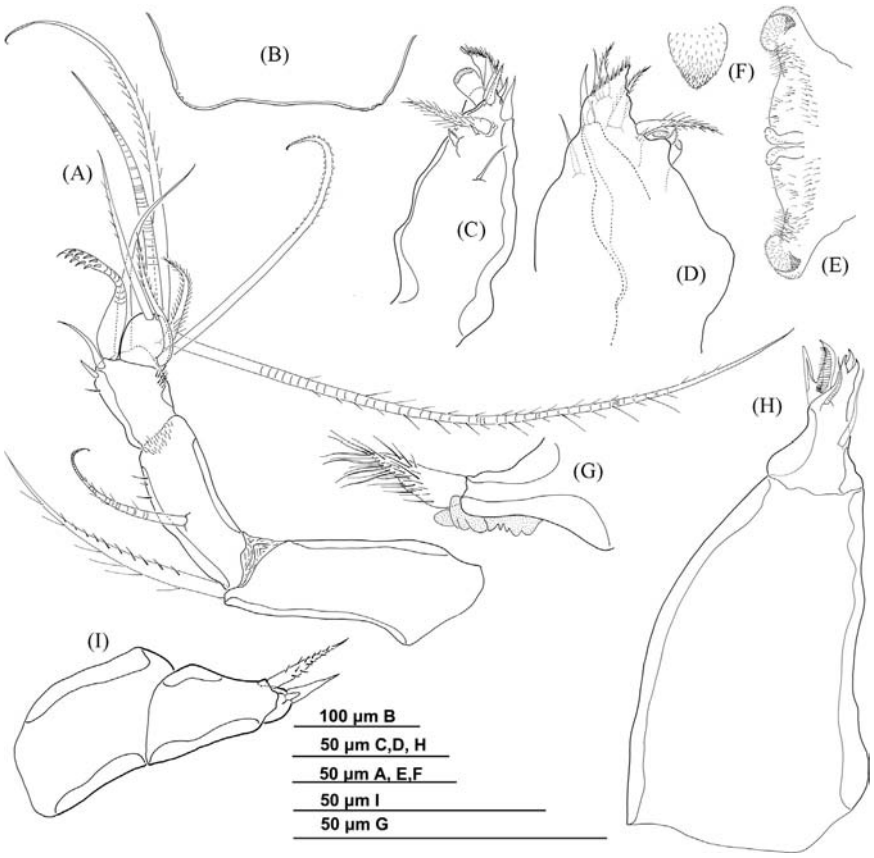

Fig. 2. *Ophelicola kurambia* sp. nov. (female) (A) antenna; (B) rostrum; (C and D) maxillule; (E) labrum; (F) detail of rounded lobe of labrum; (G) mandible; (H) maxilla; (I) maxilliped.

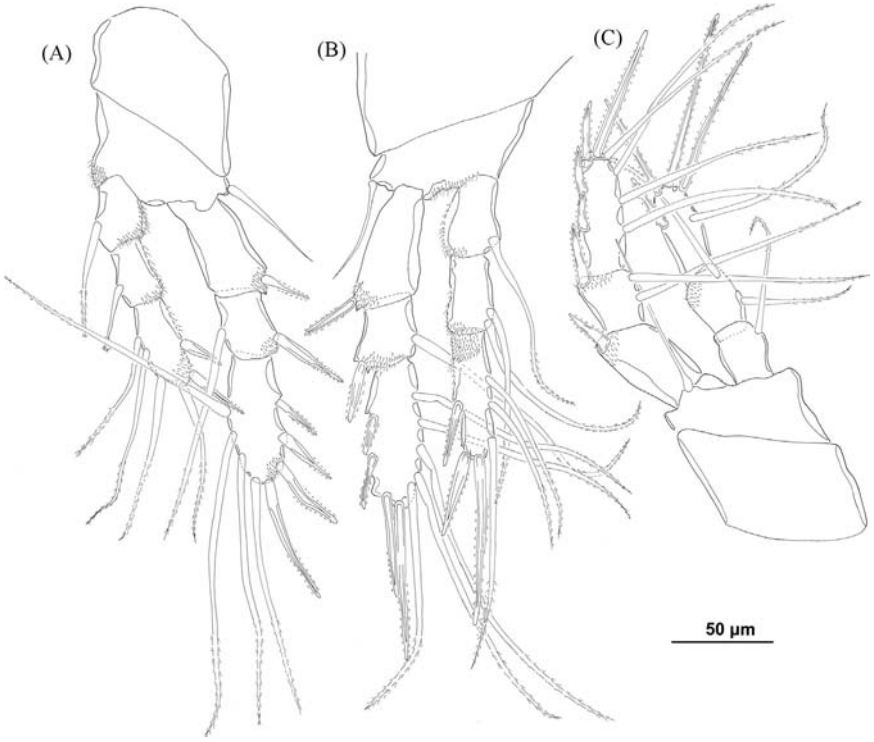

Fig. 3. *Ophelicola kurambia* sp. nov. (female) (A) leg 1; (B) leg 2; (C) leg 4.

lateral side, with 7 setae ornamented as figured, 1 of them longer than total length of antenna. Labrum (Fig. 2E and F) with patch of surface setules, with 1 pair of curved digitiform processes in middle of posterior margin, and membranous areas on each side of process, each membranous area with rounded process entirely covered with setules.

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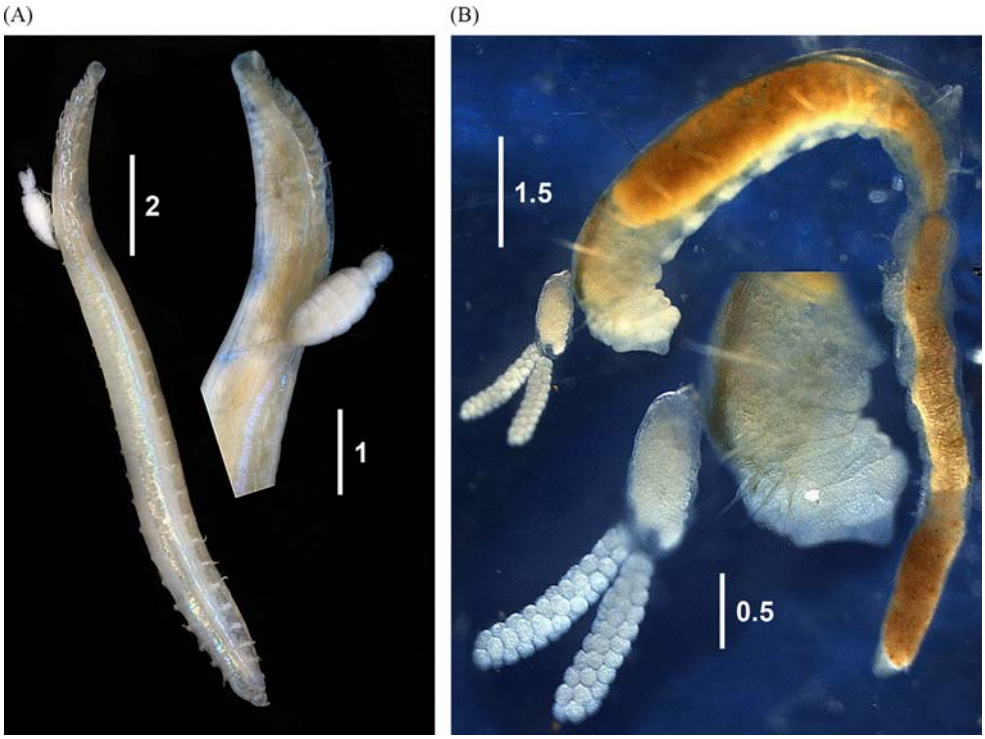

Fig. 4. Living specimens of the parasitic copepods attached to their polychaete hosts. a – *Ophelicola kurambia* sp. nov. (female) and its host Opheliidae; b –*Anomopsyllus* sp. and its host Ampharetidae.

Mandible (Fig. 2G) reduced and small, consisting of a strongly scleroterized gnathobase on which inserts a distal portion; articulation clearly visible. Basal part conical-shaped, with membranous flange along medial (posterior) margin. Distal portion short dagger-shaped, no sclerotized but densely plumose.

Maxillule (Fig. 2C and D) complex, lobate but without clear distinction between lobes (1 setulose), tapering towards apex. Armature of maxillule with 10 elements, 9 setae with length and ornamentation as figured and 1 rounded element.

Maxilla (Fig. 2H) 2-segmented, comprising large unarmed syncoxa. Segment 2 sclerotized with basal naked seta, produced into trifid claw-like process, articulated bifid claw-like process (widest claw with long setules on surface), and 1 naked seta.

Maxilliped (Fig. 2I) small, 54 μm long; 3-segmented with segment 1 unarmed, segment 2 with 1 spinulose seta, and segment 3 smallest, bearing 1 short naked seta and 1 small spine.

Swimming legs 1–4 (Fig. 3A–C), located ventrally on somites, biramous, with 3-segmented rami. Spine and seta formula listed in Table 2.

Inner basal seta absent on leg 1. Basis with outer naked seta in legs 1–4. Both, endopodal and exopodal segments with spinules at outer corner. Setae and spines are very long.

Leg 5 (Fig. 1D) 2-segmented but proximal protopodal segment incorporated into somite, with 1 posterolateral seta. Free distal segment (exopod) small, nearly as long as wide, 20.3 × 27 μm; armed with 1 subterminal seta and 2 terminal setae, the outer, the largest.

Male: Uknown

Etymology: The specific name derives from "KuramBio", the acronym of the expedition during which the copepod was collected. Gender feminine.

Distribution: Known only from the type locality at the Northwest Pacific, abyssal Kuril–Kamchatka trench area.

Ecology: The observed specimen was attached to the skin of a non identified opheliid polychaete, using its left and right maxillae together as pincers.

Table 2
Ophelicola kurambia sp. nov. Armature formula of legs 1–4.

	Coxa	Basis	Exopodal segments	Endopodal segments
Leg 1	0-0	1-0	I-0; I-1, III, I, 4	0-l; 0-l; II, 4
Leg 2	0-0	1-0	I-0; I-l; III, I, 5	0-l; 0-2; I, II, 3
Leg 3	0-0	1-0	I-0; I-l; III, I, 5	0-1; 0-2; I, II, 3
Leg 4	0-0	1-0	I-0; I-2; III, I, 4	0-l; 0-2; I, III, 1

Remarks: The genus *Ophelicola* was erected by Laubier (1978) to include a species parasitizing an opheliid polychaete, *O. drachi*, found in the abyssal plain of the Gulf of Biscay (Atlantic coast of France) at about 4500 m depth. To date, no other species of this genus has been discovered. *Ophelicola kurambia* sp. nov. is, thus, the second known species and was also found deeper than 4000 m but in the abyssal plain of the Kuril–Kamchatka trench (Northwest Pacific Ocean).

Both species are ectoparasites of an unidentified opheliid, however, *O. kurambia* sp. nov. was attached to the host through its maxillae, while *O. drachi* was attached through the mandibles (Laubier, 1978).

Both species also differ in the formula for the antennular armature (5, 14, 4+aesthetasc, 2+aesthetasc and 7 setae+aesthetasc in *O. kurambia* sp. nov.; 4, 16, 4+aesthetasc, 2+aesthetasc, 7+aesthetasc in *O. drachi*). As for the antenna, both species present the same number of elements per segment (1, 1, 4, 7), but the 3rd segment has 3 setae plus 1 claw in *O. kurambia* sp. nov. and 4 setae in *O. drachi*. The formula proposed by Boxshall and Halsey (2004) for the genus (1, 1, 3+1 claw, 4+3 claws) do not match with the two species studied. Both species show a mandible strongly sclerotized, but in the new species the gnathobase has a short dagger-shaped densely plumose, instead of the large blade distally denticulated of *O. drachi*.

The maxillule of *O. kurambia* sp. nov. has 9 setae plus 1 rounded distal element, and 1 setulose lobe tapering towards the apex, while *O. drachi* possesses 5 setae and a rounded distal lobe.

Table 3
Comparison of the armature formula for legs 1–4 according to Laubier (1978), Boxshall and Halsey (2004) and the specimen of *Ophelicola kurambia* sp. nov.; end: endopodal segment; ex: exopodal segment.

	Laubier (1978)	Boxshall and Halsey (2004)	*Ophelicola kurambia* sp. nov.
Leg 2 end.	0-1;0-2;II,4	0-1;0-2;II,4	0-1;0-2;I,II,3
Leg 3 ex.	I-0;I-1;II,II,6	I-0;I-1;III,I,5	I-0;I-1;III,I,5
Leg 3 end.	0-1;0-2;III,3	0-1;0-2;II,4	0-1;0-2;I,II,3
Leg 4 ex.	I-0;I-1; III,3,3	I-0;I-1;III,I,5	I-0;I-2;III,I,4
Leg 4 end.	0-1;0-2;III,2	0-1;0-2;III,2	0-1;0-2;I,III,1

The maxilla of *O. kurambia* sp. nov. possesses 1 bifid, pincer-like element articulated at base, 1 trifid claw-like process and 2 naked setae. In turn, the maxillar distal segment of *O. drachi* presents a basal seta and a complex system of claws, one of them bifid and the other one represented by a truncated stump with a pointed process distally according to Laubier (1978), while Boxshall and Halsey (2004) described the maxilla of *Ophelicola* with a basis produced into a trifid claw-like process bearing 1 seta.

The original description of *O. drachi* points out that maxillipeds are located in a transverse groove on the surface of the cephalothorax, as confirmed by Boxshall and Halsey (2004). However, during the dissection of *O. kurambia* sp. nov., this circumstance has not been observed.

The armature formula for legs 1–4 is similar in both species. Since the table showing the legs' ornamentation (Table 1 in Laubier, 1978) contains some errors, the main discrepancies have been here inferred from the legs illustration and are detailed in Table 3. Moreover, in the Laubier (1978) description, legs 1–4 have all setae naked and all spines smooth, while the setae are plumose and the spines are spinulose in *O. kurambia* sp. nov.

Family Nereicolidae Claus, 1875

Genus *Anomopsyllus* Sars G.O., 1921

Diagnosis: Body with small cephalosome, inflated trunk and 2-segmented urosome, 4-segmented maxilliped with stout terminal segment; unmodified, simple setae on 2- or 3-segmented antenna, and swimming legs reduced or absent. Usually living in association with polychaetes (Kim et al., 2013).

Anomopsyllus sp.

Material examined: 1 damaged female, KuramBio expedition, station 2–5 A, box corer GKG, sediment fraction 300 μm, 4869 m depth. August 2 2012, ID. 356 associated with a non identified Ampharetidae.

Diagnosis: Specimen lacking legs. Oral area seriously damaged. Other body regions damaged too, with non-distinguishable characters.

Distribution: Northwest Pacific, abyssal Kuril–Kamchatka trench area.

Remarks: *Anomopsyllus* is composed by 5 species: *A. hamiltonae* Kim et al., 2013 (legs 1–5 absent), *A. bifurcus*i Kim et al., 2013 and *A. geminus* Kim et al., 2013 (only legs 4 and 5 absent, the remaining vestigial), *A. abyssorum* Laubier, 1988 and *A. pranizoides* Sars 1921 (Legs 1–5 vestigial, the 3 first legs more development than the two latter) (Kim et al., 2013; Laubier, 1988). Our specimen resembles *A. hamiltonae* in lacking the legs, but the damaged oral area prevented us to define the position of this copepod with respect to the known congeners.

3.2. Biodiversity of annelidicolous copepods (excluding Monstrilloida)

Symbiotic copepods are known to live symbiotically with virtually all marine metazoan taxa (Huys and Boxshall, 1991). However, those infesting invertebrates are relatively poorly known in comparison with their piscicolous relatives, likely due to the economic interest of this particular group of hosts (O'Reilly, 1991). More specifically, eleven families of cyclopoid copepods are recorded exclusively from polychaete hosts, but several other families include one or more polychaete symbionts (Boxshall and Halsey, 2004).

Twenty two copepod families and seven *incertae sedis* (excluding Monstrilloida) are currently known to be involved in 235 parasitic relationships with annelid polychaetes (Table 4). These copepods include 168 species from to 74 genera. The most representative family are the Herpyllobiidae, with 50 relationships (21.5%), followed by Clausiidae and Nereicolidae with 37 (15.9%) and 34 (14.6%), respectively, Sabelliphilidae with 23 (9.9%), and Gastrodelphyidae and Xenocoelomatidae with 13 (5.6%). The remaining families are involved in less than 9 relationships. Most families include only one (41%) or two (23%) polychaete parasitic copepod genera, and there is only one, the Clausiidae, which include 17 genera. A similar pattern is shown by the species per genera, as most of them include a single polychaete parasitic species (59%), only a 18% include two species and the remaining 21% include from 3 to a maximum of 17 (in *Herpyllobius* Steenstrup & Lutken, 1861) species. This apparently supports a high degree of specificity in the relationships between the annelidicolous copepods and their polychaete hosts, however the observed pattern may also be caused by the lack of adequate observations.

In turn, these copepods are associated to 156 species of polychaetes belonging to 104 genera from 22 families (plus 14 unknown polychaetes). The family most commonly found to be infested by copepods is the Polynoidae (63 relationships, 27%), followed by Sabellidae and Terebellidae (with 30, 12.7%, and 24, 10.2%, relationships, respectively). The remaining polychaete families include less than 9% of the known relationships and, even, eight of them include less that 1% (five and three families in two and one relationships, respectively). Most families include only one (35%) or two (17%) parasitized polychaete genera, and there is only one, the Polynoidae, which include 22 genera. This trend is even more exaggerated when analysing the number of species per genera, as 73% include a single parasitized species and only 17% include two species. The remaining 11% include three or more species, and the maximum is nine in the case of the polynoid genus *Harmothoe* Kinberg, 1856. Again, the family Polynomial included the highest number of infested species, 36, which represents about 25% of the total. Curiously enough, the Polynoidae is also the family including more symbiotic polychaete species, about 56% of the known ones, this representing about 60% of the relationships (Martin and Britayev, 1998).

Concerning the type of relationships, when reported copepods are most often parasites and only four species, have been reported as commensals (Table 4). In the case of *Bulbamphiascus imuse*, for instance, the polychaete hosts shared their tubes with 1–4 copepods each (males, females and/or copepodites) and the commensals were placed between worm and tube (Moore and O'Reilly, 1993). The parasitic annelidicolous copepods, in turn, may be ectoparasitic (i.e. living on the exterior of the host), mesoparasitic (i.e. living partly embedded in its host, usually with the

Table 4
List of known annelidicolous copepods (excluding monstrilloids) including the type of association, the polychaete hosts, known depth and geographical ranges of distribution and main references. GI: *Genus inquerendum*.

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
Anomoclausiidae	*Anomoclausia indrehusae* Gotto, 1964	?	Spionidae	*Pseudopolydora paucibranchiata* (Okuda, 1937)	180–300 m	Norway	Kim et al. (2013)
Bradophilidae	*Bradophila pygmaea* Levinsen, 1878	Mesoparasite	Flabelligeridae	*Brada villosa* (Rathke, 1843)		White Sea, Groenland	Marchenov (2002)
Bradophilidae	*Trophonophila bradii* McIntosh, 1885 (GI)	?	Flabelligeridae	*Ilyphagus wyvillei* (McIntosh, 1885)	3566 m	Antarctic	Boxshall and Halsey (2004)
Catiniidae	*Cotylemyzon vervoorti* Stock, 1882	Ectoparasite	Acoetidae	*Eupolyodontes amboinensis* Malaquin & Dehorne, 1907	40 m	Indonesia	Stock (1981), Boxshall and Halsey (2004)
Catiniidae	Cotylomolgus lepidonoti Humes and Ho, 1967	Ectoparasite	Unknown	Unknown		Madagascar	Boxshall and Halsey (2004)
Clausidiidae	*Foliomolgus cucullus* Kim, 2001c	Ectoparasite	Eunicidae	*Marphysa sanguinea* (Montagu, 1815)	intertidal	Korea	Kim (2001b)
Clausidiidae	*Hersiliodes latericia* (Grube, 1869)	Ectoparasite	Maldanidae	*Praxillura longuissima* Arwidsson, 1906		Channel and Atlantic coasts of Europe and Mediterranean Sea	O'Reilly (1995)
			Maldanidae	*Leiochone leiopygos* (Grube, 1860)		Channel and Atlantic coasts of Europe and Mediterranean Sea	O'Reilly (1995)
			Maldanidae	*Euclymene oerstedii* (Claparède, 1863)		Channel and Atlantic coasts of Europe and Mediterranean Sea	O'Reilly (1995)
Clausidiidae	*Goodingius adhaerens* (Williams, 1907)	?	Unknown	Unknown			Williams (1907)
Clausidiidae	*Goodingius arenicolae* (Gooding, 1960)	?	Arenicolidae	*Arenicola cristata* Stimpson, 1856	intertidal	USA (Massachussetts)	Gooding (1960)
Clausidiidae	*Hemicyclops ctenidis* Ho and Kim, 1990	Ectoparasite	Nereididae	*Neanthes japonica* (Izuka, 1908)	shallow	Korea, Sea of Japan, brackish lagoon	Ho and Kim (1990)
Clausidiidae	*Hemicyclops nausutus* Moom and Kim 2010	?	Unknown	Unknown		Korea	Moom and Kim (2010)
Clausidiidae	*Hemicyclops membranatus* Moom and Kim 2010	?	Unknown	Unknown		Korea	Moom and Kim (2010)
Clausiidae	*Clausia lubbockii* Claparède, 1863	Ectoparasite	Spionidae	*Dipolydora* sp.	16 m	Europe	Kim et al. (2013)
			Maldanidae	Unknown		Europe	Kim et al. (2013)
Clausiidae	*Indoclausia bacescui* Sebastian and Pillai, 1974	Ectoparasite	Maldanidae	Unknown			Sebastian and Pillai (1974)
Clausiidae	*Likroclausia namhaensis* Ho and Kim, 2003	Ectoparasite	Capitellidae	*Dasybranchus caducus* (Grube, 1846)		Kyokpo, Korea, Yellow Sea	Ho and Kim (2003), host as *Dasybranchus caudatus*?
Clausiidae	*Megaclausia mirabilis* O'Reilly, 1995	Commensal	Maldanidae	*Rhodine gracilior* Tauber, 1879	40–67 m	British waters of the North Sea	O'Reilly (1995)
Clausiidae	*Mesnilia culthae* (T. & A. Scott, 1986)	Ectoparasite	Spionidae	*Dipolydora flava* (Claparède, 1870)	15–105 m	British waters	O'Reilly (1991), host as *Polydora flava* Claparède, 1870
			Spionidae	*Polydora ciliata* (Johnston, 1838)	15–105 m	British waters	O'Reilly (1991)
			Spionidae	*Dipolydora flava* (Claparède, 1870)	15–105 m	Channel coasts of France	O'Reilly (1991), Kim et al. (2013)
			Spionidae	*Polydora* sp.		British waters	O'Reilly (1991), Kim et al. (2013)
Clausiidae	*Pontoclausia antiqua* (Kim, 2001c)	Ectoparasite	Arenicolidae	*Arenicola brasiliensis* Nonato, 1958		Korea	Kim (2001b)
Clausiidae		Ectoparasite	Eunicidae			Yellow Sea	Kim (2000)

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
	Pontoclausia lobata (Kim, 2000)			*Marphysa sanguinea* (Montagu, 1815)			
Clausiidae	*Pontoclausia prima* (Rocha, 1986)	Ectoparasite	Unknown	Unknown		Brazil	Kim (2001c)
Clausiidae	*Pontoclausia wilsoni* (Gooding, 1963)	Ectoparasite	Unknown	Unknown			Kim (2001c)
Clausiidae	*Pseudoclausia giesbrechti* Bocquet and Stock, 1963	Ectoparasite	Unknown	Unknown		France	Bocquet and Stock (1963)
Clausiidae	*Pseudoclausia longiseta* Bocquet and Stock, 1963	Ectoparasite	Unknown	Unknown		France	Bocquet and Stock (1963)
Clausiidae	*Rhodinicola elongata* Levinsen, 1878	Ectoparasite	Maldanidae	*Rhodine gracilior* Tauber, 1879		Denmark	O'Reilly (1991, 1999)
			Maldanidae	*Rhodine loveni* Malmgren, 1865		British waters	Williams (1907)
Clausiidae	*Rhodinicola gibbosum* Bresciani, 1964	Ectoparasite	Maldanidae	*Praxillella praetermissa* (Montagu, 1865)	74–327 m	Denmark	Bresciani (1964)
Clausiidae	*Rhodinicola laticauda* Ho and Kim, 2003	Ectoparasite	Unknown	Unknown		Yellow Sea	Ho and Kim (2003)
Clausiidae	*Rhodinicola rugosum* (Giesbrecht, 1897)	Ectoparasite	Maldanidae	*Microclymene tricirrata* Arwidsson, 1906	104 m	Central North Sea	Kim et al. (2013), host as *Clymenura tricirrata* (Arwidsson, 1906)
			Maldanidae	*Euclymene* sp.	104 m	Central North Sea	Kim et al. (2013)
			Maldanidae	*Praxillella affinis* (Sars in G.O. Sars, 1872)	35 m	England, Suffolk and East Sussex	Kim et al. (2013)
			Maldanidae	*Leiochone johnsoni* McIntosh, 1915	64 m	North Sea	Kim et al. (2013), host as *Clymenura johnstoni* (McIntosh, 1915)
Clausiidae	*Rhodinicola tennuis* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Unknown	Unknown	69 m	Europe	Kim et al. (2013)
Clausiidae	*Rhodinicola thomassini* Laubier, 1970	Ectoparasite	Maldanidae	*Leiochone tenuis* Day, 1957		Tulear Reef, Madagascar	Laubier (1970, 1971), Ho and Kim (2003)
Clausiidae	*Rhodinicola similis* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Maldanidae	*Rhodine gracilior* Tauber, 1879	15–38 m	Scotland	Kim et al. (2013)
Clausiidae	*Rhodinicola* sp.	Ectoparasite	Maldanidae	*Clymenura clypeata* (Saint-Joseph, 1894)			O'Reilly (1991)
Clausiidae	*Rhodinicola polydorae* Björnberg and Radashevsky, 2011	Ectoparasite	Spionidae	*Polydora brevipalpa* Zask, 1993		Peter the Great Bay, Sea of Japan	Björnberg and Radashevsky (2011)
Clausiidae	*Boreoclausia recta* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Oweniidae	*Galathowenia fragilis* (Nilson & Holthe, 1985)	350 m	Europe	Kim et al. (2013)
Clausiidae	*Boreoclausia holmesi* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Oweniidae	*Myriochele danielseni* Hansen, 1879	11–178 m	Europe	Kim et al. (2013)
Clausiidae	*Sheaderia bifida* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Maldanidae	*Euclymene oerstedii* (Claparède, 1863)	146 m	Europe	Kim et al. (2013)
Clausiidae	*Vivgottoia garwoodi* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Terebellidae	*Phisidia aurea* Southward, 1956	32 m	Europe	Kim et al. (2013)
Clausiidae	*Hemadona clavicrura* Ho and Kim, 2004	Ectoparasite	Capitellidae	*Dasybranchus caducus* (Grube, 1846)		Namhae-do Island, Korea	Ho and Kim (2004), host as *Dasybranchus caudatus* ¿
Clausiidae		Ectoparasite	Maldanidae			Aegean Sea	

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
	Donusa clymenicola von Nordmann, 1864			*Nicomache lumbricalis* (Fabricius, 1780)			Walter and Boxshall, 2014, host as *Clymene lumbricalis* Savigny in Lamarck, 1818
Clausiidae	*Flabelliphilus inersus* Bresciani & Lützen, 1962	Ectoparasite	Flabelligeridae	*Flabelligera affinis* Sars, 1829		Coasts of Sweden	Walter and Boxshall (2014)
Clausiidae	*Jeanella* sp.	Ectoparasite	Maldanidae	*Praxillella abyssorum* (McIntosh, 1885)		British Sea	Walter and Boxshall (2014)
Clausiidae	*Praxillinicola kroyeri* McIntosh, 1885 (GI)	?	Maldanidae	Unknown			O'Reilly (1995)
Dirivultidae	*Ceuthoecetes aliger* Humes, 1980	Ectoparasite	Siboglinidae	*Riftia pachyptila* Jones, 1981		Galapagos Rift & East Pacific Rise	Humes and Doriji (1980)
Ectinosomatidae (Harpacticoida)	??	?	Serpulidae	*Hydroides norvergica* Gunnerus, 1768		British waters	O'Reilly (1995)
Entobiidae	*Entobius euelpis* Barnard, 1948	Endoparasite	Terebellidae	Unknown		Bristish waters; off the South African coast to Red Sea	Dogiel (1908), Barnard (1948), Gotto (1966)
Entobiidae	*Entobius hamondi* Gotto, 1966	Endoparasite	Terebellidae	*Polycirrus caliendrum* Claparède, 1869	12 m	Asis shoal, Plymouth	Gotto (1966)
Entobiidae	*Entobius loimiae* Dogiel, 1908	?	Terebellidae	*Loimia medusa* (Savigny in Lamarck, 1818)			Dogiel (1908)
Entobiidae	*Entobius scionides* Suarez-Morales and Carrera-Parra, 2012	Endoparasite	Terebellidae	*Scionides reticulata* (Elhers, 1887)		Gulf of Mexico, Caribbean Sea	Suarez-Morales and Carrera-Parra (2012)
Entobiidae	*Entobius* sp.	Endoparasite	Terebellidae	*Polycirrus plumosus* (Wollebaek, 1912)			O'Reilly (1991)
Entobiidae	*Entobius* sp.	Endoparasite	Terebellidae	*Polycirrus medusa* Grube, 1850			O'Reilly (1991)
Eunicicolidae	*Eunicicola clausi* Kurz, 1877	Ectoparasite	Eunicidade	*Eunice torquata* Quatrefages, 1866		Adriatic, Norway, Faroes Island, and British waters	Kim (2005), host as *Eunice claparedi* Quatrefages, 1866
Eunicicolidae	*Eunicicola insolens* (T. & A. Scott, 1913)	Ectoparasite	Eunicidade	*Eunice harassii* Andouin & Milne Edwards, 1834		North-east coast of Ireland	Gotto (1963); Kim (2005)
Gastrodelphyidae	*Gastrodelphys clausii* Graeffe, 1883	Ectoparasite	Sabellidae	*Bispira volutacornis* (Montagu, 1804)		English Channel and Mediterranean	Boxshall and Halsey (2004)
			Sabellidae	*Bispira* sp.		Adriatic Sea	Boxshall and Halsey (2004), host as *Distyla josephinae* ¿
Gastrodelphyidae	*Gastrodelphys dalesi* (Green, 1861)	Ectoparasite	Sabellidae	*Eudystilia polymorpha* Johnson, 1901		Californian coast	Boxshall and Halsey (2004)
Gastrodelphyidae	*Gastrodelphys fernaldi* Dudley, 1964	Ectoparasite	Sabellidae	*Bispira crassicornis* (Sars, 1851)		Pacific coast, USA	Boxshall and Halsey (2004)
			Sabellidae	*Bispira* sp.		Pacific coast, USA	Boxshall and Halsey (2004), host as *Sabella crassicornis* Sars, 1851
Gastrodelphyidae	*Gastrodelphys myxicolae* List, 1889	Ectoparasite	Sabellidae	*Myxicola infundibulum* (Montagu, 1808)		Adriatic Sea	Boxshall and Halsey (2004)
Gastrodelphyidae	*Sabellacheres aenigmatopygus* Carton, 1971	Ectoparasite	Sabellidae	*Potamilla reniformis* (Bruguière, 1789)		Madagascar	Carton (1971)
Gastrodelphyidae	*Sabellacheres antarcticus* Suárez-Morales and Boxshall, 2012	Ectoparasite	Sabellidae	*Perkinsiana brigittae* Tovar-Hernández et al. 2012		Antarctic	Suárez-Morales and Boxshall (2012)
Gastrodelphyidae	*Sabellacheres drachi* Laubier, 1868	Ectoparasite	Sabellidae	*Potamilla thorelli* (Malmgren, 1866)		Spain	Boxshall and Halsey (2004)
Gastrodelphyidae	*Sabellacheres gracilis* Sars, 1862	Ectoparasite	Sabellidae	*Myxicola infundibulum* (Montagu, 1808)		Pacific coast, USA	Boxshall and Halsey (2004)
Gastrodelphyidae		Ectoparasite	Sabellidae			Pacific coast, USA	

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
	Sabellacheres illgi Dudley, 1964			*Megalomma splendida* (Moore, 1905)			Boxshall and Halsey (2004), host as *Branchiomma burrardum* Berkeley, 1930
			Sabellidae	*Parasabella rugosa* (Moore, 1904)		Pacific coast, USA	Boxshall and Halsey (2004), host as *Distylidia rugosa* Moore, 1904
			Sabellidae	*Pseudopotamilla occelata* Moore, 1919		Pacific coast, USA	Boxshall and Halsey (2004), host as *Potamilla occelata* ¿
Gastrodelphyidae	*Chonephilus dispar* Sars, 1861 (GI)	Ectoparasite	Sabellidae	*Euchine papillosa* (Sars, 1851)		North Sea, Norway	G. O. Sars (1870), Sars (1862), Dudley (1964)
Herpyllobiidae	*Eurysilenium fungosum* Stock, 1996	Mesoparasite	Polynoidae	*Hemilipidia versluysi* (Horst, 1915)		Iles Kai, Indonesia	Stock (1996)
Herpyllobiidae	*Eurysilenium intermedium* Stock, 1996	Mesoparasite	Polynoidae	*Harmothoe corralophila* (Day, 1960)		New Caledonia	Stock (1986), host as *Harmothoe corralophila* Day, 1960
Herpyllobiidae	*Eurysilenium oblongum* Hansen, 1886	Mesoparasite	Polynoidae	*Bylgides promamme* (Malmgren, 1867)		North Atlantic Ocean	Cordell (2007)
			Polynoidae	*Harmothoe imbricata* (Linnaeus, 1767)		North Atlantic Ocean	Cordell (2007)
Herpyllobiidae	*Eurysilenium truncatum* Sars, 1870	Mesoparasite	Polynoidae	*Gattyana cirrhosa* (Pallas, 1766)		North Atlantic Ocean	Cordell (2007)
			Polynoidae	*Harmothoe imbricata* (Linnaeus, 1776)		North Atlantic Ocean	Cordell (2007)
Herpyllobiidae	*Eurysilenium australis* López-González, Bresciani & Conradi, 2006	Mesoparasite	Polynoidae	*Polyeunoa* sp.	190–286 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius antarcticus* Vanhöffen, 1913	Mesoparasite	Polynoidae	*Polyeunoa laevis* McIntosh, 1885			López-González et al. (2006), host as *Enipo rhombigera* Elhers, 1908
			Polynoidae	*Harmothoe fullo* (Grube, 1878)			López-González et al. (2006), host as *Harmothoe gourdoni* Gravier 1911
			Polynoidae	*Harmothoe gourdoni* Gravier 1911		Antarctic	López-González et al. (2006)
			Polynoidae	*Harmothoe spinosa* Kinberg, 1856	380 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius antepositus* Stock, 1986	Mesoparasite	Polynoidae	*Lagisca irritans* Marenzeller, 1904	365–485 m	Crozet Island	Stock (1986), López-González et al. (2006)
Herpyllobiidae	*Herpyllobius arcticus* Steenstrup & Lütken, 1861	Mesoparasite	Polynoidae	*Austrolaenilla mollis* (Sars, 1872)		south-west England; Skagerrak; Faroes; Kattegat; south Norway; east and west Greenland; Kara Sea	Walter and Boxshall, 2014
			Polynoidae	*Gattyana cirrhosa* (Pallas, 1766)			O'Reilly (1991)
			Polynoidae	*Harmothoe extenuata* (Grube, 1840)			Lützen (1964)
			Polynoidae	*Harmothoe imbricata* (Linnaeus, 1776)			O'Reilly (1991), Cordell (2007)

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
			Phyllodocidae	*Eumida sanguinea* (Oersted, 1843)			O'Reilly, 2000
			Phyllodocidae	*Pterocirrus macroceros* (Grube, 1860)			O'Reilly, 2000
			Polynoidae	*Harmothoe impar* (Johnston, 1839)			O'Reilly (1991)
			Polynoidae	*Polyeunoa laevis* McIntosh, 1885	666–673 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius australis* Lützen, 1964	Mesoparasite	Polynoidae	*Harmothoe spinosa* Kinberg, 1856			Lützen (1964)
Herpyllobiidae	*Herpyllobius cordiformis* Lützen, 1964	Mesoparasite	Polynoidae	*Eunoe nodosa* (Sars, 1861)		East America, Inglefield Bay, Greenland	Lützen (1964)
Herpyllobiidae	*Herpyllobius elongata* Lützen, 1967	Mesoparasite	Polynoidae	*Grubeopolynoe tuta* (Grube, 1855)		Southern Bristish, Columbia & Northern Washington	Lützen, 1967, host as *Hololepidella tuta* (Grube, 1855)
Herpyllobiidae	*Herpyllobius gravieri* Lützen, 1964	Mesoparasite	Polynoidae	*Harmothoe spinosa* Kinberg, 1856	380 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius hadddoni* Lützen, 1964	Mesoparasite	Polynoidae	*Harmothoe imbricata* (Linnaeus, 1776)			Lützen, 1964; Cordell (2007)
Herpyllobiidae	*Herpyllobius hartmanae* Lützen & Jones, 1976	Mesoparasite	Polynoidae	*Laetmonice producta* (Grube, 1876)	476–496 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius lobosaccus* Stock, 1986	Mesoparasite	Polynoidae	*Lagisca irritans* Marenzeller, 1904	365–485 m	Crozet Island	Stock (1986); López-González et al. (2006)
Herpyllobiidae	*Herpyllobius luetzeni* López-González, Bresciani and Conradi, 2000	Mesoparasite	Polynoidae	*Harmothoe cf spinosa* Kinberg, 1856	93–94 m	Antarctic	López-González et al. (2000)
Herpyllobiidae	*Herpyllobius nipponicus* Lützen, 1964	Mesoparasite	Polynoidae	*Parahalosydna pleiolepis* (Marenzeller, 1879)		East America, Kara sea, Greenland, Faroes Isles, Noway, England	Lützen (1964)
Herpyllobiidae	*Herpyllobius polasterni* López-González, Bresciani and Conradi, 2000	Mesoparasite	Polynoidae	*Eulagisca gigantea* Monro, 1939	391–673 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius polynoes* (Kroyer, 1863)	Mesoparasite	Polynoidae	*Austrolaenilla mollis* (Sars, 1878)		British Isles, North Sea, Skagerrak, North Noway, Kattegat, Iceland, Spitzbergen, east and west Greenland, Baffin Island, Labrador, Gulf of St Lawrence, northeast USA, Kara sea, Alaska, northeast Pacific	O'Reilly (1991), Walter and Boxshall (2014)
			Polynoidae	*Bylgides promamme* (Malmgren, 1867)		European waters	Lützen (1964), host as *Anthinoe badia* (Théel, 1879)
			Polynoidae	*Bylgides sarsi* (Kinberg in Malmgren, 1866)		European waters	Lützen (1964)
			Polynoidae	*Eunoe nodosa* (Sars, 1861)		European waters	Lützen (1964)
			Polynoidae	*Gattyana amnodseni* (Malmgren, 1867)		European waters	Lützen (1964)
			Polynoidae	*Gattyana cirrhosa* (Pallas, 1766)		Scotland	Lützen (1964), O'Reilly (1999)
			Polynoidae	*Gaudichaudius iphionellioides* (Johnson, 1901)		European waters	Lützen (1964)
			Polynoidae	*Harmothoe aspera* (Hansen, 1878)		European waters	Lützen (1964)
			Polynoidae			European waters	Lützen (1964)

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
				Harmothoe extenuata (Grube, 1840)			
			Polynoidae	*Harmothoe imbricata* (Linnaeus, 1767)		European waters	Lützen (1964), Cordell (2007)
			Polynoidae	*Harmothoe impar* (Johnston, 1839)		European waters	Lützen (1964)
			Polynoidae	*Malmgreniella lunulata* (Delle Chiaje, 1830)		British waters	O'Reilly (1991)
			Polynoidae	*Malmgrenia andreapolis* McIntosh, 1874		British waters	O'Reilly (1991)
Herpyllobiidae	*Herpyllobius rotundus* Lützen & Jones, 1976	Mesoparasite	Polynoidae	*Harmothoe* sp.	640–658 m	Cook Strait	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius stocki* López-González, Bresciani and Conradi, 2000	Mesoparasite	Polynoidae	*Austrolaenilla antarctica* Bergström, 1916	395–417 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Herpyllobius vanhoeffeni* López-González, Bresciani and Conradi, 2000	Mesoparasite	Polynoidae	*Eulagisca corrientis* McIntosh, 1885	666–673 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Phallusiella psalliota* Leigh-Sharpe, 1926	Mesoparasite	Polynoidae	*Harmothoe extenuata* (Grube, 1840)		Southwest England	Walter and Boxshall (2014)
Herpyllobiidae	*Phallusiella vera* Leigh-Sharpe, 1926	Mesoparasite	Polynoidae	*Malmgreniella castanea* (McIntosh, 1876)			O'Reilly (1991), host as *Malmgrenia castanea* McIntosh, 1876 and *Harmothoe castanea* (McIntosh, 1876)
Herpyllobiidae	*Gottoniella antarctica* López-González, Bresciani and Conradi, 2006	?	Polynoidae	Unknown	374–597 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Gottoniella andeepi* López-González, Bresciani and Conradi, 2006	?	Polynoidae	Unknown	2895 m	Antarctic	López-González et al. (2006)
Herpyllobiidae	*Thylacoides sarsi* Gravier, 1912	?	Syllidae	Unknown		Antarctic	Gravier (1912a)
Miraciidae (Harpacticoida)	*Bulbamphiascus imus* (Brady, 1872)	Commensal	Capitellidae	*Capitella* sp.		Irvine Bay, Scotland	Moore and O'Reilly (1993), host as *Capitella capitata* (Fabricius, 1780)
Nereicolidae	*Anomopsyllus abyssorum* Laubier, 1968	Ectoparasite	Ampharetidae	Unknown	3992 m	Gulf of Gascogne	Laubier (1988)
Nereicolidae	*Anomopsyllus pranizoides* Sars, 1921	Ectoparasite	Ampharetidae	*Amphicteis gunneri* (Sars, 1835)	300 m	Norway	Laubier (1988)
Nereicolidae	*Anomopsyllus bifurcus* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Capitellidae	*Notomastus latericius* Sars, 1851	105 m	Norway	Kim et al. (2013)
Nereicolidae	*Anomopsyllus geminus* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Ampharetidae	*Ampharete lindstroemi* Malmgren, 1867	45–112 m	Norway	Kim et al. (2013)
Nereicolidae	*Anomopsyllus hamiltonae* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Ampharetidae	*Sosane wahrbergi* (Eliasson, 1955)	290 m	North Sea, Norway	Kim et al. (2013)
Nereicolidae	*Anomopsyllus* sp.	Ectoparasite	Ampharetidae	Unknown	4869 m	Kurile Kamchatka trench and abyssal plain	This paper
Nereicolidae	*Nereicola ovata* Keferstein, 1863	Ectoparasite	Nereididae	*Nereis elitoralis* Eliason, 1962		English Channel, Mediterranean and Black Seas	Dantan (1929), Laubier (1965), O'Reilly (1995)

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Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
			Nereididae	*Nereis rava* Ehlers, 1864		Northsouth Atlanthic, North Pacific, Antarctic	Boxshall and Halsey (2004)
			Nereididae	*Nereis zonata* Malmgren, 1867			Boxshall and Halsey (2004)
			Nereididae	*Perinereis cultrifera* (Grube, 1840)		North Sea, Norway	Boxshall and Halsey (2004)
			Nereididae	*Platynereis dumerilii* (Audouin & Milne Edwards, 1834)			Boxshall and Halsey (2004)
Nereicolidae	*Pherma curticaudatum* Wilson, C. B. 1923	Ectoparasite	Unknown	Unknown		Tortugas Islands, Gulf of Mexico	Wilson (1923)
Nereicolidae	*Selioides bocqueti* Carton, 1963	Ectoparasite	Polynoidae	*Adyte assimilis* (McIntosh, 1874)			Boxshall and Halsey (2004), host as *Subadyte assimilis*?
			Polynoidae	*Gattyana cirrhosa* (Pallas, 1766)		Swedish and British coasts	O'Reilly (1995)
			Polynoidae	*Harmothoe* sp.		British waters	O'Reilly (1995)
			Polynoidae	*Malmgreniella castanea* (McIntosh, 1876)		British waters	O'Reilly (1995)
Nereicolidae	*Selioides bolbroei* Levinsen, 1878	Ectoparasite	Polynoidae	*Bylgides sarsi* (Kinberg in Malmgren, 1866)			Bresciani (1967), host as *Anthinoe sarsi* (Théel, 1879)
			Polynoidae	*Eunoe nodosa* (Sars, 1861)			Bresciani (1967)
			Polynoidae	*Gattyana cirrhosa* (Pallas, 1766)		British waters, Arctic, Denmark, Sweden and eastern North Sea	O'Reilly (1995)
			Polynoidae	*Harmothoe imbricata* (Linnaeus, 1767)		Denmarck	Bresciani (1967)
			Polynoidae	*Lagisca rarispina* (Sars, 1861)			Bresciani (1967)
Nereicolidae	*Selioides bulbifer* Stock, 1986	Ectoparasite	Polynoidae	*Gorgoniapolynoe corralophila* (Day, 1960)		Indian Ocean	Stock (1986), host as *Harmothoe corralophila* Day, 1960
Nereicolidae	*Selioides capensis* Stock, 1986	Ectoparasite	Polynoidae	*Subadyte pellucida* (Ehlers, 1864)	30 m	Sudafrica	Stock (1996)
Nereicolidae	*Selioides guineensis* Carton and Laubier, 1974	Ectoparasite	Polynoidae	*Subadyte* sp.		Golfe Guinée (Atlantic)	Carton and Laubier (1974)
Nereicolidae	*Selioides tardus* Gravier, 1912	Ectoparasite	Polynoidae	*Antarctinoe ferox* (Baird, 1865)		Antarctic	Carton and Laubier (1974), host as *Hermadion rouchi* Gravier, 1911 and *Hermadion ferox* Baird, 1865
Nereicolidae	*Selius bilobus* Kroyer, 1837	Ectoparasite	Polynoidae	*Lepidonotus squamatus* (Linnaeus, 1758)		Kattegat	Bresciani (1967)
Nereicolidae	*Sigecheres brittae* Bresciani, 1964	Ectoparasite	Phyllodocidae	*Eulalia viridis* Malmgren, 1865		Denmark and Sweden	O'Reilly (1991); Kim et al. (2013)
Nereicolidae	*Sigecheres concina* (T. Scott, 1902)	Ectoparasite	Phyllodocidae	*Sige fusigera* (Linnaeus, 1767)	102 m	Norway	O'Reilly (1991); Kim et al. (2013)
Nereicolidae	*Vectoriella marinovi* Stock, 1968	Ectoparasite	Paraonidae	*Aricidea (Acmira) cerrutii* Laubier, 1966	12–15 m	Black Sea	Laubier and Carton (1973), host as *Aricidea jeffreysi* [Auctt. (Non McIntosh, 1879)]
Nereicolidae	*Vectoriella ramosae* Laubier and Carton, 1973	Ectoparasite	Paraonidae	*Aedicira mediterranea* Laubier & Ramos, 1974	2000–3000 m	Mediterranean	Laubier and Carton (1973)
Nereicolidae	*Vectoriella gabesensis* Kim, Sikosky, O'Reilly & Boxhall, 2013	Ectoparasite	Paraonidae	*Aricidea catherinae* Laubier, 1967	13 m	Mediterranean	Kim et al. (2013)
Nereicolidae		Ectoparasite	Unknown	Unknown			Hesse (1869)

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
	Chelonidiformis typicus Hesse, 1869 (GI)						
Nereicolidae	*Leaniricola rotundata* McIntosh, 1885	Ectoparasite	Sigalionidae	*Sthenolepis areolata* (McIntosh, 1885)			Boxshall and Halsey (2004), host as *Leanira areolata* McIntosh, 1885
Nereicolidae	*Octophiophora lacertae* Stock, 1988	Ectoparasite	Serpulidae	Unknown	low tidal	Great Barrier Reef	Stock (1988)
Phyllodicolidae	*Phyllodicola petiti* Delamarre-Debouteville and Laubier, 1961	Ectoparasite	Phyllodocidae	*Eulalia expusilla* Pleijel, 1987		Mediterranean	Delamarre-Debouteville and Laubier, 1961, host as *Eulalia pusilla* Ørstedt, 1843
			Phyllodocidae	*Eumida bahusiensis* Bergstrom, 1914		Mediterranean	Delamarre-Debouteville and Laubier (1960, 1961), Laubier (1961)
			Phyllodocidae	*Eumida sanguinea* (Oersted, 1843)		Mediterranean	Delamarre-Debouteville and Laubier (1960, 1961), Laubier (1961)
			Phyllodocidae	*Phyllodoce* sp.		Mediterranean	Delamarre-Debouteville and Laubier (1960, 1961), Laubier (1961)
			Phyllodocidae	*Phyllodoce rosea* (McIntosh, 1877)		Mediterranean	Delamarre-Debouteville and Laubier (1960, 1961), Laubier (1961)
			Phyllodocidae	*Pirakia punctifera* (Grube, 1860)		Mediterranean	Delamarre-Debouteville and Laubier (1960, 1961), Laubier (1961)
Pseudanthessiidae	*Spiranthessius pleurocephalus* Stock, 1995	Ectoparasite	Serpulidae	*Spirobranchus corniculatus* (Grube, 1862)		Seychelles	Stock (1995)
Pseudanthessiidae	*Pseudanthessius tortuosus* Stock, Humes and Gooding, 1964	Ectoparasite	Amphinomidae	*Hermodice carunculata* (Pallas, 1766)		US Virgin Islands; western Caribbean and in Mexican waters	Stock et al. (1964), Yáñez-Rivera and Suárez-Morales (2008)
Pseudanthessiidae	*Pseudanthessius gracilis* Claus, 1889	Ectoparasite	Serpulidae	*Hydroides elegans* (Haswell, 1883)		Scotland, Italy, Sri Lanka, England, sweden, Norway	Costanzo et al. (1996)
			Serpulidae	*Filograna* sp.		British waters	O'Reilly (1991)
			Serpulidae	*Spirobranchus triqueter* (Linnaeus, 1758)		British waters	O'Reilly (1991), host as *Pomatoceros triqueter* (Linnaeus, 1758)
Pseudanthessiidae	*Pseudanthessius aestheticus* Stock, Humes and Gooding, 1964	Ectoparasite	Amphinomidae	*Hermodice carunculata* (Pallas, 1766)		Jamaica	Stock et al. (1964)
Pseudanthessiidae	*Pseudanthessius ferox* Humes and Ho, 1967	Ectoparasite	Sabellidae	*Sabella fusca* Grube, 1870		Indian Ocean, Red Sea	Humes and Ho (1967)
Sabelliphilidae	*Acaenomolgus gottoi* Stock, 1995	Ectoparasite	Serpulidae	*Spirobranchus* sp.		Desroches Atoll, Seychelles	Stock (1995)
Sabelliphilidae	*Acaenomolgus protulae* (Stock, 1959)	Ectoparasite	Serpulidae	*Protula intestinum* (Lamarck, 1818)		Naples, Italy; Banyuls, France; Strangford Lough, Northern Ireland	Stock (1959)
Sabelliphilidae	*Acaenomolgus serpulae* (Stock, 1960)	Ectoparasite	Serpulidae	*Serpula vermicularis* Linnaeus, 1767		Banuyls, France	Stock (1960)
Sabelliphilidae	*Doridicola hirsutipes* (T. Scot, 1893)	Ectoparasite	Sabellidae	*Sabella* sp.		British waters	O'Reilly (1991)

Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
Sabelliphilidae	*Doridicola agilis* Leydig, 1853	Ectoparasite	Polynoidae	*Polynoe* sp.		*English Channel*	Bocquet et al. (1963)
Sabelliphilidae	*Eupolymniphilus finmarchicus* (Scott, 1903)	Ectoparasite	Terebellidae	*Eupolymnia nebulosa* (Montagu, 1818)		Roscoff	O'Reilly (1991)
Sabelliphilidae	*Myxomolgoides mauritanus* Humes, 1975	Ectoparasite	Sabellidae	*Sabellastarte magnifica* (Shaw, 1800)			Humes (1975)
Sabelliphilidae	*Myxomolgus invulgus* Kim, 2001c	Ectoparasite	Sabellidae	*Myxicola* sp.		Yellow sea	Kim (2001a)
Sabelliphilidae	*Myxomolgus myxicolae* (Bocquet and Stock, 1958)	Commensal	Sabellidae	*Myxicola infundibulum* (Montagu, 1808)		Plymouth; Roscoff	Bocquet and Stock (1958)
Sabelliphilidae	*Myxomolgus proximus* Humes and Stock, 1973	Commensal	Sabellidae	*Myxicola aesthetica* (Claparède, 1870)		Finisterre, France	Humes and Stock (1973)
Sabelliphilidae	*Nasomolgus firmus* Humes and Ho, 1967	Ectoparasite	Sabellidae	*Sabellastarte spectabilis* (Grube, 1878)		Nosy Be, Madagascar	Humes and Ho (1967)
			Sabellidae	*Sabellastarte magnifica* (Shaw, 1800)		Nosy Be, Madagascar	Humes and Ho (1967)
Sabelliphilidae	*Nasomolgus leptus* Humes and Ho, 1967	Ectoparasite	Sabellidae	*Sabellastarte magnifica* (Shaw, 1800)		Nosy Be, Madagascar	Humes and Ho (1967)
Sabelliphilidae	*Nasomolgus parvulus* Humes and Ho, 1967	Ectoparasite	Sabellidae	*Sabellastarte magnifica* (Shaw, 1800)		Nosy Be, Madagascar	Humes and Ho (1967)
Sabelliphilidae	*Nasomolgus rudis* Humes and Ho, 1967	Ectoparasite	Sabellidae	*Sabellastarte magnifica* (Shaw, 1800)		Nosy Be, Madagascar	Humes and Ho (1967)
Sabelliphilidae	*Sabelliphilus elongatus* Sars, 1962	Ectoparasite	Sabellidae	*Sabella spallanzanii* (Gmelin, 1791)		Norway, Sweden, Northern Ireland, Ireland, England, France, Italy, Mediterranean coast of France, Northwestern Spain	O'Reilly (1995), host as *Sabella sarsi* Krøyer, 1856
			Sabellidae	*Sabella pavonina* Savigny, 1822		Saint George Chanel; British and European waters	O'Reilly (1995)
Sabelliphilidae	*Sabelliphilus sarsi* Claparède, 1870	Ectoparasite	Sabellidae	*Sabella spallanzanii* (Gmelin, 1791)		British waters to Mediterranean Sea	O'Reilly (1995), host as *Spirographis spallanzani* (Viviani, 1805)
Sabelliphilidae	*Sabelliphilus bispirae* McIntosh, 1904 (GI)	Ectoparasite	Sabellidae	*Bispira volutacornis* (Montagu, 1804)			Humes (1975)
Sabelliphilidae	*Sabelliphilus leuckarti* Kossmann, 1877 (GI)	Ectoparasite	Sabellidae	*Sabella* sp.			Humes (1975)
Sabelliphilidae	*Serpuliphilus duplus* Humes and Stock, 1973	Ectoparasite	Serpulidae	*Pomatostegus stellatus* (Abildgaard, 1789)		Curaçao	Humes and Stock (1973)
Sabelliphilidae	*Serpuliphilus tenax* Humes and Stock, 1973	Ectoparasite	Serpulidae	*Spirobranchus giganteus* (Pallas, 1766)		Curaçao, Bonaire, Puerto Rico, Jamaica, Barbados, Bahamas	Humes and Stock (1973)
Sabelliphilidae	*Terebelliphilus simpex* Kim, 2001c	Ectoparasite	Terebellidae	*Terebella ehrenbergi* Gravier, 1906		Yellow Sea	Kim (2001a)
Saccopsidae	*Melinnacheres ergasiloides* Sars, 1870	Ectoparasite	Ampharetidae	*Melinna cristata* (Sars, 1851)		Scandinavian waters, Massachussetts	Bresciani and Lützen (1974a)
Saccopsidae	*Melinnacheres levinseni* (McIntosh, 1885)	Ectoparasite	Terebellidae	*Ehlersiella atlantica* McIntosh, 1885		Atlantic Ocean, between Bermuda and Azores	Bresciani and Lützen (1974a)
Saccopsidae	*Melinnacheres terebellidis* (Levinsen, 1878)	Ectoparasite	Trichobranchidae	*Terebellides stroemi* Sars, 1835		off Greenland and northern North America	Bresciani and Lützen (1974a)
Saccopsidae	*Melinnacheres steenstrupi* (Delamarre-Debouteville and Laubier, 1961)	Ectoparasite	Trichobranchidae	*Terebellides stroemi* Sars, 1835		off Greenland and northern North America; Mediterranean	Bresciani and Lützen (1974a)

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Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
Saccopsidae	*Flabellicola neapolitana* Gravier, 1918 (GI)	Ectoparasite	Flabelligeridae	*Flabelligera diplochaitos* (Otto, 1821)		Mediterranean	Gravier (1918a, b), Mariniello (2010)
Sapprinidae	*Terebellicola reptans* Sars, 1862	Ectoparasite	Terebellidae	*Eupolymnia nebulosa* (Montagu, 1818)		North Sea, Norway	Laubier (1970)
Serpulidicolodae	*Parangium abstrusum* Humes, 1985	Ectoparasite	Serpulidae	Unknown		Moluccas; Deep waters in northeastern Atlantic; shallow waters in the Gulf of Mexico, South Atlantic off South America; Indo-Pacific; Antartic waters.	Humes (1985)
Serpulidicolodae	*Rhabdopus salmacinae* Southward, 1964	Ectoparasite	Serpulidae	*Salmacina setosa* Langerhans, 1884		North Atlantic Ocean	Southward (1964)
Serpulidicolodae	*Rhynchopus catinatus* Stock, 1979	Ectoparasite	Serpulidae	Undescribed		Eastern Gulf of México	Stock (1979)
Serpulidicolodae	*Serpulidicola josephellae* Humes and Grassle, 1979	Ectoparasite	Serpulidae	*Josephella* sp.		North Atlantic Ocean	Humes and Grassle (1979)
Serpulidicolodae	*Serpulidicola omphalopomae* Southward, 1964	Ectoparasite	Serpulidae	*Filogranula stellata* (Southward, 1963)		North Atlantic Ocean	Southward (1964), host as *Omphalopoma stellata* Southward, 1963
Serpulidicolodae	*Serpulidicola placostegi* Southward, 1964	Ectoparasite	Serpulidae	*Placostegus tridentatus* (Fabricius, 1779)		North Atlantic Ocean	Southward (1964)
Serpulidicolodae	*Serpulidicola segmentatus* Stock, 1989	Ectoparasite	Serpulidae	*Apomatus* sp.		Indonesia	Stock (1989)
Serpulidicolodae	*Serpulidicoloides cystopomati* (Gravier, 1912)	Ectoparasite	Serpulidae	*Hyalopomatus macintoshi* (Gravier, 1911)		Antarctic Ocean	Gravier (1912b), host as *Cystopomatus macintoshi* Gravier, 1911
Spiophanicolidae	*Spiophanicola spinosus* Ho, 1984	Ectoparasite	Spionidae	*Spiophanes berkeleyorum* Pettibone, 1962		west coast of southern of California	Ho (1984)
			Spionidae	*Spiophanes duplex* (Chamberlin, 1919)		west coast of southern of California	Ho (1984), host as *Spiophanes missionensis* Hartman, 1941
			Spionidae	*Spiophanes kroyeri* Grube, 1860		west coast of southern of California	O'Reilly (1999)
Spiophanicolidae	*Spiophanicola atlanticus* Kim, Sikosky, O'Reilly & Boxhall 2013	Ectoparasite	Spionidae	*Spiophanes kroyeri* Grube, 1860	50–433 m	Northern North Sea, Scotland	Kim et al. (2013), host as *Spiophanes spinosus* ¿
Xenocoelomatidae	*Aphanodomus terebellae* (Levinsen, 1878)	Endoparasite	Terebellidae	*Amphitrite cirrata* (O. F. Müller, 1771 in 1776)		Irish waters; wide distribution at high latitudes, from Canada, Greenland and Iceland, to the Kara Sea in the Arctic coasts of Russia	Bresciani and Lützen (1966, 1972, 1974b), O'Reilly (1995)
			Terebellidae	*Artacama proboscidea* Malmgren, 1866		South Irish Sea, Northeast England, widespread in Arctic waters	Bresciani and Lützen (1966, 1972, 1974b)
			Terebellidae	*Lanasa venusta* (Malm, 1874)		Iceland	Bresciani and Lützen (1966, 1972, 1974b)
			Terebellidae	*Nicolea zostericola* Örsted, 1844		Scandinavia	Bresciani and Lützen (1966, 1972, 1974b)
			Terebellidae			East Greenland	

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Table 4 (*continued*)

Anelidicolous copepods		Type	Polychaete hosts		Depth	Distribution	References
				Thelepus cincinnatus (Fabricius, 1780)			Bresciani and Lützen (1966, 1972, 1974b)
			Terebellidae	*Polycirrus medusa* Grube, 1850		British waters	O'Reilly (1995)
			Terebellidae	*Polycirrus plumosus* (Wollebaek, 1912)			Bresciani and Lützen (1966, 1972, 1974b);
Xenocoelomatidae	*Xenocoeloma alleni* (Brumpt, 1897)	Ectoparasite	Terebellidae	*Polycirrus caliendrum* Claparède, 1869		English Channel	Brumpt (1897), Bresciani and Lützen (1966, 1972, 1974b);
			Terebellidae	*Polycirrus arenivorus* (Caullery, 1915)		French coasts	Brumpt (1897), Bocquet et al. (1968)
			Terebellidae	*Polycirrus plumosus* (Wollebaek, 1912)			Brumpt (1897)
Xenocoelomatidae	*Xenocoeloma brumpti* Caullery & Mesnil, 1915	Ectoparasite	Terebellidae	*Polycirrus arenivorus* (Caullery, 1915)		English Channel	Bresciani and Lützen (1966)
Xenocoelomatidae	*Xenocoeloma* sp.	Ectoparasite	Terebellidae	*Polycirrus arcticus* Sars, 1865		Greenland	Bresciani and Lützen (1974b)
			Terebellidae	*Polycirrus* sp.		Hong Kong	Boxshall (2001)
Incertae sedis (Poecilostomatoida)	*Stockella indica* (Sebastian and Pillai, 1974)	?	Unknown	Unknown		Indian Ocean	Sebastian and Pillai (1974)
Incertae sedis (Poecilostomatoida)	*Cyclorhiza eteonicola* Heegaard, 1942	Ectoparasite	Phyllodocidae	*Eteone longa* (Fabricius, 1780)		North Atlantic and Mediterranean (Lower St Lawrence estuary), Isle of Man, Northeast England, West Norway, eastern North America	Gotto and Leahy (1988)
Incertae sedis (Poecilostomatoida)	*Cyclorhiza megalova* Gotto and Leahy, 1988	Ectoparasite	Phyllodocidae	*Eteone longa* (Fabricius, 1780)		British waters	Gotto and Leahy (1988); O'Reilly (1991)
Incertae sedis (Copepoda)	*Notomasticola frondosus* Kim, Sikosky, O'Reilly & Boxhall 2013	Endoparasite	Spionidae	*Pseudopolydora paucibranchiata* (Okuda, 1937)	133 m	Europe	Kim et al. (2013)
Incertae sedis (Copepoda)	*Notomasticola frondosus* Kim, Sikosky, O'Reilly & Boxhall 2013	Endoparasite	Capitellidae	*Notomastus latericius* Sars, 1851	125 m	Europe	Kim et al. (2013)
Incertae sedis (Cyclopoida)	*Ophelicola drachi* Humes, 1978	Ectoparasite	Opheliidae	Unknown	4500 m	Bay of Bisscay (abyssal plain)	Laubier (1978)
Incertae sedis (Cyclopoida)	*Ophelicola kurambia sp. nov.*	Ectoparasite	Opheliidae	Unknown	4987–4991 m	Kurile Kamchatka trench and abyssal plain	This paper

anterior end forming an anchor process) or endoparasitic (i.e. living on the interior of the host). Most parasitic annelidicolous copepods are ectoparasites (158, 68%), followed by mesoparasites (48, 20.5%) and endoparasites (14, 6%). Moreover, there are 12 species whose type of relationship has either not been reported or we have been unable to locate them. In some cases, the association with polychaete hosts may be circumstantial or has been just inferred, as the putative symbiotic copepods were obtained from washing of other organisms. This may be the case, for instance, of *Pseudanthessius gracilis*, *Parangium abstrusum* and *Stokella indica*, in which the association with polychaetes is assumed by comparing them with the most closely related species.

Ophelicola kurambia sp. nov. is a typical ectoparasitic species, which remain attached to its polychaete host with the help of the maxillae. Nothing more is known on this species except the depth range and the geographical location of the collection site, and this is a common situation for most annelidicolous copepods, as some species remain unrecorded since their original description (often very old dated). As stated by O'Reilly (1991) a careful examination of appropriate hosts is often all that is required to rediscover these species or to find new species to be described, as in the case of *O. kurambia* sp. nov.

Like our new species, some annelidicolous copepods were also reported from very deep waters, i.e. deeper than 2000 m. Among them, there are *Trophonophila bradii*, *Gottoniella andeepi*, *Anomopsyllus abyssorum*, *Vectoriella ramosae* and the other known species of *Ophelicola*, *O. drachi* (Table 4), but *O. kurambia* sp. nov. and the damaged specimen of *Anomopsyllus* found at the Kuril–Kamchatka trench occurred at the deepest known bottoms (almost 5000 m depth). It must be pointed out, however, that we have not been able to find references to the collection site depths for almost half of the species included in Table 4. Taking this into account, most other species (≈ 30) are reported from shallow waters around 100 m depth or less, while the remaining 18 occur between 200 and 700 m depth. Deep waters are by far poorly studied compared with shallow ones, but the few studies addressed to these ecosystems seem to confirm that they may be very favourable to the establishment of such intimate relationships.

Concerning the biogeographical distribution, among the 233 known relationships, almost 44% have been reported from

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European waters. Accordingly, more than 58% of all them occurred in the North Atlantic Ocean (including European and American coasts). The following region including more reports of anelidicolous copepods is the Indian Ocean (including Red Sea) with about 16%. The Antarctic Ocean, the Mediterranean Sea and the North Pacific Ocean include percentages of around 8–10%, the South Pacific Ocean and the Caribbean Sea around 3%, and the remaining locations (i.e. Black Sea, South Atlantic Ocean, and Arctic Ocean) include less than 1% (i.e. single report each). The high number of European reports (as well as those from the North Atlantic Ocean) may likely obey to a bias caused by the fact that these coasts have been more intensively studied. Although relatively less studied, the Indian Ocean also includes a relevant percentage of reports, which confirms this area as a hot spot of biodiversity.

The precise number of copepod species is difficult to determine, while the parasites of fish have been estimated to be around 1600–1800 species (Mariniello, 2010). Taking into account the wide range of hosts and the ubiquity of the invertebrate symbiotic copepods, there is no doubt that the real number of species may be as high or even higher that those associated to fish hosts, and that the annelidicolous species may substantially contribute to this number in the near future.

Acknowledgments

The KuranBio project was undertaken with the financial support of the PTJ (German Ministry for Science and Education), grant 03G0223A. We would like to thank Drs. Angelika Brandt and Marina Malyutina for giving us (IM) the opportunity to participate in the project and for processing the material. Thanks must also be extended to the captain and the crew of the RV "*SONNE*". This study is partly supported by the grant of the President of the Russian Federation МК-4481.2014.4 and the Russian Foundation for Basic Research 12-04-00540-а and 14-04-10183-к, and is a contribution of DM to the Consolidated Research Group 2014SGR120, funded by the "Generalitat de Catalunya", and to the Spanish State Research Project CTM2013-43287-P. This is the KuramBio publication # 19.

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Please cite this article as: Conradi, M., et al., Polychaete-parasitizing copepods from the deep-sea Kuril–Kamchatka trench (Pacific Ocean), with the description of a new.... Deep-Sea Res. II (2014), http://dx.doi.org/10.1016/j.dsr2.2014.08.018