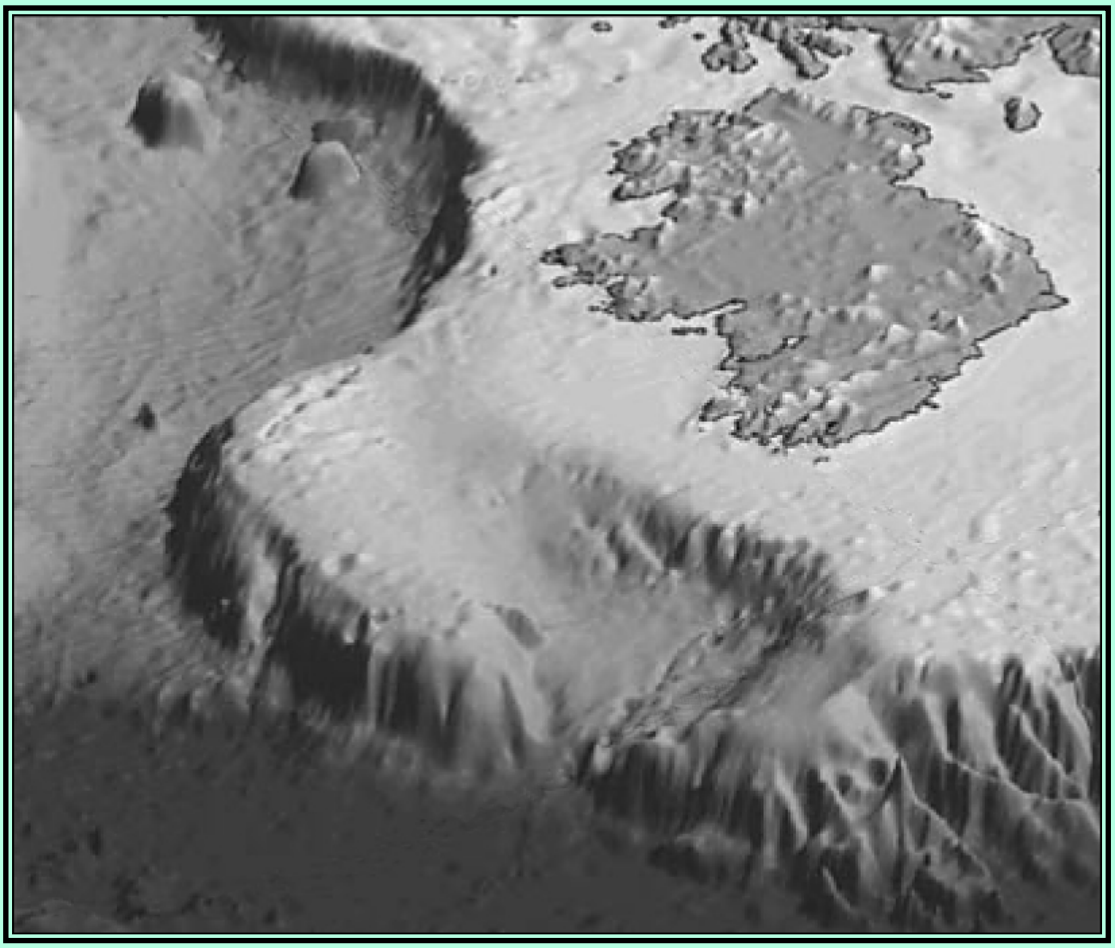
PORCUPINE MARINE NATURAL HISTORY SOCIETY

NEWSLETTER

Winter 2008/09 Number 25



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Porcupine Marine Natural History Society

Newsletter

No. 25 Winter 2008/09

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

Individual £10 Student £5

www.pmnhs.co.uk

Cover Image: This beautiful image of the Porcupine Bank was created by Bob Downie (Porcupine former council member Frank Evan's son-in-law) who is an oil sedimentologist

St Oswalds Bay, Dorset - P Tinsley

Editorial

Having completed 10 years as Hon. Editor and produced 25 issues of the newsletter I will, with much regret, be stepping down at the AGM in Plymouth in March. For the last few years Peter Tinsley has been helping with the Editorship and has done a marvellous job of putting order into chaos with all the material I send him, adding cheerful photographs and generally making the newsletter happen! He has offered to take over from me and will I'm sure make an excellent job of it, assuming the membership votes him in at the AGM. Getting material together for the newsletter is a time-consuming job and we rely on YOU, the membership, to send us copy. We are able and willing to publish short articles, accounts of field work, observations, photographs and news from the members and others, as well as the more formal papers from the Annual meeting. So please use your newsletter as a forum for all this and more. It's a great way to let others know what you are working on or to tell others about interesting records from your dives or shore rambles.

If anyone out there is interested in helping with the editorship in a more formal way or joining Council in any other capacity then do please let us know so that your name can be put forward at the AGM.

For the moment the newsletter will continue to be produced twice a year, once in summer (around June) following the Annual meeting and once in winter around January. It may also be possible to produce extra 'special issues' if there is particular interest from the membership on particular topics. Please let us have your ideas!

I myself am hoping to make use of the 'extra' time I will have, to start working through large numbers of photographs and specimens of sea fans and soft corals collected from the Semporna Islands over the last 10 years. I have been going out there with Elizabeth Wood as a volunteer from the Marine Conservation Society as part of a project that has included biodiversity work, reef monitoring and working with the local population culminating in setting up a new Marine Park. If you want to know more then visit www.sempornaislandsproject.com. And if anyone happens to have a high power microscope suitable for peering at sclerites and spicules, that they want to dispose of, please let me know!

I can't remember when I first joined Porcupine – sometime in the late 80s I think – but over the years I have made many friends and learned realms from field trips and meetings. It's a friendly and welcoming Society open to all ages and walks of life, so please encourage your friends and acquaintances to join. I shall certainly remain an 'acitive Porcupiner' for as long as I am able!

COPY DEADLINES

April 30th for Summer issue; October 31st for Winter issue

COUNCIL MINUTES

Minutes of Council Meeting held at 12.00 on 29 November 2008 at the Natural History Museum, London.

1. Present:

In attendance were Julia Nunn, Roger Bamber, Frances Dipper, Tammy Horton, Vicki Howe, Andy Mackie, Jon Moore, Roni Robbins, Peter Tinsley and Séamus Whyte, and Fiona Crouch (MBA) representing the organizers of the 2009 AGM and Conference. Apologies for absence were received from Sue Chambers, Anne Bunker, Sophie Henderson, Peter Barfield and Paul Brazier

2. Matters arising:

There were no matters arising from the Minutes of the previous Council Meeting.

3. Feedback on the 2008 Bangor Conference:

Paul Brazier reported (by letter) 73 delegates attended, there had been 20 speakers (19 talks) and 14 posters. Frances Dipper will follow up on the contributors of posters for publication in Newsletter (if only the list); the evening meal was attended by ~50 persons. The ensuing field trip was attended by 13 people, and a report on the trip has already been prepared for publication in the Newsletter. Paul gave thanks to Kathryn Birch, Tim Worsfold and others for supplying their species records for the report. Jon Moore and Paul Brazier will have a reconciliation meeting to agree the financial figures. Costs of the Meeting were in excess of £1100, income exceeded this including £55 subscriptions from new members.

All agreed that the Meeting was a success. The Council thanked Paul and all his helpers for a well-organized meeting and field trip.

4. Feedback from 2008 field trip:

In her absence, Jon Moore presented an account from Anne Bunker on the 2008 Pembroke Field Trip on 16-18 October; 15 Porcupines attended, and the event was deemed to have been a success. Plenty of marine 'aliens' were recorded (and photographed), and the trip was fortunate to have Professor John Ryland present. The report on the trip is pending. (Frances Dipper will chase this up. Julia Nunn further promised to do the report on the 2007 Kenmare field trip).

5. Finances:

Jon Moore reported that the financial situation was good. Subscriptions are up (Séamus Whyte was chasing those people in arrears) – past subscriptions collected amounted to £334 (back to 2003); this year's subscriptions amounted to ~£1500. Paul Kay donated a portion of the sales of his book at the Conference to the society. Newsletter costs over the year had reduced as there were only two issues during the year. Finances show the Society currently has total funds of ~£11,000..

6. DCUK2 Project (in collaboration with Plymouth University, SMBA and NOCS:

(with funding from Esmee Fairbairn Grant): Only Plymouth had spent a significant proportion of their first year's grant; the other partners expect to spend more during this (second) year and will catch up to target. (The first grant was issued in August 2007, but the first project meeting was in October 2007). The initial Progress Report is done; the Annual Report is pending. The second tranche of the grant was paid in November 2008.

Esmee Fairbairn seem to accept that, as much of the Porcupine input is by volunteers and not paid, we can use our allocation of funds for other Porcupine business. There will be no other funding income.

Reports will be circulated to Council members, and the annual report will be linked to our website (Action TH).

7. Porcupine Grants:

Tammy Horton reported on the 2 grant-funded projects which had been undertaken in the first year of this funding,

Paul Kay – Field-photography of gobies for identification (£600): the field-site was Loch Fyne (site changed owing to weather constraints). The project had been a great

success, many photographs had been taken of a range of gobies (and other fish), and the quality digital images were certainly good enough for identification. Those Council members who had seen his report were unanimously well-impressed. An account will be presented to the Newsletter, and a pdf will be linked onto the website. (The photographs will also be used in a pending book on Welsh fish).

Shelagh Smith – Molluscs from the Porcupine Abyssal Plain (PAP) (£300): Shelagh has collected the numerous boxes of Discovery molluscs from NOCS, and the project is progressing well; two or three new species plus new records have already been established. Her report will eventually appear in the Newsletter.

Council unanimously felt that both projects were a great success, and were encouraged by the progress of these Porcupine grants; thanks were given to Tammy Horton and Jon More for their mediation and administration.

Julia Nunn had received an enquiry for funding for another project (of up to £3000).

After discussion it was agreed that Julia would inform the applicants that they must submit for consideration to the next round of Grants (next year), for which the deadline would be shortly after the 2009 Conference (e.g. mid-April), but that an individual grant would not be as much as £3000. An announcement will appear in next issue of the Newsletter and on the Website.

Council discussed whether existing members should be favoured, or even non-members excluded, and whether such behaviour was legal under our charitable status. Wording in the announcement (applicants "should be" a member, even if not at the time of application) was considered to be acceptable.

We will consider the option of topping-up the grant-funds from another grant-awarding body after one more year under present system (and assessment of its success).

8. Membership:

Séamus Whyte reported the total number of members to be 238, including 196 active members, and 22 suspended pending review of their subscription arrears (these do not receive the Newsletter); the next attempt to contact these people will be in January. One member is overpaying and will also be contacted.

9. Newsletter:

The next issue will be Frances Dipper's last Newsletter as Hon. Editor. Owing to the continuing difficulties in obtaining sufficient copy, it was proposed to produce one Winter and one Summer (June/July) Newsletter as a matter of routine. This will require a change to the constitution (Rules of Procedure 11b). The next issue is likely to appear in February, owing partly to lack of copy. This should give time for the reports from the field trips and from Paul Kay mentioned above. In future Council would prefer the Winter issue to appear in January.

There remains a problem about getting copy from speakers at the annual conference. Council agreed that speakers must be asked to submit an abstract by the time of the meeting (for publication if no full paper was forthcoming) and that we strongly expect a report for the Newsletter.

Options for the future of the Newsletter (design, colour, etc.) will be discussed after the new Hon. Editor has been in post.

Séamus Whyte proposed the option of having electronic copy of Newsletter instead; Frances Dipper thinks it is feasible as well (pdf – which would include colour) rather than instead. With a lack of consensus on this issue, it was left for future discussion after the new Hon. Editor was in post.

10. Web-Site:

Tammy Horton produced some statistics about the web-site use (numbers of visits under various categories). Apologies were given again for virus which had got in via a photo-gallery; this gallery has now been removed. Tammy will look into a new gallery so that we can include photographs. Electronic back copies of the Newsletter on the Web-Site will be up to five issues ago (only), together with contents lists only of the more recent issues. The pending CD will offer the whole back copy.

11. Recording scheme:

Roni Robbins reported that no records had been received since the previous meeting, thus none had been 'convened'. Records from last-year's field meetings will go onto the NBN by the time of the next AGM.

12. Porcupine T-shirts:

We have no update since earlier correspondence from Oliver Chope (who is offering the t-shirts). Nor had we received a sample to look at. Roger Bamber will contact WTSPC for comparison. Meanwhile, the Plymouth Conference organisers (Fiona Crouch) will look into producing a 2009 Conference t-shirt as a one-off. Julia Nunn will keep the Council updated on t-shirt progress.

13. Retiring Officers:

Julia Nunn and |Frances Dipper are standing down from their posts of Hon. Chairman and Hon. Secretary respectively at the next AGM. Both expressed their willingness to remain on the Council. Peter Tinsley will stand as Hon. Editor; by the 2009 AGM he will formulate his ideas for the future direction of the Newsletter, and what help he may need (and from whom). Andy Mackie is willing to stand as Hon. Chairman. The other Office Bearers are all willing to remain in post if so elected. Peter Barfield and Paul Brazier are the current candidates for stepping down from Council, and both will be available for re-election if they so wish.

14. Conference and AGM 2009:

Fiona Crouch, Plymouth University, was present from the organizing committee, also representing Jason Hall-Spencer and others. She informed Council that the lecture theatre (100 capacity) has been booked for Friday 27 and Saturday 28 March 2003, plus various atria for registration, etc.. Also a "Main hall" in the Davy Building will be available for tea/coffee breaks and posters. Al Hughes (NOCS) and Kerry Howell (Plymouth) have already agreed to give talks. The theme will be shallow to deep – "from seashore to sea-floor". On the Sunday, proposals for fieldwork were Wembury for a shore trip, plus a boat for diving at Bovisand. Tides will be springs. Jon Moore will send the Porcupine conference-organizers' pack to the Plymouth people.

Potential other speakers were discussed and suggested, and will be pursued (action on all members of Council who offered).

15. Field meeting 2009:

Proposals were made for:

- SE England – e.g. Kent (linking with Wildlife Trusts);
- as an easy option the Conchological Society has a field trip to Skye in October with which we could collaborate;
- a diving trip in Dorset (Peter Tinsley) with non-divers doing laboratory-based work.

Likely dates are July or August.

16. Date of next meeting:

The next meeting of Council will be on Friday 27 March at Plymouth.

17. A.O.B.

SAHFOS/MBA asked for funding to support a plankton workshop: Council decided not to offer funding support for it.

Roger Bamber will try to track down possession of banners and *Scubahystrix* (which will hopefully appear at the 2009 Meeting).

There being no other business, the meeting finished at 16.08.

PORCUPINE 2009 Sea Shore to Sea Floor

PMNHS Annual Meeting 27-29 March 2009

As usual the meeting will be over three days with the Friday and Saturday dedicated to talks and held in the University of Plymouth, Davy Building, Main Hall. On the Sunday in keeping with tradition, we are planning dive trips and visits to local shores. Facilities for sorting and identification will be provided at Coxside Marine Centre in Plymouth, with access to microscopes and running seawater.

Registration/putting up posters/chatting with mates will be from 9.30-10.00 Main Hall Davy Building on Friday 27 March 2009 and the meeting will continue from there.

The following speakers are confirmed and others have been approached: Roddy Williamson (Director of the Marine Institute, University of Plymouth), Alan Hughes (updating the classification of deep sea sediment habitats, NOCS Southampton), Kerry Howell (updating the classification of deep sea hard bottom habitats, University of Plymouth), Chris Proctor (describing sea cave sponges in SW England), Sally Sharrock (Devon Seasearch coordinator) and Fiona Crouch (Shore Thing Project Officer, Marine Biological Association).

Please contact the local organisers; Maria Campbell (maria.campbell@plymouth.ac.uk), Fiona Crouch (ficr@MBA.ac.uk), Keith Hiscock (khis@MBA.ac.uk) and Jason Hall-Spencer (jhall-spencer@plymouth.ac.uk or call 0044 1752 232969 if you would like to attend and also let us know if you would like to give a talk or a poster presentation at the meeting.

Further details will be e-mailed to members and others and posted on the website. Costs will be similar to previous meetings. Speakers will not be charged the registration fee.

OTHER MEETINGS

15th January to 27th February.

Environmental Photographer of the Year 2008 Exhibition. Apothecary Gallery, 33 Greyhound Road, Hammersmith, London, W6 8NH. Please call ahead to arrange a viewing between 10 am and 6pm on 020 7381 5727 or email info@londonapothecary.co.uk. For more information, go to www.ciwem.org/arts/photographer

25th February 2009.

Hidden worlds beneath the waves. Engaging people with undersea landscapes. Coastnet and the Wildlife Trusts. The Guildhall, Alfred Guelder St, Hull. Contact: Theresa Redding 01206 728644 CoastNet (Conferences), The Gatehouse, Rowhedge Wharf, High Street, Rowhedge, Essex CO5 7ET

30th March -3rd April 2009.

Improving the ecological status of fish communities in inland waters. University of Hull International Fisheries Institute. Contact: www.hull.ac.uk/hifi/EFI/ or email hifi@hull.ac.uk

29th-30th April 2009.

CIWEM annual conference. Water and the global environment. Olympia conference centre, London. Contact: bob.earll@coastms.co.uk

Porcupine Marine Natural History Society AGM 2009

The Annual General Meeting of the Society will be held at Plymouth University, Plymouth, Devon on Saturday March 28th 2009 (during the Annual Conference).

In accordance with the Constitution, at least two ordinary Council Members must retire each year, but may make themselves available for immediate re-election. Retiring members this year are Paul Brazier and Peter Barfield. Paul Brazier and Peter Barfield are both available for re-election. In addition, Julia Nunn and Frances Dipper who have stepped down as Officers for the Society have been proposed as ordinary Council members.

Any proposals for additional candidates are very welcome, and names should be sent to the Chairman Julia Nunn: jdn@cherrycottage.myzen.co.uk

Office-bearers retire annually and are normally available for immediate re-election. This year office bearers available for election are listed below.

The Council proposes the following office bearers

Chairman: Andy Mackie

Hon. Treasurer: Jon Moore

Hon. Editors: Peter Tinsley

Hon. Secretary: Roger Bamber

Hon. Membership Secretary: Seamus Whyte

Hon. Records Conveners: Roni Robbins

Hon. Web Site Officer: Tammy Horton

Any proposals for additional candidates for officer posts should be sent to the Chairman Julia Nunn: jdn@cherrycottage.myzen.co.uk

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

Proposed Constitution change to Rules of Procedure section 11b

11. Activities of the Society shall include:

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

To be amended to (change underlined):

11. Activities of the Society shall include:

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

Porcupine Marine Natural History Society Small Grant Scheme – 2nd round

The Porcupine Marine Natural History Society is pleased to announce an opportunity to apply for funding for small research projects. A total fund of £3000 is available for small projects of one to three months duration. Applications will be considered for any small project which falls within the objectives of the Society.

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

Projects may be field based or pursued in a laboratory or museum. The projects could vary from basic sorting and identification, to specialist identification/study of a particular taxon of interest.

The purpose of any project would be to make information more accessible to the wider community, and therefore at least a written summary (e.g. a report for the newsletter and website) of any work undertaken will be required. Any publication of the findings from work undertaken using the PMNHS Small Grant must acknowledge the Grant and the Society. The fund may be used for research costs only,

and applicants are expected to fund their own living costs.

PMNHS Council would particularly encourage applications to study the *Discovery Collections*. The *Discovery Collections* at the National Oceanography Centre, Southampton (www.nocs.soton.ac.uk), house a great variety of both sorted and unsorted samples from the Porcupine Seabight and Porcupine abyssal plain, and provide an exciting research opportunity that could lead to the discovery of species new to science. The *Discovery Collections* differ from other collections in that they are dedicated solely to samples from the open ocean and the deep sea. They contain many unique and exotic animals. The *Discovery Collections* are used primarily for ecological research, and as a result the *Collections* are currently ordered so that whole samples, and hence communities, may be examined, rather than ranked by taxon, as in most museums. The samples have been collected using both quantitative and semi-quantitative gear, such as multicorers, box corers and acoustically monitored epibenthic sledges, otter trawls and midwater nets. The *Collections* provide important base-line data on the deep-sea environment for measuring ecosystem change and for studying local and regional biodiversity.

These collections are available for study as part of the Porcupine Marine Natural History Society Small Grant Scheme. Samples would normally be worked on at NOCS in Southampton, but may be studied in alternative approved institutions on a loan basis. Please contact Dr Tammy Horton (Discovery Collections Manager – txh@noc.soton.ac.uk) for further details if you would like to submit a proposal to study the collection.

Eligibility

Applications will be accepted from students, researchers, or any person willing and able to carry out the necessary research, under appropriate supervision if that is deemed necessary. Applicants should be members of the Porcupine Marine Natural History Society (you do not have to be a current member, but must join the society to be eligible). These grants are open to all, irrespective of status, whether professional or amateur marine biologist or environmentalist. Projects will be excluded which are part of the professional work of the applicant or are part of an undergraduate or post-graduate degree programme.

Application

The application for grant should include:

- a full description of the proposed project
- when and where the project will be carried out
- the proposed time scale to complete the project
- the expected outcomes which will result from your project.
- proposed publication plans for the results of the project
- a full CV of the applicant, together with details of relevant experience or training
- detailed proposed expenditure for the project

All proposals will be assessed by a panel from the PMNHS Council, and the best proposal(s) granted. The Council reserves the right to not grant any projects in any one round of applications.

Applications must be submitted by Thursday 30th April 2009 – late applications will not be admitted.

Please send applications to:

Dr. Julia Nunn, Chairman, Porcupine Marine Natural History Society

Cherry Cottage, 11 Ballyhaft Road, Newtownards, Co. Down BT22 2AW

Northward spread of the immigrant barnacle *Elminius modestus* on the British North Sea coast

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Following its discovery on test plates in Chichester Harbour in 1946 (Bishop, 1947), the immigrant barnacle *Elminius modestus* spread rapidly along the south and east coasts of England, being recorded by 1948 in suitable locations between Norfolk and Dorset (Crisp and Chipperfield, 1948). Its first arrival in England from Australasia was clearly by ship and this type of remote dispersal resulted, as Crisp observed, in the species appearing at first in isolated places, in Holland, the Irish Sea and on the French coast. Later, in 1977 a healthy but isolated population was discovered by Hiscock *et al*. in Vidlin Voe in Shetland (Hiscock *et al*., 1978). At the same time, spreading up the east coast of England, it had reached the Humber by 1950, where it appeared for a time to halt (Crisp, 1958).

But the advance of *Elminius* was not long interrupted at the Humber for by 1960 Crisp had reported its presence at Saltburn (54° 35′N) near the mouth of the Tees (Crisp, 1960). Following what was clearly a remote dispersal by ship, *Elminius* was found in the Firth of Forth, supposedly arriving at Rosyth around 1958 (Jones, 1961). From there it appears to have spread rapidly round the Fife coast, reaching Tayport (56° 27′N) on the south side of the Tay by 1961 but south eastwards extending only as far as Dunbar (56° 00′N).

Meanwhile, in 1958 I had discovered a single colony at Newton-by-the-Sea (55° 31′N) in north Northumberland (Evans, 1958). At this time *Elminius* was present from Dunbar northwards and from Saltburn southwards but with this single discovery in between. On finding this colony I made a search at a dozen sites along the Border coast for further examples but specimens were found only as far north of Saltburn as West Hartlepool and Seaham (54° 50′N). Apart from at Newton no other animals were discovered as far north as Eyemouth (55° 52′N).

However, by 1979 the coast between Seaham and Dunbar was widely colonised (see Evans (2000) for Northumberland records) although my return visits from 1970 onwards showed that the species was by no means secure at individual sites, *Elminius* having almost disappeared, for instance, at Newton. The site of commonest occurrence in Northumberland is on the causeway to Holy Island (55° 41′N), where it has been constantly found.

In 1981 a visit to the Fife coast found the species to be common at a number of sites between Aberdour (56° 03′N) and Tayport. The barnacle had by now succeeded in crossing the Tay and in this year a few were to be found at Broughty Ferry (56° 28′N) on the north side. Further north, at Arbroath and at Montrose (56° 43′N) it appeared entirely absent.

In 2008 a further examination of the coastline north of the Tay showed a small extension of the species range. *Elminius* was now present in very small numbers at Montrose. However, visits to Johnshaven (56° 48′N) and Gourdon (56° 50′N), a little further north, revealed no examples.

Clearly, given its slow advance, the species is proceeding northwards under difficulty in the northern North Sea at what may be near the limit of its mainland range, but the fact that it continues to make slow progress indicates some adaptability. There are few sites in eastern Scotland and northeast England where it is sufficiently common for significant reproduction to take place but its orderly movement up the British North Sea coast suggests nevertheless that new settlement is largely by development although ship dispersal

must not be overlooked. Crisp and Southward have discussed the difficulties this intertidal animal has in crossing even fairly narrow seas (Crisp and Southward, 1953). Sites possibly to be colonised in the future are Stonehaven and Aberdeen and a watch on these ports is desirable.

A list of sites I have examined, together with dates, has been lodged with the Porcupine Records Convenor. A more general description of the distribution of this barnacle around Britain has been given by Southward (Southward, 2008).

References

Bishop, M. W. H. 1947. Establishment of an immigrant barnacle in British coastal waters. *Nature* **159**: 260.

Crisp, D. J. 1958. The spread of *Elminius modestus* Darwin in north-west Europe. *Journal of the Marine Biological Association of the U. K.* **37**: 483-520.

Crisp, D. J. 1960. Northern limits of *Elminius modestus* in Britain. *Nature* **188**: 681.

Crisp, D. J. and Chipperfield, P. N. J. 1948. Occurrence of *Elminius modestus* (Darwin) in British waters. *Nature* **161**: 64.

Crisp, D. J. and Southward, A. J. 1953. Isolation of intertidal animals by sea barriers. *Nature* **172**: 208-209.

Evans, F. 1968. Isolated population of *Elminius modestus* (Crustacea: Cirripedia) in Northumberland. *Nature* **220**: 260.

Evans, F. 2000. *"The Marine Fauna and Flora of the Cullercoats District"* Vol. 1. University of Newcastle upon Tyne: 213.

Hiscock, K., Hiscock, S. and Baker, J. M. 1978. The occurrence of the barnacle *Elminius modestus* in Shetland. *Journal of the Marine Biological Association of the U. K.* **58**: 627-629.

Jones, D. H. 1961. *Elminius modestus* on the southeast coast of Scotland. *Nature* **190**: 103-104.

Southward, A.J. 2008. *Barnacles*. Synopses of the British Fauna (New Series) **57.** Field Studies Council. 140pp.

The NMBAQC Scheme – Friend of Foe to the Benthic Ecologist?

The views expressed here are those of the author and not nedessarily those of Porcupine

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In the Summer 2008 issue of Porcupine (No.24), Peter Garwood presented a Porcupine Piece expressing his personal view on the BEQUALM / NMBAQC Scheme. Peter has already made his views known to the NMBAQC committee who have responded in some detail on several occasions, providing explanations and clarifications on all issues he has raised. As much of this discussion post-dates the submission of Peter's article (in Jan 2008) it seems worthwhile to re-iterate some key points here in order to put the record straight on factual matters and to dispel some misconceptions about the scheme. (Detailed information about the origin, purpose, and scope of the scheme is available at www.nmbaqcs.org.uk).

I would like to offer a view of the scheme from a broader perspective. I am a fellow Porcupiner, and share with Peter, a long held enthusiasm for taxonomy of marine benthic invertebrates. However, I also wear additional hats as an NMBAQC participant, from its inception 15 years ago, as a senior scientist employed by the Scottish Environment Protection Agency (SEPA) which is one of the Competent Monitoring Authorities (CMAs) and also as a member of the NMBAQC committee. With a foot in all these different camps, I can perhaps appreciate the scheme in its wider context and espouse some of its positive attributes.

What and who is the NMBAQC Scheme for?

The UK National Marine Biological Analytical Quality Control (NMBAQC) Scheme was initially set up by the Department for Environment, Food and Rural Affairs (DEFRA) in 1994 to provide a Quality Assurance (QA) scheme for government agencies collecting marine macrobenthic data as part of the UK National Marine Monitoring Programme (NMMP). No appropriate scheme existed

then and the NMBAQC still appears to be the only such scheme in the UK. A similar scheme operates in Germany run by the federal government for their labs. The various agencies (now referred to as CMAs) include the EA, SEPA, NIEA, FRS, CEFAS, JNCC, and CCW and they are all required to participate fully in the relevant auditing and training exercises of the scheme.

DEFRA policy now requires QA of all data contributing to national, European, or international programmes, such as UK CSEMP (formerly NMMP), the European WFD (Water Framework Directive), or OSPAR (Oslo/Paris Commission) assessments. With the implementation of the WFD by various UK CMAs, from 2007 any data utilised for an ecological quality assessment must be validated via a recognised national QA scheme (where such a scheme exists). Hence data provided by contractors or licensees to CMAs, including aquaculture assessment data, is now treated in a similar manner to any other CMA data and the participation of contractors in a QA scheme is required to ensure an acceptable quality standard. While it may seem to some that contractors are being "forced" the join the scheme, CMAs merely require the minimum level of participation (i.e. Own Samples audits) which is generally less onerous than the quality assurance undertaken within most CMA laboratories. It seems reasonable when awarding a contract to expect good quality assurance and if the DEFRA have set up a unique UK scheme for that very purpose, it also seems logical that CMAs insist that their contractors utilise that scheme. As we say in Scotland "He who pays the piper calls the tune"!

What the scheme is not.

It is explicitly stated on the NMBAQC website that it is ***not*** an accreditation scheme and has never been portrayed as such. The scheme is not intended as a substitute for laboratory accreditation or good internal quality control procedures but aims to augment these. Performance within the scheme can be used as evidence of external auditing or quality control for a laboratory seeking accreditation from an authorised body, or a CMA may legitimately use performance as a gauge of a contractor's competence, either before or after awarding a contract. However, neither of these are the intended purpose of the scheme. The aim is to benefit the CMAs by providing and reporting quality assurance for data sets being produced for, or by, the CMAs, based on an independent selection of samples for audit.

The "emerging monster"?

In 2003 the NMBAQC Scheme was adopted by BEQUALM (Biological Effects Quality Assurance in Monitoring Programmes) as a model to progress its Community Structure Analysis component. This involved offering the services of the UK scheme to other European laboratories taking part in international or national monitoring programmes. While the scheme is clearly appropriate to adjacent European countries monitoring NE Atlantic waters, actual take up by European labs has so far has been rather piece-meal. Perhaps with the commencement of European WFD monitoring from 2007 the QA mantra may become more deeply instilled in our continental colleagues.

With the arrival of WFD the NMBAQC has recently begun to expand its remit from the Macrobenthic Invertebrate Component (and supporting Particle Size Analysis) to cover all the WFD Ecological Quality components for marine waters which includes invertebrates, phytoplankton, macroalgae, and fish.

For the newer components of the scheme, the initial focus has been on training exercises rather than sample auditing exercises. Many CMA analysts are new to these fields and all need to achieve an equal and acceptable standard. The training exercises act as a pre-cursor to the subsequent development of exercises which actually audit real samples (in as far as that will be possible). However, for the Invertebrate Component which has become well established over the last 15 years, the emphasis is shifting from training to auditing exercises. The invertebrate Ring Test exercises, for example, which until recently, were mandatory for all, are no longer so – although they are still very strongly recommended. Indeed, recent feedback from new participants

in the scheme indicated that they found this module more valuable than anticipated.

Sitting in on NMBAQC meetings I see no "emerging monster" trying to take over marine monitoring in the UK or Europe. Sure we want the quality mantra to spread, but we are not the "benthic police" – just a bunch of committed marine ecologists arguing about how best to do things! Arguing about sampling equipment and sampling techniques, about fixing and preserving, about sieving and storing, about sorting and staining or about blotting and weighing. We have lengthy deliberations too on faunal identifications, on taxonomic keys and literature, on setting targets and standards (not to mention keeping the scheme financially viable) – all directed towards the end product – Quality Assured data! It should be noted that all the committee members' costs are met by their respective CMA's and not by the scheme. This is even the case for the contractor's representative, who sits on the committee to bring any issues raised by contractors to the table.

Scheme flexibility and costs

The methodologies utilised by the CMAs for NMMP/CSEMP and WFD macrobenthic monitoring programmes (i.e. 0.1m^2 Day or Van Veen Grabs, processed on 0.5 or 1.0mm sieves) are sufficiently similar for both to be incorporated into the NMBAQC scheme Invertebrate Component. There has been some discussion whether aquaculture monitoring programmes (which use smaller grab samples, 0.02 or 0.025m^2) should be assessed in the same manner, and at the same cost, as CSEMP or WFD samples. Evidence to date suggests that aquaculture macrofaunal samples are often just as diverse (and just as costly to audit) as the larger grab samples. Although this may seem counter-intuitive it may be related to a broader mix of sediment types around fish farms in shallower waters, including coarser grits or maerls with very rich infaunal communities. Hence the audit procedure has been deemed appropriate for both CSEMP/WFD and aquaculture samples. The committee do review the scheme's scope and operation and it would be misleading, as has been suggested, that the Invertebrate Component is currently being used to assess survey work for which it was not designed.

While it has been argued that sample audit costs within the scheme should reflect the actual audit costs of individual samples of varying size or type, this would present considerable administrative difficulties as the Invertebrate Component is required to be costed and funded as a whole in advance. Therefore, the costing is based on the estimated average costs of sample processing plus reporting and the administrative overheads of the exercises of the schemes contractor. Provided the range of sample types is not too large then this is generally simpler and fairer. While the scheme does aim to be flexible it also has to be cost efficient. Conducting and reporting quality assurance is expensive and analytical labs frequently spend 20-25% of their budgets on quality control alone. Separating identified macrofaunal taxa into individual vials, for example, may be considered a tedious burden by some analysts but is routine practice in many CMA labs to facilitate internal and external QA procedures. Such practices do have additional costs and may seem like extra hoops to jump though, but they are necessary for proper auditing. There is little point in carrying out expensive monitoring programmes if they don't produce good quality assured data. Quality assurance is not something that should "be avoided" – it should pervade all the processes from beginning to end (O'Reilly, 2001). The thoroughness of the QA procedures provides considerable added value to the data.

While the costs of participation can be budgeted for by CMAs they may represent a significant burden to individual persons/ analysts vying for CMA contracts. A shared membership option has been introduced to help alleviate this difficulty. Contractors can and do, of course, pass the costs back to the CMAs via elevated charges for sample analysis. Of course it might be better if DEFRA funded the scheme up front with a generous block grant. However, government departments have their own ways of funding operations which might seem arcane to us scientists and, try as we might, it is difficult for a committee of marine ecologists to influence government fiscal policy.

Benefiting the benthic ecologist

Putting aside all the in and outs of costs and charges, just how does participation in the Invertebrate Component benefit the marine ecologist behind the microscope?

Although sample auditing is at the core of the scheme, it is very much more than an auditing service. The scheme promotes best practice for sampling and analytical methodologies and development of standard operating procedures (see Cooper & Rees 2002, Proudfoot *et al*. 2003). These are of vital importance for quality, but are not always appreciated by the practising marine ecologist. I remember when quality assurance was first mooted in our lab (perhaps 20 years ago?) being initially horrified at the suggestion we would actually have to re-analyse 10% of our samples! The quality concept has come a long way since then. The scheme also aims to improve standards and develop taxonomic/identification skills. The exercises are designed to identify sources of error in analytical processes and these are highlighted in bulletins and reports. There have been numerous training workshops on field techniques or taxonomic identification of invertebrates run under the NMBAQC banner. The taxonomic workshops may be set at a level for beginners introducing them to various groups, including some tricky ones such as Oligochaetes that most beginners try and avoid (see Worsfold, 2003). Alternatively there are "expert workshops" for more experienced analysts, focused on particular difficult invertebrate groups and led by a recognised expert in that group. Participants can bring along their own problem taxa or view reference material brought along by the workshop organiser.

The Ring Test training exercises circulate specimens of a wide range of invertebrate fauna from the northern North Sea to waters off the southern UK coast. These may include poorly known species whose occurrence in UK waters has been overlooked (i.e. missing from standard keys), new arrivals moving north with global warming, or alien taxa spreading into new habitats. Targeted Ring Tests focus on difficult faunal groups, such as Cirratulids, Oligochaetes, or small Gastropods.

The Lab Ref. exercise encourages participants to establish their own reference collections by enabling them to get voucher specimens verified, or alternatively they can use the exercise as an "Identification Amnesty" and send in a collection of specimens of which they are uncertain and the scheme contractor will try and establish the identities. Participants are encouraged to challenge the scheme contractor if they disagree with species determinations in any of the exercises. In such cases the opinions of recognised experts may be sought. Sharing knowledge gained from such discussions is of benefit to all participants. While opinions of experts may vary, the "correct" answer is out there – though it may require some revisions and re-descriptions from experts to clarify the matter. This is one way that taxonomy moves forward, with ecologists, at the blunt end of monitoring, puzzling over their unusual finds and feeding information and specimens to specialists!

As a practising macrobenthic taxonomist working in coastal waters of south-west Scotland for over 25 years, you might expect that I had seen it all by now, had honed my identification skills to tiptop and was an expert in the invertebrate fauna of my local area. Not so! In recent years I have had to review many of my determinations on Cirratulids, Maldanids, or Oligochaetes (to name just a few) in the light of new information received through the scheme exercises or workshops. In fact I am still turning up species new to my own area, or even new to UK waters. The scheme has very much been at the forefront of this process. The provision of an up-to-date searchable literature guide for marine invertebrate taxa around UK waters, along with new or revised keys is a prerequisite to help me keep abreast of taxonomic developments. The taxonomic guides produced for NMBAQC workshops, eg. on Cirratulids (by Tim Worsfold, 1996, 2006) or, more recently, on Maldanids (by Peter Garwood, 2007), are written to deal with typical samples of preserved specimens of various sizes which are often incomplete or fragmented. These new guides represent a huge advance on previous published keys which are rarely comprehensive, often out of date taxonomically, and tend to assume

all material is in perfect condition. Indeed, additional guides, funded by the NMBAQC have been published in Porcupine (Worsfold. T. M. 2006, 2007). All in all, the scheme enables the ecologist, whether greenhorn or old-timer, to get hands-on experience of a broad range of marine invertebrates, sharing information with other ecologists on distributions, key features, problems or errors in existing keys, and new or obscure literature sources. In my experience, over the last 15 years, the scheme has been instrumental in developing the field and analytical skills of its participants and has been of enormous practical help to the benthic ecologist at the lab bench.

References: (available from www.nmbaqcs.org.uk, except Unicomarine, 1996).

Cooper K.M. & Rees, H.L.,(2002). National Marine Biological Control Scheme (NMBAQC): Review of Standard Operating Procedures. NMBAQC/CEFAS Science Series, Aquatic Environment Protection: Analytical Methods No.13. 57pp.

Garwood, P.R. (2007). Maldanids: A guide to species in waters around the British Isles. 32pp.

O'Reilly, M. (2001). Implementing Quality from Beach to Bench. Pp.23-27, in: Moore, P.G.(2001)(Ed.), *Developing and sharing best practice in marine-related fieldwork*. University Marine Biological Station Millport, Occasional Publication, No.8, 61 pp.

Proudfoot,R.K., Elliott,M., Dyer,M.F., Barnett,B.E., Allen, J.H., Proctor,N.L., Cutts,N., Nikitik,C., Turner,G., Breen,J., Hemmingway,K.L.,and Mackie,T. (2003). Proceedings of the Humber Benthic Field Methods Workshop, Hull University 1997. Collection and Processing of macrobenthic samples from soft sediments; a best practice review. Environment Agency. R & D Technical Report E1 – 13/TR, 128pp.

Unicomarine (1996). A guide to the Family Cirratulidae, including a key to anterior portions. Version 1.00 (RT09), Report to NMBAQC Committee, Sep. 1996, 44pp., 16 figures.

Worsfold, T. (2003). Introduction to Oligochaetes. NMBAQC Workshop 2003, 22pp.

Worsfold. T. (2006). A provisional update to the identification of UK Cirratulidae. BEQUALM/NMBAQC Taxonomic Workshop, Dove, Nov. 2006. 15pp.

Worsfold. T. M. (2006). Identification Guides for the NMBAQC Scheme: 1. Scalibregmatidae (Polychaeta) from shallow seas around the British Isles. Porcupine Marine Natural History Society Newsletter 20: 15-18.

Worsfold. T. M. (2007). Identification Guides for the NMBAQC Scheme: 2. Goniadidae, with notes on Glyceridae (Polychaeta) from shallow seas around the British Isles. Porcupine Marine Natural History Society Newsletter 22: 19-23.

Problems in taxonomy: are *Dodecaceria laddi* and *D. diceria* the same species?

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Dodecaceria fimbriata (in the sense used by Gibson) found in the Northern Hemisphere and *D. berkeleyi* in the Southern are apparently morphologically identical. Their bipolar distributions appear to be an example of convergent evolution (Gibson, 2008)[1]. However, such evolution usually leaves small morphological differences between the species, evolutionary legacies, and these have not been found in the two species. An alternative explanation for their similarity is that they were separated by continental drift during the Precambrian (Gibson, 2008). This however supposes that the two species have not evolved since their separation. Such stasis would be possible if structures evolved to a point where they could not be improved upon. That is, improvement would be metabolically too costly. Other polychaetes that evolved in the Cambrian or before may have reached a similar evolutionary state.

Crotchets

The taxonomy of polychaetes depends on a subjective comparison of their morphology and particularly the chaetae. In *Dodecaceria* crotchets (hook-like structures) are particularly important in this respect[2]. They have a slight serpentine profile and a subterminal tooth, a raised region or ledge. The hook frequently has a distal depression or spoon (Figure 1a).

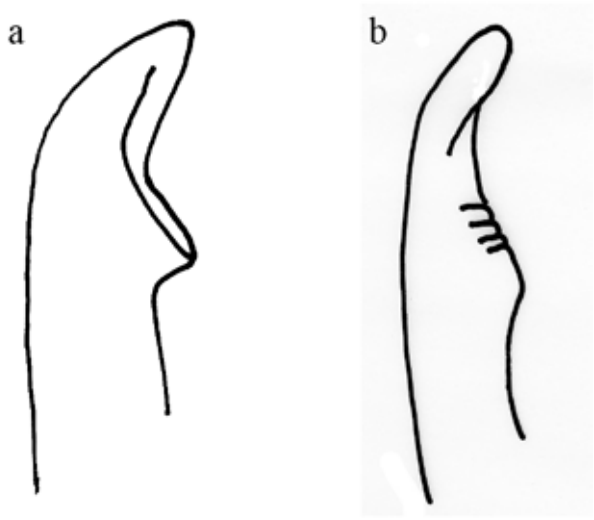

Figure 1. Drawings of the crotchets of Dodecaceria *using a X40 objective, a)* D. fimbriata *and* D. berkeleyi *and b)* D. diceria *and* D. laddi

In *D. fimbriata* and *D. berkeleyi* the crotchets appear to be the same as one another (Figure 1a). Again, in *D. diceria* and *D. laddi* they are apparently identical (Figure 1b) to each other. In the second pair of species the distal region, although hooked, does not have a depression and is without as marked a tooth or raised region seen in the first pair of species. In *D. diceria* and *D. laddi* the base of the hook runs smoothly into the shaft. The lower region of the hook is corrugated although this is on occasions only visible with an oil immersion objective. The corrugation can appear as lobes or blunt teeth.

The problem in using a characteristic crotchet for identification is that a species normally also has many forms of crotchet and these are found in other species in the genus. Therefore identification of a specimen depends on searching through the crotchets to find the defining type.

Dodecaceria diceria and D. laddi

The geographical range of *D. diceria* extends northwards from about 25° N and is common in the North Atlantic (Gibson, 1996). *D. laddi* is found between 35° N and 35° S (Gibson, in preparation). Because the two species are so similar, if not identical, they could be the same species. Hartman first described *Dodecaceria laddi* from the Marshall Islands (Hartman, 1954) and *D. diceria* from off the Florida Keys (Hartman, 1951)[3]. Since she described both species she might have been expected to have noted their similarity. As she did not, one should be cautious in saying that they are same species. Further sampling may show their ranges overlap.

In addition to looking the same both have some 40-50 chaetose segments. Therefore on balance they may be thought to be the same species. If they were then the name *D. diceria* should take priority.

Convergent evolution

For *Dodecaceria fimbriata* and *D. berkeleyi* to show convergent evolution they must have been subject to the same environmental influences. However, the environment could directly influence development. If this were so, it must be limited since the crotchets of *D. fimbriata* and *D. concharum* (*in sensu* Gibson) differ, yet the species coexist in the same habitat. To know whether such an apparently Lamarckian effect is possible the development of crotchets has to be understood.

Chaetal development

Chaetae are composed of closely packed tubules which are seen macroscopically as fibrils (Hausen, 2005). These fibres are tubules or channels. They appear to be formed from a matrix secreted around microvilli at the base of the chaetae. The shape of a chaeta is probably determined by the length of the microvilli (Gibson & Stoddart, 2005).[4] That is, the amount of matrix and the time taken to secrete it. The growth of tubules may be constrained by the growth of adjacent tubules in a manner similar to the arcing of a bimetallic strip when heated (each having different coefficients of expansion). Faster growing tubules, those with more matrix, cause a chaeta to bend as

it grows[4]. The shape of chaetae will therefore depend on the characteristics of the microvilli. A wave of secretory activity appears to pass across the microvilli. The nature of the wave, its mathematical characteristic, would modulate growth.

The polychaete crotchet and uncinus appear to have the same basic shape. One can be graphically converted to the other using a D'Arcy Thompson transformation (Gibson, 2002). That is, one type can be "morphed", evolutionarily speaking, into the other by differential growth. This principle probably applies to all types of chaetae. The shape of chaetae, then, might, as mentioned above, conform to a mathematic function (Gibson, Robson & Armitage, 1999). This function may to some degree be influenced by the environment as in developmental canalization, first postulated by Waddington (Calow, 1983).

Chaetae grow sequentially and their shape varies with their age. The form of the crotchets of *Dodecaceria* varies within the fascicle of a parapoda, between neuropodia and notopodia and along the body (Caullery & Mesnil, 1898). This, as noted, is the same for other species. In *Arenicola*, for example, the rostral teeth of the crotches become smaller and can disappear (Ashworth, 1912). Interaction between environment and gene control may therefore change with age.

Polychaete evolution

Polychaetes are best understood as an *ad hoc* group. That is, their evolution is not clearly monophyletic with one group giving rise to another[5]. The structure of their chaetae, for example, is best seen in terms of function rather than phylogeny. Dales based his classification on feeding structures (1963). Rouse & Pleijel (2001) were equivocal over morphological evidence for a monophyletic origin. Polychaetes could have polyphyletic origin if they had a Precambrian planktonic origin (Gibson, in preparation). Speciation could have occurred within the plankton and species dispersed globally in surface waters. This might account for the apparent bipolar distributions of *D. fimbriata* and *D. berkeleyi*[6]. Planktonic dispersal obviates the need to postulate continual drift. However, this origin supposes evolutionary stasis (or that exactly the same changes have occurred in both species).

Nomenclature

The distribution and naming of *Dodecaceria fimbriata/D. berkeleyi* and *D. diceria/ D. laddi* highlights a weakness in classical taxonomy. The use of priority in naming species has led to confusion (Gibson & Heppell, 1995; Heppell & Gibson, 1995). The problem is not solved by compelling authors to follow prescribed codes formulated by bodies such as the *International Commission on Zoological Nomenclature*. These procedures fail because they stultify taxonomy (Heppell, 1991). Systems must be flexible enough to allow for changes in approach.

Because morphological taxonomy depends on judgement it lacks rigor. This is particularly true for *Dodecaceria* where the species are morphologically so similar. Computer image analysis of the shape of chaetae, a more objective method, was used in an attempt to separate species in this genus (Gibson, Robson & Armitage, 1999; Gibson & Stoddart, 2005). Because the reproduction of the species of *Dodecaceria* is so varied another approach to the taxonomy was to use differences in their reproductive biology (Gibson, 1978). Other methods that might help in separating species could be the use of ontology and ecology. Bar coding (Heppell, 1991) and DNA finger printing might be effectively used in naming species.

Summary

Dodecaceria fimbriata and *D. berkeleyi* have a bipolar distribution even though they appear to be the same species. Continental drift can be used to account for their distribution. An alternative explanation is that the ancestors to polychaetes evolved in the Precambrian plankton and were distributed within surface waters. There is also the possibility of convergent evolution due to similarities in habitats. However, the environment may also have a direct effect on chaetal structure through developmental canalization.

Dodecaceria diceria and *D. laddi* are also morphologically very similar. Their distributions although different may on further

investigation be found to overlap. If they do they are likely to be the same species.

Acknowledgement

I wish to thank Professor Mark Blaxter for helpful comments.

This figure was inadvertently omitted from the summer Porcupine pieces (Peter Gibson, PMNHS News Letter No. 24, 2008, pp 31-33)

Speculative positions of Gondwana, Laurentia and New Zealand 5000 million years ago

References

Ashworth, J. H. *Catalogue of the chaetapoda of the British Museum. A - polychaete: Part 1 - Arenicolidae.* British Museum, London, 1912, pp 39-55

Calow, P. *Evolutionary principles*. Blackie, Glasgow & London, 1983, p. 68-80

Caullery, M. & Mesnil, F. (1898) Les forms épitoques et l'evolution de cirratuliens. *Annales de l'Université de Lyon*, **39**, 1-200

Dales, R. P. *Annelids*, Hutchinson, University Press Library, London, 1963, pp 64-76

Gibson, P. H. (1978). Systematics of *Dodecaceria* (Annelida: Polychaeta) and its relationship to the reproduction of its species. *Zoological Journal of the Linnean Society*, **63**, 275-287

Gibson, P. H. (1996) Distribution of the cirratulid polychaetes *Dodecaceria fimbriata, D. concharum* and *D. diceria* in European waters between latitudes 48° N and 70° N. *Journal of the Marine Biological Association of the U.K.*, 76, 625-635

Gibson, P. (2002) D'Arcy Thompson transformation of crotchets to uncini and its implication for the phylogeny of polychaetes. *Porcupine marine natural history society, News letter*, No. 10, pp 10-11

Gibson, P. (2008) Speciation of *Dodecaceria fimbriata* and *D. berkeleyi*: convergent evolution or continental drift? *Porcupine marine natural history society, News letter*, No, 24, No. 24, pp 31-33

Gibson, P. H. & Heppell, D. (1995) *Dodecaceria concharum* Örsted, 1843 and *Heterocirrus fimbriatus* Verrill, 1879 (currently *D. fimbriata*) (Annelida, Polychaeta): proposed conservation of the specific names by the designation of a neotype for *D. concharum*. Case 2899. *Bulletin of Zoological Nomenclature*, **52**, 27-33

Gibson, P., Robson, E. & Armitage, A. (1999) Computer-aided identification of polychaetes. *Newsletter of the Porcupine Marine Natural History Society*. No. 2, pp 49-53

Gibson, P. & Stoddart, L. (2005) Further characterisation of chaetae: Their structure and the use of computer neural networks. *Porcupine marine natural history society, News letter*, No. 18, pp 5-8

Hartman, O. (1951) Littoral marine fauna of the Gulf of Mexico. *Publication of the Institute of Science and Technology*, **2**, 92-93

Hartman, O. (1954) Marine annelids from the Northern Marshall Islands. U.S. *Department of the Interior Geological Survey*, Occasional Papers, 260-Q, p 368

Hausen, H. (2005) Chaetae and chaetogenesis in polychaetes (Annelida). In: Morphology, molecules, evolution and phylogeny in Polychaeta and related taxa. Bartolomaeus T. & Purschke G. (Eds.) *Hydrobiologia* **535/536**, 27-52

Heppell, D. Names without numbers? *Improving the stability of names: needs and*

options. (Ed., D. L. Hawksworth) (*Regnum Vegetabile*, No. 123) Koeltz Scientific Books, Königstein, 1991, pp 191-196

Heppell, D. & Gibson, P. H. (1995) Comment on the proposed conservation of the specific names of *Dodecaceria concharum* Örsted, 1843 and *D. fimbriata* (Verrill, 1879) (Annelida, Polychaeta) by the designation of a neotype for *Dodecaceria concharum*. *Bulletin of Zoological Nomenclature*, **52**, 329-331

Rouse G. W. & Pleijel F. (2001) *Polychaetes*. Oxford University Press, U.K. 2001, pp 11-14

Endnotes

1. Possibly *Dodecaceria fimbriata* was introduced from Europe to New Zealand on the bottom of boats or in bilge. Against this is the wide distribution of *D. berkeleyi*. *D. berkeleyi* found at Kaiteriteri, South Island, was first described by Knox in 1970. This location is 2° N of nearest international harbour at Christchurch. Specimens are also found in New South Wales and elsewhere in Australia. *D. fimbriata*, like *D. berkeleyi*, is a secondary rock borer and therefore unlikely to have been carried on the bottom of boats.
2. Similar crotchets are found in spionids, magalonids and the related capitellids, maldanids, arenicolids. These frequently have beards, hoods, a brush or teeth along the crest.
3. In Hartman's 1954 paper does not give a key and she does not mention *D. diceria*.
4. Matrix precursor may be polymerised by membrane enzymes of microvilli (Hausen, 2005).
5. Taxonomic order can be seen in some groups. The capitellids, maldanids, arenicolids, for example, form a monophyletic group. As a phylum, however, polychaetes are a disparate group.
6. Dispersal of planktonic organisms will depend to some degree on Ferrell's Law which accounts for the directions of ocean currents, due to the rotation of the earth, regardless of the configuration of continents.

A planktonic explanation for the origin of polychaetes

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The polychaetes are a diverse group of families and appear to be polyphyletic[1]. Which metazoan group or groups they evolved from is difficult to say (Clark, 1979). They are usually supposed to have arisen from a benthic platyhelminth-like ancestor (Willmer, 1990). Alternatively they arose from a planktonic ancestor which subsequently speciated.

Precambrian evolution

Polychaete fossils such as *Burgessochaeta setigera, Canadia spinosa* and *Stephenoscolex argutus* belong to the Cambrian fauna of some 500 million years ago (Rouse & Pleijel, 2001). However, these polychaete ancestors must have evolved before this period and when the sea had an oxygen level of about 10% of its present level (Willmer, 1990). These ancestors may have been planktonic and lived in the euphotic zone where oxygen levels would have been greatest. They may have been similar to present day polychaete trochophores. A planktonic origin was suggested by Davidson *et al.* (1995) and others. These ancestors would have lacked hard parts and therefore would not have fossilised. The trochophores of today may be their only legacy[2].

Planktonic ancestors

Trochophores, such as the mitraria larva, are small and maintain their position in the plankton by using long hair-like processes, chaetae. The same would have been so for planktonic polychaete ancestors. There would, however, have been advantages in becoming larger since this would increase metabolism efficiency and fecundity. A resulting problem is that the organism would have tended to sink. Polychaete ancestors may therefore have become benthic, probably during the Vendian. The sea bed is rich in organic material which

drops from the plankton. The polychaete ancestors may have taken advantage of these accumulating nutrients and increased in size through "budding" segments as trochophores do today. This metamorphosis and subsequent growth would have been accompanied by delaying reproduction. Garstang, over a century ago, pointed out that stages in the life cycle, production of gametes for example, can be moved to take advantage of new environmental demands (De Beer, 1958).

Larval speciation

The process by which a planktonic ancestor metamorphosed into a demersal polychaete is illustrated by the trochophore of the archiannelid *Polygordius*, which shows larval speciation. The larvae of *P. lacteus* and *P. neapolitanus* are dissimilar whereas the adults are indistinguishable (Fig. 1). Similar larval diversification is found in the marine larva of the sponge *Halichondria* and the fresh water larvae of the flies *Clux, Chironomus* and *Corethra*.

In *P. neapotanus* the reproductive adult is budded from the lower end of the trochophore, and in *P. lacteus* the adult develops within the larva (Fig. 1). As development progresses the trochophore sinks to the sea bed and metamorphoses into the reproductive stage. Species such as *Ophelia* defer metamorphosis until a suitable substratum is found.

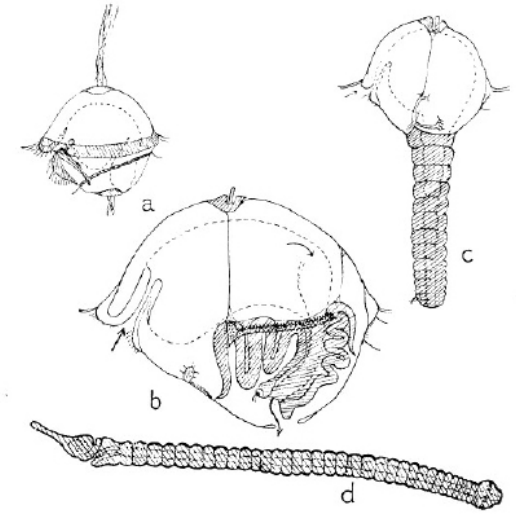

Fig. 1. Divergence in Polygordius, a) trochophore of P. lacteus and P. neopolitanus, b) larva of P. lacteus, c) larva of P. neopolitanus and d) young metamorphosed worm and P. lacteus and P. neopolitanus (From De Beer, 1958)

Increasing fitness

By becoming benthic, then, a planktonic polychaete ancestor would increase reproductive fitness through increased fecundity: greater numbers of offspring living long enough to reproduce. In extant polychaetes this evolutionary drive is achieved by either producing large numbers of metabolically cheap eggs or few metabolically expensive ones (Gibson, 2007). Inexpensive eggs have less stored yolk than the expensive ones. This reproductive option would not have been available to a planktonic ancestor due to the small size of the body cavity[3].

Allocation of recourses

Somatic growth and gamete production in polychaetes and other animals are partitioned to maximise nutritional resources. Production of eggs, especially those with much yolk, is metabolically costly. Newly metamorphosed trochophores therefore grow before reproducing: reproduction is deferred.

Cell division, however, does not appear to be directly limited by the availability of resources. For example, mitosis in the protist *Frontonia* can be initiated by surgically removing cytoplasm (Carter, 1965), which is a metabolic resource. In many organisms reduced resources appears to trigger meiosis, sexual reproduction. In polychaetes the utilisation of nutritional recourses within the body appears to shift cell division in favour of sexual reproduction once growth is complete. In some polychaetes this sequence of events is under the control of hormones produced by the brain (Clark & Olive, 1973).

Set aside cells

A universal biological necessity is the investment in the future of genes, and this is achieved by increasing reproductive fitness. Germ line cells are, as Davidson put it, "set aside" in the trochophore. They are the 4d cells of the blastula which give rise to the gametic primordial cells of the adult. They are seen in the primary embryonic mesoblast which, following metamorphosis, give rise to segmental musculature. The argument for a planktonic origin of polychaetes is supported by the observation of precocious germ cells

in certain Serpulids (Olive & Clark, 1978). That is, they can appear early in trochophore development and suggests that they may well have been present in planktonic ancestors.

Present day polychaetes, then, appear to postpone meiosis until after metamorphosis. Such a developmental shift, as noted by Garstang, may well have occurred with the planktonic ancestors.

Segmentation

Segmentation in polychaetes, then, appears to be a means for increasing fecundity. However, the numbers of segments produced is limited within each species. Mitotic cell division occurs in the blastema at the posterior end of the body and segments appear to be produced cyclically. Each segment is characteristically identical to others: they have the same tissue types and structures. The inter-segmental annuli may mark a temporarily slowing of the cycle[4]. In meiosis of the 4d cells, however, division is not restricted, and this may indicate a protozoan origin.

Discussion and summary

The suggestion that polychaetes evolved from a planktonic ancestor appears at first to be a return to the theory of recapitulation proposed by Haeckel. That is, the trochophore is an "embryonic ancestor" through which polychaetes pass to become adult. Recapitulation was discredited by De Beer and others and the trochophore is now seen as a distributive phase inserted into the life cycle. Neither of these explanations appears to accurately describe the evolution of polychaetes. The present day adult may simply be "added onto" a planktonic ancestor as a means of increasing fitness. To achieve this, meiosis is delayed. Complete suppression of meiosis results in parthenogenesis (Gibson, 1981).

An argument in favour of the radiation of a polychaete ancestor within benthos claims that this environment is varied and offers numerous niches, whereas the sea does not. This view underestimates the complexity of the marine environment. In reality the sea is constantly changing and varies in salinity, temperature, light and currents (Raymont, 1963). Intra-species competition for resources which drives evolution must always have been exacting within the plankton. The rich variety of organisms seen today is evidence for this.

Planktonic ancestors having settled on the sea bed would have diverged into burrowing, tube building, filter and deposit feeding and gave rise to the variety of extant species. To a degree this and movement between habitats, will have resulted in structures such as chaetae adapting to the point where their lineage can no longer be traced. However, the explanation for the diversity of structures may also be due to polychaetes being polyphyletic. That is, the different forms of chaetae are an expression of their function as well as a planktonic ancestry.

Acknowledgements

I wish to thank Professor Mark Blaxter of the *Institute of Evolutionary Biology* for helpful comments.

References

Carter G. S., *A general zoology of the invertebrates*. (Fourth edition), Sedgwick & Jackson, London, 1965

Clark R. B., Composition and relationships. *Physiology of annelids*. (Ed., J. P. Mill), Academic Press, London, 1979, pp. 1-32

Clark R. B. & Olive P. J. W. (1973) Recent advances in polychaete endocrinology and reproductive biology. *Oceanography & Marine Biology: Annual Review*, **11**: 175-222

Davidson E. H., Peterson K. J. & Cameron R. A. (1995) Origin of bilaterian body plans: evolution of developmental regulatory mechanisms. *Science*, **270**: 1319-1325

De Beer G. R., *Embryos and ancestors*. (Third edition), Clarendon Press, 1958

Gibson P. H. (1981) Gametogenesis of the cirratulid polychaetes *Dodecaceria concharum* and *D. caulleryi*. *Journal of Zoology*, London, **193**: 355-370

Gibson P. H. (2007) Is there a loss leader principle in oligolecithal egg production? *Porcupine Marine Natural History Society,* **22**: 12-14

Olive P. J. W. & Clark R. B., Physiology of reproduction. *Physiology of annelids*. (Ed., J. P. Mill), Academic Press, London, 1978, pp. 271-368

Raymond J. E. G. *Plankton productivity in the oceans*. Pergamon Press, Oxford, 1963

Rouse G. W. & Pleijel F. *Polychaetes*. Oxford University Press, UK, 2001, pp 11-14

Willmer P., *Invertebrate relationships*. Cambridge University Press, UK, 1990

(Endnotes)

1. This term is used in its evolutionary sense for families within a phylum cannot strictly be polyphyletic.
2. There are segmented planktonic polychaetes but these probably evolved from benthic forms. Cambrian fossil polychaetes such as *Burgessochaeta setigera* had long chaetae and may have been planktonic but they postdate any the putative trochophore-like ancestor.
3. Eggs with much yolk would have increased the buoyancy of a planktonic ancestor. Increased body sizewould probably have been a disadvantage since these individuals would have been more visible and therefore vulnerable to predation. The planktonic polychaete *Tomopterous helgolandica* is relatively large but is an active swimmer.
4. Segmentation ultimately results in evolutionary specialisation of regions of the body. This, in conjunction with the coelome, appears to have lead to the ability to burrow, as famously described by Clark.

Information Requests and Observations

Endangered swordfish found on South Wales beach

Press release from National Marine Aquarium

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On Thursday morning 3rd July 2008, the body of a large fish was found washed up on Barry Island beach, Vale of Glamorgan, South Wales. It was a torpedo-shaped fish over six feet long, with a long snout, a crescent tail and curved back fin. It was obviously a "billfish" one of the group containing swordfish and marlins. Colin Smith of the Vale of Glamorgan Council was soon on to it and contacted the Marine Conservation Society. They in turn put him on to Doug Herdson at the National Marine Aquarium in Plymouth, who manages the UK Marine Fish Recording Scheme. The records show that while swordfish are rare, they do turn up from time to time in the waters around the British Isles; but there have only ever been three marlins found in the UK.

Photo - National Museum of Wales

Photographs of the fish were sent to Plymouth and from these it was possible to identify it as a Swordfish *Xiphias gladius* ("Pysgodyn cleddyf" in Welsh) as expected. The fish has since been taken to the National Museum Wales (Amgueddfa Cymru) where it will enter the national collection. On arrival, it was carefully examined by Dr Peter Howlett, the Curator of Lower Vertebrates, who confirmed the identification and found it to be a young specimen 2.24 metres long and between 60 and 80 kg in weight. It had been dead only a few days, but it had been scavenged by other creatures and it was not possible to determine the cause of death.

Swordfish can grow to 4.6 metres (16 ft) and weigh over 600 kg, so this one was a tiddler in global terms. They are often called a Broad-billed Swordfish, but there is only one species in the world. They are found throughout the tropical and temperate waters of the world but appear to prefer sea temperatures of 18°C to 22°C, migrating to cooler waters to feed in the summer. These oceanic fish chase herring and mackerel and are among the fastest fish reaching 90 $km.h^{-1}$ (56 m.p.h.). This is in part due to their being warm-blooded, which allows not only their muscles but also their brain and eyes to work more efficiently.

By 1998 the swordfish population of the North Atlantic was thought to have declined, due to overfishing, to only 35% of its original size. Once mature a female can produce 30 million eggs each year, giving the stock the capability of rapid recovery. However the females do not mature until they reach 70 kg, and the average size now landed is a mere 40 kg. When the population was first commercially targeted in the early nineteenth century the average fish landed weighed over 200 kg. Such a decline is a classic feature of overfishing. Drastic fisheries control measures are now in force for swordfish in the North West Atlantic, but it is disputed as to how effective these have been and it is claimed that the stock is still at only half the level of a sustainable population.

Unfortunately, with stocks at these levels swordfish steak must now be on the "fish to avoid" list. It is to be hoped that effective fisheries management can be enforced in both the West and the East North Atlantic so that we can once again enjoy this delightful fish, both in the wild and on the plate.

In Europe the swordfish have probably declined even more, but they are still caught in the Mediterranean and Atlantic. Vessels fishing for tuna in the Bay of Biscay and to the south and west of Ireland occasionally catch swordfish which are sometimes landed at Newlyn, in Cornwall.

They do occur as far north as Sweden, and there are scattered records of swordfish around Britain since the first one at Margate in 1841. There are few Scottish records with only four or five in the twentieth century. They are probably commonest on the south and west coasts, but do turn up in the North Sea. Records held by the National Marine Aquarium show that in 2006 one was photographed near Teignmouth, in Devon and another seen leaping off Dorset, while a small (26 kg) one was caught off the Northumberland; while in August 2007 an even smaller one was caught south of the Lizard.

The first swordfish in Wales was off Newport back in 1905; while in 2003 one was stranded at Rhossili on the Gower, but in spite of efforts to rescue it, it died an hour later. So the present fish is the third that Mr Herdson has details of in Wales. The National Marine Aquarium would welcome any other reports.

Douglas Herdson, Information Officer at the National Marine Aquarium in Plymouth, said "We have phenomenal life thriving in the seas around the Britain, some of the richest areas being off the Welsh coast, west of Scotland and the South West. It is great that fish like the swordfish and sunfish are being seen along with the turtles, dolphins and basking sharks. We have wonderful marine biodiversity and must celebrate and protect it."

The UK Marine Fish Recording Scheme welcomes reports of any unusual marine or estuarine fish seen around the British Isles; 'phone 01752 275216 or email fishreports@national-aquarium.co.uk.

Rare ocean traveller

Press release from National Marine Aquarium

Contact: Douglas Herdson, Information Officer, National Marine Aquarium, Rope Walk, Coxside, Plymouth PL4 0LF, UK Douglas.Herdson@national-aquarium.co.uk
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Out for an early morning walk on the sands of Saundersfoot, Pembrokeshire, with his dog, on Wednesday 6th August 2008, fisherman Gavin Davies saw a strange shape rolling around as the waves pushed up the beach. On closer inspection he saw it was a billfish. With the help of four friends and a Landrover he got it pulled up the beach to where it could be examined.

Photo - Gareth Davies

At this time they could see it was a marlin and contacted South Wales Sea Fisheries Committee Officer Mark Hamblin to check it out. Mark was able to determine that it was a Blue Marlin (*Makaira nigricans*), a fish virtually unknown in British and Irish waters and the first ever recorded from the Welsh coast. This large fish with a spear-like snout can grow up to 5 metres long and weigh over 660 kilos. The Welsh fish was 2.75 metres and weighed about 190 kg. It is not known what caused its death but the large numbers of dolphins around the area at that time might have attacked it, but it also appeared slightly emaciated indicating that it may have been unwell, or simply unable to feed in the cooler British waters. Once stranded it was attacked by scavengers that opened up its belly.

There are 11 species of marlin and sailfish worldwide, five of which have been seen in the North East Atlantic, three having turned

up around the British Isles. Records from the UK Marine Fish Recording Scheme managed by the National Marine Aquarium in Plymouth show that this is the second Blue Marlin to be recorded from British and Irish waters and only the fourth billfish (the first in Wales). The first UK Blue Marlin was a specimen of 3.7 metres found dead on a beach on St Agnes in the Isles of Scilly in March 1982. A 1.8 metre long White Marlin was found alive but dying in Morecambe Bay in August 1983, and a Sailfish of 2.66 metres was washed up at the mouth of the River Yealm in South Devon back in August 1926.

Douglas Herdson, Information Officer at the National Marine Aquarium, said "The billfish are incredible wanderers of the open oceans of the world, but prefer warmer waters than ours. It is just the odd vagrant that strays into our seas and comes to grief. They are very unusual and it is a shame that this fish did not go into a national collection such as that of the National Museum of Wales."

"This is just a straggler and probably has nothing to do with climate change, but in years to come if the sea temperatures continue to increase they may become commoner around our shores, if the stocks have not been fished down to depletion."

The marlins and sailfish are powerful warm water ocean wanderers, migrating vast distances each year, often favouring the blue clear waters. The warmer surface waters above the temperature change of the thermocline are the normal hunting ground of the marlin, but they may dive to 350 metres in the search for prey. In the East Atlantic Blue Marlin normally occurs as far north as southern Bay of Biscay.

Sleek and muscular, they are the fastest of fish reaching 100 kilometres per hour. Visual predators that hunt by day they have evolved a wonderful anatomy that maintains the eyes and brain at a warm temperature so increasing their efficiency. The bill is an elongated toothless upper jaw whose purpose has long been debated, but recent studies have shown that it is frequently used to slash, and even spear, fish they feed on. They also target squid and octopus. They spawn in tropical regions and move out to cooler latitudes in the hotter periods of the year.

Fishing pressures have reduced their populations to a mere ten percent or less of their historic levels. Doug Herdson commented "The seas are a poorly known world of their own and every so often they reveal some of their wonders. This just shows how much we should celebrate and protect our marine life."

Note: Marlin are sometimes confused with Swordfish, which have a longer stouter bill. Swordfish are also "heavier" more rotund fish with no pelvic fins and a single keel on the side of the tail base. Marlin have two keels on the side of the tail base and their pelvic fins are long and thin ones attached under the "throat". The relative bulkiness and the depth of the body of the Welsh fish, in comparison to the height of the dorsal (back) fin shows it to be a *Makaira*, a blue or black marlin, as opposed the more slender sailfish and white marlins. Opinion among experts varies as to whether there are one, two or three species of *Makaira*. Hence it is difficult to distinguish between them from a photograph. The most likely one is the Blue Marlin *Makaira nigricans*, with an outside possibility of the Black Marlin *Makaira indica*.

PORCUPINE 2008
BIODIVERSITY HOTSPOTS AND COLDSPOTS

Papers and abstracts from the PMNHS meeting held at Bangor University from 21st to 23rd March 2008

Towards a network of marine protected areas in the UK

Bethany Stoker and Annabelle Aish
Joint Nature Conservation Committee, Peterborough, UK

The UK Government is committed to establishing a network of marine protected areas by 2012 that will '*recover and protect the richness of our marine wildlife and environment through the development of a strong, ecologically coherent and well-managed network of marine protected areas (MPAs) that is well understood and supported*' (Defra & WAG 2008). The Marine and Coastal Access Bill (Defra 2008) provides for a new mechanism of site designation, termed marine conservation zones (MCZs). These sites can be designated for the purpose of conserving marine flora or fauna; marine habitats or types of marine habitat; and features of geological or geomorphological interest. Marine conservation zones, in addition to European Marine Sites (that is Special Protection Areas and Special Areas of Conservation) will form the basis of a MPA network in the UK.

The new site designation measures proposed under the Marine and Coastal Access Bill will apply to English and Welsh Territorial waters, and UK offshore waters. For English territorial waters and adjacent UK offshore waters Natural England and the Joint Nature Conservation Committee (JNCC), in collaboration with Defra and other partners, are developing Regional MCZ Projects. These Projects will contribute to the UK Government's network of MPAs by identifying and recommending MCZs that should be established; the objectives and levels of protection which will be afforded to each of these sites will also be identified. Through strong stakeholder engagement, the projects will seek to design the network of MCZs so that social and economic costs are minimised, and benefits to society are maximised. One of the Regional MCZ Projects, Finding Sanctuary, in the south west has already been established and there are a further three (the Eastern English Channel, the North Sea and the Irish Sea) currently being set up (Figure 1).

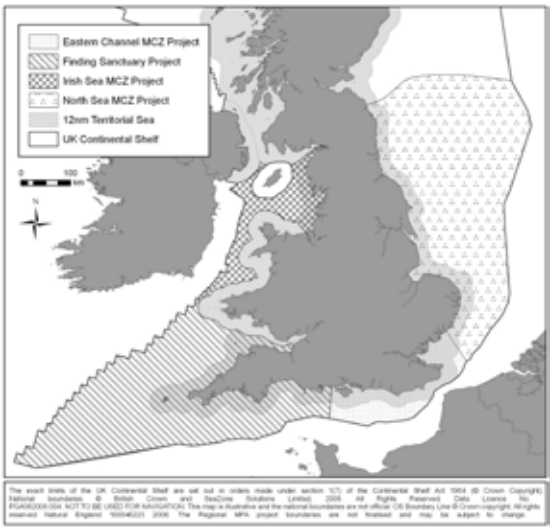

Figure 1 - Regional MCZ project areas

In Wales, the Welsh Assembly Government will use the MCZ designation mechanism to establish Highly Protected Marine Reserves (HPMRs), and are embarking on a programme of collaborative work with the Countryside Council for Wales to identify appropriate sites by 2012. Northern Ireland will continue to focus on the marine Natura 2000 process over the next couple of years, but are considering a dedicated Northern Ireland Marine Bill in the near future.

The Scottish Government recently published its 'Sustainable Seas for All: a consultation on Scotland's first marine bill' (Scottish Government 2008) where it proposed that there should be a new flexible power for Scottish Ministers to identify, designate or recognise particular locations of biodiversity importance within Scottish territorial waters. For UK offshore waters adjacent to Scotland, the Marine and Coastal Access Bill identifies Scottish Ministers as the appropriate authority for MCZ designation, although MCZs will be known as MPAs in the Scottish offshore region.

These new designation mechanisms will help the UK to build on its existing series of marine protected sites. To date, approximately 1.8 million hectares of UK waters have been designated as MPAs, covering approximately 2% of the UK Continental Shelf. These designated sites comprise of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

JNCC will continue to lead in the identification of SACs and SPAs in UK offshore waters; and last year consulted on their first seven proposals for Special Areas of Conservation. These seven SAC sites were recommended for their Annex I habitats on the basis of the selection criteria contained within the Habitats Directive Annex III, and EC Guidance on implementation of the Natura 2000 network in the marine environment. Both Braemar Pockmarks and Scanner Pockmarks were selected for the presence of submarine structures made by leaking gases. Haig Fras, Stanton Banks, Darwin Mounds and Wyville Thomson Ridge were selected for the presence of Annex I reefs. North Norfolk Sandbanks and Saturn Reef were selected for the presence of both sandbanks and reefs (Figure 2).

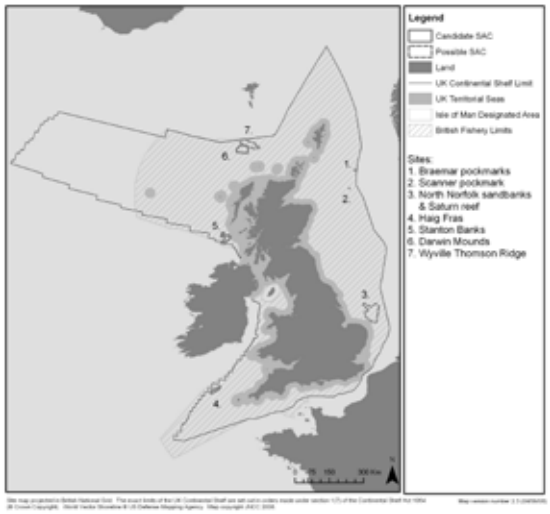

Figure 2 - proposed offshore SACs

Following the responses received through the public consultation five of these sites were formally submitted by the UK Government to the European Commission in September 2008 (Braemar Pockmarks, Scanner Pockmarks, Haig Fras, Stanton Banks and Darwin Mounds). These are the first UK offshore areas to go through the process, and they will link up with an international network of protected areas in the waters of other countries in the European Union.

JNCC are hoping to start the next round of offshore SAC consultations, which will lead to the second phase of offshore SACs, in early 2009. It is likely that at least 6 and possibly up to 13 further SACs will need to be identified to fully represent the different Annex I habitat types in the UK offshore marine area. The aim is to complete the UK contribution to the network of sites by 2010, as required by the European Commission.

Further information on marine protected areas around the UK and the various initiatives can be found at: www.jncc.gov.uk/marineprotectedsites

References

Defra & the Welsh Assembly Government (2008) Draft guidance on selection and designation of Marine Conservation Zones. Available from: http://www.defra.gov.uk/marine/biodiversity/marine-bill/guidance.htm

Defra (2008) Marine and Coastal Access Bill. Available from: http://services.parliament.uk/bills/2008-09/marineandcoastalaccess.html

Scottish Government (2008) Sustainable Seas For All: a consultation on Scotland's first marine bill. Available from: http://www.scotland.gov.uk/Resource/Doc/231463/0063135.pdf

Abstracts of papers presented at the conference but not submitted for publication

The BAP spots of Wales

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A UK Biodiversity Action Plan (BAP) was published in 1995 as one of the UK's responses to the Convention on Biological Diversity which was signed in 1992 by the UK and other participating countries in Rio de Janeiro. A number of marine habitats and species were identified in 1999 for priority conservation action in the UK through the BAP process. Following an extensive revision of the UK BAP list of habitats and species in 2007, the number of marine priorities on the UK BAP list now stands at 24 habitats and 88 species. The list of marine priorities identified at the UK level has been used to establish a revised Welsh BAP list, with the addition of a few 'extras' to better reflect the habitats and species in need of conservation action in Wales.

As well as the primary objective of better management, the revision of marine BAP priorities brings with it the added need for information on distribution and trends for the habitats and species identified. The BAP process, considered as a voluntary conservation measure, now has statutory underpinning through the Natural Environment and Rural Communities (NERC) Act 2006, which imparts a 'biodiversity duty' to all public bodies (in England and Wales).

This talk covers:

- the habitats and species on the revised marine BAP list,
- a brief introduction to the statutory underpinning provided for BAP priorities,
- information gaps and needs of marine BAP priority habitats and species.

Horse mussel reefs – biodiversity hotspots feeling the heat

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Horse mussels (*Modiolus modiolus*) form into clumping masses in our continental seas and these complex matrices are known to build-up into biodiverse reefs in some locations. In the Irish Sea there are five places where horse mussel reefs have been recorded. In the Pen Llŷn a'r Sarnau SAC in north Wales we have used digital side-scan sonar, multibeam echosounder, RoxAnn™ acoustic ground discrimination systems, and a sub-bottom profiling system over the last nine years. We now know that the horse mussel reef has a distinctive, undulating form with characteristic properties to the acoustic reflections and this has meant that we are able to differentiate the reef from other surrounding hard ground habitats and therefore map its estimated area as 349 - 373 hectares. The undulations of the reef are up to 1 m high above the underlying gravels and are perpendicular to the tide but, when 'seen' acoustically they differ from typical sand or gravel waves, which are smaller and more regular with straighter continuous crests.

When the reef has been investigated biologically by divers and with towed cameras, the small-scale form of the undulations was also reflected in the animals growing in and on the *Modiolus modiolus* reef. The communities in the troughs were 'reduced' compared to the ridges where the reef is more built-up. Animals were almost three times more abundant on the ridges and equated to about 22,000 individuals per metre square. Some species were found to have significant associations with the horse mussels themselves and overall, the apparently high biodiversity of this benthic habitat seems due to the physical complexity of the biogenic habitat and in part to the enhanced deposition caused by the mussels. Sediments of the reef, within the matrices contain higher proportions of fine sand, very fine sand and silt/clay than consistent with 'normal' sediments in an area where average spring tidal currents run at approximately 2 knots or 100cms^{-1}.

Our on-going monitoring at the Pen Llŷn a'r Sarnau *Modious* reef has now been linked with a reef in the Isle of Man. Early results from fixed quadrat stations over the last five years in N. Wales, suggests that some areas of a reef may undergo localised decline. Two of the known horse mussel reefs in the Irish Sea have undergone catastrophic declined within the last 50 years, probably as a result of disturbance by heavy benthic fishing gear. There is evidence that the reef we studied has existed for at least 150 years but our most recent acoustic surveys have shown evidence of illegal scallop dredging in the area. It is tempting to suggest from the abundance in other places of shell accumulations that these functionally important reefs may once have been more widespread in the Irish Sea and that their future may not be secure.

Lyme Bay - Marine Protected Areas (MPAs) to conserve a marine biodiversity hotspot

Hilmar Hinz[1], Jan Hiddink and Michel J. Kaiser

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The limestone reefs, located in the eastern part of Lyme Bay, harbour several species of conservation interest such as the pink sea fan *Eunicella verrucosa*, the ross coral *Pentapora fascialis* and the Devon cup coral *Caryophyllia smithii*. Scallop dredging, one of the main fisheries within Lyme Bay, has been identified as one of the activities that could be in direct conflict with local conservation efforts. As a result, four voluntary marine reserves were designated over the reef area in September 2006 to exclude all towed fishing gears. In March and in August 2007 the reefs were extensively surveyed using video and still camera tows. Areas that experienced different fishing intensities were compared inside and outside of the reserves. Abundance and mean size of four species of interest were assessed: pink seafans *Eunicella verrucosa*, dead men's fingers *Alcyonium digitatum*, ross coral *Pentapora fascialis* and king scallops *Pecten maximus*. The survey among others had three aims i) to establish if the right areas were identified for protection ii) assess the effects of scallop dredging on selected species and iii) to establish overall baseline conditions of the reefs shortly after the closure, to allow future monitoring of potential benthic recovery. Preliminary results from the first

survey showed that the highest abundances of the pink sea fan *Eunicella verrucosa* were found within the reserve boundaries. No significant difference was however found between areas of different fishing intensities for this species. *Alcyonium digitatum* was the only species showing a significant response to recent trawling activities. The preliminary baseline data demonstrated that the location of the reserves did protect high density areas of pink sea fans, the species of main conservation interest. A clear relationship between fishing and the presence or absence of pink sea fans could, however, not be demonstrated. The baseline data collected thus far should be well suited to monitor any future changes in the benthic communities within and outside of the four reserves following changes in the distribution of fishing effort from towed fishing gears.

Deep-sea conservation for the UK: developing habitat-based management of deep-sea areas

Jason Hall-Spencer[1], Maria Campbell[1], Tina Kerby[1], Andrew Davies[2], Murray Roberts[2], Alan Hughes[3], Jon Moore[4]

1Marine Institute, University of Plymouth; 2Scottish Association of Marine Science; 3National Oceanographic Centre Southampton; 4CALM (jon@ticara.co.uk)

Major advances are being made in both the discovery and protection of deep-water habitats around the UK. The Porcupine Marine Natural History Society recently began coordinating a project entitled 'Deep-sea Conservation for the UK' (see www.deepseaconservation.org). This involves a team of researchers based at the University of Plymouth, the Scottish Association of Marine Science and the National Oceanographic Centre Southampton (see Moore et al., 2007). This talk will describe the project and progress that has been made so far in the following three areas:

1. Large-scale habitat classification of the deep-sea realm
2. Predicting the occurrence of vulnerable deep-sea habitats and species
3. Practical monitoring and management of protected deep-sea areas

Moore J. et al. (2007) Porcupine Marine Natural History Newsletter 23, 11-15.

Finding Sanctuary – Developing a regional MPA network for south west England

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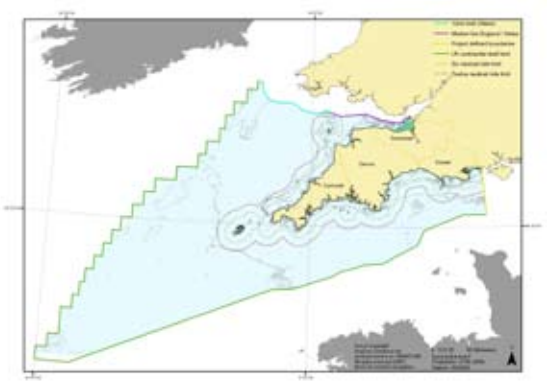
Finding Sanctuary is a regional partnership[2] project with the aim to design an MPA network around South West England. The project covers a large area, some 90,000 km^2 of sea from the high water mark out to the continental shelf limits off the south west peninsula (see figure).



Finding Sanctuary project area

The goal of the MPA network will be twofold: to safeguard and encourage recovery of marine biodiversity, and to help ensure the long-term sustainability of marine resources in the region.

Finding Sanctuary is going further than the identification of biodiversity "hotspots": We will explore ways of configuring a network that will function as a whole to deliver the best results for regional marine biodiversity in its totality. That means a network that represents the full range of regional marine biodiversity, including habitats that are highly diverse, as well as those that are less so. We are taking a systematic, regional-scale approach to reserve planning, which is in line with current thinking in conservation science. The use of decision support tools such as Marxan and GIS are at the core of our technical planning work.

The application of sound science is important to achieve a positive outcome, but the project itself is not a science project. Our planning approach combines the needs and views of stakeholders with science, to develop an MPA network that can realistically deliver positive results. Because areas of sea cannot be

owned, fenced off, and actively managed in the same way that terrestrial conservation areas can be, we believe that understanding and support from people using the sea is vital to a positive outcome. We have developed an iterative, participatory planning process, which is informed and underpinned by best available science, but which is ultimately overseen by a steering group of stakeholder representatives to enable the development of a network that has the broadest possible support. This process will also enable us to identify areas of conflict early on, and place effort on finding solutions that meet scientific targets, but at the same time cause the least conflict. Furthermore, by engaging with stakeholders early in the process, we can gather and map knowledge they have about the spatial distribution of human activities in the south west maritime region, thus improving our information base for planning.

[2]Project partners are: natural England, Joint Nature Conservation Committee, RSPB, South West Wildlife Trusts, South West Food and Drink, the National trust, and the county councils of Devon, Dorset and Cornwall.

Offshore renewables and biodiversity hot and coldspots

Victoria Copley

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The UK's first round of offshore windfarm development began in 2001 against a backdrop of a blank canvas when it came to information on the marine natural resources with which they might interact. Since then, often as a direct result of the survey work carried out by the developers, sometimes as a result of other mapping projects underway, it has become apparent that there are hotspots of marine biodiversity which overlap with some of the areas chosen for renewable energy generation.

A second round of offshore wind development is now well underway and we are learning much more about the locations they are sited in and the complexity of interactions with a range of important marine species and habitats. We are discovering that, for some species, it is hard to locate hotspots even though we know that they are there, just undetectable at significant levels.

Experience to date has shown that for a large majority of cases, there are ways in which offshore windfarms can coexist with areas of high biodiversity. There are also, perhaps surprisingly, mechanisms which need to be employed to avoid impacts on areas which might conceivably be described as coldspots.

With a third, much larger scale, round of offshore windfarms announced by government last December which would bring the UK into the global lead in marine renewable energy development, considerable pressure could be brought to bear on some hitherto undeveloped locations This presentation will take a closer look at the issues through a selection of case studies.

Using volunteers to identify hotspots: the Seasearch pipefish survey

Chris Wood

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Seasearch harnesses the skills and enthusiasm of volunteer divers in undertaking marine recording. An annual species focus has been established and this talk will present the preliminary findings of the 2007 survey of pipefish.

Divers most commonly encounter the greater pipefish, Syngnathus acus, and the snake pipefish Entelurus aequoreus. The results show an abundance of snake pipefish in inshore waters along much of the North Sea coasts of England and Scotland with occasional hotspots elsewhere. Greater pipefish were recorded more often on southerly and westerly coasts and always in small numbers.

The presentation will also introduce the Seasearch species focus for 2008, one of the new Biodiversity Action Plan species that has been much searched for by divers in the past, often for the wrong reason!

Exploring concepts of marine biodiversity hotspots: research for WWF-UK in 2006

Keith Hiscock

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Marine biodiversity hotspots are areas of high species and habitat richness that include representative, rare and threatened features[1].

The idea of identifying biodiversity hotspots where conservation effort can be concentrated to get best 'value for money' is an attractive one that has been extensively promoted for terrestrial habitats. In 2006, the Marine Biological Association was commissioned by WWF-UK to explore how the concept of biodiversity hotspots could be developed for the marine environment. The work involved a great deal of data analysis using a 'snapshot' of Marine Recorder from February 2006. The report[1], by Keith Hiscock and Mark Breckels, described how data from 120 areas around the UK, that had adequate information to make comparison a reasonable prospect, was used to identify 'hotspots' for six measures of 'richness' including for species, biotopes and for Nationally Important Marine Features.

Endemism is an important criterion to identify hotspots on the land and in freshwater but is an unusual feature in the marine environment of the north-east Atlantic and there are no marine species believed endemic to anywhere in the UK. However, hotspots should include rare or threatened species and habitats (which have been identified as 'Nationally Important Marine Features' in the UK) and the more present at a particular location, the better 'value for money'.

For hotspot measures, we concluded that:

The results of analysis broadly match the locations that are believed to be of high interest.

The wide range of types of data maintained requires 'minimum standards' to be applied to identify acceptability.

The measures developed (in which number of survey events at a location are taken into account in identifying hotspot status) require more development as naturally rich areas tend to be downgraded if they are very well surveyed. To take account of this problem, a 'weighting' was applied to such sites.

Some locations are naturally low in species and biotope richness and their low scores need to be seen in that context.

The identification of number of Nationally Important Marine Features in an area is an important measure but the current list of Features needs to be further moderated to correct anomalies especially arising from criteria-led selection.

Hotspot measures are one of several tools for assessing marine natural heritage importance of an area.

The measures we tested should all be used to inform the site selection process and we demonstrated, in a series of dossiers for case study sites, how such scientific information can be used to support proposals for protection and management.

Issues of data 'uneven-ness' will be explored during the Porcupine MNHS meeting and, as always, the importance of being able to access all survey data for an area through, preferably, a single portal will be addressed.

[1]Hiscock, K ., Breckels, M., 2006. Marine Biodiversity Hotspots in the UK: their identification and protection. Godalming: WWF-UK. [Available from: http://www.wwf.org.uk/news/n_0000003424.asp.]

Investigations into the composition of the bivalve fauna on the Porcupine Bank

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The Porcupine Bank is an elliptical topographic feature of the continental margin of Western Europe. Across a 10,000 km^2 area the bathymetry of the bank ranges from less than 150 to more than 3000 metres off the western shelf and has a variety of substrate types. It was previously believed that the bank supported upwards of 100 bivalve species, yet compared to the surrounding Rockall Trough and Porcupine Seabight, investigation into the faunal composition had, until recently, been very limited. Throughout 2003 and 2004 the National University of Ireland, Galway conducted a series of surveys across the bank which led to the compilation of the first register of bivalve species living on the bank to be made available for more than 75 years. A total of 70 species were recovered, including 22 new records for the area and three new species. Many rare species were collected along the western slope which had previously proved inaccessible due to the extreme topography. Vast aggregates of byssally attached species were taken from the rocky boulder fields of the north of the bank, while carnivorous deep water species dominated the assemblages of the steep western slope. The most speciose family found on the bank was the Thyasiridae with a total of 11 species recovered in our samples. At least one representative of this family was present in nearly every sample taken on the bank, from the relatively shallow water around the northern dome to the abyssal plains west of the bank. The significant results of our investigations will be outlined along with a presentation of detailed images of the extraordinary and less common species we encountered.

Diversity of intertidal non-native species in Wales

Kathryn Birch

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This talk will look at the non-native species found on the Welsh intertidal. Most of the information was gathered during the Welsh intertidal survey carried out by CCW between 1996 & 2006 with some additional information to bring the story up to date.

Fourteen non-native species have been recorded on the Welsh intertidal spread across the different taxonomic groups: 5 algae, 4 molluscs, 1 polychaete, 1 anemone, 1 ascidian, 1 barnacle and 1 crab as shown in table 1.

Four of the more invasive species will be looked at in more detail: Japanese wireweed *Sargassum muticum*, non-native oysters *Crassostrea gigas* and *Tiostrea lutaria* cultivation and the recent introduction in 2006 of America slipper limpet *Crepidula fornicata* into the Menai Strait with mussel seed and subsequent action taken to deal with the problem.

A full write-up of the intertidal survey including a section on non-native species can be found in 'Wyn, G., Brazier, P., Jones, M., Lough, N., Birch, K., Bunker, A. and Brunstrom, A. 2007. **When the tide goes out: the biodiversity and conservation of the shores of Wales**, CCW'.

Table 1 Non-native species recorded on the Welsh intertidal.

Species name	**Type**	**No. sites**
Elminius modestus	Barnacle	197
Codium fragile subsp. tomentosoides	Green alga	30*
Mya arenaria	Mollusc	28
Crepidula fornicata	Mollusc	26
Colpomenia peregrina	Brown alga	24
Sargassum muticum	Brown alga	10
Styela clava	Ascidian	9
Crassostrea gigas	Mollusc	7
Antithamnionella spirographidis	Red alga	2
Ficopomatus enigmaticus	Polychaete	2
Haliplanella lineata	Anemone	1
Solieria chordalis	Red alga	1
Tiostrea lutaria	Mollusc	1
Eriocheir *sinensis*	Crab	Not recorded in intertidal survey

* Included records of the green algae *Codium fragile* and *Codium fragile* subsp. t*omentosoides* because not all specimens were collected for subspecies identification.

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Although we can deal with most methods and styles of presentation, it would make our editorial lives easier if those wishing to contribute to the Newsletter could follow these guidelines. Please submit all material in electronic format if at all possible either by e-mail or disc/CD. Hard copy can also be accepted provided it is not too long!

Text

Please submit your paper, article, request for information etc. as a Word document.
Fonts, spacing etc. - general text: Times New Roman 12 point, single spacing
Do not include illustrations within the text (see below). You can insert placeholders to indicate how illustrations should be placed e.g. Insert Fig.1 here
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Photographic images should be supplied as greyscale or colour (RGB) JPGs with a resolution of 300 pixels per inch and width of 7cm. Save at high quality.
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Graphs, histograms etc are best supplied as Excel files – save each graph as a separate sheet.
We can scan good quality photographs, transparencies and hard copies of drawings.
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References

Do not leave a line space between references. Please follow the examples below for format. Journal titles should be cited in full.
Brown, M. T. and Lamare, M. D. 1994. The distribution of *Undaria pinnatifida* (Harvey) Suringar within Timaru Harbour, New Zealand. *Japanese Journal of Phycology* **42**: 63-70.
Dipper, F. A. 2001. *Extraordinary Fish*. BBC Worldwide Ltd. 96pp.

If all this is thoroughly off-putting, just send whatever you have got and we will do our best with it!!

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