



# BULLETIN of the PORCUPINE MARINE NATURAL HISTORY SOCIETY

Spring 2015 — Number 3



# Bulletin of the

## Porcupine Marine Natural History Society

No. 3 Spring 2015

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Porcupine MNHS welcomes new members- scientists, students, divers, naturalists and lay people. We are an informal society interested in marine natural history and recording particularly in the North Atlantic and 'Porcupine Bight'. Members receive 2 Bulletins per year which include proceedings from scientific meetings, plus regular news bulletins.

Membership fees: Individual £18    Student £10

 [www.pmnhs.co.uk](http://www.pmnhs.co.uk)

 <http://www.facebook.com/groups/190053525989>

 [@PorcupineMNHS](https://twitter.com/PorcupineMNHS)







## Editorial

If I were to say “Marine Conservation Zones” what would be the first thing to enter your mind?

Many of you may know that a public consultation on the designation of MCZs in England is now live and due to end on 24th April 2015. The results are expected January 2016. The purpose of the consultation is to seek the public’s views on whether it would be appropriate to designate each of the 23 proposed Marine Conservation Zones (MCZs) in the second tranche and to add new features for conservation in 10 of the first tranche MCZs.

The evidence is there, so what is stopping the Government from designating all the proposed areas? What lessons were learned last time which will make a difference this time? As someone who has little knowledge or understanding on how the politics of this work, I find it hard to understand why not all proposed zones would be designated. Could it be that the way the science is presented just doesn’t win the hearts and minds of those who make the decisions?

If winning someone’s mind is about giving a clear understanding of the purpose of the MCZs, winning someone’s heart is about generating feelings of belief, commitment and motivation that these MCZs will make a positive difference to all stakeholders. Those who have put the hard work into the science have that vision and passion but is this passed on in a way that the message is received, understood, believed, advocated and then actioned? If the science isn’t understood then the decision makers are not going to believe that these conservation measures are important. So maybe it does come down to the science – not in the detail but in the way it is presented to those who are not scientists.

Vicki Howe

Hon. Editor



*Consultation on the second  
tranche of MCZs*

*For more information on the sites, visit  
<http://jncc.defra.gov.uk/page-4525>*



# ANNOUNCEMENTS



## Recent announcements on Marine Protected Areas (MPAs)

In January 2015 it was announced that out of the 37 proposed Marine Conservation Zones for English waters, only 23 will be consulted on in the next stage of the process. The official public consultation is open from 30th January to 24th April 2015 and can be accessed via <https://consult.defra.gov.uk/marine/tranche2mczs>. Results are expected in January 2016.

The Marine Conservation Society, as well as other environmental groups, have expressed their disappointment at the news believing it will leave the English coast 'woefully under protected'. MCS and the National Trust are urging supporters and the wider public to take part in the public consultation and voice their individual opinions. See <http://www.mcsuk.org/mpa/> or follow the QR code below for further details on the process, the environmental views and background on all of the Marine Conservation Zones:



## Marine Events in 2015

### SeaSearch Courses & Training



Seasearch is a project for volunteer sports divers who have an interest in what they're seeing underwater, want to learn more and want to help protect the marine environment around the coasts of Britain and Ireland. They offer training courses in marine identification and recording for all levels.

SeaSearch has already announced dates for several Observer courses from April-July 2015 as well as Surveyor courses and Special Interest courses. See their website at <http://www.seasearch.org.uk/training.htm> for details.

### National Trust Coast Bioblitz 2015

The National Trust will be holding 25 Bioblitzes between February and October 2015 at coastal sites in England, Wales and Northern Ireland to celebrate the 50th Anniversary of Project Neptune, which led to the National Trust's acquisition of large stretches of our coasts.





Marine courses 2015

# FSC SCOTLAND



Visit FSC Millport for a new suite of marine courses at this fantastic island location.

Courses are led by expert tutors and benefit from the unrivalled island location.

The centre benefits from a research vessel, electron microscope and extensive research library.

## 2015 marine courses at FSC Millport

|                    |   |
|--------------------|---|
| 06-09 March 2015   | Recording Invertebrates of the Strandline                     |
| 06-12 April 2015   | Marine Biological Sampling                                    |
| 22-25 May 2015     | Marine Plankton   |
| 22-25 May 2015     | Identifying Marine Species and Habitats: the Biotope Approach |
| 29 Jun-03 Jul 2015 | Marine Microbiology   |
| 03-06 July 2015    | Seaweeds  |
| 03-06 July 2015    | Bryozoan Identification                                       |
| 06-08 July 2015    | Non-Native Seaweeds   |
| 02-07 August 2015  | An 'Immersion' into Marine Biology                            |
| 09-14 August 2015  | Marine Mammal and Bird Survey Techniques                      |

For full details or to book please [request our Natural History Brochure](#) by post or email or [visit the website](#).



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or visit **[www.field-studies-council.org/scotland](http://www.field-studies-council.org/scotland)**

The National Trust website does not seem to have a page detailing these events specifically however if you search for 'bioblitz' it will come up with a list of relevant events. Alternatively, the Conchological Society has a map (previous page) showing all events with dates at <http://www.conchsoc.org/node/6341>

## Introduction to Seaweed

**Marine Biological Association,  
Plymouth**

**Sunday 17th May 0930-1700**



Suitable for those interested in seaweeds at beginner level, teachers and marine educators. The course will cover the basics of seaweed classification and identification as well as a lab session to identify collected specimens with an opportunity to press collected specimens at the end. See <http://www.eventbrite.co.uk/e/short-course-introduction-to-seaweed-tickets-14805592927> for more details.

## 12th MBA Postgraduate Conference

**Queen's University, Belfast  
18th – 22nd May 2015**



The *Marine Biological Association Postgraduate Conference* is an annual scientific gathering of postgraduate students undertaking research in marine biology and related fields. The event serves as an invaluable opportunity for early career scientists to present their research to fellow students and marine biologists in a friendly, yet rigorous, environment.

This year's conference will be held at Queen's University Belfast.

Visit <http://www.qub.ac.uk/sites/12thmba/> for further details.

## World Oceans Day: 8th June 2015



The theme for 2015-16 is **Healthy oceans, healthy planet**, focussing particularly on plastic pollution. Visit [WorldOceansDay.org](http://WorldOceansDay.org) for more information and resources. Information on events will be posted from mid-February 2015 onwards.

## Unknown Wales 2015

**A conference to celebrate Welsh wildlife**



**Cynhadledd  
Cymru Anhysbys**

**Unknown Wales  
Conference**



**Amgueddfa Cymru-National Museum Wales,  
Cardiff, Saturday 3rd October**

Escape the Rugby World Cup and come to the 5th *Unknown Wales Conference*! The Conference is an opportunity to explore Welsh wildlife, from the latest breakthroughs in scientific research to habitat management for species. The conference celebrates new discoveries and new thinking on nature in Wales, whether on land or in the sea, through a series of short talks.

Further details of the conference will be uploaded as they are available on the Welsh Wildlife Trust's website: <http://www.welshwildlife.org>

## Late Sad News

As this Bulletin was being prepared, our dear friend Dr Roger Bamber sadly passed away in his sleep on 16th February. Roger was the long time Hon. Secretary of the Porcupine Society, only stepping down in 2014 due to illness, and had been involved with the Society since its beginnings in 1976. His humour, knowledge and guitar-playing will be greatly missed by all of us.



## **Aquatic Biodiversity & Ecosystems:** Evolution, Interactions & Global Change

**30<sup>th</sup> August – 4<sup>th</sup> September 2015, University of Liverpool, UK**

# **ABSTRACT SUBMISSION NOW OPEN!**

### **THEMES**

- Evolutionary Biology
- Fisheries & Aquaculture
- Dispersal & Connectivity
- General Aquatic Biology
- Global Environmental Change
- Food webs & Trophic Dynamics
- Conservation, Management & Policy
- Biodiversity, Ecosystem Functioning & Services

**Abstract deadline: 31<sup>st</sup> March**  
**Early registration deadline: 30<sup>th</sup> April**

**[www.aquaticbiodiversityandecosystems.org](http://www.aquaticbiodiversityandecosystems.org)**





## OBITUARY

### Dennis Roy Seaward

2 December 1928 – 9 January 2014



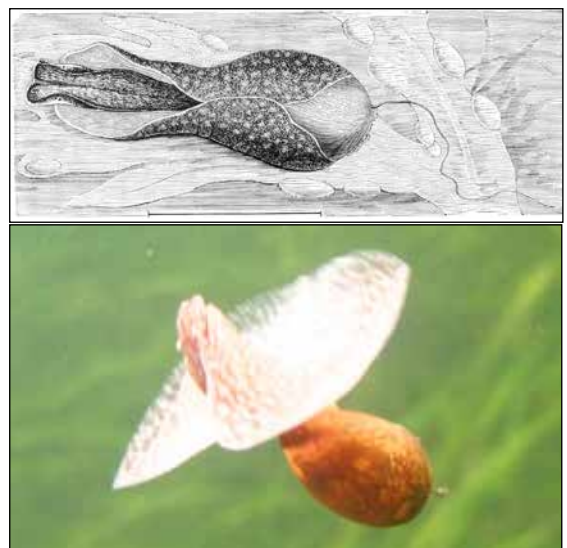
Dennis Seaward was born in Stockton-on-Tees, Co. Durham, in December 1928. His early interests were in flight, but he was bird-watching locally from at least 1947, continuing during National Service in the RAF, and during his Civil Engineering degree course at Manchester University in 1949-52.

Dennis began to visit Monks House, the Field Centre set up by wildlife artist and birdman Eric Ennion and his wife, within a couple of weeks of its opening in March 1951. He learned to ring birds there, and also met Peggy, who was working as the administrator, whom he married in November 1954. By that time Dennis was working for the Tees Valley and Cleveland Water Board. They set up house in Redcar, right on the coast, and became closely involved with the local ornithological community. His notebooks record frequent early morning walks along the shore before breakfast. One of the founder members of the Teesmouth Bird Club in 1960, he became concerned, among other things, with combating the shooting of migratory birds on Teesside and the preservation of Teesmouth marshes.

Dennis and Peggy moved in 1963 to Yeovil, Somerset, where Dennis took up a new position as Deputy Engineer and Manager of the Wessex Water Board, a newly formed body which took over responsibility for water supply in South Somerset and North Dorset. There was less time for natural history, but Dennis continued to birdwatch locally, and was involved in Yeovil and District Natural History Society and various other activities.

Dennis had been interested in marine animals in Teesmouth, an interest perhaps sparked by the stranding of pipefish *Scomberesox* at Redcar in 1960, but it was a while before he established marine molluscs as an interest. He was collecting and taking notes on land molluscs from 1968, and soon sending Michael Kerney records for Somerset and Dorset. He became a member of the Conchological Society in 1969. Soon afterwards, he was sending records of marine molluscs to the marine recorder Stella Turk.

Many of the records came from Portland Harbour, or the Fleet, the marine lagoon behind Chesil Beach in Dorset. Dennis's work on the Fleet was facilitated by the purchase of a small (very small) fibre glass dinghy, christened *Akera*. Present at the inaugural meeting of the Fleet Study Group in 1975, he became a member of the working group in 1981 and was chairman from 2000, following



*The opisthobranch mollusc Akera bullata:*

*Top - drawing published in 1896*

*Bottom - Photo by Penny Martin from Orkney (see article pp26-29 in this Bulletin)*



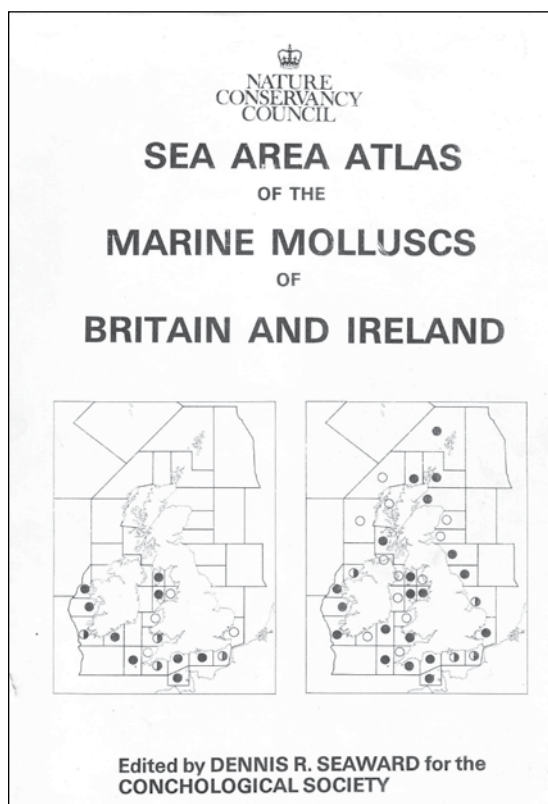
Alan Carr, with whom he worked on the geomorphology of the Fleet. Over twenty or so years he published a series of important studies on the marine molluscs of the Fleet, beginning with a survey which appeared in the *Proceedings of the Dorset Natural History and Archaeological Society* in 1978, and including work with T. E. Thompson on *Akera bullata* as well as surveys commissioned by the Nature Conservancy Council (NCC) and Joint Nature Conservation Committee (JNCC). Beyond Dorset, Dennis worked with Stella Turk to produce a list of the molluscs of the Isles of Scilly.

A member of the Malacological Society of London and Porcupine, Dennis was the Conchological Society's recorder for sea area 16, and became its marine recorder in March 1979. Within three years the *Sea Area Atlas of the Marine Molluscs of Britain and Ireland* was published by the NCC, followed in 1990 by the supplement *The Distribution of Marine Molluscs of North West Europe*. He was elected a fellow of the Linnean Society in 1992, shortly after he relinquished the marine recordership to Jan Light. In 1994, he was presented with the Linnean Society's H. H. Bloomer award for Zoology.

Dennis had retired, as District Manager, Yeovil, from the Wessex Water Authority, on the privatisation of the water industry in 1984. He and Peggy moved to Chetnole, near Sherborne, in April 1984, where Dennis began to study the local landscape and its history, as well as creating a wildlife garden. Peggy died in 1998; Dennis nursed her through her final illness. He continued to work actively on molluscs, local history and landscape and many other wildlife projects, until illness prevented him. Dennis pursued, as an amateur, a series of interests with an almost professional dedication, commitment and intelligence, but he also retained an infectious enthusiasm, a keenness to learn new things, and an enormous willingness to share his knowledge.

He died on 9 January 2014.

Paul Seaward



## Porcupine Galway field meetings, 31st March 2014

*Jon Moore*

Two field meetings (Figure 1) were arranged by Louise Firth for the Monday following Porcupine's 2014 annual conference in Galway.



*Fig. 1: Google map showing the locations of Dogs Bay (1) and Corranroo Bay (2) in west Ireland*

### **Dogs Bay: 53.3722 N, 9.9762 W**

Participants: Francis Bunker, Anne Bunker, Paul Brazier, Katheryn Birch, Laura Bush, Franki Perri, Tom Stamp.

Dogs Bay peninsula, Co. Galway, on the open coast of Connemara near Roundstone. Records (Table 1) are mainly from a west facing wave exposed rocky shore. Habitats included upper and midshore bedrock with some overhangs, dominated by barnacles and limpets, lower shore bedrock with abundant fissures, dominated by kelp and coralline rockpools.

### **Corranroo: 53.1507 N, 9.0072 W**

Participants: Julia Nunn, Jon Moore, John Fisher, Paula Lightfoot, Harry Goodge, Liz Morris, Andrew Powell

Corranroo Bay, Co. Clare, on the south-east side of Galway Bay near Kinvarra. Records (Table 2) are from a wave sheltered boulder shore at the east end of Corranroo Bay, exposed to the strong tidal outflow from a lagoon. Habitats included fucoid covered boulders and cobbles, with rich under-boulder communities, and tide-swept mixed sediments.



Fig. 2 (above): Aerial map of Dogs Bay (top left) with associated photos from the day (Photos by Laura Bush)

Fig. 3 (below): Aerial map of Corranroo Bay (top left) with associated images from the day (Photos by Liz Morris (bottom right) & Harry Gould (bottom left, centre, top right))





| Name   | Authority                     | SpCode  | Upper shore | Mid shore | Kelp zone/<br>kelp pools | Overhangs | Coralline pools |
|--|-------------------------------|---------|-------------|-----------|--------------------------|-----------|-----------------|
| <b>PORIFERA</b>                              |                               |         |             |           |                          |           |                 |
| <i>Sycon ciliatum</i>                        | (Fabricius, 1780)             | C000350 |             |           | Y                        |           |                 |
| <i>Grantia compressa</i>                     | (Fabricius, 1780)             | C000700 |             |           | Y                        | Y         |                 |
| <i>Halichondria panicea</i>                  | (Pallas, 1766)                | C004840 |             |           | Y                        |           |                 |
| <i>Hymeniacion perlevis</i>                  | (Montagu, 1814)               | C005230 |             |           | Y                        | Y         |                 |
| <b>CNIDARIA</b>                              |                               |         |             |           |                          |           |                 |
| <i>Actinia equina</i>                        | (Linnaeus, 1758)              | D011510 |             | Y         |                          |           | Y               |
| <i>Urticina felina</i>                       | (Linnaeus, 1761)              | D011680 |             |           | Y                        |           |                 |
| <i>Sagartia elegans</i> (var. <i>rosea</i> ) | (Dalyell, 1848)               | D012310 |             |           |                          | Y         |                 |
| <b>POLYCHAETA</b>                            |                               |         |             |           |                          |           |                 |
| <i>Eulalia viridis</i>                       | (Linnaeus, 1767)              | P002770 |             | Y         |                          |           |                 |
| <i>Spirobranchus</i> spp.                    | Blainville, 1818              | P023020 |             | Y         |                          |           |                 |
| <b>CRUSTACEA</b>                             |                               |         |             |           |                          |           |                 |
| <i>Chthamalus montagui</i>                   | Southward, 1976               | R000720 | Y           |           |                          |           |                 |
| <i>Chthamalus stellatus</i>                  | (Poli, 1791)                  | R000730 | Y           |           |                          |           |                 |
| <i>Semibalanus balanoides</i>                | (Linnaeus, 1767)              | R001080 |             |           | Y                        |           |                 |
| <i>Balanus crenatus</i>                      | Bruguière, 1789               | R001100 |             |           | Y                        |           |                 |
| Gammaridae                                   | Leach, 1814                   | S007590 |             |           | Y                        |           |                 |
| <i>Xantho pilipes</i>                        | A. Milne-Edwards, 1867        | S027460 |             |           | Y                        |           |                 |
| <b>MOLLUSCA</b>                              |                               |         |             |           |                          |           |                 |
| Polyplacophora                               | Gray, 1821                    | W000500 |             |           |                          | Y         |                 |
| <i>Patella vulgata</i>                       | Linnaeus, 1758                | W001340 |             | Y         |                          |           |                 |
| <i>Patella pellucida</i>                     | Linnaeus, 1758                | W001390 |             |           | Y                        |           |                 |
| <i>Phorcus lineatus</i>                      | (da Costa, 1778)              | W001740 |             | Y         |                          |           |                 |
| <i>Gibbula cineraria</i>                     | (Linnaeus, 1758)              | W001930 |             |           | Y                        |           |                 |
| <i>Calliostoma zizyphinum</i>                | (Linnaeus, 1758)              | W002000 |             |           | Y                        |           |                 |
| <i>Melarhaphe neritoides</i>                 | (Linnaeus, 1758)              | W002520 | Y           |           |                          |           |                 |
| <i>Littorina saxatilis</i>                   | (Olivier, 1792)               | W002600 | Y           |           |                          |           |                 |
| <i>Nucella lapillus</i>                      | (Linnaeus, 1758)              | W008170 |             | Y         |                          |           |                 |
| <i>Mytilus edulis</i>                        | Linnaeus, 1758                | W016500 |             | Y         |                          |           |                 |
| <b>BRYOZOA</b>                               |                               |         |             |           |                          |           |                 |
| Bryozoa (orange enc.)                        |                               | Y000001 |             |           |                          | Y         |                 |
| <i>Electra pilosa</i>                        | (Linnaeus, 1767)              | Y006780 |             |           | Y                        |           |                 |
| <b>ECHINODERMATA</b>                         |                               |         |             |           |                          |           |                 |
| <i>Henricia</i> sp.                          | Gray, 1840                    | ZB01640 |             |           | Y                        | Y         |                 |
| <i>Asterias rubens</i>                       | Linnaeus, 1758                | ZB01900 |             |           | Y                        |           |                 |
| <i>Paracentrotus lividus</i>                 | (Lamarck, 1816)               | ZB03690 |             |           |                          |           | Y               |
| <b>TUNICATA</b>                              |                               |         |             |           |                          |           |                 |
| <i>Dendrodoa grossularia</i>                 | (Van Beneden, 1846)           | ZD01940 |             |           |                          | Y         |                 |
| <i>Botryllus schlosseri</i>                  | (Pallas, 1766)                | ZD02090 |             |           | Y                        |           |                 |
| <b>OSTEICHTHYES</b>                          |                               |         |             |           |                          |           |                 |
| <i>Symphodus melops</i>                      | (Linnaeus, 1758)              | ZG06010 |             |           | Y                        |           |                 |
| <b>RHODOPHYCOTA</b>                          |                               |         |             |           |                          |           |                 |
| <i>Porphyra linearis</i>                     | Greville, 1830                | ZM00870 | Y           |           |                          |           |                 |
| <i>Porphyra umbilicalis</i>                  | Kützinger, 1843               | ZM00900 | Y           |           |                          |           |                 |
| <i>Palmaria palmata</i>                      | (Linnaeus) Weber & Mohr, 1805 | ZM02420 |             |           | Y                        |           |                 |
| <i>Dilsea carnosus</i>                       | (Schmidel) Kuntze, 1898       | ZM02560 |             |           | Y                        |           |                 |
| <i>Hildenbrandia</i> sp.                     | Nardo, 1834                   | ZM03760 |             |           | Y                        |           |                 |
| Corallinaceae (enc.)                         | Lamouroux, 1812               | ZM03840 |             | Y         | Y                        | Y         | Y               |

Table 1: Species list for all habitats surveyed at Dogs Bay

| Name   | Authority  | SpCode  | Upper shore | Mid shore | Kelp zone/<br>kelp pools | Overhangs | Coralline pools |
|--|--|---------|-------------|-----------|--------------------------|-----------|-----------------|
| <i>Corallina caespitosa</i>                      | R.H.Walker, J.Brodie & L.M.Irvine, 2009                      | ZM04010 |             |           | Y                        |           |                 |
| <i>Ellisolandia elongata</i>                     | (J.Ellis & Solander) K.R.Hind & G.W.Saunders, 2013           | ZM04030 |             |           | Y                        |           |                 |
| <i>Corallina officinalis</i>                     | Linnaeus, 1758   | ZM04040 |             | Y         |                          |           |                 |
| <i>Phyllophora crispa</i>                        | (Hudson) P.S.Dixon, 1964                                     | ZM05840 |             |           | Y                        |           |                 |
| <i>Mastocarpus stellatus</i>                     | (Stackhouse) Guiry, 1984                                     | ZM06050 |             |           | Y                        |           |                 |
| <i>Chondrus crispus</i>                          | Stackhouse, 1797   | ZM06110 |             |           | Y                        |           |                 |
| <i>Plocamium cartilagineum</i>                   | (Linnaeus) P.S.Dixon, 1967                                   | ZM06310 |             |           | Y                        |           |                 |
| <i>Furcellaria lumbricalis</i>                   | (Hudson) J.V.Lamouroux, 1813                                 | ZM06430 |             |           | Y                        |           |                 |
| <i>Caulacanthus okamurae</i>                     | Yamada, 1933   | ZM06750 |             |           | Y                        |           |                 |
| <i>Gastroclonium ovatum</i>                      | (Hudson) Papenfuss, 1944                                     | ZM07450 |             |           | Y                        |           |                 |
| <i>Lomentaria articulata</i>                     | (Hudson) Lyngbye, 1819                                       | ZM07510 |             |           | Y                        |           |                 |
| <i>Lomentaria clavellosa</i>                     | (Lightfoot ex Turner) Gaillon, 1828                          | ZM07520 |             |           | Y                        |           |                 |
| <i>Aglaothamnion sepositum</i>                   | (Gunnerus) Maggs & Hommersand, 1993                          | ZM07990 |             | Y         |                          |           |                 |
| <i>Plumaria plumosa</i>                          | (Hudson) Kuntze, 1891  | ZM08830 |             |           | Y                        |           |                 |
| <i>Cryptopleura ramosa</i>                       | (Hudson) L.Newton, 1931                                      | ZM09500 |             |           | Y                        |           |                 |
| <i>Membranoptera alata</i>                       | (Hudson) Stackhouse, 1809                                    | ZM09900 |             |           | Y                        |           |                 |
| <i>Osmundea hybrida</i>                          | (A.P.de Candolle) K.W.Nam, 1994                              | ZM10780 |             | Y         |                          |           |                 |
| <i>Osmundea pinnatifida</i>                      | (Hudson) Stackhouse, 1809                                    | ZM10800 |             | Y         |                          |           |                 |
| <i>Polysiphonia brodiei</i>                      | (Dillwyn) Sprengel, 1827                                     | ZM11030 |             | Y         |                          |           |                 |
| <i>Polysiphonia elongata</i>                     | (Hudson) Sprengel, 1827                                      | ZM11050 | Y           |           |                          |           |                 |
| <i>Neosiphonia harveyi</i>                       | (J.W.Bailey) M.-S.Kim, H.-G.Choi, Guiry & G.W.Saunders, 2001 | ZM11125 |             | Y         |                          |           |                 |
| <b>CHROMOPHYCOTA</b>                             |  |         |             |           |                          |           |                 |
| <i>Laminaria digitata</i>                        | (Hudson) J.V.Lamouroux, 1813                                 | ZR06320 |             |           | Y                        |           |                 |
| <i>Laminaria hyperborea</i>                      | (Gunnerus) Foslie, 1884                                      | ZR06330 |             |           | Y                        |           |                 |
| <i>Saccharina latissima</i>                      | (Linnaeus) C.E.Lane, C.Mayes, Druehl & G.W.Saunders, 2006    | ZR06360 |             |           | Y                        |           |                 |
| <i>Alaria esculenta</i>                          | (Linnaeus) Greville, 1830                                    | ZR06520 |             |           | Y                        |           |                 |
| <i>Fucus serratus</i>                            | Linnaeus, 1753   | ZR06740 |             |           | Y                        |           |                 |
| <i>Fucus spiralis</i>                            | Linnaeus, 1753   | ZR06750 | Y           |           |                          |           |                 |
| <i>Fucus vesiculosus</i> (var. <i>lineatus</i> ) | Linnaeus, 1753   | ZR06760 |             | Y         |                          |           |                 |
| <i>Pelvetia canaliculata</i>                     | (Linnaeus) Decaisne & Thuret, 1845                           | ZR06810 | Y           |           |                          |           |                 |
| <i>Himanthalia elongata</i>                      | (Linnaeus) S.F.Gray, 1821                                    | ZR06870 |             |           | Y                        |           |                 |
| <i>Sargassum muticum</i>                         | (Yendo) Fensholt, 1955                                       | ZR06940 |             |           | Y                        |           | Y               |
| <i>Bifurcaria bifurcata</i>                      | R.Ross, 1958   | ZR07010 |             |           | Y                        |           |                 |
| <i>Halidrys siliquosa</i>                        | (Linnaeus) Lyngbye, 1819                                     | ZR07160 |             |           | Y                        |           |                 |
| <b>CHLOROPHYCOTA</b>                             |  |         |             |           |                          |           |                 |
| <i>Monostroma grevillei</i>                      | (Thuret) Wittrock, 1866                                      | ZS02790 |             | Y         |                          |           |                 |
| <i>Chaetomorpha melagonium</i>                   | (F.Weber & Mohr) Kützing, 1845                               | ZS03330 | Y           |           |                          |           |                 |
| <i>Cladophora rupestris</i>                      | (Linnaeus) Kützing, 1843                                     | ZS03560 |             | Y         |                          |           |                 |
| <i>Bryopsis plumosa</i>                          | (Hudson) C.Agardh, 1823                                      | ZS03920 |             |           | Y                        |           | Y               |
| <i>Codium fragile</i> (subsp. <i>fragile</i> )   | (Suringar) Hariot, 1889                                      | ZS04190 |             |           | Y                        |           |                 |
| <i>Codium tomentosum</i>                         | Stackhouse, 1797   | ZS04220 |             |           | Y                        |           |                 |
| <i>Lichina confinis</i>                          | (O.F. Müller) C. Agardh, 1821                                |         |             | Y         |                          |           |                 |
| <i>Lichina pygmaea</i>                           | (O.F.Müller) C.Agardh, 1820                                  |         |             | Y         |                          |           |                 |

| Name                                     | Authority           | SpCode  | Name   | Authority              | SpCode  |
|--|---------------------|---------|--|------------------------|---------|
| <b>PORIFERA</b>                          |                     |         | <i>Spirobranchus triqueter</i>               | (Linnaeus, 1758)       | P023040 |
| Ponifera (enc orange)                    | Grant, 1836         | C000001 | Spirorhinae                                  | Chamberlin, 1919       | P023550 |
| <i>Leucosolenia</i> sp.                  | Bowerbank, 1864     | C000240 | <b>CRUSTACEA</b>                             |                        |         |
| <i>Sycon ciliatum</i>                    | (Fabricius, 1780)   | C000350 | <i>Verruca stroemia</i>                      | (O.F. Müller, 1776)    | R000640 |
| <i>Grantia compressa</i>                 | (Fabricius, 1780)   | C000700 | <i>Semibalanus balanoides</i>                | (Linnaeus, 1767)       | R001080 |
| <i>Suberites ficus</i>                   | (Johnston, 1842)    | C002210 | <i>Austrominius modestus</i>                 | (Darwin, 1854)         | R001200 |
| <i>Terpios gelatinosa</i>                | (Bowerbank, 1866)   | C002450 | <i>Idotea granulosa</i>                      | Rathke, 1843           | S015630 |
| <i>Protosuberites epiphytum</i>          | (Lamarck, 1815)     | C002500 | <i>Ligia oceanica</i>                        | (Linnaeus, 1767)       | S017890 |
| <i>Myxilla (Myxilla) incrustans</i>      | (Johnston, 1842)    | C006450 | <i>Palaemon elegans</i>                      | Rathke, 1837           | S022080 |
| <i>Dysidea fragilis</i>                  | (Montagu, 1814)     | C008900 | <i>Galathea squamifera</i>                   | Leach, 1814            | S024890 |
| <i>Aplysilla rosea</i>                   | (Barrois, 1876)     | C009030 | <i>Pisidia longicornis</i>                   | (Linnaeus, 1767)       | S025020 |
| <i>Aplysilla sulfurea</i>                | Schulze, 1878       | C009040 | <i>Porcellana platycheles</i>                | (Pennant, 1777)        | S025070 |
| <i>Halisarca dujardini</i>               | Johnston, 1842      | C009100 | <i>Hyas</i> sp.                              | Leach, 1814            | S025580 |
| <b>CNIDARIA</b>                          |                     |         | <i>Macropodia</i> sp.                        | Leach, 1814            | S025820 |
| <i>Clava multicornis</i>                 | (Forsskål, 1775)    | D003580 | <i>Cancer pagurus</i>                        | Linnaeus, 1758         | S026460 |
| <i>Dynamena pumila</i>                   | (Linnaeus, 1758)    | D006480 | <i>Carcinus maenas</i>                       | (Linnaeus, 1758)       | S026900 |
| <i>Obelia dichotoma</i>                  | (Linnaeus, 1758)    | D007300 | <i>Pilumnus hirtellus</i>                    | (Linnaeus, 1761)       | S027350 |
| <i>Actinia equina</i>                    | (Linnaeus, 1758)    | D011510 | <i>Xantho pilipes</i>                        | A. Milne-Edwards, 1867 | S027460 |
| <i>Anthopleura ballii</i>                | (Cocks, 1851)       | D011790 | <b>MOLLUSCA</b>                              |                        |         |
| <b>PLATYHELMINTHES</b>                   |                     |         | <i>Lepidochitona (Lepidochitona) cinerea</i> | (Linnaeus, 1767)       | W000740 |
| <i>Fecampia enyrocephala</i> (egg flask) | Giard, 1886         | F000001 | <i>Acanthochitona fascicularis</i>           | (Linnaeus, 1767)       | W000890 |
| <b>NEMERTEA</b>                          |                     |         | <i>Diodora graeca</i>                        | (Linnaeus, 1758)       | W001190 |
| <i>Lineus longissimus</i>                | (Gunnerus, 1770)    | G000780 | <i>Patella vulgata</i>                       | Linnaeus, 1758         | W001340 |
| <b>SIPUNCULA</b>                         |                     |         | <i>Patella pellucida</i>                     | Linnaeus, 1758         | W001390 |
| Sipunculidae                             | Rafinesque, 1814    | N000010 | <i>Phorcus lineatus</i>                      | (da Costa, 1778)       | W001740 |
| <i>Sipunculus (Sipunculus) nudus</i>     | Linnaeus, 1766      | N000030 | <i>Gibbula cineraria</i>                     | (Linnaeus, 1758)       | W001930 |
| <i>Golfingia (Golfingia) elongata</i>    | (Kieferstein, 1862) | N000090 | <i>Dikoleps nitens</i>                       | (Philippi, 1844)       | W002140 |
| <b>POLYCHAETA</b>                        |                     |         | <i>Tricola pullus</i>                        | (Linnaeus, 1758)       | W002310 |
| <i>Alentia gelatinosa</i>                | (M. Sars, 1835)     | P000600 | <i>Lacuna vincta</i>                         | (Montagu, 1803)        | W002440 |
| <i>Arenicola marina</i>                  | (Linnaeus, 1758)    | P015760 | <i>Littorina littorea</i>                    | (Linnaeus, 1758)       | W002500 |
| <i>Eupolymnia nebulosa</i>               | (Montagu, 1818)     | P020190 | <i>Littorina fabalis</i>                     | (Turton, 1825)         | W002540 |

Table 2: Species list compiled from all contributors of species present at Corranroo Bay



| Name                                    | Authority                | SpCode  | Name                                    | Authority                    | SpCode  |
|---|--------------------------|---------|---|------------------------------|---------|
| <i>Littorina obtusata</i>               | (Linnaeus, 1758)         | W002550 | <i>Buccinum undatum</i>                 | Linnaeus, 1758               | W008440 |
| <i>Littorina saxatilis</i>              | (Oliv, 1792)             | W002600 | <i>Nassarius incrassatus</i>            | (Strøm, 1768)                | W008870 |
| <i>Rissoa lilacina</i>                  | Récluz, 1843             | W002810 | <i>Nassarius reticulatus</i>            | (Linnaeus, 1758)             | W008890 |
| <i>Rissoa parva (Rissoa interrupta)</i> | (da Costa, 1778)         | W002840 | <i>Philine punctata</i>                 | (J. Adams, 1800)             | W009840 |
| <i>Rissoa parva</i>                     | (da Costa, 1778)         | W002850 | <i>Retusa truncatula</i>                | (Bruguière, 1792)            | W010170 |
| <i>Pusillina inconspicua</i>            | (Alder, 1844)            | W002950 | <i>Acanthodoris pilosa</i>              | (Abildgaard in Müller, 1789) | W013190 |
| <i>Pusillina sarsii</i>                 | (Lovén, 1846)            | W002960 | <i>Onchidoris bilamellata</i>           | (Linnaeus, 1767)             | W013320 |
| <i>Alvania beanii</i>                   | (Hanley in Thorpe, 1844) | W003070 | <i>Auriculinea bidentata</i>            | (Montagu, 1808)              | W015720 |
| <i>Crisilla semistriata</i>             | (Montagu, 1808)          | W003180 | <i>Mytilus edulis</i>                   | Linnaeus, 1758               | W016500 |
| <i>Manzonina crassa</i>                 | (Kannmacher, 1798)       | W003260 | <i>Musculus subpictus</i>               | (Cantraine, 1835)            | W016690 |
| <i>Cingula trifasciata</i>              | (J. Adams, 1800)         | W003330 | <i>Modiolus barbatus</i>                | (Linnaeus, 1758)             | W016740 |
| <i>Onoba aculeus</i>                    | (Gould, 1841)            | W003380 | <i>Modiolula phaseolina</i>             | (Philippi, 1844)             | W016830 |
| <i>Onoba semicostata</i>                | (Montagu, 1803)          | W003400 | <i>Crassostrea gigas (Shell only)</i>   | (Thunberg, 1793)             | W017640 |
| <i>Skeneopsis planorbis</i>             | (O. Fabricius, 1780)     | W004000 | <i>Ostrea edulis</i>                    | Linnaeus, 1758               | W017690 |
| <i>Omalogyra atomus</i>                 | (Philippi, 1841)         | W004050 | <i>Talochlamys pusio</i>                | (Linnaeus, 1758)             | W017960 |
| <i>Rissoella diaphana</i>               | (Alder, 1848)            | W004210 | <i>Mimachlamys varia</i>                | (Linnaeus, 1758)             | W018000 |
| <i>Rissoella opalina</i>                | (Jeffreys, 1848)         | W004240 | <i>Pecten maximus (Shell only)</i>      | (Linnaeus, 1758)             | W018090 |
| <i>Eatonina fulgida</i>                 | (Adams J., 1797)         | W004290 | <i>Anomia ephippium</i>                 | Linnaeus, 1758               | W018150 |
| <i>Caecum imperforatum</i>              | (Kannmacher, 1798)       | W004332 | <i>Monia patelliformis</i>              | (Linnaeus, 1761)             | W018200 |
| <i>Caecum glabrum</i>                   | (Montagu, 1803)          | W004350 | <i>Heteranomia squamula</i>             | (Linnaeus, 1758)             | W018220 |
| <i>Bittium reticulatum</i>              | (da Costa, 1778)         | W004550 | <i>Lasaea adansonii</i>                 | (Gmelin, 1791)               | W018760 |
| <i>Cerithiopsis tubercularis</i>        | (Montagu, 1803)          | W004860 | <i>Kurtiella bidentata (Shell only)</i> | (Montagu, 1803)              | W019050 |
| <i>Odostomia plicata</i>                | (Montagu, 1803)          | W005430 | <i>Parvicardium exiguum</i>             | (Gmelin, 1791)               | W019750 |
| <i>Odostomia scalaris</i>               | MacGillivray, 1843       | W005570 | <i>Cerastoderma edule</i>               | (Linnaeus, 1758)             | W019910 |
| <i>Chysalida nivosa</i>                 | (Montagu, 1803)          | W005680 | <i>Ensis magnus (Shell only)</i>        | Schumacher, 1817             | W020260 |
| <i>Turbonilla lactea</i>                | (Linnaeus, 1758)         | W005990 | <i>Moerella donacina</i>                | (Linnaeus, 1758)             | W020610 |
| <i>Calyptoraea chinensis</i>            | (Linnaeus, 1758)         | W007220 | <i>Macoma balthica (Shell only)</i>     | (Linnaeus, 1758)             | W020670 |
| <i>Trivia arctica</i>                   | (Pulteney, 1799)         | W007370 | <i>Gari depressa</i>                    | (Pennant, 1777)              | W020920 |
| <i>Trivia monacha</i>                   | (da Costa, 1778)         | W007380 | <i>Venus verrucosa</i>                  | Linnaeus, 1758               | W021470 |
| <i>Nucella lapillus</i>                 | (Linnaeus, 1758)         | W008170 | <i>Dosinia exoleta</i>                  | (Linnaeus, 1758)             | W021660 |
| <i>Ocenebra erinaceus</i>               | (Linnaeus, 1758)         | W008290 | <i>Ruditapes decussatus</i>             | (Linnaeus, 1758)             | W021710 |

Table 2 (cont.): Species list compiled from all contributors of species present at Corranroo Bay

| Name                           | Authority                | SpCode  | Name                             | Authority   | SpCode  |
|--------------------------------|--------------------------|---------|----------------------------------|---|---------|
| <i>Irus irus</i>               | (Linnaeus, 1758)         | W021750 | <i>Pholis gunnellus</i>          | (Linnaeus, 1758)  | ZG06800 |
| <i>Polittapes aureus</i>       | (Gmelin, 1791)           | W021800 | <b>RHODOPHYCOTA</b>              |   |         |
| <i>Venerupis corrugata</i>     | (Gmelin, 1791)           | W021850 | <i>Rhodothamniella floridula</i> | (Dillwyn) Feldmann, 1978                                  | ZM01160 |
| <i>Hiatella arctica</i>        | (Linnaeus, 1767)         | W022510 | Corallinaceae (enc)              | Lamouroux, 1812   | ZM03840 |
| <i>Turtonia minuta</i>         | (Fabricius, 1780)        | W022180 | <i>Corallina officinalis</i>     | Linnaeus, 1758  | ZM04040 |
| <b>BRYOZOA</b>                 |                          |         | <i>Chondrus crispus</i>          | Stackhouse, 1797  | ZM06110 |
| <i>Alcyonidium hirsutum</i>    | (Fleming, 1828)          | Y001390 | <i>Gigartina</i> sp.             | Stackhouse, 1809  | ZM06150 |
| <i>Flustrellidra hispida</i>   | (O. Fabricius, 1780)     | Y001480 | <i>Furcellaria lumbicalis</i>    | (Hudson) J.V.Lamouroux, 1813                              | ZM06430 |
| <i>Bowerbankia</i> sp.         | Farre, 1837              | Y002490 | <i>Catenella caespitosa</i>      | (Withering) L.M.Irvine, 1976                              | ZM06710 |
| <i>Schizoporella unicornis</i> | (Johnston in Wood, 1844) | Y004400 | <i>Lomentaria articulata</i>     | (Hudson) Lyngbye, 1819                                    | ZM07510 |
| <i>Electra pilosa</i>          | (Linnaeus, 1767)         | Y006780 | <i>Heterosiphonia japonica</i>   | Yendo, 1920   | ZM10380 |
| <i>Scrupocellaria</i> sp.      | Van Beneden, 1845        | Y008360 | <i>Vertebrata lanosa</i>         | (Linnaeus) T.A.Christensen, 1967                          | ZM11150 |
| <b>ECHINODERMATA</b>           |                          |         | <b>CHROMOPHYCOTA</b>             |   |         |
| <i>Asterina gibbosa</i>        | (Pennant, 1777)          | ZB01130 | <i>Ectocarpus</i> sp.            | Lyngbye, 1819   | ZR00290 |
| <i>Asterias rubens</i>         | Linnaeus, 1758           | ZB01900 | <i>Elachista fucicola</i>        | (Velley) Areschoug, 1842                                  | ZR02490 |
| <i>Amphipholis squamata</i>    | (Delle Chiaje, 1828)     | ZB03000 | <i>Cladostephus spongiosus</i>   | (Hudson) C.Agardh, 1817                                   | ZR04390 |
| <i>Paracentrotus lividus</i>   | (Lamarck, 1816)          | ZB03690 | <i>Colpomenia peregrina</i>      | Sauvageau, 1927   | ZR06050 |
| <b>TUNICATA</b>                |                          |         | <i>Saccharina latissima</i>      | (Linnaeus) C.E.Lane, C.Mayes, Druehl & G.W.Saunders, 2006 | ZR06360 |
| <i>Aplidium punctum</i>        | (Giard, 1873)            | ZD00640 | <i>Saccorhiza polyschides</i>    | (Lightfoot) Batters, 1902                                 | ZR06460 |
| <i>Didemnum maculosum</i>      | (Milne-Edwards, 1841)    | ZD00860 | <i>Ascophyllum nodosum</i>       | (Linnaeus) Le Jolis, 1863                                 | ZR06640 |
| <i>Ciona intestinalis</i>      | (Linnaeus, 1767)         | ZD01170 | <i>Fucus serratus</i>            | Linnaeus, 1753  | ZR06740 |
| <i>Corella eumyota</i>         | Traustedt, 1882          | ZD01340 | <i>Fucus spiralis</i>            | Linnaeus, 1753  | ZR06750 |
| <i>Ascidia aspersa</i>         | (Müller, 1776)           | ZD01410 | <i>Fucus vesiculosus</i>         | Linnaeus, 1753  | ZR06760 |
| <i>Ascidia scabra</i>          | (Müller, 1776)           | ZD01430 | <i>Pelvetia canaliculata</i>     | (Linnaeus) Decaisne & Thuret, 1845                        | ZR06810 |
| <i>Ascidia conchilega</i>      | Müller, 1776             | ZD01490 | <i>Sargassum muticum</i>         | (Yendo) Fensholt, 1955                                    | ZR06940 |
| <i>Ascidia mentula</i>         | Müller, 1776             | ZD01500 | <i>Halidys siliquosa</i>         | (Linnaeus) Lyngbye, 1819                                  | ZR07160 |
| <i>Styela clava</i>            | Herdman, 1881            | ZD01720 | <b>CHLOROPHYCOTA</b>             |   |         |
| <i>Polycarpa scuba</i>         | Monniot C., 1971         | ZD01880 | <i>Ulva</i> sp.                  | Linnaeus, 1753  | ZS02400 |
| <i>Dendrodoa grossularia</i>   | (Van Beneden, 1846)      | ZD01940 | <i>Ulva lactuca</i>              | Linnaeus, 1753  | ZS02450 |
| <i>Botrylloides leachii</i>    | (Savigny, 1816)          | ZD02140 | <i>Chaetomorpha</i>              | Kützinger, 1845   | ZS03270 |
| <b>OSTEICHTHYES</b>            |                          |         | <i>Cladophora rupestris</i>      | (Linnaeus) Kützinger, 1843                                | ZS03560 |
| <i>Nerophis lumbiciformis</i>  | (Jenyns, 1835)           | ZG03710 | <i>Verrucaria maura</i>          | Wahlenberg, 1803  |         |
| <i>Taurulus bubalis</i>        | (Euphrasen, 1786)        | ZG04380 | <i>Verrucaria mucosa</i>         | Wahlenberg, 1803  |         |

Table 2 (cont.): Species list compiled from all contributors of species present at Corranroo Bay

## Porcupine Annual Field Meeting 2014 - Isle of Man

Angie Gall

The Isle of Man has long been of interest to marine biologists, and its position in the Irish Sea, within sight of all four countries of the United Kingdom makes it a fascinating place to study marine life. It lies on a biogeographic boundary, meaning that many species are at the edge of their range here, so it is a key place for noticing range extensions and contractions as sea temperatures rise.

Port Erin Marine Laboratory in the south of the island opened as a marine research laboratory in 1892 and became part of the University of Liverpool in 1919. Vast amounts of research took place here, especially relating to fisheries. *The Marine Fauna of the Isle of Man* was published in 1954. Sadly the laboratory closed permanently in 2006, but the Port Erin closed area that was closed to scallop dredging in 1989 as an experiment, is still in place as a marine protected area and has been recognised worldwide for its success.

The Manx Wildlife Trust works to protect the island's wildlife and habitats including those in the marine environment. They do this through education, working with the Isle of Man Government's fisheries department, surveying cetaceans and basking sharks and supporting Seasearch diving to record marine life. Seasearch has a local coordinator on the island, Tony Glen who, along with Lara Howe from Manx Wildlife Trust was a key local partner for our Porcupine field meeting in 2014.

Porcupine last visited the Isle of Man in 2006 for our annual meeting (conference), but after some prompting from the previous marine officer at Manx Wildlife Trust, Eleanor Stone, we decided it was high time we returned. Our field meeting took place between 1st and 5th August 2014 and involved 12 people, all divers. On the first evening we were greeted by Lara and Tony who briefed us and set the scene about marine conservation in the Isle of Man. Five days of diving with the excellent Discover Diving folk followed, using their comfortable dive boat, *Endeavour*, where there was a

constant flow of tea, cakes and banter from the crew. Our aim was to carry out Seasearch surveys within Marine Protected Areas so that we could provide information to help manage these sites. We were very grateful to Sea Changers who gave us funding towards this in recognition of the importance of our aims.

On the first day of diving we were treated to a visit to Port Erin closed area. Over 25 years of closure to bottom towed gear had left the seabed teeming with life. The gravel was stabilised by encrusting sponges, bryozoans and algae. The scallops were enormous and so were the edible crabs. It really struck all of us how much more diverse and interesting this area was to other flat gravelly areas we had dived elsewhere.

Our next dive was off the Calf of Man, a small uninhabited island separated from the main island by a channel that the tide rips through. The Calf of Man is managed as a nature reserve because of its important seabird populations including of course the Manx shearwater which breeds there. We dived a rock stack to the north west of the Calf, a site that had not been surveyed before. It was another very rich site, with large boulders covered in dead man's fingers, *Alcyonium digitatum*, and plumose anemones, *Metridium senile* (Figure 1). Many of us were lucky to get the chance to watch a curled octopus *Eledone cirrhosa* out in the open, hunting for prey under rocks.

In the evening we set up a field lab in a church hall near the quay, where we could look at our samples, download photographs and most importantly fill out our Seasearch forms to record what we had found. The hall also became our dining room for the week as we squeezed our evening meals into our busy programme.

On the second and third days of diving the wind got up and stopped our boat from being able to leave the harbour at Port St Mary, but it was a very short trip by road to Port Erin harbour on the west coast of the island where the sea was much calmer. We dived off the quay there on a shallow seabed of sand and gravel. There were several types of anemones there including pretty gem anemones, *Aulactinia verrucosa*, and red speckled pimplets, *Anthopleura balli*.





Fig. 1: Diver and wall of plumose anemones near the Calf of Man (Photo: Sue Daly)

It was bad luck for the Manx Wildlife Trust that the weather turned nasty as they had organised a Bioblitz for the public to join in. Several of us headed over to the shore at Derbyhaven in the morning to help out by recording the species we found on the shore. It was a fairly enclosed, east facing bay with sandy and rocky intertidal areas. We enjoyed rummaging and producing our list despite the horizontal rain.

Our shore dive the following day was at a beautiful undeveloped bay north of Port Erin called Fleshwick Bay, which was protected by high cliffs on either side. Kelp forest on boulders fringed the sandy bay and scoured rocky gullies ran up into the intertidal zone. In one of these gullies, Andy Grant spotted a tiny cushion star, *Asterina phylactica*, which was the first of many that we recorded on subsequent dives. We tend to think of it as an unusual species but in the Isle of Man we were almost tripping over them!

The next day, back on the boat we headed straight to one of the Isle of Man's most famous



Fig. 2: Pink sea fingers (*Alcyonium hibernicum*) (Photo: Sarah Bowen)

dive sites, The Burroo, off the south of the Calf of Man. The site is rightly popular for its diversity of marine life which left our writing slates overflowing with species names. The area is extremely tidal and very exposed; the rock breaks the surface and drops in steps to a less steeply sloping area at about 15 m. The deepest areas we surveyed were densely covered in animal life, with patches dominated by different turf species such as anemones, hydroids and bryozoans. Amongst the turf were various nudibranchs and numerous *A. phylactica* cushion stars. In the shallower area, a vertical wall, covered in oaten pipe hydroids, *Tubularia* sp., rose out of the kelp forest. Amongst the hydroids we spotted some small, pale pink soft corals, *Alcyonium hibernicum* (Figure 2), an unusual species with scattered records in Northern Ireland and on the west coast of Britain. In the kelp zone, there was an uncommon, small, red gelatinous seaweed called *Schmitzia hiscockiana* which does not seem to have been recorded previously in the Isle of Man although it is distributed widely in the British Isles.

Our second dive of the day was in a recently designated Marine Protected Area very close to Port Erin harbour. The area, Bay ny Carrickey, was closed to the extraction of scallops by any means in late 2012. This was following a plea from various community sectors for protection from dredging, including anglers, pot fishermen and conservationists. Low lying ridges of rock run across an area of mobile sediment. The rock appeared scoured with sparse marine life including light bulb seasquirts, *Clavelina lepadiformis*, and forked



Fig. 3: Sponges and ascidians on the cave walls (Photo: Sarah Bowen)

brown seaweed, *Dictyota dichotoma*. The sediment also appeared impoverished in terms of marine communities, with large amounts of broken shell present. It will be interesting to re-survey this area in a few more years to see whether there will be recovery from the effects of past dredging.

We squeezed in a third dive in the late afternoon in some fabulous sea caves a short way from Port St Mary, on the south east coast of the island. Sugarloaf caves at the base of some high cliffs cut huge slits and tunnels through the rock face. We surveyed the base of



Fig. 4: David Kipling delivering his nudibranch talk (Photo: Sarah Bowen)

the cliffs inside and outside the caves and found diverse communities of animal turf, particularly seasquirts and sponges (Figure 3). The tidal current whisked us through the final cave, hardly giving us time to look at the colourful communities lining the walls; we surfaced at the base of a sea stack into a cacophony of seabirds calling from the cliffs above.

After a full day of three dives we rushed to our lab at the Methodist Hall where David Kipling gave a public talk (Figure 4) illustrated with colourful photos about how volunteer recorders have contributed to our understanding of British nudibranch species.

On our final day of diving we managed to cram in another three boat dives, surveying more areas that had not been visited by Seasearch before. The first was an area near some sea caves on the west coast that had not been surveyed, and possibly had not been dived before. Niarbyl Bay was closed to scallop dredging in 2009 and seeded with scallops with the aim of promoting recovery. We split up into our pairs and explored different parts of this area at the base of the sea cliffs. We recorded very few scallops in the area but the gravelly sea bed slightly out from the cliffs supported a range of species such as razor shells, *Ensis* sp., brittlestars, *Ophiothrix fragilis* (Figure 5), and a football jersey worm *Tubulanus annulatus*. None of the caves penetrated much more than a few metres into the cliffs, their shaded surfaces were encrusted with colourful sponges and we met a startled grey seal at the back of one of them. Secondly, we dived the wreck of the *Citrine*, a British cargo ship that sunk in a storm in 1931. The hull



Fig. 5: Brittlestar *Ophiothrix fragilis* (Photo: Sue Daly)



was largely broken up but the boilers stood proud of the seabed and the jumble of metal. The wreck was surrounded by a mixed sandy seabed and boulders covered in a variety of fine red seaweeds. Like most shallow wrecks it had shoals of wrasse and pollack around it and a resident conger eel.

The team's final dive was another site off the Calf of Man, called Gibdale. Though we tried our hardest to concentrate on survey work we were constantly pestered until we turned our full attention to the playful grey seals that were in the water with us. It was a magical experience interacting with them underwater – though large, agile and with sharp teeth, they were gentle as they climbed on our backs and explored our dive kit with their mouths. They clearly enjoyed it as much as we did because they kept disappearing through tunnels under the boulders and then popping up through the kelp to come back for more. It was only very reluctantly that we tore ourselves away after about an hour.

We have come away with a huge list of species (Table 1), including some that have not previously been recorded from the Isle of Man. For example, we recorded 28 species of nudibranch of which 5 were new records for the Isle of Man. We also have some amazing photos as there were a lot of skilled photographers in the group. We hope that we have contributed to the understanding of marine life in this fantastic part of the world. Plans are already underway for Seasearch to run another week of diving, bringing specialists to share their knowledge with local divers in 2015.

*Note: Sea-Changers is a registered charity working hard to address some of the threats the marine environment faces. Through innovative partnerships with marine businesses they raise thousands of pounds for marine conservation. 100% of the money raised is distributed to projects and charities around the UK where it can make the biggest difference to seas and shores. To find out more visit: [www.sea-changers.org.uk](http://www.sea-changers.org.uk).*



Fig. 6: The team (Photo: Michelle Haywood)



1. Nudibranch *Cuthona caerulea* (Sue Daly)
2. Emily Priestley & Fiona Crouch at Derbyhaven Bioblitz (Angie Gall)
3. Cushion star *Asterina phylactica* (Sarah Bowen)
4. Urchin & dead man's fingers near Calf of Man (Sue Daly)
5. Octopus (*Eledone cirrhosa*) near Calf of Man (Sue Daly)
6. Gem anemones (David Kipling)
7. Diver & wreck of Citrine (Sue Daly)
8. Recording marine life around the Calf of Man (Sarah Bowen)
9. Ling (Sue Daly)
10. Chiton *Tonicella marmorea* (Paula Lightfoot)



| Scientific Name                                   | Comment          | Port Erin Closed Area              | The North Stack                    | Port Erin Harbour                  | Fleshwick Bay                      | The Burroo                         | Perwick Bay                        | Perwick Bay                        | Sugar loaf caves                   | Steve's caves                      | Near Steve's caves                 | Citrine Wreck                      | Gibdale                            | Garden Rock |
|---|------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------|
|   |                  | 54° 04.535'N 004° 00.4° W 46.989°W | 54° 03.289'N 004° 00.4° W 49.872°W | 54° 05.124'N 004° 00.4° W 46.002°W | 54° 06.455'N 004° 00.4° W 45.160°W | 54° 02.577'N 004° 00.4° W 48.755°W | 54° 03.782'N 004° 00.4° W 44.998°W | 54° 03.866'N 004° 00.4° W 44.662°W | 54° 03.618'N 004° 00.4° W 45.366°W | 54° 07.040'N 004° 00.4° W 44.903°W | 54° 07.040'N 004° 00.4° W 44.903°W | 54° 06.254'N 004° 00.4° W 46.274°W | 54° 03.621'N 004° 00.4° W 48.766°W |             |
| <b>PROTOZOA</b>                                   |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| A00010 <i>Halphysema tumanowiczii</i>             |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    | 1                                  |             |
| <b>PORIFERA</b>                                   |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C00001 Porifera sp.                               | orange crust agg |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |             |
| C00080 <i>Clathrina coriacea</i>                  |                  |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    | 1                                  | 1                                  |                                    |                                    |                                    |             |
| C00240 <i>Leuconia nivea</i>                      |                  |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C00240 <i>Leucosolenia</i> sp.                    |                  |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C00350 <i>Sycon ciliatum</i>                      |                  | 1                                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    | 1                                  |                                    |                                    |                                    | 1           |
| C00700 <i>Grantia compressa</i>                   |                  |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    | 1                                  |             |
| C01250 <i>Dercitus (Dercitus) bucklandi</i>       |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    | 1                                  | 1                                  |                                    |                                    |                                    |             |
| C01670 <i>Pachymatisma johnstonia</i>             |                  |                                    | 1                                  |                                    |                                    | 1                                  | 1                                  |                                    |                                    | 1                                  |                                    |                                    |                                    | 1           |
| C02130 <i>Tethya citrina</i>                      |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02180 <i>Suberites</i> sp.                       |                  | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02210 <i>Suberites ficus</i>                     |                  |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02560 <i>Polymastia</i> sp.                      |                  | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02580 <i>Polymastia boletiformis</i>             |                  |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02610 <i>Polymastia mamillaris</i>               |                  |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C02610 <i>Polymastia penicillus</i>               |                  |                                    | 1                                  |                                    |                                    | 1                                  | 1                                  |                                    | 1                                  |                                    |                                    |                                    |                                    |             |
| C03020 <i>Cliona celata</i>                       |                  |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    | 1                                  |                                    |                                    |                                    |                                    |             |
| C04070 <i>Stelligera rigida</i>                   |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C04250 <i>Raspailia (Clathriodendron) hispida</i> |                  |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C04290 <i>Raspailia (Raspailia) ramosa</i>        |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C04840 <i>Halichondria (Halichondria) panicea</i> |                  |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    | 1                                  | 1                                  |                                    |                                    |                                    |             |
| C05230 <i>Hymeniacion perlevis</i>                |                  |                                    |                                    | 1                                  | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C05960 <i>Amphilectus fucorum</i>                 |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |             |
| C05970 <i>Antho (Acarinia) coriacea</i>           |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C06420 <i>Myxilla</i> sp.                         |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C06450 <i>Myxilla (Myxilla) incrustans</i>        |                  |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |             |
| C07250 <i>Hymedesmia (Hymedesmia) paupertas</i>   |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    | 1                                  | 1                                  |                                    |                                    |                                    | 1           |
| C07750 <i>Hemimycale columella</i>                |                  |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    | 1                                  |                                    |                                    |                                    |                                    |             |
| C07890 Microcionidae sp.                          |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C08600 <i>Haliclona (Haliclona) oculata</i>       |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| C08650 <i>Haliclona (Rhizoniera) viscosa</i>      |                  |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |             |
| C08900 <i>Dysidea fragilis</i>                    |                  |                                    |                                    |                                    |                                    | 1                                  | 1                                  |                                    |                                    | 1                                  |                                    |                                    |                                    |             |
| C09090 <i>Haliscara</i> sp.                       | ? no spicules    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| <b>CNIDARIA</b>                                   |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| D00160 <i>Halicylistus</i> sp.                    |                  |                                    |                                    |                                    | 1                                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |             |
| D00290 <i>Lucernariopsis campanulata</i>          |                  |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    |                                    | 1                                  |                                    |                                    |             |
| D00760 <i>Cyanea capillata</i>                    |                  | 1                                  |                                    |                                    |                                    |                                    | 1                                  |                                    | 1                                  | 1                                  |                                    |                                    |                                    |             |

Table 1: Species list for all sites surveyed around the Isle of Man

| Scientific Name | Comment                                      | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|-----------------|--|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| D00770          | <i>Cyanea lamarckii</i>                      | 1                     |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| D00830          | <i>Aurelia aurita</i>                        | 1                     |                 |                   |               |            | 1           |             | 1                | 1             |                    |               |         |             |
| D00830          | <i>Aurelia aurita</i>                        |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| D00830          | <i>Schizophostoma</i> sp.                    |                       |                 |                   |               |            |             |             |                  |               |                    |               |         | 1           |
| D01320          | <i>Ectopleura larynx</i>                     |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D01440          | <i>Tubularia indivisa</i>                    |                       |                 |                   |               | 1          | 1           |             | 1                |               |                    |               |         |             |
| D01560          | <i>Coryne eximia</i>                         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D02290          | <i>Eudendrium</i> sp.                        |                       |                 |                   |               | 1          | 1           |             |                  |               |                    |               |         |             |
| D04410          | <i>Calycella</i> sp.                         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D04420          | <i>Calycella syringa</i>                     |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D04765          | <i>Calycella gracilis/Campanulina pumila</i> |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D05260          | <i>Halecium halecinum</i>                    |                       | 1               |                   |               | 1          |             |             |                  | 1             |                    | 1             |         | 1           |
| D05260          | <i>Halecium halecinum/beamii</i>             | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| D05290          | <i>Halecium muricatum</i>                    |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D05300          | <i>Halecium plumosum</i>                     |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D05540          | <i>Aglaophenia pluma</i>                     |                       |                 |                   |               |            | 1           |             |                  |               | 1                  | 1             |         |             |
| D05560          | <i>Aglaophenia tubulifera</i>                |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| D05850          | <i>Kirchenpaueria pinnata</i>                |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| D05970          | <i>Nemertesia antennina</i>                  | 1                     | 1               |                   |               | 1          | 1           |             |                  | 1             |                    | 1             |         | 1           |
| D05990          | <i>Nemertesia ramosa</i>                     | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         | 1           |
| D06050          | <i>Plumularia setacea</i>                    | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| D06320          | <i>Amphisbetia operculata</i>                |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D06360          | <i>Diphasia attenuata/rosacea</i>            |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D06480          | <i>Dynamena pumila</i>                       |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| D06530          | <i>Hydrallmania falcata</i>                  |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| D06640          | <i>Sertularella</i> sp.                      |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D06670          | <i>Sertularella gayi</i>                     |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D06690          | <i>Sertularella polyzonias</i>               |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D06760          | <i>Sertularia argentea</i>                   |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D07020          | <i>Clytia gracilis</i>                       |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| D07030          | <i>Clytia hemisphaerica</i>                  |                       |                 |                   |               | 1          |             |             | 1                |               |                    |               |         |             |
| D07300          | <i>Obelia dichotoma</i>                      |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| D07310          | <i>Obelia geniculata</i>                     | 1                     | 1               | 1                 | 1             | 1          | 1           | 1           | 1                |               | 1                  | 1             | 1       |             |
| D10240          | <i>Alcyonium digitatum</i>                   |                       | 1               |                   |               | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| D10241          | <i>Alcyonium hibernicum</i>                  |                       |                 |                   |               | 1          |             |             | 1                |               |                    |               |         |             |
| D10750          | <i>Cerianthus lloydii</i>                    | 1                     |                 | 1                 |               |            | 1           | 1           |                  |               |                    | 1             | 1       |             |
| D11070          | <i>Epizoanthus couchii</i>                   |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D11510          | <i>Actinia equina</i>                        |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| D11580          | <i>Anemonia viridis</i>                      | 1                     |                 | 1                 | 1             | 1          | 1           | 1           |                  | 1             | 1                  | 1             |         |             |
| D11670          | <i>Urticina</i> sp.                          |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| D11680          | <i>Urticina felina</i>                       |                       | 1               |                   |               | 1          | 1           | 1           |                  | 1             | 1                  |               |         |             |
| D11690          | <i>Urticina eques</i>                        |                       |                 |                   |               |            |             |             | 1                |               |                    |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

| Scientific Name                                   | Comment | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|---|---------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| D11740 <i>Aulactinia verrucosa</i>                |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| D11790 <i>Anthopleura ballii</i>                  |         |                       |                 | 1                 |               |            |             |             |                  |               | 1                  |               |         |             |
| D11920 <i>Stomphia cocinea</i>                    |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D12250 <i>Metridium senile</i>                    |         | 1                     | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D12300 <i>Sagartia</i> sp.                        |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| D12310 <i>Sagartia elegans</i>                    |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| D12420 <i>Actinothoe sphyrrodeta</i>              |         | 1                     | 1               |                   |               | 1          | 1           |             | 1                |               |                    |               |         | 1           |
| D12920 <i>Adamsia cariniopados</i>                |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| D13190 <i>Peachia cylindrica</i>                  |         | 1                     |                 |                   |               |            |             | 1           |                  |               |                    |               | 1       | 1           |
| D13570 <i>Corynactis viridis</i>                  |         |                       | 1               |                   |               | 1          |             |             | 1                | 1             | 1                  | 1             | 1       | 1           |
| D13700 <i>Caryophyllia (Caryophyllia) smithii</i> |         | 1                     | 1               |                   |               |            | 1           |             | 1                | 1             |                    |               |         |             |
| <b>CTENOPHORA</b>                                 |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| E00050 <i>Pleurobrachia pileus</i>                |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| <b>PLATYHELMINTHES</b>                            |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| F01620 <i>Prostheceraeus vittatus</i>             |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| <b>NEMERTEA</b>                                   |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| G00400 <i>Tubulanus annulatus</i>                 |         |                       |                 | 1                 |               |            |             |             |                  |               | 1                  |               |         |             |
| G00780 <i>Lineus longissimus</i>                  |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| <b>ANNELIDA</b>                                   |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| P12780 <i>Polydora ciliata</i>                    |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| P13720 <i>Chaetopterus</i>                        | tubes   |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| P15760 <i>Arenicola marina</i>                    | casts   |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| P18760 <i>Sabellaria spinulosa</i>                |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| P20190 <i>Eupolymnia nebulosa</i>                 |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| P20310 <i>Lanice conchilega</i>                   |         | 1                     |                 | 1                 | 1             |            | 1           | 1           |                  |               | 1                  |               | 1       |             |
| P21570 <i>Bispira volutacornis</i>                |         |                       |                 |                   |               |            | 1           |             |                  | 1             |                    |               |         |             |
| P22270 <i>Myxicola infundibulum</i>               |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| P23020 <i>Spirobranchus</i> sp.                   |         | 1                     |                 |                   | 1             |            | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| P23510 <i>Salmacina dysteri</i>                   |         |                       | 1               |                   |               |            |             |             | 1                |               |                    |               |         |             |
| P23550 <i>Spirorbinae</i> sp.                     |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             | 1       |             |
| P24010 <i>Spirorbis</i> sp.                       |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| <b>CHELICERATA</b>                                |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| Q00730 <i>Pycnogonidae</i> sp.                    |         | 1                     |                 |                   |               |            | 1           |             |                  |               |                    |               | 1       |             |
| <b>CRUSTACEA</b>                                  |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| R00210 <i>Cirripedia</i> sp.                      |         |                       |                 |                   |               |            |             |             |                  | 1             | 1                  |               | 1       |             |
| R00640 <i>Verruca stroemia</i>                    |         | 1                     |                 |                   | 1             |            |             |             |                  | 1             |                    |               |         |             |
| R01060 <i>Balanus</i> sp.                         |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| R01090 <i>Balanus balanus</i>                     |         | 1                     |                 |                   |               |            | 1           |             | 1                |               |                    |               | 1       |             |
| S00460 <i>Mysidae</i> sp.                         |         |                       |                 |                   |               |            |             |             | 1                |               | 1                  | 1             |         |             |
| S09550 <i>Jassa falcata</i>                       |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| S10710 <i>Caprella</i> sp.                        |         | 1                     | 1               |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| S11010 <i>Pseudoprotella phasma</i>               |         |                       |                 |                   | 1             |            |             |             |                  | 1             |                    |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

|        | Scientific Name                              | Comment | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|--------|--|---------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| S13160 | <i>Isopoda</i> sp.                           |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| S22710 | <i>Hippolyte</i> <i>varians</i>              |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| S23160 | <i>Pandalina brevirostris</i>                |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| S23220 | <i>Pandalus montagui</i>                     | 1       |                       |                 |                   |               |            |             |             |                  | 1             | 1                  |               |         |             |
| S23600 | <i>Homarus gammarus</i>                      | 1       |                       | 1               | 1                 |               | 1          | 1           |             | 1                |               |                    | 1             | 1       |             |
| S24620 | <i>Pagurus</i> sp.                           |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| S24650 | <i>Pagurus bernhardus</i>                    | 1       |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| S24700 | <i>Pagurus prideaux</i>                      |         |                       |                 | 1                 |               |            | 1           |             |                  |               |                    |               |         |             |
| S24860 | <i>Galathea intermedia</i>                   |         |                       |                 |                   |               |            | 1           |             |                  | 1             |                    |               |         |             |
| S24900 | <i>Galathea strigosa</i>                     |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| S25020 | <i>Pisidia longicornis</i>                   |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| S25530 | <i>Maja squinado</i>                         |         |                       |                 |                   |               | 1          | 1           |             |                  |               |                    |               |         | 1           |
| S25660 | <i>Achaeus cranchii</i>                      |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| S25820 | <i>Macropodia</i> sp.                        | 1       |                       |                 | 1                 |               |            |             | 1           |                  |               |                    |               |         |             |
| S26460 | <i>Cancer pagurus</i>                        | 1       |                       | 1               | 1                 |               | 1          | 1           |             | 1                | 1             |                    |               | 1       | 1           |
| S26690 | <i>Liocarcinus depurator</i>                 |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| S26720 | <i>Necora puber</i>                          |         |                       | 1               | 1                 |               | 1          | 1           |             | 1                | 1             | 1                  |               |         |             |
| S26900 | <i>Carcinus maenas</i>                       |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| S27350 | <i>Pilumnus hirtellus</i>                    |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| S27460 | <i>Xantho pilipes</i>                        |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
|        | <b>MOLLUSCA</b>                              |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W00500 | <i>Polyplacophora</i> sp.                    |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W00550 | <i>Leptochiton asellus</i>                   |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               | 1       |             |
| W00740 | <i>Lepidochitona (Lepidochitona) cinerea</i> |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| W01250 | <i>Testudinalia testudinalis</i>             |         |                       |                 |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| W01260 | <i>Tectura virginea</i>                      |         |                       |                 | 1                 |               |            |             |             |                  |               | 1                  |               |         |             |
| W01300 | <i>Patella</i> sp.                           |         |                       | 1               | 1                 | 1             |            |             |             |                  |               |                    |               | 1       |             |
| W01340 | <i>Patella vulgata</i>                       |         |                       |                 |                   |               |            |             |             | 1                |               |                    |               |         |             |
| W01380 | <i>Patella pellucida</i>                     |         |                       | 1               |                   |               |            |             |             | 1                |               | 1                  | 1             | 1       |             |
| W01890 | <i>Gibbula magus</i>                         |         |                       |                 | 1                 |               |            | 1           | 1           |                  |               | 1                  |               | 1       |             |
| W01930 | <i>Gibbula cineraria</i>                     | 1       |                       | 1               | 1                 | 1             |            | 1           | 1           | 1                | 1             | 1                  | 1             | 1       |             |
| W02000 | <i>Calliostoma zizyphinum</i>                | 1       |                       | 1               | 1                 | 1             | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       |             |
| W02310 | <i>Tricolia pullus</i>                       |         |                       | 1               | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| W02440 | <i>Lacuna vincta</i>                         |         |                       | 1               |                   |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W02850 | <i>Rissoa parva</i>                          |         |                       | 1               |                   |               |            |             |             | 1                |               | 1                  | 1             | 1       |             |
| W07360 | <i>Trivia</i> sp.                            |         |                       |                 |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| W07370 | <i>Trivia arctica</i>                        | 1       |                       |                 |                   | 1             |            | 1           |             |                  |               | 1                  | 1             |         |             |
| W07380 | <i>Trivia monacha</i>                        | 1       |                       | 1               |                   |               | 1          | 1           |             |                  |               |                    |               |         |             |
| W07755 | <i>Euspira nitida</i>                        |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               | 1       |             |
| W07755 | <i>Euspira nitida</i>                        | eggs    |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W08170 | <i>Nucella lapillus</i>                      |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| W08290 | <i>Ocenebra erinaceus</i>                    |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man



| Scientific Name                         | Comment | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|---|---------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| W08870 <i>Nassarius incrassatus</i>     |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| W08890 <i>Nassarius reticulatus</i>     |         |                       |                 | 1                 |               |            |             |             |                  |               |                    | 1             |         |             |
| W09420 <i>Raphitoma</i> sp.             |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| W10620 <i>Elysia viridis</i>            |         |                       |                 | 1                 |               |            |             |             | 1                |               |                    |               |         |             |
| W11020 <i>Aplysia punctata</i>          | eggs    | 1                     |                 |                   |               |            | 1           | 1           |                  | 1             |                    |               |         |             |
| W11020 <i>Aplysia punctata</i>          |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               | 1       |             |
| W12420 <i>Tritonia hombergii</i>        |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W12520 <i>Lomanotus marmoratus</i>      |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W12670 <i>Dendronotus frondosus</i>     |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| W12720 <i>Doto</i> sp.                  |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W12740 <i>Doto coronata</i>             |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| W12790 <i>Doto fragilis</i>             |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W12810 <i>Doto koenneckeri</i>          |         |                       |                 |                   |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W12880 <i>Doto pinnatifida</i>          |         | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| W12970 <i>Goniadoris nodosa</i>         |         | 1                     | 1               |                   |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W13190 <i>Acanthodoris pilosa</i>       |         |                       |                 |                   |               |            | 1           | 1           |                  |               | 1                  |               |         |             |
| W13370 <i>Onchidoris pusilla</i>        |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W13420 <i>Diaphorodoris luteocincta</i> |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W13480 <i>Crimora papillata</i>         |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W13580 <i>Limacia clavigera</i>         |         | 1                     | 1               |                   |               | 1          |             |             |                  | 1             |                    | 1             |         |             |
| W13620 <i>Polycera faeroensis</i>       |         |                       |                 |                   |               |            |             | 1           | 1                |               |                    |               |         |             |
| W13630 <i>Polycera quadrilineata</i>    |         | 1                     | 1               | 1                 |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W13820 <i>Cadlina laevis</i>            |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         | 1           |
| W14030 <i>Doris pseudoargus</i>         |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W14030 <i>Doris pseudoargus</i>         | eggs    |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W14310 <i>Janolus cristatus</i>         |         |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| W14590 <i>Flabellina browni</i>         |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W14590 <i>Flabellina verrucosa</i>      |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| W14600 <i>Flabellina pedata</i>         |         | 1                     | 1               |                   |               | 1          |             |             | 1                |               |                    |               |         |             |
| W14650 <i>Cuthona gymnota</i>           |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W14670 <i>Cuthona caerulea</i>          |         |                       |                 | 1                 |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W14860 <i>Tergipes tergipes</i>         |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W15120 <i>Eubranchius exiguus</i>       |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| W15130 <i>Eubranchius farrani</i>       |         |                       | 1               |                   |               |            |             |             |                  |               | 1                  | 1             |         |             |
| W15140 <i>Eubranchius pallidus</i>      |         |                       | 1               |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| W15150 <i>Eubranchius tricolor</i>      |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W15260 <i>Facelina bostoniensis</i>     |         |                       | 1               |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| W15270 <i>Facelina auriculata</i>       |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    | 1             |         |             |
| W18090 <i>Pecten maximus</i>            |         | 1                     |                 | 1                 |               |            | 1           | 1           |                  |               | 1                  |               |         |             |
| W18220 <i>Heteranomia squamula</i>      |         | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| W19870 <i>Laevicardium crassum</i>      |         |                       |                 |                   |               |            | 1           |             |                  |               | 1                  |               |         |             |
| W20110 <i>Lutraria lutraria</i>         |         |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

|        | Scientific Name                 | Comment        | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|--------|---------------------------------|----------------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| W20220 | <i>Ensis</i> sp.                |                |                       |                 | 1                 |               |            |             |             |                  |               | 1                  |               |         |             |
| W20260 | <i>Ensis magnus</i>             |                | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W21510 | <i>Venus casina</i>             |                | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W21620 | <i>Dosinia</i> sp.              |                |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| W21690 | <i>Ruditapes</i> sp.            |                | 1                     |                 |                   |               |            | 1           |             |                  |               | 1                  |               |         |             |
| W21930 | <i>Clausinella fasciata</i>     |                | 1                     |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| W22270 | <i>Mya truncata</i>             |                | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| W22510 | <i>Hiatella arctica</i>         |                |                       | 1               |                   | 1             |            |             |             |                  |               |                    | 1             |         |             |
| W24370 | <i>Alloteuthis subulata</i>     | eggs           |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| W25220 | <i>Fledone cirrhosa</i>         |                |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
|        | <b>BRYOZOA</b>                  |                |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| Y00001 | Bryozoa sp.                     | crusts         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| Y00001 | Bryozoa sp.                     | orange crust   |                       |                 |                   |               |            | 1           |             | 1                |               | 1                  |               | 1       |             |
| Y00001 | Bryozoa sp.                     | pink crust     |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y00100 | <i>Crisidia cornuta</i>         |                |                       | 1               |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| Y00100 | <i>Crisidia cornuta</i>         |                |                       |                 |                   | 1             | 1          |             |             |                  |               |                    |               |         |             |
| Y00150 | <i>Bicrisia abyssicola</i>      |                |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| Y00240 | <i>Crisia</i> sp.               |                |                       |                 | 1                 |               |            |             |             | 1                |               |                    |               |         | 1           |
| Y00250 | <i>Crisia aculeata</i>          |                |                       |                 |                   | 1             | 1          |             |             |                  |               |                    |               |         |             |
| Y00270 | <i>Crisia denticulata</i>       |                |                       |                 |                   |               | 1          |             |             | 1                | 1             |                    |               | 1       |             |
| Y00280 | <i>Crisia eburnea</i>           |                |                       | 1               |                   |               |            |             |             | 1                |               | 1                  |               | 1       |             |
| Y00280 | <i>Crisia eburnea</i>           | dense on algae |                       |                 |                   |               | 1          |             |             | 1                |               |                    |               |         |             |
| Y00450 | Tubuliporidae                   |                |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| Y00640 | <i>Eurystrotos compacta</i>     |                | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y00690 | <i>Plagioecia patina</i>        |                |                       |                 |                   |               | 1          |             |             |                  | 1             |                    | 1             |         |             |
| Y00750 | <i>Diplosolen obelia</i>        |                |                       |                 |                   |               | 1          |             |             |                  |               |                    | 1             |         |             |
| Y01210 | <i>Disporella hispida</i>       |                | 1                     |                 |                   |               | 1          |             | 1           |                  | 1             |                    | 1             |         |             |
| Y01370 | <i>Alcyonidium diaphanum</i>    |                | 1                     | 1               |                   |               | 1          | 1           | 1           | 1                |               | 1                  |               | 1       |             |
| Y01480 | <i>Flustrellidra hispida</i>    |                |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| Y01610 | <i>Noella</i> sp.               |                |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y02490 | <i>Bowerbankia</i> sp.          |                |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| Y02540 | <i>Bowerbankia pustulosa</i>    |                | 1                     |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| Y03070 | <i>Oshurkovia littoralis</i>    |                |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| Y03140 | <i>Escharoides coccinea</i>     |                |                       |                 |                   |               | 1          |             |             |                  | 1             |                    |               |         |             |
| Y03510 | <i>Pentapora foliacea</i>       |                |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| Y03770 | <i>Parasmittina trispinosa</i>  |                | 1                     |                 |                   |               |            |             | 1           |                  | 1             |                    |               |         |             |
| Y04060 | <i>Escharella immersa</i>       |                | 1                     |                 |                   |               | 1          |             |             |                  | 1             |                    | 1             |         |             |
| Y04400 | <i>Schizoporella unicornis</i>  |                |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| Y04450 | <i>Schizomavella auriculata</i> |                |                       |                 |                   |               |            |             |             |                  | 1             |                    | 1             |         |             |
| Y04450 | <i>Schizomavella cornuta</i>    |                | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| Y04480 | <i>Schizomavella linearis</i>   |                | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y05170 | <i>Microporella ciliata</i>     |                | 1                     |                 |                   |               | 1          |             | 1           |                  | 1             |                    | 1             |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

| Scientific Name                                     | Comment | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|---|---------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| Y05230 <i>Fenestulina malusii</i>                   |         | 1                     |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| Y05430 <i>Chorizopora brongniartii</i>              |         | 1                     |                 |                   |               | 1          |             |             |                  | 1             |                    | 1             |         |             |
| Y05710 <i>Celleporella hyalina</i>                  |         |                       | 1               |                   | 1             | 1          |             | 1           |                  |               |                    |               |         |             |
| Y05710 <i>Celleporina caliciformis</i>              |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y06060 <i>Cellepora pumicosa</i>                    |         | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y06230 <i>Turbicellepora avicularis</i>             |         | 1                     |                 |                   |               | 1          |             |             |                  |               |                    | 1             |         |             |
| Y06430 <i>Aetea anguina</i>                         |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y06440 <i>Aetea sica</i>                            |         | 1                     |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| Y06510 <i>Scruparia ambigua</i>                     |         |                       |                 |                   | 1             |            |             |             |                  | 1             |                    |               |         |             |
| Y06520 <i>Scruparia chelata</i>                     |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y06640 <i>Membranipora membranacea</i>              |         | 1                     | 1               |                   | 1             | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| Y06780 <i>Electra pilosa</i>                        |         | 1                     | 1               | 1                 | 1             | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       |             |
| Y06830 <i>Pyripora catenularia</i>                  |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y06940 <i>Flustra foliacea</i>                      |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y07100 <i>Securiflustra securifrons</i>             |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y07250 <i>Callopora lineata</i>                     |         |                       |                 |                   | 1             |            |             | 1           |                  |               |                    |               |         |             |
| Y07260 <i>Callopora rylandi</i>                     |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| Y08110 <i>Cellaria</i> sp.                          |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| Y08120 <i>Cellaria fistulosa</i>                    |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y08360 <i>Scrupocellaria</i> sp.                    |         |                       | 1               | 1                 | 1             |            | 1           |             | 1                |               | 1                  |               | 1       |             |
| Y08380 <i>Cradoscrupocellaria reptans</i>           |         |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| Y08410 <i>Scrupocellaria scruposa</i>               |         |                       | 1               |                   |               | 1          |             | 1           |                  | 1             |                    | 1             |         |             |
| Y08530 <i>Bicellariella ciliata</i>                 |         |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| Y08640 <i>Beania mirabilis</i>                      |         | 1                     |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| Y08720 <i>Bugula flabellata</i>                     |         | 1                     | 1               | 1                 |               | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| Y08750 <i>Bugula plumosa</i>                        |         | 1                     |                 |                   |               |            | 1           | 1           |                  |               |                    | 1             |         |             |
| Y08790 <i>Bugula turbinata</i>                      |         | 1                     |                 |                   |               | 1          |             |             |                  |               |                    |               |         | 1           |
| <b>PHORONIDA</b>                                    |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZA00040 <i>Phoronis hippocrepia</i>                 |         |                       |                 |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| <b>ECHINODERMATA</b>                                |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZB00110 <i>Antedon bifida</i>                       |         | 1                     |                 |                   |               | 1          | 1           | 1           | 1                | 1             | 1                  |               | 1       |             |
| ZB00670 <i>Luidia ciliaris</i>                      |         | 1                     | 1               |                   |               |            | 1           | 1           |                  |               |                    |               | 1       |             |
| ZB01140 <i>Asterina phylactica</i>                  |         | 1                     | 1               |                   | 1             | 1          |             |             | 1                | 1             | 1                  |               | 1       | 1           |
| ZB01490 <i>Crossaster papposus</i>                  |         | 1                     | 1               |                   |               |            | 1           | 1           |                  |               |                    | 1             |         |             |
| ZB01640 <i>Henricia</i> sp.                         |         | 1                     | 1               |                   |               | 1          | 1           | 1           |                  |               | 1                  | 1             |         | 1           |
| ZB01900 <i>Asterias rubens</i>                      |         | 1                     | 1               |                   |               | 1          | 1           | 1           |                  | 1             | 1                  | 1             | 1       |             |
| ZB01950 <i>Leptasterias (Leptasterias) muelleri</i> |         |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| ZB02000 <i>Marthasterias glacialis</i>              |         | 1                     | 1               | 1                 | 1             | 1          | 1           | 1           |                  |               | 1                  | 1             | 1       |             |
| ZB02350 <i>Ophiothrix fragilis</i>                  |         |                       |                 | 1                 |               |            | 1           |             |                  |               | 1                  | 1             |         |             |
| ZB02420 <i>Ophiocomina nigra</i>                    |         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZB02850 <i>Acronida brachiata</i>                   |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZB03000 <i>Amphipholis squamata</i>                 |         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

| Scientific Name      | Comment                          | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|----------------------|----------------------------------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| ZB03110              | <i>Ophiura</i> sp.               |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZB03130              | <i>Ophiura albida</i>            | 1                     |                 | 1                 |               |            | 1           |             |                  | 1             | 1                  |               | 1       |             |
| ZB03150              | <i>Ophiura ophiura</i>           |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| ZB03550              | <i>Psammochinus miliaris</i>     | 1                     | 1               |                   |               |            | 1           |             |                  | 1             | 1                  | 1             |         |             |
| ZB03620              | <i>Echinus esculentus</i>        | 1                     | 1               | 1                 | 1             |            | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZB04740              | <i>Pawsonia saxicola</i>         | 1                     |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| <b>TUNICATA</b>      |                                  |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD00060              | <i>Clavelina lepadiformis</i>    | 1                     | 1               | 1                 |               | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZD00120              | <i>Pycnoclavella aurilucens</i>  | 1                     | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| ZD00120              | <i>Pycnoclavella producta</i>    |                       | 1               |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| ZD00120              | <i>Pycnoclavella stolonialis</i> |                       | 1               |                   |               | 1          | 1           |             | 1                |               |                    |               |         |             |
| ZD00460              | <i>Morchellium argus</i>         | 1                     | 1               | 1                 |               | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZD00520              | <i>Aplidium turbinatum</i>       |                       |                 |                   |               |            |             |             | 1                |               |                    |               |         |             |
| ZD00570              | <i>Aplidium</i>                  | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD00600              | <i>Aplidium glabrum</i>          |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD00610              | <i>Aplidium nordmanni</i>        |                       |                 |                   | 1             | 1          |             |             | 1                |               |                    |               |         |             |
| ZD00620              | <i>Aplidium pallidum</i>         |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| ZD00640              | <i>Aplidium punctum</i>          | 1                     |                 | 1                 |               | 1          |             |             |                  | 1             |                    |               |         |             |
| ZD00750              | <i>Trididemnum cereum</i>        |                       | 1               | 1                 |               | 1          |             | 1           |                  |               |                    |               |         |             |
| ZD00860              | <i>Didemnum maculosum</i>        |                       |                 | 1                 |               | 1          | 1           |             | 1                |               | 1                  |               |         |             |
| ZD00860              | <i>Didemnum maculosum</i>        |                       |                 |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| ZD00910              | <i>Polysyncraton bilobatum</i>   | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD00970              | <i>Diplosoma listerianum</i>     |                       |                 | 1                 | 1             |            |             |             | 1                |               |                    |               | 1       |             |
| ZD00990              | <i>Diplosoma spongiforme</i>     |                       |                 |                   | 1             |            |             |             |                  | 1             |                    |               |         |             |
| ZD01090              | <i>Lissoclinum perforatum</i>    | 1                     |                 |                   |               | 1          | 1           |             | 1                | 1             |                    |               | 1       | 1           |
| ZD01290              | <i>Perophora listeri</i>         |                       |                 |                   |               |            |             |             | 1                |               |                    |               |         |             |
| ZD01340              | <i>Corella</i> sp.               | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD01410              | <i>Ascidella aspersa</i>         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD01430              | <i>Ascidella scabra</i>          | 1                     |                 | 1                 |               |            |             |             |                  | 1             | 1                  | 1             | 1       |             |
| ZD01850              | <i>Polycarpa fibrosa</i>         | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD01940              | <i>Dendrodoa grossularia</i>     | 1                     |                 |                   |               |            |             |             | 1                | 1             |                    | 1             |         |             |
| ZD02090              | <i>Botryllus schlosseri</i>      |                       |                 |                   | 1             | 1          | 1           |             | 1                | 1             |                    |               | 1       |             |
| ZD02130              | <i>Botrylloides</i>              |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZD02140              | <i>Botrylloides leachii</i>      | 1                     |                 |                   |               | 1          |             | 1           |                  |               |                    |               |         |             |
| ZD02390              | <i>Pyura</i> sp.                 | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZD02400              | <i>Pyura microcosmus</i>         |                       |                 |                   |               | 1          |             |             |                  |               |                    | 1             |         |             |
| <b>CHONDRICTHYES</b> |                                  |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZF00400              | <i>Scyliorhinus canicula</i>     |                       |                 | 1                 | 1             |            | 1           |             |                  | 1             | 1                  |               |         |             |
| ZF00400              | <i>Scyliorhinus canicula</i>     |                       |                 |                   |               |            |             |             |                  |               | 1                  | 1             |         |             |
| <b>OSTEICHTHYES</b>  |                                  |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZG00220              | <i>Conger conger</i>             |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZG01270              | <i>Lepadogaster</i> sp.          | 1                     | 1               |                   |               |            |             |             |                  |               |                    | 1             |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man



| Scientific Name     | Comment                           | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|---------------------|-----------------------------------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| ZG01730             | <i>Gadus morhua</i>               |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| ZG01960             | <i>Molva molva</i>                |                       |                 |                   |               |            | 1           |             |                  |               |                    | 1             |         |             |
| ZG02080             | <i>Pollachius pollachius</i>      | 1                     | 1               | 1                 | 1             | 1          | 1           |             |                  | 1             |                    | 1             | 1       |             |
| ZG02190             | <i>Trisopterus minutus</i>        |                       |                 |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| ZG03510             | <i>Spinachia spinachia</i>        |                       |                 | 1                 |               |            |             |             | 1                |               |                    |               |         |             |
| ZG03760             | <i>Syngnathus acus</i>            | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZG04010             | Triglidae sp.                     |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| ZG04210             | <i>Trigloporus lastoviza</i>      | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZG04380             | <i>Taurulus bubalis</i>           |                       | 1               | 1                 |               |            | 1           |             | 1                | 1             | 1                  |               |         |             |
| ZG05920             | <i>Centrolabrus exoletus</i>      |                       |                 |                   |               |            | 1           |             | 1                | 1             |                    |               | 1       |             |
| ZG06010             | <i>Symphodus melops</i>           |                       |                 | 1                 | 1             |            |             |             | 1                |               |                    |               |         |             |
| ZG06050             | <i>Ctenolabrus rupestris</i>      | 1                     | 1               |                   |               |            | 1           |             |                  |               |                    | 1             | 1       |             |
| ZG06090             | <i>Labrus bergylta</i>            | 1                     | 1               | 1                 | 1             | 1          | 1           |             | 1                | 1             |                    | 1             | 1       | 1           |
| ZG06100             | <i>Labrus mixtus</i>              | 1                     | 1               |                   | 1             | 1          | 1           |             |                  |               | 1                  | 1             | 1       |             |
| ZG06320             | <i>Lipophrys pholis</i>           |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZG06360             | <i>Parablennius gattorugine</i>   | 1                     | 1               | 1                 |               | 1          | 1           |             |                  |               |                    |               |         | 1           |
| ZG06800             | <i>Pholis gunnellus</i>           |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZG06830             | Ammodytidae sp.                   |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| ZG06840             | <i>Ammodytes</i> sp.              |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| ZG07000             | <i>Callionymus lyra</i>           | 1                     |                 | 1                 |               |            | 1           |             |                  |               |                    | 1             |         |             |
| ZG07020             | <i>Callionymus reticulatus</i>    | 1                     |                 |                   |               |            |             | 1           |                  |               | 1                  | 1             |         |             |
| ZG07050             | Gobiidae sp.                      |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| ZG07280             | <i>Gobiusculus flavescens</i>     |                       |                 | 1                 | 1             |            | 1           |             | 1                | 1             | 1                  | 1             | 1       |             |
| ZG07400             | <i>Pomatoschistus</i> sp.         |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZG07420             | <i>Pomatoschistus minutus</i>     | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZG07440             | <i>Pomatoschistus pictus</i>      |                       |                 |                   |               |            |             |             |                  | 1             | 1                  | 1             |         |             |
| ZG07440             | <i>Pomatoschistus pictus</i>      | /minutus              |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZG07480             | <i>Thorogobius ephippiatus</i>    |                       |                 |                   |               | 1          | 1           |             |                  | 1             |                    |               |         |             |
| ZG08000             | <i>Scomber scombrus</i>           |                       |                 |                   |               |            |             |             |                  | 1             |                    |               |         |             |
| ZG08460             | <i>Pleuronectiformes</i>          | juv                   |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| ZG09030             | <i>Pleuronectes platessa</i>      |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| <b>MAMMALIA</b>     |                                   |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZK00250             | <i>Halichoerus grypus</i>         |                       |                 |                   |               | 1          |             |             |                  | 1             |                    |               | 1       |             |
| <b>RHODOPHYCOTA</b> |                                   |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM00010             | <i>Rhodophyta</i> sp.             |                       |                 |                   | 1             |            | 1           |             |                  |               | 1                  |               |         |             |
| ZM00010             | <i>Rhodophyta</i> sp.             | crust                 |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM00010             | <i>Rhodophyta</i> sp.             | very fine             |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM00830             | <i>Porphyra</i> sp.               |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM01160             | <i>Rhodothamniella floridula</i>  |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM01820             | <i>Scinia</i> sp.                 |                       |                 | 1                 |               |            |             |             |                  |               | 1                  | 1             | 1       |             |
| ZM01960             | <i>Naccaria wiggii</i>            | 1                     |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZM02080             | <i>Bonnemaisonia asparagoides</i> |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZM02420             | <i>Palmaria palmata</i>           | 1                     |                 |                   |               | 1          | 1           |             | 1                | 1             |                    |               | 1       |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

| Scientific Name                            | Comment    | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|--|------------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| ZM02560 <i>Dilsea carnosia</i>             |            |                       | 1               |                   |               |            |             |             | 1                |               |                    | 1             |         |             |
| ZM03230 <i>Callophyllis laciniata</i>      |            |                       | 1               |                   | 1             |            | 1           |             |                  |               |                    |               | 1       |             |
| ZM03280 <i>Kallymenia reniformis</i>       |            |                       | 1               |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM03330 <i>Meredithia micrrophylla</i>     |            |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| ZM03840 <i>Coralinaceae</i> sp.            | encrusting | 1                     | 1               |                   | 1             | 1          | 1           | 1           | 1                |               | 1                  |               | 1       | 1           |
| ZM04010 <i>Coralina</i> sp.                |            |                       |                 | 1                 |               | 1          |             |             |                  |               |                    |               |         |             |
| ZM04010 <i>Coralina caespitosa</i>         |            |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM04040 <i>Coralina officinalis</i>        |            |                       | 1               |                   |               |            |             |             | 1                |               | 1                  |               | 1       |             |
| ZM04940 <i>Phymatolithon purpureum</i>     | 1          |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM05590 <i>Schmitzia hiscockiana</i>       |            |                       |                 |                   |               | 1          |             |             |                  |               |                    |               |         |             |
| ZM05660 <i>Ahnfeltia plicata</i>           |            |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZM06050 <i>Mastocarpus stellatus</i>       |            |                       | 1               |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM06110 <i>Chondrus crispus</i>            |            |                       | 1               | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM06300 <i>Plocamium</i> sp.               |            |                       |                 | 1                 |               |            |             |             |                  | 1             |                    |               | 1       |             |
| ZM06310 <i>Plocamium cartilagineum</i>     |            | 1                     | 1               |                   |               | 1          | 1           |             |                  |               | 1                  | 1             |         | 1           |
| ZM06430 <i>Furcellaria lumbicalis</i>      |            |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM06480 <i>Halarachnion ligulatum</i>      |            |                       |                 |                   |               |            | 1           |             |                  |               |                    | 1             |         |             |
| ZM06880 <i>Cystoclonium purpureum</i>      |            |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZM07260 <i>Rhodomenia holmesii</i>         |            |                       |                 |                   |               |            |             |             |                  |               | 1                  |               |         |             |
| ZM08070 <i>Ceramium</i> sp.                |            | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM08460 <i>Halurus flosculosus</i>         |            |                       |                 |                   |               | 1          |             |             | 1                |               |                    |               |         | 1           |
| ZM08560 <i>Halurus equisetifolius</i>      |            |                       |                 |                   | 1             |            |             |             |                  |               |                    | 1             |         |             |
| ZM08880 <i>Pterothamnion plumula</i>       |            |                       |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| ZM09400 <i>Apoglossum ruscifolium</i>      |            |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM09500 <i>Cryptopleura ramosa</i>         |            |                       | 1               |                   |               | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZM09550 <i>Delesseria sanguinea</i>        |            | 1                     | 1               |                   | 1             | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZM09840 <i>Hypoglossum heterocystideum</i> |            |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM09850 <i>Hypoglossum hypoglossoides</i>  |            |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZM09900 <i>Membranoptera alata</i>         |            |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| ZM10120 <i>Phycodrys rubens</i>            |            |                       |                 |                   | 1             | 1          | 1           | 1           | 1                | 1             |                    | 1             | 1       |             |
| ZM10380 <i>Heterosiphonia</i> sp.          |            |                       | 1               | 1                 | 1             |            | 1           | 1           | 1                | 1             |                    |               | 1       |             |
| ZM10390 <i>Heterosiphonia plumosa</i>      |            |                       |                 |                   | 1             |            |             |             |                  | 1             |                    |               |         |             |
| ZM10500 <i>Brongniartella byssoides</i>    |            | 1                     | 1               | 1                 |               | 1          | 1           | 1           |                  |               | 1                  | 1             |         |             |
| ZM10777 <i>Osmundea</i> sp.                |            |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM10970 <i>Odonthalia dentata</i>          |            | 1                     | 1               |                   |               | 1          |             |             | 1                |               |                    |               | 1       |             |
| ZM11010 <i>Polysiphonia</i> sp.            |            |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZM11370 <i>Pterosiphonia parasitica</i>    |            |                       |                 |                   |               |            | 1           |             |                  |               |                    |               |         |             |
| <b>CHROMOPHYCOTA</b>                       |            |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZR00010 <i>Phaeophyceae</i> sp.            | crust      |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZR02810 <i>Leathesia marina</i>            |            |                       |                 |                   | 1             |            |             |             |                  |               |                    | 1             |         | 1           |
| ZR04320 <i>Halopteris filicina</i>         |            | 1                     |                 |                   |               |            |             |             |                  |               |                    |               |         |             |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

|         | Scientific Name                   | Comment | Port Erin Closed Area | The North Stack | Port Erin Harbour | Fleshwick Bay | The Burroo | Perwick Bay | Perwick Bay | Sugar loaf caves | Steve's caves | Near Steve's caves | Citrine Wreck | Gibdale | Garden Rock |
|---------|-----------------------------------|---------|-----------------------|-----------------|-------------------|---------------|------------|-------------|-------------|------------------|---------------|--------------------|---------------|---------|-------------|
| ZR04390 | <i>Cladostephus sporigiosus</i>   |         |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR04520 | <i>Dictyopteris polypodioides</i> |         | 1                     | 1               |                   |               | 1          | 1           | 1           |                  |               |                    | 1             |         | 1           |
| ZR04570 | <i>Dictyota dichotoma</i>         |         | 1                     | 1               | 1                 | 1             | 1          | 1           | 1           | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZR04780 | <i>Taonia atomaria</i>            |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZR04960 | <i>Desmarestia</i> sp.            |         |                       |                 | 1                 |               |            |             |             |                  |               |                    |               |         |             |
| ZR04970 | <i>Desmarestia aculeata</i>       |         |                       | 1               |                   | 1             |            | 1           |             | 1                | 1             |                    | 1             | 1       |             |
| ZR04990 | <i>Desmarestia ligulata</i>       |         | 1                     | 1               |                   |               | 1          | 1           |             | 1                | 1             | 1                  | 1             | 1       |             |
| ZR05000 | <i>Desmarestia viridis</i>        |         | 1                     |                 |                   |               |            |             | 1           |                  |               |                    |               |         |             |
| ZR06050 | <i>Gelpomenia peregrina</i>       |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR06250 | <i>Chorda filum</i>               |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR06320 | <i>Laminaria digitata</i>         |         |                       |                 | 1                 | 1             |            | 1           |             |                  |               |                    |               |         | 1           |
| ZR06330 | <i>Laminaria hyperborea</i>       |         | 1                     | 1               | 1                 | 1             |            | 1           |             | 1                | 1             | 1                  | 1             | 1       |             |
| ZR06360 | <i>Saccharina latissima</i>       |         | 1                     | 1               | 1                 | 1             |            | 1           |             | 1                | 1             | 1                  | 1             | 1       |             |
| ZR06460 | <i>Saccorhiza polyschides</i>     |         | 1                     | 1               | 1                 | 1             |            | 1           |             | 1                | 1             | 1                  | 1             | 1       | 1           |
| ZR06520 | <i>Alaria esculenta</i>           |         |                       | 1               |                   | 1             |            | 1           |             | 1                |               | 1                  |               | 1       |             |
| ZR06740 | <i>Fucus serratus</i>             |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR06760 | <i>Fucus vesiculosus</i>          |         |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR06870 | <i>Himanthalia elongata</i>       |         |                       |                 |                   | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR06940 | <i>Sargassum muticum</i>          |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZR07160 | <i>Halidrys siliquosa</i>         |         |                       | 1               |                   | 1             |            | 1           |             |                  | 1             | 1                  | 1             |         | 1           |
|         | <b>CHLOROPHYCOTA</b>              |         |                       |                 |                   |               |            |             |             |                  |               |                    |               |         |             |
| ZS02190 | <i>Ulva intestinalis</i>          |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZS02230 | <i>Ulva linza</i>                 |         |                       |                 |                   |               |            |             |             |                  |               |                    | 1             |         |             |
| ZS02400 | <i>Ulva</i> sp.                   |         |                       | 1               |                   |               |            |             |             |                  |               |                    |               | 1       |             |
| ZS02450 | <i>Ulva lactuca</i>               |         |                       |                 | 1                 | 1             |            |             |             |                  |               |                    |               |         |             |
| ZS03510 | <i>Cladophora pellucida</i>       |         |                       |                 |                   |               |            |             |             | 1                |               |                    |               |         |             |
| ZS03850 | <i>Bryopsis</i> sp.               |         |                       |                 |                   |               |            |             |             | 1                |               |                    |               | 1       |             |
| ZS03920 | <i>Bryopsis plumosa</i>           |         | 1                     |                 |                   |               |            | 1           |             |                  |               |                    |               |         | 1           |

Table 1 (cont.): Species list for all sites surveyed around the Isle of Man

## Regeneration - Isle of Man 2014

Emily Priestley

Ever felt you were being watched? A thousand eyes peering at you from deep in the gloom, creatures linked so closely to their evolutionary past that even a fossil from 180 million years ago could barely be distinguished from what I was looking at now. *Pecten maximus* – the giant and rather scrumptious scallop – a frill of beady black eyes peeping from the shells' rim, nestled in the shingle off the south coast of the Isle of Man (Figure 1).



Fig. 1: King scallop *Pecten maximus* (Photo: Paula Lightfoot)

Why was it so exciting to see these creatures?

I thought back to 1983 when, on an autumn evening in Falmouth Bay, led by a marine biologist, we marvelled at the billowing mantle of one such scallop, settled in the maerl, lit by a weak torch beam. In the 90s – collecting food was the culture; in Lyme Bay there seemed an endless supply, until disappointingly we stumbled into the trawl zone, and saw rubble and empty shells, whilst in the distance, trawlers were wrecking the sea bed – sustainability seemed a lost cause, until this dive.

Remembering I had a task to perform, I hoisted my camera and started to take a few shots... and then, like butterflies, I noticed them... swimming upwards, dancing before my eyes, not a few, but dozens of scallops, propelling themselves up from the sea bed and off to another spot. I have never seen so many – granddaddy scallops seated solidly, clammed shut; watchful ones – taking a side long glance or several side long glances before closing in a puff of light sand; active ones, squid-like, landing amongst the pebbles; others festooned in sponges and weed, almost complacent – no,

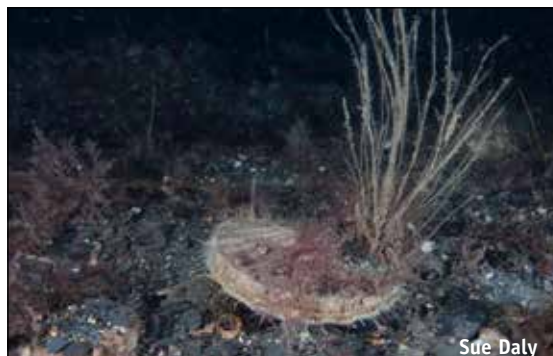
we were not going to take any of them. This is a closed Marine Protected Area (MPA) – since 1989 – and the results are magnificent.

It is hard to believe this area had ever been fished – there was a huge density of life, especially slow growing molluscs, sponges, bryozoans and sea squirts. It was one of the first dives of the week's survey and I didn't know quite how to begin recording for the Seasearch form; it was all a bit overwhelming.

Later in the week we dived another closed MPA which had been left for about a year – it was clear there was damage, with low lying rock scraped smooth, mobile sand in the hollows, a few molluscs taking refuge in amongst the rocks – but the potential was exhilarating. Already powerful kelp forests had taken hold, shoals of Pollack bordered a reef area which was bristling with *Tubularia*, the steady colonisation of the area was guaranteed through protection and will become as marvellous as the last. It has become well known that the larvae of the scallop will travel and settle in other areas benefitting those seeking to fish for them, whilst ensuring the long term health of the sea bed in the MPA – I am glad that not a single trawl will seek to undo what years of protection has achieved.

I would like to celebrate the success of the closed MPAs in the Isle of Man and feel privileged to experience the marine life in this habitat thanks to the dedication and efforts of the Marine Conservation Team at the Wildlife Trust. This best practice example is supported by the long term commitment of the coastal community – it would be great to see this regeneration more widespread across UK.

I look forward to heading back that way and seeing how the new MPA is doing in a year's time ...and in the meantime, just one more scallop photo...



Sue Daly



## Exceptionally large Great Atlantic Scallops *Pecten maximus* (L.) from Irish and UK waters

Declan T.G. Quigley

Dingle Oceanworld (Mara Beo Teo), The Wood,  
Dingle, Co. Kerry

The Great Atlantic Scallop, *Pecten maximus* (L.), is an important high-value commercial species of bivalve mollusc exploited in northern European waters from Norway to the south of Spain. The species occurs from low water down to depths of 183 m, albeit normally down to 46 m (Mason 1983). In Irish and UK waters the fishery occurs in both inshore and offshore waters, mainly off the southeast coast of Ireland, in the southern Irish Sea, around the Isle of Man, in Mulroy Bay, Co. Donegal and in the western approaches to England and

Wales (Gibson 1956; Bruce *et al.* 1963; Minchin 1981; Mason 1983; Gosling 2003; Wilkins 2004; Tully *et al.* 2006). Scallop fisheries in the Irish and Celtic Seas are managed by a minimum legal landing size of 110 mm shell width in ICES areas VIIa and VIId and 100 mm in other areas (EU Council Regulation 1998/850).

Tebble (1976) noted that the maximum shell length of *P. maximus* was 152 mm. However, since the early 1940s, at least eleven specimens exceeding this length have been recorded from both Irish (Minchin 1975, 1978, 1993) and UK waters (Tang 1941), including the largest known European specimen, measuring 214.3 mm, from Irish waters in 1977 (Minchin 1978).

On 24 January 2013, an exceptionally large specimen of *P. maximus* was captured in a 4' dredge by the MFV *Barvic* (S 376) [Skipper/Owner: Mr Sean Power, Springwell, Castletownberehaven, Co. Cork) at a depth of c.6 m, off Carrigfuihane Point (known locally



Fig. 1: Exceptionally large Great Atlantic Scallop *Pecten maximus* (L.) from Castletownberehaven Harbour, Bantry Bay, Co Cork (Photo Declan Quigley)

as Casey's Point) [51° 39.35' N, 09° 50.52' W], Castletownberehaven Harbour, Bantry Bay, Co. Cork (Figure 1). The live weight of the specimen was 810 g and the shell measured 190 mm (width), 155 mm (length), 55 mm (maximum height) and 90 mm (hinge width).

It is interesting to note that 60% of the exceptionally large specimens of *P. maximus* recorded from Irish waters to date were taken in Bantry Bay, and that 70% were taken from shallow (4-10 m) inshore waters. Minchin (1993) remarked that giant scallops are rare in both inshore and offshore waters and hypothesised a genetic basis for their exceptionally fast growth rate compared with local populations. He also suggested that these giant scallops might represent a superior source of broodstock for the development of commercial scallop aquaculture in Ireland. Indeed, experience at the Daithi O'Murchu Marine Research Station (Gearhies, Bantry, Co. Cork) has shown that scallop stocks derived from Castletownberehaven have always outperformed other stocks from around the country in terms of survival and growth rates (Maguire pers. comm.).

### Acknowledgements

I am grateful to Sean and Mary Power (Springwell, Castletownberehaven, Co Cork) for bringing the current specimen to my attention and to Cillian Chute, John Falvey and Christopher Nalty (Sea Fisheries Protection Authority, Clonakilty, Co Cork) for arranging its collection and safe return. I am also grateful to Professor Gavin Burnell (School of Biological, Earth and Environmental Sciences, University College Cork), Dr Richard Fitzgerald (Carna Research Station, Martin Ryan Institute, University College Galway), Julie Maguire (Daithi O'Murchu Marine Research Station, Gearhies, Bantry, Co. Cork), Geoffrey Robinson and Donal Maguire (Bord Iascaigh Mhara, Dun Laoghaire, Co. Dublin) for information about scallop aquaculture in Ireland. I also wish to thank Chilekwa Chisala (Vlaams Instituut voor de Zee, Oostende, Belgium) for her assistance in sourcing references.

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## Assessing the extent of establishment of *Undaria pinnatifida* in Plymouth Sound Special Area of Conservation, UK

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& Keith Hiscock<sup>3</sup>

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Research into non-native marine species has increased over recent years as more species new to Britain arrive and they become a more prevalent part of our wildlife. Whilst some species appear to 'fit' into the existing ecosystem, others may have devastating effects. Their presence not only threatens the functioning of the ecosystem and compromises its 'naturalness' (of importance in nature conservation) but can also impact the local economy through fouling of boats and fish farms for example. The kelp *Undaria pinnatifida* (Harvey) Suringar (Figure 1) has been identified as one of the most invasive seaweeds in the world. It originates from the north-west Pacific, but has spread into the south-west Pacific, north-east Atlantic and northern Mediterranean. It has spread

in European waters to France, Italy, Spain, Britain, Holland and Belgium. However, this information is from 2007 and *U. pinnatifida* has spread even further since. In Britain, it was first recorded in the Hamble Estuary in 1994 and has since spread to various locations along the south coast and northern Irish Sea. In Plymouth Sound Special Area of Conservation (SAC), *U. pinnatifida* was first recorded in 2003. In order to monitor the spread of a non-native species over time, baseline data is of vital importance. Hence, the distribution of *U. pinnatifida* in Plymouth Sound SAC was quantified in 2011 in this study at several locations in the sound from 0 to +1 m relative to Chart Datum.

The map (Figure 2) shows *U. pinnatifida* to be widespread in Plymouth Sound SAC. That spread is likely to be via spore dispersal from established populations but also by recreational boating activities and ferry services. The highest abundance was found on floating pontoons in a marina and it was on such pontoons that it was especially abundant. It was found on rocky shores amongst *Saccharina latissima* and *Saccorhiza polyschides* and, in other studies, a few individual plants have been found on natural bedrock including in the *Laminaria hyperborea* forest near the open



Fig. 1: The kelp *Undaria pinnatifida* in Queen Anne's Battery, Plymouth (Photo: Keith Hiscock)

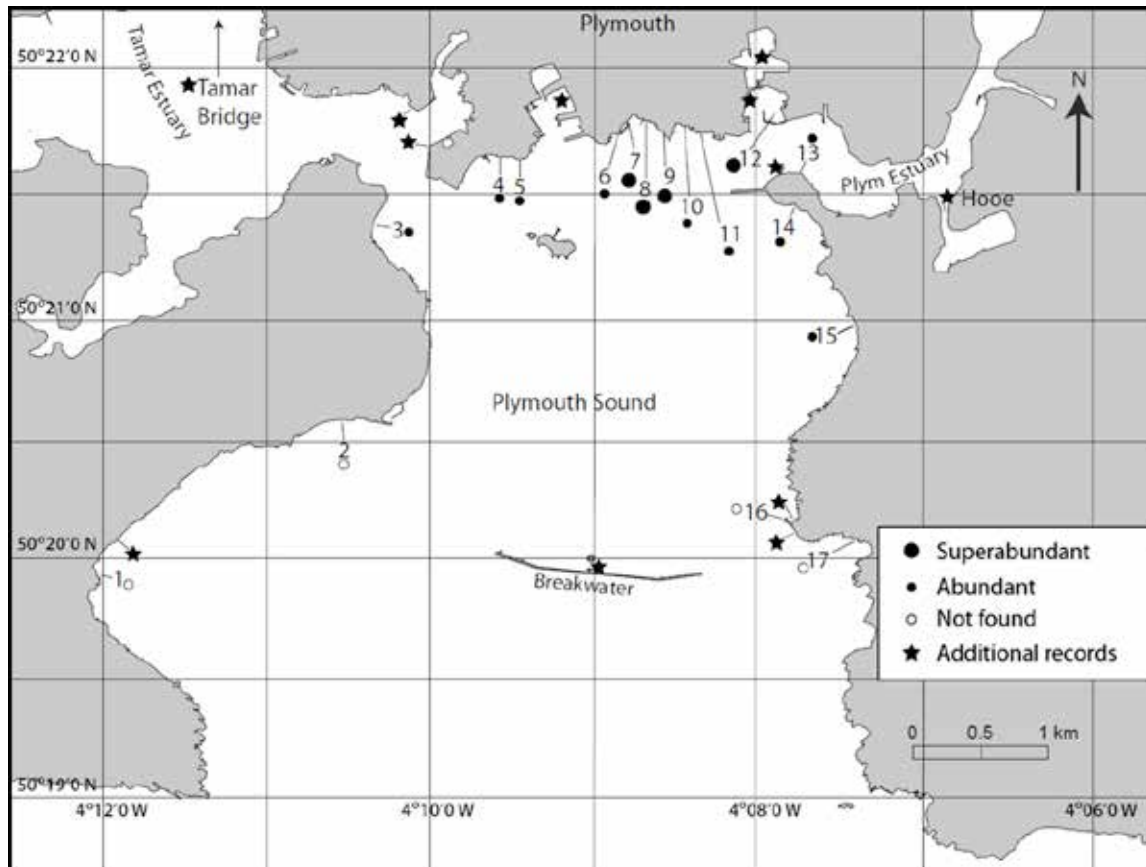


Fig. 2: Map of occurrence of *Undaria pinnatifida* in Plymouth Sound SAC in 2011

coast and amongst *Laminaria ochroleuca* to depths of 7m below chart datum in the Sound. Whilst *U. pinnatifida* was outnumbered by the other native Laminariales and Tilopteridales on upward-facing surfaces, it was nearly as high in abundance on vertical surfaces as all the other species combined. These vertical surfaces especially included harbour walls and the Breakwater Fort.

*Undaria pinnatifida* is well established in Plymouth Sound SAC and is likely to spread even further. By settling in large numbers on vertical surfaces it has the potential to overshadow other species with its large fronds. In addition to our findings, other studies have shown that *U. pinnatifida* has a higher tolerance of turbidity and siltation than native kelps. It is also successful at settling on artificial surfaces, its propagules settle throughout the year and it rapidly colonises recently disturbed areas. This combination of life history and ecological traits explains its dominance wherever it has settled. However, the nature of the wider ecosystem and

biodiversity implications still needs to be evaluated taking into account its apparent ability to become dominant as well as its potential to provide nutritional value and surfaces for epiphytes. A re-evaluation of its distribution and abundance should be carried out in 2016 (five years after the original 2011 survey) to estimate its rate of spread and consider if *U. pinnatifida* is having an adverse effect on native biota.

Full article (in which references to sources of further information can be found):

Heiser, S., Hall-Spencer, J.M. & Hiscock, K. 2014. Assessing the establishment of *Undaria pinnatifida* in Plymouth Sound Special Area of Conservation, UK. *Marine Biodiversity Records* 7: e93.



## **A note concerning the curious case of radial symmetry in the adult echinoderms and bilateral symmetry in the larvae**

*Dr Frank Evans & Professor Peter Olive*

This note concerns the theory of hybridisation and evolution advanced by D. I. Williamson of the Port Erin lab (Williamson, 1992; 2003). His two books on the subject have both been reviewed in the Porcupine Newsletter (Evans, 2003; 2007). Don was an early member, now lapsed, of Porcupine and he is well into his nineties. While his theory has been undermined, the problem of the taxonomic position of the echinoderms remains and here is an alternative suggestion for its solution:

*This account was sent to me by Prof. Peter Olive of Newcastle, to whom I offer my acknowledgement and grateful thanks. He wrote:*

Cite this article as: David, B. & Mooi, R. 2014. How Hox genes can shed light on the place of echinoderms among the deuterostomes. *EvoDevo* 5:22.

He went on, this article made me think of dear Don Williamson and our many discussions about how the odd echinoderms became so odd during their evolutionary history. How did these animals, which have bilaterally symmetrical larvae and which clearly belong in the deuterostome group of phyla, come to have later development dominated by the pentaradial symmetry of the water vascular system? This seemed to be one of the great evolutionary mysteries. Don had suggested that perhaps some kind of gene capture was involved, but he was trying to make sense of the oddness of echinoderms before the days of 'the complete genome' and rapid sequencing of genes. Now the complete genome of an echinoderm is available and many many of the key genes across the deuterostome spectrum have been sequenced. Analysis of this fund of information now makes it possible to think again about why echinoderms have such an odd pattern of development and such an unusual body plan.

The answer it seems lies, not just 'in the genes', but more specifically in the Hox genes. When I first started teaching developmental biology back in the dark ages, around 1970, very little was known about the genetics of development, but great strides were being taken and the years that followed saw an explosion of information. If I was to continue teaching animal development, I had to incorporate more and more molecular biology, and the emergence of the hox genes story provided me with an ideal handle for teaching the subject to our marine biology and zoology students. I have now retired from the fray but still find it fun from time to time catch up on the latest developments, and I thought you would be interested in this example relating to the oddness of echinoderms and the evolutionary history of the deuterostomes to which they belong.

David and Mooi provide an excellent overview of the discovery of the hox gene system and provide us with an in depth analysis of all the data that has accumulated about the structure of these genes and their paralogous relatives in the deuterostomes. The hox genes are members of a class of DNA binding genes deeply involved in body patterning. Homeotic gene mutations in the fruit fly *Drosophila*, for example, have been known since the 1920's. Mutations at these loci had the most dramatic effect on bodily organisation. Mutations of Antennopodia gene had the dramatic effect of causing a fully formed leg to develop where an antenna would normally appear. Other homeotic genes caused equally dramatic changes, the development of a wing for instance instead of a haltere. The discovery by Levine during the 1980s that such genes share a highly conserved sequence of base pairs - the homeobox - coding for a conserved sequence of amino acids - the homeodomain - a DNA binding region in the gene product, opened up the way for isolating and sequencing similar genes across the animal kingdom. This in turn led to the quite unexpected, and still remarkable discovery that this class of genes is involved in anterior/posterior patterning throughout the bilateria. Even more unexpected was the finding that the sequence of the genes in the DNA molecule, mirrors both the temporal appearance of the

gene products during development and the anterior/posterior organisation of the animal. The 3' to 5' sequence of the known hox genes and parahox genes in the genome is mirrored by temporal and structural colinearity. The genes towards the 3' end of the DNA strand are transcribed before those more towards the 5' end, and, the gene products RNA and ultimately proteins are located in more anterior zones of the embryo. Across the animal kingdom (in virtually all bilateria) the same pattern of colinearity at the molecular, temporal and structural levels was found.

So what about our friends the echinoderms in which a seemingly bilaterally symmetrical larvae with a clear anterior/posterior axis (the blastopore being posterior), gives rise to a pentaradial adult structured around the water vascular system?

David and Mooi put this question in the context of a comprehensive analysis of hox gene organisation in the Deuterostomes as a whole, identifying key steps in the evolutionary history of the group. They also summarise the data which suggests that in the line leading to echinoderms a major chromosome re-arrangement occurred, a translocation of genes which resulted in a number of the more 'anterior' hox genes (hox 1-5) being translocated to a position more toward the 5' end of the hox gene cluster than is normally the case. They also deduce that this translocation occurred prior to the subsequent loss of hox 4 in the line leading to the crown echinoids. Normally in bilateria anterior hox genes are expressed earlier than, and occur more anteriorly in the body than, the hox genes having a more 5' position in the genome. David and Mooi also point out that the later expressed 'posterior' genes are the dominant ones. Because of the translocation, the originally anterior hox genes, which now express later, may become more dominant in the patterning of the echinoderm embryo, and this may have had profound effects on the subsequent evolution and ultimately the morphology of the group. In echinoderms the more anterior hox genes are now transcribed in a novel posterior and more dominant position, associated with what is to become the water vascular system. The authors put

forward a hypothesis to be tested (science must involve a little speculation to move forwards) that this translocation frees the Hox 1-3 genes to be more dominant and allows the full expression of the pentaradial symmetry of the water vascular system with which they are associated. Thus the translocation event allows the expression of the pentaradial symmetry of the echinoderms without revealing the origin of these structures. The novel positioning of the genes in the echinoderm genome, allows anterior hox genes to organise the pentaradiality of the echinoderm body pattern, which looks like a novel and very peculiar feature, but according to this hypothesis is based on a fuller expression of pre-existing genes.

Reading this made me think about Don and the theories he found so hard to publish and which proved in the end to be incorrect, but what does that matter in the general scheme of things? His ideas were interesting enough at the time and certainly had the effect of making people think about a deep seated problem.

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## Snorkelling in Orkney .... an exciting addiction

Penny Martin



Fig. 1: Map of the Orkney Islands

Snorkelling in Orkney ...Why do I do it? What do I see? These are questions that I am frequently asked.

Orkney (Figure 1) is well known as a scuba diving destination, mainly to explore the wrecks, but it is not widely recognised for its snorkelling opportunities.

I love the sea and was spending much of my time either sailing or walking on the beaches and cliffs in Orkney. In 2010 a friend persuaded me to give snorkelling a go. Little did I realise what it would lead to! I am now a keen snorkeller, diver and amateur marine recorder and have been asked to tell of my journey:

To be quite honest, as I stood on a pebbly beach alongside the concrete blocks of Barrier 2, looking at the brown seaweed strandline reaching to the grey surface of the sea, I had little expectation that I would enjoy it or be tempted to invest in my own kit.

However, the moment I put my head underwater I felt I was in a different world. The colours startled me: vivid green *Ulva* floating above

the pink *Corallina* covered rocks, stripey dahlia anemones in the sandy bottomed caves, red squirts and orange sponges scattered over the concrete blocks. Small spindly spider crabs threatened me with their minute claws, tiny juvenile flat fish skittered over the sand then stopped and instantly disappeared, camouflaged against the sandy bottom. And I was still in less than 150 cm of water! I had not realised there was so much to see.

Two hours later, I emerged from the water, hooked and already planning my next snorkelling expedition. So fascinated and intrigued am I by the varied and beautiful habitats populated by the unexpected wealth of marine life that live in shallow water around the Orkney coastline that since then rarely a weekend goes by without me getting in the water. In the summer I even keep my kit in the back of my car so I can go in after work in the long light evenings.

Orkney has many varied marine habitats within easy reach of a snorkeller. Sandy bays, rocky reefs, kelp forest and park, mixed algae, eel grass beds, *Codium* and plenty of maerl. It is easy to access high-energy Atlantic coasts, sheltered Scapa Flow, geos, bays, harbours, old piers and artificial reefs created by the Churchill Barriers and blockships. The island location means that we have coasts facing every point of the compass so there is nearly always somewhere sheltered from the wind.

At first, I was content to swim around exploring and looking for the easily recognisable crabs, starfishes and urchins amongst the "gardens and forests" of seaweed. I marvelled at the many legs of the urchins, the delicacy of the different jellyfish, watched the cheeky antics of the hermit crabs, compared the different anemones, came face to face with conger eels in the "caves" between the concrete blocks of the Barriers, discovered nudibranchs ..... but then my questions started.

What was I seeing? What were they called? Were they animal or plant? I did not have a clue how to identify them. It was difficult to accurately remember descriptions of so many different animals and I didn't want to take them out of the water. So I started underwater photography - another steep learning curve.

This meant I could examine the photos closely, try to look “things” up in marine identification books and also post the photos on Facebook. This was the breakthrough. I found there were many specific Facebook marine identification groups and pages. People from all over the UK (and the world) have been very helpful and patient, commented on my photos, answered my queries, helped with identification and shared a wealth of information about the organisms. I very much appreciate their generous help.

The more time I spent in the water, the more I saw. The different species of crabs and brittlestars, the many colours of scorpion fish, the cheeky juvenile lump sucker which attached itself to my glove and the bright red “brick shaped” adult lurking in the kelp. The beauty of the scallops which are so much more attractive alive in the water than on a plate as a restaurant starter.

Then I started seeing sea slugs and learnt they were called nudibranchs. I was surprised. Compared to the mundane garden slug, many “nudis” are ornate and brightly coloured. The site where I have seen most is down an old flying boat launch ramp near a ferry terminal at Houton. I call it our “industrial” site. I have now seen more than twenty different nudibranch species there, sometimes in great numbers. It taught me that one can not judge a place without going in and looking, for underneath the surface can lurk surprising variety and numbers of species.

Next I discovered Seasearch ...but could I do it as a snorkeller? I joined an Observer course in Orkney with scuba divers. Initially I was told I could do the theory but not the practical part of the course but after some discussion, it was agreed that I could do both theory and practical so I snorkelled with them at a shallow eel grass site and then while they dived deeper, I snorkelled along a floating pontoon which was a feast of anemones, squirts, sponges, dead man’s fingers, worms, barnacles, brittlestars and sea slugs on the mussel bed attached underneath.

I took along a video clip to show the tutors. It was of a “weird” spectacle that I had seen while snorkelling the evening before. While exploring an eel grass bed, hundreds of strange

“angels” were bobbing up and down using their “capas” as wings. Seasearch leader Chris Wood promptly enlightened me that they were *Akera bullata*; a weird and wonderful species of sea slug that I still delight in seeing.

I started to learn the difference between a sponge and a squirt, I realised that hydroids and bryozoans are not plants and that species can have very specific habitats or food, for example *Hydractinia echinata* and *Cuthona nana*, both of which I have seen in Orkney. I found snakelocks anemones in one of the eel grass beds, possibly one of the northerly locations? I have now completed a Seasearch Surveyor course although I am well aware that I still have much to learn.

I had by then started a “Snorkel Orkney” Facebook page where I and other snorkellers share photos with friends and family who wish to see the marine life in Orkney waters. Many people have helped me learn more by posting positive comments, information and identification. My photo of a “wiggly mystery swimmer” glimmering with bioluminescence posted on Facebook was identified within three minutes by an Italian marine biologist as the marine planktonic polychaete worm *Tomopteris* which is usually found in deep water.

Interestingly I find that photos of common species are often more appreciated than the rarer species. The most popular has been a live *Trivia monacha*, the well loved “groatie buckie” (cowrie) which is deemed to bring one luck if the shell is found on an Orkney beach.

A memorable few weeks in July 2013 brought a swarm of thousands of long strings of salps into the Orkney coast accompanied by hundreds of jellyfish, *Aequorea forskalea*, *Cyanea capillata* and *C. lamarckii*, *Pelagia noctiluca*, *Aurelia aurita*. It was the most amazing sight. I also saw *Lampea pancerina*, a comb jelly whose main food is salps. There have been “jellyfish soup” occasions, mainly due to comb jellies, *Pleurobrachia pileus* and *Bolinopsis infundibulum*, various species of “cross jellies” such as *Cosmetira pilosella*, *Staurophora mertensii*, *Clytia hemisphaerica* and the hydromedusae, *Sarsia tubulosa*, *Neoturris pileata* and *Leuckartiara octona* are sometimes present.



There are several sites where I find stalked jellyfish at certain times of year. Previously I wasn't aware that they existed but we have found 4 different species at different locations in Orkney: *Haliclystus auricula* and *H. octoradialis*, *Lucernariopsis campanulata* and *Craterolophus convolvulus*. On request, we have sent some specimens of *Haliclystus auricula* to The Smithsonian Institute for DNA analysis and are awaiting results.

All in all, I think snorkelling is a way to easily see many marine species and sometimes in great numbers. Something that started as a casual recreation has evolved into a passion and I snorkel all through the year. In summer the water reaches 12/13°C and I frequently stay in for 2 hours or more but temperature drops to 5 degrees in Feb/March so I can only manage an hour.... but I am always disappointed to be getting out.

I have had the joy of swimming with seals, watching shags diving and fishing underwater, have been mesmerised by thousands of horse mackerel swirling round me, counted hundreds of sea hares gathering together to lay eggs. I have been lucky enough to see sea spiders mating and watched Little cuttles *Sepiola atlantica* catching and eating prawns. I can now tell the difference between nudibranch and saccoglossan, plaice from dab, two spot from painted goby, painted from purple topshell ..... but I still have so much to learn!

Snorkelling is not "poor man's diving" or something one only does in the Mediterranean when on holiday. I also scuba dive which I enjoy but snorkelling gives one a different freedom and there are specific species and habitats that I only see snorkelling. I believe one can have the best of both worlds by doing both!

Thank you to all who have helped me start this fascinating journey exploring the shallow underwater world of the UK. I look forward to continuing to explore and learn about our wonderful UK marine life and habitats.

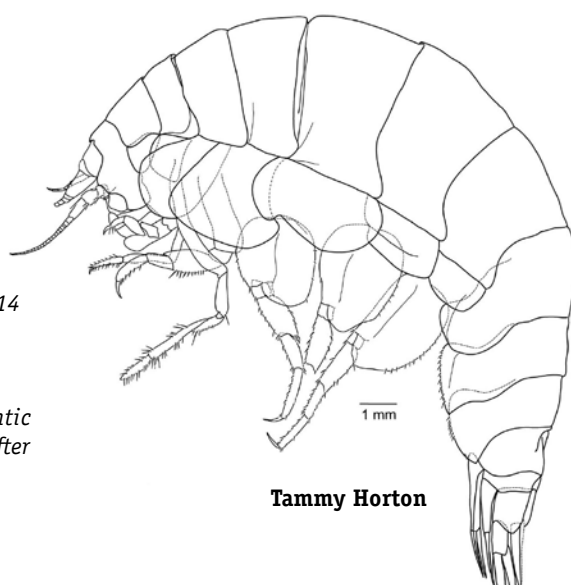
Figure 2 (right):

- a. Fishing shag: Houton, Scapa Flow
- b. King and Queen, *Pecten maximus* and *Aequipecten opercularis*: St Peters Pool, Deerness
- c. Algae
- d. Akera Bullata: St Peters pool, Deerness
- e. West coast walk
- f. Trivia Monacha, "Groatie Buckie": Holm of Houton, Scapa Flow
- g. Pelagia noctiluca: Brough of Birsay
- h. Lightbulb sea squirts, *Clavelina lepadiformis*
- i. Tomopteris sp.: Barrier 1
- j. *Haliclystus auricula* x 10: Barrier 2
- k. Juvenile skate
- l. Sea gooseberry, *Pleurobrachia pileus*: The Lash, Scapa Flow
- m. *Aequorea forskalea* with salp: Yesnaby, West mainland, Orkney
- n. Underside of a juvenile skate
- o. *Sepiola atlantica*: Barrier 2

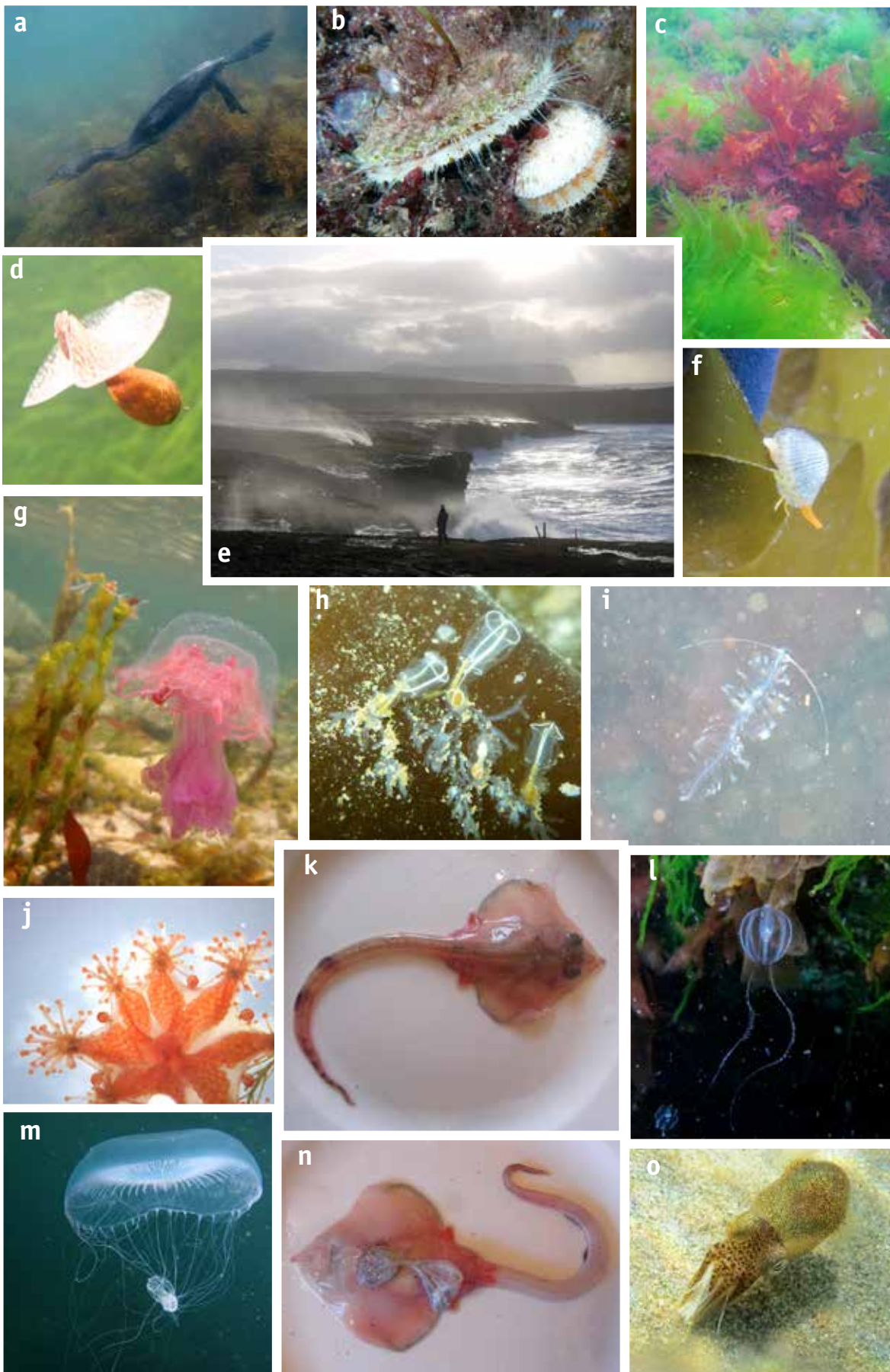
*Cyclocaris franki* Horton & Thurston, 2014

Crustacea: Amphipoda

A deep water species from the Atlantic Ocean, found in 1203–2059 m. Named after Tammy's son, Frank.



Tammy Horton



## Managing native oysters is not just about oysters...

Cass Bromley<sup>1</sup> and Ciarán McGonigle<sup>2</sup>

<sup>1</sup> IBIS Project/ Queen's University Belfast

<sup>2</sup> Loughs Agency

IBIS is a partnership of the Loughs Agency, University of Glasgow and Queen's University Belfast and is funded by the EU's INTERREG IVA Programme, with additional support from the Ireland and Northern Ireland Governments and the University of Glasgow. The project is to deliver a wide range of freshwater and marine doctoral and masters research, continual professional development courses and knowledge transfer workshops (for further information please visit [www.loughs-agency.org/ibis](http://www.loughs-agency.org/ibis))

In the Society's 2013 newsletter (Vol. 34: 49–54), Cass discussed the IBIS Project's research on the native oyster, *Ostrea edulis*, fishery in Lough Foyle, located on the border between Northern Ireland and the Republic of Ireland. For the 2015 Bulletin, given the broad ranging interests of the Society's members, we decided to write about the wide range of associated organisms (and inorganic items) which are encountered during everyday management of the oyster fishery.

Oysters are increasingly being recognised for their environmental value, both as ecosystem engineers and as providers of Ecosystem Goods & Services (EGS). A single oyster can support a wide range of associated organisms (Figure



Fig. 1: Live oysters and oyster shell can provide a substratum for a large number of associated epifauna.

1). An extensive bed or reef can therefore be of high importance for enhancing biodiversity.

Benthic filter feeders associated with native oysters are also of interest to the fishery's managers. Carrying capacity modelling is currently being carried out for Lough Foyle. As potential competitors of bivalve molluscs, all filter and suspension feeders need to be taken into account to produce the most accurate model possible and ensure that estimates of capacity to cope with potential increases in the native oyster population or aquaculture of *Crassostrea gigas* and *Mytilus edulis* are realistic. We find, for example, high abundances of the ctenostomate bryozoan *Alcyonidium diaphanum* (bubble weed, rat's tails or sea chervil). This species is the subject of ongoing investigations to ascertain whether the large volume may be having negative effects on the native oyster population. It also interferes with dredge efficiency during harvesting of oysters at the start of the fishing season (Figure 2).



Fig. 2: The bryozoan, *Alcyonidium diaphanum*, can be highly abundant in the lough and can make up a large part of dredge hauls at certain times of the year.

Filter feeders, including conspecifics, can be important predators of bivalve larvae and these may therefore have detrimental effects on successful recruitment of new cohorts into the fishery. Many of these species also have planktonic larval dispersal stages and exhibit similar requirements for habitat and suitable settlement surfaces to those of *O. edulis*, creating spatial competition. Many of these "fouling organisms" have cycles of settlement so that, in one year, barnacles (e.g. *Chthamalus* sp. and the introduced *Austrominius modestus*) may be the most abundant, in another keel





Fig. 3: A very large barnacle-encrusted berried female *Necora puber* (velvet swimming crab) collected in the oyster dredge.

worms (the polychaete *Pomatoceros triqueter*), and in another ascidians such as *Ascidella scabra* and *Dendrodoa grossularia*.

In addition to epifauna, *O. edulis* also supports organisms that bore into the shell – the poriferan, *Cliona*, and the polychaete *Polydora*. These can weaken shells and leave the oysters open to ingress of pathogens and predators, as well as affecting their suitability for market when harvested.

Benthic macrofauna such as crabs (e.g. *Carcinus maenas*, *Cancer pagurus*, *Necora puber*) (Figure 3), gastropod molluscs such as whelks *Buccinum undatum* and oyster drills *Ocenebra erinacea*, and starfish *Asterias rubens* are potential predators of oysters, especially recently settled juveniles or “spat”. The sunstar *Crossaster papposus* is a predator of *A. rubens* and therefore may be a “friend” to oyster and mussel fishers (Figure 4). Many of these species are also target species for other fisheries.



Fig. 4: Sunstar (*Crossaster papposus*).



Fig. 5: Oyster beds provide refugia and habitat for numerous species of fish, including dragonets, cling fish and pipefish.

Oyster beds can act as nursery areas or refugia for fish species. The shell cultch matrix combined with associated seaweed, bryozoans and hydroids provide food and shelter for fish such as common goby *Pomatoschistus microps*, Pogge Agonus *cataphractus*, dragonet *Callionymus lyra*, sea snail *Liparis liparis*, clingfish *Diplecogaster bimaculata* and sea scorpion *Taurulus bubalis* (Figure 5). Juvenile flatfish such as sole *Solea solea* and plaice *Pleuronectes platessa* utilise these oyster beds at a critical stage in their life cycle when protection from predators is of the upmost importance. *Ostrea edulis* is increasingly also being subject to conservation protection legislation (e.g. UKBAP, OSPAR, EU Habitats Directive). We also have to consider other protected species in the lough. Seagrass *Zostera marina* is present in some areas and ocean quahog *Arctica islandica*, the focus species for a proposed MCZ in Belfast Lough, is present, albeit in lower densities in Lough Foyle.

The potential for the introduction of invasive species is also a concern for shellfish managers and producers in Lough Foyle. We therefore need to be able to reliably identify invasive species, such as the invasive colonial ascidian, *Didemnum vexillum*, and macroalga, *Sargassum muticum*, which may have detrimental effects on shellfish resources. The Loughs Agency and fishermen also keep on the alert for the slipper limpet, *Crepidula fornicata*, which arrived in





Fig. 6: Oyster spat settled on a piece of plastic.

Belfast Lough several years ago. This species is a competitor of commercial bivalves and can rapidly invade and alter oyster and mussel beds.

On occasion we encounter exotic visitors in the lough. This year a juvenile sunfish *Mola mola* appeared. We also sometimes encounter “novelties”. In 2013, we dredged up a crisp packet covered in barnacle spat – a classic case of “larval desperation”. Similarly, in 2014, we found a native oyster spat settled on plastic (Figure 6). Even discarded fishermen’s oilskins can be a settlement surface for benthic organisms – we dredged up one set covered in plumose anemones *Metridium senile* and dahlia anemones *Urticina felina*. Retrieving



Fig. 7: Tree trunk found caught up in lines when retrieving experimental pots in September 2014.



Fig. 8: Aircraft wreck on the east coast of the lough.

store pots from an experiment, we wondered why one string of pots was requiring rather more effort than usual, until it surfaced with part of a tree trunk wrapped in the rigging (Figure 7). One of the strangest finds was the head of a vacuum cleaner dredged up as we were carrying out habitat remediation works.

Whilst carrying out monitoring surveys of intertidal mussel beds and feral Pacific oyster, *Crassostrea gigas*, it is not unusual to literally stumble across artefacts from World Wars I and II. The Foyle area was a major centre of activity, especially in WWII, as it was the first landfall for the Atlantic convoys and was the site of the surrender of the German U-Boat fleet at the end of hostilities. There are consequently numerous remains of structures, wrecks of aircraft, and ordnance around the shore (Figure 8) and several aircraft and shipwrecks in the subtidal. One wreck is a schooner dating back to the 1800s, which shows up on the depth sounder as three peaks of sediment built up around the masts.

All of this goes to show that working with oysters also means working with taxa ranging from sponges to *Homo sapiens*, and you never know what is going to turn up next.

## Intertidal Discovery – unlocking the secrets between the tides

Caz Waddell & Martin Goodall

### *Intertidal Discovery Project*

In July 2012, the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS) launched a fantastic new project called “Intertidal Discovery”. The aim of this project was to survey and map all the habitats found between the tides on Cornwall’s rugged north coast. Results have now been published and are already being put to good use to better conserve and manage our seas.

Over a two-year period staff and volunteers surveyed almost 32 million m<sup>2</sup> of intertidal habitat, along an area stretching from Marsland Mouth on the Devon border, to Lands End in the far west. Surveys were conducted using recognised scientific methodology established by the Joint Nature Conservation Committee (JNCC) and Countryside Council for Wales [now Natural Resources Wales]. Surveys



Fig. 1: Surveying the shores by foot, boat and kayak (Photos: Caz Waddell)

were conducted of over 450 km (280 miles) of the north coast’s headlands, coves, inlets and bays; 51% of which was surveyed on foot, 40% by boat and 9% by kayak (Figure 1).

Project results are now available via a new website and interactive online map which can be viewed at [www.intertidaldiscovery.org.uk](http://www.intertidaldiscovery.org.uk). We have only just started to analyse this incredible resource, and given the level of detail we envisage this to be a lengthy process! However, an initial view has revealed superb examples on our Cornish shores of some of the more uncommon intertidal habitats, such as intertidal under-boulder communities and honeycomb worm reefs (Figure 2).

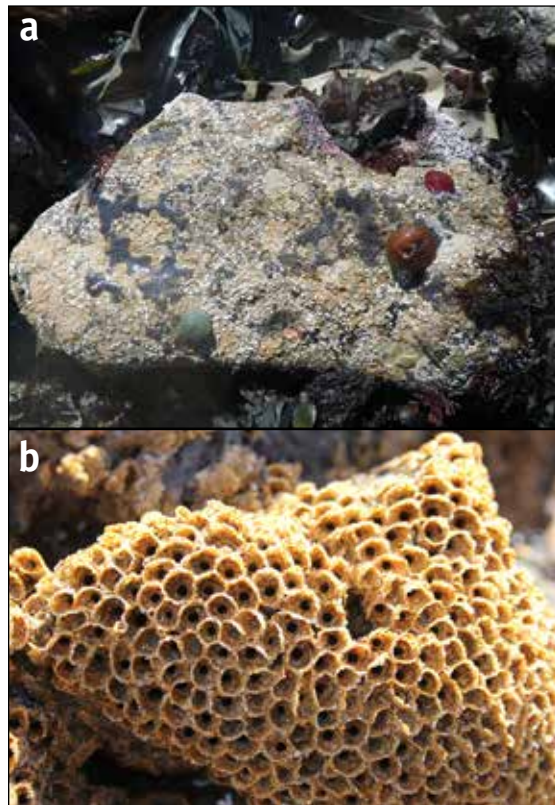


Fig. 2: a. Intertidal Underboulder Community (Photo: Caz Waddell); b. Honeycomb worm reef, *Sabellaria alveolata* (Photo: Alan Rowland)

If you would like to learn more you can view the mapping portal at [www.intertidaldiscovery.org.uk/HabitatMap](http://www.intertidaldiscovery.org.uk/HabitatMap) (Figure 3) and interactively explore all the habitats along the north coast, or perhaps zoom in to your local beach!

The website also contains links to informative resource guides produced by the project. This



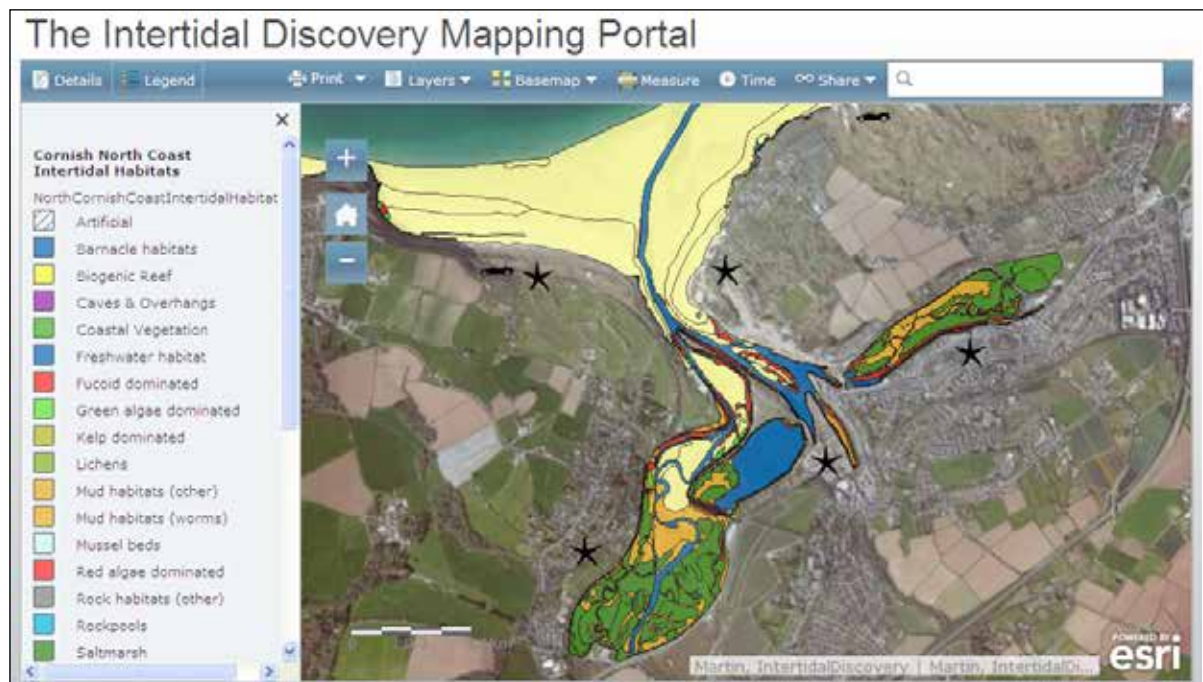


Fig. 3: Interactive online habitat map, available at [www.intertidaldiscovery.org.uk/habitatmap](http://www.intertidaldiscovery.org.uk/habitatmap)

includes a series of over 100 habitat (biotope) guides (Figure 4) detailing species of interest, ecological designation and conservation status for each habitat; and a separate series of over 70 beach guides (Figure 5) with facts and figures, maps, and a detailed breakdown of the habitat types in each location.

Having an accurate baseline dataset of where specific habitats are located along the Cornish coast will be an invaluable tool to use in the conservation of the local marine environment in the South West. It will also enable priority areas to be identified for conservation action, and is already contributing to this process by providing evidence to support

the second tranche of Marine Conservation Zones to be designated by the government next year. Results are also freely available to any individual with an interest in marine conservation.

More information about the Intertidal Discovery Project can be found at [www.intertidaldiscovery.org.uk](http://www.intertidaldiscovery.org.uk)



#### The Intertidal Discovery Project in numbers:

- 31,899,064 m<sup>2</sup> of intertidal habitat surveyed (3,190 hectares).
- Every major outlying rock and island within 1 mile of the coast included.
- Extending to the tidal limits on the 3 major estuaries (Camel, Gannel and Hayle).
- 111 different intertidal habitat types (biotopes) recorded.
- 32 Biodiversity Action Plan (BAP) and/or Features of Conservation Interest (FOCI) habitats.
- Approx. 1,200 ha of rocky habitats; of which 6.5% is BAP habitat (18 BAP types).
- Approx. 1,850 ha of sediment habitats; of which 24% is BAP habitat (14 BAP types)
- Detailed species records of over 200 intertidal species, including non-natives.

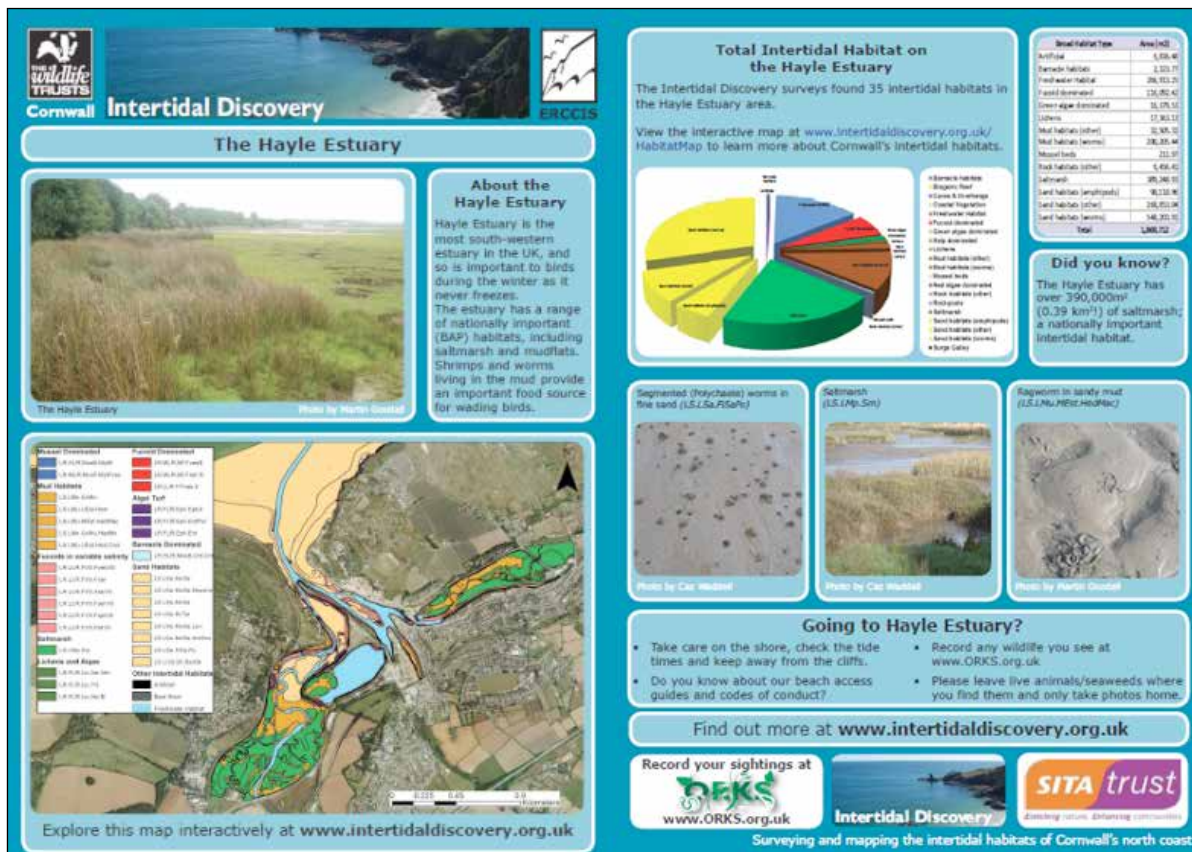
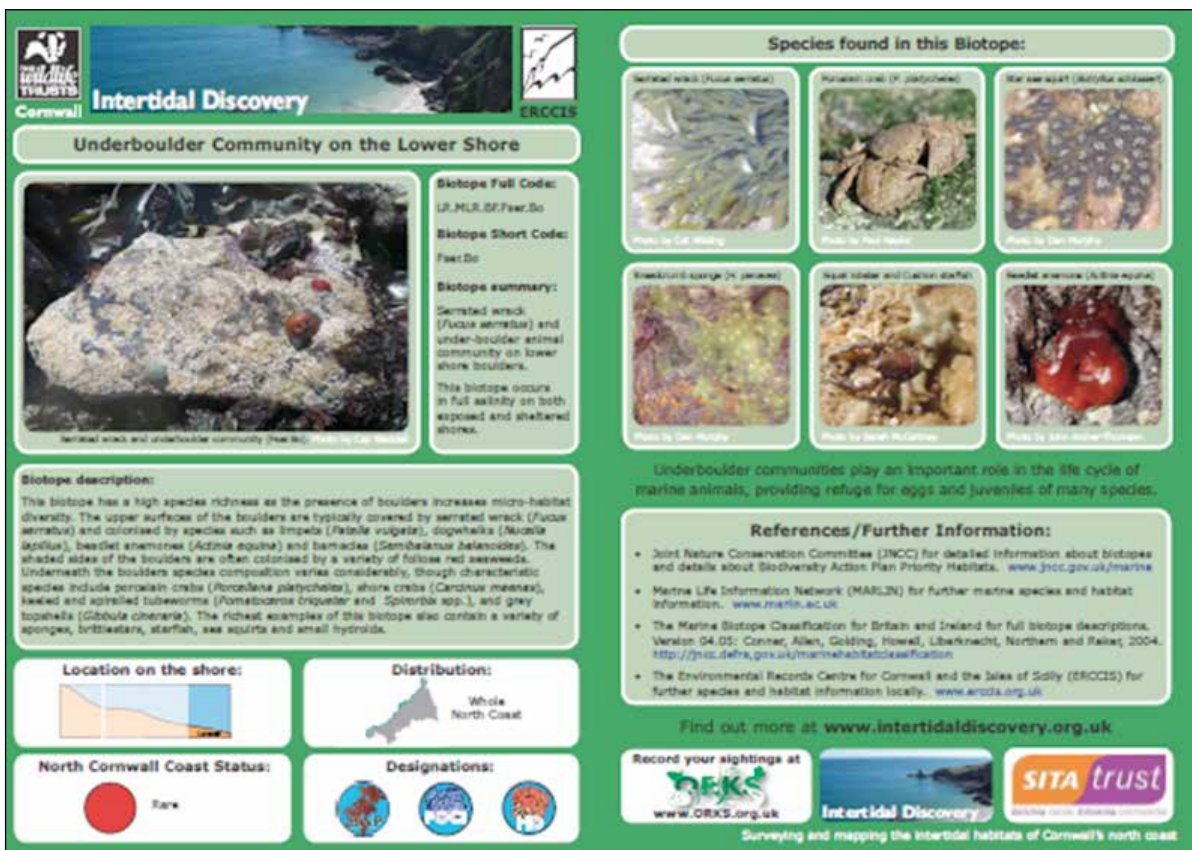


Fig. 4 (top): Intertidal Discovery Project resource guide to biotopes

Fig. 5 (below): Intertidal Discovery Project resource guide to local beaches





## Investigations of the Black Lugworm (*Arenicola defodiens*) in South Wales

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### Introduction

Many people are probably unaware that there are two species of lugworm to be found around the UK: the blow lug, *Arenicola marina* (Linnaeus, 1758), and the black lug, *Arenicola defodiens* Cadman & Nelson-Smith, 1993. Described only relatively recently, although recognized by fishermen as different for long before that, *A. defodiens* was described as a separate species in 1993 from shores in South Wales. The two species are, in fact, easy to tell apart by morphological characters and the shape of the surface cast.

*Arenicola marina* is by far the more common of the two species and is widely distributed around the UK, found on many sandy to muddy shores, particularly in estuaries, from high shore down to the subtidal. *Arenicola defodiens*, however, is less common, only recorded from a few localities around England, Wales and Ireland, usually only from the low shore and shallow sub-tidal and never in estuaries. Shores with black lug tend to be more exposed and, where they occur with the blow lug, the black lug is always found lower down on the shore. As the black lug is a larger animal than the blow lug, it is more sought after by fishermen for bait.

The two species burrow differently with *A. marina* creating a U-shaped burrow with a messy surface cast and separate feeding depression close by. Animals can burrow fast and the depth of the burrow can vary but they are usually accessible by digging with a garden spade. *Arenicola defodiens*, however, creates a J-shaped burrow almost vertically beneath the neatly coiled cast within which, hard to discern, is a small feeding hole. *A. defodiens*



Fig. 1: Chloe using a bait pump at Rest Bay, Porthcawl

burrows very deeply and is only found from around low water down and it is extremely difficult to collect specimens with only a spade. Instead, a bait pump is the best and most successful method for obtaining them although this requires some practice (Figure 1)! Differences between the casts are so marked and consistent that the two species can be reliably identified by the surface appearance alone (Figure 2).



Figure 2: A. neatly coiled cast of *A. defodiens*, no separate feeding depression; B. messy cast of *A. marina* with separate feeding depression nearby.

In 2013, while identifying some black lug, it was found that some of the description in Cadman & Nelson-Smith's paper was not always easy to interpret and some of it is

inaccurate. In 2014, the project was developed into a 4-week Nuffield studentship to clarify the differences between the two species. The methods included comparing the 2 species both alive and dead, using morphological and molecular characters.

Cadman & Nelson-Smith (1993) used several localities for collecting what became the type specimens of *A. defodiens*. In a later paper, Cadman (1997) further described the distribution of both *A. defodiens* and *A. marina* with respect to each other on several other South Wales localities. *A. defodiens* was collected from both Whiteford Burrows, Gower (type locality) and Rest Bay, Porthcawl. Oxwich Bay, Gower was scanned for signs of *A. defodiens* as Cadman (1997) recorded it as present there, but none were detected although *A. marina* surface casts were abundant. Unfortunately, the sand was very dry and hard and no specimens were obtained. *Arenicola marina* was collected from West Aberthaw in the Severn Estuary, as it was recorded by Boyden *et al.* (1977) as a location where *A. marina* was 'abundant'. Although there was no previous record of *A. defodiens* at this site (it was not described at the time of Boyden *et al.*'s paper and Cadman did not look that far east), a single distinctive cast was observed although again, no specimen was obtained. No additional specimens of *A. defodiens* were available from the collections of National Museum Wales except for those collected in 2013 (Whiteford Burrows). However, there were several specimens of *A. marina* available from other locations around the UK.

## Methods

Previously, in 2013, specimens of *A. defodiens* were collected from Whiteford Burrows, Gower using an Alvey bait pump. Only black lug are found at this site and they are highly abundant, present from midshore to below low water mark in soft muddy sand. Specimens were initially maintained alive in seawater and taken back to the laboratory to be relaxed in 7% magnesium chloride solution and then photographed before being either fixed in 4% formaldehyde, followed by 80% industrial methylated spirits a couple of days later, for morphological analysis, or 100% ethanol for

molecular analysis. Further specimens of *A. defodiens* were collected in 2014 from sand at Rest Bay, Porthcawl using the same methods for both collection and preservation.

Also in 2014, specimens of *A. marina* were collected from West Aberthaw where the species was abundant in sand at high water. Samples were obtained by digging with a garden spade and animals were treated as for *A. defodiens*.

Morphological work was carried out using compound and stereo microscopes to investigate both macro- and micro- differences in external and internal anatomy. Molecular work used the polymerase chain reaction (PCR) method to first isolate and then replicate the cytochrome oxidase 1 (CO1) and 16S mitochondrial genes before sequencing.

## Results

The same morphological characters investigated by Cadman & Nelson-Smith (1993), as well as some newly observed characters were compared for both species:

### *Internal characters*

The genus *Arenicola* is delineated from *Abarenicola* (different genus, same family, not present in the UK) by animals having a single pair of oesophageal sacs as opposed to multiple pairs. We investigated the size and location of these sacs in each species but could not find a significant difference.

### *External characters*

### Ring formula

This is the number of rings (annulations) between the bristles on each of the first 3 chaetigers (segments with bristles). This is the easiest and most consistent character to separate the species. The formula for *A. defodiens* is: 2-2-4; the formula for *A. marina* is 2-3-4 (Figure 3).

### Proboscis

All lugworms have an eversible proboscis for feeding that is covered in papillae. Both *A. marina* and *A. defodiens* have 2 types of papillae on the proboscis, large papillae found proximally (closest to the body) and numerous small papillae distally (furthest from the

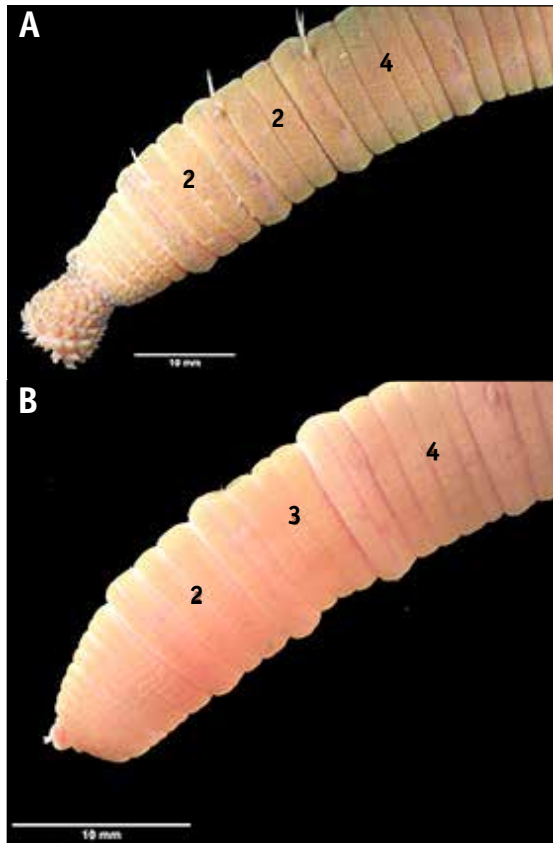


Figure 3: Illustration of ring formula A. *Arenicola defodiens* (proboscis partially extended); B. *Arenicola marina* (proboscis retracted).

body when proboscis extended). There was no difference between species regarding the small proximal papillae, however in *A. defodiens*, the large papillae had hard chitinous-looking black tips although these could detach easily (Figure 3A). Colour of the proboscis and papillae also varied between species and was inconsistent.

### Gills (Branchiae)

Both species have 13 (occasionally 14) pairs of external gills from either chaetiger 7 (occasionally 6) to chaetiger 19. *Arenicola defodiens* gills have more and longer gill stems than *A. marina* and more side branches which are 'tree-like' in appearance as opposed to 'bush-like' in *A. marina* (Figure 4). Both species had a 'palmar membrane', a thin flap connecting all of the gill stems together.

### Parapodia

Parapodia on lugworms are lateral projections from the body wall that bear chaetae (bristles). They consist of an upper (notopodium) and a lower part (neuropodium). The notopodium is a retractable lobe that bears hair-like chaetae while the neuropodium is a long, cushion-like structure within which sit numerous hooks. No difference was found in the form of either type of chaetae between the species or in the shape of the lobes. However, in *A. defodiens*, the anterior face of the notopodium had dark shading around the outer edge (Figure 4A), present both before and after fixation. The shading was not present in *A. marina*.

### Colour

*Arenicola defodiens*, as it's common name 'black' lug implies, tends to be a darker, as well as larger, more robust-looking species (Figure 5). Colour varies from black to dark brown, even after preservation, although paler varieties were observed, and the tail is often yellowish. *Arenicola marina* is a paler, thinner

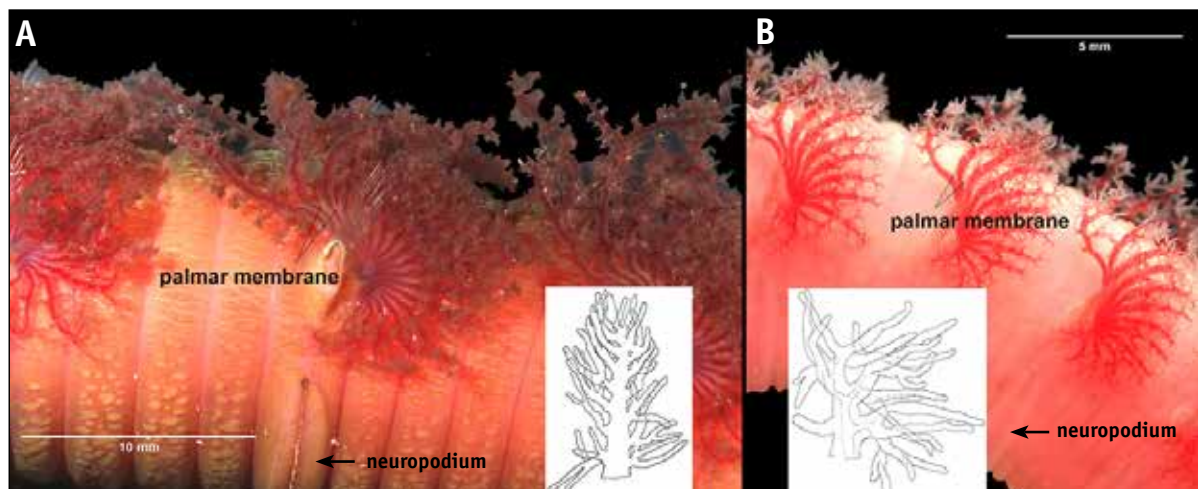


Figure 4: Comparison of gill appearance with inset drawings of detailed structure for A. *Arenicola defodiens* and B. *Arenicola marina*.



Figure 5: Comparison of live specimens of *A. defodiens* (above) and *A. marina* (below)

species with bright red gills although darker varieties of this species could also be found. Colour is not a consistent character of value for identification.

### Dimensions

The length (from tip of head to end of last segment bearing gills) and width was measured for all preserved specimens. As the tail (region with no gills or chaetae) can often be lost during collecting or preservation it was excluded from the measurements. *Arenicola defodiens*, was longer (12.2–23.2 cm, 17 specimens measured) and wider than any measured specimens of *A. marina* (2.5–10.9 cm, 19 specimens measured). Length is not, however, considered a reliable indicator of species.

### Molecular characters

In 1993, Polymerase Chain Reaction (PCR) was not available to Cadman & Nelson-Smith to extract molecular data, instead they observed genetic differences between the species with allozyme analysis.

In 2013, the PCR method was applied to the CO1 and 16S mitochondrial genes in both species. The two populations of *A. defodiens* (Whiteford Burrows, Rest Bay) and of *A. marina* (West Aberthaw, Isles of Scilly) were compared. In addition to these analyses, we accessed GenBank (a global storage database of genetic sequences), and 16S sequences were obtained from other *Arenicola* and *Abarenicola* species from around the world. No other CO1 sequences were available for other *Arenicola* or *Abarenicola* species although unpublished CO1 and 16S sequences for two species of *Abarenicola* collected from the Falkland Islands were made available as part of another NMW project.

*Arenicola defodiens* was more difficult to sequence for the 16S gene with only 2 out of 5 specimens successful compared to all for the CO1 gene. *Arenicola marina*, however, was successfully sequenced for both genes from all specimens. Comparisons between the specimens' sequences showed no genetic difference (CO1 – Figure 6A; 16S – Figure 6B) between the different populations of either *A. marina* or *A. defodiens*.

A comparison of the two British species with two of the other five non-British *Arenicola* species (*A. cristata* Stimpson, 1856, *A. loveni* Kinberg, 1866) showed that the UK species are more closely related to each other than to the non-British species (16S only, Figure 6B). Sequences of *Abarenicola* species showed the distinction between the two genera with species of each genus more closely related to each other than to species of a different genus (CO1 & 16S; Figures 6A&B).

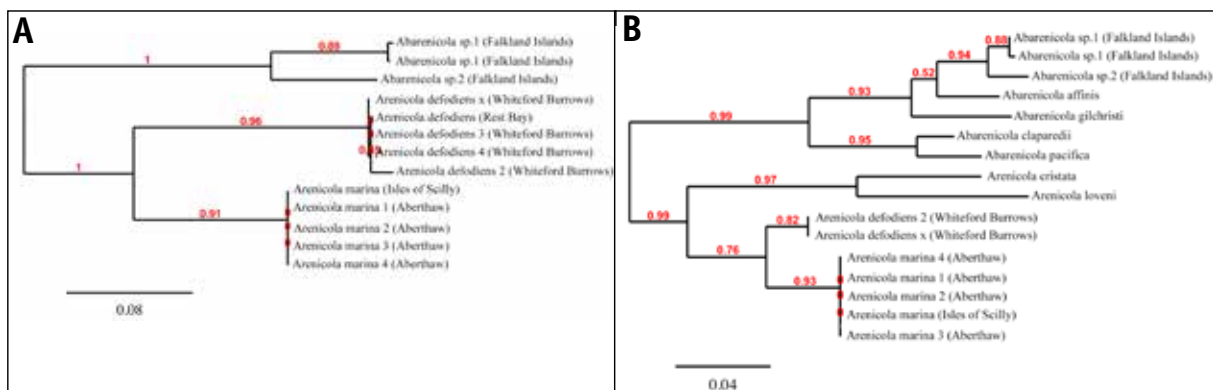


Figure 6: Phylogenetic trees derived from sequences of CO1 (left, A) and 16S (right, B) illustrating how closely related the different species or populations are to each other. Branch distances are related to the amount of genetic change i.e. longer = more change; numbers in red indicate the level of support for that branch, 1 = maximum support.



## Discussion

*Arenicola defodiens* and *A. marina* have been recognized as separate species since 1993 (Cadman & Nelson-Smith 1993). Although there are some distinctive characters by which to separate the two species, some of the characters described were found to be confusing and in need of clarification.

Several characters used by Cadman & Nelson-Smith (1993) in their comparisons (ring formula, colour, size, gill structure, cast appearance) together with several they didn't (parapodial appearance, proboscoidal papillae, PCR analysis) were investigated.

Cast surface structure (for remote identification) and the ring formula were the best characters for separating the two species and were consistent. The description of the gills by Cadman & Nelson-Smith, however, was found to be inaccurate. The original description states that *A. defodiens* gills have a palmar membrane whereas *A. marina* gills do not. However, the membrane was found to be present in both species. The descriptions of pinnate (*A. defodiens* – feather-like with parts arranged on either side of a common axis) and dendritic (*A. marina* – branching, tree-like) were also inaccurate or confusing and have been clarified to tree-like (*A. defodiens* – more even and neat arrangement) or bush-like (*A. marina*). The additional characters of the notopodial dark anterior edge in *A. defodiens*, absent in *A. marina*, and proboscoidal papillar appearance (black tips to proximal large papillae in *A. defodiens*, absent in *A. marina*) have also been recognized and described.

Molecular work was also undertaken to make a comparison both between species and between populations of the same species as well as with other *Arenicola* and *Abarenicola* species from around the world.

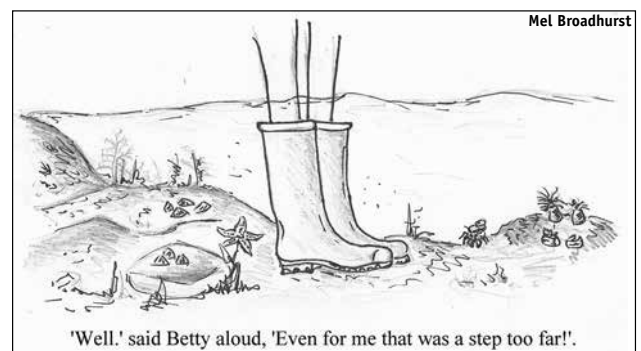
In addition to the morphological differences, molecular investigation using the CO1 and 16S genes has shown that there is no significant difference between populations of the same species and that the two species of *Arenicola* in British waters are more closely related to each other than to the other *Arenicola* species for which sequences were available (*A. cristata*, *A. loveni*).

## Acknowledgements

Chloe Brind is an A-level student at Cardinal Newman Catholic Sixth Form College, Bargoed and was funded by the Nuffield Science Foundation on a 4 week Nuffield studentship based at Amgueddfa Cymru–National Museum Wales. Nuffield Studentships offer 16-17 year old A-level students the opportunity to undertake a science project of their own and experience working with scientists within a genuine research environment. AC-NMW funded the research and provided all facilities and equipment.

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## Encyclopaedia of Life

Website review by Mel Broadhurst

<http://eol.org/>



The Encyclopaedia of Life (EOL) is an internet web-based portal dedicated to increasing knowledge and access to information about life on earth, at a global scale. It was founded in 2007 by institutions such as the Field Museum, Harvard University, Marine Biological Laboratory, Missouri Botanical Garden and the Smithsonian Institution.

The primary aim is to build individual information web-pages for each taxon, with a staggering 1,361,548 pages already built. This ranges through the vast spectrum of animals, plants, fungi, protists and bacteria including those that live in the sea as well as on land. The EOL also provides valuable links to online species identification guides, species multimedia (photographs, videos and podcasts) and educational tools, which is updated and frequently promoted through news updates and their community forum. You can also join as an EOL member and assist the

development of the portal. There are currently 79,850 active members.

I tested the EOL portal by looking for one of my favourite species, the beadlet anemone, *Actinia equina*. I was pleasantly surprised, as the portal found this species instantly, and provided nice generic information including a general description, taxonomic classification, trait information, data sources, spatial distribution photographs and references. It also allows you to view how and when the information is updated.

I would recommend this website to fellow Porcupines, as a nice website to find specific species information, to source educational aids or to learn something new about life on earth. However, I urge some caution. Despite finding really interesting species that I had never come across (e.g. the watermelon snow alga: *Chlamydomonas nivalis*), I got a little lost due to the sheer size of the portal. EOL does provide pages dedicated to how to use the portal effectively. Therefore I also recommend reading these pages and booking some time off to enjoy this most valuable and endless website.



# REVIEWS

## Marine Biodiversity Conservation – A Practical Approach

Routledge, 2014, 318pp.

ISBN-10 0415723566 / ISBN-13 978-0415723565

Available online in hardback, paperback & for Kindle from £29.92.

Book review by Renata Kowalik



Hiscock has produced a really well laid out introduction and practical approach to marine biodiversity conservation in twelve concise chapters. This text book it will make both students and conservation managers think about why, when and how to conserve, and provides the tick lists for researching the

methods to utilise in marine biodiversity conservation. The chapters are clearly laid out with good diagrams that enhance the text.

The first chapter begins with a brief historical background to the drivers for biodiversity conservation and how it developed into the science it is today. It outlines the scale of decline and loss in biodiversity and the causes. Useful references are provided throughout the text, which lead on to a multitude of relevant material for the research student and undergraduate. The rationale for conservation today is presented and reminds us to think about why we need biodiversity in the marine environment – something I always stumbled over as an undergraduate, “so why do we need biodiversity?” “eerrrm well its important” “but why is it important?” and so on. Here Hiscock gives us useful leaders/triggers to make us think again why it is important.

The first few chapters provide a background to why we would want to carry out marine biodiversity conservation, what biodiversity has to offer, the science-based approach to conservation, the effective use of a common language and utilising old data sets as well as collecting new. The majority of the

128 Sampling and recording

### Selection of methods

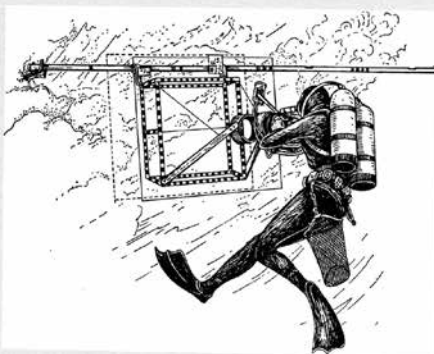
To ensure that the most meaningful and accurate information is obtained to support conservation, care is needed in deciding what methods are most feasible, statistically reliable and informative. Some techniques such as grab sampling and rocky shore and subtidal abundance scale surveys have well-established equipment and techniques. Others, such as acoustic survey, continue to develop.

At the end of the survey, reporting forms will need to be completed. If they are pre-existing standard forms, it is wise to make sure that you know what is in those forms before you design your programme!

'Attainable' (the 'A' in SMART) is important and encompasses practicality from an economical as well as a technical point of view. It is no use identifying a programme of stratified random sampling using quadrats if the number required to produce statistically meaningful results will be impossible to achieve within the constraints of time and budget.

### Box 8.1 Determining appropriate methods

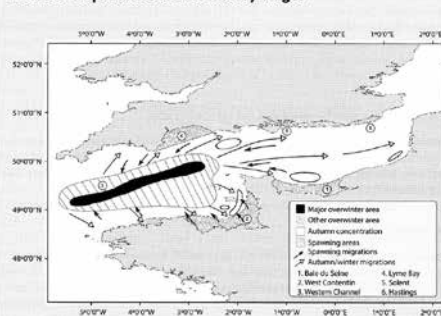
Fixed quadrat locations ensure that the same community and, if they are long-lived, the same individuals of a species are being recorded in surveillance or monitoring studies, but they suffer from concerns that they are not statistically representative of the whole community.



Source: Lundqvist (1971) (see Plate 62).

150 Selection, design and management of MPAs

### Box 9.3 Importance for life history stages



Cuttlefish, *Sepia officinalis*, in the north-east Atlantic have well-known locations where they breed and lay their eggs (Plate 64) and some knowledge of where they overwinter. Breeding areas attract the use of traps to catch the cuttlefish. Overwintering areas attract trawling. In the case of breeding areas, the cuttlefish enter the traps, breed and lay their eggs on the traps. Ideally, such breeding areas should be protected but, after breeding, cuttlefish die and so harm is limited providing the traps are left in the water until eggs have hatched. Much greater damage may be done to the populations by fisheries that target overwintering populations – and their locations are well known (Pawson, 1995).

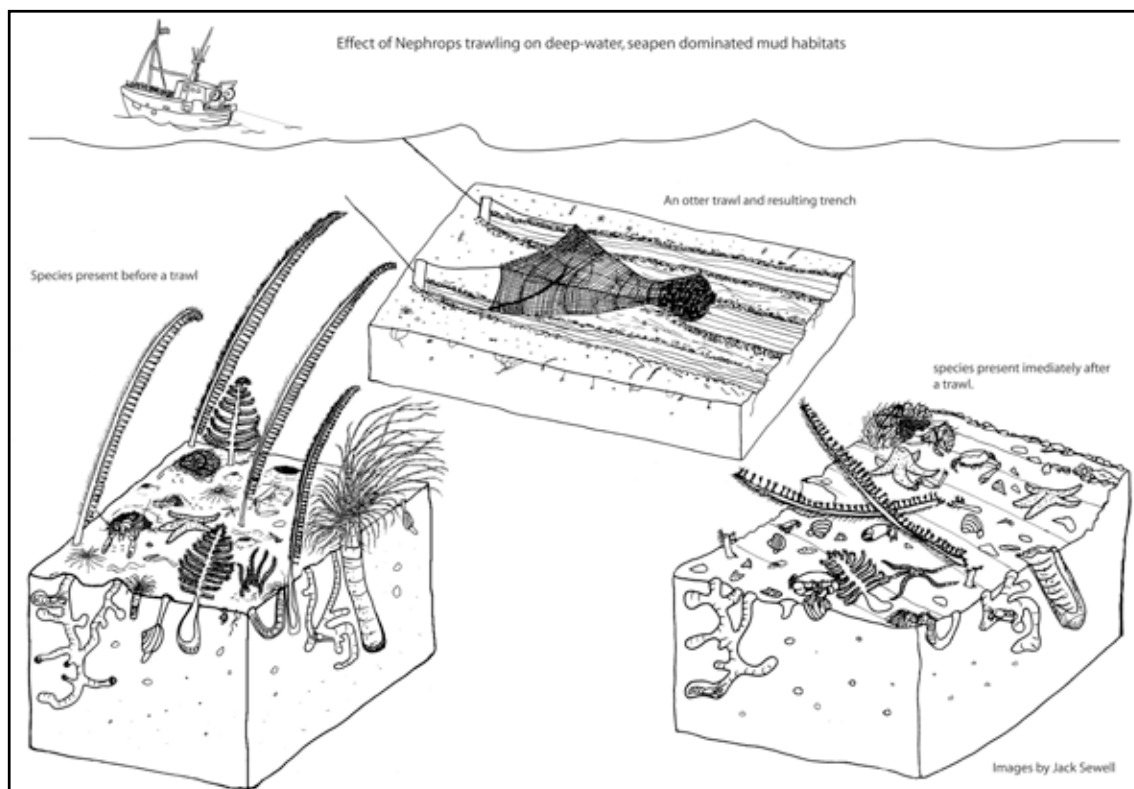
Source: diagram redrawn by Isobel Bloor for the English Channel from Legrande (unpublished) in Pawson (1995).

species in the Isles of Scilly, UK that included nationally rare and scarce species and that, when seen by an experienced naturalist, shouted 'biodiversity hotspot'.

Richness is also important in the case of biotopes. If, for instance, a location can be found that has a wide range of Level 4, 5, and 6 biotopes, we get the most bang for our bucks by selecting the location within the Level 3 biotope used to identify representativeness.

### SENSITIVITY (VULNERABILITY, FRAGILITY OR SLOW RECOVERY)

Chapter 7 describes the concept of sensitivity and the ways of assessing 'species and habitat sensitivity'. The value of understanding sensitivity is for much more than identifying protected sites and so is not described in detail in this chapter. However, what needs explaining



text is then dedicated to the application of scientific approaches to biodiversity conservation: identifying threatened and sensitive species and habitats; approaches to sampling and recording; selection, design and management of MPAs; assessing impacts and monitoring change; understanding recovery and responding to damage either through restoration or replacing if the natural habitat is destroyed.

This book doesn't provide the student or practitioner with all the methodologies available to them – this would require a tome of immense proportions – but it does provide them with an introduction to ecological structures from: ecosystem-scale and function; natural and man-made variability; large and small-scale permanent change; identifying both real and coincidental cause and effect. And as Hiscock states, he can only provide a few examples in a text of this size but those interested can dig deeper in journals and dedicated texts on the subject.

I particularly like the layout and structure of each chapter. Good examples are given of how an undergraduate or research student can approach a subject. Hiscock divides

up the text into neat manageable chapters including: the methods and approaches to conservation, and the science behind it; impacts; understanding the difference between man-made impacts (adverse or not) and natural environmental fluctuations; management; field work (monitoring and surveying); designing and selecting protected areas; and restoration. It finishes with an example of a managers 'toolbox', concluding with comments on the way forward.

I know I should try to balance this review with some critical comments but to be honest I think its only limitation is that it caters to a specific audience (practitioners and students of marine conservation). But this is what makes it an excellent and concise text.

I think this book will become a regular and popular addition to the reading lists for ecology and conservation modules for both undergraduate and post-graduate studies as well as providing a convenient aid to conservation practitioners.



## How I became a museum marine biologist?

*Claire Goodwin*



In the summer before sixth form, I happened to see an advert in the local paper 'Girls wanted to sail tall ship – bursary provided'. A quickly rattled off application found me, two months later, scudding up the channel in one of the Sail Training Association's tall ships in a force 8 gale in pouring rain. It was not everyone's idea of a good time; most of the rest of the crew were violently seasick, including one from the very top yard arm down onto the horrified spectators below. Being practically vegan at the time I couldn't eat any of the food and lost half a stone, we were dragged out of our warm beds for seemingly unending night watches and, as the foul-weather gear



was well-used and consequently not entirely waterproof, we were all perpetually freezing. Somehow, despite all this, I caught a good dose of sea fever and, as soon as I was back, set about applying for my next trip. A year of fundraising later, I went off to Australia for a leg of the Ocean Youth Trust's world voyage. It was sitting talking on a night watch under the southern cross that someone suggested marine biology as a career- a bit of a change from the English degree I'd been thinking about prior to starting sailing. My school were a lot more encouraging about this than my plan B of going into the merchant navy (apparently not the thing for a girl's grammar school pupil!) so after sixth form I headed off to Liverpool University and a marine biology degree.

I was keen to explore under the oceans as well as on top of them, so one of the first things I did at Liverpool was sign up for the dive club. At the time, it was largely a technical dive unit unwittingly sponsored by the University with a small amount of student teaching on the side. On the first 'novice' trip they ran the shallowest dive was to 70m, the Easter 'training' trip to Cornwall was by special invitation only, and the instructors had a selection of off-putting nicknames – most memorably 'Bendy Bob'. Fortunately I had some extra help from Dave, a fellow marine biology student and dive instructor, who I had started dating. Both I and our relationship survived my first open water dive in the Menai Straits in zero viz – despite me having to be shaken into his very small old drysuit and shouting at him after the dive for throwing swimming crabs at me (I wasn't yet aware of their willingness to start a fight with anything, no matter how big). Reader – I married him.

One of the best things about Liverpool was spending the final year of the degree at Port Erin Marine Laboratory on the Isle of Man (now sadly closed). Situated at the south end of the island in Port Erin Bay, it provided ready access to sandy and rocky shores, had great diving facilities, and a couple of research vessels, so fieldwork opportunities were plentiful. There were only 30 students in our year, so the course had an informal feel; you often found yourself chatting to lecturers and researchers at tea time or over a pint after work on a

Friday. For my honours project, I selected a study comparing the fauna of an area closed to scallop dredging with a dredged area –largely attracted by sea time on the R.V. *Roagan* and the prospect of free food from the by-catch. It was my supervisor Dr Clare Bradshaw, who seemed very old and experienced to me then, but in fact was a new post-doc, who during hours staring down a microscope first got me interested in taxonomy.

After my degree, I worked as a research assistant to Dr Stuart Jenkins who was studying how dredging affects scallops. Tasks included chasing scallops with a starfish tied to a stick (to see if undredged ones could swim better), and watching hours of video from a baited trap to see what is attracted to damaged scallops: answer - loads of black brittlestars which eat everything after the first half hour leaving you with a lot of very boring video, featuring only dragonets, to watch. I also managed to squeeze in some dives with the marine lab dive team. Having somewhat itchy feet I had a couple of sojourns away in this time: working on great white shark research, training as a divemaster and teaching ecology to children in the Florida Keys as well as spending a summer as a divemaster with Dave in France. All of these greatly improved my diving – teaching me to have eyes in the back of my head, an extra pair of hands, and never to under-estimate what mistakes divers are capable of making. I also got a lot of practice at tank filling.

As I was not really sure what I wanted to do next, I applied for a variety of funded Ph.D. and M.Sc. places, and landed a Ph.D. at Queen's University Belfast in Northern Ireland on lamprey ecology. I hadn't visited Northern Ireland before, but liked the sound of it. My mum, however, was convinced I was going to be blown up, despite it being well after the main 'troubles', and spent weeks trying to talk me out of it. During three years of freshwater study, I kept up with my marine interests by instructing and acting as a training officer for Queen's dive club. This included the logistical nightmare of running an Easter training trip for 40 perpetually hung-over students and instructors and keeping all the boat and shore excursions on time: we found a combination



*Top: Fieldwork on Rathlin Island*

*Bottom: Surveying seacaves, Rathlin Island*

of carrot (plentiful tea and biscuits) and stick (extra compressor duty) seemed to work best. I also volunteered on sail training boats and put in several long distance passages on friend's yachts including Ireland to Gibraltar and sailing back to Ireland from the Azores. I met Dr Julia Nunn (Senior Marine Recorder at CEDaR and Porcupine Council member) through the Portaferry Scientific Divers, which was primarily for casual scientific diving, but was under-resourced (no boat!). We decided the Club could do with a new project, so in 2002 we got Chris Wood over to run the first Northern Irish Seasearch course which had 22 keen participants. This was the start of a slippery slope for me, and I ended up co-ordinating the Northern Ireland branch of the project from 2003-2010, meeting many great volunteers and diving a wide variety of Northern Irish sites along the way.

By the time I finished my Ph. D. Dave had found a good job in Northern Ireland and wasn't keen to move (how you become a forensic scientist with a marine biology degree is another story!) so my options were rather limited. I applied for post-doc funding to continue my lamprey work but was very tempted by a job at the Ulster



*Dressed for work*

Museum – a one year diving project studying the sponges of Rathlin Island. This was led by Bernard Picton, the Museum's curator of marine invertebrates – known to many a diver from his excellent marine life ID website and books. Not knowing anything about sponges I unsurprisingly wasn't the first choice for the job but luckily their chosen candidate got offered a job with BAS that they felt they couldn't turn down. A few weeks later, I found myself on Rathlin undergoing intensive sponge taxonomy training with Bernard. When the call came from Queen's to say we had got the lamprey post-doc funding I turned it down – I was happy to be back in the sea again and had no regrets about leaving freshwater.

During the Rathlin project we found 30 sponge species new to science. Bearing in mind that this is from an island just 6 miles long, it really opened my eyes to how little we know about sponge biodiversity. Although there are currently around 8,500 described species, researchers estimate that there are twice as many in existence. It seems like every trip I go on I run into new sponges, which, whilst obviously exciting, is also slightly annoying as instead of doing a species list you have to write another description paper – my running total is currently at 54 species. Sponges really are a very diverse, ecologically important and fascinating group and their skeleton 'spicules' come in beautiful forms. I enjoy the detective work of trying to track down the correct name for something – trawling through literature and museum specimens. Additionally, I've found studying a rather poorly known group of animals is an excellent way of getting on surveys to exciting places: I've been lucky

enough to survey the sponges of the Falklands and South Georgia with the Falklands based Shallow Marine Survey Group, CO<sub>2</sub> seeps off Italy, the Isles of Scilly and (perhaps rather less exotic) the east coast of England. The first three invitations were through encounters at Porcupine conferences – you never know who you might run into at one!



*Surveying in the South Atlantic*

I've now been at the Museum for almost ten years, with a brief pause from diving and work when I had my twins in 2012. I've worked on a variety of projects – mostly involving diving somewhere along the way. One of the great things about working in marine biology is getting to work with such a variety of interesting people (and I'm not just saying that because several of them are Porcupine members!). I've been lucky enough to benefit from on-the-job identification training from Bernard – whilst books are great I find there is no substitute for being able to directly interrogate an expert. I qualified as a HSE SCUBA diver and also gained qualifications for work-boat operation and scientific dive supervising. I've also been honing my skills in

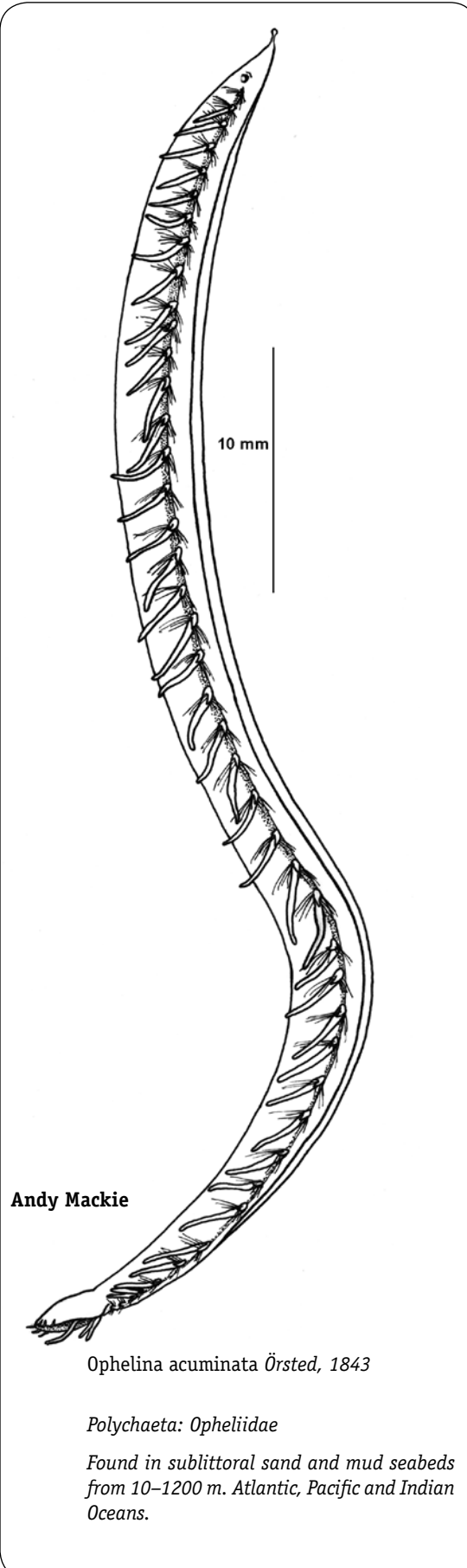


*Starting young*



underwater photography – we use the photos for both scientific and outreach work. The Museum has a long standing partnership with the local government DoE Marine Division, and we’ve coordinated dive surveys for them and provided taxonomic expertise for a series of projects. I’ve really enjoyed working with the DoE dive team, despite some challenging diving conditions, ‘experimental’ dives, and the Northern Irish weather. We’ve surveyed much of the beautiful underwater landscape of the Northern Irish coast but, as always with diving work, we cover such a small area on each dive that there is plenty more to discover and document.

One of the downsides to my post at the museum is that it is an externally funded post so I am constantly chasing grants (anyone need a sponge taxonomist?!). On the upside this does mean that I can, within reason, write my own job description. Following on from the Rathlin sponge project Bernard and I secured funding from the Esmée Fairbairn Foundation (though their ‘uncharismatic species’ fund), Countryside Council for Wales (now Natural Resources Wales), and Scottish Natural Heritage for a three year project surveying the sponges of areas of Scotland and Wales, with side trips to Sark and the Isles of Scilly. I’m currently working, in conjunction with Dr Kate Hendry (Bristol University) and Dr Jade Berman (Ulster Wildlife) on a project funded by the Leverhulme Trust on Antarctic Sponges. Kate is interested in how silicon isotopes in sponge silica skeletons can be used as a proxy for climate change - different isotopes are laid down depending on the amount of silica in the water. This can be related back to number of diatoms and hence the climate, as they are more abundant when temperatures are warmer. She wanted to test if the isotope ratios were the same in the skeletons of different sponge species – hence the requirements for a taxonomist. It can be tough to get funding for pure taxonomy projects, and these sorts of collaborations are an excellent way of getting some taxonomy done. Whilst Kate had already collected deep-water sponges, we decided we definitely needed shallow water sponges for comparison so I’m off to the Antarctic, on a dive survey in February 2015. I’ll be sure to pack my thermals and hopefully will report back at the 2015 Porcupine Conference!





## Instructions to authors

Although we can deal with most methods and styles of presentation, it would make our editorial lives easier and speed up publication if contributions to the *Bulletin* could follow these simple guidelines. Please submit material in electronic format where possible either by e-mail or CD.

### Title, Author(s) & Address(es)

Title should be concise, informative and in bold type. Include author(s) names each with one full Christian name. In multiauthored contributions, the last name is separated by an ampersand, e.g., John Smith, David G. Jones & Susan White.

Include any institution/place of residence & contact details to appear with your name at the beginning of your article. Multiple author addresses can be linked to authors by superscript numerals.

### Text

- Times New Roman font, 12pt, single line spacing, saved as a Word document (.doc/.docx)
- Use bold to highlight headings but do not use any Word 'styles' to format text. Avoid using headers and/or footers where possible.
- Reference tables & figures in the text as Figure 1, Table 1 etc. and in legends as Table 1: , Fig. 1: (individual parts A, B etc should be described also).
- Indicate where figures should be placed e.g. Insert Fig.1 here (send image files separately to text)

### Illustrations (Figures and Plates)

- Photographs: greyscale or colour (RGB) JPGs or TIFFs with a resolution of 300 pixels per inch and maximum width of 16 cm. Save at **high quality** (very important).
- Line drawings (particularly maps): EPS (preferred) or TIFF files. If it is a detailed map which will need the full page width, save it with a width of 16 cm. Maps with complicated colouring schemes are difficult to interpret in print – please consider using easily distinguished symbols instead.
- Graphs, histograms, etc. can be supplied as line drawings, or Excel files, each saved as a separate sheet

We can scan good quality photographs, transparencies and hard copies of drawings, where necessary.

For each illustration, photo etc. submitted, please provide: Filename, Caption, Photographer (if appropriate) and please be aware of any copyright issues.

**Do NOT embed images in the text** as they cannot be extracted at high enough quality to reproduce in the *Bulletin*. Send as separate image files, preferably with the caption as the file name though this is not essential.

### Scientific names

Latin names should be italicized. The entire scientific name should be given in full the first time it is mentioned, but thereafter the genus can be abbreviated — except at the beginning of a sentence. Authorities for taxa follow standard taxonomic guidelines, with a comma before the date; e.g., *Zeuxo holdichi* Bamber, 1990; *Melinna albicincta* Mackie & Pleijel, 1995; *Neanthes irrorata* (Malmgren, 1867).

### References

- Do not leave a line space between references. Journal titles should be cited in full.
- Citations in text: ....Brown & Lamare (1994)...or... (Brown & Lamare 1994)...., Dipper (2001)... or...(Dipper 2001).
- The main reference styles are as follows:

Brown, M.T. & Lamare, M.D. 1994. The distribution of *Undaria pinnatifida* (Harvey) Suringar within Timaru Harbour, New Zealand. *Japanese Journal of Phycology* **42**: 63–70.

Dipper, F.A. 2001. *Extraordinary Fish*. BBC Worldwide Ltd, London. 96pp.

Ellis, J.R., Lancaster, J.E., Cadman, P.S. & Rogers, S.I. 2002. The marine fauna of the Celtic Sea. In J.D. Nunn (Ed) *Marine Biodiversity in Ireland and adjacent waters. Proceedings of the ECSA Conference, 26-27 April 2001*. Ulster Museum, Belfast. pp. 83-82.



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