Porcupine Newsletter

Volume 4 Number 8

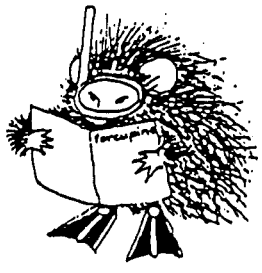
APRIL 1990 ISSN 0309 - 3085

- 169 -

CONTENTS

* * * *

Roger Bamber, Hon. Editor
Marine Biology Unit, National Power,
Fawley Power Station, Fawley,
Southampton SO4 1TW, U.K.



PORCUPINE

Hon Secretary
Dr Martin Sheader

Hon Treasurer
Dr Antony Jensen

Department of Oceanography, The University
Southampton, Hants SO9 5NH, U.K.

Hon Records Coordinator
Jonathan Moore
FSCRC, Fort Popton, Angle,
Pembroke, Dyfed SA71 5AD, U.K.

EDITORIAL

It was with deep regret that we heard of the death on 1st January of Tom Thompson; those Members present will recall his most recent Porcupine involvement at the Trink field meeting last Summer. The large number of phone calls I received to inform me of his fatal accident is a measure of his popularity, and I am grateful to those concerned and to Liz Platts, Alan Bebbington and particularly Malcolm Edmunds for the details published on p.181.

While I am flattered to receive mail from Members offering membership monies, new addresses or whatever, I should point out that some correspondence is more properly the territory of my fellow Office Bearers, whose addresses are given at the head of this page (and have so appeared in the last few issues). (If Members are still wishing to offer such a service, I know of some people who would be delighted to have their pigeon holes appear regularly busy, though forwarding cannot be guaranteed.) Regardless of which, do not be put off, I am delighted to receive all relevant PN correspondence - especially articles, letters, notices, new records, requests, observations, comments, feedback, criticism, wit, etc., etc. The relevant quotation from the Hon. Editor's (brief) Report at the AGM was;

"Friends, Members, Porcupines, send me your Articles;
"I come to edit Newsletters, not to write them,"

(with posthumous apologies to W.S.)

On the subject of Notices for upcoming meetings, symposia, and the like, could I suggest that contributors observe our attempts to publish Newsletters approximately in April, August and December (yes, I know it doesn't always work out that way!); some notices I receive are for events which will have occurred *before* the issue of the next PN, so they never appear (sorry, Mark; we all hope that the Underwater Association 1990 Annual Symposium went well!).

Meanwhile, this issue, slightly more bulging than the last, includes papers from most of the remaining talks given at the Autumn meeting in Guildford on Islands, where a good time was had by all (notwithstanding the food-throwing competition undertaken by the hotel staff during the dinner!). Articles arising from the presentations at the Spring Meeting in Dundee will appear in the next issue.

Roger Bamber, Hon. Ed.

WHY SO MUCH FUSS ABOUT ISLANDS?

by Sarah Fowler

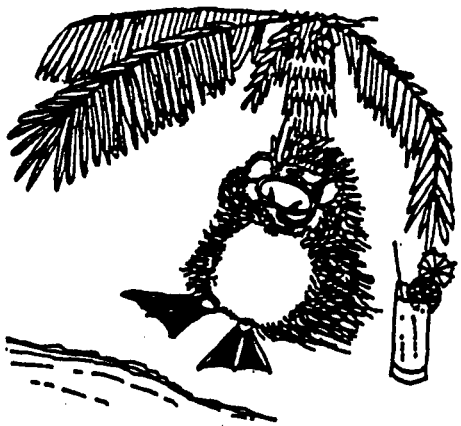
The Nature Conservation Bureau, 122 Derwent Road, Thatcham, Newbury, Berkshire RG13 4UP

Of the first seven sites identified in Britain by the Nature Conservancy Council as proposed Marine Nature Reserves (MNR), four on the west coast are islands: the Isles of Scilly, Lundy, Skomer and Bardsey. There has been some criticism of this concentration of effort on island habitats. Admittedly, examples of marine inlets should also be included on the MNR shortlist when this is revised, but there are very good reasons for the emphasis on island MNRs.

Islands possess an unusually wide range of marine communities because of the variety of environmental conditions and habitats found around their coasts. This is particularly the case in western Britain where the rocky coastline is exposed to prevailing winds. Both wave-exposed and sheltered coastlines will be present and probably also tidal stream conditions varying from strong currents to still waters. Deep water may be found close to the shore. A much wider variety of habitats and communities will therefore be represented within a relatively small area than would be the case for an equivalent stretch of mainland coast.

Additionally, many islands have unusual features caused by their isolation from the mainland. More equable sea temperatures throughout the year than are experienced on mainland coasts may be the cause of emergence of some deep-water species onto the shore. The absence of pollution and freshwater influences could explain the presence of rarities. Conversely, isolation can result in the absence of some common mainland species, such as certain gastropods (even Lundy, in the Bristol Channel, has smaller populations of *Littorina littorea* and *Monodonta lineata* than are found on adjacent mainland shores).

For these reasons, many islands provide a convenient 'unit' of marine habitats and other interesting features frequently the subject of considerable marine biological study. All of these features contribute to the attraction of islands to inquisitive Porcupines and marine conservationists in search of potential Marine Nature Reserves.



MORCEAUX DE FRANCE

by Roger Brehaut

La Canurie, Collings Road, St Peter Port, Guernsey

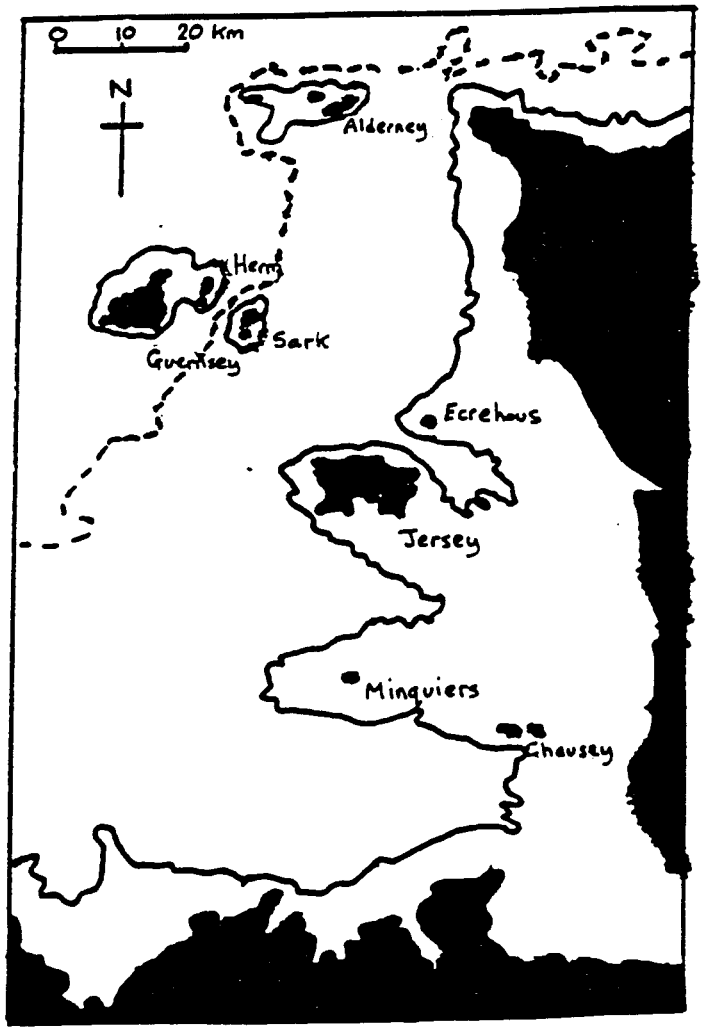
The French author Victor Hugo described the Channel Islands (in translation) as "pieces of France, fallen into the sea, and gathered up by England". The islands are the southern-most part of the British Isles and their geography, geology, history and biology are all more closely associated with those of France than with those of England.

15,000 years ago the islands were hills on the plateau extending westward from what is now Normandy, but, soon after that date, Guernsey became detached and is now the island furthest from France, and surrounded by the deepest water. Alderney and Sark became detached later, but Jersey was still part of the continent 5000 years ago and was probably still connected at low tide as recently as 3000 years ago. It is surrounded by broader, sandier bays and by much shallower water than the other islands. The rocks of all the islands are old and hard. All are older than 700 million years and some of the gneiss on Guernsey has been dated as 2,600 million years old.

The fact that Jersey is a relatively young island has interesting bearings on its land fauna - mammals, reptiles and amphibia - as well as on its marine life. The inter-tidal brown alga *Himanthalia lorea* only seems to thrive in the vicinity of deep offshore water, and is absent from most parts of Jersey, although abundant in the other islands. Animals which migrate offshore during the winter may only rarely reach the shallow waters around Jersey when they move in during the spring, and some prawns, crabs (*Cancer* and *Maia*) and mackerel tend to be scarcer in Jersey than in the other islands. *Cancer pagurus* is called "the Guernsey crab" by Jersey fishermen.

All the islands have a high tidal range, being greatest in Jersey (13 metres) and smallest at Alderney (8 m). This results in a great expanse of exposed shore at low tide - as

THE CHANNEL ISLANDS



15,000 yrs ago: Whole area dry land.
12,000 yrs ago: Shoreline represented by broken line; Guernsey is an island.
5,000 yrs ago: Shoreline represented by solid line; Jersey is still part of mainland Europe.

much as 3 km wide off the south east corner of Jersey. As a result of this, together with the variable geology and the small size of the islands, there is a large variety of shore type - rock, boulder, pebble, sand, mud, etc. - with all degrees of shelter or exposure, facing virtually any point of the compass within a few miles of any site.

Sea temperatures rarely fall below 10°C at the coldest time of the year (in February) and the even warmer Brittany coast, from where larvae can readily drift, is nearby. This results in many species reaching their northern limit in or near the islands, so that the communities contain members which are absent or rare on the northern side of the English Channel. A few examples of animals which come into this category are:

Convoluta roscoffensis - a flatworm with symbiotic algae

Gibbula pennanti - a top shell whose distribution seems to be very restricted, and centred on the Channel Islands.

Ocinebra aciculata - a whelk with a bright red body.

Charonia lampas - a very large whelk, up to 25 cm long.

Thia polita - a small burrowing crab.

*Leptosynapta gallienne*i - a sea cucumber, first collected by an amateur Guernsey naturalist, J.T. Gallienne.

Glossobalanus sarniensis - an acorn worm which reaches 50 cm in length with a diameter of 1 cm. Sarnia is the old Roman name for Guernsey.

Haliotis tuberculata - the ormer.

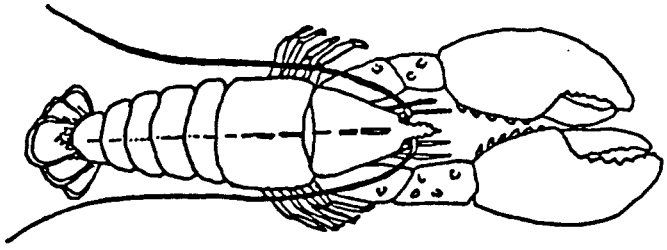
This last species is the one which arouses most passion in a Channel Islander. One of the earliest references to it appears in a publication entitled "News from the Channel" dated 1673. This says "There is also a large shellfish called an Ormond which we beat off the rocks with iron bars. 'Tis much bigger than an oyster, and like that, good either fresh or pickled, but infinitely more pleasant to the gusto, so that an epicure would think his pallat in paradice if he might but always gormandise on such delitious ambrosia" (Note genuine 17th Century spelling!). In the early nineteenth century around ten tons of shells were exported annually for button making. By 1865 Jeffreys was able to note that "the ormer was put to a rather novel use, viz. to frighten away small birds from standing corn. Three or four shells are strung loosely together, and suspended from the top of a pole, so as to make a clatter when moved by the wind."

By the end of the last century, ormer collections for the table were declining, probably because of over-fishing. Regulations governing its collection were made in 1880 and amended in 1898. Following a survey by T.A. Stephenson, a two-year ban was enforced from 1923. Catches seemed to improve after the unforeseen closing of the beaches from 1940 to 1945, but a new scarcity was noticed in the 1960s and blamed on divers who were collecting around 400 per head during an afternoon's dive. Collection by diving is now prohibited, and shore collection is still restricted to a handful of spring tide periods during winter months. However, attempts to cultivate the animal on tiles at low water level seem to be proving successful, and the ormer is once again available for sale in the markets.

Tidal streams flow at great rates around the islands, reaching speeds of more than 7 knots between Alderney and France, and more than 5 knots between Guernsey and Herm. This helps to keep the water very clean and to disperse larvae very effectively. However, since the tides rotate every six hours, the effect seems to be to create a whirlpool situation around the islands, which is only penetrated with difficulty by larvae from outside the area. For example, *Elminius* and *Sargassum* arrived in the islands several years later than might have been expected from their rate of spread in neighbouring areas.

There are two habitats which gain much publicity in the tourist literature. One is the Herm Shell Beach, where a regularly replenished

supply of mollusc shells provides rich pickings for those with sharp eyes, although the guide book story that the shells are brought from the Caribbean on the Gulf Stream can be safely disregarded. The second is the series of Gouliot Caves in Sark, where an impressive array of dense organisms, more usually associated with shallow water (*Tubularia, Alcyonium, Metridium, Corynactis*) can be easily observed on the walls. These sessile organisms of course also harbour the more mobile crustaceans, pycnogonids, nudibranchs and so on in greater than usual abundance.



SKYE'S UISGE BEATHA?

('Water of life' [Gaelic], or whiskey!)

by Rohan Holt

c/o "Anarly", Jemimaville, Dingwall, Ross-shire IV7 8LU

From personal experience of a "Seasearch" expedition around Skye, a general impression is gained that species diversity is somewhat limited, especially when considering the number of diverse habitats available. Around the hundreds of miles of coastline, habitats range from exposed rocky cliff faces to fine muddy sediments influenced by freshwater at the heads of the many sea lochs.

By making a comparison of the fauna around Skye with that of areas immediately to the south (Loch Sunart, Sound of Mull, Firth of Lorn and Sound of Jura) several species were found to be noticeably absent, or present only in small numbers. For example, the sponges *Polymastia boliteformis, Axinella infundibuliformis* and *Phakelia ventilabrum* were scarce, as were the gorgonian *Swiftia pallida*, a calcareous bryozoan *Porella compressa* and other species such as *Alcyonium glomeratum, Parazoanthus anguicornus* and *Corynactis viridis*. Fewer hydroids than expected were found in areas with strong currents, possibly influencing other species such as nudibranchs.

Some supporting evidence for Skye's lack of species diversity comes from work by C. Maggs (Scottish Marine Macroalgae: A distributional checklist, Biogeographical analysis and literature abstract, N.C.C. 1986) who has shown that the diversity of red algae around Skye was the lowest on the west coast of Scotland.

Evidently some explanation should be sought for, if indeed this phenomenon is not just an artefact of the survey technique used or simply related to the amount of survey work carried out around Skye. Suggestions include the obvious effect *Echinus* grazing has on faunal and floral diversity and the effects of different currents circulating around the coast. The question of what major factor is influencing the island's ecology remains unanswered and only through further survey work and oceanographical studies will we find out.

* * * * *

-175-

THE SALT MARSH ENVIRONMENT IN SHETLAND

by Kery Dalby

Dept. of Biology, Imperial College, London SW7 2BB

The Shetland salt marshes are not at all typical when seen in the perspective of the British Isles as a whole, but they do possess some unusual physiographical and biological features. Their small size and their species poorness can be partly related to the isolation of the Shetland archipelago and its exposure to the Atlantic swell.

Salt marshes are a vegetation type developed over soft sediments in sheltered intertidal environments - it is thus hardly surprising that they are scarce in Shetland, where seas are so often rough and where there are no rivers to supply sediment as a basis for colonisation. Additionally, most of the stream catchments are small, and are dominated by blanket bog peat (now often improved or cultivated), the direct source of the commonly-found organic deposits in shallow waters. Glacial tills, though widespread under the peat cover, are rarely exposed and offer little potential as sources of fines. Deep water is found close inshore in many areas, and this prevents any significant recycling of bottom deposits (as happens for instance in the west Danish salt marshes). Nevertheless, salt marshes of a sort do occur - at the heads of the sea inlets (voes), around the shores of small rocky bays (vadills) and in rounded embayments (houbs) now almost closed at the seaward end by shingle bars (ayres). These marshes are generally small - often no more than a marginal terrace 1 to 2 m wide at best. Only in a few localities are they large enough to be considered on a national scale (only 4 out of about 90 surveyed exceeded 1 ha). Floristically rather similar communities turn up on cliff tops on the west coast, where the salt water requirement is met by frequent heavy salt spray - however salt marsh fucoids are absent from these sites as there is no regular cyclical tidal cover. Cliff top saline communities of this kind are also known from Faroe. The Shetland examples are characterized by the presence of *Spergularia marina*, elsewhere often acting as an indicator of horse- and cattle-grazed sites - the obvious agents here being multicoloured Shetland ponies.

The voe-side fringes seem to be in a constant state of instability, eroding and accreting simultaneously at different parts along the seaward edges. Ine product of these processes is the development of staircases of small terraces, with 'waves' of new terraces forming and moving upshore. Material of wholly local origin is recycled virtually in situ as the cliffs are undercut and as new fines accumulate amongst the stolons and leaves of *Puccinellia maritima*. More extensive sites show very clear evidence of downward slumping on wetter muds accompanied by richer growths of blue-green *P. maritima*, whilst erosion is indicated by vertical cliff features supporting *Fucus spiralis* and gelatinous cyanophyte colonies.

The Shetland salt marshes are rarely large enough to develop the typical surface features of pans and creeks so familiar from further south. Small pans are generally floored by coarse cobbles and stones rather than silt or mud, and appear to be no more than incipient erosion features. Generally, creeks are actually watercourses taking rainwater from the hinterland over the marsh terrace - they are often straight and parallel, and carry quite a volume of water in heavy rain. It is hardly surprising that they carry a somewhat glycophytic flora (it is not uncommon to see *Triglochin maritima* on the salt marsh turf, and *T. palustris* in the adjacent channels). Virtually identical parallel channel systems occur on west Norwegian salt marshes (though the surrounding flora is a little different).

Dominant angiosperms on the main marsh surface include *Plantago maritima, Triglochin maritima, Armeria maritima* and *Puccinellia maritima*. At rather higher levels *Festuca rubra, Glaux maritima* and *Juncus gerardii* become abundant; their belt is succeeded at approximately normal high tide level by a rapid transition through to non-halophytic vegetation. Overall the angiosperm species list is about half that of southern English salt marshes, a result of geographical isolation of the

island group and the short growing season controlled by low summer temperatures.

The conservation value of these small, species-poor sites may be questioned. It is my view that they most certainly have a value, as they carry a flora that necessarily includes species that are very rare in Shetland, and the sites represent the northernmost part of the salt marsh gradient seen throughout the British Isles over a distance of about 1000 km. In contrast, the alternative view, expressed by some industrial ecologists who compare these sites with those of the Hampshire Basin or Norfolk (and, hardly surprisingly, find them wanting), is that they are too small to be of any value. It seems odd that rarity has weight when applied to species but not when applied to habitats.

So far studies of the Shetland salt marshes have been largely descriptive and observational; even so we have scarcely any information on the algae, or on the marsh fauna. We also have virtually no data on substrate chemistry. The majority of sites are nutrient-poor, with continued leaching by rain and virtually no input of soluble nutrients from the catchment areas. Experimental fertilization of sample plots may be expected to yield spectacular changes. We also have no quantitative knowledge on the effectiveness of these marshes as traps for pollutants. Simple field experience shows that floating oil and oiled fucoid drift accumulate preferentially in certain sheltered sites, such as the houbs around Sullom Voe, as does the debris of polythene, polystyrene and other waste materials. These accumulate for precisely the same reasons as do the fine sedimentary particles.

When I undertook a survey of Shetland salt marshes for the Nature Conservancy Council in 1985, I attempted to predict likely threats to the sites. This has proved, with hindsight, to be rather unsuccessful. I could not, for instance, predict that a monitoring site near Brae, used in the Sullom Voe environmental study, would be destroyed by a tracked vehicle in the assembling of a salmon farm. But conversely, when predicting the effects of salmon farming, we generally concentrate on anoxia, eutrophication of the water column, etc., and do not take account of possible onshore damage.

The obvious threat of oil pollution from the Sullom Voe oil terminal remains. Sheen from the loading jetties can splash over the boom at the Houb of Scatsta, and accumulate on the salt marsh fringe, where scorching of grasses (*Puccinellia maritima* and *Festuca rubra*) follows contact by the oil. Such damage is not expected to be long-lasting if it is due to a one-off incident; repeated oilings (and treatment of the shores with dispersants) could however lead to weakening of the plants' vigour and performance. If this were to happen, then widespread erosion could be expected. This was the basic philosophy underlying my choice of vigour of growth in *P. maritima* as my main tool in environmental monitoring of the Sullom Voe salt marshes for the Shetland Oil Terminal Environmental Advisory Group. The choice was in principle good, as was shown at Voxter Voe where deterioration of the grass cover was followed by erosion of the shore. These sites do have some resilience, however, and, as was also predicted, *P. maritima* is now showing limited signs of recovery on the Voxter shoreline. As with all such environmental programmes, however, difficulties arise in the interpretation of observed results.

This brief account is intended to show that, morphologically and dynamically, there is much of interest in the small Shetland salt marshes, where processes may not be too complicated to understand. Critical studies on their dynamics and stability are still awaited, especially in relation to industrial activities at Sullom Voe and to the increasingly pervasive effects of fish farming throughout the Islands.

-177-

THE MARINE MALACOFAUNA OF THE ISLE OF WIGHT

by Ian Killeen & Jan Light

163 High Road West, Felixstowe, Suffolk IP11 9BD and 88 Peperharow Road, Godalming, Surrey GU7 2PN, respectively.

The Isle of Wight lies off the south coast of England and is separated from the mainland by the Solent, a shallow (rarely more than 20 m deep) drowned river valley. Although the Island is small, measuring 37·8 km from east to west and 22·1 km from north to south, it has approximately 380 km of coastline (including the estuaries).

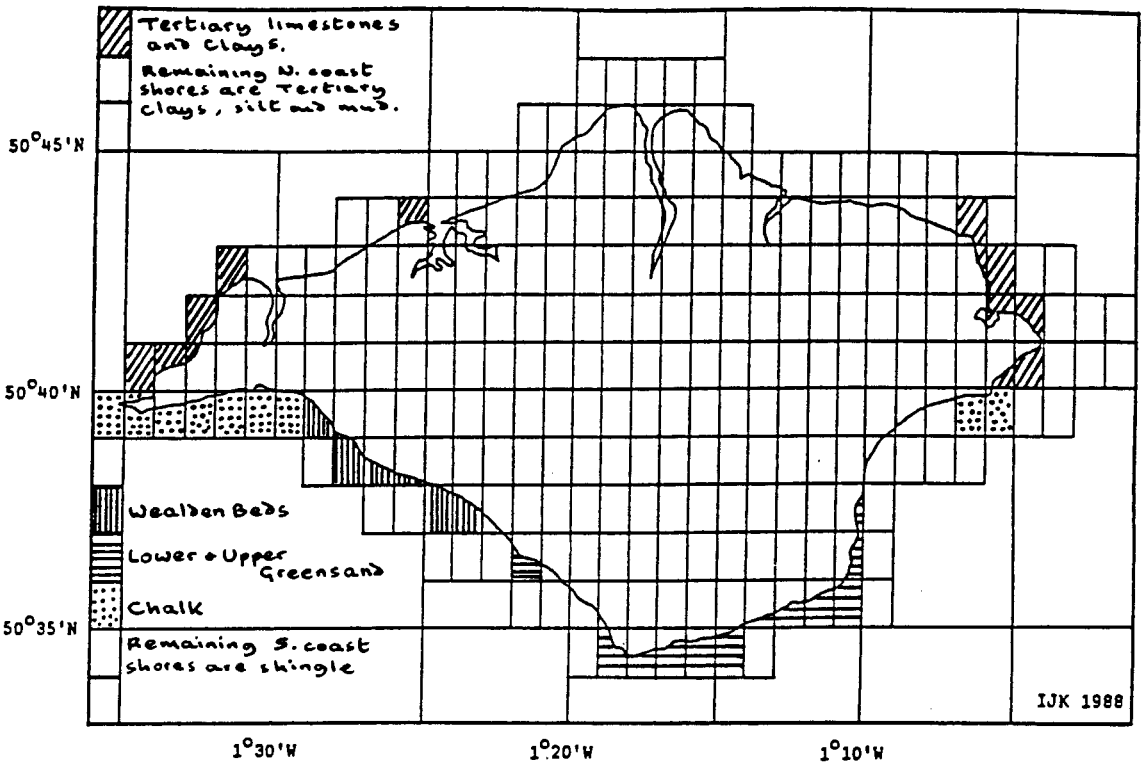
A distinguishing feature of the Island is its varied geological structure. The Island has a monoclinal structure, having been subjected to relatively intense folding during the Tertiary period. Thus it is dominated by a chalk ridge running lengthwise across the Island. This is exposed at the eastern and western extremities and gives rise to rocky shores with flints, ledges, stacks and sheer cliffs. To the north of the chalk ridge are Tertiary deposits, primarily clays but with several limestone outcrops. Generally, Solent shores are rather featureless, often with large expanses of muddy silt. However, sites where the limestone is exposed on the shore tend to be oases for marine life including molluscs in otherwise rather dirty surroundings. There are more extensive shores with limestone rocks and ledges just to the north of the chalk at either end of the Island. A further feature of the north coast are the river estuaries with their associated salt marshes and mudflats.

To the south of the chalk ridge, the geology gives rise to three main shore types. All deposits are Cretaceous, comprising mainly Wealden Beds and Lower and Upper Greensands. The Wealden Beds are made up of marls, shales and harder silts and at low water they are exposed in a series of reefs extending for some 7 km along the southwest coast of the Island. Lower Greensand is the main rock on the remainder of the southwest coast and on much of the southeast coast. Many of these shores are composed of long shingle beaches backed by sandstone cliffs and are consequently rather barren; however, at Atherfield and to the south of Shanklin in particular there are a number of ledges. All shores on the south coast of the Island are composed mainly of large rocks of Upper Greensand which are derived from landslipping. These shores tend to be very exposed and unstable.

This combination of small size, geology and geography makes the Isle of Wight an ideal place for a biogeographical study. Thus, after an investigative visit in September 1987 as part of routine Sea Area 15 fieldwork, we embarked on a survey to record in detail the Island's marine Mollusca. For accuracy, a fine unit of mapping has to be used. The tetrad (2 x 2 km square) system currently employed for most terrestrial surveys is inappropriate for marine work and, as no other suitable system was available to us, we have designed our own. The Island's shores and surrounding waters have been divided into rectangles of 1' of latitude by 1' of longitude. There are 105 rectangles that have shore that is accessible at LWST and to date we have examined 70 (many of these having been visited more than once). A specimen of our base map superimposed with the shore types is shown opposite.

Of the 122 species of mollusc recorded alive since the survey began, 83 have been found intertidally and for many of these species distinct distribution patterns are beginning to emerge.

Some species, such as *Littorina littorea*, are ubiquitous on the Island's shores living at mid-tide level and below in a wide variety of habitats. At many sites large populations are formed irrespective of shore type, frequently adapting to the local conditions. For instance, on the very exposed chalk boulder shore to the east of Freshwater Bay, the shells have become thickened with elevated spires and smaller apertures.



The effect of tributyl tin from marine antifouling paint on *Nucella lapillus* has been well documented and it would appear that the Isle of Wight population has been dramatically affected (Herbert, 1988). From Bembridge ledges in the east to the most southwesterly point at Rocken End, *N. lapillus* is one of the commonest marine gastropods, living on all rocky shores, piers, groynes, etc.. There are also several smaller colonies on the southwest coast as far north as Compton. However, apart from one worn adult specimen at Hatherwood Point to the north of Alum Bay, we have not found any living specimens on the north coast of the island. The disappearance of this species from the Solent is clearly a recent phenomenon and pollution from the numerous marinas and boating activities must be implicated as the main culprit.

Another species that is rare or absent from the Solent is the blue-rayed limpet *Helcion pellucidum* which lives on the stipes and holdfasts of kelp. Despite the presence of kelp on many of the northern shores, we have so far failed to find *Helcion* between Yarmouth and Nettlestone.

In contrast, some species thrive in the silty substrate and dirtier environment afforded by the Solent. An example is *Cerastoderma edule* which has been found at most sites examined on the northern shores and estuaries. The apparent absence of this species from other sites around the island is curious, particularly as there are many suitable habitats.

Many less familiar species also have interesting distributions. Small gastropods of the family Rissoidae are common in a variety of small weeds on the middle and lower shores. *Rissoa guerini* is a southern species usually associated with *Codium*. On the Isle of Wight it is confined to sheltered places mainly on the eastern side, together with shingle sites on the southwest coast and in the western Solent, but it does not appear to live everywhere that *Codium* is present. *Skeneopsis planorbis* on the other hand only lives on the Island's exposed rocky shores. It is typically found amongst the algae *Corallina* and *Cladophora* which occur commonly all around the Island. It lives on the chalk shores of the west, but avoids the Wealden reefs before becoming abundant on all the Greensand along the south coast. In addition to an apparent aversion to the Wealden clays, exposure also seems to be a limiting factor with the species showing a preference for the pounded conditions not present on the northern and eastern shores. Similarly, the bivalve *Musculus discors* is also generally restricted to the exposed chalk and Greensand shores of the west and south coasts.

In contrast to *S. planorbis*, *Ammonicera rota* shuns the exposed rocky shores, and the two species are rarely associated. Until recently little was known about Britain's smallest snail with only a handful of live records. However, our work on the Isle of Wight (and elsewhere in southern Britain and Western Ireland) has shown that *A. rota* has probably been underrecorded and is widespread and common (Killeen & Light, 1989). We have found it at many places around the Island, in thequieter conditions prevailing in the west Solent, Wealden reefs and at a number of shores along the southeast. It appears to be more tolerant of 'dirtier' conditions than many of the other rissoids.

An interesting feature of the Island's fauna is the paucity of nudibranch records (particularly intertidally) compared to the shores further west. The reasons for this are as yet unclear; this is one of the many questions for which we hope to have answers by the end of the five years allocated for this survey.

If any **Porcupines** have molluscan records to pass on arising from their own fieldwork on the Island, we would be grateful to receive them.

References

Herbert, R. 1988. A survey of the dog-whelk *Nucella lapillus* (L.) around the coast of the Isle of Wight. Proc. Isle Wight nat. Hist. archaeol. Soc., 8 (3); 15-21.

Killeen, I.J. & Light, J.M., 1989. *Ammonicera rota* and *Omalogyra atomus* from the Isle of Wight. J. Conch. Lond., 33; 187.

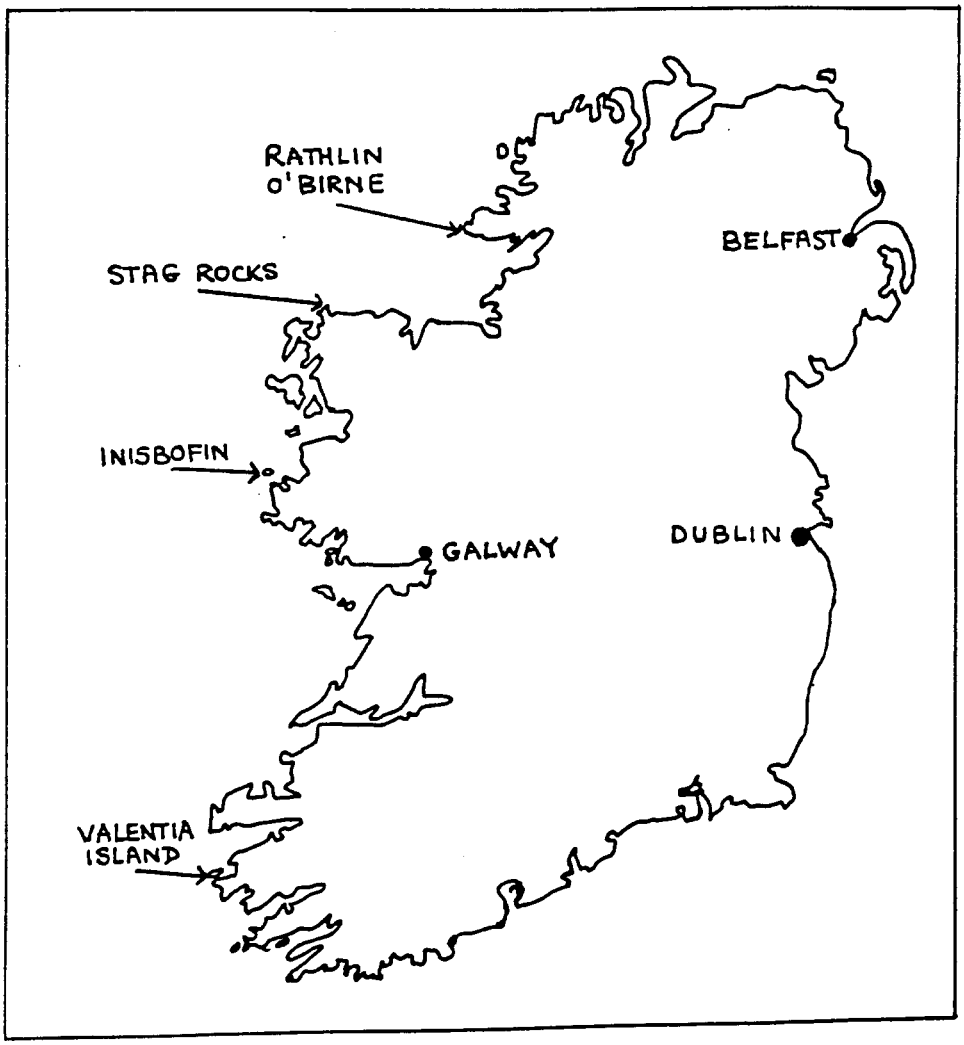
-180-

DIVING ISLANDS OFF THE WEST COAST OF IRELAND

by Julia Nunn
45, Mount Michael Park, Belfast BT8 4JX

For the past three years I have been diving the west coast of Ireland. The most spectacular sites are the steep underwater cliffs and slopes around the islands and pinnacles exposed to the Atlantic swell. Visibility underwater, especially in the spring, is good, usually 10 to 20 m. Four areas in particular offer a wonderful variety of colourful marine life (see the map).

Rathlin O'Birne is a small, largely granite island 2 to 3 miles off the south west coast of Donegal. Parts of it are very exposed: common species are *Holothuria forskali* and *Echinus esculentus* grazing over cliff faces encrusted with pink *Lithothamnion* sp. and the Devonshire cup coral *Caryophyllia smithii*, with clumps of feather stars, *Antedon bifida*, and soft corals *Alcyonium digitatum* and *A. glomeratum*. It is also the most northerly site in the British Isles for the sea fan *Eunicella verrucosa*. Dogfish are more common in the more sheltered bays on the south side of the island.



The Stag Rocks (about 2 to 3 miles from mainland Co. Mayo) and a group of islands around Inisbofin (7 to 8 miles from mainland Co. Galway) are probably the best diving on the west coast. Walls covered in plumose anemones (*Metridium senile*) and the hydroid *Tubularia indivisa* are present in the most exposed areas. Elsewhere, carpets of the multi-coloured jewel anemone *Corynactis viridis* cover the cliff faces. Fish (ballan wrasse, cuckoo wrasse and pollack) are particularly common around the pinnacle Mweelaundhu off the island of Inishark near Inisbofin. The hydroid and bryozoan turf (including *Nemertesia* spp., *Gymnangium montagui* and *Securiflustra securifrons*) supports many species of nudibranch (for example, *Limacia clavigera*, *Janolus cristatus*, *Coryphella browni*, *Eubranchus farrani*, *Dendronotus frondosus* and *Polycera faeroensis*). *Simnia patula*, a false cowry, is locally common on its food dead man's fingers (*Alcyonium digitatum*). Several specimens of the white form of the top shell *Calliostoma ziziphynum* have been observed around the Stag Rocks.

Further south, separated from the mainland only by a narrow channel, lies the beautiful island of Valentia in Co. Kerry. The marine life at the south west end of the island is again typical of an exposed coastline - walls of *Corynactis viridis*, with huge edible crabs (*Cancer pagurus*) sheltered in rows under overhangs. Other anemones - *Sagartia elegans* (including var *rosea*) and *Urticina felina* - are very common. At some sites are rocky clefts covered in the huge dahlia anemones; the Ross coral, *Pentapora foliacea*, can also be seen, and crayfish seem to lurk under every boulder!

The Skelligs Rocks lie some 8 miles from Valentia and are famous for their bird colonies (especially gannets and puffins) and seals. Shallow water kelp, covered in hydroids with the nudibranch *Tergipes tergipes*, gives way to cliff faces down to 35 m. Boulders covered in *Cliona caelata* lie on gravel at the cliff base. In places there is a thick hydroid and bryozoan turf where *Coryphella pedata* can be seen. Small clumps of *Paraerythropodium coralloides* lie under shallow overhangs.

As I am particularly interested in recording molluscs, I carry a polythene bag on each dive to collect specimens for identification, and samples of hydroids, bryozoa and algae for later examination for small species. In the four areas discussed I have had 41 dives (depth range 12 to 45 m) and recorded 64 live species of mollusc, including 27 species of nudibranch. Some of these species are new or updated records for the Sea Area Atlas of Mollusca published by the Conchological Society of GB & Ireland (Ed. D. Seaward). I give here a list of these records, while acknowledging that some of these species may have been recorded by others before me since the Atlas was published in 1982.

Sea Area 34	*Margarites helecinus, Cuthona viridis*
Sea Area 35	*Lamellaria latens, Vitreolina philippi, Colpodaspis pusilla, Polycera quadrilineata, Diaphodoris luteocincta, Limacia clavigera, Janolus cristatus, Eubranchus farrani, Coryphella pedata, C. lineata, Pododesmus squamula*
Sea Area 37	*Jorunna tomentosa, Tergipes tergipes, Coryphella pedata.*

* * * * *

MARINE NATURE CONSERVATION IMPORTANCE OF THE ISLES OF SCILLY

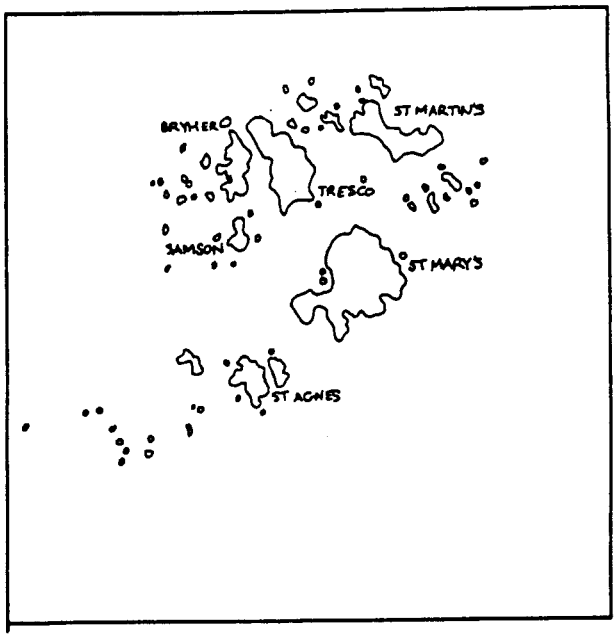
by Sarah Fowler

The Nature Conservation Bureau, 122 Derwent Road, Thatcham, Newbury, Berkshire RG13 4UP

The Isles of Scilly are an archipelago of small granite islands and rocks in the extreme southwest of England. They were a single island in the Bronze Age and known to the Romans as Siluram Insulam, when the northern group of islands was still joined. Field walls and hut circles are now found on the lower shore of the sand flats between the islands, which are still falling in relation to sea level.

There has been an extensive history of study in the islands, commencing in the 19th Century and continued by numerous marine biologists in the second half of the 20th Century. Harvey (1969) provides a general overview of the marine flora and fauna, the first of a series of papers on the islands, and most recently the Nature Conservancy Council has funded several detailed surveys, described in unpublished reports. In common with many other south-western islands, the Scillies have attracted many rarities and numerous south-western species are present - too numerous to list here. Some 'common' species of intertidal fauna are rare or absent and the emergence of sublittoral species onto the shore is quite widespread. The algal flora is particularly notable. The islands are considered by some to have more in common with Brittany than with the British coast.

The extensive low tide sand flats between the northern islands are considered to be of national or international nature conservation importance. The sediments are low in calcium carbonate and organic content and poorly sorted, but vary from coarse intertidal sands to fine, sheltered sediments both in deep water and in sheltered pocket beaches. There is a complex mosaic of sediment habitat and community types betwen the islands, unusual in the way in which these alter markedly over very short distances. The largest *Zostera marina* beds known in southern Britain are present here and these have a very rich associated flora and fauna, both on the leaves and between the roots of the plants. For example, the anemone *Anthopleura ballii* has apparently only been recorded here in south-west Britain and there are several rare algae. There are extensive areas of *Gibbula magus* gravels and beds of *Cereus pedunculatus* in some of the shallow, tide-swept channels between the islands.



The boulder and bedrock shores on the sheltered sides of the northern islands are considered to be of national importance, with particularly rich under-boulder communities. One of the dominant components of this community is the orange-peel bryozoan, *Turbicellipora magnicostata*, a Mediterranean species not known elsewhere in the south-west. The algal flora of these shores is also characterized by numerous rarities, primarily southern species not found in such abundance elsewhere in Britain. Other shores tend not to be as rich in fauna, owing to the paucity of microhabitats on granite, but the

south-western rocks are notable for being the most wave-exposed rocky shores in England and are therefore also of national nature conservation importance. A particularly unusual and abundant component of the rocky shore and shallow sublittoral is the alga *Pikea californica*, a Pacific species first recorded here in the eastern Atlantic and still confined to Scilly in Britain.

Communities of regional importance are present on tide-exposed cobbles and boulders in the deeper sounds between some of the islands, including several rare algae of national importance. On the sheltered east-facing coasts, regionally important circalittoral rock communities also include south-western (Mediterranean-Atlantic) species of national importance. The deepwater sponge assemblage present on the east coast of St Mary's is more extensive than those recorded elsewhere in Britain.

Reference

Harvey, L.A., 1969. The marine flora and fauna of the Isles of Scilly. The islands and their ecology. **J. nat. Hist.**, 3; 3-18.

THE SUBLITTORAL COMMUNITIES OF RATHLIN ISLAND, NORTHERN IRELAND

by Bernard E. Picton

Ulster Museum, Botanic Gardens, Belfast BT9 5AB

Location and Topography

Rathlin Island is the largest island off the Northern Ireland coast and is situated about 5 km offshore, north of Ballycastle on the Co. Antrim coast. The island lies at the mouth of the North Channel, the northern entrance to the Irish Sea. The position of the island in the strong tidal streams which result from the filling and emptying of the Irish Sea results in a complex pattern of tidal movements around the island. The Channel is only 20 km wide at its widest part, between Fair Head and the Mull of Kintyre and tidal streams reach strengths of 6·5 knots in Rathlin Sound. Exposure to the open Atlantic to the north-west and the sheltered nature of the east coast both contribute to the diversity of habitats present around the island. A deep channel to the north of the island extends to just below continental shelf depths (200 m) and the submerged cliffs on this part of the island are a unique phenomenon. Nowhere else in the British Isles are there vertical cliffs in the sublittoral which extend directly to such depths. Similar cliffs are only found elsewhere in Scottish sea lochs, where the environmental parameters are quite different (i.e. they are normally sheltered from both wave and tidal stream action).

Geologically, Rathlin Island consists of horizontally bedded chalk deposits which have been covered and metamorphosed by basalt deposits. The two rock types weather quite differently in the sublittoral: the basalt tends to break up into angular boulders with smooth surfaces, whereas the limestone remains as bedrock wherever it is exposed and has a rough pitted surface with horizontal fissures and crevices, sometimes eroding into small caves and overhangs. As a result, the animals and plants present on these two contrasting rock types often form quite distinctly different communities under the same environmental parameters. The north coast of Rathlin Island is probably unique for this opportunity to study such effects of geology on community structure.

The animal and plant communities

Factors of physiogeography, exposure and tidal streams interact to produce a complex mosaic of habitats and communities in the shallow sublittoral around Rathlin Island. Rapid gradients of tidal stream strength around headlands and bays combine with differing exposure to wave action so that communities are not easily separated or defined, especially on rocky substrates. A high proportion of the species listed in the Northern Ireland Sublittoral Survey (NISS) report as of special interest were found around Rathlin Island and, in addition to rare species, rare communities in both a Northern Ireland and a British Isles context occur here.

1. Medium sand community

In the inner part of Church Bay along its northern edge the seabed consists of medium sand. The animal community characteristic of this sand included the burrowing sea-cucumber *Labidoplax digitata* in large numbers, together with the brittle star *Amphiura brachiata* and the burrowing sea urchin *Echinocardium cordatum*. The sand is well-worked and probably has a rich infauna. In slightly deeper water (15 m) the sand is colonized by numbers of the hydroid *Corymorpha nutans*, on which a rare nudibranch, *Cumanotus beaumonti*, was found feeding. Other characteristic species in this area were the crab *Corystes cassivelaunus* and the bivalve *Arctica islandica*; large plaice, *Pleuronectes platessa* were observed frequently. A small area of similar sediment with several of these species present was also observed in Arkill Bay on the east coast of Rathlin.

2. Coarse sand/gravel/mud

A steep slope of muddy gravel extends from 20 m to beyond 50 m depth off the white cliffs at the western end of Church Bay and is swept by a gentle current. Occasional boulders and cobbles are partially embedded in the gravel and the substrate is stable and undisturbed. The scallop *Pecten maximus* is frequent and the rare burrowing anemone *Arachnanthus sarsi* was observed here, as well as one specimen in a less characteristic habitat in the sand further east. This gravel slopes in an east-west direction, parallel to the shore, and a sharp transition to a slope of large boulders occurs in a shoreward direction. Tubes occupied by the worm *Chaetopterus variopedatus* are frequent and the undisturbed nature of the substrate allows abundant and diverse erect hydroids and bryozoa to grow on pebbles and cobbles. Cup corals, *Caryophyllia smithii*, were found here attached to small stones, an indication of the stability of the seabed. The sea-cucumber *Neopentadactyla mixta* is present in small numbers buried in the gravel. Further away from the shore the substrate becomes more sandy, with occasional boulders heavily colonized by hydroids and the bryozoans *Flustra* and *Securiflustra*. The crab *Atelecyclus rotundatus*, often associated with gravel habitats, was also present here. This was one of the most diverse muddy gravel communities found in the NISS and would be very vulnerable to disturbance by dredging.

3. Very coarse clean stony gravel

In shallow water inside the medium sand habitats on the north side of Church Bay patches of stone gravel occur among boulders at a depth of about 10 m. Two burrowing sea anemones, *Halcampa chrysanthellum* and *Edwardsia timida*, both rare in N. Ireland, occur in this habitat. The boulders support a range of algae.

4. Coarse clean shell gravel

Patches of coarse shell gravel, often interspersed with boulders and cobbles, occur in the outer part of Church Bay. The heart urchin *Spatangus purpureus* was recorded from this habitat and, from the evidence of dead shells, a variety of bivalves was probably present. Elsewhere this sediment type supports a rich infauna of bivalves and some echinoderms, and so was probably not adequately sampled by NISS methods.

5. Muddy gravel with boulders - East coast

In 30 to 50 m on the southern part of the east coast of Rathlin Island are considerable areas of gravel with varying proportions of boulders. The boulders and cobbles are colonized by a range of hydroids,

especially *Sertularella gayi, Polyplumaria flabellata, Diphasia alata, D. pinastrum* and, rarely, *D. nigra*. The sponge *Axinella infundibuliformis* is frequent in this area and several rarer sponges, including *A. polypoides* and *Clathria foliata*, are present. The hydroid assemblage, with *C. foliata*, was only found elsewhere during the survey at the Maidens, and has not been reported from anywhere else, though some of the component species have been recorded occasionally in deep water (usually beyond diving range) both in south-west Britain and in west Scotland.

6. Bedrock and boulder

The north-east coast of the island consists mainly of boulder slopes with occasional areas of bedrock. Most of the bedrock observed by the survey team in this area was limestone, whereas boulders were mostly basalt, indicating that these rcok types weather differently. In the shallow water, rich algal communities were present, with surge gullies in very shallow water. The deeper water communities were diverse, with several sponges prominent.

7. Boulder slopes

Stable boulder slopes consisting of large basalt blocks occur between the white cliffs and Bull Point at the north-west corner of Church Bay. These boulder slopes were unusually steep, typically 40°, and the large spaces between the boulders sheltered a rich fauna of sponges and bryozoans. Tidal streams were particularly variable here, with small sheltered bays between headlands with strong tidal streams. This area harboured several of the spouth-western species found on Rathlin, such as the holothurian *Holothuria forskali* and the sponge *Axinella damicornis*. The algae *Drachiella spectabilis, Dictyopteris membranacea* and *Myriogramme heterocarpum*, all with south and west distributions, were found in this area.

8. Vertical bedrock, circalittoral

Along the north-west coast of Rathlin Island from Bull Point to Farganlack Point are vertical sublittoral cliffs, starting at about 25 m depth and continuing below diving depths. Echo soundings indicate that the vertical cliff extends to at least 80 m. Depths of 150 to 200 m are shown on the chart within 750 m of the coast. Elsewhere in the British Isles such large cliffs are almost unknown, though similar structures do exist in some places on the west coast of Scotland. These Scottish sites are, however, almost always very sheltered from wave exposure and with weak tidal streams, and therefore support different communities. North-west Rathlin Island is exposed to swell from the North Atlantic and tidal streams run along the cliffs at 3 to 4 knots.

This habitat is dominated by several different species in large patches, predominantly the sea-squirt *Dendrodoa grossularia*, the soft coral *Alcyonium digitatum*, the anemones *Metridium senile* and *Sagartia elegans*, the hydroid *Tubularia indivisa* and a variety of sponges, especially *Pachymatisma johnstonia* and *Iophonopsis nigricans*. A number of species are characteristic of this habitat and rarely or never found elsewhere, viz. *Parazoanthus axinellae, Stelleta grubei, Stryphnus ponderosus, Tethyspira spinosa* and *Spongionella pulchella*.

9. Caves

Small caves are found in the vertical cliffs and shelter a variety of species, forming a separate habitat or habitats. One cave at Derginan Point, for instance, had a soft mud floor with sea pens, *Virgularia mirabilis*, growing in the mud, an extreme example of a physical feature providing small modified habitats.

10. Terraced bedrock

At Bull Point the seabed consists of terraced bedrock and boulders, with some coarse gravel. The tidal streams are strong. The anemone *Actinothoe sphyrodeta* is particularly conspicuous, with large amounts of *Alcyonium digitatum* and sponges. In shallow water rich algal communities are present, including *Dictyopteris membranacea, Radicilingua thysanorhizans* and the only survey record of the rare red alga *Schizymenia dubyi*. In the circalittoral a diverse sponge and

hydroid community is found including *Antenella secundaria*, *Diphasia pinaster* and *Hymedesmia* spp..

Reasons For Protection of Rathlin Island

Rathlin Island is a site of unique importance in marine biological terms. Its geographical position at the entrance to the North Channel suggests that it should be an important site from a zoogeographical standpoint. The frequency of species found to be at or near their northern limits of distribution in the British Isles around Rathlin Island confirm this suggestion. The presence of many rocky circalittoral habitats and rare sedimentary habitats make the island an important site in a Northern Ireland context as such habitats have been shown by the NISS to be comparatively rare in this area. The underwater cliffs on the north side of the island are probably the largest vertical sublittoral rockfaces in the British Isles. The presence of deep water which is being turbulently mixed by the strong tidal streams may also account for the occurrence of some of the species, found on the east coast, which are thought to be characteristically deep-water forms and are not known elsewhere within diving range. This sort of habitat coincides with the open sea étage of Glamarec.

Sediment habitats around Rathlin were apparently in a natural state and did not appear to have been damaged by dredging or other fishing activities. The muddy gravel habitats in particular, which support small populations of scallops (*Pecten maximus*), are mostly mixed with numbers of boulders and cobbles which support rich populations of hydroids and bryozoans and greatly increase the diversity of these sites. On the west coast of Scotland such sites have been extensively dredged, with consequent removal of most of the cobbles causing permanent damage to the habitat. While the presence of larger boulders and bedrock outcrops may inhibit dredging on the east coast of Rathlin, urgent protection should be sought to guard against this threat, especially in view of current trends towards dredging of more marginal areas using sophisticated instrumentation such as side-scan sonar.

Unfortunately, since the completion of the NISS, boats from the east coast of Northern Ireland have dredged extensively for scallops in Church Bay and on the east coast of Rathlin Island (T. Cecil, pers. comm.). Fieldwork carried out by this author during 1989 confirmed that the stable sediment communities on the east coast have been stripped of their cover of hydroids and bryozoans over considerable areas. Boulders with populations of slow-growing sponges and other sessile invertebrates have been lifted out of the sediment and rolled over, damaging or killing the attached fauna. In the weeks after the dredging many lobsters with damaged carapaces and missing limbs were taken in pots close inshore, where they had presumably been driven by loss of habitat in the offshore area (T. Cecil, pers. comm.). That such rare habitats should be damaged so soon after their description shows how urgently the few remaining areas of undisturbed sediment habitats of this type need protection.

It is suggested, therefore, that full Marine Nature Reserve status should be given to Rathlin Island as soon as possible. Licensing of current fishing with lines and pots should not pose any threat to the environment if continued at present levels, and indeed protection of this fishery by exclusion of boats from elsewhere should be seen as beneficial by the islanders. Rathlin has considerable potential from a sport-diving - tourism point of view and if the reserve is established on a "look but don't take" principle then it could be developed along these lines as an educational and sports resource.

Acknowledgements

The work reported here was carried out by the diving team of the Ulster Museum - David Erwin, Bernard Picton, David Connor and Christine Howson - as part of the Northern Ireland sublittoral survey funded by the Countryside and Wildlife Branch of the Department of the Environment (Northern Ireland).

OBITUARY

Thomas Everett Thompson

Tom Thompson died tragically in a motoring accident on January 1st 1990 at the age of 57. He was first and foremost a zoologist, but a zoologist with a lifelong passion for sea slugs. He did his doctoral thesis on them at Port Erin and he has been studying them ever since, first in the British Isles and then travelling overseas, from Cape Town to Friday Harbour (Seattle), from Jamaica to Queensland, and most recently in the eastern Mediterranean. He began by studying almost all aspects of their biology from ecology, physiology and behaviour to embryology, larval development and histology. Then, after a decade, he entered the minefield of taxonomy, which had been dominated for the previous twenty years by Ernst and Eveline Marcus. He immediately realised that what was needed was not more and more descriptions of preserved material collected on the occasional trip to the beach at low tide with, if one was lucky, a few notes on the living animal. Instead it was becoming essential to observe and collect animals in their natural habitat, so he took up SCUBA diving. His early taxonomic papers can be faulted today because he was then very much a lumper, but over the years he broadened his experience, sought advice from colleagues and developed a more realistic assessment of what constitutes a species, and of how several species of similar appearance can occur together. He has become not just one of the leading experts on opisthobranch molluscs in Britain and in the world, but *the* authority on every aspect of the biology and classification of sea slugs. The overwhelming majority of his 80 or so scientific papers deal with the biology or taxonomy of sea slugs.

Tom will be remembered with affection and thanks by many younger colleagues for his enthusiasm and willingness both to listen and to assist with practical advice. Though very knowledgeable himself he was always ready to listen to other people's ideas and experiences, and he had a genuine respect for views that other people held. I never heard him lecture at Bristol but I am sure he was clear and lively. He also took responsibility for the professional side of his work, including playing an active role in the Malacological Society of which he served a term as President, but to which perhaps an even more important contribution was his period right up to his death as treasurer. He had recently been elected Vice President of the Ray Society. The best testimonial to his life and work is perhaps the *Biology of Opisthobranch Molluscs*. The first volume of this *magnum opus* was comprehensive and good, but the second is an outstanding piece of work which will stand alongside Alder and Hancock's classic monograph of the Victorian era. Tom clearly saw that what was needed for his beloved dorids and aeolids had got to be a book of alpha grade. As his work on this volume progressed he realised that his former research student Greg Brown was the best man to help with the illustrations, and the result is a monograph that is a true *tour de force*, a fitting memorial to a first class scientist and a good friend.

Malcolm Edmunds

AGM Reports

MINUTES OF THE THIRTEENTH ANNUAL GENERAL MEETING OF PORCUPINE, held at the University of Dundee, on Sunday 4th March 1990 at 9.30 am.

Jan Light was in the Chair; 22 Members were present. Apologies for absence were received from the Hon. Treasurer. The Minutes of the Twelfth Annual General Meeting (Published in PORCUPINE NEWSLETTER, Vol.4 No.5) were approved.

The Hon. Secretary's Report and the Hon. Treasurer's Report were presented by Martin Sheader and approved.

The Hon. Editor's Report was presented by Roger Bamber and approved.

The Hon. Records Coordinator's Report was presented by Jonathan Moore and approved.

Office bearers were elected as follows:

Hon. Secretary	Martin Sheader
Hon. Treasurer	Antony Jensen
Hon. Editor	Roger Bamber
Hon. Records Coordinator	Jonathan Moore

In accordance with Rule of Procedure 5, David Heppell and John Wilson retired from Council; both had served as Hon.Treasurer and had been Council Members since its inception. They were thanked for their efforts on behalf of **Porcupine**. The following Members were elected to Council:

Iain Dixon	Jan Light
Frank Evans	Ivor Rees
Bill Farnham	Ralph Robson
Willie Fowler	Dennis Seaward
Robin Harvey	Shelagh Smith
Christine Howson	Brenda Thompson
David Lampard	Fred Woodward

The auditors were thanked for their work last year. Ralph Robson retired and Nick Light was re-elected as auditor: as a non-Member of this non-charity, a single auditor was deemed sufficient.

Future meetings were announced at Anglesey (Field Meeting - 6-7 October 1990), Fawley near Southampton (Autumn 1990) and Swansea (5-6 April 1991).

It was agreed to increase the **Porcupine** membership fee to £8 for 1991 (as due 1 January 1991). Tom Gascoigne was elected as a Life Member in recognition of his service to **Porcupine** and marine biology over many years. The proposed introduction of a species of Japanese scallop (*Patinopecten yessoensis*) to Ireland was brought to the attention of the Meeting by Dave McKay. This introduction was generally considered to be undesirable. Fred Woodward agreed to contact the Fisheries Department in Dublin.

The Meeting closed at 10.05 am with the chair proposing thanks to those involved in the organization of the Dundee Meeting.

PORCUPINE
RECEIPTS AND PAYMENTS ACCOUNT
for the period 5 March 1989 to 20 February 1990

01.04.88 to 04.03.89			05.03.89 to 20.02.90	
£	£		£	£
		RECEIPTS		
		Subscriptions - 1988	-	
107		1989	186	
531		1990	627	
7		1991	-	813
5	650			
	30	Advertising Revenue		-
	60	Sale of P.N. back numbers		17
	59	Bank Interest		-
	799	Total Receipts		830
		PAYMENTS		
188		Newsletter - Printing	601	
67		- Postage	188	
-		- Envelopes	40	
255		Total Newsletter Costs	829	
27		Delegates Travel	32	
8	290	Postage and Stationery	31	892
	509	SURPLUS (SHORTFALL) BEFORE MEETINGS		(62)
		GUILDFORD MEETING		
		Meeting costs	847	
	-	Less receipts	694	(153)
	509	SURPLUS (SHORTFALL) FOR THE PERIOD		(215)
	1832	BALANCE BROUGHT FORWARD		2341
		BALANCE CARRIED FORWARD		
550		Current Account	635	
1791	2341	Deposit Account	1491	2126

Hon Auditor
N. Wigley.

Hon. Secretary's Report 1989-1990

Over the last year **Porcupine** has held three meetings. The 12th Annual General Meeting, organized by Shelagh Smith, took place at the University of Lancaster on 1-2 April 1989. The theme of the meeting was 'The Irish Sea', with a broad range of topics including benthic studies, pollution and fisheries. The second meeting, a field meeting based at Cullercoats, Northumberland on 20-21 July 1989, was organized by Frank Evans, who was able to provide laboratory space, microscopes and, more importantly, the services of the Newcastle University research vessel "*Bernicia*". Around 235 species were recorded, some new to the area. The third meeting, organized by Jan Light on the theme of 'Islands', was held at the University of Surrey on 28-29 October 1989, providing a interesting and stimulating end to the year.

I would like to express the wishes of the society in thanking all those involved in the organization of the above events. I also make the usual plea for ideas for topics and venues for future meetings.

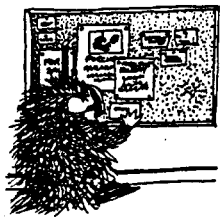
To date, for 1990-91, an Autumn meeting on 'Plankton' is planned to take place at Fawley (nr. Southampton); there will be an Autumn Field Meeting at Anglesey joint with the Conchological Society, and the AGM will be held at Swansea in association with the Coelenterate Club.

Membership during the current year has remained steady at around 190. Could I encourage members to bring the society to the attention of students, colleagues and friends whose interests fall within the broad remit of Porcupine.

It is with sadness that we learned of the death of Member Tom Thompson over Christmas. He will be missed both as a colleague and for his renowned expertise as an Opisthobranch taxonomist and ecologist.

Finally, I wish to announce that, owing to work and research commitments, I will not be available for re-election as Hon. Secretary at the 1991 AGM.

Martin Sheader
Hon. Secretary 4.3.90



FUTURE MEETINGS

There will be a Field Meeting based at Anglesey on the 5-7 October 1990. The meeting will be joint with the Conchological Society of Great Britain and will cover a number of shore types (and a lagoon!) on Anglesey. Laboratory facilities are planned to be available.
For further information contact Dr Martin Sheader, Department of Oceanography, University of Southampton, Highfield, Southampton SO9 5NH (Tel. 0703 593639).

The dates for the Autumn Meeting at Fawley have yet to be finalized; they will be announced as soon as possible and in good time. Meanwhile, those wishing to offer contributions on the theme of "Plankton" should contact Dr Frank Evans, Dove Marine Laboratory, Cullercoats, North Shields, Tyne and Wear NE30 4PZ.

The 14th Annual General Meeting and 1991 Spring Meeting will be a joint meeting with the Coelenterate Group, in Swansea over 5th to 7th April 1991, on the theme "Change and Adaptation". Our host will be Professor J.S. Ryland of the School of Biological Sciences, University College, Swansea.

NOTICES

THE MARINE FORUM FOR ENVIRONMENTAL ISSUES:
North Sea Environment

In a new report, handed over on the 8 February to the Junior Environment Minister with responsibilities for marine issues Parliamentary Undersecretary David Heathcoat-Amory, the Marine Forum for Environmental Issues analyses the current environmental status of the North Sea, including inputs, impacts and trends.

"This is the most comprehensive analysis of the environmental state of the North Sea produced in the UK", said Swantje Brodie Cooper, Marine Forum's administrator. "This report is aimed at influencing the decision-makers at the 3rd Interministerial Conference in The Hague on the 7 and 8 March 1990".

The report ['The Marine Forum for Environmental Issues 1990 North Sea Report', available from the Marine Forum f.E.I., 80 York Way, London N1 9AG at a cost of £10] was launched at a conference at the Royal Geographical Society on 31 January 1990. The 24 papers of the report on major issues of concern were introduced by the authors, leading UK scientists and NGO experts.

For further information contact: The Earl of Cranbrook (Chairman), Tel. 072378 543 or Swantje Brodie Cooper (Administrator), Tel. 01 837 5359

* * * * *

IRISH SEA CONFERENCE, 22 to 24 October 1990

at the Manx Museum and Palace Hotel, Douglas, Isle of Man, jointly organised by the Irish Sea Study Group, Liverpool University Centre for Marine and Coastal Studies, and the Isle of Man Government.

Sessions will cover Management of the Irish Sea, Conservation, Waste and Pollution, Fishing, and Coastal Development, variously under the Chairmen Dr Duncan Shaw, Dr Brian O'Connor, Rick Boelens, Prof. Trevor Norton and Dr Hance Smith; there will also be discussion groups, poster presentations (offers by 1 April) and the opportunity for supplementary seminars.

Further information, booking and registration forms can be obtained from the Conference Secretariat, Dept. of Local Government and the Environment, Central Government Offices, Douglas, Isle of Man. Persons wishing to make poster presentations or to organise supplementary seminars should contact Dr D.F.Shaw, Liverpool University Centre for Marine and Coastal Studies, c/o Faculty of Science, P.O. Box 147, Liverpool L69 3BX

* * * * *

A GOOD YEAR FOR FOULING TUBE-WORMS?

Clifford Thorp, of The Marine Laboratory, Ferry Road, Hayling Island PO11 0DG, has been studying notable outbreaks of two serpulid tube-worms which occurred in the summer of 1989. Portsmouth Dockyard was "invaded" by the tropical/sub-tropical species *Hydroides elegans* (the first record of this species in British waters since it was described - as *H. incrustans* - from Swansea Docks in the 1950s), while there was unusually heavy fouling of cultivated mussels in Scottish waters caused by the indigenous *Pomatoceros lamarckii*.

These "outbreaks" are readily attributable to the unusually equable climatic conditions which we have been experiencing recently. As such, they may represent only the tip of the iceberg with regard to excessive growth, reproduction and possible introductions during last year.

Any readers who may have further information on such increases in tube-worm fouling from other places and for other species are encouraged to contact Cliff, or indeed drop the Hon.Ed. a letter.

OBSERVATIONS ON *AURELIA AURITA* WITHIN THE ZOOPLANKTON OF SOUTHAMPTON WATER, WITH PARTICULAR REFERENCE TO ITS 'ABSENCE' IN SUMMER 1988

by J.A. Williams and J. Reubold

Dept. of Oceanography, Southampton University, U.K.

Preliminary data from a continuing survey of the zooplankton community of Southampton Water show a typical spring-autumn seasonal pattern of abundance, with highest densities between August and October and relatively low numbers from April to July. Cirripede larvae were recorded throughout the spring to autumn period, with copepods, particularly calanoids, becoming the dominant group after August. This pattern contrasts with the only critical survey of recent years (Raymont & Carrie, 1964) in which there was evidence of a sequential, clear and rapid increase in the density of all identified zooplankton groups, observed to start in April.

The sequential appearance, in significant numbers, of the gelatinous predators *Aurelia aurita* and *Pleurobrachia pileus* coincide with the lower zooplankton abundance before August. This paper describes the seasonal appearance of the scyphozoan *A. aurita* in Southampton Water, and identifies the probable cause of its virtual absence from the estuary in 1988.

Aurelia aurita is essentially neritic, with a cosmopolitan distribution in the Atlantic, Baltic and Mediterranean (Moeller, 1980; Sushkina & Musayeba, 1983; Hernroth & Groendahl, 1985; Papathanassiou *et al.*, 1987). Around the UK coast, ephyrae typically appear in the plankton between January and April; Hernroth & Groendahl (1985) found that ephyrae in the Baltic are predominantly released in October/ November and overwinter at depth, before appearing in surface waters in April. Development to adults is usually rapid and medusae are normally present in British waters from April until August/September. Following release of planulae in late summer, mortality is high and adult numbers decline, although some individuals may overwinter at depth in the water column.

Although capable of forming dense annual swarms in estuaries, the appearance of *A. aurita* is often sporadic. Qualitative observations over a number of years have shown *A. aurita* to have a consistent seasonal abundance in Southampton Water. This species is regarded as an opportunistic, generalist predator with a wide prey size spectrum, though capable of some size selectivity; copepods typically form a substantial part of the diet (Moeller, 1980; Arai & Jacobs, 1980; Bailey & Batty, 1983; Stoecker *et al.*, 1987). With its potential as a swarming predator in estuaries and enclosed waters, *A. aurita* should have a considerable impact on zooplankton communities.

A quantitative zooplankton sampling programme was initiated in April 1985 in Southampton Water using buoyed sample stations at Hamble, N.W. Netley and Cracknore, situated along the northwest-southeast axis of the estuary and up into the River Test (Fig.1). Collections of mixed zooplankton and *A. aurita* were made with 140 µm and 210 µm mesh plankton nets respectively. A TSK flowmeter was deployed in the 0·5 m mouth of each net, and horizontal tows of between 3 and 10 minutes duration were made at 2 m and 6 m depths, resulting in samples of 25 to 30 m^3 of water. Whenever possible samples were taken at approximately the same state of tide. Hamble and N.W. Netley are considered marine sites, with a salinity of 32 to 34‰ recorded throughout the water column; Cracknore is more estuarine, with a surface water salinity of 25‰ recorded at some states of the tide (Lockwood, 1986), although the water column is typically above 30‰.

Samples were treated with 5% formalin, counted and categorized into a number of zooplankton groups based on the convention of Raymont & Carrie (1964).

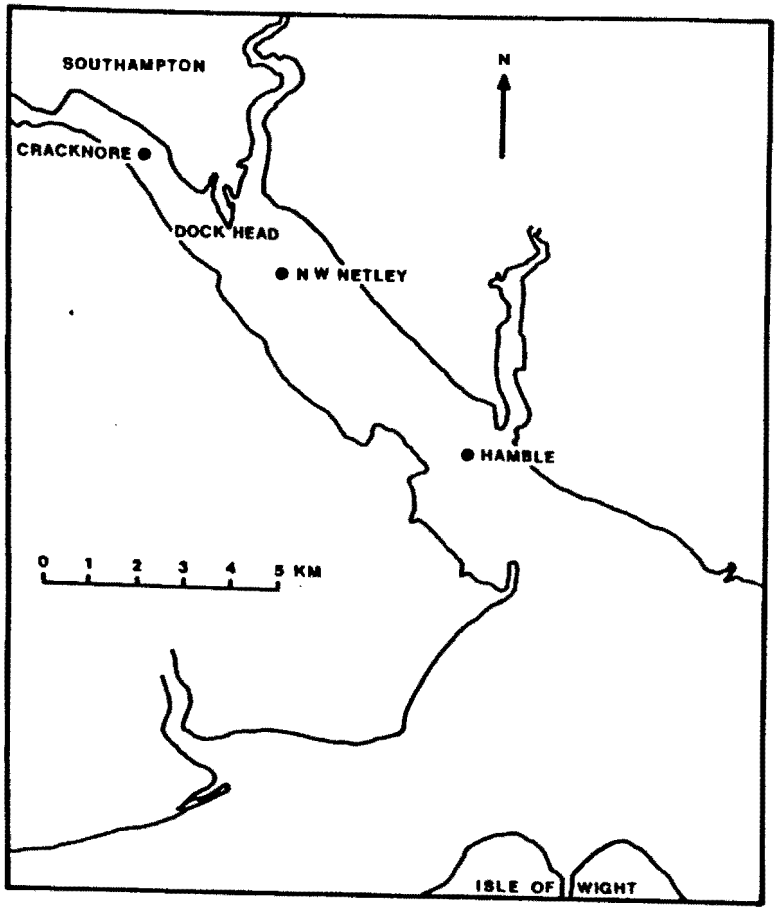


FIGURE 1. Southampton Water and collection sites.

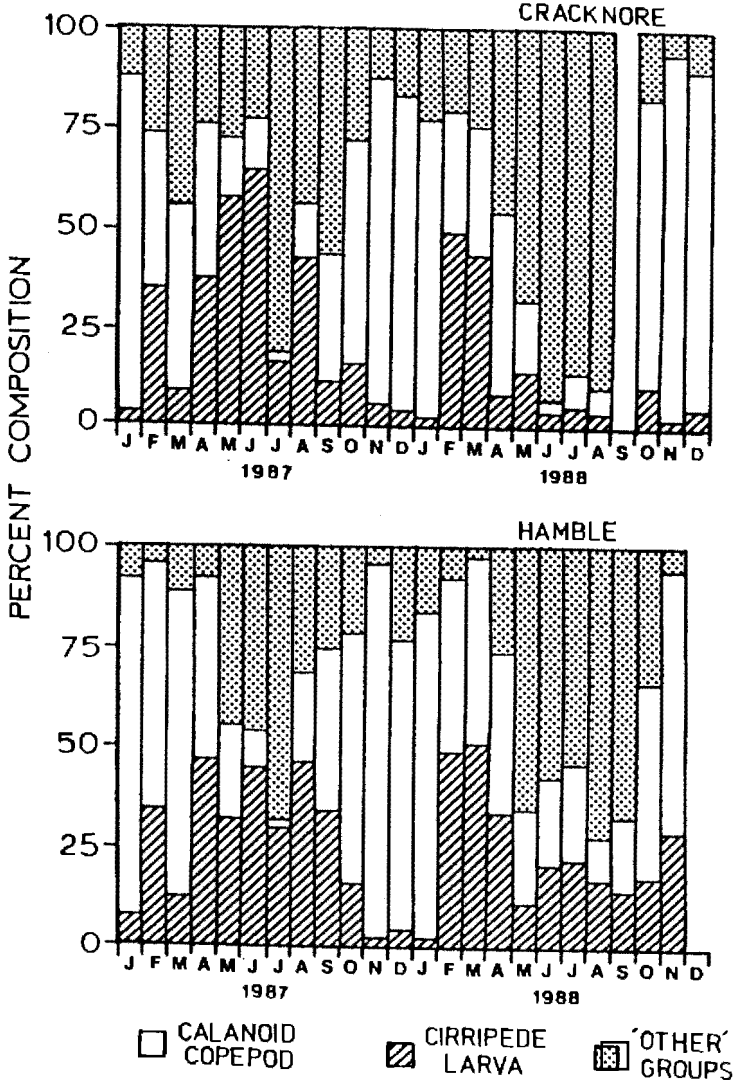


FIGURE 2. Seasonal percentage composition of zooplankton groups in Southampton Water.

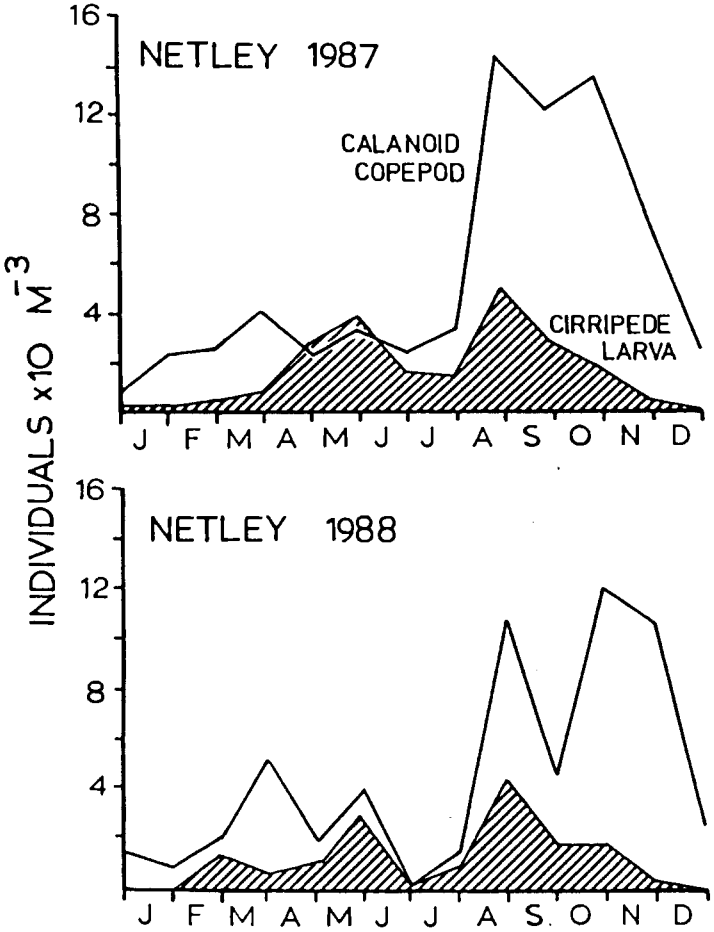


FIGURE 3. Typical seasonal abundance of zooplankton 'groups' in Southampton Water.

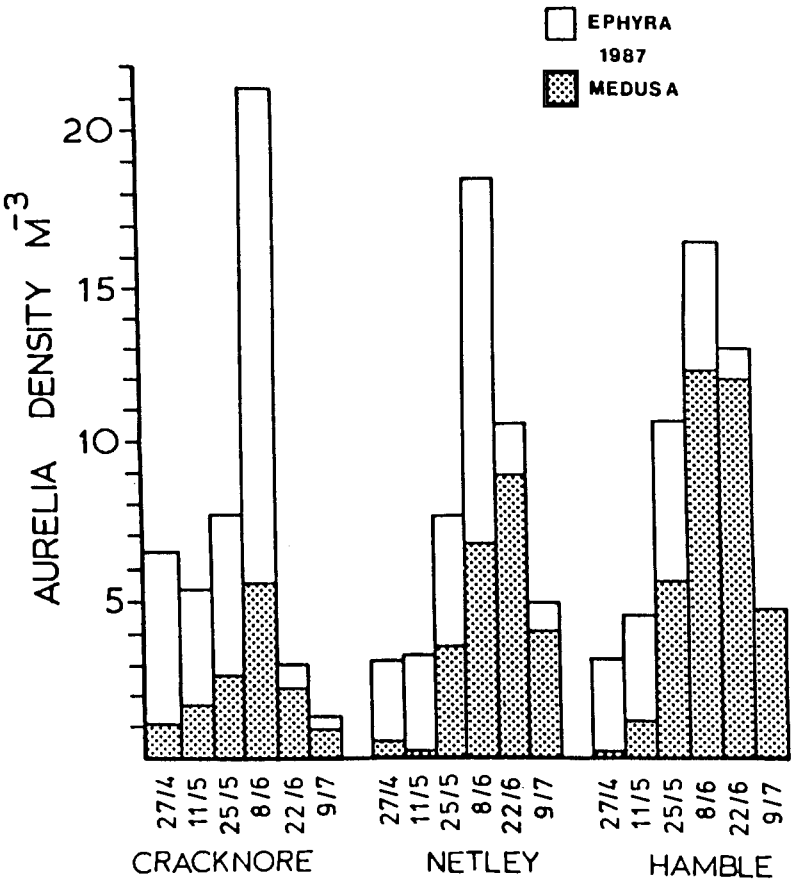


FIGURE 4. Temporal and geographic variation in density of ephyrae and medusae in Southampton Water.

Results

The seasonal zooplankton community pattern (Fig's 2, 3) showed a consistent presence of cirripede nauplii from spring to autumn, with calanoid copepods, especially *Acartia* spp., becoming dominant from August/September and through the winter. Larvae of polychaetes, bivalve and fish, together with "gelatinous forms" made up the majority of the remainder of the zooplankton recorded (Fig.2). In May and June cirripede nauplii typically contributed up to 50% of the zooplankton standing stock, with densities up to 4 x 10^3 m^{-3} (Fig.3). Calanoid copepods were usually present in similar numbers (2 to 4 x 10^3 m^{-3}) at this time, with *Acartia clausi* and *A. discaudata* occurring sequentially through late spring to summer. Copepod numbers increased significantly from August to October, rising to peak densities of 12 to 14 x 10^3 m^{-3}. Cirripede larvae also increased in density during autumn (up to 6 x 10^3 m^{-3}). The seasonal pattern of the zooplankton groups was essentially similar at all three sites and at both depths sampled, and for both years 1987 and 1988, although densities were slightly lower in 1988 (Fig.3).

In 1987, *A. aurita* ephyrae were first observed in late April and the medusae appeared in the plankton at all three sites in early May (Fig.4), remaining at relatively low densities of 2 to 4 m^{-3} until June when they increased dramatically to mean abundances of up to 12 m^{-3} in the lower estuary; densities remained typically between 5 and 10 m^{-3} before beginning to decline in July, eventually reaching <1·0 m^{-3}. Exaggerated peaks of abundance were noted during June and July, particularly at Cracknore where 28 individuals m^{-3} were recorded in the upper part of the water column on one occasion. Analysing the sites individually, ephyrae of *A. aurita* (<10 mm diameter) were more abundant at Cracknore during April/May with relatively few medusae present. By the end of June ephyrae were absent from all sites. Abundance of medusae began to decline in late June, declining first at Cracknore at the head of the estuary (Fig.4).

In 1988 *A. aurita* was again present in low numbers during late April and early May; subsequent sampling at approximately weekly intervals throughout the estuary from June to August failed to collect any significant numbers of *Aurelia*, with typical densities of <0·1 m^{-3} recorded.

Meteorological conditions were analysed as a possible cause of the 1988 "absence" of *A. aurita* from Southampton Water: information on water temperature, rainfall and wind speed and direction (supplied by the Meteorological Office, Southampton) were obtained for the periods April to August 1987 and 1988 (Table 1). Sea temperatures for 1987, of 15·4 to 17·9°C, were considered average for the period (compared with monthly data for 1951 to 1980); temperatures for 1988 were initially higher, but approximately 1·5 to 2°C lower in July and August. Rainfall was slightly above average for 1987 and below average for 1988, such that surface salinities at Cracknore varied within the expected range of 25 to 30‰ during June/July 1988.

TABLE 1. METEOROLOGICAL DATA FOR 1987 AND 1988

	April		May		June		July		August	
	87	88	87	88	87	88	87	88	87	88
Mean monthly sea temperature (°C)	10·5	9·2	12·0	13·5	14·4	15·8	17·6	15·6	17·3	15·9
Mean monthly wind direction	SW	NE	SW	SW/NE	SW	NE	SW	SW	SW	-

Wind speed and direction showed great variability during the course of a day. Therefore, only wind speeds of above 10 knots were used for analysis, as lower wind speeds might not be expected to affect sea state, and thus *A. aurita* distribution, significantly. The prevailing wind was taken to be the strongest for the day. The data (Table 1) indicated that during 1987 winds were south-westerly and typical of the English Channel region, while from April to August 1988 the winds were predominantly north-easterly, i.e. offshore. For complete meteorological data see Reubold (1988).

Discussion

The proportions of the dominant zooplankters (cirripede larvae and copepods) at all three sample sites were essentially similar between 1987 and 1988, as were total zooplankton abundances, although density in 1988 was slightly lower. Both Raymont & Carrie (1964) and Barlow & Montiero (1979) described a similar, but smaller, shift in dominance during late July between a "summer" population dominated by cirripede nauplii and an "autumn" population dominated by copepods. In 1987 the peak abundance of *Aurelia* was associated with this "transition point" in community structure, with the higher *Aurelia* density from May to July coincident with low copepod density, followed by increasing copepod numbers during the decline of *Aurelia* abundance. A similar reciprocal association of reduced plankton density and peak *Aurelia* density has been noted by a number of authors (Hernroth & Grondahl, 1985; Papathanassiou *et al.*, 1987; Grondahl, 1988).

The spatial and temporal pattern of ephyra and medusa abundance in Southampton Water shows both life stages initially appearing at high densities at the head of the estuary (Cracknore), with a gradual movement of peak medusa abundance down the estuary: this suggests that a significant proportion of the *Aurelia* population is endemic, generated within the estuary rather than transported in from other sites. Overall population movement is therefore out of the estuary; Van der Veer & Oorthuysen (1985) report a similar continuous ebb surplus of medusae out of the Waddensee which was attributed, in part, to selective swimming or vertical migration on the part of *Aurelia* in order to utilize currents to aid seaward movement. Schneider (1987) reports a parallel observation of the importance of advection in the abundance of *Pleurobrachia pileus* in Kiel Bight.

The virtual absence of *A. aurita* from the zooplankton hauls after early May 1988 is consistent with reports of the sporadic appearances of *Aurelia* in coastal waters (Russell, 1970). Early reports suggested wind as a factor contributing to the sudden appearance of medusae in certain areas (Thiel, 1962), and Maaden (1942) recorded that *Aurelia* were found most frequently along the Dutch coast during periods of northerly, onshore winds.

A comparison of the meteorological data for 1987 and 1988 indicates a number of differences. Mean sea temperatures for April to June 1988 were comparable, usually higher, than those recorded in 1987, so temperature is probably not a major structuring factor of *A. aurita* abundance in this case. Moeller (1980) reported that medusae are present and actively growing in Kiel Bight from April onwards with mean sea temperatures of no more than 15°C. Rainfall in summer 1988 was generally below average, although little change was noted in the salinity profile of the estuary.

The most significant difference between meteorological conditions in 1987 and 1988 was in the direction ofthe prevailing wind, with onshore, southwesterly winds recorded throughout summer 1987 and offshore, northeasterly winds predominant during the same period of 1988. Such conditions would result in *A. aurita* being rapidly "blown out" of the local area of Southampton Water and/or prevented from entering the estuary.

It is interesting to note that total zooplankton abundance did not significantly differ between 1987 and 1988 despite the limited

residence time of *A. aurita* in the water column, nor was there any change in the timing of the cirripede-calanoid population "switch". Clearly the grazing pressure of *A. aurita* is not solely responsible for the seasonal abundance patterns of zooplankton in Southampton Water.

References

Arai M.N. & Jacobs J.R., 1980. Interspecific predation of common Strait of Georgia planktonic coelenterates: laboratory evidence. Can. J. Fish. Aquat. Sci., 37; 120-123.

Bailey K.M. & Batty R.S., 1983. Laboratory study of predation by *Aurelia aurita* on larvae of cod, flounder, plaice and herring: development and vulnerability to capture. Mar. Biol., 83; 287-291.

Barlow J.P. & Monteiro J.D.C., 1979. Selective grazing by zooplankton populations in Southampton Water. Mar. Biol., 53; 335-344.

Grondahl F., 1988. A comparative ecological study of the scyphozoans *Aurelia aurita, Cyanea capillata* and *C. lamarkii* in the Gullmar Fjord, western Sweden, 1982-1986. Mar. Biol., 97;541-550.

Hernroth L. & Grondahl F., 1985. On the biology of *Aurelia aurita* 2. Major factors regulating the occurrence of ephyrae and young medusae in the Gullmar Fjord, western Sweden. Bull. Mar. Sci., 37; 567-576.

Lockwood A.P.M., 1986. Southampton Water and the Solent: biological effects of the multi-use of an estuarine system. *In:* La Baie de Seine, IMFREMER Actes de Coloques, 4; 421-430.

Maaden H. von der, 1942. Ueber *Cyanea capillata* Eschscholz und die sog. var. Zool. Anz., 137; 63-70.

Moeller H., 1980. Population dynamics of *Aurelia aurita* medusae in Kiel Bight, Germany. Mar. Biol., 60; 123-128.

Papathanassiou E., Panayotidis P. & Anagnostaki K., 1987. Notes on the biology and ecology of the jellyfish *Aurelia aurita* in Elefsis Bay (Saronikos Gulf, Greece). Mar. Ecol., 8; 49-58.

Raymont J.E.G. & Carrie B.G.A., 1964. The production of zooplankton in Southampton Water. Int. Rev. ges. Hydrobiol., 49; 185-232.

Reubold J., 1988. The biology and feeding strategy of *Aurelia aurita* in Southampton Water: problems associated with laboratory assessments. MSc Thesis, Southampton University, 107pp.

Russell F.S., 1970. The medusae of the British Isles, Vol.2. Pelagic Scyphozoa. Cambridge University Press, 284pp.

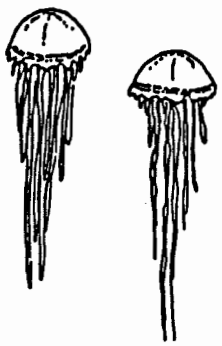
Schneider G., 1987. The role of advection in the distribution and abundance of *Pleurobrachia pileus* in Kiel Bight. Mar. Ecol. Prog. Ser., 41;99-102.

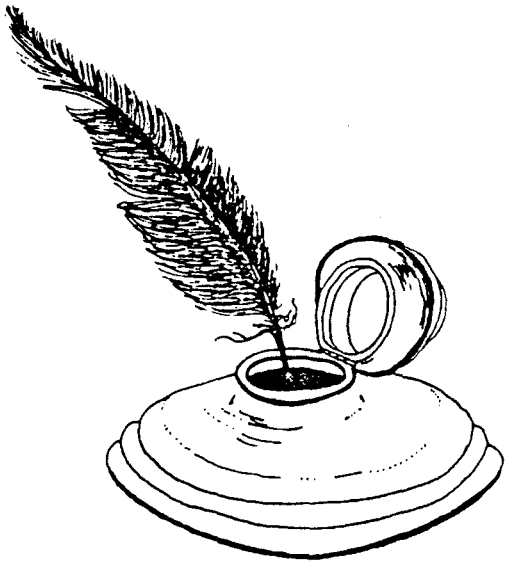
Shushkina E.A. & Musayeva E.I., 1983. Role of medusae in the energetics of planktonic communities in the Black Sea. Okeanologiya, 23; 125-130.

Stoecker D.K., Michaels A.E. & Davis L.H., 1987. Grazing by the jellyfish *Aurelia aurita* on microzooplankton. J. Plankton Res., 9; 901-915.

Thiel H., 1962. Untersuchungen ueber die Strobilisation von *Aurelia aurita* an einer Population der Kieler Foerde. Kieler Meeresforsch., 18; 198-230.

van der Veer H.W. & Oorthuysen W., 1985. Abundance, growth and food demand of the scyphomedusa *Aurelia aurita* in the western Wadden Sea. Neth. J. Sea Res., 19; 38-44.





Letters to the Editor

From Mike Kendall
Plymouth Marine Laboratory
Prospect Place, Plymouth PL1 3DH

Dear Roger,

For some years now the COST 647 programme of the Commission of the European Communities has served as a forum for marine biologists with interests in spatial and temporal changes in elements of the fauna of coastal waters. When it was first established, four areas of study were designated; intertidal sediment, subtidal sediment, subtidal rock and intertidal rock, but as time has progressed the increase in interest in sediment communities has been matched by a decline in numbers of those interested in working on rocky substrata. Matters have now reached the point where unless further interest can be generated both rock programmes might well be dropped. As yet I'm not willing to believe that rocky shore ecology in Europe has died and wonder if I could appeal through the pages of PN for details of

a) active workers in this field who through previous oversight I have not yet contacted

b) workers from other fields who collect (and keep) data on rocky shore communities as part of their teaching activities

c) researchers working for statutory authorities who collect rocky shore data as part of a monitoring commitment.

If there is sufficient evidence of interest I might be able to keep the rocky intertidal programme of COST 647 alive.

* * * * *

From Dennis Seaward
Barn Court, Hamlet, Chetnole
Sherbourne, Dorset DT9 6NY

Is anyone interested in *Gromia*?

"Attached to weed or stone may be found small, rounded or ovate balls on short stalks, about 2 mm in diameter and the colour of mud".

Thus wrote Nellie Eales (Littoral Fauna of the British Isles, 1967; 13-14) about *Gromia (Allogromia) oviformis*, succinctly describing the little brown jobs that wander around most samples of shallow substrate from the Weymouth area. Yet they seldom figure in fauna lists. Are they so common that everyone yawns and ignores them?

Foram buffs usually regard them as improper subjects for inquiry. John Murray's Linn. Soc. Synopsis (British Nearshore Foraminiferids, 1979) mentions them not, and his paper on the Foraminifera of the Exe Estuary (in 'Essays on the Exe Estuary', 1980, Devon Association Special No.2) begins "Foraminifera are protozoans that build or secrete chambered shells". But *Gromia* has a "test composed of a flexible chitinous secretion..." (Eales, again), not a shell.

I'm sure that most Porcupines know all about these things, but for those of us prepared to admit our ignorance, will someone please write for PN a beginner's guide to "squishy forams"?

KING-SIZED PRAWNS IN THE ENGLISH CHANNEL

by Paul F. Clark

Dept. of Zoology, The Natural History Museum, Cromwell Rd., London SW7 5BD

King-sized prawns are a delicacy that feature regularly on the menu of the local Chinese restaurant. To satisfy these culinary demands, many tonnes of prawns have to be imported annually into the UK. But what of the future - recent discoveries suggest that wild populations of jumbo prawns may be living in the English Channel. Could they become a common sight in the fishing nets of trawlers operating off the south Devon coast?

Early in 1989, Peter Walker, rare fish recorder for MAFF Lowestoft, sent a king-sized female prawn to the Natural History Museum at South Kensington for identification. The specimen was caught on 3 February by the *Marilyn Jane*, a Brixham trawler, in 50 m of water off the south Devon coast at 50°10'N 03°15'W. Putting a name to the specimen proved difficult because of the unusual number of spines present on the rostrum and telson, and it was passed to Alain Cronier, a biologist with ORSTOM working in the Muséum National d'Histoire Naturelle, Paris. He immediately identified the prawn as *Penaeus japonicus* because the female of this species has a distinctive thelycum (an external pocket on the ventral side of the thorax which serves as a receptacle for sperm) and other distinctive carapace characters. Even so, the morphology of the rostrum and telson was different from typical Japanese specimens.

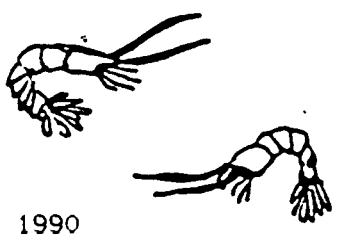
Crosnier offered an interesting explanation as to how *P. japonicus* found its way into the English Channel. Along the Atlantic coast of France *P. japonicus* is being cultured on commercial farms - the Channel specimen was an escapee.

Sue Utting (MAFF, Conwy), who is the representative from England and Wales on the ICES Working Group for Introductions and Transfers of Marine Organisms, agrees with Crosnier. As far as she is aware, no-one on England or Wales is breeding *P. japonicus*. Sue visited the SATMAR Hatchery in Barfleur on the Cherbourg peninsula in May 1987 and was shown a tank of *P. japonicus* broodstock. The intention was to rear juveniles in this hatchery. Large numbers of broodstock are also held by IFREMER in Brest.

The geographical distribution of *P. japonicus* is Indo-West Pacific from the Red Sea, east and south-east Africa to Korea, Japan and the Malay Archipelago. It is also reported from Australia and Fiji. In the eastern Atlantic this species has entered the Mediterranean through the Suez Canal and has reached the south coast of Turkey. Although fished in the eastern Mediterranean and on the east African coast, it is of minor commercial importance. In the Philippines the species is regarded as commercially important, but it is the Japanese who exploit *P. japonicus* to the full. There it is of major importance in the fishing industry and in pond culture.

The first record of this prawn in UK waters is probably not very noteworthy on its own. However, on 7 January this year a second specimen was trawled up from 70 m, south of Eddystone Rock, 49°35'N 04°30'W, by another Brixham trawler, *De Vrouw Marie*.

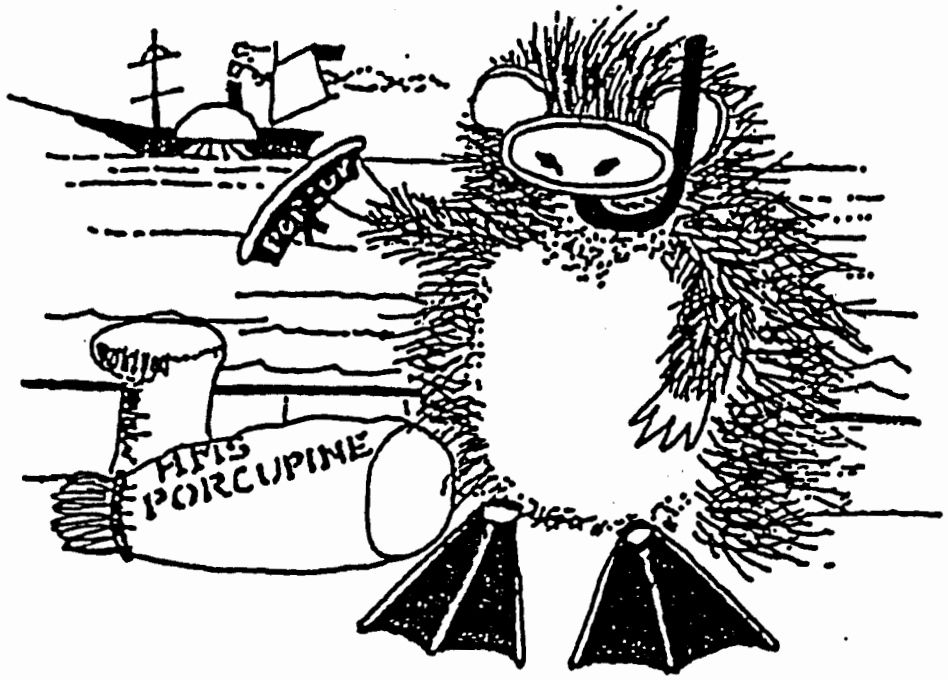
Sargassum muticum, the Japanese seaweed, was first recorded from Bembridge, Isle-of-Wight, in February 1973 and is now widespread along the south coast of England. Are we about to witness another sea-borne invasion from the Land of the Rising Sun?



Porcupine **Sweatshirt**

For the information of those Members not present at the Annual General Meeting in Dundee (where the product was on display!), **PORCUPINE** sweatshirts are now available at £11.00 (+ p&p at cost if required).

They come in the usual range of sizes up to Extra Large (if unsure err on the larger side), and in white, yellow, pale blue, jade green, pink, framboise (! is this fuchsia?) or grey with a black design (as below), or black, royal blue, red, or purple with a white design.



Orders should be addressed to the Hon. Ed. - Dr Roger Bamber, Marine Biology Unit, National Power, Fawley Power Station, Fawley, Southampton SO4 1TW. I hold at present a limited stock, but most will be made to order (and thereby so much fresher!). And you are allowed more than one each.