

PORCUPINE MARINE NATURAL HISTORY SOCIETY

NEWSLETTER



May 2003

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Porcupine Marine Natural History Society

Newsletter

No. 12 May 2003

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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 3 newsletters a year which include
proceedings from scientific meetings.

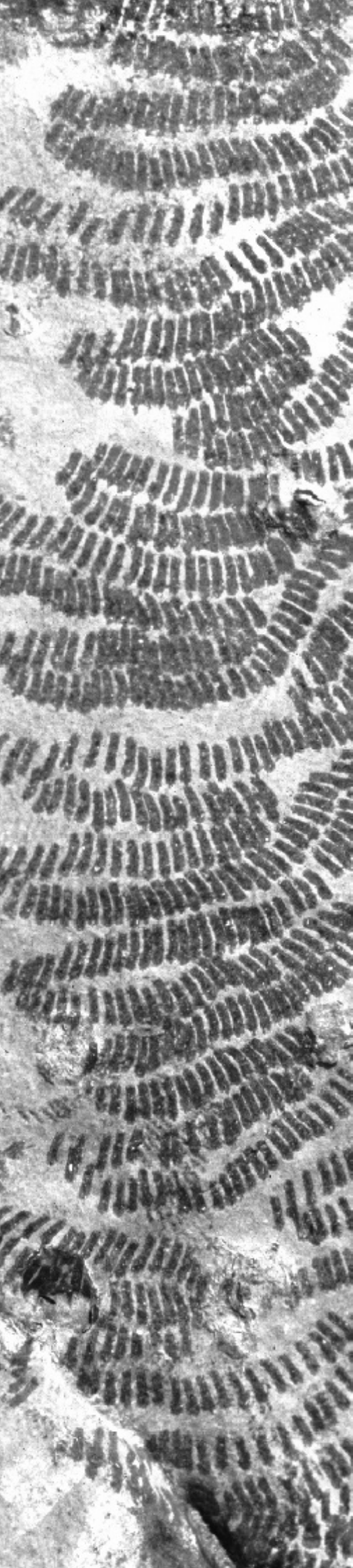
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EDITORIAL

The PMNHS annual meeting was held at the National Museum and Galleries of Wales, Cardiff on March 14-16th 2003. If our records are correct then this was the largest meeting in the history of Porcupine with 99 registered delegates. This is both a reflection of the hard work put in by the organisers and a keen focus on marine things in Wales and the South-West. If all the delegates were Porcupine members then more than half our membership was there! However, I'm am pleased to say that there were a lot of non-members at the meeting, and I hope many of them have now decided to join the Society.

The papers presented were all of a high standard and I was not even remotely tempted to fall asleep in any of them, even on Saturday morning following the very enjoyable conference dinner on the Friday night. If you didn't make it to the meeting, you missed an enjoyable and very informative meeting. Try to come next year! However, I will be publishing as many of the papers as possible in this and following issues of the newsletter, so you can see what you missed.

With the extraordinary warm and sunny weather we have experienced through March and April my thoughts have been turning, not only to cold beer and Bar-B-Qs but also to global warming. Here in East Anglia spring came incredibly early. The daffodils in my garden appeared well before they normally do and cutting the hedge was a nightmare with the birds starting to nest. Are similar things happening underwater? Keith Hiscock addressed this issue in his presentation at the Cardiff meeting, describing the possible consequences of sustained increased water temperatures for seabed wildlife. This year please keep an eye out for any unusual records of species outside their normal range, rare species, or anything unusual happening on your favourite shore or dive site. If you see anything similar in newspapers or magazines, do please send a copy to Jon Moore or myself. At the end of the year we will try to collate any such records received.

The field trip organised for the Sunday following the Cardiff meeting was very enjoyable. Again the weather was amazing – beautifully sunny and mild. There will be a full report on the trip in the next newsletter (I hope) with a few photos and comments in this issue to wet your appetite.

Whilst never of great (or any) interest to most members of most societies, we now have a revised Constitution and a Data Policy. These are published for your information in this issue and were ratified at the AGM on March 14th. Any further comments should be sent to Julia Nunn for future consideration.

Frances Dipper

COPY DEADLINES

June 1st for July issue
October 1st for November



MINUTES OF THE 26TH ANNUAL GENERAL MEETING OF PORCUPINE MARINE NATURAL HISTORY SOCIETY

Held at the National Museums and Galleries of Wales, Cardiff on Friday 14th March 2003.

Chairman: Julia Nunn

Apologies for absence

Apologies were received from Shelagh Smith and Mike Bailey

Minutes of last AGM

These were published in the April 2002 issue of Porcupine newsletter and were accepted.

Matters arising from the minutes of the last AGM

There were no matters arising from the Minutes.

Officer's reports

Hon. Treasurer, Jon Moore

The un-audited Treasurer's report was presented to the meeting. The Hon. Treasurer reported that income from subscriptions had increased slightly. Surplus before meetings was £1! However, the Edinburgh meeting had made a substantial surplus thanks to the efforts of Sue Chambers. Therefore with this and the balance brought forward the surplus stood at £4930 for the year ended 31 December 2002.

The report was accepted following proposal by Keith Hiscock, seconded by Anne Bunker.

Hon. Editor, Frances Dipper

The Hon Editor reported that there had only been two issues of the newsletter since the last AGM. One of these was the special 25th edition. The reason was lack of copy especially papers from the Edinburgh meeting. In spite considerable cajoling few speakers had submitted their papers for publication although more had intended to do so. Speakers at the present meeting were urged to submit their papers if they had not already done so. The content of the two issues had been interesting and varied. Porcupine members had

contributed articles and pieces on giant squid, barracuda, ballan wrasse and polychaetes. A first for this year was the inclusion of an advert – for a lazer granulometer (free to good home). Members should take advantage of free advertising to promote their work, research, organizations, books, leaflets etc. Student members are invited to submit papers on their research work or observations. Peter Tinsley has agreed to work as the second Hon. Editor working alongside Frances Dipper and will be updating and improving the look of the newsletter.

The report was accepted following proposal by Judy Foster-Smith, seconded by Pamela Tompsett.

Hon. Records Convener, Jon Moore

Jon Moore reported on progress with the recording scheme. The scheme is an informal one designed for input of various types of record. It is slowly picking up momentum and results are published in the Newsletter and on the website. Those present were encouraged to submit more records and to publicize the scheme.

The report was accepted following proposal by Roger Bamber, seconded by Lin Baldock.

Chairman, Julia Nunn

The Chairman reported the sad news of the deaths of 4 members since the last AGM: Annette Little, Steve May, Larry Hamlin and Colin Gillard. There have been two council meetings since the last AGM, on 16th November in London and 14th March in Edinburgh, where general society business was discussed. A poster advertising the PMNHS has been produced and copies are available from Ivor Rees, Anne Bunker or Roger Bamber. A members e-mail list has been produced which will facilitate advertisement of meetings etc. Please help by forwarding any changes to Julia

Nunn.

Website:

(reported by Anne Bunker) The aim of the website is to inform members and promote the society. It provides information about the society, the Newsletter, recording scheme, and meetings. It also has a features page that is changed regularly. This is currently a feature on *Sargassum* seaweed written by Steve Morrell and dedicated to Annette Little. There is a page on the history of the society written by Frank Evans and links to other websites. Suggestions from members as to what they would like to see on the site are welcome plus material such as news, requests and suggestions for links to other sites and key words for search engines.

The Council has produced a revised Constitution and a Data Policy document. The 2002 meeting in Edinburgh was very successful and Sue Chambers and her team were thanked once again for their efforts.

The report was accepted following proposal by Keith Hiscock, seconded by Peter Barfield.

Election of officers and council members

Four council members were retiring and did not wish to stand for re-election: Judy Foster-Smith, Ivor Rees, Mike Bailey and Ian Killeen. One council member, Annette Little, had sadly died since the last AGM. All remaining council members and office holders expressed themselves willing to stand for re-election. Council had invited and nominated five new council members: Lin Baldock, Seamus Whyte, Vicki Howe, Andy Mackie and Roni Robbins. Frances Dipper was proposed as Secretary and Peter Tinsley as joint Hon. Editor. There being no further nominations from the floor, the Chairman proposed a vote that Officers and Council members be elected en bloc and this was agreed with no objections or abstentions.

Officers for the next year:

Hon. Chairman, Julia Nunn; Hon. Treasurer and Hon. Records Convenor, Jon Moore; Hon. Editors, Frances Dipper and Peter Tinsley Hon. Secretary, Frances Dipper

Council members for the next year:

Lin Baldock, Roger Bamber, Peter Barfield, Paul Brazier, Anne Bunker, Susan Chambers, Frances Dipper, Frank Evans, Vicki Howe, Andy Mackie, Jon Moore, Julia Nunn, Roni Robbins, Shelagh Smith, Peter Tinsley, Seamus Whyte.

Constitution and Data Policy

The revised Constitution had been circulated to all members. In addition to these revisions, the Council proposed that the words "and are normally available for immediate re-election", be added under Rules of Procedure Item 4. The revised Constitution with this further minor amendment was put to the vote. The Constitution was accepted unanimously with no objections or abstentions.

The new Data Policy had been circulated to all members. The Chairman asked for any comments from the floor. There being none, it was proposed that a vote be taken to accept the Data Policy. The Data Policy was accepted with no objections or abstentions.

Any Other Business

The Chairman gave the provisional dates for the 2003 field meeting as within the period August 27th to September 2nd, led by Shelagh Smith. This will include boat dredging the cost of which will be subsidised by Porcupine. Details will be in the next Newsletter, on the website and on the group membership e-mail. The next conference may be in London in the Natural History Museum. (*Note from Editor: Unfortunately this will not now be the case*). The Chairman thanked the organisers of the annual meeting, Andy Mackie, Jon Moore and Peter Barfield for all their hard work in making the meeting so successful.

There being no other business, the Chairman declared the meeting closed.

MINUTES OF THE COUNCIL MEETING

Held on March 14th 2003 at the National Museums and Galleries of Wales, Cardiff.

Present: Ivor Rees, Peter Barfield, Ian Killeen, Julia Nunn, Anne Bunker, Jon Moore, Frances Dipper, Judy Foster-Smith, Roger Bamber, Peter Tinsley, Frank Evans. Observer – Andy Mackie.

Apologies: Mike Bailey, Shelagh Smith

Finances and membership

The accounts for 2002 were presented by Jon Moore. He reported that income from subscriptions had increased slightly. There were still a few members who had not paid. The Edinburgh meeting had made a substantial surplus thanks to the efforts of Sue Chambers. The total in the bank at 31 December 2002 was £4930. Membership stands at 176, plus 6 students, 3 life members, 9 libraries, and 9 'other' libraries. There have been no retirements but sadly 4 deaths.

AGM business

Judy, Ivor, Ian and Mike reported their intention to retire from Council. Including the sad death of Nettie last year, this means the loss of 5 council members. Possible nominations were discussed. The following people had been approached and had agreed to stand – Lin Baldock, Seamus Whyte, Vicki Howe, Andy Mackie and Roni Robbins.

Further minor modifications to the Constitution were discussed and it was agreed these must be indicated at the AGM before voting on acceptance. The Constitution requires that there be an Honorary Secretary. Frances Dipper volunteered to stand for election to this role.

Newsletter

Frances reported that whilst the newsletter was running smoothly, it was still difficult to obtain copy especially papers from meetings. In spite of much cajoling only a few speakers from Edinburgh had submitted papers. In future every effort must be made to obtain manuscripts from speakers before or at the AGM

symposium. An 'Instructions to authors' sheet is required. The Constitution allows for more than one Hon Editor and Peter Tinsley agreed to stand as joint Editor with Frances at the AGM. Suggestions were raised that key people in other organisations should be e-mailed for copy and 'future events' eg. Jim Wilson, Ian Killeen, Andy Horton.

Action: Frances and Peter.

Website and memorial

Anne Bunker reported that 30% of delegates for the AGM meeting had booked via the website. She requested that council members look at the site and suggest any improvements plus Links to other sites. An article on seaweed dedicated to Nettie is up on the website. Plans for a memorial in the form of an interpretative display panel on algae were discussed. It is planned to produce camera-ready copy using volunteers, which will keep costs down to a ballpark figure of around £1000. Possible sites for the display are Skomer or Martin's Haven. CCW may grand aid the project.

Action: Anne Bunker, Jon Moore

Field trips 2003/2004

Jan Light might organize one in 2004. Shelagh Smith has volunteered for this year (2003). The venue may be Lindisfarne and Firth of Forth. Her suggested dates in August were discussed. The period 27th August to 2nd September was agreed (the other period possible was August 11th-16th). Shelagh had suggested a dredging trip and it was agreed that a boat be provisionally booked. PMNHS would cover the cost of around £500. If there is insufficient support this can be cancelled later. The format of field meetings was discussed. Suggestions for this meeting should be sent to Shelagh. There are monitoring sites along that coast where useful work might be done. Jon Moore has information on EN monitoring sites.

Action: Shelagh Smith, Jon Moore, others?

AGM 2004 venue

Venues were discussed. It was agreed that London would be suitable as a meeting had not been held there in recent years. Roger Bamber agreed to explore the possibility of using the Natural History Museum. The theme could include collectors and collecting, databases, photos and archiving.

Action: Roger Bamber

(Note from editor: unfortunately Roger has since reported that the museum meeting rooms are undergoing refurbishment and will not be available in March 2004. ALL council members therefore need to think NOW about another venue).

Publicity

Suggestions for advertising Porcupine and increasing the membership were discussed. The following suggestions were made – University notice boards, web key word links, identify key contacts in universities, get the website onto suitable search engines, include A4 poster in next newsletter, next years AGM conference fee to include membership, in next newsletter include membership forms and in editorial suggest everyone try to recruit a new member

Action: Frances plus others

AOB

Suggestions for 2004 field trip by e-mail to Julia

Seasearch, how many divers? Paul Brazier

Julia Nunn thanked all the retiring council members for their hard work and commitment

Date of next meeting

to be arranged (autumn)

Memorial for Netty Little

A plan is being developed to prepare a memorial for Netty Little, Porcupine Council member, who sadly died last July. The plan is to design, and have built, an interpretive display board on the subject of marine algae (a particular interest of Netty's and one which could do with a higher profile). A number of friends of Netty, who also have algal skills, and most of whom are also Porcupine members, are helping to develop the idea. It is envisaged that the display board (or boards) could be freestanding weather-proof structures, erected at one or more coastal sites in Pembrokeshire, where Netty spent a lot of time. The text and drawings could focus on the diversity of algae, aspects of algal biology/ecology, algal communities present at the site, and human uses of algae; written for the general public as an educational display. There will obviously be a need to get authorisation for any such display board, and there has been some liaison with the Countryside Council for Wales and the Pembrokeshire County Council. A fund raising scheme will be started once a costed proposal has been prepared. Anybody who would like to know more about the memorial plans or feels they could help, should contact Jon Moore (jon@ticara.co.uk).

PORCUPINE MNHS
RECEIPTS AND PAYMENTS ACCOUNT
for the year ended 31 December 2002

Year to 31.12.01			Year to 31.12.02	
£	£		£	£
		RECEIPTS		
10		Subscriptions- 1997 - 1999	0	
15		2000	10	
1352		2001	10	
5		2002	1422	
	1382			1442
	69	Bank Interest (net of tax)		76
	14	Sale of PN Back Number		2
	0	Donations		50
	1465	Total Receipts		1570
		PAYMENTS		
476		Newsletter- Printing	684	
321		Postage	135	
	797	Total Newsletter Costs	819	
	0	Bank charges	2	
	0	Poster preparation	100	
	0	Web site development	424	
163		Council meeting expenses (travel/catering)	224	
	960			1569
	505	SURPLUS (DEFICIT) BEFORE MEETINGS		1
	278	MEETINGS – Huntingdon (2001		0
	0	MEETINGS – Edinburgh (2002)		778
	783	SURPLUS (DEFICIT) FOR THE YEAR		779
	3369	BALANCE BROUGHT FORWARD		4151
		BALANCE CARRIED FORWARD		
747		Current Account	456	
3404		Deposit Account	4474	
	<u>4151</u>			<u>4930</u>

Jon Moore, Hon Treasurer
13th March 2003

	Members		2001 Income		2002 Income		Unpaid £
	No.	£	No.	£	No.	£	in 2002
Full	174	1740	134	1206	135	1263	-477
Student	7	35	4	22	5	30	-5
Library	9	90	7	70	3	30	-60
Life	3	0	2	20	2	20	20
Free	9	0					
Dropped			7	36	5	23	23
Unknown			1	8	1	8	8
Total	202	1865		1362		1374	-491

Notes for AGM 2003

Subscriptions: I had planned to chase up unpaid subscriptions in 2002, but didn't manage to find the time.

Newsletter costs: Costs for only 1.5 newsletters in 2002, but larger and better quality

Extra costs in 2002: Web site development & poster design

Profit on meetings: Congratulations to Susan Chambers & co for making a large profit at Edinburgh

Current membership:

Full	176
Student	6
Life	3
Free	9
Libraries	9
Joined since last AGM	11
Retired since last AGM:	0
Died since last AGM:	3

(Annette Little 15/7/02, Steve May (6/01/03), Larry Hamblin (11/10/02))

PORCUPINE MARINE NATURAL HISTORY SOCIETY (PMNHS) DATA POLICY

This policy refers to data stored in an electronic database by the Hon. Records Convener on behalf of PMNHS.

These data include records

- collected by its members and others on field excursions;
- submitted to the Hon. Records Convener on cards or in other formats, including electronic;
- published in the PMNHS Newsletter or Website.

All records stored by the PMNHS will be clearly labelled with the name 'Porcupine Marine Natural History Society', together with a full list of the recorders, who remain the owners of the data.

Data may be released to all enquirers without any prior contact with the record owner to obtain permission. The PMNHS membership will be informed that its information has been used through a short annual report published in the PMNHS Newsletter.

All users of these data will be required to acknowledge the record owner and PMNHS.

The PMNHS Council reserves the right to impose restrictions on certain data being released at any time in the future if such action is deemed appropriate. It may so happen that data of a sensitive nature may be submitted to PMNHS that requires imposition of a restriction in terms of onward release.

Neither the owner, nor any other person involved in PMNHS gives any warrant or undertakings as to or accepts liability for the accuracy and currency of the data, whether published on the PMNHS website or for any other purpose to which the data may be used.

Further enquiries about any PMNHS records should, in the first instance, be directed to Hon. Records Convener.

This policy was agreed by the Council of the Porcupine Marine Natural History Society on 1st March 2003.

If any member of the PMNHS, or any person submitting records to PMNHS, disagrees with this policy, and thus does not wish his/her records collected on a PMNHS excursion or elsewhere to be available for release to enquirers under the above policy, then this person must inform the Hon. Records Convener in writing, or the person collecting records during the excursion.

CONSTITUTION

1. The name of the Society is Porcupine Marine Natural History Society (which may be abbreviated to PMNHS).

2. This Society shall consist of Hon. Chairman, Hon. Secretary, Hon. Treasurer, Hon. Editor or Editors (not to exceed two persons), Hon. Records Convenor, an appropriate number (see Rules of Procedure, section 2) of Council members, in addition to ordinary members. No Council member may hold more than two office-bearing posts.

3. The object of this Society is to promote interest in the ecology and distribution of marine fauna and flora in the N.E. Atlantic.

RULES OF PROCEDURE

1. Any change in standing orders must be ratified by a simple majority of members at a general meeting.

2. The maximum and minimum numbers of members on the Council shall be left open, but shall not normally exceed twenty.

3. Council meetings shall be held when necessary, at least once a year. Quorum at Council meetings shall be five. Prior notice of Council meetings shall be at least 21 days.

4. Office-bearers retire annually and are normally available for immediate re-election. Council members shall at present serve for three years, at least two retiring each year, and are normally available for re-election.

5. Prior notice for Annual General Meetings shall be at least 21 days and will normally be in the preceding newsletter.

6. Voting shall take place at the AGM and will be restricted to members present.

7. Names of persons seeking election to the Council (as chosen by the Council) will appear in the Newsletter prior to the AGM together with an intimation that proposals from ordinary members of additional candidates are welcome.

8. Sudden vacancies in the Council shall be filled at the discretion of the Council.

A person so appointed shall serve until the next election and shall then be eligible to stand.

9. The Council shall co-opt additional helpers as necessary. Among these will be local events organisers (who may or may not be Council members already). The duty of an events organiser is to run the meeting held in his/her district and such a person may be invited to attend any Council meeting at which items concerning that meeting are on the agenda.

10. Membership is open to persons interested in the aims of PMNHS upon payment of the annual subscription. Membership shall be discontinued upon a majority vote at a General Meeting. The amounts of the annual subscription shall be determined by the Council. Audited accounts shall be circulated annually to all members.

11. Activities of the Society shall include:

(a) Meetings held at least once a year, normally lasting for two days and open to non-members. Meetings will be held with as wide a rotation of venues as is reasonable. Proposed venues are normally to be ratified by Council.

(b) A Newsletter normally published three times a year, which shall, in addition to other items, carry reports of previous meetings.

12. An Extraordinary General Meeting shall be called on the approval of a Quorum of the Council or at least 20% of the membership. At least 21 days notice shall be given to all members of the date and venue of an Extraordinary General Meeting.

PORCUPINE FIELD MEETING

28th August – 1 September 2003,
Northumberland

The 2003 Porcupine field meeting will be held from 28 August - 1 September 2003. Shelagh Smith has recently investigated a number of shores and has chosen the following (one shore per day):

Boulmer [55°25.0'N 01°34.4'W; NGR 46/2614]. This is a huge shore with extensive rock platforms and a sandy/muddy bay. There is a wide variety of life.

Newton-by-the-Sea [55°31.0'N 01°37.0'W; NGR 46/2425] or **Beadnell** [55°37.4'N 01°33.2'W; NGR 46/2330]. Newton has rock platforms and a sandy bay while Beadnell is rocky with gullies and rock pools, with a sandy bay to the south. Newton also has the best pub for lunch!

Lindisfarne [55°40.5'N 01°48.0'W; NGR 46/1342]. Cross the tidal causeway (by car) and there is a variety of shores including limestone rocks and a muddy/sandy bay. More walking required than for the others so we'll hope for a particularly good day. No parking problems but loos not very evident.

We have also planned a day on Dove Marine Laboratory's boat "Bernicia" for which Porcupine will underwrite some of the cost. However people going on this trip will be expected to pay a small charge (say £15). The tides are such that it would be most convenient to go on "Bernicia" on Thursday 28 August, although Monday 1 September is a possibility. Further south near Cresswell there are interesting brackish lagoons.

If you are interested in coming on all or part of this field meeting, please let Shelagh Smith know ASAP. You will have to book accommodation soon as it will still be the holiday period. Alnwick is a suitable base area. Details of accommodation from the Tourist Guide and further information from:

Shelagh Smith, Woodleigh, Townhead,
Hayton, Brampton, Cumbria, CA8 9JH.
Tel: 01228 670676. e-mail:
shelagh@smithurd.demon.co.uk

OTHER MEETINGS

May 15th 2003, Beaches and Bathing Waters
- Implications for the Revision to the
Bathing Water Directive

SOAS, Russell Square, London. A CIWEM Conference. Further details are available from bob.earll@coastms.co.uk. Tel: 01531 890415.

June 3rd 2003 CoastNET Conference,
Conserving Biodiversity in the Marine
Environment – What needs to change?
Targets and Actions for the Future Decade

SOAS, Russell Square, London. The programme for this event is on the CMS website www.coastms.co.uk or contact Bob Earll as above.

June 9-11th 2003 Molecular Systematics for
Taxonomists.

Centre for Marine Biodiversity and Biotechnology, Heriot-Watt University. Recently advances in molecular genetics has opened new avenues of approach to traditional taxonomic studies based on anatomy and morphology and it is clear that the power of molecular systematics is being increasingly appreciated by zoologists and botanists working with marine flora and fauna. This course is aimed at people who are engaged in taxonomic work but who are not familiar with techniques in molecular systematics. Participants need not have previous knowledge of the subject as the course will provide both a basic theoretical grounding together with instruction in practical techniques. The course is for anyone who needs to extend their taxonomic capability beyond traditional morphological and anatomical approaches.

Contact: Dr P F Kingston, Tel:
01314495111, e-mail: P.F.Kingston@hw.ac.uk

June 17-18th 2003 European Flooding
Conference, London

Details of the programme for this conference which will include:

- a review of the major flooding events across Europe over the last few years

- full discussion of the various mechanisms and solutions for addressing the risks posed by such events
- a demonstration of the Thames Barrier and the systems used in its function

Further details are available from bob.earll@coastms.co.uk

Summer 2003, ECSA local meeting – Fjordic Science Meeting, Oban.

Co-hosted by ECSA, GS_MSG and SAMS.
Contact: axel.miller@dml.ac.uk or see SAMS website: www.sams.ac.uk

Autumn 2003, ECSA 36 – Environmental measurement, Edinburgh.

Contact: m.wilkinson@hw.ac.uk



Larvae and Evolution

By Donald I. Williamson

(Chapman & Hall, 1992 ISBN 0-412-03081-0)

Review by Frank Evans

Many years ago the author of this book began a journey to publicise a new theory that would modify our accepted view of evolution by natural selection. The journey was both academic and physical. On the academic side Don Williamson wished to see his new theory set down in print for consideration by his fellow biologists while on the physical side he set out to visit numerous seats of learning to propagate the theory and initiate a debate.

I recall his visit to Newcastle University at the time. His proposition ran thus: The crab *Dromia* as an adult has the characteristics of a true brachyuran but its larvae are anomuran in appearance. Similarly, the echinoderms, which as adults are fundamentally radial in construction, have in many cases bilateral planktonic larvae. His strikingly original idea was that these aberrant larvae are not phylogenetically developed in the line from egg to adult but have been captured from other species sometimes far removed from the adult in the classificatory order of the animal kingdom. Behind this proposal lay the idea that the Darwinian evolutionary tree with which we were all familiar was defective in that it contained no anastomosing points but only successive branching. The presentation of this theory to his academic audiences got the sort of reception that Galileo got in the Vatican for saying the earth went round the sun. I recall the amused disdain with which his audience received his address when he visited Newcastle. I now recall in the same way that an audience threw pennies onto the Newcastle stage when, long ago, the great jazz trumpeter, Louis Armstrong, played there.

Dr. Williamson had a parallel difficulty with publication. We learn from the forward to his book by Prof. Lynn Margulis that the theory first saw the light of day in *Progress in*

Oceanography, 1988 after its rejection by seven other journals. We have also heard independently that a well-known British science magazine once commissioned an article on the subject by Williamson and on receiving it shamefully refused to publish it, offering him a fee in compensation. As the intrepid editor of *Progress in Oceanography* remarked: "Darwin would have probably had less trouble submitting a draft of "The Origin of Species" to the Bishop of Oxford".

Slowly, however, the scientific world began to listen. It had first to be made to realise how real the problem of aberrant larvae was and how inadequate were the current explanations. Williamson's theory cuts through the problem in a single stroke and, if true, leads to a dramatic simplification of taxonomic relationships in the animal kingdom.

At last, in 1992 the present book appeared. It is in three parts plus a conclusion. Opening with a spirited presentation of Williamson's theory of genome transfer from one species to another it proceeds to a second section occupying more than half of the book with a scholarly description of development in much of the invertebrate phyla. This section is valuable and interesting in itself although the principal object is always the furthering of his argument. Most of the section deals with echinoderms including an instructive consideration of their development compared with the hemichordates. Juvenile enteropneusts metamorphose conventionally from tornaria larvae but echinoderm development proceeds in a strange and convoluted fashion, often involving only portions of the larval coelom, to produce a quasi-parasitic juvenile lying within the larva. Moreover, the standard classification of echinoderms as enterocoelous deuterostomes applies to the larvae but in significant cases not to the juveniles, which may possess schizocoelous coeloms. This is cited as an example of the late insertion of a deuterostome larva into a protostome life history lacking a larval stage. The variety of larval developments in echinoderms is bewildering, species of the same genus which have been classified on adult

characteristics, often having grossly differing planktonic larvae. Williamson takes a broad view of his theory and assumes that larval invasions into the life history of echinoderms must have happened on a number of occasions, with the tornaria invasion of the echinoderm phylum to transform into an auricularia being the first. Further transformations within the echinoderms are then supposed.

Within the fossil record no echinoderms are known to be bilaterally symmetrical and at the time of writing Williamson believed that no fossil echinoderm larvae had been discovered although there are now reported to be mid-Jurassic echinoplutei larvae found in northern France. However, a geological sequence of introductions of bilateral larvae into developmental history is proposed in the order starting from the tornaria of the enteropneust hemichordates to holothuromorph (his formulation) auricularia, asteromorph bipinnaria, echinopluteus and finally ophiopluteus. It is suggested that benthic animals with planktonic larvae are better placed to survive hard times than those without, and a severe pinch at the end of the Triassic period may have weeded out most species with direct development. Williamson points out that the existence or absence of planktonic larvae may be revealed in fossils by such adult characteristics as brood pouches, sexual dimorphism (not found in those living species with larvae) and the size of the genital pore, which is small in producers of non-yolky planktonic larvae. In the timeworn phrase, in this connection much work remains to be done.

From echinoderms Williamson moves to consider the groups with trochophore larvae, the polychaetes, echiurans, sipunculids and molluscs. And having taken the plunge he swims vigorously against the tide with his suggestion that horizontal genetic transfer, with its powerful reordering of our classifications, has taken place both recently, as with the molluscs, and frequently. Throughout, he suggests that individual life histories are only slightly modified if the transfer is from a fairly near relative as in the

crab *Dromia* but hugely altered if the transfer is from a distance and that in this case by no means all of the larval tissue is taken up by the developing juvenile. As an example among the protostomous animals he notes that virtually none of the tissues of the molluscan trochophore are used in the veliger.

The pilidium larva of nemertine worms and the Müller's larva of polyclad flatworms both bear a resemblance to a trochophore. The development of Müller's larva into the adult worm is by a smooth process of growth but in the pilidium a juvenile nemertine develops around the larval stomach in a form resembling a parasite and having a totally new orientation. Again, in this case we are seeing a discarding of much tissue on metamorphosis and in parallel with the larva of the echinoderm *Luidia* the now redundant pilidium swims off to a short independent existence. At this point Williamson hazards the proposal that through horizontal genetic transfer it is the Müller's larva that is the forerunner of the trochophore of all the above groups. Equally boldly Williamson proposes that the tadpole larvae of the ascidian and thaliacean urochordates are derivatives of the larvaceans (an appropriate title in this context), which retain this structure throughout life.

Williamson is careful to say that a cataclysmic metamorphosis is not in itself a completely reliable indicator of larval transfer although it may be indicative, but he places much reliance on the failure to take up all the planktonic larval tissue into the ensuing juvenile form. His theory is in two parts; firstly the adoption of distant genetic material in a life history and secondly its method of transfer. He states that the transfer is an act between individuals of two species and given that it is from the egg of a species that the adult develops and that the planktonic phase is an interruption of this development then it is the sperm which is the plankton phase carrier. Williamson suggests that the route described is favoured by the urging of maternal cytoplasmic inclusions.

The third and final portion of the book

takes the form of prescriptions for investigating the truth of the theory. Employment of chromatography, immunology, electrophoresis, DNA and RNA studies are proposed as ways forward. There is an extensive consideration of varieties of cross fertilisation under laboratory conditions including both his own experiments and earlier reports. But for the reader the most compelling of these is the photograph in the frontispiece that shows a veritable echinoid larva which has resulted from the fertilisation of an ascidian egg by echinoid sperm. A short conclusion summarises Williamson's case.

Williamson's book was published in 1992. In her forward to the book Professor Lynn Margulis remarks that Williamson's proposals deserve to be heard and that "he has functioned alone in a nineteenth century mode for too long." Since its publication we learn (and I quote) that his theory "is getting rave reviews at research grant committee meetings and he is evidently a man before his time". Williamson himself, although formally retired, has not been idle and has continued to publish in the scientific journals. But better, he has almost completed a volume to be entitled "The Origins of Larvae" which is effectively a second edition of the work reviewed here. We look forward eagerly to its publication and we hope that this account of his propositions here placed before Porcupine members will capture for them the attention they so clearly deserve.

Marine Biodiversity in Ireland and Adjacent Waters

Edited by J. D. Nunn

Review by Frances Dipper

This A4 sized report contains the proceedings of a conference held on 26-27 April 2001 at the Ulster Museum, Belfast. This was a local meeting of the Estuarine and Coastal Sciences Association. Marine biodiversity is highly topical at the moment with all the work currently underway on Biological Action Plans and so on and this meeting was well timed.

The first thing that struck me about this publication was the exceptionally high quality – glossy paper with excellent colour photos and clear tables and figures. A lot of effort has obviously gone into the editing and production of this volume. Thirteen papers are presented in full with a further 14 extended abstracts and 9 other abstracts.

The volume starts off well with a fascinating and well-written account by Trevor Norton, of the pioneering historical ecological work done in Loch Hyne. This loch also features in another paper by Bell and Shaw describing the present biodiversity of habitats and species. Not surprisingly Strangford Lough, an MNR and cSAC also features in several papers. Species and groups covered include molluscs, seaweeds, marine bacteria, cetaceans, fish and marine aliens. There are also papers on habitats including sediment shores, lagoons, maerl beds, and fish habitats. Mapping projects, methodology and other general papers on marine biodiversity add to the (bio) diversity of the papers presented.

Whilst I have not read all the papers in depth, those that I have dipped into make me wish I had been able to attend the meeting. Especially so, as I would have been able to celebrate my birthday there in true Guinness style! The mostly well-written and informative, papers mean that this volume will not languish unused on my bookshelf but is likely to become well-thumbed in the near future.

Hopefully copies are still available but as they are FREE and of excellent quality, put your request in soon. Order your copy from Julia Nunn, CEDaR, Ulster Museum, Botanic Gardens, Belfast BT9 5AB.



Fishy records.

From Doug Herdson, Information Officer,
National Marine Aquarium, Rope Walk, Coxside,
Plymouth PL4 0LF, UK, Tel: 01752 275216/01752
600301, Email: Douglas.Herdson@national-aquarium.co.uk, website www.national-aquarium.co.uk

1. Bluntnose shark

A one-metre pup of a Bluntnose sixgill shark was landed at Mevagissey in mid-February, the first of the very few records of this species likely to be made in the UK this year. The Bluntnose sixgill shark is principally a deepwater species, usually found offshore and near the bottom at depths of up to 1,800m. Young specimens can however occasionally be found inshore in cold water at depths as shallow as 25m - 50m, especially near rocky coasts or islands where deep water occurs close by.

Sixgill shark pups measure 65cm - 70cm at birth and can grow up to at least 4.8m (over 15ft). This grey coloured shark is unusual in that, compared with most species of shark, they have an extra pair of gills. Females are thought to have 22 - 108 pups per litter. Sixgill sharks have big mouths with six rows of prominent comb-like teeth in the lower jaw. Although apparently sluggish, these sharks are powerful and feed on a wide range of prey, including bony fish, other sharks, marine mammals, rays, squid, octopus, crabs and shrimp. More agile prey (such as seals) might be ambushed on or near the bottom. Bluntnose sixgills are voracious bottom scavengers and will also feed on hooked or netted fish. They often rise to near the surface during the night to feed and are sometimes hooked by surface longlines.

Sarah Fowler, Shark Trust trustee and Co Chair of the IUCN Shark Specialist Group said:

Information requests and Observations

"This unusual record reminds us of the huge diversity of sharks in our oceans, even close to home. This species, with its amazing fluorescent blue-green eyes, is very popular with divers in British Columbia, Canada. Alas, population declines caused by over-fishing have made it all too rare a sight in most areas". Douglas Herdson, Information Officer at the National Marine Aquarium and coordinator of the UK Marine Fish recording Scheme said: "This impressive shark is one of the less-recorded of the 29 species which turn up in British waters. It would be very interesting to find out how often they turn up in the commercial or angling catches."

For more information on this and other sharks, see the Shark Trust's Web site www.sharktrust.org.

2. Flying gurnard

A flying Gurnard *Dactylopterus volitans*, was caught in a scallop dredge by the F.V. Natalie B, skipper Steven Frank Hatton, out of Newlyn, Cornwall, on 18th September 2002. It was in 38 fathoms (70 metres) of water 9.7 miles east of Wolf Rock (on a bearing 095° from the rock) at 49° 55.6N 5° 33.6 W. It was reported by Mr Robin Turner of J. H. Turner and Co., fish merchants of Newlyn; and described by him as about 1 foot long with large scales. Colour olive green flecked brown. Small ventral mouth, 2 large spikes pointing down its back and 2 bony protrusions from its jowls. Very large pectoral fins.

The name is mis-leading as it is not actually a gurnard although it looks very similar - Order Dactylopteriformes, family Dactylopteridae (gurnards are Triglidae in the Scorpaeniformes). The only previous record I know of this species is in Quero & Gueguen (1981) (which I do not have) quoted in Alwynne Wheeler's 1992 List of British Fish (Supplement to J. Fish Biol.). That gives the position as NW of the Longship, but the Lat/Long given (50° 00' 30"N 6° 10' 30"W) is some

way WSW of the Longships light and in fact SW of the Seven Stones (just NE of the Scilly Isles). The depth given is 90 metres, but the average depths NW of the Longships is 50 to 60 metres and SW of the Seven Stones, down to 75 metres, but at the exact lat/long given, is about 60 metres. The reference is: 'Quero, J.C. & Gueren, J. (1981) Capture, près de la côte sud-ouest de l'Angleterre d'un *Cephalacanthus volitans* (Linné, 1758) (Pisces, Dactylopteriformes, Cephalacanthidae) espece probablement nouvelle pour la faune anglaise. *Cybius* (ser.3), 5(no 4), 87 - 89. Does anyone have access to this to check out the details?

Does a Flying Gurnard fly? Some books say it leaps out of the water and glides, and that observations show that they use their pectoral fins to glide above the surface apparently searching for prey. Others books say it definitely does not glide. Looking at its anatomy I doubt it can get the power to jump out of the water, (but I would have said the same about Sunfish if there had not been several reliable reports of them leaping out of the water.) The alternative suggestion for the enormous pectoral fins is that when feeding on the bottom it opens these when alarmed giving a "startle effect" to scare off potential predators. There are a few reports of this behaviour. Two of my sources say they also walk on the seabed using the free part of the pectoral fin, while another says that unlike the gurnards they do not walk on the pectorals but on the ventral fins.

Anyone with experiences to confirm or refute these ideas?

I have read media reports that *Dactylopterus volitans* is a "tropical Mediterranean" species. The recognized distribution is from Angola to northern Brittany; Mediterranean, but not the Black Sea; Canaries, Azores, Madeira, and Cape Verde Islands; and Argentina to Massachusetts in the Western Atlantic. I am afraid that Brittany to the Scillies/SW Cornwall is not quite so spectacular.

3. Scorpionfish – Doug Herson has also received three records of scorpionfish *Scorpaena scrofa* recently (22nd

Feb off Fowey; 18th March off Plymouth; one not seen landed Plymouth 25th April). If anyone else has heard of any other *Scorpaena* turning up lately please contact Doug Herson as above.

4. Have you seen any millstones jumping out of the sea lately?

Well, not actually millstones, but Oceanic Sunfish. Their scientific name ***Mola mola*** means millstone, and with their rounded shape and leaden colour, they do resemble old millstones as they lie on their side at the surface. However looks can deceive. It was thought that that the sunfish seen in this posture around our coasts were a few sickly individuals passively carried by the currents, tides, and winds. We now know they can have an array of colouration, be very active, and have a wide range of behaviours including diving rapidly and even leaping clear of the water.

They also have a seasonal migration pattern arriving off our coast in large numbers in July and August, but where do they come from? Despite the National Marine Aquarium having one of the best databases of sunfish sightings in Europe, we do not know. We want your help to find out. This summer the National Marine Aquarium is co-operating with Dr Tierney Thys of the Sea Studios Foundation of Monterey, in an effort to put satellite tags on sunfish in the southwest. Dr Thys has already done this in California, Taiwan and off South Africa with intriguing results. (There was an article about this work in the November 2002 *National Geographic*, and further information on sunfish can be found on www.oceansunfish.org.)

In order to find the sunfish to tag some, we need all reports of sunfish this year. Please 'phone sightings in to Doug Herson, Information Officer, on 01752 275216 or email fishreports@national-aquarium.co.uk. Details of previous sightings, especially ones before 1998 would also be appreciated.

***Elminius modestus* request for information.**

*From: Frank Evans, 15 Thirlmere Avenue,
North Shields, NE30 3UQ, tel. 0191 2575354,
email: frankevans@zooplankton.demon.co.uk*

The northern range of the Australasian barnacle *Elminius modestus* on the UK east coast has been reasonably well mapped over several years and this is ongoing. Has anyone information on this creature from the west side? It has been found in the Solway and there is a report from Shetland. News from the intervening coastline would be welcomed.

Lost Newsletter request for copy. From: Frank Evans

Frank Evans would be very glad to hear of anyone who might have a spare copy of Porcupine Newsletter No. 5 (new series), July 2000. Sadly his has gone adrift, leaving an incomplete set. **Reward for finder**, (contact as above).

Lundy No Take Zone Declared

*(copied from CMS e-mail news
www.coastms.co.uk)*

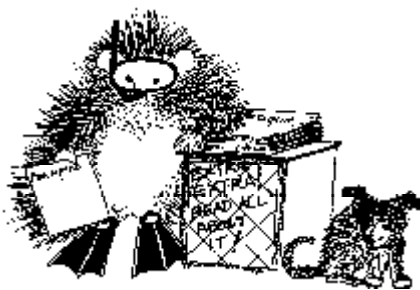
An area of sea on the east side of Lundy Island Marine Nature Reserve (MNR) off the North Devon coast has been confirmed by Government as the first statutory No Take Zone (NTZ) for marine nature conservation in the UK. It was jointly proposed by the Devon Sea Fisheries Committee and English Nature. This means that no living natural resources including lobsters, crabs and fish can be taken from the area. The No Take Zone has the strong support of the local fishermen as well as the Lundy Management and Advisory Groups, Devon Sea Fisheries Committee and English Nature. This is a small but highly significant step forward in alleviating the pressure on fish and shellfish stocks and restoring the wildlife value of the marine environment in North Devon.

The No Take Zone could have several long-term benefits including:

- Enhancing populations of fish and shellfish stocks within and outside the closed area;
- Effectively establishing a refuge for fish and shellfish stocks within the closed area;
- Greater catches of fish for fishermen around the edges of the closed area;
- Increasing the wealth of marine life;
- Increasing benefits to local economies from tourism, diving, research and providing a long-term viable area for fishing.

Chris Davis, English Nature's Maritime Conservation Officer for Lundy said, "This is fantastic news all round. The marine life around Lundy Island is internationally important as well as being a valuable asset for local fishermen. The No Take Zone aims to ensure that our rich marine biodiversity is given full protection as well as continuing to provide for the local fishing community."

Lundy Marine Nature Reserve is managed by a partnership between English Nature, the Environment Agency, Devon Sea Fisheries Committee, the National Trust, and the Landmark Trust. For more information contact: English Nature's National Press Office 01733 455190 (out-of-hours 07970 098005), email: press@english-nature.org.uk or visit the website at www.english-nature.org.uk



Porcupine field excursion to Dunbar 16 March 2002

by Shelagh Smith

Following the PORCUPINE 2002 meeting in Edinburgh, there was a field excursion on the Saturday. The weather forecast was poor, rain and strong winds, but a surprisingly large number of people got up early and found their way to Belhaven, Dunbar, on the Firth of Forth. And the weather was kind, merely overcast with little wind. The shore here consists of slightly brackish low rocks and sandy pools beside the Belhaven Burn, giving way to the open sea where there is a wide rock platform largely consisting of sandstones and shales with some igneous rock. Offshore there are small islets that partly protect the shore from the north and east. There are many shallow rock pools scattered with boulders, many of which, because of recent gales, had been overturned and so harboured little life. The lower part of the shore had reasonable algal cover although fewer species than expected.

David (Hurd) stayed at the car park and directed people to the best parts of the shore. We followed the tide down and investigated rock pools, overhangs, boulders and algae with gratifying results (see species lists). One joy of this type of excursion is that interest was not directed at just one phylum, but at many aspects of shore life. Note the list of birds seen. One participant brought children who were enthusiastic as only children can be. We were particularly glad that Annette Little came on the shore and later joined us for lunch. She was very ill then and has since died. This was her swan song for Porcupine. The tides in this area are very generous and do not hurry in, so late comers had plenty of time to enjoy the shore, long after official low water.

Although two sites were chosen for study, the less accessible one at Tynninghame on the north side of the estuary of the river Tyne, was not popular and visiting it meant that time would be short. Thus we concentrated in a leisurely fashion on Belhaven and then adjourned for lunch to the Hillside Hotel where a selection of seafood, amongst other dishes, was on offer. The food and the chat were much appreciated by all.

SPECIES FOUND AT DUNBAR 16.03.2002

Porifera

Clathrina sp

Leuconia sp

Halichondria panicea (Pallas, 1776)

Dysidea fragilis (Montagu, 1818)

Halisarca dujardini Johnston, 1842

Cnidaria

Dynamena pumila (Linnaeus, 1758)

Alcyonium digitatum Linnaeus, 1758

Actinia equina (Linnaeus, 1758)

Urticina felina (Linnaeus, 1761)

Nemertea

Lineus longissimus (Gunnerus, 1779)

Nematoda spp

Sipunculidae

Sipunculid sp

Annelida

Lepidonotus squamatus

Alentia gelatinosa

Sthenelais boa

Pholoe synophthalmica

Eulalia viridis

Nereis pelagica

Flabelligera affinis

Cirratulus cirratus

Cirriformia tentaculata

Caulleriella alata

Arenicola marina

Sabellaria alveolata

Pomatoceros lamarcki

Pomatoceros triqueter Linnaeus, 1758

Spirorbidae

Arthropoda

Verruca stroemia

Semibalanus balanoides (Linnaeus, 1767)

Balanus balanus (Linnaeus, 1758)

Gammaridae

Jaera sp

Idotea granulosa Rathke, 1843

Tanaidae sp

Cumacean sp

Pagurus bernhardus (Linnaeus, 1758)

Galathea squamifera Leach, 1814

Pisidia longicornis (L, 1767)

Porcellana platycheles (Pennant, 1777)

Hyas araneus (Linnaeus, 1758)

Cancer pagurus Linnaeus, 1758

Carcinus maenas (Linnaeus, 1758)

Pinnotheres pisum (Linnaeus, 1767)

Bryozoa

Alcyonidium diaphanum (Hudson, 1762)

Alcyonidium hirsutum (Fleming, 1828)

Membranipora membranacea (Linnaeus, 1767)

Electra pilosa (Linnaeus, 1767)

Cellepora pumicosa (Pallas, 1766)

Echinodermata

Henricia sp

Asterias rubens Linnaeus, 1758

Ophiothrix fragilis (Abildgaard, 1789)

Amphipholis squamata (delle Chiaje, 1829)

Psammechinus miliaris (Gmelin, 1778)

Echinus esculentus Linnaeus, 1758

Echinocardium cordatum (Pennant, 1777)

dead

Mollusca

Lepidochitona cinerea (Linnaeus, 1767)

Acanthochitona crinita (Pennant, 1777)

Gibbula cineraria (Linnaeus, 1758)

Tectura virginea (Müller, 1776)

Patella ulysiponensis Gmelin, 1791

Patella vulgata Linnaeus, 1758

Patella pellucida Linnaeus, 1758

Lacuna vincta (Montagu, 1803)

Littorina littorea (Linnaeus, 1758)

Littorina fabalis Turton, 1825

Littorina saxatilis (Oliv, 1792)

Melarhaphe neritoides (Linnaeus, 1758)

Rissoa interrupta (J Adams, 1800)

Rissoa parva (da Costa, 1778)

Crisilla semistriata (Montagu, 1808)

Onoba aculeus (Gould, 1841)

Onoba semicostata (Montagu, 1803)

Trivia arctica Pulteney, 1779

Trivia monacha (da Costa, 1778)

Lamellaria latens (O F Müller, 1776)

Lamellaria perspicua (Linnaeus, 1758)

Nucella lapillus (Linnaeus, 1758)

Buccinum undatum Linnaeus, 1758

Hina incrassata (Ström, 1768)

Odostomia plicata (Montagu, 1803)

Odostomia turrita Hanley, 1844

Odostomia unidentata (Montagu, 1803)

Partulida pellucida (Dillwyn, 1817)

Limapontia capitata (O F Müller, 1774)

Limapontia senestra (Quatrefages, 1844)

Goniodoris nodosa (Montagu, 1808)

Onchidoris bilamellata (Linnaeus, 1767)

Polycera quadrilineata (O F Müller, 1776)

Limacia clavigera (O F Müller, 1776)

Cadlina laevis (Linnaeus, 1767)

Archidoris pseudoargus (Rapp, 1827)

Jorunna tomentosa (Cuvier, 1804)

Mytilus edulis Linnaeus, 1758

Modiolus modiolus (Linnaeus, 1758)

Modiolarca tumida (Hanley, 1843)

Musculus discors (Linnaeus, 1767)

Heteranomia squamula (Linnaeus, 1758)

Pododesmus patelliformis (L, 1761)

Kellia suborbicularis (Montagu, 1803)

Lasaea adansonii (Gmelin, 1791)

Cerastoderma edule (Linnaeus, 1758)

Venerupis senegalensis (Gmelin, 1791)

Turtonia minuta (O Fabricius, 1780)

Hiatella arctica (Linnaeus, 1758)

Zirfaea crispata (Linnaeus, 1758) shell only

Tunicata

Ciona intestinalis (Linnaeus, 1767)

Corella parallelogramma (O F Müller, 1776)

Botryllus schlosseri (Pallas, 1766)

Osteichthyes

Nerophis lumbriformis (Jenyns, 1835)

Cyclopterus lumpus Linnaeus, 1758 juv

Lipophrys pholis (Linnaeus, 1758)

Pholis gunnellus (Linnaeus, 1758)

Aves

Phalacrocorax aristotelis (Linnaeus, 1761)

Shag

Phalacrocorax carbo (Linnaeus, 1758)

Cormorant

Anas penelope Linnaeus, 1758 Wigeon

Anas platyrhynchos Linnaeus, 1758 Mallard

Anser anser (Linnaeus, 1758) Greylag goose

Bucephala clangula (Linnaeus, 1758)

Goldeneye

Mergus serrator Linnaeus, 1758

Red-breasted merganser

Somateria mollissima (Linnaeus, 1758)

Eider duck

Tadorna tadorna (Linnaeus, 1758) Shelduck

Haematopus ostralegus Linnaeus, 1758

Oyster catcher

Charadrius hiaticula Linnaeus, 1758

Ringed plover

Pluvialis squatarola (Linnaeus, 1758)

Grey plover

Arenaria interpres (Linnaeus, 1758)

Turnstone

Calidris alpina (Linnaeus, 1758) Dunlin

Calidris maritima (Brünnich, 1764)

Purple sandpiper

Limosa lapponica (Linnaeus, 1758)

Bar-tailed godwit

Numenius arquata (Linnaeus, 1758) Curlew

Numenius phaeopus (L., 1758) Whimbrel

Tringa totanus (Linnaeus, 1758) Redshank

Larus argentatus Pontoppidan, 1763

Herring gull

Larus marinus Linnaeus, 1758

Great blackbacked gull

Larus ridibundus Linnaeus, 1766

Blackheaded gull

Mammalia

Halichoerus gryphus (Fabricius, 1791)

Grey Seal

Rabbit

Stoat

Rhodophyta

Gelidium pusillum (Stackhouse) Le Jolis

Palmaria palmata (Linnaeus) Kuntze

Hildenbrandia rubra (Sommerfelt) Meneghini

Corallina sp

Lithamnion glaciale Kjellmam

Dumontia contorta (S Gmelin) Ruprecht

Chondrus crispus Stackhouse

Mastocarpus stellatus (Stackhouse) Guiry

Plocamium cartilagineum (Linnaeus) Dixon

Lomenataria articulata (Hudson) Lyngbye

Ceramium shuttleworthianum (Ktzing)

Rabenhorst

Membranoptera alata (Hudson) Stackhouse

Osmundea pinnatifida (Hudson) Stackhouse

Chromophyta

Laminaria digitata (Hudson) Lamaouroux

Fucus ceranoides Linnaeus

Fucus serratus Linnaeus

Fucus spiralis Linnaeus

Fucus vesiculosus Linnaeus

Pelvetia canaliculata (Linnaeus) Decaisne et

Thuret

Chlorophyta

Enteromorpha sp

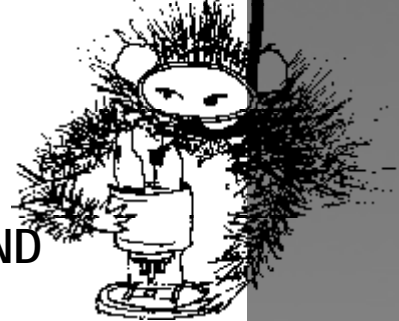
Cladophora rupestris (Linnaeus) Ktzing

Lichenes

Verrucaria mucosa Wahlenberg

Lichina pygmaea (Lightfoot) C A Agardh

'PORCUPINE 2003. ECOLOGY, TAXONOMY AND CONSERVATION'



Papers from the PMNHS meeting held at the National Museums and Galleries of Wales, Cardiff from 14th-15th March 2003.

Sublittoral monitoring at Skomer Marine Nature Reserve

Mark Burton, Phil Newman and Kate Lock

Countryside Council for Wales, Skomer Marine Nature Reserve, Fisherman's Cottage, Martin's Haven, Marloes, Haverfordwest, Pembrokeshire. SA62 3BJ. Skomer.mnr@ccw.gov.uk

What follows is related to the presentation given to the Porcupine Society 2003 Conference held at the National Museum of Wales, Cardiff. If you were one of those who attended the conference you will be forgiven for not recognising much of the content. Instead of summarising the talks content, this brief piece is a history of the "thinkings" and "doings" that have shaped the Skomer MNR monitoring programme into its current form.

Pre-MNR designation

The area around Skomer Island has had a long history of marine biological survey and research. The very existence of a designated Marine Nature Reserve was due, in part, to the enormous efforts of a wide variety of - largely volunteer - divers and marine biologists. These efforts resulted in a wealth of species and habitat information that highlighted the diverse and special nature of the area.

Hunnam first described the sub-littoral habitats around Skomer in 1976. Then, in the 1980's several large-scale surveys took place that not only mapped the habitats around the Reserve, but also started to collate species information. These are reviewed in Bunker & Hiscock (1987). In 1982 Bullimore started the Skomer Marine Reserve Sub-littoral Monitoring Project (S.M.R.S.M.P) that has continued uninterrupted to this day. 1981 saw the first survey of the eelgrass bed (*Zostera marina*) in North Haven with a comprehensive survey completed in 1984. In 1985 a sea fan (*Eunicella verrucosa*) tagging project was started along

with other species-specific projects. The ideas and information contained in these early projects provided a basis for all the current monitoring projects.

Post -MNR designation

Since the designation of the Skomer MNR in 1990 the work of the Skomer MNR team has focused on developing a range of sublittoral projects to monitor the health of the Reserve, and investigating the relevant aspects of species life histories for baseline information.

The first step in the process was to map the survey sites to allow accurate relocation year on year. Once this was completed, the collection of time series data began in earnest. The projects encompassed a wide range of habitats (from exposed rock to sheltered muds) and species (from scarlet and gold cup coral *Balanophyllia regia* to territorial fish). Many of the projects involved photography and much time was spent refining project methods in order to get consistent and reliable images that could subsequently be used to gain quantitative data.

After an initial period of photographic data collection, the images were assessed for quality and consistency. An extensive review then began to determine what sort of information could be extracted from the images. Gilbert (1998) explored the use of digital analysis techniques to collect counts and measurements from the images. This review of the data and the development of the image analysis methodology was the start of

quantitative data analysis from time series projects in the Reserve. As a result of Gilbert's review, the sea fan growth project was extended to cover more areas within the Reserve, inappropriate methods were discontinued and new ones developed. This was an important opportunity to refine the methodologies, to improve image quality and to produce protocols for quality assurance. In 2001 the projects were reviewed again but this time the emphasis was on analysing the data, not the images, and producing monitoring targets to assess the condition of the species and habitats in the Reserve.

There are various types of information that can be extracted from the time series data:

- Life history details such as longevity, recruitment, mortality and growth rates.
- Stability of communities over time.
- Variability of community structure over time.
- Variability of species abundance over time.
- The effect of known events (e.g. the Sea Empress oil spill) on species or communities.

Coupled with the time series data is an extensive set of environmental data (running from 1993) that has allowed the responses of the biota to environmental fluctuations to be investigated. This has proved very important; the goal of the monitoring projects is to separate "natural" change from change induced by anthropogenic activity. It is vital, therefore, to build environmental factors into the surveillance programme.

What has been described so far is simply the development of a monitoring programme, not actual monitoring itself (in the sense of assessing a features condition against a set of minimum requirements or "targets"). This developmental process, however, is vital if the targets that we are to monitor against are to be meaningful.

The process can be summarised as follows;

- Survey and mapping – what have we got and how much.
- Surveillance of biota – collecting time series data (consistent, comparable data

designed with monitoring in mind).

- Surveillance of environmental factors.
- Review of the surveillance data (environmental and biotic) to produce meaningful monitoring targets for species or habitats.

The Skomer MNR is currently at the stage of producing monitoring targets so that true, full-blooded monitoring can start. For example:

Eel grass (*Zostera marina*) – A minimum bed area and a minimum shoot density have been set. Between 1997 and 2001 the bed area has remained constant while the shoot density has increased; so the bed is in a favourable condition. The main anthropogenic threats to the eel grass bed come from pollution and damage from anchors / moorings. There is an exclusion zone around the bed to prevent anchoring and the MNR provides visitor moorings outside the bed to further discourage anchoring.

Scallops (*Pecten maximus*)

The current monitoring target for scallops is to see no decrease in the density of scallops within the Reserve and to have no reported incidents of scallop collection from within the Reserve. The first target makes the assumption that the population is currently recovering from exploitation and would be expected to increase given the legal protection offered by the Sea Fisheries Committee byelaw prohibiting collection by any means within the MNR. This target may be further refined as more time series data is collected. The second target however will remain in place and is a target from which management action can be taken. A joint MNR and Sea Fisheries Committee poster, explaining the byelaw, has been distributed to all the local dive clubs and dive shops and has been posted at the local slipways. The MNR team patrol the Reserve insuring that all the visitors are aware of the restrictions.

Sublittoral communities:		
Rocky reef communities	Time series stereo photos.	1982-2002
Algal communities	Survey and report completed	1999
Sponge assemblages	Time series mono-photo/digitised.	1994-2002
Infaunal sediment	Surveys and reports completed	1993/1996/1998
Epifaunal sediment	Survey and reports completed	2001/2003?
Flora:		
Zostera marina	Extent of NHV bed & density distribution. Excel/GIS. 2 reports completed.	1997/2002 (boundary maps for 2000 & 2002
Fauna:		
Eunicella verrucosa	80 colonies, time series mono-photo/digitised. Excel/MapInfo. 4 colonies, stereo-photo.	1993-2002 1982-2002
Alcyonium glomeratum	Time series stereo-photo/digitised.Excel/MapInfo. North wall 5 transects (% frequency)	1984-2002 2002
Parazoanthus axinellae	6 sites, time series mono- photo/digitised. Excel/MapInfo.	2001/2002
Balanophylia regia	Time series stereo-photo/digitised.Excel/MapInfo. 51 quadrats from The Wick.	1984-2002 2002
Pentapora foliacea	3 sites, time series mono-photo/digitised. Excel/MapInfo. New sites established 2002	1994-2001
Pecten maximus	UCS survey Summary report Survey completed, 3 sites. Monitoring report completed	1979/80 1979-82 2000 2001
Nudibranch species	various surveys MNR survey and report	1975-1991 2002
Territorial fish	Method report Survey completed	1998 2001/2002

Table 1. Time series projects currently running at Skomer MNR

Sea fans (*Eunicella verrucosa*)

The targets for monitoring the condition of the sea fan population are defined in terms of:

- No losses of individuals from the mapped population
- A measure of growth of colonies
- An assessment of fan condition based on damage, entanglement and coverage with epi-biota.

Many of the other projects still wait to have targets defined. This is because there is still insufficient information on the “natural” behaviour/condition of the species or habitat to set any meaningful targets.

There is a lot that still needs to be learnt about the species monitored in the Skomer MNR. The current projects are collecting some of that information but specific, intensive research is needed to gather the rest. In particular very little is known about the recruitment rates of species within the Reserve, for example the cup coral *Balanophyllia regia* or the hydroid *Gymnangium montagui*. Any life history information about the species featured in the MNR monitoring programme will be useful and can only add to the understanding of the condition of the Reserve.

Research into the response of species and communities to specific stresses (for example how do sponge communities respond to increasing levels of surface sediment or turbidity?) may prove very useful in highlighting the indicator species or assemblages that could be used to detect the early stages of anthropogenically-induced stress.

The MNR would welcome any interest from parties wishing to undertake research in the Reserve or on the species / communities featured in the monitoring programme. The MNR could offer access to the existing data sets (biotic and environmental) and some limited field support. Links with outside research bodies will be vital to continue the development of the MNR monitoring programme.

Benthic Marine Biodiversity Action Plans: Realities of reaching targets

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Abstract

Many marine BAP species can be described as 'charismatic', and have always held considerable conservation status, not only amongst the scientific community, but also with the general public (partly through the work of campaigning NGOs). Many smaller, benthic marine species that occur in the UK have historically been neglected, but can be considered as equally if not more threatened than some marine fish and mammals. This paper will highlight what is known of the biology and ecology of some marine benthic invertebrate and plant BAP organisms, and indicate that targets being set for conservation are arbitrary due to the lack of distribution and abundance data. A call will be made for a substantial mapping/survey programme, combined with considerable tightening of legislation and enforcement (through setting up No Take Zones) that will enable better protection of these species, where current distributions are known.

Introduction

The Biodiversity Action Plan was written by UK government in 1994 as a result of a national commitment made by the government at the time to nationally achieve the aims set out in The Convention on Biological Diversity (Rio, 1992), and Agenda 21. The general aim

of the Biodiversity Action Plans have been to promote partnerships at all levels and sectors of society, set and reach targets for conservation goals, to integrate policy to achieve sustainable development, provide new information on threatened species, and finally,

Habitat Action Plan	Lead Partner	Species Action Plan	Lead Partner
Sabellaria alveolata reefs	English Nature	Atrina fragilis	Marine Conservation Society
Sabellaria spinulosa reefs	English Nature	Ostrea edulis	Shellfish Association of GB
Modiolus modiolus reefs	CCW	Thyasira gouldi	SNH
Maerl beds	SNH	Amphianthus dohrnii	Wildlife Trusts
Seagrass beds	Environment and Heritage Service, NI	Edwardsia ivelli	WWF-UK
Serpulid reefs	SNH	Nematostalla vectensis	WWF-UK
Lophelia pertusa reefs	DEFRA	Eunicella verrucosa	Wildlife Trusts
		Leptosammia pruvoti	Wildlife Trusts
		Anotrichium barbatum	CCW
		Ascophyllum nodosum ecad mackaii	SNH

Table 1. Examples of some Habitat (with associated benthic invertebrate species) and Species Action Plans and relevant listed Lead Partners.

to raise public awareness of UK biodiversity. Overall, there are approximately 19 marine Species Action Plans (SAP) and 19 marine Habitat Action Plans (HAP) (see Table 1 for an example of invertebrate plans).

Success stories

There are some examples of success with The Biodiversity Action Plans. Programmes have been initiated by The Wildlife Trusts (TWT), The Whale and Dolphin Conservation Society (WDCS), The Marine Conservation Society (MCS) and The World Wide Fund for Nature (WWF) in order to monitor larger, more charismatic marine mammals, reptiles, and fish (principally, observations of the basking shark (*Cetorhinus maximus*). Similarly, statutory law protects many of these species, both through provisions within the Countryside and Wildlife Act, 1981, and through The Habitats Directive, Natura 2000. It is debatable, and not within the subject of this paper to discuss the relative efficacy of these forms of legislation, but at least they are there for mammals, reptiles and basking sharks. Many species within these groups are also protected from international trade by being CITES listed (recently, the basking shark was also added to the list in Chile in December 2002).

What are benthic BAP species, and why have they been selected?

Individual benthic Biodiversity Action Plan species have been selected for their rarity, their importance as indicator species, their uniqueness to UK waters, and because they

Several colonial benthic invertebrates (which in certain cases form biogenic reefs) and some calcareous algae, are included in habitat BAPs and can provide an important ecological niche for a whole suite of other organisms. They are listed in many different pieces of legislation, and can be reasons behind particular areas being designated candidate Special Areas of Conservation. Falmouth harbour and the Helford River in Cornwall have cSAC status as they have a high proportion of the UK population of maerl within their boundaries. Other biogenic reefs, such as the horse mussel *Modiolus modiolus* beds that occur in the calm waters of Strangford Lough in Northern Ireland, were one of the reasons behind this area being designated as the first Marine Nature Reserve for Northern Ireland, and subsequently, for cSAC status. Unfortunately, these designations have had little impact on the process of population decline in these so-called 'protected areas'.

Benthic invertebrate BAP species – not adapted to disturbance

Considerable damage has occurred to many areas of our seabed through the activity and passage of trawlers (Kaiser, 2000). Many marine invertebrates have fallen foul of this destructive fishing technique, and little has been done to mitigate against the damaging effects of the technique (Auster *et al*, 1996).

It is important to emphasise that many of the populations of *Atrina fragilis* are only known from by-catch records of trawler fishing vessels, and scientific research ship records (ERCCIS), usually using gear for dredging scallops. These gear types will considerably damage the benthos, and physically disturb the sediment, in many cases raising lighter sediments to the surface, which smother living organisms.

Much of the Darwin Mounds *Lophelia pertusa* coral reefs are at present being damaged through the unregulated passage of benthic trawl fishing boats. The UK government is now committed to protecting these deep water reefs as part of its obligation to set up

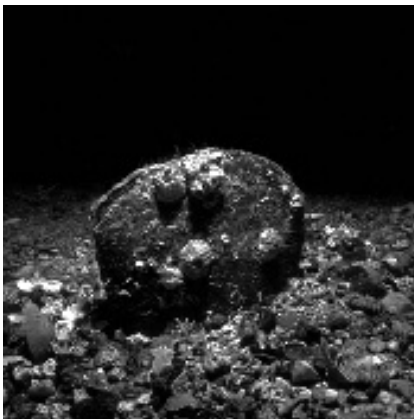


Figure 1. Example of benthic BAP invertebrate species – a fan shell, *Atrina fragilis* (© Sue Scott)

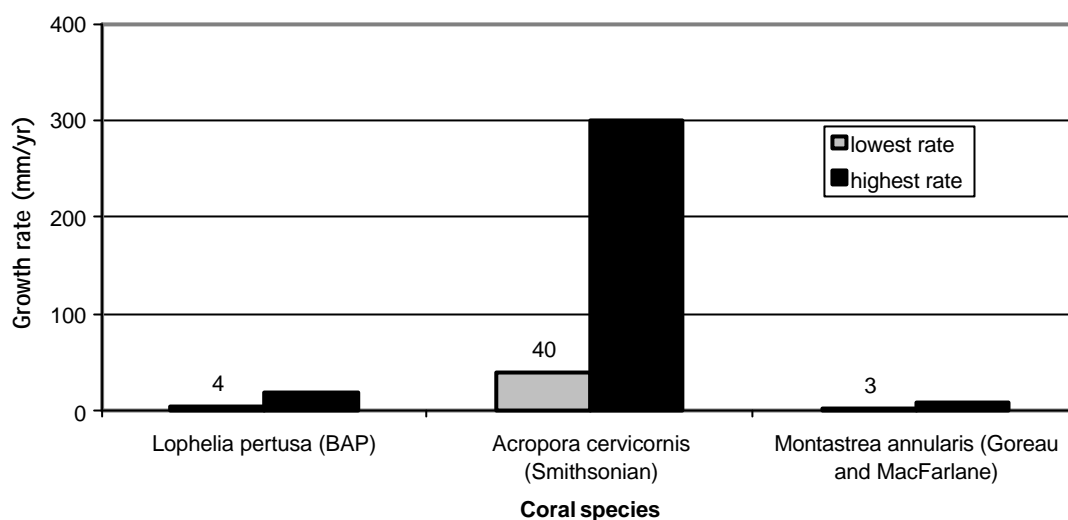


Figure 2. Growth rate of *Lophelia* coral, and hermatypic corals from the Caribbean (variety of sources).

Marine Protected Areas beyond 12 nm territorial UK waters, within the 200 nm EZ boundary. The government has heeded scientific advice in selecting The Darwin Mounds as it's flagship for offshore protection, however, due to the slow pace of legislation implementation, and a lack of enforceable powers at sea, it is likely that many of the offshore reefs will be destroyed before practical conservation measures are put in place. The slow growth rate of *Lophelia* coral suggests that some of the coral structures in the North Sea, and northwest Atlantic could be around 800 years old (Fig. 2), and have associated faunal species richness that rivals many marine ecosystems found in the photic zone (Fig. 3). The upshot of this information is that *Lophelia* provides an important habitat in an otherwise barren seascape (because of the great depths at which it lives), and that when it is damaged by fishing or other activities, it is likely to take many years to recover.

Lack of effective conservation targets

There is a considerable lack of distributional data for most marine BAP species, and particularly for benthic invertebrates. Therefore the issue of reaching targets for conserving individual BAP species are rather arbitrary, and almost impossible to set on a national scale. With the compilation

of sporadic and sometimes anecdotal data on individual species over long timescales, it is difficult to estimate national population levels at any one time. This is particularly the case for rare individual species that do not form aggregations or colonies such as the fan shell (*Atrina fragilis*) (Fig. 4), and some of the more obscure and well-camouflaged sea anemones, such as Ivell's sea anemone (*Edwardsia ivelli*). There are a considerable number of anecdotal data sets for incidental capture of *A. fragilis*, usually from scallop divers, and scallop trawler and dredger boats, but no systematic UK-wide survey has ever been undertaken for this species on a national scale, and it is hard to see the real worth in carrying out this work, when evaluating cost-benefit analysis. We can therefore see why there is discrepancy between one dataset and another when trying to compile population numbers from individual countries.

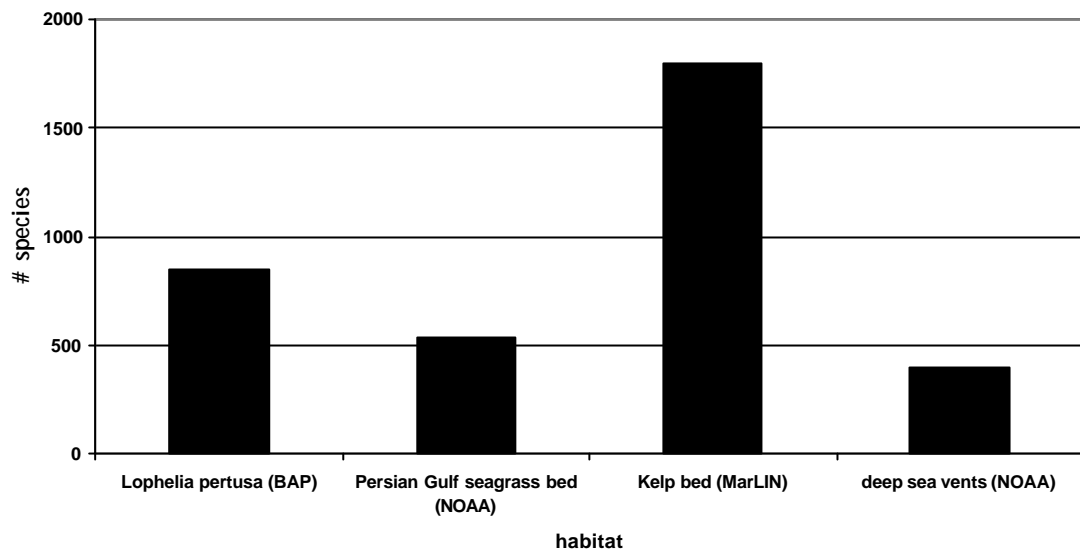


Figure 3. Species richness associated with a diverse range of ecosystems, from deepwater coral reefs (UK BAP data), to Persian Gulf seagrass beds (data from the National Oceanographic Atmospheric Administration).

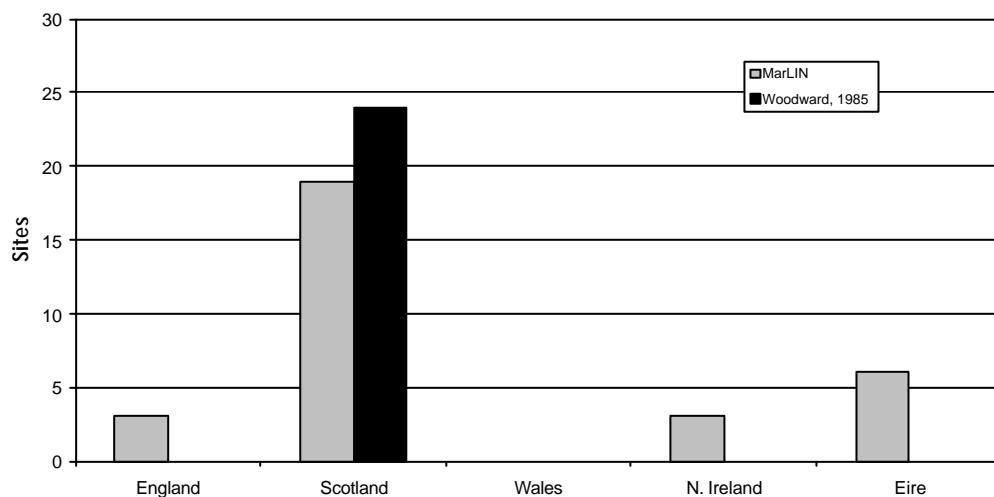


Figure 4. Different reference datasets have different figures for population numbers (sites) of a species. In this example, Woodward (1985) lists 23 sites for *A. fragilis*, where current MarLIN data suggests 18 sites for Scotland. Furthermore, the CCW atlas for marine species in Wales has two sites for *Atrina fragilis* in south Wales's waters.

Surveys and BAP 2002 reporting round

A simple survey was compiled in order to assess the issues behind the failure to reach conservation targets for marine benthic BAP species. The following questions were asked:

1. What BAP are you lead partner for / What is your involvement in BAP?
2. What are the main limitations for you to carry out adequate conservation for your species/habitat?
3. What do you think that the main practical solutions to conservation of your species/habitat is?
4. How do you see integration of marine benthic BAP monitoring and research in terms of getting better results - would this

be more cost effective?

5. If the BAP did not exist, would your BAP species and habitats be less well protected?
6. Are the timescales for the BAP reporting and target setting realistic?
7. How best can the general public be stimulated towards BAP?
8. Are local BAP's the answer?
9. How many hours per week do people in your organisation spend on BAP work?

The following information became apparent (Table 2) from the answers to the questions, and from researching the recent BAP reporting round.

Factors	Problem	Solution
Funding	Considerable lack of funding to promote BAP awareness that goes from bottom (where are they?) to top (no practical enforcement of wildlife species legislation)	Conservation programmes to be set up at local levels. NERC/government to be approached through joined-up approach from Lead Partners. One loud voice rather than many little ones.
Awareness	Lack of awareness of benthic marine BAPs due to relative obscurity of species.	Engage local communities through aquarium displays, factsheets, stimulation of local BAP elements (for example, <i>A. fragilis</i> in western Scotland). Engage divers through Seasearch.
Practical conservation measures	Lack of knowledge of population structures.	Mermaid programme to be re-established. Find and conserve localised 'hotspots' of species, especially for 'nursery effect' with broadcast spawners.
Policy	WCA/Natura 2000/CROW need to be helped through practical enforcement.	Some policy is fine. Needs a hard edge through practical enforcement, adequate warnings procedures, prosecution and fining more offenders, by-catch prosecutions.

Table 2. Answers to above questionnaire relating to invertebrate BAP targets.

Conclusions

Benthic marine BAP species protection can only succeed if there is considerable integration between Lead Partners to promote the conservation of a suite of marine species. Species and habitat protection will never effectively occur if partners act on species alone, and what purpose will be served through protecting individual species, rather than protecting biodiversity hotspots. Better collaboration between scientific advisors, managers, coastal local authorities, and interested parties (members of the local general public), will better provide a start for integrated protection of these species.

Targets can be set for discrete individual populations. Some BAP 2002 Lead Partner reports show data from known discrete metapopulations of species such as *Eunicella verrucosa* (Lyme Bay, Dorset) and *Leptopsammia pruvoti* (Lundy Island, Devon). It is unrealistic to set targets for species such as these at a national scale, as we only know of one or two areas where these species have been accurately recorded, and because we know that much of the data reported on the BAP site is from 'best guess', extrapolated from known populations. Therefore, we need to seek further funding to monitor known populations, such that patterns of population fluctuations can be seen from well-studied areas.

Many of these species are susceptible to pollution (*Eunicella*) and/or fishing damage (*Atrina fragilis*), and may benefit from statutory (NTZ?) protection from these impacts, where known pockets of populations occur, and not just through listing on the Wildlife and Countryside Act. This is because it is difficult to prove wilful damage to these species through pollution and benthic fishing, and they are incidental to any fishing haul. It may be fruitful to abandon national protection measures, and establish completely protected areas with associated limits of pollution and intrusion to protect, and possibly enhance (into the future) known populations of these species.

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The nature conservation value of intertidal biotope maps

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Editor's Note: The Figures in this paper were originally in colour. Unfortunately we do not currently use colour in the Newsletter. Those wishing to have an electronic colour copy of the paper should contact the editor or the author.

Intertidal survey – SCOPE

- Complete survey of intertidal biotopes in Wales.
- Survey was scoped in 1996 and is programmed to finish in 2005.
- From the splash zone at the top of the shore to the extreme lower shore (Lowest Astronomic Tide LAT).
- Provides information to enable intertidal SSSI notification, SAC information and casework.

Intertidal survey – DATA

- Information on the position and extent of biotopes (physical habitat and associated community).
- Species information for specialised and nationally important biotopes as identified in the JNCC SSSI guidelines.
- Presence and extent of artificial substrata.
- Presence and abundance of non-native species.
- Information on evidence of activities on the shore (outfalls, recreation, fisheries).

Intertidal survey – FORMAT

- Each biotope is represented as a polygon in GIS (MapInfo).
- Broader mapping units, each with a specific colour, are formed by grouping biotopes into **life forms** according to the nature of the fauna and flora. These are easier to view on a map.
- Each biotope polygon has linked with it a comment column for information about artificial substrata.
- Target Notes are made that have a geographic reference and are used to add any further information.
- General information about the survey site is held on an Access database.

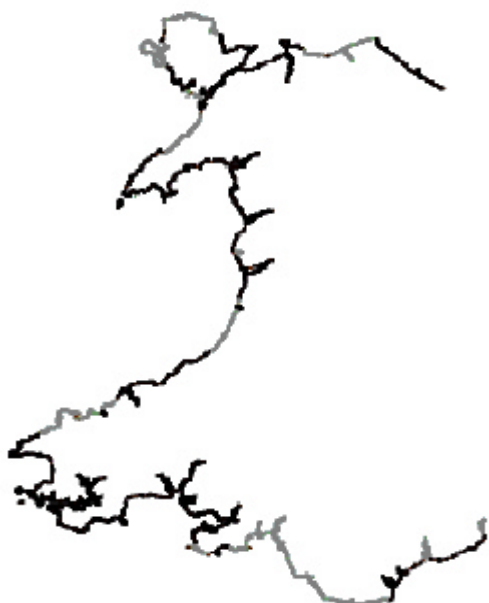
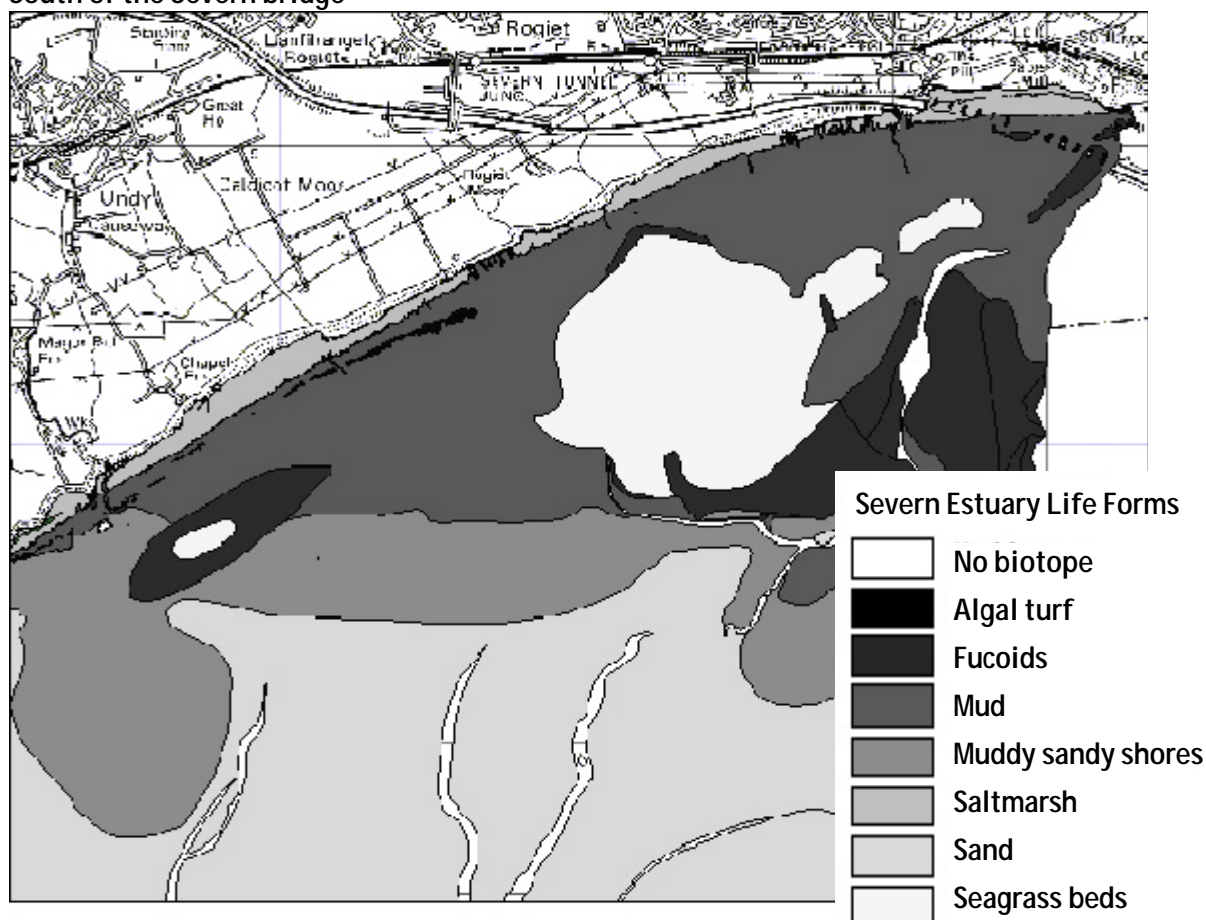


Fig. 1 Extent of Wales coast currently surveyed, 2002 - black=surveyed

Fig. 2 Recent example of survey output
South of the Severn bridge



South of the Severn bridge – target notes

- 5 ST415821 Area of firm sand with abundant *Bathyporeia* sp. An elevated sand bank extends east and west of the target note. LGS.AEur.
- 6 ST418821 Occasional boulders found in the channel and between the sand waves. Boulders support *Tubularia larynx*.
- 7 ST419832 Area of scoured out pebbles and peat with very sparse SLR.BLlit. *Elminius modestus* (P) and *Littorina saxatilis*. Occasional *Fucus serratus* plants found.
- 8 ST421833 Gravel and pebbles are found below 30cm of mobile medium sand.
- 9 ST425820 Sand waves with mud lenses. Phase 2 core sample taken.
- 10 ST425806 Level fine sand. Phase 2 core sample taken.
- 11 ST431842 Sluice gate with concrete step access. Concrete supports LR.YG, LR.Ver.Ver, and SLR.Pel. SLR.EphX occurs on cobbles in the stream. Boulder/cobble embankments stretch across the stream with SLR.Fves and SLR.Fspi.

South of the Severn bridge – other info

Conservation Interest:

Specialised biotope LMS.Znol.

Non-native (established) *Elminius modestus* in SLR.BLlit (0-F), LMS.Znol (0), SLR.FserX (0), SLR.FvesX (0 - C), SLR.Asc.Vs (0-C), MLR.Ent (0-A), SLR.Fspi (C-A) and ELR.BPat (C).

Uses and Impacts

Fishing – angling On the shore south of Sudbrook.

Coastal defence – seawalls Rip-rap found along the back of the shore for most of the site.

Coastal defence - groyne Old groynes and possible old outfall supports.

Military use Firing range near Caldicot.

Sewage discharge Sewage outfalls and land drainage creeks. Litter and debris at the back of the shore near Sudbrook and below the embankment along the site.

Evidence of physical damage Saltmarsh - poached and grazed.

Uses for the intertidal data

1. Evaluate the nature conservation value of the seashore

A standard data set (intertidal mapping survey) and procedure are used throughout Wales. The nature conservation assessment uses the Guidelines from the Joint Nature Conservation Review that provide the principles as well as:

- A standard list of 'nationally important biotopes'
- A standard list of 'specialised biotopes'.

The CCW site assessment protocol provides the mechanism to identify specific areas of nature conservation importance and is based on naturalness, extent, diversity, typicalness and rarity.

2. Improve the level of detail of biotope distribution

Most other data available until recently are point data that require extrapolation for most uses. When boundary setting or considering casework, distributional data are crucial. Distribution data provides a measure of the total quantity of a particular biotope/resource for Wales.

3. Better understand the character of the

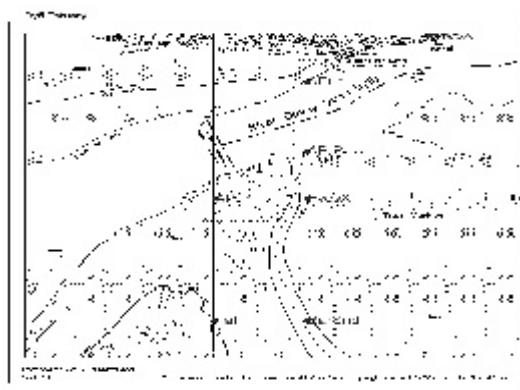


Fig.3 Point data available from MNCR survey 1995

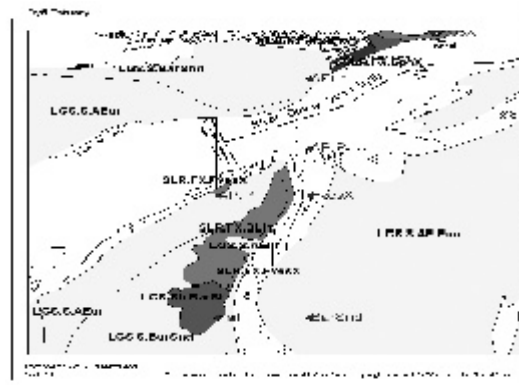


Fig. 4 Mapped data from CCW intertidal survey 1997

coastline (Fig 5)

- Identify fundamental differences in distribution of types of biotopes.
- Oil spill contingency mapping.
- Other sensitivity mapping.

4. Identify extent of human activities on the shore

e.g. Boulder turning: By identifying the areas of boulder and cobble and overlaying this with data on human activities, we can get a measure of what proportion of the habitat is impacted.

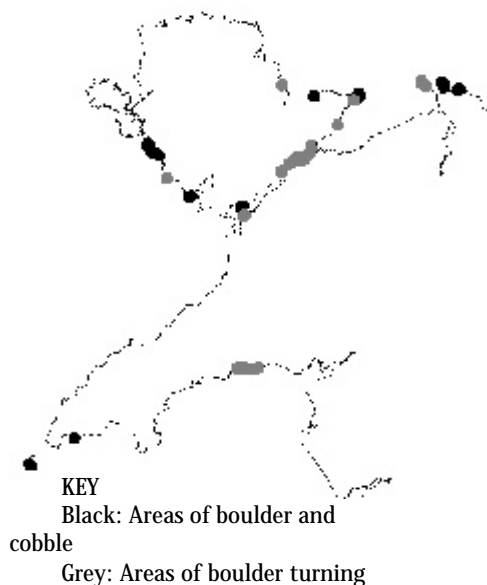


Fig. 6 Extent of boulder turning in boulder and cobble habitats

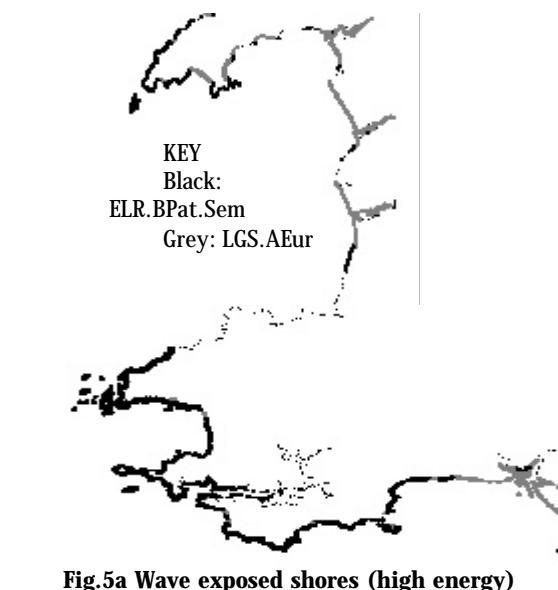


Fig.5a Wave exposed shores (high energy)
e.g. Barnacles and limpets on boulders
ELR.BPat.Sem and mobile sand with amphipods
LGS.AEur

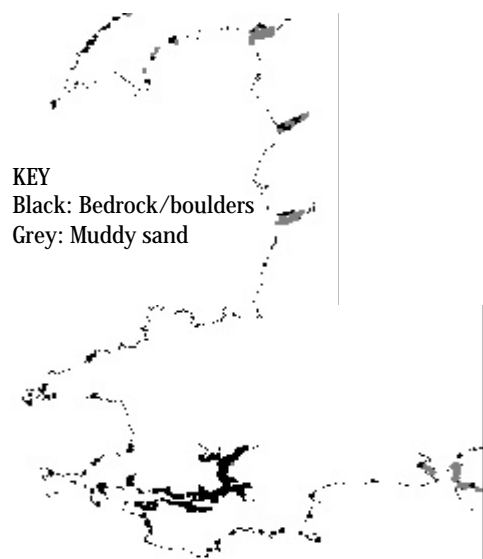


Fig. 5b Wave sheltered shores (low energy)
e.g. Muddy sand with polychaetes (worms) and
amphipods (shrimps), Mawddach estuary and bedrock
and boulders with egg wrack *Ascophyllum nodosum*,
Severn estuary

5. Data to support policy decisions in CCW

- Sites of Special Scientific Interest (SSSI) have historically been applied as far down the shore as Mean Low Water (MLW).
- Intertidal data has crystallised the view held by many that it is not satisfactory to protect **only** the part of the seashore above MLW through SSSI legislation.

Throughout Wales, SSSI designation is to lowest astronomical tide, providing protection to many areas of threatened biotopes.



Fig. 7 Intertidal Phase 1 survey map of
biotopes, also showing Mean High Water and Mean
Low Water (black lines).
South of Aberaeron, Ceredigion

6. Broaden knowledge of intertidal communities

The intertidal communities recorded are based on the JNCC 1997 version of the Marine Nature Conservation Review marine biotope classification for Britain and Ireland, Volume 1 Littoral biotopes. There is always the possibility of unusual or undescribed biotopes. For example, on the lower shore in the Severn estuary, there are boulders and cobbles with sponges *Haliclona oculata*, hydroid *Tubularia larynx* and barnacles

7. Improve understanding of the influences that effect the distribution of specific biotopes

e.g. Honeycomb reef worm *Sabellaria alveolata* biotope MLR.Salv (BAP habitat). The distribution of this biotope can be correlated with physical parameters such as shelter due to inshore shallows, long shore drift providing a supply of sand of the appropriate grain size, rocky substratum for the sand reef worm to use as an initial anchor.

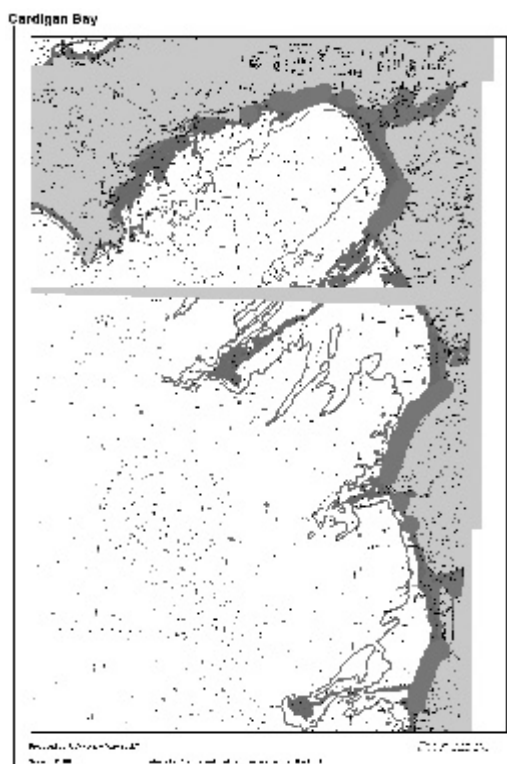


Fig. 8 Distribution of Honeycomb reef worm *Sabellaria alveolata* biotope MLR.Salv (BAP habitat)

carried out to collect additional data (i.e. on species, abundances, etc).

e.g. Extent of *Zostera noltei* on muddy sand and mud habitats. The map also gives a feel for the potential extent of the eelgrass bed, where the bed is fragmented

8. Distribution of nationally important biotopes

- Nationally important biotopes are those with a restricted geographic distribution or are threatened
- Due to their rarity, it has been difficult in the past to quantify 'how rare'.
- Nationally important biotopes are an important part of SSSI designation.

e.g. Distribution of the rockpool biotope LR.Cor.Bif, characterised by the brown alga *Bifurcaria bifurcata*. CCW mapping survey has identified numerous examples from the Pembrokeshire open coast, previously, there were no records from Pembrokeshire (NBN data).

9. Provide a baseline for use in developing monitoring programs

Having used the data to identify areas of importance for nature conservation value, the same data can provide information on the extent and quality of those areas. Once specific biotopes/habitats have been targeted using the mapped data, further, specific survey can be

Rare red algae in Wales

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Abstract only

The UK Biodiversity Group has selected only one marine red alga, *Anotrichium barbatum* (Ceramiales), as a priority species under the UK Biodiversity Action Plan. This small filamentous seaweed had not been seen in the UK this century, and had apparently vanished from its known former sites in S. England and the Channel Isles. In August 1998 a reproductive population of *A. barbatum* was discovered on the stabilized gravel of an old oyster bed at 7 m depth near Pwllheli, Cardigan Bay. It was found there in decreasing amounts over the following two years, then became undetectable in 2001. Two other Ceramiales algae not seen in the British Isles since the nineteenth century were found in Wales at the same time. *Polysiphonia sanguinea*, the UK status of which had been considered dubious, was growing abundantly with *A. barbatum*. At a sheltered shallow site in S. Pembrokeshire, *Polysiphonia foetidissima* was found in September 1998 on low-lying limestone bedrock outcropping from fine mobile sand. This species had not been seen in the British Isles since its original collection by Cocks in the autumn of 1855. The simultaneous reappearance of these three species at their northern limits in Britain could be coincidental, but might be related to the exceptionally mild winter sea temperatures of 1997/8 that permitted development of conspicuous populations.

Aspects of the ecology and distribution of the hermit crab *Diogenes pugilator*

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Diogenes pugilator (Roux, 1829) is a small hermit crab found only on limited parts of the coasts of Britain and Ireland. The most obvious feature distinguishing them from the familiar and widespread *Pagurus bernhardus* is that the left cheliped is the major one. The family Diogenidae contains species mainly with warm water distributions (Ingle, 1993), so that of the twenty species of hermit crab listed for British seas (Howson & Picton, 1997) only two are in the Diogenidae. Both these have southern distributions and only *D. pugilator* is found at all regularly. It is primarily a Mediterranean – Lusitanian species that presently reaches northern limits in Anglesey and on the west coast of Ireland (McGrath *et al.*, 2000).

Since *D. pugilator* also occupies similar gastropod shells to the right-handed pagurid crabs, the adaptive significance of reversal in the asymmetry of the chelae prompts several questions. This paper is based mainly on intermittent observations made by the author over a period of 30 years on the beaches of southwest Anglesey and from the supervision of three MSc projects on aspects of the comparative morphology and ecology of these hermit crabs (Widdop, 1979; Sabar, 1980; Pearce, 1998).

The species was first recorded on British coasts from specimens from “Worm’s Head” supplied to Bate in about 1850 by a correspondent named Dilwyn who lived near Swansea. It was figured under the name *Pagurus Dilwynii* by Bell (1858), who had not actually seen it himself. By the time Bell added the species to his “Stalk-eyed Crustacea” book, with notes on it taken from Bate, it had also been found in Cornwall by Couch. The early description mentions their ability to rapidly bury in the sand. From such comments and subsequent data on the ecology of this

specialised species, the Gower locality where Dilwyn collected it, was more likely to have been Rhosilli beach rather than the mainly rocky habitats at the nearby Worm’s Head. It still occurs 150 years later on several of the South Wales beaches, which like Rhosilli face on to Carmarthen Bay.

Table 1. Proportions of the populations of the *D. pugilator* found in various level bands relative to MLWS. Different search / sampling methods were used on the shore and in the subtidal zone so data from two parts of the vertical range cannot be combined, (A) shows percentages by shore levels – full tide range 5m. (B) shows percentages found by sub-tidal depth bands.

Beach Level (m to MLWS)	Proportions of those found on the beach
A. From counts on shore at Aberffraw	
> +1.5	2
+1 to 1.5	5
+0.5 to 1	18
0 to +0.5	62
	12
B. Averages from beam trawls off 3 beaches	
Subtidal depths (m)	Proportions of catches at each beach
0 to 1	38
1 to 3	25
3 to 5	22
5 to 7	10
>7	4

Near the northern limits of the range, *D. pugilator* has mainly been found on coasts with broad and rather flat sand shores, where it lives at around the LWS level and in the shallow water sand just offshore. Table 1 shows relative distributions on and just offshore from beaches in southwest Anglesey. It is probable that in summer about 75-80% of the Anglesey population lives in a zone between 0.5m above MLWS and depths of 4m just offshore. A feature of these gently shelving moderately exposed SW facing beaches is that waves impinging on them spill when breaking rather than plunging. Oscillatory water movements at the seabed are less turbulent than on steeper beaches. The sand on these beaches is well sorted with grain sizes spanning the boundary of the Wentworth scale categories between the medium and fine sand. The clean sand ground extends offshore rather than giving way quickly to muddier sediments in more sheltered locations

At the water's edge, *D. pugilator* buries rapidly in the sand. This takes only 10-15 seconds (average 12 secs.) (Widdop, 1979). When disturbed or rolled in the surf they react quickly to stabilise themselves by extending their limbs. In similar circumstances and at similar sizes, *Pagurus bernhardus* is very much slower to re-emerge after disturbance and if they try to bury themselves at all, they take more than a minute to do so. Close observation shows that *D. pugilator* uses the major chela by thrusting it into the sand almost as an anchor, while it rocks the shell and uses its walking legs to do the digging. The minor chela is also used to throw sand over the shell. Pearce (1998) also investigated the role of the major chela and using models was able to demonstrate the greater mechanical advantage of putting out a left major chela to stop overturning by wave backwash rather than using a right chela of similar dimensions.

The pagurids feed by scavenging (macrophagy) or by processing sediment with the mouth parts (microphagy). *Diogenes* spp. can use both these methods but they have pairs of extended setae along the antennae and, like mole crabs, antennary net feeding is

a prime food collecting method. *D. pugilator* can be seen to bury in the sand so that just the rim of the shell shows. From this position the antennae are swept alternately in circles at about 30-40 degrees above the horizontal (Widdop, 1979).

Most of the morphological differences between *D. pugilator* and the pagurids seem to relate to adaptations to life in the shallow surf-influenced zone of clean sand locations. *D. pugilator* seems to be a specialised occupant of this limited ecological niche where it can compete with the generalist *Pagurus bernhardus*.

In sediment choice experiments they showed strong preferences for sand of the grain sizes similar to the natural beaches and for sand that had not been previously dried. Hermit crab populations are often restricted in part by the availability of suitable shells. On Anglesey shores *D. pugilator* is most commonly found in *Hinia reticulata*, but when offered a super-abundance of shells in choice experiments, equal numbers occupied *Littorina* spp., while *Nucella lapillus* and *Gibbula* spp. were less often chosen.

In keeping with the general Mediterranean – Lusitanian distribution of *D. pugilator*, the range around Britain and Ireland (Figure 1) is limited to southern and south-western coasts. For such an easily recognised species there are still apparent gaps in the overall extent. The map shows a tendency for clusters of records from around several of the larger bays. There is doubt whether the species occurred on the Anglesey coast before 1945, though Pike & Williamson (1959) obtained animals from here for studies of reproduction. It was only found at several locations on the west coast of Ireland for the first time in the 1990s during the BIOMAR surveys (McGrath, *et al.*, 2001). The trend suggests that the species may be extending its range but that once a large embayment has been colonised the populations may become self sustaining rather than being dependant on intermittent recruitment from further south.

In Japan *D. nitidimanus* migrates on and

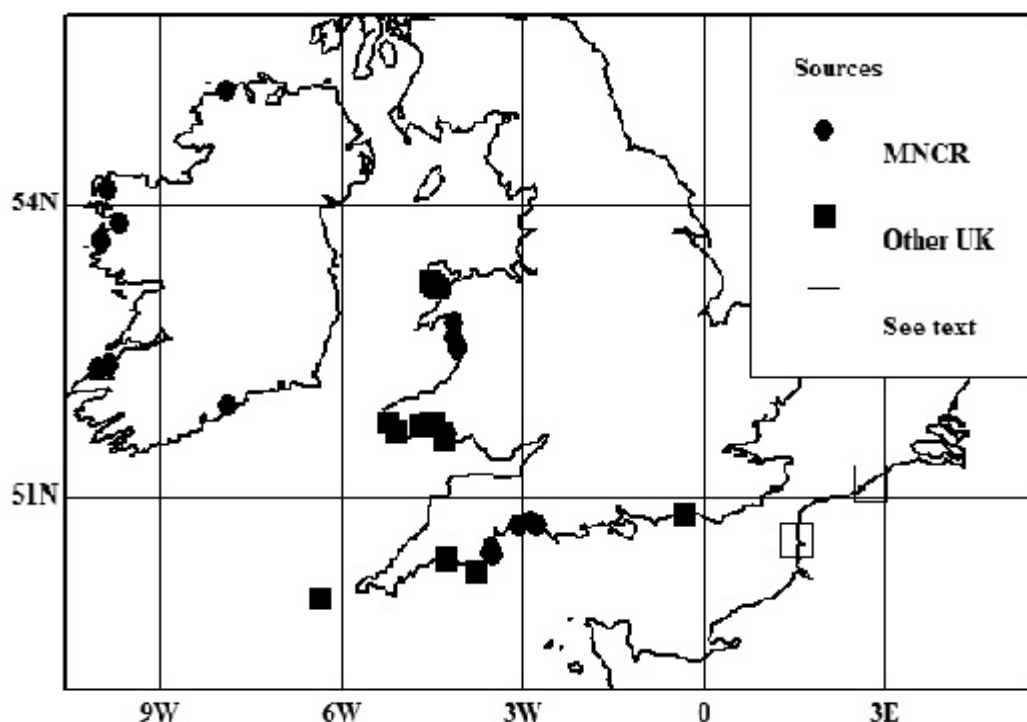


Figure 1. Distribution of *D. pugilator* around Britain and Ireland based on MNCR and BIOMAR survey records (circles), with other information from correspondents and published sources (squares).

offshore as part of the reproductive cycle (Asakura, 1987). Movement into the slightly warmer conditions found in the shallows adjacent to wide beaches may allow *D. pugilator* to breed in high summer at the northern limits of the distribution.

In the English Channel *D. pugilator* has frequently been recorded on the English side to the west of Portland Bill. They were abundant enough on a beach near Plymouth to be used for toxicity test experiments at the time of the *Torrey Canyon* oil spill in 1967 (Smith, 1970). On the continental side of the Channel the regular distribution extends much further northeast, along the beaches of northern France, to the sandy shores of the Dutch coast. In Belgium there are indications that they have become more common in recent years, though numbers are said to vary between years depending on the severity of the preceding winter (Strandgroep, 2002).

As a warmer water species occupying a specialised ecological niche, *D. pugilator* will be worth keeping records of, bearing in mind the possibility of climate change. It may

already be extending in range. They can readily be recognised in the field and, at least in high summer, can be searched for with ease. Mass emergence from the sand with other decapods, through some form of unexplained stress has been noted (Rees & Coppock, 2000), but other than catastrophic accidental pollution events, there are few credible immediate threats to the species. In Italy it was found to be one of the main by-catch species when hydraulic dredges were used in fishing for bivalve molluscs on shallow sand grounds (Hauton *et al.*, 2002).

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