

A CATALOGUE OF THE ASELOTA (CRUSTACEA: ISOPODA) OFF THE WEST COAST OF IRELAND AND BRITAIN, FROM 100-5000M

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Summary

This catalogue comprises a complete record of the deep-sea isopods collected off the west coast of Ireland and Britain to date. Benthic samples were taken over a two-year period by the zoobenthos group of the National University of Ireland, Galway, aboard the *RV Celtic Explorer*. Additional material collected as part of an environmental assessment by an Irish environmental consultancy (Aqua-Fact), was donated by the Galway-Mayo Institute of Technology, Galway. Further samples collected by the U.K. Department of Transport and housed at the National Museums of Scotland, Edinburgh, were also examined. Records from peer-reviewed literature, published catalogues and reports are included in the list. Information is provided on the type specimens, type locality and depth range of the species, where known.

Ten new records were reported for the area including one new species. An additional 15 new species were collected to be used in future research studies. It was noted that the species recorded in this area of the North East Atlantic bear an affinity to the fauna of the Northern Seas. A total of 40% of the species recorded in the study area are also found in the Northern Seas, supporting the hypothesis that the fauna of the Northern Seas consists of comparatively recent immigrants from the adjacent shelves. A comprehensive bibliography is provided and a history of deep-sea research in the area is presented.

Introduction

Historical background

The North Atlantic is one of the best researched areas in terms of the Isopoda, in particular, the Northern Seas. However, the taxonomy of isopods off the west coast of Ireland has traditionally only been studied in shallow water, with the majority of deep water taxonomy focusing on other groups such as the Polychaeta and the Mollusca. For example, a checklist of invertebrate groups from 100–2000m from Irish waters produced by Greenwood *et al.* (2001), displayed a paucity of crustacean and echinodermatan records in comparison to the groups above.

The North Atlantic was the birth place of deep sea biology during the late 19th century, and in 1868, the earliest expedition in Irish waters was carried out aboard the *HMS Lightning* by Carpenter and Thompson (1870). The survey consisted of dredges, in depths of up to 970m (Carpenter, 1868). Thompson and Carpenter, along with Jefferys, also carried out an expedition aboard the *HMS Porcupine* in 1869, which sampled at approximately 45 stations off the west coast of Ireland. The results of this survey showed that animal life existed down to depths of 650 fathoms (1188m), that all marine invertebrate groups are present at this depth, and that deep sea temperatures vary considerably and indicate oceanic circulation (Thompson, 1873).

Building on the success of the *HMS Lightning* and *HMS Porcupine*, several other expeditions were carried out in the late 19th and early 20th centuries (see Table 1) that contributed significantly to our knowledge of deep sea fauna. The *HMS Challenger* expedition from 1873–1876 is perhaps the best known expedition, and is considered to have laid the foundations for almost every branch of oceanography as we know it today. Wyville Thompson was the scientific director of the survey, which lasted for three years and covered much of the world's oceans. Unfortunately, little of the survey took place in Irish waters. Tattersall (1905) described several new asellote species, collected aboard the gunboat the *Helga*, from 1901–1904; this comprised the majority of our knowledge of deep-sea isopods in Irish waters until recent years. With the outbreak of World War I in 1914, research abruptly stopped in Irish waters, and in the North East Atlantic as a whole, and it was not until the 1960s that the deep

sea again became a focal point for research.

In the 1960s, significant work carried out by Sanders, Hessler and colleagues on the continental margin of the northeastern United States showed that the macrofauna is abundant and highly diverse in the deep-sea (Hessler and Sanders, 1967; Sanders, 1968; Sanders and Hessler, 1969). Up until this point it had been thought that deep-sea animals displayed low diversity. In 1972, the Scottish Marine Biological Association (SMBA), now known as the Scottish Association for Marine Science (SAMS), began a time series study of the megafauna in the Rockall Trough that continues to the present day. They collected data from two permanent stations in the area, one at 2200m and one at 2900m. A large number of publications have been produced from this work. In terms of the Isopoda, the most significant work was published by Lincoln and Boxshall (1983) and Lincoln (1985), in which they described the Dendrotonidae and Haploniscidae collected in the region; and by Harrison in 1987, in which he described specimens of the family Thambematidae. In 1988, a preliminary analysis of asellote isopods in the area was published by Harrison, the majority of these specimens (85%) was identified to genus level only. A large amount of data on isopods from this region exists but has not been published; a database containing this information is currently under construction by SAMS. In the mid 1970s, Woods Hole Oceanographic Institute (WHOI) carried out a series of transects in Irish waters, to the northwest and southwest of the country and elsewhere in the Atlantic Ocean using an epibenthic sled. Although some of this material has been illustrated (Kavanagh *et al.*, 2006), much of it remains undescribed. It was also in the late 1970s that the Institute for Oceanographic Sciences-Deacon Laboratory (IOSDL), now known as Southampton Oceanographic Centre (SOC), commenced its Porcupine Seabight programme. This led to the formation of the Porcupine Abyssal Plain (PAP) observatory in 1989, for the purpose of facilitating repeated studies concentrating on the effect of processes (biological, chemical and physical) in the upper ocean on the seabed. SOC have been very successful in terms of numbers of publications resulting from work carried out on the PAP, but again, little information on isopod diversity has been recorded. In 1987, BIOFAR was established for the sole purpose of surveying benthic macrofauna in waters around the Faeroe Islands. BIOFAR I ran from 1988–

1990 and collected about 800 samples from depths of 100–1100m. BIOFAR 2 ran from 1993–1995 and concentrated on shallow water areas, from the littoral to the 100m line (see Table 1 for details of all the research initiatives).

In the late 1990s, thanks to an upsurge in the global economy, several large scale projects were undertaken in Irish and British waters. The Marine Science and Technology programme (MAST), funded by the European Union, funded three projects (MAST I–III), from 1990–1998 with the aim of developing new technologies for the exploration, protection and exploitation of marine resources. These were based in the North Atlantic Ocean. Several projects were established in association with oil producing companies. For example, the Atlantic Frontier Environmental Network (AFEN) was established in 1995, and consisted of a consortium of oil companies with interest in the U.K. Atlantic Margin Oil Province. The objective of the network was to ‘understand the environment better, and to establish an environmental baseline for the licensed area’. The four main areas of research were the seabed, cetaceans, seabirds and coastal protection. In 1999, the U.K. Department of Transport and Energy (DTI), a member of AFEN, established the Strategic Environmental Assessments (SEA) which are still running. The aim of these projects, with seven phases (SEA1–SEA7) is to assess the implications of further licensing of the U.K. Continental Shelf (UKCS) for oil and gas exploration and production, with SEA 6 due to commence in 2006. The projects are being carried out by SOC.

In Ireland, the Petroleum Infrastructure Programme (PIP) was established in 1997, with its primary aim to promote hydrocarbon exploration in Ireland. Two subprogrammes exist under the PIP. From 1997–2002, three groups functioned within the subprogramme PIP- the Rockall Studies Group (RSG), the Porcupine Studies Group (PSG) and the Offshore Studies Group (OSG). In total, 58 projects were funded during this time. Biological projects concentrated mainly on cetacean and seabird research based at University College Cork (UCC). From 2002 onwards, a second subprogramme was established *viz.* the Petroleum Exploration and Production Programme Support (PEPPS). Within this programme, the Expanded Offshore Support Group (EOSG) and the Irish Shelf Petroleum Study Group (ISPSG) operate and are currently supporting 41 and 38 projects respectively.

To summarise, despite the large number of studies which have been carried out in the deep-sea area, few of these have been taxonomically orientated. Projects focus instead on creating an understanding of ecological and hydrographic processes, or, where faunal diversity is studied, vertebrate and larger invertebrate groups, including Crustacea such as the Decapoda, are favoured. In many cases, isopod samples remain unsorted or identified to family/genus level only. In 2003, the Irish government launched the first Irish deep-sea research vessel, the *R/V Celtic Explorer*. In conjunction with this, the Higher Education Authority (HEA) of Ireland funded a multidisciplinary project under PRTLII Cycle III at the National University Ireland Galway (NUIG), with deep-sea research in the area of geophysics, microbiology, oceanography and benthic zoology. Within the zoology sector, work has focused on taxonomic work of the main benthic invertebrate groups recorded in the deep-sea (Polychaeta, Mollusca and peracarid Crustacea). One of the aims of the group was to build up knowledge of the species found in the area off the west coast of Ireland, and in particular, the Porcupine Bank and surrounding areas.

The Isopoda consist of nine suborders:- Anthridea, Anthuridae, Asellota, Epicaridea, Flabellifera, Gnathiidae, Oniscidea, Phreatoicidea and Valvifera. This catalogue focuses on the Asellota. Within the Isopoda, the Asellota are by far the largest suborder and dominate deep-sea isopod samples, comprising approximately 90% of samples (Wilson, 1989; Poore and Wilson, 1993).

Isopod biology

Definition: The Isopoda is a monophyletic order of crustaceans within the superorder Peracarida containing 9,000–11,000 named marine, freshwater and terrestrial species (Bruce, 2001; Brusca and Brusca, 2002).

Peracarida are defined within the Malacostraca by the possession of a ventral thoracic marsupium (pouch) in which the eggs are brooded. Isopoda undergo direct development within the marsupium (as do other Peracarida), and emerge as juveniles known as manca. Adults possess seven pairs of thoracic appendages; manca lack the last pair of legs which then develop prior to adulthood. Within the Peracarida, 13 synapomorphies unite the Isopoda within a monophyletic clade including, for example, the reduced carapace which forms a cephalic shield,

biphasic moulting and sessile eyes. Although some of these synapomorphies are present within a second peracarid group, the Amphipoda, this is a result of convergence (Brusca and Wilson, 1991). Much debate exists as to which suborders of the Isopoda are primitive, and which are derived. Strömberg (1972), Kussakin (1973, 1979) and Bruce (1981) advocated that the suborder Flabellifera contains the primitive isopods, and that the Asellota are derived. From the Flabellifera, the Cirolanidae are chosen as the model for the archetypical ancestral isopod by most workers. Other workers including Monod (1922), Hansen (1925) and Schmaulfuss (1989) supported the converse theory: that the Asellota are primitive, and the Flabellifera are derived. Phylogenetic analyses on the isopod suborders by Schram (1974), Wägele (1989) and Brusca and Wilson (1991) concluded that the Phreatoicoidea are the most primitive group of Isopoda, a hypothesis supported by the fact that the oldest isopods fossils are Phreatoicoidea from the Upper Carboniferous era, 300 million years ago. Brusca and Wilson (1991) found the Asellota and Microcerberidea to be sister-groups, and the next most primitive following the Phreatoicoidea. The suborders of Isopoda can be generally divided into groups based on the morphology of the uropods. 'Short-tailed' isopods have styliform uropods as observed in the Phreatoicoidea, Asellota, Microcerberiidea, Calabozoidea and Oniscidea. 'Long-tailed' isopods have biramous lamellar uropods e.g. Flabellifera, Valvifera, Anthuridea, Gnathiidea and Epicaridea. Brusca and Wilson (1991) consider the 'short-tailed' morphology to be plesiomorphic for the Isopoda.

Wetzer (2002) carried out molecular analysis on all the suborders of Isopoda to test the two main hypotheses put forward by Brusca and Wilson (1991). Firstly, that the Phreatoicoidea are the earliest living isopods, and secondly, that the long-tailed isopod morphology is the derived condition within the isopods. The phylogeny estimated from the combined 12s rDNA: 16s rDNA 6P (six-parameter parsimony) analysis corroborates Brusca and Wilson's (1991) analysis. Other aspects of the analysis are contradictory to this result: the 12s rDNA analysis shows that asellotans are ancestral to the Phreatoicoideans, a hypothesis favoured by Schmaulfuss (1989), while the 16s rDNA data placed the Oniscidea at the base, with the Phreatoicoidea as more derived. Wetzer (2002) concluded that the variation in placement of ancestral and derived isopods suggest that higher order characters from slower evolving genes

will be needed to more strongly support the deeper nodes of the phylogeny, and that hypotheses based on the results should be judged cautiously.

Regardless of whether they are primitive or derived, the Asellota exhibit a large degree of diversity, both at the family and the species level. Body shape, for example, can range from being elongated and slender (Ischnomesidae) to being broad and depressed (Haploniscidae). Some families such as the Dendrotionidae have very spinose bodies and the Ilyarachnidae have enlarged heads to accommodate crushing jaws. Taxa within the Asellota exhibit marked depth zonation, and the families display increased specialization with increasing depth, such as the lack of eyes, uniramous uropoda and a reduction in the number of thoracic appendages. In families which have representatives in both shallow and deep water, the more primitive families occur in shallow water, with more specialized families dominating in the deep sea (Hessler *et al.*, 1979). An exception to this pattern occurs at high latitudes, where specialized families occur in shallow water.

The ultimate origin of the isopod fauna has been argued by Kussakin (1973) to be in the Antarctic Ocean, and one hypothesis suggests that asellote evolution occurred in shallow water and that the presence of Asellota in the deep sea then occurred as a result of invasion from shallow water at high latitudes such as the Antarctic Ocean. The alternative hypothesis states that the initial invasion of the deep sea by shallow water species was followed by a large amount of radiation *in situ*, and the presence of asellote families at shallow high latitudes is a result of subsequent emergence. Three lines of evidence were put forward by Hessler and Wilson (1983) to support the latter hypothesis. Firstly, both generic and specific diversity have their centres in the deep-sea. Hessler and Thistle (1975) had previously advanced this argument using the distribution of the asellote family Ilyarachnidae as an example. They pointed out that the most primitive species of the family, *Ilyarachna abyssorum* Richardson, is found only in the abyss. The genus *Ilyarachna* was noted to have its greatest species diversity at 2400m, and to be cosmopolitan in the deep-sea, even though it is also present in shallow waters of both the North and South Poles. Secondly, the most primitive genera or species of deep-sea families live in deep-water, not shallow water. In the example of Hessler and Thistle, the eurycopid genus

Betamorpha, which is hypothesized to be the ancestor of the family Ilyarchnidae, is found only and abundantly in the deep sea. All these facts support the hypothesis of deep-sea evolution.

If a taxon bears a morphological imprint that it could only have gained in one of its ecological areas, this provides a criterion for choosing one area over the other as the source of evolution (Hessler and Thistle, 1975). One such imprint is the absence of eyes in deep-sea asellote families. Hessler and Thistle (1975), as well as Hessler and Wilson (1983), used this morphological character to support their hypothesis. The deep-sea families are all blind, even those representatives that are found in shallow water. Conversely, those families which are common in shallow water and possess eyes, lose these eyes as they move into deeper water. Because eyes are plesiomorphic in isopods, lack of them implies regression in an environment where they offer no selective advantage, such as the deep-sea (Hessler and Wilson, 1983). This is an example of the irreversibility of evolution, where a character that has been lost, cannot be retrieved. To further reinforce this theory, one can examine the lifestyle of those isopods that move into deep-water. The majority of deep-sea families that show high-latitude emergence are adapted for swimming. It is highly unlikely that swimming forms of Isopoda in shallow water should lose eyes, unless they had previously evolved without them in such an environment as the deep-sea.

If one accepts the theory of deep-sea evolution for asellote isopods, the next question which must be considered is ‘Why have the Isopoda undergone such a remarkable radiation in the deep sea?’ The most obvious explanation is that they evolved earlier than other taxa in the deep-sea, which allowed time for the diverse morphological adaptations that we observe today. Hessler and Wilson (1983) suggest that their success is probably due to a detritivorous life style, which is favoured in the deep-sea because of factors such as lower prey densities. Nevertheless, most genera of Isopoda are ubiquitous, which indicates that they must have been in the deep-sea long enough to become evenly distributed. In general, peracarids are rarely preserved as fossils. As mentioned above, the oldest isopod fossils are the Phreatoicidea from the Upper Carboniferous era. These fossils are well-developed, indicating that isopods first appeared prior to this era. The realization of the deep-sea as the centre of asellote evolution highlights the

importance of deep-sea sampling in resolving taxonomic difficulties within the suborder.

Study area

The study area ranged from 48°N to 62°N and as far west as 20°W, including depths from 100m-5000m. The area included is shown in Figure 1. It was decided to include areas north and northwest of Britain, including the Faeroe Islands, as significant work has been carried out in recent years (see Table 1), and the species collected are likely to be present in samples from Irish waters.

Materials and methods

The material examined consisted of samples collected by NUIG aboard the Irish Marine Institute's research vessel, the *RV Celtic Explorer*, from 2003–2004. Samples collected as part of the SEA 1 and SEA 4 projects by DTI U.K. and housed at the National Museums of Scotland were also examined. Samples from other SEA projects carried out thus far are not relevant to the study as they are taken from the coastal areas of the U.K. Finally, material collected by the Galway-Mayo Institute of Technology (GMIT), as part of an environmental assessment by an Irish environmental consultancy, Aqua-Fact, were also examined. Records from peer-reviewed literature, and published catalogues and reports were also used. Unpublished records where the material was not examined directly were excluded.

Specimens collected by G. O. Sars were seldom labeled as 'type', with the result that it is unclear what specimens he described in his publications. G. O. Sars' material is held at ZMO, and in many instances needs to be examined directly in order to confirm the existence of type specimens. This situation is also true of several other taxonomists from the 19th and early 20th century, and the type material is described as 'unknown' below. In addition, G. O. Sars did not give precise locations for the collection of his material, in many cases stating just a general geographical area, and this is reflected in this catalogue.

All station numbers are given as originally listed. In some cases this may mean using the previous name of an institution, e.g. SMBA station x, IOS station x. The coordinates for the

SMBA permanent stations mentioned in the introduction are: 55°N, 12°W, 2900m and 57°N, 12°W, 2200m. Throughout the text, the stations are referred to as SMBA permanent station, 2900m or SMBA permanent station, 2200m.

Table 1 lists all surveys carried out in the study area. Some additional surveys carried out near the study area are also included as type material collected from these surveys has since been recorded in the study area. These include: the Danish *Ingolf* and *Galathea* expeditions, the Swedish *Ymer* expedition, the Swedish-French NORBI expedition, the U.S. led FRAM I Drift-Ice expedition, the German *RV Håkon Mosby* expeditions and the French Campagne Noratlante, Waldo, Biogas and Biaçores surveys.

The following abbreviations are used:-

AFEN: Atlantic Frontier Environmental Network.

AMNH: American Museum of Natural History.

DTI: Department of Transport and Industry (UK).

IOS: Institute of Oceanographic Sciences, Wormley.

IOSDL: Institute of Oceanographic Sciences, Deacon Laboratory.

MHN: Museum d'Histoire Naturelle, Paris.

NHM: Natural History Museum, London.

NUIG: National University Ireland Galway.

OMEX: Ocean Margin Exchange.

SAMS: Scottish Association of Marine Science.

SEA: Strategic Environmental Assessments (run by DTI above).

SMBA: Scottish Marine Biological Association.

SOC: Southampton Oceanographic Centre.

ZMO: Zoological Museum of Oslo.

ZMUB: Zoological Museum of the University of Bergen.

ZMUC: Zoological Museum of the University of Copenhagen.

Results

The following is a catalogue of all asellote Isopoda recorded from 100-5000m in the study area outlined above. New Irish records are indicated by an asterisk (*).

ORDER ISOPODA

SUBORDER ASELLOTA LATREILLE, 1803

FAMILY DENDROTIONIDAE VANHOEFFEN, 1914

Genus *Dendrotion* G. O. Sars, 1872

Species name: *Dendrotion elegans* Lincoln and Boxshall, 1983

Dendrotion elegans Lincoln and Boxshall, 1983: 309–310, fig. 6.

Type locality: Rockall Trough. SMBA station 197, (1981) 57.21°N, 10.29°W, 2200m.

Type material: ♂ holotype, NHM reg. no. 1983: 101. 6♂♂ 53♀♀ paratypes, same locality as the holotype.

Distribution: Rockall Trough.

Records: type locality; additional ♀ collected by SMBA station 105 (1981) at 58.27°N, 12.35°W, 1600m.

***Species name:** *Dendrotion paradoxum* Hansen, 1916

New to Ireland

Dendrotion paradoxum Hansen, 1916: 51–52, pl. IV, figs 3a–3e.

Type locality: south west of Iceland. *Ingolf* station 78, 60°37'N, 27°52'W, 799 fathoms (1504m).

Type material: lectotype, ZMUC: CRU 7710.

Records: collected by NUIG (2004) at 52°49.97'N, 12°39.83'W, 441m.

Species name: *Dendrotion setosum* Lincoln and Boxshall, 1983

Dendrotion setosum Lincoln and Boxshall, 1983: 305–309, figs 4A–E, 5A–J.

Dendrotion spinosum Hansen, 1916: 50 pl. IV, figs 2a–2c.

Type locality: Rockall Trough. SMBA station 99 (1976) 66°00'N, 10°35'W, 1160m.

Type material: ♂ holotype, NHM reg. no. 1983: 99.

Distribution: recorded throughout the North East Atlantic.

Records: 5 additional ♂♂ collected by SMBA at Rockall Trough, station 12 (1976), 56°49'N, 10°15'W, 2076m; collected by NUIG in 2004 at 52°49.97'N, 12°39.83'W, 441m; 53°14.46'N, 14°46.05'W, 979m; collected by SEA 1 at 61°00.98'N, 2°31.80'W, 543m and 60°59.44'N, 2°29.52'W, 495m.

Species name: *Dendrotion spinosum* G. O. Sars, 1872

Dendrotion spinosum G. O. Sars, 1872: 273; Hansen, 1916: 50–51, pl. IV, figs 2a–2c.

Type locality: Hardanger Fjord, 150 fathoms (282m).

Type material: ZMO (data unavailable).

Distribution: North East Atlantic, North Sea.

Records: collected by AFEN 1996 at 60°57.71'N, 2°24.99'W, 408m.

Genus *Dendromunna* Menzies, 1962

Species name: *Dendromunna compsa* Lincoln and Boxshall, 1983

Dendromunna compsa Lincoln and Boxshall, 1983: 299–304, figs 1A–H, 2A–G, 3A–J.

Type locality: collected by SMBA at their permanent station in the Rockall Trough. 54°39'N, 12°17'W, 2900m.

Type material: holotype ♂ by original designation, NHM reg. no 1983: 97.

Distribution: recorded at numerous stations throughout the Rockall Trough by SMBA.

Records: all records are from the Rockall Trough.

FAMILY DESMOSOMATIDAE G. O. SARS, 1897

Genus *Eugerda* Meinert, 1890

Species name: *Eugerda tenuimana* (G. O. Sars, 1868)

Desmosoma tenuimanum G. O. Sars, 1868: 114–115.

Type locality: Langesund, south Norway, 0–50m.

Type material: ZMO (data unavailable).

Distribution: North East Atlantic.

Records: *Desmosoma ?tenuimanum* collected by AFEN 1996 at 61°36.16'N, 2°26.56'W, 1484m; collected by the *Helga* in 1906 60 miles (97km) west of Achill Island, County Mayo, 199 fathoms (364m).

Genus *Eugerdella* Kussakin, 1965

Species name: *Eugerdella hessleri* Just, 1980

Eugerdella hessleri Just, 1980: 203–206, fig. 5; Svavarsson, 1988A, 21–25, figs 16–17.

Type locality: collected on FRAM I Drift-Ice Expedition (1979). 84°10.38'N, 7°48.52'W, 3620m. Bottom type of soft brown foraminiferous clay, trapped in bottom hydrophone.

Type material: preparatory ♀ holotype, ZMUC CRU-6702.

Distribution: North East Atlantic.

Records: *Eugerdella ?hessleri* collected by SEA 1 61°54.95'N, 2°48.06'W, 1624m.

Genus *Desmosoma* G. O. Sars, 1864

Species name: *Desmosoma lineare* G. O. Sars, 1864

Desmosoma lineare G. O. Sars, 1864: 11; 1866: 114–115; 1867: 125–126, pl. LIII, pl. LIV, fig 1; 1897: 126; 1899, figs 53–54.

Type locality: Straits of Drøbak.

Type material: ZMO (data unavailable).

Distribution: North East Atlantic.

Records: collected by the *Helga* 77 miles (124km) west of Achill Head, County Mayo, 382 fathoms (699m); collected by NUIG at 53°14.55'N, 14°55.45'W, 1564m, using an epibenthic sled.

Genus *Oecidiobranthus* Hessler, 1970

Species name: *Oecidiobranthus nanseni* Just, 1980

Oecidiobranthus nanseni Just, 1980: 206–209, fig. 6.

?*Desmosoma plebejum* Menzies and Mohr, 1962: 197, fig. 2A–B.

Type locality: collected by FRAM I Drift-Ice Expedition. Station 18: 83°40.08'N, 6°49.21'W, 2300m. Bottom type clay, sand, gravel, pebbles, empty shells.

Type material: brooding ♀ holotype, ZMUC CRU–7485. Brooding ♀ and preparatory ♀ paratypes (same locality as holotype), ZMUC CRU–7486.

Distribution: North East Atlantic.

Records: *Oecidiobranthus ?nanseni* collected by SEA 1 at 59°34.66'N, 8°55.38'W, 1389m and 61°55.03'N, 2°48.30'W, 1622m.

FAMILY HAPLONISCIDAE HANSEN, 1916

Genus *Antennuloniscus* Menzies, 1962

Species name: *Antennuloniscus simplex* Lincoln, 1985

Antennuloniscus simplex Lincoln, 1985: 687–690, figs 18a–i, 19a–I; Kussakin, 1988: 412.

Type locality: Rockall Trough, South Feni Ridge. SMBA Station 112, 55°12'N, 15°50'W, 1900m.

Type material: ♂ holotype, NHM reg. no. 1984: 192. Paratypes: NHM reg. no. 1984: 193.

Distribution: known only from type locality.

Records: type locality.

Species name: *Antennuloniscus diversus* Lincoln, 1985

Antennuloniscus diversus Lincoln, 1985: 690–693, figs 20a–i, 21a–i; Kussakin, 1988: 414.

Type locality: IOS Station 101121, 50°25'–50°26.4'N, 13°19.1'–13°17.6'W, 2648–2660m.

Type material: ♂ holotype, NHM reg. no. 1984: 190. Paratypes 1984: 191.

Distribution: North East Atlantic.

Records: recorded by Lincoln from SMBA stations in Rockall Trough, and IOS stations in the

Porcupine Abyssal Plain; collected by NUIG at 53°59.90'N, 13°59.95'W, 1800m, and 54°08.63'N, 13°59.95'W, 2200m.

Genus *Chauliodoniscus* Lincoln, 1985

Species name: *Chauliodoniscus armadilloides* (Hansen 1916)

Haploniscus armadilloides Hansen, 1916: 31, pl. II, figs 4a–4d.

Chauliodoniscus armadilloides Lincoln, 1985: 682–687, figs 15c–i, 16a–h, 17a–h. Kussakin, 1988: 402.

Type locality: south east of Iceland. *Ingolf* station 54, 63°08'N, 15°40'W, 301m.

Type material: ♀ holotype, ZMUC CRU-5601.

Distribution: South East Iceland, Rockall Trough, Porcupine Bank.

Records: Recorded by Lincoln from collections by SMBA at numerous Rockall Trough stations within the sector 54°34'N–57°21'N, 10°29'W–12°29'W, 2200–2925m and from two IOS stations in the Porcupine Sea Bight, station 101122, 50°25.2'–50°25.7'N, 13°20.3'–13°20.4'W; station 506041, 50°6.1'–50°6.4'N, 13°53'–13°49.9'W, 2640–3550m; collected by SMBA at their permanent station in the Rockall Trough: 54°40'N, 12°17.5'W, 2900m.

Genus *Haploniscus* Richardson, 1908

Species name: *Haploniscus aduncus* Lincoln, 1985

Haploniscus aduncus Lincoln, 1985: 682, figs 15a–b; Kussakin, 1988: 380.

Type locality: IOS station 7709, 60°7.1'–60°6.1'N, 19°30.3'–19°24.8'W, 2636–2646m.

Type material: ♀ holotype, NHM reg. no. 1984: 188.

Distribution: Rockall Trough.

Records: type locality.

Species name: *Haploniscus ampliatus* Lincoln, 1985

Haploniscus ampliatus Lincoln, 1985: 663–666, figs 3a–h, 4a–i; Kussakin, 1988: 371.

Type locality: Porcupine Bank. SMBA station 37, 54°37'N, 12°19'W, 2900m.

Type material: ♂ holotype, NHM reg. no. 1984: 178.

Distribution: Porcupine Bank, Iceland Basin.

Records: type locality; several SMBA stations on the Porcupine Bank from 54°34'–54°42'N and 12°11.5'–12°22'W, 2636–2925m.

Species name: *Haploniscus angustus* Lincoln, 1985

Haploniscus angustus Lincoln, 1985: 676–679, figs 11a–j, 12a–j; Kussakin, 1988: 390.

Type locality: Rockall Trough. SMBA station 143, 54°41'N, 12°14'W, 2892m, using an epibenthic sled.

Type material: ♂ holotype by original designation, NHM reg. no. 1984: 185. Paratypes, NHM reg. no. 1984: 186.

Distribution: Rockall Trough, Porcupine Bank.

Records: type locality, collected by SEA 1 at 61°34.42'N, 2°00.42'W, 1231m; several SMBA stations in the Rockall Trough, including permanent station at 2900m; IOS stations on the Porcupine Bank, 1484–2910m; collected by NUIG on the Porcupine Bank from 53°00.07'N, 15°59.81'W, 3283m.

Species name: *Haploniscus bicuspis* (G. O. Sars, 1877)

Nannoniscus bicuspis G. O. Sars, 1877: Sars, 1855: 122, pl. 10, figs 31–35.

Haploniscus bicuspis Hansen, 1916: 29, pl. 2, fig. 2; Menzies, 1962: 96, figs 6A–D; Gurjanova, 1964: 258; Svavarsson, 1988B: 85–86; Kussakin, 1988: 365.

Type locality: east of Iceland. 65°53'N, 7°18'W, 1163 fathoms (2130m). Bottom temperature -1.1°C.

Type material: ♀ holotype, ZMO F1716.

Distribution: Rockall Trough, Faeroe Islands.

Records: collected by SMBA at 3 stations in the Rockall Trough, stations 12, 87, 197 from 56–61°N and 3–11°W, 1050–2200m. Specimens deposited in NHM reg. no. 1984: 177.

Haploniscus ?bicuspis collected by SEA 1 at 59–63°N, 1–6°W, 0–0° 35.18'E, 785–1582m.

Species name: *Haploniscus borealis* Lincoln, 1985

Synonym: *Haploniscus* Lincoln, 1985: 673–676, figs 9a–i, 10a–j; Kussakin, 1988: 378.

Type locality: Porcupine Bank. SMBA station 15, 56°44'N, 09°28'W, 1632m.

Type material: holotype, NHM reg. no: 1984: 183. Paratypes, NHM reg. no: 1984: 184.

Distribution: Rockall Trough, Porcupine Bank.

Records: collected by IOS from several stations on the Porcupine bank; by SMBA throughout the Rockall Trough; by NUIG at 53°14.55'N, 15°5.45'W; 53°15.22'N, 14°50.43'W; 52°49.97'N, 12°39.83'W, 441–1564m.

Species name: *Haploniscus foresti* Chardy, 1974a

Haploniscus foresti Chardy, 1974a: 1139–1141, fig. 1–2; Lincoln, 1985: 669–673. figs. 7a–i, 8a–h; Kussakin, 1988: 399.

Type locality: Campagne Noratlante, station 2. 53°54.9'N, 17°51.8'W, 2456m.

Type material: ♀ holotype, deposited at the MNHN.

Distribution: Rockall Trough, Porcupine Bank.

Records: collected by NUIG at 53°00'N, 15°59'W, 3283m; collected by SMBA in the Rockall Trough, including their permanent station at 2900 m and IOS on the Porcupine Bank at depths from 1632–3697m.

Species name: *Haploniscus hamatus* Lincoln, 1985

Haploniscus hamatus Lincoln, 1985: 667–669, figs. 5a–j, 6a–k; Kussakin, 1988: 381.

Type locality: Rockall Trough. SMBA station 137, 54°34'N, 12°19'W, approx 2900m.

Type material: ♂ holotype, NHM reg. no. 1984: 180.

Distribution: Rockall Trough, Iceland Basin.

Records: recorded by SMBA from several stations in the Rockall Trough within the sector 54°34'–54°42'N, 12°11.5'–12°22'W, 2878–2925m.

Species name: *Haploniscus ingolfi* Wolff, 1962

Haploniscus ingolfi Wolff, 1962: 56, pl. 2, figs A–B, text figs 23–24; Chardy, 1974a: 1165; Lincoln, 1985: 679–682, fig. 13a–l, 14a–h; Svavarsson, 1988B: 86, fig. 1; Kussakin, 1988: 376.

Type locality: south of Jan Mayen, Norway. *Ingolf* station 113, 69°31'N, 7°06'W, 2465m.

Type material: ♀ holotype, ZMUC CRU–6831; non-type from the Rockall Trough deposited by Lincoln in the NHM, reg. no. 1984: 187.

Distribution: North Polar Sea, North Atlantic Ocean.

Records: collected by SMBA from several stations in the Rockall Trough at 54°34'N–54°41'N and 12°3'W–12°19'W, 2892–2916m; by NUIG west of the Porcupine Bank 53°00'N, 15°59'W, 3283m.

FAMILY MUNNOPSISIDAE LILJEBORG, 1864

Genus *Bathybadistes* Hessler and Thistle, 1975

Species name: *Bathybadistes spinosissima* (Hansen, 1916)

Ilyarachna spinosissima Hansen, 1916: 127–128, pl. XI, figs 10a–10e, pl. XII, figs 1a–1c.

Bathybadistes spinosissima Hessler and Thistle, 1975: 163.

Type locality: Davis Strait. *Ingolf* station 36, 61°50'N, 56°21'W, 1435 fathoms (2702m).

Type material: ♂♀ labeled 'type', ZMUC CRU-8212, CRU 9248.

Distribution: Rockall Trough, Davis Strait.

Records: collected by SMBA at their permanent station in the Rockall Trough, 54°40'N, 12°17.5'W, 2900m between November 1973 and May 1983.

Genus *Disconnectes* Wilson and Hessler, 1981

New to Ireland

***Species name:** *Disconnectes furcatus* (G O Sars, 1870)

Eurycope furcata G. O. Sars, 1870: 165; G. O. Sars, 1898: 148, pl. 67, fig. 2; Hansen, 1916: 151, pl. XIII, figs 9a–9b; Menzies, 1962: 140, fig. 33C–F.

Disconnectes furcatus Wilson and Hessler, 1981: 406.

Type locality: Lofoten Islands at Skraaven, Norway. 100–200 fathoms (188–377m).

Type material: ZMO (data unavailable).

Distribution: North East Atlantic.

Records: collected by NUIG in 2004 at 52°49'N, 12°39'W; 53°14'N, 14°46'W; 53°12'N, 14°39'W, 441–979m.

Eurycope ?furcata collected by AFEN 1996 at 60°46'N, 2°55'W, 390m.

Species name: *Disconectes latirostris* (G. O. Sars, 1882)

Eurycope latirostris G. O. Sars, 1882: 67, pl. 2, fig. 6; 1898: 148, pl. LXVII, fig. 1.

Disconectes latirostris Wilson and Hessler, 1981: 406.

Type locality: west of Norway. 188–536m.

Type material: ZMO (data unavailable).

Records: collected by the *Helga* 60 miles (97km) west of Achill Head, County Mayo, 199 fathoms (364m); collected by NUIG in 2004 at 52°49.97'N, 12°39.83'W, 441m; 53°12.25'N, 14°39.32'W, 633m.

Eurycope ?latirostris collected by AFEN 1996 at 60°32.03'N, 3° 17.67'W, 314m.

Eurycope ?latirostris collected by SEA 1 at 59°59.74'N, 7°43.08'W, 584m; 60°55.62'N, 2°24.06'W, 342m; 60°53.23'N, 2°20.69'W, 246m.

Species name: *Disconectes phalangium* (G. O. Sars, 1864)

Eurycope phalangium G. O. Sars, 1864: 210; Wolff, 1962: 146, 257; Hult, 1941: 110.

Eurycope phallangium G. O. Sars, 1899: 147, pl. 66; Hansen, 1916: 50, pl. XIII, fig. 8a.

Disconectes phallangium Wilson and Hessler, 1981: 407–409, figs 2–3.

Type locality: Straits of Drøbak, Norway.

Type material: preparatory ♀ lectotype, ZMO F15478a. Paralectotypes: 20 additional specimens, ZMO F15478b.

Distribution: Norway, Porcupine Bank.

Records: collected by the *Helga* on the Porcupine Bank at 53°1'N, 14°34' W, 293 fathoms (536m); collected by NUIG at 53°12.25'N, 14°39.32'W, 633m.

Genus *Echinozone* G. O. Sars, 1897

Species name: *Echinozone coronata* (G. O. Sars, 1870)

Ilyarachna coronata G. O. Sars, 1870: 168.

Echinozone coronata G. O. Sars 1879: 139; pl. 61, fig. 2.

Type locality: Varanger Fjord, Vadso, Norway. 100–300 fathoms (188–565m).

Type material: ZMO (data unavailable).

Distribution: Davis Strait, Iceland, Shetland Islands, Norway, Northern Britain.

Records: collected by SEA 1 at 59°56.66'N, 7°40.98'W; 59°56.83'N, 6°59.94' W; 59.34' N, 0°18.50' E, 320–808m; by AFEN 1996 at 60°58.41'N, 2°28.26'W, 448m.

Genus *Eurycope* Sars, 1864

Species name: *Eurycope cornuta* G. O. Sars, 1864

Eurycope cornuta G. O. Sars, 1864: 209; 1897: 145; pl. 64; Hansen, 1916: 141–142 pl. XII, figs 8a–8k; Hult, 1941: 103; Wilson and Hessler, 1981: 405–406, fig. 1.

Eurycope robusta Harger, 1878, part VI: 332; pl. III, fig. 15.

Type locality: Straits of Drøbak, Norway.

Type material: preparatory ♀ lectotype, straits of Drøbak, from Sars' collection, ZMO F546a.

Paralectotypes: 16 individuals, ZMO F546b.

Distribution: North-East Atlantic, Gulf of St Lawrence, south of the Faeroe Islands.

Records: *Eurycope ?cornuta* was collected by AFEN 1996 at 61°08.02'N, 2° 41.77'W, 789m.

Species name: *Eurycope producta* G. O. Sars, 1868

Eurycope producta G. O. Sars, 1868: 113; 1898: 147, pl. 65; Hansen, 1916: 147–148, pl. XIII, fig. 6a; Menzies, 1962: 141, fig. 33C–J.

Type locality: Norwegian coast from Christiana Fjord to Vadso.

Type material: ZMO (data unavailable).

Distribution: Davis Strait, Iceland, Norway, Greenland, Faeroe Islands, Ireland.

Records: collected by: the *Helga 77* miles (124km) west of Achill Island, County Mayo at a

depth of 382 fathoms (699m); NUIG in 2004 at 52°49.971'N, 12°39.8320'W, 441m; 53°14.4606'N, 14°46.0556'W, 979m.

Eurycope ?producta was collected by AFEN 1996 at 61°02.55'N, 2°33.97'W, 591m.

Eurycope ?producta was collected by SEA 1 at 59°58.34'–61°54.96'N, 1°42.80'–6°13.68'W, 543–1279m.

Genus *Ilyarachna* Sars, 1870

Species name: *Ilyarachna antarctica* Vanhoeffen, 1914

Ilyarachna antarctica Vanhoeffen, 1914: 591; Nordenstam, 1933: 256; Wolff, 1956: 106–111; Menzies, 1962: 156; Wolff, 1962: 94, 102–105; Thistle, 1980: 118–122, fig. 3.

Ilyarachna bicornis Hansen, 1916: 215; Gurjanova, 1932: 66; Menzies, 1962: 156–157; Wolff, 1962: 96, 101–102; Hessler and Thistle, 1975: 157.

Type locality: Antarctic Indian Ocean. 65°15'S, 80°19'E, 3397–3423m, -0.3°C.

Type material: ♀ lectotype designated by Wolff (1956).

Distribution: Antarctic, Kermadec Trench (Galathea stations), Porcupine Bank.

Records: collected by WHOI in 1969 on the Porcupine Abyssal Plain at 50°04.9'N, 14°23.8'W, 3859m.

Species name: *Ilyarachna longicornis* (G. O. Sars, 1864)

Ilyarachna longicornis G. O. Sars, 1864: 212; Meinert, 1890: 196; G. O. Sars, 1899: 136, pl. LIX; Hult, 1941: 97–100.

Ilyarachna hirticeps G. O. Sars 1869: 167; Hult, 1941: 97; Menzies, 1962: 157–158, fig. 45e–h; Thistle, 1980: 129–130, fig. 9a–b.

Ilyarachna plunketti Tattersall, 1905: 28–29, pl. VII, figs 1–9.

Type locality: Skager Rak, Norway.

Type material: ♀ holotype by original designation. ?Type, ZMO F19145.

Distribution: North Atlantic, Arctic Ocean.

Records: collected by WHOI in 1969 from the Porcupine Abyssal Plain at 51°32.2'N,

12°35.9'W, 1500–1491m; 50°12.3'N, 13°35.8'W, 2868–2890m; 50°08.3'N, 13°53.7'W, 3338–3856m; 50°04.9'N, 14°23.8'W, 3859m; collected by NUIG in 2004. 52°49'N, 12°39'W, 441m.

Ilyarachna ?longicornis collected by AFEN 1996 at 60°02.15'N, 4°54.56'W, 415m.

Ilyarachna ?longicornis collected by SEA 1 at 59–61°38.8'N, 4–8°W, 584–1380m.

Species name: *Ilyarachna polita* Bonnier, 1896

Ilyarachna polita Bonnier, 1896: 608; Wolff, 1962: 96; Hessler and Thistle, 1975: 157; Thistle, 1980: 133–135.

Ilyarachna simplex Menzies, 1962: 160; Wolff, 1962: 95; Hessler and Thistle, 1975: 157.

Ilyarachna thori Wolff, 1962: 97–100; Hessler and Thistle, 1975: 157.

Type locality: Bay of Biscay, 216–4885m.

Type material: holotype, ZMUC CRU-8388.

Distribution: Porcupine Abyssal Plain, Bay of Biscay.

Records: collected by WHOI on the Porcupine Abyssal Plain at 50°04.9'N, 14°23.8'W, 3859m.

Species name: *Ilyarachna triangulata* Menzies, 1962

Ilyarachna triangulata Menzies, 1962: 161–162, fig. 49d-e; Wolff, 1962: 94; Hessler and Thistle, 1975: 157; Thistle, 1980: 138–140, fig. 14.

Type locality: South Atlantic, L. G. O. Biotrawl no.14, 30°14.9'S, 13°03'E, 3049m.

Type material: ♀ holotype by original designation, AMNH 12084.

Distribution: South Atlantic, Porcupine Abyssal Plain.

Records: collected by Woods Hole Oceanographic Institute on the Porcupine Abyssal Plain at 50°04.7'N–50°43.5'N, 13°35.8'W–17°51.7'W, 2868–4632m.

Genus *Lipomera* (*Lipomera*) Tattersall, 1905

Species name: *Lipomera* (*Lipomera*) *lamellata* Tattersall, 1905

Lipomera lamellata Tattersall, 1905: 32–35, pl. viii.

Lipomera (*Lipomera*) *lamellata* Wilson, 1989: 55, fig. 18.

Type locality: collected by the *Helga* 60 miles (97km) west of Achill Head, County Mayo, 199 fathoms (364m).

Type material: none designated, both ♂♀ specimens described.

Distribution: recorded from the type locality only.

Records: type locality.

Genus *Munnopsis* M. Sars, 1861

Species name: *Munnopsis beddardi* (Tattersall, 1905)

Munnopsides beddardi Tattersall, 1905: 26, 73, pl. VI, figs 1–8.

Pseudomunnopsis beddardi Hansen, 1916: 160–162, pl. VI, figs 1–8.

Munnopsis beddardi Wolff, 1962: 188–189, figs 118–119.

Type locality: 60–77 miles (124km) west of Achill Island, County Mayo, at a depth of 199–382 fathoms (364–699m).

Type material: unknown.

Records: type locality.

Species name: *Munnopsis typica* M. Sars, 1861

Munnopsis typica M. Sars, 1861: 84; 1868: 310, plates. VI–VII; Hansen, 1887: 196, pl. XX, figs 2–2e; Meinert, 1890: 196; G. O. Sars, 1897: 133, plates. 57–58; Richardson, 1905: 486, figs 544–546; Hansen, 1916: 156–157; Wolff, 1962: 188–189, figs 118–119; Svavarsson, 1988B: 101.

Type locality: coast of Norway, from Christiana Fjord to Vadso, 60–400 fathoms (113–753m).

Type material: ZMO (data unavailable).

Distribution: North Atlantic Ocean.

Records: collected by the AFEN 1996, 61°10.51'N, 2°45.29'W, 979m.

Genus *Munnosurus* Richardson, 1912

Species name: *Munnosurus longipes* (Tattersall, 1905)

Eurycope longipes Tattersall, 1905: 30–32, pl. X, figs 1–8.

Munnopsurus longipes Richardson, 1912: 4; Hansen, 1916: 136, pl. XII, 6a–6b; Monod, 1926: 21; Wolff, 1962: 151–153, figs 92–93, pl. IX B–C.

Type locality: no type locality is stated, but descriptions are based on specimens taken by the *Helga*, described below.

Type material: One ♂ described; ♀ description from several ♀♀, largest of which is 10mm. No types designated and no material deposited in the National Museum of Ireland.

Distribution: West of Ireland, Porcupine Bank.

Records: collected by the *Helga* 50 miles (81km) west-north-west of Tearaght, County Kerry, at a depth of 350 fathoms (640m), and 54 miles (87km) west-north-west of the same location at 454 fathoms (830m); collected by NUIG in 2004 at 53°14'N, 14°55'W, 1564m.

Genus *Munneurycope* Stephensen, 1912

Species name: *Munneurycope murrayi* (Walker, 1903)

Munnopsis? murrayi Walker, 1903: 227, pl. XVIII, figs 1–6.

Munnopsis murrayi Tattersall, 1905: 24, 73, pl. V, fig. 8; 1911: 190, figs 8–14.

Munneurycope tjalfiensis Stephensen, 1913: 99, figs 6–8; 1915: 23, figs 12–13.

Eurycope murrayi Hansen, 1916: 137, pl. XII, 7a–b; Gurjanova, 1932: 72, pl. XXVI, 105; Stephensen, 1936: 11, fig. 4; Barnard, 1936: 188, fig. 18; Tchindonova, 1959: 173, figs 1 and 4; Menzies, 1962: 141, fig. 34M.

Munneurycope murrayi Wolff, 1962: 157–161, figs 94–97, pl. IX D.

Type locality: not designated. Material recorded from one of the following stations from the west coast of Ireland: 52°27.6'N, 15°40'W, 920–1470 fathoms (1682–2688m); 52°18'N, 15°53'W, 1410–1710 fathoms (2578–3127m).

Type material: no type material designated. Seven specimens collected by Walker, which he described as 'probably all males'. Non-type material collected by Trans. Fisheries deposited in the National Museum of Ireland, from 450 fathoms (823m).

Distribution: West of Ireland, Porcupine Bank.

Records: collected by the *Helga* 40–50 miles (64–81 km) north by west of Eagle Island, County Mayo. 54 miles (87 km) west-north-west of Teaghart, County Kerry, at a depth of 350–454 fathoms (640–830 m); outside the Porcupine Bank at a depth of 700 fathoms (1280 m).

Genus *Paramunnopsis* Hansen, 1916

Species name: *Paramunnopsis oceanica* (Tattersall, 1905)

Munnopsis oceanica Tattersall, 1905: 23, 72, pl. V, figs 1–7; 1911: 187, with figures; Vanhoffen, 1914: 581, figs IIa–b (? and IIc–d).

Paramunnopsis oceanica Hansen, 1916: 155, pl. XIII, figs IIa–Iii, pl. XIV, figs 1a–1b.

Type locality: 40–50 miles (64–81 km) west by north of Eagle Island, County Mayo, 750–1150 fathoms (1370–2100 m).

Type material: unknown.

Distribution: North Atlantic, South Atlantic, Sub-Antarctic Ocean (dubious record by Vanhoeffen (1903).

Records: type locality.

Genus *Tythocope* Wilson and Hessler, 1981

Species name: *Tythocope megalura* (G. O. Sars, 1872)

Eurycope megalura G. O. Sars, 1872: 274; 1899: 151; Tattersall, 1905: 75; Nierstrasz and Stekhoven, 1930: 125; Gurjanova, 1933: 424; Wolff, 1962: 146, 261.

?*Eurycope megalura* Hansen, 1916: 148.

Tythocope megalura Hessler and Wilson, 1981: 412–415.

Type locality: the outer part of Hardanger Fjord at Mosterhavn, Norway, 267–355 m.

Type material: juvenile ♀ lectotype, ZMO F15332a. Brooding ♀ paralectotype, ZMO F15332b.

Distribution: southwestern Norway; Hardanger, Stavanger, and Hjelte Fjords; west of Ireland, Porcupine Bank and south west of Iceland.

Records: collected by the *Helga* 60 miles (97 km) west of Achill Head, County Mayo, 199

fathoms (364m); collected by NUIG in 2004 at 52°49.97'N, 12°39.83'W, 441m; 53°15.12'N, 14°50.43'W, 1208m; 53°12.25'N, 14°39.32'W, 633m.

Eurycope ?megalura collected by AFEN 1996 at 61°37.34'N, 1°47.11'W, 1072m.

Eurycope ?megalura collected by SEA 1 at 59°59.74'N, 7°43.08'W, 584m; 61°36.82'N, 1°58.80'W, 1279m; 61°37.80'N, 1°45.72'W, 1053m; 61°54.96'N, 2°48.06'W, 1624m.

FAMILY ISCHNOMESIDAE HANSEN, 1916

Genus *Gracilimesus* Kavanagh and Wilson, 2007

***Species name:** *Gracilimesus celticensis* (Kavanagh *et al.*, 2006) **New to Ireland**

Haplomesus celticensis, Kavanagh *et al.*, 2006: 14–21, figs 8–12.

Gracilimesus celticensis Kavanagh and Wilson, 2007: 519.

Type locality: the Celtic Sea, off the west coast of Ireland. 51°32.2'N, 12°35.9'W 1491–1500m; WHOI station 313 August 1972, using a large epibenthic sled.

Type material: ♀ holotype. Paratypes: ♂, AM P.71659; juvenile ♂, AM P.71660; manca ♂, AM P.71661, same locality; additional paratypes 49 ind., AM P.71662–P.71667, same locality as holotype.

Distribution: recorded only from type locality.

Records: type locality.

***Species name:** *Gracilimesus* cf. *gorbunovi* (*sensu* Svavarsson, 1984) **New to Ireland**

Haplomesus ?gorbunovi Svavarsson, 1984: 31, fig. 5–6.

Gracilimesus gorbunovi Kavanagh and Wilson, 2007: 520.

Type locality: not available (specimens collected in the Norwegian Sea).

Type material: not available.

Records: collected by NUIG at 53°00'N, 15°59'W, 3283m; 52°49.97'N, 12°39.83'W, 441m; collected by SEA 1 at 61°33.36'N–61°54.96'N, 1°55.40'W–3°06.96'W, 1202–1582m.

Remarks: *Haplomesus gorbunovi* Gurjanova, 1946 differs from specimens collected by J. Svavarsson in several respects. According to Svavarsson (1984) these differences can be

explained by the different size of the specimens and errors in Gurjanova's (1946) descriptions and illustrations. The specimens collected by NUIG and SEA 1 are the same species as collected by Svavarsson; whether these are the same species as described by Gurjanova is unclear at the moment (Kavanagh and Wilson, 2007).

***Species name:** *Gracilimesus modestus* (Hansen, 1916)

New to Ireland

Haplomesus modestus Hansen, 1916: 65–66 pl.V, fig. 5, a–b; Gurjanova, 1932: 44; 1933: 410; Wolff, 1962: 72, 86, 87, 88, 217, 265, fig. 40, pl. III B-C; Menzies, 1962: 119, fig. 20e; Kussakin, 1988: 449–450, fig. 369.

Gracilimesus modestus Kavanagh and Wilson, 2007: 523.

Type locality: Davis Strait. *Ingolf* station 24, 63°06'N, 56°00'W, 1199 fathoms (2258m).

Type material: immature ♀ holotype, ZMUC CRU-7359.

Distribution: Davis Strait, Porcupine Bank.

Records: collected by NUIG at 54°08.02'N, 13°59.82'W, 2765m.

Genus *Heteromesus* Richardson, 1908

Species name: *Heteromesus greeni* (Tattersall, 1905)

Ischnosoma greeni Tattersall, 1905: 20–22, 72, pl. IV, figs 1–6.

Heteromesus greeni (Tattersall). Richardson, 1908: 81; Wolff, 1962: 86, 217, 260, 274; Kussakin, 1988: 483–485, fig 397.

Type locality: 60–77 miles (97–124km) west of Achill Head, County Mayo. Approximately 54°N, 11°W, 199–382 fathoms (364–699m).

Type material: ♀ holotype, NHM 1911.11.8.9599.

Distribution: West of Ireland, Porcupine Seabight.

Records: type locality; collected by NUIG at 50°55'N–54°09'N, 13°59'W–14°55'W, 1018–2200m.

Species name: *Heteromesus longiremis* Hansen, 1916

Heteromesus longiremis Hansen, 1916: 68–69, pl. VI, fig. 2a–f; Gurjanova, 1932: 45, tabl. XV, 55; Menzies, 1962: 122, fig. 22A–B; Wolff, 1962: 85, 217, 262, 275, 289; Kussakin, 1988: 481–483, fig. 394–396.

Type locality: North Atlantic: Davis Strait. *Ingolf* station 36, 61°50'N, 56°21'W, 2702m.

Type material: syntypes, ZMUC CRU-7130. This type material is now missing (Cunha and Wilson, 2006).

Distribution: North Atlantic.

Records: collected by NUIG at 52°59'N, 14°54'W; 50°54'N, 14°35'W, 1018–1022m; collected on the Noratlante Expedition by Pierre Chardy at 52°10'N–61°50'N, 23°00'W–56°21'W, 2624–4100m.

***Species name:** *Heteromesus spinosus* (Beddard, 1886)

New to Ireland

Ischnosoma spinosum Beddard, 1886: 40–42, pl. VI, fig. 1–5.

Heteromesus spinosus (Beddard) Richardson, 1908: 81.

Type locality: North Atlantic, off the Azores. 37°26'N, 25°13'W, 1829m.

Type material: ♀ holotype, NHM: 89.4.27.52.

Distribution: North Atlantic.

Records: collected by NUIG at 52°59'N, 14°54'W; 53°00'N, 15°22'W, 1022–2770m.

Genus *Ischnomesus* Richardson, 1908

***Species name:** *Ischnomesus armatus* Hansen, 1916

New to Ireland

Ischnomesus armatus Hansen, 1916: 57–58, pl. IV, figs 6a–6f; Menzies, 1962: 113, fig. 16j; Kussakin, 1988: 436, fig. 359.

Type locality: Davis Strait. *Ingolf* station 36, 61°50'N, 56°21'W, 1435 fathoms (2702m).

Type material: ♂ holotype, ZMUC CRU-5623.

Distribution: North Atlantic, Davis Strait, Rockall Trough.

Records: collected by NUIG at 53°00'N, 15°22'W, 2770m.

Species name: *Ischnomesus bispinosus* (G. O. Sars, 1868)

Ischnosoma bispinosum G. O. Sars, 1866: 34; Meinert, 1890: 194; G. O. Sars, 1897: 123, pl. 52; Tattersall, 1905: 71.

Ischnomesus bispinosus (G. O. Sars). Richardson, 1908: 81; Hansen, 1916: 55, 57; Gurjanova, 1932: 42–43, tabl. XIV, 48; Menzies, 1962: 112–113, fig. 16 E–I; Wolff, 1962: 74, 257, 274; Kussakin, 1988: 420, fig. 347.

Type locality: Christiana Fjord.

Type material: ♂♀, ZMO (data unavailable).

Distribution: North Atlantic.

Records: collected by the *Helga* 77 miles (124km) west of Achill Island, County Mayo, at a depth of 382 fathoms (699m); collected by GMIT at 54° 34'N, 11° 05'W, 351m; 54° 33'N, 11° 06'W, 347m; 54° 33'N, 11° 07'W, 344m.

Ischnomesus ?bispinosus collected by AFEN1996 at 61°26.45'N, 2°15.53' W, 1163m.

Ischnomesus ?bispinosus collected by SEA 1 at 59°46'N, 8°27'W; 59°54'N, 7°39'W; 59°56'N, 6°59'W, 598–1092m.

FAMILY JANIRIDAE G. O. SARS, 1897

Genus *Janira* Leach, 1814

Species name: *Janira maculosa* Leach, 1814

Janira maculosa Leach, 1814: 435.

Henopomus muticus Kroyer, 1846, pl. 30, figs. 1a–1h; Kroyer, 1847: 366.

Janira maculosa G. O. Sars, 1897: 99, 40; Hansen, 1916: 14–15, pl.I, figs 1a–1f.

Type locality: Greenland.

Type material: unknown.

Distribution: widespread in the North-East Atlantic.

Records: collected by the *Helga* off the coasts of Counties Antrim Galway, Kerry and Mayo and, on the Porcupine Bank from depths of 118–388 fathoms (216–710m); collected by SEA 1 from 59°50.99–60°59.44'N, 2°29.52'–4°43.08'W, 201–967m; collected by SEA 4 from 60–

62°N, 0–2°W, 300–454m; collected by AFEN 1996 from 60°55'N, 2°24'W, 341m.

Genus *Ianiropsis* Sars, 1897

Species name: *Ianiropsis breviremis* (G. O. Sars, 1882)

Janira breviremis G. O. Sars, 1882: 64.

Ianiropsis breviremis G. O. Sars 1897: 102–103, pl. XLII; Tattersall, 1905: 69; Zirwas, 1910: 93; Nierstrasz and Stekhoven, 1930: Stephensen, 1948: 76; Menzies, 1951: 153–155; Holthuis, 1956: 110; Wolff, 1962: 254; Gruner, 1965: 138–142; Kussakin, 1988: 90.

Type locality: North East Atlantic, 0–210m.

Type material: ZMO (data unavailable).

Distribution: coast of Norway, West of Ireland.

Records: collected by the *Helga* 70 miles (124km) south west of Fastationet Rock at a depth of 70 fathoms (128m).

FAMILY JANIRELLIDAE MENZIES, 1956

Genus *Janirella* Bonnier, 1896

Species name: *Janirella priseri* Chardy, 1972

Janirella priseri Chardy, 1972: 11–17, figs A–L.

Type locality: 55°52'5N, 49°53'4W, 3465m.

Type material: ♂ holotype, MNHN.

Distribution: North Atlantic Ocean, 2456–4166m.

Records: collected by SMBA at their permanent station in the Rockall Trough, 54°40' N, 12°17.5'W, 2900m.

FAMILY MACROSTYLIDAE HANSEN, 1916

Genus *Macrostylis* G. O. Sars, 1864

Species name: *Macrostylis magnifica* Wolff, 1962

Macrostylis magnifica Wolff, 1962: 91–93, pl. IV A–B, fig. 43.

Type locality: south of the Davis Strait. *Ingolf* station 38, 59°12'N, 51°05'W, 352m. Bottom temperature 1.3°C.

Type material: pereonites 5–7 and pleon of ♀ holotype.

Distribution: recorded from the type locality, and the station below.

Records: collected by NUIG in February 2003 at 53°00'N, 15°22'W 2770m; collected by SMBA at their 'permanent station' in the Rockall Trough, 54°40'N, 12°17.5'W, 2900m.

***Species name:** *Macrostylis spinifera* G. O. Sars, 1864

New to Ireland

Macrostylis spinifera G. O. Sars, 1864: 219; G. O. Sars, 1897: 121, pl. 51; Hansen, 1916: 76–77, pl. VI, figs 6a–6c, pl. VII, figs 1a–1c; Wolff, 1962: 92, fig. 44.

Type locality: Norwegian Sea.

Type material: ZMO (data unavailable).

Distribution: widespread in the North-East Atlantic.

Records: collected by NUIG at 53°15'N, 14°50'W, 1208m over a substrate of gravelly sand; collected by AFEN 1996 at 61°03'N, 2°24'W, 542m.

***Species name:** *Macrostylis subinermis* Hansen, 1916

New to Ireland

Macrostylis subinermis Hansen, 1916: 80, 81, pl. VII, figs 4a–4h; Wolff, 1962: 91.

Type locality: not designated, but taken from one of the 5 Danish *Ingolf* stations from around Iceland and the Faeroe Islands below.

Type material: syntypes, ZMUC CRU-8301–8306.

Distribution: Iceland: *Ingolf* station 102: 66°23'N, 10°26'W, 750 fathoms (1412m); *Ingolf* station 103: 66°23'N, 8°52'W, 579 fathoms (1090m); *Ingolf* station 119: 67°53'N, 10°19'W, 1010 fathoms (1902m); *Ingolf* station 125: 68°08'N, 16°02'W, 729 fathoms (1372m); north of the Faeroes, *Ingolf* station 139: 63°36'N, 7°30'W, 702 fathoms (1322m); Porcupine Bank.

Records: collected by NUIG in February 2004 at 53°29'N, 16°15'W, 2800m.

FAMILY PARAMUNNIDAE G. O. SARS, 1899

Genus *Metamunna* Tattersall, 1905

Species name: *Metamunna typica* Tattersall, 1905

Metamunna typica Tattersall, 1905: 70–71, pl. IX, figs 1–3.

Type locality: not designated, but taken from one of the localities below.

Type material: unknown.

Distribution: as for Irish Records (below).

Records: collected by the *Helga* 50 miles (81km) west north west of Cleggan Head, County Galway, 120 fathoms (219m) and on the Porcupine Bank at 53°20'N, 13°W, 164 fathoms (300m).

Genus *Paramunna* G. O. Sars, 1866

Species name: *Paramunna bilobata* G. O. Sars, 1866

Paramunna bilobata G. O. Sars, 1866: 112 ; 1889: 111, plate 47, fig. 1; Wilson, 1980: fig. 1A, D. E. Kusakin, 1988: 330; Just, 1990: fig. 1A.

Type locality: Vallø, outer west coast of Oslo Fjord, Norway (~59°20'N, 11°W). Sars (1866) also mentioned a single specimen from Lofoten, Norway (~68°N, 13°W).

Type material: no holotype designated and no type material deposited.

Distribution: southern and western Norway, west coast of Sweden, Kattegat, North Sea, West of Ireland, Faeroe Islands.

Records: collected by the *Helga* 50miles (81km) west-north-west off Cleggan Head at a depth of 120 fathoms (219m); collected by AFEN 1996 at 60°44'N, 2°35'W, 148m.

Genus *Pleurogonium* G. O. Sars, 1864

Species name: *Pleurogonium inerme* G. O. Sars, 1882

Pleurogonium inerme G. O. Sars, 1882: 67, pl. II, fig. 5; Meinert, 1890A: 193; G. O. Sars, 1897: 114, pl. 48, fig. 1; Hansen, 1916: 43–44, pl. III, figs 8a–8b; Kussakin, 1988: 348.

Type locality: west coast of Norway, 60–150 fathoms (113–282m).

Type material: ZMO (data unavailable).

Distribution: Britain, Denmark, Ireland, North Sea and Norway.

Records: collected by the *Helga* 60 miles (97km) west of Achill Head, County Mayo, at a depth of 199 fathoms (364m); collected by AFEN 1996 at 61°10.51'N, 2°45.29'W, 979m; collected by SEA 4 at 61–62°N, 0–2°W, 803–1094m.

***Species name:** *Pleurogonium pulchrum* Hansen, 1916

New to Ireland

Pleurogonium pulchrum Hansen, 1916: 46–47, pl. III, figs 12a–12e; Kussakin, 1988: 351.

Type locality: west of Iceland. *Ingolf* station 8, 63°56'N, 24°40'W, 136 fathoms (256m), temperature 6°C.

Type material: ♀ holotype, ZMUC CRU–7894.

Distribution: North-East Atlantic.

Records: collected by NUIG at 53°15'N, 14°50'W, 1208m on a substrate of gravelly sand.

Species name: *Pleurogonium rubicundum* (G. O. Sars, 1864)

Pleuracantha rubicunda G. O. Sars, 1864: 220.

Pleurogonium rubicundum G. O. Sars, 1897: 113, pl. 47, fig. 2; Hansen, 1916: 45–46, pl. III, figs IIa-IIb; Kussakin, 1988: 338.

Type locality: Norwegian coast, from Christiana Fjord to Vadso, 6–30 fathoms (11–56m).

Type material: ♀ holotype, ZMO (data unavailable).

Distribution: North East Atlantic including Ireland (shallow water).

Records: collected by SEA 4 at 61°52'N, 1°14'W, 753m; collected by AFEN 1996 at 61°08'N, 2°41'W, 789m.

FAMILY MUNNIDAE G. O. SARS, 1899

Genus *Munna* Kroyer, 1839

Species name: *Munna fabricii* Kroyer, 1846

Munna fabricii Kroyer, 1846, pl. XXXI, fig. 1a–1q; 1847: 380; Meinert, 1890A: 193; Hansen, 1916: 211, pl. III, figs 1a–1e; Hansen, 1916: 38–39, pl. III, figs 5a–5d; Carton, 1962: 236–238,

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pl. VIII; Kussakin, 1988: 306.

Type locality: Norway, 0–366m.

Type material: syntypes, ZMUC CRU-6386, 6387.

Distribution: widespread in the North East Atlantic including Ireland (shallow water records only).

Records: *Munna ?fabricii* collected by AFEN 1996 at 60°40'N, 3°03'W.

Species name: *Munna kroyeri* Goodsir, 1842

Munna kroyeri Goodsir, 1842: 365, pl. VI, fig. 6 (*teste* Sars); G. O. Sars, 1897: 109, pl. 46, fig. I; Hansen, 1916: 37–38, pl. III, figs 4a–4b; Carton, 1962: 234–236, pl. VII–VIII; Kussakin, 1988: 292.

Type locality: the mouth of the Firth of Forth, shallow water.

Type material: one specimen described, sex and location of material unknown.

Distribution: North East Atlantic.

Records: collected by the *Helga* off Rathlin Island, County Antrim, at a depth of 115 fathoms (210m); also collected in shallow water samples.

Munna ?kroyeri collected by AFEN 1996 at 60°57'N, 2°24'W, 408m.

Species name: *Munna limicola* G. O. Sars, 1867

Munna limicola G. O. Sars, 1867: 108, pl. XLV, fig. 1.

Munna limicola Carton, 1962: 232–234, pl. V–VI.

Type locality: Christiana Fjord, 60–300 fathoms (113–565m). Muddy bottom type.

Type material: ♀ holotype, location unknown.

Records: collected by the *Helga* at the Porcupine Bank at 53°1'N, 14°34'W, 293 fathoms (536m).

FAMILY NANNONISCIDAE HANSEN, 1916

Genus *Nannoniscus* G. O. Sars, 1870

***Species name:** *Nannoniscus oblongus* G. O. Sars, 1870

New to Ireland

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Nannoniscus oblongus G. O. Sars, 1870: 164; 1897: 119, pl. 50; Hansen, 1916: 92–94, pl. VIII, figs 4a–f; Menzies, 1962: 136–137, figs. 31I–K.

Type locality: off the Lofoten Islands, at Skraaven, Norway, 225–468m.

Type material: unknown.

Records: collected by NUIG in 2004 at 53°14'N, 14°46'W, 978.7m; 53°12.25'N, 14°39.32'W, 633m; collected by SEA 1 at 60°59'N, 2°29' W, 495m.

FAMILY PSEUDOMESIDAE HANSEN, 1916

Genus *Pseudomesus* Hansen, 1916

***Species name:** *Pseudomesus brevicornis* Hansen, 1916 **New to Ireland**

Pseudomesus brevicornis. Hansen, 1916: 74, pl. IV, figs 5a–5g.

Type locality: north of Iceland. *Ingolf* station 102: 66°23'N, 10°26'W, 750 fathoms (1412m), temperature 0.9°C.

Type material: syntype. ZMUC-CRU 87.

Distribution: Iceland, Porcupine Bank.

Records: collected by NUIG in October 2003 at 53°00'N, 15°22'W, 2770m; 54°08'N, 13°59'W, 2200m.

FAMILY THAMBEMATIDAE STEBBING, 1912

Genus *Thambema* Stebbing, 1912

Species name: *Thambema amicorum* Stebbing, 1912

Thambema amicorum Stebbing, 1912: 42; 1913: 231, 237–239, 246, p. XXVI; Bocquet and Lévi, 1955: 133; Birstein, 1961: 135–136, 139–140; Menzies, 1962: 184, fig. 63; Wolff, 1962: 264; Schiecke, 1975: 169–175; Harrison, 1987: 54–59, figs 1–4; Kussakin, 1988: 18–20, figs 1–3.

Type locality: North Atlantic, west of County Donegal. *Porcupine* Station 19, 54°53'N, 10°56'W, 2486m.

Type material: unknown.

Distribution: Rockall Trough.

Records: collected by SMBA at their permanent station in the Rockall Trough, 54°40'N, 12°17.5'W, 2900.

Species name: *Thambema fiatum* Harrison, 1987

Thambema fiatum Harrison, 1987: 68–72, figs 13–15.

Type locality: Hebridean Slope, Rockall Trough. SMBA station 63, 56°37'N, 09°49'W, 1800m.

Type material: ♂ holotype, NHM reg. no. 1986:126:1. Paratypes: ♀ from the same location as the holotype, NHM 1986:126: 1; adult ♂ and ovigerous ♀ from SMBA station 68, 58°42'N, 09°43'W, 1800m, 1986: 127: 2.

Distribution: continental slope west of the Hebrides, and northern Rockall Trough.

Records: type localities.

Species name: *Thambema golanachum* Harrison, 1987

Thambema golanachum Harrison, 1987: 59–63, 70, figs 5–8.

Type locality: Southern Rockall Trough. SMBA Station 46, 55°04'N, 12°06'W, 2875m.

Type material: adult ♂ holotype, NHM reg. no. 1956: 114: 1. Paratypes collected from 9 additional stations:- SMBA station 10, 56°37' N, 11°04' W, 2540m, NHM reg. no. 1986: 118: 2; SMBA station 34, 56°36'N, 11°30'W, 2515m, 1986: 115: 1; SMBA station 46, permanent station at 2900m, 1986; 116: 1; SMBA station 47, permanent station at 2900m, 1986: 117: 2; SMBA station 61, 57°08'N, 12°09'W, 2000m; 1986: 119:3 and 1986: 120:1; SMBA station 64, 56°38'N, 09° 29'W, 1400m, 1986: 121: 1; SMBA station 150, permanent station at 2900m, 1986: 122: 1; SMBA station 155, 48°27'N, 10°20'W, 1330m, 1986: 123: 1; SMBA station 185, permanent station at 2900m, 1986: 124: 1; 9 adult ♂♂, 4 non-ovigerous ♀♀ and 1 manca specimen.

Distribution: Southern Rockall Trough, continental slope of the Celtic Sea, 1330–2916m.

Records: type localities.

Species name: *Thambema tanum* Harrison, 1987

Thambema tanum Harrison, 1987: 64–67, 71, figs 9–12.

Type locality: Southern Rockall Trough. SMBA station 48, 55°04'N, 12°04'W, 2875m.

Type material: adult ♂ holotype, NHM reg. no. 1986: 113: 1.

Distribution: north-east of Porcupine Bank.

Records: type locality.

INCERTAE SEDIS

Genus *Tole* Ortmann, 1901

***Species name:** *Tole laciniata* (G. O. Sars, 1872)

New to Ireland

Janira laciniata G. O. Sars, 1872: 92.

Ianthe laciniata G. O. Sars, 1897: 101, pl. 41.

Ianira laciniata Hansen, 1916: 20–21, pl. I, fig. 5a.

Tole laciniata Ortmann, 1901: 157.

Type locality: Storeggen Bank, off Molde, Norway, 400 fathoms (753m).

Type material: ZMO (data unavailable).

Distribution: Davis Strait, Norway, Denmark, British Isles.

Records: collected by NUIG at 53°14.46'N, 14°46'W, 978.7m; collected by SEA 1 at 59°56.66'N–61°02.65'N, 2°29.52'W–7°45.12'W, 492–677m; collected by AFEN 1996 at 60°58.41'N, 2°28.26'W, 448m.

Discussion

The asellote fauna of the study area is comprised of 13 families, 31 genera and 73 species. Eight of the species listed above are new Irish records, and six of these are also new to the territorial waters of the British Isles as a whole. A total of 15 new species of Asellota, as yet undescribed, were also collected by NUIG including one new species of *Dendrotion* (Asellota: Dendrotionidae); two new species of *Janirella* (Asellota: Janirellidae); one new species of *Macrostylis* (Asellota: Macrostylidae); nine new species of *Eurycope* (Asellota:

Munnopsididae) and two new species of *Paramunna* (Asellota: Paramunnidae). The depth ranges of the species recorded are shown in table 2. This range is likely to be affected by sampling bias, with several species having been collected at only one station.

The most speciose family in the study area is the Munnopsidae, with 18 described species and seven new species (see Table 3). Wilson's (1989) classification of the Munnopsidae included the former families Ilyarachnidae and Eurycopidae in the family, a revision which has significantly increased its diversity. The Haploniscidae are also speciose, with 11 species in the study area. This reflects the large amount of work carried out by Lincoln in 1985, in which he described eight of these 11 species. The most speciose genus is *Haploniscus* with eight described species. A total of 58% of all the genera recorded (19) are represented by only one species, and 74% of the genera (23) are represented by one or two species. A similar situation occurs in the Northern Seas (Norwegian, Greenland, Icelandic and Arctic seas) where 55% of genera have a single species, and 70% of genera have one or two species (Svavarsson *et al.*, 1993).

The species recorded in this area of the North East Atlantic bear an affinity to the fauna of the Northern Seas. Svavarsson *et al.* (1993) noted that the arctic deep-sea fauna is characterized by genera and species predominantly of an Atlantic origin. It is thought that this fauna consists of comparatively recent immigrants from the adjacent shelves (Dahl, 1972, 1979; Dahl *et al.*, 1976; Just, 1980; Hessler and Wilson, 1983). A connection between the North Atlantic and the Norwegian-Greenland seas has existed since the opening of the Norwegian sea, *via* a shallow (0.8km) water connection in the region of the Faeroe channel. Forty percent of the species recorded in the study area are also found in the Northern Seas, while thirty percent of the species recorded in the Northern Seas have been collected in the study area. The deeper opening from the Atlantic compared with the Pacific into the Northern Seas has allowed northern Atlantic species to enter to a greater extent (Svavarsson *et al.*, 1993). The Northern Seas contain 12 asellotan families, two of which, Katianiridae and Acanthaspidiidae, are not recorded from the study area. Three families from the study area, Janirellidae, Thambematidae and Pseudomesidae, are not recorded from the Northern Seas (Svavarsson *et al.*, 1993). Although

the overall diversity in the study area is similar to that observed in more northerly waters, there is a higher proportion of pronounced deep-sea families. In particular, the Haploniscidae and Ischnomesidae display greater diversity in terms of species, while the Haploniscidae also have a higher number of genera recorded in the study area. Harrison (1987) found that the families Haploniscidae, Ischnomesidae and the subfamilies Ilyarachnidae and Eurycopidae together provided approximately 77% of the collection (by numbers of individuals) from 19 epibenthic sled samples collected from 1973–1983 at one site in the southern Rockall Trough. In the area sampled by NUIG (see Figure 1), these taxa account for 57% of the collection by numbers of individuals (Table 4). This figure is lower than that observed in the Rockall Trough due to the shallow stations sampled across the Porcupine Bank. The family Paramunnidae account for approximately 15% of the specimens collected. However, these specimens were collected from two stations only, with one genus and three species (two sp. nov.).

Several species recorded in the study area support the theory of subsequent emergence of asellote isopods in northern latitudes. *Pseudomesus brevicornis* is recorded from 1412–2770m in the study area, while in the Arctic Ocean it occurs in waters as shallow as 80m (Svavarsson *et al.*, 1993). *Ischnomesus bispinosus* is recorded in the study area from 300–700m, while in the Arctic Ocean it has been recorded in water as shallow as 10–531m. *Desmosoma lineare* is found at depths of 699–1564m in the study area, and depths of 17–531m in the Northern Seas. *Eurycope producta* has a range of 441–979m in the study area compared to 72–1260m in the Arctic sea. Although this catalogue focuses on areas from 100–5000m, none of the species listed above are recorded from shallower waters in the study area.

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FIGURE 1. Map of study area with stations from dedicated surveys aboard the RV Celtic Explorer 2003-2004.

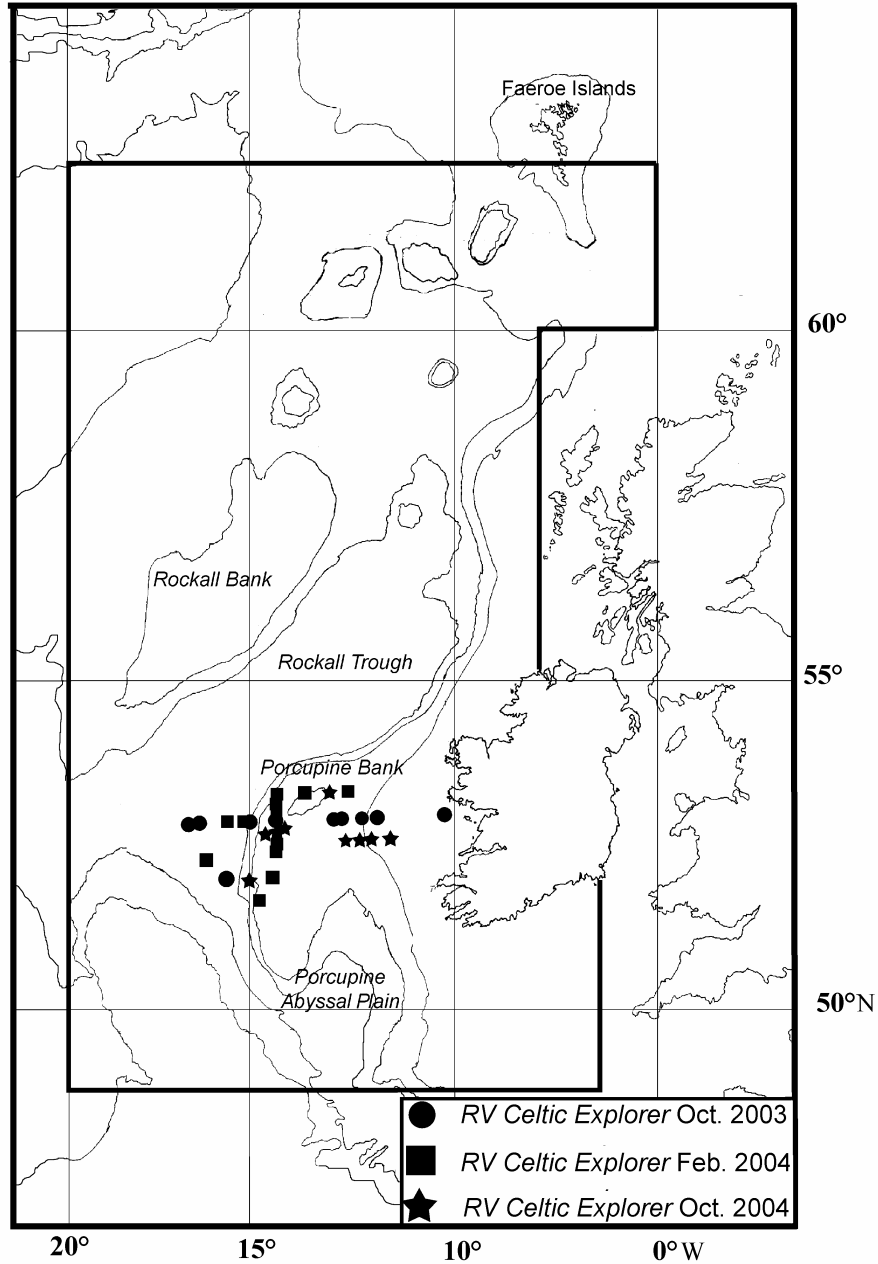


TABLE 1. Benthic sampling projects carried out in the North East Atlantic study area.

| COUNTRY | PROJECT | DATES | STUDY AREA | PURPOSE | RELEVANT PUBLICATIONS |
|----------------|-----------------------|------------------|--|--|---|
| UK (Ireland) | <i>HMS Lightning</i> | 1868 | Shetland Islands | Faunal survey comprising dredge sampling. | Thompson, 1873; Carpenter, 1868. |
| UK (Ireland) | <i>HMS Porcupine</i> | 1869-1870 | British Isles including Porcupine Bank, Rockall Trough, Rockall Bank | Faunal survey comprising dredge sampling. | Carpenter and Thompson, 1870; Carpenter and Jefferys, 1871; Thomson, 1873. |
| UK (Ireland) | <i>HMS Challenger</i> | 1872-1876 | World's oceans | Exploratory multidisciplinary oceanographic survey. | Beddard, 1886; See www.19thcenturyscience.org/HMSC/HMSC-INDEX/index-linked.htm for a link to all zoological reports from the voyage. |
| UK (Ireland) | <i>Lord Bandon</i> | 1885, 1886, 1888 | Irish waters | To investigate the fauna of the 100 fathom line off the south-west coast of Ireland, comprising dredge sampling. | Haddon, 1886; Haddon and Green, 1889; O'Riordan, 1967; Sladen, 1891; Went, 1967. |

| | | | | | |
|--------------|---|-----------|--------------------------------------|--|--|
| UK (Ireland) | <i>HMS Research</i> | 1889 | Irish waters | Faunal survey comprising trawl sampling. | Bourne, 1889. |
| UK (Ireland) | <i>Flying Fox</i> | 1889-1890 | Irish waters | Faunal survey comprising beam trawl and dredge sampling. | Green, 1889. |
| UK (Ireland) | <i>Fingal</i> | 1890 | Irish waters | Faunal survey comprising beam trawl sampling. | Holt, 1892; Went 1967. |
| UK (Ireland) | <i>Harlequin</i> | 1891 | Irish waters | Faunal survey comprising beam trawl sampling. | Holt, 1892; Went, 1967. |
| UK (Ireland) | <i>Gramuaille</i> | 1896 | Irish waters | Faunal survey comprising Agassiz trawl sampling. | Green, 1896; Praeger, 1897. |
| UK (Ireland) | <i>Helga</i> | 1901-1904 | Deep water west of Ireland | Faunal survey comprising hauls. | Tattersall, 1905. |
| UK (Ireland) | <i>Helga II</i> | 1904-1914 | Irish waters | Faunal survey comprising hauls. | Clarke, 1913; Farran, 1913; Massy, 1920. |
| Denmark | Danish <i>Ingolf</i> Expedition | 1895-1896 | Faeroes, Iceland and South Greenland | Deep-sea investigation. | Hansen, 1908, 1913, 1916, 1920, 1923. |
| Denmark | Danish <i>Galathea</i> Round the World Expedition | 1950-1952 | World's oceans | Deep-sea round the world investigation. | Wolff, 1956, 1962. |

| | | | | | |
|-------------------|--|--------------|------------------------------------|--|--|
| France | Campagne Noratlantique aboard <i>RV Jean Charcot</i> | 1969 | Deep North Atlantic | Faunal sampling. | Chardy, 1972, 1974a, b, c. |
| France | Campagne Walda aboard the <i>RV Jean Charcot</i> | 1971 | Deep North Atlantic | Faunal sampling. | Chardy, 1974a, 1974b |
| France | Campagne Biacores aboard the <i>RV Jean Charcot</i> | 1971 | Azores region and La Chapelle bank | Oceanographic survey organized by MNHN. | Emig, 1972; Monniot and Monniot, 1973; Chardy, 1975; Young 1998. |
| UK (Scotland) | Rockall Time series by Scottish Association of Marine Science (SAMS) | 1972-present | Rockall Trough | Time series study of bathyal and abyssal benthos sampling programme. | Harrison, 1987; Harrison, 1988; Lincoln, 1985; Greenwood <i>et al.</i> , 2001. |
| France | Campagne Biogas IV | 1973 | Gulf de Gascogne | Multidisciplinary survey. | Chardy, 1975; Laubier and Sibuet, 1977. |
| France/ Sweden | NORBI expedition | 1975 | Norwegian-Greenland Seas | Deep-sea exploration. | Svavarsson, 1982, 1984, 1988a, 1988b; Svavarsson <i>et al.</i> , 1993. |

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|-----------------------------------|---|-----------|--|---|---|
| USA | WHOI transects | 1976 | Rockall Trough, Porcupine Seabight | Benthic sampling <i>via</i> transects. | Kavanagh, F. A. <i>et al.</i> , 2006. |
| UK (England) | IOSDL Porcupine Seabight | 1977-1986 | Porcupine Seabight | Survey of mega-, macro- and meiofauna. | See http://eprints.soton.ac.uk/ for most publications and reports. |
| US | FRAM I Drift-Ice expedition | 1979 | Polar Sea | Oceanographic study. | Hunkins <i>et al.</i> , 1979; Just, 1980. |
| Sweden | <i>Ymer-80</i> Expedition | 1980 | North Polar Sea | Multi-disciplinary expedition. | Svavarsson, 1984; 1988a; 1988b. |
| Norway | University of Bergen survey: <i>RV Håkon Mosby</i> | 1981 | Norwegian Sea | Deep-sea exploration. | Svavarsson, 1984, 1988a, b. |
| Denmark | BIOFAR | 1990 | Slope south of Faeroes | Faunal survey. | Johansen and Brattegard, 1998; Klitgaard, 1991 (reports). |
| European Union (MAST I Framework) | 'Natural variability and the prediction of change in marine benthic ecosystems' | 1990-1993 | North East Atlantic slope and abyssal plains | Describing environmental and biological variability at different temporal and spatial time scales; investigating effects of disturbance on benthos. | Publications can be searched at http://www.cordis.lu/guidance/services.htm |

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|-------------------------------------|--|---------------|---|---|--|
| European Union (MAST II Framework) | 'Community structure and processes in the deep-sea benthos' | 1993-1996 | Porcupine, Madeira, Cape Verde abyssal plains | Comparison of benthic communities disturbed by phytodetritus with undisturbed communities. | As above, publications can be searched at http://www.cordis.lu/guidance/services.htm |
| European Union (MAST II Framework) | OMEX I | 1992-1996 | Transects of continental margin in Goban Spur (Porcupine Seabight) area | Physical, chemical and biological processes at ocean margins controlling transport of material from shelf into deep-sea | Duineveld, G. C. A. <i>et al.</i> , 1997. See also http://www.cordis.lu/guidance/services.htm |
| European Union (MAST III Framework) | | 1994-1998 | Atlantic Ocean | To understand how marine systems function at basin scales, in order to prepare for sustainable use of the oceans and determine their role in global change. | See the following website for a list of publications from MAST III http://www.cordis.lu/mast/src/pubs.htm |
| UK | AFEN (Atlantic margin environmental surveys of the seafloor) | 1996 and 1998 | UK Atlantic margin oil province | Environmental management of oil-producing areas. | Final report is available as a cd-rom from the publisher geotek at www.geotek.co.uk |

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|---------|--|----------------------------|---|--|--|
| UK | Strategic Environmental Assessment (SEA) by UK Department of Trade and Industry (DTI). | 1999-Present (SEA1 - SEA7) | UK Continental Shelf | Environmental assessment of the UK Continental shelf. | CD-ROMs available from http://www.offshore-sea.org.uk/site/scripts/products.php |
| Ireland | Environmental Impact Assessment Aqua-Fact | 2003 | West of Mayo, Ireland | Environmental assessment of potential oil field. | Environmental assessment report. |
| Ireland | NUIG PRTL (Cycle 3) | 2003-present | West of Ireland-Porcupine Bank and Seabight | Multidisciplinary project incorporating geophysics, oceanography, microbiology and benthic zoology | Barry and McCormack, 2007; Kavanagh <i>et al.</i> , 2006; Koennecker, 2005; McCarthy <i>et al.</i> , 2006. See also www.nuigalway.ie |

TABLE 2. Depth range of Asellota (Isopoda) recorded from the North East Atlantic study area.

| Species | Depth range (m) | Species | Depth range (m) |
|--------------------------------------|-----------------|--------------------------------------|-----------------|
| <i>Dendrotion elegans</i> | 1600–2200 | <i>Bathybadistes spinosissima</i> | 2900 |
| <i>Dendrotion paradoxum</i> | 441–1504 | <i>Echinozone coronata</i> | 188–808 |
| <i>Dendrotion setosum</i> | 362–1160 | <i>Disconectes furcatus</i> | 390–979 |
| <i>Dendrotion spinosum</i> | 282–408 | <i>Diconectes latirostris</i> | 246–633 |
| <i>Dendromunna compsa</i> | 2900 | <i>Disconectes phallangium</i> | 536–633 |
| <i>Eugerdella tenuimana</i> | 62–1484 | <i>Eurycope ?cornuta</i> | 789 |
| <i>Eugerdella hessleri</i> | 814–3620 | <i>Eurycope producta</i> | 441–978.7 |
| <i>Desmosoma lineare</i> | 699–1564 | <i>Ilyarachna antarctica</i> | 3859 |
| <i>Oecidiobranthus nanseni</i> | 844–2300 | <i>Ilyarachna longicornis</i> | 364–4632 |
| <i>Antennuloniscus simplex</i> | 1900 | <i>Ilyarachna polita</i> | 3859 |
| <i>Antennuloniscus diversus</i> | 1800–2755 | <i>?Ilyarachna triangulata</i> | 2868–4632 |
| <i>Chauliodoniscus armadilloides</i> | 2200–476 | <i>Munnopsis beddardi</i> | 364–699 |
| <i>Haploniscus aduncus</i> | 2636–2646 | <i>Munnopsis typica</i> | 979 |
| <i>Haploniscus ampliatus</i> | 2636–2925 | <i>Munnopsurus longipes</i> | 640–1564 |
| <i>Haploniscus angustus</i> | 1231–2900 | <i>Munneurycope murrayi</i> | 640–1280 |
| <i>Haploniscus bicuspis</i> | 428–1321 | <i>Paramunnopsis oceanica</i> | 1370–2100 |
| <i>Haploniscus borealis</i> | 441–1632 | <i>Tytthocope megalura</i> | 364–1624 |
| <i>Haploniscus foresti</i> | 1632–3697 | <i>Lipomera (Lipomera) lamellata</i> | 364 |
| <i>Haploniscus hamatus</i> | 2878–2925 | <i>Gracilimesus celticensis</i> | 1491–1500 |
| <i>Haploniscus ingolfi</i> | 2465–3283 | <i>Gracilimesus ?gorbunovi</i> | 441–1582 |

TABLE 2 (Continued).

| Species | Depth range (m) | Species | Depth range (m) |
|-------------------------------|-----------------|--------------------------------|-----------------|
| <i>Gracilimesus modestus</i> | 2765 | <i>Pleurogonium inerme</i> | 364–1094 |
| <i>Heteromesus greeni</i> | 364–2200 | <i>Pleurogonium pulchrum</i> | 1208 |
| <i>Heteromesus longiremis</i> | 1018–4100 | <i>Pleurogonium rubicundum</i> | 20–789 |
| <i>Heteromesus spinosus</i> | 1022–2770 | <i>Munna fabricii</i> | 0–366 |
| <i>Ischnomesus armatus</i> | 2770 | <i>Munna kroyeri</i> | 0–408 |
| <i>Ischnomesus bispinosus</i> | 344–1163 | <i>Munna limicola</i> | 536 |
| <i>Janira maculosa</i> | 201–967 | <i>Nannoniscus oblongus</i> | 495–979 |
| <i>Ianiropsis breviremis</i> | 128 | <i>Pseudomesus brevicornis</i> | 2200–2770 |
| <i>Janirella priseri</i> | 2900 | <i>Thambema amicorum</i> | 1330–2900 |
| <i>Macrostylis magnifica</i> | 2900 | <i>Thambema golanachum</i> | 1800 |
| <i>Macrostylis spinifera</i> | 542–1208 | <i>Thambema fiatum</i> | 1800 |
| <i>Macrostylis subinermis</i> | 2800 | <i>Thambema tanum</i> | 2875 |
| <i>Metamunna typica</i> | 219–300 | <i>Tole laciniata</i> | 448–979 |
| <i>Paramunna bilobata</i> | 148–219 | | |

TABLE 3. Number of genera and species of Asellota (Isopoda) recorded per family in the North East Atlantic study area.

| Family | No. of genera | No. of described species | No. of undescribed species | No. of species |
|-----------------|----------------------|---------------------------------|-----------------------------------|-----------------------|
| Dendrotioniidae | 2 | 5 | 1 | 6 |
| Desmosomatidae | 3 | 5 | 0 | 5 |
| Haploniscidae | 3 | 11 | 0 | 11 |
| Munnopsididae | 8 | 18 | 7 | 25 |
| Ischnomesidae | 3 | 8 | 0 | 8 |
| Janiridae | 2 | 2 | 0 | 2 |
| Janirellidae | 1 | 1 | 2 | 3 |
| Macrostylidae | 1 | 3 | 1 | 4 |
| Paramunnidae | 3 | 5 | 2 | 7 |
| Munnidae | 1 | 5 | 0 | 5 |
| Nannoniscidae | 1 | 1 | 0 | 1 |
| Pseudomesidae | 1 | 1 | 0 | 1 |
| Thambematidae | 2 | 4 | 0 | 4 |
| Incertae Sedis | 1 | 1 | 0 | 1 |

TABLE 4. Summary of samples of Asellota (Isopoda) collected by NUIG 2003-2004 in the North East Atlantic study area.

| (Sub)Family | No. samples | No. specimens | % | No. genera | No. species |
|--------------------|--------------------|----------------------|----------|-------------------|--------------------|
| Haploniscidae | 6 | 85 | 17.4 | 2 | 5 |
| Ischnomesidae | 8 | 76 | 15.6 | 3 | 5 |
| Paramunnidae | 2 | 71 | 14.6 | 1 | 3 |
| Eurycopidae | 6 | 70 | 14.4 | 2 | 11 |
| Ilyarachnidae | 6 | 59 | 12.1 | 1 | 1 |
| Dendrotioniidae | 2 | 38 | 7.8 | 1 | 3 |
| Janirellidae | 4 | 33 | 6.8 | 1 | 2 |
| Nannoniscidae | 5 | 20 | 4.1 | 1 | 1 |
| Janiridae | 6 | 11 | 2.3 | 1 | 1 |
| Macrostylidae | 4 | 7 | 1.4 | 1 | 4 |
| Desmosomatidae | 1 | 6 | 1.2 | 1 | 1 |
| Munnopsidae | 2 | 6 | 1.2 | 1 | 1 |
| Pseudomesidae | 3 | 4 | 0.8 | 1 | 1 |