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BULLETIN of the PORCUPINE MARINE NATURAL HISTORY SOCIETY

Autumn 2016 — Number 6

Bulletin of the

Porcupine Marine Natural History Society

No. 6 Autumn 2016

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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.facebook.com/groups/190053525989

@PorcupineMNHS

Ordinary Council Members

Cover Image: Trawl sample collected during the Millport field trip – see p.23 (Credit: Susan Chambers)

Editorial

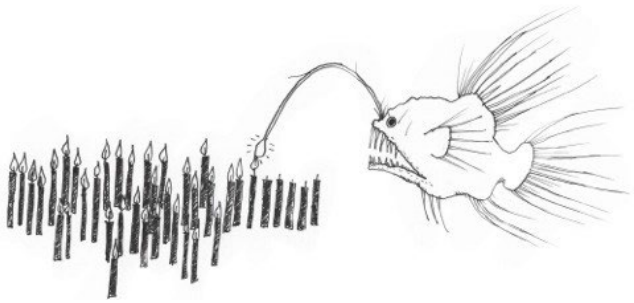
This edition is rather special as it is 40 years since the first publication of the *Porcupine Newsletter*.

A conversation at the 2016 Porcupine conference at Millport led me to google exactly 'how old' Porcupine is; the Newsletter/Bulletin is 40 years in November 2016, and next year we celebrate 40 years of Porcupine conferences. To mark 40 years since the first Newsletter, I started on a mission to uncover 40 more Porcupine firsts – see page 3. I hope you will enjoy reading this timeline of Porcupine firsts as much as I have enjoyed delving through past publications and gleaning stories from many Porcupines.

It seems that a passion for all things marine, a wry sense of humour and a willingness to bear all weathers in search of curious critters and seaweeds are common denominators for all Porcupines. This was demonstrated very clearly by the prickle of Porcupines captivated by the hatching of Little Cuttle (*Sepiola atlantica* d'Orbigny, 1842) at the Millport Field Station in March. The eggs had been placed in a tray as part of a sample collected during the Sunday fieldwork, and as onlookers peered into the tray, out popped 3 or 4 of these baby cuttlefish. I think the excitement of never quite knowing what might appear in a sample, or even a photograph, when more closely examined, is part of the thrill of fieldwork for me. Porcupine field visits offer opportunities to work in an informal way with experts and highly knowledgeable and experienced non-professionals, and I believe this is not only unique, but an under-estimated way of improving one's own fieldwork and identification skills.

With this in mind, I would urge you to look at what Porcupine is up to next year, starting with our conference in Plymouth, in March, which will include shore and diving field visits. We also plan to offer a family-friendly field visit, location to be confirmed, so please do keep an eye on our website, Facebook & twitter feeds for further updates.

Vicki Howe
Hon. Editor



*Photos: Little Cuttle (*Sepiola atlantica*) hatching during the PMNHS Conference fieldtrip, Millport, March 2016 (Photos: Jon Moore)*

ANNOUNCEMENTS

Porcupine Annual Conference 2017

Plymouth University
March 10th–12th 2017 (provisional)

The next Porcupine Marine Natural History Society Conference will take place at Plymouth University from 10th–12th March 2017 (provisional dates; to be confirmed soon), with the conference dinner to be held in the historic Marine Biological Association on Citadel Hill. Final details are still to be confirmed but will be posted on the website as soon as they are available.

Introduction to Rocky Shore Identification course

Marine Biological Association, Plymouth
16-17 November 2016

A basic introduction to the main groups of animal and seaweeds likely to be found on British rocky shores including an explanation of key identification methods, species confusions as well as a more in-depth look at some commonly found species. Suitable for beginner - intermediate level but more experienced naturalists interested in brushing up their skills are also welcome. For more details visit the MBA website at https://www.mba.ac.uk/courses-and-training/.

Collecting & Identifying Seaweeds

British Phycological Society
Marine Biological Association, Plymouth
25– 27 April 2017

Course Leaders: Professor Christine Maggs (Bournemouth University) and Francis Bunker (MarineSeen, Pembrokeshire)

A popular 3 day course now in its 13th year

Numbers will be limited to enable the tutors to cater for individual needs of interested amateurs, professional biologists requiring further training or refreshers, students (graduate and post graduate), artists, and those working with the Water Framework Directive. Topics covered will include identification of Water Framework Directive species.

The course fee is £220 inc VAT. Application forms are available from archerthomson@btinternet.com

Porcupine Bulletin Prize 2015

Three students submitted articles for the Bulletin during 2015 and as the standard was high it was very tough to choose the winner. However after considerable deliberation, the winner is Stephanie Deane for her article on the Pacific Oyster published in Bulletin No.4. Well done Stephanie! The prize this year is £50 and a year's membership of Porcupine Marine Natural History Society. Porcupine would like to thank all the students who contributed articles and to encourage them and others to submit further articles.

Porcupine Bulletin Prize 2016

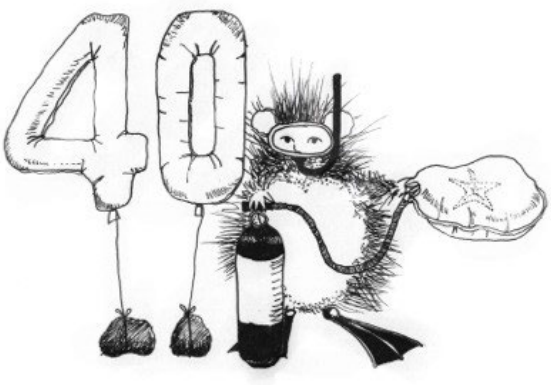
We are pleased to announce that there will again be a prize awarded to the best article published in the Bulletin by a student or amateur enthusiast (i.e., not professionally employed in the marine field), as judged by a subcommittee of the Council. The prize will consist of £50, plus 1 year's membership.

There are no exclusive themes. An article could be on a project or thesis you are working on, a visit or field trip you have made to a shore or dive site or a particular marine organism you are interested in and have been researching (in the field or desktop) etc. There are many examples you can draw on for inspiration in past Newsletters and Bulletins. We ask only that there be no multiple authors.

To be considered for the prize, please make your status clear on submission of your article to the Honorary Editor – Vicki Howe, viks@sun-fish.co.uk. The PMNHS looks forward to your contributions.

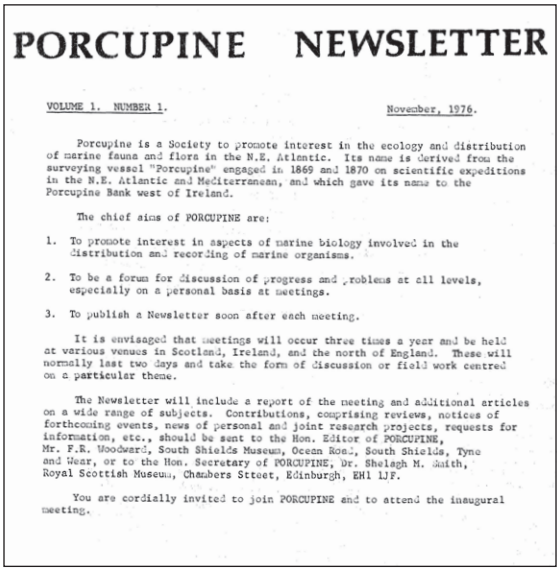
40 Porcupine firsts

Vicki Howe



1. The first publication of the Porcupine Newsletter was VOLUME 1, NUMBER 1 (PNV1N1 November 1976, see front page right).

http://pmnhs.co.uk/wp-content/uploads/2011/11/001-PNV1N1NOV76.pdf



PORCUPINE NEWSLETTER

VOLUME 1. NUMBER 1. November, 1976.

Porcupine is a Society to promote interest in the ecology and distribution of marine fauna and flora in the N.E. Atlantic. Its name is derived from the surveying vessel "Porcupine" engaged in 1869 and 1870 on scientific expeditions in the N.E. Atlantic and Mediterranean, and which gave its name to the Porcupine Bank west of Ireland.

The chief aims of PORCUPINE are:

1. To promote interest in aspects of marine biology involved in the distribution and recording of marine organisms.
2. To be a forum for discussion of progress and problems at all levels, especially on a personal basis at meetings.
3. To publish a Newsletter soon after each meeting.

It is envisaged that meetings will occur three times a year and be held at various venues in Scotland, Ireland, and the north of England. These will normally last two days and take the form of discussion or field work centred on a particular theme.

The Newsletter will include a report of the meeting and additional articles on a wide range of subjects. Contributions, comprising reviews, notices of forthcoming events, news of personal and joint research projects, requests for information, etc., should be sent to the Hon. Editor of PORCUPINE, Mr. F.R. Woodward, South Shields Museum, Ocean Road, South Shields, Tyne and Wear, or to the Hon. Secretary of PORCUPINE, Dr. Shelagh M. Smith, Royal Scottish Museum, Chambers Street, Edinburgh, EH1 1JF.

You are cordially invited to join PORCUPINE and to attend the inaugural meeting.

2. The first time the Newsletter was published with an ISSN number was VOLUME 1, NUMBER 3 (August 1977): ISSN 0309-3085. An ISSN (International Standard Serial Number) is an eight digit serial number used to uniquely identify a serial publication.

3. The first Records Convenor was David McKay, with Bob Earll taking over in 1980. In 1985, Bob wrote to the Council announcing that he was stepping down from the role. He pointed out that in Mr McKay's retirement speech no records had yet been submitted

Some of the founder members of the Porcupine Marine Natural History Society. Photo taken at the PMNHS Conference at National Museums Scotland, Edinburgh, March 2002. From left to right: Ralph Robson, Frank Evans, Robin Harvey, Shelagh Smith, Trevor Norton, Ivor Rees, Paul Kingston

(PNV3N3 March 1985). Thus in 1985, the post was re-defined, and became that of a Records Co-ordinator with Fred Woodward acting as 'caretaker' for one year. At this time, only a small number of novel records were published in the Newsletter, and Bob suggested that the Newsletter would seem to be the best repository for any records members wish to send in. In 1986, Jon Moore became the Recorders Co-ordinator, and remained in this office until Dennis Seaward took over in 1991. In April 1992, the position of Honorary Records Coordinator was suspended due to the position being unnecessary or impossible to office (PNV5N4 April 1992). The position was reinstated in 2001, with Jon Moore once again taking on the role (PNV7 March 2001). Roni Robbins took over in March 2005 (PNV17 June 2005) and remained in post until March 2015 when Julia Nunn was elected Honorary Records Co-ordinator.

4. The first page 40 (PNV1N3 Aug 1977) contains an article on field photography by Richard Platts. He refers to Kodachrome film and detailed settings which many of us would not now contemplate in this fast developing digital age, where cameras have an amazing array of features and functions as well as being reasonably foolproof for the amateur photographer.

5. The first time wild Porcupines were noted:

> *YOU HAVE BEEN WARNED. Personnel from the Ministry of Agriculture, Fisheries and Food, and the Forestry Commission, are investigating the Porcupine introduction. It is not presently known how many of these animals are at large in the area. Intensive surveys will be carried out this winter with live trapping when any animals are located. The field evidence suggests that numbers are very low. It is hoped that the remaining animals will be trapped over the next few months, before their range is extended.*

[Extracted from CSLP Annual Report, 1976. F.R. Woodward (Hon. Ed.). (PNV1N1 November 1976).]

6. The first Porcupine Meeting took place on 12/13 February 1977 in the Royal Scottish Museum in Edinburgh. The title was *Forum for Marine Recording*, and 74 people attended. An excerpt from the programme includes this: '10.45 'Coffee' as coffee may not be available this will include wine'. F.R. Woodward (Hon. Ed.) (PNV1N1 November 1976).

7. The first Porcupine fieldwork excursion was to Whitburn Steel and St. Mary's Island in June 1977 after the second Porcupine meeting in Tayside. 23 people attended (PNV1N5 April 1978). A list of molluscs recorded was published in PNV1N3 August 1977. The first meeting 'overseas' was to Orkney from 27 August to 3 September 1977. This was also a first for members from across the English Channel, namely Louis and Jacqueline Cabioch (Roscoff) and Roger Brehaut (Guernsey). Despite disruption to public transport (a ferry strike), most people made it by passenger ferry. Shelagh Smith discovered a car ferry, and so arrived with all the gear such as boat and seine net and a very seasick Geoff Swinney.

8. The first time we hear from Frank Evans is in PNV1N3 August 1977.

Marine Biological Films. Frank Evans, Dove Marine Laboratory.

> *At the South Shields 'PORCUPINE' meeting, members saw a teaching film called* The Rocky Shore. *It was 16 mm, sound, colour, running time 25 minutes, and is the most recent of three films I have made for biology students, the others being* Ocean Tides *(1966) and* Ocean Waves *(1972). All three films were made in the Film and TV section of Newcastle University.* Ocean Tides *and* Ocean Waves *were made as replacements or reinforcements for 1 hour lectures. The Rocky Shore was an attempt to give coherence to a marine course for large numbers of 'first-year' university students (over 150 in some years) and to make some sense of their shore collecting.*

Frank was made a life member in 1991.

9. The first year of Porcupine (1977) saw the membership grow to 120, with Dr Celia Ellis allocated membership number 40. There were four meetings and four Newsletters in this first year, with much planned for the following year. In 2016 our membership is 184: two Bulletins have been published, a successful and well attended conference was held at Millport, and we have had field work in two

locations; Millport and the Staffa Archipelago, Inner Hebrides with a third trip planned in October to Aberystwyth. Our first membership payment via PayPal was on 16th March 2016, and hopefully this will encourage more folk to become Porcupines, as all you need to do if you are a PayPal user is to click on the button!

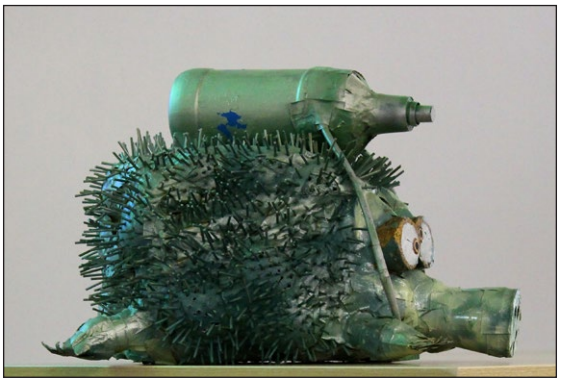
10. The first meeting to be held in Wales was 29-30 October 1977 at the National Museum of Wales, Cardiff. The theme was *Commensals, Symbionts and Parasites in the Marine Environment*. Twenty-four members and friends were present from far-ranging places including Skye, Edinburgh, Aberdeen, South Shields, Huntingdonshire, Reading, London, Bristol, Plymouth and the Channel Islands, in addition to those from the immediate vicinity in South Wales. (F.R. Woodward (Hon. Ed.) 1977, PNV1N4 December 1977). The most recent meeting in Wales was at Swansea University in 2013.

11. The first Annual General Meeting to be held in England was in February 1978 in Manchester Museum. The theme was *The Species Problem*. Forty five members and friends were present, representing all parts of the UK, with particularly strong contingents from Ireland, north and south (PNV1N5 April 1978).

12. The first meeting in Northern Ireland was 24-25 June 1978 at the Marine Biological Station, The Strand, Portaferry, Co. Down, Northern Ireland. The theme was *Interstitial Fauna* (PNV1N6 August 1978). The most recent meeting in Northern Ireland was also to Portaferry, theme *Marine Protected Areas*, in 1997, with fieldwork afterwards on the (unusually) hot and sunny coast of west Galway (PNV6N7-8 June & October 1997).

13. *Scubahystrix boadeni* was first described by Shelagh Smith in August 1978. The holotype is well known (above right), and has attended most of the Porcupine meetings since its first appearance at the Portaferry, Co. Down meeting in 1978 (PNV1N6, p. 93).

14. The first Honorary Editor was Fred Woodward who served for four years and worked hard on making Porcupine known through the Newsletter. Frank Evans took over the position in February 1981 and the late Roger Bamber in 1985. Roger was Hon. Ed. for 9



years, and passed the task to Shelagh Smith in March 1994. In April 1998, Frances Dipper took on the role, with Peter Tinsley joining Frances in May 2003 to form a creative and effective editorial team. Frances stepped down in 2009, and I joined Peter in early 2011 to learn the ropes. In November 2011, I became the 7th Porcupine to hold the Hon. Ed. Role, and I am still enjoying every minute of it.

15. The first Honorary Secretary is our Founding Mother, Shelagh Smith. Shelagh went on to be the Hon. Ed. in March 1994, and is a now an Honorary life member. She continues to support and contribute to Porcupine, and attended our conference in Millport this year.

16. The first book review is contained in the April 1978 Newsletter (PNV1N5) for Gibbs (1978) *The Synopses of the British Fauna: Sipunculans* Volume 12. The review is succinct, positive and recommends the book to ecologists needing a readily available accurate book dealing with Sipunculans.

17. During the 2nd Annual General meeting in April 1979, it was proposed that Sir Maurice Yonge, CBE, FRS. FRSE, be elected as the first honorary life member of Porcupine. This was in recognition of his continued and outstanding service to marine zoology.

Sir Maurice, known throughout the world for his work, particularly on bivalve Mollusca, is very highly respected both as a scientist and naturalist. He has been a friend of Porcupine since its inauguration, showing great interest behind the scenes and encouraging us with his belief in, and commitment to the aims of Porcupine. In addition during a period extending over fifty years he has not only instructed and inspired undergraduates with

his enthusiasm and example in the marine biological sciences but has, at the same time, instilled inspiration to the amateur by the popularisation of marine biology through his publications. These include The Seas, *first published in 1928 (in conjunction with F.S. Russell);* A Year on the Great Barrier Reef, *1930;* British Marine Life, *1944;* The Sea Shore, *1949;* Guide to the Sea Shore, *1958 (in conjunction with J. Barrett); and* Living Marine Molluscs, *1976 (in conjunction with I.E. Thompson). Here is a great man who has done Porcupine a great honour.*

Woodward, F. R. (Hon. Ed.) 1979 (PNV1N8 May 1979).

18. The first poem in the Newsletter appeared in May 1979:

Further thoughts on Porcupine splinters - in the fingers, this time.

What! would you slap the Porcupine?
Unhappy child - desist.
Alas! that any friend of mine
Should turn tuptophilist. *
To strike the meanest and the least
Of creatures is a sin.
How much more bad to beat
a beast with prickles on its skin.

**One that loves to strike. The word is not found in classical Greek, nor does it occur among the writers of the Renaissance - nor anywhere else.* Hilaire Belloc.

F.R. Woodward. 1979 (PNV1N8 May 1979).

19. First C.T. Canon article was published in April 1978 and resulted in two responses from David Heppell and Richard Melville (PNV1N7 December 1978).

Here is the original letter:

LETTER TO THE EDITOR. Dear Sir, Perhaps your membership can help me with regard to a problem type status which I am experiencing. I have some specimens of what I consider to be a new species of mollusc (as yet to be fully analysed), which will consequently be the holotype and paratypes; however, the female is brooding developing larvae, which hopefully will be released before I have to resort to preserving the specimen. Will these larvae be further paratypes (although relatively valueless for comparative purposes with regard to future identification) or is there perhaps such a term as a "larvotype"? Obviously they must be some class of primary type, and, if the term "allotype" is in accepted use, one would expect are equivalent term for larval forms (I shall not select the holotype from the larvae). Yours sincerely, C. T. Canon.

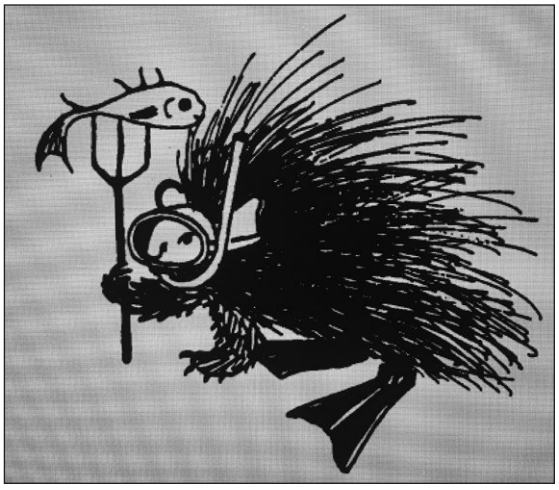
C.T. Canon, 1978. (PNV1NN5 April 1978).

C. T. Canon's final contribution was in PN 34, when he wrote of Porcupines in the field on the Scilly Field trip in 2010. C. T. Canon followed Roger Bamber to distant shores, and both are remembered fondly by many Porcupines.

20. *Thalassiohystrix scuba* (Smith & Heppell) was first mentioned in March 1982 (PNV2N4, p. 86) in a note titled Symposia of the Zoo. Soc. Number 34 – A serious Omission. Julia Nunn complied a comprehensive desktop study of the Porcupine, which was published in winter 2007 (PNV23).

http://pmnhs.co.uk/wp-content/uploads/2011/11/Porcupine-23-colour-web.pdf

21. The first illustration of a Porcupine appeared in July 1981 (PNV2N2). These drawings were created by Susie Arnott. Susie is still creating drawings for Porcupine, and I would like to thank her for her outstanding contribution to Porcupine over many years.



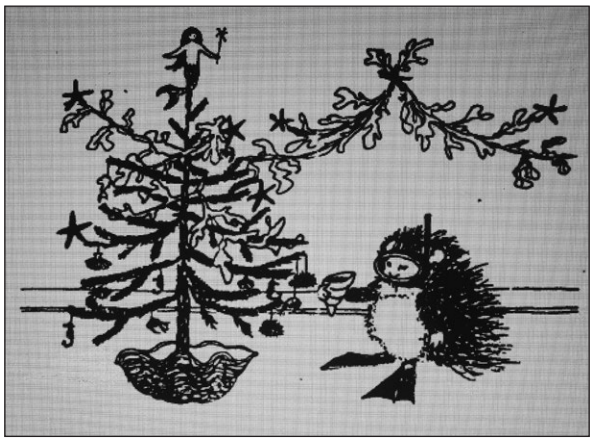
22. The first formal joke (although there are many amusing anecdotes before this) was published in March 1983 as part of Porcupine notes and news.

YOU DON'T OFTEN come across jokes in biology text-books. Browsing through the arthropod section of Sedgwick's massive Student's Text-book of Zoology *(1909), we were delighted, on p. 744 of volume 3, to see the following:* Ceratopogon *is the midge which causes much annoyance in Scotland, where its presence in conjunction with that of the kilt is said to have given rise to the Highland Fling.*

F. Evans (Hon. Ed.) 1983 (PNV2N7 March 1983).

23. In July 1981 a new feature appeared in the Newsletter (PNV2N2). This was called Around the Marine Labs, and the first was devoted to the oldest British laboratory, Dunstaffnage, formerly at Millport (all is explained in the article!). Millport was the 13th lab to be featured (PNV3N5 December 1985), and was recently the home for the 2016 Porcupine conference. The recent re-investment in Millport by the Field Studies Council enabled Porcupines to spend three very happy days doing all things Porcupine in what might be considered true luxury. Millport was also the venue for the first Porcupine television appearance when, in March 1995, there was a ferry strike and Shelagh Smith and Morag Mackinnon appeared on Scottish television taking supplies (cases of wine!) via passenger ferry to the beleaguered islanders. This was watched with much hilarity by those very same Porcupines.

24. In July 1983 the newsletter advertised the first Porcupine Christmas cards to go on sale at £1.20 for 10. Is this something we need to do again? Does anyone still have one?



25. Porcupine has funded and supported a number of projects over the years including FFLASK. (The Fauna and Flora Lists And Systematic Keys project). Using a grant awarded to Porcupine by the World Wildlife Fund, Porcupine Judy Foster-Smith was employed to undertake a study to examine the feasibility of producing a synopsis of fauna and flora lists and systematic keys (FFLASK) of British marine biota. This was completed in early 1987. Porcupine also part funded the updating of *The Marine Fauna and Flora of the Cullercoats District* (PNV6N4 May 1996).

26. The first Porcupine sweatshirt was advertised in the Newsletter in December 1989 for a cost of £11.00. The colours were white, yellow, pale blue, pink, or framboise with a black design, or black, jade green, red, or purple with a white design (PNV4N8 April 1990, p. 200).

27. The 40th Porcupine Newsletter was published in December 1990 (PNV4N10 December 1990) and includes a field report from a Porcupine meeting to Easthaven, Tayside (Shelagh Smith, Jan Light and Ian Killeen) and a key for coastal and estuarine oligochaetes of the Forth by C. J. L. Taylor. This Newsletter was the third published in 1990. The Newsletter was printed three times each year between the years of 1987 (not including 1988) and 1992 with the content moving away from notes, comments, notices and letters towards more academic papers.

28. The first photograph contained in an article was of a commercial scallop dredge in an article by Jason Hall-Spencer on the effects of scallop dredging on the maerl beds in the Firth of Clyde (PNV6N1 May 1995). The first photos of Porcupines appeared in PNV1 Winter 1998, and were of founding Porcupines Shelagh Smith and David Heppell, who were both awarded life membership in 1998.

29. The first time Porcupine offered a prize for an essay was in June 1994 (PNV5N9 June 1994). This was open to registered students, undergraduates or post-graduates, including Open University. The advertisement ran full page, and the prize offered was £100. Although there was a poor response, Porcupine did run it again in 1995 when one submission was

PMNHS Council, March 2002. Taken at the PMNHS Conference, National Museums Scotland, Edinburgh. Left to right: Frank Evans, Jon Moore, Judy Foster-Smith, Ivor Rees, Julia Nunn, Frances Dipper, Shelagh Smith, Roger Bamber, Anne Bunker, Nettie Little, Susan Chambers.

obtained which was not 'up to standard'. In 2010, Frank Evans proposed that Porcupine might wish to again offer a prize, and it was agreed by the Council that £50 and a year's membership would be awarded to the best article submitted by a student or amateur on an annual basis. This was initiated in 2011 (PNV29 Spring 2011), and first winner of the prize was Kathryn Ross. You can read her article *Invertebrate life of Brownsea Island Lagoon and its importance to the birds of Poole Harbour* in PNV30 Autumn 2011.

30. In 1998 a team of Porcupines (Jon Moore, Jenny Mallinson, Lin Baldock and Jan Light) gathered to develop a new recording scheme, and this was outlined in PNV1 (1998). Porcupine's first recording cards were then printed, made available online and could be photocopied from the final page of the Newsletter. In March 2001, Jenny Mallinson wrote extensively about the Porcupine recording scheme and included some records from that year under categories such as 'unusual species' and 'species outside their expected range' (PNV7 March 2001). Julia Nunn has kindly written an update on the status of the Porcupine Recording Scheme in this Bulletin, and has put forward ideas on how this scheme will be taken forward. You will also note she has included a call for location and missing survey data!

31. The first time the Newsletter was published with a separate front cover was in 1999. It was re-formatted and published as the *Newsletter of the Porcupine Marine Natural History Society*. The issue is Winter 1998/99 Number 1.

32. Thanks were given to Judy Foster-Smith and artist David Hall in 2000 for the Porcupine logo, which first appeared in July 2000 (PNV4 July 2000). It now features on all Porcupine Bulletins and the website.

33. The first Porcupine website went live in late 2000. The intention to create a website was announced in PNV6N7 June 1997. PNV7 March 2001 confirms the website is live on page 4, in the summary of Council Minutes. Anne Bunker became the first Porcupine Website Officer, and handed over to Tammy Horton in March 2008.

http://pmnhs.co.uk/wp-content/uploads/2011/11/PMNHSnewslett-7.pdf

34. Ratification of a new honorary post of Chairperson took place during the 24th Annual General Meeting at Brampton, Huntington in March 2001. Julia Nunn was Porcupine's first Chairperson. Andy Mackie stepped into the role in 2009 and remained Chair until spring 2016 when Susan Chambers took on the mantle.

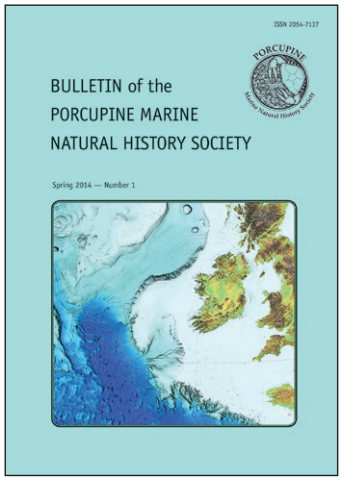
35. In the Winter 2007 Newsletter (PNV23), Porcupine announced its own Small Grants Scheme. For 6 years, an annual total fund of £3000 was available for small projects of one to three months duration. Any small project application which fell within the objective of the Society was considered. The objective of the Society is to promote interest in the ecology and distribution of marine fauna and flora in the northeast Atlantic and the Mediterranean. The first grant was awarded to Paul Kay for a project on field photography of gobies for identification (PNV31 Spring 2012). The grant scheme is currently unavailable, but it is hoped that we can resume this offer at some stage in the not too distant future.

36. There are some notable, regular and longstanding contributors to the Porcupine Newsletter/Bulletin and their offerings have always been appreciated and enjoyed. However during my research for '40 firsts' I realised that there is one Porcupine who has contributed 40 articles (as well as other comments and notes). Aptly for Roger his first, in PNV1N3 August 1977, was a request for materials and records of what might be described as his 'first love', British pycnogonids, and his final contribution was a request for data on what could be considered his 'second love', tanaidaceans, in Spring 2014 (PBV1). Thank you Roger Bamber.

37. The first Newsletter to fully embrace colour was published in the summer of 2010 (PNV28). The Newsletter gained its first glossy front cover in November 2007 (PNV23) and was printed in black and white until 2010, although it has been available in colour as a pdf from 2007.

38. In spring 2013 (PNV33), Tammy Horton wrote our first website review which gave an overview of WoRMS (the World Register of Marine Species). http://www.marinespecies.org/. At the time of writing, there were 215,026 taxa accepted of which 197,838 were checked (92%), and on 2nd Aug 2016, 551,527 marine taxa accepted and 518,702 checked (94%). The first mobile phone app reviewed was MarineLife – Genus Trait Handbook by Deep Blue Sky Digital Ltd. Anne Bunker reviewed the app in PNV30 Autumn 2011, and concluded that although it may be a useful app she wasn't going to give up on books just yet!

39. The Newsletter transformed into the Bulletin in the spring of 2014, ISSN 2054-7137. Not only did the Porcupine publication change its name, but also the colour of the front cover to distinguish it from the Newsletters. The format and style remain the same, as do the constant age-old requests for copy from the Hon. Ed.



40. Porcupine first tweeted on 25th November 2015 with *Colourful sponges and anemones at Porthtowan, Cornwall today @PorcupineMNHS*. As of 1st August, we have 566 followers, and have tweeted over 1200 times!

Porcupine Marine Natural History Society

Minutes of the 39th Annual General Meeting Saturday 12th March 2016

Millport Field Studies Centre, Isle of Cumbrae

1. Apologies for absence:

Peter Barfield, Angie Gall, Teresa Darbyshire, Séamus Whyte, Tammy Horton, Dawn Powell, Roni Robbins.

2. Matters arising from the Minutes of the 38th AGM, as published in the PMNHS Bulletin, Autumn 2015, No. 4:

The Minutes were accepted with no corrections or additions. There were no matters arising.

3. Officers' reports:

The Hon. Treasurer's Report (Jon Moore)
There has been a downturn in the finances in the past few years due to improvements in the quality of the Bulletin and a reduction in membership numbers. However in the last couple of years things have been improving, and in 2015 the membership income covered outgoings, for the first time since 2010. The balance at the end of the 2015 financial year was £1737 (£2009 in 2014). Council is currently discussing ways to try and not have to pay corporation tax such as becoming a charity. With a better bank balance we are aiming to re-start the small grants scheme ASAP.

Acceptance of the report was proposed by Shelagh Smith and seconded by Julia Nunn.

The Hon. Membership Secretary's Report (Roni Robbins)

Séamus Whyte is stepping down as Membership Secretary and Roni Robbins has been working with him during the year prior to this AGM. There is now a dedicated membership email for all enquiries, which can be found on the website (membership@pmnhs.co.uk) and which should avoid any confusion in future. As of today, there is now an online option for payment of membership fees which remain at £18 (full) and £10 (students and unwaged). Membership currently (before the end of the conference) stands at about 150.

Acceptance of the report was proposed by Christine Howson and seconded by Vicki Howe.

The Hon. Editor's report (Vicki Howe)

Two full colour Bulletins have been produced this year, Spring 2015 with >15 contributions, 14 articles and 59 pages; and Autumn 2015 with >18 contributions, 17 articles and 79 pages. Vicki thanked Teresa Darbyshire and all others (Anne, Paul, Angie, Tammy, Peter, Sue) who had helped to proof read and distribute the final products. All those present were invited to contribute reports, articles and papers from the conference. Deadlines for forthcoming Bulletins are 1st week in June and 1st week in December. Guidelines for writing are on the website and in the Bulletins. All current members receive a hard copy and an email with a link and password to download a pdf copy. New members will receive a pdf copy and will be asked to opt in if they wish to have a hard copy (current members can of course opt out of having a hard copy but a show of hands indicated that most would not wish to do this).

In the next bulletin, there will be details of a Porcupine family field meeting (no height restriction!) to be held in 2017.

Acceptance of the report was proposed by Jon Moore and seconded by Fiona Crouch.

The Hon. Website Officer's report (Tammy Horton)

The website is continually being improved and updated. The most recent addition is of the 'live' Twitter feed, although this still needs some work to improve visual appearance. The website is a one-stop-shop for all things Porcupine. The website is being well-used primarily for announcements regarding the annual conference and all that entails. The most recent addition to the website is the means to pay for membership by Paypal

(which has already been used during the 2016 conference). Since January 2016 the site had >2750 page loads of which >1400 were unique visits. All issues of the Newsletter from the very first until the last when it was superceded by the Bulletin, plus the new Bulletin up to Issue No. 1 Spring 2014, are available on the website. Issues from the past two years are also available to paid-up members of the Society as a password protected download. The Facebook group remains very active with 461 members. The Twitter account has 406 followers and many tweets/re-tweets (thanks to Angie Gall and Kate Mortimer-Jones).

Acceptance of the report was proposed by Susan Chambers and seconded by Anne Bunker.

The Hon. Records Convenor report (Julia Nunn)

This role was taken over by Julia at the 2015 AGM. The database is a small one and is used mainly to house records from Porcupine field trips. However Porcupine field trips capture many important records due to the considerable identification expertise that is often present. A complete review of the data has been undertaken and upgraded to *Marine Recorder* 5.4 with appropriate corrections. The data encompasses 24 surveys. There are some records from Northumberland with no location information, so if anyone can provide this please do so. There are no data from 2010 onwards so this will now be extracted from the Newsletters/Bulletins. Records will be sent to the NBN who are our data partner. The licence for our data on NBN is the freely available one so with full access. The original idea of the Porcupine recording scheme was for casual records, because at that time there was no suitable repository for such records. Now there are several hence our focus on our own surveys.

Acceptance of the report was proposed by Paul Brazier and seconded by Shelagh Smith.

The Hon. Chairman's report (Andy Mackie)

In terms of field activities, it has been a fairly quiet year for Porcupine as the proposed trip to Staffa had to be moved to September this year (2016). That means that this year there will be two field trips: Aberystwyth and Staffa. Details of both are on the website, in the current Bulletin and on fliers here at the conference. Last year was tinged by sadness as we lost our long-term member and stalwart of the Council, Roger Bamber. Porcupine has now consolidated its running and the finances are under control and improving. We are now looking at innovative sources of funding so that we can start the small grants system again ASAP.

Acceptance of the report was proposed by Christine Howson and seconded by Julia Nunn.

4. Porcupine Grants Scheme and Bulletin student prize

The Porcupine grants scheme was initially funded with a partner organisation which provided the funding. Alternative funding is now being sought. Student Prize: three students submitted articles for the Bulletin during the year and as the standard was high it was very tough to choose the winner. However after considerable deliberation the winner is Stephanie Deane for her article on the Pacific Oyster published in Bulletin No.4. Due to financial constraints the prize this year is £50 and a year's membership (it was £100 and 2 years previously). Porcupine would like to thank all the students who contributed articles and to encourage them and others to submit further articles. The question arose as to whether 'internees' count as students. This will be discussed at the next council meeting.

5. Constitution

Three amendments to the Constitution were proposed by Council to allow official notifications to be made via the website and email and to change 'Newsletter' to 'Bulletin'. The amendments were provided as an insert to Bulletin No.4.

The amendments were unanimously agreed.

6. Election of Officers and Council

Most office bearers were willing to continue in their posts for the coming year. However, after 13 years as a member of council and 7 years as chairman, Andy Mackie expressed his wish to step down as chairman. Susan Chambers was proposed as chairman by Andy Mackie, seconded by Anne Bunker and elected by a show of hands.

Séamus Whyte (not present) had expressed his wish to step down as Membership Secretary. Roni Robbins has been transitioning and updating the membership database. She was proposed as Membership Secretary by Frances Dipper, seconded by Jon Moore and elected by a show of hands.

Re-election of the other 5 officers was proposed by Susan Chambers and seconded by Fiona Crouch and elected 'en masse' by a show of hands.

As per the Constitution, 2 ordinary members stood down: Paul Brazier and Anne Bunker. Andy Mackie, Séamus Whyte and Anne Bunker were available for re-election as ordinary members. Paul Brazier did not wish to stand. In addition, two expressions of interest to serve on the Council had been received: Sarah Bowen and Fiona Ware. This meant there were 5 candidates for four Ordinary Member places. The situation and options had been discussed separately just beforehand by a section of the Council and the Constitution consulted. The latter does not specifically exclude there being more than 16 members. It was therefore put to those present that it was acceptable to have 17 on the Council. Election of the five candidates was proposed by Vicki Howe, seconded by Julia Nunn and confirmed by a show of hands.

The Council for 2016–17 is therefore as follows:

Office bearers:

Hon. Chairman Susan Chambers
Hon. Secretary Frances Dipper
Hon. Treasurer Jon Moore
Hon. Editor Vicki Howe
Hon. Membership Secretary Roni Robbins
Hon. Records Convenor Julia Nunn
Hon. Website Officer Tammy Horton

Ordinary members of Council:

Peter Barfield	Anne Bunker
Sarah Bowen	Fiona Crouch
Teresa Darbyshire	Angie Gall
Andy Mackie*	Dawn Powell
Fiona Ware	Séamus Whyte

7. Future meetings

The location and dates for future meetings including conferences and field trips will be discussed by Council. A map showing past indoor and field meetings was presented. The aim is to rotate the location of the annual conference to allow members from all parts of the UK to have the chance to attend. The aim with field trips is also to fill in recording gaps. Bob Earll commented that he felt the annual conference was crucial to the society and that care should be taken to choose venues that had good public transport and accommodation. Liverpool was suggested from the floor. Field trips this year will be to Staffa (September) and Aberystwyth (October).

8. Any other Business

There was no other business.

** Subsequent to the Conference, Andy Mackie resigned from the Council returning the Council membership to 16.*

PORCUPINE MNHS

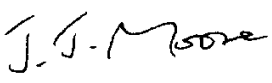
RECEIPTS AND PAYMENTS ACCOUNT

Year to 31 December 2015

Year to 31.12.14				Year to 31.12.15	
£	£			£	£
		RECEIPTS			
26		Subscriptions	2013 & earlier	120	
2049			2014	229	
46			2015	2630	
0			2016 onwards	0	
	2121				2979
	0	Sales (Sweatshirts & books)			0
	0	Bank Interest (gross, both accounts)			0
	(0)	Tax deducted			(0)
	0	Contribution			50
	2121	Total Receipts			3029
		PAYMENTS			
(3142)		Bulletin-	Printing	(2212)	
(0)			Postage & other expenses	(559)	
(3142)		Total Newsletter Costs		(2771)	
(10)		Web site expenses		(144)	
(0)		Council meeting expenses (travel/catering)		(53)	
	(3152)				(2968)
	(1031)	**SURPLUS BEFORE MEETINGS & GRANTS**			60.98
344		**Annual Conferences** – Galway (2014)		0	
0			– Portsmouth (2015)	0	
0			– Millport (2016)	(333)	
(777)		**Field meetings** – Isle of Man (2014)		0	
0		**Porcupine grants**		0	
(50)		**Newsletter prize**		(0)	
	(1071)				(333)
	(40)	**DEFICIT FOR THE YEAR (before tax)**			(272)
	0	Corporation Tax			0
	(40)	**DEFICIT FOR THE YEAR (after tax)**			(272)
	1969	**BALANCE BROUGHT FORWARD**			2009
		BALANCE CARRIED FORWARD			
2009			Current Account	1737	
	2009				**1737**

Jon Moore, Hon Treasurer
9 March 2016

Nick Light, Hon Examiner
? April 2016



Porcupine Marine Recording Scheme

Julia Nunn

In March 2015, at the PMNHS AGM, I became the Honorary Records Convenor for the Society, a role which involves the compilation and management of records submitted by Porcupine members (principally from field excursions): the Porcupine Marine Recording Scheme. I replaced Roni Robbins, who retired after ably carrying out this duty for the 10 years since March 2005, including initiating the use of the database *Marine Recorder*. In autumn 2015, I received a copy of the PMNHS database for Marine Recorder from Roni.

Marine Recorder is the database application used by JNCC and other organizations to store marine sample data such as species, physical attributes and biotopes. It is fully compatible with the NBN data model, enabling data to be contributed to the NBN Gateway http://jncc.defra.gov.uk/page-1599. The PMNHS dataset was upgraded by me to the latest *Marine Recorder* version 5.4. This also involved an update to the taxonomic dictionary, to comply with the World Register of Marine Species http://www.marinespecies.org/. The update includes technical errors to the matching process, due to taxonomic issues which were not identified when *Marine Recorder* was being upgraded by JNCC. These have been rectified in the Porcupine dataset. A small number of species duplications during data entry were identified and deleted.

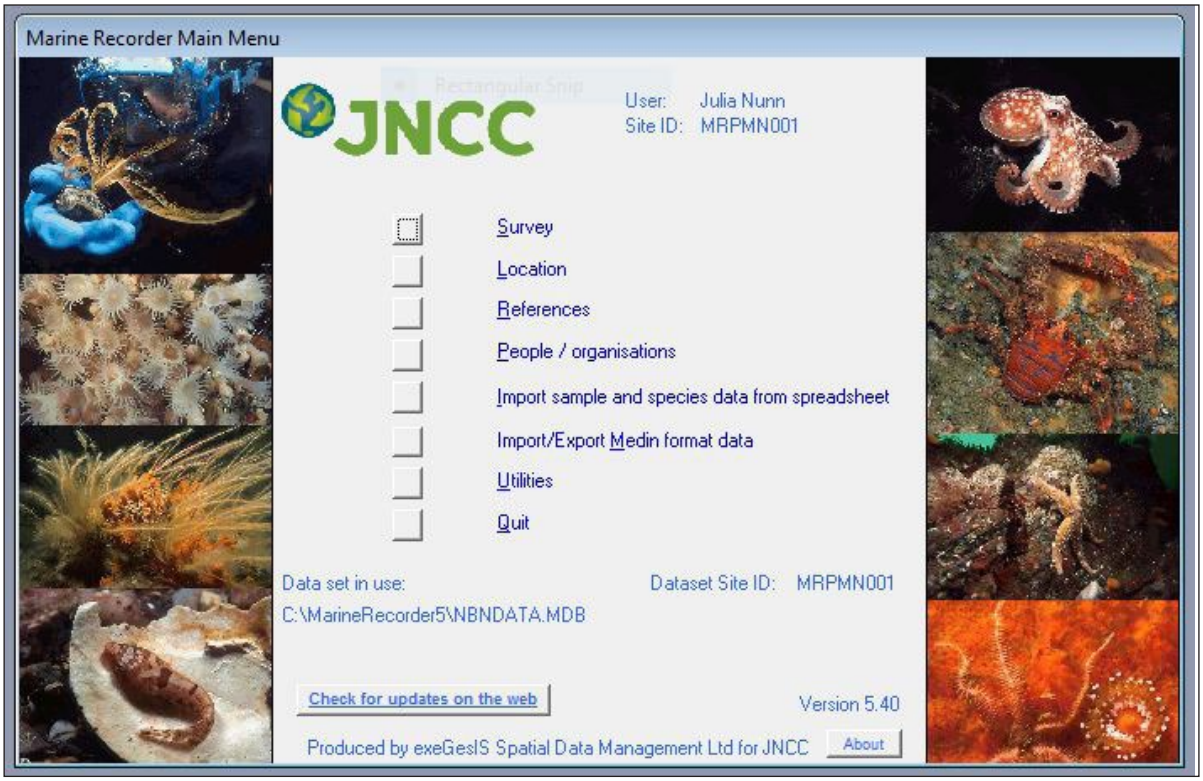
The dataset holds 24 surveys from 1977 (field meeting to Orkney) to 2009 (field meeting to Wembury) inclusive, comprising 3087 records. Of these, two are missing location data.

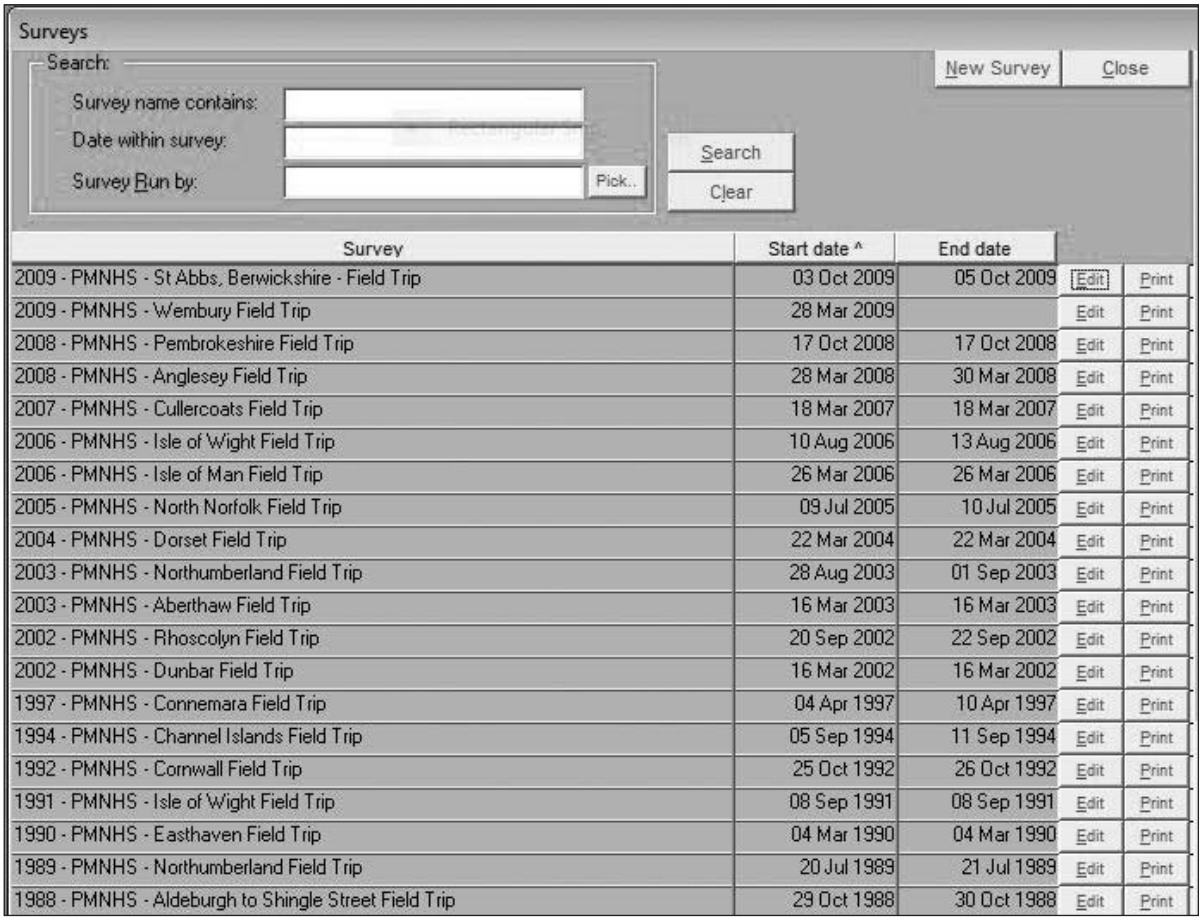
- 1983 - PMNHS - Newton Haven, Northumberland
- 2003 - PMNHS - Northumberland Field Trip

The database is missing all data from 2010 onwards. I have a full set of PMNHS Bulletins, so I will be entering any data for any reported fieldtrips, together with any casual records in articles. Data already entered will be checked.

However, some field trip surveys were entered onto *Marine Recorder* by others, for example, the Scillies in 2010. I hope that copies of such surveys will be sent to me (in the NBNdata.mdb format) to be kept with the other PMNHS surveys.

When all records have been entered to date, a full copy of the corrected PMNHS dataset (excluding those already dealt with by others)




Surveys

Search:

Survey name contains:

Date within survey:

Survey Run by:

Pick..

Search

Clear

New Survey

Close

Survey	Start date ^	End date		
2009 - PMNHS - St Abbs, Berwickshire - Field Trip	03 Oct 2009	05 Oct 2009	Edit	Print
2009 - PMNHS - Wembury Field Trip	28 Mar 2009		Edit	Print
2008 - PMNHS - Pembrokeshire Field Trip	17 Oct 2008	17 Oct 2008	Edit	Print
2008 - PMNHS - Anglesey Field Trip	28 Mar 2008	30 Mar 2008	Edit	Print
2007 - PMNHS - Cullercoats Field Trip	18 Mar 2007	18 Mar 2007	Edit	Print
2006 - PMNHS - Isle of Wight Field Trip	10 Aug 2006	13 Aug 2006	Edit	Print
2006 - PMNHS - Isle of Man Field Trip	26 Mar 2006	26 Mar 2006	Edit	Print
2005 - PMNHS - North Norfolk Field Trip	09 Jul 2005	10 Jul 2005	Edit	Print
2004 - PMNHS - Dorset Field Trip	22 Mar 2004	22 Mar 2004	Edit	Print
2003 - PMNHS - Northumberland Field Trip	28 Aug 2003	01 Sep 2003	Edit	Print
2003 - PMNHS - Aberthaw Field Trip	16 Mar 2003	16 Mar 2003	Edit	Print
2002 - PMNHS - Rhoscolyn Field Trip	20 Sep 2002	22 Sep 2002	Edit	Print
2002 - PMNHS - Dunbar Field Trip	16 Mar 2002	16 Mar 2002	Edit	Print
1997 - PMNHS - Connemara Field Trip	04 Apr 1997	10 Apr 1997	Edit	Print
1994 - PMNHS - Channel Islands Field Trip	05 Sep 1994	11 Sep 1994	Edit	Print
1992 - PMNHS - Cornwall Field Trip	25 Oct 1992	26 Oct 1992	Edit	Print
1991 - PMNHS - Isle of Wight Field Trip	08 Sep 1991	08 Sep 1991	Edit	Print
1990 - PMNHS - Easthaven Field Trip	04 Mar 1990	04 Mar 1990	Edit	Print
1989 - PMNHS - Northumberland Field Trip	20 Jul 1989	21 Jul 1989	Edit	Print
1988 - PMNHS - Aldeburgh to Shingle Street Field Trip	29 Oct 1988	30 Oct 1988	Edit	Print

will be sent to the NBN Gateway (we are a Data Partner) to override the dataset already there.

Please could Porcupine members:

• Try to find the location data for the 1983 & 2003 surveys that are missing.

• Ensure that copies of PMNHS surveys since 2009 already in *Marine Recorder* format be sent to me.

Every year, Porcupine runs field trips – one day usually after the conference; and a week-long survey during the summer or autumn. It would be very helpful to me if all PMNHS field trip leaders could send me species/location etc. data as soon as the full and final lists are available, for data entry. If the trip is run as a Porcupine trip, the records should go to the Society, even as copy (e.g. Seasearch records).

The Porcupine Marine Recording Scheme is there to encourage and support anyone who wishes to find a 'home' for casual records. Although there are many ways to enter records online (directly e.g. iRecord http://www.brc.ac.uk/irecord/ or indirectly e.g. Seasearch dives), not all these paths are either marine friendly, or ensure that they are made available to the NBN Gateway, and from there freely to anyone who is interested.

If anyone wishes to send me a casual record of a marine sighting to enter onto the Porcupine dataset, please email me at: jdn@cherrycottage.myzen.co.uk

CONFERENCE 2016

Report on the Annual Conference Millport, March 11th-13th 2016: *Millport, the Clyde and Marine Biology*

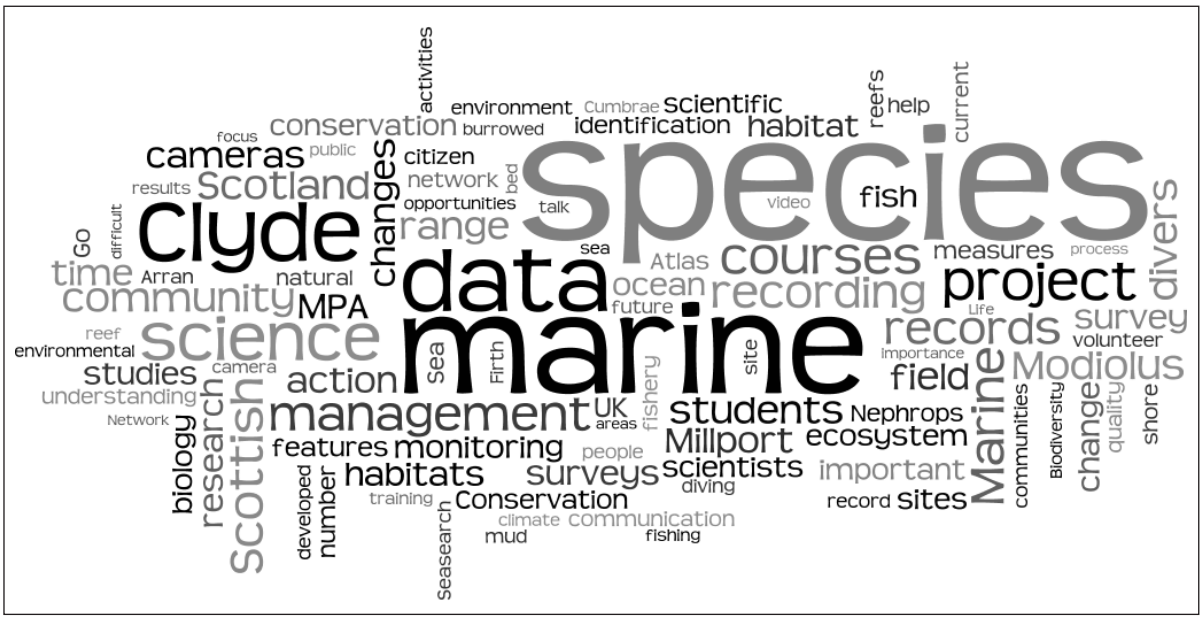
Frances Dipper (joint conference organiser)

Eighty delegates made their way to Millport from all parts of the UK, for the annual conference in early March. The little ferry from Largs was kept busy as people arrived by car and on foot from trains and buses. Whilst some lived near enough on the mainland to 'commute', most delegates took advantage of the excellent en suite rooms in the Field Studies Council (FSC) new accommodation block. The journey from room to bar and back again was thus very short. The lecture room and facilities were everything we could have wished for, and we were well fed from the on site canteen.

Proceedings were opened by Andy Mackie, PMNHS Chairman, and delegates and speakers were welcomed to the FSC Millport Field Centre by Daniel Moncrieff, head of FSC Scotland. Thirty speakers from 25 diverse organisations, including universities, environmental consultancies, government agencies, biodiversity and conservation forums and several independents, presented their papers over two days. The first day covered 'Marine Biologists' Contributions to Marine Management' and included papers on various aspects of the Clyde, *Nephrops* fisheries, *Modiolus* beds, marine algae, things

that live in sediment holes, the Scottish MPA network, SAC monitoring, and marine biology serving industry. The day finished with an excellent, amusing, and informative look at 'life, amphipods and the universe' by long-term Millport resident Geoff Moore.

The second day was devoted to 'Ocean literacy, Education and Citizen Science' and included a wide variety of papers on the ways in which the marine scientific community interacts and works with the general public ('citizens'). Volunteers play an increasingly important role in marine recording, conservation and education, and many are keen to receive training through courses such as those run by the FSC and Seasearch. The day's topics included citizen science projects such as 'The Shore Thing' and 'Capturing Our Coast' as well as presentations by the Scottish Sea Angling Conservation Network, Seasearch and others.



Conference delegates at the Annual Porcupine Conference in Millport, Isle of Cumbrae

Feedback forms, received back from 35 delegates, were universally positive. The main benefits of attending the conference were perceived as: networking and meeting new people (all); keeping up to date on the topics covered; feedback on own subject; promoting projects; gaining ideas and learning. The main (small) niggles were: lack of microphone (FSC apologised that this was not ready); start earlier, have longer lunch break and fewer talks (many thought this and it seems Porcupines prefer the more usual coffee, lunch and tea breaks); more natural history/species talks; more new research from PhD students. We will be taking all this on board when organising the 2017 conference.

During the conference 'tweets' were flying around and out and the use of social media is obviously appreciated especially by the younger generation! The conference dinner hosted by FSC on the Friday night, and preceded by drinks in the bar, was enjoyed by 55 delegates. Those who were not there can only imagine the noise level of so many Porcupines catching up on news and views! On the Sunday the weather was calm and dry enough for all three planned surveys; on the shore, diving and remote sampling from the FSC boat RV *Actinia*. These surveys are reported separately.

Finally, Porcupine MNHS would like to thank the FSC for their wonderful hospitality, patience, provision of excellent facilities including lab space, all in spite of having to juggle ongoing building works. I for one would certainly like to visit again. A future Porcupine field trip perhaps? We would also like to thank Dr Bob Earll from CMS for his generosity in setting up and running the programme of talks and advertising the conference for us.

A.S.Y. Mackie

Porcupine shore recording at Millport, Isle of Cumbrae

Frances Dipper

Following a fascinating and (mentally) exhausting two days of conference held in the excellent facilities provided by the Field Studies Council at Millport, it was time for some fresh air and exercise. For a Sunday morning at 7am, the 20 or so Porcupiners who gathered for an early breakfast seemed remarkably bright and cheerful. A short walk along Marine Parade took us to the footpath that goes round the rocky peninsula of Farland Point. Most of the recording was done in the boulder strewn bay of Farland Bight with some intrepid and (shore-footed!) recorders extending to Farland Point itself.

A good spring low tide revealed the sublittoral fringe with a dense kelp forest of *Laminaria digitata*, excellent fossicking grounds for those with waders. The rock surface between the holdfasts was colonised by sponges (mainly *Halichondria panicea* and *Hymeniacidon perlevis*), tunicates, encrusting coralline algae and the pretty little tortoiseshell limpet *Tectura virginea*, plus a wide range of red seaweeds. The hidden world between boulders was explored by Jack Sewell ('Jackapod') with a neat torch-shaped 'microscope', revealing many tiny animals. Broad-clawed porcelain crabs (*Porcellana platycheles*) are expert at upside-down living and showed off their skills by creeping quickly over the edge and underneath when picked up and put in the palm of a hand. Long-clawed porcelain crabs (*Pisidia longicornis*) do not have this skill but were present alongside their cousins. These inter-boulder spaces were also a favourite of butterfish (*Pholis gunnellus*) and tiny snub-nosed worm pipefish (*Nerophis lumbriciformis*).

The site also has a rich under-boulder habitat which was avidly (but carefully) explored and revealed a wealth of invertebrates including the green sea urchin (*Psammechinus miliaris*), a typical inhabitant of boulder shores in the north-west, along with juvenile common starfish (*Asterias rubens*) and various brittlestars. Keel worms, spiral tube worms (*Spirorbis*), scale worms, chitons and encrusting bryozoans and tunicates were found attached to the underside of most boulders on the lower shore. Stones and boulders set

Above and right: Shore Porcupiners getting stuck in

in coarse shell sand provided a habitat for a variety of amphipods, many polychaete worms and juvenile edible crabs (*Cancer pagurus*), the latter usually found half buried.

So far I have hardly mentioned molluscs but suffice it to say that the list is a long one, principally gastropods as would be expected on a rocky shore, plus chitons and the occasional sea slug. Finally, in the quiet of the previous morning, with no other Porcupiners around, Maya Plass was lucky enough to encounter a harbour seal (*Phoca vitulina*) eating a fat, juicy Ballan wrasse. Lucky her.

The species list from Farland is given in Table 1, but there are likely to be additional fauna records from sediment, seaweed and rock samples. These are currently being worked up by various Porcupiners and will be published in the next Bulletin as a supplementary list.

An additional visit was made to Whitesand Bay in the north of the island by Shelagh Smith and David Hurd. This is a sandy bay flanked by rocky areas and is moderately sheltered. They searched the sandy areas for mollusc shells. A total of 35 species (dead shells) was recorded plus some washed up live juveniles of *Mytilus edulis* and *Modiolus modiolus* and some nudibranch eggs. Shelagh has also provided a list of 50 live mollusc records from Whitesand Bay (rocky and sediment areas) from 4th March 1995. This recording was carried out by Shelagh during the 1995 Porcupine conference in Millport. Papers from this conference were published in the old '*Porcupine Newsletter*' Volume 6, numbers 1 (May 1995) and 2 (August 1995) but do not include *ad hoc* field work records. Shelagh's lists are available from Frances Dipper.


A.S.Y. Mackie


A.S.Y. Mackie


V. Howe


V. Howe

Taxon name	Authority	Common name	Notes
PORIFERA			
Halichondria panicea	(Pallas, 1766)	Breadcrumb sponge	
Hymeniacidon perlevis	(Montagu, 1814)	a sponge	
Ophlitaspongia papilla	Bowerbank, 1866	a sponge	
Halisarca dujardinii	Johnston, 1842	a sponge	
CNIDARIA			
Dynamena pumila	(Linnaeus, 1758)	a hydroid	
Obelia sp.	Péron & Lesueur, 1810	a hydroid	
Actinia equina	(Linnaeus, 1758)	Beadlet anemone	
Urticina felina	(Linnaeus, 1761)	Dahlia anemone	
Sagartia elegans	(Dalyell, 1848)	Elegant anemone	
NEMERTEA			
Lineus longissimus	(Gunnerus, 1770)	Bootlace worm	
POLYCHAETA			
Harmothoe extenuata	(Grube, 1840)	scaleworm	
Harmothoe fragilis	Moore, 1910	scaleworm	
Harmothoe impar	(Johnston, 1839)	scaleworm	
Lepidonotus clava	(Montagu, 1808)	scaleworm	
Pholoe inornata	Johnston, 1839	scaleworm	
Sthenelais boa	(Johnston, 1833)	sand scaleworm	
Eulalia viridis	(Linnaeus, 1767)	green leaf paddleworm	
Eumida sanguinea	(Örsted, 1843)	paddleworm	
Phyllodoce lamelligera	Johnston	paddleworm	
Phyllodoce maculata	(Linnaeus, 1767)	paddleworm	
Phyllodoce mucosa	Örsted, 1843	paddleworm	
Psamathe fusca	Johnston, 1836		
Nereis pelagica	Linnaeus, 1758	ragworm	
Flabelligera affinis	M. Sars, 1829	bristlecage worm	
Sabellaria alveolata	(Linnaeus, 1767)	honeycomb worm	
Spirobranchus triqueter	(Linnaeus, 1758)	keel worm	
Spirorbis spp.	Daudin, 1800	spiral tube worm	
ARTHROPODA			
Verruca stroemia	(O.F. Müller, 1776)	Wart barnacle	
Austrominius modestus	(Darwin, 1854)	Australasian barnacle	
Semibalanus balanoides	(Linnaeus, 1767)	Acorn barnacle	
Balanus crenatus	Bruguière, 1789	Crenulated acorn barnacle	
Amphipoda	Latreille, 1816	amphipods	
Apherusa jurinei	Milne Edwards, 1830	amphipod	
Stenothoe monoculoides	(Montagu, 1815)	amphipod	
Tryphosella sarsi	Bonnier, 1893	amphipod	
Dexamine thea	Boeck, 1861	amphipod	
Echinogammarus obtusatus	(Dahl, 1938)	amphipod	
Jassa herdmani	(Walker, 1893)	amphipod	
Caprella septentrionalis	Krøyer, 1838	amphipod	
Munna sp.	Krøyer, 1839	isopod	
Idotea balthica	(Pallas, 1772)	isopod	
Idotea granulosa	Rathke, 1843	isopod	
Pagurus bernhardus	(Linnaeus, 1758)	Common hermit crab	
Pisidia longicornis	Linnaeus, 1767	Long-clawed porcelain crab	
Porcellana platycheles	Pennant, 1777	Broad-clawed porcelain crab	
Hyas sp.	Leach, 1814	spider crab	
Cancer pagurus	Linnaeus, 1758	Edible crab	
Necora puber	(Linnaeus, 1767)	Velvet swimming crab	

Table 1: Species recorded from Farland Point area, March 13th 2016. Species lists provided by Jane Pottas (seaweeds, also incorporates information from Anne & Francis Bunker), Susan Chambers (polychaetes), Julia Nunn (molluscs and general), Steve Jarvis (small fauna, mainly worms, amphipods, isopods, molluscs), Frances Dipper (fish). Notes: FP=Farland Point, FB=Farland Bight, US=upper shore, MS=mid shore, LS=lower shore, RP=rock pool.

Taxon name	Authority	Common name	Notes
MOLLUSCA			
Lepidochitona cinerea	(Linnaeus, 1767)	Grey chiton	
Gibbula cineraria	(Linnaeus, 1758)	Grey top shell	
Gibbula umbilicalis	(da Costa, 1778)	Flat top shell	
Testudinalia testudinalis	(O.F. Müller, 1776)	Common tortoiseshell limpet	
Tectura virginea	(O.F. Müller, 1776)	White tortoiseshell limpet	
Patella pellucida	Linnaeus, 1758	Blue-rayed limpet	
Patella vulgata	Linnaeus, 1758	Common limpet	
Lacuna vincta	(Montagu, 1803)	Banded chink shell	
Littorina fabalis	(Turton, 1825)	Flat periwinkle	
Littorina littorea	(Linnaeus, 1758)	Common periwinkle	
Littorina obtusata	(Linnaeus, 1758)	Common flat periwinkle	
Littorina saxatilis	(Olivi, 1792)	Rough periwinkle	
Skeneopsis planorbis	(O. Fabricius, 1780)	Flat skenea	
Rissoa lilacina	Récluz, 1843	a rissoid snail	
Rissoa parva	(da Costa, 1778)	a rissoid snail	
Pusillina sarsii	(Lovén, 1846)	a rissoid snail	
Lamellaria latens	(O.F. Müller, 1776)	a gastropod	
Nucella lapillus	(Linnaeus, 1758)	Dog whelk	
Goniodoris nodosa	(Montagu, 1808)	a sea slug	
Onchidoris muricata	(O.F. Müller, 1776)	a sea slug	
Limacia clavigera	(O.F. Müller, 1776)	Orange-clubbed sea slug	
Mytilus edulis	Linnaeus, 1758	Common mussel	
Monia patelliformis	(Linnaeus, 1761)	Ribbed saddle oyster	
Venerupis sp.	Lamarck, 1818	Carpet shell	
Hiatella arctica	(Linnaeus, 1767)	Wrinkled rock borer	
ECHINODERMATA			
Henricia sp.	Gray, 1840	Bloody Henry starfish	
Asteriidae spp.	Gray, 1840	Forcipulatid starfish	
Asterias rubens	Linnaeus, 1758	Common starfish	
Ophiothrix fragilis	(Abildgaard in O.F. Müller, 1789)	Common brittlestar	
Amphipholis squamata	(Delle Chiaje, 1828)	Small brittlestar	
Psammechinus miliaris	(P.L.S. Müller, 1771)	Green sea urchin	
Echinus esculentus	Linnaeus, 1758	Edible sea urchin	
BRYOZOA			
Flustrellidra hispida	(O. Fabricius, 1780)	a bryozoan	
Electra pilosa	(Linnaeus, 1767)	Frosty sea mat	
TUNICATA			
Didemnidae	Giard, 1872	a didemnid sea squirt	
Corella eumyota	Traustedt, 1882	a sea squirt	
Botryllus schlosseri	(Pallas, 1766)	Star ascidian	
Botrylloides leachii	(Savigny, 1816)	a colonial sea squirt	
PISCES			
Ciliata mustela	(Linnaeus, 1758)	Five-bearded rockling	
Nerophis lumbriciformis	Jenyns, 1835	Worm pipefish	
Cyclopterus lumpus	Linnaeus, 1758	Lumpsucker	
Lipophrys pholis	(Linnaeus, 1758)	Shanny	
Pholis gunnellus	Linnaeus, 1758	Butterfish	
MAMMALIA			
Phoca vitulina	Linnaeus, 1758	Harbour seal	
RHODOPHYTA			
Aglaothamnion sp.	Feldmann-Mazoyer, 1941		FP (mussel sp.)
Ceramium sp.	Roth, 1797	a pincer weed	FB (MS RP)
Ceramium shuttleworthianum	(Kützing) Rabenhorst, 1847	a pincer weed	FP

Table 1 (cont.): Species recorded from Farland Point area, March 13th 2016. Species lists provided by Jane Pottas (seaweeds, also incorporates information from Anne & Francis Bunker), Susan Chambers (polychaetes), Julia Nunn (molluscs and general), Steve Jarvis (small fauna, mainly worms, amphipods, isopods, molluscs), Frances Dipper (fish). Notes: FP=Farland Point, FB=Farland Bight, US=upper shore, MS=mid shore, LS=lower shore, RP=rock pool.

Taxon name	Authority	Common name	Notes
Chondrus crispus	Stackhouse, 1797	Irish moss	FB (LS)
Corallina caespitosa	R.H.Walker, J.Brodie & L.M.Irvine, 2009	a coral weed	FB (LS)
Corallina officinalis	Linnaeus, 1758	Common coral weed	
Cryptopleura ramosa	(Hudson) L.Newton, 1931	Fine-veined crinkle weed	FB (LS)
Cystoclonium purpureum	(Hudson) Batters, 1902	Purple claw weed	FB (LS)
Dilsea carnosa	(Schmidel) Kuntze, 1898	Red rags	
Dumontia contorta	(S.G.Gmelin) Ruprecht, 1850	Dumont's tubular weed	FB (LS)
Gelidium crinale	(Hare ex Turner) Gaillon, 1828	straggle weed	FB (LS) & FP
Gelidium spinosum	(S.G.Gmelin) P.C.Silva, 1996	Spiny straggle weed	FB (LS)
Hildenbrandia crouaniorum	J. Agardh, 1852	Hildenbrand's red weed	FB (LS)
Lithothamnion sp.	Heydrich, 1897	pink paint weed	
Lomentaria articulata	(Hudson) Lyngbye, 1819	Bunny ears	FB (LS) & FP
Mastocarpus stellatus	(Stackhouse) Guiry, 1984	Grape pip weed	FB (LS)
Membranoptera alata	(Hudson) Stackhouse, 1809	Winged weed	FB (LS)
Odonthalia dentata	(Linnaeus) Lyngbye, 1819	Northern tooth weed	FB (LS)
Osmundea hybrida	(A.P.de Candolle) K.W.Nam, 1994	False pepper dulse	FB (LS)
Palmaria palmata	(Linnaeus) Weber & Mohr, 1805	Dulse	FB (LS)
Phycodrys rubens	(Linnaeus) Batters, 1902	Sea oak	FB (LS)
Phyllophora pseudoceranoides	(S.G.Gmelin) Newroth & A.R.A.Taylor, 1971	Stalked leaf bearer	FB (LS) & FP
Plumaria plumosa	(Hudson) Kuntze, 1891	Soft feather weed	FP
Polyides rotunda	(Hudson) Gaillon, 1828	Discoid fork weed	FB (MS RP)
Polysiphonia stricta	(Dillwyn) Greville, 1824	Pitcher siphon weed	FB (LS & MS RP)
Porphyra sp.	C.Agardh, 1824	Laver	FP
Red coralline crusts		pink paint weeds	FB (LS)
Rhodothamniella floridula	(Dillwyn) Feldmann, 1978	Sand binder	FB scoured gulley
Vertebrata lanosa	(Linnaeus) T.A.Christensen, 1967		
OCHROPHYTA			
Alaria esculenta	(Linnaeus) Greville, 1830	Dabberlocks	FB (LS)
Cladostephus spongiosus	(Hudson) C.Agardh, 1817	Hairy sand weed	
Desmarestia aculeata	(Linnaeus) J.V.Lamouroux, 1813	Desmarest's prickly weed	FB (LS)
Dictyota dichotoma	(Hudson) J.V.Lamouroux, 1809	Divided net weed	FB (MS RP)
Ectocarpus sp.	Lyngbye, 1819	filamentous brown	FB (LS)
Fucus serratus	Linnaeus, 1753	Serrated wrack	FB (LS)
Fucus spiralis	Linnaeus, 1753	Spiral wrack	
Halidrys siliquosa	(Linnaeus) Lyngbye, 1819	Sea oak	
Himanthalia elongata	(Linnaeus) S.F.Gray, 1821	Thong weed	
Laminaria digitata	(Hudson) J.V.Lamouroux, 1813	Oar weed	FB (LS)
Laminaria hyperborea	(Gunnerus) Foslie, 1884	Forest kelp	FB (LS)
Pelvetia canaliculata	(Linnaeus) Decaisne & Thuret, 1845	Channel wrack	
Petalonia filiformis	(Batters) Kuntze, 1898		FP
Saccharina latissima	C.E.Lane, C.Mayes, Druehl & G.W.Saunders, 2006	Sugar kelp	FB (LS)
Saccorhiza polyschides	(Lightfoot) Batters, 1902	Furbellows	FB (LS)
CHLOROPHYTA			
Acrosiphonia arcta	(Dillwyn) Gain, 1912		FP
Blidingia sp.	Kylin, 1947		FB (US), & FP
Blidingia minima	(Nägeli ex Kützing) Kylin, 1947		FP
Chaetomorpha melagonium	(F.Weber & Mohr) Kützing, 1845	brick weed	FP
Cladophora hutchinsiae	(Dillwyn) Kützing, 1845	green branched weed	FB (LS) & FP
Cladophora rupestris	(Linnaeus) Kützing, 1843	Common green branched weed	FB (LS) & FP
Prasiola stipitata	Suhr ex Jessen, 1848		FB (US), & FP
Spongomorpha aeruginosa	(Linnaeus) Hoek, 1963	Spongy weed	FP
Ulva lactuca	Linnaeus, 1753	Sea lettuce	
LICHENS			
Caloplaca marina	Wedd., 1873	Orange sea lichen	
Ramalina siliquosa	(Hudson) A.L. Smith, 1918	Sea ivory	

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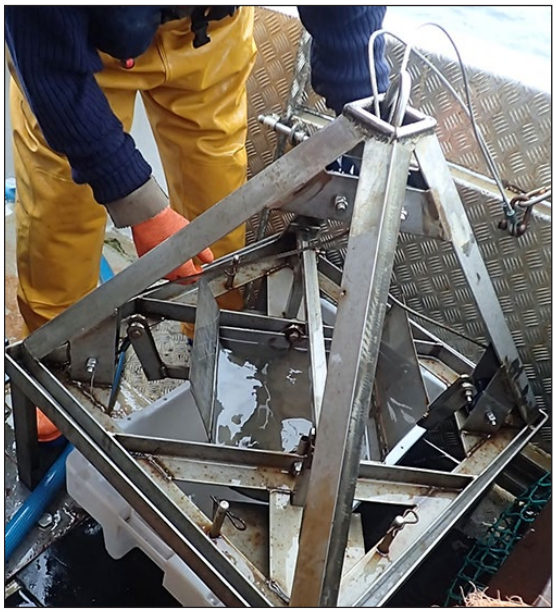
Dredge Report from the Fairlie Channel, Clyde, 13 March 2016

Susan Chambers

The Millport Field Studies Council generously gave us the opportunity to use their Research Vessel *Actinia* to sample the benthos in the Fairlie Channel. There was snow on the hills but no wind and rain, providing a picturesque setting. Twelve Porcupines joined the crew on a lovely Sunday morning to sample with a beam trawl on hard ground at about 32 metres (55° 45.9′ N, 04° 53.6′ W) and a Day grab for the softer sediment at a couple of sites at about 40-46 metres (55° 45.5′N, 04° 53.0′W).

There was great anticipation as the first dredge haul was lowered on deck as you never know what is going to be caught. The first site was a mass of pink, bronze, white wriggling marine life. Then the Porcupines dived in and started separating the squat lobsters *Galathea*, *Crossaster* starfish, *Buccinum*, *Alcyonium*, *Echinus* and several fish along with bits of kelp. Some of the larger specimens were separated in crates to be examined and photographed later, but many smaller animals were discovered amongst the dead bivalve shells and on the kelp.



While the excitement of picking over the dredge sample continued, the crew deployed a Day grab on soft sediment and hauled the contents directly into a crate. The experienced benthic marine biologists jumped to action at the sight of brown/grey mud and began swirling the contents and sieving. The marine life is not obvious but once most of the sediment is removed, the polychaetes and smaller echinoderms are revealed.

The contents of the sieve was scooped up and taken back to the lab for sorting. There were one or two larger specimens of heart urchins, *Brissopsis* and spider crabs *Hyas*. Two hours had passed and we were back at the harbor very happy with our hauls and many hours of identification to look forward to.

Very many thanks to the crew who were very helpful on a sunny Sunday morning.


A.S.Y. Mackie

The Highland Seashore Biodiversity Project

Michael A. Kendall & Janet Ullman

Highland Seashore Project, c/o The Highland Council, Planning & Development Service, Glenurquhart Road, Inverness, IV3 5NX

The Highlands of Scotland cover around one eighth of the area of the United Kingdom and, depending on how you measure it, has half of the coastline of mainland Scotland. On the western and northern coast rocky shores prevail, while to the east the sediment shores of the Moray Firth are a dominant feature. There is a lot of coastline but records of its biota on national recording schemes are sparse. One objective of the Highland Seashore Biodiversity Project was to improve the knowledge of local people about the coastline on which they live. We hoped that we might draw in biological recorders from natural history societies and field clubs, as well as stimulating interest from the broader public via local themed talks and shore walks at a broad range of locations across the whole area.

A good recorder is hard to come by, and you have to do everything that you can to develop and maintain their involvement. That is difficult enough to do in big conurbations where there are frequently more than 2000 people living in a square kilometre, but in the Highlands of Scotland the average population density is only 9 per square kilometre. In the cities there are fast roads, urban trains and buses but in the Highlands such luxuries are few and far between, as is access to 4G phones and fast broadband. With such a dispersed population and poor communications between towns and villages, we had to work very hard indeed to locate recorders, and they had to be highly dedicated and well-motivated to keep themselves involved in our activities.

With a small population to recruit from, we could not afford to select our volunteers; anybody who was at all interested was encouraged to come along to our introductory rocky shore workshops. It was clear from the outset that that type of recording we could do was going to be set by the abilities and enthusiasms of the participants rather than by well-defined scientific priorities. The people who came along were largely either retired or had independent children and had been stimulated to come along for a whole range of different reasons:

- Some wanted to revive or enhance knowledge from college or university days.
- Some were terrestrial naturalists wanting to expand.
- Some wanted access to specific information about their local area for conservation or management purposes.
- Some wanted to make their daily dog-walking more interesting.
- A few just wanted to learn something new and be entertained.

Nobody came forward with the express desire to begin biological recording or to help science; what they wanted was enrichment of their existing way of life.

Our fledging recorders were certainly enthusiastic and trips to the seashore were fun for all, but it was made very clear to us just what they thought their limitations were:

- Those new to the seashore were overwhelmed by the diversity of species that they encountered and some feared that they simply could not cope with such a volume of new information if they were to learn to identify them all competently.
- They hated using scientific names; even the most complicated and contrived English name was preferable.
- They were frustrated when we told them that identifications could not always be made in the field and that you could not identify everything with a photograph. Some of the published field guides which give definite names to tiny animals were a cause for considerable concern.
- They were reluctant to kill animals or sometimes even to take them to the laboratory.
- They found quantification of abundance difficult and abundance scales just about impossible to use.
- Ideas of attaching confidence to records ("may be," "possibly is," "probably is") were difficult for us to convey.

Despite all their uncertainties following introductory workshops, people came back for more on day courses on rocky shores, sand and mud, worms, algae (Clare Scanlan), molluscs and crustaceans (Fiona Ware and Sankurie Pye) and coastal flowering plants (James Merryweather). In all, over 120 people attended project workshops.

After considerable discussion with our potential recorders we made the decision that, given our limited budget for training, the considerable distances between training locations and the reservations of our volunteers, we should restrict training to the most common species reliably identifiable in the field. Any species that needed laboratory identification was excluded and, sadly, we were forced to abandon any recording on sediment shores. Accordingly, we developed a list of around 30 rocky shore species as the core of our recording and sent out laminated identification sheets for field use. This list was perhaps longer than might have been ideal as the north coast of the Highlands is an area of transition between Atlantic and North Sea temperature regimes (Lewis 1964; Mieszkowska *et al.* 2005) and some common west coast species (e.g. *Gibbula umbilicalis* (da Costa, 1778), *Chthamalus montagui* Southward, 1976 and *Chthamalus stellatus* (Poli, 1791) are either not found in the North Sea or have only recently started to move into it. Our list included *Littorina saxatilis* agg. as we had no wish to perpetuate the taxonomic confusion that permeates published seashore guides. We actively encouraged records at higher taxonomic levels; it was far preferable that recorders had the freedom to say "I'm not sure" rather than shoe-horning a difficult-to-identify individual into one species or another.

The list we produced was acceptable to the majority of our volunteers and we had few reservations about accepting records based on it. While around 120 people were trained, only about 12 have regularly submitted their observations. These records were sent to the project using an online form (or occasionally in the post), verified and, perhaps, amended after email conversations. Verified records were passed on to the Highland Biological Recording Group for submission to the National Biodiversity Network. The small number of recorders, all well known to those verifying the records, is one of the few advantages of the project's remote and rural setting; we have the time for dialogue and online coaching.

We believe that in the Highlands, where many, perhaps the majority, of seashores are unrecorded, simple records of the presence or absence of dominant species are a considerable step forwards and, should it ever be necessary, offer a basis for the detection of some level of change by the use of multivariate analysis. Nevertheless, such an approach would be more effective if it were possible to include abundance estimates. Our experience and that of others suggests that the concept of SACFOR (Connor *et al.* 2004) is difficult to teach quickly and requires both training and cross calibration of operators; we would question its suitability for use by the general public. The reduced scale used in The Shore Thing project (https://www.mba.ac.uk/shore_thing/documents/survey_protocol.pdf) is probably more intuitive and easier to teach, even if it lacks the scale-based subtleties of the original scheme.

The Highland Seashore Biodiversity Project formally came to an end in March 2016 and left behind it a core of trained seashore recorders, all of whom have continued to develop their skills well beyond the core species of the project. They will receive informal support whenever they need it. A mechanism remains in place for records to be submitted via the Highland Biological Recording Group and the project's Facebook page remains open for discussion and questions.

References

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Lewis, J. R. 1964. *The Ecology of Rocky Shores*. English Universities Press, London. 323 pp.

Mieszkowska, N., Leaper, R., Moore, P., Kendall, M.A., Burrows, M.T., Lear, D., Poloczanska, E., Hiscock, K., Moschella, P.S., Thompson, R.C., Herbert, R.J., Laffoley, D., Baxter, J., Southward, A.J. & Hawkins, S.J. 2005. Marine Biodiversity and Climate Change: Assessing and Predicting the Influence of Climatic Change Using Intertidal Rocky Shore Biota. *Occasional Publications, Marine Biological Association of the United Kingdom* **20**: 53pp.

The Atlas of Living Scotland: New open data infrastructure for research and citizen science

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Introduction

The Atlas of Living Scotland (http://www.als.scot/) is a new website which provides a platform to engage, educate and inform people about the natural world, and which will become important for growing capacity and capability in research, citizen science, education and environmental decision-making. The platform is being developed as a partnership between Scotland's Environment Web, the Scottish Environment Protection Agency, the National Biodiversity Network (NBN) Trust, Scottish Natural Heritage and the Atlas of Living Australia. It was launched at the Royal Botanic Gardens, Edinburgh on 27th May 2016.

Data sharing and the UK's National Biodiversity Network

The NBN has been championing the sharing of biological data in the UK since 2000. One of its fundamental strategic aims is to improve the availability of high resolution and high quality data to provide the evidence base for all environmental decision-making in the UK. The Network's priority is to grow the national commitment to sharing biological data and information. The NBN Strategy 2015-2020 outlines how the Network will achieve the vision that "Biological data collected and shared openly by the Network are central to the UK's learning and understanding of its biodiversity and are critical to all decision-making about nature and the environment."

Currently the Network's Data Partners share data via the NBN Gateway and, with over 127 million species observations shared nationally, it is one of the largest collections of data of any country in the world. However, the NBN Gateway infrastructure is in need of updating. After exploring the options, the NBN decided to adopt the Atlas of Living Australia open-source framework. The Atlas of Living Australia was designed by CSIRO in 2010, and provides a suite of online tools for capturing, accessing and analysing biological and related environmental data. Designed to fulfil a broad spectrum of user-needs in flexible ways, the open-source framework has enabled it to be replicated in other countries. The NBN are now adopting this platform in the UK, and the Atlas of Living Scotland is a pilot site for similar atlases that we are working towards creating in Wales, England and Northern Ireland. Complete UK country atlas coverage will result in an overarching UK-wide platform which will eventually replace the NBN Gateway.

The objectives and features of the Atlas of Living Scotland

The objectives of the Atlas are to:

- Promote the Network's Data Partners, the value of their data and to facilitate improved decision-making.

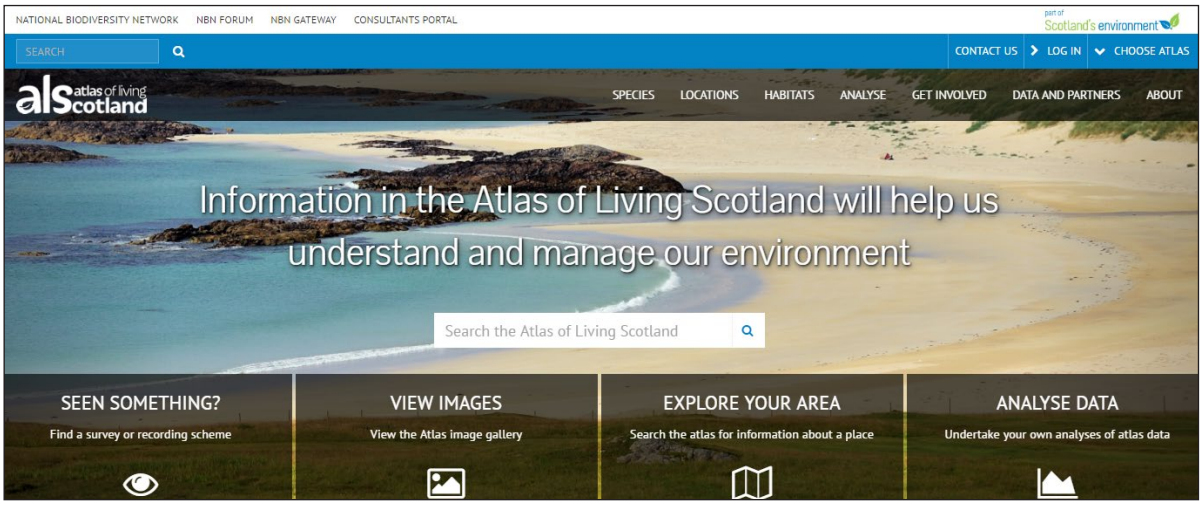

Fig. 1: The Atlas of Living Scotland home page

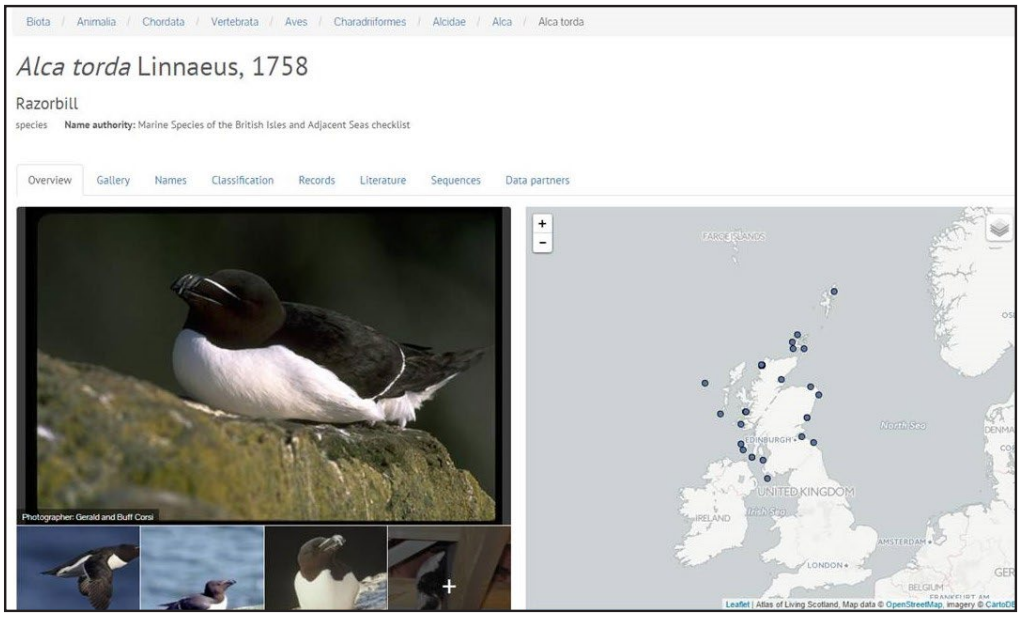

Fig. 2: Extract from a species page

• Provide a trusted portal with access to raw data and tools for collection, management, visualisation, analysis and research.

• Educate people about Scotland's biodiversity.

The Atlas allows professionals and amateurs to view and interrogate all data types such as species occurrences, habitats, images and spatial environmental layers. The Atlas can be used to help you identify things you have seen, to learn more about species, explore different areas of Scotland and undertake data analysis. It provides tools for species alerts, site reports and integration of biodiversity data of all kinds and it will provide tools for bioclimatic modelling in the future.

Data are held under Creative Commons licences to encourage innovation and collaboration over data analysis and use. This new platform, along with sister sites in Wales, England and Northern Ireland, will enrich the way biological data are aggregated, shared, stored, analysed and used across the UK and ensure our history of biological recording continues for centuries to come.

Functions and resources available on the Atlas of Living Scotland

1. Searching for information about a species, e.g. *Alca torda* Linnaeus 1758 (Razorbill)

A search by species name results in access to a species page with links to a distribution map, an image gallery, the UK species inventory, analysis of records, a reference library and information about data partners.

2. Analysing species records

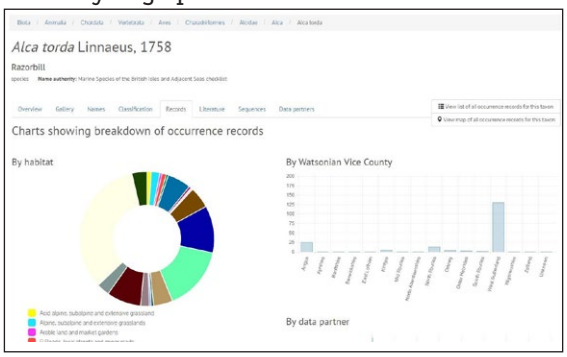

Fig. 3: Extract showing selected analyses of occurrence records

From the species page (via the 'Records' tab) all the available occurrence records can be accessed and analysed by habitat, vice-county, data partner and year.

3. Exploring your area

It is possible to search for species records by address, postcode, grid reference and place name via the 'Locations' tab on the home page. Figure 4 shows the results of a search centred on the postcode of the Field Studies Council's Millport Field Station, buffered to a 5km radius, and mapped on a satellite image. The species records are aggregated and mapped by number of records per location; lists of species can be viewed or downloaded.

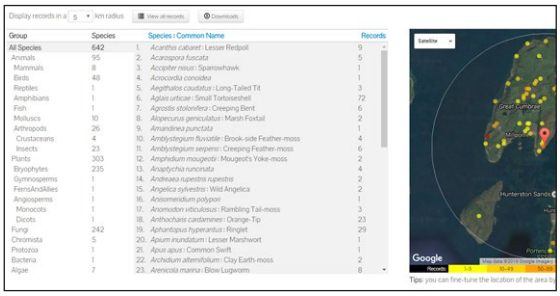

Fig. 4: Species records mapped for a 5km radius around the Millport Field Station

4. Mapping species by OSGB grid reference

Species records can also be mapped by OSGB grid reference. Figure 5 shows all grid squares with records that intersect with the Firth of Tay and Eden Estuary Special Area of Conservation (SAC). Grid squares are coloured by resolution of the grid reference for a record. The full list of species records can be filtered by various options, such as presence on the Scottish Biodiversity List.

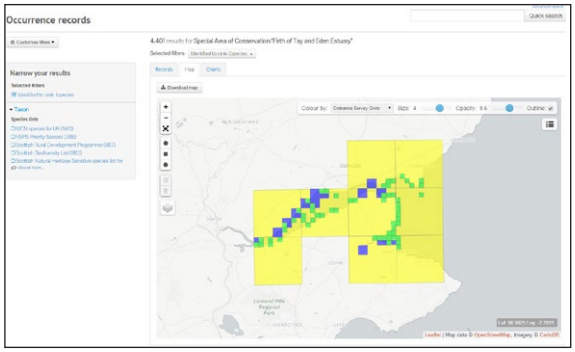

Fig. 5: Grid squares containing records for the Firth of Tay and Eden Estuary SAC

5. Overlaying species data on environmental layers

In the spatial portal (accessed via the 'Analyse' tab on the home page), the Atlas offers the option to map species records in relation to environmental layers. In Figure 6, all species records that occur in ancient (of semi-natural origin) woodland are mapped. Each point can be interrogated to reveal a list of associated records.

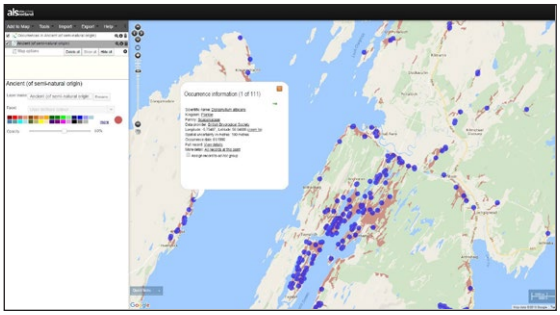

Fig. 6: Points containing records (blue) in areas of ancient (of semi-natural origin) woodland (pink)

6. Data Partner pages

Individual Data Partner pages include information about the organisations that have contributed data to the Atlas and details of the resources (datasets) that have been shared by the organisation.

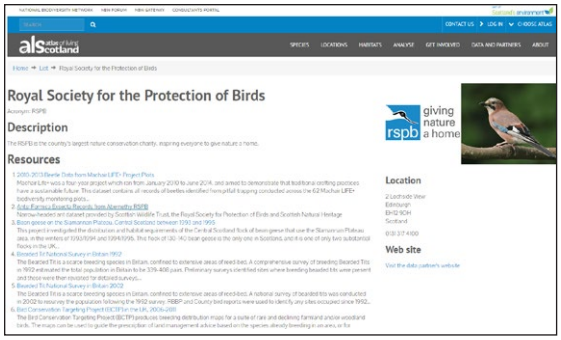

Fig. 7: Extract from the RSPB's Data Partner page

Current datasets available on the Atlas of Living Scotland

The website is still developing and datasets are being added regularly. At the beginning of June there were just over 2.5 million species records and 24 spatial layers available through the Atlas. To view the full NBN data holdings please continue to visit the NBN Gateway. We would also encourage you to explore the Atlas of Living Scotland, try out its functions and send us your comments to info@aols.scot.

Website addresses

Atlas of Living Scotland: http://www.als.scot/

National Biodiversity Network Gateway: https://data.nbn.org.uk/

Atlas of Living Australia: http://www.ala.org.au/

Scotland's Environment Web: http://www.environment.scotland.gov.uk/

The Atlas of Living Scotland has received funding from the European LIFE+ programme.

Data behind the Scottish MPA network – illustrated on the South Arran MPA

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On 7 August 2014, Scottish Ministers designated a suite of 30 new Nature Conservation Marine Protected Areas (NC MPAs) to strengthen the existing MPA network and conserve some of Scotland's most important marine wildlife, habitats and geodiversity. Covering over 10% of our seas, Nature Conservation MPAs will play an important role in delivering a healthy, productive and biologically diverse marine environment for Scotland.

To assist designation of the NC MPAs a survey programme was run to determine the distribution and general condition of seabed habitats and species targeted for spatial protection. The results, together with all other available information, were then assessed against the Scottish MPA Selection Guidelines (Marine Scotland 2011), to identify the most appropriate locations and features for protection. Where there were few or no good quality examples of a feature in a specific geographic area (e.g. maerl beds in the Clyde), poorer quality representatives of these features were selected with a proposed conservation objective of 'recover'. Data confidence assessments and documents detailing the assessment against the selection guidelines were produced by SNH for all inshore NC MPAs subsequently put forward for consultation (SNH 2013).

An independent science review of the MPA designation process was carried out under commission by the Scottish Government; to ensure that the decisions and recommendations were supported by transparent, scientifically robust evidence with any data limitations highlighted (Ernshaw *et al.* 2014).

In the South Arran MPA, 'maerl beds' are now a protected feature, and form part of a band of coarse sedimentary biotopes stretching around much of the island between approximately the 5 and 20 m depth contours. 'Shallow tide-swept coarse sands with burrowing bivalves' and 'maerl or coarse shell gravel with burrowing sea cucumbers' are further protected features of the South Arran MPA, which also contribute to this band of coarse sedimentary habitats.

These benthic communities form a complex mosaic together with additional non-designated sedimentary habitats. To guide the implementation of proportionate management measures and support the recovery conservation objective set for the 'maerl beds' feature, it was necessary to define precisely what constituted the 'maerl bed' feature at this location and divide the habitat gradient into distinct categories. A data review was conducted to achieve this (Moore 2014). As a result, a threshold of 5% live maerl was adopted for maerl biotope recognition, while also acknowledging the importance of dead maerl material in supporting diverse communities. Most records assigned to the 'maerl bed' feature contained substantially more than 5% live material (see Figure 1 for an example). The review also defined 'maerl recovery areas', incorporating clusters of records of relatively unbroken dead maerl with live maerl below the 5% threshold. These may represent areas of historically richer maerl and, based on current knowledge, were thought to offer the most suitable targets for conservation management.

Survey effort prior to designation of the NC MPAs was focussed on inventory survey and habitat mapping, but also informed the development of appropriate management measures. There are still many unknowns and gaps in our understanding of pressure - state response relationships in the marine environment. Primary research is required to answer questions such as how and to what degree habitats can change when pressures are removed, and what 'recovery' even means. A report by SNH starts to define recovery for some features (Mazik *et al*. 2015), but management decisions had to be made pragmatically on the best currently available evidence. An initial suite of fisheries measures came into effect on 08 February 2016 (Marine Scotland 2016).

In 2015 SNH initiated a programme of work to determine baselines of current feature

Fig. 1: A maerl bed off Pladda. Credit: Lisa Kamphausen

condition, against which the achievement of conservation objectives will be assessed in future, and by implication the effectiveness of the management measures. Since such studies are highly resource intensive and impossible to conduct for all protected features in all MPAs, a few features and areas were selected as case studies in the hope that inferences can be drawn from the results across the MPA network.

In the South Arran MPA, case studies were conducted on the maerl and coarse sediments, and burrowed mud habitats. Data have been collected as quantitative drop down video footage, grab samples, diver MNCR phase II type records along re-locatable transects, photo quadrats and acoustic survey products, which together represent a baseline of current feature condition. Results from studies conducted in the South Arran MPA by other parties, such as the fish habitat utilisation studies by Glasgow University (Elliott *et al.* 2016) will be invaluable to complement data collected by SNH.

Future survey programmes will be designed to enable us to pick up potential changes from the current condition, which may happen in response to the new fisheries management measures.

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Research in the context of community led marine protected areas – lessons learnt by the Community of Arran Seabed Trust (COAST)

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A coastal community with a vision: healthy seas

The Community of Arran Seabed Trust (COAST) is an internationally renowned community group striving to improve the health of the marine environment around the Isle of Arran and the Firth of Clyde. COAST believe that the Arran island community - and all coastal and island communities - should have more say in what goes on in the waters around them.

Established in 1995 by local divers Howard Wood and Don McNeish (Figure 1), COAST influences change in marine practice and policy through research, education and advocacy activities, and is supported by approximately 2000 individuals and businesses on Arran.

Fig. 1: COAST founders Don McNeish and Howard Wood

Twenty years of community action and 'learning by doing' have empowered the group, building local skills and capacity as well as strong links with fishermen associations, community groups, key government bodies and scientists. COAST proposed and created the first community marine reserve in Scotland, the Lamlash Bay No Take Zone (NTZ), designated in 2008 and the South Arran Marine Protected Area (MPA) which came into force in February 2016.

Research that matters

The COAST team has developed an extensive informal network of scientists across academia and government, working on key projects to improve marine management in the Clyde. These have often included baseline and monitoring studies of species and biotopes (seagrass, gadoids, scallops, etc.) for the No Take Zone (NTZ) and the Marine Protected Area (MPA) as well as social studies, such as quantifying public awareness of the NTZ. For example, Leigh Howarth's PhD research (Howarth *et al.* 2011) between 2010 and 2013, helped show the success of the NTZ, where he found larger and more fertile lobsters and larger scallops, and increased biodiversity within the zone.

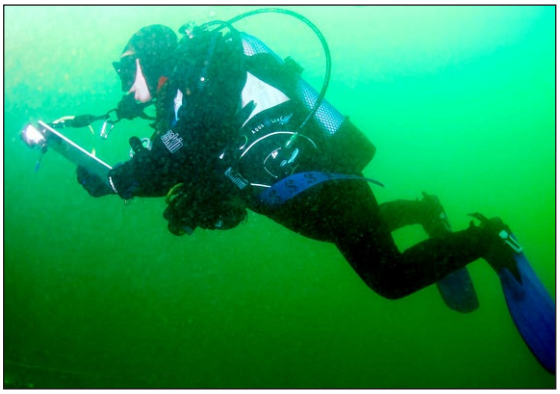

Fig. 2: COAST conducting Seasearch surveys in the South Arran MPA ©Angus Robson

Since its first experience with Seasearch surveys in 2003 (Figure 2), COAST has hosted over 20 MSc students, as well as a number of PhD and undergraduate students, and collaborated with the universities of Glasgow, York, Aberdeen, Bangor, West of England, Strathclyde, Heriot-Watt, Edinburgh Napier and SAMS. This has contributed towards a valuable body of knowledge (see the Research section of the COAST website www.arrancoast.com) and established COAST as a science hub on the Clyde. COAST is currently developing new citizen science initiatives and working with the universities of York and Glasgow to carry out drop-down camera surveys in the MPA. Other projects include seagrass mapping and social research with students from the universities of Edinburgh and Edinburgh Napier. Keen to be part of Clyde-wide initiatives, COAST coordinates local volunteers for the Clyde Nurdle Quest and the Clyde Marine Mammal project.

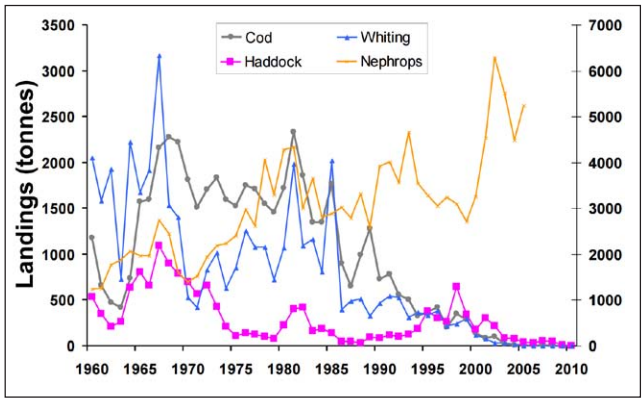

Fig. 3: Landings from 1960 for cod, haddock, whiting and Nephrops in the Clyde. Source: Marine Scotland Science

COAST's work has attracted political and media attention, stimulating the Clyde marine ecosystem debate, where numerous scientific papers have discussed the issues. This led the Scottish government to produce the Clyde Ecosystem Review (McIntyre *et al.* 2012), which described the Firth of Clyde as being like "used agricultural land in need of restoration" (Figure 3).

Science and communities of place: making the relationship work

How can science and coastal community groups complement each other's work and create synergies that can progress effective marine management? In COAST's experience we have found that it is essential to prioritise research efforts. Environmental decisions need to be based on the best available science but funding is limited, so projects need to be well chosen. Research questions usually stem from scientists, but an engaged and knowledgeable community can also be well-placed to put their finger on important scientific questions.

However, science is often overlooked and decisions can be based instead on politics, emotions and values. It is COAST's role to work with scientists to present and disseminate their research in a way that the public can understand and advocate for well-informed, progressive and fair decisions about their local waters (Figure 4).

Collaboration with a number of universities brings together different ideas, areas of expertise and methods that can produce a range of results from different perspectives. The research process benefits from working with local fishermen (Figure 5), the local tourism board or other community groups and businesses in terms of logistics and local knowledge, and improves communication and trust. The locals involved learn new skills and gain more insight into the issues that affect them.

Researchers and communities need to be aware of the time, capacity and resources that research entails, especially if it involves fieldwork at sea. COAST found hosting scientists was much easier when it had staff

Fig. 4: COAST guided tour in the MPA with the Arran Youth Foundation

Fig. 5: COAST field work with the University of York and local fishermen

and an office which could double up as a base for researchers. Time needs to be set aside to listen and engage with local partners, to become aware of why their research matters to those who live there or whose livelihood depends on healthy seas. Flexibility is required from both sides to seize opportunities that may arise during the process or adapt to changes. With good communication it is possible to identify cost-effective ways of doing things.

For younger researchers, to have worked with COAST is considered a valuable career experience. They become more aware of marine protection, management and campaigning in Scotland, while gaining hands-on experience with the local community.

Fig. 6: South Arran Marine Protected Area poster

The future for COAST and the Clyde

Regardless of the changing political scene, COAST will continue to push for effective marine management through the new regional Clyde Marine Planning Partnership where a collaborative, ecosystem-based approach management is needed. Communities should be at the core of decision-making and informed by the best available science.

COAST is determined that the South Arran Marine Protected Area (Figure 6) realises its full environmental, social and economic potential. Scottish coastal communities need to understand marine issues and how these are managed to enjoy, wisely use and defend their right to healthy seas. This is why COAST is working towards bridging the gap between marine literacy and citizenship through new ways of engaging and empowering the public. In the next few years we would like to see collaborative work between science and communities leading us to healthier, productive seas that benefit us all.

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The impact of fishing the Firth of Clyde: background information for the basis of an ecosystem enhancement plan

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The Firth of Clyde is a large fjord, located in the southwest of Scotland, that connects Glasgow to the Atlantic Ocean through the river Clyde. The Firth of Clyde ecosystem has been subject to various anthropogenic pressures including eutrophication, dumping at sea, shipping, recreational activities and fishing (Bock *et al*. 1999). Of these pressures, it is fishing that has caused the greatest disruption to the ecosystem. Some of the history and consequences of fishing in the Clyde are discussed here.

Development of Clyde fisheries

Herring were, historically, the mainstay of the Firth of Clyde fishery. Landings of the seasonally abundant herring far exceeded the landings of other fish species from the Clyde until the latter half of the 20th century (Thurstan & Roberts 2010). Throughout most of the 19th century the provincial fleet consisted of small rowing and sailing boats that fished for herring with drift, trammel and seine nets. Seine nets were first used in the Clyde in 1838 to harvest herring from Loch Fyne, which had long been a productive fishing ground. The introduction of seine nets created disputes between fishers, because seines were capable of harvesting huge quantities of fish in a single haul, putting boats using traditional drift or trammel nets at a disadvantage. It was also argued that seines indiscriminately caught undersized, unmarketable fish, and that large seine nets contacting the seabed destroyed the spawn of herring and other fish species. Seine netting was banned in 1851 due to these concerns, but the ban was short-lived as it was repealed in 1867. Most of the fleet had adopted seine nets to target herring by 1880. By the start of the 20th century, the seasonal herring fishery had been considered a failure in some important fishing grounds for several years, although the harvest of herring was still the most profitable part of the Clyde fishery.

Many demersal fish species such as cod, dab and flounder were also harvested from the Firth of Clyde during the 19th century. Demersal fish tended to be targeted during the summer months when herring did not form large shoals. They were exploited with lines, static nets and traps, although a small number of vessels harvested these fish with bottom trawling gear. Trawling gears were towed by small sailing vessels, so many parts of the Clyde were inaccessible as they required areas of smooth ground, free of obstacles that could impede movement of the gear. The number of vessels fishing the Clyde with trawling gear increased greatly during the mid 1880s when steam powered trawlers came into regular use (Jones *et al*. 2015). Many fishers expressed concerns about the catch composition and resulting discarding practises of trawling vessels, stating that large species such as dogfish and skate were regularly caught, along with a great amount of small fish that were usually thrown overboard. The size of marketable fish caught from the Clyde was thought to be in decline, and many linked this to trawling. A ban on trawling within the Clyde was imposed on vessels weighing over 8 tonnes in 1889 to protect fish stocks from further declines in abundance or size composition – sailing vessels under 8 tonnes were still permitted to trawl. The ban benefited fishers using more traditional fishing methods since competition from the trawling sector was greatly reduced, and fewer trawls interfered with static fishing gears.

Herring continued to be the most economically important species to the Clyde fishery during the first half of the 20th century. Technological advances (including feeler wires, echo location and motorised boats) improved fisher's ability to locate herring and helped to sustain the high quantity of landings throughout most of the 20th century, despite stock depletion in some key fishing grounds. Concerns continued to be raised about the small size of herring caught from the Clyde, and it was determined in 1936 that the Clyde herring fishery was dependent on immature

herring from successive year classes, and that sporadic recruitment accounted for the large fluctuations in annual landings. By the late 1950s, shoals of herring were not frequently observed, and annual landings tended to be less than in the late 19th century. The mid-water pair trawl was invented in the 1960s, allowing diffuse (non-shoaling) herring to be harvested effectively, and seine netting for Clyde herring was gradually replaced. The mid-water trawls also caught lots of large demersal fish, which formed a valuable part of the bycatch. Landings of herring declined from 1970 onwards, and although landings quotas were introduced in 1976, the herring fishery did not recover. By this time most fishers were targeting demersal fish, *Nephrops* and other shellfish, and the Clyde fishery remained profitable.

The Clyde fishery for *Nephrops* began to expand in the 1950s due to increasing demand and market price, and because *Nephrops* were an abundant alternative target species to herring. This fishery consisted of large vessels equipped with seine nets, and small (under 8 tonnes) trawling vessels towing nets with mesh sizes small enough to retain the target *Nephrops*; these vessels also caught large amounts of demersal fish. The trawling ban was partially lifted in 1962 when vessels weighing more than 8 tonnes were permitted to trawl in areas further than 3 miles from the coast. Most of the Clyde fishing fleet adopted demersal trawling during the 1960s, and most vessels still targeting herring began using mid-water trawls. Despite the decline in herring landings, the traditional mainstay of Clyde fishers, the fishery entered a boom period due to high demersal fish landings. Landings of the main commercial demersal stocks all increased immediately after large vessels were permitted to trawl the Clyde, but for most of these species the period of high landings was fleeting. Total landings of demersal fish increased to a peak in 1973, but began to decline thereafter as landings of each demersal species declined one after another. The landings of most commercially important demersal fish species had fallen by the early 1980s. Large vessels were permitted to trawl within 3 miles of the coast from 1984 in an effort to sustain the high landings, but this was unsuccessful and demersal fish landings continued to decline. Vessels equipped with nets fine enough to target *Nephrops* accounted for most of the trawling effort in the Clyde, and further increases in trawling effort were biased towards *Nephrops* gear. *Nephrops* had become the most profitable component of the fishery by the mid 1980s, and the Clyde *Nephrops* fishery swelled as demersal fish landings plummeted. The abundance of *Nephrops* was thought to have increased in response to reductions in the number of predators in the environment, and the quantity of *Nephrops* landings has sustained the profitability of the Clyde fishery into the 21st century. Demersal fish landings were a negligible part of the fishery profit by 2005, by which time almost all fishing effort was targeted at *Nephrops* and other shellfish.

Recent research on the Clyde demersal fish community

A survey indicated that opinions on the causes of the Clyde fin-fish collapse varied between different fishing sectors (Watson & Bryson 2003). When asked `is the Clyde overfished?', 67% of creel fishers said yes and 85% of trawl fishers said no. When asked `is trawling in the Clyde a sustainable method?', 77% of creel fishers said no while 70% of trawl fishers said yes. There was a clear need for scientific research into the demise of the Clyde fin-fish fishery.

A study by Heath & Speirs (2012) used research vessel survey data collected during 1927-2011 to investigate changes in the demersal fish community of the Firth of Clyde. They examined trends in several length-based indices and measures of diversity to assess changes in the condition of the demersal fish community. Community mean length and the proportion of the demersal fish biomass comprising individuals greater than 40 cm long were among the length-based indices studied. The diversity indices considered included species richness (the number of species sampled per 20 survey tows) and species evenness (a measure of how evenly biomass was distributed among different species). It was found that, although landings had declined to negligible levels by the mid 2000s, demersal fish remained highly abundant within the Clyde. Estimates of the

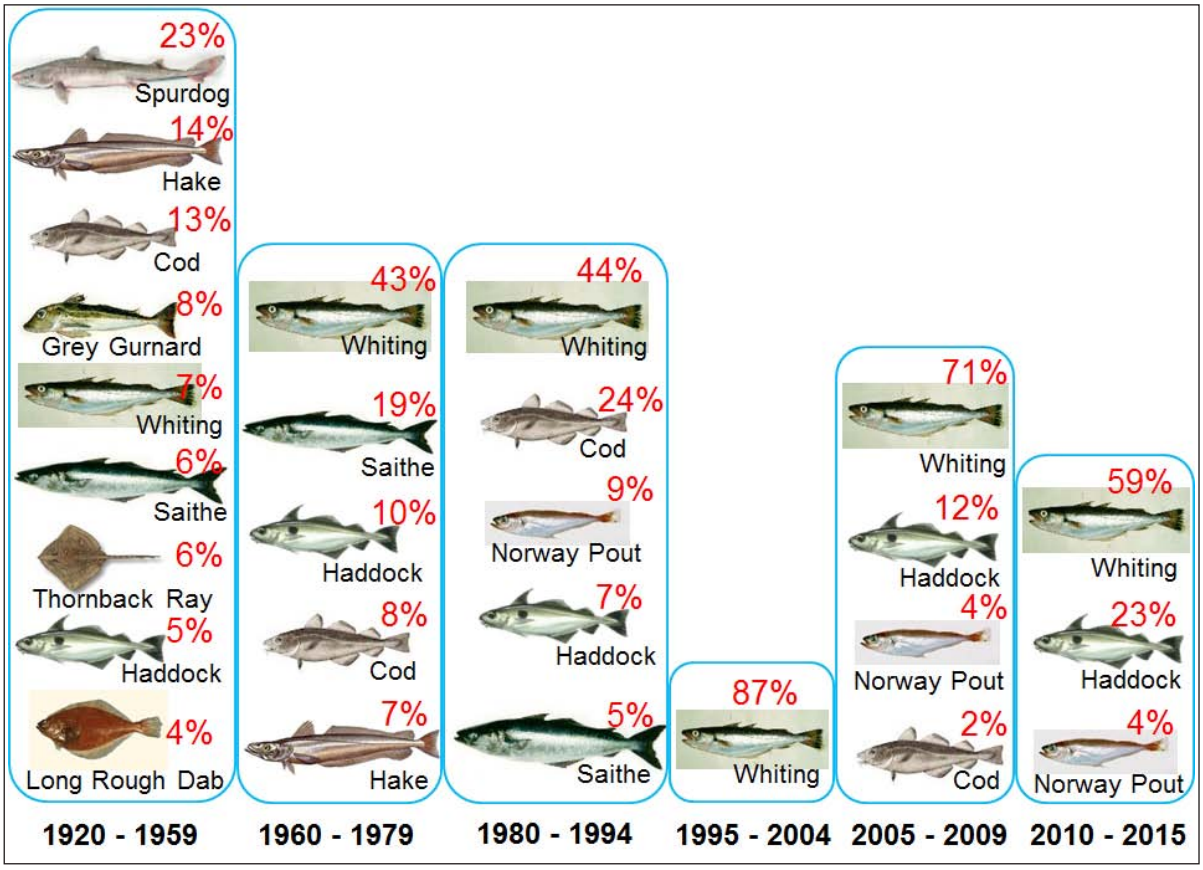

Fig. 1: Species cumulatively accounting for 85% of the total demersal fish biomass over the periods shown. The percentages show the contribution each species made to total demersal fish biomass. The analyses of Heath & Speirs (2012) was extended to include the years 2010-2015 (Samolins 2016).

total biomass of demersal fish during 1927-1960 and 2000-2009 were similar, and declines in total biomass were not evident. What had changed, however, was the proportion of that biomass comprised of fish that were greater than 40 cm in length. The biomass of fish larger than 40 cm began to decrease after the resumption of industrial trawling in 1962, and rapidly declined from the early 1980s so that large individuals became increasingly rare within the Clyde. The biomass comprised of individuals smaller than 40 cm increased when the trawling ban was lifted, and has consistently been greater than it was pre 1960; it appeared to increase substantially again from about 1990. The shift in length structure was evident from the trend in community mean length, which was consistently estimated to be greater than 50 cm during 1927-1960, but had declined to around 20 cm by the 2000s. Demersal whitefish currently form a negligible part of the landings from the Clyde fishery due to the fact that few marketable-sized fish remain, although the Clyde is still a productive ecosystem and continues to sustain a large stock of small-bodied demersal fish.

No change in species richness was evident, so the number of demersal fish species present within the Clyde does not appear to have changed. Species evenness, on the other hand, was estimated at a maximum during the late 1920s and '30s, had decreased by the 1960s, and then declined steeply between 1980 and 2000. The change in species evenness is illustrated in Fig. 1. During 1920-1959, 13 species accounted for 95% of the demersal fish biomass, and about 31% of this comprised of spurdog, thornback rays and tope, all large and predatory species. The abundance of these large species declined when industrial trawling recommenced in 1962 (spurdog accounted for about 4% of the demersal biomass in 1960-1979, thornback rays and tope were each less than 1%) and the biomass began to comprise more of smaller species, particularly whiting. The relative abundance of other large species,

cod, saithe and hake also declined, but the decrease in the relative abundances of saithe and cod lagged the increased trawling effort. Saithe became relatively abundant (about 18% of demersal biomass) during 1960-1979, and their abundance dropped off thereafter; the relative abundance of cod also increased (to about 24% of demersal biomass) in 1980-1994, then fell to less than 3% of the demersal biomass from 1995 onwards; and the relative abundance of hake declined steadily from 14% of demersal biomass in 1920-1959 to <2% from 1995 onwards. The decline in species evenness was so severe that 1 species, whiting, accounted for 87% of the demersal fish biomass during 1995-2004, when 95% of the biomass was invested in just 4 species. Species evenness then increased from 2005-2009, when 8 species accounted for 95% of the demersal biomass, although whiting was still by far the most abundant species at 72% of the biomass. Although species evenness increased from the mid 2000s, the majority of the biomass was still invested in 1 species, and the main species complement consisted of relatively small-bodied species. The demersal fish biomass of the Clyde is as high now as it was in 1927-1960, but the abundance of large bodied species has declined, and the biomass now consists of small individuals and relatively small bodied species. Despite the encouraging sign of increased species evenness since the targeted demersal fishery effectively ceased in 2005, the Clyde community has yet to show signs of returning to a state in which large, marketable fish are once more abundant.

Further analyses of research vessel survey data collected during 1980-2012 aimed to determine whether the decrease in the abundance of large fish within the Clyde was partially due to declines in the growth rates of individual species (Hunter *et al*. 2016), and if temporal changes in the maturation scheduling of individual species were evident (Hunter *et al*. 2015). Otolith data were used to investigate trends in growth rates, and data specifying maturity stages were used to study trends in maturation propensity given age and length. It was found that the average growth rates of haddock and whiting from the west of Scotland had declined substantially over time, and that the rates of decline were considerably faster within the Firth of Clyde populations. Since these 2 species now contribute most to the demersal fish biomass of the Clyde, declines in their growth rates will have significantly contributed to the increased rarity of large Clyde fish. There was some evidence that the average growth rate of Norway pout from the Clyde had declined over time, yet the growth rate of Norway pout from the rest of the west of Scotland had increased. The maturation analyses indicated that the lengths at which cod, haddock and whiting were likely to mature had declined significantly over time. The rates at which typical lengths at maturation decreased were greater in the Clyde fish than in populations from the rest of west of Scotland. The trends in growth rates and lengths at maturation were not strongly related to variations in abundance or rising temperature. Since fishing effort density in the Firth of Clyde was greater than in the rest of the west of Scotland; the use of fine mesh *Nephrops* trawls was more prevalent in the Clyde; and growth rates and maturation lengths declined most rapidly in the Clyde populations, it was concluded that intensive size selective trawling was the most likely cause of the observed changes in growth and maturation.

Further issues to be addressed

If the Firth of Clyde ecosystem is to be enhanced so that large fish are once more abundant, then various interventions should be considered and further studies conducted. The repeal of the 3 mile limit on trawling in 1984 seemed to seal the fate of the Clyde demersal fish community. The re-introduction of this spatial restriction on trawling may enable complex habitats to regenerate and would provide a refuge for fish that may allow some recovery of the stocks. Trawling has been regarded as detrimental to the abundance and size composition of Clyde fish stocks since the 19th century, so segregating towed and static gears to different regions of the Clyde may bring some benefits by providing areas of refuge from trawling. The potential benefits of Marine Protected Areas (MPAs) within the Clyde have already been considered, and the introduction of 3 MPAs were proposed last year

within a Clyde Regulating Order application (SIFT 2015) – unfortunately the Scottish Government has since decided not to approve this Regulating Order. The current discarding practises of vessels targeting *Nephrops* are unknown, so investigating whether bycatch rates are inhibiting recovery of fish stocks may be crucial.

Even with further study and a conservationist approach to the future management of the Clyde fishery, it may be unrealistic to expect to recover the past state of the ecosystem. Nutrient loads have declined due to efforts to decrease eutrophication, particularly in the cleaning up of the river Clyde. This may have affected the abundance of plankton and benthos, potentially reducing the food supply for fish. The rising temperature may displace some species northwards into cooler waters, and may also begin to contribute significantly to the declines in growth rates and increasingly small lengths at maturation. If the observed changes in growth and maturation were a genetic (evolutionary) response to size selective fishing, rather than an adaptive phenotypic response, then those changes may take very much longer to reverse than they did to occur. All that being said, even if the past state of the ecosystem cannot be fully recovered, it should be possible with well informed management to improve the condition of the Clyde fish community.

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Walney Channel sea grass beds: recovery following pipeline construction

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Introduction

The development of the North Morecambe gas field in the Irish Sea required the construction of pipelines to a reception terminal at Westfield Point near Barrow-in-Furness at the southwest tip of the Furness peninsula, Cumbria. Three have been laid across Walney Island and the Walney Channel to the mainland at Westfield, in 1982, 1992 and 2003. Their construction involved the clearance of corridors through intertidal sea grass beds. The Walney Channel is of considerable environmental importance as a Site of Special Scientific Interest (SSSI) for its sea grass, marine biological and ornithological features (Davies *et al*. 1990), a RAMSAR wetland site, a Special Protection Area (SPA) under the European Union Wild Birds Directive, and lies within an Area of Outstanding Natural Beauty (AONB). The two sea grasses in Britain, *Nanozostera* (formerly *Zostera*) *noltei* (Hornem.) Tomlinson & Posluzny, and *Zostera marina* L., are nationally scarce and sea grass beds are a protected habitat under the UK Biodiversity Action Plan, the EU Habitats Directive, and the EU Water Framework Directive; sea grasses are also on the OSPAR list of threatened and/or declining species and habitats. Their dynamic and sensitivity characteristics have been reviewed by Davison (1997). Sea grass beds in the Walney Channel and elsewhere are important feeding habitats for birds.

The Walney Channel contains the only known populations of the dwarf eelgrass *Nanozostera noltei* and the narrow-leaved eelgrass *Zostera marina* var. *stenophylla* Asch. & Graebn. (formerly *Z. angustifolia*) in northwest England, the nearest being in southern Scotland and North Wales. Their occurrences in the Walney Channel appear to be sporadic, present before 1930, missing after, but present again in the 1970s (Halliday 1978) confirmed in 1982 by Pierce (1988). Rae (1981) first recorded *Nanozostera noltei* on the lower mudflats on Walney Island and, in 1993, it was found for the first time at Westfield (Tittley 1993).

In order to establish the extent of sea grass beds in the Walney Channel, they were mapped using a grid of 100 m x 100 m squares based on the Ordnance Survey national grid (Tittley 1993; Tittley *et al*. 1998, 1999). Sea grasses are present on the east side of the channel in Roosecote Bay and between two ridges of shingle and cobble, Ridding Head Scar, and Concle Bank near the causeway to Roa Island; there are also patches on Walney Island.

Because of the conservation importance of this wetland area and its sea grass beds, planning consent for the second and third pipeline routes required a commitment by the energy companies to undertake ecological studies after engineering work was completed to monitor their recovery (cf. Tittley & Huxley 1998, 2012). This article reports these recovery studies. Contemporaneously with our study on the recovery of the third pipeline route, another survey undertook annual monitoring of sea grasses in Roosecote Bay to assess the effects of discharge from a nearby waste water treatment plant; this also involved examination of the sea grass bed at Westfield (Hubble 2012).

Methods

Field studies were undertaken between Ridding Head Scar (Ordnance Survey grid reference SD224667) and Concle Bank (SD229661) where the coastal zone comprises low, eroding, clay cliffs, below which is a shingle beach with a patchy zone of *Spartina anglica* C.E.Hubb, and an extensive midlittoral area of gently sloping mud and sand-flat approximately 1.1 km wide and traversed by shallow meandering channels.

Field studies for the second pipeline route commenced in the late summer of 1992 prior to construction and annually thereafter until 1998. The construction corridor was 100 m wide and contained the pipeline trench (several meters wide and deep), artificial trackways of plastic and stone for construction vehicles, and the excavated spoil. Engineering work took place in summer when the sea grasses were actively growing. A transect was established across the construction corridor

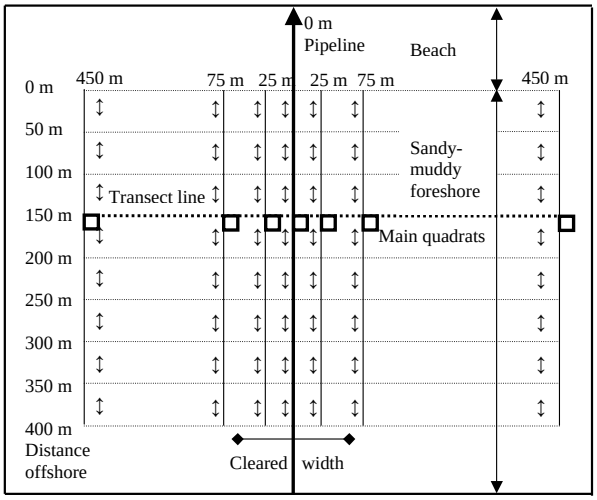

Fig. 1: Pipeline 2: Schematic diagram (not to scale) of study areas with the main study quadrats along the 150 m line, and 5 randomly placed additional quadrats (indicated by short arrows) in 50 m wide bands.

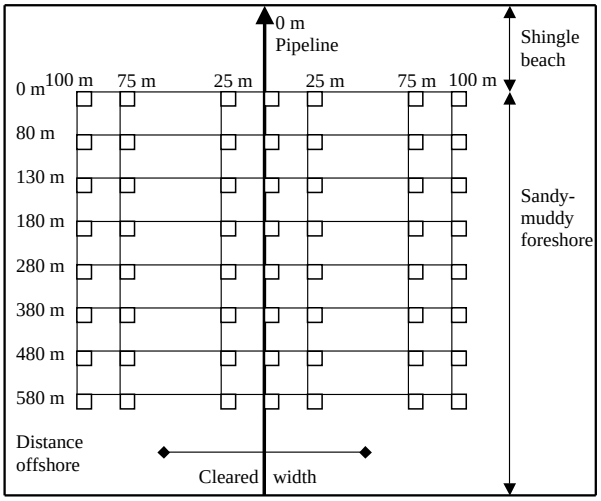

Fig. 2: Pipeline 3: schematic diagram of quadrat layout (not to scale)

at right angles to the pipeline route at 150 m from the base of the shingle beach (coinciding with invertebrate sampling and bird survey sites). Study quadrats were located along this lateral transect at distances of 0 m, 25 m (in the cleared corridor), 75 m (boundary areas) and 450 m (control areas) to the north and south of the pipeline route (Figure 1); the quadrats measured 3 m x 3 m and were divided into nine 1 m x 1 m smaller quadrats of which five were selected randomly for study. Sea grass and other plant and algal species present in each were listed and their cover estimated. Since a single transect did not give the full picture of recovery within the cleared corridor, additional studies were undertaken from 1996 to 1998 along seven line transects at the distances referred to above along and to either side of the pipeline route, with five quadrats randomly placed within bands 0-50 m, 50-100 m 100-150 m, 150-200 m, 200-250 m, 250-300 m, 300-350 m and 350-400 m from the beach (Figure 1).

The first study on the third pipeline route in 2001 was prior to construction; recovery studies were undertaken annually in early September from 2003 to 2011. The cleared corridor, 100 m wide and organised as for pipeline 2, was treated as a belt transect with a zero point permanently marked (at SD2271666360) on the centre line of the corridor adjacent to the shingle beach. The sea grass area was studied along lateral transects across the corridor at 0 m, 25 m (cleared areas), 75 m (boundary areas), and 100 m (control areas) to the north and south of the centre pipeline route, and seawards at 80 m, 130 m, 180 m, 280 m, 380 m, 480 m and 580 m from the beach (Figure 2); sea grasses were absent beyond. At each sampling station sea grasses, other plants and algae within a 3 m x 3 m quadrat were listed, and their cover estimated and photographed.

Results

On the second pipeline route prior to clearance in 1992 the muddy foreshore supported a patchy bed of *Zostera marina* var. *stenophylla* and *Nanozostera noltei* to the north and south of the cleared corridor extending 300 m seawards. Also present were commonly *Ulva* (*Enteromorpha*) spp., occasional *Fucus* spp., and cord-grass *Spartina anglica* C.E Hubb. in inshore areas. On stones and cobbles, *Zostera marina* var. *stenophylla* grew preferentially in standing water while *Nanozostera noltei* grew in slightly raised and drier areas. Mean values of 3%, 38% and 34% respectively in the 25 m north, 0 m and 25 m south quadrats were recorded (Figure 3).

From 1994 to 1998 only trace growths were recorded in the 25 m north, 0 m and 25 m south quadrats except for the 25 m north quadrat in 1998 that showed a burst of growth (Figure 3). The cleared corridor was visible for the first two years after engineering work.

The additional quadrats studied in the final year (1998) showed sea grasses to be present

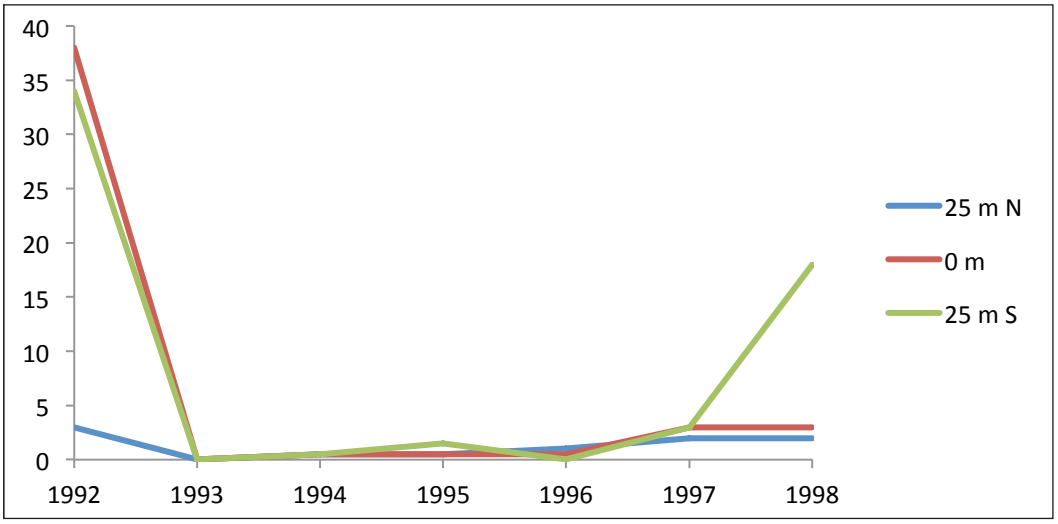

Fig. 3: Growth of seagrass in 3 quadrats between 1992–1998

patchily in the cleared corridor (Figure 2). They were absent on the 25 m north line in the inshore area with maximum cover between 200 m and 300 m decreasing further out. Cover on the 25 m south line was at a maximum between 100 m and 150 m, and between 250 m and 300 m out. Overall the sea grass bed was patch-dynamic with local increases and decreases from year to year.

On the third pipeline route sea grasses formed a patchy bed to 580 m offshore with both *Zostera marina* var. *stenophylla* and *Nanozostera noltei* present. As on the second pipeline corridor *Ulva* (*Entermorpha*) spp., *Fucus* spp., and *Spartina anglica* were also present. Sea grass cover in the quadrats in the cleared corridor increased from absent in 2003 (Figure 3) to obviously present in the final year of the survey (2011) although occurrence was patchy. As for pipeline 2 the cleared corridor was visible for the first two years after engineering work.

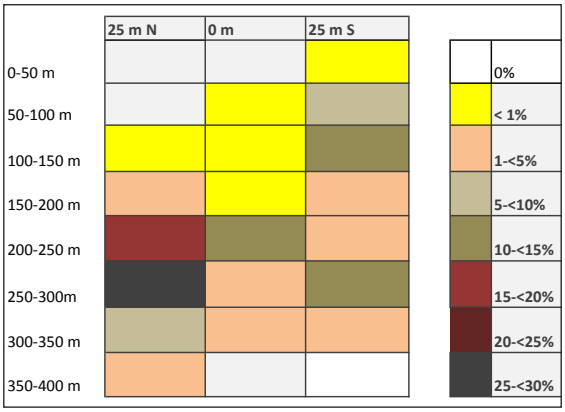

Fig. 4: Pipeline 2: sea grass cover in the additional quadrats in the final year of the study

Discussion

Sea grass beds are an important coastal habitat in the United Kingdom and damaging disturbance is of concern. They declined nationally in the 1930s due to a wasting disease, and loss of wetland and coastal development has also contributed to their reduction. The vigorous spread of *Spartina anglica* has the potential to outcompete sea grasses by reducing the extent of available intertidal area. These processes have occurred in the Walney Channel. While the construction of gas pipelines across the sea grass bed at Westfield caused local disturbance and temporary exclusion, we observed their slow and gradual recovery after a few years. Our studies also showed recovery to be patch-dynamic, a feature for sea grass beds elsewhere (Davison 1997; Hubble 2013). We also noted that the seaward extent varied from year to year. Seed set and vegetative propagation were important in their recovery and annual growth; recovery was probably also aided by rhizoidal remains in the replaced spoil and noticed particularly in the first years' surveys. Our study concludes that sea grass beds show resilience to severe physical disturbance.

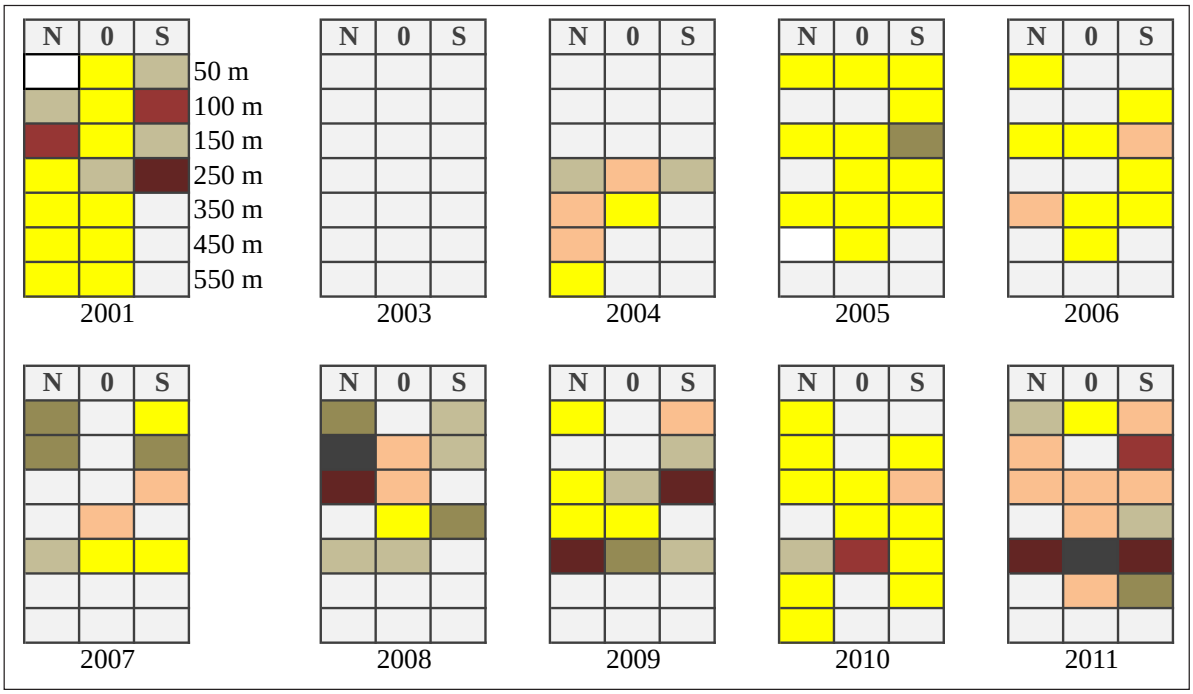

Fig. 5: Pipeline 3: sea grass cover in the 25 m N, 0 m and 25 m S quadrats along the cleared corridior; key to shading in Figure 4.

Acknowledgements

These studies were carried out under contract to British Gas Hydrocarbon Resources Limited and ConocoPhillips (UK) Limited. The authors wish to thank Alison Paul and other colleagues from the Natural History Museum, too many to mention, who helped with the fieldwork.

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Susceptibility of *Modiolus modiolus* biogenic reef to acute and chronic damage

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Introduction

Shellfish reefs are one of, if not the most imperilled marine habitats on earth according to a global analysis of their status (Beck *et al.* 2009). Destructive fishing practices are primarily to blame which have been shown to damage both the individual bed-forming animals and the integrity of the reefs that they build. The horse mussel *Modiolus modiolus* is a long-lived (>40 years) species that forms beds in northern latitudes, but appears to be being depleted in areas where it was once extensive (Magorrian & Service 1998; Kaiser *et al.* 2007). The species itself is not uncommon and individuals are found in a wide variety of sublittoral habitats, but extensive and highly species-rich beds are not common, are possibly disappearing and have been shown to degrade rapidly when physically impacted by mobile benthic fishing gear – even after a single event (Sanderson *et al.* 2008; Cook *et al.* 2013) as shown as part of this work. We have also found that there may be a chronic degradation of the bed-form caused by regular but much lighter impacts on the seabed although this needs further investigation and might not be true for all *Modiolus* beds across their geographical range. This may have important implications for the *Modiolus* beds in North Wales that are fished using pots and traps that have traditionally been regarded as causing little if any physical damage.

Monitoring studies

The Countryside Council for Wales (now superseded by Natural Resources Wales) initiated studies of two *Modiolus* beds; one to the north of the Lleyn peninsula in North Wales (in 2004) and one just off the northernmost point of the Isle of Man (in 2007). Diving surveys of live and dead shell counts were conducted using 0.25m^2 quadrats (15 at each site) re-positioned annually on fixed-location marker pegs at both locations. Initial results showed that the beds in the two locations were broadly similar with respect to very high densities of live animals and associated species living on and amongst the matrix formed by the larger shells, their byssus threads and the sediment and pseudofaecal / faecal mix of fine silt trapped between them. The most visually dominant species associated with the living *Modiolus* is the dead man's fingers soft coral *Alcyonium digitatum* which is often found to colonise the shells either side of the 'gape' where the siphons protrude, and has proved to be a useful surrogate for estimating the abundance of live shells from towed video records of the area (Figure 1).

The habitat at both study sites comprised mixed sediment and dead shells with a veneer of live *Modiolus* shells forming hummocks and dune-shaped ridges of around 1.5m height x 5-10 m wavelength that form distinctive images on side-scan sonar traces. At both locations the beds were moderately strongly tide-swept at around 30-35 m depth (Figure 2)

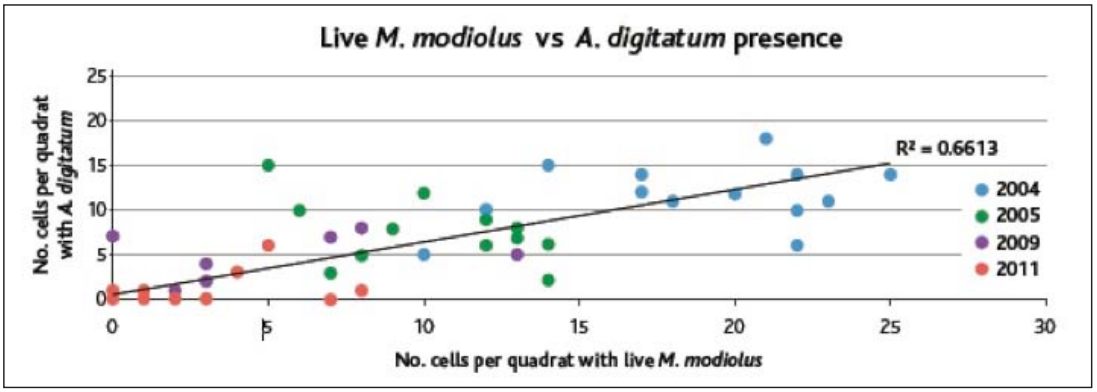

Fig. 1: Alcyonium digitatum *as a visible indicator of live* Modiolus modiolus *density on the horse mussel reef north of the Lleyn Peninsula.*

Fig. 2: Mounds of live Modiolus modiolus *with associated epifauna*

Manx site impacted by otter trawl

On the second visit to the Manx site in 2008, it was immediately evident that the study area had been physically disturbed. Two distinct parallel furrows, approximately 8 m apart, had cut through several of the *Modiolus* hummocks and the seabed between the furrows was flattened. This pattern of damage is consistent with similar marks made by an otter trawl where two heavy metal 'doors', that are used to hold the mouth of the net open, dig deep into the seabed and the net's ground chain drags over the seabed between them. At least 6 of the fixed-location quadrats were within the disturbed area (although bent, their marker pegs were still in place) leaving the remainder apparently untouched. Although not initially the aim of this study, the partially damaged site could now be utilised for a before-and-after impact study. The quadrats were re-surveyed at this 2008 event and the year after in 2009. Additional infaunal samples (four sets of cores inside the impacted zone and 2 sets of non-impacted) were also taken (Figures 3 & 4).

The results of the 2009 epifauna and infauna studies at the Manx study site were self-evident with regard to the effects of the trawl. All the visible *Modiolus* in the impacted area had gone, and only small fractions of the epifauna such as *A. digitatum*, feather stars *Antedon bifida*, anemones *Urticina felina, Sagartia elegans* and hydroids were left. The infaunal data trends were similar with significant

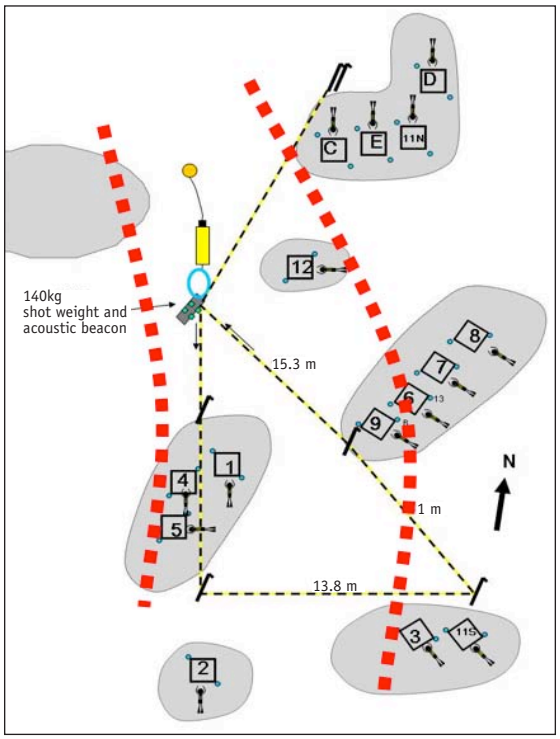

Fig. 3: Mounds of live Modiolus modiolus *with associated epifauna*

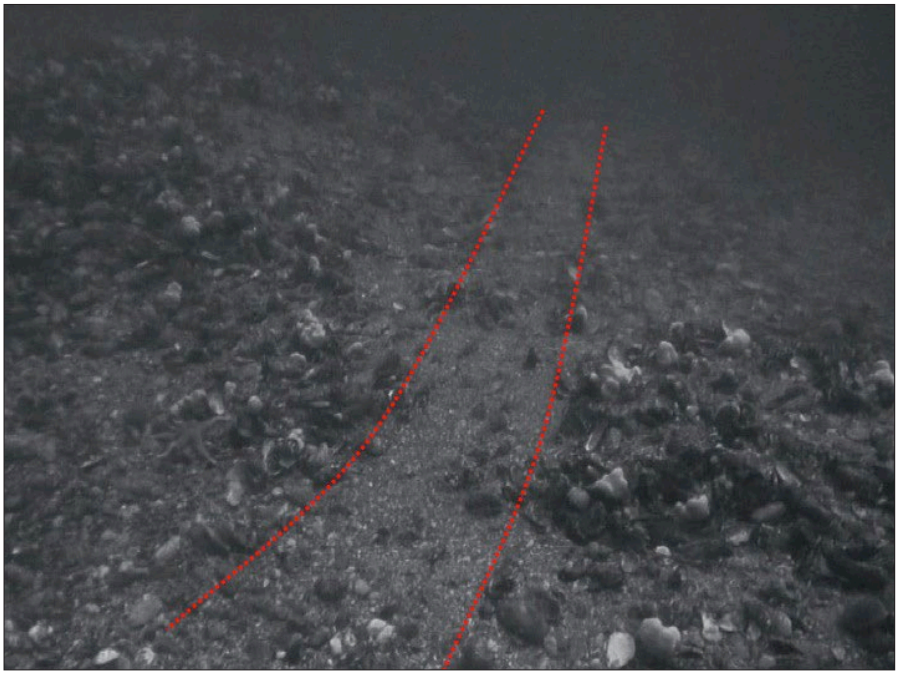

Fig. 4: One of the pair of otter trawl 'door' marks in the seabed

drops in numbers of polychaetes, bivalves, crustaceans and brittle stars. By 2009 one of the quadrats immediately just outside the impacted zone had developed characteristics of the impacted zone. It appeared that the partially de-stabilised *Modiolus* mound had been further winnowed away by tidal current action and had completely collapsed and no longer supported live *Modiolus* and associated epifauna and infauna (Figures 5–7).

North Lleyn peninsula site

Although there has never been any evidence of a specific impact at the Lleyn peninsula *Modiolus* bed fixed-location monitoring station, there are other areas of bed nearby where vessels have been spotted fishing illegally in the fisheries exclusion zone using mobile benthic gear. Characteristic scallop trawl marks, coinciding with these sightings, have been located on the seabed using side scan sonar and specific sets of marks targeted for *in situ* survey (Figure 8).

Diving survey using similar methods described above on transects across these marks have shown similar depletion of infauna and epifauna in the damaged zones compared with nearby

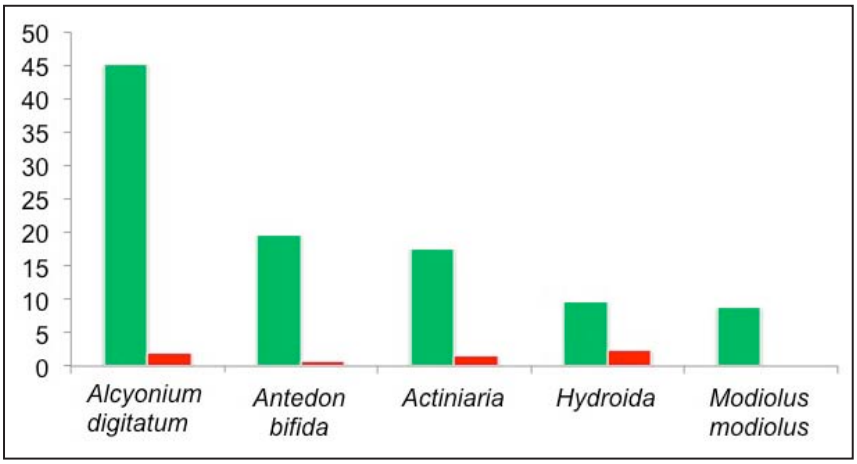

Fig. 5: Average abundance per m² for the key species significantly contributing to the difference between impacted (red) and un-impacted quadrats (green). All groups decline except Paguridae (scavenging species – known to increase in numbers post-trawling)

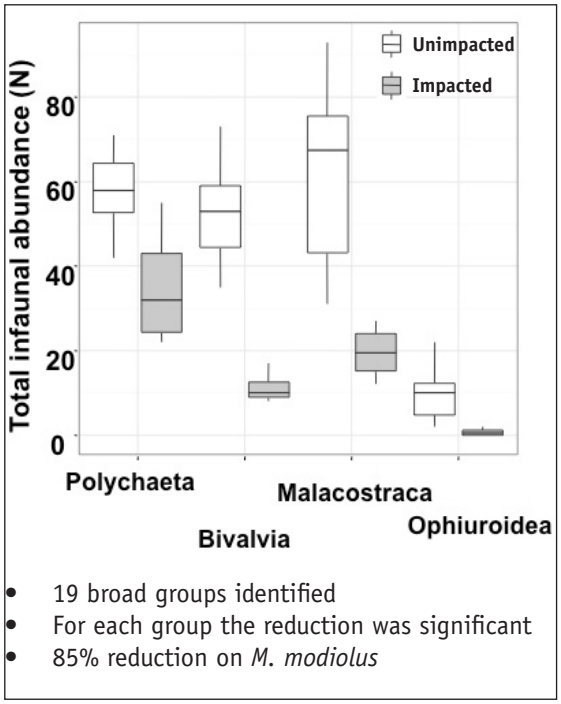

Fig. 6: Infaunal abundance for groups of species significantly contributing to the difference between impacted and un-impacted samples

un-impacted seabed and other randomly sampled seabed where the *Modiolus* bed appears normally healthy. There has, however, been a gradual decline in *Modiolus* abundance in the fixed location quadrats that were sampled between 2004 and 2011 (Figure 9).

On further investigation, it appears that this decline, which includes a completed collapse of the three dimensional structure of the *Modiolus* bed, is only apparent immediately in the area where the quadrats have been sampled on a near-annual basis (6 visits over 8 years). Only a few metres away, on the opposite side of the site marker and just beyond the limits of the area regularly sampled, recent (2014) video survey shows normal healthy *Modiolus* bed in stark contrast to the depleted zone where regular sampling has taken place. Other than our own regular visits, there have been no known impacts specific to this exact location (Figure 10).

Discussion

From the work on the Manx and north Lleyn peninsula *Modiolus* beds, there is direct evidence that mobile benthic fishing gear physically impacts *Modiolus* bed communities resulting in rapid and complete loss of the reef formation. Once damaged there appears to be little scope, certainly in the short term, for recovery and regeneration, particularly where water movement further de-stabilises the bed-form and results in loss of the living layer of *Modiolus* and associated epifauna and infauna.

There is also emerging evidence that requires further investigation that *Modiolus* bed is also susceptible to chronic low-level impacts such as that caused by divers moving around on the seabed. *Modiolus* has a fairly heavy shell and large size and would seem to be a robust,

Fig. 7: Fixed location quadrats from (labelled c) outside and (labelled d) inside the impacted zone at the Manx study site

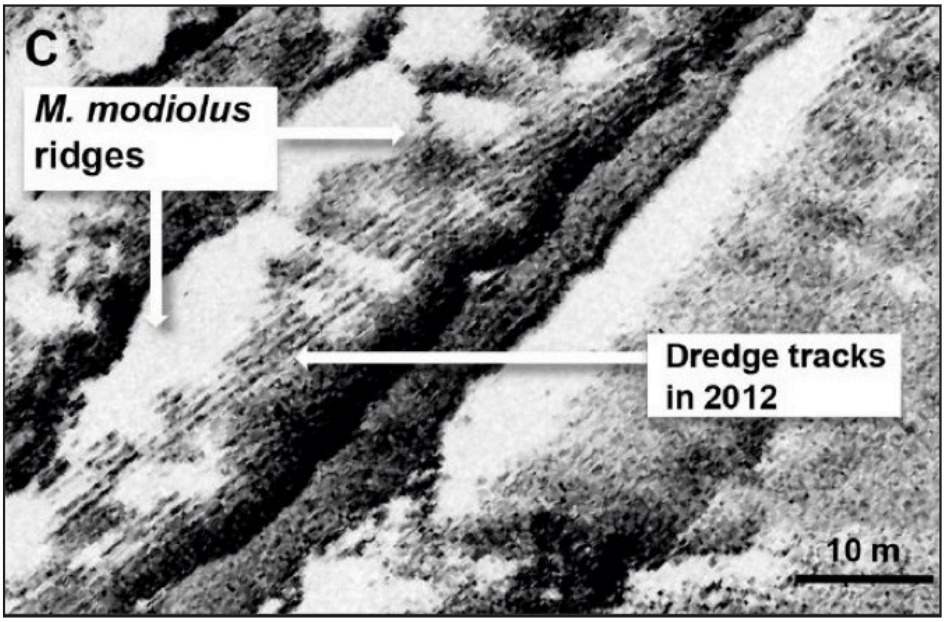

Fig. 8: Side scan sonar image from north Lleyn peninsula showing characteristic scallop dredge tracks found in 2012

hardy species not susceptible to damage by the fairly light touch a diver, with near neutral buoyancy, has while working on the seabed. However, we now suspect that damage occurs, not only if shells are broken, but if the living animals are dislodged, byssus threads broken or destabilised in some way that then allows water movements to further dislodge the animals and wash out trapped sediment resulting in the loss of the *Modiolus* and its epifauna and infauna. Once the process of destabilisation has been initiated it appears to be irreversible, resulting in collapse of the reef formation.

Although chronic damage that might be caused by divers is an important consideration when designing monitoring survey, management and even restoration of *Modiolus* reef, there are far more prevalent sources of potential chronic damage that ought to be considered as a matter of urgency if *Modiolus* reefs are to be protected, especially those nearing the southern limits of their range where thermal stress might weaken or slow the rate of bed recruitment and repair (as suggested by Gormley *et al.* 2013). Whelk and lobster potting takes place near continuously around the Lleyn peninsula and, although not causing visible scarring of the seabed, could potentially destabilise the bed-form enough to destroy the integrity of the bed and eventual loss of the *Modiolus* reef.

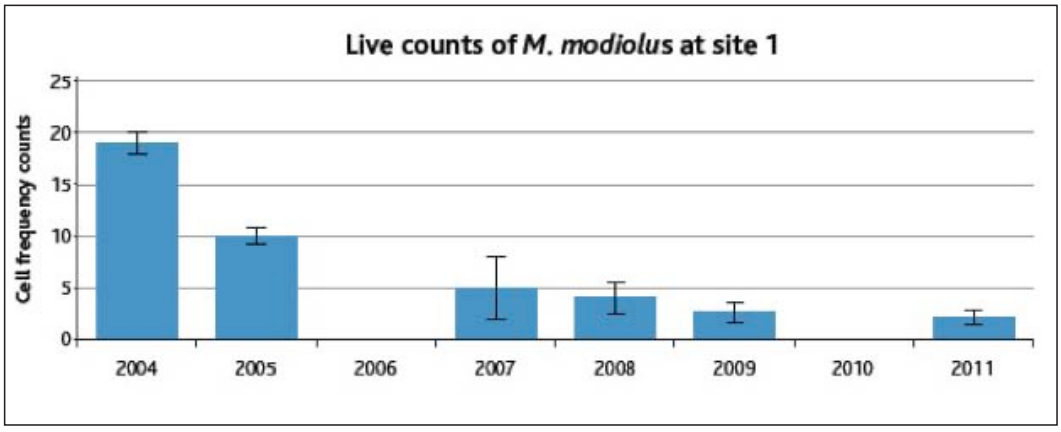

Fig. 9: Gradual decline in mean frequency of Modiolus *per quadrat at the north Lleyn peninsula monitoring station from 2004 to 2011*

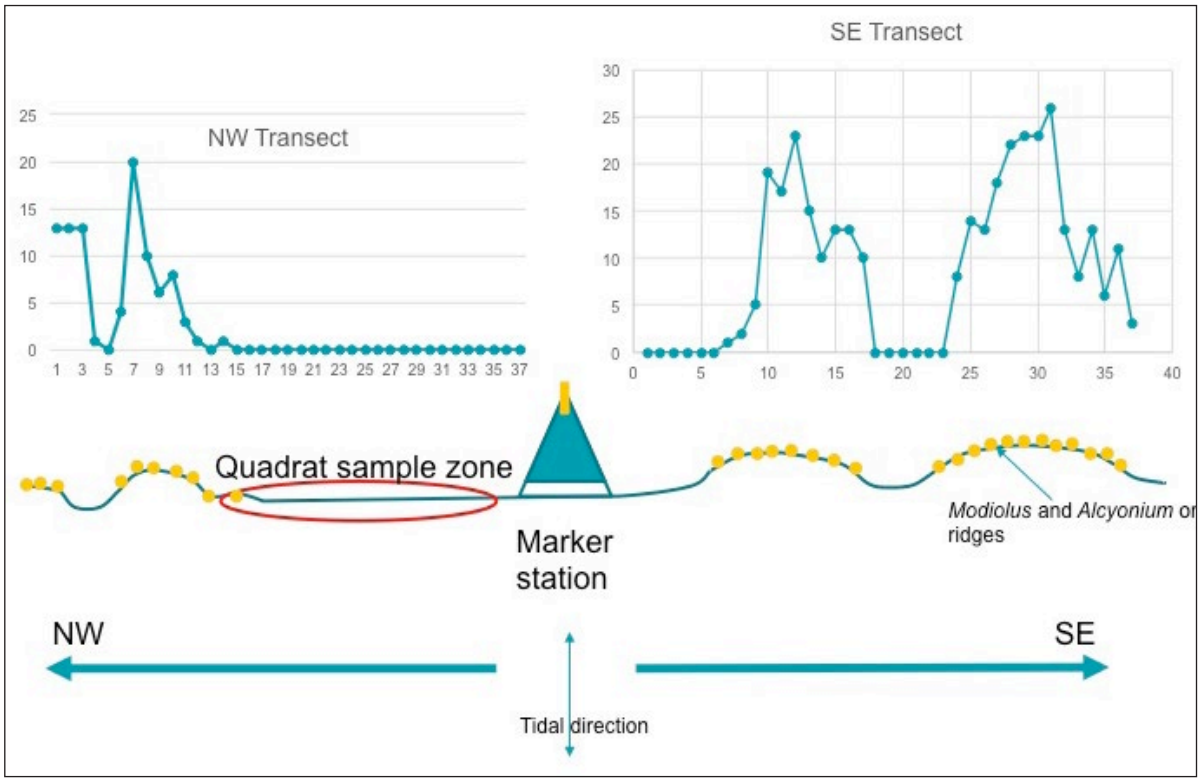

Fig. 10: Video frame counts of Alcyonium digitatum *from the NW and SE sides of the monitoring station indicate a depleted zone within the boundary where quadrats have been sampled on a regular basis.*

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Recipe for *Modiolus*

Take one *Modiolus* and one pebble. Place both in a pan of boiling water. When the pebble has gone soft the mussel is ready to eat.

Rohan Holt.

SHORT ARTICLES

Ross Worm *Sabellaria spinulosa* (Leuckart, 1849) in Irish waters and observations on its epibiont association with Whelk *Buccinum undatum* L.

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Key words: Ross Worm, Sabellaria spinulosa, *Whelk*, Buccinum undatum*, Irish waters*

The Ross Worm, *Sabellaria spinulosa* (Leuckart, 1849), is a tube-building polychaete closely related to the Honeycomb Worm, *S. alveolata* (L.). However, in contrast to *S. alveolata*, which often forms extensive biogenic reefs in intertidal areas and less frequently in subtidal areas (De Grave & Whitaker 1997), *S. spinulosa* mostly occurs in subtidal areas with high levels of suspended solids, and less frequently in intertidal areas (Goodwin *et al.* 2011). It can be either solitary or in small aggregations, but can be gregarious under favourable conditions, forming large reef-like structures up to 60 cm high and extending over several hectares. Large sub-tidal colonies of *S. spinulosa* occur in the Wash on the east coast of the UK (Anon 2015). The colony tubes are upright and typically consist of several layers of sediment particles (Benson *et al.* 2013).

While hauling whelk pots from a depth of 36-38 m off Greystones, Co Wicklow (53.13°N, 05.49°W) on 22 May 2014, the MFV 'Golden Venture (WD54)' (Skipper: Mr Ivan Toole, Newtownmountkennedy, Co. Wicklow) captured several live specimens of Whelk, *Buccinum undatum* L., which were heavily encrusted with live epibiont colonies of *S. spinulosa* (Figure 1). During the same haul, one detached colony of *S. spinulosa*, measuring 80 mm in height and maximum 60 mm in width, was found attached to the outside of a whelk pot (Figure 2). The latter specimen was donated to the National Museum of Ireland (Natural History) (NMINH:2014.44.1).

Fig. 1: Colonies of Sabellaria spinulosa epibiont on live Buccinum undatum (Photo Ivan Toole)

Although *S. spinulosa* colonies have not been previously reported in association with live *B. undatum* in Irish waters, it is possible that excessive levels of encrustation by *S. spinulosa* colonies may represent a size-related physical obstruction preventing some whelk gaining access to commercial whelk pots. The aperture size of commercial whelk pots used on the east coast of Ireland usually ranges from 75 to 100 mm (Ivan Toole pers. comm.). Considering that the maximum reported shell length and width of *B. undatum* is 165 mm (McMillan 1968) and 68 mm (Hayward *et al.* 2003) respectively, it is conceivable that any additional external encrustation caused by epibionts such as *S. spinulosa* may preclude at least some of the larger whelk from gaining access to commercial pots. Although the nature of the association between *S. spinulosa* and *B. undatum* may simply be opportunistic, it may represent a symbiotic relationship. Whelk shells clearly provide a suitably hard, albeit mobile demersal living substrate for *S. spinulosa* to colonise in an otherwise potentially unstable sedimentary environment which is usually characterised by mud, sand and gravel (Fahy *et al.* 2002), while the encrusting annelid may provide *B. undatum* with some level of protective camouflage. Wilson (1970) noted that in the Plymouth area (SW UK), *S. spinulosa* is often found on live dredge-caught Great Atlantic Scallop, *Pecten maximus* (L.), much more rarely on Queen Scallop, *Aequipecten (Chlamys) opercularis* (L.), and frequently on *B. undatum*, especially those inhabited by hermit crabs (Paguridea). In UK, Irish and NW French waters, Killeen & Light (2000) noted a recurring association between *Sabellaria* spp. and two marine gastropods, *Noemiamea dolioliformis* (Jeffries, 1848) and *Graphis albida* (Kanmacher, 1798).

Fig. 2: Detached colony of Sabellaria spinulosa (Photo Ivan Toole)

Prior to the mid-1980s there were relatively few definitive records of *S. spinulosa* from Irish waters. Thompson (1856) listed two species of *Sabellaria* from Irish waters, including *S. alveolata* as 'common in some parts of Belfast Bay, between tide-marks, W.T. "Cork and Youghal Harbours" (Cork Fauna)' and *S. crassissima* (Penn.) from 'North of Ireland, Mr Templeton'. McIntosh (1922) remarked that 'Johnston (1865) described *S. crassissima* and figured one of the palea, but so far as can be observed it is a variety of *S. spinulosa*, or the author has confused the two British species (de Saint-Joseph 1894). Dr. Johnston considered *Alceolaria lumbricalis* (Mus. Leach) this form'. Since *S. crassisima* Savigny (in Lamarck, 1818) and *Hermella crassissima* Quatrefages, 1866 are now regarded as subjective synonyms of *S. alveolata* (See WoRMS http://www.marinespecies.org/aphia.php?p=taxdetails&id=337798), it is possible that Thompson's reference to *S. crassissima* may refer to *S. alveolata* rather than *S. spinulosa*. There are three specimens of *S. spinulosa* in the collections of the National Museum of Ireland (Natural History) dating from the late 19th and early 20th century (NC:zool.jar.422). Although Haddon (1886) and Haddon & Green (1889) did not list the species in either of their reports on the results of the Royal Irish Academy expeditions off SW Ireland, the first NMINH specimen (NMINH:1891.25), was taken during August 1885 at a depth of 80 m, 14.4 km S of Glandore, Co Cork (Station XII, Log 29). The second, an unregistered specimen, was taken in 1892 at a depth of 46 m off Bray Head, Co Wicklow, and the third specimen (NMINH:1909.151) was taken on 25 May 1909 during the Clare Island Survey (Southern 1914) at a depth of 26 m in Clew Bay, Co Mayo. During the same survey, Southern (1914) reported *S. spinulosa* from Newport Bay and Westport Bay, both within Clew Bay (10-37 m), and from Blacksod Bay, NW Co Mayo. Southern (1914)

remarked that 'Isolated specimens of this species are common on the shore at Blacksod Bay, living under stones, in *Laminaria* roots, and on shells. One tube was found embedded in a sponge. It is commonly taken in the dredge (4-12 m), growing on shells and stones. Mature specimens were found in September'. Southern (1914) also noted that although '*S. alveolata* was not found in the Clare Island area, it was common in some places on the west coast, forming large reefs'. *S. spinulosa* was also recorded, albeit sporadically, from a small number of other locations, including the Shennick's Islands, Skerries, Co Dublin (Southern 1910), Dublin Bay (Southern 1910, Walker & Rees 1980), Kinsale Harbour, Co Cork (Dinneen *et al*. 1986), off Carnsore Point, Co Wexford (Keegan *et al*. 1987), and Galway Bay (O'Connor 1981, Costello 1983). Southern (1910) remarked that *S. spinulosa* 'usually frequents the deeper waters (26-36 m) near the coast. It is however, occasionally found between tide-marks, as at Skerries. It was dredged in large quantities in the Bay (Dublin). The interlacing tubes form masses on stones and old shells; but their arrangement is not so regular as those of *S. alveolata*.'

Since the mid-1980s, *S. spinulosa* has been recorded during extensive SCUBA diving surveys from at least 53 specific sites around the Irish coast (https://data.nbn.org.uk/Taxa/NBNSYS0000177765), including the following maritime counties: Derry (4), Antrim (21), Down (19), Dublin (2), Cork (1), Kerry (1), Galway (4), and Mayo (1). Although the vast majority (75%) of the records were reported from the NE coast (Antrim and Down), the absence and/or paucity of both current and historical records from other maritime regions may simply be due to a lack of recording effort and/or the limitations of SCUBA diving surveys. Scally *et al.* (2010) recognised the limitations of SCUBA diving in ground truthing habitats at depths greater than 40 m. Although the vast majority of Irish records were reported from sublittoral depths (average 17.0 m, SD 9.8 m, range 0.5-36.0 m, N=22), it is possible that the species may occur more frequently at depths beyond the normal maximum range of SCUBA diving. For example, using Van Veen grabs, anchor dredges and rectangular trawls at depths ranging from 42 to 130 m, Mackie *et al*. (1995) and Wilson *et al.* (2001) recorded *S. spinulosa* in generally high to moderate abundance from several sites in the southern Irish Sea. However, considering the rather fragile nature of *S. spinulosa* colonies, it is likely that colony fragments retrieved from offshore waters, especially by commercial trawlers, may often go unnoticed and/or are discarded. Indeed, *Sabellaria* species are particularly vulnerable to anthropogenic disturbance (Vorberg 2000, Dubois *et al*. 2002, 2006, Hendrick *et al*. 2011, Benson *et al.* 2013).

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Fig. 1: 2007 Kenmare Team © Peter Tinsley

Kenmare Bay, SW Ireland – 2007 & 2014 Seasearch expeditions

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Introduction

Kenmare Bay (also known as Kenmare River) is a long, narrow, south-west facing bay in counties Kerry and Cork, SW Ireland (see location map http://www.npws.ie/protected-sites/sac/002158). It is a deep, drowned glacial valley, and the bedrock is mainly Old Red Sandstone which forms reefs along the middle of the bay throughout its length. Exposure to prevailing winds and swells at the mouth diminishes towards the head of the bay. Numerous islands and inlets along the length of the bay provide further areas of additional shelter (Department of Arts, Heritage and the Gaeltacht 2013).

Kenmare River SAC (site code 2158) has a wide range of marine communities from exposed coast to ultra-sheltered areas. The site contains three marine habitats listed on Annex I of the E.U. Habitats Directive, namely reefs, large shallow bays and marine caves. There is also a very high number of rare and notable marine species present and some uncommon communities. Kenmare Bay is the only known site in Ireland for the Northern Sea fan (*Swiftia pallida*), and is the only known area where this species and the Southern Sea fan (*Eunicella verrucosa*) co-occur. This SAC is one of only four known locations in Ireland for the burrowing anemone *Pachycerianthus multiplicatus*. Communities characterized by burrowing brittlestars including the uncommon *Ophiopsila annulosa* and rare *Amphiura securigera* also occur. Red calcareous free living algae (maerl) occur in the sheltered bays (Department of Arts, Heritage and the Gaeltacht 2013).

Historical studies

Kenmare River has been the focus of only occasional marine research activity in the past. The apparently earliest known record is of *Ostrea edulis* from Sneem Harbour in 1754. Some of the early records from the area were published in 1899 by Praeger, being a list of shells from Parknasilla and Blackwater (intertidal). It was noted at the time that there were few records from this Bay. Other sublittoral records (mostly deep water) included occasional records from Royal Irish Academy, Royal Dublin Society and Fisheries (Ireland) (1886, 1890-1891, 1904). In 1959 and 1960, Arnold recorded the invasive slipper limpet *Crepidula fornicata* from Kilmakillogue Harbour, but fortunately this did not establish. D. Minchin visited Kenmare in 1982 and recorded *Swiftia pallida* for the first time (Minchin 1987) and subsequently it was recorded by B. Picton in 1984 (Picton 1985). In 1987, the national research vessel *Lough Beltra* carried out a brief survey of the area (MERC 2009). 30 stations were sampled using a qualitative dredge, in depths that ranged from 15-170 m.

The BioMar project (Picton & Costello 1997) carried out a comprehensive survey of subtidal communities in Kenmare Bay during 1995. Biological data was collected from a total of 62 dives, producing extensive faunal and

Fig. 2: 2014 Kenmare Team © Claire Goodwin

Fig. 3: Zostera marina © *Claire Goodwin*

floral species lists (402 taxa) and community descriptions (131 biotope records). Kenmare Bay was confirmed to hold a very wide range of seabed communities that are characteristic of a broad spectrum of substrates and environmental conditions, from open exposed rocky substrata to extremely sheltered areas with sedimentary substrata.

A survey of maerl beds in Irish waters (De Grave & Whitaker 1999) located maerl at two locations within Kenmare Bay: west of Ardgroom and south of Gleesk. The invasive marine alga *Sargassum muticum* was first recorded from Kenmare Bay in 2001 (Winder 2002).

The Kenmare River SAC broadscale mapping project in 2002 (Aquafact 2003) investigated the subtidal habitats and biological communities of Kenmare River. Grab samples were taken at 46 sites with more than 250 taxa being identified. Fauna recorded were mostly represented by annelids, crustaceans and molluscs. The video survey sampled 156 locations within Kenmare Bay recording 18 different habitat types and 15 community types. Seabed habitats varied from fine sediments including sand and mud to maerl, gravel, cobbles, pebbles and bedrock. The dive survey revealed six seabed habitats, which ranged from bedrock, boulders, live maerl and fine sand to mud. A total of 213 faunal and 70 floral taxa were recorded during the dive survey.

The combined results of the three ground truthing surveys confirmed that Kenmare Bay contained a high diversity of both seabed habitats and biological communities. In 2009, this work was continued through a number of surveys to map sensitive communities in this area (MERC 2009; ERM 2009).

Seasearch Expeditions 2007 and 2014

Undoubtedly amateur divers have visited Kenmare Bay many times over the previous 30 years, but there has only been one previous systematic amateur dive survey. In June 1984, B. Picton led a diving expedition to Kenmare Bay to record general marine life; the results were not published but some records are available from a marine database held at the National Museums Northern Ireland (16 dives, 88 taxa). In 2000, Julia Nunn and Lin Baldock visited and dived Kenmare Bay, experiencing some of the potential for recording (12 dives, 131 taxa). In 2007, both returned for a Seasearch expedition organised by Nunn (Figure 1). Although not an official Porcupine Marine Natural History Society trip, of the six participants, four were then members of PMNHS Council! In 2014, a second Seasearch expedition was organised under the auspices of Seasearch Ireland by O'Callaghan and Goodwin (Figures 2, 3).

Fig. 4: 2007 Kenmare Team enjoying tea between dives © Julia Nunn

Seasearch was devised by Bob Earll and Roger Mitchell during the 1980s. It was developed further with a formal training programme in 2001-2002, and a National Coordinator, Chris Wood, was appointed in 2003 http://www.seasearch.org.uk/. The current coordinator is Charlotte Bolton (as of 2016). The Seasearch project was extended to the Republic of Ireland in 2009 through the Irish Underwater Council. The Seasearch co-ordinator for the Republic of Ireland is Tony O'Callaghan. The 2014 Kenmare Bay expedition was part of an organised annual programme of dives.

Both expeditions were based in the sheltered Kilmakillogue Harbour on the south side of Kenmare Bay (the Beara Peninsula), staying either in Teddy O'Sullivan's pub (also known as Helen's Bar) on Kilmakillogue Pier, or in a self-catering house at Lauragh. Local operator Kenmare Bay Diving was based behind the pub for fills, spare and repairs, and provided the dive boat for the 2007 expedition (skippered by Paul Tanner). Refreshments could also be obtained on one of the islands (Figure 4).

In 2014 for the first couple of days of the trip, a 5.5m Pro Zodiac floppy inflatable was used. For the rest of the week, the University of Limerick kindly provided their twin-engined RIB 'Plassy Bird' (a Redbay Stormforce 7.4m). Club member Adrian Thomas selflessly acted as a dedicated skipper as he was unable to dive due to a cold, ably assisted by Rory McShane.

Records from most phyla were made, with particular emphasis on Mollusca (Nunn 2007), Bryozoa (Jo Porter 2007) and Porifera (although no samples were taken) (Goodwin 2014). All dives carried out during these surveys were entered onto Seasearch forms. The data were then entered onto the database *Marine Recorder*. The records are now on the NBN Gateway and are publicly available, from which further details of sites/dives/habitats seen may be obtained (Figure 5).

A total of 388 unique taxa were recorded combined from both expeditions, which compares favourably with similar professional surveys (Appendix 1). More than 730 species have been recorded from the sublittoral in Kenmare Bay. Of these, perhaps 80-90 have been contributed by the two Seasearch surveys (mainly bryozoans and molluscs). The exact number is uncertain as some of the previous reports do not give a full species list.

	2007	2014
Dive teams	Lin Baldock, Keith Coombs, Jon Moore, Julia Nunn, Jo Porter, Peter Tinsley	Sergei Belloshapkine, John Breen, Tim Butter, Jessie Castle, Brendan Derrane, Mercy Fenton, Claire Goodwin, Jean Kennedy, Ken Maye, Rory McShane, Tony O'Callaghan, Celsus O'Leary, Frances O'Sullivan, Paul Roland, Agnes Walsh
Date	12th -17th August 2007	12th-20th July 2014
No. of dives	34	32
No. of sites	13	20
No. of records	1358	1040
No. of taxa	291	193

Table 1: Comparison of the recording statistics between the dive surveys in 2007 & 2014

Fig. 5: Map for Sites in Kenmare Bay (red circles = 2007; blue circles = 2014)

Swiftia pallida (Figure 6) and *Eunicella verrucosa* were seen together at Book Rocks, Killmakillogue Harbour in 2007, but only *Swiftia* in 2014. *Swiftia* was also seen north of Cleanderry Harbour, together with the rare brittle star *Ophiopsila annulosa* in 2007, and in Sneem Harbour in 2014. *Pachycerianthus multiplicatus* (Figure 6) south of Potato Island in 2007, and in Sneem Harbour and west of Colorus Harbour in 2014.

A number of uncommon molluscan species were recorded in 2007: *Jujubinus montagui, Doto maculata, Doto millbayana, Eubranchus pallidus, Onchidoris depressa, Onchidoris sparsa*. A sheltered shallow inlet on Sherky Island was an excellent habitat for bivalve molluscs, and an unusual crustacean, the crab *Thia scutellata*. It has only apparently been recorded from Ireland elsewhere in Galway Bay.

In 2007, the bryozoan *Reptadeonella violacea* was an interesting find. Its northern limit is at the Isle of Man, being a warm temperate species apparently present around the Channel Islands and widespread in the Mediterranean, also reported at Cape Verde, West Africa, the Gulf of Mexico, Caribbean, Brazil and the Pacific coasts of Mexico and North America (Jo Porter pers. comm.).

During the 2014 survey, many records were made of small angler fish *Lophius piscatorius,* mainly from maerl habitats. Potentially Kenmare Bay may be a nursery ground for this species. Another fish of interest, the red blenny *Parablennius ruber*, was recorded from a sea cave near Cleanderry Harbour. It is not clear whether this species is a relatively recent arrival to Ireland due to climate change, or if it has always been present but historically under-recorded due to confusion with the more common tompot blenny *P. gattorugine* (Goodwin & Picton 2007). Seasearch records will aid in monitoring its distribution and potential spread.

The most stunning sight in Kenmare Bay was the huge bed of *Lithophyllum dentatum* off the wreck in Ardgroom Harbour (Figure 6), explored in 2007 and 2014. The rare south-western Trumpet Anemone *Aiptasia mutabilis*

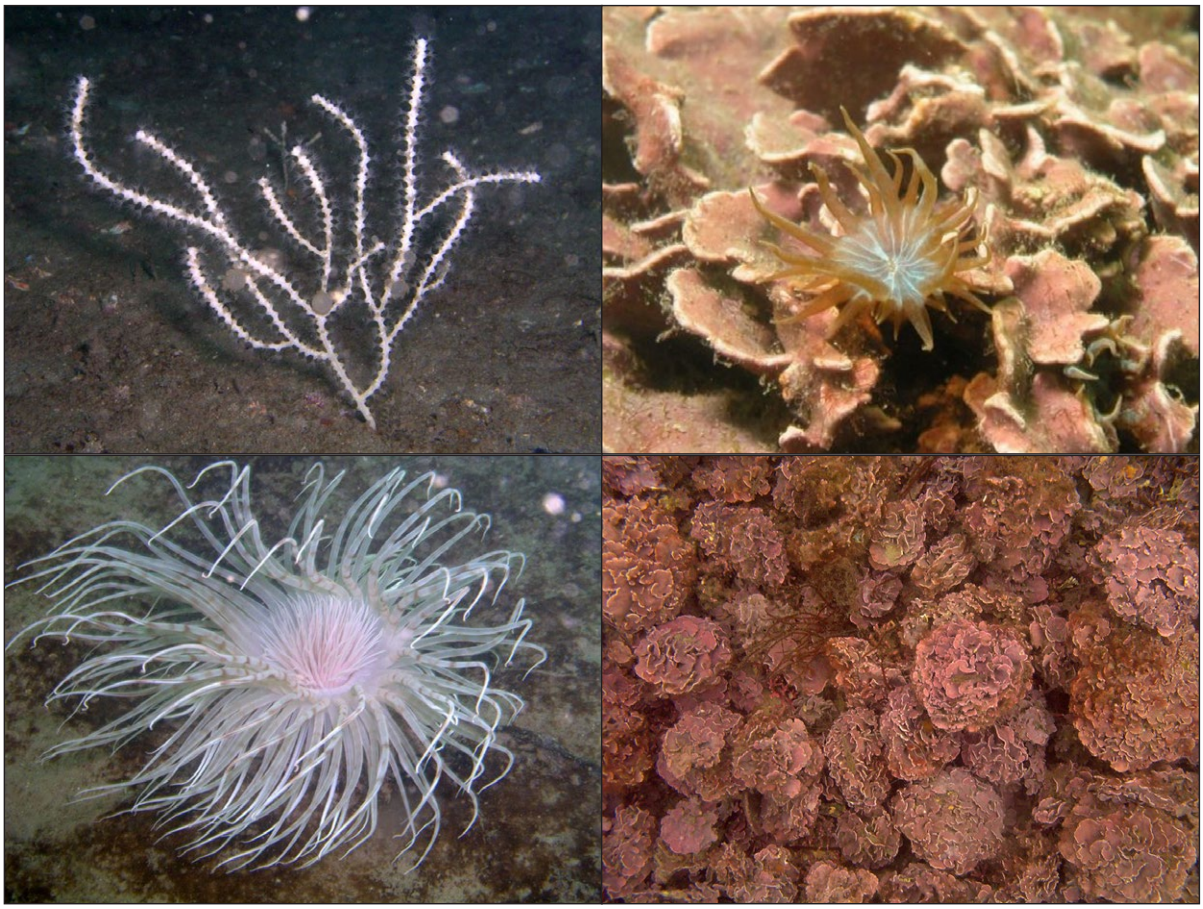

Fig. 6: Swiftia pallida; Aiptasia mutabilis; Pachycerianthus multiplicatus; Lithophyllum dentatum © *Peter Tinsley*

(Figure 6) was seen here on both occasions. In 2007, thanks to the 'technology' set up by Peter Tinsley (a time-delay camera on a tripod!), the whole Team was photographed on the maerl bed on the last dive of the trip (Figure 1).

The diversity of habitats present in the SAC, and the sheltered easy diving conditions provided by the many inlets of Inner Kenmare Bay, made for extremely enjoyable Seasearch diving. Although continued monitoring of the SAC is being undertaken by NPWS, supplementary data is always useful and there is potential for further Seasearch expeditions. Due to less than ideal weather conditions, some interesting areas towards the outer Kenmare Bay were not explored fully, such as steep walls on the outer southern side of Kenmare Bay and the many sea caves. Perhaps something to consider for a future Porcupine field meeting?

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Appendix 1: Species found

Phylum PORIFERA: *Amphilectus fucorum, Axinella dissimilis, Ciocalypta penicillus, Cliona celata, Dysidea fragilis, Halichondria panicea, Haliclona viscosa, Leucosolenia, Pachymatisma johnstonia, Polymastia boletiformis, Polymastia penicillus, Raspailia hispida, Raspailia ramosa, Stelligera stuposa, Suberites carnosus, Suberites ficus, Tethya citrina*

Phylum CNIDARIA: *Abietinaria abietina, Actinothoe sphyrodeta, Adamsia carciniopados, Aglaophenia tubulifera, Aiptasia mutabilis, Alcyonium digitatum, Alcyonium glomeratum, Anemonia viridis, Aulactinia verrucosa, Aurelia aurita, Bougainvillia ramosa, Campanulinidae, Caryophyllia inornata, Caryophyllia smithii, Cereus pedunculatus, Cerianthus lloydii, Chrysaora hysoscella, Corynactis viridis, Cyanea lamarckii, Edwardsia claparedii, Epizoanthus couchii, Eunicella verrucosa, Halecium beanii, Halecium halecinum, Halecium muricatum, Halecium plumosum, Haliclystus auricula, Hormathia coronata, Hydractinia echinata, Isozoanthus sulcatus, Metridium senile, Nemertesia antennina, Nemertesia ramosa, Obelia dichotoma, Obelia geniculata, Pachycerianthus multiplicatus, Peachia cylindrica, Plumularia setacea, Rhizostoma pulmo, Sagartia elegans, Sagartiogeton undatus, Schizotricha frutescens, Sertularella gayi, Sertularella polyzonias, Swiftia pallida, Urticina felina, Virgularia mirabilis*

Phylum CTENOPHORA: *Bolinopsis infundibulum*

Phylum PLATYHELMINTHES: *Prostheceraeus vittatus*

Phylum NEMERTEA: *Tubulanus annulatus*

Phylum ANNELIDA: *Arenicola marina, Bispira volutacornis, Chaetopterus variopedatus, Eupolymnia nebulosa, Lanice conchilega, Myxicola aesthetica, Myxicola infundibulum, Phylo norvegicus, Sabella pavonina, Spirorbinae, Spirobranchus* sp., Terebellidae

Phylum ARTHROPODA

PYCNOGNIDA: Pycnogonida indet.

CRUSTACEA: *Balanus balanus, Balanus crenatus, Cancer pagurus, Carcinus maenas, Crangon crangon, Eualus cranchii, Galathea squamifera, Galathea strigosa, Goneplax rhomboides, Homarus gammarus, Hyperia galba, Inachus sp., Liocarcinus corrugatus, Liocarcinus depurator, Maja squinado, Megatrema anglica, Necora puber, Nephrops norvegicus, Pagurus bernhardus, Pagurus prideaux, Palaemon serratus, Pisidia longicornis, Palinurus elephas, Thia scutellata, Verruca stroemia, Xantho* sp.

Phylum MOLLUSCA: *Abra alba, Acanthochitona crinita, Acanthodoris pilosa, Aequipecten opercularis, Alvania beanii, Alvania punctura, Aplysia punctata, Barleeia unifasciata, Bittium reticulatum, Brachystomia eulimoides, Buccinum undatum, Cadlina laevis, Caecum imperforatum, Calliostoma zizyphinum, Callochiton septemvalvis, Clausinella fasciata, Crisilla semistriata, Cuthona caerulea, Cuthona nana, Cuthona rubescens, Diaphorodoris luteocincta, Doris pseudoargus, Dosinia exoleta, Doto fragilis, Doto hystrix, Doto maculata, Doto millbayana, Doto pinnatifida, Doto tuberculata, Eatonina fulgida, Eubranchus exiguus, Eubranchus pallidus, Euspira nitida, Facelina auriculata, Facelina*

bostoniensis, Gari depressa, Gari tellinella, Gibbula cineraria, Gibbula magus, Goniodoris nodosa, Gouldia minima, Hermaea bifida, Heteranomia squamula, Hiatella arctica, Jorunna tomentosa, Jujubinus montagui, Kurtiella bidentata, Lacuna parva, Leptochiton asellus, Leptochiton cancellatus, Limacia clavigera, Littorina littorea, Lutraria lutraria, Mangelia costata, Marshallora adversa, Mimachlamys varia, Moerella donacina, Musculus subpictus, Mytilus edulis, Nassarius reticulatus, Nassarius incrassatus, Onchidoris depressa, Onchidoris sparsa, Onoba semicostata, Parvicardium exiguum, Parvicardium scabrum, Patella pellucida, Patella vulgata, Pecten maximus, Pleurobranchus membranaceus, Politapes aureus, Polycera quadrilineata, Pusillina inconspicua, Pusillina sarsi, Raphitoma linearis, Retusa truncatula, Rissoa lilacina, Rissoa parva, Rissoa parva var. interrupta, Ruditapes rhomboides, Sepiola atlantica, Spisula solida, Stiliger bellulus, Tectura virginea, Thracia villosiuscula, Tricolia pullus, Tritonia hombergii, Tritonia lineata, Trivia arctica, Venerupis corrugata, Venus verrucosa

Phylum BRYOZOA: *Aetea anguina, Aetea truncata, Alcyonidium diaphanum, Alcyonidium gelatinosum, Alcyonidium parasiticum, Amphiblestrum auritum, Amphiblestrum flemingii, Annectocyma major, Bugula plumosa, Bugula stolonifera, Bugula turbinata, Callopora craticula, Callopora dumerilii, Cellepora pumicosa, Celleporella hyalina, Cradoscupocellaria reptans, Crisia denticulata, Crisia eburnea, Diplosolen obelia, Disporella hispida, Electra pilosa, Escharoides coccinea, Escharella immersa, Escharella variolosa, Filicrisia geniculata, Flustra foliacea, Haplopoma graniferum, Haplopoma impressum, Membranipora membranacea, Microporella ciliata, Omalosecosa ramulosa, Oschurkovia littoralis, Palmiskenea skenei, Parasmittina trispinosa, Porella compressa, Reptadeonella violacea, Rhynchozoon bispinosum, Schizomavella auriculata, Schizomavella linearis, Schizoporella errata, Scruparia ambigua, Scruparia chelata, Smittina affinis, Tubulipora liliacea, Tubulipora phalangea, Tubulipora plumosa*

Phylum PHORONIDA: *Phoronis* sp.

Phylum ECHINODERMATA: *Acrocnida brachiata, Amphipholis squamata, Amphiura chiajei, Antedon bifida, Aslia lefevrii, Asterias rubens, Asterina gibbosa, Astropecten irregularis, Echinocardium cordatum, Echinus esculentus, Henricia oculata, Holothuria forskali, Luidia ciliaris, Marthasterias glacialis, Neopentadactyla mixta, Ocnus planci, Ophiopsila annulosa, Ophiothrix fragilis, Ophiura albida, Ophiura ophiura, Pawsonia saxicola, Stichastrella rosea*

Phylum TUNICATA: *Aplidium punctum, Ascidia mentula, Ascidiella aspersa, Botryllus schlosseri, Ciona intestinalis, Clavelina lepadiformis, Corella parallelogramma, Dendrodoa grossularia, Diazona violacea, Didemnidae, Diplosoma spongiforme, Lissoclinum sp., Morchellium argus, Polycarpa scuba*

Phylum CHONDRICHTHYES: *Raja batis, Raja clavata, Scyliorhinus canicula*

Phylum OSTEICHTHYES: *Ammodytes tobianus, Atherina sp., Callionymus lyra, Callionymus reticulatus, Centrolabrus exoletus, Chelidonichthys lucerna, Conger conger, Ctenolabrus rupestris, Gadus morhua, Gobius couchii, Gobius niger, Gobius paganellus, Gobiusculus flavescens, Labrus bergylta, Labrus mixtus, Lepadogaster candolii, Lesueurigobius friesii, Lipophrys pholis, Lophius piscatorius, Merlangius merlangus, Myoxocephalus scorpius, Parablennius gattorugine, Parablennius ruber, Pholis gunnellus, Pleuronectes platessa, Pollachius pollachius, Pomatoschistus minutus, Pomatoschistus pictus, Symphodus melops, Syngnathus acus, Syngnathus typhle, Taurulus bubalis, Thorogobius ephippiatus, Trisopterus luscus, Trisopterus minutus, Zeugopterus punctatus, Zeus faber*

Phylum RHODOPHYTA: *Acrosorium venulosum, Bonnemaisonia asparagoides, Brongniartella byssoides, Calliblepharis ciliata, Calliblepharis jubata, Callophyllis laciniata, Champia parvula, Chondrus crispus, Chylocladia verticillata, Corallina officinalis, Cryptopleura ramosa, Delesseria sanguinea, Dilsea carnosa, Drachiella spectabilis, Dudresnaya verticillata, Furcellaria lumbricalis, Gelidium sp., Gracilaria gracilis, Halarachnion ligulatum, Heterosiphonia plumosa, Hildenbrandia rubra, Hypoglossum hypoglossoides, Jania rubens, Kallymenia reniformis, Lithophyllum dentatum, Lithothamnion corallioides, Lomentaria articulata, Membranoptera alata, Meredithia microphylla, Nitophyllum punctatum, Phycodrys rubens, Phyllophora crispa, Phymatolithon calcareum, Plocamium cartilagineum, Polyneura bonnemaisonii, Polysiphonia sp., Pterothamnion plumula, Rhodymenia ardissonei, Schottera nicaeensis, Scinaia sp., Sphaerococcus coronopifolius, Stenogramme interrupta*

Phylum OCHROPHYTA: *Asperococcus bullosus, Chorda filum, Colpomenia peregrina, Cystoseira, Desmarestia aculeata, Dictyopteris polypodioides, Dictyota dichotoma, Dictyota spiralis, Ectocarpus, Fucus serratus, Halidrys siliquosa, Himanthalia elongata, Laminaria hyperborea, Saccharina latissima, Saccorhiza polyschides, Sargassum muticum, Sphacelaria sp., Sporochnus pedunculatus*

Phylum CHLOROPHYTA: *Codium* sp., *Ulva* sp., *Ulva lactuca*

Phylum ANGIOSPERMAE: *Zostera marina*

Buried treasure

Peter Barfield

Sea-nature Studies
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We are all aware that not everything is available online but when was the last time you went offline to search for some information? Time and tide wait for no man, so inevitably we rely on those sources which are more accessible, hand-to-mouse.

I know with certainty that most, if not all, who might read this short introduction have experienced the sense of finding hidden treasure in the intertidal. Backs-bent double, head-under-a-stone, or eyes diving into some secret pool tucked away within a crevice which might be in full view but is off the beaten track all the same because you have to be looking to see. Don't tell me you haven't been there.

These small discoveries are moments of delight and surprise and of course they are not restricted to that space between the tides. On rainy days when you're researching inside with a shot of your favourite poison in hand (espresso, thanks for asking) trying to find that bit of the puzzle to slot into your *Porcupine Bulletin* article on *Velella velella* you suddenly google-stumble on something which up until then you'd been google-stumped on. But not always. Some things which were written have yet to be digitised. These are the lost treasure texts.

The Marine Observer was published from January 1924 up until July 2003 when the Met Office was "no longer able to support the editorial, printing, publishing and distribution costs involved in producing the journal" (Walker 2012). I had never heard of it until Frank Evans very kindly sent me an article he had written for the journal back in 1986 on *Velella velella*. If I'd known about it I would certainly have referenced it.

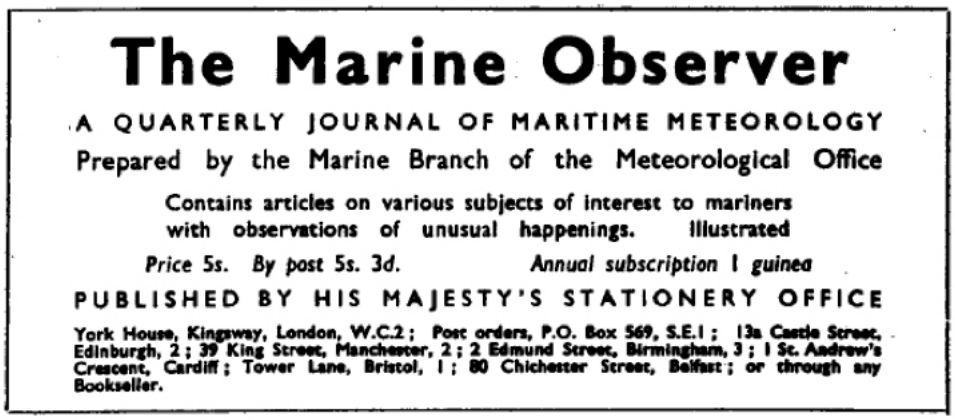
The 9th edition of the Marine Observers Handbook, also published by the Met Office noted the following:

Throughout the history of the Marine Branch of the Meteorological Office, observations at sea have been made on a voluntary basis. The number of ships making observations at any time depends upon requirements but is limited by practical considerations. The captains and officers of ships undertaking this work are referred to as the "Corps of Voluntary Marine Observers", their ships comprising the "Voluntary Observing Fleet".

Indirect contact with the Observing Fleet is maintained through the medium of The Marine Observer*, a quarterly publication which contains articles on meteorology, oceanography, ice, etc., of interest to seamen. A large section in each number is devoted to observations of phenomena of a meteorological or general scientific nature, mostly extracted from the meteorological logbooks of ships of the British Commonwealth.*

Perhaps there are other lost articles or publications out there which you know about. Perhaps the *Porcupine Bulletin* can accelerate the resurrection of some. Coming soon to a mouse near you? For now, read on and I hope you enjoy the discovery, as I did.

Walker, M. 2012. *History of the Meteorological Office.* Cambridge University Press. 450pp. ISBN: 9780521859851



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Velella velella (L.), the 'by-the-wind-sailor', in the North Pacific Ocean in 1985

Frank Evans

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Velella velella (L.) lives in the open ocean, and because it floats at the very surface of the sea, it has long been known to deep-water sailors. Sailing ship men called it the 'by-the-wind-sailor' or 'Jack-by-the-wind'. The name was suggested by the sail (actually a part of the skeleton) which drives the animal before the wind on a broad reach. Nowadays, seamen correctly and more commonly use the generic title, *Velella*. The (L.) following the animal's name credits the great naturalist, Linnaeus, with first naming it; in 1758, he called it *Medusa velella*; he thought it was a mollusc. *Velella*, we now know, is a hydrozoan coelenterate, and is so very closely related to the sea-firs or polyps found on rocky shores; more distantly, it is related to corals and sea-anemones.

The genus is monotypic i.e., there is only one species of *Velella* worldwide, although Bieri (1977a) has suggested that there are genetically different stocks in different oceans. At one time, as many as thirty different species of *Velella* were thought to exist.

The marine biologist, Sir Alister Hardy (1956), referring to sailing ship records of *Velella* then wrote: 'Today I do not suppose the steamship men, travelling fast, ever notice them'. In this he was in error, for numerous reports of the creature continue to reach the Meteorological Office. Nevertheless, our knowledge of the biology and distribution of *Velella* remains poor. Partly, this is because of its patchiness. A research vessel may search fruitlessly and expensively for *Velella* over thousands of miles of ocean, and consequently such searches are hardly ever undertaken.

Velella occurs in the lower latitudes of the three major oceans. Published records from the western North Atlantic are few. Linnaeus mentioned above, recorded it from the Mediterranean, where it is still found. Reports of stranded *Velella* on British southern coasts appear from time to time. The creature is then at the polar limit of its range.

Bieri (1977b) states 'although *Velella* has been observed by naturalists for 150 years, records giving the three variables of date, location and size are scanty'. Further records are desirable, and the value of reports received from the Voluntary Observing Fleet is plain. While the many records to date are in the process of collation, a single remarkable explosion of the *Velella* population in the North Pacific Ocean in 1985 merits immediate notice. First, however, a short description of the life history of the species may be appropriate.

Like related sea-firs, *Velella* undergoes an alternation of generations, first as an asexual or budding form, then as the sexual or egg-laying form, which in turn gives rise to the asexual form. The familiar blue-edged creature up to 15 cm long, with a chitinous sail, represents the asexual generation, called a polyp. In almost all other sea-firs, the polyp is attached to rocks, weed and so on, often in colonies, but in *Velella* it is single, buoyant and free-floating. In all sea-firs, the polyp generation is characteristically asexual.

From the polyp small medusae, or jellyfish, are budded off. These represent the sexual generation and each medusa is either male or female. From the medusa, eggs and sperm are shed into the sea, where, after fertilisation, a new polyp grows from the egg. This is the general sequence in sea-firs.

Before reproducing, some kinds of sea-fir medusae feed and grow into quite large jellyfish. Not so in the case of *Velella* where the medusa remains small, initially no more than 1·5 mm long, and with only four tentacles. At this stage, the medusae make a remarkable descent from the sea surface down to a depth of 600 - 1000 m. Here, it is supposed that they release their sex products into the sea, the eggs are fertilised and the new polyp generation begins its development. Fertilisation at that depth has never, of course, been observed, but the medusae have been captured there.

The minute polyp secretes an oil droplet into its tissues whose buoyancy bears it back towards the surface and a new life.

Velella is a member of the pleuston, those animals living at the interface of air and sea. It is a predator, feeding on near-surface plankton and small fish which it captures by means of

Ship	Date	Position	Maximum Density	Size
British Spey	21–22 April	37.7N, 168·0°W - 37·7°N, 162·1°W	'thousands'	5 cm
Fort Providence	22–25 April	36·3°N, 147·3°W - 37.7°N, 164·7°W	20 m^{-2}	5 cm
British Spey	7 May	35·2°N, 179.4°W	'many millions'	
Pacific Crane	7–11 May	42.3°N, 147·6°W - 34·0°N, 127.9°W	40-50 m^{-2}	
Mosel Express	9 May	42·4°N, 135.5°W	'large clusters'	4 cm
Albright Explorer	9–18 May	38·00 N, 172.0°E - 34.3°N, 137·0W	'varying'	
Main Express	12–15 May	38.00 N, 180·0° - 38.0°N, 175.0°W	'solid patches, millions upon millions'	4-5 cm
Stolt Sceptre	18 May	37.0°N, 179·8°W	'completely covered the sea in patches'	
Pacific Teal	18–20 May	37·4°N, 166.8°W - 39·2°N, 179·9°W	'grouped into lines 5 m across, the lines stretching for miles'	
Fort Victoria	19–22 May	42·1°N, 143·2°W - 37.2°N, 162.5°W	4-6 m^{-2}	10-15 cm
Valdivia	26 May	42.8°N, 151·6°W	'in clusters all day'	4 cm
Galconda	13–14 June	42·0°N, 137.2°W - 44·3°N, 132.9°W	(present)	
Myrmidon	6–10 July	41.4°N, 162.7°E - 44.1°N, 157·2°W	'looked like oil tanker sludge'	10-12 cm

Table 1: Velella *reports from selected ships*

trailing tentacles bearing stinging cells. In its turn, it is preyed upon by other animals, in particular by the purple floating snail, *Janthina*. It may be noted that members of the near-surface community, *Velella* included, are commonly coloured blue or purple as a camouflage (a greener colour in colder waters).

Manifestly, the fertilisation of eggs at 600 -1000 m must be a co-ordinated event. From this may arise the patchiness and occasional abundance of the species.

From April to July 1985 there was a remarkable upsurge in numbers of *Velella* in the North Pacific Ocean. This upsurge was reported by twelve Selected Ships in the area from 21 April to 10 July (Table 1). Although the observations were made by seamen and not by specialists, ample evidence of correct identification was supplied in the form variously, of descriptions, drawings, photographs and skeletons included with the reports.

A map of the recorded locations is given in Figure 1. The 'box' enclosing the *Velella* patch during the period was approximately 2·1 million square miles in area. Total numbers cannot be estimated since they varied greatly between sightings. However, what is notable about the outburst apart from its vast extent, are the very high densities at times reported. More than one record spoke of an appearance resembling grease, or the sludge remains of an oil tanker. A remarkable photograph in *The Marine Observer*, April 1986 indicates this very high concentration.

Sizes of individuals varied both between reports and within individual sightings. In general they agreed with the published information, which suggests a general maximum length of 10 cm. (Kirkpatrick & Pugh 1984), but two reports give 6 inches (15cm), which was larger than Bieri's (1977b) largest specimen. There is no clear size progression with the advance of the season, which is perhaps not surprising given the very wide area of occurrence.

The length of the tentacles is usually given in the literature as 'short', and illustrations commonly show a tentacular fringe with individual tendrils no longer than the width of the disc, perhaps 50 mm. However, one ship report speaks of tentacles mostly 0·5 m long, with some extending even to 2 m. This seems, by analogy with *Physalia*, the Portuguese man o' war, a much more probable length for tentacles extended in fishing. It is likely that drawings of *Velella* are commonly made from captured animals, with the tentacles contracted.

Several reports noted numbers of seals or sea-lions near the concentrations of *Velella*.

Published observations of sightings of *Velella* in recent years are to be found in issues of *The Marine Observer* for April of 1976, 1979, 1980, 1982 and 1986. Further unpublished

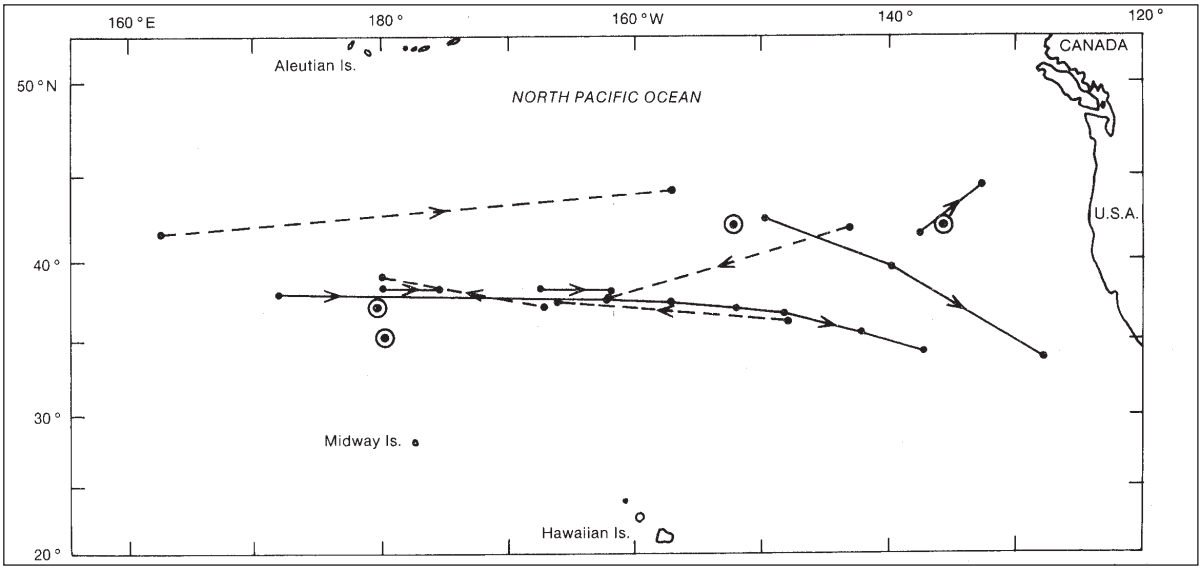

Fig. 1: Tracks of sevlected ships through shoals of Velella in 1985. The plotted routes are in some cases the tracks of more than one ship. open circles represent single reports (see Table 1)

reports from Selected Ships since 1976 have been consulted. In them, positions recorded in the Pacific extended, during these years, from the North American coast westwards to about 175°w, covering the same wide expanse as in the 1985 reports. In the North Atlantic Ocean, *Velella* was found from 30°N to 45°N, but no farther west than 20°W. The species thus appears to be concentrated towards the east side of both oceans. The months of sightings from both published and unpublished reports are summarized in Table 2. It is seen that in both the Atlantic and Pacific, those animals large enough to be seen from the deck of a ship are to be found in late spring and early summer. Densities were similar to those reported in Table 1, i.e. high, and at times covering the whole sea surface. In no other year, however, was the majestic abundance of 1985 approached.

Bieri (1977b) collected together many records of *Velella* from research vessels and from strandings, including a total of 68 records in the Northern Hemisphere. He concluded that there are two full life-cycles (polyp and medusa)

Month	Pacific Ocean	Atlantic Ocean
April	4	4
May	13	4
June	4	1
July	2	0
Total	23	9

Table 2: Monthly incidence of Velella. *Summary of published and unpublished Selected Ship observations, 1976-1985, including the present records.*

per year, with polyps at maximum size in April and October, when the medusae are released and sink. He believed the period spent at depth by the medusae to be between one and four months, during which time the polyps die off.

Against this, it is remarkable that no Selected Ship record since 1975 reports the species at the surface in the autumn. Since Bieri gives a typical September - October length for *Velella* of 70 mm, length well within the range of size reported from Selected Ships, there is a clear contradiction of evidence. The subject awaits further study and further reports.

These latter are unlikely to be supplied except by merchant ships.

Acknowledgement

My thanks are due to Paul Hilgersom of S.B.N.O., Amsterdam, editor of *Plankton News-Letter*, for his help with the literature.

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Habitat mapping on a wing and a prayer

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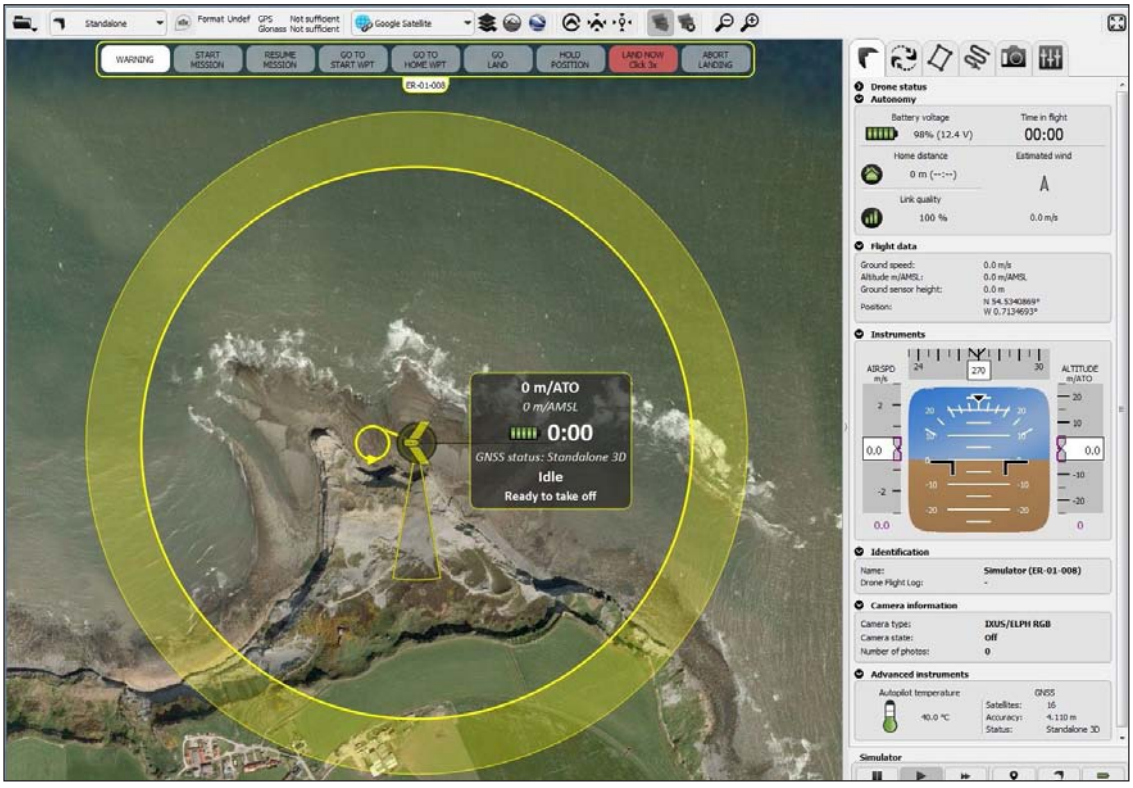
Come fly with me, let's fly, let's fly away –
If you could use some exotic booze,
There's a bar in Runswick Bay!

Sounds idyllic doesn't it? As part of my PhD research on mapping marine habitats from remote sensing data, I spent several days last year using a drone to collect high resolution aerial imagery of the intertidal zone on Yorkshire shores. I was warned it wouldn't be easy – the drone could face dangers ranging from cliff-induced turbulence and downdrafts to being mobbed by angry herring gulls! This is my account of the highs and lows of flying a drone between the tides.

My fieldwork was carried out in partnership with the North and East Yorkshire Ecological Data Centre (www.neyedc.co.uk), who own a senseFly eBee professional mapping drone. You don't need Top Gun skills to fly the eBee – specialist software lets you pre-programme a flight to cover your area of interest at the required resolution while ensuring the drone stays within your line of sight (500 m) as required by law.

Then you simply throw the drone in the air and let it follow the flight plan. The eBee's internal GPS ensures that if it is blown off course it will automatically correct itself and complete its mission. It even returns to land at the same spot from which it was launched. What could possibly go wrong?

Our first fieldwork foray with the drone took place at Runswick Bay in North Yorkshire, which was designated as a Marine Conservation Zone this year for intertidal and subtidal features. Kettleness headland was chosen as the study site due to its varied topography and habitats. In contrast with typical fucoid-dominated Yorkshire shores, it is a high energy shore dominated by *Corallina* and *Osmundea* species. As UK law prohibits flying a drone within 50 metres of any person, vessel or vehicle, this site also had the advantage of being little used by beach-goers, being accessible only by a long and strenuous walk over a boulder field.



Using senseFly's eMotion software to plan a flight

NEYEDC Director Simon Pickles launching the senseFly eBee at Kettleness

We chose dates for flying when a very low spring tide occurred around midday to reduce shadows in the imagery, and as each day approached we watched the weather forecast anxiously because the eBee cannot fly in rain or in winds higher than 28 mph. The eBee has a maximum flight time of 50 minutes, but the restrictions imposed by keeping the drone within your line of sight meant that several shorter flights were needed to cover the intertidal area. We planned flight times to maximise capture of imagery while the lower shore was exposed, allowing time between flights to change cameras, download data and move to the next take-off point if necessary. Operating within this tight tidal window was stressful - any small delay could mean running out of time to complete all the flights, and delays did occur for several reasons.

Our very first flight almost had to be aborted when we discovered during pre-flight checks that the terrain maps needed to inform the flight plan had not downloaded correctly to the tablet. The flight planning software could access them via the internet, if only we had wi-fi… I'm not quite sure what the residents of the nearby farm thought when they opened their door to an out-of-breath drone pilot asking to borrow their wi-fi code! Thankfully they agreed, but the delay meant that we only completed one flight that day.

We frequently experienced connection problems between the flight-planning tablet and the drone, which could only be resolved by switching everything off and starting again, which was a very frustrating experience as the tide crept higher. However, the most bizarre cause for delay occurred during a survey at Flamborough Head in August, when our final flight had to be postponed and eventually cancelled due to a flotilla of paragliders making their way from Bridlington right into our airspace!

Selecting suitable take-off and landing sites was an important part of the learning experience. The eBee needs to be launched and land into the wind so although flights can be pre-planned, some flexibility is needed when you arrive on site and assess the weather conditions. We launched our first flight from Kettleness cliff top, which was an ideal central location to provide good coverage of the site, but landing the drone on this very narrow promontory with a 30 metre drop either side was nerve-racking to say the least! So, we launched our next flight from the shore, choosing an extensive flat area of rock and putting down a picnic rug as a landing strip. Although the eBee returns to its take-off point with an impressive degree of accuracy, it dropped just short of the picnic rug - while no damage was done to the camera, the barnacles left some nasty scrapes on the drone's expanded polypropylene underside. On the second attempt, it overshot the picnic rug slightly, hit its own carrying case and knocked a wing off! Again, no harm was done as the wings just slot back on, but we decided to take more precautions in future.

On subsequent flights we laid out lots and lots of blankets, placed coats and bags over protruding rocks, and also aimed to catch the drone in a blanket or in our arms before it hit the ground, which proved a much more successful tactic. With a cruise speed of 25-56 mph it is more 'Droning Doris' than 'Glamorous Glennis' and the propeller is at the back rather than on the nose for safety reasons, but I was still nervous the first time I saw it heading straight for my outstretched arms. Luckily I didn't drop it!

Despite occasional small setbacks, the fieldwork season was a great success. We completed 17 flights and captured 1,500 images which I have processed to create orthomosaics and digital surface models at 4cm resolution. I also collected over 260 ground truth samples which I am using to train and validate predictive habitat models using an object-based image analysis approach.

Catch me if you can! NEYEDC's Ecological Data Officer Mark Wills and Paula Lightfoot catching the drone in a blanket to protect its bottom from barnacles – happy landings. Photos by Bex Lynam.

Automated classification of the aerial imagery using simple habitat classes (red algae, green algae, brown algae, barnacles/bare rock, sea and cliffs) has produced predictive maps with over 90% accuracy. Early attempts at biotope mapping have produced predictive maps with over 50% accuracy, and I am currently improving these methods, which I believe have great potential for monitoring intertidal habitats.

The drone never was mobbed by herring gulls. A couple of fulmars at Kettleness showed some curiosity towards it, but no aggression. As the eBee's wingspan is smaller than theirs, they probably didn't see it as much of a threat!

NEYEDC's eBee has had its connector board replaced, which should eliminate delays caused by connection issues in future, and a protective plate has been fitted to the underside in case of belly landings on barnacles! We are now well equipped to carry out aerial surveys of the wonderful Yorkshire coast. So…

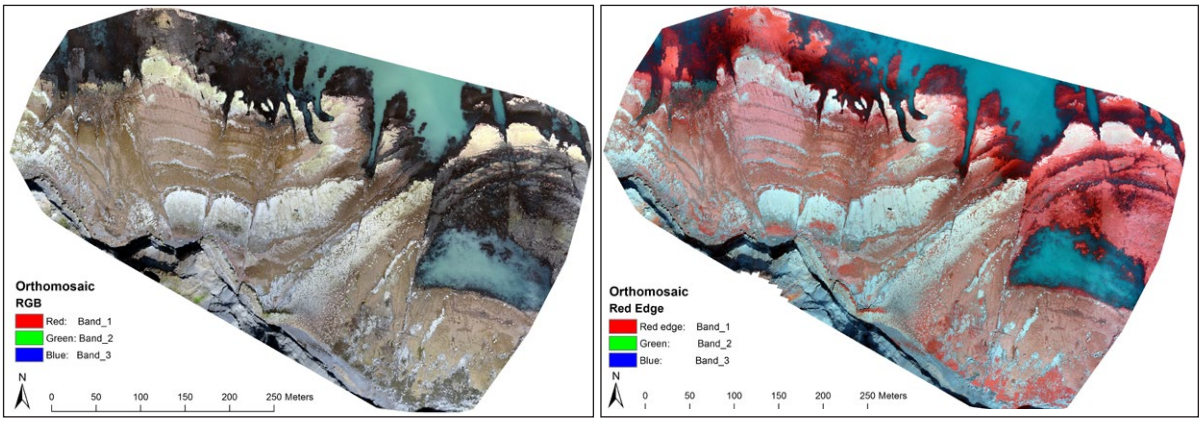
Come fly with me, let's float down to Filey!
At Speeton Sands there's a one-man-band,
As you glide over Hunmanby
Come fly with me, let's fly, let's fly awaaaaay!

Acknowledgements

Paula Lightfoot's PhD research at Newcastle University is supervised by Dr Clare Fitzsimmons, Prof. Nick Polunin and Dr Catherine Scott, and funded by the Natural Environment Research Council and Natural England.

NEYEDC's senseFly eBee drone was purchased with LEADER funding provided by the North York Moors National Park Authority.

Thanks to all the volunteers who came and helped with the drone fieldwork.



Orthomosaics of part of the Kettleness intertidal zone captured using a standard Canon S110 camera (left) and a camera modified to capture reflected light in the 'red edge' part of the spectrum (680-730 nm) (right)

Stranding

Vicki Howe

On a breezy yet sunny afternoon on July 10th my good friend Simon learned through the efficient local 'surf network' of Chapel Porth, Cornwall that a sperm whale (*Physeter macrocephalus)*, also known as a cachalot, had been washed up and died on Perranporth beach. Both of us decided that seeing this magnificent creature close up was an experience not to be missed, so we checked the tides and decided that an early start the following morning was in order.

Whispering "would you like to see the sperm whale?" in my sons' ears at 5.30am initiated such a rapid response I might be tempted to use that phrase again come the return to school in September! And so an hour later one husband, two small children, two excitable collies and I set off across a very wind-swept expanse of sand to find the sperm whale. For a creature so large it was unexpected that we did not sight her until quite close – her dark body camouflaged against the cliffs. Anyone who knows Perranporth will appreciate the walk from the village end of the beach to the far end is 'significant' so it took some distraction to keep the boys walking with no whale in sight.

Being there so early meant we were lucky to not encounter many others with similar curiosity, and the body (carcass seems so harsh a word) was not fenced off as it would be that afternoon.

On approach it was easy to understand how, when such a great creature becomes stranded so high up the shore, the challenge to refloat and rescue would be insurmountable. Even though the whale had been dead less than 24 hours her skin was damaged, perhaps through exposure to sun, sand and wind and she looked a sorry sight. Her narrow jaw remained open and we could see her huge tongue and fearsome looking teeth. Albie (age 8) was tempted to feel just how strong and sharp they were, and they apparently reminded him of crocodile teeth. (We have a few of those at home so he knew what he was talking about!).

We took some time to walk around the body and my thoughts strayed into thinking how she really did look like all those annotated drawings I have seen of a sperm whale! A random thought perhaps but I guess it is only when you are able to get up close that you can appreciate all the subtleties of such a gigantic creature. Her tail was much thicker and more flexible than I anticipated and her dorsal fin more of a lump or bend in her body than I had previously appreciated. Imagining how she would look in the water was tricky – perhaps the angle she rested at meant that she just didn't seem so large or maybe the fact that she was just out of her natural environment made her seem less immense. Nevertheless

Fig. 1: Cachalot washed up on Perranporth beach, Cornwall

Fig.2: Albie investigating the mouth and teeth

as my family and I walked away from her in silence, paying our individual respects to a life lost, we could only wonder at her majesty even when lying there on the sand. The only comment Iggy my younger son (age 6) had was "I wish we could have seen her alive in the sea Mummy". Me too Iggy, me too.

Below I have included further information on the stranding which is taken from the CSIP (Cetacean Stranding's Investigation Programme) Facebook group who posted updates about their investigation into the stranding over the following few days.

The sperm whale was live stranded and died at Perranporth beach on Sunday 9th July. She was examined by the CSIP (Cetacean Stranding's Investigation Programme) and by staff and volunteers from the Cornwall Wildlife Trust Marine Strandings Network/ Exeter University over the course of Monday afternoon through into Tuesday morning. According the CSIP (2016) she was a 10.3m long adult female judged to be in reasonable nutritional condition. It is unclear how the whale died as so far no evidence of significant disease or any notable trauma has been found. Samples and specimens have been taken to further understand her death and gain more information on this great species.

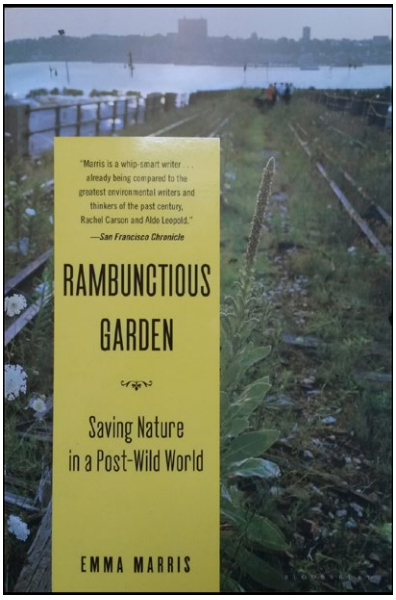
Fig.3: A sad sight

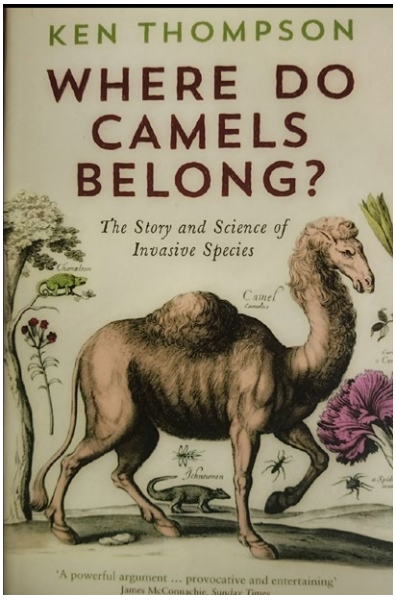
CSIP also note that "We have historically only ever had juvenile/subadult male sperm whale strandings in the UK and this is the first confirmed female sperm whale to be recorded stranded in the UK, since routine collection of strandings data by the Natural History Museum began in 1913, illustrating the unusual nature of this stranding event. This was also only the sixth sperm whale to be recorded stranded in Cornwall in this same 100+ year period."

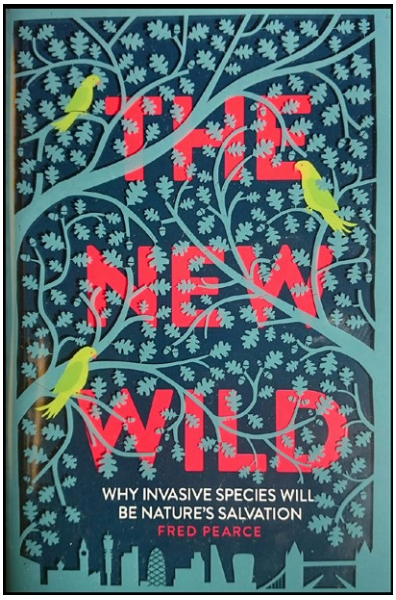
Once the results of the CSIP's field necropsy are available we will publish an update.

https://www.facebook.com/Cetacean-Strandings-Investigation-Programme-UK-strandings-142706582438320/

Fig.4: A close up encounter







'Native species good', 'non-native species bad'?

Peter Barfield

Sea-nature Studies
Email: peter@seanature.co.uk

I have what I'd like to refer to as a 'literary triptych' for you. The three books in question weren't written to be appreciated together but, I am suggesting they could be taken that way and that together they provide something more, perhaps, than the sum of their parts.

In any triptych there is a centre piece flanked on either side by works that both expand and support the larger central picture. These side panels could stand in their own right and certainly hold interest features not captured by the middle ground. But if we stand back to observe the ideological panorama of the triptych we might encounter something suggestive of a certain stability or robustness not otherwise so accessible. Any one particular section might walk you part way or even all the way to an epiphany, but the triptych offers to grow and ground you on that new shore and make it home.

Let's deal with the centre-piece first.

Where Do Camels Belong - The story and science of invasive species – Ken Thompson

Profile Books, 2014.
Paperback 272 pp.
ISBN: 978-1781251744

If you like the 'science bit', and I'm assuming you do, this is where to start. In 2011 Ken Thompson was one of the signatories on a paper published in *Nature* called 'Don't judge species on their origins' (Davis *et al*. 2011). 'Where do camels belong' provides a systematic and forensic analysis which essentially says, 'No, really, the origin of the species is not the issue - and here's why'. Over a series of twelve chapters he guides the reader intelligently and persuasively through the current inconsistencies and confused thinking to a more nuanced position based on evidence and logic. I laughed out loud several times as recognition of what he was saying lit up my brain. So put on your anorak, hunker down and be ready to have your thoughts challenged, corroborated and clarified. Enjoy.

Rambunctious Garden - Saving nature in a post-wild world – Emma Marris

Bloomsbury USA, 2011.
Paperback 224 pp.
ISBN 978-1608194544

But Ken Thompson's book was, in chronological terms, not the first to hit the shelves. That honour (I know, showing my colours, as if I haven't already) belongs to the eloquent and poetically titled 'Rambunctious Garden' by Emma Marris (2011). Honestly, I'd probably have been curious to read it on the strength of the title alone, although it was Ken Thompson's book that led me to purchasing it.

I'd describe this book as a piece of engaging and eloquent investigative journalism, primarily interested in, as the subtitle suggests, 'Saving nature in a post-wild world'. Through interviews with scientists and conservationists and the excavation of historical perspectives Emma Marris presents an optimistic analysis of where we are, how we got here and where we might be better off going. Don't get side-tracked by utopic visions of some pristine past instead embrace the noisy, boisterous and wild reality and recognise that change is the common thread that winds through nature and tipping points, if they occur, may be less of a cliff edge and more of a gateway.

The New Wild - Why invasive species will be nature's salvation – Fred Pearce

Icon Books Ltd., 2015.
Hardback 288 pp.
ISBN: 978-1848318342

This is the most recent publication and it's safe to say, there are no pulled punches in Fred Pearce's book 'The New Wild' which is a strongly argued polemic. He takes on the opposition and doesn't shy from naming names. Noting the rise of the phrase 'alien invasive species' he marks it as a 'catch-all for nastiness and a recipe for muddled thinking'. The gloves are well and truly off here and the ride is a bit of a whirlwind and fact-cascade which at times is somewhat overwhelming. But it's entertaining stuff which bursts many of the bubbles it takes aim at and is essentially arguing much the same thing as the other two. Waving the flag for the new wild Fred Pearce shouts hard that the king is dead, long live the king. Whether you're a convert or not you'd be hard pushed not to agree that, 'Nature never goes back; it always moves on'.

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Would you like to contribute to the next *Porcupine Bulletin*?

- We are always open to offers of book reviews, website reviews and reviews of mobile apps!
- Interesting or topical sightings of marine life, or stories of your fieldwork experiences are always enjoyed;
- Informative line drawings of marine life are great for filling in small spaces at the end of articles;
- Articles on any subject relevant to marine natural history
- or anything else that you feel would be of interest to the readership!

In the first instance, please contact Vicki Howe with what you would like to offer. Guidelines to Authors are printed on the back page of the Bulletin, please take note of these when writing your article and particularly with reference to any images you wish to have printed.

Deadlines for contributions are:

Spring 2017 issue - Friday 9th December 2016

Autumn 2017 issue - Friday 2nd June 2017

How I became a marine biologist

Frank Evans

Fig. 1: Merchant Navy apprentice, aged 17, 1943. I had been taught to fire the gun.

From the beginning of WWII in 1939 until 1942 I was evacuated with my Croydon school to Bideford in Devon. Then, at the age of sixteen and with a clutch of the GCSE equivalents of the time I left to join the Merchant Navy (Figure 1, 2). For the next seven years I progressed through a seagoing apprenticeship to become a ship's officer. In 1949 I came ashore to sit for my First Mate's Certificate, a qualification a step below that of a ship's captain. But by then my long-held wish to follow the sea had diminished and, having married the year before, I began to consider a career on land.

Fig. 2: Aboard Swordfish aircraft on Merchant Aircraft Carrier 1945 (self in rear cockpit). We were not allowed to take off! The aircraft were operated by the Fleet Air Arm on this tanker. Note improper MN on the fuselage, not the required RN (Royal Navy).

My new certificate confirming my ability to take a ship from one port to another had little value among a city's bricks and mortar and I realised that to leave the sea I had to search for alternative qualifications.

At school I had found an interest in biology and so I applied for a position in a biology course at London University, principally so that, supported by my wife's teaching salary, I could live cheaply at home. Queen Mary College accepted me for their intermediate B.Sc. course, a one-year course of the time designed for students without A levels. I took zoology, botany and chemistry and was then admitted to the zoology honours course with chemistry as my subsidiary subject. I was still an innocent abroad in university affairs and was unsure what a zoology degree involved. On the first day of term our professor assembled us and asked us in succession what special subject we wished to choose. I heard a clutch of names spoken and then the student next to me said "marine biology". I immediately thought: I'm a sailor, that's the one for me.

Fig. 3: Field course at Whitstable.

The honours zoology courses in London colleges were quaintly old-fashioned in that it was required of undergraduates that they spend three years on their studies while the courses themselves occupied only two years, one year of vertebrates and one year, invertebrates. The third year was supposed to be spent in revision and following one's special subject. In my second year in the honours course a fellow student and I conceived the idea that observations of pelagic animals by research vessels were biased by the presence

Fig. 4: Caulking the Petula*'s hull, Southampton.*

Fig. 5: My wife, Rosie, steering the Petula *down Channel.*

of the vessel itself. We resolved to test this theory in practice.

We planned to drift silently across the Atlantic, using the North Equatorial Current, from Dakar to Barbados, taking samples on the way.

The preparations for the transatlantic voyage of the yacht *Petula* would fill a book (a book and film exist about the voyage itself). Sufficient to say that we wrote a prospectus, begged and borrowed the equipment we needed, illicitly commandeered an office in the Natural History Museum, complete with the essential free telephone, did the same in the Royal Geographical Society and generally bluffed our way through troubles. On one occasion we encountered a member of the Museum staff who said he was looking for a million pounds to establish a marine geology unit and to start a journal (which he later did under the title *Deep Sea Research*). We plugged into his philanthropic backers through the Natural History Museum in Brussels and got funding from them for the voyage and the price of a yacht. I bought the *Petula* in 1952 near the end of my second year in the honours course, and it was obvious that any oceanographic venture was from now on going to occupy all

Fig. 6: Petula *leaving Plymouth, 1953. MBA building in background.*

Fig. 7: The meteorologist taking air temperatures.

my time. I declared that consequently I would abandon my degree forthwith.

Happily, my tutor, Professor Gordon Newell, later a very good friend, realised that although I had had only two years in the honours class, with my intermediate year I had spent three years in the university and consequently was qualified to sit finals. He arranged my entry for the degree, although it was too late to pay a late entry fee. On hearing that I was to take the exam, one of our lecturers remarked that with so little time I must be swotting hard. I am slightly ashamed to recall that I replied that unfortunately I was too busy for that. I have no explanation for the good second class honours degree that I achieved.

Our ship, the *Petula*, lay at Southampton and we spent much time fitting her out (Figure 4). She was fifty years old but in good condition. I had bought her from Col. H. G. Hasler the leader of the Royal Marine commando raid by canoe on Bordeaux in 1942 that formed the basis of the film: "Cockleshell Heroes". He agreed to accompany us round to Faversham in the Thames, on the way to visit our Belgian backers. It was in December and we hit a force ten gale in the Channel: the short voyage took four days. Later, we attempted to leave our

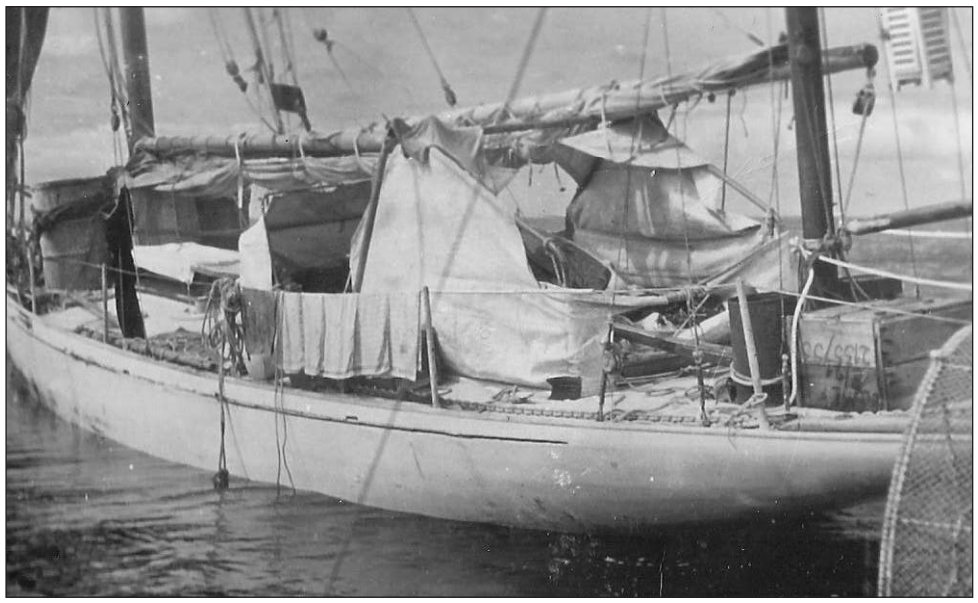

Fig. 8: The Petula *drifting in the tropical Atlantic.*

Fig. 9: Showing the one-man fighter pilot's dinghy that we used to transfer to the raft.

berth in Faversham Creek but ran aground. This was a most fortunate accident as we were not yet really ready for voyaging. We remained in a mud berth until May when we began slowly to make our way west towards Plymouth and the Atlantic. All this while preparations continued. As an example, we dedicated the ship's after cabin to stores and racked it out to hold over three hundred Kilner jars, all filled with drinking water, to be successively replaced by plankton samples. The Kilner jars, generously donated by the manufacturers, were sealed with specially made copper rings, not steel that would rust.

Finally we sailed from Plymouth in August 1953, our crew now consisting of two marine biology graduates and a meteorologist. Arriving in Dakar, we built a raft to tow astern of the boat, which would allow us to undertake a programme of measurement of sea and air temperatures (Figure 7) at graded distances above and below the sea surface in an investigation of heat exchange. From Dakar we sailed for the West Indies at the end of November 1953 (Figure 8). At sea we visited the raft each day for air and sea temperatures

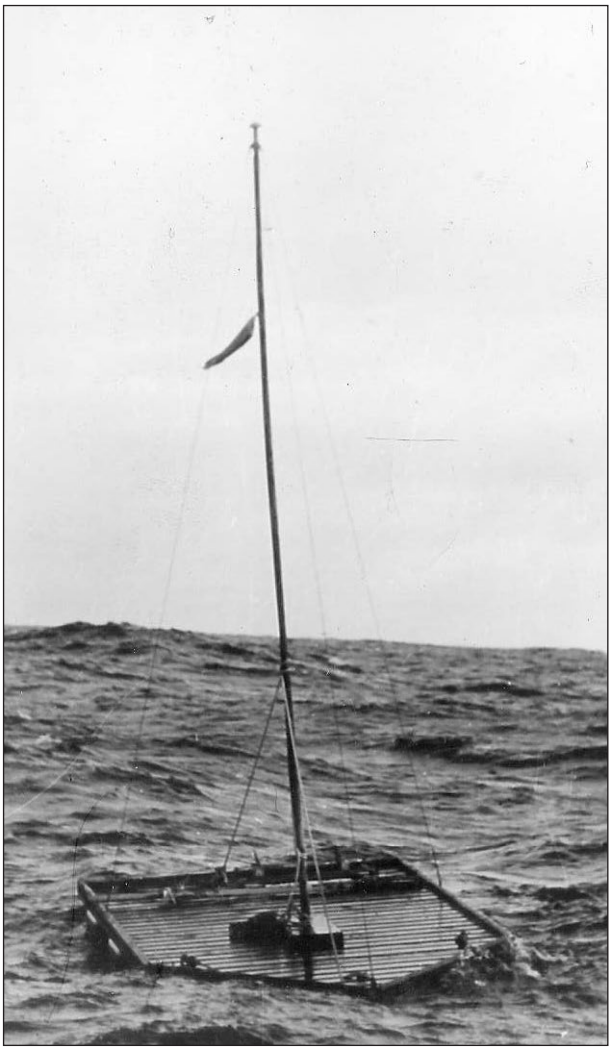

Fig. 10: The raft with air-sea temperature apparatus stowed.

whenever the sea state permitted (Figures 9, 10). Although lacking a radio we ran a weather station for the Met. Office, searched for Sahara dust, counted Aitken nuclei, measured pH and water density, charted the current, fished, filmed, and took plankton samples every six hours. The voyage lasted eighty three days, travelling under just the jib, at a speed of one knot.

On reaching Barbados in February 1954 we packed and despatched our samples, sold the *Petula* and came home by air to our quarter of an hour of fame. We had funding for a further year of research on our material, after which I applied for and was awarded a post as lecturer in marine biology in the Dove Marine Laboratory of Newcastle University. I had become a marine biologist.

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 TIFs 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

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

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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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