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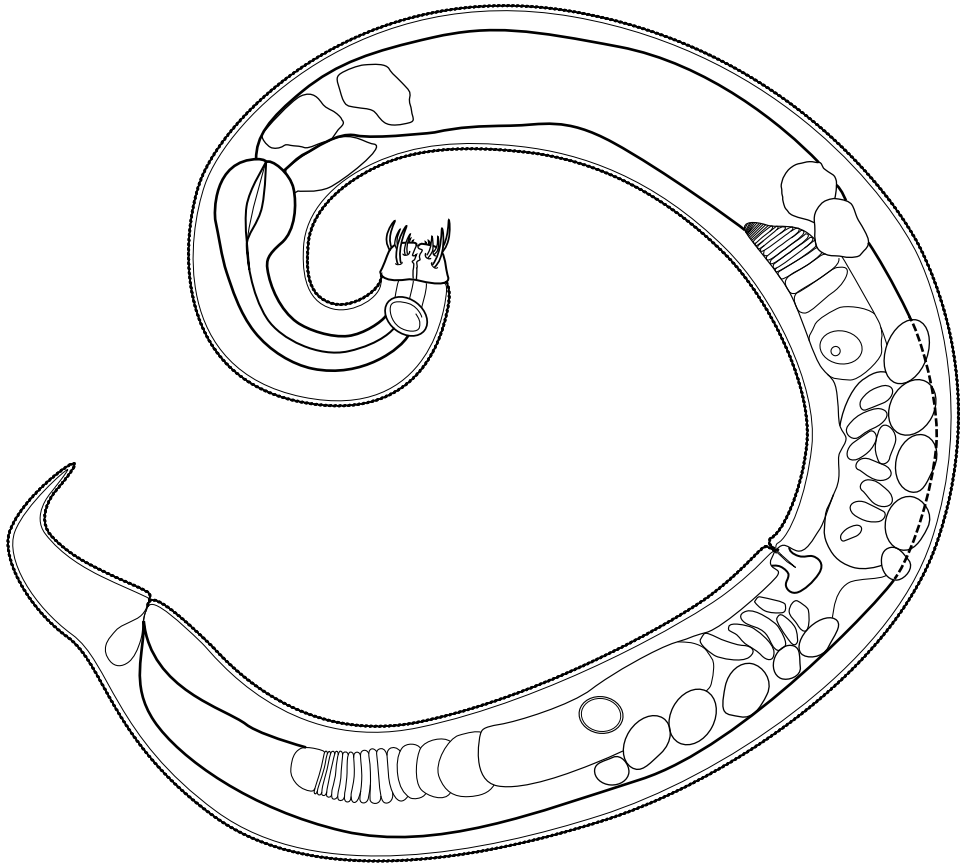
Taxonomic Analysis of Meiofaunal Nematode Samples Collected From Benthic Sediments at the Croker Carbonate Slabs SCI



Meiofaunal taxonomy analyses
undertaken for

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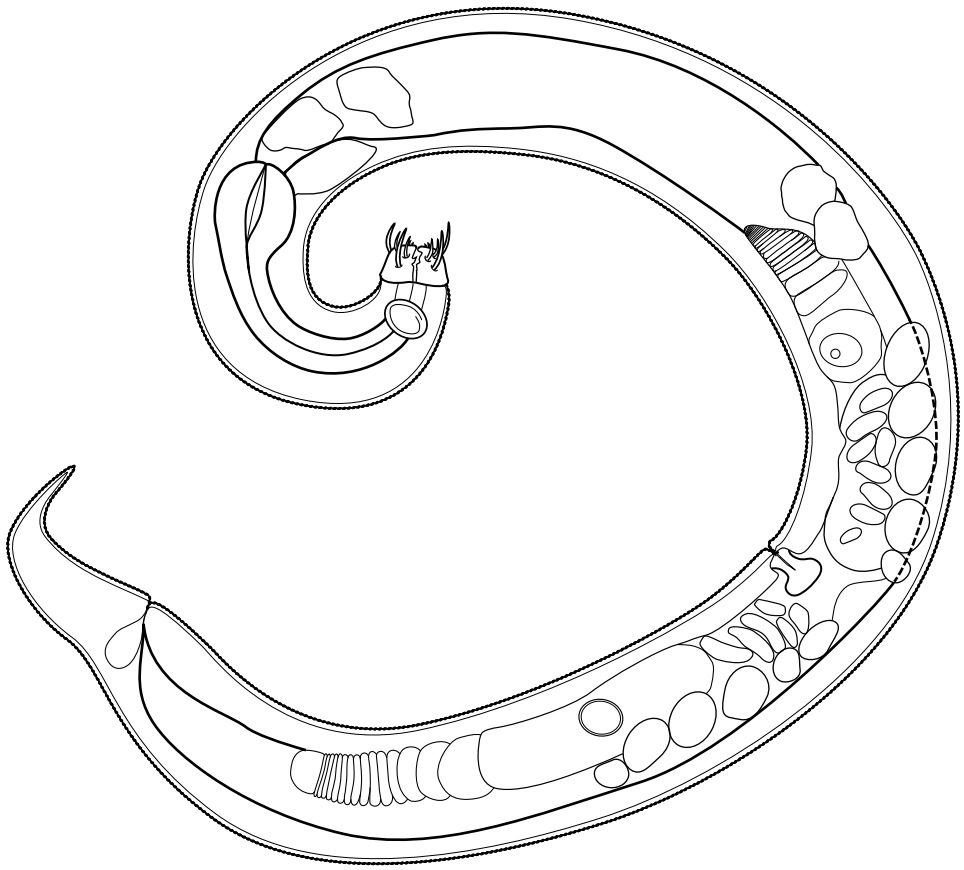

2015 Survey

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CONTENTS

1. Introduction

This short report presents the results and findings of analyses of meiofaunal nematode assemblages present in samples collected from the Croker Carbonate Slab SCI site in the Irish Sea, approximately 30 km west of Anglesey.

The Croker Carbonate Slab SCI[1] site comprises areas of exposed methane-derived authigenic carbonate (MDAC). MDAC forms when calcite precipitates from the seawater and infills the interstices between sand grains. This process can lead to the development of 'pavements' and 'chimneys' of solid substrata in an otherwise sediment dominated, benthic habitat. The erosion of these structure produces characteristic sand and gravel-rich substrata. These 'submarine structures made by leaking gas' are listed habitats under Annex I of the EC Habitats Directive.

The Croker Carbonate Slab SCI site was surveyed CEFAS during 2015. As part of this survey, sediment samples were collected to determine the biodiversity characteristics of the meiofaunal nematode communities in the benthic sediment habitats in the vicinity of the MDAC structures. Of particular interest was the potential for the habitats to support nematode species that enter into symbiotic associations with chemo-autotrophic micro-organisms (cyanobacteria). In this instance the microbes derive nutrients by chemosynthetic fixation of the natural gas seeps.

The following report presents the results of the taxonomic analysis of the nematode communities present in the seven sediment samples supplied by CEFAS. Where appropriate, brief comments are included on the taxonomy of selected meiofaunal groups and species and notes are presented regarding the nematode communities that were observed and described.

2. Materials and Methods

2.1 Meiofaunal Sample Collection

Seven sediment samples taken from three sampling stations within the Croker Carbonate Slabs SCI were collected by deploying a 0.1m^2 Day grab. Sub-samples were taken by inserting a 30 mm diameter core to collect the top 50 mm of sediment. The sediment was subsequently preserved in approximately 4% formalin solution and forwarded to Physalia for processing and analyses.

[1] SCI = Site of Community Importance

2.2 Meiofaunal Sample Processing and Examination

a - Meiofaunal Sample Separation

Standard laboratory protocols developed and refined by staff at Physalia over the past 30 years were used for the extraction of the meiofauna. After re-coding of the samples, the volume of sediment in each sample was measured. The samples were then homogenised gently in approximately 800 ml water. Initial separation was carried out using a modified, multiple Boisseau apparatus to elutriate the microscopic organisms from the bulk of the inorganic matrix. The first ("light") and subsequent ("heavy") meiofaunal fractions were collected on 38 µm mesh sieves immersed in flowing tap water (Flegg and Hooper, 1970). Pooled meiofauna/silt fractions for each sample were further concentrated by a polymer density separation technique with centrifugation and the meiofauna re-collected onto 38 µm mesh sieves. The density separation technique was repeated and the separation efficiencies were estimated.

b - Nematoda Sample Preparation and Taxonomy Identification

Modified nematological techniques based on those of Bührer (1949), Baker (1953) and Cairns and Tarjan (1955) were used to process, handle and examine the remaining meiofauna, (primarily Nematoda - free-living roundworms). Specimens were processed to glycerol using a modified Seinhorst method (Seinhorst, 1959) in Syracuse watch glasses at 40°C. Taxonomic microscope slides were then prepared for identification and enumeration. Taxonomic identification of meiofaunal specimens was carried out on prepared microscope slides using Zeiss and Nikon Nomarski DIC (differential interference contrast) compound microscopes. For the nematodes, the first 100 specimens encountered were identified and counted. Remaining animals were then counted enabling total densities of each species in each sample to be calculated and then recorded. Throughout the taxonomic analyses, standard taxonomic texts, including Platt and Warwick (1983 and 1988) and Warwick, Platt and Somerfield (1998) were consulted along with the in-house Physalia reference materials.

The nematodes present were reported as numbers of individuals per species (OTU[2]) per litre sediment per sample (sampling site)[3]. In addition to the density of individual species/taxa, the results were expressed as total number of species and total density. Under stressed or sub-optimal conditions, selection results in tolerant species predominating whilst the abundances of more sensitive species decline. To give an indication of this effect, Simpson's Diversity Index was calculated for the species assemblages present in the 7 samples analysed. This index considers both the total

[2] OTU = Observed taxonomic unit - adopted where specimens fail to comply with published species descriptions.

[3] Due to the varying volumes of sediment in each sample the results are presented as numbers of meiofaunal nematodes per species (taxon) per litre rather than numbers of species per area of substrate.

number of species/taxa within a sample and the distribution of individuals amongst species/taxa within that sample.

3. Results of Analyses

The taxonomic species lists for the meiofaunal nematode taxa recorded in the Croker Carbonate Slabs SCI samples are presented in Table A1 (Appendix A). Tables B1 (Appendix B) present the site-by-site results for the nematode taxa and the summary community statistics.

4. Comments on Taxonomy

Wherever possible, the full species name was provided for each taxa encountered during the taxonomic analysis of the nematode assemblages. However, in numerous cases, the features of the specimens examined did not comply with the accepted, published descriptions of UK nematode species. Where the deviation from the published description was minor and it was possible that the differences could be considered intra-specific variation, i.e. polymorphism, the species name was queried; e.g. *Pselionema* species (?*P. longiseta*). Polymorphism occurs regularly for features such as number of pre-cloacal supplements, setae and details of cuticular ornamentation.

A number of taxa encountered during the analyses are worthy of particular mention:.

a. Species 103, 243, 269 and 324 - *Leptolaimoides* species

The genus *Leptolaimoides* (family Leptolaimidae) is a microbivous (type 1A) species that has not been recorded regularly in UK coastal/offshore sediment samples. It is characterized by the occurrence of a narrow loop amphid that extends back, laterally from the buccal region of the nematode on either side of the body. Four distinct taxa were recorded in the seven Croker samples.

b. Species 110 and 304 - *Leptonemella* species (?*L. aphanothecae*) and *Catonema* species (?*C. macintyrei*)

These Desmodorid genera were characterized by a layer micro-organisms (cyanobacteria) on the cuticle of the animals. The occurrence of this epibiont layer obscures the features of the nematode and makes confirmation of the species identification difficult. In most cases, the cyanobacteria observed were coccoid (spherical), however, on numerous *Leptonemella* specimens the microbes were elongate (bacilliform) and formed a 'thatch' covering the surface of the cuticle. It is not known whether the type of episymbiotic micro-organism is determined by the species of the host nematode or whether the micro-organism that establishes is determined by the environmental conditions that prevail at given location. Consequently, given the

above, we cannot ascribe species names to the *Leptonemella* and *Catonema* species observed with any confidence.

Species 166 – *Dichromadora* (?*D. cephalata*)

This chromadorid species occurred frequently in the 187 site samples. Possessing seven pre-cloacal supplements and the correct buccal armature, this species resembled closely *D. cepahalata*. However, deviations from the accepted descriptions occurred in the lateral patterns of cuticular differentiation which appear to vary widely between specimens of this taxon and in the oesophageal bulb which was less well defined than would be expected for *D. cephalata*.

c. Species 312 – *Manunema* species

This is a distinctive genus of microbivorous/selective deposit feeding nematode with a highly characteristic somatic form. Posterior of the esophagus, this member of the family Leptolaimidae possesses a short, fat/inflated body that contrasts strongly with the anterior, "cervical" region. The latter is narrow and elongate, often flexed back against the body – a feature that might reflect the effects of fixatives. Specimens of *Manunema* are not regularly observed in UK sediments and, currently, only five species are listed on the World Database of Free-Living Marine Nematodes (see Vanaverbeke *et al.*, 2015).

5. Comments on Nematode Communities

A total of 145 distinct nematode taxa was recorded in the seven Croker benthic sediment samples that were analysed. The number of species recorded with the first 100 specimens examined in each sample ranged from 32 taxa (Sample 152 A3) to 51 taxa (Sample 187 A4; see Table B1; Appendix B).

Overall the "187 samples" appeared to be the most species-rich. In none of these samples examined did a single taxon account for more than 10% of the total animals observed. The "152 sample" species assemblages were characterised by elevated dominance values of the desmodorid species, *Chromaspirina parapontica*, albeit at a relatively modest percentage abundance. This species was recorded at a peak dominance of 31 % in Sample 152 A3.

The Simpson's Diversity values reflected the observations made above, with the highest values recorded for the 187 samples (maximum diversity: 34.07, Sample 187 A4) and the lowest for the 152 samples (lowest diversity: 8.15, Sample 152 A3).

Overall, the results of these analyses reveal a remarkable diversity of nematode species. Given the species "discovery rate" observed during the taxonomic analyses, it is highly likely that many more taxa would have been observed had the taxonomy not been restricted to the first 100 specimens identified. It is suggested here that the cause of the

observed high diversity related to the heterogeneity of the microhabitats within the sediment. The sediments comprised fine silts amongst the carbonate (presumably MDAC) debris. This mixed matrix most probably provided diverse microhabitats that were exploited readily by the wide range of nematode species described here. These included microbivorous species (Type 1A nematodes) such as the Monhysteridae and Leptolaimidae, selective epigrowth feeders and diatomivorous species (Type 2A nematodes) such as members of the Chromadoridae, the non-selective detritivores/deposit feeders (Type 1B nematodes including several Xyalidae species) and the omnivorous/predatory (Type 2B) species, including the Oncholaimids. Each of the trophic groups was well represented in the seven samples analysed with the exception of the Type 2B species that were relatively poorly represented.

In earlier studies of natural methane seep sites, the nematode species *Astomonema southwardarum* occurred in the vicinity of the seeps. *A. southwardarum* adults possess degenerate alimentary canals and they derive nutrients from the endosymbiotic, chemoautotrophic bacteria that are contained within their body cavity (see Tchesunov *et al.* (2012)). Analysis of sediment samples from the Braemar Pockmarks SAC site in the North Sea undertaken by Physalia for CEFAS in 2013, revealed high densities of this species in the vicinity of methane seeps and, previously, Austin *et al.* (1993) had recorded this species at the Scanner Pockmark SAC site, also in the North Sea.

In the present survey no specimens of *Astomonema southwardarum* were observed in the Croker Carbonate Slabs SCI sediment samples. However, species of Desmodorid that possessed ectosymbiotic cyanobacteria were recorded, namely *Leptonemella* and *Catonema* species (see Section 4, above). As with all members of the subfamily Stilbonematinae, both *Leptonemella* and *Catonema* species browse on the ectosymbiotic cyanobacteria that develop on their cuticles, which they in turn supply with reduced sulphur compounds and oxygen as an electron acceptor by migrating through the chemocline (Ott *et al.*, 1991). Whilst the presence of sulphidic materials associated with the methane seeps may enhance the sediment conditions for these species, both *Leptonemella* and *Catonema* species occurred at sites with no natural gas seeps. Therefore, on the basis of the information available, the presence of *Leptonemella* and *Catonema* species cannot be associated directly with the presence of the seeps.

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Appendix A

Taxonomic Species List

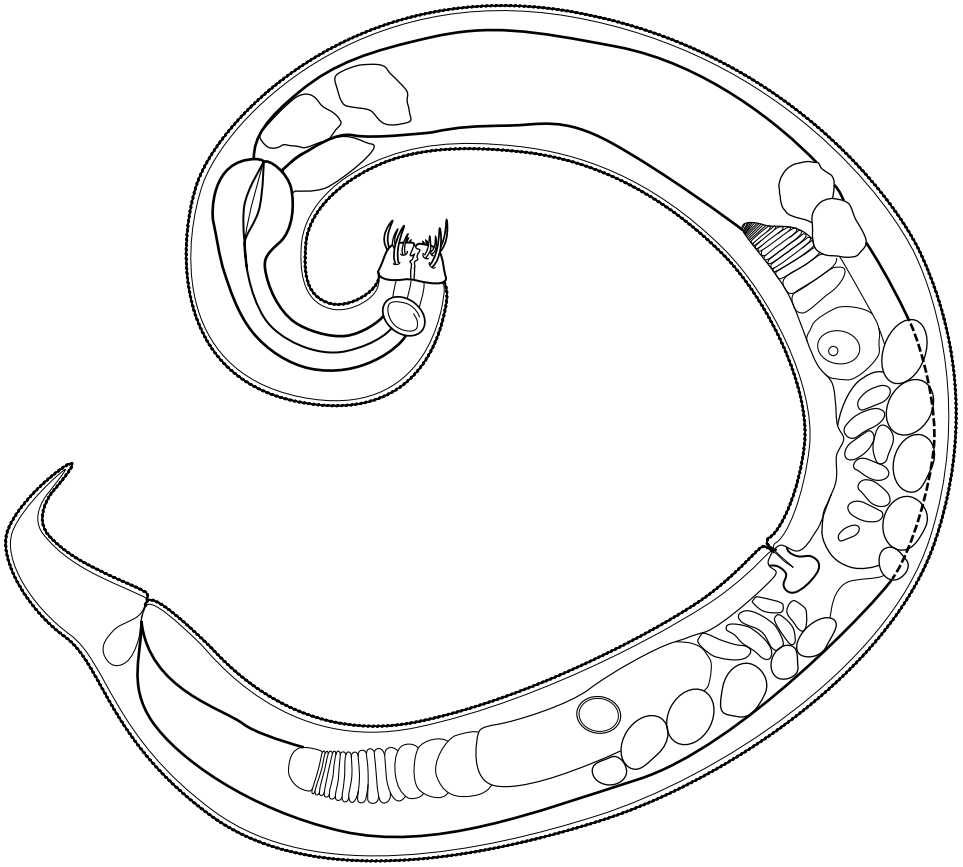


Table A. Taxonomic list of the meiofaunal invertebrate species recorded in the CEFAS survey of Croker Carbonate Slabs SCI benthic habitats, 2016. Numbers shown are identifier codes unique to each species in each survey region and relate to specimens in the faunal reference collections held at Physalia. These codes are used in the multivariate (mathematical) analyses of communities and appear in the site-by-site results tables (see Table B; Appendix B).

Class Enoplea

Sub-class Enoplia

Order Enoplida

Sub-order Enoplina

Family Anticomidae

291 *Anticoma* species
181 Anticominid species

Family Phanodermatidae

272 *Crenopharynx marioni*

Family Thoracostomopsidae

254 *Paramesacanthion* species

Sub-order Trefusiina

Family Trefusiidae

39 *Rhabdocoma*species (? *R. riemanni*)
337 *Trefusia*species (? *T. longicaudata*)

Sub-order Oncholaimina

Family Enchelidiidae

280 *Symplocostoma tenuicolle*

Family Oncholaimidae

327 *Oncholaimus species (?O. skawensis)*
118 *Viscosia elegans*
193 *Viscosia glabra*

Sub-order Ironina

Family Oxystominidae

5 *Halalaimus gracilis*
211 *Halalaimus isaitshikovi*
205 *Halalaimus longicaudatus*
277 *Halalaimus* species
276 *Halalaimus (? H. filicorpus*)

100 *Oxystomina asetosa*
104 *Oxystomina elongata*
10 *Thalassoalaimus tardus*

Order Triplonchida

Sub-order Tobrilina

Family Pandolaimidae
251 *Pandolaimus* species

Family Rhabdodemaniidae
294 *Rhabdodemania minor*

Class Chromadorea

Sub-class Chromadoria

Order Chromadorida

Sub-order Chromadorina

Family Chromadoridae
223 *Actinonema* species (?*A. pachydermatum)*
313 *Chromadorella duopapillata*
303 *Chromadorella filiformis*
51 *Chromadorita nana*
31 *Chromadorita tentabunda*
166 *Dichromadora* species (?*D. cephalata*
232 *Dichromadora cucullata*
13 *Neochromadora poecilosoma*
318 *Neochromadora poecilosomoides*
279 *Neochromadora* species
238 *Prochromadorella* (?*P. attenuata*)
297 *Prochromadorella longicaudata*
83 *Spilophorella paradoxa*
249 Chromadorid species 1
186 Chromadorid species 2

Family Cyatholaimidae
298 *Nannolaimoides effilatus*
342 *Paracanthonchus caecus*
165 *Paracanthonchus longicaudatus*
230 *Paracanthonchus longus*
237 *Paralongicyatholaimus minutus*
210 *Pomponema multipapillatum*
151 *Pomponema sedecima*
278 *Pomponema (? P. astrodes*)

Family Ethmolaimidae
134 *Comesa cuanensis*

289 *Filitonchus* species (? *F. filiformis*)

Family Neotonchidae

288 *Neotonchus boucheri*

Family Selachinematidae

315 *Cheironchus* species
152 *Gammarus rapax*
225 *Halichoanolaimus dolichurus*
101 *Halichoanolaimus robustidens*
338 *Latronema* species (? *L. deconincki*)
24 *Richtersia inaequalis*

Order Desmodorida

Sub-order Desmodorina

Family Desmodoridae

304 *Catonema (?C. macintyrei*)
307 *Chromaspirina multipapillata*
292 *Chromaspirina parapontica*
333 *Desmodora pontica*
106 *Desmodora scaldensis*
306 *Desmodora schulzi*
309 *Desmodora tenuispiculum*
275 *Desmodora* species
110 *Leptonemella* species (? *L. aphanothecae*)
311 *Spirinia gerlachi*
75 *Spirinia parasitifera*

Family Microlaimidae

330 *Aponema* species
45 *Bolbolaimus teutonicus*
112 *Calomicrolaimus honestus*
43 *Calomicrolaimus parahonestus*
113 *Microlaimus conothelis*
65 *Microlaimus globiceps*
321 *Microlaimus* species 1 (? *M. marinus*)
218 Microlaimid species 2
332 Microlaimid species 3 (? *Calomicrolaimus*)

Order Desmoscolecida

Family Desmoscolecidae

163 *Desmoscolex falcatus*
305 *Perepsilonema* species
198 *Quadricoma scanica*
270 *Quadricoma* species
334 *Tricoma* species (? *Brevirostris*)
116 *Tricoma* species (? *T. longirostris*)

Order Monhysterida

Sub-order Monhysterina

Family Monhysteridae

144 *Geomonhystera disjuncta*
266 *Monhystera vulgaris*
4 *Thalassomonhyster* species (? *T. venusta*)
285 *Thalassomonhystera* species

Family Sphaerolaimidae

28 *Sphaerolaimus gracilis*
188 *Sphaerolaimus islandicus*

Family Xyalidae

23 *Daptonema hirsutum*
2 *Daptonema normandicum*
27 *Daptonema oxycerca*
142 *Daptonema* species
320 *Gnomoxyla* species 2
343 *Gonionchus cumbriensis*
274 *Linhystera* species
107 *Metadesmolaimus gelana*
175 *Paramonhystera* species 1
329 *Paramonhystera* species 2
345 *Rhynchonema* species (? *R. ornatum*)
26 *Theristus acer*
48 *Theristus* species (? *T. denticulatus*)
12 *Theristus longus*
169 Xyalid species
231 Xyalid species
282 Xyalid species (? *Amphimonhystera*)
290 Xyalid species

Sub-order Linhomoeina

Family Linhomoeidae

172 *Desmolaimus* species
147 *Metalinhomoeus* species (? *M filiformis*)
331 *Paralinhomoeus conicaudatus*
299 *Paralinhomoeus tenuicaudatus*
301 *Paralinhomoeus uniovarium*
295 *Paralinhomoeus* species
271 *Terschellingia communis*
63 *Terschellingia longicaudata*
323 Linhomoeid species (? *Didelta*)

Family Siphonolaimidae

336 *Siphonolaimus* species (? *S. ewensis*)

Order Araeolaimida

Family Axonolaimidae

283 *Odontophora exharena*
273 *Odontophora wieseri*

Family Comesomatidae

204 *Cervonema* species (?C. *jensenî*)
194 *Laimella longicaudata*
54 *Sabatieria celtica*
322 *Sabatieria elongata*
287 *Sabatieria longisetosa*
191 *Sabatieria ornata*
281 *Setosabatieria hilarula*

Family Diplopeltidae

130 *Campylaimus lefevrei*
328 *Diplopeltula asetosa*
213 *Diplopeltula* species 1 (? *D. asetosa*)
339 *Diplopeltula* species 4
296 *Southerniella* species 2

Order Plectida

Family Aegialoalaimidae

71 *Aegialoalaimus elegans*
340 *Cyartonema* species

Family Ceramonematidae

125 *Dasynemoides albaensis*
310 *Pselionema (?P. longiseta*)

Family Haliplectidae

325 *Haliplectus* species 2
319 *Haliplectus* species 3

Family Leptolaimidae

64 *Camacolaimus tardus*
308 *Halaphanolaimus pellucidus*
103 *Leptolaimoides* species 1
243 *Leptolaimoides* species 2
269 *Leptolaimoides* species 3
324 *Leptolaimoides* species 4
6 *Leptolaimus elegans*
314 *Onchium* species
316 Leptolaimid species 1
326 Leptolaimid species 2

Family Peresianidae

312 *Manunema* species

Family Tarvaiidae
344 *Tarvaia* species

Class Indet.

Sub-class Indet.

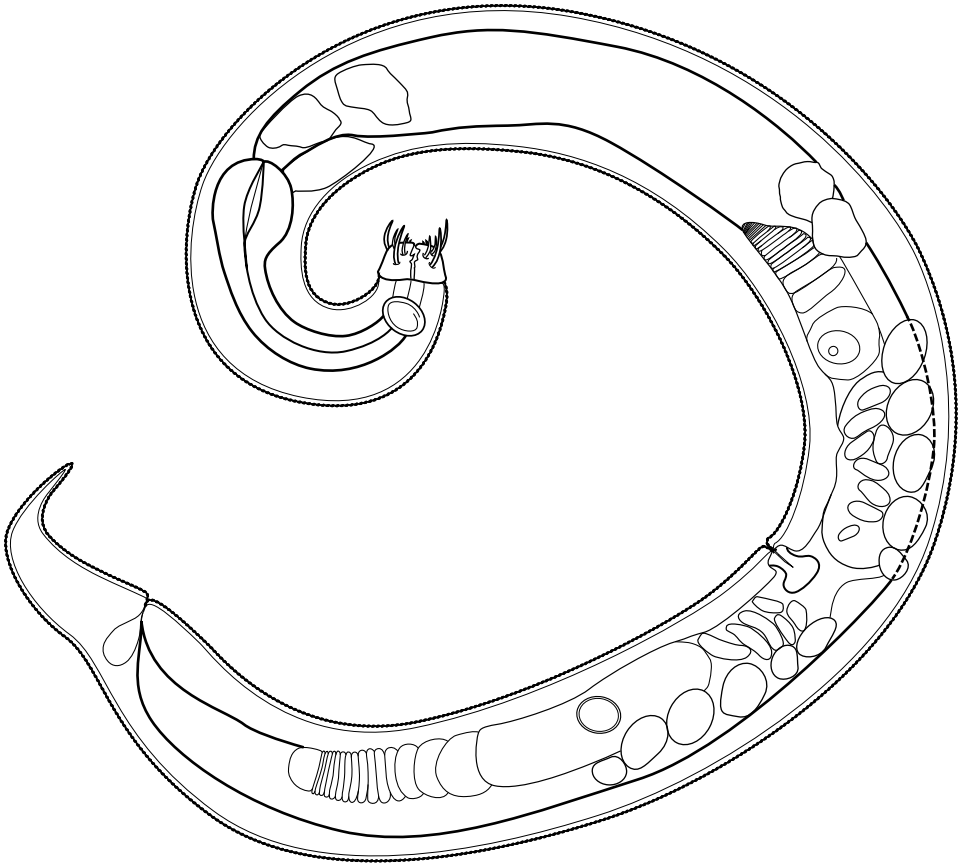
Order Indet.

Family Indet.
341 CRO.15.A (? Desmodoridae)

Taxonomic Analysis of Meiofaunal Nematode Samples Collected From Benthic Sediments at the Croker Carbonate Slabs SCI

Appendix @

Site-by-Site Results Tables



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	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Anticomidae								
291	*Anticoma* species	0	41	0	0	0	0	0
181	Anticominid species	0	0	0	18	0	0	0
Family Phanodermatidae								
272	*Crenopharynx marioni*	19	41	0	0	0	0	0
Family Thoracostomopsidae								
254	*Paramesacanthion species*	0	81	0	0	0	0	0
Family Trefusiidae								
39	*Rhabdocoma* species (?*R. riemanni*)	19	122	60	0	28	31	24
337	*Trefusia* species (?*T. longicaudata*)	0	0	0	0	0	0	24
Family Enchelidiidae								
280	*Symplocostoma tenuicolle*	19	0	0	0	0	0	0
Family Oncholaimidae								
327	*Oncholaimus skawensis*	0	0	0	0	0	31	0
188	*Viscosia elegans*	0	81	0	0	0	0	0
193	*Viscosia glabra*	0	0	30	18	0	0	0
Family Oxystominidae								
5	*Halalaimus gracilis*	0	204	30	36	0	0	0
211	*Halalaimus isaitshikovi*	0	122	0	0	0	0	0
205	*Halalaimus longicaudatus*	74	0	212	54	0	0	0
277	*Halalaimus* species	19	0	0	0	0	0	0
276	*Halalaimus* (?*H. filicorpus*)	19	0	0	0	0	0	0
100	*Oxystomina asetosa*	56	0	60	0	0	0	0
104	*Oxystomina elongata*	0	41	30	0	0	0	24
10	*Thalassoalaimus tardus*	0	0	60	0	0	0	0
Family Pandolaimidae								
151	*Pandolaimus* species	19	0	30	0	0	0	0
Family Rhabdodemaniidae								
294	*Rhabdodemania minor*	0	41	0	0	0	0	0

Table B1i. The nematode taxa that were recorded from the sediment samples collected from the Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Chromadoridae								
223	*Actinonema pachydermatum*	19	0	0	0	0	0	47
313	*Chromadorella duopapillata*	0	0	0	18	0	0	0
303	*Chromadorella filiformis*	0	0	30	0	0	0	0
51	*Chromadorita nana*	0	0	0	0	0	94	71
31	*Chromadorita tentabunda*	0	0	0	18	0	0	47
166	*Dichromadora cephalata*	186	285	182	0	0	250	47
232	*Dichromadora cucullata*	56	0	0	0	0	0	0
13	*Neochromadora poecilosoma*	0	0	0	234	56	0	189
318	*Neochromadora poecilosomoides*	0	0	0	0	28	0	0
279	*Neochromadora* species	19	0	0	0	0	0	0
238	*Prochromadorella attenuata*	0	0	0	36	0	0	0
297	*Prochromadorella longicaudata*	0	41	0	0	0	0	0
83	*Spilophorella paradoxa*	0	41	60	18	113	94	0
249	Chromadorid species 1	0	41	0	0	0	0	0
186	Chromadorid species 2	0	0	30	0	0	0	0
Family Cyatholaimidae								
298	*Nannolaimoides effilatus*	0	0	60	0	0	0	24
342	*Paracanthonchus caecus*	37	0	0	0	0	0	0
165	*Paracanthonchus longicaudatus*	0	0	0	0	28	0	0
230	*Paracanthonchus longus*	0	0	0	0	0	0	24
237	*Paralongicyatholaimus minutus*	0	0	0	18	0	0	0
210	*Pomponema multipapillatum*	0	0	91	18	0	0	0
151	*Pomponema sedecima*	19	0	30	0	0	0	0
278	*Pomponema* (?*P. astrodes*)	19	0	30	36	0	0	0
Family Ethmolaimidae								
134	*Comesa cuanensis*	37	0	60	0	0	0	0
289	*Filitonchus* species (?*F. filiformis*)	0	81	60	0	0	31	0
Family Neotonchidae								
288	*Neotonchus boucheri*	0	41	0	0	0	0	0

Table B1ii. The nematode taxa that were recorded from the sediment samples collected from the Croker Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Selachinematidae								
315	*Cheironchus* species	0	0	0	18	0	31	0
152	*Gammanema rapax*	0	0	0	18	0	0	47
225	*Halichoanolaimus dolichurus*	37	41	60	0	0	0	0
101	*Halichoanolaimus robustus*	56	0	121	0	0	0	0
338	*Latronema* species (?*L. deconincki*)	0	0	0	0	0	0	47
24	*Richtersia inaequalis*	93	41	60	198	0	0	94
Family Desmodoridae								
304	*Catonema (?C. macintyrei*)	0	0	0	108	56	0	24
307	*Chromaspirina multipapillata*	0	0	0	54	0	0	0
292	*Chromaspirina parapontica*	0	41	0	234	873	438	543
333	*Desmodora pontica*	0	0	0	0	0	62	71
106	*Desmodora scaldensis*	112	204	0	54	28	0	24
306	*Desmodora schulzi*	0	0	0	36	0	0	24
309	*Desmodora tenuispiculum*	0	0	0	72	0	0	24
275	*Desmodora* species	37	0	30	18	0	31	24
110	*Leptonemella* sp. (?*L. aphanothecae*)	19	41	0	0	197	156	118
311	*Spirinia gerlachi*	0	0	0	18	0	0	0
75	*Spirinia parasitifera*	0	0	0	18	141	31	24
Family Microlaimidae								
330	*Aponema* species	0	0	0	0	0	31	0
45	*Bolbolaimus teutonicus*	0	0	0	0	113	62	0
112	*Calomicrolaimus honestus*	0	0	0	0	0	0	47
43	*Calomicrolaimus parahonestus*	19	0	0	0	0	0	0
113	*Microlaimus conothelis*	0	0	0	18	0	0	24
65	*Microlaimus globiceps*	0	163	30	0	84	31	0
321	*Microlaimus marinus*	0	0	0	0	84	125	0
218	Microlaimid species 2	56	0	0	0	0	0	0
332	Microlaimid sp. 3 (?*Calomicrolaimus*)	0	0	0	0	0	62	0

Table B1iii. The nematode taxa that were recorded from the sediment samples collected from the Croker Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Desmoscolecidae								
163	*Desmoscolex falcatus*	56	0	60	0	0	31	0
305	*Perepsilonema* species	0	0	0	54	0	31	0
198	*Quadricoma scanica*	56	0	30	0	0	0	0
270	*Quadricoma* species	93	0	0	18	0	0	0
334	*Tricoma brevirostris*	0	0	0	0	0	0	24
116	*Tricoma* species (?*T. longirostris*)	0	0	0	18	0	0	0
Family Monhysteridae								
144	*Geomonhystera disjuncta*	0	0	30	18	0	0	0
266	*Monhystera vulgaris*	167	122	0	0	28	0	0
4	*Thalassomonhystera venusta*	0	0	30	18	28	62	0
285	*Thalassomonhystera* species	0	41	91	0	56	62	0
Family Sphaerolaimidae								
28	*Sphaerolaimus gracilis*	0	0	0	36	0	0	0
188	*Sphaerolaimus islandicus*	0	81	0	0	0	0	0
Family Xyalidae								
23	*Daptonema hirsutum*	0	0	0	0	0	0	24
2	*Daptonema normandicum*	0	0	0	18	56	0	0
27	*Daptonema oxycerca*	0	41	91	0	0	31	0
142	*Daptonema* species	93	81	60	0	0	188	47
320	*Gnomoxyla* species 2	0	0	0	0	28	0	0
343	*Gonionchus cumbriensis*	0	0	0	0	0	0	71
274	*Linhystera* species	37	81	0	18	0	0	0
107	*Metadesmolaimus gelana*	0	0	30	0	0	0	0
175	*Paramonhystera* species 1	19	0	0	0	0	0	0
329	*Paramonhystera* species 2	0	0	0	0	0	62	94
345	*Rhynchonema* species (?*R. ornatum*)	0	0	0	18	0	0	0
26	*Theristus acer*	0	0	0	0	0	31	0
48	*Theristus denticulatus*	0	0	0	0	28	0	0
12	*Theristus longus*	0	41	0	0	0	31	0
169	Xyalid species	0	0	0	0	28	31	0
231	Xyalid species	37	244	60	0	28	62	24
282	Xyalid species (?*Amphimonhystera*)	19	122	60	0	28	31	0
290	Xyalid species	0	122	0	0	0	31	24

Table B1iv. The nematode taxa that were recorded from the sediment samples collected from the Croker Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Linhomoeidae								
172	*Desmolaimus* species	0	0	30	0	0	0	0
147	*Metalinhomoeus filiformis*	19	81	0	0	0	0	0
331	*Paralinhomoeus conicaudatus*	0	0	0	0	0	31	0
299	*Paralinhomoeus tenuicaudatus*	0	0	60	0	0	0	0
301	*Paralinhomoeus uniovarium*	0	0	30	0	0	0	0
295	*Paralinhomoeus* species	0	122	60	0	0	0	0
271	*Terschellingia communis*	19	0	0	0	0	0	0
63	*Terschellingia longicaudata*	19	41	30	0	56	125	0
323	Linhomoeid species (?*Didelta*)	0	0	0	0	28	0	24
Family Siphonolaimidae								
336	*Siphonolaimus* species (?*S. ewensis*)	0	0	0	0	0	0	24
Family Axonolaimidae								
283	*Odontophora exharena*	19	81	30	0	254	344	94
273	*Odontophora wieseri*	19	81	91	0	0	62	0
Family Comesomatidae								
204	*Cervonema jenseni*	0	0	30	0	0	0	0
194	*Laimella longicaudata*	19	41	0	0	0	31	24
54	*Sabatieria celtica*	112	81	121	0	113	62	0
322	*Sabatieria elongata*	0	0	0	0	56	31	0
287	*Sabatieria longisetosa*	0	41	0	0	0	0	0
191	*Sabatieria ornata*	0	163	0	0	0	0	0
281	*Setosabatieria hilarula*	19	244	60	0	0	0	0
Family Diplopeltidae								
130	*Campylaimus lefevrei*	19	41	30	0	0	0	24
328	*Diplopeltula asetosa*	0	0	0	0	0	31	47
213	*Diplopeltula* species 1 (?*D. asetosa*)	19	0	0	0	0	0	0
339	*Diplopeltula* species 4	0	0	0	0	0	0	24
296	*Southerniella* species 2	0	0	30	0	0	0	0

Table B1v. The nematode taxa that were recorded from the sediment samples collected from the Croker Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

	Nematode Taxa/Species	187 A1	187 A2	187 A4	192 A1	152 A3	152 A4	152 A5
Family Aegialoalaimidae								
71	Aegialoalaimus elegans	0	81	91	18	28	0	0
340	Cyartonema species	0	0	0	0	0	0	24
Family Ceramonematidae								
125	Dasynemoides albaensis	0	0	0	36	0	0	71
310	Pselionema (?P. longiseta)	0	0	0	18	0	0	0
Family Haliplectidae								
325	Haliplectus species 2	0	0	0	0	28	0	0
319	Haliplectus species 3	0	0	0	0	28	0	0
Family Leptolaimidae								
64	Camacolaimus tardus	0	81	60	0	0	0	0
308	Halaphanolaimus pellucidus	0	0	0	18	0	0	0
103	Leptolaimoides species 1	0	0	30	0	0	0	0
243	Leptolaimoides species 2	0	41	60	0	0	0	0
269	Leptolaimoides species 3	19	0	30	0	0	0	0
324	Leptolaimoides species 4	0	0	0	0	28	0	0
6	Leptolaimus elegans	0	0	182	0	28	0	0
314	Onchium species	0	0	0	18	0	0	0
316	Leptolaimid species 1	0	0	0	18	0	0	0
326	Leptolaimid species 2	0	0	0	0	0	31	0
Family Peresianidae								
312	Manunema species	0	0	0	18	0	0	0
Family Tarvaiidae								
344	Tarvaia species	0	0	0	36	0	0	0
Family Indet.								
341	CRO.15.A (?Desmodoridae)	0	41	0	0	0	0	0
	No. spp.	44	46	51	42	32	39	40
	Sum	1944	4072	3043	1782	2784	3023	2320
	1B/2A	0.58	1.71	0.96	0.29	0.28	0.43	0.35
	Diversity	24.01	30.71	34.07	16.61	8.15	17.83	13.47

Table B1vi. The nematode taxa that were recorded from the sediment samples collected from the Croker Croker Carbonate Slabs SCI, 2015. Nematode densities presented as numbers per litre sediment. Analyses undertaken by Physalia Ltd on behalf of CEFAS

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Assessment & ranking of ecologically significant contaminants (ARESC) - Bio-sentinel system monitoring - Biodiversity database development - Cohort analyses - Community geometric mean studies - Contaminated land assessment & monitoring - Ecological risk assessment - Ecotoxicological studies - Effluent component monitoring - Ecological impact predictions for proposed developments - Ecological mitigation studies - Ecological/physico-chemical trend analyses - Fouling & biocide monitoring - Forensic studies - Growth performance stress assessment - Impact assessment & analyses - Incident monitoring & analyses - Indicator species analyses (ISA) - Local indicator of spatial association (LISA) Analyses - Mantel matrix analysis studies - Meiofaunal analyses for the establishment of prevailing environmental conditions - Meiofaunal colonisation unit (MCU) surveys - Monte Carlo permutation test studies - Multivariate data analyses for biological & non-biological data sets - Multivariate Groundwaters Tracking Analyses (MVGTAs) - Parasitological Assessments - Parallax corrected spatial determinations - Performance & monitoring index derivation - Photomicroscopy & Photomacrography - Remediation measure performance testing & monitoring - Sediment contaminant assessment plot (SCAP) analyses - Scientific & technical photography - Spatial autocorrelation analyses - Spatial & temporal trend analyses - Spectral analyses of algal/floral assemblages for stress detection & community assessments - Stress & contaminant hotspot analyses - Terrestrial meiofauna analyses (TMA) - Taxonomic distinctness & taxonomic diversity indices analyses - Taxonomic studies -

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