

# Irish Biodiversity: a taxonomic inventory of fauna



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Comhshaol, Oidhreacht agus Rialtas Áitiúil  
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## Irish Biodiversity: a taxonomic inventory of fauna

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## EXECUTIVE SUMMARY

This report provides a taxonomic overview of the animal species known to occur in the Republic of Ireland. It is clear that Ireland is home to an interesting and diverse fauna in its marine, terrestrial and freshwater habitats. Records have been found for approximately 19,122 species; however this figure is likely to be a significant underestimate of the true diversity of Irish fauna. Many species remain to be discovered in particular small, cryptic animals and species that live in areas that have not been fully surveyed (e.g. deep-water marine species).

Although the vertebrates (which include mammals, birds, reptiles, amphibians and fish) are the most familiar and well-known group of animals, Ireland's faunal diversity is largely made up of invertebrates. The arthropods are the most speciose group with at least 11,260 species of insect, 1,775 species of crustacean and 1,107 species of arachnid known to occur in Ireland. A relatively high number (1,088) of mollusc species have also been recorded. At the phylum level, the marine environment appeared to be the most diverse with many poorly-known phyla recorded from or likely to occur in Ireland.

For many groups species numbers were derived from published checklists, and information generated through various research studies proved key to the compilation of species lists. However, comprehensive checklists were not available for many groups, highlighting the paucity of information on Irish fauna and the gaps in our knowledge of these groups. Furthermore a number of key unpublished reports were not available to us, and information from such reports would certainly improve this document.

This report thus hopes to provide baseline information on the fauna known to occur in Ireland. It is hoped that this will generate debate amongst experts, lead to further collection and dissemination of species information for Ireland and raise the profile of biodiversity in particular for the lesser known groups. For this reason it is intended that this report be considered a work in progress, which can be updated following further expert input.

This report includes information published up to September 2008, any data published after this date have not been included.

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We are grateful to all those field biologists and taxonomists that have collected and published records for Irish fauna, which formed the basis of this report.

### *Disclaimer*

Please note that the views expressed in this report are solely those of the authors and should not be inferred to represent the policy of NPWS.

## INTRODUCTION

Ferriss, S. E., Regan, E. and Smith, K.G.

This report provides a summary of the number of species known to occur in the Republic of Ireland for all animal phyla. Information is compiled at the family level and supporting references are provided for all taxonomic groups. It aims to update a report compiled in 1996 by Purcell, who estimated that there were at least 14,616 species in Ireland.

It is hoped that this report will provide a useful estimate of the number of animal species in the Republic of Ireland and furthermore that the information in this report will generate debate amongst taxonomic experts, lead to further collection and dissemination of species information for Ireland and raise the profile of biodiversity in particular for the lesser known groups. As such, this report can be considered a work in progress, which can be updated following further expert input and revision.

## Methodology

Extensive literature reviews were undertaken for all phyla. Where available, published checklists were used to compile information on species numbers and higher taxonomy, and these were updated with new records as necessary. However, such checklists were not available for many species groups and, in these cases, species numbers were compiled following extensive reviews of widely dispersed literature. For many such groups, it is very likely that species records have been overlooked, particularly those that have not been published or were unavailable to us, and the numbers provided should be considered underestimates. Furthermore a number of key unpublished reports were not available to us, and information from such reports would certainly improve the information in this document.

Online databases such as *Fauna Europaea* (2004) and the *European Register of Marine Species* (Costello *et al.*, 2008) proved to be invaluable resources particularly to resolve taxonomic issues, to exclude synonyms and include accepted names. Other websites such as that operated by CEDaR ([habitas.org.uk](http://habitas.org.uk)), *FishBase* (Froese and Pauly, 2008) and data from surveys such as the BIOMAR (Picton and Costello, 1998) project provided valuable distribution information.

Where possible, chapters were reviewed by taxonomic experts; however, reviewers were not available for many groups. Full reference lists are provided so that all data can be traced and verified if necessary. However, it should be noted that the report is not intended to be a bibliography for the Animalia of Ireland, and therefore only references needed to support the species numbers are included.

## *Geographic scope*

The focus in this report is on the species known to occur in the Republic of Ireland. However, for some groups relevant checklists provided an all-Ireland inventory, and it was not possible to separate the faunal component of the Republic of Ireland from that of Northern Ireland. The value of an all-Ireland inventory is recognised; however, it is noted that this would require additional work beyond the scope of this contract, for marine species in particular. Where the numbers provided relate to the island of Ireland, rather than just the Republic, this is indicated as such.

Irish waters were taken to be represented by the Exclusive Economic Zone (EEZ) which generally covers an area 200 nautical miles from the coast; however, this is reduced where the Irish and UK EEZ

meet. The area covered by the Irish EEZ is shown in the map produced by the Marine Institute and available from the following website:

<http://www.maps.marine.ie/smv/default.aspx> - accessed September 2008

*Taxonomic scope*

In recent years, five kingdoms of life have been recognised: Animalia, Plantae, Fungi, Protista, and Monera. However, in their revision Cavalier-Smith (2004) recognised six kingdoms (Table 1). Several online classifications also recognise the Archaea as a separate kingdom (e.g. Encyclopedia of Life (2008), Species 2000 (2008)). Further discussion of the kingdoms of life is beyond the scope of this report.

The viruses are an additional group of organisms, which contain genes made from either DNA or RNA but which cannot grow or reproduce outside their hosts. The International Committee on Taxonomy of Viruses is charged with developing, refining, and maintaining a universal virus taxonomy. Discussion of viruses is beyond the scope of this report.

**Table 1. The six kingdoms of life according to Cavalier-Smith (2004)**

|                   |                          |
|-------------------|--------------------------|
| <hr/>             |                          |
| empire PROKARYOTA |                          |
|                   | <b>kingdom Bacteria</b>  |
| <hr/>             |                          |
| empire EUKARYOTA  |                          |
|                   | <b>kingdom Protozoa</b>  |
|                   | <b>kingdom Animalia</b>  |
|                   | <b>kingdom Fungi</b>     |
|                   | <b>kingdom Plantae</b>   |
|                   | <b>kingdom Chromista</b> |

The intention of this report is to provide a taxonomic inventory of the fauna of Ireland, and so the focus is on the Kingdom Animalia. However, a very brief introduction to the kingdoms Bacteria and Protozoa are provided for information.

*Species information*

Both the National Parks and Wildlife Service and the National Biodiversity Data Centre have populated their databases with taxonomic information from the Natural History Museum (NHM, 2007) of the UK and, where possible, this taxonomy has been followed. However, where current thinking or published checklists deviated from the NHM list, or where the NHM list was incomplete, alternative taxonomic hierarchies and nomenclature were followed, and these are indicated as such in the text. The authors recognise that the taxonomy used in this report may not always reflect the most recent scientific thinking, however a taxonomic revision was beyond the scope of this report and a pragmatic approach to nomenclature was therefore necessary.

Species numbers are taken to include species that are resident in Ireland, seasonal migrants and, in the case of birds, reptiles, fish and any mobile marine group, occasional vagrants. The inventory does include species that were introduced to Ireland, in historic and recent times; this is indicated in the text for some, but not all, groups. However, species that are only known from hothouses and other artificial environments but that have not established populations in the wild have not been included.

### *Chapter authors*

A number of authors were involved in the production of this report. Authors' names are provided at the start of each relevant section, and it is recommended that these names are used when citing this publication.

### **Species overview**

Purcell (1996) estimated the occurrence of at least 14,616 species in Ireland, a figure which he noted was likely to be an underestimate. This analysis revealed that there are at least 19,122 species of animal known to occur in Ireland, a figure which is also likely to be a significant underestimate of the number of species that actually occur. This 2008 figure is a 31% increase on the figure derived Purcell (1996), presumably as a reflection of the increased level of research undertaken on Irish biodiversity, as well as greater accessibility of this information.

Table 2 provides an overview of the number of species in Ireland, according to both Purcell (1996) and this review. The arthropods were the most speciose groups with 11,260 species of insect, 1,775 species of crustacean and 1,107 species of arachnid estimated to occur in Ireland. A relatively high number (1,088) of mollusc species have also been recorded. At the phylum level, the marine environment appeared to be the most diverse with many poorly known phyla known or likely to occur in Ireland.

The figures provided in this report are considered to be significant underestimate of the true number of species likely to occur. This is particularly true for marine groups especially deep sea taxa, and some parasitic groups. Many species records were not available in the published literature, but rather were reported in unpublished grey literature, much of which was not available when compiling this report. However, it is clear that Ireland is home to an interesting and diverse fauna in each of marine, terrestrial and freshwater habitats, with many species yet to be recorded in Ireland.

Table 2. Number of species in Ireland according to Purcell (1996) and 2008 estimates.

| Phylum           | Class                     | Number         |             |
|------------------|---------------------------|----------------|-------------|
|                  |                           | Purcell (1996) | 2008        |
| Kingdom Bacteria |                           |                | ?           |
| Kingdom Protozoa |                           | 614            | ?           |
| Kingdom Animalia |                           |                |             |
| Myxozoa          |                           | n/a            | ? (>2)      |
| Placozoa         |                           | n/a            | ?           |
| Porifera         |                           | 225            | 290         |
| Cnidaria         |                           | 263            | 302         |
| Ctenophora       |                           | 3              | 3           |
| Mesozoa          |                           | n/a            | ?           |
| Platyhelminthes  |                           | >254           | 300         |
| Gnathostomulida  |                           | n/a            | ?           |
| Gastrotricha     |                           | >3             | 6           |
| Rotifera         |                           | 315            | 306         |
| Kinorhyncha      |                           | 5              | 5           |
| Loricifera       |                           | n/a            | 0           |
| Cycliophora      |                           | n/a            | 0 – 2       |
| Acanthocephala   |                           | >13            | 14          |
| Entoprocta       |                           | <34            | 4           |
| Nematoda         |                           | 579            | 172         |
| Nemertea         |                           | 39             | 40          |
| Nematomorpha     |                           | 2              | 3           |
| Bryozoa          |                           | 199            | 206         |
| Phoronida        |                           | 4              | 1 – 3       |
| Brachipoda       |                           | >4             | 14          |
| Mollusca         |                           | 688            | 1088        |
| Priapulida       |                           | 1              | 1           |
| Sipuncula        |                           | <13            | 23          |
| Echiura          |                           | 6              | 7           |
| Annelida         | Polychaeta                | 342            | 404         |
|                  | Aphanoneura               | 2              | 2           |
|                  | Oligochaeta               | >160           | 179         |
|                  | Hirudinea                 | 14             | 32          |
| Tardigrada       |                           | 41             | 42          |
| Pogonophora      |                           | >15            | 1           |
| Arthropoda       | Arachnida                 | 860            | 1,109       |
|                  | Pycnogonida               | >19            | 20          |
|                  | Subphylum Crustacea       | 1774           | 1,775 (+2?) |
|                  | Subphylum Myriapoda       | 59             | 74          |
|                  | Entognatha                | 214            | 210         |
|                  | Insecta                   | 7,162          | 11,260      |
| Echinodermata    |                           | 73             | 192         |
| Chaetognatha     |                           | 14             | 15          |
| Hemichordata     |                           | <12            | 3           |
| Chordata         | Subphylum Urochordata     | <105           | 72          |
|                  | Subphylum Cephalochordata |                | 1           |
|                  | Myxini                    |                | 2           |
|                  | Cephalaspidomorphi        | 3              | 3           |
|                  | Elasmobranchii            |                | 55          |
|                  | Holocephali               |                | 5           |
|                  | Actinopterygii            | 243            | 363         |
|                  | Amphibia                  | 3              | 3           |
|                  | Reptilia                  | 1              | 7-8         |
|                  | Aves                      | 161-403        | 444         |
|                  | Mammalia                  | 55             | 62          |
| <b>Total</b>     |                           | >14,616        | >19,122     |

## International and national protection

A number of regulatory frameworks have been established with a focus on the conservation of biodiversity. The key species-related global, regional and national conventions, frameworks and legislation to which Ireland is a Party and/or has enacted are listed in Table 3. Implementation of each of these is generally coordinated by National Parks and Wildlife Service, though various other bodies (e.g. the police, customs) may be involved in their implementation. Discussion of some of the main instruments is provided in the sections below; however, further information can be found on the National Parks and Wildlife Service website at:

<http://www.npws.ie/en/Biodiversity/International/>

**Table 3. Main species related instruments and legislation**

| Scope               | Convention/legislation   | Irish species | Ireland Party |
|---------------------|--|---------------|---------------|
| International       | Convention on Biological Diversity   | n/a           | yes           |
|                     | Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)    | yes           | yes           |
|                     | Convention on Migratory Species (CMS)  | yes           | yes           |
|                     | Agreement on the Conservation of Populations of European Bats (EUROBATS)                   | yes           | yes           |
|                     | African Eurasian Waterbirds Agreement (AEWA)   | yes           | yes           |
|                     | Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)   | yes           | no            |
|                     | The Convention on Wetlands (RAMSAR)  | yes           | yes           |
|                     | OSPAR Convention (protection of the marine environment of North-Eastern Atlantic)          | yes           | yes           |
|                     | Convention on the conservation of European wildlife and natural habitats (Bern Convention) | yes           | yes           |
| European Union (EU) | EU Habitats Directive  | yes           | yes           |
|                     | EU Birds Directive   | yes           | yes           |
|                     | Water Framework Directive  | n/a           | yes           |
| National            | Wildlife (Amendment) Act 2000  | yes           | yes           |
|                     | Wildlife Act 1976  | yes           | yes           |
|                     | Whale Fisheries Act, 1937  | yes           | yes           |

### *Convention on Biological Diversity*

Ireland has been a Party to the Convention on Biological Diversity since 1996. This convention is a key global instrument for the conservation of biodiversity and the promotion of sustainable development. In April 2002, the Parties to the Convention, including Ireland, committed themselves “to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth.” The Conference of the Parties to the Convention “emphasized that national biodiversity strategies and action plans, as the primary mechanisms for the implementation of the Convention and the Strategic Plan, should be developed or reviewed” (CBD, 2007).

Ireland's first National Biodiversity Plan was launched in 2002 and sets out the framework through which Ireland will provide for the conservation and sustainable use of biodiversity over a five-year period. The second National Biodiversity Plan will be launched in 2009 and will build on the actions and achievements of the first plan.

Among the achievements of the first National Biodiversity Plan was the establishment of the National Biodiversity Data Centre in Waterford, the publication of Species Action Plans for a number of Irish species of highest conservation concern, and the preparation of Irish Red Data Lists for a number of animal groups, including bees and water beetles. Alongside the National Biodiversity Plans, many counties are publishing County Biodiversity Action Plans which focus on the description and conservation of biodiversity at a county level.

#### *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments that aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Ireland has been Party to CITES since 08 April 2002, and, in doing so, has undertaken to regulate trade in species that might be threatened by international trade. One hundred and one Irish species (as defined by the Convention, not this report) are listed in the Appendices to CITES, and permits are required to export or import these species, with stricter conditions in place for those listed in Appendix I of the Convention. CITES is implemented in the European Union through Council Regulation 338/97 and the implementing regulation Commission Regulation 865/2006.

#### *Convention on Migratory Species (CMS)*

The Convention on the Conservation of Migratory Species of Wild Animals (CMS) aims to conserve terrestrial, marine and avian migratory species throughout their range. Ireland has been Party to the CMS since 01 November 1983 and so has committed to strive towards the strict protection and conservation of animals listed in Appendix I of the Convention and their habitats. Ireland has also agreed to co-operate with other range States to protect migratory species listed in Appendix II of the Convention that need or would significantly benefit from international co-operation. Ireland is Party to two daughter agreements of CMS which are: the African Eurasian Waterbirds Agreement (AEWA) and the Agreement on the Conservation of Populations of European Bats (EUROBATS).

#### *European legislation*

The EU Habitats Directive is considered to be the single most important piece of legislation concerning the conservation of biodiversity in Ireland (NPWS, 2008a). This is complemented by the EU Birds Directive that affords equivalent protection for bird species. These Directives include powerful measures to designate protected areas for priority species and habitats, and elaborate on various other measures to be taken. Fifty eight species of Irish fauna are listed in the Habitats Directive (NPWS, 2008a).

#### *National legislation*

National protection is afforded to Irish biodiversity principally through the Wildlife Act, 1976 and the Wildlife Amendment Act, 2000. These provide statutory provisions for the protection of both flora and fauna and the control of activities which may impact adversely on the conservation of wildlife. The

EU Directives noted in section 2.2.4 are transposed into Irish law through a series of statutory instruments, known as ‘regulations’.

As well as the provisions outlined in the Wildlife Acts, the Whale Fisheries Act prohibits the hunting of all whale species, including dolphins and porpoises within the fisheries limits of the State, i.e. out to 200 miles from the coast. In 1991, Ireland declared its waters a whale and dolphin sanctuary, the first European sanctuary within the fishery limits of an entire country.

### Species of conservation concern

Biodiversity is under threat globally and Ireland is no exception. Most changes in the wildlife of Ireland have been the direct or indirect results of human activity, and the number of threatened species is increasing (Hawksworth, 2001).

The National Parks and Wildlife Service recently undertook an assessment of all habitats and species that are protected through the Habitats Directive and that are known to occur in Ireland (NPWS, 2008a). The assessment considered the range, population, suitable habitat and future prospects of protected species, and concluded on an overall assessment rating of good, poor, bad or unknown. A summary of the results of this assessment process for animals is provided in Table 4.

**Table 4. Assessment of the status of animals protected by the EU Habitats Directive (NPWS, 2008a)**

| Assessment             | Number of species |
|------------------------|-------------------|
| Good                   | 23                |
| Poor                   | 9                 |
| Bad                    | 7                 |
| Unknown                | 13                |
| Vagrant – not assessed | 6                 |

Another way of assessing the status of species is through the production of “red lists” whereby species are assessed against an agreed and standard set of criteria to determine whether or not they appear to be threatened.

### IUCN Red List

At an international level, species extinction risk is assessed through the IUCN Red List. The IUCN Red List status reflects a species risk of extinction at a global scale (i.e. across the species entire distribution) and may differ to the risk of extinction within Ireland alone. Three hundred and fifty three Irish species (as defined by IUCN Red List and not this report) are included in the 2008 IUCN Red List (IUCN, 2008). Of these, twenty seven species are threatened; nine Critically Endangered, seven Endangered and eleven Vulnerable (Table 5), there is also one extinct animal (*Pingus imprennis*, the Great Auk). The majority of Irish species in the IUCN Red List are vertebrates, which is due to the fact that all birds, mammals and amphibians species in the world and freshwater fishes of Europe have been assessed by IUCN; however, the vast majority animal species (the invertebrates) found in Ireland have not yet been assessed. The nine Critically Endangered species are: Balearic Shearwater *Puffinus mauretanicus*, Eskimo Curlew *Numenius borealis* (regionally extinct in Ireland), Angel Shark *Squatina squatina*, Blue Skate *Dipturus batis*, Common Sturgeon *Acipenser sturio* (possibly extinct from Ireland), European Eel *Anguilla anguilla*, Killarney Shad *Alosa killarnensis*, Melvin Charr *Salvelinus grayi* and Blunt-snouted Charr *Salvelinus obtusus*.

**Table 5. Number of Irish species assessed in the Global IUCN Red List and their threat category**

| Description            | IUCN Red List Category            | No. species |
|------------------------|-----------------------------------|-------------|
|                        | Extinct                           | 1           |
| Threatened             | Critically Endangered             | 9           |
|                        | Endangered                        | 7           |
|                        | Vulnerable                        | 11          |
| Lower risk             | Least Concern                     | 285         |
|                        | Lower Risk/conservation dependant | 3           |
|                        | NearThreatened                    | 20          |
| Not enough information | Data Deficient                    | 17          |
| <b>Total</b>           |                                   | <b>353</b>  |

### National Red lists

Nationally, a number of Irish red data books have been compiled, in particular for vertebrates, bees (Fitzpatrick *et al.*, 2006a), and water beetles (Foster *et al.*, 2009).

The Red Data book for vertebrates, which was compiled by Whilde (1993), indicated that 12 vertebrate species were Endangered, six were Vulnerable, 16 were Rare and a further eight had an Indeterminate status.

The red list for bees found that in Ireland six species are Critically Endangered, seven are Endangered, 16 are Vulnerable and 13 are Near Threatened, and three are Extinct (Fitzpatrick *et al.*, 2006a). In total, 101 species were assessed and the populations of more than half these had undergone substantial declines in their numbers since 1980.

### Threats

At a global level, the main direct drivers of ecosystem changes were reported by the Millennium Ecosystem Assessment (2005) to be:

- Terrestrial ecosystems: land cover change (in particular, conversion to cropland) and the application of new technologies
- Marine ecosystems: fishing
- Freshwater ecosystems: depending on the region, modification of water regimes, invasive species, and pollution, particularly high levels of nutrient loading
- Coast ecosystems: multiple drivers including fishing, pollution, habitat loss, invasive species etc.

This assessment noted that over the past four decades, excessive nutrient loading has emerged as one of the most important direct drivers of ecosystem change in terrestrial, freshwater, and marine ecosystems. A further five indirect drivers of changes in ecosystems and their services: population change, change in economic activity, sociopolitical factors, cultural factors, and technological change (Millennium Ecosystem Assessment, 2005).

In Ireland, the main drivers of biodiversity loss were reported to be habitat degradation and habitat loss (National Biodiversity Plan, 2002). Recently, National Parks and Wildlife Service (NPWS, 2008a) identified the following key threats to habitats and species protected through the EU Habitats Directive:

- Direct damage to habitats e.g. peat cutting, building, reclamation of wetlands, removal of sand and gravel etc.
- Overgrazing and undergrazing
- Pollution
- Unsustainable exploitation
- Invasive alien species
- Recreational pressure

### **Biodiversity information management**

The National Biodiversity Data Centre, established in January 2007, will bring together data on Ireland's species in one central database and become the hub for biodiversity data exchange in Ireland. One of the objectives of the Centre is to establish a series of biological baselines. A starting point for this is compiling existing data on biological groups to form National Databases. National Databases that the Centre are currently compiling on a partnership basis with experts and expert organisations include water beetles, non-marine molluscs, butterflies and moths, cetaceans, and vegetation. There are also National Databases being held by various other organisations, including dragonflies, marine molluscs, and lichens (CEDaR in Northern Ireland), algae (NUI, Galway), butterflies (Dublin Naturalists' Field Club), moths (MothsIreland), birds (BirdWatch Ireland), bats (Bat Conservation Ireland), and frogs (Irish Peatland Conservation Council).

The National Parks and Wildlife Service maintain extensive databases for most rare and threatened species found in Ireland, particularly those listed under national or European legislation. A checklist of all species considered protected (i.e. national or European legislation) or rare (i.e. red listed) is maintained by NPWS and is available from their website ([www.npws.ie/en/datapolicy](http://www.npws.ie/en/datapolicy)).

Invertebrate Ireland is an on-line resource, which provides up-to-date checklists for some of Ireland's freshwater and terrestrial invertebrates, alongside the information that validates the presence of a species on the Irish list. The website is a valuable tool for conservation planners, researchers, and anybody interested in Ireland's biodiversity.

Europe-wide databases have also been established with the intention of collecting taxonomic and distribution information on the species of Europe. *Fauna Europaea* (2004) and the *European Register of Marine Species* (Costello *et al.*, 2008), which cover freshwater/terrestrial and marine species respectively, were set up with funding from the European Commission, and provide a valuable resource.

## SPECIES INVENTORY

### KINGDOM BACTERIA (MONERA)

Ferriss, S. E.

Usually invisible to the naked eye, the bacteria were the earliest organisms on Earth and have been evolving for at least 3.5 billion years (Campbell, 1990). They are primarily unicellular organisms, although some cyanobacteria do have a simple multi-cellular organization of two or three types of specialized cells, and they are distinguished by the presence of a prokaryotic cell (Campbell, 1990). Many people will be familiar with bacteria as one of the causes of human and animal disease; however, bacteria also play a more positive role, as represented by species that produce antibiotics such as streptomycin, and other species that are important components of the gut (and elsewhere) of animals including humans. Bacteria are ubiquitous, occurring in every habitat and ecosystem known. Whitman *et al.* (1998) estimated the number of prokaryotes on earth to be approximately  $4-6 \times 10^{30}$  cells.

Between 100,000 to 10 million species have been estimated to occur (Hammond, 1995 cited in Whitman *et al.*, 1998). However, Whitman *et al.* (1998) noted that “the absence of detailed knowledge of prokaryotic diversity was a major omission in our knowledge of life on earth.” It is not known how many British species of bacteria there are (NHM, 2007) and similarly the number of Irish species is not known. Purcell (1996) stated that the “estimated number of species in Ireland is in the order of 50,000 to 100,000 (pers. comm. Dr. R. Powell)”.

## KINGDOM PROTOZOA

Ferriss, S. E. and Inskipp, T. P.

The Protozoa are eukaryotic (i.e. their cells have a membrane enclosed nucleus and membrane enclosed organelles) and as such are more complex than the prokaryotic bacteria (Campbell, 1990). They vary so much in cellular anatomy, ecological roles, and life cycles that few general characteristics can be found without citing exceptions (Campbell, 1990). All Protozoa are aquatic, including those that live in the soil and many are microaerobic. They are also very abundant, for example one gramme of soil may contain 10,000 to 10 million amoebae (Finlay, 2001).

There has been some debate as to the classification of this group and the taxa within it. Cavalier-Smith (2004) included the following in the kingdom:

Subkingdom Sarcomastigota [= Subphylum Mastigophora (part) *sensu* Purcell, 1996]

+ Phylum Amoebozoa

+ Phylum Choanozoa

Subkingdom Biciliata

+ Infrakingdom Rhizaria [= subphylum Sarcodina *sensu* Purcell, 1996]

+ Phylum Cercozoa [= Order Rhizopoda *sensu* Purcell, 1996]

+ Phylum Foraminifera [= Order Foraminifera *sensu* Purcell, 1996]

+ Phylum Radiozoa [= Order Radiolaria *sensu* Purcell, 1996]

+ Infrakingdom Excavata [= Subphylum Mastigophora (part) *sensu* Purcell, 1996]

+ Phylum Loukozoa

+ Phylum Percolozoa

+ Phylum Euglenozoa

+ Phylum Metamonada (now includes Parabasalia and Anaeromonadea)

+ Infrakingdom Alveolata

+ Phylum Myxozoa [= Phylum Microsporida *sensu* Purcell, 1996]

+ Phylum Ciliophora

Subkingdom Biciliata *incertae sedis*

+ Phylum Apusozoa (may be sister to Excavata)

+ Phylum Heliozoa [= Order Heliozoa *sensu* Purcell, 1996]

An estimate of 10,000 to 15,000 species worldwide was provided by Finlay (2000, in Finlay, 2001). Finlay (2001) noted that most species of Protozoa are probably ubiquitous, that their global number is modest and that a distinctive British protozoan fauna probably does not exist. The number of species in Ireland can therefore be assumed to include a large proportion of the global total. Purcell (1996) noted records for 614 species, although a few of these were non-specific and had no reference source, others are not protozoans (e.g. *Opalina ranarum* is an alga), and 11 species of Ciliophora were recorded only from Northern Ireland. Purcell (1996) gave details for 555 species recorded for the Republic of

Ireland that are now considered to be Protozoa: six species of Amoebozoa, five species of Choanozoa, 30 species of Euglenozoa, one species of Metamonada, and 39 species of Ciliophora (Dunkerly, 1913), 50 species of Cercozoa (Hopkinson, 1910), 287 species of marine Foraminifera (Heron-Allen and Earland, 1913), 94 species of Amoebozoa, 38 species of Cercozoa, one species of Choanozoa, one species of Foraminifera, and three species of Heliozoa (Wailes and Penard, 1913). Other species recorded include the parasites *Babesia divergens* (Phylum Myzozoa) (Gray and Harte, 1985), *Plasmodium falciparum* and *P. vivax* (Phylum Myzozoa) (Anon., 2004), *Cryptosporidium parvum* (Phylum Myzozoa) (Corbett-Feeny, 1987), *Neoparamoeba pemaquidensis* (Phylum Amoebozoa) (Munday *et al.*, 2002), *Entamoeba coli* (Phylum Amoebozoa) (Anon., 2004), *Giardia lamblia* (Phylum Metamonada) (Anon., 2004), and the introduced freshwater species *Ophryoglena hemophaga* and *Conchophthirus acuminatus* (both Phylum Ciliophora) (Minchin, 2007 a).

## KINGDOM ANIMALIA

### Phylum Myxozoa

Ferriss, S. E.

The Myxozoa are microscopic metazoan parasites with an extremely reduced body. They are parasites of fishes, worms (oligochaetes and polychaetes), bryozoans (Fiala, 2008), mammals (Prunescu *et al.*, 2007) and birds (Bartholomew *et al.*, 2008). These species have become increasingly important as parasites, particularly relating to the expansion of fin fish aquaculture in the 1990s, and several marine myxozoans have been recognized or elevated in status as pathological agents (Kent *et al.*, 2005).

Myxozoans were considered to be protists until recently but were transferred to the Kingdom Animalia in a radical overhaul of protozoan systematics that lasted for three decades (Cavalier-Smith, 2006). However, the systematic position within the Metazoa remains unclear (Fiala, 2008). On the basis of an analysis of rDNA gene sequence data, Kent *et al.* (2005) concluded that the Myxozoa are closely related to the Cnidaria, a relationship they noted was supported by morphological data.

Fiala (2008) summarised the Myxozoa as follows: “Myxozoa Grassé, 1970 contains two classes: Malacosporea Canning, Curry, Feist, Longshaw et Okamura, 2000 and Myxosporea Bütschli, 1881. Malacosporea includes only two genera (*Tetracapsuloides* and *Buddenbrockia*) with a total of three described species. Myxosporea includes about 2200 species in 60 genera. “

Costello *et al.* (2008) listed 212 species in European waters; these are all in the Class Myxosporea, with the majority (200) from the Order Bivalvulida and the remaining 12 included in the Order Multivalvulida. It is not known how many of these species occur in Irish waters, although details for two species have been traced: *Kudoa thyrsites* (Family Kudooidae) (Kent *et al.*, 2001) and *Myxobolus cerebralis* (Family Myxobolidae) (O’Brien, 1976). Purcell (1996) did not include this group in his report nor is the group included in NHM (2007).

## Phylum Placozoa

Ferriss, S. E.

The phylum Placozoa is a poorly known group of simple animals. They have the smallest amount of DNA ever measured for any type of animal and their bodies are made up of a few thousand cells of just four types (Collins, 2000). They are transparent, flat, round (up to 3 millimetres across), and have two distinct sides (Collins, 2000).

Two species of Placozoa have been described, *Trichoplax adhaerens* and *Treptoplax reptans*. Both are listed as occurring in European waters by Costello *et al.* (2008) and Hansson (1997). The UK Natural History Museum Species Dictionary noted two British species (NHM, 2007). Collins (2000) noted that *Treptoplax reptans* has not been seen since its description in 1896, casting doubts on its validity, but that *Trichoplax adhaerens* has been reported from many tropical and subtropical locations around the world, including the Mediterranean Sea.

No Irish records for this phylum were identified.

## Phylum Porifera

Smith, K. G.

Porifera represent the simplest form of multi-cellular organisms, and do not possess true tissues, muscles, organs or a nervous system (Dyrynda and Dyrynda 1990). They are sessile aquatic animals, mostly marine and feed by filtering detritus particles, plankton and bacteria on water currents created by special cells with flagellae called choanocytes (Myers, 2001b). They can reproduce sexually or asexually. There are three body forms; asconoid (simple tube perforated by pores), syconoid (similar to asconid but have thicker walls and more complex pores/canals) and leuconoid (largest and most complex body type with canals and chambers). There are currently 8,192 valid species of sponges worldwide (van Soest *et al.*, 2008), of those there are an estimated 150 freshwater species (Myers, 2001b).

There is no acceptable system of higher taxonomic classification available for the Porifera (Picton *et al.*, 1997) and, therefore, for marine species this report follows Picton *et al.* (1997), Ackers *et al.* (2007) and the World Porifera Database (van Soest *et al.*, 2008). For freshwater species Fauna Europaea (2004) was followed. The phylum is divided into three classes, Calcarea, Hexactinellida and Demospongiae (includes Sclerospongiae); all three are represented in Irish waters.

References for 290 species of Porifera have been found for the Republic of Ireland and its EEZ, and this most likely represents a large underestimate of true species diversity. Picton and Goodwin (2007) recorded 128 Porifera species from Rathlin Island, Northern Ireland, eight of which were new species to science and 29 were new to Britain and Ireland. This brings the total number of sponges recorded from Rathlin Island to 134 (Picton and Goodwin, 2007). Note that these species were not included in the tables below unless a reference verifying their occurrence in the Republic of Ireland was identified.

### Class Calcarea

Calcarea, the calcareous sponges, are thought to be the most primitive group of sponges. They are exclusively marine, usually in waters less than 1,000 metres deep and found mainly in temperate regions (Mulcrone, 2005a). This is the only class that contains all three sponge body forms. There are currently 670 valid species worldwide (van Soest *et al.*, 2008).

References for 31 species of Calcarea in Irish waters (EEZ) have been identified (Table 6).

**Table 6. Number of species in the Class Calcarea known to occur in Ireland.**

| Order         | Family          | No. species | References  |
|---------------|-----------------|-------------|---|
| Clathrinida   | Clathrinidae    | 6           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Picton and Costello (1998); Shin (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (1981)                                 |
|               | Soleneiscidae   | 1           | van Soest <i>et al.</i> (2007)  |
|               | Levinellidae    | 1           | van Soest <i>et al.</i> (2007)  |
|               | Leucaltidae     | 1           | van Soest <i>et al.</i> (2007)  |
|               | Leucascidae     | 1           | van Soest <i>et al.</i> (2007)  |
|               | Leucettidae     | 1           | van Soest <i>et al.</i> (2007)  |
| Leucosolenida | Leucosoleniidae | 4           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Shin (1981); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008) |

| Order                  | Family         | No. species | References   |
|------------------------|----------------|-------------|--|
|                        | Sycettidae     | 5           | Boaden <i>et al.</i> (1976); Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Shin (1981); Stephens (1912); van Soest and Weinberg (1980); van Soest <i>et al.</i> (1981)           |
|                        | Grantiidae     | 4           | Boaden <i>et al.</i> (1976); Costello <i>et al.</i> (1986); Konnecker (1973); Konnecker and Keegan (1987); Picton and Costello (1998); Stephens (1912); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008) |
|                        | Jenkinidae     | 1           | van Soest <i>et al.</i> (2007)   |
| Baerida                | Baeridae       | 5           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981)   |
| Lithonida              | Minchinellidae | 1           | van Soest <i>et al.</i> (2007)   |
| <b>Total species =</b> |                | <b>31</b>   |  |

### Class Hexactinellida

The hexactinellids, or glass sponges, mostly occur at depths of between 200 and 1000 metres and possess sturdy skeletons made entirely of silica (fused spicules). Unlike species from the other classes, glass sponges cannot contract in response to external stimuli; however, they possess the ability to send electrical impulses across their bodies (Atwater and Fautin, 2001). The class includes only the leuconoid form of sponges. There are currently 565 valid species of glass sponges (van Soest *et al.*, 2008).

Seven species of Hexactinellida are recorded from Irish waters (EEZ) by van Soest *et al.* (2007) (Table 7). The location of these species records was at the western limit of the Irish EEZ in the southern Rockall Bank.

**Table 7. Number of species in the Class Hexactinellida known to occur in Ireland.**

| Order                  | Family           | No. species | References                     |
|------------------------|------------------|-------------|--------------------------------|
| Hexactinosida          | Aphrocallistidae | 1           | van Soest <i>et al.</i> (2007) |
|                        | Euplectellidae   | 1           | van Soest <i>et al.</i> (2007) |
|                        | Tretodictyidae   | 1           | van Soest <i>et al.</i> (2007) |
| Lyssacosida            | Leucopsacidae    | 2           | van Soest <i>et al.</i> (2007) |
|                        | Rossellidae      | 2           | van Soest <i>et al.</i> (2007) |
| <b>Total species =</b> |                  | <b>7</b>    |                                |

### Class Demospongiae

The Demospongiae, horny sponges, is the most speciose class of Porifera, containing about 6,955 species worldwide (van Soest *et al.*, 2008). They are mostly found in the marine environment from the intertidal to the abyssal zone; however, there are also some freshwater species. Demospongiae are asymmetrical and they range in size from a few millimetres to over 2 metres (Wheeler, 2001). The class includes only the leuconoid form of sponges.

References for 252 species of Demospongiae in Irish marine (EEZ) and fresh waters were identified (Table 8). This includes five freshwater species from the Family Spongillidae.

**Table 8. Number of species in the Class Desmospongiae known to occur in Ireland.**

| Order             | Family           | No. species | References   |
|-------------------|------------------|-------------|--|
| Homosclerophorida | Plakinidae       | 5           | Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
| Astrophorida      | Pachastrellidae  | 4           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); Stephens (1917); van Soest <i>et al.</i> (2007)  |
|                   | Theneidae        | 1           | Stephens (1917); van Soest <i>et al.</i> (2007)  |
|                   | Ancorinidae      | 4           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)   |
|                   | Geodiidae        | 6           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)   |
| Spirophorida      | Tetillidae       | 2           | Picton and Costello (1998)   |
| Hadromerida       | Tethyidae        | 1           | Costello <i>et al.</i> (1986); Picton and Costello (1998); van Soest <i>et al.</i> (1981)  |
|                   | Suberitidae      | 10          | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Stephens (1917); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
|                   | Polymastiidae    | 11          | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); Picton <i>et al.</i> (1997); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
|                   | Clionaidae       | 6           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Stephens (1917); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
|                   | Timeidae         | 1           | Stephens (1912)  |
|                   | Hemiasterellidae | 5           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)   |
| Chondrosida       | Chondrillidae    | 1           | Konnecker and Keegan (1987); Picton and Costello (1998)  |
| Poecilosclerida   | Raspailiidae     | 15          | Costello <i>et al.</i> (1986); Farran <i>et al.</i> (1915); Konnecker and Keegan (1987); Picton (1991); Picton and Costello (1998); Stephens (1912); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)                              |
|                   | Rhabderemiidae   | 1           | van Soest <i>et al.</i> (2007)   |
|                   | Microcionidae    | 19          | Bell (2003); Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Picton and Costello (1998); Picton and Goodwin (2007); Stephens (1917); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van |

| Order         | Family          | No. species | References  |
|---------------|-----------------|-------------|---|
|               |                 |             | Soest <i>et al.</i> (2008)  |
|               | Chondropsidae   | 1           | van Soest <i>et al.</i> (2007)  |
|               | Coelosphaeridae | 7           | Keegan <i>et al.</i> (1987); Lilly <i>et al.</i> (1953); Stephens (1917); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
|               | Cladorhizidae   | 3           | van Soest <i>et al.</i> (2007)  |
|               | Desmacididae    | 1           | Stephens (1917); Konnecker and Keegan (1987)  |
|               | Tedaniidae      | 1           | van Soest (1987)  |
|               | Myxillidae      | 9           | Costello <i>et al.</i> (1986); Lilly <i>et al.</i> (1953); Picton and Costello (1998); Konnecker and Keegan (1987); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
|               | Iotrochotidae   | 1           | van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
|               | Hymedesmiidae   | 43          | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Picton (1991); Picton and Costello (1998); Stephens (1917); van Soest (1987); van Soest and Weinberg (1980); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008) |
|               | Crellidae       | 5           | Keegan <i>et al.</i> (1987); Picton and Costello (1998); van Soest <i>et al.</i> (2007)   |
|               | Mycalidae       | 9           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); Stephens (1912); Stephens (1917); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
|               | Hamacanthidae   | 2           | van Soest <i>et al.</i> (2007)  |
|               | Desmacellidae   | 5           | Konnecker (1973); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)   |
|               | Esperiopsidae   | 6           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
|               | Isodictyidae    | 1           | Konnecker (1973)  |
|               | Latrunculiidae  | 2           | van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
| Halichondrida | Axinellidae     | 8           | Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and Costello (1998); van Soest (1987); van Soest <i>et al.</i> (2008)   |
|               | Bubaridae       | 2           | Picton and Costello (1998); van Soest <i>et al.</i> (2007)  |
|               | Desmoxyidae     | 3           | Picton and Costello (1998); van Soest (1987); van Soest <i>et al.</i> (2007); van Soest <i>et al.</i> (2008)  |
|               | Halichondriidae | 6           | Konnecker and Keegan (1987); Lynch <i>et al.</i> (2006); Picton and   |

| Order          | Family                 | No. species | References  |
|----------------|------------------------|-------------|---|
|                | Hymeniacionidae        | 3           | Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)   |
|                | Dictyonellidae         | 3           | Picton and Costello (1998); Kirkpatrick (1907); Konnecker and Keegan (1987); Stephens (1917); van Soest (1987); van Soest <i>et al.</i> (1981)  |
|                | Heteroxyidae           | 3           | Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
| Haplosclerida  | Chalinidae             | 17          | Costello <i>et al.</i> (1986); Kirkpatrick (1907); Konnecker and Keegan (1987); Lilly <i>et al.</i> (1953); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Stephens (1912); Stephens (1917); van Soest and Weinberg (1980); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007) |
|                | Phloeodictyidae        | 2           | Stephens (1917); van Soest <i>et al.</i> (2007)   |
|                | Niphatidae             | 1           | van Soest <i>et al.</i> (2007)  |
|                | Spongillidae           | 5           | Stephens (1920); Fauna Europaea (2004)  |
| Dictyoceratida | Dysideidae             | 4           | Bell (2001a); Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); Shin (1981); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)   |
| Dendroceratida | Darwinellidae          | 4           | Costello <i>et al.</i> (1986); Konnecker and Keegan (1987); Picton and Costello (1998); van Soest <i>et al.</i> (1981); van Soest <i>et al.</i> (2007)  |
| Halisarcida    | Halisarcidae           | 1           | Picton and Costello (1998); van Soest <i>et al.</i> (1981); Konnecker and Keegan (1987); Costello <i>et al.</i> (1986)  |
| Verongida      | Ianthellidae           | 2           | Picton and Costello (1998); van Soest <i>et al.</i> (2007)  |
|                | <b>Total species =</b> | <b>252</b>  |   |

## Phylum Cnidaria

Ferriss, S. E.

The Cnidaria is a diverse group that contains the jellyfishes, sea anemones and corals. Although primarily a marine group, a few genera in the Class Hydrozoa occur in freshwater. Two basic structural types of Cnidaria are recognized: sessile polyps and free-living medusa, and cnidarians may be exclusively medusoid, exclusively polypoid or may have both polypoid and medusoid phases (Cornelius *et al.*, 1990). All cnidarians are characterised by the presence of stinging capsules of varying types which are called cnidae or nematocysts (Cornelius *et al.*, 1990).

The higher taxonomy of the Cnidaria, in particular the Hydrozoa, Scyphozoa and Staurozoa, has been the subject of numerous revisions. In this report, Staurozoa and Scyphozoa are recognized as classes following Collins *et al.* (2006), and Anthozoa is recognized as a superclass following Cornelius *et al.* (1997). The orders and families of these three groups follow Cornelius *et al.* (1997) which concurs with the UK Natural History Museum Species Dictionary, with the addition of the anthozoan families Actinoscyphiidae, Acanthogorgiidae, Fungiacyathidae, Halcuriidae, and Isididae (following Costello *et al.* (2008)). Hydrozoa is also considered to be a superclass following Cornelius *et al.* (1997) and Bouillon *et al.* (2006), with three classes (Automedusa, Hydroidomedusa and Polpodiozoa) following Bouillon *et al.* (2006). Order and family level for the Hydrozoa also follow Bouillon *et al.* (2006).

The changing nature of the taxonomy and nomenclature in this group has meant that many records of Cnidaria in Ireland have been published using different names to refer to the same taxa. Every effort was made to exclude synonyms and invalid taxa; however, it is likely that all such cases have not been resolved. Additionally a number of older records related to names not currently considered valid; many of these were excluded because it was not possible to easily resolve whether they are now recognised using an alternative name or whether they are in fact invalid taxa. It is also likely that records have been overlooked, in particular recent survey work which may not have yet been published. Bearing this in mind, records were found for the occurrence of 302 species of Cnidaria in Ireland, although this can be considered to be an underestimate of the true Irish diversity. This compares with the figure of 263 estimated by Purcell (1996).

### Class Staurozoa

This sessile group contains the benthic, so-called stalked jellyfish (Collins *et al.*, 2006). Six species from two families and one order are known to occur in Irish waters (Table 9).

**Table 9. Number of species in the Class Staurozoa known to occur in Ireland.**

| Order                  | Family            | No. species | References   |
|------------------------|-------------------|-------------|--|
| Stauromedusae          | Cleistocarpidae   | 1           | Stephens (1905)  |
|                        | Eleutherocarpidae | 5           | Cornelius <i>et al.</i> (1990); Dale (in prep.); Picton and Costello (1998); Stephens (1905) |
| <b>Total species =</b> |                   | <b>6</b>    |  |

### Class Scyphozoa

This marine group contains the jellyfish, in which the pelagic medusoid stage predominates and the sessile polyp is usually small (Cornelius *et al.*, 1990). At least six species from four families and two orders are known to occur in Irish waters (Table 10).

**Table 10. Number of species in the Class Scyphozoa known to occur in Ireland.**

| Order                  | Family          | No. species | References   |
|------------------------|-----------------|-------------|--|
| Semaestomeae           | Pelagiidae      | 2           | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Doyle <i>et al.</i> (2007); Doyle <i>et al.</i> (2008); Oliver and Healy (1998); Ryan <i>et al.</i> (1986); Tully (1987)  |
|                        | Cyaneidae       | 2           | Ballard and Myers (2000); Doyle <i>et al.</i> 2007; Hillis (1967); O’Riordan (1979); Stephens (1905)   |
|                        | Ulmaridae       | 1           | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Doyle <i>et al.</i> (2007); Fauna Europea (2004); Healy <i>et al.</i> (1982); Oliver and Healy (1998); Picton and Costello (1998); Ryan <i>et al.</i> (1986); Stephens (1905) |
| Rhizostomeae           | Rhizostomatidae | 1           | Boyd <i>et al.</i> (1973); O’Connor and McGrath (1978); O’Riordan (1977); O’Riordan (1979)   |
| <b>Total species =</b> |                 | <b>6</b>    |  |

### Superclass Hydrozoa

The Hydrozoa contains species that have both polyp and pelagic, free-living stages. However, they differ from the scyphozoa, in that the medusa is generally small, while the polyp tends to propagate into conspicuous colonies (Cornelius *et al.*, 1990).

Bouillon *et al.* (2006) recognize the three classes (Automedusa, Hydroidomedusa and Polpodiozoa) in the superclass Hydrozoa. In total, 196 species from 49 families and at least eight orders are known to occur in Irish waters (Tables 11 and 12).

**Table 11. Number of species in the Class Automedusa known to occur in Ireland.**

| Subclass               | Family           | No. Species | References  |
|------------------------|------------------|-------------|---|
| Narcomedusae           | Aeginidae        | 2           | Hansson (1998c)   |
|                        | Cuninidae        | 1           | Hansson (1998c)   |
|                        | Solmarisidae     | 1           | Ballard and Myers (2000); Boyd <i>et al.</i> (1973)   |
| Trachymedusae          | Halicutidae      | 2           | Hansson (1998c)   |
|                        | Rhopalonematidae | 5           | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Fauna Europea (2004); Hansson (1998c); Ryan <i>et al.</i> (1986) |
| <b>Total species =</b> |                  | <b>11</b>   |   |

Table 12. Number of species in the Class Hydroidomedusa known to occur in Ireland.

| Order          | Family             | No. species   | References  |
|----------------|--------------------|---------------|---|
| Filifera       | Bougainvilliidae   | 10            | Ballard and Myers (1996); Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Cornelius <i>et al.</i> (1990); Costelloe <i>et al.</i> (1986); Davidson (2004); Dineen <i>et al.</i> (1986); Picton and Costello (1998); Ryan <i>et al.</i> (1986); Stephens (1905)                       |
|                | Clavidae           | 5             | Boyd <i>et al.</i> (1973); Healy <i>et al.</i> (1982); Minchin (2007 a); Oliver and Healy (1998); Picton and Costello (1998); Stephens (1905)   |
|                | Hydractiniidae     | 4             | Fauna Europea (2004); Hansson (1998c); Picton and Costello (1998); Stephens (1905)  |
|                | Stylasteridae      | 1             | Henry and Murray Roberts (2007)   |
|                | Rathkeidae         | 1             | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Ryan <i>et al.</i> (1986)  |
|                | Eudendriidae       | 7             | Boero and Cornelius (1987); Bourne (1890); Duerden (1894a); O’Riordan (1975a); Picton and Costello (1998); Stephens (1905)  |
|                | Pandeidae          | 5             | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Hansson (1998c); Stephens (1905)   |
|                | Proboscidactylidae | 1             | Ballard and Myers (1997); Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Cornelius <i>et al.</i> (1990); Ryan <i>et al.</i> (1986)  |
|                | Hydridae           | 2             | Fauna Europaea (2004)   |
|                | Capitata           | Candelabridae | 1   |
| Cladonematidae |                    | 1             | Cornelius <i>et al.</i> (1990); Stephens (1905)   |
| Corymorphidae  |                    | 2             | Boyd <i>et al.</i> (1973); Picton and Costello (1998); Ryan <i>et al.</i> (1986); Stephens (1905)   |
| Corynidae      |                    | 10            | Ballard and Myers (2000); Boyd (1972); Boyd <i>et al.</i> (1973); Picton and Costello (1998); Rees (1939); Ryan <i>et al.</i> (1986); Stephens (1905)   |
| Tubulariidae   |                    | 5             | Ballard and Myers (2000); Bourne (1890); Boyd <i>et al.</i> (1973); Cornelius <i>et al.</i> (1990); Costelloe <i>et al.</i> (1986); Davidson (2004); Fauna Europea (2004); Picton and Costello (1998); Ryan <i>et al.</i> (1986); Stephens (1905); Stephens and Buchanan-Wollaston (1907) |
| Porpitidae     |                    | 1             | Boyd <i>et al.</i> (1973); McGrath (1985); Picton and Costello (1998)   |
| Zanclidae      |                    | 1             | Boyd <i>et al.</i> (1973)   |
| Calycophorida  | Diphyidae          | 16            | Ballard and Myers (2000); Boyd (1972); Boyd <i>et al.</i> (1973); Hansson (1998c); Jeal and West (1970); Kirkpatrick and Pugh (1984)  |
|                | Hippopodiidae      | 4             | Hansson (1998c); Kirkpatrick and Pugh (1984)  |
|                | Abylidae           | 1             | Hansson (1998c)   |
|                | Prayidae           | 3             | Hansson (1998c); Fautin (2007); Kirkpatrick and Pugh (1984); Tyler and Zibrowius (1992)   |
| Conica         | Aequoreidae        | 4             | Ballard and Myers (2000); Boyd <i>et al.</i> (1973); Cornelius (1995); West and Jeal (1976)   |
|                | Aglaopheniidae     | 8             | Cornelius (1995); Cornelius <i>et al.</i> (1990); Dineen <i>et al.</i> (1986); Duerden (1894 a); Picton   |

| Order | Family            | No. species | References   |
|-------|-------------------|-------------|--|
|       | Campanulinidae    | 3           | and Costello (1998)<br>Cornelius (1995); Costelloe <i>et al.</i> (1986); Dineen <i>et al.</i> (1986); Duerden (1894 a); Fauna Europea (2004); Henry and Murray Roberts (2007); Stephens (1905)   |
|       | Dipleurosomatidae | 1           | Cornelius (1995)   |
|       | Eirenidae         | 6           | Boyd <i>et al.</i> (1973); Cornelius (1995); Fauna Europea (2004); Ryan <i>et al.</i> (1986)   |
|       | Haleciidae        | 8           | Cornelius (1995); Costelloe <i>et al.</i> (1986); Davidson (2004); Dineen <i>et al.</i> (1986); Duerden (1894a); Henry and Murray Roberts (2007); Keegan <i>et al.</i> (1987); Picton and Costello (1998); Stephens (1905); Stephens and Buchanan-Wollaston (1907)   |
|       | Halopterididae    | 1           | Henry and Murray Roberts (2007); Picton and Costello (1998)  |
|       | Kirchenpaueriidae | 3           | Henry and Murray Roberts (2007); Picton and Costello (1998)  |
|       | Lafoeidae         | 7           | Dineen <i>et al.</i> (1986); Duerden (1894a); Henry and Murray Roberts (2005); Henry and Murray Roberts (2007) Picton and Costello (1998); Stephens (1905)   |
|       | Laodiceidae       | 1           | Boyd <i>et al.</i> (1973); Cornelius <i>et al.</i> (1997); Ryan <i>et al.</i> (1986)   |
|       | Lovenellidae      | 1           | Boyd <i>et al.</i> (1973); Cornelius (1995); Cornelius <i>et al.</i> (1990); Dineen <i>et al.</i> (1986); Fauna Europea (2004); Stephens (1905)  |
|       | Melicertidae      | 1           | Boyd <i>et al.</i> (1973); Cornelius (1995)  |
|       | Mitrocomidae      | 3           | Boyd <i>et al.</i> (1973); Cornelius (1995)  |
|       | Phialellidae      | 2           | Ballard and Myers (2000); Boyd (1972); Boyd <i>et al.</i> (1973); Dineen <i>et al.</i> (1986); Fauna Europea (2004); Ryan <i>et al.</i> (1986); Stephens (1905)  |
|       | Plumulariidae     | 6           | Costelloe <i>et al.</i> (1986); Dineen <i>et al.</i> (1986); Henry and Murray Roberts (2007); Picton and Costello (1998); Stephens (1905)  |
|       | Sertulariidae     | 22          | Bourne (1890); Cornelius (1995); Cornelius <i>et al.</i> (1990); Costelloe <i>et al.</i> (1986); Davidson (2004); Dineen <i>et al.</i> (1986); Duerden (1894a); Henry and Murray Roberts (2007); Oliver and Healy (1998); O'Sullivan (1983); Picton and Costello (1998); Stephens (1905); Stephens and Buchanan-Wollaston (1907) |
|       | Tiarannidae       | 2           | Hansson (1998c); Henry and Murray Roberts (2007)   |
|       | Tiaropsidae       | 2           | Boyd <i>et al.</i> (1973); Cornelius (1995); Könnecker and Keegan (1983); Keegan <i>et al.</i> (1987); Stephens (1905)   |

| Order                  | Family          | No. species | References  |
|------------------------|-----------------|-------------|---|
| Proboscoida            | Campanulariidae | 15          | Ballard and Myers (2000); Cornelius (1995); Cornelius <i>et al.</i> (1990); Costelloe <i>et al.</i> (1986); Davidson (2004); Dineen <i>et al.</i> (1986); Duerden (1894a); Fauna Europea (2004); Hansson (1998c); Henry and Murray Roberts (2007); Oliver and Healy (1998); Picton and Costello (1998); Stephens (1905); Stephens and Buchanan-Wollaston (1907) |
|                        | Olindiidae      | 2           | Fauna Europea (2004); Hansson (1998c)   |
| Cystonectae            | Physaliidae     | 1           | Atkins (1959); Boyd <i>et al.</i> (1973); Friel (1995); Jeal and West (1970); Kirkpatrick and Pugh (1984);  |
| Physonectae            | Agalmatidae     | 2           | Boyd <i>et al.</i> (1973); Jeal and West (1970); Kirkpatrick and Pugh (1984); Ryan <i>et al.</i> (1986)   |
|                        | Apolemiidae     | 1           | Minchin (1987b)   |
|                        | Forskaliidae    | 1           | Kirkpatrick and Pugh (1984)   |
|                        | Physophoridae   | 1           | Jeal and West (1970)  |
| <b>Total species =</b> |                 | <b>185</b>  |   |

### Superclass Anthozoa

The Anthozoa are a well-known group which contain the relatively familiar hard and soft corals, and the anemones. The taxonomy of this group is relatively stable, although there are continual additions to the fauna as little-known species and species known previously only from outside the area are recorded (Cornelius *et al.*, 1997).

### Class Octocorallia

The Octocorallians are colonial species, with eight tentacles arranged in a single cycle (Cornelius *et al.*, 1990). Twelve species from seven families and four orders are known to occur in Irish waters (Table 13).

**Table 13. Number of species in the Class Octocorallia known to occur in Ireland.**

| Order                  | Family           | No. species | References   |
|------------------------|------------------|-------------|--|
| Stolonifera            | Clavulariidae    | 2           | Davidson (2004); Henry and Murray Roberts (2007); Picton and Costello (1998); van Soest and Weinberg (1980); Stephens (1905)   |
| Alcyonacea             | Alcyoniidae      | 3           | Bell (2001b); Costelloe <i>et al.</i> (1986); Dineen <i>et al.</i> (1986); Keegan (1974); Manuel (1981); Picton and Costello (1998); Renouf (1931); Stephens (1905); Stephens and Buchanan-Wollaston (1907); van Soest and Weinberg (1980) |
| Gorgonacea             | Paramuriceidae   | 2           | Cornelius <i>et al.</i> (1990); Minchin (1987a); Picton and Costello (1998)  |
|                        | Plexauridae      | 1           | Picton and Costello (1998)   |
|                        | Acanthogorgiidae | 1           | Henry and Murray Roberts (2007)  |
|                        | Isididae         | 1           | Stephens (1905)  |
| Pennatulacea           | Funiculinidae    | 1           | Cornelius <i>et al.</i> (1990); Manuel (1981)  |
|                        | Virgulariidae    | 1           | Picton and Costello (1998); Stephens (1905)  |
| <b>Total species =</b> |                  | <b>12</b>   |  |

**Class Hexacorallia**

The Hexacorallians can be solitary, colonial or aggregated (Cornelius *et al.*, 1990). Fautin (2007) summarizes this group as including “the Actiniaria (sea anemones in the strict sense), Antipatharia (black corals), Ceriantharia (tube anemones), Corallimorpharia (sea anemones in the loose sense), Ptychodactiaria (sea anemones in the loose sense), Scleractinia (hard or stony corals), and Zoanthidea (sea anemones in the loose sense)”. Eighty-two species from 26 families and six orders are known to occur in Irish waters (Table 14).

**Table 14. Number of species in the Class Hexacorallia known to occur in Ireland.**

| Order        | Family         | No. species | References   |
|--------------|----------------|-------------|--|
| Ceriantharia | Arachnactidae  | 2           | Fautin (2007); Manuel (1981); Stephens (1905)  |
|              | Cerianthidae   | 2           | Colgan (1912a); Fautin (2007); Keegan (1974); Manuel (1981); Picton and Costello (1998); Stephens (1905)   |
| Antipatharia | Antipathidae   | 4           | Tyler and Zibrowius (1992)   |
| Zoantharia   | Epizoanthidae  | 5           | Bourne (1890); Fautin (2007); Manuel (1981); Picton and Costello (1998); Stephens (1905)   |
|              | Parazoanthidae | 3           | Fautin (2007); Manuel (1981); Picton and Costello (1998); Stephens (1905); Williams (2000)   |
| Actiniaria   | Gonactiniidae  | 1           | Costelloe <i>et al.</i> (1986); Fautin (2007)  |
|              | Actiniidae     | 9           | Bell (2001b); Dale (in prep.); Davidson (2004); Fautin (2007); Keegan (1974); Manuel (1981); Oliver and Healy (1998); O'Sullivan (1983); Picton and Costello (1998); Stephens (1905); Stephens and Buchanan-Wollaston (1907); Stephenson (1918)            |
|              | Aurelianiidae  | 1           | Fautin (2007); Manuel (1981); Picton and Costello (1998)   |
|              | Actinostolidae | 2           | Hansson (1998c); Fautin (2007)   |
|              | Aiptasiidae    | 1           | Fautin (2007)  |
|              | Metridiidae    | 1           | Keegan (1974); Picton and Costello (1998); Stephens and Buchanan-Wollaston (1907)  |
|              | Sagartiidae    | 8           | Costelloe <i>et al.</i> (1986); Davidson (2004); Fautin (2007); Fisher (1933); Manuel (1981); Oliver and Healy (1998); Picton and Costello (1998); Stephens (1905); Stephenson (1918); Stephens and Buchanan-Wollaston (1907)                              |
|              | Hormathiidae   | 10          | Bourne (1890); Colgan (1912a); Colgan (1912b); Cornelius <i>et al.</i> (1990); Davidson (2004); Fautin (2007); Hansson (1998c); Keegan (1974); Manuel (1981); O'Riordan (1979); Picton and Costello (1998); Stephens (1905); Stephenson (1918); Tur (1993) |
|              | Halcampoididae | 1           | Picton and Costello (1998); Manuel (1981)  |
|              | Haloclavidae   | 2           | Picton and Costello (1998)   |
|              | Halcampidae    | 1           | Picton and Costello (1998)   |
|              | Edwardsiidae   | 6           | Cornelius <i>et al.</i> (1997); Dineen <i>et al.</i> (1986); Fautin (2007); Henry and Murray Roberts (2007); Manuel (1981); Picton and Costello  |

| Order                  | Family           | No. species | References  |
|------------------------|------------------|-------------|---|
|                        |                  |             | (1998); Picton and Howson (1999); Stephens (1905)   |
|                        | Actinoscyphiidae | 2           | Hansson (1998c); Tyler and Zibrowius (1992)   |
|                        | Halcuriidae      | 1           | Hansson (1998c); Stephenson (1918)  |
| Corallimorpharia       | Corallimorphidae | 1           | Bell (2001b); Davidson (2004); Manuel (1981); Muntz <i>et al.</i> (1972); Picton and Costello (1998)  |
| Scleractinia           | Fungiacyathidae  | 2           | Fautin (2007)   |
|                        | Oculinidae       | 1           | Fautin (2007); Henry and Murray Roberts (2007); Tyler and Zibrowius (1992)  |
|                        | Caryophylliidae  | 8           | Bell (2001b); Bell and Turner (2000); Cornelius <i>et al.</i> (1997); Davidson (2004); Dineen <i>et al.</i> (1986); Fautin (2007); Guiry (1971); Henry and Murray Roberts (2005); Henry and Murray Roberts (2007); Keegan (1974); O’Riordan (1971); Picton and Costello (1998); Stephens (1905); Tyler and Zibrowius (1992) |
|                        | Flabellidae      | 2           | Fautin (2007)   |
|                        | Guyniidae        | 1           | Fautin (2007)   |
|                        | Dendrophylliidae | 5           | Fautin (2007); Hansson (1998c); Stephens (1905)   |
| <b>Total species =</b> |                  | <b>82</b>   |   |

## Phylum Ctenophora

Ferriss, S. E.

The phylum Ctenophora is an entirely marine and primarily planktonic group, with only three species presently recognised in British waters (Evans and Foster-Smith, 1997). All three (*Pleurobrachia pileus*, *Bolinopsis infundibulum* and *Beroë cucumis*) have been reported from Irish waters (Table 15). However, it is likely that many more ctenophores occur in Irish waters than have been recorded in the published literature e.g. Venus' Girdle *Cestum veneris* (Doyle, pers. comm.). The higher taxonomy in this list follows that of Evans and Foster-Smith (1997).

**Table 15. Number of species in the Phylum Ctenophora known to occur in Ireland.**

| Class                  | Order     | Family           | No. species | References   |
|------------------------|-----------|------------------|-------------|--|
| Tentaculata            | Cydippida | Pleurobrachiidae | 1           | Ryan <i>et al.</i> (1986), Stephens (1905), Yip (1981), Yip (1984a), Yip (1984b) |
|                        | Lobata    | Bolinopsidae     | 1           | Barnes (2008)  |
| Nuda                   | Beroida   | Beroidae         | 1           | Ryan <i>et al.</i> (1986); Stephens (1905)                                       |
| <b>Total species =</b> |           |                  | <b>3+</b>   |  |

## Phylum Mesozoa

Ferriss, S. E.

The Mesozoa are tiny, worm-like, simply organized parasites of marine invertebrates that comprise two classes, the Rhombozoa and the Orthonectida (Pawlowski *et al.*, 1996). Hosts include echinoderms, cephalopods, nemertines, polychaetes, and flatworms (Pawlowski *et al.*, 1996).

The taxonomic placement of the Mesozoa has been long debated, and they are considered to be degenerate flatworms by some authors, intermediates between protists and more complex metazoans by other others, and others again have placed them within the Protozoa. Pawlowski *et al.* (1996) concluded that the Mesozoa may have branched early in the animal evolution, close to nematodes and myxozoans. They also noted that the placement of rhombozoids and orthonectids together in the same phylum may need to be revised. Indeed these two classes are treated as separate phyla by some others e.g. Brusca and Brusca (2002).

This Phylum was not included by Purcell (1996). It is not known how many species occur in Irish waters. However, O'Reilly (1997c) listed at least 19 species expected to occur in the British Isles, and the NHM (2007) indicated that there are 20 British species (Table 16). Thirty seven species are listed by Costello *et al.* (2008) in European waters. In this report the higher taxonomy follows Costello *et al.* (2008) which concurs with that used by O'Reilly (1997c).

**Table 16. Number of Mesozoa species known to occur in British (O'Reilly, 1997c) and European waters (Costello *et al.*, 2008)**

| Class                  | Order         | Family            | O'Reilly (1997c) | Costello <i>et al.</i> (2008) |
|------------------------|---------------|-------------------|------------------|-------------------------------|
| Rhombozoa              | Dicyemida     | Dicyemidae        | 5                | 14                            |
|                        |               | Kantharellidae    | -                | 1                             |
|                        | Heterocyemida | Conocyemidae      | 2                | 2                             |
| Orthonectida           | -             | Rhopaluridae      | 11               | 20                            |
|                        |               | Pelmatosphaeridae | 1                | 1                             |
| <b>Total species =</b> |               |                   | <b>19</b>        | <b>37</b>                     |

## Phylum Platyhelminthes

Ferriss, S. E.

The Phylum Platyhelminthes, or flatworms, are a group of bilaterally symmetrical pseudocoelomate animals (Gibson and Knight-Jones, 1990). They comprise both parasitic and free living species, and occur in terrestrial, freshwater and marine environments. Groombridge and Jenkins (2002) estimated that approximately 20,000 species have been described worldwide, but noted that the proportion of the group known is low to moderate.

The phylogenetic relationships within the Platyhelminthes have been controversial. Studies in the 1990s questioned the view that the Platyhelminthes were a monophyletic group (e.g. Winnepeninckx *et al.*, 1995; Carranza *et al.*, 1997 etc.) and recent molecular studies suggest that the Platyhelminthes may be polyphyletic, having arisen as two independent groups from different ancestral groups. However, a full taxonomic review was beyond the scope of this report.

The higher taxonomy presented here, primarily follows that of Costello *et al.* (2008) and *Fauna Europaea* (2004) for marine and terrestrial/freshwater species respectively. As per Costello *et al.* (2008), the phylum in Ireland comprises four classes: the predominantly free-living Turbellaria, the parasitic flukes (Trematoda and Monogenea) and the tapeworms (Cestoda); the orders and families presented below are in alphabetical order. While an effort was made to exclude obvious synonyms, particularly in the older literature, it is likely that a number of these have been overlooked.

Tables 17 - 20 include records for 300 species in the Republic of Ireland. This includes records for a number of introduced species, such as the triclads *Kontikia ventrolineata* and *Geoplana sanguinea*.

The Platyhelminthes appear to be a much under-recorded group and so the number of records in Ireland can be expected to be a significant underestimate of the actual species numbers that occur. This group would particularly benefit from the production of a checklist covering Irish species.

### Class Turbellaria

The Turbellaria are mostly free-living and are found in marine and freshwater habitats, as well as in moist terrestrial habitats. 130 species from 36 families and eight orders are known to occur in Ireland (Table 17).

**Table 17. Number of species in the Class Turbellaria known to occur in Ireland.**

| Order              | Family        | No. species | References   |
|--------------------|---------------|-------------|--|
| Acoela             | Convolutidae  | 5           | Hansson (1998e); Southern (1936)                                 |
|                    | Otocelididae  | 1           | Hansson (1998e); Southern (1936)                                 |
|                    | Proporidae    | 1           | Hansson (1998e); Southern (1936)                                 |
| Catenulida         | Catenulidae   | 1           | Fauna Europaea (2004); Southern (1936); Young (1970)             |
|                    | Stenostomidae | 4           | Fauna Europaea (2004); Southern (1936); Young (1970)             |
| Lecithoepitheliata | Prorhynchidae | 4           | Fauna Europaea (2004); Southern (1936); Young (1970)             |
| Macrostomida       | Macrostomidae | 4           | Farran <i>et al.</i> (1914); Fauna Europaea (2004); Young (1970) |
|                    | Microstomidae | 4           | Hansson (1998e); Southern (1936); Young (1970)                   |

| <b>Order</b>    | <b>Family</b>    | <b>No. species</b> | <b>References</b>   |
|-----------------|------------------|--------------------|---|
| Polycladida     | Euryleptidae     | 5                  | Davidson (2004); Picton and Costello (1998); Prudhoe (1982); Hansson (1998e); Southern (1936)         |
|                 | Leptoplanidae    | 1                  | Colgan (1907a); Davidson (2004); Hansson (1998e); Prudhoe (1982); Southern (1936)                     |
|                 | Pleioplanidae    | 1                  | Davidson (2004); Hansson (1998e); Prudhoe (1982); Southern (1936)                                     |
|                 | Prosthiostomidae | 1                  | Hansson (1998e); Prudhoe (1982); Southern (1936)  |
|                 | Stylochoplanidae | 1                  | Hansson (1998e); Prudhoe (1982); Southern (1936)  |
| Prolecithophora | Cylindrostomidae | 1                  | Southern (1936)   |
|                 | Plagiostomidae   | 13                 | Fauna Europaea (2004); Southern (1936); Young (1970)  |
|                 | Pseudostomidae   | 1                  | Southern (1936)   |
| Rhabdozoa       | Byrsophlebiidae  | 3                  | Hansson (1998e); Southern (1936)  |
|                 | Dalyelliidae     | 9                  | Fauna Europaea (2004); Southern (1936); Young (1970)  |
|                 | Fecampiidae      | 2                  | Hansson (1998e); Southern (1936)  |
|                 | Koinocystididae  | 1                  | Hansson (1998e); Southern (1936)  |
|                 | Polycystididae   | 8                  | Fauna Europaea (2004); Hansson (1998e); Southern (1936); Young (1970)                                 |
|                 | Promesostomidae  | 4                  | Hansson (1998e); Southern (1936)  |
|                 | Provorticidae    | 4                  | Hansson (1998e); Southern (1936)  |
|                 | Trigonostomidae  | 10                 | Hansson (1998e); Southern (1936)  |
|                 | Typhloplanidae   | 11                 | Fauna Europaea (2004); Southern (1912b); Southern (1936); Young (1970)                                |
| Seriata         | Bipaliidae       | 1                  | Anderson (1986); Ball and Reynoldson (2001); Fauna Europaea (2004); Southern (1936)                   |
|                 | Cercyridae       | 1                  | Hansson (1998e); Southern (1936)  |
|                 | Dendrocoelidae   | 2                  | Ball and Reynoldson (2001); O'Connor and Norton (1977); Southern (1936)                               |
|                 | Dugesidae        | 2                  | Ball and Reynoldson (2001); Fauna Europaea (2004); O'Connor and Norton (1977); Southern (1936)        |
|                 | Geoplanidae      | 4                  | Anderson (1986); Cawley and Jones (2001); Fauna Europaea (2004); McCarthy (1995)                      |
|                 | Monocelididae    | 4                  | Hansson (1998e); Southern (1936)  |
|                 | Otomesostomidae  | 1                  | Fauna Europaea (2004); Hansson (1998e); Southern (1936); Young (1970)                                 |
|                 | Planariidae      | 8                  | Ball and Reynoldson (2001); Fauna Europaea (2004); Southern (1936)                                    |
|                 | Procerodidae     | 1                  | Ball and Reynoldson (2001); Hansson (1998e); Davidson (2004)  |
|                 | Rhynchodemidae   | 5                  | Anderson (1986); Ball and Reynoldson (2001); Fauna Europaea (2004); Southern (1907b); Southern (1936) |

| Order                  | Family       | No. species | References   |
|------------------------|--------------|-------------|--|
|                        | Uteriporidae | 1           | Ball and Reynoldson (2001); Hansson (1998e); Healy (1975 b); Southern (1936) |
| <b>Total species =</b> |              | <b>130</b>  |  |

### Class Trematoda (Digenea)

This group contains the majority of the parasitic flukes, which were formerly united with the Monogenea under the name Trematoda (Gibson and Knight-Jones, 1990). The adults of almost all species are endoparasites of vertebrates, with almost half of these parasitizing fish (Gibson and Knight-Jones, 1990). 85 species from 26 families and three orders are known to occur in Ireland (Table 18).

**Table 18. Number of species in the Class Trematoda known to occur in Ireland.**

| Order           | Family           | No. species   | References  |                 |
|-----------------|------------------|---------------|---|-----------------|
| Echinostomida   | Diplodiscidae    | 1             | Fauna Europaea (2004)   |                 |
|                 | Echinostomatidae | 3             | Cabot (1969); Fauna Europaea (2004)   |                 |
|                 | Fasciolidae      | 1             | Fauna Europaea (2004); Mulcahy, pers. comm.   |                 |
|                 | Notocotylidae    | 3             | Cabot (1969); Fauna Europaea (2004)   |                 |
|                 | Paramphistomidae | 3             | Fauna Europaea (2004)   |                 |
| Plagiorchiida   | Allocreadiidae   | 4             | Conneely and McCarthy (1984); Faherty and McCarthy (2006); Fauna Europaea (2004); Kane (1966); Holland and Kennedy (1997); Kennedy (1974)                               |                 |
|                 | Acanthocolpidae  | 3             | Little (1929)   |                 |
|                 | Calycodidae      | 1             | Hansson (1998e)   |                 |
|                 | Gorgoderidae     | 2             | Conneely and McCarthy (1984); Fauna Europaea (2004); Holland and Kennedy (1997)   |                 |
|                 | Heterophyidae    | 2             | Cabot (1969); Costello <i>et al.</i> (1996); Fauna Europaea (2004); McCarthy and Hasset (1993)  |                 |
|                 | Lepocreadiidae   | 2             | Hansson (1998e); Yip (1984 a); Little (1929)  |                 |
|                 | Microphallidae   | 10            | Cabot (1969); Fauna Europaea (2004)   |                 |
|                 | Opecoelidae      | 5             | Conneely and McCarthy (1984); Costello <i>et al.</i> (1996); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Little (1929)              |                 |
|                 | Plagiorchiidae   | 6             | Cabot (1969); Fauna Europaea (2004)   |                 |
|                 | Prosthogonimidae | 1             | Cabot (1969)  |                 |
|                 | Zoogonidae       | 2             | Hansson (1998e); Little (1929)  |                 |
|                 | Strigeida        | Accacoeliidae | 2   | Hansson (1998e) |
|                 |                  | Azygiidae     | 1   | Little (1929)   |
| Bucephalidae    |                  | 4             | Costello <i>et al.</i> (1996); Little (1929); O'Rourke (1968)   |                 |
| Cyclocoelidae   |                  | 1             | Cabot (1969)  |                 |
| Derogenidae     |                  | 1             | Fahy (1983); Kane (1966); Little (1929)   |                 |
| Diplostomidae   |                  | 15            | Conneely and McCarthy (1984); El-Toumi and McCarthy (1990); Faherty and McCarthy (2006); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974) |                 |
| Fellodistomidae |                  | 4             | Hansson (1998e); Little (1929)  |                 |

| Order                  | Family          | No. species | References  |
|------------------------|-----------------|-------------|---|
|                        | Hemiuridae      | 5           | Costello <i>et al.</i> (1996); Fahy (1983); Hansson (1998e); Little (1929)      |
|                        | Lecithasteridae | 1           | Fahy (1983); Little (1929); Molloy <i>et al.</i> (1993)                         |
|                        | Strigeidae      | 2           | Cabot (1969); Fauna Europaea (2004); Holland and Kennedy (1997); Kennedy (1974) |
| <b>Total species =</b> |                 | <b>85</b>   |   |

### Class Monogenea

The monogeneans are predominantly a group of ectoparasites on fishes, especially marine, although some are endoparasites in the cloaca, oviducts or bladders of their hosts (Gibson and Knight-Jones, 1990; Lyons, 1978). 30 species from 12 families and three orders are known to occur in Ireland (Table 19).

**Table 19. Number of species in the Class Monogenea known to occur in Ireland.**

| Order                  | Family            | No. species | References   |
|------------------------|-------------------|-------------|--|
| Mazocreaidea           | Diplozoidae       | 1           | Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974)   |
|                        | Discocotylidae    | 1           | Conneely and McCarthy (1984); Faherty and McCarthy (2006); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Molloy <i>et al.</i> (1993) |
|                        | Mazocraeidae      | 2           | Hansson (1998e)  |
| Monopisthocotylea      | Capsalidae        | 2           | Hansson (1998e); Little (1929)   |
|                        | Dactylogyridae    | 3           | Copley and McCarthy (2001); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974)   |
|                        | Gyrodactylidae    | 2           | Fauna Europaea (2004);   |
|                        | Microbothriidae   | 3           | Garvin <i>et al.</i> (1961); Hansson (1998e); Henderson and Dunne (1999 a); Little (1929)  |
|                        | Monocotylidae     | 1           | Little (1929)  |
| Polyopisthocotylea     | Udonellidae       | 1           | Minchin (1991)   |
|                        | Diclidophoridae   | 9           | Hansson (1998e); Little (1929)   |
|                        | Hexabothriidae    | 4           | Hansson (1998e); Henderson and Dunne (1999); Little (1929)   |
|                        | Plectanocotylidae | 1           | Little (1929)  |
| <b>Total species =</b> |                   | <b>30</b>   |  |

**Class Cestoda**

The Cestoda, or tapeworms, are endoparasites, usually in the vertebrate gut (Lyons, 1978). Different groups of tapeworms infect different groups of vertebrate hosts, and they have a complex lifecycle, involving one or more intermediate hosts (Lyons, 1978). References for records of 55 species from 17 families and six orders in Ireland were identified (Table 20).

**Table 20. Number of species in the Class Cestoda known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>      | <b>No. species</b> | <b>References</b>   |
|------------------------|--------------------|--------------------|---|
| Caryophyllidea         | Caryophyllaeidae   | 1                  | Conneely and McCarthy (1984); Fauna Europaea (2004); Holland and Kennedy (1997); Kennedy (1974)   |
|                        | Lytocestidae       | 1                  | Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974)  |
| Cyclophyllidea         | Anoplocephalidae   | 4                  | Fauna Europaea (2004)   |
|                        | Catenotaeniidae    | 1                  | Fauna Europaea (2004)   |
|                        | Davaineidae        | 1                  | Cabot (1969)  |
|                        | Dilepididae        | 7                  | Cabot (1969)  |
|                        | Hymenolepididae    | 15                 | Cabot (1969); Fauna Europaea (2004)   |
|                        | Progynotaeniidae   | 1                  | Cabot (1969); Fauna Europaea (2004)   |
|                        | Taeniidae          | 3                  | Fauna Europaea (2004)   |
| Proteocephalidea       | Proteocephalidae   | 6                  | Conneely and McCarthy (1984); Chubb <i>et al.</i> (1987); Fauna Europaea (2004); Holland and Kennedy (1997)   |
| Pseudophyllidea        | Bothriocephalidae  | 2                  | Chubb <i>et al.</i> (1987); Fauna Europaea (2004); Hansson (1998e); Holland and Kennedy (1997); Kane (1966); Kennedy (1974)   |
|                        | Diphyllobothriidae | 5                  | Chubb <i>et al.</i> (1987); Conneely and McCarthy (1984); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Molloy <i>et al.</i> (1993)                                 |
|                        | Triaenophoridae    | 4                  | Conneely and McCarthy (1984); Faherty and McCarthy (2003); Faherty and McCarthy (2006); Fahy (1983); Fauna Europaea (2004); Hansson (1998e); Kane (1966); Kennedy (1974); Molloy <i>et al.</i> (1993) |
| Tetraphyllidea         | Phyllobothriidae   | 1                  | Hansson (1998e)   |
| Trypanorhyncha         | Grillotiidae       | 1                  | Hansson (1998e)   |
|                        | Hepatoxylidae      | 1                  | Healy (1956); Kane (1966)   |
|                        | Lacistorhynchidae  | 1                  | Bates (1990)  |
| <b>Total species =</b> |                    | <b>55</b>          |   |

## **Phylum Gnathostomulida**

Inskipp, T. P.

The Phylum Gnathostomulida is a small phylum of nearly microscopic marine animals, known as jaw worms. They are hermaphrodite, have no body cavity and no circulatory or respiratory system. They have a specialized, muscular jaw, which they use to scrape smaller organisms off grains of sand in their muddy seabed habitat. There are approximately 100 described species, but many more must remain undescribed. Costello *et al.* (2008) lists 24 species as occurring in Europe.

No species have been recorded in the Republic of Ireland and Purcell (1996) made no mention of the group. However, Sterrer (1969, 1971) listed seven species recorded in Northern Ireland and it is likely that some species also occur in the Republic.

## Phylum Gastrotricha

Smith, K. G.

Gastrotrichs are microscopic, free-living aquatic worms. In the marine environment they are interstitial (living between the spaces in benthic sediments); in freshwater they are found on submerged solid surfaces, and some are planktonic (Todaro, 2006).

References for only three marine (Chaetonotida and Macrodasyida), and three freshwater species (Chaetonotida) of Gastrotricha could be identified for the Republic of Ireland (Table 21). This is likely to be a huge underestimate of the true species diversity. For example, references for 29 species have been identified for Northern Ireland, 28 of these have been recorded from Strangford Lough alone (Boaden, 1961, 2005; Boaden, 1966; Maguire 1976), and nine species have been recorded from the Irish Sea (unknown whether this is UK or Irish waters) (Hansson, 1997). Unfortunately the world database on marine Gastrotricha could not be accessed. However according to Boaden (2005) it records 6 species of chaetonotoids and 6 macrodasyoids in Irish west coast localities, although these were not included in Table 21 as they cannot be identified to family level. Boaden (2005) also stated that the number of currently known species on Irish beaches probably represents less than a third of those occurring. There are an estimated 750 species worldwide (Todaro, 2006).

**Table 21. Number of species in the Phylum Gastrotricha known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>       | <b>No. species</b> | <b>References</b>              |
|------------------------|---------------------|--------------------|--------------------------------|
| Chaetonotida           | Chaetonotidae       | 3                  | d'Hondt (1978); Hansson (1997) |
|                        | Neogosseidae        | 1                  | d'Hondt (1978)                 |
| Macrodasyida           | Thaumastodermatidae | 1                  | Hansson (1997)                 |
|                        | Turbanellidae       | 1                  | Hansson (1997)                 |
| <b>Total species =</b> |                     | <b>6</b>           |                                |

## Phylum Rotifera

Inskipp, T. P.

The rotifers make up a phylum of microscopic and near-microscopic pseudocoelomate animals. There are about 2,030 species worldwide (Segers, 2007). Most rotifers are around 0.1-0.5 mm long, and are common in freshwater environments throughout the world, with a few saltwater species. Some rotifers are free swimming and truly planktonic, others move by inchworming along the substrate, and some are sessile, living inside tubes or gelatinous holdfasts that are attached to a substrate. About 25 species are colonial, either sessile or planktonic.

Taxonomy down to family level follows Segers (2002) and at species level follows Segers (2007).

The occurrence of a total of 306 species has been established for the Republic of Ireland (Table 22), all except one species listed by Horkan (1981). Purcell (1996) gave a figure of 315 species for the whole of Ireland, based exclusively on Horkan (1981). The difference in the two figures is accounted for by examining the species composition in Horkan's list – his figure of 315 'species' included 20 subspecies, and the fact that the taxonomy of a number of forms differs from that in Segers (2007).

**Table 22. No. of species in the Phylum Rotifera (Class Eurotatoria) known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>   | <b>No. species</b> | <b>References</b>                              |               |
|------------------------|-----------------|--------------------|--|---------------|
| Bdelloida              | Adinetidae      | 6                  | Horkan (1981)                                  |               |
|                        | Habrotrochidae  | 17                 | Horkan (1981)                                  |               |
|                        | Philodinavidae  | 1                  | Horkan (1981)                                  |               |
|                        | Philodinidae    | 48                 | Horkan (1981)                                  |               |
| Ploima                 | Asplanchnidae   | 4                  | Horkan (1981)                                  |               |
|                        | Brachionidae    | 23                 | Healy, Bates and McGrath (1982); Horkan (1981) |               |
|                        | Dicranophoridae | 15                 | Horkan (1981)                                  |               |
|                        | Epiphanidae     | 5                  | Horkan (1981)                                  |               |
|                        | Euchlanidae     | 9                  | Horkan (1981)                                  |               |
|                        | Gastropodidae   | 5                  | Horkan (1981)                                  |               |
|                        | Ituridae        | 1                  | Horkan (1981)                                  |               |
|                        | Lecanidae       | 12                 | Horkan (1981)                                  |               |
|                        | Lepadellidae    | 13                 | Horkan (1981)                                  |               |
|                        | Lindiidae       | 1                  | Horkan (1981)                                  |               |
|                        | Microcodidae    | 1                  | Horkan (1981)                                  |               |
|                        | Mytilinidae     | 6                  | Horkan (1981)                                  |               |
|                        | Notommatidae    | 39                 | Horkan (1981)                                  |               |
|                        | Proalidae       | 10                 | Horkan (1981)                                  |               |
|                        | Scaridiidae     | 1                  | Horkan (1981)                                  |               |
|                        | Synchaetidae    | 20                 | Horkan (1981)                                  |               |
|                        | Trichocercidae  | 26                 | Horkan (1981)                                  |               |
|                        | Trichotriidae   | 4                  | Horkan (1981)                                  |               |
|                        | Flosculariaceae | Conochilidae       | 3  | Horkan (1981) |
|                        |                 | Filiniidae         | 2  | Horkan (1981) |
| Flosculariidae         |                 | 16                 | Horkan (1981)                                  |               |
| Hexarthridae           |                 | 1                  | Horkan (1981)                                  |               |
| Testudinellidae        |                 | 7                  | Horkan (1981)                                  |               |
| Collothecaceae         | Collothecidae   | 10                 | Horkan (1981)                                  |               |
| <b>Total species =</b> |                 | <b>306</b>         |  |               |

## Phylum Kinorhyncha

Ferriss, S. E.

These free-living marine pseudocoelomates occur throughout the world from the intertidal to the deep sea, generally in sediments but sometimes associated with plants or other animals (Neuhaus and Higgins, 2002).

Approximately 150 species have been described worldwide, although the proportion of the group known is low to moderate (Groombridge and Jenkins, 2002). British records comprise some 15 species, but additional species are likely to occur (Bamber, 1997). Records for five species have been identified in Irish waters (Table 23); however, this is likely to be an underestimate for this poorly studied group (Sørensen, pers. comm.). The higher taxonomy in Table 23 follows Bamber (1997).

**Table 23. Number of species in the Phylum Kinorhyncha known to occur in Ireland.**

| Order                  | Family        | No. species | References                                    |
|------------------------|---------------|-------------|---|
| Cyclorhagida           | Echinoderidae | 2           | Farran <i>et al.</i> (1915); Southern (1914c) |
| Homalorhagida          | Pycnophyidae  | 3           |   |
| <b>Total species =</b> |               | <b>5</b>    |   |

## **Phylum Loricifera**

Smith, K. G.

Loriciferans are tiny animals ( $\frac{1}{4}$  millimetre in length) that live in the interstitial spaces in marine sediments (O'Reilly, 1997b). The phylum was discovered in the 1980's (Kristensen, 1983) and there are about 80 species known worldwide (NHM, 2007). Only one species is known from British waters and two are listed by Costello *et al.* (2008) in European waters; however, as they are notoriously difficult to survey more species are expected to be discovered (O'Reilly, 1997b). No references for the presence of the phylum in Irish waters were found.

## **Phylum Cycliophora**

Ferris, S. E.

A recently described phylum, Cycliophora are minute sessile organisms which live attached to the mouthparts of lobsters (O'Reilly, 1997a). The type species (*Symbion pandora*) was found on the Norway lobster, *Nephrops norvegicus* from Scandinavian waters (Funch and Kristensen, 1995). A second species (*Symbion americanus*) was described by Obst *et al.* (2005a) and a third, as yet undescribed, species has also been found on lobsters such as *Homarus gammarus* in Europe (Kristensen, 2002).

On the eastern side of the Atlantic, species of Cycliophora have been collected from lobsters in the waters of Croatia, Denmark, Faroe Islands, France, Sweden, Spain, Scottish Islands (Obst *et al.*, 2005b). *Symbion pandora* has been recorded in Scotland (Obst *et al.*, 2005 b) and as noted by O'Reilly (1997a), it seems likely that its distribution is closely related to that of their host. As the host is found throughout Irish waters, the occurrence of *S. pandora* seems likely; however, a reference verifying the occurrence of this phylum in Ireland was not identified. Experts contacted (P. Funch, M. Obst, and R. M. Reinhardt) confirmed this view.

## Phylum Acanthocephala

Smith, K. G.

Acanthocephala, commonly known as spiny-headed worms, are intestinal parasitic worms that possess a proboscis with hooks that is used to anchor to its host's gut wall. They lack a mouth and absorb nutrients ingested by the host through their body surface. Acanthocephala use vertebrates as final (definitive) hosts and arthropods as intermediate hosts (Mehlhorn, 2001). There are an estimated 750 species of Acanthocephala worldwide (NHM, 2007).

References for 14 species of Acanthocephala have been identified for the Republic of Ireland. The higher taxonomy follows Fauna Europaea (2004).

### Class Palaeacanthocephala

Palaeacanthocephala use fish (and also waterbirds and seals) as final hosts and crustaceans as intermediate hosts. They are classed as having an aquatic life cycle (Mehlhorn, 2001).

Thirteen species are known to occur in the Republic of Ireland (Table 24).

**Table 24. Number of species in the Class Palaeacanthocephala known to occur in Ireland.**

| Order                  | Family           | No. species | References  |
|------------------------|------------------|-------------|---|
| Echinorhynchida        | Echinorhynchidae | 6           | Brown <i>et al.</i> (1986); Byrne <i>et al.</i> (1999); Byrne <i>et al.</i> (2003); Chubb (2004); Conneely and McCarthy (1984); Copley and McCarthy (2005); Costello <i>et al.</i> (1996); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Kennedy <i>et al.</i> (1989); Kennedy and Moriarty (1987); Lyndon and Kennedy (2001); Molloy <i>et al.</i> (1993); |
|                        | Pomphorhynchidae | 2           | Brown <i>et al.</i> (1986); Byrne <i>et al.</i> (1999); Byrne <i>et al.</i> (2003); Conneely and McCarthy (1984); Fauna Europaea (2004); Hansson (1997); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Kennedy <i>et al.</i> (1989); Lyndon and Kennedy (2001); Molloy <i>et al.</i> (1993);   |
| Polymorphida           | Plagiorhynchidae | 2           | Cabot (1969); Fauna Europaea (2004)   |
|                        | Polymorphidae    | 3           | Cabot (1969); Costello <i>et al.</i> (1996); Fauna Europaea (2004); McCarthy and Hasset (1993); Mulcahy, pers. comm.  |
| <b>Total species =</b> |                  | <b>13</b>   |   |

### Class Eoacanthocephala

According to Mehlhorn (2001) the final hosts for Eoacanthocephala are fishes (also reptiles and amphibians) and the intermediate hosts are small crustaceans (mostly Ostracoda). They are classed as having an aquatic life cycle.

Records of only one species have been identified for the Republic of Ireland (Table 25).

**Table 25. Number of species in the Class Eoacanthocephala known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>       | <b>No. species</b> | <b>References</b>   |
|------------------------|---------------------|--------------------|---|
| Neoechinorhynchida     | Neoechinorhynchidae | 1                  | Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Lyndon and Kennedy (2001) |
| <b>Total species =</b> |                     | <b>1</b>           |   |

## Phylum Entoprocta

Smith, K. G.

Entoprocts are small (0.2-5 mm long) solitary or colonial animals that occur in the marine environment, except one species *Urnatella gracilis* which is found in freshwater (Nielsen, 1989). They are mostly sedentary, attached to a substrate by a stalk and have a cup-shaped body, giving them their common name of ‘goblet worms’. There are around 150 described species, but Nielsen (1989) estimated the real number of species to be more than 500. The taxonomy used here follows Howson (1997d).

Only four species have been recorded from Irish waters (EEZ); however, more species are likely to be present e.g. an additional nine species have been recorded in the Irish Sea, near the Isle of Man (Nielsen, 1989). No references could be found for the occurrence of *Urnatella gracilis* in the Republic of Ireland. Purcell (1996) gave a figure of 34 species, though this referred to species known to occur in the British Isles and not in Ireland; indeed Purcell noted that the Irish figure was likely to be less than this.

**Table 26. Number of species in the Phylum Entoprocta known to occur in Ireland.**

| Order                  | Family         | No. species | References   |
|------------------------|----------------|-------------|--|
| Solitaria              | Loxosomatidae  | 2           | Nielsen (1989)   |
| Coloniales             | Pedicellinidae | 1           | Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987);<br>Konnecker (1983) |
|                        | Barentsiidae   | 1           | Costelloe <i>et al.</i> (1986)   |
| <b>Total species =</b> |                | <b>4</b>    |  |

## Phylum Nematoda

Smith, K. G.

Nematodes, commonly known as roundworms, are unsegmented, bilaterally symmetrical and covered by a strong flexible non-cellular layer called a cuticle (Myers, 2001a). They are incredibly abundant and are found in marine, terrestrial and freshwater environments (Platt and Warwick, 1983). Many species are also parasitic. They are divided into two classes, the Secernentea and Adenophorea.

There are an estimated 20,000 species worldwide (NHM, 2007). References for 172 species of nematodes in the Republic of Ireland and its marine waters have been identified. Of these 67 are free-living marine species (all from the Class Adenophorea) and the majority of the rest are parasitic. An additional 52 free-living marine species have been recorded for Northern Ireland, nearly all of these from Strangford Lough (Platt and Warwick, 1983 and 1988; Warwick *et al.*, 1998). Even if these species were included, this number would still represent a huge underestimate of the true species diversity of nematodes in Ireland. Purcell (1996) gave a figure of 579 species, though this mostly referred to species known to occur in the British Isles, and without a reference specific to Ireland.

The higher taxonomy used in Tables 27 and 28 follows Platt and Ball (1997) for free-living marine species and Fauna Europaea (2004) for the remainder of species. Taxa are listed in alphabetical order.

### Class Adenophorea

Adenophorea are primarily free-living worms (apart from some parasitic species in the Dorylaimida), and include many marine species in the Chromadorida, Monhysterida and Enoplida. Records for 105 Adenophorea species have been found for the Republic of Ireland and its marine waters (Table 27).

**Table 27. Number of species in the Class Adenophorea known to occur in Ireland.**

| Order        | Family           | No. species | References   |
|--------------|------------------|-------------|--|
| Chromadorida | Chromadoridae    | 10          | Hansson (1998a); Moore (1977); Platt and Warwick (1988); Southern (1914c)            |
|              | Comesomatidae    | 2           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
|              | Cyatholaimidae   | 3           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
|              | Desmodoridae     | 4           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
|              | Desmoscolecidae  | 4           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
|              | Draconematidae   | 2           | Hansson (1998a); ; Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c) |
|              | Leptolaimidae    | 4           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
|              | Selachinematidae | 2           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1988); Southern (1914c)   |
| Dorylaimida  | Dorylaimidae     | 6           | Southern (1914c)   |
|              | Longidoridae     | 8           | Brown <i>et al.</i> (1977); Fauna Europaea (2004)                                    |
|              | Qudsianematidae  | 1           | Fauna Europaea (2004)  |
|              | Tylencholaimidae | 2           | Siddiqi and Hawksworth (1982)  |
|              | Xiphinematidae   | 1           | Brown <i>et al.</i> (1977)   |
| Enoplida     | Anoplostomatidae | 2           | Hansson (1998a)  |
|              | Anticomidae      | 2           | Hansson (1998a); Platt and Warwick (1983);   |

| Order        | Family               | No. species | References   |
|--------------|----------------------|-------------|--|
|              |                      |             | Southern (1914c)   |
|              | Capillariidae        | 4           | Cabot (1969); Fauna Europaea (2004); Holland and Kennedy (1997); Mulcahy pers comm.    |
|              | Enchelidiidae        | 3           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Enoplidae            | 2           | Henry (in press); Southern (1914c)   |
|              | Ironidae             | 3           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Leptosomatidae       | 6           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Oncholaimidae        | 6           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Oxystominidae        | 2           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Phanodermatidae      | 2           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Rhabdodemaniidae     | 2           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
|              | Thoracostomopsidae   | 5           | Hansson (1998a); Platt and Ball (1997); Platt and Warwick (1983); Southern (1914c)     |
| Monhysterida | Axonolaimidae        | 1           | Hansson (1998a); Southern (1914c)  |
|              | Diplopeltidae        | 3           | Hansson (1998a); Moore (1977); Platt and Ball (1997); Warwick <i>et al.</i> (1998);    |
|              | Monhysteridae        | 2           | Fauna Europaea (2004); Moore (1977); Warwick <i>et al.</i> (1998)                      |
|              | Sphaerolaimidae      | 1           | Hansson (1998a); Southern (1914c)  |
|              | Xyalidae             | 3           | Hansson (1998a); Platt and Ball (1997); Southern (1914c); Warwick <i>et al.</i> (1998) |
| Mononchida   | Mononchidae          | 2           | Southern (1914c)   |
| Plectida     | Plectidae            | 4           | Fauna Europaea (2004); Southern (1914c)  |
| Triplonchida | Trichodoridae        | 1           | Brown <i>et al.</i> (1977); Fauna Europaea (2004)                                      |
|              | <b>Total species</b> | <b>105</b>  |  |

### Class Secernentea

The Secernentea are, for the most part, associated with terrestrial and freshwater habitats. The group includes many parasitic species. References for 67 Secernentea species have been found for the Republic of Ireland and its marine waters (28).

**Table 28. Number of species in the Class Secernentea known to occur in Ireland.**

| Order          | Family           | No. species | References   |
|----------------|------------------|-------------|--|
| Anguilluloidea | Anguillulidae    | 1           | Southern (1914c)   |
| Aphelenchida   | Aphelenchoididae | 1           | Fauna Europaea (2004); Siddiqi and Hawksworth (1982)   |
| Ascaridida     | Anisakidae       | 7           | Byrne <i>et al.</i> (1999); Conneely and McCarthy (1984); Costello <i>et al.</i> (1996); Cheetham and Fives (1990); Fahy (1983); Fauna Europaea (2004); Henderson and Dunne (1998); Holland and Kennedy (1997); Kennedy (1974); Mattiucci <i>et al.</i> (2008); McCarthy and Hasset (1993) |
|                | Ascarididae      | 5           | Cabot (1969); Fauna Europaea (2004); Mulcahy   |

| Order       | Family               | No. species | References   |
|-------------|----------------------|-------------|--|
|             |                      |             | pers comm.   |
|             | Cucullanidae         | 1           | Byrne <i>et al.</i> (2003); Conneely and McCarthy (1984); Fauna Europaea (2004); Holland and Kennedy (1997)  |
|             | Quimperiidae         | 1           | Copley and McCarthy (2005); Fauna Europaea (2004); Holland and Kennedy (1997);   |
| Enoplida    | Trichuridae          | 1           | Fauna Europaea (2004)  |
| Oxyurida    | Heteroxynematidae    | 1           | Fauna Europaea (2004)  |
|             | Oxyuridae            | 2           | Fauna Europaea (2004); Mulcahy pers comm.  |
| Rhabditida  | Diplogastridae       | 1           | Southern (1914c)   |
|             | Rhabdiasidae         | 1           | Kennedy (1974)   |
|             | Rhabditidae          | 1           | Mulcahy pers comm.; Southern (1914c)   |
|             | Steinernematidae     | 2           | Fauna Europaea (2004)  |
|             | Strongyloididae      | 1           | McCarthy and Hasset (1993)   |
| Spirurida   | Acuariidae           | 6           | Cabot (1969)   |
|             | Anguillicolidae      | 1           | Fauna Europaea (2004)  |
|             | Camallanidae         | 1           | Kane (1966); Kennedy (1974); Holland and Kennedy (1997); Conneely and McCarthy (1984); Fauna Europaea (2004); Copley and McCarthy (2005)   |
|             | Cystidicolidae       | 3           | Byrne <i>et al.</i> (1999); Byrne <i>et al.</i> (2003); Conneely and McCarthy (1984); Cheetham and Fives (1990); Fauna Europaea (2004); Holland and Kennedy (1997); Kane (1966); Kennedy (1974); Henderson and Dunne (1998); Henderson and Dunne (1999a) |
|             | Physalopteridae      | 1           | Henderson and Dunne (1998); Henderson and Dunne (1999a)  |
|             | Rhabdochonidae       | 1           | Kennedy (1974); Holland and Kennedy (1997); Byrne <i>et al.</i> (2003)   |
|             | Tetrameridae         | 2           | Cabot (1969); Baylis (1928)  |
| Strongylida | Filaroididae         | 1           | Fauna Europaea (2004); Mulcahy pers comm.  |
|             | Heligmosomidae       | 1           | Fauna Europaea (2004)  |
|             | Heterorhabditidae    | 1           | Fauna Europaea (2004)  |
|             | Molineidae           | 1           | Fauna Europaea (2004)  |
|             | Skrjabinylidae       | 1           | Fauna Europaea (2004)  |
|             | Strongylidae         | 1           | Fauna Europaea (2004); Mulcahy pers comm.  |
|             | Syngamidae           | 1           | Cabot (1969); Mulcahy pers comm.   |
|             | Trichostrongylidae   | 3           | Fauna Europaea (2004); Finnerty and Dunne (2007); Mulcahy pers comm.   |
| Tylenchida  | Criconematidae       | 7           | Brown <i>et al.</i> (1977); Fauna Europaea (2004)  |
|             | Heteroderidae        | 4           | Fauna Europaea (2004)  |
|             | Neotylenchidae       | 1           | Siddiqi and Hawksworth (1982)  |
|             | Neotylenchidae       | 1           | Davide (1980)  |
|             | Rotylenchulidae      | 1           | Siddiqi and Hawksworth (1982)  |
|             | Tylenchidae          | 2           | Siddiqi and Hawksworth (1982); Southern (1914c)  |
|             | <b>Total species</b> | <b>67</b>   |  |

## Phylum Nemertea

Inskipp, T. P.

Nemertea is a phylum of animals known as ribbon worms or proboscis worms. There are about 1,400 species globally (Gibson, 1995), most of which are marine, with a few living in fresh water, and a small number are terrestrial. Most nemerteans are carnivorous and predatory, catching prey with their proboscis, although some are scavengers and a few are herbivores.

Taxonomy follows Gibson (1999) for marine species, with the addition of the terrestrial *Argonemertes dendyi* (Plectonemertidae) and the deep sea species *Protopelagonemertes levinseni* (Protopelagonemertidae) from Gibson (1995).

The occurrence of a total of 40 species has been established for the Republic of Ireland (Table 29). Purcell (1996) gave a figure of 39 species, based on Southern (1913c) (37 spp.), Cawley (1994) (*Argonemertes*) and one freshwater species listed by Sebastian (1987). Southern (1911) referred to the occurrence of two freshwater species: *Leptonemertes chalicophora* (von Grapff, 1879) and *Prostoma clepsinoides* Dugès, 1904, but Gibson (1994) regarded their identification as doubtful.

It seems likely that this current list does not represent the true diversity of Nemertea in the Republic.

**Table 29. Number of species in the Phylum Nemertea known to occur in Ireland.**

| Class  | Order          | Family                                   | No. species    | References  |
|--------|----------------|--|----------------|---|
| Anopla | Archinemertea  | Cephalothricidae                         | 2              | Southern (1913c)                                    |
|        | Palaeonemertea | Tubulanidae                              | 6              | Beaumont (1900);<br>Southern (1913b)                |
|        |                | Heteronemertea                           | Cerebratulidae | 2   |
|        |                | Lineidae                                 | 8              | Beaumont (1900); Gibson<br>(1994); Southern (1913b) |
| Enopla | Hoplonemertea  | Amphiporidae                             | 4              | Beaumont (1900);<br>Southern (1913b)                |
|        |                | Cratenemertidae                          | 1              | Southern (1913b)                                    |
|        |                | Emplectonematidae                        | 4              | Southern (1913b)                                    |
|        |                | Plectonemertidae                         | 1 (int.)       | Cawley (1994)                                       |
|        |                | <i>Oerstedia</i> spp. (family uncertain) | 2              | Beaumont (1900);<br>Southern (1913)                 |
|        |                | Tetrastemmatidae                         | 7              | Southern (1913b)                                    |
|        |                | Drepanophoridae                          | 1              | Southern (1913b)                                    |
|        |                | Paradrepanophoridae                      | 1              | Sheppard (1935)                                     |
|        |                | Protopelagonemertidae                    | 1              | Brinkmann (1917)                                    |
|        |                | <b>Total species =</b>                   |                |   |

## Phylum Nematomorpha

Ferris, S. E.

The Nematomorpha, containing the horsehair worms, is a small phylum of aquatic worms with about 200 species worldwide (O'Reilly, 1997d). Horsehair worms occur mostly in freshwater habitats (Order Gordioidea) with only a few species described from marine waters (Order Nectonematoidea) (O'Reilly, 1997d). The gordiids are parasites of terrestrial arthropods, such as mantids, beetles, and crickets, whereas the nectonematids are parasites of marine invertebrates such as hermit crabs (Hanelt *et al.*, 2005). Members of both of these groups are free-living as adults in marine and freshwaters respectively (Hanelt *et al.*, 2005).

The global species diversity of freshwater hairworms based on published descriptions is approximately 326 species, and a conservative estimate for the global species diversity in this group would be around 2,000 species (Poinar Jnr., 2008). The marine nematomorph Order Nectonematoidea comprises a single genus, *Nectonema*, with four described species (Nielsen, 1969 cited in O'Reilly, 1997).

Three freshwater species have been reported to occur in Ireland (30). Two marine species were listed by O'Reilly (1997) as species expected to occur within British waters but records for Ireland were not identified.

**Table 30. Number of species in the Phylum Nematomorpha (Class Gordioidea) known to occur in Ireland.**

| Order                  | Family      | No. species | References  |
|------------------------|-------------|-------------|---|
| Chordodea              | Chordodidae | 2           | Camerano (1908); Baylis (1943); Schmidt-Rhaesa (2001); Schmidt-Rhaesa (2004); Schmidt-Rhaesa, pers. comm.; Southern (1914c) |
| Gordea                 | Gordiidae   | 1           | Baylis (1943); Schmidt-Rhaesa (2001); Schmidt-Rhaesa (2004); Schmidt-Rhaesa, pers. comm.                                    |
| <b>Total species =</b> |             | <b>3</b>    |   |

## Phylum Bryozoa

Smith, K. G.

Bryozoans are small colonial animals that are restricted to aquatic environments. The majority of species are marine and they can be found in most marine habitats, often abundant in shallow sub-littoral areas. A minority are found in estuarine and freshwater (Hayward and Ryland, 1998).

Colonies are founded by a single sexually produced ‘zooid’ that settles on its preferred substrate. The zooid then replicates by non-sexual budding, producing new ‘autozooids’ which are functionally independent (Hayward and Ryland, 1998). Other types of zooids can also be produced that have more specific functions. Most colonies form flat encrusting sheets, but they can be erect and branching which can be flexible or rigid (Hayward and Ryland, 1998).

The total number of bryozoan species worldwide is often estimated to be around 4,000; however, the true number is likely to be double this (Hayward and Ryland, 1998). The Phylum is divided into three classes, all of which are represented in Irish waters and one (Phylactolaemata) is exclusively freshwater. The taxonomy follows Hayward (1997) for marine species and Mundy (1980) and Fauna Europaea (2004) for freshwater species.

References for 206 bryozoan species have been found for the Republic of Ireland and its marine waters (EEZ), including 197 marine and nine freshwater species.

### Class Stenolaemata

Stenolaemata bryozoans have strongly calcified walls, cylindrical zooids and are exclusively marine (Hayward and Ryland, 1998). References have been found documenting the occurrence of 27 Stenolaemata species in the Republic of Ireland (Table 31).

**Table 31. Number of species in the Class Stenolaemata known to occur in Ireland.**

| Order          | Family                 | No. species | References   |
|----------------|------------------------|-------------|--|
| Cyclostomatida | Crisiidae              | 6           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1987); Wyse Jackson (1991)   |
|                | Oncousociidae          | 2           | Wyse Jackson (1991)  |
|                | Tubuliporidae          | 7           | Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Nichols (1909); Wyse Jackson (1991)              |
|                | Diastoporidae          | 4           | Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Maughan and De Grave (2000); Wyse Jackson (1991) |
|                | Terviidae              | 1           | Wyse Jackson (1991)  |
|                | Annectocymidae         | 2           | Wyse Jackson (1991)  |
|                | Horneridae             | 1           | Wyse Jackson (1991)  |
|                | Stegohorneridae        | 1           | Wyse Jackson (1991)  |
|                | Lichenoporidae         | 3           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)   |
|                | <b>Total species =</b> |             | <b>27</b>  |

### Class Gymnolaemata

Gymnolaemata represent the majority of bryozoan species (mostly in the Order Cheilostomatida). They have cylindrical or flattened zooids and the body wall can be calcified or uncalcified (Hayward and Ryland, 1998). The class includes some freshwater species, one of which is known to occur in the Republic of Ireland (Order Ctenostomatida, Family Paludicellidae).

References for 171 Gymnolaemata species have been found for the Republic of Ireland and its marine waters (EEZ) (Table 32).

**Table 32. Number of species in the Class Gymnolaemata known to occur in Ireland.**

| Order           | Family           | No. species  | References  |  |
|-----------------|------------------|--------------|---|--|
| Ctenostomatida  | Alcyoniidiidae   | 8            | Costelloe <i>et al.</i> (1986); Dinneen <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Ryland and Porter (2005); Wyse Jackson (1991) |  |
|                 | Flustrellidridae | 1            | Wyse Jackson (1991)   |  |
|                 | Paludicellidae   | 1            | Fauna Europaea (2004); Smyth (1994)   |  |
|                 | Arachnidiidae    | 2            | Wyse Jackson (1991)   |  |
|                 | Nolellidae       | 1            | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Konnecker and Keegan (1983); Wyse Jackson (1991);  |  |
|                 | Walkeridae       | 2            | Keegan <i>et al.</i> (1987); Wyse Jackson (1991)  |  |
|                 | Triticellidae    | 4            | Wyse Jackson (1991)   |  |
|                 | Hypophorellidae  | 1            | Wyse Jackson (1991)   |  |
|                 | Penetrantiidae   | 1            | Wyse Jackson (1991)   |  |
|                 | Vesiculariidae   | 6            | Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)   |  |
|                 | Cheilostomatida  | Aeteidae     | 3   | Keegan <i>et al.</i> (1987); Wyse Jackson (1991)   |
|                 |                  | Scrupariidae | 2   | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991) |
|                 |                  | Eucrateidae  | 1   | Keegan <i>et al.</i> (1987); Wyse Jackson (1991)   |
| Membraniporidae |                  | 4            | Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); O'Riordan (1982a); Wyse Jackson (1991)  |  |
| Electridae      |                  | 3            | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Hayward and Ryland (1998); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)   |  |
| Flustridae      |                  | 6            | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)                              |  |
| Calloporidae    |                  | 13           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Davidson (2004); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)             |  |
| Chaperiidae     |                  | 1            | Wyse Jackson (1991)   |  |
| Bugulidae       |                  | 11           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Picton and Costello (1998); Wyse Jackson (1991)  |  |
| Beaniidae       |                  | 1            | Costelloe <i>et al.</i> (1986); Wyse Jackson (1991)   |  |
| Candidae        |                  | 6            | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)                              |  |
| Microporidae    |                  | 2            | Wyse Jackson (1991)   |  |

| Order | Family                 | No. species | References  |
|-------|------------------------|-------------|---|
|       | Cellariidae            | 3           | Bourne (1890); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)  |
|       | Cribrilinidae          | 7           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Wyse Jackson (1991)   |
|       | Hippoporidridae        | 1           | Wyse Jackson (1991)   |
|       | Chorizoporidae         | 2           | Barnes and Maughan (2001); Keegan <i>et al.</i> (1987); Wyse Jackson (1991)   |
|       | Umbonulidae            | 2           | Barnes and Maughan (2001); Wyse Jackson (1991)  |
|       | Exochellidae           | 1           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)  |
|       | Escharellidae          | 12          | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Hayward and Ryland (1998); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Maughan and De Grave (2000); Wyse Jackson (1991)  |
|       | Teuchoporidae          | 1           | Keegan <i>et al.</i> (1987); Wyse Jackson (1991)  |
|       | Tessaradomidae         | 1           | Wyse Jackson (1991)   |
|       | Hippotheidae           | 3           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)  |
|       | Adeonidae              | 2           | Keegan <i>et al.</i> (1987); Wyse Jackson (1991)  |
|       | Cryptosulidae          | 1           | Wyse Jackson (1991)   |
|       | Hippoporinidae         | 2           | Konnecker and Keegan (1983); Wyse Jackson (1991)  |
|       | Schizoporellidae       | 10          | Barnes and Maughan (2001); Hayward and Ryland (1998); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Maughan and De Grave (2000); Wyse Jackson (1991)                                  |
|       | Smittinidae            | 9           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Hayward and Ryland (1998); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)                               |
|       | Porellidae             | 5           | Hayward and Ryland (1998); Konnecker and Keegan (1983); Wyse Jackson (1991)   |
|       | Bitectiporidae         | 6           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Davidson (2004); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Picton and Costello (1998); Wyse Jackson (1991)             |
|       | Microporellidae        | 7           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Wyse Jackson (1991)  |
|       | Celleporidae           | 10          | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Maughan and De Grave (2000); Picton and Costello (1998); Wyse Jackson (1991) |
|       | Phidoloporidae         | 5           | Barnes and Maughan (2001); Costelloe <i>et al.</i> (1986); Konnecker and Keegan (1983); Wyse Jackson (1991)   |
|       | Pasytheidae            | 1           | Wyse Jackson (1991)   |
|       | <b>Total species =</b> | <b>171</b>  |   |

### **Class Phylactolaemata**

Phylactolaemata bryozoans are found exclusively in freshwater. References for eight Phylactolaemata species have been found for the Republic of Ireland (Table 33).

**Table 33. Number of species in the Class Phylactolaemata known to occur in Ireland.**

| <b>Order</b> | <b>Family</b>          | <b>No. species</b> | <b>References</b>                   |
|--------------|------------------------|--------------------|-------------------------------------|
| -            | Cristatellidae         | 1                  | Fauna Europaea (2004); Smyth (1994) |
|              | Fredericellidae        | 1                  | Fauna Europaea (2004); Smyth (1994) |
|              | Lophopodidae           | 1                  | Fauna Europaea (2004); Smyth (1994) |
|              | Plumatellidae          | 5                  | Fauna Europaea (2004); Smyth (1994) |
|              | <b>Total species =</b> | <b>8</b>           |                                     |

## **Phylum Phoronida**

Smith, K. G.

Phoronids are sedentary, filter-feeding, marine worm-like animals which secrete and live in a chitinous cylindrical tube (Emig, 1979). There are an estimated 15 species known worldwide (NHM, 2007), in two genera (*Phoronis* and *Phoronopsis*). Although all species are widely distributed, only *Phoronis* is represented in the waters off the British Isles (Emig, 1979).

References documenting the occurrence of one species (*Phoronis muelleri* Selys-Longchamps, 1903, Family Phoronidae) in the Republic of Ireland's marine waters were identified (Emig, 1979; Shin *et al.*, 1982). However, Ryland (1990) stated that two other species are widely distributed in waters of the British Isles although he did not indicate whether this included Irish waters.

## Phylum Brachiopoda

Ferris, S. E.

Brachiopods, commonly known as lampshells, are sessile, benthic invertebrates that possess a bi-valved shell. They range from the antarctic to tropical reefs, and from intertidal areas to depths of around 6,000 metres (Brunton and Curry, 1979). The fossil record indicates that they were more diverse in the past than they are today, and approximately 300 species are known worldwide, of which 21 have been recorded in British waters (Brunton and Curry, 1979).

In this report, the class names follow the Costello *et al.* (2008); however, the order and family names in Howson (1997d) were followed in all cases except for the Order Lingulida which is not included in Howson (1997d), and the only order (Craniida) in the Class Craniata which is recognised following Costello *et al.* (2008).

At least 14 species from 10 families and three orders are known from Irish waters (Table 34). However, it seems likely that this is an underestimate of the true diversity in Irish waters.

**Table 34. Number of species in the Phylum Brachiopoda known to occur in Ireland.**

| Class          | Order          | Family                 | No. species        | References  |  |                          |
|----------------|----------------|------------------------|--------------------|---|--|--------------------------|
| Craniata       | Craniida       | Craniidae              | 1                  | Picton and Costello (1998);<br>Brunton and Curry (1979);<br>Massy (1925); Ryland (1990) |  |                          |
| Rhynchonellata | Rhynchonellida | Cryptoporidae          | 1                  | Cooper (1981); Curry (1983);<br>Brunton and Curry (1979);<br>Massy (1925)               |  |                          |
|                |                | Hemithirididae         | 1                  | Brunton and Curry (1979)  |  |                          |
|                |                | Frieleiidae            | 1                  | Brunton and Curry (1979)  |  |                          |
|                |                | Terebratulida          | Cancellothyrididae | 2   | Harper (1991); Brunton and<br>Curry (1979); Könnecker and<br>Keegan (1983); Massy (1925);<br>Picton and Costello (1998); |                          |
|                |                |                        | Megathirididae     | 3   | Brunton and Curry (1979);<br>Logan <i>et al.</i> (1997); Massy<br>(1925)   |                          |
|                |                |                        | Platidiidae        | 1   | Brunton and Curry (1979)   |                          |
|                |                | Dallinidae             | 2                  | Atkins (1960); Cooper (1981);<br>Massy (1925)   |  |                          |
|                |                | Laqueidae              | 1                  | Cooper (1981); Harper (1991);<br>Brunton and Curry (1979)                               |  |                          |
|                |                | Lingulata              | Lingulida          | Discinidae  | 1  | Brunton and Curry (1979) |
|                |                | <b>Total species =</b> |                    |   | <b>14</b>  |                          |

## Phylum Mollusca

Smith, K. G. and Nunn, J.

Molluscs are soft-bodied animals, often covered with a hard exoskeleton (shell). Although they are predominantly a marine group, they are also commonly found in terrestrial and freshwater environments. They vary widely in shape and size from a few millimetres to over 10 metres and around 200kgs in the case of the Giant Squid (*Architeuthis dux*) which is probably the world's largest invertebrate (the largest recorded was 18 metres in length and 900kgs) (National Geographic 2005). Mollusca is also one of the most speciose groups of animals, with around 80,000 species worldwide (NHM, 2007). They provide many economic benefits (e.g. food and jewellery from clams, oysters and mussels) and significantly contribute to many ecosystem services (e.g. water filtration by bivalves) around the world. There are eight extant classes of molluscs, seven of which have been recorded in the Republic of Ireland.

1,088 species of molluscs have been recorded in the Republic of Ireland and its waters (EEZ), including 920 marine and 173 non-marine species. The sum of the total species for these two groups does not match the total for the Phylum as there are a number of brackish Gastropoda species, and five of these species have been recorded for both 'groups'. As the higher taxonomy between marine and non-marine molluscs are not currently directly comparable, different tables have been produced for each of these 'groups'. The higher taxonomy used for the marine species follows Heppell, Smith and Picton (1997), and for the non-marine species Anderson (2005).

### Class Caudofoveata

The Caudofoveata are small (up to 80 mm in length) worm-shaped molluscs, which do not possess a shell. They are exclusively marine, and they burrow in muddy sediments below 20 metres in depth (Jones and Baxter, 1987). The class is sometimes combined with Solenogastres and termed Aplacophora.

Nine species of Caudofoveata have been recorded from Irish waters (Table 35).

**Table 35. Number of species in the Class Caudofoveata known to occur in Ireland.**

| Order                  | Family                 | No. species | References                                     |
|------------------------|------------------------|-------------|--|
| Chaetodermatida        | Limifossoridae         | 1           | Nunn, pers. comm.                              |
|                        | Chaetodermatidae       | 2           | McGrath (1981a); Nunn, pers. comm.             |
|                        | Protochaetodermatiidae | 6           | Nunn, pers. comm.; Scheltema and Ivanov (2000) |
| <b>Total species =</b> |                        | <b>9</b>    |  |

### Class Solenogastres

The Solenogastres are mostly small (less than 5 cm long) marine worm-like molluscs that lack a shell and live on the surface of mud or on cnidarians, upon which they feed. They are rarely found in water less than 20 metres deep (Jones and Baxter, 1987). The class is sometimes combined with Caudofoveata and termed Aplacophora.

Eight species of Solenogastres have been recorded from the Republic of Ireland EEZ (Table 36).

**Table 36. Number of species in the Class Solenogastres known to occur in Ireland.**

| Order                  | Family           | No. species | References   |
|------------------------|------------------|-------------|--|
| Pholidoskepia          | Dondersiidae     | 1           | Mackie <i>et al.</i> (1995); Wilson <i>et al.</i> (2001) |
|                        | Lepidomeniidae   | 1           | Caudwell <i>et al.</i> (1995)                            |
|                        | Macellomeniidae  | 1           | Scheltema (1999)   |
| Neomeniamorpha         | Neomeniidae      | 1           | Nunn, pers. comm.  |
|                        | Acanthomeniidae  | 1           | Scheltema (1999)   |
| Cavibelonia            | Pararrhopaliidae | 1           | Mackie <i>et al.</i> (1995); Wilson <i>et al.</i> (2001) |
|                        | Rhopalomeniidae  | 1           | Mackie <i>et al.</i> (1995); Wilson <i>et al.</i> (2001) |
|                        | Simrothiellidae  | 1           | Arnofsky (2000)  |
| <b>Total species =</b> |                  | <b>8</b>    |  |

### Class Polyplacophora

Polyplacophora, or chitons, are an ancient group of molluscs (Jones and Baxter, 1987) that possess eight separate overlapping shell plates, which gives them their other common name ‘coat-of-mail shells’. They are between 8 mm and 33 cm in length and only found in the marine environment where they inhabit hard bottoms and rocky coasts (Campbell and Fautin, 2001).

Eleven species have been recorded from the Republic of Ireland EEZ (Table 37).

**Table 37. Number of species in the Class Polyplacophora known to occur in Ireland.**

| Order       | Family            | No. species | References   |
|-------------|-------------------|-------------|--|
| Neoloricata | Lepidochitonidae  | 6           | Nunn (1990a); Nunn (1990b); Nunn (1996); Nunn, pers. comm. |
|             | Hanleyidae        | 1           | Nunn, pers. comm.  |
|             | Ischnochitonidae  | 2           | Nunn (1990b); Nunn, pers. comm.                            |
|             | Acanthochitonidae | 2           | Nunn (1990b); Nunn (2002)                                  |
| Total       |                   | 11          |  |

### Class Gastropoda

Gastropoda is the most diverse group of molluscs with around 70,000 species worldwide (NHM, 2007). They are found in a wide variety of habitats in marine, freshwater and terrestrial environments. The group includes the snails, which usually possess a spirally coiled shell into which the body can be withdrawn, and the slugs where the shell has been lost or reduced (Myers and Burch, 2001).

Six hundred and fifty eight species of gastropods have been recorded from Ireland and its marine waters (EEZ) (Tables 38 and 39). This includes 511 marine species and 152 non-marine species (141 native, and 11 introduced; 1 Neotaenioglossa, 10 Pulmonata). Of these, the Subclass Pulmonata has 136 species and is almost exclusively terrestrial.

**Table 38. Number of marine species in the Class Gastropoda known to occur in Ireland.**

| Order             | Family         | No. species | References  |
|-------------------|----------------|-------------|---|
| Actophila         | Ellobiidae     | 2           | Nunn (1990b); O'Sullivan (1983)   |
| Archaeogastropoda | Scissurellidae | 2           | Henry and Roberts (in press); Nunn, pers. comm.                               |
|                   | Fissurellidae  | 6           | Massy (1916a); Nichols (1900); Nunn (1990b); Nunn (1996); Nunn, pers. comm.   |
|                   | Turbinidae     | 3           | NMSZ coll.; Nunn (1990b)  |
|                   | Trochidae      | 18          | Henry and Roberts (in press); Massy (1916a); McGrath (1981b); Nichols (1900); |

| Order             | Family          | No. species | References   |
|-------------------|-----------------|-------------|--|
|                   |                 |             | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.  |
|                   | Skeneidae       | 15          | Nichols (1900); Nunn (1990a); Nunn (1996); Nunn, pers. comm.; Warén (1991)   |
|                   | Pendromidae     | 1           | Henry and Roberts (in press)   |
|                   | Seguenziidae    | 2           | Massy (1916a); Nunn, pers. comm.   |
| Patellogastropoda | Lottiidae       | 2           | Nunn (1990b)   |
|                   | Patellidae      | 3           | Nunn (1990b); Nunn (1996)  |
|                   | Lepetidae       | 2           | Nunn, pers. comm.  |
|                   | Propilidiidae   | 1           | Nunn, pers. comm.  |
| Mesogastropoda    | Cerithiidae     | 2           | NMNI coll.; Nunn (1990b)   |
|                   | Turritellidae   | 1           | Nunn (1996)  |
|                   | Cerithiopsidae  | 7           | Bouchet and Warén (1993); Nunn (1990b); Nunn, pers. comm.  |
|                   | Littorinidae    | 13          | Nunn (1990b); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; Picton and Costello (1998); Small and Gosling (2001)   |
|                   | Skeneopsidae    | 1           | Nunn (1990b)   |
|                   | Cingulopsidae   | 1           | Nunn (1996)  |
|                   | Barleeidae      | 1           | Nunn (1990b)   |
|                   | Rissoidae       | 25          | Henry and Roberts (in press); Massy (1930); McGrath (1981a); Nichols (1900); Nunn (1990a); Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm. |
|                   | Hydrobiidae     | 4           | Anderson (2005); Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998)  |
|                   | Truncatellidae  | 1           | Nunn (2005); Anderson (2005)   |
|                   | Assimineidae    | 1           | Kerney (1999)  |
|                   | Iravadiidae     | 2           | McGrath (1981a)  |
|                   | Caecidae        | 2           | Nunn (1990b); Nunn, pers. comm.  |
|                   | Tornidae        | 1           | Nunn, pers. comm.  |
|                   | Adeorbidae      | 1           | Nunn, pers. comm.  |
|                   | Aporrhaiidae    | 2           | Nunn, pers. comm.; Picton and Costello (1998)  |
|                   | Vanikoridae     | 1           | Henry and Roberts (in press)   |
|                   | Calyptraeidae   | 2           | Nunn (2002); Nunn, pers. comm.   |
|                   | Capulidae       | 3           | Nichols (1900); Nunn, pers. comm.  |
|                   | Ovulidae        | 2           | Massy (1930); Nunn (1990b)   |
|                   | Triviidae       | 3           | Nunn (1990b); Picton and Costello (1998)   |
|                   | Lamellaridae    | 3           | Nunn (1990b); Nunn, pers. comm.  |
|                   | Velutinidae     | 2           | Nunn, pers. comm.  |
|                   | Naticidae       | 7           | Massy (1930); Nunn (1996); Nunn, pers. comm.; O'Riordan (1984b)  |
|                   | Ampullospiridae | 2           | Nichols (1900); Nunn, pers. comm.  |
|                   | Cassidae        | 3           | Nichols (1900); Nunn, pers. comm.; O'Riordan (1971)  |
|                   | Ranellidae      | 2           | Nunn, pers. comm.  |
|                   | Carinariidae    | 1           | Nunn, pers. comm.  |
|                   | Atlantidae      | 2           | SAHFOS records   |
|                   | Triphoridae     | 3           | Nunn (1990b); Nunn, pers. comm.  |
|                   | Epitoniidae     | 9           | Henry and Roberts (in press); McGrath (1981a); Nunn (1996); Nunn, pers. comm.  |
|                   | Janthinidae     | 4           | NMSZ coll.; Nunn, pers. comm.  |

| Order         | Family            | No. species | References  |
|---------------|-------------------|-------------|---|
|               | Acclididae        | 5           | McGrath (1981a); Nunn (1994); Nunn, pers. comm.   |
|               | Eulimidae         | 21          | Bouchet and Warén (1986); McGrath (1981a); Nichols (1900); Nunn (1990b); Nunn, pers. comm.; Picton and Costello (1998)  |
| Neogastropoda | Muricidae         | 9           | Henry and Roberts (in press); Massy (1930); Nunn (1990b); Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998)  |
|               | Turbinellidae     | 1           | Bouchet and Warén (1986)  |
|               | Buccinidae        | 19          | NMSZ coll.; Nunn (1990b); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; O'Riordan (1973); Picton and Costello (1998)  |
|               | Volutomitridae    | 1           | NMSZ coll.  |
|               | Cancellariidae    | 5           | Nunn, pers. comm.   |
|               | Turridae          | 40          | Bouchet and Warén (1980); Massy (1916a); McGrath (1981a); Nichols (1900); Nunn (1990b); Nunn (1993); Nunn <i>et al.</i> (2006); Nunn, pers. comm.                 |
| Heterostropha | Architectonicidae | 1           | NMSZ coll.  |
|               | Rissoellidae      | 3           | Nunn (1990a); Nunn (1990b)  |
|               | Cimidae           | 1           | Nunn (1996)   |
|               | Omalogyridae      | 2           | Nunn (1990a); Nunn (1990b)  |
|               | Pyramidellidae    | 46          | Dale (in prep.); Massy (1930); McGrath (1981a); Nichols (1900); Nunn (1990b); Nunn (1993); Nunn (1996); Nunn (2002); Nunn <i>et al.</i> (2006); Nunn, pers. comm. |
|               | Tjaernoeyidae     | 3           | Nichols (1900); Nunn, pers. comm.   |
| Cephalaspidea | Acteonidae        | 2           | Massy (1930); Picton and Costello (1998)  |
|               | Ringiculidae      | 1           | Nunn, pers. comm.   |
|               | Scaphandridae     | 4           | Nunn (2002); Nunn, pers. comm.; Picton and Costello (1998); Sykes (1905)  |
|               | Cylichnidae       | 3           | Nunn (2002); Nunn, pers. comm.  |
|               | Philinidae        | 9           | Bishop (2003); Massy (1930); Nichols (1900); Nunn (1990a); Nunn (1996); Nunn, pers. comm.   |
|               | Diaphanidae       | 6           | Nunn (1990b); Nunn, pers. comm.; Picton and Costello (1998)   |
|               | Haminoeyidae      | 2           | NMSZ coll.; Nunn (1996)   |
|               | Retusidae         | 9           | McGrath (1981a); Nichols (1900); Nunn (1990b); Nunn (1996); Nunn, pers. comm.   |
|               | Runcinidae        | 2           | Nunn (1996); Nunn <i>et al.</i> (2006)  |
| Sacoglossa    | Elysiidae         | 1           | Nunn (1990b)  |
|               | Stiligeridae      | 2           | Nunn (1990a); Nunn <i>et al.</i> (2006)   |
|               | Alderiidae        | 1           | O'Sullivan (1983)   |
|               | Hermaeyidae       | 2           | Nunn (1996); Picton and Costello (1998)   |
|               | Limapontiidae     | 3           | Nunn (1990b); Nunn (1996); Nunn, pers. comm.  |
| Anaspidea     | Akeridae          | 1           | Nunn (1996)   |
|               | Aplysiidae        | 2           | Bebbington (1995); Nunn (1996)  |
| Notaspidea    | Pleurobranchidae  | 2           | Nunn (1990a); Nunn (1996)   |
| Thecosomata   | Limacinidae       | 3           | Nunn, pers. comm.; SAHFOS records   |
|               | Cavoliniidae      | 8           | Massy (1909a); Nunn, pers. comm.; SAHFOS records  |
|               | Peraclidae        | 4           | Nunn, pers. comm.   |

| Order        | Family                 | No. species | References  |
|--------------|------------------------|-------------|---|
|              | Cymbuliidae            | 1           | Nunn, pers. comm.   |
| Gymnosomata  | Pneumodermatidae       | 7           | Massy (1909a); Massy (1917); Nunn, pers. comm.; SAHFOS records                                      |
|              | Notobranchaeidae       | 1           | Massy (1917)  |
|              | Clionidae              | 1           | SAHFOS records  |
|              | Thliptodontidae        | 6           | Massy (1909b); Massy (1917)   |
| Nudibranchia | Tritoniidae            | 4           | Picton and Costello (1998)  |
|              | Lomanotidae            | 2           | Nunn (1996); Picton and Costello (1998)   |
|              | Hancockiidae           | 1           | Nunn (1990a)  |
|              | Dendronotidae          | 1           | Picton and Costello (1998)  |
|              | Dotidae                | 15          | Nunn (1990a); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; Picton and Costello (1998) |
|              | Embletoniidae          | 1           | Nunn <i>et al.</i> (2006)   |
|              | Goniodorididae         | 2           | Nunn (1990a); Nunn (1990b)  |
|              | Okeniidae              | 5           | Nunn, pers. comm.; Picton and Costello (1998)   |
|              | Onchidorididae         | 10          | Nichols (1900); Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Picton and Costello (1998)    |
|              | Triophidae             | 1           | Picton and Costello (1998)  |
|              | Aegiretidae            | 1           | Nunn (1990b)  |
|              | Polyceridae            | 7           | Nunn (1990b); Nunn (1996); Nunn, pers. comm.  |
|              | Chromodorididae        | 1           | Nunn (1990b)  |
|              | Aldisidae              | 1           | Picton and Costello (1998)  |
|              | Rostangidae            | 1           | Nunn (1996)   |
|              | Dorididae              | 2           | Nunn, pers. comm.   |
|              | Archidorididae         | 1           | Nunn (1990b)  |
|              | Discodorididae         | 1           | Nunn (1990b)  |
|              | Kentrodorididae        | 1           | Nunn (1990b)  |
|              | Arminidae              | 1           | Picton and Costello (1998)  |
|              | Janolidae              | 3           | Nunn (1990b); Nunn <i>et al.</i> (2006)   |
|              | Heroidae               | 1           | Picton and Costello (1998)  |
|              | Flabellinidae          | 6           | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.                             |
|              | Tergipedidae           | 10          | Nunn (1990b); Nunn (1996); Picton and Costello (1998)   |
|              | Eubbranchidae          | 7           | Nunn (1990b); Nunn (1996); Picton and Costello (1998)   |
|              | Calmidae               | 2           | Nunn <i>et al.</i> (2006); Picton and Costello (1998)   |
|              | Facelinidae            | 5           | Nunn (1990b); Nunn <i>et al.</i> (2006); Picton and Costello (1998)                                 |
|              | Favorinidae            | 3           | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006)  |
|              | Aeolidiidae            | 4           | Nunn (1990b); Nunn (1996)   |
|              | <b>Total species =</b> | <b>511</b>  |   |

Table 39. Number of non-marine species in the Class Gastropoda known to occur in Ireland.

| Order                  | Family          | No. species | References   |
|------------------------|-----------------|-------------|--|
| Neritopsina            | Neritidae       | 1           | Anderson (2005); Invertebrate Ireland (all families) |
| Architaenioglossa      | Aciculidae      | 1           |  |
|                        | Viviparidae     | 1           |  |
| Neotaenioglossa        | Assimineidae    | 1           |  |
|                        | Bithyniidae     | 2           |  |
|                        | Hydrobiidae     | 5           |  |
|                        | Pomatiidae      | 1           |  |
|                        | Truncatellidae  | 1           |  |
|                        | Thiaridae       | 1           |  |
| Ectobranchia           | Valvatidae      | 2           |  |
| Pulmonata              | Acroloxidae     | 1           |  |
|                        | Agriolimacidae  | 3           |  |
|                        | Arionidae       | 14          |  |
|                        | Boettgerillidae | 1           |  |
|                        | Carychiidae     | 2           |  |
|                        | Clausiliidae    | 4           |  |
|                        | Cochlicellidae  | 1           |  |
|                        | Cochlicopidae   | 2           |  |
|                        | Discidae        | 1           |  |
|                        | Ellobiidae      | 3           |  |
|                        | Enidae          | 1           |  |
|                        | Euconulidae     | 2           |  |
|                        | Ferussaciidae   | 1           |  |
|                        | Gastrodontidae  | 3           |  |
|                        | Helicidae       | 6           |  |
|                        | Helicodiscidae  | 1           |  |
|                        | Hygromiidae     | 9           |  |
|                        | Lauriidae       | 2           |  |
|                        | Limacidae       | 6           |  |
|                        | Lymnaeidae      | 8           |  |
|                        | Milacidae       | 4           |  |
|                        | Otinidae        | 1           |  |
|                        | Oxychilidae     | 7           |  |
|                        | Physidae        | 4           |  |
|                        | Planorbidae     | 14          |  |
|                        | Pleurodiscidae  | 1           |  |
|                        | Pristilomatidae | 2           |  |
|                        | Punctidae       | 1           |  |
|                        | Pupillidae      | 1           |  |
|                        | Pyramidulidae   | 1           |  |
| Subulinidae            | 3               |             |  |
| Succineidae            | 5               |             |  |
| Testacellidae          | 3               |             |  |
| Valloniidae            | 5               |             |  |
| Vertiginidae           | 10              |             |  |
| Vitrinidae             | 2               |             |  |
| Zonitidae              | 1               |             |  |
| <b>Total species =</b> |                 | <b>152</b>  |  |

### Class Scaphopoda

Scaphopoda, known as ‘tusk-shells’ due to their resemblance in shape and colour to elephant tusks, range in size from 4 mm to 15 cm long. They are exclusively marine and found at extreme low water or in shallow sub-littoral areas down to waters that are 4,570 m deep, where they burrow in sediments (Mulcrone, 2005b).

Twenty three species have been recorded from the Republic of Ireland EEZ (Table 40).

**Table 40. Number of species in the Class Scaphopoda known to occur in Ireland.**

| Order                  | Family             | No. species | References  |
|------------------------|--------------------|-------------|---|
| Dentaliida             | Dentaliidae        | 8           | Nunn (1993); Nunn <i>et al.</i> (2006); Nunn, pers. comm. |
|                        | Laevidentaliiidae  | 1           | Massy (1916a)   |
| Siphonodentalioida     | Entalinidae        | 3           | Nunn, pers. comm.   |
|                        | Pulsellidae        | 2           | Nunn, pers. comm.   |
|                        | Siphonodentaliidae | 3           | Nunn, pers. comm.   |
| Gadilida               | Gadilidae          | 6           | Massy (1930); Nunn, pers. comm.                           |
| <b>Total species =</b> |                    | <b>23</b>   |   |

### Class Pelecypoda

Pelecypoda, commonly known as the bivalves, possess two shells (usually symmetrical) joined at the dorsal end by a region called the ligament. They are exclusively aquatic and most are filter feeders. They use their muscular foot to either bury into soft sediments or attach to substrates. Some species (scallops) can ‘swim’ to escape predators (Kellogg and Fautin, 2002). The group contains the clams, cockles, mussels and oysters.

There are 329 bivalves recorded from the Republic of Ireland and its EEZ, 308 in the marine environment and 21 in freshwater (Tables 41 and 42). There are no species that are recorded in both marine and non-marine environments.

**Table 41. Number of marine species in the Class Pelecypoda known to occur in Ireland.**

| Order      | Family         | No. species | References   |
|------------|----------------|-------------|--|
| Nuculoida  | Nuculidae      | 7           | Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998) |
|            | Nuculomidae    | 3           | Nunn, pers. comm.  |
|            | Pristiglomidae | 2           | Nunn, pers. comm.  |
|            | Nuculanidae    | 2           | Nunn, pers. comm.  |
|            | Ledellidae     | 9           | Barry (2008); Nunn, pers. comm.                            |
|            | Spinulidae     | 2           | Nunn, pers. comm.  |
|            | Sareptidae     | 16          | Massy (1930); Nunn, pers. comm.; Warén (1980)              |
|            | Neilonellidae  | 3           | Nunn, pers. comm.  |
|            | Malletiidae    | 3           | Nunn, pers. comm.  |
|            | Lametilidae    | 1           | Nunn, pers. comm.  |
|            | Phaseolidae    | 1           | Nunn, pers. comm.  |
|            | Siliculidae    | 1           | Nunn, pers. comm.  |
|            | Arcoida        | Arcidae     | 6  |
| Noetiidae  |                | 1           | Nunn, pers. comm.  |
| Limopsidae |                | 4           | Nunn, pers. comm.  |

| Order     | Family          | No. species | References   |
|-----------|-----------------|-------------|--|
|           | Glycymerididae  | 1           | Picton and Costello (1998)   |
| Mytiloida | Mytilidae       | 17          | Barry (2008); Berrow <i>et al.</i> (1995); Nunn (1990a); Nunn (1990b); Nunn (1996); Nunn (2002); Nunn, pers. comm.; Picton and Costello (1998) |
| Pterioida | Pteriidae       | 1           | Nunn, pers. comm.  |
|           | Pinnidae        | 1           | Nunn, pers. comm.  |
| Limoida   | Limidae         | 11          | Barry (2008); Henry and Roberts (in press); McGrath (1981a); Nunn (1996); Nunn, pers. comm.  |
| Ostreoida | Ostreidae       | 3           | Nunn (1990b); Nunn (1996); Nunn, pers. comm.   |
|           | Gryphaeidae     | 1           | Nunn, pers. comm.  |
|           | Pectinidae      | 11          | Nunn (1990b); Nunn (1996); Nunn, pers. comm.   |
|           | Propeamussiidae | 9           | Barry (2008); Nunn, pers. comm.  |
|           | Anomiidae       | 3           | Nunn (1990b); Nunn, pers. comm.  |
| Veneroida | Lucinidae       | 4           | Nunn (1990b); Nunn, pers. comm.  |
|           | Thyasiridae     | 17          | Barry (2008); Nunn, pers. comm.; Picton and Costello (1998)  |
|           | Ungulinidae     | 1           | Picton and Costello (1998)   |
|           | Galeommatidae   | 7           | Nunn (1990b); Nunn (1996); Nunn, pers. comm.; Oliver and Killeen (2002)  |
|           | Leptonidae      | 2           | Dale (in prep.); Nunn, pers. comm.   |
|           | Montacutidae    | 13          | Nunn (1990b); Nunn, pers. comm.; Picton and Costello (1998)  |
|           | Neoleptonidae   | 3           | Nunn (1990a); Nunn, pers. comm.  |
|           | Astartidae      | 6           | Nunn (1996); Nunn, pers. comm.   |
|           | Cardiidae       | 10          | Nunn (1990b); Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998)   |
|           | Mactridae       | 8           | Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; Picton and Costello (1998)  |
|           | Solenidae       | 1           | Picton and Costello (1998)   |
|           | Pharidae        | 5           | Nunn (1996); Picton and Costello (1998)  |
|           | Tellinidae      | 10          | Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; Picton and Costello (1998)  |
|           | Donacidae       | 2           | Nunn, pers. comm.  |
|           | Psammobiidae    | 6           | Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998)   |
|           | Semelidae       | 8           | Nunn (1996); Nunn, pers. comm.; Picton and Costello (1998)   |
|           | Arcticidae      | 1           | Picton and Costello (1998)   |
|           | Kelliellidae    | 5           | Henry and Roberts (in press); Nunn, pers. comm.  |
|           | Glossidae       | 1           | Nunn, pers. comm.  |
|           | Veneridae       | 16          | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm.; Picton and Costello (1998)  |
|           | Turtoniidae     | 1           | Nunn (1990b)   |
|           | Petricolidae    | 1           | Nunn (1996)  |

| Order                  | Family          | No. species | References  |
|------------------------|-----------------|-------------|---|
| Myoida                 | Myidae          | 3           | Keegan (1974b); Nunn (1996)   |
|                        | Corbulidae      | 2           | Nichols (1900); Nunn (1996)   |
|                        | Gastrochaenidae | 1           | Nunn <i>et al.</i> (2006)   |
|                        | Hiatellidae     | 3           | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006)                    |
|                        | Pholadidae      | 6           | Nunn, pers. comm.; Picton and Costello (1998)                           |
|                        | Xylophagaidae   | 1           | O'Riordan (1971)  |
|                        | Teredinidae     | 5           | Nunn (1990b); Nunn (1993); Nunn, pers. comm.                            |
| Pholadomyoida          | Thraciidae      | 6           | Nunn (1990b); Nunn (1996); Nunn <i>et al.</i> (2006); Nunn, pers. comm. |
|                        | Periplomatidae  | 2           | Nunn (2002); Nunn, pers. comm.  |
|                        | Lyonsiidae      | 3           | Barry (2008); Nunn, pers. comm.   |
|                        | Pandoridae      | 2           | Nunn, pers. comm.   |
|                        | Poromyidae      | 8           | Massy (1930); Nunn, pers. comm.   |
|                        | Cuspidariidae   | 19          | Barry (2008); Massy (1916a); Nunn, pers. comm.                          |
| <b>Total species =</b> |                 | <b>308</b>  |   |

Table 42. Number of non-marine species in the Class Pelecypoda known to occur in Ireland.

| Order                  | Family           | No. species | References   |
|------------------------|------------------|-------------|--|
| Uniodoida              | Margaritiferidae | 1           | Anderson (2005); Invertebrate Ireland (all families) |
|                        | Unionidae        | 2           |  |
| Veneroida              | Dreissenidae     | 1           |  |
|                        | Sphaeriidae      | 17          |  |
| <b>Total species =</b> |                  | <b>21</b>   |  |

### Class Cephalopoda

Cephalopoda is the most morphologically and behaviourally complex class in the phylum Mollusca, possessing the most complex brain of any invertebrate (Wheeler and Fautin, 2001). They possess arms or tentacles, are carnivorous and can use cells in their skin called chromatophores to change colour in response to danger or for camouflage. They are only found in marine environments and include the octopi, squids and cuttlefish.

Fifty species of cephalopods have been recorded from Irish waters (Table 43).

Table 43. Number of species in the Class Caudofoveata known to occur in Ireland.

| Order      | Family         | No. species | References   |
|------------|----------------|-------------|--|
| Sepioidea  | Spirulidae     | 1           | Nichols (1900)   |
|            | Sepiidae       | 3           | Massy (1928); O'Riordan (1975a)  |
|            | Sepiolidae     | 8           | Collins <i>et al.</i> (2001); Massy (1928); Nichols (1900); NMI coll.; Nunn (1996); Nunn, pers. comm.; O'Riordan (1975a) |
| Teuthoidea | Loliginidae    | 4           | Lordan <i>et al.</i> (2001); Massy (1928); Nichols (1900); O'Riordan (1975b)   |
|            | Architeuthidae | 1           | Collins (1998)   |
|            | Bathyteuthidae | 1           | Massy (1916b)  |

| <b>Order</b> | <b>Family</b>          | <b>No. species</b> | <b>References</b>  |
|--------------|------------------------|--------------------|--|
|              | Brachioteuthidae       | 2                  | Massy (1909a); Massy (1916b)   |
|              | Chiroteuthidae         | 1                  | Massy (1913)   |
|              | Cranchidae             | 3                  | Collins <i>et al.</i> (2001)   |
|              | Gonatidae              | 1                  | Collins <i>et al.</i> (2001)   |
|              | Histioteuthidae        | 2                  | Collins <i>et al.</i> (2001)   |
|              | Octopoteuthidae        | 1                  | Massy (1928)   |
|              | Ommastrephidae         | 4                  | Collins <i>et al.</i> (2001); Heppell (1992); Lordan <i>et al.</i> (1998); O'Riordan (1975b) |
|              | Onychoteuthidae        | 1                  | Massy (1916b)  |
| Octopoda     | Cirroteuthidae         | 2                  | Collins <i>et al.</i> (2001)   |
|              | Opisthoteuthidae       | 2                  | Collins <i>et al.</i> (2001)   |
|              | Grimpoteuthidae        | 2                  | Collins (2003); Nunn, pers. comm.  |
|              | Alloposidae            | 1                  | Collins <i>et al.</i> (1997)   |
|              | Stauroteuthidae        | 1                  | Collins and Henriques (2000)   |
|              | Octopidae              | 8                  | Collins <i>et al.</i> (2001); Massy (1909a); Nunn (1990b); Nunn, pers. comm.                 |
|              | Ocythoidae             | 1                  | NMI coll.  |
|              | <b>Total species =</b> | <b>50</b>          |  |

## **Phylum Priapulida**

Ferris, S. E.

The Priapulida are a small group of marine, unsegmented worm-like animals (Howson, 1997c). They are burrowing animals (van der Land, 1970) and live in soft sediments (Knight-Jones and Ryland, 1990b).

Knight-Jones and Ryland (1990b) noted that only 15 living species were known from the phylum although, more recently, 19 species were listed in the Species 2000 Catalogue of Life (Species 2000, 2008). One species (*Priapulus caudatus* Lamarck, 1816) has been recorded for the British Isles although others may be found (Howson, 1997c). *P. caudatus* (Family Priapulidae) has also been recorded in Ireland (Shin *et al.*, 1982; van der Land, 1970).

## Phylum Sipuncula

Ferris, S. E.

Commonly known as “peanut worms”, the Sipuncula is a small phylum of marine non-segmented worms, with bilaterally symmetrical bodies (Maxmen *et al.*, 2003). This phylum has in the past been classified with the Echiura and Priapulida (Gibbs, 2001). It is a widespread but often overlooked group, and approximately 149 species in 29 genera are recognised, although several species are known only from a very few specimens (Howson and Ball, 1997b). At least 23 species are known to occur in Ireland (Tables 44 and 45).

The higher taxonomy used follows that in the Costello *et al.* (2008), and the taxonomic sequence follows Gibbs (2001).

**Table 44. Number of species in the Class Sipunculidea known to occur in Ireland.**

| Order                  | Family         | No. species | References   |
|------------------------|----------------|-------------|--|
| Golfingiida            | Sipunculidae   | 2           | Cutler and Cutler (1987); Gibbs (2001); Hansson (1997); Knight-Jones and Ryland (1990b); Southern (1912a)  |
|                        | Golfingiidae   | 12          | Cutler and Cutler (1987); Dinneen <i>et al.</i> (1986); Gibbs (1986); Gibbs (2001); Hansson (1997); Keegan <i>et al.</i> (1987); Knight-Jones and Ryland (1990b); O'Connor (1988); Picton and Costello (1998); Shin <i>et al.</i> (1982); Southern (1912a) |
|                        | Phascolionidae | 4           | Colgan (1907b); Cutler and Cutler (1987); Dinneen <i>et al.</i> (1986); Gibbs (1985); Keegan <i>et al.</i> (1987); O'Connor (1988); Picton and Costello (1998); Shin <i>et al.</i> (1982); Southern (1912a)  |
| <b>Total species =</b> |                | <b>18</b>   |  |

**Table 45. Number of species in the Class Phascolosomatidea known to occur in Ireland.**

| Order                  | Family            | No. species | References   |
|------------------------|-------------------|-------------|--|
| Phascolosomatida       | Phascolosomatidae | 3           | Cutler and Cutler (1987); Gibbs (2001); Knight-Jones and Ryland (1990); Picton and Costello (1998); Southern (1912a) |
| Aspidosiphonida        | Aspidosiphonidae  | 2           | Cutler and Cutler (1987); Picton and Costello (1998); Southern (1912a)   |
| <b>Total species =</b> |                   | <b>5</b>    |  |

## Phylum Echiura

Ferris, S. E.

The echiurans or spoon worms are almost entirely marine, with a few brackish water species (Howson and Ball, 1997a). They are distinguished by possession of an unsegmented, sac-like body and, in almost all species, a highly extensible strap-like or ribbon-like proboscis (Hughes, 1998).

Howson and Ball (1997a) reported the occurrence of two families and seven species from British waters, noting that additional species were likely to occur; five of these species have also been recorded in Ireland. An additional two species were recorded in the western part of the Irish Exclusive Economic Zone by Fabri *et al.* (2004), bringing the Irish total to seven species (Table 46). The higher taxonomy and taxonomic sequence follows that used in Howson and Ball (1997a); however, information on class is not provided by Howson and Ball (1997a) so Costello *et al.* (2008) is followed in this regard.

**Table 46. Number of species of in the Phylum Echiura known to occur in Ireland.**

| Class                  | Order      | Family      | No. species | References  |
|------------------------|------------|-------------|-------------|---|
| Echiuroidea            | Echiurida  | Echiuridae  | 2           | Dinneen <i>et al.</i> (1986); Hayward and Ryland (1990); Richards (2008); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982) |
|                        | Bonelliida | Bonelliidae | 5           | Fabri <i>et al.</i> (2004); Hayward and Ryland (1990); Hughes <i>et al.</i> (1996); O'Connor and Mulligan (1977)                |
| <b>Total species =</b> |            |             | <b>7</b>    |   |

## Phylum Annelida

Ferris, S. E.

The Annelida contains the segmented worms, which range from the common earthworms to marine polychaetes and leeches. They occur worldwide and can be found in the deep seas, to tropical forests, to mountain ice fields, to urban environments. They are macroscopic, mostly free-living, cylindrical or flattened worms.

Traditionally the annelids were divided into three classes: the polychaetes, the oligochaetes, and the leeches, but the classification of the Annelida has been subject to much debate and revision (e.g. Martin, 2001; Siddall *et al.*, 2001). Current taxonomic thinking places the leeches and oligochaetes together in the Class Clitellata, and it is this classification that is followed here. There has also been some debate on how the Clitellata relate to the Polychaeta, and whether these groups, and others such as the Echiura, are monophyletic, or whether they are paraphyletic or even polyphyletic groups (Rouse and Pleijel, 2001).

### Class Polychaeta

The Polychaeta is the largest group of annelids and it occurs in all marine habitats and at all depths. Mackie and Erséus (1997) noted that they are particularly abundant in the benthos, commonly dominating the macrofauna in both number of species and individuals. Around 9,000 species of polychaetes are currently recognized, although the overall systematics of the group remains unstable (Rouse and Pleijel, 2001).

The higher taxonomy and taxonomic sequence presented here follows that in Mackie and Erséus (1997). O'Connor (1981a) stated that approximately 340 species were known to occur in Ireland. In this report, records for 404 polychaete species from 17 orders and 58 families were identified for the Republic of Ireland (Table 47). It is likely, however, that this number represents an underestimate, particularly for deep-water species, and so this number can be expected to increase.

**Table 47. Number of species of in the Class Polychaeta known to occur in Ireland.**

| Order        | Family          | No. species | References  |
|--------------|-----------------|-------------|---|
| Phyllodocida | Chrysopetalidae | 2           | O'Connor (1981a); Southern (1914a)  |
|              | Pisionidae      | 1           | Chambers and Muir (1997); Dinneen <i>et al.</i> (1986); Southern (1914a)  |
|              | Aphroditidae    | 4           | Bourne (1890); Carpenter and Praeger (1900); Chambers and Muir (1997); McIntosh (1910); Picton and Costello (1998); Southern (1910); Southern (1914a)   |
|              | Polynoidae      | 29          | Carpenter and Praeger (1900); Chambers and Muir (1997); Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); McIntosh (1910); Norton (1971); O'Sullivan (1983); Picton and Costello (1998); Rawlinson (2004); Southern (1910); Southern (1914a) |
|              | Pholoidae       | 4           | Chambers and Muir (1997); Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1914a)   |

| Order | Family            | No. species | References  |
|-------|-------------------|-------------|---|
|       | Sigalionidae      | 8           | Carpenter and Praeger (1900); Chambers and Muir (1997); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Mackie and Chambers (1990); McIntosh (1910); O'Connor (1981a); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a)  |
|       | Phyllodocidae     | 38          | Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Healy (1975b); Healy <i>et al.</i> (1982); Keegan <i>et al.</i> (1987); Lynch <i>et al.</i> (2006); McIntosh (1910); O'Connor (1981); Parker (1987); Pleijel and Dales (1991); Picton and Costello (1998); Pleijel and Dales (1991); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a) |
|       | Lacydoniidae      | 1           | Southern (1914a)  |
|       | Alciopidae        | 3           | Pleijel and Dales (1991)  |
|       | Lopadorrhynchidae | 5           | Pleijel and Dales (1991)  |
|       | Typhloscolecidae  | 2           | Pleijel and Dales (1991)  |
|       | Tomopteridae      | 2           | Pleijel and Dales (1991); Rawlinson (2004); Ryan <i>et al.</i> (1986); Southern (1910; 1914a)   |
|       | Glyceridae        | 10          | Carpenter <i>et al.</i> (1905); Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); McIntosh (1910); O'Connor (1987); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a)   |
|       | Goniadidae        | 3           | Carpenter <i>et al.</i> (1905); Dinneen <i>et al.</i> (1986); Mackie and Erséus (1997); McIntosh (1910); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a)  |
|       | Sphaerodoridae    | 4           | Dinneen <i>et al.</i> (1986); Southern (1914a)  |
|       | Hesionidae        | 10          | Davidson (2004); Dinneen <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); McIntosh (1910); Picton and Costello (1998); O'Connor and Shin (1983); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a)   |
|       | Pilargidae        | 1           | Dinneen <i>et al.</i> (1986)  |
|       | Syllidae          | 38          | Boyd (1972), Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Keegan <i>et al.</i> (1987); McIntosh (1910); Picton and Costello (1998); Rawlinson (2004); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a)  |
|       | Nereididae        | 10          | Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Healy (1975b); Healy <i>et al.</i> (1982); Keegan <i>et al.</i> (1987); Lynch <i>et al.</i> (2006); Norton (1971); Oliver and Healy (1998); O'Sullivan (1983); Picton and Costello (1998); McIntosh (1910); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a)                           |

| Order       | Family           | No. species | References   |
|-------------|------------------|-------------|--|
|             | Nephtyidae       | 11          | Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); McIntosh (1910); O'Connor (1981); Picton and Costello (1998); Rainer (1989); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a)  |
| Amphinomida | Amphinomidae     | 3           | O'Connor (1981a); O'Connor (1984); Southern (1914a)  |
|             | Euphrosinidae    | 2           | Carpenter and Praeger (1900); Davidson (2004); McIntosh (1910); Picton and Costello (1998); Southern (1914a)   |
| Spintherida | Spintheridae     | 1           | George and Hartmann-Schröder (1985)  |
| Eunicida    | Onuphidae        | 1           | Carpenter <i>et al.</i> (1903); McIntosh (1910)  |
|             | Eunicidae        | 8           | Carpenter <i>et al.</i> (1903); Dinneen <i>et al.</i> (1986); McIntosh (1910); O'Riordan (1973); Picton and Costello (1998); Southern (1914a)  |
|             | Lumbrineridae    | 5           | Dinneen <i>et al.</i> (1986); McIntosh (1910); Parapar <i>et al.</i> (1994); Picton and Costello (1998); Roche <i>et al.</i> (2007) Shin <i>et al.</i> (1982)  |
|             | Oeononidae       | 3           | Davidson (2004); O'Connor (1981a); McIntosh (1910); Southern (1914a)   |
|             | Dorvilleidae     | 6           | Davidson (2004); Dinneen <i>et al.</i> (1986); O'Connor (1981a); Shin <i>et al.</i> (1982) Southern (1910); Southern (1914a); Westheide (1990)   |
| Orbiniida   | Orbiniidae       | 3           | Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); McIntosh (1910); O'Sullivan (1983); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1914a)   |
|             | Paraonidae       | 13          | Dinneen <i>et al.</i> (1986); O'Connor (1981); O'Connor <i>et al.</i> (1984); Roche <i>et al.</i> (2007)   |
| Spionida    | Apistobranchidae | 1           | Dinneen <i>et al.</i> (1986); O'Connor (1981)  |
|             | Poecilochaetidae | 1           | Dinneen <i>et al.</i> (1986); Roche <i>et al.</i> (2007)   |
|             | Spionidae        | 31          | Dinneen <i>et al.</i> (1986); Healy (1975b); Healy <i>et al.</i> (1982); Lynch <i>et al.</i> (2006); O'Connor (1981a); O'Sullivan (1983); Rawlinson (2004); Picton and Costello (1998); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a) |
|             | Magelonidae      | 5           | Dinneen <i>et al.</i> (1986); Fiege <i>et al.</i> (2000); Mackie and Erséus (1997); O'Connor (1981a); Picton and Costello (1998); Rawlinson (2004); Roche <i>et al.</i> (2007); Southern (1914a)   |
|             | Chaetopteridae   | 3           | Davidson (2004); Dinneen <i>et al.</i> (1986); O'Connor (1981a); Picton and Costello (1998); Southern (1914a)  |
|             | Cirratulidae     | 12          | Chambers <i>et al.</i> (2007); Davidson (2004); Dinneen <i>et al.</i> (1986); O'Connor (1981a); Picton and Costello (1998); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a)   |

| Order                            | Family           | No. species | References  |
|----------------------------------|------------------|-------------|---|
| Cossurida                        | Cossuridae       | 1           | Dinneen <i>et al.</i> (1986)  |
| Flabelligerida                   | Flabelligeridae  | 4           | Dinneen <i>et al.</i> (1986); O'Sullivan (1983); Picton and Costello (1998); Southern (1910); Southern (1914a)  |
|                                  | Acrocirridae     | 1           | Dinneen <i>et al.</i> (1986); Southern (1914a)  |
| Capitellida                      | Capitellidae     | 9           | Dinneen (1982); Dinneen <i>et al.</i> (1986); Healy (1975b); Lynch <i>et al.</i> (2006); Mackie and Erséus (1997); O'Connor (1981a); Oliver (1998); O'Sullivan (1983); Picton and Costello (1998); Roche <i>et al.</i> (2007); Shin <i>et al.</i> (1982); Southern (1910); Southern (1914a) |
|                                  | Arenicolidae     | 3           | Davidson (2004); Dinneen <i>et al.</i> (1986); Healy (1975b); Healy <i>et al.</i> (1982); Oliver (1998); O'Sullivan (1983); Picton and Costello (1998); Southern (1910); Southern (1914a)   |
|                                  | Maldanidae       | 10          | Davidson (2004); Dinneen <i>et al.</i> (1986); Minchin (2007 a); O'Connor (1981a); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1914a)   |
| Opheliida                        | Opheliidae       | 9           | Dinneen <i>et al.</i> (1986); Picton and Costello (1998); Picton and Costello (1998); Southern (1910); Southern (1914a)   |
|                                  | Scalibregmatidae | 4           | Dinneen <i>et al.</i> (1986); O'Sullivan (1983); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a)  |
| Nerillida                        | Nerillidae       | 1           | Southern (1910); Southern (1914a); Westheide (1990)   |
| Polygordiida                     | Polygordiidae    | 2           | Southern (1914a); Westheide (1990)  |
| Protodrilida                     | Protodrilidae    | 1           | Southern (1910)   |
| Polychaeta <i>incertae sedis</i> | Saccocirridae    | 1           | Westheide (1990)  |
| Oweniida                         | Oweniidae        | 2           | Dinneen <i>et al.</i> (1986); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1914a)  |
| Terebellida                      | Pectinariidae    | 3           | Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); Picton and Costello (1998); Rawlinson (2004); Southern (1910); Southern (1914a)   |
|                                  | Sabellariidae    | 3           | De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); O'Connor (1981a); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a)   |
|                                  | Ampharetidae     | 5           | Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Grehan (1991); Healy <i>et al.</i> (1982); Lynch <i>et al.</i> (2006); O'Sullivan (1983); Southern (1910); Southern (1914a)  |
|                                  | Trichobranchidae | 2           | Southern (1914a)  |
|                                  | Terebellidae     | 23          | Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Lynch <i>et al.</i> (2006); Minchin (2007 a); O'Connor (1981a); Oliver (1998); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910; 1914a)  |

| Order                  | Family       | No. species | References   |
|------------------------|--------------|-------------|--|
| Sabellida              | Sabellidae   | 19          | Davidson (2004); De Grave and Whitaker (1997); Dinneen <i>et al.</i> (1986); Healy (1975b); Lynch <i>et al.</i> (2006); O'Sullivan (1983); Picton and Costello (1998); Roche <i>et al.</i> (2007); Southern (1910); Southern (1914a) |
|                        | Serpulidae   | 8           | Cotter <i>et al.</i> (2003); Dinneen <i>et al.</i> (1986); Minchin (2007 a); Oliver (1998); Picton and Costello (1998); Southern (1910); Southern (1914a)  |
|                        | Spirorbidae  | 8           | Minchin (2007 a); Norton (1971); Oliver (1998); Picton and Costello (1998); Toner (1967); Southern (1910); Southern (1914a)  |
| Myzostomida            | Myzostomidae | 1           | Southern (1914a)   |
| <b>Total species =</b> |              | <b>404</b>  |  |

### Class Aphanoneura

Two species from the Family Aeolosomatidae (*Aeolosoma hemprichi* and *A. variegatum*) were reported to occur in Ireland according to Southern (1909).

### Class Clitellata

#### Subclass Oligochaeta

The Oligochaetes are traditionally considered a predominantly non-marine group (Mackie and Erséus, 1997). They contain, *inter alia*, the earthworms, and as such they are an important group in terms of soil processing and ecosystem functioning. Mackie and Erséus (1997) remarked that due to the small size of marine oligochaetes, the number of marine species has been greatly underestimated.

Following the taxonomy of Brands (2007), four orders of Oligochaete are known to occur in Ireland: Enchytraeida, Tubificida, Lumbriculida and Opisthopora. The family level names are from NHM (2007) and Fauna Europaea (2004), with the exception of Naididae and Tubificidae which are grouped under Naididae according to the rules of the ICZN (Erséus *et al.*, 2008).

One hundred and seventy nine oligochaete species from four orders and six families have been recorded from Ireland (Table 48).

**Table 48. Number of species of in the Subclass Oligochaeta known to occur in Ireland.**

| Order                  | Family   | No. species | References   |
|------------------------|--|-------------|--|
| Opisthopora            | Acanthodrilidae  | 1           | Cotton (1992); Sims and Gerard (1999)  |
|                        | Octochaetidae  | 1           | Rota and Schmidt (2006)  |
|                        | Lumbricidae  | 26          | Cotton (1977); Cotton (1978); Cotton (1979); Cotton (1992); Muldowney <i>et al.</i> (2003); Muldowney and Schmidt (2002); Rota (2004); Schmidt and Curry (2001); Sims and Gerard (1999); Southern (1914b)  |
| Enchytraeida           | Enchytraeidae  | 96          | Brinkhurst (1982); Healy (1975a); Healy (1979a); Healy (1979b); Healy (1979c); Healy <i>et al.</i> (1982); Locke and Coates (1998); McGrath (1975); Rota (1994a); Rota (1994b); Rota and Healy (1994); Rota (1995); Rota (2004); Rota <i>et al.</i> (2003); Schmelz and Collado (2005a); Schmelz and Collado (2005b); Schmidt <i>et al.</i> (2002); Schmidt <i>et al.</i> (2004); Southern (1914b) |
| Tubificida             | Naididae<br>(incl. species formerly classified in the Tubificidae) | 50          | Fauna Europaea (2004); Healy (1979b); Healy <i>et al.</i> (1982); Kennedy (1964); McCarthy (1974); McGrath (1975); Oliver and Healy (1998); Southern (1910); Southern (1914b); Sweeney <i>et al.</i> (2003); Trodd <i>et al.</i> (2005)  |
| Lumbriculida           | Lumbriculidae  | 5           | Cotton (1977), Cotton (1978); Muldowney <i>et al.</i> (2003); Sims and Gerard (1999); Southern (1907a); Southern (1914b); Trodd <i>et al.</i> (2005)   |
| <b>Total species =</b> |  | <b>179</b>  |  |

### Subclass Hirudinea

The leeches are a relatively small group of mainly parasitic annelids. They are recognisable by their muscular, contractile bodies and their suckers, one at each end, which are used to adhere to any firm substrate (Purcell, 1996). While some leeches feed on small invertebrates, others are blood-sucking parasites that temporarily attach to other animals to feed. Leeches have been used for medicinal purposes for many years, and today are used to treat bruised tissue and to help stimulate circulation.

Of the 680 species described, approximately 15% are marine and slightly less are terrestrial; the remaining species are freshwater, divided among 91 genera (Sket and Trontelj, 2008). Thirty two species from two orders and five families are known to occur in Ireland (Table 49). Of these, 18 are marine species recorded in Irish waters by Jeal and West (1969), Southern (1913a), and in particular noted by Sawyer, pers. comm.. McCarthy (1975) and McCarthy, pers. comm. noted that *Erpobdella testacea* and *Hirudo medicinalis* were doubtful species in Ireland; neither of these species have been included in this list. The higher taxonomy used in this section follows that of NHM (2007).

**Table 49. Number of species of in the Subclass Hirudinea known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>  | <b>No. species</b> | <b>References</b>   |
|------------------------|----------------|--------------------|---|
| Arhynchobdellida       | Erpobdellidae  | 5                  | Elliott and Tullett (1982); McCarthy (1975); O'Connor and Norton (1977); Sawyer, pers. comm.; Southern (1913a)                                      |
|                        | Hirudinidae    | 1                  |   |
| Rhynchobdellida        | Glossiphonidae | 7                  | Elliott and Tullett (1982); McCarthy (1975); O'Connor and Norton (1977); Southern (1913a)   |
|                        | Ozobranhidae   | 2                  | Sawyer, pers. comm.   |
|                        | Piscicolidae   | 17                 | Elliott and Tullett (1982); Jeal and West (1969); Mackie and Erséus (1997); McCarthy (1975); Sawyer, pers. comm.; Southern (1910); Southern (1913a) |
| <b>Total species =</b> |                | <b>32</b>          |   |

## Phylum Tardigrada

Smith, K. G.

Tardigrada are tiny multicellular animals known as water bears which move with a characteristic bear-like lumbering gait (Morgan and King, 1976). Although the majority of species are found in freshwater or moist terrestrial habitats, where they survive in the water film on mosses and forest litter, there are also some marine species (Groombridge and Jenkins, 2002). They are segmented animals that feed on plants, bacteria and animals. They can also survive extreme temperature conditions and desiccation through lowering or suspending their metabolism or surviving in an encysted form (Groombridge and Jenkins, 2002). There are an estimated 400 species worldwide (NHM, 2007). The taxonomy in this report follows O'Reilly (1997e) for the marine species and Fauna Europaea (2004) for the terrestrial and freshwater species, and the sequence of names is alphabetical. The phylum is divided into two classes, the Eutardigrada and Heterotardigrada, both of which are represented in the Republic of Ireland.

References for 42 species of Tardigrada in the Republic of Ireland and its marine waters have been identified.

### Class Eutardigrada

Eutardigrada primarily comprise freshwater and terrestrial species. References for 30 species in the Republic of Ireland have been identified (Table 50).

**Table 50. Number of species of in the Class Eutardigrada known to occur in Ireland.**

| Order                  | Family           | No. species | References  |
|------------------------|------------------|-------------|---|
| Apochela               | Milnesiidae      | 1           | Fauna Europaea (2004); Morgan and King (1976); Murray (1911)                |
| Parachela              | Calohypsibiidae  | 2           | Fauna Europaea (2004); Morgan and King (1976)                               |
|                        | Hypsibiidae      | 14          | Baxter (1979); Fauna Europaea (2004); Morgan and King (1976); Murray (1911) |
|                        | Macrobotidae     | 11          | Baxter (1979); Fauna Europaea (2004); Morgan and King (1976); Murray (1911) |
|                        | Microhypsibiidae | 2           | Fauna Europaea (2004)   |
| <b>Total species =</b> |                  | <b>30</b>   |   |

### Class Heterotardigrada

Heterotardigrada contains species from marine, freshwater and terrestrial environments. References for 12 species in the Republic of Ireland and its marine waters have been identified (Table 51).

**Table 51. Number of species of in the Class Heterotardigrada known to occur in Ireland.**

| Order                  | Family          | No. species | References   |
|------------------------|-----------------|-------------|--|
| Arthrotardigrada       | Batillipedidae  | 2           | Morgan (1980)  |
| Echiniscoidea          | Echiniscidae    | 9           | Fauna Europaea (2004); Morgan and King (1976); Murray (1911) |
|                        | Echiniscoididae | 1           | Morgan (1980); Morgan and King (1976); Murray (1911)         |
| <b>Total species =</b> |                 | <b>12</b>   |  |

## Phylum Pogonophora

Smith, K. G.

The status of Pogonophora as a phylum is debatable. The *European Register of Marine Species* (Costello *et al.* 2008) cites the group as Siboglinidae, a family of annelids in the Class Polychaeta. Species 2000 places Pogonophora as a class in Annelida and NHM (2007) considers it to be a phylum in its own right.

Pogonophora, commonly known as bearded worms, are worm-like invertebrates that are most abundant in cold, deep waters or shallow polar seas, living in chitin tubes in sediments (Groombridge and Jenkins, 2002). Some species also occur in shallower water and may be found within the waters of the British Isles (Connor, 1997). There are 165 species known worldwide (NHM, 2007). Purcell (1996) stated that at least 15 species of Pogonophora occur in Irish waters, citing O'Connor (1981). However, O'Connor (1981) actually lists only one species of Pogonophora; the other fourteen species referred to taxa in other phyla.

References for only one species of Pogonophora in Irish waters has been identified (O'Connor, 1981; Southward, 1963). This species, *Siboglinum holmei* Southward, 1963 is in the Family Siboglinidae and Order Athecanephrida.

## Phylum Arthropoda

### Subphylum Chelicerata

#### Class Arachnida

Smith, K. G., Regan, E. and McCormack, S.

#### Infraclass Acari

Acari, the ticks and mites, are small often microscopic animals that live in a wide range of habitats in both terrestrial and aquatic environments. Some species are parasitic, but many are free-living. They are the most diverse and abundant group of arachnids (Thomas, 2001). However, they differ from other arachnids as they do not have a segmented body.

There are seven orders within Acari, five of which are represented in the Republic of Ireland. The Orders Ixodida and Mesostigmata fall within the Superorder Parasitiformes, which as the name suggests, contains many parasitic species, including the ticks. The remaining orders of Acari that are present in Ireland: Astigmata, Orbatida and Prostigmata fall within the Superorder Acariformes.

There are an estimated 47,000 species of ticks and mites worldwide (NHM, 2007). References for 684 species of Acari have been found for the Republic of Ireland; however, it has not been possible to distinguish between the Republic of Ireland and Northern Ireland for all of the publications used. The number of species recorded here represents a large underestimate of the true species diversity of Acari in Ireland.

The higher taxonomy follows Fauna Europaea (2004), apart for the marine species (in Order Prostigmata) which follow Bamber *et al.* (1997). The families are listed alphabetically.

#### Order Ixodida

Ixodida, commonly known as ticks, are ectoparasitic animals on vertebrates, feeding upon blood, and are responsible for the transmission of many disease organisms (Hillyard, 1996). These are generally the largest species of Acari and can often be seen with the naked eye. There are at least 825 species worldwide, and the order contains three families, two of which are found in Ireland: Ixodidae (hard ticks) and Argasidae (soft ticks) (Hillyard, 1996).

A total of 12 species have been recorded from the Republic of Ireland (Table 52).

**Table 52. Number of species of in the Order Ixodida known to occur in Ireland.**

| Family                 | No. species | References  |
|------------------------|-------------|---|
| Argasidae              | 2           | Fauna Europaea (2004); Hillyard (1996); Kelly <i>et al.</i> (2001); Martyn (1988) |
| Ixodidae               | 10          | Fauna Europaea (2004); Hillyard (1996); Kelly <i>et al.</i> (2001); Martyn (1988) |
| <b>Total species =</b> | <b>12</b>   |   |

#### Order Mesostigmata

Mesostigmata are relatively large mites that occur in a wide range of habitats; most species are predatory, though a few also feed on pollen and nectar (Halliday, 2008). Some species are used to control pests that damage crops.

References for 245 species have been identified for the Republic of Ireland (Table 53); this is slightly more than Luxton (1998), who cited records for 235 species for Ireland. Luxton (1998) also stated that, of the species known from the British Isles, 7% are confined to Ireland.

**Table 53. Number of species of in the Order Mesostigmata known to occur in Ireland.**

| <b>Family</b>          | <b>No. species</b> | <b>References</b>  |
|------------------------|--------------------|--|
| Ameroseiidae           | 5                  | Luxton (1998)  |
| Antennophoridae        | 1                  | Luxton (1998)  |
| Ascidae                | 34                 | Arroyo and Bolger (2007); Baker and Bayliss (2005); Luxton (1998); O'Connell and Bolger (1997); Speight and Healy (1977)               |
| Celaenopsidae          | 1                  | Luxton (1998)  |
| Dermanyssidae          | 1                  | Luxton (1998)  |
| Digamasellidae         | 6                  | Baker and Bayliss (2005); Luxton (1998); Speight and Healy (1977)  |
| Epicriidae             | 1                  | Luxton (1998)  |
| Eviphididae            | 4                  | Baker and Bayliss (2005); Luxton (1998)  |
| Halarachnidae          | 1                  | Luxton (1998)  |
| Halolaelapidae         | 3                  | Baker and Bayliss (2005); Luxton (1998)  |
| Laelapidae             | 20                 | Baker and Bayliss (2005); Luxton (1998); O'Connell and Bolger (1997)   |
| Macrocheilidae         | 21                 | Bolger (1990); Baker and Bayliss (2005); Luxton (1998); Speight and Healy (1977)   |
| Macronyssidae          | 1                  | Luxton (1998)  |
| Ologamasidae           | 2                  | Baker and Bayliss (2005)   |
| Pachylaelapidae        | 5                  | Luxton (1998)  |
| Parasitidae            | 58                 | Arroyo and Bolger (2007); Baker and Bayliss (2005); Hyatt (1988); Luxton (1998); O'Connell and Bolger (1997); Speight and Healy (1977) |
| Phaulodinychidae       | 4                  | Luxton (1998)  |
| Phytoseiidae           | 14                 | Luxton (1998)  |
| Polyaspididae          | 6                  | Luxton (1998)  |
| Protodinychidae        | 2                  | Athias-Binche and Evans (1981); Luxton (1998)  |
| Rhodacaridae           | 9                  | Baker and Bayliss (2005); Luxton (1998); Speight and Healy (1977)  |
| Seiodidae              | 1                  | Luxton (1998)  |
| Sejidae                | 1                  | Luxton (1998)  |
| Spinturnicidae         | 2                  | Luxton (1998)  |
| Thinozerconidae        | 1                  | Baker and Bayliss (2005); Athias-Binche (1982)   |
| Trachyuropodidae       | 6                  | Luxton (1998)  |
| Trematuridae           | 5                  | Luxton (1998)  |
| Urodinychidae          | 6                  | Luxton (1998)  |
| Uropodidae             | 9                  | Baker and Bayliss (2005); Luxton (1998); Speight and Healy (1977)  |
| Veigaiidae             | 10                 | Arroyo and Bolger (2007); Baker and Bayliss (2005); Bolger (1990); Halbert (1920);   |
| Zerconidae             | 5                  | Luxton (1998); Skorupski and Luxton (1996)   |
| <b>Total species =</b> | <b>245</b>         |  |

## Order Astigmata

The Order Astigmata contains many parasitic species, including the feather mites that are ectoparasitic on birds, and the species that cause scabies in humans and animals.

References for five species have been identified from the Republic of Ireland (Table 54).

**Table 54. Number of species of in the Order Astigmata known to occur in Ireland.**

| Family                 | No. species | References                  |
|------------------------|-------------|-----------------------------|
| Acaridae               | 2           | O'Connell and Bolger (1997) |
| Epidermoptidae         | 1           | Fauna Europaea (2004)       |
| Pterolichidae          | 1           | Fauna Europaea (2004)       |
| Sarcoptidae            | 1           | Rueda-López (2006)          |
| <b>Total species =</b> | <b>5</b>    |                             |

## Order Oribatida

Oribatida mites (also called Cryptostigmata) are found in most soils, where they feed on plant detritus and fungi. They form an important component of food webs and in the decomposition of organic matter and nutrient cycling processes (Oliviera *et al.*, 2005).

References for 173 species have been identified for the Republic of Ireland (Table 55); this is slightly higher than the 163 species recorded by Luxton (1998). Luxton (1998) also stated that 7% of the species recorded for the British Isles are confined to Ireland.

**Table 55. Number of species of in the Order Oribatida known to occur in Ireland.**

| Family            | No. species | References   |
|-------------------|-------------|--|
| Achipteriidae     | 4           | Luxton (1998)  |
| Adelphacaridae    | 1           | Luxton (1998)  |
| Ameronothridae    | 7           | Luxton (1998); Speight and Healy (1977)                              |
| Banksinomidae     | 1           | Arroyo and Bolger (2007)   |
| Belbidae          | 1           | Luxton (1998)  |
| Brachychthoniidae | 19          | Arroyo and Bolger (2007); Luxton (1998)                              |
| Caleremaeidae     | 1           | Luxton (1998)  |
| Camisiidae        | 6           | Arroyo and Bolger (2007); Luxton (1998); Speight and Healy (1977)    |
| Carabodidae       | 5           | Luxton (1998)  |
| Cepheidae         | 3           | Luxton (1998); O'Connell and Bolger (1997)                           |
| Ceratozetidae     | 12          | Luxton (1998); Speight and Healy (1977)                              |
| Chamobatidae      | 4           | Arroyo and Bolger (2007); Luxton (1998); O'Connell and Bolger (1997) |
| Cosmochthoniidae  | 1           | Luxton (1998)  |
| Ctenobelbidae     | 1           | Luxton (1998)  |
| Cymbaeremaeidae   | 1           | Luxton (1998)  |
| Damaeidae         | 3           | Arroyo and Bolger (2007); Luxton (1998)                              |
| Eremaeidae        | 1           | Luxton (1998)  |
| Euphthiracaridae  | 1           | O'Connell and Bolger (1997)  |
| Euzetidae         | 2           | Luxton (1998); O'Connell and Bolger (1997)                           |
| Galumnidae        | 2           | Luxton (1998)  |
| Haplozetidae      | 1           | Luxton (1998)  |

| Family                 | No. species | References  |
|------------------------|-------------|---|
| Hermannidae            | 7           | Luxton (1998); O'Connell and Bolger (1997); Speight and Healy (1977)                            |
| Humerobatidae          | 1           | Luxton (1998)   |
| Hydrozetidae           | 1           | Luxton (1998)   |
| Hypochthoniidae        | 2           | Luxton (1998)   |
| Liacaridae             | 4           | Luxton (1998); O'Connell and Bolger (1997)  |
| Limnozetae             | 2           | Luxton (1998)   |
| Liodidae               | 1           | Luxton (1998)   |
| Malaconothridae        | 6           | Luxton (1987); Luxton (1998)  |
| Metrioppiidae          | 1           | Arroyo and Bolger (2007)  |
| Micreremidae           | 1           | Luxton (1998)   |
| Mycobatidae            | 4           | Arroyo and Bolger (2007); Luxton (1998); Speight and Healy (1977)                               |
| Nanhermanniidae        | 4           | Arroyo and Bolger (2007); Luxton (1998); O'Connell and Bolger (1997)                            |
| Neoliodidae            | 1           | Luxton (1998)   |
| Nothridae              | 2           | Luxton (1998); O'Connell and Bolger (1997)  |
| Oppiidae               | 16          | Arroyo and Bolger (2007); Arroyo and Bolger (in press); Luxton (1998); Speight and Healy (1977) |
| Oribatellidae          | 3           | Arroyo and Bolger (2007); Luxton (1998)   |
| Oribatulidae           | 7           | Arroyo and Bolger (2007); Luxton (1998)   |
| Passalozetidae         | 1           | Luxton (1998)   |
| Perlohmanniidae        | 1           | Luxton (1998)   |
| Phenopelopidae         | 8           | Arroyo and Bolger (in press); Healy (1975b); Luxton (1998); O'Connell and Bolger (1997)         |
| Phthiracaridae         | 4           | Luxton (1998); O'Connell and Bolger (1997)  |
| Protibatidae           | 1           | Speight and Healy (1977)  |
| Punctoribatidae        | 1           | Arroyo and Bolger (2007)  |
| Quadropiidae           | 1           | O'Connell and Bolger (1997)   |
| Scheloribatidae        | 2           | Luxton (1998); Speight and Healy (1977)   |
| Scutoverticidae        | 2           | Luxton (1998)   |
| Steganacaridae         | 2           | Luxton (1998); O'Connell and Bolger (1997)  |
| Suctobelbidae          | 6           | Arroyo and Bolger (2007); Luxton (1998)   |
| Tectocephidae          | 1           | Luxton (1998)   |
| Thyrisomidae           | 2           | Luxton (1998)   |
| Xenillidae             | 1           | Luxton (1998)   |
| <b>Total species =</b> | <b>173</b>  |   |

### Order Prostigmata

Prostigmata is the most diverse order within Acari. It contains many plant pest species, parasites and predators.

References for 249 species of Prostigmata have been found for Ireland (Table 56). This includes 44 marine and brackish water species from the exclusively aquatic Family Halacaridae, most of which are less than 1 mm in body length, and occur from the intertidal zone to the deep ocean (Green and MacQuitty, 1987).

**Table 56. Number of species of in the Order Prostigmata known to occur in Ireland.**

| <b>Family</b>          | <b>No. species</b> | <b>References</b>   |
|------------------------|--------------------|---|
| Alycidae               | 4                  | Baker and Bayliss (2005); Fauna Europaea (2004)   |
| Arrenuridae            | 5                  | Conroy (1984)   |
| Aturidae               | 2                  | Conroy (1984)   |
| Bdellidae              | 5                  | Baker and Bayliss (2005); Speight and Healy (1977)  |
| Ereynetidae            | 1                  | O'Connell and Bolger (1997)   |
| Eriophyidae            | 52                 | Fauna Europaea (2004); O'Connor (2004b); O'Connor (2007b)   |
| Erythraeidae           | 7                  | Fauna Europaea (2004); Baker and Bayliss (2005)   |
| Erythraeidae           | 1                  | Baker and Bayliss (2005)  |
| Eupodidae              | 2                  | Baker and Bayliss (2005); Fauna Europaea (2004); Speight and Healy (1977)   |
| Eylaidae               | 3                  | Conroy (1984); Reilly and McCarthy (1993)   |
| Halacaridae            | 44                 | Baker and Bayliss (2005); Farran <i>et al.</i> (1915); Green and Macquitty (1987); Somerfield (1988); Somerfield (1991); Somerfield and Jeal (1996) |
| Hydrachnidae           | 2                  | Reilly and McCarthy (1993); Conroy (1984)   |
| Hydrodromidae          | 1                  | Conroy (1984)   |
| Hydryphantidae         | 2                  | Conroy (1984)   |
| Hygrobatidae           | 6                  | Conroy (1984)   |
| Lebertiidae            | 11                 | Conroy (1984)   |
| Limnesiidae            | 2                  | Conroy (1984)   |
| Meyerellidae           | 3                  | Fauna Europaea (2004)   |
| Microtrombidiidae      | 4                  | Baker and Bayliss (2005); Fauna Europaea (2004)   |
| Mideidae               | 1                  | Conroy (1984)   |
| Mideopsidae            | 1                  | Conroy (1984)   |
| Nanorchestidae         | 2                  | Fauna Europaea (2004); Baker and Bayliss (2005)   |
| Oxidae                 | 1                  | Conroy (1984)   |
| Penthaleidae           | 2                  | Baker and Bayliss (2005); Fauna Europaea (2004)   |
| Phytoptidae            | 2                  | Fauna Europaea (2004); O'Connor (2004b)   |
| Pionidae               | 14                 | Conroy (1984)   |
| Podothrombiidae        | 1                  | Baker and Bayliss (2005)  |
| Rhagidiidae            | 4                  | Baker and Bayliss (2005); Fauna Europaea (2004)   |
| Scutacaridae           | 1                  | Momen (1989)  |
| Sperchontidae          | 7                  | Conroy (1984)   |
| Stigmaeidae            | 3                  | Baker and Bayliss (2005); Speight and Healy (1977)  |
| Tanaupodidae           | 1                  | Fauna Europaea (2004)   |
| Tarsonemidae           | 14                 | Fauna Europaea (2004)   |
| Tetranychidae          | 6                  | Fauna Europaea (2004)   |
| Teutoniidae            | 1                  | Conroy (1984)   |
| Torrenticolidae        | 9                  | Conroy (1984)   |
| Trombiculidae          | 1                  | Fauna Europaea (2004)   |
| Tydeidae               | 15                 | Fauna Europaea (2004); Baker and Bayliss (2005)   |
| Unionicolidae          | 6                  | Conroy (1984); Ross and McCarthy (1991)   |
| <b>Total species =</b> | <b>249</b>         |   |

**Infraclass Megoperkulata****Order Araneae**

The Araneae are the true spiders. Almost 40,000 species have been described worldwide but it is believed that up to 200,000 species may exist but have been overlooked to date because they are often very minute and evasive. There are 390 species from the island of Ireland, belonging to 31 families (Table 57). This compares with 649 species in Great Britain (NHM, 2007).

**Table 57. Number of species of in the Order Araneae known to occur in Ireland.**

| <b>Suborder</b> | <b>Family</b>          | <b>No. species</b> | <b>References</b>          |
|-----------------|------------------------|--------------------|----------------------------|
| Orthognatha     | Atypidae               | 1                  | van Helsdingen (1996); van |
| Labidognatha    | Amaurobiidae           | 3                  | Helsdingen (2006)          |
|                 | Dictynidae             | 5                  |                            |
|                 | Uloboridae             | 1                  |                            |
|                 | Oonopidae              | 2                  |                            |
|                 | Dysderidae             | 3                  |                            |
|                 | Segestriidae           | 1                  |                            |
|                 | Scytodidae             | 1                  |                            |
|                 | Pholcidae              | 2                  |                            |
|                 | Gnaphosidae            | 9                  |                            |
|                 | Liocranidae            | 6                  |                            |
|                 | Clubionidae            | 15                 |                            |
|                 | Zoridae                | 1                  |                            |
|                 | Anyphaenidae           | 1                  |                            |
|                 | Sparassidae            | 1                  |                            |
|                 | Philodromidae          | 7                  |                            |
|                 | Thomisidae             | 14                 |                            |
|                 | Salticidae             | 13                 |                            |
|                 | Lycosidae              | 23                 |                            |
|                 | Pisauridae             | 2                  |                            |
|                 | Agelenidae             | 11                 |                            |
|                 | Argyronetidae          | 1                  |                            |
|                 | Hahniidae              | 5                  |                            |
|                 | Mimetidae              | 2                  |                            |
|                 | Theridiidae            | 34                 |                            |
|                 | Nesticidae             | 1                  |                            |
|                 | Metidae                | 4                  |                            |
|                 | Tetragnathidae         | 9                  |                            |
|                 | Araneidae              | 18                 |                            |
|                 | Theridiosomatidae      | 1                  |                            |
|                 | Lynphiidae             | 193                |                            |
|                 | <b>Total species =</b> | <b>390</b>         |                            |

**Order Opiliones**

The Opiliones are the harvestmen of which there are over 6,000 species described worldwide. The Irish fauna (the whole island) has 15 native species of harvestmen and three species which are not considered to be native: *Odiella spinosus*, *Opilio parietinus* (Phalangiidae) and *Dicranopalpus ramosus* (Leiobunidae) (Cawley 2002). These are all included here as they have established populations in Ireland (Table 58).

**Table 58. Number of species in the Order Opiliones known to occur in Ireland.**

| Family                 | No. species | Reference                               |
|------------------------|-------------|---|
| Trogulidae             | 1           | Sankey and Savory (1974); Cawley (2002) |
| Nemastomatidae         | 2           |   |
| Phalangiidae           | 11          |   |
| Leiobunidae            | 4           |   |
| <b>Total species =</b> | <b>18</b>   |   |

### Order Pseudoscorpiones

The pseudoscorpions are also known as the false scorpions or book scorpions as they have pincers that resemble those of scorpions. They are small and inoffensive and are rarely seen due to their size. The Irish fauna (the whole island) has 17 species (Table 59); 25 species are known from Britain (Legg and O'Connor, 1997).

**Table 59. Number of species in the Order Pseudoscorpiones known to occur in Ireland.**

| Family                 | No. species | Reference                |
|------------------------|-------------|--------------------------|
| Chthoniidae            | 4           | Legg and O'Connor (1997) |
| Neobisiidae            | 5           |                          |
| Cheiridiidae           | 1           |                          |
| Chernetidae            | 6           |                          |
| Cheliferidae           | 1           |                          |
| <b>Total species =</b> | <b>17</b>   |                          |

### Class Pycnogonida

Smith, K. G.

Pycnogonida, commonly known as sea spiders, are small marine arthropods (though they are not arachnids). The largest reach over 70 cm (diameter across legs); however, most species are much smaller. They are mostly found in shallow water and feed using a proboscis, which sucks juices from soft-bodied invertebrates (Myers, 2001). There is an estimated 1,100 species worldwide (NHM, 2007). The higher taxonomy in this report follows Bamber and Nagar (2007).

References for 20 species of Pycnogonida (all in the Order Pantopoda) in Irish waters have been found (Table 60).

**Table 60. Number of species in the Order Pantopoda known to occur in Ireland.**

| Family                 | No. species | References   |
|------------------------|-------------|--|
| Ammonotheidae          | 4           | Duerden (1894b); Elliot <i>et al.</i> (1990); Farran <i>et al.</i> (1915); Gamble (1896); Keegan <i>et al.</i> (1987); King (1974); King <i>et al.</i> (1971)                                  |
| Ammonotheidae          | 1           | Bamber and El Nagar (2007); Muller (1993)  |
| Callipallenidae        | 2           | Gamble (1896); Keegan <i>et al.</i> (1987); King (1974); King <i>et al.</i> (1971); Ryland and Nelson-Smith (1975)   |
| Colossendeidae         | 2           | Bamber (1983) in Bamber <i>et al.</i> (1997); Stock (1978)   |
| Endeidae               | 2           | Elliot <i>et al.</i> (1990); King (1974); King <i>et al.</i> (1971)  |
| Nymphonidae            | 3           | Bamber and El Nagar (2007); Duerden (1894b); Elliot <i>et al.</i> (1990); Farran <i>et al.</i> (1915); King (1974); Muller (1993); Shin <i>et al.</i> (1982)                                   |
| Phoxichilidiidae       | 5           | Duerden (1894b); Farran <i>et al.</i> (1915); Gamble (1896); King (1974); King <i>et al.</i> (1971); Muller (1993); Shin <i>et al.</i> (1982)  |
| Pycnogonidae           | 1           | Duerden (1894b); Elliot <i>et al.</i> (1990); Farran <i>et al.</i> (1915); Gamble (1896); Keegan <i>et al.</i> (1987); King (1974); King <i>et al.</i> (1971); Ryland and Nelson-Smith (1975); |
| <b>Total species =</b> | <b>20</b>   |  |

## Subphylum Crustacea

Inskipp, T. P.

The Crustacea is a large group of arthropods, comprising almost 52,000 described species (Martin and Davis, 2001). They include various familiar animals, such as crabs, lobsters, crayfish, shrimp, krill and barnacles. The majority of them are aquatic, living in either marine or fresh water environments, but a few groups have adapted to life on land, such as terrestrial crabs, terrestrial hermit crabs and woodlice.

The taxonomy of classes, orders and families generally follows Martin and Davis (2001), although the sequence of families within orders mainly follows Holmes, Costello and Connor (1997), and a few families not listed in the former reference (marked with an asterisk in the list below), are included following the latter authors and Greenwood *et al.* (2001). Species treatment also largely follows the latter source but additional species have been included based on a number of other sources in the list of references below.

The occurrence of 1,775 (+2?) species of Crustacea was established for the Republic of Ireland (Tables 61 – 64). Coincidentally, Purcell (1996) also reported 1,774 species for the whole of Ireland – the species composition of the two lists must be different but, without access to Purcell’s species lists, it is not possible to compare them in detail. The current list is probably deficient in deep sea species from the Irish EEZ in the Atlantic Ocean.

**Table 61. Number of species in the Class Branchiopoda known to occur in Ireland.**

| Order                  | Family          | No. species | References                           |
|------------------------|-----------------|-------------|--------------------------------------|
| Anostraca              | Branchiopodidae | 1           | Young (1975)                         |
| Diplostraca            | Holopediidae    | 1           | Fauna Europaea (2004)                |
|                        | Sididae         | 3           | Duigan (1988); Fauna Europaea (2004) |
|                        | Bosminidae      | 3           | Duigan (1988); Fauna Europaea (2004) |
|                        | Chydoridae      | 41          | Duigan (1990); Fauna Europaea (2004) |
|                        | Daphniidae      | 12          | Duigan (1988); Fauna Europaea (2004) |
|                        | Macrothricidae  | 8           | Duigan (1988)                        |
|                        | Cercopagididae  | 2           | Duigan (1988); Fauna Europaea (2004) |
|                        | Podonidae       | 4           | Farran (1913)                        |
|                        | Polyphemidae    | 1           | Duigan (1988)                        |
|                        | Leptodoridae    | 1           | Duigan (1988)                        |
| <b>Total species =</b> |                 | <b>77</b>   |                                      |

**Table 62. Number of species in the Class Maxillopoda known to occur in Ireland.**

| Order        | Family        | No. species | References   |
|--------------|---------------|-------------|--|
| Apygophora   | Trypetesidae  | 2           | McGrath and Holmes (2003)  |
| Kentrogonida | Sacculinidae  | 1           | O’Riordan (1969)   |
| Pedunculata  | Lepadidae     | 6           | O’Connor and Farinas-Franco (2003);<br>O’Riordan (1967; 1969; 1972b) |
|              | Scalpellidae  | 4           | O’Riordan (1967; 1969)   |
| Sessilia     | Verrucidae    | 1           | O’Riordan (1969)   |
|              | Chthamalidae  | 2           | O’Riordan (1969); Myers and Cross (1992)                             |
|              | Coronulidae   | 2           | O’Riordan (1969); Smiddy and Holmes (1992)                           |
|              | Tetraclitidae | 1           | Picton and Costello (1998)   |

| Order         | Family            | No. species | References  |
|---------------|-------------------|-------------|---|
|               | Archaeobalanidae  | 3           | O’Riordan (1969)  |
|               | Balanidae         | 6-7         | Farran (1913); Minchin (2007b);<br>O’Riordan (1967; 1969) |
|               | Pyrgomatidae      | 1           | O’Riordan (1967)  |
| Arguloida     | Argulidae         | 2           | Fauna Europaea (2004); Holland and<br>Kennedy (1997)      |
| Porocephalida | Linguatulidae     | 1           | Fauna Europaea (2004)                                     |
| Platycopioida | Platycopiidae     | 1           | Holmes (2001)   |
| Calanoida     | Temoridae         | 4           | Holmes (2001)   |
|               | Metridinidae      | 10          | Holmes (2001)   |
|               | Centropagidae     | 6           | Holmes (2001)   |
|               | Diaptomidae       | 6           | Holmes (2001)   |
|               | Lucicutiidae      | 8           | Holmes (2001)   |
|               | Heterorhabdidae   | 12          | Holmes (2001)   |
|               | Augaptilidae      | 28          | Holmes (2001)   |
|               | Arietellidae      | 6           | Holmes (2001)   |
|               | Nullosetigeridae  | 2           | Holmes (2001)   |
|               | Pseudocyclopidae  | 2           | Holmes (2001)   |
|               | Candaciidae       | 6           | Holmes (2001)   |
|               | Pontellidae       | 4           | Holmes (2001)   |
|               | Parapontellidae   | 1           | Holmes (2001)   |
|               | Bathypontiidae    | 1           | Holmes (2001)   |
|               | Acartiidae        | 4           | Holmes (2001)   |
|               | Clausocalanidae   | 5           | Holmes (2001)   |
|               | Calanidae         | 7           | Holmes (2001)   |
|               | Mecynoceridae     | 1           | Holmes (2001)   |
|               | Eucalanidae       | 4           | Holmes (2001)   |
|               | Megacalanidae     | 3           | Holmes (2001)   |
|               | Paracalanidae     | 3           | Holmes (2001)   |
|               | Calocalanidae*    | 5           | Holmes (2001)   |
|               | Spinocalanidae    | 7           | Holmes (2001)   |
|               | Aetideidae        | 35          | Holmes (2001)   |
|               | Euchaetidae       | 12          | Holmes (2001)   |
|               | Phaennidae        | 12          | Holmes (2001)   |
|               | Scolecitrichidae  | 22          | Holmes (2001)   |
|               | Diaixidae         | 2           | Holmes (2001)   |
|               | Stephidae         | 3           | Holmes (2001)   |
|               | Tharybidae        | 3           | Holmes (2001)   |
|               | Pseudocyclopiidae | 1           | Holmes (2001)   |
| Misophrioida  | Misophriidae      | 1           | Holmes (2001)   |
| Cyclopoida    | Oithonidae        | 6           | Holmes (1980); Holmes and Gotto<br>(2000)                 |
|               | Cyclopinidae      | 8           | Holmes and Gotto (2000)                                   |

| Order         | Family             | No. species | References   |
|---------------|--------------------|-------------|--|
|               | Cyclopidae         | 41          | Farran (1913); Fauna Europaea (2004); Fives (1969); Holmes and Gotto (2000)          |
|               | Notodelphyidae     | 23          | Holmes and Gotto (2000)  |
|               | Ascidicolidae      | 12          | Gotto (1966); Holmes and Gotto (2000)  |
| Mormonilloida | Mormonillidae      | 2           | Holmes (2001)  |
| Harpacticoida | Longipediidae      | 6           | Holmes and O'Connor (1990); O'Riordan (1966)   |
|               | Canuellidae        | 2           | Holmes and O'Connor (1990)   |
|               | Aegisthidae        | 2           | Holmes and O'Connor (1990)   |
|               | Ectinosomatidae    | 16-17       | Holmes and O'Connor (1990)   |
|               | Darcythompsoniidae | 2           | Holmes and O'Connor (1990)   |
|               | Euterpinidae       | 1           | Holmes and O'Connor (1990)   |
|               | Tachidiidae        | 5           | Farran (1913); Holmes and O'Connor (1990)  |
|               | Thompsonulidae     | 1           | Holmes and O'Connor (1990)   |
|               | Harpacticidae      | 12          | Holmes (1996); Holmes and O'Connor (1990)  |
|               | Tisbidae           | 18          | Holmes (1996); Holmes and O'Connor (1990)  |
|               | Porcellidiidae     | 4-5         | Holmes and O'Connor (1990); O'Riordan (1969)   |
|               | Peltidiidae        | 8           | Farran (1913); Holmes and O'Connor (1990); Roe (1958)                                |
|               | Clytemnestridae    | 2           | Holmes and O'Connor (1990)   |
|               | Tegastidae         | 4           | Holmes and O'Connor (1990)   |
|               | Thalestridae       | 34          | Picton and Costello (1998); Farran (1913); Holmes (1996); Holmes and O'Connor (1990) |
|               | Ambunguipedidae    | 1           | Dale (in prep.)  |
|               | Balaenophilidae    | 1           | Holmes and O'Connor (1990)   |
|               | Parastenheliidae   | 1           | Holmes and O'Connor (1990)   |
|               | Diosaccidae        | 38          | Holmes and O'Connor (1990); Roe (1958)   |
|               | Metidae            | 1           | Holmes and O'Connor (1990)   |
|               | Ameiridae          | 23          | Farran (1913); Holmes and O'Connor (1990)  |
|               | Paramesochridae    | 5           | Holmes and O'Connor (1990)   |
|               | Tetragonicipitidae | 6           | Holmes (1996); Holmes and O'Connor (1990)  |
|               | Canthocamptidae    | 26          | Holmes and O'Connor (1990); Roe (1958)   |
|               | Orthopsyllidae     | 1           | Holmes and O'Connor (1990)   |
|               | Leptastacidae      | 2           | Holmes and O'Connor (1990)   |
|               | Cylindropsyllidae  | 3           | Holmes and O'Connor (1990)   |
|               | Cletodidae         | 8           | Holmes and O'Connor (1990)   |
|               | Huntemanniidae     | 1           | Holmes and O'Connor (1990)   |

| Order             | Family             | No. species | References  |
|-------------------|--------------------|-------------|---|
|                   | Rhizothricidae     | 3           | Holmes and O'Connor (1990)  |
|                   | Argestidae         | 2           | Holmes and O'Connor (1990)  |
|                   | Laophontidae       | 36          | Farran (1913); Holmes and O'Connor (1990); Holmes and Minchin (1999); Wouters and De Grave (1992) |
|                   | Laophontopsidae    | 1           | Holmes and O'Connor (1990)  |
|                   | Normanellidae      | 2           | Holmes and O'Connor (1990)  |
|                   | Ancorabolidae      | 3           | Holmes and O'Connor (1990)  |
| Poecilostomatoida | Ergasilidae        | 3           | Fauna Europaea (2004); Holmes and O'Connor (1990)   |
|                   | Rhynchomolgidae    | 4           | Holmes and O'Connor (1990)  |
|                   | Macrochironidae    | 1           | Holmes and O'Connor (1990)  |
|                   | Sabelliphilidae    | 4           | Holmes and O'Connor (1990)  |
|                   | Lichomolgidae      | 16-17       | Farran (1913); Holmes and O'Connor (1990)   |
|                   | Pseudanthessiidae  | 5           | Holmes and O'Connor (1990)  |
|                   | Oncaeidae          | 14          | Holmes and O'Connor (1990)  |
|                   | Sapphirinidae      | 2           | Holmes and O'Connor (1990)  |
|                   | Clausidiidae       | 3           | Holmes and O'Connor (1990)  |
|                   | Synaptiphilidae    | 1           | Holmes and O'Connor (1990)  |
|                   | Mytilicolidae      | 3           | Holmes and Minchin (1995); Holmes and O'Connor (1990); O'Shaughnessy and McGrath (1996)           |
|                   | Anthessiidae       | 1           | Holmes and O'Connor (1990)  |
|                   | Mycolidae          | 1           | Holmes and Minchin (1995)   |
|                   | Corycaeidae        | 2-3         | Holmes and O'Connor (1990)  |
|                   | Bomolochidae       | 2           | Farran (1913); Holmes and O'Connor (1990)   |
|                   | Taeniacanthidae    | 2           | Holmes and O'Connor (1990)  |
|                   | Chondracanthidae   | 6           | Holmes and O'Connor (1990); O'Riordan (1966)  |
|                   | Splanchnotrophidae | 3           | Holmes and Nunn (1996); Holmes and O'Connor (1990)  |
|                   | Philichthyidae     | 1           | Holmes and O'Connor (1990)  |
|                   | Lamippidae         | 2           | Holmes and O'Connor (1990)  |
|                   | Synapticolidae     | 1           | Holmes (1987)   |
|                   | Phyllocolididae    | 1           | Holmes (1998)   |
|                   | Herpyllobiidae     | 1           | Holmes (1998)   |
| Siphonostomatoida | Rataniidae         | 1           | Holmes (1998)   |
|                   | Asterocheridae     | 16          | Holmes (1998)   |
|                   | Artotrogidae       | 1           | Holmes (1998)   |
|                   | Dyspontidae*       | 5           | Holmes (1998)   |
|                   | Nanaspidae         | 1           | Holmes (1998)   |
|                   | Micropontidae      | 1           | Holmes (1998)   |
|                   | Cancerillidae      | 2           | Holmes (1998)   |

| Order                  | Family           | No. species | References                  |
|------------------------|------------------|-------------|-----------------------------|
|                        | Nicothoidae      | 8           | Holmes (1998)               |
|                        | Melinnacheridae* | 1           | Holmes (1998)               |
|                        | Caligidae        | 18          | Holmes (1998)               |
|                        | Trebiidae        | 1           | Holmes (1998)               |
|                        | Pandaridae       | 3           | Holmes (1998)               |
|                        | Cecropidae       | 3           | Holmes (1998)               |
|                        | Dichelethiidae   | 1           | Holmes (1998)               |
|                        | Hatschekiidae    | 1           | Holmes (1998)               |
|                        | Lernanthropidae  | 1           | Holmes (1998)               |
|                        | Pennellidae      | 6           | Holmes (1998)               |
|                        | Sphyriidae       | 2           | Holmes (1998)               |
|                        | Lernaeopodidae   | 10-11       | Gotto (1955); Holmes (1998) |
| Monstrilloida          | Monstrillidae    | 7           | Holmes (2001)               |
| <b>Total species =</b> |                  | <b>806</b>  |                             |

**Table 63. Number of species in the Class Ostracoda known to occur in Ireland.**

| Order                  | Family              | No. species                     | References  |
|------------------------|---------------------|---------------------------------|---|
| Myodocopida            | Cylindroleberididae | 2                               | Holmes (1981; 1984)   |
|                        | Philomedidae        | 1                               | O’Riordan (1969)  |
| Halocyprida            | Polycopidae         | 2                               | Holmes (1984); O’Riordan (1969)   |
| Podocopida             | Bythocytheridae     | 2-3                             | O’Riordan (1969)  |
|                        | Cytheridae          | 1                               | O’Riordan (1969)  |
|                        | Cytherideidae       | 4                               | Douglas and McCall (1992); O’Riordan (1969)                                   |
|                        | Krithidae           | 1                               | O’Riordan (1969)  |
|                        | Cuneocytheridae*    | 1                               | O’Riordan (1969)  |
|                        | Cytheruridae        | 13                              | Holmes (1980); O’Riordan (1969)   |
|                        | Hemicytheridae      | 5                               | O’Riordan (1969)  |
|                        | Leptocytheridae     | 4                               | Douglas and McCall (1992); O’Riordan (1969)                                   |
|                        | Limnocytheridae*    | 5                               | Douglas and McCall (1992); Fauna Europaea (2004)                              |
|                        | Loxoconchidae       | 8                               | Douglas and McCall (1992); Holmes and O’Connor (1990); O’Riordan (1969)       |
|                        | Neocytherideidae    | 1                               | O’Riordan (1969)  |
|                        | Paradoxostomatidae  | 11                              | Dale (in prep.); Holmes (1987); O’Riordan (1969); Wouters and De Grave (1992) |
|                        | Trachyleberididae   | 6                               | O’Riordan (1969)  |
|                        | Xestoleberididae    | 2                               | Holmes (1981); O’Riordan (1969)   |
|                        | Darwinulidae        | 2                               | Douglas and McCall (1992); Fauna Europaea (2004)                              |
|                        | Candonidae          | 22                              | Douglas and McCall (1992); Fauna Europaea (2004)                              |
|                        | Cyprididae          | 25                              | Douglas and McCall (1992); Fauna Europaea (2004)                              |
| Ilyocyprididae         | 2                   | Douglas and McCall (1992)       |   |
| Pontocyprididae        | 3                   | Holmes (1980); O’Riordan (1969) |   |
| <b>Total species =</b> |                     | <b>124</b>                      |   |

**Table 64. Number of species in the Class Malacostraca known to occur in Ireland.**

| Order         | Family                | No. species | References   |
|---------------|-----------------------|-------------|--|
| Leptostraca   | Nebaliidae            | 2           | O’Riordan (1969); Tattersall (1905)  |
| Stomatopoda   | Nannosquillidae       | 1           | O’Ceidigh and Mulligan (1978)  |
|               | Squillidae            | 1           | McGrath, Holmes and Flanagan (2002)  |
| Bathynellacea | Bathynellidae         | 1           | Fauna Europaea (2004)  |
| Lophogastrida | Lophogastridae        | 3           | O’Riordan (1969)   |
|               | Eucopiidae            | 3           | Tattersall (1911); Tattersall and Tattersall (1951)  |
| Mysida        | Petalophthalmidae     | 3           | Tattersall and Tattersall (1951)   |
|               | Mysidae               | 66          | Mauchline (1986); McGrath (1984); Minchin and Holmes (2008); Parker (1979); Tattersall and Tattersall (1951) |
| Amphipoda     | Niphargidae           | 2           | Fauna Europaea (2004); Holmes (2007)   |
|               | Crangonyctidae        | 1           | Holmes (1975)  |
|               | Eusiridae             | 6           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Calliopidae           | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Gammarellidae         | 2           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Oedicerotidae         | 11          | Costello, Holmes, McGrath and Myers (1989); De Grave and Myers (1997); Holmes (2007)                         |
|               | Pleustidae            | 5           | Costello, Holmes, McGrath and Myers (1989); Greenwood <i>et al.</i> (2001)                                   |
|               | Amphilochidae         | 5-6         | Costello, Holmes, McGrath and Myers (1989)   |
|               | Cyproideidae          | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Leucothoidae          | 4           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Colomastigidae        | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Cressidae             | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Stenothoidae          | 10          | Costello, Holmes, McGrath and Myers (1989)   |
|               | Hyalidae              | 6           | Costello, Holmes, McGrath and Myers (1989); Holmes (2007)  |
|               | Talitridae            | 6           | Picton and Costello (1998); Costello, Holmes, McGrath and Myers (1989)                                       |
|               | Urothoidae            | 3           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Phoxocephalidae       | 8-9         | Costello, Holmes, McGrath and Myers (1989); Greenwood <i>et al.</i> (2001); Holmes (2007)                    |
|               | Lysianassidae         | 42          | Costello, Holmes, McGrath and Myers (1989); Greenwood <i>et al.</i> (2001); Holmes (2007); O’Riordan (1969)  |
|               | Synopiidae            | 2           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Argissidae            | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Iphimediidae          | 6           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Stegocephalidae       | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Acanthonotozomellidae | 1           | Greenwood <i>et al.</i> (2001)   |
|               | Epimeriidae           | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Liljeborgiidae        | 3           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Pardaliscidae         | 1           | Greenwood <i>et al.</i> (2001)   |
|               | Dexaminidae           | 8           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Ampeliscidae          | 15          | Costello, Holmes, McGrath and Myers (1989); King, Myers and McGrath (2004); Myers and McGrath (1994)         |
|               | Pontoporeiidae        | 7           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Hauستيidae            | 1           | Costello, Holmes, McGrath and Myers (1989)   |
|               | Gammaridae            | 15-16       | Costello, Holmes, McGrath and Myers (1989); De Grave and Myers (1997)  |
|               | Melphidippidae        | 2           | Costello, Holmes, McGrath and Myers (1989)   |

| Order   | Family          | No. species | References  |
|---------|-----------------|-------------|---|
|         | Melitidae       | 13          | Costello, Holmes, McGrath and Myers (1989); Greenwood <i>et al.</i> (2001);   |
|         | Ampithoidae     | 6           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Isaeidae        | 2           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Microprotidae*  | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Photidae*       | 8           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Ischyroceridae  | 14          | Costello, Holmes, McGrath and Myers (1989); Holmes (2007); King and Holmes (2004)   |
|         | Aoridae         | 15          | Costello, Holmes, McGrath and Myers (1989)  |
|         | Cheluridae      | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Corophiidae     | 14          | Picton and Costello (1998); Costello, Holmes, McGrath and Myers (1989); De Grave and Wilkins (1994); Fauna Europaea (2004); Greenwood <i>et al.</i> (2001); Lucy <i>et al.</i> (2004) |
|         | Dulichiiidae    | 2           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Podoceridae     | 3           | Costello, Holmes, McGrath and Myers (1989); Lincoln (1979)  |
|         | Caprellidae     | 11          | Costello, Holmes, McGrath and Myers (1989); Tierney <i>et al.</i> (2004)  |
|         | Phtisicidae     | 2           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Mimonectidae    | 2?          | Costello, Holmes, McGrath and Myers (1989)  |
|         | Scinidae        | 10          | Costello, Holmes, McGrath and Myers (1989)  |
|         | Lanceolidae     | 5           | Costello, Holmes, McGrath and Myers (1989); Greenwood <i>et al.</i> (2001)  |
|         | Vibiliidae      | 4           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Cystisomatidae  | 4           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Hyperiididae    | 7           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Dairellidae     | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Phronimidae     | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Phrosinidae     | 3           | Costello, Holmes, McGrath and Myers (1989); O’Riordan (1969)  |
|         | Pronoidae       | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Brachyscelidae* | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Tryphanidae*    | 1           | Costello, Holmes, McGrath and Myers (1989)  |
|         | Platyscelidae   | 1           | Costello, Holmes, McGrath and Myers (1989)  |
| Isopoda | Anthuridae      | 2           | Griffith (1970); Tattersall (1913)  |
|         | Leptanthuridae  | 1           | Greenwood <i>et al.</i> (2001)  |
|         | Gnathiidae      | 9           | De Grave and Holmes (1998); Greenwood <i>et al.</i> (2001); O’Riordan (1969); Tattersall (1913)   |
|         | Aegidae         | 6           | Greenwood <i>et al.</i> (2001)  |
|         | Limnoriidae     | 2           | De Grave and Holmes (1998); O’Riordan (1969)  |
|         | Cirolanidae     | 10          | Greenwood <i>et al.</i> (2001); McGrath and De Grave (2000); O’Riordan (1969); Tattersall (1913); Tully and O’Ceidigh (1986)  |
|         | Ancinidae       | 1           | Greenwood <i>et al.</i> (2001)  |
|         | Sphaeromatidae  | 8           | De Grave; Casey and Kelly (1997); De Grave and Holmes (1998); Greenwood <i>et al.</i> (2001); O’Riordan (1969)  |
|         | Asellidae       | 1           | Fauna Europaea (2004)   |
|         | Dendroitiidae   | 2           | Greenwood <i>et al.</i> (2001)  |
|         | Haplomiscidae   | 10          | Greenwood <i>et al.</i> (2001)  |
|         | Ilyarachnidae*  | 1           | Greenwood <i>et al.</i> (2001)  |
|         | Janiridae       | 10          | De Grave and Holmes (1998); Tattersall (1913)   |

| Order        | Family            | No. species | References   |
|--------------|-------------------|-------------|--|
|              | Munnidae          | 4           | De Grave and Holmes (1998); Tattersall (1913)                            |
|              | Paramunnidae      | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Pleurogonidae*    | 2           | Greenwood <i>et al.</i> (2001); Tattersall (1913)                        |
|              | Thambematidae     | 1           | Greenwood <i>et al.</i> (2001)   |
|              | Desmosomatidae    | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Eurycopidae*      | 6           | Greenwood <i>et al.</i> (2001)   |
|              | Ischnomesidae     | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Munnopsiidae      | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Idoteidae         | 8           | McGrath (1980); O’Riordan (1969); Tattersall (1913)                      |
|              | Arcturidae        | 3           | Greenwood <i>et al.</i> (2001); O’Riordan (1969)                         |
|              | Bopyridae         | 7           | McGrath and Atkins (1979); Tattersall (1913)                             |
|              | Hemioniscidae     | 1           | De Grave and Holmes (1998)   |
|              | Phryxidae*        | 3           | De Grave and Holmes (1998); McGrath and Atkins (1979); Tattersall (1913) |
|              | Ligiidae          | 1           | O’Riordan (1969)   |
|              | Trichoniscidae    | 13          | Fauna Europaea (2004); Gregory and Collis (2006)                         |
|              | Styloniscidae     | 1           | Fauna Europaea (2004)  |
|              | Halophilosciidae  | 1           | Fauna Europaea (2004)  |
|              | Philosciidae      | 1           | Gregory and Collis (2006)  |
|              | Oniscidae         | 1           | Gregory and Collis (2006)  |
|              | Platyarthridae    | 1           | Gregory and Collis (2006)  |
|              | Porcellionidae    | 8           | Fauna Europaea (2004); Gregory and Collis (2006)                         |
|              | Armadillidiidae   | 7           | Cawley (1997a); Fauna Europaea (2004); Gregory and Collis (2006)         |
|              | Cylistidae        | 1           | Gregory and Collis (2006)  |
| Tanaidacea   | Tanaidae          | 1           | Tattersall (1913)  |
|              | Paratanaidae      | 2           | Holmes (1981); Tattersall (1913)   |
|              | Anarthruridae     | 3           | Greenwood <i>et al.</i> (2001); Holmes (1984); Tattersall (1913)         |
|              | Typhlotanaidae    | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Nototanaidae      | 1           | Greenwood <i>et al.</i> (2001)   |
|              | Neotanaidae       | 2           | Greenwood <i>et al.</i> (2001)   |
|              | Apseudidae        | 1           | Greenwood <i>et al.</i> (2001); O’Riordan (1969)                         |
|              | Sphyrapidae       | 2           | Greenwood <i>et al.</i> (2001)   |
| Cumacea      | Bodotriidae       | 9           | McGrath and O’Sullivan (1977); O’Riordan (1969); Tattersall (1912)       |
|              | Leuconidae        | 2           | O’Riordan (1969)   |
|              | Nannastacidae     | 6           | O’Riordan (1969); Tattersall (1912)                                      |
|              | Pseudocumatidae   | 2           | O’Riordan (1969)   |
|              | Lampropidae       | 2           | O’Riordan (1969)   |
|              | Diastylidae       | 12          | O’Riordan (1969); Tattersall (1912)                                      |
| Euphausiacea | Bentheuphausiidae | 1           | Tattersall (1911)  |
|              | Euphausiidae      | 13          | O’Riordan (1969); Tattersall (1911; 1912)                                |
| Decapoda     | Aristeidae        | 1           | Quigley; Flannery and Holmes (1998)                                      |
|              | Benthesicymidae   | 2           | Kemp (1910); O’Riordan (1969)  |
|              | Solenoceridae     | 1           | O’Riordan (1969)   |
|              | Sergestidae       | 3           | Greenwood <i>et al.</i> (2001); O’Riordan (1969)                         |
|              | Stenopodidae      | 1           | Kemp (1910)  |
|              | Pasiphaeidae      | 4           | Greenwood <i>et al.</i> (2001); Kemp (1910); O’Riordan (1969)            |
|              | Oplophoridae      | 9           | Greenwood <i>et al.</i> (2001); Kemp (1910); O’Riordan (1969)            |
|              | Bresiliidae       | 1           | Kemp (1910)  |
|              | Nematocarinidae   | 2           | Greenwood <i>et al.</i> (2001); Kemp (1910)                              |

| Order | Family                 | No. species   | References  |
|-------|------------------------|---------------|---|
|       | Palaemonidae           | 6             | Picton and Costello (1998); O'Ceidigh (1962); O'Riordan (1969)  |
|       | Alpheidae              | 3             | Linnane <i>et al.</i> (2003); O'Riordan (1969)  |
|       | Hippolytidae           | 13            | Greenwood <i>et al.</i> (2001); Kemp (1910); O'Ceidigh (1962); O'Ceidigh and McGrath (1978; 1981; 1982); O'Riordan (1969) |
|       | Processidae            | 2             | O'Ceidigh (1962); O'Riordan (1969)  |
|       | Pandalidae             | 5             | Kemp (1910); O'Riordan (1969)   |
|       | Crangonidae            | 11            | Kemp (1910); O'Riordan (1969)   |
|       | Glyphocrangonidae      | 1             | Kemp (1910)   |
|       | Nephropidae            | 3             | O'Riordan (1969); Selbie (1914)   |
|       | Astacidae              | 1             | Fauna Europaea (2004)   |
|       | Laomediidae            | 1             | O'Riordan (1969)  |
|       | Callianassidae         | 2             | O'Ceidigh (1962); O'Riordan (1969)  |
|       | Upogebiidae            | 1             | O'Riordan (1969)  |
|       | Axiidae                | 2             | O'Ceidigh (1962); O'Riordan (1969)  |
|       | Polychelidae           | 8             | Greenwood <i>et al.</i> (2001); O'Riordan (1969); Selbie (1914)   |
|       | Palinuridae            | 2             | O'Riordan (1969)  |
|       | Chirostylidae          | 3             | Selbie (1914)   |
|       | Galatheidae            | 10            | Greenwood <i>et al.</i> (2001); O'Riordan (1969); Selbie (1914)   |
|       | Porcellanidae          | 2             | O'Riordan (1969)  |
|       | Lithodidae             | 2             | Greenwood <i>et al.</i> (2001); Hillis (1966)   |
|       | Paguridae              | 11            | Ingle (1993); O'Ceidigh (1962); O'Riordan (1969)  |
|       | Parapaguridae          | 1             | O'Riordan (1969)  |
|       | Diogenidae             | 1             | McGrath, Costello and Emblow (2000)   |
|       | Homolidae              | 1             | O'Riordan (1969)  |
|       | Cymonomidae            | 1             | O'Riordan (1969)  |
|       | Leucosiidae            | 5             | Ingle (1980); O'Riordan (1969)  |
|       | Majidae                | 17            | Linnane <i>et al.</i> (2003); O'Riordan (1969)  |
|       | Corystidae             | 1             | O'Riordan (1969)  |
|       | Atelecyclidae          | 1             | O'Riordan (1969)  |
|       | Thiidae                | 1             | Ingle (1980)  |
|       | Pirimelidae            | 1             | O'Riordan (1969)  |
|       | Cancriidae             | 2             | O'Riordan (1969); Quigley and Flannery (1994a)  |
|       | Portunidae             | 14            | Holmes <i>et al.</i> (1983); Ingle (1980); O'Riordan (1969)   |
|       | Geryonidae             | 3             | Greenwood <i>et al.</i> (2001); O'Riordan (1969); Quigley <i>et al.</i> (1994b)   |
|       | Goneplacidae           | 1             | O'Riordan (1969)  |
|       | Xanthidae              | 6             | Farran (1912); Holmes <i>et al.</i> (1983); Ingle (1980); O'Riordan (1969)  |
|       | Pinnotheridae          | 2             | O'Riordan (1969)  |
|       | Grapsidae              | 2             | Minchin (2006); O'Riordan (1969)  |
|       | <b>Total species =</b> | <b>768+2?</b> |   |

## Subphylum Myriapoda

Ferriss, S. E.

### Class Chilopoda

The centipedes (Class Chilopoda) are relatively familiar invertebrates that can be found in soil and litter, and under bark and stones (Lewis, 2007). They are soft-bodied and dorso-ventrally flattened, with one pair of legs per trunk segment (Lewis, 2007).

About 3,000 species of centipede have been described worldwide (Lewis, 2007). Twenty eight species, from three orders and six families, are known to occur in Ireland (see Table 65). The higher taxonomy in this list follows that of Barber and Keay (1988).

**Table 65. Number of species in the Class Chilopoda known to occur in Ireland.**

| Order                  | Family        | No. species | References  |
|------------------------|---------------|-------------|---|
| Geophilomorpha         | Himantariidae | 1           | Barber (1985); Barber and Keay (1988); Cawley (1998; 1999b; 2001a; 2001b); Higgins (1984) |
|                        | Schendylidae  | 4           |   |
|                        | Geophilidae   | 11          |   |
| Scolopendromorpha      | Cryptopsidae  | 3           | Barber (1985); Barber and Keay (1988); Cawley (1998; 1999b; 2001b)                        |
| Lithobiomorpha         | Lithobiidae   | 8           | Barber (1985); Barber and Keay (1988); Cawley (1998; 1999b; 2001a; 2001b); Higgins (1984) |
|                        | Henicopidae   | 1           |   |
| <b>Total species =</b> |               | <b>28</b>   |   |

### Class Symphyla

The Symphyla are small fast-moving arthropods that live in soil. They superficially resemble centipedes, although parts of their anatomy and development suggest affinities to the millipedes, and also to some of the more primitive insect groups (Kendall, 2007). Most feed on decayed vegetation, but some are crop pests. Kendall (2007) suggested that the glasshouse or garden symphyliid (*Scutigereilla immaculata*) is usually the most troublesome species. This species has been reported in Ireland (Fauna Europaea, 2004).

Purcell (1996) did not include this group in his report. NHM (2007) indicated that there are 14 species occurring in Britain, and Fauna Europaea (2004) listed three species as occurring in Ireland.

**Table 66. Number of species in the Class Symphyla known to occur in Ireland**

| Family                 | No. species | References            |
|------------------------|-------------|-----------------------|
| Scolopendrellidae      | 2           | Fauna Europaea (2004) |
| Scutigereillidae       | 1           | Fauna Europaea (2004) |
| <b>Total species =</b> | <b>3</b>    |                       |

### Class Diplopoda

The Diplopoda, which contains the millipedes, is the largest of the four myriapodan classes (Blower, 1985). Millipedes are mostly detritivores, preferring to eat decaying plant material, and are usually found under leaf litter or stones, or in the soil itself (Hopkin and Read, 1992). They can play an important role in enhancing the decomposition of dead plant material (Hopkin and Read, 1992).

An estimated 10,000 species of millipede have been described worldwide (Blower, 1985; Hopkin and Read, 1992). Forty-one species, from five orders and 12 families, are known to occur in Ireland (see 67). Anderson (1999) also listed *Anamastigona pulchellum* in Antrim and Down, and Lee (2006) noted a recent record for *Cylindroiulus truncorum* from Mount Stewart in Northern Ireland; these species are not currently included in the list for the Republic of Ireland. Lee (2006) also noted a record for the alien *Oxidus gracilis* in two locations; however, this species has not established itself outdoors, and is not included in Table 67. The higher taxonomy in this list follows that in Lee (2006).

**Table 67. Number of species in the Class Diploda known to occur in Ireland**

| Order                  | Family               | No. species | References   |
|------------------------|----------------------|-------------|--|
| Polyxenida             | Polyxenidae          | 1           | Cawley (1997b; 2001c); Doogue <i>et al.</i> (1993) |
| Glomerida              | Glomeridae           | 2           | Cawley (2001c); Doogue <i>et al.</i> (1993)        |
|                        | Doderiidae           | 1           |  |
| Chordeumatida          | Craspedosomatidae    | 2           | Cawley (1997b; 2001c); Doogue <i>et al.</i> (1993) |
|                        | Chordeumatidae       | 3           |  |
|                        | Brachychaeteumatidae | 2           |  |
| Polydesmida            | Paradoxosomatidae    | 2           | Cawley (1997b; 2001c); Doogue <i>et al.</i> (1993) |
|                        | Polydesmidae         | 5           |  |
|                        | Macrosternodesmidae  | 2           |  |
| Julida                 | Blaniulidae          | 6           | Cawley (1997b; 2001c); Doogue <i>et al.</i> (1993) |
|                        | Nemasomatidae        | 2           |  |
|                        | Julidae              | 13          |  |
| <b>Total species =</b> |                      | <b>41</b>   |  |

### Class Pauropoda

The Pauropoda are the smallest myriapods, ranging from about 0.5 to 1.5 mm long, with nine to eleven leg-bearing segments in the adult (Barber *et al.*, 1992).

Purcell (1996) did not include this group in his report. Barber *et al.* (1992) listed 23 species from the British Isles, with Irish records for two: *Allopauropus gracilis* (Hansen) and *A. vulgaris* (Hansen) both from the Family Pauropodidae. These two species were both listed in Fauna Europaea (2004) as occurring in Ireland.

## Subphylum Hexapoda

### Class Entognatha

McCormack, S.

#### Order Collembola

This group contains the springtails, with 201 species known to occur in Ireland (Table 68).

**Table 68. Number of species in the Order Collembola known to occur in Ireland.**

| Suborder               | Family          | No. species | References    |
|------------------------|-----------------|-------------|---------------|
| Poduromorpha           | Poduridae       | 1           | Bolger (1986) |
|                        | Hypogastruridae | 25          |               |
|                        | Neanuridae      | 22          |               |
|                        | Onychiuridae    | 30          |               |
| Entomobryomorpha       | Isotomidae      | 58          | Bolger (1986) |
|                        | Entomobryidae   | 32          |               |
|                        | Tomoceridae     | 4           |               |
| Neelipleona            | Neelidae        | 2           | Bolger (1986) |
| Symphypleona           | Sminthurididae  | 6           | Bolger (1986) |
|                        | Sminthuridae    | 21          | Bolger (1986) |
| <b>Total species =</b> |                 | <b>201</b>  |               |

#### Order Protura

There are five species recorded in Ireland (Blackith and Good, 1991). These belong to two families in separate suborders (see table 69).

**Table 69. Number of species in the Order Protura known to occur in Ireland.**

| Suborder               | Family        | No. species | References               |
|------------------------|---------------|-------------|--------------------------|
| Acerentomata           | Acerentomidae | 4           | Blackith and Good (1991) |
| Eosentomata            | Eosentomidae  | 1           |                          |
| <b>Total species =</b> |               | <b>5</b>    |                          |

#### Order Diplura

The Diplura contains the two-tailed bristletails. Three species were noted as Irish by Delany (1954) and Good *et al.* (1989) added one species. All four Irish species are in the genus *Campodea* in the Family Campodeidae.

## **Class Insecta**

Regan, E. and McCormack, S.

There are over 11,000 species of insects recorded in Ireland. This figure is less than half of the British fauna, which suggests that this is an under-recorded group in Ireland, and that there are still many more species to be recorded. Indeed, there are new species being recorded in Ireland every year. Previous attempts to quantify this figure (e.g. McCarthy, 1986; Purcell, 1996) relied on estimates for some groups, as checklists for many groups have only recently become available. Over the last decade there has been a steady production of modern Irish checklists and this process is now nearing completion, so it is possible for the first time to calculate a figure that is not reliant on estimation or extrapolation.

The information on insects is based on a number of recently published checklists, review papers or catalogues and expert input. The Hemiptera is the only large group of insects for which there is no modern publication and the species number for this group has been compiled with the assistance of relevant experts. Additional insect species recorded as new to Ireland subsequent to the cited lists have generally not been included, as to do so is beyond the scope of this project and not possible in the time available.

The checklists cited include species which are native, have occurred naturally, or have established self-sustaining populations in Ireland. It is not always possible to identify alien species from a checklist without a good knowledge of each group. Where it is known to us, we have excluded species that have only been recorded from artificial situations such as greenhouses or as vagrants. The original checklists should be consulted to confirm the status of all species. This section summarises the insect fauna of Ireland on an all-island basis as existing checklists do not distinguish between the Republic and Northern Ireland.

In the accounts below, nomenclature follows the checklist, catalogue, review or list cited. Higher classification generally follows that used by NHM (2007). Higher classifications are constantly changing as molecular analyses reveal the nature of relationships between taxonomic groups.

### **Order Archaeognatha**

This order contains the bristletails. Four species in one family are known to occur in Ireland (Delany, 1954). The Machilidae contains *Petrobius maritimus* and *P. brevistylis*, which are both commonly found around coastal areas. *Dilta saxicola* and *D. hibernica* are more local. *Dilta saxicola* is known from Howth Head and is not recorded from Britain (Delany, 1954).

### **Order Coleoptera**

This order contains the beetles, a very large and diverse group with many species of economic and ecological importance. Anderson *et al.* (1997) provided a checklist for the group in Ireland, and this has been updated online by Anderson *et al.* (2005). Currently there are 2,154 species of beetles in 84 families in Ireland (Table 70), with additional species being recorded every year. There are 4,034 species of Coleoptera in the British Isles, consisting of 106 families (Duff, 2008). The largest beetle families in Ireland are the rove beetles (Staphylinidae) with 641 species, the weevils (Curculionidae) with 214 species, and the ground beetles (Carabidae) with 210 species.

Several families have been relatively well documented in Ireland. The aquatic species covering all or part of 15 families (Foster *et al.*, 2009), ground beetles (Anderson and McFerran, 2001), rove beetles

(Anderson, 1997), weevils (Morris, 1993), and leaf beetles (Cox, 2007) have been recently reviewed or have up to date distribution data available. For many of the other families little has been published on them since Johnson and Halbert (1902).

**Table 70. Number of species in the Order Coleoptera known to occur in Ireland.**

| Suborder   | Superfamily    | Family        | No. species | References                          |
|------------|----------------|---------------|-------------|-------------------------------------|
| Adephaga   | Caraboidea     | Gyrinidae     | 10          | Anderson <i>et al.</i> (1997, 2005) |
|            |                | Haliplidae    | 13          |                                     |
|            |                | Hygrobiidae   | 1           |                                     |
|            |                | Noteridae     | 2           |                                     |
|            |                | Dytiscidae    | 86          |                                     |
|            |                | Carabidae     | 210         |                                     |
| Polyphaga  | Staphylinoidea | Leiodidae     | 51          | Anderson <i>et al.</i> (1997, 2005) |
|            |                | Leptinidae    | 1           |                                     |
|            |                | Hydraenidae   | 20          |                                     |
|            |                | Ptilidae      | 43          |                                     |
|            |                | Scydmaenidae  | 13          |                                     |
|            |                | Scaphidiidae  | 2           |                                     |
|            |                | Silphidae     | 12          |                                     |
|            |                | Staphylinidae | 641         |                                     |
|            |                | Pselaphidae   | 29          |                                     |
|            | Scarabaeoidea  | Lucanidae     | 2           |                                     |
|            |                | Trogidae      | 1           |                                     |
|            |                | Geotrupidae   | 5           |                                     |
|            |                | Scarabaeidae  | 35          |                                     |
|            | Hydrophiloidea | Helophoridae  | 16          |                                     |
|            |                | Georissidae   | 1           |                                     |
|            |                | Hydrochidae   | 3           |                                     |
|            |                | Hydrophilidae | 51          |                                     |
|            | Histeroidea    | Histeridae    | 21          |                                     |
|            | Scirtoidea     | Clambidae     | 21          |                                     |
|            |                | Scirtidae     | 14          |                                     |
|            | Dascilloidea   | Dascillidae   | 1           |                                     |
|            | Byrrhoidea     | Byrrhidae     | 7           |                                     |
|            |                | Elmidae       | 4           |                                     |
|            |                | Dryopidae     | 3           |                                     |
|            |                | Heteroceridae | 5           |                                     |
|            | Elateroidea    | Eucnemidae    | 1           |                                     |
|            |                | Throscidae    | 1           |                                     |
| Elateridae |                | 25            |             |                                     |

| <b>Suborder</b> | <b>Superfamily</b> | <b>Family</b>  | <b>No. species</b> | <b>References</b> |
|-----------------|--------------------|----------------|--------------------|-------------------|
|                 |                    | Lycidae        | 1                  |                   |
|                 |                    | Cantharidae    | 27                 |                   |
|                 | Bostrichoidea      | Dermestidae    | 14                 |                   |
|                 |                    | Bostrichidae   | 3                  |                   |
|                 |                    | Anobiidae      | 18                 |                   |
|                 | Lymexyloidea       | Lymexylidae    | 1                  |                   |
|                 | Cleroidea          | Phloiophilidae | 1                  |                   |
|                 |                    | Trogossitidae  | 2                  |                   |
|                 |                    | Cleridae       | 5                  |                   |
|                 |                    | Melyridae      | 4                  |                   |
|                 | Cucujoidea         | Aspidiphoridae | 1                  |                   |
|                 |                    | Brachypteridae | 5                  |                   |
|                 |                    | Nitidulidae    | 42                 |                   |
|                 |                    | Monotomidae    | 13                 |                   |
|                 |                    | Silvanidae     | 2                  |                   |
|                 |                    | Laemophloeidae | 2                  |                   |
|                 |                    | Phalacridae    | 5                  |                   |
|                 |                    | Cryptophagidae | 59                 |                   |
|                 |                    | Erotylidae     | 1                  |                   |
|                 |                    | Byturidae      | 2                  |                   |
|                 |                    | Bothrideridae  | 1                  |                   |
|                 |                    | Cerylonidae    | 3                  |                   |
|                 |                    | Alexiidae      | 1                  |                   |
|                 |                    | Endomychidae   | 2                  |                   |
|                 |                    | Coccinellidae  | 27                 |                   |
|                 |                    | Corylophidae   | 5                  |                   |
|                 |                    | Corticariidae  | 27                 |                   |
|                 | Tenebrionoidea     | Mycetophagidae | 2                  |                   |
|                 |                    | Ciidae         | 11                 |                   |
|                 |                    | Tetratomidae   | 2                  |                   |
|                 |                    | Melandryidae   | 7                  |                   |
|                 |                    | Mordellidae    | 1                  |                   |
|                 |                    | Rhipiphoridae  | 1                  |                   |
|                 |                    | Colydiidae     | 2                  |                   |
|                 |                    | Tenebrionidae  | 19                 |                   |
|                 |                    | Oedemeridae    | 3                  |                   |
|                 |                    | Meloidae       | 3                  |                   |
|                 |                    | Pyrochroidae   | 1                  |                   |

| Suborder               | Superfamily    | Family         | No. species  | References |
|------------------------|----------------|----------------|--------------|------------|
|                        |                | Salpingidae    | 11           |            |
|                        |                | Anthicidae     | 4            |            |
|                        |                | Scraptiidae    | 8            |            |
|                        |                | Cerambycidae   | 22           |            |
|                        |                | Chrysomelidae  | 154          |            |
|                        | Curculionoidea | Anthribidae    | 1            |            |
|                        |                | Attelabidae    | 7            |            |
|                        |                | Apionidae      | 43           |            |
|                        |                | Curculionidae  | 214          |            |
|                        |                | Rhynchitidae   | 4            |            |
|                        |                | Erirhinidae    | 7            |            |
|                        |                | Dryophthoridae | 2            |            |
| <b>Total species =</b> |                |                | <b>2,154</b> |            |

### Order Dermaptera

There are three species of earwigs in Ireland, *Labia minor*, belonging to the Family Labiidae, and *Forficula auricularia* and *F. lesnei* belonging to the Family Forficulidae. *F. auricularia* is a common and widespread species with the other two more locally distributed (Good, 1979; Cawley, 1999a).

### Order Diptera

The true flies make up the largest insect order in Ireland with over 3,300 species recorded and new species being added every year. There are 98 Dipteran families in Ireland and a checklist for the order will be published shortly (Chandler *et al.*, in prep.). The three largest families are the Chironomidae, Mycetophilidae, and Syrphidae with 475, 242, and 183 species, respectively. Ashe *et al.* (1998) provide a checklist for the aquatic members of the order.

**Table 71. Number of species in the Order Diptera known to occur in Ireland.**

| Suborders     | Superfamily    | Family          | No. species | References   |
|---------------|----------------|-----------------|-------------|--|
| Nematocera    | Tipuloidea     | Tipulidae       | 57          | Chandler (1998); Chandler pers. comm.; Chandler <i>et al.</i> (in prep.) |
|               |                | Cylindrotomidae | 3           |  |
|               |                | Pediciidae      | 15          |  |
|               |                | Limoniidae      | 130         |  |
|               | Bibionoidea    | Bibionidae      | 12          |  |
|               | Sciaroidea     | Bolitophilidae  | 6           |  |
|               |                | Diadocidiidae   | 2           |  |
|               |                | Ditomyiidae     | 1           |  |
|               |                | Keroplastidae   | 24          |  |
|               |                | Mycetophilidae  | 242         |  |
|               |                | Sciaridae       | 104         |  |
|               |                | Cecidomyiidae   | 100         |  |
|               | Psychodoidea   | Psychodidae     | 67          |  |
|               | Trichoceroidea | Trichoceridae   | 6           |  |
| Anisopodoidea | Anisopodidae   | 4               |             |  |

| Suborders  | Superfamily     | Family          | No. species | References   |
|------------|-----------------|-----------------|-------------|--|
|            |                 | Mycetobiidae    | 2           |  |
|            | Scatopsoidea    | Scatopsidae     | 23          |  |
|            | Ptychopteroidea | Ptychopteridae  | 6           |  |
|            | Culicoidea      | Dixidae         | 14          |  |
|            |                 | Chaoboridae     | 5           |  |
|            |                 | Culicidae       | 17          |  |
|            | Chironomoidea   | Thaumaleidae    | 2           |  |
|            |                 | Simuliidae      | 28          |  |
|            |                 | Ceratopogonidae | 64          |  |
|            |                 | Chironomidae    | 475         |  |
| Brachycera | Xylophagoidea   | Xylophagidae    | 1           | Chandler (1998); Chandler pers. comm.; Chandler <i>et al.</i> (in prep.) |
|            | Tabanoidea      | Athericidae     | 2           |  |
|            |                 | Rhagionidae     | 5           |  |
|            |                 | Spaniidae       | 2           |  |
|            |                 | Tabanidae       | 10          |  |
|            | Stratiomyoidea  | Stratiomyidae   | 32          |  |
|            | Nemestrinoidea  | Acroceridae     | 1           |  |
|            | Asiloidea       | Bombyliidae     | 4           |  |
|            |                 | Therevidae      | 4           |  |
|            |                 | Scenopinidae    | 2           |  |
|            |                 | Asilidae        | 3           |  |
|            | Empidoidea      | Atelestidae     | 1           |  |
|            |                 | Hybotidae       | 77          |  |
|            |                 | Empididae       | 99          |  |
|            |                 | Microphoridae   | 3           |  |
|            |                 | Dolichopodidae  | 158         |  |
|            | Platypezoidea   | Opetiidae       | 1           |  |
|            |                 | Platypezidae    | 16          |  |
|            |                 | Phoridae        | 151         |  |
|            | Lonchopteroidea | Lonchopteridae  | 3           |  |
|            | Syrphoidea      | Syrphidae       | 183         |  |
|            |                 | Pipunculidae    | 31          |  |
|            | Nerioidea       | Micropezidae    | 3           |  |
|            | Diopsoidea      | Psilidae        | 19          |  |
|            | Conopoidea      | Conopidae       | 11          |  |
|            | Tephritoidea    | Lonchaeidae     | 14          |  |
|            |                 | Palloppteridae  | 10          |  |
|            |                 | Piophilidae     | 7           |  |
|            |                 | Uliidiidae      | 6           |  |
|            |                 | Platystomatidae | 2           |  |
|            |                 | Tephritidae     | 27          |  |
|            | Lauxanioidea    | Lauxaniidae     | 35          |  |
|            |                 | Chamaemyiidae   | 8           |  |
|            | Sciomyzidea     | Coelopidae      | 3           |  |
|            |                 | Dryomyzidae     | 3           |  |
|            |                 | Helcomyzidae    | 1           |  |
|            |                 | Heterocheilidae | 1           |  |
|            |                 | Sciomyzidae     | 55          |  |
|            |                 | Sepsidae        | 19          |  |
|            | Opomyzoidea     | Clusiidae       | 5           |  |

| Suborders              | Superfamily     | Family            | No. species  | References |
|------------------------|-----------------|-------------------|--------------|------------|
|                        |                 | Acartophthalmidae | 2            |            |
|                        |                 | Odiniidae         | 2            |            |
|                        |                 | Agromyzidae       | 114          |            |
|                        |                 | Opomyzidae        | 8            |            |
|                        |                 | Anthomyzidae      | 6            |            |
|                        |                 | Aulacigastridae   | 1            |            |
|                        |                 | Stenomicridae     | 1            |            |
|                        |                 | Asteiidae         | 3            |            |
|                        | Carnoidea       | Milichiidae       | 2            |            |
|                        |                 | Carnidae          | 2            |            |
|                        |                 | Braulidae         | 1            |            |
|                        |                 | Canacidae         | 6            |            |
|                        |                 | Chloropidae       | 70           |            |
|                        | Sphaeroceroidea | Heleomyzidae      | 33           |            |
|                        |                 | Trichoscelididae  | 2            |            |
|                        |                 | Chyromyidae       | 3            |            |
|                        |                 | Sphaeroceridae    | 72           |            |
|                        | Ephydroidea     | Drosophilidae     | 30           |            |
|                        |                 | Campichoetidae    | 2            |            |
|                        |                 | Diastatidae       | 4            |            |
|                        |                 | Camillidae        | 1            |            |
|                        |                 | Ephydriidae       | 68           |            |
|                        | Hippoboscoidea  | Hippoboscidae     | 8            |            |
|                        |                 | Nycteribiidae     | 1            |            |
|                        | Muscoidea       | Scathophagidae    | 33           |            |
|                        |                 | Anthomyiidae      | 93           |            |
|                        |                 | Fanniidae         | 27           |            |
|                        |                 | Muscidae          | 163          |            |
|                        | Oestroidea      | Calliphoridae     | 20           |            |
|                        |                 | Rhinophoridae     | 4            |            |
|                        |                 | Sarcophagidae     | 24           |            |
|                        |                 | Tachinidae        | 65           |            |
|                        |                 | Oestridae         | 6            |            |
| <b>Total species =</b> |                 |                   | <b>3,304</b> |            |

### Order Ephemeroptera

There is a total of 33 species of mayfly in Ireland belonging to seven families (Table 72). This compares with 49 species in Great Britain and 71 species in Northern Europe (Kelly-Quinn and Bracken, 2000). The distribution and ecology of Ephemeroptera in Ireland was reviewed by (Kelly-Quinn and Bracken, 2000).

**Table 72. Number of species in the Order Ephemeroptera known to occur in Ireland.**

| Suborder    | Superfamily            | Family          | No. species | References   |
|-------------|------------------------|-----------------|-------------|--|
| Schistonota | Baetoidea              | Siphonuridae    | 4           | Kelly-Quinn and Bracken (2000);<br>Ashe <i>et al.</i> (1998, 2005) |
|             |                        | Baetidae        | 10          |  |
|             | Heptagenioidea         | Heptageniidae   | 9           |  |
|             | Leptophlebioidea       | Leptophlebiidae | 3           |  |
|             | Ephemeroidea           | Ephemeridae     | 1           |  |
| Pannota     | Ephemerelloidea        | Ephemerellidae  | 2           | Kelly-Quinn and Bracken (2000);<br>Ashe <i>et al.</i> (1998, 2005) |
|             | Caenoidea              | Caenidae        | 4           |  |
|             | <b>Total species =</b> |                 | <b>33</b>   |  |

### Order Hemiptera

True bugs, Hemiptera, are a large and economically very important order of insects. There are over 1,600 species in the British Isles (Unwin 2001). At least 770 species are known to occur in Ireland (Table 73) although this number should be regarded as an underestimate.

There are three suborders of Hemiptera in Ireland, the Heteroptera, Auchenorrhyncha, and Sternorrhyncha. The Heteroptera include the predatory and blood-sucking bugs, plant bugs and the aquatic and semi-aquatic bugs. The Auchenorrhyncha include the planthoppers and leafhoppers and the Sternorrhyncha include the psyllids, whiteflies, aphids, and scale insects and these are amongst the least studied insects in Ireland. The Auchenorrhyncha and Sternorrhyncha are almost all plant feeders and the recorded Irish fauna includes some exotic and introduced species that feed on non-native plant hosts. The classification below follows Aukema and Rieger (1995-2006) for the Heteroptera and De Courcy Williams (1989) for the Auchenorrhyncha. The Sternorrhyncha follows Fauna Europaea (2004), except for the Coccoidea where Ben-Dov *et al.* (2008) is followed.

**Table 73. Number of species in the Order Hemiptera known to occur in Ireland.**

| Suborders    | Superfamily | Family           | No. species | References   |
|--------------|-------------|------------------|-------------|--|
| Heteroptera  |             | Acanthosomatidae | 4           | Aukema and Rieger (1995, 1996,<br>1999, 2001, 2006); Aukema <i>et al.</i><br>(2007); Cuppen and Nelson<br>(2007); Halbert (1935); Nelson<br>(1995); Nelsonpers. comm.; Roth<br>and O'Connor (1993) |
|              |             | Aepophilidae     | 1           |  |
|              |             | Alydidae         | 1           |  |
|              |             | Anthocoridae     | 21          |  |
|              |             | Aphelocheiridae  | 1           |  |
|              |             | Aradidae         | 1           |  |
|              |             | Berytidae        | 6           |  |
|              |             | Ceratocombidae   | 1           |  |
|              |             | Cimicidae        | 3           |  |
|              |             | Coreidae         | 1           |  |
|              |             | Corixidae        | 30          |  |
|              |             | Cydnidae         | 1           |  |
|              |             | Dipsocoridae     | 2           |  |
|              |             | Gerridae         | 8           |  |
|              |             | Hebridae         | 1           |  |
|              |             | Hydrometridae    | 2           |  |
|              |             | Lygaeidae        | 34          |  |
|              |             | Microphysidae    | 4           |  |
| Miridae      | 127         |                  |             |  |
| Nabidae      | 9           |                  |             |  |
| Notonectidae | 4           |                  |             |  |

| Suborders       | Superfamily    | Family                 | No. species | References   |
|-----------------|----------------|------------------------|-------------|--|
|                 |                | Nepidae                | 1           |  |
|                 |                | Pentatomidae           | 8           |  |
|                 |                | Piesmididae            | 2           |  |
|                 |                | Pleidae                | 1           |  |
|                 |                | Reduviidae             | 2           |  |
|                 |                | Rhopalidae             | 3           |  |
|                 |                | Saldidae               | 15          |  |
|                 |                | Scutelleridae          | 1           |  |
|                 |                | Stenocephalidae        | 1           |  |
|                 |                | Thyreocoridae          | 1           |  |
|                 |                | Tingidae               | 8           |  |
|                 |                | Veliidae               | 4           |  |
| Auchenorrhyncha | Cercopoidea    | Cercopidae             | 197         | De Courcy Williams (1989); Helden (2005a, 2005b, 2005c, 2005d, 2005e, 2006a, 2006b, 2007a, 2007b, 2007c); Kirby (1991) |
|                 | Cicadoidea     | Cicadidae              |             |  |
|                 |                | Tettigarctidae         |             |  |
|                 | Membracoidea   | Cicadellidae           |             |  |
|                 |                | Membracidae            |             |  |
|                 | Fulgoroidea    | Cixiidae               |             |  |
|                 |                | Delphacidae            |             |  |
| Sternorrhyncha  | Aleyrodoidea   | Aleyrodidae            | 2           | Martin <i>et al.</i> (2000)  |
|                 | Aphidoidea     | Aphididae              | 117         | Carter <i>et al.</i> (1987); Hopkins (2000)  |
|                 |                | Callaphididae          | 29          |  |
|                 |                | Chaitophoridae         | 13          |  |
|                 |                | Lachnidae              | 16          |  |
|                 |                | Pemphigidae            | 19          |  |
|                 |                | Thelaxidae             | 7           |  |
|                 | Coccoidea      | Asterolecaniidae       | 1           | Ben-Dov <i>et al.</i> (2008)   |
|                 |                | Coccidae               | 3           |  |
|                 |                | Diaspididae            | 13          |  |
|                 |                | Eriococcidae           | 1           |  |
|                 |                | Ortheziidae            | 3           |  |
|                 |                | Pseudococcidae         | 3           |  |
|                 | Psylloidea     | Psyllidae              | 27          | Hodkinson and White (1979)   |
|                 |                | Triozidae              | 3           |  |
|                 | Phylloxeroidea | Adelgidae              | 6           | Carter <i>et al.</i> (1987)  |
|                 |                | Phylloxeridae          | 1           |  |
|                 |                | <b>Total species =</b> | <b>770</b>  |  |

### Order Hymenoptera

The Hymenoptera is a very large and diverse group, containing many species of economic and ecological importance. This group includes sawflies, ants, bees, wasps, gall wasps, and parasitoid wasps. The majority of the Hymenoptera are parasitoids, mainly in the Suborder Parasitica, and many of these are poorly known and difficult to identify. At least 3,042 species are known to occur in Ireland (Table 74), compared to around 7,000 species recorded for Britain (Noyes *et al.*, 1999). The true number of species occurring in Ireland is likely to be significantly greater than the present figure.

**Table 74. Number of species in the Order Hymenoptera known to occur in Ireland.**

| Suborder        | Superfamily     | Family      | No. species | References                    |
|-----------------|-----------------|-------------|-------------|-------------------------------|
| <b>Symphyta</b> | Xyeloidea       | Xyelidae    | 1           | O'Connor <i>et al.</i> (1997) |
|                 | Pamphilioidea   | Pamphilidae | 8           |                               |
|                 | Siricoidea      | Siricidae   | 5           |                               |
|                 | Cephoidea       | Cephidae    | 1           |                               |
|                 | Tenthredinoidea | Argidae     | 7           |                               |

| Suborder          | Superfamily      | Family            | No. species            | References   |      |                               |
|-------------------|------------------|-------------------|------------------------|--|------|-------------------------------|
|                   |                  | Cimbicidae        | 10                     |  |      |                               |
|                   |                  | Diprionidae       | 3                      |  |      |                               |
|                   |                  | Tenthredinidae    | 239                    |  |      |                               |
| <b>Apocrita</b>   | Chrysoidea       | Dryinidae         | 18                     | Ronayne and O'Connor (2006 a)  |      |                               |
|                   |                  | Bethylidae        | 3                      |  |      |                               |
|                   |                  | Chrysididae       | 6                      |  |      |                               |
|                   | Vespoidea        | Tiphiidae         | 1                      |  |      |                               |
|                   |                  | Mutillidae        | 1                      |  |      |                               |
|                   |                  | Formicidae        | 19                     |  |      |                               |
|                   |                  | Pompilidae        | 13                     |  |      |                               |
|                   | Apoidea          | Vespidae          | 14                     |  |      |                               |
|                   |                  | Sphecidae         | 2                      |  |      |                               |
|                   |                  | Crabronidae       | 39                     |  |      |                               |
|                   |                  | Apidae            | 100                    | Ronayne and O'Connor (2006 a);<br>Fitzpatrick <i>et al.</i> (2006 b); Fitzpatrick<br>(pers. comm.) |      |                               |
| <b>Parasitica</b> | Chalcidoidea     | Aphelinidae       | 11                     | O'Connor <i>et al.</i> (2000)  |      |                               |
|                   |                  | Chalcididae       | 1                      |  |      |                               |
|                   |                  | Encyrtidae        | 59                     |  |      |                               |
|                   |                  | Eulophidae        | 140                    |  |      |                               |
|                   |                  | Eupelmidae        | 3                      |  |      |                               |
|                   |                  | Eurytomidae       | 17                     |  |      |                               |
|                   |                  | Mymaridae         | 21                     |  |      |                               |
|                   |                  | Ormyridae         | 1                      |  |      |                               |
|                   |                  | Pteromalidae      | 167                    |  |      |                               |
|                   |                  | Tetracampidae     | 2                      |  |      |                               |
|                   |                  | Torymidae         | 32                     |  |      |                               |
|                   |                  | Trichogrammatidae | 3                      |  |      |                               |
|                   |                  | Ichneumonoidea    | Ichneumonidae          |  | 1135 | O'Connor <i>et al.</i> (2007) |
|                   |                  |                   | Braconidae             |  | 529  | O'Connor <i>et al.</i> (1999) |
|                   | Platygastroidea  | Platygastridae    | 65                     | O'Connor <i>et al.</i> (2004)  |      |                               |
|                   |                  | Scelionidae       | 28                     |  |      |                               |
|                   | Proctotrupeoidea | Diapriidae        | 185                    |  |      |                               |
|                   |                  | Heloridae         | 2                      |  |      |                               |
|                   |                  | Proctotrupidae    | 36                     |  |      |                               |
|                   | Ceraphronoidea   | Ceraphronidae     | 6                      | O'Connor (2007)  |      |                               |
|                   |                  | Megaspilidae      | 13                     |  |      |                               |
|                   | Cynipoidea       | Figitidae         | 56                     | O'Connor and Nash (1997); O'Connor<br>(2003a, 2004a, 2004b)  |      |                               |
|                   |                  | Cynipidae         | 39                     |  |      |                               |
|                   |                  | Ibaliidae         | 1                      |  |      |                               |
|                   |                  |                   | <b>Total species =</b> | <b>3,042</b>   |      |                               |

## Order Lepidoptera

The Lepidoptera includes the butterflies and moths and there are 1,454 species in Ireland (Bond *et al.*, 2006; Bond *et al.*, 2008), representing 53 families (Table 75). The largest of these are the Noctuidae with 248 species, the Geometridae with 233 species, and the Tortricidae with 224 species. The adults are mostly liquid-feeders, imbibing nectar and other juices. The larvae, on the other hand, feed almost exclusively on plant material. For this reason, the order is economically very important, mainly because of the damage caused by larvae to crops and plants.

**Table 75. Number of species in the Order Lepidoptera known to occur in Ireland.**

| Suborder    | Superfamily         | Family              | No. species   | References   |  |
|-------------|---------------------|---------------------|---------------|--|--|
| Zeugloptera | Microterigoidea     | Micropterigidae     | 4             | Bond <i>et al.</i> (2006); Bond <i>et al.</i> (2008) |  |
| Glossata    | Eriocranioidea      | Eriocraniidae       | 8             |  |  |
|             | Hepialoidea         | Hepialidae          | 4             |  |  |
|             | Nepticuloidea       | Nepticulidae        | 62            |  |  |
|             |                     | Opostegidae         | 2             |  |  |
|             | Tischerioidea       | Tischeriidae        | 3             |  |  |
|             | Incurvarioidea      | Incurvariidae       | 5             |  |  |
|             |                     | Prodoxidae          | 3             |  |  |
|             |                     | Adelidae            | 11            |  |  |
|             |                     | Heliozelidae        | 3             |  |  |
|             | Cossoidea           | Cossidae            | 2             |  |  |
|             | Zygaenoidea         | Zygaenidae          | 4             |  |  |
|             | Tineoidea           | Psychidae           | 5             |  |  |
|             |                     | Tineidae            | 25            |  |  |
|             | Gracillarioidea     | Buccalatricidae     | 9             |  |  |
|             |                     | Gracillariidae      | 55            |  |  |
|             | Sesioidea           | Sesiidae            | 6             |  |  |
|             | Choreutoidea        | Choreutidae         | 4             |  |  |
|             | Yponomeutoidea      | Glyphipterigidae    | 6             |  |  |
|             |                     | Yponomeutidae       | 50            |  |  |
|             |                     | Lyonetiidae         | 8             |  |  |
|             |                     | Gelechioidea        | Coleophoridae | 52   |  |
|             |                     |                     | Elachistidae  | 33   |  |
|             |                     | Oecophoridae        | 44            |  |  |
|             |                     | Gelechiidae         | 71            |  |  |
|             |                     | Autostichidae       | 1             |  |  |
|             |                     | Blastobasidae       | 1             |  |  |
|             |                     | Batrachedridae      | 1             |  |  |
|             |                     | Momphidae           | 8             |  |  |
|             |                     | Cosmopterigidae     | 9             |  |  |
|             |                     | Scythrididae        | 2             |  |  |
|             | Tortricoidea        | Tortricidae         | 224           |  |  |
|             | Epermenioidea       | Epermeniidae        | 2             |  |  |
|             | Schreckensteinoidea | Schreckensteiniidae | 1             |  |  |
|             | Alucitoidea         | Alucitidae          | 1             |  |  |
|             | Pyraloidea          | Pyralidae           | 88            |  |  |
|             | Pterophoroidea      | Pterophoridae       | 22            |  |  |
|             | Hesperoidea         | Hesperiidae         | 2             |  |  |
|             | Papilionoidea       | Papilionidae        | 2             |  |  |

| Suborder | Superfamily  | Family                 | No. species | References |
|----------|--------------|------------------------|-------------|------------|
|          |              | Pieridae               | 11          |            |
|          |              | Lycaenidae             | 9           |            |
|          |              | Nymphalidae            | 25          |            |
|          | Bombycoidea  | Lasiocampidae          | 9           |            |
|          |              | Saturniidae            | 1           |            |
|          | Drepanoidea  | Drepanidae             | 10          |            |
|          | Geometroidea | Geometridae            | 233         |            |
|          | Sphingoidea  | Sphingidae             | 13          |            |
|          | Noctuoidea   | Notodontidae           | 20          |            |
|          |              | Lymantriidae           | 6           |            |
|          |              | Arctiidae              | 22          |            |
|          |              | Ctenuchidae            | 3           |            |
|          |              | Nolidae                | 1           |            |
|          |              | Noctuidae              | 248         |            |
|          |              | <b>Total species =</b> | <b>1454</b> |            |

### Order Mecoptera

*Panorpa germanica* is the only species of scorpionfly found in Ireland (King and Halbert, 1910). It belongs to the Family Panorpidae and is widely distributed across Europe.

### Order Megaloptera

There are two species of alderflies in Ireland *Sialis lutaria* and *S. nigriceps* (Ashe *et al.*, 1998). Both species are in the Family Sialidae.

### Order Neuroptera

There are 32 species of lacewings or Neuroptera recorded from Ireland (Barnard *et al.*, 1991; O'Connor, 2003b) from five families (Table 76). There are 65 species recorded from Great Britain (Barnard, 1999).

**Table 76. Number of species in the Order Neuroptera known to occur in Ireland.**

| Suborder        | Family                 | No. species | References                                     |
|-----------------|------------------------|-------------|--|
| Hemerobiiformia | Chrysopidae            | 9           | Barnard <i>et al.</i> (1991); O'Connor (2003b) |
|                 | Coniopterygidae        | 3           |  |
|                 | Hemerobiidae           | 16          |  |
|                 | Osmylidae              | 1           |  |
|                 | Sisyridae              | 3           |  |
|                 | <b>Total species =</b> | <b>32</b>   |  |

### Order Odonata

Ashe *et al.* (2005) list 34 dragonfly and damselfly species in eight families as Irish (Table 77). This includes vagrant and migrant species that may have only been recorded once in Ireland. Nelson and Thompson (2004) reviewed the natural history of the group and stated that 24 species have a breeding population in Ireland. This compares with 38 species in Great Britain, 64 in the Netherlands and 81 in France (Nelson and Thompson, 2004).

**Table 77. Number of species in the Order Odonata known to occur in Ireland.**

| Suborder               | Superfamily       | Family           | No. species | References                |
|------------------------|-------------------|------------------|-------------|---------------------------|
| Zygoptera              | Calopterygoidea   | Calopterygidae   | 2           | Ashe <i>et al.</i> (2005) |
|                        | Lestoidea         | Lestidae         | 2           |                           |
|                        | Coenagrionoidea   | Coenagrionidae   | 7           |                           |
| Anisoptera             | Aeshnoidea        | Aeshnidae        | 8           | Ashe <i>et al.</i> (2005) |
|                        |                   | Gomphidae        | 1           |                           |
|                        | Cordulegastroidea | Cordulegastridae | 1           |                           |
|                        | Libelluloidea     | Corduliidae      | 2           |                           |
|                        |                   | Libellulidae     | 11          |                           |
| <b>Total species =</b> |                   |                  | <b>34</b>   |                           |

### Order Orthoptera

The Order Orthoptera contains the grasshoppers, crickets, and bush-crickets. Twelve species in three families are noted as Irish and are regarded as native (Marshall and Haes, 1988; Cawley, 2005) (Table 78). Thirty-one species are regarded as native to Britain (Barnard, 1999). *Acheta domesticus* has not been recorded from Ireland after 1960 and it is presumed that this alien species is now rare or absent from Ireland (Marshall and Haes, 1988). *Tachycines asynamorus* is an introduced species that can temporarily be established in artificial situations such as greenhouses and is not included in this summary.

**Table 78. Number of species in the Order Orthoptera known to occur in Ireland.**

| Suborder               | Superfamily  | Family        | No. species | References                |
|------------------------|--------------|---------------|-------------|---------------------------|
| Ensifera               | Tetigonoidea | Tettigoniidae | 5           | Marshall and Haes (1988); |
| Caelifera              | Aridoidea    | Tetrigidae    | 2           | Cawley (2005)             |
|                        |              | Acrididae     | 5           |                           |
| <b>Total species =</b> |              |               | <b>12</b>   |                           |

### Order Phthiraptera

The lice are an order of wingless insects that are obligate ectoparasites on birds and mammals. There are 117 species in Ireland (Butler and O'Connor, 1994; O'Connor, 2005; O'Connor *et al.*, 2005) belonging to 11 families (Table 79). The order was traditionally divided in the Anoplura sucking lice and the Mallophaga chewing lice. However, recent classification suggests that the Mallophaga are paraphyletic and this group is now split into the Amblycera and Ischnocera.

**Table 79. Number of species in the Order Phthiraptera known to occur in Ireland.**

| Suborder             | Family           | No. Species | References  |
|----------------------|------------------|-------------|---|
| Amblycera            | Menoponidae      | 20          | Butler and O'Connor (1994); Doyle <i>et al.</i> (2004); O'Connor (2005) |
|                      | Laemobothriidae  | 1           |   |
|                      | Ricinidae        | 1           |   |
| Ischnocera           | Phloptoridae     | 66          | Butler and O'Connor (1994); Doyle <i>et al.</i> (2004)                  |
|                      | Trichodectidae   | 13          |   |
| Anoplura             | Haematopinidae   | 3           | O'Connor <i>et al.</i> (2005)   |
|                      | Enderleinellidae | 1           |   |
|                      | Hoplopleuridae   | 1           |   |
|                      | Polyplacidae     | 5           |   |
|                      | Linognathidae    | 4           |   |
|                      | Pediculidae      | 2           |   |
| <b>Total species</b> |                  | <b>117</b>  |   |

### Order Plecoptera

Twenty species of stonefly are recorded from Ireland (Ashe *et al.*, 1998, 2005) belonging to seven families (Table 80). This compares with 34 species recorded from Britain (Ashe *et al.*, 1998). They are freshwater insects that are intolerant of water pollution and are commonly used to evaluate water quality. Costello (1988) reviewed their distribution in Ireland.

**Table 80. Number of species in the Order Plecoptera known to occur in Ireland.**

| Suborder               | Superfamily | Family           | No. species | References                |                           |
|------------------------|-------------|------------------|-------------|---------------------------|---------------------------|
| Arctoperlaria          | Nemouroidea | Taeniopterygidae | 1           | Ashe <i>et al.</i> (1998) |                           |
|                        |             | Nemouridae       | 6           |                           |                           |
|                        |             | Leuctridae       | 4           |                           |                           |
|                        |             | Capniidae        | 2           |                           |                           |
|                        | Perloidea   | Perlodidae       | 3           |                           | Ashe <i>et al.</i> (1998) |
|                        |             | Perlidae         | 2           |                           |                           |
|                        |             | Chloroperlidae   | 2           |                           |                           |
| <b>Total species =</b> |             |                  | <b>20</b>   |                           |                           |

### Order Psocoptera

The Psocoptera are known as the booklice, barklice, or psocids and are small or minute soft-bodied insects. There are 46 species recorded from Ireland (Smithers *et al.*, 2000) belonging to 16 families (Table 81). Worldwide, there are about 2,000 described species, with around 90 known from Britain, including several from artificial situations (Chinery, 1993).

**Table 81. Number of species in the Order Psocoptera known to occur in Ireland.**

| Suborder               | Family          | No. species | References                    |
|------------------------|-----------------|-------------|-------------------------------|
| Trogiomorpha           | Lepidopsocidae  | 1           | Smithers <i>et al.</i> (2000) |
|                        | Trogiidae       | 3           |                               |
|                        | Psyllipsocidae  | 2           |                               |
| Troctomorpha           | Liposcelidae    | 2           | Smithers <i>et al.</i> (2000) |
|                        | Sphaeropsocidae | 1           |                               |
| Psocomorpha            | Epipsocidae     | 1           | Smithers <i>et al.</i> (2000) |
|                        | Caeciliusidae   | 6           |                               |
|                        | Stenopsocidae   | 2           |                               |
|                        | Lachesillidae   | 1           |                               |
|                        | Ectopsocidae    | 4           |                               |
|                        | Peripsocidae    | 4           |                               |
|                        | Trichopsocidae  | 1           |                               |
|                        | Elipsocidae     | 6           |                               |
|                        | Philotarsidae   | 1           |                               |
|                        | Mesopsocidae    | 2           |                               |
|                        | Psocidae        | 9           |                               |
| <b>Total species =</b> |                 | <b>46</b>   |                               |

## Order Siphonaptera

Fleas are external parasites living by hematophagy on mammals and birds. There are 40 species of fleas in Ireland belonging to five families (Smiddy and Sleeman, 1993; Sleeman and Smiddy, 1994; Sleeman *et al.*, 1996) (Table 82). This includes 18 species of terrestrial mammal fleas (Smiddy *et al.*, 1996), six species of bat fleas (Smiddy and Sleeman, 1993), and 16 species of avian fleas (Smiddy and Sleeman, 1993). The distribution of Irish fleas was reviewed by Fairley (1984) who also provided an account of flea biology and advice on collecting.

**Table 82. Number of species in the Order Siphonaptera known to occur in Ireland.**

| Superfamily            | Family             | No. Species | References                   |
|------------------------|--------------------|-------------|------------------------------|
| Ceratophylloidea       | Ceratophyllidae    | 19          | Smiddy and Sleeman (1993);   |
|                        | Ischnopsyllidae    | 6           | Sleeman and Smiddy (1994);   |
|                        | Leptopsyllidae     | 1           | Sleeman <i>et al.</i> (1996) |
| Hystrichopsylloidea    | Hystrichopsyllidae | 6           |                              |
| Pulicoidea             | Pulicidae          | 8           |                              |
| <b>Total species =</b> |                    | <b>40</b>   |                              |

## Order Strepsiptera

The Order Strepsiptera or the stylopids are unusual insects that parasitize Hymenoptera and Hemiptera. Adult males are free living but females generally remain inside the host. They are quite common but are rarely encountered by the non-specialist. There are about 20 species in the British Isles (Hammond and Hine, 1993) with only three species recorded in Ireland (Table 83): *Halictoxenos tumulorum* and *H. spencei* in the Family Stylopidae and *Elenchus tenuicornis* in the Family Elenchidae (Ronayne and O'Connor, 2006b).

**Table 83. Number of species in the Order Strepsiptera known to occur in Ireland.**

| Suborder               | Family     | No. species | References                   |
|------------------------|------------|-------------|------------------------------|
| Stylopoidia            | Stylopidae | 2           | Ronayne and O'Connor (2006b) |
|                        | Elenchidae | 1           |                              |
| <b>Total species =</b> |            | <b>3</b>    |                              |

## Order Thysanoptera

There are 40 species of thrips in Ireland from two families (O'Connor, in prep.) (Table 84). There are 158 species in 3 families in Britain, including 12 species from artificial situations (Pitkin, 1976). The group is of economic importance as some species are pests causing damage to crops and are vectors of diseases (Dunne and O'Connor, 1989; 1997). About 5,000 species have been described worldwide (Chinery, 1993).

**Table 84. Number of species in the Order Thysanoptera known to occur in Ireland.**

| Suborder               | Family          | No. species | Reference           |
|------------------------|-----------------|-------------|---------------------|
| Terebrantia            | Thripidae       | 33          | O'Connor (in prep.) |
| Tubulifera             | Phlaeothripidae | 7           |                     |
| <b>Total species =</b> |                 | <b>40</b>   |                     |

**Order Thysanura**

This group contains the silverfish and firebrats. There are two species *Thermobia domestica* and *Lepisma saccharina* in one family: the Lepismatidae. Both species occur only in buildings but are widespread and common (Delany, 1954).

**Order Trichoptera**

There are 147 species of caddisflies recorded from Ireland (Ashe *et al.*, 2005) belonging to 17 families (Table 85). There are 198 species recorded for the British Isles (Barnard, 1999).

**Table 85. Number of species in the Order Trichoptera known to occur in Ireland.**

| <b>Suborder</b>        | <b>Superfamily</b> | <b>Family</b>     | <b>No. species</b> | <b>Reference</b>          |
|------------------------|--------------------|-------------------|--------------------|---------------------------|
| Annulipalpia           | Hydropsychoidea    | Ecnomidae         | 1                  | Ashe <i>et al.</i> (2005) |
|                        |                    | Hydropsychidae    | 7                  |                           |
|                        |                    | Polycentropodidae | 11                 |                           |
|                        |                    | Psychomyiidae     | 9                  |                           |
|                        |                    | Philoptamoidea    | Philopotamidae     |                           |
| Integripalpia          | Leptoceroidea      | Leptoceridae      | 23                 |                           |
|                        |                    | Molannidae        | 1                  |                           |
|                        |                    | Odontoceridae     | 1                  |                           |
|                        | Limnephiloidea     | Goeridae          | 3                  |                           |
|                        |                    | Lepidostomatidae  | 3                  |                           |
|                        |                    | Limnephilidae     | 42                 |                           |
|                        | Phryganeidae       | Phryganeidae      | 6                  |                           |
|                        | Sericostomatoidea  | Beraeidae         | 3                  |                           |
|                        |                    | Sericostomatidae  | 1                  |                           |
|                        | Spicipalpia        | Glossosomatoidea  | Glossosomatidae    | 5                         |
| Hydroptiloidea         |                    | Hydroptilidae     | 24                 |                           |
| Rhyacophiloidea        |                    | Rhyacophilidae    | 2                  |                           |
| <b>Total species =</b> |                    |                   | <b>147</b>         |                           |

## Phylum Echinodermata

Ferriss, S. E.

The Phylum Echinodermata, an entirely marine group (McKenzie, 1997), comprises five classes which are distinguished by their radial symmetry, usually with five rays (Southward and Campbell, 2006), although a few exceptional species may have more than five (Moyses and Tyler, 1990). Echinoderms typically have a superficial layer of calcareous skeletal plates, which may be joined together to form a complete shell, or may be separated by a flexible membrane (Moyses and Tyler, 1990). They possess tube feet, which are flexible extensions of the body wall that can be used for walking, grasping, obtaining food and burrowing (Southward and Campbell, 2006). Internally, they possess a unique hydraulic water vascular system that controls the movement of the tube feet (Moyses and Tyler, 1990).

The echinoderm fauna around the British Isles is rich in species, with many reaching either their northern or southern limits of distribution in these waters (McKenzie, 1997). They are often the most ecologically important species within any particular habitat (McKenzie, 1997).

Ninety-four species were listed in seas surrounding the British Isles by Southward and Campbell (2006) and 142 were listed by McKenzie (1997), although a number of the latter were known from the waters adjacent to the British Isles rather than in the waters of the British Isles themselves, or were species whose bathymetric range elsewhere indicates that they may be found on the shelf.

This review identified records for 192 species found in Irish waters. This number is an increase on past estimates (e.g. 73 species noted by Purcell, 1996), in large part due to records of deep-water species compiled by Greenwood *et al.* (2001).

The higher taxonomy used in this list follows Costello *et al.* (2008).

### Class Crinoidea

The crinoids or featherstars have a cup-shaped body (Moyses and Tyler, 1990), five, ten or more feathery, flexible arms that are attached to a small central disc (Southward and Campbell, 2006). Crinoids are attached to the sea floor, at least in the early post-larval stage, although stalked crinoids (sea-lillies) remain attached all their lives (Southward and Campbell, 2006). Thirteen species from one order and three families are known to occur in Irish waters (Table 86).

**Table 86. Number of species in the Class Crinoidea known to occur in Ireland.**

| Order                  | Family            | No. species | References   |
|------------------------|-------------------|-------------|--|
| Millericrinida         | Bathycrinidae     | 1           |  |
|                        | Bourgueticrinidae | 2           | Greenwood <i>et al.</i> (2001)   |
|                        | Antedonidae       | 7           | Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Guiry (1971); Keegan <i>et al.</i> (1985); Nichols (1902); Nichols (1912); O'Connor (1988); Picton and Costello (1998) |
|                        | Atelecrinidae     | 1           | Greenwood <i>et al.</i> (2001)   |
|                        | Pentametocrinidae | 1           | Greenwood <i>et al.</i> (2001)   |
|                        | Thalassometridae  | 1           | Greenwood <i>et al.</i> (2001)   |
| <b>Total species =</b> |                   | <b>13</b>   |  |

**Class Asteroidea**

The seastars or starfishes are among the more well known echinoderms. They possess a flattened star-shaped body that has five or more arms radiating from the central region (Southward and Campbell, 2006). Forty-nine species from seven orders and 18 families are known to occur in Irish waters (Table 87).

**Table 87. Number of species in the Class Asteroidea known to occur in Ireland**

| <b>Order</b>  | <b>Family</b>          | <b>No. species</b> | <b>References</b>   |
|---------------|------------------------|--------------------|---|
| Paxillosida   | Luidiidae              | 2                  | Bell (1890); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Oliver and Healy (1998); Nichols (1902); Nichols (1912); Picton and Costello (1998)  |
|               | Astropectinidae        | 8                  | Bell (1890); Dale (in prep.); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Nichols (1902); Nichols (1912); Picton and Costello (1998); Sumida <i>et al.</i> (2001)   |
|               | Radiasteridae          | 1                  | Greenwood <i>et al.</i> (2001)  |
|               | Porcellanasteridae     | 2                  | Greenwood <i>et al.</i> (2001); Sumida <i>et al.</i> (2001)   |
| Notomyotida   | Benthopectinidae       | 4                  | Bell (1890); Greenwood <i>et al.</i> (2001); Nichols (1902); Sumida <i>et al.</i> (2001)  |
| Valvatida     | Odontasteridae         | 2                  | Greenwood <i>et al.</i> (2001)  |
|               | Asterinidae            | 3                  | Bell (1890); Davidson (2004); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); McMillan (1950); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); O'Connor and Tyndall (1978); Picton and Costello (1998); Southward and Campbell (2006)  |
|               | Poraniidae             | 1                  | Bell (1890); Ellis and Rodgers (2000); Nichols (1902); Nichols (1912); Picton and Costello (1998)   |
|               | Goniasteridae          | 7                  | Greenwood <i>et al.</i> (2001); O'Connor and Tyndall (1986); Picton and Morrow (2007); Southward and Campbell (2006); Sumida <i>et al.</i> (2001)   |
|               | Pseudarchasteridae     | 1                  | Greenwood <i>et al.</i> (2001)  |
| Velatida      | Solasteridae           | 2                  | Ellis and Rodgers (2000); Nichols (1902); Nichols (1912); O'Connor (1988); O'Connor and Tyndall (1978); O'Riordan (1971); O'Riordan (1984 a); Picton (1993); Picton and Costello (1998); Southward and Campbell (2006)  |
|               | Pterasteridae          | 2                  | McKenzie (1997); O'Connor (1981b); Southward and Campbell (2006); Sumida <i>et al.</i> (2001)   |
| Brisingida    | Brisingidae            | 3                  | Bell (1890); Greenwood <i>et al.</i> (2001); Nichols (1902); Sumida <i>et al.</i> (2001)  |
|               | Freyellidae            | 2                  | Greenwood <i>et al.</i> (2001)  |
| Spinulosida   | Echinasteridae         | 2                  | Davidson (2004); Ellis and Rodgers (2000); Nichols (1902); Nichols (1907); Nichols (1912); Picton and Costello (1998)   |
| Forcipulatida | Asteriidae             | 5                  | Bell (1890); Dale (in prep.); Davidson (2004); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); Oliver and Healy (1998); O'Riordan (1971); O'Riordan (1975 a); Picton (1993); Picton and Costello (1998); Rawlinson (2004); Southward and Campbell (2006) |
|               | Pedicellasteridae      | 1                  | Greenwood <i>et al.</i> (2001)  |
|               | Neomorphasteridae      | 1                  | Greenwood <i>et al.</i> (2001)  |
|               | <b>Total species =</b> |                    | <b>49</b>   |

**Class Ophiuroidea**

The ophiuroids or brittlestars are the largest group of living echinoderms which, in British waters, usually occur sublittorally or in the lower intertidal on rocks or soft substrata (Moyses and Tyler, 1990). Forty-five species from three orders and 13 families are known to occur in Irish waters (Table 88).

**Table 88. Number of species in the Class Ophiuroidea known to occur in Ireland.**

| Order     | Family                 | No. species | References   |  |
|-----------|------------------------|-------------|--|--|
| Euryalida | Asteronychidae         | 1           | Greenwood <i>et al.</i> (2001); O'Connor and Tyndall (1978); O'Riordan (1984 a)  |  |
|           | Gorgonocephalidae      | 1           | Greenwood <i>et al.</i> (2001); Southward and Campbell (2006)  |  |
|           | Asteroschematidae      | 2           | Greenwood <i>et al.</i> (2001)   |  |
| Ophiurida | Ophiomyxidae           | 2           | Greenwood <i>et al.</i> (2001)   |  |
|           | Ophiotrichidae         | 2           | Bell (1890); Dale (in prep.); Davidson (2004); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); Lynch <i>et al.</i> (2006); McKenzie, (1997); Moyses and Tyler (1990); Nichols (1902)  |  |
|           | Ophiocomidae           | 3           | Davidson (2004); Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); Moyses and Tyler (1990); McKenzie (1997); Nichols (1902) and Nichols (1912); O'Connor (1981); O'Connor (1988); Picton (1993); Picton and Costello (1998); Southward and Campbell (2006)  |  |
|           | Ophiactidae            | 3           | Bell (1890); Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); O'Riordan (1975 a); Picton and Costello (1998)   |  |
|           | Amphiuridae            | 9           | Dale (in prep.); Davidson (2004); Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); Lynch <i>et al.</i> (2006); McKenzie (1997); McMillan (1950); Moyses and Tyler (1990); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1981b); O'Connor (1988); O'Connor and Tyndall (1978); Oliver and Healy (1998); Picton and Costello (1998); Picton and Morrow (2007); Roche <i>et al.</i> (2007); Southward and Campbell (2006) |  |
|           | Amphilepididae         | 2           | Greenwood <i>et al.</i> (2001); McKenzie (1997)  |  |
|           | Ophiacanthidae         | 2           | McKenzie (1997)  |  |
|           | Ophiuridae             | 16          | Bell (1890); Dale (in prep.); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); McKenzie (1997); Moyses and Tyler (1990); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); Picton (1993); Picton and Costello (1998)   |  |
|           | Ophiolepididae         | 1           | Greenwood <i>et al.</i> (2001); Moyses and Tyler (1990); Nichols (1902)  |  |
|           | Ophiochitonidae        | 1           | Greenwood <i>et al.</i> (2001)   |  |
|           | <b>Total species =</b> |             | <b>45</b>  |  |

**Class Echinoidea**

The sea urchins, another relatively well known group, have a globular or disc-shaped rigid test or shell, which comprises a number of plates that bear many articulated spines (Moyses and Tyler, 1990; Southward and Campbell, 2006). Twenty-seven species from six orders and 10 families are known to occur in Irish waters (Table 89).

**Table 89. Number of species in the Class Echinoidea known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>  | <b>No. species</b> | <b>References</b>   |
|------------------------|----------------|--------------------|---|
| Cidaroida              | Cidaridae      | 2                  | Bell (1890) and Nichols (1902); Greenwood <i>et al.</i> (2001); O'Connor and Tyndall (1978)   |
| Echinothuroida         | Echinothuridae | 5                  | Greenwood <i>et al.</i> (2001); Nichols (1902); O'Connor and Tyndall (1978); Sumida <i>et al.</i> (2001)  |
| Echinoida              | Echinidae      | 9                  | Bell (1890); Davidson (2004); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); McKenzie (1997); Moyses and Tyler (1990); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); Oliver and Healy (1998); Picton (1993); Picton and Costello (1998); Rawlinson (2004); Southward and Campbell (2006) |
| Clypeasteroida         | Fibulariidae   | 1                  | Dale (in prep.); Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); Nichols (1902); Nichols (1912); O'Connor (1988); O'Riordan (1971); Picton and Costello (1998)  |
| Spatangoida            | Aeropsidae     | 1                  | Greenwood <i>et al.</i> (2001)  |
|                        | Hemiasteridae  | 1                  | Greenwood <i>et al.</i> (2001)  |
|                        | Spatangidae    | 2                  | Bell (1890); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); McKenzie (1997); Moyses and Tyler (1990); Nichols (1902); Nichols (1912); O'Connor (1988); Picton and Costello (1998)  |
|                        | Loveniidae     | 3                  | Dale (in prep.); Dinneen <i>et al.</i> (1986); Ellis and Rodgers (2000); Greenwood <i>et al.</i> (2001); Nichols (1902); Nichols (1907); Nichols (1912); O'Connor (1988); Picton and Costello (1998)  |
|                        | Brissidae      | 1                  | Greenwood <i>et al.</i> (2001); Nichols (1902)  |
| Pourtalesioida         | Pourtalesiidae | 2                  | Greenwood <i>et al.</i> (2001)  |
| <b>Total species =</b> |                | <b>27</b>          |   |

**Class Holothurioidea**

The holothurians, or sea cucumbers, are the most taxonomically confused group of British echinoderms, particularly at generic level (McKenzie, 1997). They are long and narrow echinoderms, with a mouth at one end, surrounded by a circle of tentacles (Southward and Campbell, 2006). Softer and more muscular than other echinoderms, the holothurians can change shape considerably (Southward and Campbell, 2006). Fifty-eight species from five orders and 15 families are known to occur in Irish waters (Table 90).

**Table 90. Number of species in the Class Holothurioidea known to occur in Ireland.**

| <b>Order</b>           | <b>Family</b>   | <b>No. species</b> | <b>References</b>   |
|------------------------|-----------------|--------------------|---|
| Aspidochirotida        | Synallactidae   | 9                  | Greenwood <i>et al.</i> (2001); McKenzie (1997); Southward and Campbell (2006)  |
|                        | Stichopodidae   | 2                  | Bell (1890); Greenwood <i>et al.</i> (2001); O'Connor and Tyndall (1978); Southward and Campbell (2006)   |
|                        | Holothuriidae   | 1                  | Picton and Costello (1998); Nichols (1902); Nichols (1912); Southward and Campbell (2006)   |
| Dactylochirotida       | Ypsilothuriidae | 3                  | Greenwood <i>et al.</i> (2001)  |
| Dendrochirotida        | Psolidae        | 3                  | Greenwood <i>et al.</i> (2001); Moyses and Tyler (1990); Nichols (1902)   |
|                        | Cucumariidae    | 13                 | Davidson (2004); Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); Moyses and Tyler (1990); Nichols (1902); Nichols (1912); O'Connor <i>et al.</i> (1980); O'Connor (1988); Picton (1993); Picton and Costello (1998); Southward and Campbell (2006) |
|                        | Phyllophoridae  | 2                  | Greenwood <i>et al.</i> (2001); Keegan <i>et al.</i> (1985); Moyses and Tyler (1990); Picton and Costello (1998)  |
| Apodida                | Synaptidae      | 7                  | Dinneen <i>et al.</i> (1986); Greenwood <i>et al.</i> (2001); O'Connor (1981); O'Connor (1988); O'Connor and Tyndall (1978); Picton and Costello (1998); Southward and Campbell (2006)  |
|                        | Myriotrochidae  | 5                  | Greenwood <i>et al.</i> (2001)  |
| Elasipodida            | Deimatidae      | 2                  | Greenwood <i>et al.</i> (2001)  |
|                        | Laetmogonidae   | 2                  | Greenwood <i>et al.</i> (2001)  |
|                        | Psychropotidae  | 4                  | Greenwood <i>et al.</i> (2001)  |
|                        | Elpidiidae      | 3                  | Greenwood <i>et al.</i> (2001)  |
| Molpadiida             | Molpadidae      | 1                  | Greenwood <i>et al.</i> (2001)  |
|                        | Eupyrgidae      | 1                  | Greenwood <i>et al.</i> (2001)  |
| <b>Total species =</b> |                 | <b>58</b>          |   |

**Phylum Chaetognatha**

Smith, K.G.

Chaetognatha, commonly known as arrow worms, are small marine carnivorous worms that are all planktonic, apart from the benthic genus *Spadella*. They are found across the world and have a wide depth range (Pierrot-Bults and Chidgey, 1988). They range in size from 2 mm to 12 cm in length. There are currently around 110 species described worldwide (NHM, 2007). The higher taxonomy used here follows Costello *et al.* (2008).

Fifteen species have been recorded from the waters of the Republic of Ireland, all from the Class Sagittoidea (Table 91).

**Table 91. Number of species in the Class Sagittoidea known to occur in Ireland.**

| Order                  | Family       | No. species | References   |
|------------------------|--------------|-------------|--|
| Aphragmophora          | Sagittidae   | 11          | Farran (1947); Fives (1971) ; Hansson (1997); O'Brien (1976); O'Brien (1977); Pierrot-Bults and Chidgey (1988); Ritter-Zahony (1910); Southern (1914c) |
|                        | Krohnittidae | 1           | O'Brien (1976); O'Brien (1977); Pierrot-Bults and Chidgey (1988); Ritter-Zahony (1910)   |
| Phragmophora           | Eukrohniidae | 2           | Pierrot-Bults (1988); Ritter-Zahony (1910); Pierrot-Bults and Chidgey (1988)   |
|                        | Spadellidae  | 1           | Farran <i>et al.</i> (1915); Fives (1971); Ritter-Zahony (1910); Southern (1914c)  |
| <b>Total species =</b> |              | <b>15</b>   |  |

## Phylum Hemichordata

Smith, K.G.

Hemichordates, or acorn worms, are marine benthic worm-like animals that range in size from a few millimetres to over a metre (Ramel, 2008b). This small phylum has an estimated 100 species worldwide (NHM, 2007). There are two classes, Pterobranchia and Enteropneusta, but records for only one class, Enteropneusta, have been identified for the Republic of Ireland; however, Knight-Jones and Ryland (1990a) record a species of Pterobranchia from Northern Ireland.

References for three species of hemichordates in the Republic of Ireland's marine waters have been identified. One reference (Brambell and Cole, 1939) just states "Segment of large *Balanoglossus* obtained from Galway coast in 1900". The higher taxonomy follows Howson (1997b).

### Class Enteropneusta

Enteropneusta are found in deep and shallow waters in burrows in the sediment (Ramel, 2008).

**Table 92. Number of species in the Class Enteropneusta known to occur in Ireland.**

| Family                 | No. Species | References                                    |
|------------------------|-------------|---|
| Harrimanidae           | 1           | Knight-Jones and Ryland (1990a)               |
| Ptychoderidae          | 2           | Brambell and Cole (1939); Burden-Jones (1953) |
| <b>Total species =</b> | <b>3</b>    |   |

## Phylum Chordata

### Subphylum Urochordata

Smith, K.G.

Urochordates are related to the vertebrates. This relationship is more apparent in the notochord (primitive spinal chord) and the central nervous system of the larvae rather than any adult character (Millar, 1970). The body is enclosed by a ‘tunic’, which is secreted by the soft body wall called a mantle (Knight-Jones and Ryland, 1990a). The group is divided into the pelagic tunicates (Classes Appendicularia and Thaliacea) and the sessile ascidians (Class Ascidiacea). Most species are filter feeders, though a very few are predatory on small invertebrates. There is an estimated 3,000 species of tunicates worldwide (NHM, 2007). The higher taxonomy used follows Connor and Picton (1997).

Records for 72 species of urochordates have been found for the Republic of Ireland’s marine waters (EEZ). Purcell (1996) gave a figure of 105 species, though this referred to species known to occur in the British Isles without specific reference to Ireland.

#### Class Ascidiacea

Ascidians are sessile tunicates in the adult phase, but have mobile ‘tadpole’ like larvae. The adults are fixed to firm substrates and some species are solitary with individuals reaching several centimetres in length, whereas others are colonial (Millar, 1970). They are all marine, and can be found in a wide variety of habitats including rocky shores and the muddy sea bed.

References for 52 ascidians in the Republic of Ireland could be found (Table 93).

**Table 93. Number of species in the Class Ascidiacea known to occur in Ireland.**

| Order      | Family       | No. species | References   |
|------------|--------------|-------------|--|
| Enterogona | Clavelinidae | 3           | Farran (1911); Farran <i>et al.</i> (1915); Keegan <i>et al.</i> (1987); Knight-Jones and Ryland (1990b); Konnecker and Keegan (1983)  |
|            | Polyclinidae | 10          | Buchanan-Wollaston (1907); Connor (1989); Davidson (2004); Farran (1911); Farran <i>et al.</i> (1915); Goodbody (1951); Keegan <i>et al.</i> (1987); Knight-Jones and Ryland (1990); Konnecker and Keegan (1983); Millar (1970); Norton (1971)   |
|            | Didemnidae   | 7           | Davidson (2004); Dinneen <i>et al.</i> (1986); Farran <i>et al.</i> (1915); Goodbody (1950); Hansson (1998b); Knight-Jones and Ryland (1990); Millar (1970); Ryland and Nelson-Smith (1975)  |
|            | Cionidae     | 1           | Goodbody (1950); Konnecker and Keegan (1983)   |
|            | Diazonidae   | 1           | Dinneen (1986); Knight-Jones and Ryland (1990); Konnecker and Keegan (1983)  |
|            | Perophoridae | 1           | Goodbody (1950)  |
|            | Corellidae   | 1           | Dinneen (1986); Farran (1911); Konnecker and Keegan (1983)   |
|            | Asciidiidae  | 7           | Davidson (2004); Farran (1911); Farran <i>et al.</i> (1915); Goodbody (1950); Keegan <i>et al.</i> (1987); Knight-Jones and Ryland (1990); Konnecker and Keegan (1983); Norton (1971); Ryland and Nelson-Smith (1975); Shin <i>et al.</i> (1982) |
| Pleurogona | Styelidae    | 11          | Berrill (1950); Connor and Picton (1997); Dinneen (1986); Farran (1911); Farran <i>et al.</i> (1915); Goodbody (1950); Keegan <i>et al.</i> (1987); Konnecker and Keegan   |

| Order                  | Family     | No. species | References   |
|------------------------|------------|-------------|--|
|                        | Pyuridae   | 4           | (1983); Minchin and Duggan (1988); Norton (1971); Ryland and Nelson-Smith (1975); Dinneen (1986); Farran (1911); Farran <i>et al.</i> (1915); Goodbody (1950); Keegan <i>et al.</i> (1987); Konnecker and Keegan (1983); Millar (1970) |
|                        | Molgulidae | 6           | Farran (1911); Farran <i>et al.</i> (1915); Goodbody (1950); Keegan (1974a); Keegan <i>et al.</i> (1987); Knight-Jones and Ryland (1990); Konnecker and Keegan (1983); Millar (1970)   |
| <b>Total species =</b> |            | <b>52</b>   |  |

### Class Appendicularia

Appendicularians, are free swimming tunicates that permanently possess a tail and notochord, resembling the larvae of the ascidians (Fraser, 1981). References for nine species of Appendicularia in the Republic of Ireland have been found (Table 94).

**Table 94. Number of species in the Class Appendicularia known to occur in Ireland.**

| Order                  | Family         | No. species | References                                 |
|------------------------|----------------|-------------|--|
| Copelata               | Oikopleuridae  | 5           | Hansson (1998b); Ryan <i>et al.</i> (1986) |
|                        | Fritillariidae | 4           | Hansson (1998b); Ryan <i>et al.</i> (1986) |
| <b>Total species =</b> |                | <b>9</b>    |  |

### Class Thaliacea

Thaliacea are free swimming urochordates, which have complicated life histories with alternation of generations (sexual and asexual). The class is divided into three orders, all of which are represented in Irish waters. The Pyrosomida are colonial animals and the colonies move through the sea and can become quite large, up to several metres long (Ramel, 2008a). Salpida (the salps) have different forms depending on the generation. The sexually reproducing generation forms colonial chains of individuals, whereas individuals from the subsequent asexually reproducing generation are solitary (solitary individuals). The Doliolida are similar to, but smaller than, the Salpida, averaging 1 cm in length, compared to the salps that can reach up to 19 cm (Ramel, 2008a).

Reference for 11 species of Thaliacea in the Republic of Ireland been found (Table 95).

**Table 95. Number of species in the Class Thaliacea known to occur in Ireland.**

| Order                  | Family      | No. species | References   |
|------------------------|-------------|-------------|--|
| Doliolida              | Doliolidae  | 3           | Berrill (1950); Fraser (1981)  |
| Salpida                | Salpidae    | 7           | Bathmann (1988); Berrill (1950); Farran (1911); Fraser (1955); Fraser (1981) |
| Pyrosomida             | Pyrosomidae | 1           | Berrill (1950)   |
| <b>Total species =</b> |             | <b>11</b>   |  |

### **Subphylum Cephalochordata**

Smith, K. G.

The Cephalochordata, commonly known as lancelets, are an extremely small sub-phylum with an estimated 23 species worldwide (NHM, 2007). They are eel-like, growing to around 5 to 10 centimetres long and are found in sandy sediments in the marine environment (Ramel, 2008b). They possess a notochord (primitive spinal chord), and are often used in the study of the evolution of the vertebrates.

Only one species is known from European shores, *Branchiostoma lanceolatum* (Pallas, 1774) from the Family Branchiostomidae and Class Leptocardii (Ramel, 2008b). Only one reference could be found (Keegan, 1974a) recording its presence in the Republic of Ireland's waters.

## Subphylum Vertebrata

### Class Myxini

Smith, K. G.

Myxini, known as hagfish, are jawless, eel-shaped fish, of which there are about 20 species worldwide (Philippe, 1997). They are the only group within the subphylum Vertebrata that have a notochord and not a true backbone. They are found in cold waters on muddy sediments, where they eat dead and dying fish by boring into their bodies (Fernholm, 1998 in Froese and Pauly, 2008). They can also excrete large amounts of slime through their skin as a form of defence. The taxonomy follows Froese and Pauly (2008). The Myxini are grouped with the Cephalaspidomorphi (lampreys) under the superclass Agnatha.

References for two species of hagfish have been found for Irish waters (Table 96), *Myxine glutinosa* and *M. ios* both from the family Myxinidae.

**Table 96. Number of species in the Class Myxini known to occur in Ireland.**

| Order                  | Family    | No. species | References   |
|------------------------|-----------|-------------|--|
| Myxiniiformes          | Myxinidae | 2           | Fernholm (1990) in Froese and Pauly (2008); Muus and Dahlström (1978) in Froese and Pauly (2008) |
| <b>Total species =</b> |           | <b>2</b>    |  |

### Class Cephalaspidomorphi

Smith, K. G.

The Class Cephalaspidomorphi, jawless fish, contains the lampreys (Petromyzontiformes). They are eel like in shape but possess an oral disc rather than jaws, which they use to attach themselves to prey. Some are parasitic, some predatory and some do not feed at all as an adult (Kottelat and Freyhof, 2007). Lampreys are either anadromous (migrate from sea to spawn in freshwater) or landlocked (spend their whole life in freshwater). The taxonomy follows Froese and Pauly (2008).

Three species have been recorded from the Republic of Ireland, two anadromous species (*Petromyzon marinus* is parasitic and *Lamprreta fluviatilis* is predatory) and one freshwater resident (*Lamprreta planeri*) which is non-predatory/non-parasitic (Table 97).

**Table 97. Number of species in the Class Cephalaspidomorphi known to occur in Ireland.**

| Order                  | Family          | No. species | References   |
|------------------------|-----------------|-------------|--|
| Petromyzontiformes     | Petromyzontidae | 3           | Kelly and King (2001); Kottelat and Freyhof (2007) |
| <b>Total species =</b> |                 | <b>3</b>    |  |

### Class Elasmobranchii

Smith, K. G.

Elasmobranchii is often included, along with Holocephali, as a subclass within a class called Chondrichthyes. However, here we follow Froese and Pauly (2008) and treat both as separate classes and do not use the name Chondrichthyes. The elasmobranchs are jawed fish with skeletons made of cartilage (not bone), have five or six gill slits on either side of the head, do not possess a swim bladder and are mostly oviparous (embryo develops inside an egg in the mother) but can be oviparous (lay

eggs) and very rarely viviparous (birth to live young). The elasmobranchs include the sharks and rays, of which there are between 954 and 1,125 species worldwide (Fowler *et al.*, 2005); most are marine but some are found in freshwater. They are predatory, eating a wide variety of animals from marine mammals to crustaceans, and two species filter zooplankton (Fowler *et al.*, 2005).

Reference for 55 species of elasmobranchs in Republic of Ireland waters have been identified (Table 98). This includes representatives of the six-gill sharks (Hexanchiformes), mackerel sharks (Lamniformes), ground sharks (Carcharhiniformes), dogfish sharks (Squaliformes), angel sharks (Squatiniiformes), electric rays (Torpediniiformes) and the skates (Rajiformes).

**Table 98. Number of species in the Class Elasmobranchii known to occur in Ireland.**

| Order             | Family                 | No. species | References  |
|-------------------|------------------------|-------------|---|
| Hexanchiformes    | Hexanchidae            | 1           | Henderson <i>et al.</i> (2003); Quigley and Flannery (1993);  |
|                   | Chlamydoselachidae     | 1           | Compagno (1984) in Froese and Pauly (2008)  |
| Lamniformes       | Lamnidae               | 2           | Henderson <i>et al.</i> (1999); Henderson <i>et al.</i> (2003)  |
|                   | Cetorhinidae           | 1           | Wall <i>et al.</i> (2005)   |
|                   | Alopiidae              | 1           | O'Riordan (1984b)   |
| Carcharhiniformes | Scyliorhinidae         | 6           | Compagno (1984) in Froese and Pauly (2008); Henderson and Dunne (1999b); Henderson and Dunne (2001); Henderson <i>et al.</i> (2003); Iglésias <i>et al.</i> (2004) in Froese and Pauly (2008); Minchin (1987b); Minchin and Costello (1996)                               |
|                   | Triakidae              | 3           | Henderson <i>et al.</i> (2003); Irish Marine Institute data; Quigley and Flannery (1994p)   |
|                   | Carcharhinidae         | 1           | Henderson <i>et al.</i> (2003)  |
|                   | Sphyrnidae             | 1           | Compagno (1984) in Froese and Pauly (2008)  |
| Squaliformes      | Dalatiidae             | 1           | Henderson <i>et al.</i> (2003)  |
|                   | Etmopteridae           | 3           | Compagno (1984) in Froese and Pauly (2008); O'Riordan (1984a)   |
|                   | Somniosidae            | 5           | Compagno (1984) in Froese and Pauly (2008); O'Riordan (1984a)   |
|                   | Oxynotidae             | 2           | Compagno (1984) in Froese and Pauly (2008); Quigley and Flannery (1993); Quigley and Flannery (1994n); Quigley and Flannery (1996c)   |
|                   | Centrophoridae         | 2           | Irish Marine Institute data; O'Riordan (1984a)  |
|                   | Squalidae              | 1           | Henderson <i>et al.</i> (2002); Henderson <i>et al.</i> (2003)  |
|                   | Echinorhinidae         | 1           | Compagno (1984) in Froese and Pauly (2008)  |
| Squatiniiformes   | Squatinae              | 1           | Minchin (1987)  |
| Torpediniiformes  | Torpedinidae           | 2           | Muus and Dahlström (1978) in Froese and Pauly (2008); Went (1957) in Froese and Pauly (2008)  |
| Rajiformes        | Rajidae                | 17          | Bourne, G. (1890); Cotton (2002); Irish Marine Institute data; Minchin (1987); Minchin and Costello (1996); Quigley and Flannery (1993); Quigley and Flannery (1994d); Stehmann (1990) in Froese and Pauly (2008); Stehmann and Bürkel (1984b) in Froese and Pauly (2008) |
|                   | Dasyatidae             | 1           | Irish Marine Institute data   |
|                   | Myliobatidae           | 2           | McEachran and Capapé (1984) in Froese and Pauly (2008); Wheeler (1992) in Froese and Pauly (2008)   |
|                   | <b>Total species =</b> | <b>55</b>   |   |

### Class Holocephali

Smith, K. G.

The only extant group in the Class Holocephali are the Chimaeriformes (chimaeras or ratfish). They are jawed, cartilaginous fishes and are closely related to sharks and rays, but have only one gill opening on either side of the head. They are primarily deep water species that feed on the bottom upon invertebrates and fishes, and there are no freshwater species (Compagno *et al.* 2008). The taxonomy follows Froese and Pauly (2008).

References for five species of chimaeras have been identified for the Republic of Ireland (Table 99).

**Table 99. Number of species in the Class Holocephali known to occur in Ireland.**

| Order          | Family           | No. species | References  |
|----------------|------------------|-------------|---|
| Chimaeriformes | Chimaeridae      | 3           | Quigley and Flannery (1993); Quigley and Flannery (1994k); Stehmann and Bürkel (1984a) in Froese and Pauly (2008) |
|                | Rhinochimaeridae | 2           | Stehmann and Bürkel (1984a) in Froese and Pauly (2008)  |
| Total          |                  | 5           |   |

### Class Actinopterygii

Smith, K. G.

Actinopterygii, the ray finned fishes, are often considered to be a sub-class, along with Sarcopterygii (lobe finned fishes), in the Class Osteichthyes (bony fish). However, the higher taxonomy in this section follows Froese and Pauly (2008) so Actinopterygii and Sarcopterygii (no Irish species) are treated as separate classes. At the species level, Kottelat and Freyhof (2007) were followed for freshwater species and Froese and Pauly (2008) for marine species.

Actinopterygii, with nearly 24,000 species, account for almost half of all described vertebrates (based on 52,500 species of vertebrates Groombridge and Jenkins (2002)). The group possess 'ray fins' which are webs of skin supported by bony spines, a swim bladder which maintains buoyancy, and often scales which are present in some species and absent in others. They can be found in a huge variety of habitats in the aquatic environment from desert springs, ephemeral pools and subterranean caves to the polar seas and the deep ocean (Jonna, 2004). Some species require both marine and freshwater environments to complete their lifecycles. These are migratory species and are either anadromous (feed and grow at sea and migrate up rivers to breed) or catadromous (feed and grow in freshwater and migrate to sea for breeding). This class not is not only economically very important but also provides food for millions of people around the world.

The vast majority of the Actinopterygii recorded from the Republic of Ireland and its EEZ are marine species, however there are 33 freshwater species in the Republic of Ireland, and 11 of these are thought to be introduced. Eight species (though often recognised as sub-species) are endemic to the island of Ireland (Kottelat and Freyhof, 2007) (Table 100), making them Ireland's only endemic vertebrate species. The recognition as species of many of the fishes listed in Table 100 is not universally accepted and has been widely debated (see Adams and Maitland, 2007; Cullen *et al.*, 2007; Ferguson, 2004; Igoe and Hammer, 2004; Kottelat and Freyhof, 2007; Rosell *et al.*, 2004). Kottelat and Freyhof (2007), which is followed in this report, and Eschmeyer (2008) treat them all as valid species. All except one species are valid according Froese and Pauly (2008) (the exception is *Alosa killarnensis* which is listed as *Alosa*

*fallax killarnensis*). Whether these taxa are separate species, sub-species or unique sub-populations their threatened status is not in doubt (see Doherty *et al.*, 2004; Ferguson, 2004; Fitzimmons and Igoe, 2004; Igoe, 2001; Igoe, 2004; Igoe *et al.* 2003; IUCN, 2008; Kottelat and Freyhof 2007; Maitland 1996; Maitland, 2004; Maitland *et al.*, 2007). In addition some of the non-endemics species, particularly the migratory species such as the European Eel (*Anguilla anguilla*) and Atlantic salmon (*Salmo salar*) are also threatened (see Dekker, 2008; IUCN, 2008; Mathers *et al.* 2002).

**Table 100. Freshwater fish species endemic to Ireland**

| Family     | Species (alternate sub-species name)   | Common name              | Distribution                             |
|------------|--|--------------------------|--|
| Clupeidae  | <i>Alosa killarnensis</i> ( <i>Alosa fallax killarnensis</i> )                 | Goureen / Killarney Shad | Republic of Ireland                      |
| Salmonidae | <i>Coregonus pollan</i> ( <i>Coregonus autumnalis pollan</i> )                 | Pollan                   | Republic of Ireland and Northern Ireland |
| Salmonidae | <i>Salmo nigripinnis</i> ( <i>Salmo trutta nigripinnis</i> )                   | Sonaghen                 | Republic of Ireland and Northern Ireland |
| Salmonidae | <i>Salmo stomachicus</i> (incl. in <i>Salmo trutta</i> )                       | Gillaroo                 | Republic of Ireland and Northern Ireland |
| Salmonidae | <i>Salvelinus colii</i> (incl. in <i>Salvelinus alpinus</i> spp. complex)      | Cole's charr             | Republic of Ireland                      |
| Salmonidae | <i>Salvelinus fimbriatus</i> (incl. in <i>Salvelinus alpinus</i> spp. complex) | Coomasaharn charr        | Republic of Ireland                      |
| Salmonidae | <i>Salvelinus grayi</i> (incl. in <i>Salvelinus alpinus</i> spp. complex)      | Melvin charr             | Republic of Ireland and Northern Ireland |
| Salmonidae | <i>Salvelinus obtusus</i> (incl. in <i>Salvelinus alpinus</i> spp. complex)    | Blunt-snouted charr      | Republic of Ireland                      |

References for 363 species of Actinopterygii in the Republic of Ireland's marine and inland waters have been identified (Table 101). As fish are highly mobile this includes a number 'vagrant' species that are not commonly found in the area. The orders that make up the majority of the fish fauna are the Perciformes (perch-like fish), Gadiformes (cod and hakes), Osmeriformes (smelts) and the Scorpaeniformes (sculpins and scorpion fish).

**Table 101. Number of species in the Class Actinopterygii known to occur in Ireland.**

| Order               | Family           | No. species | References  |
|---------------------|------------------|-------------|---|
| Acipenseriformes    | Acipenseridae    | 1           | O'Riordan (1984b)   |
| Notacanthiformes    | Halosauridae     | 2           | Haedrich and Merrett (1988) in Froese and Pauly (2008)  |
|                     | Notacanthidae    | 4           | Haedrich and Merrett (1988) in Froese and Pauly (2008); O'Riordan (1984a); Quigley and Flannery (1993); Sulak (1986) in Froese and Pauly (2008) |
| Anguilliformes      | Anguillidae      | 1           | Kottelat and Freyhof (2007); Minchin (1987c); Minchin (1995); Minchin and Costello (1996)   |
|                     | Muraenidae       | 1           | Quigley and Flannery (2004e)  |
|                     | Synphobranchidae | 5           | Haedrich and Merrett (1988) in Froese and Pauly (2008); Irish Marine Institute data   |
|                     | Congridae        | 1           | Minchin (1995); Minchin and Costello (1996)   |
|                     | Nemichthyidae    | 2           | Irish Marine Institute data; O'Riordan (1984a)  |
|                     | Nettastomatidae  | 1           | Haedrich and Merrett (1988) in Froese and Pauly (2008)  |
| Saccopharyngiformes | Saccopharyngidae | 1           | Bertelsen and Nielsen (1986) in Froese and Pauly (2008)   |

| Order          | Family           | No. species | References  |
|----------------|------------------|-------------|---|
|                | Eurypharyngidae  | 1           | Nielsen and Bertelsen (1986) in Froese and Pauly (2008)   |
| Clupeiformes   | Clupeidae        | 6           | Kottelat and Freyhof (2007); Minchin (1987c); Minchin and Costello (1996); O’Riordan (1982a); Quigley and Flannery (1995d); Quigley <i>et al.</i> (2004b)   |
|                | Engraulididae    | 1           | Quigley and Flannery (1997c)  |
| Cypriniformes  | Cyprinidae       | 8           | Maitland (1996); Kelly <i>et al.</i> (2007); Kottelat and Freyhof (2007)  |
|                | Balitoridae      | 1           | Kottelat and Freyhof (2007)   |
| Esociformes    | Esocidae         | 1           | Kottelat and Freyhof (2007)   |
| Osmeriformes   | Argentinidae     | 2           | Irish Marine Institute data; Minchin and Molly (1981); Quigley and Flannery (1993)  |
|                | Microstomatidae  | 3           | Cohen (1984b) in Froese and Pauly (2008)  |
|                | Bathylagidae     | 1           | Cohen (1984a) in Froese and Pauly (2008)  |
|                | Opisthoproctidae | 1           | Cohen (1984c) in Froese and Pauly (2008)  |
|                | Alepocephalidae  | 17          | Haedrich and Merrett (1988) in Froese and Pauly (2008); Markle and Quéro (1984a) in Froese and Pauly (2008)   |
|                | Platytroutidae   | 5           | Quéro <i>et al.</i> (1984) in Froese and Pauly (2008)   |
|                | Leptoichthyidae  | 1           | Markle and Quéro (1984b) in Froese and Pauly (2008)   |
|                | Osmeridae        | 1           | Quigley <i>et al.</i> (2004b); Kottelat and Freyhof (2007)  |
| Salmoniformes  | Salmonidae       | 11          | Hanvey and Anketell (2001); Kelly <i>et al.</i> (2007); Kottelat and Freyhof (2007); Maitland (1996); Minchin (1987); Minchin and Costello (1996); McCarthy <i>et al.</i> (2004)  |
| Stomiiformes   | Gonostomatidae   | 4           | Badcock (1984a) in Froese and Pauly (2008)  |
|                | Sternoptychidae  | 5           | Armstrong and Dickey-Collas (1999); Badcock (1984a) in Froese and Pauly (2008); Badcock (1984b) in Froese and Pauly (2008)  |
|                | Phosichthyidae   | 2           | Haedrich and Merrett (1988) in Froese and Pauly (2008); Parin and Borodulina (1990) in Froese and Pauly (2008)  |
|                | Stomiidae        | 5           | Gibbs (1984a) in Froese and Pauly (2008); Gibbs (1984b) in Froese and Pauly (2008); Gibbs (1984c) in Froese and Pauly (2008)  |
| Aulopiformes   | Ipnopidae        | 2           | Haedrich and Merrett (1988) in Froese and Pauly (2008)  |
|                | Notosudidae      | 1           | Kreff (1984) in Froese and Pauly (2008)   |
|                | Bathysauridae    | 2           | Haedrich and Merrett (1988) in Froese and Pauly (2008); Sulak (1984) in Froese and Pauly (2008)   |
|                | Paralepididae    | 4           | Post (1984) in Froese and Pauly (2008)  |
|                | Alepisauridae    | 1           | Quigley and Flannery (1997b); Quigley and Flannery (2005e)  |
| Myctophiformes | Myctophidae      | 11          | Acevedo and Fives (2001); Hulley (1984) in Froese and Pauly (2008)  |
| Lampridiformes | Lamprididae      | 1           | Quigley and Flannery (1993); Quigley <i>et al.</i> (1997a)  |
|                | Trachipteridae   | 1           | Quigley and Flannery (2005f)  |
| Gadiformes     | Macrouridae      | 17          | Cohen <i>et al.</i> (1990) in Froese and Pauly (2008); Edwards and Davis (1997); Geistdoerfer (1986) in Froese and Pauly (2008); Haedrich and Merrett (1988) in Froese and Pauly (2008); Irish Marine Institute data; O’Riordan (1984a) |

| Order                | Family          | No. species | References   |
|----------------------|-----------------|-------------|--|
|                      | Moridae         | 5           | Cohen <i>et al.</i> (1990) in Froese and Pauly (2008); Eschmeyer (1997) in Froese and Pauly (2008); Irish Marine Institute data  |
|                      | Gadidae         | 11          | Ehrenbaum (1936) in Froese and Pauly (2008); Irish Marine Institute data; Minchin (1987c); Minchin (1995); Minchin and Costello (1996); Picton and Costello (1998); Quigley <i>et al.</i> (1997d); Quigley and O'Shea (2000d); Quigley and Flannery (2004c)      |
|                      | Lotidae         | 11          | Cohen <i>et al.</i> (1990) in Froese and Pauly (2008); Haedrich and Merrett (1988) in Froese and Pauly (2008); Minchin (1987); Minchin (1995); Picton and Costello (1998); Quigley and Flannery (1993); Quigley and Flannery (1994b); Quigley and O'Shea (2000b) |
|                      | Phycidae        | 1           | O'Riordan (1984b)  |
|                      | Merlucciidae    | 2           | Maurin (1990) in Froese and Pauly (2008); Quigley and Flannery (1994q)   |
| Ophidiiformes        | Ophidiidae      | 2           | Haedrich and Merrett (1988) in Froese and Pauly (2008); Nielsen (1986b) in Froese and Pauly (2008)   |
|                      | Carapidae       | 1           | Irish Marine Institute data  |
|                      | Bythitidae      | 3           | Haedrich and Merrett (1988) in Froese and Pauly (2008); Nielsen (1986a) in Froese and Pauly (2008)   |
|                      | Aphyonidae      | 1           | Haedrich and Merrett (1988) in Froese and Pauly (2008)   |
| Lophiiformes         | Lophiidae       | 2           | Quigley and Flannery (1994l); Quigley and Flannery (1996b); Minchin and Costello (1996); Quigley and Flannery (2005a); Quigley and Flannery (2005b)  |
|                      | Chaunacidae     | 2           | Quigley and Flannery (1993); Quigley <i>et al.</i> (1996)  |
|                      | Himantolophidae | 1           | Quigley and Flannery (1993); Quigley and Flannery (1997d)  |
|                      | Oneirodidae     | 3           | Bertelsen (1986) in Froese and Pauly (2008); Bertelsen (1990) in Froese and Pauly (2008)   |
|                      | Ceratiidae      | 2           | Quigley and Flannery (1993); Quigley and Flannery (1995f); Quigley <i>et al.</i> (2005a)   |
| Gobiesociformes      | Gobiesocidae    | 4           | Briggs (1986) in Froese and Pauly (2008); Minchin (1995); Picton and Costello (1998)   |
| Atheriniformes       | Atherinidae     | 2           | Minchin (1987c); Minchin and Costello (1996); O'Riordan (1982);  |
| Beloniformes         | Belonidae       | 2           | Edwards and Davis (1997); Minchin (1987c); Minchin and Costello (1996); Quigley and Flannery (1993);   |
|                      | Scomberesocidae | 1           | Quigley and Flannery (1993)  |
| Stephanoberyciformes | Melamphaidae    | 2           | Maul (1986) in Froese and Pauly (2008)   |
| Beryciformes         | Trachichthyidae | 2           | Quigley and Flannery (1993); Quigley <i>et al.</i> (2005a)   |
|                      | Diretmidae      | 1           | Post (1986b) in Froese and Pauly (2008)  |
|                      | Anoplogastridae | 1           | Post (1986a) in Froese and Pauly (2008)  |
|                      | Berycidae       | 2           | Quigley and Flannery (1993); Quigley and Flannery (1994f); Quigley <i>et al.</i> (1997c)   |
| Zeiformes            | Parazenidae     | 1           | Quigley and Flannery (1995a)   |
|                      | Zeidae          | 2           | Minchin (1987c); Quigley and Flannery (1995c)  |
|                      | Oreosomatidae   | 1           | Karrer (1986) in Froese and Pauly (2008)   |

| Order             | Family           | No. species | References   |
|-------------------|------------------|-------------|--|
| Gasterosteiformes | Gasterosteidae   | 3           | Kottelat and Freyhof (2007); O’Riordan (1982a);<br>Picton and Costello (1998); Minchin (1987c);<br>Minchin and Costello (1996)   |
| Syngnathiformes   | Macroramphosidae | 1           | Quigley and Flannery (1997e); Quigley and<br>Flannery (2004f)  |
|                   | Syngnathidae     | 8           | British Seahorse Survey (2008); Lyons and Dunne<br>(2005); Irish Marine Institute data; Minchin<br>(1987c); Minchin and Costello (1996); Picton and<br>Costello (1998)   |
| Scorpaeniformes   | Sebastidae       | 2           | Hureau and Litvinenko (1986) in Froese and<br>Pauly (2008); Irish Marine Institute data  |
|                   | Scorpaenidae     | 1           | O’Riordan (1982b); Quigley and Flannery (1993)   |
|                   | Dactylopteridae  | 1           | Quigley <i>et al.</i> (2004a)  |
|                   | Triglidae        | 6           | Hureau (1986) in Froese and Pauly (2008); Irish<br>Marine Institute data; Picton and Costello (1998);<br>Minchin (1987c); Minchin and Costello (1996)  |
|                   | Cottidae         | 5           | Fedorov (1986) in Froese and Pauly (2008); Irish<br>Marine Institute data; Minchin (1987c); Minchin<br>(1995); Minchin and Costello (1996); Picton and<br>Costello (1998)  |
|                   | Psychrolutidae   | 1           | Haedrich and Merrett (1988) in Froese and Pauly<br>(2008)  |
|                   | Agonidae         | 1           | Picton and Costello (1998); Minchin and Costello<br>(1996)   |
|                   | Cyclopteridae    | 1           | Minchin (1987c); Minchin and Costello (1996);<br>Picton and Costello (1998);   |
|                   | Liparidae        | 8           | Andriashev (1997) in Froese and Pauly (2008);<br>Andriashev and Chernova (1997) in Froese and<br>Pauly (2008); Haedrich and Merrett (1988) in<br>Froese and Pauly (2008); Minchin (1987c); Picton<br>and Costello (1998)   |
| Perciformes       | Moronidae        | 1           | O’Riordan (1982)   |
|                   | Polyprionidae    | 1           | O’Riordan (1984b); Quigley and Flannery (1993)   |
|                   | Percidae         | 1           | Kottelat and Freyhof (2007)  |
|                   | Epigonidae       | 1           | Irish Marine Institute data  |
|                   | Pomatomidae      | 1           | Edwards and Davis (1997); Quigley and Flannery<br>(1993)   |
|                   | Echeneididae     | 1           | O’Riordan (1984b); Quigley and Flannery (1993)   |
|                   | Carangidae       | 4           | Bauchot (1987) in Froese and Pauly (2008);<br>Minchin (1987c); Quigley and Flannery (1993);<br>Quigley and Flannery (2005d); Quigley and<br>Mullins (2004); Quigley <i>et al.</i> (1997b); Smith-<br>Vaniz (1986) in Froese and Pauly (2008)                       |
|                   | Bramidae         | 2           | Minchin and Molly (1981); Quigley and Flannery<br>(1993); Wheeler (1992) in Froese and Pauly (2008)  |
|                   | Sparidae         | 7           | Bauchot (1987) in Froese and Pauly (2008);<br>Bauchot and Hureau (1986) in Froese and Pauly<br>(2008); Irish Marine Institute data; Quigley and<br>Flannery (1993); Quigley and Flannery (1995b);<br>Quigley and Flannery (1997a); Quigley and<br>Flannery (2005c) |
|                   | Mullidae         | 2           | Irish Marine Institute data; Minchin and Molly<br>(1981); Minchin (1987c); Quigley and Flannery<br>(1993)  |

| Order        | Family         | No. species | References  |
|--------------|----------------|-------------|---|
|              | Cepolidae      | 1           | Bell (2002); Cotton <i>et al.</i> (2003); Quigley and Flannery (2005h)  |
|              | Labridae       | 7           | Irish Marine Institute data; Minchin (1987c); Minchin (1995); Minchin and Costello (1996); Picton and Costello (1998); Wheeler (1992) in Froese and Pauly (2008)  |
|              | Zoarcidae      | 6           | Anderson and Almeida (1990) in Froese and Pauly (2008); Andriashev (1986) in Froese and Pauly (2008); Haedrich and Merrett (1988) in Froese and Pauly (2008); Irish Marine Institute data   |
|              | Stichaeidae    | 1           | Picton and Costello (1998); Minchin and Costello (1996)   |
|              | Pholididae     | 1           | Minchin (1987c); Minchin (1995); Minchin and Costello (1996)  |
|              | Anarhichadidae | 2           | Quigley and Flannery (1993); Quigley and Flannery (1995e); Quigley and Flannery (1998a)   |
|              | Ammodytidae    | 5           | Cotton (2004); Minchin (1987c); O'Connell and Fives (1996); Quigley and Flannery (1994h)  |
|              | Trachinidae    | 2           | Quigley and Flannery (1994j); Tortonese (1986b) in Froese and Pauly (2008)  |
|              | Uranoscopidae  | 1           | Halstead <i>et al.</i> (1990) in Froese and Pauly (2008)  |
|              | Blenniidae     | 4           | Minchin (1987c); Minchin (1995); Minchin and Costello (1996); Picton and Costello (1998)  |
|              | Callionymidae  | 3           | Irish Marine Institute data; Minchin (1987c); Minchin and Costello (1996); Picton and Costello (1998)   |
|              | Gobiidae       | 15          | Miller (1986) in Froese and Pauly (2008); Minchin (1987c); Minchin (1995); Minchin and Costello (1996); O'Riordan (1982a); Picton and Costello (1998); Wilkins (1998)   |
|              | Luvaridae      | 1           | Quigley and Flannery (1993)   |
|              | Gempylidae     | 3           | Nakamura and Parin (1993) in Froese and Pauly (2008); Quigley and Flannery (2005g)  |
|              | Trichiuridae   | 3           | Irish Marine Institute data; Nakamura and Parin (1993) in Froese and Pauly (2008); Quigley and Flannery (1996a)   |
|              | Xiphiidae      | 1           | Quigley and Flannery (1993); Quigley <i>et al.</i> (1994a); Quigley and O'Shea (2000a)  |
|              | Istiophoridae  | 1           | Quigley and Flannery (1993)   |
|              | Scombridae     | 8           | Collette and Nauen (1983) in Froese and Pauly (2008); Minchin and Molly (1981); Minchin (1987c); Minchin and Costello (1996); Picton and Costello (1998); Pollock (1994); Quigley and Flannery (1993); Quigley and Flannery (1994o); Quigley and Mullins (2004); Quigley <i>et al.</i> (2005) |
|              | Centrolophidae | 4           | Minchin and Molly (1981); O'Riordan (1986); Quigley and Flannery (1993); Quigley and O'Shea (2000c); Quigley and Flannery (2004a)   |
|              | Nomeidae       | 1           | Whitehead <i>et al.</i> (1986) in Froese and Pauly (2008)   |
|              | Caproidae      | 1           | Quigley and Flannery (1993); Sleeman (1994)   |
| Mugiliformes | Mugilidae      | 3           | Ben-Tuvia (1986) in Froese and Pauly (2008); Minchin (1987c); Minchin and Costello (1996); Muus and Dahlström (1978) in Froese and Pauly (2008); Richter (1995)   |

| Order                  | Family         | No. species | References   |
|------------------------|----------------|-------------|--|
| Pleuronectiformes      | Scophthalmidae | 7           | Irish Marine Institute data; Minchin (1987c); Minchin and Costello (1996); Picton and Costello (1998); Quigley and Flannery (1994c); Quigley and Flannery (1994g); Quigley and Flannery (1994p); Robson <i>et al.</i> (2000) |
|                        | Bothidae       | 3           | Edwards and Davis (1997); Irish Marine Institute data; Minchin and Molly (1981)  |
|                        | Pleuronectidae | 8           | Allen <i>et al.</i> (2004); Irish Marine Institute data; Minchin (1987c); Minchin and Costello (1996); Quigley and Flannery (1993); Quigley and Flannery (1994i); Quigley and Flannery (1998b); Quigley and Flannery (2004d) |
|                        | Soleidae       | 5           | Allen <i>et al.</i> (2005); Edwards and Davis (1997); Irish Marine Institute data; Minchin (1987c); Minchin and Molly (1981)   |
| Tetraodontiformes      | Balistidae     | 1           | O’Riordan (1984b); Minchin (1987c); Quigley and Flannery (1993); Quigley and Flannery (1994m)  |
|                        | Tetraodontidae | 1           | Quigley and Flannery (1993); Quigley and Flannery (2004b)  |
|                        | Molidae        | 2           | Quigley and Flannery (1993); Quigley and Flannery (1994c); Tortonese (1986a) in Froese and Pauly (2008)  |
| <b>Total species =</b> |                | <b>363</b>  |  |

### Class Amphibia

Ferriss, S. E.

Three species of amphibian occur in Ireland: the Common Frog *Rana temporaria*; the Natterjack Toad *Bufo calamita*; and the Smooth (or Common) Newt *Triturus vulgaris*. Whilde (1993) classified the Natterjack Toad as Endangered and the Common Frog as internationally important in the Irish Vertebrate Red Data Book.

**Table 102. Number of species in the Class Amphibia known to occur in Ireland.**

| Order                  | Family        | No. Species | References  |
|------------------------|---------------|-------------|---|
| Anura                  | Bufonidae     | 1           | Bécart <i>et al.</i> (2007); Gleed-Owen <i>et al.</i> (1999); Marnell (1999); NPWS (2008c); Whilde (1993) |
|                        | Ranidae       | 1           |   |
| Caudata                | Salamandridae | 1           | Marnell (1993; 1998); NPWS (2008c)  |
| <b>Total species =</b> |               | <b>3</b>    |   |

### Class Reptilia

Ferriss, S. E.

Ireland has only one species of native terrestrial reptile, the Viviparous Lizard *Lacerta vivipara* (Marnell, 2002) and one species of introduced terrestrial reptile, the Slow Worm *Anguis fragilis* (McGuire and Marnell, 2000; McCarthy, 1976).

Four species of marine turtle (Leatherback, Loggerhead, Kemp's Ridley and Hawksbill Turtles) have been recorded in Irish waters, and a fifth, the Green Turtle, might occur, although records are unverified (King and Berrow, in press); this latter species has been recorded in UK waters e.g. Penrose (2004). Of the marine turtles, the Leatherback occurs regularly in Irish waters and can be considered

an established part of the Irish fauna; sightings of the other species are infrequent (King and Berrow, in press).

**Table 103. Number of species in the Class Reptilia known to occur in Ireland.**

| Order                  | Family         | No. species | References   |
|------------------------|----------------|-------------|--|
| Testudines             | Dermochelyidae | 1           | Doyle (2007); Doyle <i>et al.</i> (2008); King and Berrow (in press) |
|                        | Cheloniidae    | 4-5         | King and Berrow (in press); O’Riordan <i>et al.</i> (1984)           |
| Sauria                 | Anguidae       | 1           | McCarthy (1976); McGuire and Marnell (2000); NPWS (2008b)            |
|                        | Lacertidae     | 1           | Marnell (2002)   |
| <b>Total species =</b> |                | <b>7-8</b>  |  |

### Class Aves

Inskipp, T. P.

Birds are bipedal, endothermic (warm-blooded), vertebrate animals that lay eggs. There are around 10,000 living species, making them the most diverse tetrapod vertebrates. They inhabit ecosystems across the globe, from the Arctic to the Antarctic. Modern birds are characterised by feathers, a beak with no teeth, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a lightweight but strong skeleton. All birds have forelimbs modified as wings and most can fly.

The occurrence of a total of 444 species has been established for the Republic of Ireland. Table 104 is based on Annex 5 of Ferriss *et al.* (2007) that was compiled by the author of this chapter using Hutchinson (1989) as a basis, and newly recorded species were added from *Irish Birds* up until No. 8 (2006). The taxonomy follows UNEP-WCMC (2005) rather than that used in Ireland (e.g. by the Irish Rare Birds Committee). Two new species were recorded in 2006: Cirl Bunting and Canada Warbler (Milne and McAdams, 2007). Purcell (1996) gave a figure of 403 species for the whole of Ireland but provided no reference for this figure.

**Table 104. Number of species in the Class Aves known to occur in Ireland.**

| Order             | Family            | No. species | References                   |
|-------------------|-------------------|-------------|------------------------------|
| Gaviiformes       | Gaviidae          | 4           | Ferriss <i>et al.</i> (2007) |
| Podicipediformes  | Podicipedidae     | 6           |                              |
| Procellariiformes | Diomedidae        | 1           |                              |
|                   | Procellariidae    | 8           |                              |
|                   | Hydrobatidae      | 5           |                              |
| Pelecaniformes    | Sulidae           | 1           |                              |
|                   | Phalacrocoracidae | 3           |                              |
| Ciconiiformes     | Ardeidae          | 10          |                              |
|                   | Ciconiidae        | 2           |                              |
|                   | Threskiornithidae | 2           |                              |
| Anseriformes      | Anatidae          | 46          |                              |
| Accipitriformes   | Pandionidae       | 1           |                              |
|                   | Accipitridae      | 14          |                              |
|                   | Falconidae        | 7           |                              |
| Galliformes       | Phasianidae       | 6           |                              |
| Gruiformes        | Gruidae           | 2           |                              |
|                   | Rallidae          | 9           |                              |
|                   | Otididae          | 2           |                              |

| Order            | Family           | No. species            | References   |
|------------------|------------------|------------------------|--|
| Charadriiformes  | Haematopodidae   | 1                      |  |
|                  | Recurvirostridae | 2                      |  |
|                  | Burhinidae       | 1                      |  |
|                  | Glareolidae      | 2                      |  |
|                  | Charadriidae     | 12                     |  |
|                  | Scolopacidae     | 49                     |  |
|                  | Stercorariidae   | 4                      |  |
|                  | Laridae          | 37                     |  |
|                  | Alcidae          | 7                      |  |
| Columbiformes    | Pteroclididae    | 1                      |  |
|                  | Columbidae       | 5                      |  |
| Cuculiformes     | Cuculidae        | 3                      |  |
| Strigiformes     | Tytonidae        | 1                      |  |
|                  | Strigidae        | 5                      |  |
| Caprimulgiformes | Caprimulgidae    | 2                      |  |
| Apodiformes      | Apodidae         | 6                      |  |
| Coraciiformes    | Alcedinidae      | 2                      |  |
|                  | Meropidae        | 1                      |  |
|                  | Coraciidae       | 1                      |  |
|                  | Upupidae         | 1                      |  |
| Piciformes       | Picidae          | 4                      |  |
| Passeriformes    | Alaudidae        | 4                      |  |
|                  | Hirundinidae     | 5                      |  |
|                  | Motacillidae     | 14                     |  |
|                  | Laniidae         | 6                      |  |
|                  | Bombycillidae    | 1                      |  |
|                  | Cinclidae        | 1                      |  |
|                  | Troglodytidae    | 1                      |  |
|                  | Mimidae          | 1                      |  |
|                  | Prunellidae      | 1                      |  |
|                  | Muscicapidae     | 68                     |  |
|                  | Aegithalidae     | 1                      |  |
|                  | Paridae          | 4                      |  |
|                  | Certhiidae       | 1                      |  |
|                  | Emberizidae      | 18                     | Ferriss <i>et al.</i> (2007), Milne and McAdams (2007) |
|                  | Parulidae        | 11                     | Ferriss <i>et al.</i> (2007), Milne and McAdams (2007) |
|                  | Vireonidae       | 2                      | Ferriss <i>et al.</i> (2007)                           |
|                  | Icteridae        | 2                      |  |
|                  | Fringillidae     | 14                     |  |
|                  | Ploceidae        | 2                      |  |
|                  | Sturnidae        | 2                      |  |
|                  | Oriolidae        | 1                      |  |
|                  | Corvidae         | 8                      |  |
|                  |                  | <b>Total species =</b> | <b>444</b>   |

## **Class Mammalia**

Ferriss, S. E.

Mammals are vertebrate animals that have hair or fur, glands that are modified for milk production, and larger brains than other vertebrates of equivalent size. Virtually all mammals give birth to live young. Mammals include familiar species such as rabbits and squirrels, to the more elusive bats and whales.

A total of 5,416 species of mammal were listed by Wilson and Reeder (2005) in their checklist of the mammals of the world. At present 62 species of mammal are recorded as occurring in Ireland or in Irish waters (tables 105 and 106). This list does not include domesticated animals. Taxonomic hierarchy and sequence follows Wilson and Reeder (2005).

There has been some discussion as to whether the Brown Hare *Lepus europaeus* Pallas, 1778 occurs in the Republic of Ireland. Fairley (1981) provided anecdotal evidence that the Brown Hare may occur locally in west Tyrone and east Donegal. Hayden and Harrington (2001) noted that the species appears to be patchily distributed throughout Northern Ireland but is generally considered absent from the Republic. Furthermore, Reid *et al.* (2007) stated that “No records of brown hares were confirmed during the survey, suggesting that this non-native and potentially invasive species is mostly, if not entirely, restricted to Northern Ireland.” This species has not been included in this list.

As regards the bats from the Family Vespertilionidae, two species that were not included in table 105 are of note. A previous recording of the Barbastelle *Barbastella barbastellus* was reported but it was never verified. A recording for another species, Noctule *Nyctalus noctula* was also made and confirmed by several people. However, there are no recorded roost sites or specimens in the hand for either species and neither record has been published. For these reasons, neither species is considered to be part of Ireland’s bat fauna at this stage (Kelleher, pers. comm.) and neither have been included in Table 105.

Although records for only four species of seal were obtained, it is possible that other species, e.g. Hooded Seal and Harp Seal, which occur in UK waters may also occur in Irish waters.

A number of the species included in the Irish fauna were introduced, either in historic or more recent times e.g. the Grey Squirrel, the Bank Vole, the Common/Brown Rat, the Greater White-toothed Shrew, the American Mink, feral ferrets to name but a few. Most recently, populations of Muntjac Deer have established in Wicklow (Marnell pers. comm.). A number of other species were introduced some hundreds of years ago including rabbits and the feral goat. These species are all included in table 105.

In the *Irish Red Data Book for vertebrates* (Whilde, 1993), the Ship Rat, *Rattus rattus* was considered to be Rare, and two species were considered to have an Indeterminate status: Whiskered Bat, *Myotis mystacinus* and Natterer's Bat, *Myotis nattereri*. Ten species were considered to be internationally important (Hedgehog, *Erinaceus europaeus*; Lesser Horseshoe Bat, *Rhinolophus hipposideros*; Daubenton's Bat, *Myotis daubentoni*; Leisler's Bat, *Nyctalus leisleri*; Pipistrelle Bat, *Pipistrellus pipistrellus*; Brown Long-eared Bat, *Plecotus auritus*; Irish Hare, *Lepus timidus hibernicus*; Pine Marten, *Martes martes*; Badger, *Meles meles*; Otter, *Lutra lutra*). Cetaceans were excluded from the *Irish Red Data Book for vertebrates* because there was insufficient information available on their occurrence, movements and ecology in Irish waters (Whilde, 1993).

Two taxa of particular note are the Irish hare *Lepus timidus hibernicus* and the Irish Stoat *Mustela erminea hibernica* both of which are sufficiently distinct from populations elsewhere to be considered an endemic subspecies (Hayden and Harrington, 2001).

**Table 105. Number of species in the Class Mammalia (excluding cetaceans) known to occur in Ireland.**

| Order                  | Family           | No. Species | References  |
|------------------------|------------------|-------------|---|
| Rodentia               | Sciuridae        | 2           | Fauna Europea (2004); Whilde (1993)   |
|                        | Muridae          | 5           | Claassens and O’Gorman (1965); Fauna Europea (2004); Hayden and Harrington (2001); Smal and Fairley (1984); Whilde (1993)   |
| Lagomorpha             | Leporidae        | 2           | Fauna Europea (2004); Hayden and Harrington (2001); Whilde (1993)   |
| Erinaceomorpha         | Erinaceidae      | 1           | Fauna Europea (2004); Hayden and Harrington (2001); Whilde (1993)   |
| Soricomorpha           | Soricidae        | 2           | Fauna Europea (2004); Hayden and Harrington (2001); Whilde (1993); Tosh <i>et al.</i> (2008)  |
| Chiroptera             | Rhinolophidae    | 1           | Fauna Europea (2004); Hayden and Harrington (2001); Whilde (1993)   |
|                        | Vespertilionidae | 9 +         | Fauna Europea (2004); Hayden and Harrington (2001); Kelleher (2006a); Kelleher (2006b); Kelleher (2006c); Mullen (2006); Whilde (1993)                                |
| Carnivora              | Canidae          | 1           | Fauna Europea (2008); Hayden and Harrington (2001); Mitchell-Jones <i>et al.</i> (1999); Whilde (1993)  |
|                        | Mustelidae       | 6           | Bailey and Rochford (2006); Buckley and Sleeman (2007); Fauna Europea (2004); Hayden and Harrington (2001); Whilde (1993)   |
|                        | Phocidae         | 4+          | Cotton (2007); Fauna Europea (2008); Hayden and Harrington (2001); Kiely <i>et al.</i> (2000); Lyons (2004); O’Cadhla (2003); O’Callaghan, unpub. data; Whilde (1993) |
| Artiodactyla           | Cervidae         | 4           | Fauna Europea (2004); Hayden and Harrington (2001); Marnell (pers. comm.); Whilde (1993)  |
|                        | Bovidae          | 1           |   |
| <b>Total species =</b> |                  | <b>38</b>   |   |

### Order Cetacea

This group contains the whales, dolphins and porpoises. Nearly one third of the world’s known whale, dolphin and porpoise species have been recorded in Irish waters (Wilson and Berrow, 2006). They live off the Irish coast or pass through Irish waters as part of their migration. Some species of dolphin and porpoise enter harbours and estuaries, whilst most whales usually keep well out to sea.

The Irish Whale and Dolphin Group operate a recording scheme for cetacean sightings and strandings, the results of which are available online at [www.iwdg.ie](http://www.iwdg.ie). Twenty four species are known to occur in

Ireland (Table 106). This includes a number of beaked whale species, which are rarely recorded in Europe.

**Table 106. Number of species in the Order Cetacea known to occur in Ireland.**

| <b>Family</b>          | <b>No. Species</b> | <b>References</b>                              |
|------------------------|--------------------|--|
| Phocoenidae            | 1                  | Berrow (pers. comm.); Wilson and Berrow (2006) |
| Delphinidae            | 9                  |  |
| Balaenopteridae        | 5                  |  |
| Physeteridae           | 2                  |  |
| Ziphiidae              | 5                  |  |
| Balaenidae             | 1                  |  |
| Monodontidae           | 1                  |  |
| <b>Total species =</b> | <b>24</b>          |  |

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**NOTES**