Report Number
630

'Making Connections': Proceedings of the second North East Kent Coastal Conference, 11 November 2004

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Introduction

Management of the north east Kent coast is coming of age: 2005 represents five years of management under the North East Kent European marine sites Management Scheme.

So, what makes the north east Kent coast different from other coastlines? It is covered by many nature conservation designations, including two Sites of Special Scientific Interest (SSSIs), which are designated on the basis of geological interest as well as wildlife value. The Thanet Coast, from Birchington to Pegwell, is also designated as a Special Area of Conservation (SAC) for its chalk reefs and sea caves, and this relatively small area holds 20% of all the UK's coastal chalk and 12% of Europe's. The adjacent Sandwich Bay is designated as a SAC for its sand dune and mudflat habitats. Other conservation designations focus on species, for example the Thanet Coast and Sandwich Bay Special Protection Area (SPA) protects two species of wintering bird: turnstone and golden plover. Thanet Coast and Sandwich Bay is also internationally recognised as a Ramsar Site, for its bird and invertebrate life. It is this mosaic of natural habitats, and collection of features and species, all within a comparatively small area, that makes this coastline different from many others.

Over the last five years, much has been achieved in the management and conservation of the area's valuable coastal features, and the plants and animals that live there. A lot of work has been accomplished through working with stakeholders in reaching consensus and in decision-making, education and taking responsibility. A substantial amount of scientific research has been achieved in the last two years alone, and the coastline continues to attract new studies. It is now clear that there is a better understanding of natural processes that occur around the north east Kent coast than ever before.

However, it has become clear over the lifetime of the existing Management Scheme that there are larger forces at work that affect the north east Kent coast. As a result, contradictions have arisen, because the focus on protection of a number of individual components of the site does not always reflect the effects of larger outside influences, some of which are beyond the remit of the Management Scheme. At the first North East Kent coast conference in October 2002, these issues began to surface. For example, there were suggestions that nutrient enrichment and possible eutrophication was changing the macro-algal intertidal communities found on the chalk reefs. Research is still ongoing, however it has been established that there is an influence of nutrients from both local sources and sources outside of the SAC area.

There is now an acknowledgement that attempts to protect elements of the site are best accomplished with due consideration to the whole site and the wider influences on it – taking an 'Ecosystem Approach' to the management of the area. 2005 sees a review of the current Management Scheme, and a revised scheme will be in place by April 2006. It is proposed that the management and conservation of the north east Kent coast are enhanced by using the principles of the Ecosystem Approach to underpin this review.

The 2002 conference brought together many interested parties. As a result of a desire for greater communication, co-operation and co-ordination, the North East Kent Coastal Advisory Group (NEKCAG) was formed (now the North East Kent Coastal Scientific Advisory Group - NEKCSAG). In the last two years, NEKCSAG has set up working groups to produce a researchers' code of conduct, a database group to amalgamate data from the coastline, and researched impacts of shellfish harvesting, with more projects on the way.

This second conference, held on 11 November 2004, enabled NEKCSAG members to meet other interested parties, present recent work, and discuss various current issues. The title of the conference was *Making connections,* reflecting the new Ecosystem Approach thinking.

It also linked recent research and management advances surrounding human influences on the coast as well as the more traditional areas of scientific research. The day consisted of eight short presentations, two question and answer slots, and workshop discussions looking at how the adoption of the Ecosystem Approach will shape the next Management Scheme.

This report presents papers based on each of the presentation given on the day. The full verbatim write-up of the workshops and question and answer sessions is also presented, in Appendix 1 of this report.

Philip Rogers
On behalf of NEKCSAG.

Attendance list

Name	Organisation
Mike Albury	‘Bayblast’ RHIB Trips
Tim Aldous	Durrell Institute of Conservation & Ecology, University of Kent
Naomi Biggs	Thanet District Council
Linda Bleasdale	Local resident
Fred Booth	Kent Wildlife Trust / Kent Field Club
Alasdair Bruce	Geologist/Rock Doc Ltd
Jonathan Bramley	Bramley Associates
Bryony Chapman	Kent Wildlife Trust
Tony Child	Thanet Coast Project, Thanet District Council
Prof. Georges Dussart	Canterbury Christ Church University College (CCCUC)
Richard Evans	Warwick Energy Ltd
Pete Forrest	Kent Wildlife Trust
Norman Foulkes	Thanet District Council
Manda Gifford	Canterbury City Council
Martin Griffiths	Sandwich Bay Bird Observatory Trust /University of Kent
Stephane Gueritte	CCCUC
John Hawkins	Canterbury City Council
Elizabeth Holliday	Kent Coastal Officer, Kent County Council
Mike Humber	Thanet District Council
Ian Humpheryes	Environment Agency
Roger Just	
Ray Lee	Marine Wildlife Assessments
Brett Lewis	Lewis Ecology
Dr. Corinne Martin	Canterbury Christ Church University College
Paul Martin	Environmental Health, Thanet District Council
Joe McCarthy	Thanet District Council
Jodie McGregor	Medway Swale Estuary Partnership
Sarah Maloney	Canterbury City Council
Jason Mitchell	Kentish Stour Countryside Project
Yoshitaka Ota	University of Kent
David & Irene Neden	Local residents
Susannah Peckham	English Nature
Diana Pound	Ecologist, dialogue matters
Philip Rogers	Canterbury Christ Church University College
Chris Riddell	Great Stour Downstream Interests Group
Craig Samuels	Planet Thanet
Lionel Solly	Conservation Officer, English Nature
John Stroud	Kent and Essex Sea Fisheries Committee
Ian Tittley	Natural History Museum, Department of Botany
Emilie Touze	Kent County Council
Mike Turner	‘Wildlife’ Sailing Trips
Stuart Vahid	Student
Mike Walkey	DICE, University of Kent
John Websper	Planet Thanet /SBBOT
Dylan Wrathall	Planet Thanet

Programme

9.30 – 10.00	Arrive, register and coffee
10.00-10.05	**Welcome to the day** Philip Rogers, NEKCSAG & CCCUC
10.05-10.20	**Introduction to the day: Systems thinking** Diana Pound, Ecologist

Making Connections: Human systems
(Morning session chaired by Philip Rogers, NEKCSAG & CCCUC)

10.20-10.40	**European Marine Sites – North East Kent Management Scheme update** Susannah Peckham, Conservation Officer, English Nature
10.40-11.00	**Making links with local people – The Thanet Coast Project** Tony Child, Thanet Coast Project
****11.00**	**Two minute silence will be observed****
11.02-11.20	**Fisheries on the North East Kent coast: An anthropological study** Yoshitaka Ota, University of Kent
11.20-11.40	**Kent Coastal Project – What is it and what is it achieving?** Elizabeth Holliday, Kent Coastal Officer, Kent County Council
11.40-12.0	**Questions and answers**
12.00-12.50	**Lunch break**

Making Connections: Natural systems
(Afternoon session chaired by Philip Rogers, NEKCAG & CCCUC)

12.50-1.00	**Raising questions – thinking about what the Ecosystem Approach means for science** Diana Pound, Ecologist
1.00-1.20	**CHARM – Mapping the Eastern English Channel** Dr. Corinne S. Martin, CHARM (Eastern Channel Habitat Atlas for Marine Resource Management), Marine Fisheries GIS Unit, Department of Geographical and Life Sciences, Christ Church University College
1.20-1.40	**Kent's forgotten mammals – Seal haul out sites off of the North Kent coast** Jonathan Bramley, Bramley Associates

1.40-2.00	**So did it recover? – Using winkles to investigate recovery from a change in sewage discharge on the Thanet Coast.** Prof. Georges Dussart, Ecology Research Group, Department of Geographical and Life Sciences, Christ Church University College
2.00 - 2.20	**The marine algal flora of Thanet: past, present, and future; stability or change?** Ian Tittley, Natural History Museum, London
2.20-2.40	**Questions and answers**
2.40-3.00	**Tea break**
3.00-4.00	**Workshop – What does the Ecosystem Approach mean for the coastal and marine areas of NE Kent?** (Three discussion groups)
4.00-4.30	**Feedback from discussion groups; final questions; what happens next?**
4.30	**Close of conference and departure**

Presentations

Systems thinking

Diana Pound BSc MSc, IEEM, IUCN CEC
Dialogue Matters, Wye, Kent TN25 5BU

All those who work with a focus on the natural environment are familiar with the concept of sustainability and understand what it means in practice – or do we?

The concept of sustainability derives from the Earth Summit held in 1992 in Rio de Janeiro. At the summit it was widely acknowledged that traditional approaches to the management of natural resources and human impacts were inadequate. Environmental degradation, with consequent knock to effects on social and economic well-being, was continuing apace and a new approach was needed. A multilateral environmental agreement called the Convention on Biological Diversity (CBD) was signed and by March 2003, 183 nations (all but three countries in the world) were CBD Party States (JNCC 2003). During negotiations, there was a general agreement on the necessity of striking the right balance between conservation and use. The concept of 'sustainability' was developed from this and expressed in the Convention's three main objectives:

1. Conserving biological diversity.
2. The sustainable use of its components.
3. The fair and equitable sharing of benefits arising out of the utilisation of genetic resources.

Regrettably, since then the concept of sustainability has become blurred, often meaning little more than something that is a little greener than it might otherwise be. In practice, decisions are labelled 'sustainable' without being based on the functional limits of supporting ecosystems. If systems are stressed beyond their functional limits, either by abstracting resources or depositing waste, the ecosystem will collapse with unpredictable consequences. These are likely to bring high socio-economic and environmental costs. Without basing decisions on functional limits, the drive towards sustainability remains little more than a nice idea. In 1995, in recognition of the need to bring clarity to the concept of sustainability, the 'Ecosystem Approach' was developed; it has been adopted as the primary framework for action under the Convention.

The Ecosystem Approach is: 'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way' (CBD).

In 1998, at a CBD workshop in Malawi, the concept was developed further and resulted in 12 guiding principles (sometimes referred to as the *Malawi Principles*). The workshop concluded that the 12 principles had to be taken from the conceptual realm and made operational and so five points of operational guidance have also been developed (see text boxes).

> *'Ecosystem' means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit". (Article 2 of the Convention)*

The Ecosystem Approach represents a paradigm shift in thinking. It roots the concept of sustainability in fully functioning ecosystems with integrated management across sectoral interests and the sharing of benefits.

Thinking in this holistic way is a welcome departure from the narrow focus on individual species, habitats and isolated sites that has characterised much biodiversity conservation. The North East Kent European marine sites Management Scheme (Pound 2001) is an example of where statutory and policy drivers caused management to focus on just a limited range of species and habitats that occur within the area:

- wintering turnstone and golden plover,
- breeding little tern,
- reefs (the wave cut chalk shores that extend from the base of the cliff out to sea and are colonised by unusual combinations of marine plants and animals),
- sea caves.

Taking this fragmented view of natural environments is not based on systems thinking, and without systems thinking the following tends to happen:

- a reductionist approach where management fixates on part of the system and misses the whole,
- acting to produce short-term benefit at long-term cost,
- taking small actions that have unexpectedly large or unforeseen effects,
- finding that the solution to one problem causes another problem elsewhere in the system with unintended consequences.

The 12 Malawi Principles are:

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralised to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Need to understand and manage the ecosystem in an economic context.
5. Conservation of ecosystem structure and function to provide ecosystem services should be a priority.
6. Ecosystem must be managed within the limits of their functioning.
7. The approach should be taken at the appropriate spatial and temporal scales.
8. Process and objectives for ecosystem management should be set for the long term.
9. Management must recognise that change is inevitable.
10. Seek the appropriate balance between integration, conservation and use of biodiversity.
11. Decision-making should consider all forms of relevant information (scientific, indigenous and local).
12. Involve all relevant sectors of society and scientific disciplines.

The Ecosystem Approach has the potential to overcome these kind of effects and the ‘shortcomings and deficiencies of using classical nature conservation approaches as the sole tool for management of biodiversity’. (CBD)

The five points of operational guidance are:

1. Focus on the relationship and processes within the ecosystem.
2. Enhance benefit sharing.
3. Use adaptive management practices.
4. Carry out management actions at the scale appropriate to the issue, with decentralisation to the lowest level appropriate.
5. Ensure intersectoral co-operation.

The focus of the current literature on the Ecosystem Approach does not demonstrate what is achievable. However, it does demonstrate an acute awareness of how little is known. It also demonstrates the amount of knowledge required to understand even the most simple and easy to study systems. As a result, concern is expressed about the meaning of the 12 principles and whether or not it will mean biodiversity losing out (Nowicki,and others, in press).

When a science community is faced with uncertainty, the fix is usually seen as more research to play for time and to delay decision making until more is known. It would seem the Ecosystem Approach is no exception. However, not knowing how a system works cannot be an excuse for ignoring its existence and either failing to make any decisions (a decision in itself) or continuing to make them based on old conservation approaches that are now considered flawed.

'Adaptive management' (CBD, Operational Guidance 3, see text box) means acknowledging that not only is little known but that it cannot be known before management decisions have to be made. This means management has to be flexible enough to respond to changing natural and socio-economic processes and new scientific understanding, whilst still aiming towards an agreed and defined overall goal.

Bringing this back to the management of the north east Kent coast means starting to grapple with the Ecosystem Approach as more than a theoretical concept. It will mean beginning the process of trying to define the local ecosystem(s), understanding ecosystem resilience, spatial and temporal scales, relationships with adjacent or linked ecosystems and natural change. Taking the Ecosystem Approach forwards means not just developing increased understanding of the natural parts of the system, but also understanding the human systems used in managing, using and harvesting the resources of the area and the feedback mechanisms between them.

The Ecosystem Approach, challenging and hard to implement as it may be, is not going to go away. The UK Government has already made a commitment in exploring ways of turning it into a practical reality (Defra 2004), and it has been adopted as a cornerstone of the Government's Marine Stewardship Process (the framework for delivering the UK's Marine sustainable development strategy). Moving from generic principles and political commitments to using the Ecosystem Approach 'to influence and improve management arrangements on a day to day basis' is the next challenge (Laffoley and others 2004).

With its groundbreaking history of integrated decision making and stakeholder involvement in the European marine site management scheme, north east Kent is well placed to demonstrate how taking the Ecosystem Approach can work at the local level.

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Rapid review of current management of the NE Kent European marine sites against the 12 principles of the Ecosystem Approach

Ecosystem Approach Principle	The stakeholder dialogue and current management scheme	Discussion	What would need to be done to bring management closer to the ecosystems approach
1. The objectives of management of land, water and living resources are a matter of societal choice.	Societal choice has been made at different levels: Selecting particular habitats and species as worthy of protection under the Directives. — European Selection of Thanet as a candidate Special Area of Conservation (cSAC) and defining the boundary. — National Decide how human activities can be managed to minimise effects on the habitats and species. — Local Be consistent with, or actively promote, socio-economic benefits.	The focus of ecosystems approach is about holistic management and moving away from a fragmented approach that focus on particular species or habitats. This concurs with 'societal choice' at the local level. Local people expressed frustration with the narrow focus of the management scheme wanting it to be holistic and include: • all habitats protected under SSSI designation and geological features; • other features valued locally eg all wintering birds, seahorses, seals and fish	• Future management would reflect local 'societal choice' and be extended to include all parts of the ecosystem and include those habitats and species that are key to the functioning of the system as well as those valued for other reasons at local, national and European level; • management of the natural environment would continue to engage positively with other benefits to promote sustainable use. This includes recreation and tourism, which underpin the local economy; • future versions of the Management Scheme would be written to take an ecosystem approach. Parts of the scheme that were statutory requirements under the Habitats Regulations could be differentiated from other parts.
2. Management should be decentralised to the lowest appropriate level.	An innovative stakeholder consensus-building process, that engaged a wide range of local and regional stakeholders, was used to decide the content of the management scheme. Following this more strategic process, management was taken to the grass roots level with local interests agreeing their own codes of conduct.	The innovative process used to develop the first management scheme engaged local people who represented a wide range of interests.	• The process of stakeholder participation and consensus-building (not mere consultation) used for the first Management Scheme meets Principle 2 and would continue to be used for future management decision making.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.	Management decisions were not evaluated to assess their effects on adjacent or other ecosystems.	Ecosystems are a concept that can be defined at many levels. Before the effects on adjacent or other systems can be assessed, the ecosystem or systems that are the focus of management decision-making need to be defined.	The first steps would be to: • identify and define this ecosystem; • identify and define adjacent or other ecosystems; • include consideration of the effects of management on these systems; • summarise findings in future Management Schemes.

Ecosystem Approach Principle	The stakeholder dialogue and current management scheme	Discussion	What would need to be done to bring management closer to the ecosystems approach
4. Need to understand and manage the ecosystem in an economic context (*and remove perverse economic incentives*).	The stakeholder process was used to decide the content of the management scheme including local socio-economic issues related to the coast. However, resulting actions were not taken forward under the scheme itself. A flaw in the process was that many new social and economic projects were proposed and gained new legitimacy and momentum by being discussed in the process. However, they were not implemented as a direct result of the process. This was because of staff changes in the local authority and a lack of ownership at the departmental level. This only became apparent when the officer who was going to 'champion' the projects left and no one else took up the task. This caused stakeholders disappointment although in the longer term many ideas were implemented through other means. The main economic use of the site is recreation and this was integrated with management of the habits and species. The only activities that extract anything from the area are fishing and shellfishing. Shellfishing is being evaluated to assess what effect it is having and whether or not it is sustainable. However, this activity is cultural and not driven by 'perverse economic incentives'. Inputs to the system include waste water but this is being evaluated and reviewed under the Waste Water Treatment Directive.	It is important to engage a wide group of stakeholders in the decision-making process. Managers need to understand the social and economic as well as the environmental context, acceptable management can then be agreed. It is important that stakeholders make proposals. However, these must be proactively evaluated as part of the decision-making process. This will then ensure that they can be done and incorporated into organisational work programmes.	Future management would: • continue to integrate socio-economic and environmental agendas; • ensure that if organisations agree and support particular action, implementation is not dependant on individuals but incorporated in organisational work programmes.
5. Conservation of ecosystem structure and function to provide ecosystem services should be a priority.	The management scheme itself was narrowly focused on particular habitats and species. The decision making process, however, had a broader remit, seeking to look for outcomes which gave social, economic and environmental benefit. Nevertheless, it did not include the objective of managing structure function for the services it provides humans.	Despite the more holistic approach, the focus on the environment was unilateral ie looking at the effects of human activities on particular features rather than looking to see if the structure and function of the ecosystem could maintain human need. For example, fishing, shell fishing, and recreation or coastal protection.	Future management would: • identify the key ecosystem services provided by the local coastal and marine ecosystem/s; • consider the environment from both perspectives ie – the effect of humans on the environment, <u>and,</u> – the ability of the current structure and function to provide sustainable 'ecosystem services' over the long-term.

Ecosystem Approach Principle	The stakeholder dialogue and current management scheme	Discussion	What would need to be done to bring management closer to the ecosystems approach
6. Ecosystem must be managed within the limits of their functioning.	The process identified potential or actual effects of current human activity on the protected habitats and species and these were explored in discussion. Where data was available from other sources (eg base line surveys and water quality monitoring) it was used to form a view about how significant an effect might be. This should have picked up significant problems in ecosystem function and where it was under stress but ecosystem function was not specifically considered.	The focus of management was on protecting habitats and species. However, these were not necessarily keystone species, or sensitive indicator species. As a result these would not necessarily indicate the health of ecosystem function, or pick up subtle declines.	Future management would: • start work on understanding the functioning of the ecosystem: – its relationships and processes (eg energy flows, genetic mixing, interdependencies, feedback mechanisms, trends, natural change), – identify keystone species, – identify indicator species of ecosystem function and limits, – ecosystem resilience and functional limits; • evaluate existing monitoring to find out to what extent it indicates ecosystem function; • include human processes as part of functional systems; • extend evaluation of human use to include direct and indirect effects on all features of conservation interest (local, national and European); • evaluate the likely effect of known 'locked in change' eg global warming and sea level rise.
7. The approach should be taken at the appropriate spatial and temporal scales.	The focus of the decision-making was the shore and near shore. Decisions about management took place at this local scale engaging a wide range of local stakeholders. Some decisions relating to policy were taken at a national level and rolled out to all European Marine sites.	The process used to decide the management scheme was ahead of its time. It involved innovative stakeholder participation in the decision-making for protecting site management and integrating that with social and economic interests.	The process adopted met this principle and so future management would do the same.
8. Process and objectives for ecosystem management should be set for the long term.	The decision-making process used long-term objectives and then planned what would need to be done in the first 5 years is set out a clear action plan. Now that baselines have been set, and the first five years of management is well under way, it is possible to evaluate trends both in human use and the ecosystem itself.	The use of long-term objectives and short-term action missed out consideration of 'locked-in' change ie sea level rise and the effect this may have on the ecosystem. As much of the shoreline is fixed with coastal protection, natural process of erosion are not taking place. Eventually, intertidal zones will become subtidal. This was not discussed or taken into account in the setting of objectives.	Future management would: • take account of sea level rise and the effect of other long term processes in considering long-term objectives and how these could be met; • include long-term defined objectives for ecological function not just particular features; • include the likely long term effect (and sustainability) of short term (5 year) management actions.

Ecosystem Approach Principle	The stakeholder dialogue and current management scheme	Discussion	What would need to be done to bring management closer to the ecosystems approach
9. Management must recognise that change is inevitable.	The focus of management in the scheme was on various habitats and species and the objectives 'take account of natural change'. However, it does not say how differentiation can occur between human-induced change and natural change, nor the current degree of naturalness.	Defining 'natural change' is difficult and will only develop over time. The scheme does not provide for the introduction of new recreational activities and uses being taking place in the area. It also does not discuss other processes of change within the system eg social and economic changes, nor how it might adapt to these.	**Management would:** • meet objectives that are set in a way to allow for flexible, adaptive management whilst at the same time defining clear long-term goals; • describe the ways in which the system is currently not in a natural state. For example, 75% of the cliff is 'protected' with concrete; • seek to understand and take into account the long term trends and process of change in all three parts of the ecosystem: social, economic and environmental.
10. Seek the appropriate balance between integration, conservation and use of biodiversity.	This was a founding principle of the stakeholder dialogue and the actions listed in the management scheme.		Management would: • do the same again – only better with more information and using the ecosystems approach!
11. Decision-making should consider all forms of relevant information (scientific, indigenous and local).	This was a founding principle of the stakeholder dialogue and the actions listed in the management scheme.		Management would: • **do the same again – only better with more information and using the ecosystems approach!**
12. Involve all relevant sectors of society and scientific disciplines.	This was a founding principle of the stakeholder dialogue, however, whilst the process sought to include all sectors of society it only included environmental scientists - not social scientists or economic experts.		Management would: • review the list of stakeholders and add any that should be included; • involve all stakeholders in a stakeholder dialogue that took the ecosystems approach.

North East Kent European marine sites Management Scheme: Where have we got to and where are we going?

Susannah Peckham
Conservation Officer, English Nature Kent Team, Wye, Kent.

Introduction

The term 'North East Kent European marine sites' (NEKEMS) refers to an area of the coast covered by a number of designated marine areas. The NEKEMS has a landward boundary of the Highest Astronomical Tide and a variable seaward boundary which extends up to 2km offshore, to include intertidal and subtidal chalk reef.

All or parts of the following sites are included within the boundary of the NEKEMS:

- **Thanet Coast Special Area of Conservation (SAC)**. Designated for its chalk reefs and caves.
- **Sandwich Bay SAC**. Designated for its dune habitats, but these are not included in the Management Scheme as they are above high water. Coastal mudflats within this area are included.
- **Thanet Coast & Sandwich Bay Special Protection Area and Ramsar Site**. Designated for its wintering turnstone and golden plover populations. Summer breeding little terns were on the citation until recently but have been removed as they have not bred here for several years.

Turnstones in flight

Other important nature conservation features in the area include:

- **Thanet Coast Site of Special Scientific Interest (SSSI):** geological features, coastal shingle, cliff top grassland, wintering ringed plover, grey plover, sanderling and Lapland bunting.
- **Sandwich Bay to Hacklinge Marshes SSSI:** geology, saltmarsh, mudflats.
- **Sandwich & Pegwell Bay National Nature Reserve:** this includes parts of all of the above designations and is managed by Kent Wildlife Trust.


Thanet's chalk cliffs and reefs

Why are North East Kent's marine chalk habitats so important?

Coastal chalk is an uncommon habitat in the UK and Europe. At 23km, north east Kent (the area known as Thanet) has the UK's longest continuous stretch of coastal chalk, forming 20% of the UK's coastal chalk and 12% of Europe's. Thanet also has 250 hectares of intertidal chalk reef, which is the largest such area in UK. The UK has 75% of all chalk reefs in Europe. Thanet's chalk sea caves are the second most extensive in the UK, after Flamborough Head in Yorkshire.

Thanet is a densely urbanised area and, as a result, only 25% of the chalk cliff face at Thanet remains unprotected by sea defences and promenades. Most of the biological interest lies in the areas which remain unprotected, although all of the cliffs are of considerable geological importance.

Conservation Objectives for the North East Kent European marine sites

English Nature has a statutory responsibility under the Conservation (Natural Habitats &c.) Regulations 1994 (known as 'The Habitats Regulations') to advise all the relevant authorities involved in management of the area, of the conservation objectives for the site. The relevant authorities for this site are English Nature, Environment Agency, Kent County Council, Dover District Council, Thanet District Council, Canterbury City Council, Southern Water, Kent & Essex Sea Fisheries Committee and Sandwich Port & Haven Commissioners.

The conservation objectives are as follows:
Subject to natural change:

- maintain **reefs** in favourable condition,
- maintain **sea caves** in favourable condition,
- maintain in favourable condition the **habitats for the internationally important population of regularly occurring species**, in particular:
  - sand and shingle shores,
  - intertidal mudflats and sandflats,
  - chalk shores,
  - shingle shores,
  - shallow coastal waters.

Setting up the Management Scheme and the Thanet Coast Project

All the relevant authorities in the North East Kent European marine sites area worked together to produce a Management Scheme for the area, under the co-ordination of English Nature. This was launched in summer 2001 ands runs until April 2006. The Scheme sets out guidelines and an action plan for the management of a wide range of ongoing activities within the site, such as fishing, recreation, ports activities, shoreline management and scientific research. The Management Scheme enables these activities to take place within parameters that ensure that the Conservation Objectives for the site are being met as far as possible. Where they are not being fully met, the Scheme proposes appropriate remedial action.

The Management Scheme was produced using a process known as ‘stakeholder dialogue’, which starts with the premise that those likely to be affected by a decision or course of action should be involved in making that decision. North East Kent was one of the few Management Schemes for European marine sites written in this way, and it is now seen as a model of good practice in participative working.

During the process, a series of independently facilitated workshops was held, attended by stakeholders from 67 different organisations. The key question under consideration at these workshops was: “Do any of the human uses of the coast cause harm to the internationally important wildlife and, if so, how can they be managed?”

Many issues were raised in the workshops, with some of the key concerns relating to management of different kinds of recreation and other unregulated activities. Some positive suggestions were made for improving the management of the area, including voluntary codes of conduct and setting up a new project to work with local people.

Thanet Coastal Codes leaflet

As a result of this, funding was sought and the Thanet Coast Project was set up in summer 2001, when a Project Officer was appointed, and in 2004 a new Education Officer joined the team. The Project’s achievements include setting up a voluntary Coastal Wardening Scheme, including monitoring of human activities; running a very successful events programme; and developing, promoting and reviewing the Thanet Coastal Codes – voluntary codes of conduct for a range of coastal activities, which were written and are monitored by local users.

Who manages the Management Scheme?

A Management Group is in place, chaired by English Nature. This group is composed of representatives of the relevant authorities, meets twice a year and undertakes an annual review of the Management Scheme. The Thanet Coast Project reports its progress to the Group.

The North East Kent Coastal Scientific Advisory Group (NEKCSAG) is a scientists' forum which provides technical advice to the Management Group and was formed in August 2003. It runs its own projects in liaison with the Management Group, and is currently working to set up a database of research for North East Kent.

Stakeholder meetings are held at 6-monthly intervals to allow stakeholders representing a wide range of local interests to contribute to Management Group activities, such as reviewing codes of conduct and commenting on the action plan.

Some of the key issues and achievements of the North East Kent European marine sites Management Scheme since the last conference in October 2002

Shoreline management

- The Environment Agency and English Nature have worked together on shingle management between Reculver and Minnis Bay, in particular trying to improve the sustainability of the shingle ridge in front of the Coldharbour saline lagoon.
- Thanet District Council have commissioned a study of reef erosion in front of sea walls, to see whether the walls are contributing to scouring of the reef and, if so, what is the extent of the issue.
- The North Kent Shoreline Management Plan review started September 2004 and will involve relevant authorities from north east Kent.

Fishing and harvesting

- The North East Kent Coastal Scientific Advisory Group is investigating the sustainability of shellfish harvesting on the Thanet coast.
- Fixed netting: concerns over 'abandoned' nets and a need for management of this activity is being investigated by NEKCSAG.
- The possible importance of the chalk reefs as a bass spawning area has been raised and will be investigated.

Recreation

The North East Kent Coast is an extremely busy urbanised area, with a range of recreational activities taking place along all parts of the coast and a high potential for conflict with wildlife.

As part of the Management Scheme, English Nature funded a 3 year study into the effects of human activities on wintering birds, particularly the turnstone, which concluded in 2003. This found that different activities caused different levels of disturbance, with dog walking and kite surfing/buggying being the most disturbing. Voluntary codes of conduct were drawn up by local people working with the Thanet Coast Project, and these have helped to reduce disturbance. Winter bird wardening has also helped to reduce disturbance from dog walking, and interested dog walkers are helping to spread the word to others.

Research and education

The first North East Kent coastal science conference was held in October 2002. As a result of this, the North East Kent Coastal Scientific Advisory Group (NEKCSAG) was formed in August 2003, with information-gathering and research as one of its' key remits. The following Statement of Intent has been agreed by the group:

The North East Kent Coastal Scientific Advisory Group will:

- act as a focus for coastal & information gathering and dissemination, to include a research database;
- investigate scientific problems and issues affecting the coast & act as a springboard for future coastal research;
- work to influence coastal policy decisions;
- advise the North East Kent European Marine Sites Management Group;
- maintain appropriate contact with local stakeholders.

Seashore safari with Thanet Coast Project

The Thanet Coast Project has always had a strong educational remit, but particularly since the appointment of an Education Officer in August 2004. The Project is now looking to reach sectors of the local community which it has not previously engaged with, such as disadvantaged groups and teenagers.

Water quality

A Water Quality Group convened to discuss issues around eutrophication on the North East Kent coast in 2001-2. Site characterisation work is now being undertaken by the Environment Agency as a result of this, which will inform future management of the area. This group is now subsumed within NEKCSAG.

Species management

Japweed *Sargassum muticum*. Advice has been provided to Thanet District Council on management of the sea bathing pools, where this non-native species is often found. In 2004, a summer survey was undertaken by a university student, to help inform management.

Wakame ***Undaria pinnatifida***. This non-native seaweed was found for first time in 2004 on pontoons in Ramsgate Harbour by NEKCSAG members; a Kent-wide survey is proposed

Wakame is discovered in Ramsgate Harbour

Seaweed removal from beaches: English Nature has worked with Thanet District Council to draw up a Site Management Statement with Thanet DC, giving permission to remove washed up seaweed from beaches in the summer, but prohibiting it in the wintering bird season (October to mid April), when it provides an important food source, especially for turnstones. The Statement also covers many other routine activities undertaken by the Council, and provides conditional permission to undertake these, so that features of nature conservation importance are not affected.

The future: Management Scheme review

The current Management Scheme expires in April 2006, and stakeholders and relevant authorities will be involved in a full review process during 2005.

The intention is to undertake the review according to the principles of the Ecosystem Approach, which can be defined as:

"A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" (Convention on Biological Diversity).

The current scheme already fits well with many of the guiding principles of the Ecosystem Approach, and it is a challenge for all the relevant authorities over the coming year to ensure that the review leads to an even better fit.

Making links with local people – The Thanet Coast Project

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Introduction

The Thanet Coast Project was set up in July 2001 to take forward many of the wildlife related actions in the North East Kent European marine sites Management Scheme (2001-6) that were not being dealt with by other organisations. Originally, it was anticipated that there would be three project staff – manager, education and arts officers. However, initial funding would only allow for one Project Officer, who started in post in July 2001. Further funding was secured for an Education Officer, who started in post in August 2004.

The Thanet Coast Project's remit is to:

- **Make people more aware of the importance of the bird & marine life** and how to avoid damage to it.
- **Implement Management Scheme actions**, eg 'Help local users produce, follow and monitor codes of conduct'.
- **Encourage or run wildlife related events** and make links with wildlife and green tourism, coastscape and the arts.
- **Be a focal point for enquiries** and gathering information.
- **Keep people informed**, eg newsletters, articles and stakeholder meetings to keep everyone up to date with progress.

Engaging with people: methods

The Thanet Coast Project's work can be viewed on three distinct levels, according to the way that it engages with the local community and visitors to the coast. The gradient of awareness, interest and involvement increases along a scale, but in essence, these are:

Level 1:	Level 2:	Level 3:
Raising awareness	Raising interest & concern	Public participation & action

Examples of the various ways that the Thanet Coast Project has raised public awareness of this European marine site and coastline include:

- **Communications**
  - media: news releases; articles; radio interviews;
  - project representation: presentations; site visits; meetings;
  - networking: within local authority; with project partners and coastal user groups;
  - responding to public enquiries and requests for information;
  - keeping people informed: newsletters; leaflets; website; stakeholder meetings.

- **Implementing action - specific management scheme action: including awareness posters, signs, coastal bird wardens, volunteers and monitoring.**
- **Workshops - stakeholder meetings; writing the coastal codes.**
- **Public events & activities**.

Figure 1. Engaging with people: Examples of Thanet Coast newsletters and posters

All our activities have an effect: voluntary codes of conduct

The *North East Kent European marine sites Management Scheme* was produced by the relevant authorities in conjunction with coastal stakeholders using consensus-building (stakeholder dialogue) workshops. The documents produced from the Management Scheme illustrate the important nature conservation and geological features of the coastline, to show that the Thanet coast really is an asset for all. However, all our coastal and marine activities have the potential to affect these features, and the main focus of the *action plan* is to consider what needs to be done to keep the geology and plant and animal life in good condition.

Whilst many of the actions needed are within the remit of the relevant authorities, and are often covered by their statutory duties, there were some recreational activities that local individuals and groups could act upon. The stakeholders agreed that a series of voluntary codes of conduct could help safeguard wildlife, while allowing locals and visitors to enjoy their coastal activities.

Figure 2. Examples of relevant authority statutory duty activities Statutory activities – from coastal defences, water quality testing, sea fisheries, and port authority dredging - are the responsibility of the relevant authorities.

The guidelines agreed with local stakeholders for producing these new voluntary codes of conduct were:

- to include information about how to avoid harming the bird & marine life,
- to encourage responsible use of the coast,
- and to include safety issues relating to the activity.

It was also agreed that:

- the codes would be written by stakeholders deciding together, and should encourage self-regulation by user groups, and
- the codes would be kept under review and monitored to check they are working.

The process for achieving this was carried out in three main steps:

Step 1: **Collate information** about codes from previous Management Scheme workshop information supplied by the stakeholders;

Step 2: **draft the codes -** using stakeholder information and incorporating advice from wider user contacts for this activity, using the guidelines above;

Step 3: **consensus building workshops -** with the relevant local stakeholders to agree on detailed content of the codes.

The workshops took place during 2001-2, and the Thanet Coastal Codes were launched in November 2002. This is the first time that a set of specific codes has been drawn up by local users for a protected marine site in the UK. They include a general code to cover all beach users, plus codes for specific activities. Stakeholders from local interest groups, as well as individuals, were invited to participate in the workshops, and this was easier to organise where groups already existed. Most of the shellfish collectors and fixed netters were not willing to meet up with others at a workshop, but were willing to liaise in the field. The schools code was a late addition to complete the series, and was agreed by representative stakeholders through written comments. Some specific recreational activities were excluded from these codes. For example, surfers, where the effect was deemed to be minimal, or small recreational hovercraft where participatory numbers are low and advice can be given directly to the users concerned.

The Thanet Coastal Codes (2002)

Shore-based recreation:
- seashore (general beach code),
- horse riding,
- dog walking,
- school (organised group) trips.

Water-based recreation:
- powercraft activities,
- wind-powered activities.

Fishing & harvesting:
- bait digging and collecting,
- shore angling,
- harvesting shellfish & fixed netting.

Figure 3. Thanet Coastal Codes workshop sheet in progress.

Some impressive results from the introduction of the coastal code have been recorded already. The level of disturbance to turnstones by coastal activities was reduced by as much as 40% in this first year (The effects of human activity on turnstones and other wading birds within the Thanet and Sandwich Bay SPA, Kevin Webb). However, the codes were produced alongside other actions, such as turnstone posters, information signs and temporary coastal bird wardens and these all played their part. We cannot be complacent, as this initial success may be much more difficult to achieve over a longer period of time without developing new initiatives and relying on the continued support of the majority of coastal users. A downside to the voluntary codes is that despite goodwill by the majority of responsible users, it only takes one irresponsible person to let the others down.

Most of the information about the location of coastal activities in the Management Scheme was provided by word of mouth by various stakeholders. However, a more accurate account of the number of participants involved is required to form a baseline for these activities. Trial monitoring of the different coastal activities was carried out by Thanet Coast Project volunteers in 2003, and the information and technique is an important precursor to the new Thanet Coastal Warden Scheme.

Specific actions and issues arising

Reference has been made to some of the specific projects that have come from the Management Scheme. For example, the turnstone signs, posters and temporary coastal bird wardens. The concept of the original codes of conduct has been streamlined to one set of voluntary coastal codes for recreational users, and one new *Research Code* for academic researchers (produced by the North East Kent Scientific Coastal Advisory Group).

Figure 4. Turnstone signs

However, there were numerous issues of local importance that were not included in the 2001-2006 Management Scheme. It is likely that these will be discussed during the imminent review of the scheme (2005-6), especially if this takes into account the principles of the wider ecosystem approach that is currently being advocated. These issues include:

- **Seaweed management**: driftweed management was recently included in a Site Management Statement agreed with the local authority. A new non-indigenous species, Wakame also requires adding to this list;
- **algae blooms** and better public awareness;
- **coastal litter** and practical action and links to Beachwatch/Adopt-a-Beach with Marine Conservation Society;
- **offshore seal colonies** and green tourism links as well as potential disturbance included within the codes. The Project acted as the local contact for the Phocine Distemper Virus in 2002-3;
- **cetacean bycatch** - records.

Two other issues that get extensive local publicity are **dogs on beaches** (environmental health issues), and **seagulls** (nesting, juveniles and protective parent seagulls). There are also potential links with national and regional recording schemes such as Jellyfish (Marine Conservation Society*),* eggcases of skates and rays (Shark Trust), MarLIN's signpost indicator species and Kent Shoresearch schemes.

In addition, there have been notable exclusions such as the impact of future climatic changes, and also the prospect of the chalk reef disappearing (or dissolving) before our eyes as three quarters of the Thanet chalk coast has sea defences preventing the natural dynamic process of retreat.

Other issues, such as the establishment of a coastal park suggested by stakeholders have not been taken forward by the local authority. However, a coastal park is mentioned within the Thanet Local Plan. One older initiative that was established before the Project was formed, the Thanet Coastal Path is in need of rejuvenating and the maintenance of the old panels have found their way into the work remit of the Project.

Thanet Coast's events and activities

The Thanet Coast Project's diverse events programme has gone from strength to strength since it started in 2002. This approach to raising awareness, interest and engaging with people has followed a distinctive style to promote links between local marine and coastal wildlife and green tourism, the local marine environment, coastscape and, more recently, the arts. At first this could seem in quite a stark contrast to many other protected marine sites, where similar project officers do not run such extensive events programme.

Figure 5. Rockpool recording at Birchington.

Examples of the Thanet Coast events:

- ‘Seashore safaris’ - aimed at families over the schools holidays,
- ‘Chalk Walks’ with the Rock Doc - bringing the history of the rocks to life,
- ‘Wildlife Sailing’ excursions - to the seals and sandbanks,
- ‘Secrets of seaweeds’ - with expert help from Dr Ian Tittley, Natural History Museum,
- ‘Rocky Shore Discovery Tour’ - with Ian Humpheryes, to see what lurks between the tides,
- beach cleans.

The main focus for events has been centred around regional and national awareness initiatives, such as Marine Week (with the Wildlife Trusts-South East); Low Tide Day (River Oceans); Beachwatch (Marine Conservation Society) and World Ocean Day. The most popular activities have been the Seashore Safaris that take place around various different bays each year. These have been run in conjunction with the Kent Wildlife Trust, and over the last summer involved trial rockpool recording forms to help focus attention on the life found on the shore. There have also been links with the work of other county initiatives such as Kent Shoresearch (intertidal) and Kent Seasearch (subtidal) volunteer recording projects.

Figure 6. From top-left to right: Seashore safari (Stone Bay, Broadstairs), Chalk walk with the Rock Doc, , Marine Week (with Wildlife Trusts) – Whale & Dolphin roadshow, Sea cave – 'Seaweeds and their secrets'.

In addition, there have been new links with artists during 2004, leading to further events, such as:

- 'Life's-A-Beach' exhibition - with local 12 artists on display for a month;
- Sand art, Angela Molloy and Lauren Sebastian;
- Thanet Coast's Big Draw, involving 20 different artists, co-ordinated by Paul Goodrick;
- Sand wind-barriers, Paul Goodrick working with a very amenable JCB driver/local authority;
- Beach clean collage, Ruth Cutler, Low Tide Day and beach clean.

There are a few projects which involve direct practical action each year, such as the beach cleans in the spring and autumn. These concentrate on the sections of coastline between Birchington and Reculver - where no authorities arrange for coastal litter to be collected. Pegwell Bay, the only National Nature Reserve in the Thanet Coast area, always seems to need volunteer help to keep the beach clean.

Figure 8. From top-left to right: Thanet Coast's Big Draw , Sand plaice by Angela Molloy, Life's a Beach art exhibition, Shellfish art (fish) by Angela Molloy.

The level of public 'engagement', as discussed earlier, varies depending on the type of public event. However, the number of these events and people participating has been steadily increasing.

Year	Number of public events	Participants
2002	25 events	600
2003	40 events	942
2004	53 events	2126

Whilst these are the Coast Project's public events, these figures exclude all the stakeholder workshop participants, other organisation events attended (eg Community Fairs), organised group events and presentations given to local organisations.

Brief analysis, 2004 achievements and the future

Looking at the first three years of the Thanet Coast Project, my personal analysis of the Project's work would include the following.

The **strengths** include dramatically raising the profile of coastal nature conservation in Thanet, by raising awareness of issues of concern, and encouraging positive action by coastal users and visitors to the area. Much new work has been forged through new partnerships with organisations such as the Kent Wildlife Trust, which has enabled both our organisations to work more effectively within the area. The Thanet Coast Project has also developed a reputation of quality and a distinctive style (eg newsletters and leaflets) and has demonstrated that it can help to resolve potential conflicts and promote good practice in conjunction with the coastal users.

The **weaknesses** are that the project has very limited financial resources, and staff numbers. Consequently, methods have often relied on voluntary help (development of codes, wardens, leaders, and experts on events giving their time for free). The Sandwich and Pegwell National Nature Reserve within the North East Kent European marine sites has recently received many complaints about incompatible activities. For example, speeding powercraft and kite-surfing etc.

However, the **opportunities** are there. A recent successful Heritage Lottery Fund application has enabled a second member of staff, an Education Officer, to start (31 August 2004). The new post is focusing on running the new voluntary Thanet Coastal Warden Scheme to further engage people with their own local sections of coastline. The officer will also develop new links with community groups, and run more regular coastal stakeholder meetings.

There are also **lessons to be learnt** so that the project can improve. For example, in areas such as the recent monitoring trials and brand new work with artists. There are opportunities to explore new and inspiring ways of raising public awareness about the importance of their coastline - so there are still plenty of things to do!

Threats include the uncertainty of future support from funding partners. The Project needs to be seen as independent from any one of the partner organisations and so requires a Memorandum of Agreement which will enable it to seek extra funds. There is a continual need to establish where future funding is coming from, to keep the work going! The current project funding is due to end in 2006.

The Thanet Coast Project has achieved much over the last year. In particular,

- a new set of four display panels,
- a web-site: www.thanetcoast.org.uk,
- its most extensive coastal events programme,
- a successful Heritage Lottery Fund application,
- Thanet Coast Education Officer started,
- educational/community liaison links (eg whale and dolphin roadshow school visits),
- new Thanet Coast Warden Scheme (launch: 25 Nov 2004, Community Pharmacy Gallery, Margate),
- more regular stakeholder events, every six months.

In 2005 we hope to do more of the same with:

- Thanet Coastal Warden volunteer training – core and optional modules,
- more links to local community groups (Millennium Volunteers; WI; 16+Youth Forum),
- revision/reprint: Management Scheme - Summary (booklet),
- update/reprint: Thanet Coastal Codes and revised (booklet),
- starting the revision of the Management Scheme process,
- and a more extensive events programme!

Figure 10. Beach clean volunteers

As long as funding can be found to secure the Project's future then prospects to build on past achievements look bright! The most exciting future prospect is the work to develop new links beyond our current local stakeholder input to the Project and Management Scheme. By encouraging local people to volunteer as Coastal Wardens, where they will act as the 'eyes & ears' of their local stretch of coastline, they will be able to contribute directly by helping to monitor coastal activities and wildlife, report incidents and champion the importance of our local coast and marine environment. This will be the second coastal warden scheme in the country and will trial new methods of working, such as a Volunteers' Agreement. The coastal volunteer approach could be one of the best ways to build greater links between the natural asset of the north east Kent coastline and the local community and coastal users.

An anthropological study of Kent Fishing communities – research objectives and methodology

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Introduction

From October 2003, a team of four anthropologists have been conducting research on fishing communities on the North Kent coast. The project, 'A Study of small-scale fishing, Thanet Coast, Kent', has been funded for 18 months by the Economics and Social Science Research Council (ESRC). The research team consists of Roger Just, Glenn Bowman, Cecilia Busby and Yoshitaka Ota. Roger Just is the project leader, and Yoshitaka Ota has carried out most of the field research. Glen Bowman and Cecilia Busby focus on specific aspects of the topic, such as its visual documentation and gender relations within the communities.

The outcome of this research will be presented as an academic report to the Economics and Social Science Research Council in late March 2005. We will also give two presentations at the 2005 Marine Studies Conference in Amsterdam in early July 2005. Those presentations will subsequently be published in anthropological journals. The project has been specifically designed as a pilot study, and a further project proposal has now been submitted to the ESRC. If it is successful, then the same team will conduct a multi-sited study of small-scale sea fishing communities in four locations in both in Europe (Dover Strait) and Africa (Indian Ocean).

Background

The common assumption is that the present demise of UK fisheries is a direct result of over-fishing and of declining fish stocks. The press has regularly reported that stocks of such staple fish as cod and skate are falling below sustainable levels, and in some cases are already locally extinct.[1] This severity of the crisis, claimed by both the media and statutory bodies, has prompted a political action: the EU Commission's drastic overhauling of its Common Fisheries Policy (CFP). Consequently, UK fisheries now face a dilemma; if something is not done to reduce the over-exploitation of fish-stocks, the industry will collapse; if something is done, then it would appear to be at the expense of local fishers who must pay the price of conservation measures.

Research objectives

We hope to provide through our research a better understanding of UK small-scale fisheries, and thus to contribute to the industry's future support.

1 *The Guardian*, 17 December 2001; *The Guardian*, 21 March 2002; *The Guardian*, 22 March 2002; *The Guardian*, 28 March 2002; *The Guardian*, 1 June 2002; *Financial Times*, 18 July 2002.

We have allowed 12 months for field research, and 6 months for data handling and analysis. We have limited the study to two fishing communities on the North Kent coast: Whitstable and Ramsgate.

In order to gain a comprehensive picture of these communities, three types of research data are being collected:

1. Quantitative data to ascertain the real scale of the communities' activities, including the number of boats and fishers engaged in small-scale fishing;
2. Qualitative data concerning human relationships with the marine environment, eg fishers' own perceptions of the seascapes with which they engage, and their narrative accounts of the operation of different fishing methods;
3. Qualitative and quantitative data concerning the social context of small-scale fisheries, eg the life histories of fishers, and the pattern of their everyday social interaction.

By amalgamating and analysing all three types of data, we hope in the end to be able to determine (amongst other things):

i. The economic viability of the local fishing industry;

ii. The social and cultural impact on local communities of the (possible) demise of fishing;

iii. The possibility (and acceptability) of alternative employment opportunities for local fishers.

Theoretical framework

There have been two notable anthropological studies of contemporary British fishing communities. Theoretically, they both focused on the construction of community, and on fishing as a source of social identity. Anthony Cohen (1987) studied the community of Whalsay in the Shetland Isles from the mid 1970s to the mid 1980s, a period during which fishing was undergoing a significant social and economic transformation from a subsistence and/or part-time activity to a capital-intensive industry. Through his extensive field research, Cohen observed that the people in Whalsay retained their sense of cultural difference between 'inside' and 'outside' of the community despite social and economic changes. For them, Cohen argues, the increase in their contact with the outside world did not result in 'blurring of the community's boundary', but, rather, they persistently reasserted the distinctiveness of 'Whalsay life' by the 'subtle use of community symbols' (or 'ideas behind words'), which was engaged with both communal and individual interests.[2]

More recently, Jane Nadel-Klein (2003) has published an account of a fishing village on the coast of Scotland that was undergoing severe economic decline. Economic pressures and the struggle to make a living from the sea were causes of constant anxiety, not only in relation to the survival of fishing as an economically viable occupation, but also in connection to the loss of a particular way of life, a 'culture', that the villagers saw as inextricably linked to fishing. The villagers' solution was to self-consciously promote their fishing heritage as a

2 Cohen, A. 1987. *Whalsay – Symbol, segment and boundary in a Shetland island community*. Manchester: Manchester University Press.

tourist attraction and to present themselves to others as authentic, living ‘fishfolk’. Their cultural heritage became itself a commodity able to sustain the local economy. But as Nadel-Klein argues, this act of ‘ (cultural) heritage making’ was not merely a pragmatic choice for a community trying to survive in what had become an economic cul-de-sac; it was also genuinely an ‘act of telling…an argument for their worth and their right to place’. People were able, collectively and individually, to retain their identity, but as a form of ‘heritage’ rather than an economic practice[3].

Like these two studies, our research in Kent focuses on the construction of community and on the forms of social identity created within the local fishery. We consider fishing as an encompassing ‘way of life’, thought both by fishers themselves and by outsiders to imbue its practitioners with a particular ethos or character. However, we have also been able to participate in, and to take much fuller account of, the actual technical practice of fishing on a day-to day basis, rather than having to concentrate solely on questions of discourse and ‘heritage’. Consequently, we hope to be able to show in a much more direct way how the versatile nature of small-scale fishing gives rise to different forms of social identity.

Research method

In this study we have employed the two standard research methods of social anthropology: ‘participant observation’ and long-term interviews.

Our use of participant observation stems from a desire to observe and interact with our subjects on a day-to-day basis in order to come to know and to understand fishing as it is actually practised by fishers. Long-term semi-structured interviews are conducted in order to allow fishers themselves to take the initiative in describing their lives and practices. Through this combination of methods we are able to experience fishing ‘from the inside’ and to learn in a quite practical way through daily interaction and participation what it is to be a fisherman, and also to identify specific issues that concern individual fishers as they describe and comment on their own lives.

Thus far, we have recorded interviews with 27 of the 36 men currently working as a full-time fishers. Through participant observation (including the time I have spent just ‘hanging around’ at the harbour) I have come to know 94 individuals who are in some ways linked to the local fishery, including part-time crew, fish traders, boat owners and retired fishers. I have also acquired a knowledge of three different fishing methods - trawling, netting and potting - and the different techniques involved in each, by having participated in more than 25 fishing trips on 14 different boats.

Some findings

We are currently reviewing the data collected over the 12 months’ field research period. What I list below are just a few observations perhaps of interest to those who know little or nothing about fishing along the North Kent coast. A detailed account of our findings will be written up over the next six months.

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3 Nadel-Klein, J. 2003. Fishing for Heritage – modernity and loss along the Scottish coast. London: Berg

i. There is a significant difference in the scale of fishing between Ramsgate and Whitstable. Ramsgate has approximately three times as many fishing vessels and fishers operating from its harbour as Whitstable does.

ii. Most fishing vessels and fishermen now based in Ramsgate are originally from other harbours along the North Kent coast including Margate, Deal and Broadstairs, and those who fish from Ramsgate actually reside in three different towns. Fishing vessels and fishers based in Whitstable use only the Whitstable harbour, and are resident in Whitstable. Whitstable fishers thus constitute a much more cohesive local community than do fishers from Ramsgate.

iii. Perhaps as a consequence of their not constituting a long-term local community, fishers based in Ramsgate have organised themselves into a well-run formal union, the Ramsgate Fishers Association. Whitstable fishers have no such organisation, and perhaps need none, since their cohesion is based on long-term familiarity - although it must be admitted that one company, the Cardinum Shell Fishery, employs half of the fishing population from the harbour.

iv. There is also a distinctive difference between Ramsgate and Whitstable fishers in terms of their fishing methods: fishing in Ramsgate is dominated by netting, whereas fishing in Whitstable is dominated by trawling. These different methods may relate to the different constitutions of the fishing populations, for it is easier to move into netting than into trawling, and Ramsgate's fishing community is a less stable one that Whitstable's.

v. The decline of North Kent fishing may not necessarily have been caused solely by over-fishing. Certainly fishers claim that other factors including sewage pollution and climate change must be taken into account.

vi. Many fishers claim that they have suffered as a result of external pressures coming from both statutory bodies and the private sector. Some see that there will be more unrecognised socio-economic and environmental pressures on the industry, including disturbance to their fishing grounds caused by new off-shore developments such as wind farm.

vii. Fishers in North Kent show a collective sense of camaraderie in their everyday practice of fishing, and they have always maintained a sense of being a 'community' of fishers, despite their strong sense of independence, competitiveness and territoriality - factors which, to some extent, have weakened their ability to negotiate with external bodies.

The Kent Coastal Network

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Introduction - why a Network?

Kent has one of the longest and most varied coastlines in England. The coastline to some is just a backdrop to their lives but to more it is a source of pleasure, providing leisure opportunities and points of historical interest. To others it is a commercial resource that provides resources for exploitation and passage to other countries. In addition, to some, Kent's coastline is a barrier to the encroaching sea and the potential for flooding that this brings. Kent's coast is also of national and international importance, being home to a number of exceptional natural habitats.

All of these interests put pressures on the coast, which need to be effectively and responsibly managed, and any management decisions need to be based on sound advice and research. Within Kent there are a multitude of different bodies, partnerships and projects that are concerned with delivering or assisting in the delivery of the sustainable management and use of the coast.

The challenge, with such a diverse range of stakeholders, is disseminating this work out to all the relevant organisations. Without effective communication, duplication of work can occur and opportunities for partnership working, and therefore sharing of resources and costs, can be missed.

Whilst there are a number of partnership bodies which enabled discussion and working between different organisations, these are largely regional and there is little opportunity for a county-wide exchange of information.

In response to this, the Kent Coastal Network was established. This paper outlines the development of the Network, its aims and activities and the benefits of a coastal network for Kent.

The development of the Network

The need for a forum or network that linked the coastal stakeholders of Kent was identified through consultation with various bodies. The initiative was taken forward by Kent County Council, and assisted by funding from SAIL (Interreg IIIB).

Kent County Council was keen that any subsequent development of a network should be taken forward in partnership with those who would potentially benefit from a coastal forum of some sort. A workshop was established to discuss the establishment of a network and to agree that there was a need for its development. By developing the structure and workings of the Network with potential members, it was ensured that the resulting Network was one that stakeholders would be willing to contribute to, want to be engaged in and hence ensure that it would be effective.

One of the main considerations during the Network's development was how it could deliver benefits to members, such as improving communication and facilitating the exchange of information, without putting increased pressures on member's already constrained time and resources. It was agreed the best way to address this would be to use communication methods, such as emails, bulletins and a website, to keep members in touch with each others activities, removing the need to meet on a regular basis. However the value of networking with members was recognised and the convening of the Network once a year was recommended.

As a result of the workshop and discussions, the Kent Coastal Network was established in late spring 2004. The membership of the Network has grown steadily and to date the Network has attracted over one hundred members, representing over sixty-five different organisations.

Network aims

The main aims of the Network are to improve communication and increase awareness of the activities taking place along Kent's coast. This helps to reduce duplication of effort and enables members to identify opportunities for working together and to also identify where experience and knowledge lies and hence where advice and learning can be sought.

In addition the Network also aims to facilitate working in partnership and to provide a platform for discussion of common issues. The Network represents a wealth of knowledge and experience and provides opportunities to share this to tackle common issues facing the coast.

Network activities

The Network undertakes a number of various activities in order to achieve the aforementioned aims. These are detailed below.

Bulletin

The bulletin is distributed quarterly and to date three editions have been published (all bulletins are available from the Kent Coastal Network website http://coastalkent.net/bulletins.php). The bulletin has a distribution number of over 600 to Network members, national organisations and non-members. The aim of the bulletin is to promote the valuable work being undertaken in Kent and reports on member news and Network activities. It also features articles looking at issues for the Kent coast and details events and research taking place within the county. The bulletin is open to all Network members for the promotion of their activities.

Email updates

The purpose of the email update is to keep members informed of activities in between bulletins and goes out once or twice a month depending on the level of news. As with the bulletin, it updates on member and Network news and events and also highlights any points of interest from the UK. The email update also provides members with the facility to request information from other members or to consult with them.

Website

The Network also has a website at www.coastalkent.net As the Network represents many of Kent's coastal stakeholders, the website's member database provides a vital information portal on the key organisations working for Kent's coast. The database can be viewed either by sector category or by an A-Z listing. However, visitors to the website may not always know the organisation they are looking for, so a useful search function has been included that will allow users to identify which organisation is associated with the particular issue they are concerned with. The database provides a summary of the member's roles and responsibilities, contact details and an outline of their current activities.

In addition to information on the Network and it's members, the website also lists for the Network, members and other relevant UK organisations events and news and any member can use these pages to promote their activities. Members are informed of new articles and events through the monthly email update.

The website also has the facility to download the current and past editions of the Kent Coast Bulletin and to register as a member of the Network. It is anticipated that the website will assist in the wider promotion of the Network and will help to attract new members in order to expand and develop the already strong member base. In addition, each member will also be promoted and will have the opportunity to promote their work further by submitting news articles and events to be featured on the website. The website will also act as a one stop shop for information on the activities taking place in Kent and the organisations carrying them out.

Working groups

As previously mentioned, the Network represents many different stakeholders and therefore can act as a facilitator in getting people together to discuss common issues. These form the Network working groups. Such working groups provide an opportunity to not only discuss the issue but share and learn from the wealth of experience and knowledge within the Network. Working groups are set up to address issues which are common to the coastline of Kent, with the aim of identifying ways to improve the situation.

The first Network working group was held in October 2004 to look at the management of Personal Water Craft (PWCs), which had previously been identified as an issue.

PWC Working Group results

Personal Water Craft (PWC) management is an issue facing many coastal managers around the coast of Kent and the PWC Working Group was established to bring together all relevant stakeholders to discuss this pertinent issue. The first meeting was held on 15th October with the aim of providing a platform for the sharing of experience and knowledge and the discussion of effective PWC management. A further aim of the Group was to identify actions to be taken forward in partnership to address the management of PWCs in Kent.

The meeting was attended by all major stakeholders, offering a valuable opportunity to discuss the management of PWCs in a fully integrated and holistic way. Stakeholder groups represented at the meeting included:

- local authorities,
- regulators and safety authorities
- yachting and recreation clubs,
- PWC riders.
- coastal partnerships,
- environmental bodies,
- ports.

The wide representation at the meeting meant that contacts were established that might not have been otherwise and the different sectors were able to hear the concerns of others, helping to address any previously held misconceptions.

To set the context before discussions commenced, a number of members of the group provided viewpoints and experiences of management, safety, environmental impact and the sport itself. Presentations were provided by:

- Captain Peter White (Medway Ports) on experiences with PWC activity and control in the Medway and Swale;
- John Hawkins (Canterbury City Council) on the highly successful PWC management scheme at Whitstable and Herne Bay;
- Guy Addinton (RNLI) on safety issues relating to PWC use;
- Susannah Peckham (English Nature) on the environmental impacts of PWCs and management to minimise this;
- Chris Neville-Parry (Personal Watercraft Partnership) on experiences of PWC use and management in the UK;
- John Biggar (JAWS) providing the PWC rider's perspective.

The conclusions of the Group's discussions are summarised below:

- majority of problems are caused by a limited number of individuals, unregulated by management schemes or clubs;
- controlled launch sites and management schemes have proven success, however they are neither easy nor cheap to establish, therefore self-regulation through clubs is seen as the best way to proceed in the first instance;
- clubs have an important role to play, not only in regulation but also in training and education;
- information provided at launch sites needs to be maintained to ensure users of the water are fully aware of restrictions. However, this is made difficult by vandalism of signs;
- education of all parties is key;
- the extent of the problem in Kent is not fully understood.

In order to address the above points, the Group identified a number of actions as summarised below:

- production of a map of launch sites and designated PWC areas in Kent;
- development of a Kent wide code of conduct for PWC use;

- more interaction between PWC clubs and other water user clubs to improve communication and reduce conflict;
- development of a database of contacts who can provide help and advice on PWC management;
- awareness raising activities, such as articles in the press and seminars;
- establishment of an intelligence profile of PWC activity in Kent to identify problem areas and prioritise issues for attention;
- production of an information leaflet on environmental impacts and considerations for Kent.

Over the course of the next few months these actions will be taken forward by members of the working group and progress will be reported through the Kent Coastal Network website and this Bulletin. The Working Group report, with full details of the presentations and discussion, is available to download from the Kent Coastal Network website at www.coastalkent.net/news.php?id=19

Conference

The final activity of the Network will be the hosting of an annual conference, which will provide the opportunity for members to discuss their work of the past year and their aspirations for the next. The conference and its resulting proceedings would therefore act as a showcase for the valuable work and activities taking place along the Kent coast. It is anticipated that the first conference will be held early summer 2005.

Benefits of Network

Network membership is open to anyone with an interest in Kent's coast and is free of charge. As a member, there are a number of benefits to be gained:

- improved awareness of coastal activities in Kent;
- the opportunity to promote work to a wide range of coastal stakeholders;
- the opportunity to work with others to address Kent's coastal issues;
- exchange of knowledge and experience;
- reduced duplication of effort;
- opportunities for partnership working and funding;
- shared resources and costs.

Further information

For further information on the Network see www.coastalkent.net or contact kent.coasts@kent.gov.uk

Starting to think about the questions science may need to consider to understand the ecosystems of the North East Kent European marine sites

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Part 1

Our use of the natural environment will only be genuinely sustainable when we understand the functional limits of the ecosystems on which we depend and chose to live in. The focus of this paper is to start to think about the questions science may need to ask in order to understand the functional limits of one particular coastal and marine area, the North East Kent European marine site (NEKEMS) which stretches from Whitstable, on the Northern Coast round to Deal, on the Eastern Coast.

It has been suggested in a separate paper in this report that the NEKEMS is well placed to begin to press forward with adopting the Ecosystem Approach. The Ecosystem Approach is described in that paper and is the primary framework for achieving sustainable development under the Convention on Biodiversity (see page 7). For the Ecosystem Approach to deliver its aims, ecosystems must be managed within the limits of their function. This requires:

- an understanding of what an ecosystem is,
- agreement amongst scientists and managers about the ecosystem/s under discussion,
- developing understanding about the relationships and processes within these systems and the ecosystems structure and function,
- developing a clearer idea of what the systems functional limits might be.

Definitions of the word 'ecosystem' abound, including:

- a functioning unit of biological life and natural processes,
- a community of interdependent organisms together with the environment they inhabit and with which they interact (Dictionary of the Environment),
- a dynamic complex of plant, animal and micro-organism and their non-living environment interacting as a functional unit (Article 2 of the Convention on Biodiversity).

What is notable about these definitions is that none of them mention humans as part of the system. It is implicit that we are included within descriptive titles such as, 'biological life', 'interdependent organisms' or 'animals'. However, we rarely use these titles to describe ourselves in these terms, and have tended to see ourselves as separate or outside ecosystems. When we do this, and ignore the need to maintain the functionality of the systems that provide our life support, we put both the system and ourselves at risk.

Before the structure and function of any given ecosystem can be understood, the spatial scale must be defined.   Ecosystems can be defined at any spatial scale depending on the scale of the process – or the problem - under consideration. It is possible to talk about the ecosystem of a rock pool, a shore, a coastal cell, a regional sea or an ocean. Many ecosystems do not have readily definable boundaries because key processes eg water and nutrient supply originate 'beyond any habitat or structural limit and operate at a range of scales' (Laffoley and others, 2004). This is particularly the case with the sea where processes operate over large scales and distances.

In practice, defining a particular ecosystem(s) is best done at a scale which is most appropriate in respect to managing human activities that form part of that system and depend on it. The focus of this paper is to start to think about the systems that operate in and around the NE Kent European marine site. The current boundaries of the NEKEMS have been defined based on the location of features of European importance and do not consider the ecosystem/s of which they are a part. For the purposes of managing NEKEMS from an ecosystem perspective, it will be necessary to decide whether the area defined on the current designations map is considered an ecosystem, part of an ecosystem or many ecosystems.

Once the ecosystem(s) relevant to local decision-making have been defined, the next challenge is to begin to develop a sense of how resilient those systems are and what their functional limits might be. This concept accepts that ecosystems are dynamic. Traditionally, ecologists perceived all ecosystems as progressing along a continuum in a recognisable sequence with incremental changes occurring in a process of succession. Natural processes and feedback mechanisms would keep the system functioning within certain limits. It is now also accepted that if a system experiences sufficient natural or human induced disruption, these limits can be crossed, sudden changes occur, and a new state emerges. The model below aims to describe this concept visually. The circle represents the current state of the ecosystem as a ball that can role backwards and forwards between two points. With enough disruption the ball crosses the tipping point into a whole new state.

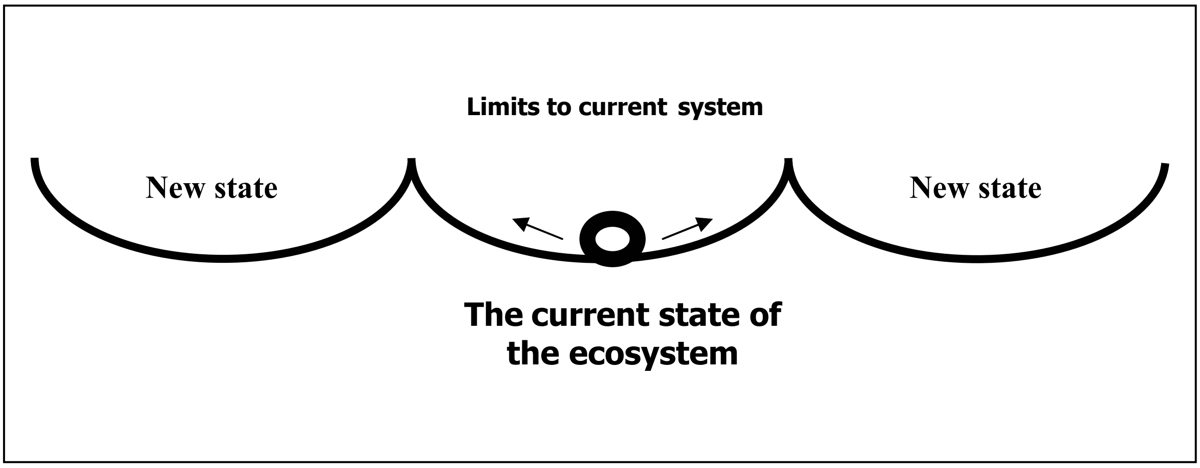


Diagram 1: Model showing the idea that there are limits beyond which the processes in an ecosystem collapse and a new state results

The implications of this are that scientists and managers need to start to work out what these limits might be, and what stresses or combination of stresses would take the system beyond the point of no return. Indicators can then be identified that provide early warning that the system is getting close to its functional limits. Indicators will include species that are sensitive to particular parameters - a concept that is already familiar, particularly in the monitoring of water quality and nutrient levels. Some indicators will also need to be non-biological, such as working out the sediment budget in a coastal cell and the indicators of whether or not this is sustainable or headed towards cell fragmentation.

Whilst the concept of indicators is not new, thinking about marine management from a holistic ecosystems approach is. There is an acknowledgement that we "need to shift the agenda from 'what is there' to 'what does it do'" (Laffoley and others, 2004). However, it is not necessary for marine scientists to start from scratch. The science of landscape ecology may offer some helpful insights and models as the following quote shows:

"Although applications in landscape ecology have traditionally been restricted to the study of terrestrial systems, the questions defining the science are equally relevant for marine systems. Indeed, knowledge of spatial pattern and the scales at which ecological processes take place is essential for effective management of marine environments. It is still unclear how the principles of landscape ecology can be translated into the marine environment, a three-dimensional milieu with physical and biological characteristics that often vary rapidly in space and time but it must start with bringing together researchers in the growing field of "seascape" ecology who are attempting to adapt the tools of landscape ecology to address ecological questions within marine and coastal systems", (US International Association of Landscape Ecologists 2004 Symposium).

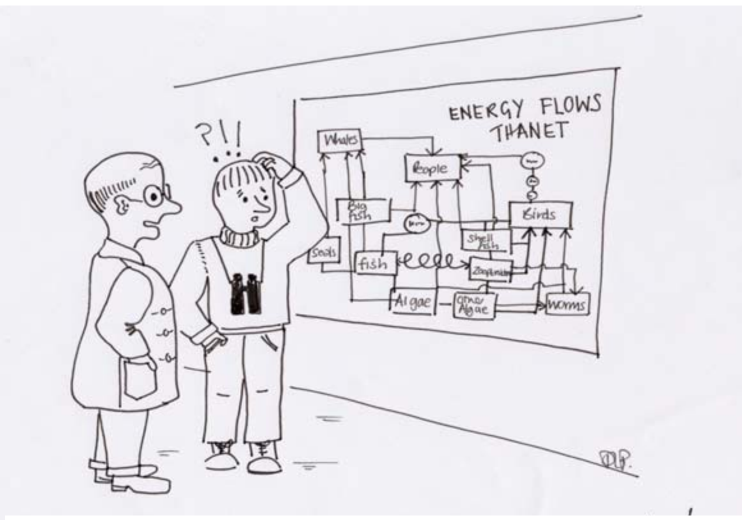
Part 2

The second part of this paper seeks to borrow from the science of landscape ecology by considering some of the basic concepts, and begin to explore how they might apply and help in taking an Ecosystem Approach to the NEKEMS.

Energy flows

A foundation of the science of ecology is the consideration of energy flows. Part of considering functional limits must be to consider what the main energy flows are, whether or not they are in equilibrium, or whether more is going into the system or being depleted from it.

At present the main flow of energy is from terrestrial ecosystems into marine systems in the form of nutrient runoff and wastewater. However, energy is also being depleted at higher trophic levels where over-fishing has led to the collapse of some fish stocks and as a consequence, fishing effort is now shifting down the food chain.



That's all sorted then...........quite simple really.

At a local level, work has yet to be done to understand the main energy flows in the ecosystem/s around north east Kent. Nutrient concentrations in the seawater are monitored and the Environment Agency is reviewing concentrations to see what effect they are having on the features of European importance (wintering turnstone and golden plover, chalk sea caves and reefs). However, the sensitivities and usefulness of these species and habitats as indicators for the health of the ecosystem as a whole is not known.

Hey guys….. I've just heard we're VIPs. We're KEYSTONE species!

Keystone species

The concept of keystone species is best explained with reference to the game of Jenga, a game in which wooden blocks are stacked on top of each other in a solid column. The game is to remove the blocks that are not essential to the stability of the column and the loser is the one who removes one of the crucial blocks so that the whole column collapses.

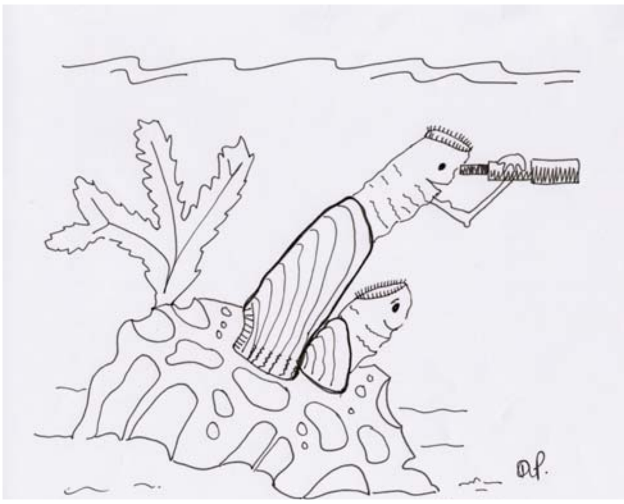
Keystone species are like those crucial Jenga blocks - they are vital for the functioning and resilience of the system, and have such a key role that their removal would lead to the collapse of the whole. Unlike Jenga, removing any components of the system unacceptably reduces its biodiversity. However, it is the keystone species that afford the system its stability.

If the keystone species of the European marine site can be identified, and their niche requirements and sensitivities understood, then a way of maintaining the resilience of the system will be to maintain a viable and healthy population of these species.

Metapopulations

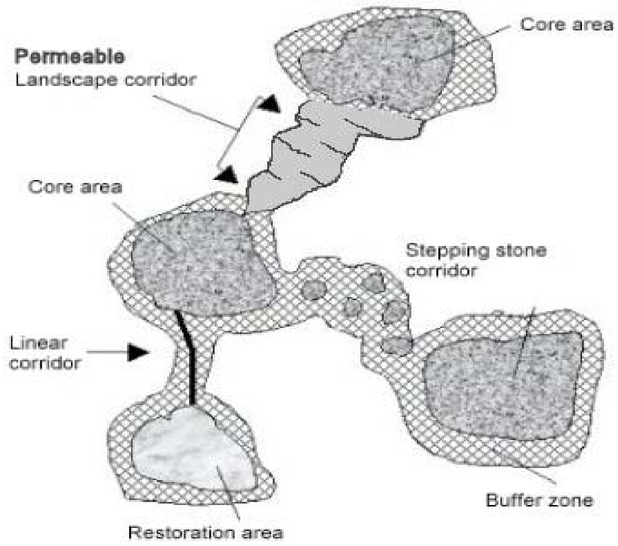
Metapopulations are the sum total of many local populations between which there is genetic mixing. Metapopulations provide resilience in a species gene pool and maximise the potential for adaptation to change. Isolated populations suffer the vulnerabilities of inbreeding with greater mutations, less resilience to disease or disaster, and loss of genetic diversity and adaptability.

Ensuring the viability of the European marine site's keystone species includes identifying whether or not they form part of a metapopulation and, if so, maintaining its range, size and connectivity.



Say ……
just how many boring piddocks are there around here??

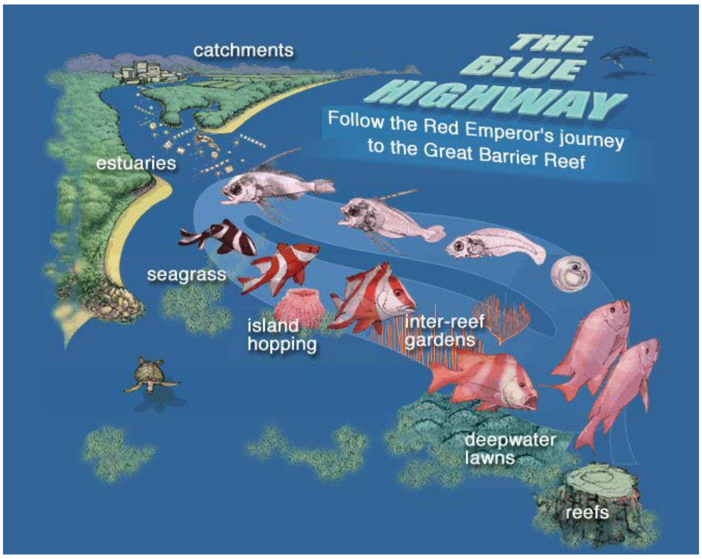
Connectivity



Schematic example of an ecological network adapted from ECNC 2000.

Connectivity is the word used to describe the links that allow genetic mixing and a fully functional metapopulation. From a landscape ecology perspective, connectivity is provided by linking corridors, stepping-stones and through *'permeable'* landscapes. Permeable landscapes are those that allow dispersal of species whilst not directly providing niche requirements. An example would be native grassland habitat that is permeable to more woodland birds, mammals and invertebrates than a freshly ploughed field or an urban area. It has been suggested that concern about connectivity is not relevant to the marine environment. This is because it appears to be seamless, with ecological process operating over large areas. However, although they may be subtle, natural boundaries do still exist, "defined by temperature, currents, depth, stratification and salinity" (Laffoley and others, 2004).

The extent to which human activities have created new boundaries to connectivity and dispersal in the sea has yet to be studied but it is certainly a possibility. It has been suggested that noise is a barrier to movement by species that travel in pods and communicate by sonar; dredging presents a barrier to movement by fish because the silt fines clog up their gills; near shore species may be prevented from long shore dispersal and breeding with adjacent populations by structures such as harbour walls that extend out to sea. All this is anecdotal but one clear example where the need to maintain connectivity has been demonstrated is the Red Emperor Fish of the Great Barrier Reef. At different life stages this species depends on different habitat types found at increasing distances from the shore. In areas



Great Barrier Reef Marine Park Authority where one of these habitats has been lost, the species can no longer complete its lifecycle. The poster *The Blue Highway* has been used to explain the concept and importance of connectivity to the public.

Drawing this back to consideration of the management of the (rather less exotic) north east Kent reefs would mean looking at the keystone species, finding out their lifecycle requirements and the mechanisms they use to disperse and mix at metapopulation scales. Once these mechanisms are known, consideration of whether they are viable for the long-term and whether or not they are susceptible to interruption by human activity, can be made.

Whilst the focus of this section is the connectivity within the sea, it is already known that the shores and sand flats of the north east Kent coast have a connectivity function, providing vital 'stepping-stones' for birds in passage between their northern breeding grounds and southern wintering grounds. Webb (2002) demonstrated that this link was at risk because levels of disturbance from human activity were compromising the ability of birds to feed and store sufficient body fat to survive the next leg of their journey.

Natural change

The Ecosystem Approach accepts that change is inevitable. There are processes of natural change in all ecosystems, some linear, some cyclical and others periodic. Teasing apart natural change from human induced change is a challenge and requires a greater understanding of the functioning of a given system and the web of natural and human feedback mechanisms that operate within it.

It also requires analysis of the long-term effects of humans on the system including:

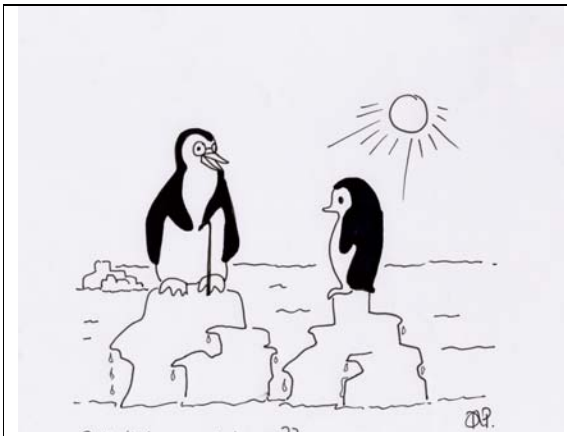
- adding nutrients and other chemicals,
- providing vectors for introduction of alien species,
- interrupting natural processes, eg by freezing the naturally eroding cliff line and interrupting coastal processes,
- extracting resources, eg fisheries, shellfish, dredged material.

How do we tell the kids that we're edible again?

Improvements in environmental quality will also have knock-on effects. For example, improved water quality may alter the composition and number of shore birds as a result of a change in the invertebrate community. Another example is an increase in harvesting of edible shellfish for human consumption as a result of cleaner coastal waters.

Locked in change

In considering ecosystem function it is important to take into account the changes that are already 'locked –in' to the environment as a result of past human activities. Global warming and sea level rise are two such changes that are going to affect the future management of the ecosystem(s) of the North East Kent European marine site.



Call this an iceberg??..... Now when I was a lad we really knew what an iceberg was!

In north east Kent, without naturalisation of the coastal process, sea level rise will squeeze the area of intertidal habitats against the current fixed sea walls. In time, as the shore continues to erode downwards and the sea level rises, the intertidal habitats will become subtidal. The only solution to this will be for the existing coastal protection to be removed and the cliffs to erode back inland naturally. In the short-term this will be politically unacceptable, with far reaching socio-economic consequences as cliffs erode and property falls into the sea. However, coastal squeeze and changes in coastal processes will also affect the beaches on which the tourist economy depends. Future generations will have some tough choices to make between keeping the coastal protection and losing the shore, or removing protection to maintain a shore and accepting the loss of property.

Climate space

Sea level rise is not the only consequence of global warming. Terrestrial ecologists have developed the concept of 'climate space'. This is the climatic requirement of a particular species or habitat. They have theorised that with climate change the 'climate space' for a particular species will shift location. The species will be lost if it cannot disperse to the new location or the geological and other conditions there are not suitable for it.

As a result of global warming, sea surface temperatures are set to rise by up to 3° C in the UK's shallowest seas by the 2080's and more in semi-enclosed areas. "This will change the mixture, distribution and abundance of marine wildlife" (Laffoley and others 2004).

It is unclear what effect this will have locally. It seems likely that species that depend on the soft chalk substrate will be unable to shift location with their climate space. Species with less specific requirements will be able to migrate and colonise new areas whilst others that have not been recorded here before will arrive in north east Kent. Either way, the task of understanding the existing ecosystem is further complicated.

Summary

In summary, scientists and managers face a challenge as they seek to understand the ecosystems that comprise the sea and shore around the north east part of Kent. The extent to which borrowing concepts and models from landscape ecology helps in this challenge remains to be seen. What is certain is that short-term management and a narrow focus on the particular habitats and species that are specially protected will not allow a flexible, adaptive and holistic Ecosystem Approach.

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Eastern Channel Habitat Atlas for Marine Resource Management (CHARM Project)

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Introduction

The Dover Strait (Figure 1), which connects the English Channel to the North Sea, constitutes a significant economic resource for a wide range of human activities including the extraction of biotic (eg fisheries) and abiotic (eg aggregate) resources, ports, shipping. Exploitation of these natural and human resources currently lacks integration and applies pressure on the marine ecosystem, including fish stocks. CHARM (eastern Channel Habitat Atlas for marine Resource Management) is a Franco-British INTERREG IIIA project that intends to harmonize physical, biological and human use information in the Eastern English Channel through the development of a digital atlas. Included is a cross-border evaluation of the policy and legal frameworks for the assessment and monitoring of the marine ecosystem. The project intends to result in the development of an integrated system of marine management for the evaluation of living resources, important species and habitats in the Eastern English Channel. The main biological objectives of the project are to assess the status of key commercial fish species (15 species shown in Figure 2), to describe/model their habitats, and to develop a scientific prediction tool capable of accounting for the impact of various current and future anthropogenic impacts to marine habitats. Pressures might include planned and deliberate use of the area (eg aggregate extraction, wind farms, fisheries), unplanned events (eg accidental pollution, shipping accidents), but also long-term climatic change.

Potential users of the atlas include environment agencies, conservation bodies, fisheries managers, aggregate extraction companies, scientists, but also the general public since the project also aims to increase public awareness of the marine environment of the Eastern English Channel. Originally planned as a two phase project (of two years each), the project's phase I runs until June 2005, at which time a paper version of the digital atlas will be made available. Depending on further funding, phase II of the project will gather data for a larger area, will further develop habitat models, and then will use state of the art Web mapping technology to make the digital atlas available on-line and interactive on the project's Web site (http://charm.canterbury.ac.uk).

Study site

The physical characteristics of the seabed in the Dover Strait and adjacent waters are heavily influenced by the strong tidal dynamics encountered in the region. Much of the inshore waters are relatively shallow and generally do not exceed 10 m in depth, whereas offshore depths range up to 60-70 m. The slope of the seabed is relatively gentle throughout most of the region, but is more steeply-shelved in the immediate vicinity of the Dover Strait. A narrow deep (40 m) water channel runs through the centre of the Strait. The currents in the Dover Strait are dominated by tidal flows. Superimposed onto the tidal regime are wind-driven currents, and to a lesser extent, currents caused by density gradients from the mixing of fresh and saline coastal waters.

The seabed sediments in the region consist predominantly of sands and gravels. Sands are found along much of the French, Belgian and UK coasts, except in the immediate vicinity of the Dover Strait where gravely sediments dominate. A few localised areas of muddy sediments are found in the outer Thames estuary, along the southern UK coast, and along the Belgian coast to the east of the Dover Strait. The most prominent seabed feature within the region is the large number of sandbanks aligned roughly parallel to the coast in both nearshore and offshore waters.

A coastal-offshore temperature gradient exists throughout much of the year, particularly near to regions of freshwater influence (essentially the North coast of France): coastal waters tend to be warmer than the offshore waters in the summer, and colder in winter. The salinity of the water throughout the region is typical of oceanic water. The waters along the south-east coast of England are an exception, as they receive minimal freshwater inputs and so a higher salinity is maintained throughout the year. In contrast, the French coast of the Eastern English Channel is characterised by a region of freshwater known as the "fleuve côtier", or coastal flow (Brylinsky and others 1991). The flow, which can extend to 6 miles from the coast, is maintained by freshwater inputs from the numerous rivers discharging along the French coast.

The Dover Strait and adjacent waters represents a unique transitional zone between two contrasting environments: to the west lie the warmer, more saline waters of the Eastern English Channel, whilst to the north are the colder, less saline waters of the North Sea (Corten & van de Kamp 1996). This marine environment supports a number of important marine biological features, such as (1) a unique assemblage of demersal fish and benthic fauna that represents the biogeographical transition between the waters of the North Sea and of the English Channel, (2) important spawning and nursery habitats for key commercially-exploited fish (eg sole and whiting) and (3) an unique coastal and marine habitats of international importance (eg Thanet Coast and Parc Naturel Régional des Caps et Marais d'Opale, both Natura 2000 sites). The marine habitats and living resources of the region are environmentally valuable because they contribute toward the healthy functioning of this particular ecosystem.

Methods

Datasets

Work started by short-listing the physical, biological and human use parameters which best described the marine environment of the Eastern English Channel (Figure 1). Physical data types included eg bathymetry, seabed sediments, seabed stress, currents, nutrients, water temperature and salinity. Biological data types included eg chlorophyll a, plankton, benthos, fish abundance, fish larvae. Finally, human use data included eg fish landings, shipping traffic intensity, underwater cables, aggregate extraction, windfarm sites, and protected areas. Data sources are varied and numerous (eg oceanographic survey data provided by project partners; historical datasets; satellite imagery; published maps and models; administrative sources; conservation bodies; newly acquired data collected especially for the project; etc). It was usually necessary to standardise and validate data obtained from different sources in order to allow (1) displaying them at meaningful temporal and spatial scales within the atlas and (2) using some of these datasets for habitat suitability modelling. For all maps, a custom Transverse Mercator projection was chosen because it was applicable for the study area and preserved distance and area as best possible.

Metadata describing each of the atlas' datasets is being written and will be made available on the project's Web site in June 2005. Because of copyright issues, almost all the datasets gathered for CHARM have access restrictions, ie interested parties will have to contact data providers directly for accessing the raw data behind the maps.

From survey data points to continuous raster maps

When data were provided as data points (eg water temperature or fish abundance obtained from scientific surveys), kriging interpolation was used to create continuous raster maps. Geostatistics is a methodology for estimating the values of a parameter of interest in areas where the parameter has not been sampled directly. Kriging is the general term for geostatistical estimation, and is different from other interpolation techniques (eg inverse distance weighted) because it uses a model of the spatial variation within the dataset – the variogram (Webster & Oliver 2001).

In short, survey data points were interpolated by kriging into regular grids of chosen resolution (according to the spatial resolutions of the original survey dataset). These regular grids were then imported into ArcGIS version 8.2 (ESRI), plotted and projected to a custom Transverse Mercator projection. The grids' data points were then re-interpolated into raster maps using the default kriging parameters available in ArcGIS's Spatial Analyst tool. Care was taken to limit the spatial extent of the interpolated maps so as to avoid keeping data resulting from extrapolation (ie in areas where no sampling had taken place).

Habitat suitability modelling

A habitat suitability model describes the relationship between a species and its environment. It does not predict the abundance of a species but rather the environmental conditions that are more or less suitable for this species to live. Quantile regression (Eastwood and others 2001, Cade and Noon 2003) was used to model habitat suitability for fifteen commercial species of fish using five physical parameters (bathymetry plus mean sea level, water temperature and salinity, seabed sediment type, seabed stress). The software Blossom (Cade and Richards

1999) was used to automate the selection of physical factors by backward elimination. For each species of fish, the result was an equation where only the physical factors and interactions to which the fish was sensitive were kept. The ones to which the fish was not sensitive were dropped. ArcGIS' Raster Calculator was then used to apply the equation to the raster maps of the selected physical factors, hence creating a habitat suitability map for this species of fish.

Results to date & discussion

Although work is on-going, more than 400 geo-referenced maps have already been created for the project's atlas. Admittedly, the great majority of these maps show scientific survey data (temperature, salinity and fish abundance) from CEFAS and IFREMER, for the years 1988 to 2003, despite some years lacking data for certain parameters. Some examples of the atlas' maps are described below. This document is available on-line at http://charm.canterbury.ac.uk, with colour versions of the maps.

Seabed sediments

Among the GIS datasets available for seabed sediment in the study area, the paper map created by Larsonneur (1979) and digitised by IFREMER was found to provide the best spatial coverage. Although Larsonneur's classification comprises over 20 sediments types, a simpler five type classification (Figure 3A) was adopted: fine sand, coarse sand, gravel, pebbles, mud, since five sediment types were sufficient for habitat suitability modelling.

Water temperature

In-situ measurements of sea surface temperature were obtained from IFREMER (Channel Ground Fish Survey, CGFS, October months) and CEFAS (Beam Trawl Survey, BTS, August months). Temporal and spatial coverages were uneven, but relatively good datasets were available for 1997-2003 (CGFS) and for the years 1989, 1990, 1993, 1994, 1998-2002 (BTS, Figure 3B).

Fish abundance

Fish abundance data (as estimated from Catch Per Unit Effort, or CPUE) were also obtained from IFREMER's and CEFAS' scientific surveys (1988-2003). For each year and fish species, abundance maps were created. Figure 4A shows log transformed Flounder abundance for the years 1988 to 2003 for the month of October (IFREMER/CGSF).

Shipping traffic intensity

Anatec UK kindly provided shipping intensity data (in number of ship per year, Figure 5)

Habitat suitability models

Figure 4B shows a Habitat Suitability map for Flounder in October (based on IFREMER/CGFS data). The Habitat Suitability map is compatible with the mean abundance of Flounder for the month of October (Figure 4A) as obtained by kriging interpolation of survey data points.

Acknowledgments

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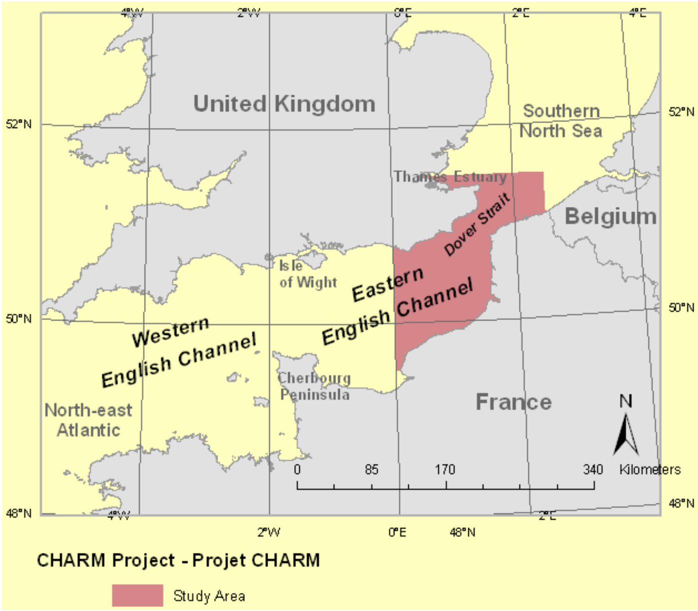

Figure 1. Map showing CHARM's study area.

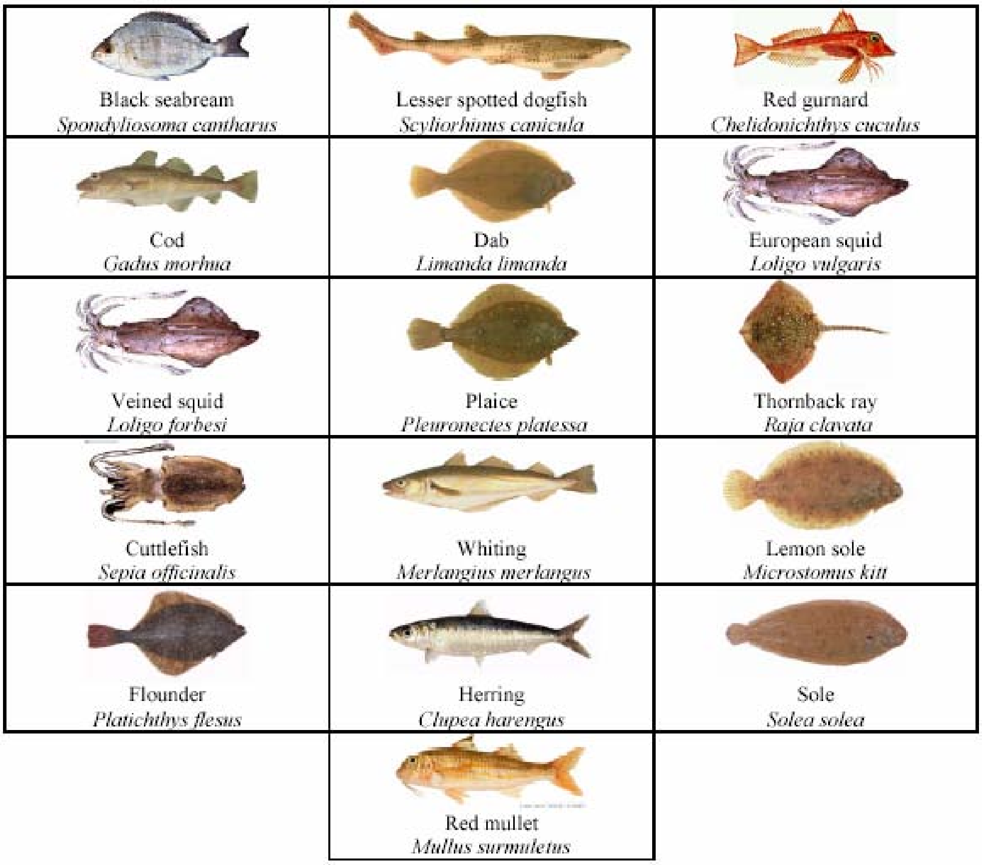

Figure 2. The 15 fish species selected for the CHARM Project.

A) B)

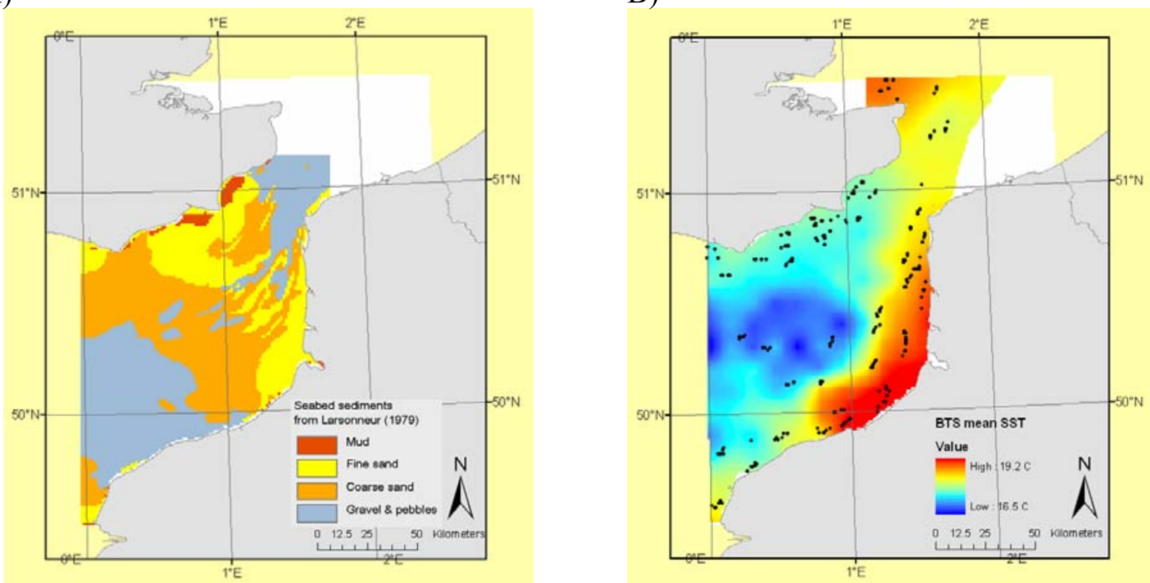

Figure 3. A) Seabed sediments according to Larsonneur (1979). **B**) Mean sea surface temperature over nine years of BTS surveys (CEFAS) in August (years 1989, 1990, 1993, 1994, 1998-2002). Survey sampling stations are shown in black. The map was created using kriging interpolation.

A) B)

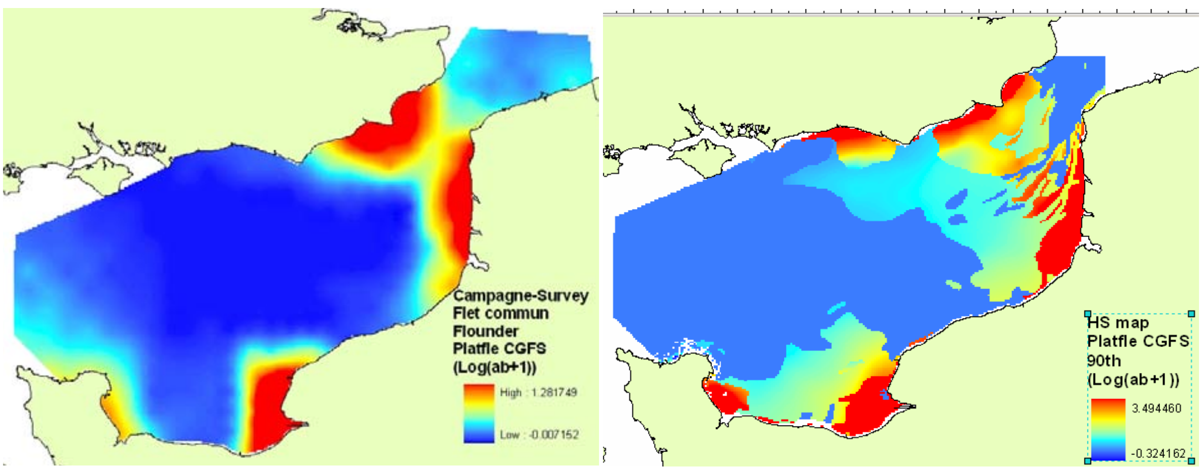

Figure 4. A) Log transformed Flounder abundance for the years 1988 to 2003 for the month of October (IFREMER/CGSF). This map was obtained using kriging interpolation. **B**) Habitat Suitability map for Flounder (high suitability in red and low suitability in blue) as obtained using quantile regression modelling.

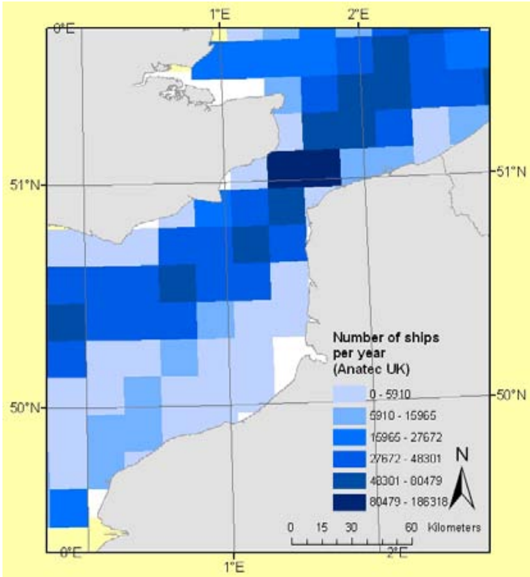

Figure 5. Shipping traffic Intensity (Anatec UK)

Pilot survey of seal haul-out sites off of the north Kent Coast

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Introduction

Seals belong to the group of mammals known as the 'pinnipeds' ('wing' footed animals) and world-wide there are some 33 species (Bonner 1989). Two of these species, namely the common or harbour seal *Phoca vitulina* and the grey seal *Halichoerus grypus*, have resident populations around the UK and a number of others, including walrus *Odobenus rosmarus*, harp-seal *Phoca groenlandica* and hooded seal *Cystophora cristata* are migrant visitors (Macdonald & Tattersall 2001).

Figure 1. This picture, taken during the pilot survey, shows common seals hauled out on the Goodwin Sands.

It is estimated that currently some 35,000 common and 120,000 grey seals occur around the coasts of Britain and this relates respectively to some 5%[*] and 45% of the world's population of these species (Jackson & McLeod 2000; English Nature 2004a). The importance of the UK populations is reflected in their conservation status and both species are listed under Appendix III of the Bern Convention and Annex II of the EU Habitats Directive, which requires 'appropriate measures' be carried out to ensure their protection.

[*] Four sub-species of common seal are commonly recognised. The eastern Atlantic common seal (*Phoca vitulina vitulina*) is the only sub-species that occurs in Europe and the UK holds some 40% of the population of this sub-species (Mitchell-Jones and others 1999).

The distribution of common and grey seals around the UK is related to the particular habitat preferences of both species, including the suitability of haul-out sites. Both species occur in many areas, though common seals tend to be found in more sheltered places with sandy coastlines and sandbanks, while grey seals are predominantly found on rocky shores.

In general, maps showing the distribution of common and grey seals around the UK do not show populations of either species as occurring in the SE corner of England (Bonner 1989; Anderson 1990) and no significant haul-out sites are identified south of Suffolk in two recent English Nature marine planning documents (English Nature 2004a & 2004b).

Seals are though known to occur in SE England, particularly around the coasts of Kent, and at a local level a number of organisations, including Kent Mammal Group, have been collecting records of reported observations of these species for a number of years. Most of these observations are of individuals or small numbers of seals seen feeding near to the shore or lying up in estuarine areas.

While there are some records of seals hauling up on one or two of the larger offshore sandbanks along the north Kent coast (M. Turner personal communication; C. Duck personal communication), the number and distribution of sandbanks used as haul-out sites in this area remained, until this survey, largely unknown.

Survey methods

For the collection of census data, it has become a standard practice in the UK to count hauled out seal populations on spring low tides in late July or August, a time of year when common seals are moulting (Anderson 1990). As not all seals in an area are likely to haul-out at any one time, it is estimated that this census technique collates some 60% of the seal population in any one area (Thompson and others 1997).

The aim of this pilot survey was to examine those offshore sandbanks (that had charted drying heights above 1 metre) lying within approximatley 12 nautical miles of the Kent coast, in the area between Whitstable around to Kingsdown, near Deal. Due to the number and dispersed distribution of these sandbanks (Figure 1), it was not possible to survey all banks in this area by boat during one spring tide. Therefore for the purposes of this survey, sandbanks were divided into three sub-groups according to their location.

One group referred to as 'Off Herne Bay Banks' included the sandbanks West Barrow, North Knob, Knock John, Shingles*,* Shingles Patch, Pan Sand and Ridge; a second group known as the 'Margate Complex' included Margate Sand, North East Last, Last and Margate Hook; the third group known as the 'Goodwin Complex', included North Sand (Goodwin Knoll), Kellet Gut Bank, Central Goodwin and South Calliper. A survey visit by rigid inflatable boat was made to all of the sandbanks within each sub-group during the first week of August 2004, with one sub-group being visited per spring tide.

On survey visits there was at least one dedicated surveyor and one cox/surveyor. Seal counts were taken of total numbers seen and included both adult and young animals.

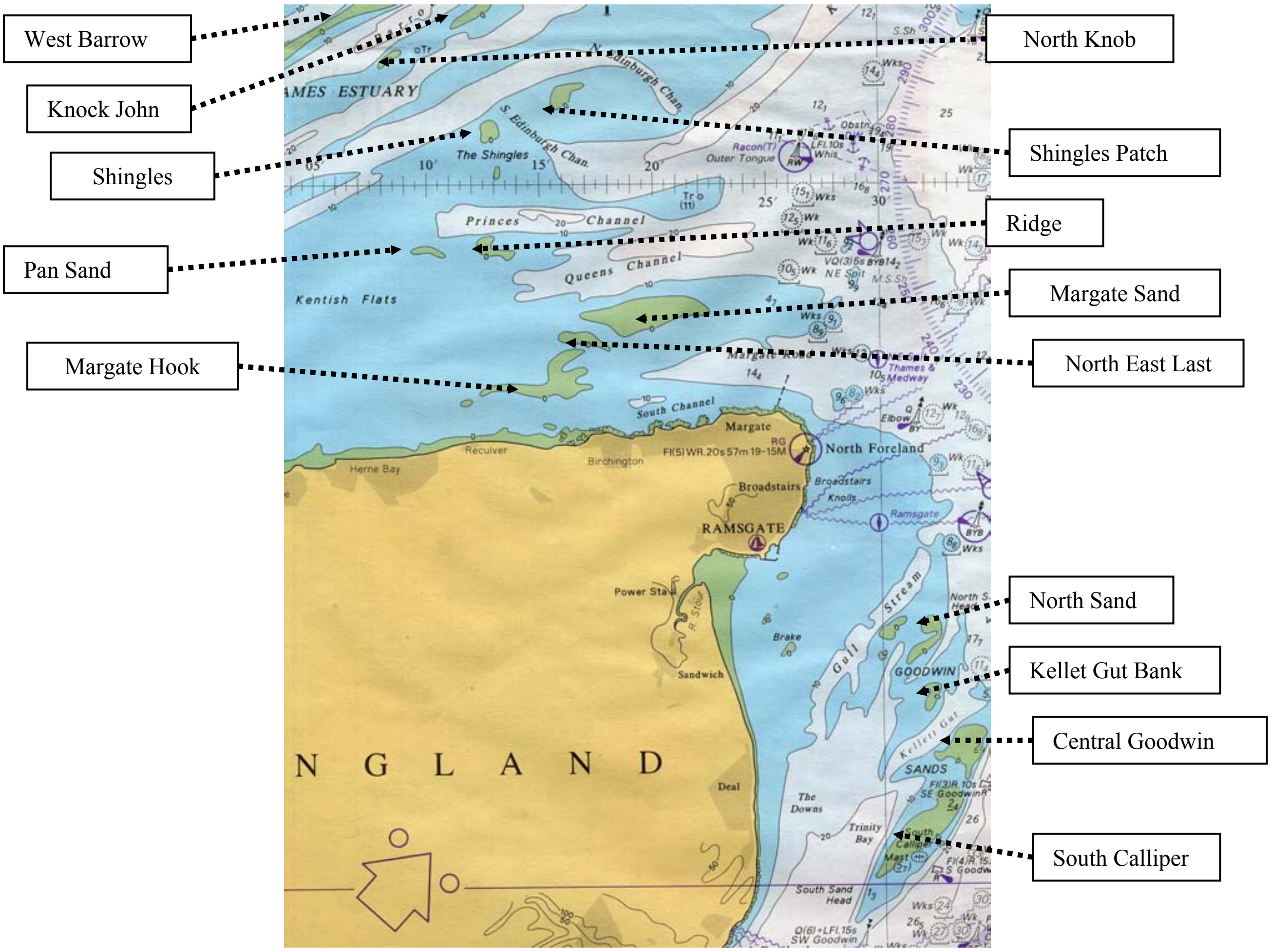

Figure 1. Shows the distribution of sandbanks lying off of the north Kent coast (out to about 12 nautical miles) surveyed in August 2004. The 'Last' sandbank lies between Margate Hook and North East Last. Reproduced from Admiralty chart 1406 by permission of the Controller of Her Majesty's Stationery Office, Port of London Authority and the UK Hydrographic Office.

Results

The total number of seals observed during the survey was 140; one hundred and twelve of these were common seals and twenty-eight were grey seals (Table 1).

Common seals were widely distributed across the whole survey area, from the West Barrow sandbank north of Herne Bay around to the Central Goodwin, lying just off of Deal.

Grey seals were also found on many sandbanks, but generally in smaller numbers and often in amongst larger groups of common seals. One group of 20 grey seals was recorded in the 'Goodwin Complex' on the North Sand sandbank.

Table 1. Displays the number and species of seals recorded on the sandbanks off of the north Kent coast in the August 2004 survey.

Sub-group	Sandbank	Number of common seals	Number of grey seals
Off Herne Bay Banks	West Barrow	21	3
	North Knob & Knock John	0	0
	Shingles & Shingles Patch	n/a	n/a
	Pan Sand & Ridge	12	4
Margate Complex	Margate Sand	10	0
	North East Last	9	0
	Last	0	0
	Margate Hook	0	0
Goodwin Complex	North Sand	25	20
	Kellet Gut Bank	1	1
	Central Goodwin	34	0
	South Calliper	n/a	n/a
	Totals	**112**	**28**

All records are of seals on or just in the water beside each bank, except those of the Kellet Gut bank. The two seals recorded at the Kellet Gut Bank were seen swimming above this bank, which was submerged at the time of survey. The Shingles and Shingles Patch banks did not show during the time of survey, although according to chart and tide information both banks should have been exposed. The South Calliper was the last sandbank of the 'Goodwin Complex' sub-group to be surveyed and was just covering as the survey team approached. No seals were seen in the water above the South Calliper, Shingles or Shingles Patch during survey periods.

To obtain accurate information on the identification and numbers of seals on sandbanks, great care was taken on approach to haul-out sites to minimise disturbance to hauled out groups. However, one large group on the North Sand in the 'Goodwin Complex', which may experience frequent disturbance from craft going in and out of Ramsgate harbour*, did disperse to some extent on approach. Observations of this group, which are included in the overall count for this sandbank, are an estimation of species/number based on probable minimum numbers. Therefore, overall counts for this bank may have been slightly higher.

Conclusions

The total count of 140 seals observed on sandbanks during this survey equates to a possible population of around 250 seals in this area at this time (Thompson and others 1997). However, the actual overall figure of seals around north Kent in August 2004 though is likely to have been higher, as it is known that some seals also commonly haul-out on a few intertidal shore areas, particularly in Pegwell Bay and around Sheppey (personal observation). Although the haul-out numbers at intertidal shore areas is yet to be properly investigated, we estimate this to be at least 20 animals. Our overall estimate therefore is that at least 300 seals were resident in the north Kent area during August 2004. The vast majority of these (over 200) were likely to have been common seals.

* Deliberate disturbance of hauled out seals by boat users was observed on at least one occasion by the surveyors during the course of this survey.

The population of seals off on the north Kent coast is relative to the total UK population. However, it is probable that this population is an important and significant link between larger populations found in the Wash and those found across the Channel in northern Europe. The north Kent seals may also have given rise to populations known to occur along the south coast of England and in estuarine areas as far as Portsmouth.

This pilot survey has shown that common and grey seals use a number of sandbanks as haul-out sites on the north Kent coast and there is a case for including these important habitat areas within the Thanet cSAC.

A number of windfarm developments are envisaged for the north Kent coast/Thames estuary during the next decade. The possible impact of these developments on resident seal populations is unclear and further studies on these populations are required. For example, the seasonal use of sandbanks as haul-out sites and the fidelity of seals for individual haul-out areas is unknown. There is also uncertainty concerning the movement of seals between the sandbanks on the north Kent and between these sandbanks and elsewhere. On occasion over 140 seals have been recorded on the sandbanks of the 'Margate Complex' (personal observation) yet the count during this August 2004 survey was 19. So far the reasons for this disparity have not been established.

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Littorina littorea (Linnaeus, 1758) considered as an indicator of recovery from sewage pollution

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Introduction

After fifty years discharging untreated sewage, a short-sea outfall (SSO) at Foreness Point (FP) in the South East of England was replaced in 1989 by a 1900m long-sea outfall (LSO). In 1994, the chalk platform (about 0.25 ha) supporting the SSO had few algal macrophytes but had large numbers of *Littorina littorea*. By contrast, the adjacent Walpole Bay (WP) was covered by dense macroalgae but few *L. littorea*, Littorinids feed on diatoms and macrophytic algae such as *Enteromorpha*, although they avoid eating the tougher fucoids; on the upper shore, plant detritus becomes an important food (Watson and Norton 1985).

Since sewage pollution reduces algal diversity and encourages growth of green algae such as *Enteromorpha* (Borowitzka 1972), the outfall change might have affected the algal community. However, four years after the SSO stopped working, macrophyte cover on the shore had not significantly changed. On the mid/upper shore, algal cover was sparse and *L. littorea* population density remained high at approximately $161/m^2$. By contrast, the lower middle shore had a higher percentage cover of algae than the upper middle/lower upper shore. However, these lower middle shore algae comprised mainly grazing-resistant taxa such as *Laurencia, Catenella and Corallina*. Here, where the settlement rate of sporelings was probably greater than in the higher shore zones, the littorinids could have been dependent on organic nutrients from other sources,

It was possible that before the change in outfall, the upper shore littorinids at FP had been partially sustained by the sewage nutriment, and loss of this resource might have ecologically stressed the population. Bilton (1974) observed that starved salmon could maintain body length yet lose body mass. The ratio of body mass to shell size ('body condition') of individuals in the littorinid population might have changed in a similar way.

Unfortunately, no detailed information was available on the *L. littorea* populations prior to the change in the outfall at FP, though Dayton (1971) notes that recovery time for mature rocky intertidal communities is typically greater than two years. The aim of the current investigation was therefore to use a *post hoc* study to investigate whether the *L. littorea* population had been stressed by the change in discharge. This would be achieved by, firstly, investigating the relationship between *L. littorea* and the algal community and secondly, comparing population structure and body condition of *L. littorea* populations at FP with populations unaffected nearby sites.

Method

The shore at each site comprises a Cretaceous chalk reef, exposed at low tide. All platforms have a gentle slope, and are backed by sea walls. For all parametric statistical analyses, data were confirmed to be normal.

The effect of removal of *L. littorea* on macrophyte cover at Forness Point (FP)

At FP, sixteen sites were randomly selected. Eight replicate sites of $1m^2$ were situated in the upper shore intertidal band and eight in the mid shore. Four controls and four experimental sites within each band were randomly allocated and the experimental sites were each cleared completely of algae and littorinids on 29.6.1994. Numbers of *L. littorea* and macrophyte percentage cover were recorded at each site. The sites were observed regularly to 14.8.1994. Every day the transects were observed and littorinids counted in each square. Littorinids were cleared from the controls and within a buffer strip around each fixed quadrat. The quadrats were marked by painted nails hammered into the chalk at each corner such that a grid-divided quadrat could be laid exactly over each square. This method was used as it would cause less impact to the shore than alternatives such as the use of fixed exclusion cages.

Effect of the removal of *L. litto*rea on distribution of littorinids at experimental sites at Foreness Point (FP)

It was possible that littorinids were migrating into and out of the cleared areas on each tide so that unidentified animals would be responsible for the grazing being investigated in the previous experiment. Therefore, four experimental sites were randomly selected. Numbers of *L. littorea* $/m^2$ were recorded over several tides in four orthogonal directions for a distance of four metres using a metre quadrat. Data were investigated by analysis of variance.

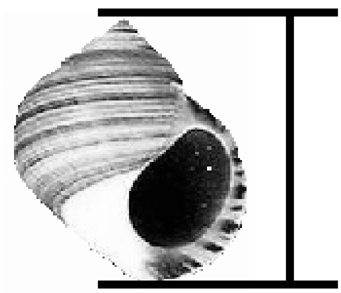

Figure 1. Dimension of shell length measurement

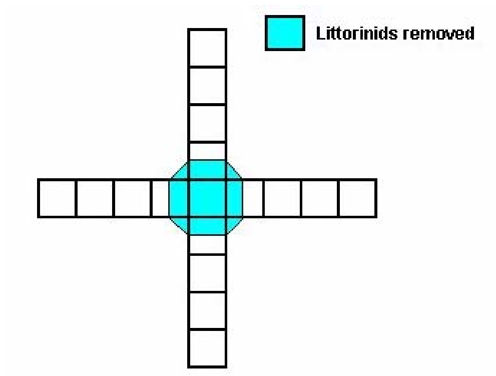

Figure 2. Design to test migration of *L. littorea* from adjacent positions after clearing of *L. littorea* from a m^2 quadrat.

Comparison of *L. littorea* number in relation to vegetation cover on three shores (FP, WB and BG)

In order to confirm results from the previous experiments, eight $1m^2$ quadrats were randomly chosen on the mid-shore at each of three shores. Macrophyte percentage cover and density of *L. littorea* were recorded and compared between the shores

Population structure of *L. littorea* at Forness Point (FP) and Beresford Gap (BG)

L. littorea from two rocky shores were examined. The maximum shell length of all the *L. littorea* in a randomly selected quadrat on the lower and upper shore at FP was measured. The slope of the chalk platform at BG was so low that upper and lower shore could not be distinguished. Population structures were investigated by using an adaptation of the Cassie curve (Cassie 1954).

Body condition of *L. littorea* at Forness Point (FP), Beresford Gap (BG) and Ramsgate Undercliff) (RU)

Fifty specimens of *L. littorea,* ranging in size, were randomly selected from each shore. Maximum shell length was measured (Figure 1) and bodies were removed after 1m immersion in boiling water. The wet-weight of each body was recorded. Dry body weight was then obtained after drying at 60^0 C for 24 hours. Initially, body mass was plotted against shell length cubed. However, the regression fit was no improvement on a simple plot of shell length on dry mass and therefore, the latter was used as an index of body condition.

Results

Relationships between *L. littorea* and macrophyte cover

Before the experimental areas were cleared, the relationships between abundance of *L. littorea* and algae was investigated by multiple regression. This is not technically legal since each algal taxon is not independent of the others. However, the method serves as a pointer to relationships. Table 1 indicates a significant positive relationship between *L. littorea* density and abundance of both *Enteromorpha* and other green algae such as *Ulva*. (nb since this works was done, it has been suggested by Hayden and others (2003) that *Enteromorpha* and *Ulva* are, in fact, ecotypes of the same species). After removal of the *L. littorea* and algae, percentage coverage of *Enteromorpha* increased rapidly*,* reaching 100% cover by 6.7.1994. By contrast, the control sites showed fluctuating numbers of *L. littorea* and little algal presence except for *Catenella* sp. and the lichen, *Verrucaria maura*.

Table 1 Results of multiple regression analysis where number of *L. littorea* comprised the y variable and algal abundances comprised the x variables.

	Regression Coefficient	**t**	**P**
Miscellaneous green algae	-37.50	-1.98	0.050
Verrucaria sp.	-0.33	-1.85	0.066
Catenella sp.	0.24	0.42	0.674
Fucus sp.	16.38	3.62	0.000
Enteromopha sp.	-1.29	-9.13	0.000
Laurencia sp.	-5.63	-0.66	0.513
Porphya sp.	-0.99	-0.25	0.802

Effects of removal of *L. littorea* from experimental sites

A two-way analysis of variance was used to test whether harvesting from 4 separate quadrats caused significant depletion of littorinids from adjacent areas. The results (Table 2) indicated that aspect (North South East or West) had no effect on the distribution (F=0.1.56 d.f.=3 *P*=0.212). Harvesting caused significant depletion but only from quadrats in the adjacent position (F=4.56 d.f.=3 *P*=0.007). There was no significant interaction between aspect and position (*P*=0.96).

Comparison of *L. littorea* density in relation to vegetation cover on three shores

The algal community composition differed between the shores. With only 4.6 *L. littorea* /m^2, WP had the highest plant cover, mainly comprising Chlorophyta. BG with 270 *L .littorina* /m^2 supported fucoids and *Porphyra umbilicalis*, whereas at FP, *Catenella caespitosa* was most abundant .

FP and BG both had high densities of *L. littorea*, but differed in their algal communities. In order to investigate whether the littorinid population structures differed between these shores, the following analysis was carried out.

Population structure of *L. littorea* at Forness Point (FP) and Beresford Gap (BG)

The curve for BG (Figure 3) suggests there was a single cohort of large *L. littorea.* By contrast, the Foreness Lower Shore curve suggests there were two cohorts averaging approximately 9mm and 20mm in size. The curve for the Foreness Upper Shore population fell somewhere between the two.

Body Condition of *L. littorea* at Forness Point (FP), Beresford Gap (BG) and Ramsgate Undercliff) (RU)

The sites were visited in 1996, 1999 and 2000 in order to investigate possible changes in body condition which might reflect change in nutritional stress. Figure 4 compares the slope coefficients. At FP, body condition as indicated by the slope coefficient, stayed remarkably constant, whereas BG and RU showed significant fluctuations. Two-way anova indicated significant differences between the sites ($F_{2,841}$~65 P<0.0001), between the times ($F_{3,841}$~103 P<0.0001) and with significant interactions ($F_{6,841}$~33 P<0.0001).

A comparison of Summer and Winter data for 2000 (Figure 5) shows patterns similar to 1994 and 1999 but the mean slope coefficient at each site was lower in Winter. A two-way anova showed significant differences between seasons ($F_{1,300}$~14.7 P<0.0001) and sites ($F_{2,300}$~122 P<0.001).

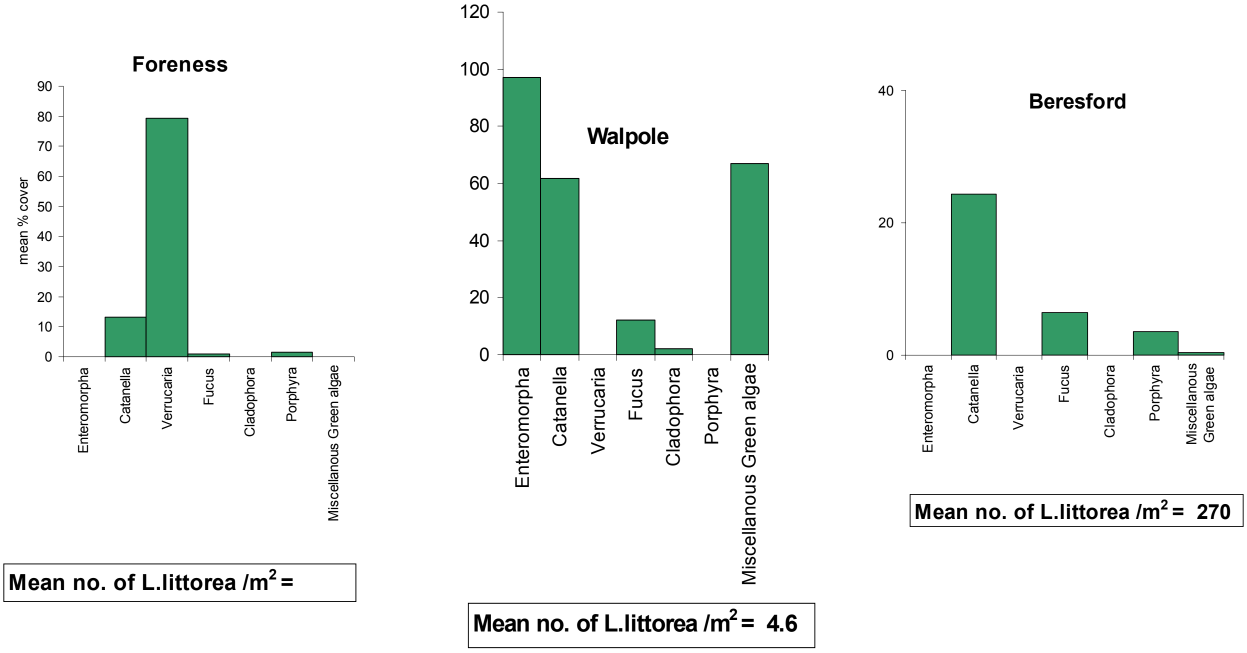

Figure 2 Mean percentage plant cover for eight replicate quadrats on each of three shores which differed in density of *L. littorea*.

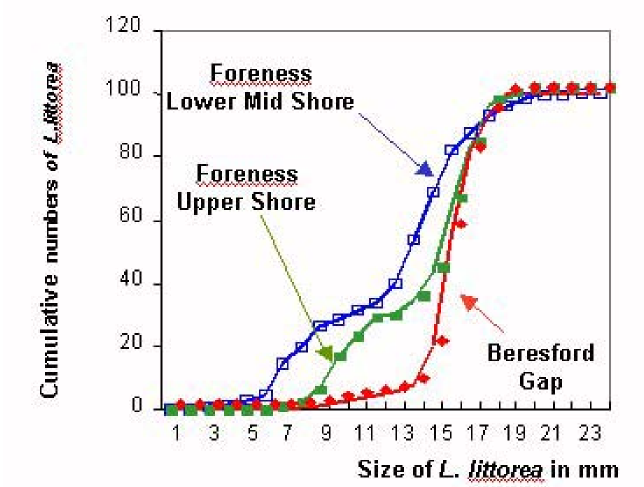

Figure 3. Comparison of the population structures of *L. littorea* populations at Foreness Point (FP) and Beresford Gap (BG)

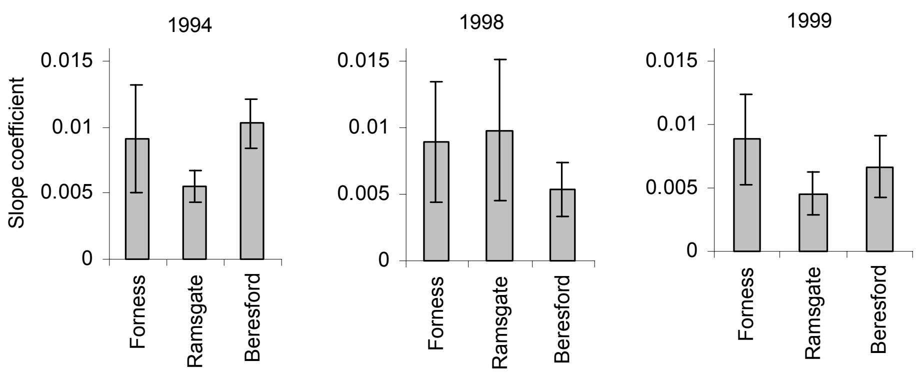

Figure 4. Comparison of regression slope coefficient (a measure of body condition) for dry weight of soft body, regressed on the maximum shell length.

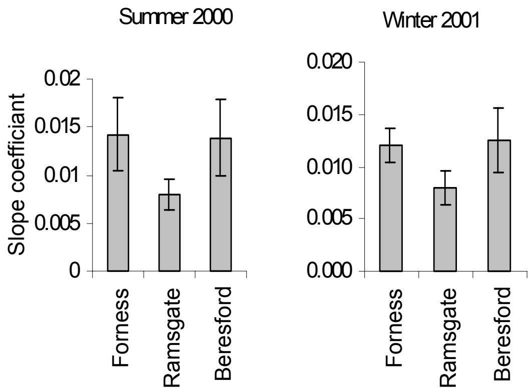

Figure 5. A comparison of Summer and Winter body condition of *L. littorea* at Forness Point (FP), Beresford Gap (BG) and Ramsgate Undercliff (RU) in 2000

Discussion

Relationships between *L. littorea* and macrophyte cover

As result of the experimental manipulation, there was an immediate increase in the abundance *E. intestinalis*. In some areas, vigorous colonisation by *E. intestinalis* led to the development of dense patches of this green alga. Invasion by *L. littorea* into these areas was then restricted. On other cleared areas, the results support the suggestions of Lodge (1948) , Southwood (1962) and Underwood (1980) that mollusc grazing is an important control on macroalgal establishment and production.

Effects of removal of *L. littorea* from experimental sites

The depletion experiment showed that although there was only a local effect of harvesting on the population density of adjacent areas. The results of the previous experiment were, therefore, unlikely to be due to littorinids migrating in and out of the harvested area on a single, or few tides.

Comparison of *L. littorea* density in relation to vegetation cover on three shores

Once *E. intestinalis* established itself in cleared areas, there was only a limited migration of *L. littorea* into the cleared experimental sites. Therefore, the investigation was extended to compare three sites with different macrophyte community composition and littorinid densities (FP, WB and BG).

L. littorea size of individuals within a population

During the experiment to look at grazing effects of littorinid on the vegetation, there appeared to be a different population structure between upper and mid shore at FP and a mixed population structure at BG. The sizes of the individual littorinids were examined at these three sites to investigate this observation. Size distribution analysis (Figure 3) of littorinids showed there were different size distributions at different shore heights. Contrary to anecdotal observation, the graphs showed that there were a larger number of smaller littorinids at the mid-shore, though there was a greater number of small littorinids on the mid-shore than on the upper shore area. The graphs also showed similarities between the upper shore at FP and the upper shore at BG. It is not possible to say from the Cassie curve analysis whether these size difference have any relationship to the age of the littorinids. Further research would need to be carried out on aspects such as shell formation to determine age differences. The Cassie curve did show distinct changes within the populations at all three sites. FP mid shore was different from the upper shores at FP and BG.

Population stress

The large numbers of *L. littorea* found at FP and the low amounts of vegetation in this area suggest that other forms of food must have been available to support the population. The original food supply may have come from the organic matter contained in the sewage which was discharged onto rocky chalk shore before the long sea outfall came into use. Since the removal of the sewage discharge, the amount of food available for the littorinid population has been reduced; therefore, there is constant competition for any macroalgae sporelings that may try to settle on the shore. Although the spores are continuously settling on the rocks, they are removed by the littorinids before the algae has a chance to establish. The results of body mass against shell size suggest that the younger members of the population are under stress and probably have difficulties finding sufficient food resources.

The larger members of the population are probably also under stress caused by competition for food but this is not so clearly seen when compared with populations supplied with organic matter. Littler and Murray (1978) found that *Littorina* sp. had larger gut volumes when taken from a control area, than those that were taken from an area polluted by domestic waste. They suggested that *Littorina* sp. may need to consume less food volume to meet their energetic requirements in an enriched environment. The finding of Littler and Murray may suggest a reason for the low body mass to shell size ratio at RU, while its population of littorinid are still receiving supplies of organic matter. The Western Undercliff population (RU) may be consuming less food but still gaining the same energy value, compared with other populations which might have to eat larger volumes of algae. Periwinkles feeding on the thin film of algal sporelings/ diatoms might also consume amounts of soft chalk, thereby adding to their body weight. This could also help to account for the large body mass to shell ratio found at FP among the larger littorinids. However, the younger members of the population at FP do not show this relatively greater body mass; one explanation for this could be that the larger littorinids are out competing the smaller littorinids and consuming greater amounts of the food available as well as chalk substratum.

The body mass to shell ratio at BG was greater than that found at RU. The disparity in the size of the littorinids at these two sites may be due to genetic differences. Curry and Hughes (1992) note that because *L. littorea* produce pelagic eggs, there is little difference between populations connected by tidal currents. On beaches which were separated by tidal currents not coming into contact with each other, populations were different. In this context, RU and BG are separated by tidal flows but BG and FP are not separated by tidal flow. The population structure on these two beaches are similar, thereby confirming the observations of Curry and Hughes (1982).

Conclusion

The main experiment showed that the intense grazing of littorinids was having an effect on the return of macroalgae to the mid and upper shore area of FP. It appears that A large population had been able to develop due to the sewage being discharged onto the beach. This sewage provided organic matter on which the littorinids could feed. The continuous supply of organic matter allowed the population to exceed the carrying capacity which might have been expected in more normal conditions. The removal of the organic matter supply has placed stress on the population at FP. This will probably lead to a reduction in the numbers of littorinids found in this area in years to come. The reduction in the numbers of littorinids may in turn allow the macroalgae (particularly fucoid species) to re-establish.

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The marine algal flora of Thanet - stability or change?

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Introduction

The historical continuity of algal recording and research in Thanet has been referred to several times (Tittley and others 1999; Tittley 2004) and goes back 400 years. The earliest records for Thanet are species that today, and presumably in the past, are the characterising species of shores around Thanet although there is little past ecological information to support the assertion.

This paper will firstly review algal species records for Thanet and add new records from recent fieldwork, and secondly briefly describe local changes in community structure at Botany Bay that contradicts the notion of ecological stability.

The Thanet coast

Thanet coast and surrounding inshore waters have undergone change over the past 200 – 400 years. Coastal configuration has been altered through natural processes and more recently by man through the construction of sea-walls (cf Fowler & Tittley 1993), harbours, marinas, tidal swimming pools, and other structures. While natural habitat and some associated communities have been lost, artificial structures have increased habitat diversity and as a consequence enhanced species diversity. Nutrient enrichment in inshore waters may be responsible for encouraging blooms of certain algal species (cf Tittley and others 1998). Climate has undergone small oscillations over the past 400 years and North Atlantic sea temperatures have periodically risen and fallen (Lüning 1990; Hiscock and others 2004) with possible effects on algal species and communities and also animals (Southward 1967). Warmer periods may be linked to the temporary occurrence in Thanet of south-western species such as *Padina pavonica*. The effects of cold snaps on marine communities, such as the harsh winter of 1962-3 when inshore seas around Thanet froze, may have been profound but were not investigated.

The flora - species content

A large body of floristic (species) information has been built up over the past four centuries and contributes to our knowledge of algal diversity in Thanet. Time-series collation raises questions as to why species were recorded previously but not recently (and vice versa) with inferences for stability or change. Marine recording continues to identify new species records for Thanet or re-discover sometimes discounted older records. A full algal species list for Thanet is given below and is based on that of Tittley (2004) but with additions and amendments, comments on the validity of species records, and also some brief ecological information. In the list specimen records are indicated S and literature records L (other than the collations in Tittley & Price 1977; Tittley and others 1983; Tittley 2004); where indicated S^F specimens are with R.L. Fletcher (University of Portsmouth), and where S* specimens were examined but are not available. For full author citation see Hardy & Guiry (2003).

Chlorophyceae (green algae)

Acrochaete viridis: microscopic filaments; a single record from Westgate epiphytic on *Fucus*. Not found since the 1930s. (L)

Acrosiphonia arcta: recorded only sporadically. (LS)

Blidingia minima: widespread and common mainly on sea-walls, occasionally chalk cliffs; characterises a biotope at high tide level. (L S)

Bryopsis hypnoides: an imprecisely located early record. (L)

Bryopsis plumosa: long known, widespread and common. (LS)

Chaetomorpha linum: long known but rarely recorded. (S)

Chaetomorpha melagonium: long known, widespread and not uncommon. (S)

Cladophora albida: known only from two early records, one from Ramsgate. (S)

Cladophora fracta: recorded once at Westgate, possibly a misidentification. (L)

Cladophora hutchinsiae: an imprecisely located early record. (S)

Cladophora laetevirens: early records, not found recently. (S)

Cladophora lehmanniana: an early record, not found recently. (L)

Cladophora pellucida: until recently known only from an early imprecisely located specimen; discovered in 2004 growing abundantly on floating pontoons in Ramsgate inner harbour. (S)

Cladophora rupestris: long known, widespread and common. (LS)

Cladophora sericea: long known, widespread and common. (S)

Ectochaete wittrockii: a microscopic endophyte on larger algae growing on chalk cliffs; not found since the 1930s. (L)

Epicladia perforans: microscopic filamentous growths on chalk cliffs and on larger algae; occurs widely. (L)

Eugomontia sacculata: microscopic filamentous growths in shells; widespread and common. (S*)

Gomontia polyrhiza: microscopic filamentous growths in shells; widespread and common. (L)

Prasiola stipitata: Grows sporadically on breakwaters and sea-walls. (S)

Pringsheimiella scutata: microscopic discs epiphytic on larger algae; recorded sporadically.

Pseudendoclonium submarinum: microscopic clusters cells or filaments forming green gowths at high levels on walls and ceilings of caves. (S)

Pseudulvella applanata: microscopic discs or crusts; poorly recorded. (S*)

Rhizoclonium tortuosum (incl. Chaetomorpha ligustica, *C. mediterranea)*: forms cotton wool like growths over *Corallina* in rock pools, or filamentous growths on chalk cliffs among *Ulva (Enteromorpha)* spp. (LS)

Ulothrix flacca: poorly recorded, known only on cliffs at Westgate. (L)

Ulothrix speciosa: poorly recorded, known only on cliffs at Westgate. (L)

Ulothrix subflaccida: poorly recorded, known only on cliffs at Westgate. (L)

Ulva (Enteromorpha) clathrata: long known but poorly recorded. (LS)

Ulva (Enteromorpha) compressa: long known, widespread and common. (LS)

Ulva (Enteromorpha) intestinalis: long known, widespread and common. (LS)

Ulva (Enteromorpha) linza: long known, widespread and common. (S)

Ulva lactuca: long known (since 1597), widespread and common. (LS)

Ulva (Enteromorpha) prolifera: widespread and common; common biotope forming species with other *Ulva (Enteromorpha)* spp and/or *Porphyra* spp. (LS)

Ulvaria obscura: poorly recorded, known only on cliffs at Westgate. (L)

Urospora penicilliformis: long known but poorly recorded. (S)

Urospora wormskioldii: common among green algae on cliffs; characterises a biotope with *Ulothrix* spp. on sea walls and occasionally chalk cliffs. (S)

Phaeophyceae (brown algae)

Acinetospora crinita: a small filamentous, often epiphytic, species, found in 1983 in Ramsgate inner harbour and in 2004 on *Laminaria* in Walpole rock tidal swimming pool. (S)

Arthrocladia villosa: not recently recorded, probably drift, absent from southeast England. (S)

Ascophyllum nodosum: does not grow on Thanet, common as drift. (LS)

Asperococcus fistulosus: an ephemeral species widespread in Britain, not recently recorded. (LS)

Chorda filum: not recently recorded, possibly drift. (LS)

Chordaria flagelliformis: not recently recorded, probably drift, absent from southeast England. (L)

Cladostephus spongiosus: long-recorded and common. (LS)

Compsonema saxicola: a minute crustose species on chalk overlooked and poorly recorded. (S^F)

Cutleria multifida: first recorded in the late nineteenth century and subsequently at Ramsgate, latterly only on pontoons in the inner harbour.

Cystoseira baccata: drift, southwestern species absent in southeast England. (S)

Cystoseira foeniculacea: as previously but not recorded since the early nineteenth century. (LS)

Desmarestia aculeata: long known as a drift species, absent from southeast England. (S)

Desmarestia ligulata: as previously. (S)

Desmarestia viridis: an isolated dense population on pontoons in Ramsgate inner harbour confirming a less precisely located nineteenth century record, otherwise absent from southeast England. (S)

Dictyota dichotoma: a long known and widely recorded species. (LS)

Ectocarpus fasciculatus: a long known but poorly recorded species. (S)

Ectocarpus siliculosus: as previously.

Elachista flaccida: an epiphyte on *Cystoseira baccata*, drift. (S)

Elachista fucicola: a long known, common epiphyte on *Fucus* spp. (L)

Feldmannia globifera: recently recorded only from pontoons in Ramsgate inner harbour. (S^F)

Feldmannia irregularis: a small filamentous species recorded in the 1930s from chalk cliff faces; not recently found and presumed locally extinct due to habitat loss. (L)

Fucus ceranoides: old misidentified records. (LS)

Fucus serratus: long known and common, characteristic species of a biotope on many Thanet shores. (LS)

Fucus spiralis: as previously. (LS)

Fucus vesiculosus: as previously. (LS)

Halidrys siliquosa: long known and common species of deep pools; characterising species of deep pool biotopes. (LS)

Himanthalia elongata: long known drift species, absent from southeast England. (LS)

Hincksia granulosa: small filamentous species, probably overlooked but known since the nineteenth century; common on offshore navigation buoys, and on pontoons in Ramsgate harbour. (S)

Hincksia ovata: known only from pontoons in Ramsgate inner harbour. (S^F)

Hincksia seunda: only once recorded in 1970 from Nayland Rock. (S)

Hincksia sandriana: known only from pontoons in Ramsgate inner harbour. (S^F)

Isthmoplea sphaeophora: although long known on Thanet, now occurs only on cliffs at Westgate. (LS)

Kuetzingiella holmesii: a small filamentous species recorded in the 1930s from chalk cliff faces; not recently found and presumed locally extinct due to habitat loss. (L)

Laminaria digitata: long known and common, characteristic species of the biotope at subtidal fringe and subtidal levels on many Thanet shores. (LS)

Laminaria saccharina: as previously; a non bullate form more common in the eastern southern North Sea was found in 2004 in Walpole Rock tidal swimming pool. (LS)

Leathesia difformis: a small globular epiphyte sporadically recorded in 1969 and 1970, not found since. (S^F)

Mikrosyphar polysiphoniae: a microscopic filamentous epiphyte not recorded since the 1930s. (L)

Mikrosyphar porphyrae: a microscopic filamentous epiphyte not found since 1970. (S^F)

Myriactula clandestina: a microscopic filamentous epiphyte on *Fucus*. (S^F)

Myrionema corunnae: a minute discoid epiphyte on *Laminaria* blades. (S^F)

Myrionema strangulans: a small discoid epiphyte on *Ulva* and *Laminaria* spp. (S)

Padina pavonica: known only from Margate and Foreness Point in the early and late nineteenth century; rarely recorded in southeastern England. (LS)

Pelvetia canaliculata: doubtful past records, does not grow on Thanet. (LS)

Petalonia fascia: widespread and common, seasonal (spring). (S)

Petalonia filiformis: widespread and not uncommon on chalk cliff faces only. (S^F)

Petroderma maculiforme: a small crustose species, infrequently recorded. (S^F)

Phycocelis foecunda: a minute epiphyte, sporadically recorded (Long Nose Spit, Ramsgate Harbour) and probably overlooked. (S)

Pilinia rimosa (=Waerniella lucifuga): grows only in caves at White Ness and Kingsgate. (S)

Pleurocladia lacustris: a minute filamentous species known only from chalk cliffs and Margate harbour wall; now presumed locally extinct. (LS)

Pseudolithoderma extensum: a poorly recorded crustose species. (S^F)

Punctaria latifolia: recorded only in 1970 epiphytic on *Chaetomorpha linum* and on concrete inner wall of a foreshore swimming pool at Ramsgate. (S^F)

Pylaiella littoralis: a widespread and common filamentous species. (LS)

Ralfsia verrucosa: a widespread and common crustose species. (LS)

Saccorhiza polyschides: an imprecisely located kelp record, drift; the species is absent in southeast England. (S)

Sargassum bacciferum: an imprecisely located record, drift; a tropical species. (S)

Sargassum muticum: a recent invasive species first recorded in 1987 and now common on the north coast of Thanet; has become a characterising species of a deep pool biotope. (S)

Scytosiphon lomentarius: a long known, widespread and common species. (LS)

Sphacelaria cirrosa: Small filamentous tufts found in 2004 in Walpole Rock tidal swimming pool epiphytic on larger algae; confirms an imprecisely located, older drift record, on *Chorda*. (S)

Sphacelaria nana: a small filamentous species that forms turfy patches; sporadically recorded in Thanet. (S)

Sphacelaria plumigera: known only as drift, but probably grows subtidally. (S)

Sphacelaria plumosa: older records, probably misidentified. (S)

Sphacelaria radicans: a small filamentous species that forms turfy patches; not uncommonly recorded. (S)

Spongonema tomentosum; a filamentous species usually epiphytic on *Fucus*; long known but only sporadically recorded. (LS)

Sporochnus pedunculatus: old probaly drift records; absent in southeastern England. (LS)

Stictyosiphon soriferus: known only from pontoons in Ramsgate inner harbour. (S^F)

Stragularia clavata: a widespread and common crustose species. (S)

Stypocaulon scoparium: first recorded in 1597, found once at Margate in 1960s, but abundantly on chalk and concrete walls in Walpole Rock tidal swimming pool in 2004. (LS)

Taonia atomaria: an ephemeral species recorded only in 1968 and 1972 at Botany Bay. (S)

Ulonema rhizophorum: a minute epiphyte on *Dumontia*, probably overlooked. (S^F)

Undaria pinnatifida: an invasive species recently found on floating pontoons in Ramsgate harbour. (S)

Rhodophyceae (red algae)

Acrochaetium daviesii: a minute filamentous epiphyte on *Palmaria*, poorly recorded, probably overlooked. (S)

Acrochaetium secundatum: a minute filamentous epiphyte on larger algae, poorly recorded, probably overlooked. (S)

Acrochaetium sparsum: a minute epiphyte, recorded only from Westgate in the 1930s, probably overlooked. (L)

Ahnfeltia plicata: a wiry plant long known and common but grows only on flint (not chalk). (LS)

Antithamnion cruciatum: a drift record only. (S)

Apoglossum ruscifolium: long known but only as drift. (S)

Bangia fuscopurpurea: a small filiform species, long known and widely recorded. (S)

Bostrychia scorpioides: a filamentous species imprecisely located early records; grows mainly in saltmarsh and currently not known in Thanet. (S)

Brongniartella byssoides: An old imprecisely located record. (S)

Calliblepharis ciliata: a mainly subtidal species, common as drift, long known and widespread. (LS)

Calliblepharis jubata: several early, presumed doubtful or drift records; discovered in 2004 growing abundantly on concrete wall of the tidal Walpole Rock swimming pool. (LS)

Callophyllis laciniata: several early, presumed doubtful or drift records. (Ls)

Catenella caespitosa: small creeping distended thalli, long known but sporadically recorded.

Ceramium cilatum: known only from an uncertain early record. (L)

Ceramium deslongchampsii: records confused with those of *C. diaphanum*; long known and widespread. (LS)

Ceramium echionotum: early records, correctly determined; the species has not been found since the nineteenth century. (LS)

Ceramium fastigiatum: old records only; not found since the 19th century. (LS)

Ceramium gaditanum: long known, common and widespread in Thanet. (LS)

Ceramium rubrum (= C. nodulosum): long known, abundant and widespread; with *Polysiphonia fucoides* forms a characteristic biotope/community at lower shore levels. (LS)

Ceramium shuttleworthianum: known only from two nineteenth century records. (S)

Chondria dasyphylla: long known from Margate but only rarely recently recorded. (LS)

Chondria tenuissima: very early records from Margate; possibly confused with *C. tenuissima*. (L)

Chondrus crispus: long known, widespread and common. (LS)

Coccotylus truncatus: two early possibly drift records. (S)

Corallina officinalis: widespread and common, records go back to 1597; characterises the shallow rock-pool biotope. (LS)

Cryptopleura ramosa: long-known and widespread; grows mainly at low shore and subtidal levels. (LS)

Cystoclonium purpureum: long known, widespread and common in Thanet. (S)

Delesseria sanguinea: although long known, recently rarely recorded only as drift. (LS)

Dilsea carnosa: known only from early, possibly drift records. (LS)

***Dumontia contorta*: long known, widespread and common; seasonal (winter-spring). (S)**

Erythropeltis discigera: an endophyte in the Bryozoa *Flustra foliacea*, rarely recorded; a taxonomically confused entity. (S)

Erythrotrichia carnea: a small filamentous epiphyte, not uncommon. (S)

Erythrotrichia ciliaris: two old records from Ramsgate, otherwise only recorded in 1971 on *Chaetomorpha linum* and base and sides of a tidal swimming pool at Ramsgate. (S)

Furcellaria lumbricalis: long known, widespread and common. (LS)

Gastroclonium ovatum: two old, imprecisely located records. (S)

Gelidium crinale/pusillum: long known, widespread and common; a taxonomically confused species group. (LS)

Gelidium spinosum (=G. latifolium): long known but sporadically recorded in Thanet; probably confused with the previous species. (LS)

Gracilaria gracilis: confused with *Gracilariopsis longissima* under the name "*Gracilaria verrucosa"*; recently found in Walpole Rock tidal swimming pool; probably widespread. (S)

Griffithsia corallinoides: grows only on floating pontoons in Ramsgate inner harbour. (S)

Gymnogongrus crenulatus: known only from old or drift records. (S)

Halopithys incurvus: known only from an old imprecisely located record; a southwestern species, probably drift. (S)

Halurus equisetifolius: known only from old or drift records. (LS)

Halurus flosculosus: long known, widespread and common. (LS)

Haraldiophyllum bonnemaisonii: known only from a drift record. (S)

Harveyella mirabilis: a minute parasite on *Rhodomela confervoides*, known only from a single drift record in Thanet. (S)

Heterosiphonia plumosa: long known but only once recorded in the twentieth century (Dumpton Gap 1967) as drift; a population discovered in 2004 growing on the inner wall of the Walpole Rock tidal swimming pool. (LS)

Hildenbrandia rubra: widespread and common, but grows on flint only. (LS)

Hypoglossum hypoglossoides: long known; occurs sporadically at low shore levels. (LS)

Jania rubens: a single imprecisely located early record; probably drift. (S)

Lomentaria articulata: long known but occurs only sporadically. (LS)

Lomentaria clavellosa: a single imprecisely located early record; probably drift. (S)

Lomentaria orcadensis: early records from Ramsgate not recorded since the nineteenth century; possibly drift. (LS)

Mastocarpus stellatus: long known, widespread but not common; grows only on flint. (S)

Membranoptera alata: long known, widespread but not common; grows on rocks and in pools at low shore and subtidal levels. (LS)

Naccaria wiggii: known only from a single old record from Ramsgate. (S)

Nitophyllum punctatum: known only from a single drift specimen collected in 1966; probably grows at subtidal levels. (S)

Nitophyllum versicolor: a single imprecisely located early record; probably drift. (S)

Osmundea hybrida: grows widely and commonly. (S)

Osmundea pinnatifida: long known, widespread and common; characterises a turf biotope on wave washed shores. (LS)

Palmaria palmata: long known (since 1632), widespread and common; characterises a low shore biotope. (LS)

Phyllophora crispa: long known but only recorded as drift in the twentieth century. (LS)

Phyllophora pseudoceranoides: long known, widespread and not uncommon; grows only on flint. (LS)

Phymatolithon lenormandii: a crustose coralline alga; although poorly recorded, occurs widely and commonly. (LS)

Plocamium cartilagineum: long known, widespread and common in Thanet, grows at low shore and subtidal levels. (LS)

Plumaria plumosa: long known but only sporadically recorded; a characteristic species of shade biotopes. (S)

Polyides rotundus: long known, widespread and not uncommon. (LS)

Polyneura bonnemaisonii: long known but sporadically recorded; grows at lower shore and subtidal levels. (S)

Polysiphonia elongata: long known but sporadically recorded, found on several occasions in tidal swimming pools at Margate. (LS)

Polysiphonia elongella: rarely recorded in the Margate area. (S)

Polysiphonia fibrillosa: a single record from North Foreland. (L)

Polysiphonia foetidissima: a single record from cliffs at Westgate (L)

Polysiphonia fucoides: long known, widespread and common; characterises a species assemblage/biotope at low shore levels (see note to *Ceramium rubrum*). (LS)

Polysiphonia lanosa: drift records. (LS)

Polysiphonia nigra: long known, widespread but sporadic. (LS)

Polysiphonia stricta: occurs widely and commonly. (LS)

Porphyra leucosticta: Thanet material probably misidentified. (S)

Porphyra linearis: sporadically recorded on sea walls and chalk cliffs at high tide level. (S)

Porphyra purpurea: long known, widespread and common. (LS)

Porphyra umbilicalis: widespread and common. (LS)

Ptilothamnion pluma: a single imprecisely located early record; usually an epiphyte on *Laminaria hyperborea* stipes. (S)

Pterothamnion plumula: long known from Ramsgate; recently found only in the inner harbour on floating pontoons. (S)

Rhodochorton purpureum: a single imprecisely located early specimen, particularly in caves. (LS)

Rhodomela confervoides: long known and widely and commonly recorded. (LS)

Rhodophyllis divaricata: imprecisely located early records; probably drift. (S)

Rhodothamniella floridula: long known and widespread and common; forms cushions that characterise a biotope at lower shore levels. (LS)

Rhodymenia holmesii: widely not uncommonly recorded, often as drift; grows at low shore and subtidal levels. (S)

Rhodymenia pseudopalmata: known only from early or drift records. (S)

Scinaia furcellata: a single nineteenth century record from Ramsgate. (S)

Spermothamnion repens: long known but not recently recorded. (S)

Spyridia filamentosa: found for the first time in south and east England growing abundantly in the tidal Walpole Rock swimming pool. (S)

A small number of the species listed here are characterising species of the intertidal and shallow subtidal biotopes of Thanet. Others have been recorded consistently during the past two or more centuries and are faithful components of biotopes. Yet others are ephemeral components of the Thanet flora periodically appearing and disappearing sometimes with long, often irregular, time intervals between recorded occurrences. *Scinaia furcellata* is an example of an alga that remains for long and/or irregular periods as a microthallus. A macrothallus forms only when conditions are appropriate. The present data reflect the log-normal distribution curve for the abundance of successively ranked species where there is a small number of common species and a large number of rare species (Preston 1948; Wilkinson & Tittley 1979). Tittley (1999) showed that only a few species characterise the intertidal vegetation of the chalk shores of North Norfolk by contributing the major amount of biomass, as on Thanet. Qualitative data for Norfolk showed that species composition of the algal flora changed seemingly randomly from year to year. This situation seems to occur in Thanet too.

A recent feature in Thanet is the spread of non-native species. *Sargassum muticum*, first recorded in 1987, now occurs abundantly along the north coast although recent research (Vahid 2004) suggests that its local impact is minimal. *Undaria pinnatifida* currently remains restricted to Ramsgate harbour. Their dispersal has been facilitated by both anthropogenic and natural means. Man-made habitats around Thanet are currently the only known sites for a small but significant component of the local flora; some of those in Ramsgate harbour may have arrived via human vectors while dispersal from other habitats was presumably by natural means.

Several species that are common around Great Britain such as *Pelvetia canaliculata* and *Ascophyllum nodosum* do not grow in Thanet; reasons for their absence remain unclear. *A. nodosum* commonly occurs as drift and it is important to distinguish species records based on drift and attached so as not to inflate local species diversity and incorrectly define species distributions. The rich species lists and collections of the nineteenth century may reflect this lack of distinction and some of the early species records listed above are, as indicated, based on drift material. Species such as *Himanthalia elongata* and *Desmarestia aculeata* occur regularly and sometimes in quantity on Thanet shores as drift but are absent from southeast England.

Algal communities and biotopes

The intertidal plant and animal communities/biotopes were described and mapped by Tittley and others. (1998) although quantitative (Tittley & Price, unpub. MSS) and descriptive (Tittley & Price 1978) ecological studies that described the principal algal communities were undertaken between 1967 and 1969. Tittley and others. (1999) noted that the very early (1632) records of marine algae from Margate are those that today form the principal vegetational features on intertidal chalk reef and inferred long-term stability in the key features of the vegetation of Thanet. At Botany Bay, however, field observations in 1986 (Tittley and others 1986) and after revealed differences in intertidal community structure compared with the 1960s.

In May 1991 the Kent Marine Group (forerunner of *Shoresearch*) undertook a quantitative transect study at Botany Bay that re-visited the quadrats studied in 1968. The results of this study revealed for inshore parts of the wave-cut chalk platform the replacement of algae by animals. The common mussel *Mytilus edulis* formed an extensive cover where previously *Ulva* (including *Enteromorpha*) spp. and *Fucus serrratus* were the dominant and characterising features of inshore communities (Plate 1). Overall algal species diversity had decreased considerably, notably in deep pools and channels; *Halidrys siliqosa* present in large amounts in a deep mid shore pool in the 1960s was only present in 1991. On the outer parts of the foreshore *Mytilus edulis* was the dominant species on both occasions; the absence of *Ulva lactuca* in large amounts in 1991 may have been a seasonal feature. Still further seawards a species assemblage comprising the crustose coralline alga *Phymatolithon lenormandii* and the turf-forming *Osmundea pinnatifida* replaced an assemblage that in 1968 was characterised by *Palmaria palmata* and *U. lactuca*. At low shore levels differences were fewer and the filamentous red algae *Ceramium rubrum* and *Polysiphonia fucoides* were predominant in 1968 and 1991. The sublittoral fringe level vegetation in 1991 was characterised by *Laminaria digitata* and *P. palmata*, as in 1968. Table 1 is a quadrat recording made at 304 feet (approximately 100m) seawards of the cliffs that shows the differences in the characterising species in 1968 and 1991.

Table 1: Quadrat recordings made on the chalk reef at 304 feet seawards of the cliff.

Species	April 1968	May 1991
Mytilus edulis	+	**30%**
Lanice conchilega	*	+
Littorina littorea	0	+
Littorina saxatilis	0	+
Semibalanus balanoides	0	+
Patella vulgata	0	+
Nucella lapillus	0	+
Osmundea pinnatifida	**0**	**30%**
Phymatolithon lenormandii	+	**30%**
Dumontia contorta	0	+
Corallina officinalis	+	+
Osmundea hybrida	0	+
Arthropyrenia halodites	0	+
Fucus serratus	**65**	**0**
Cladophora rupestris	5	0
Gelidium pusillum	+	0
Ulva lactuca	+	0
Fucus vesiculosus	+	0
Palmaria palmata	+	0

Bold = dominant species; + = present in small amounts; * = possibly overlooked

Figures 1 and 2 are maps of the principal communities and biotopes respectively in 1968 (Tittley & Price, MS) and 1997 (from Tittley and others 1998); these figures also show the loss of the inshore *Fucus serratus* canopy and its replacement by a turf biotope of *Osmundea pinnatifida* and *Gelidium pusillum*, and by *Mytilus edulis* that had increased in extent. Low shore biotopes characterised by *Laminaria digitata* and *Palmaria palmata* in 1996 were as much as in 1968. The maps suggest there were changes to the inshore biotopes between 1968 and 1996.

Figure 3 is a DECORANA (De-trended correspondence analysis part of the VESPAN package, Malloch 1999) ordination of quadrat data collected in 1968 and 1991. The separation of paired quadrats in the plot (Figure 3 key) indicates change; had the quadrats remained similar in content they would have been positioned closer together. Most 1991 quadrats cluster together, suggesting their greater similarity; the 1968 quadrats are, in contrast, more widely spaced. Exceptions in 1991 are the lower shore quadrats 23 and 25. In quadrat 25, *Laminaria digitata* was more abundant in 1991 (50% cover) than in 1968 (5% cover) perhaps due to changes in chalk reef topography and an inshore spread of *L. digitata*.

More recently, Tittley and others. (2002) undertook in 2001 a monitoring survey of intertidal biotopes in the Thanet Coast cSAC and compared quantitative quadrat data with those gathered in 1997 (Tittley and others 1998). It revealed no decrease in extent and distribution of key biotopes and characterising species in the study areas in the short (4 year) time interval between surveys. Humpheryes (2004), however, demonstrated that change in periwinkle (*Littorina* spp.) dominance on the chalk reef at Foreness Point quickly changed an animal grazed area to an algal dominated community.

Conclusions

The historical record of algal occurrence on Thanet is exceptional and indicates a continuity of occurrence of species that characterise the principal intertidal and subtidal biotopes on many shores. Other species faithful to these biotopes but not present in large amounts also have a long history of records. Yet other species are ephemeral in occurrence appearing and disappearing at varying time intervals indicating natural change; reasons for this are unclear. Early recorders did not distinguish between drift and attached material and some Thanet records must therefore be discounted as part of the local flora. Although the principal communities/biotopes appear to be stable this is not true for the entire coast of Thanet, as at Botany Bay, there has been major change in community structure. Reasons for this are also unclear. Non-native invasive species are small in number although locally abundant and they do not appear to be deleterious to the local biota. Man-made structures create alternative habitats for algae and as a consequence species are present in Thanet that may otherwise have been absent. Overall algal diversity has been enhanced.

There is a continuing need for species recording to define accurately the marine algal flora of Thanet, its nature in relation to adjacent areas, and the impact of environmental change, man-made or natural, on the content and diversity of the flora. For similar reasons and especially those of sea-level rise, climate change, and water quality, there is also a continuing need to regularly monitor the nature, content and extent of species assemblages/biotopes.

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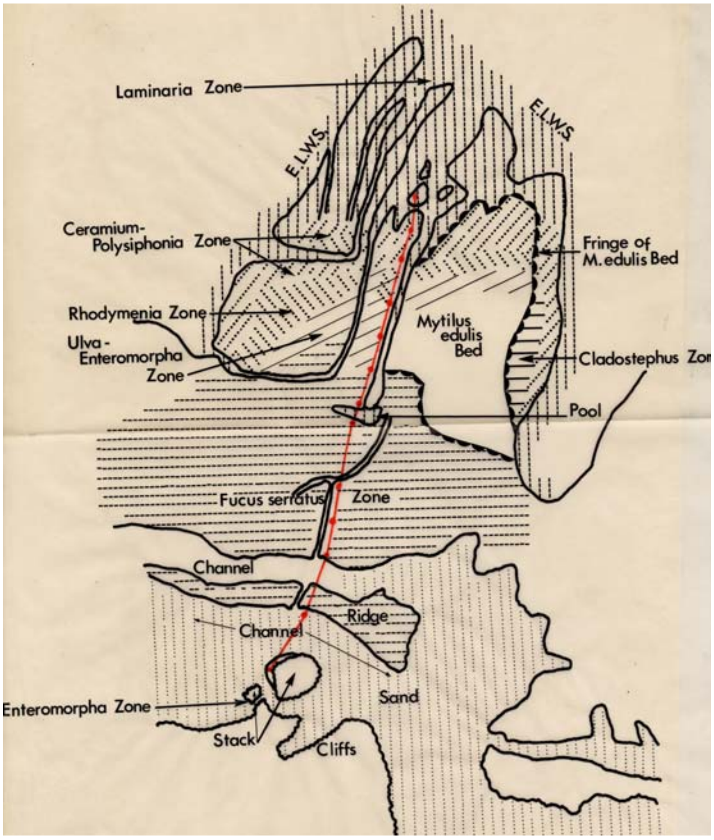

Figure 1. Botany Bay communities recorded in 1968 (red line indicates transect line).

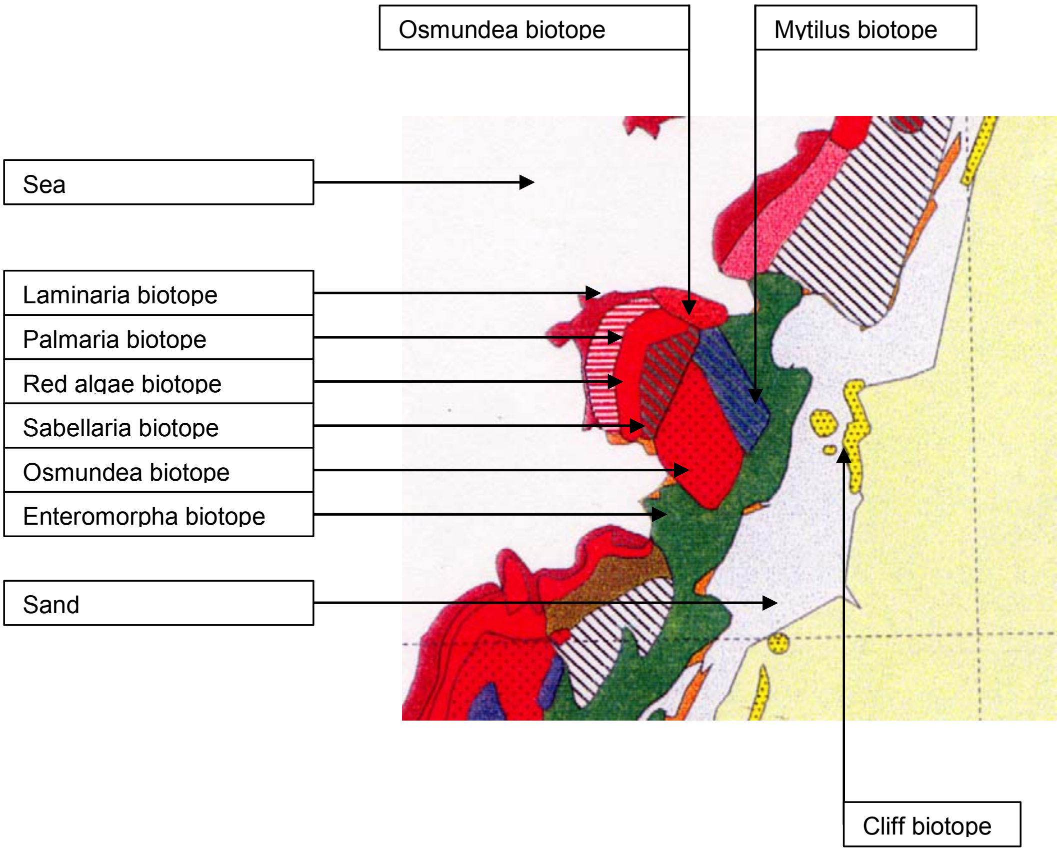

Figure 2. Botany Bay biotopes recorded in 1997 (Tittley and others 1998)

Key to numbers in plot.

April 1968	May 1991	Quadrat no.	Distance offshore (Feet)
Plot no.	Plot no.		
1	2	13	113
3	4	14	124
5	6	26	141
7	8	15	163
9	10	16	194
11	12	17	245
13	14	18	304
15	16	19	361
17	18	20	526
19	20	21	604
21	22	22	656
23	24	23	685.5
25	26	24	721.5
27	28	25	771.5

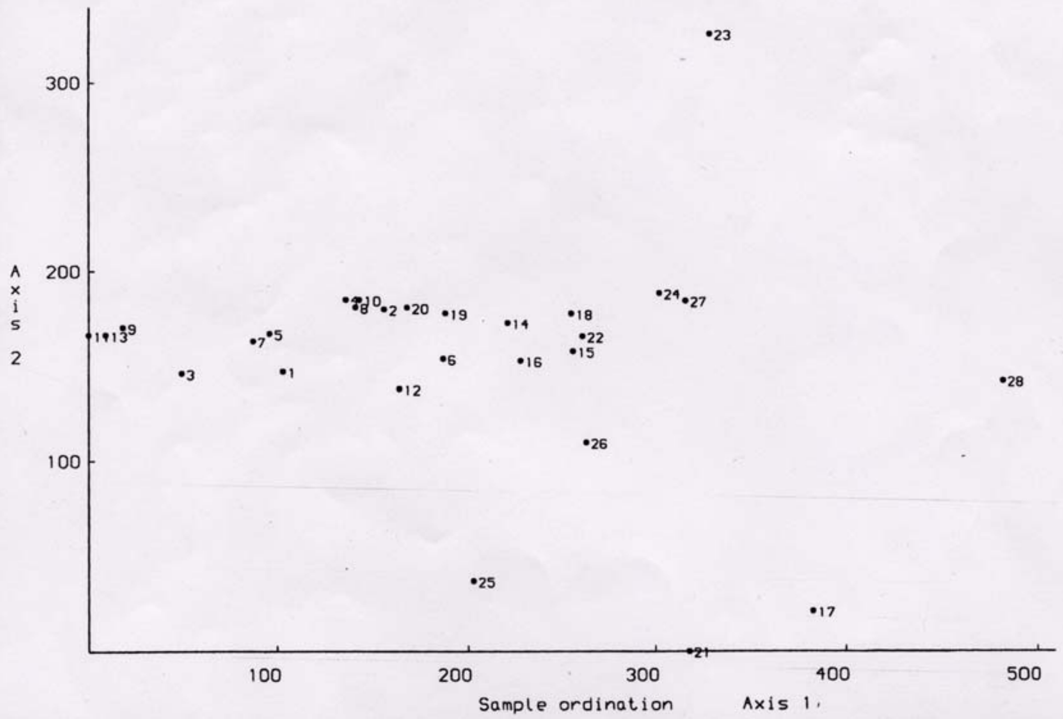

Figure 3. Ordination of Botany Bay quadrats 1968 and 1991

Plate 1. Botany Bay, inshore *Fucus* canopy in 1968

Appendix 1 Summary of workshops and whole group sessions

Verbatim report of discussion sessions

Question on arrival

What do we need to know about North East Kent's coastal and marine habitats and ecosystems to inform future integrated management?

Ray Lee
- We need to know what literature and other reports have been made.
- Present and future coastal construction projects.
- The 'positive' and 'negative' impact on Kentish Flats on bird, fish, seal, movements, habitat etc.

J Stroud
- Baseline study on existing ecosystems.
- The effects of the chalk reef being covered by sand.
- Study of fishing methods at present existing on site.

Chris Riddell
- Effect on the marine environment of pollutants entering the sea via the River Stour and its tributaries.
- Contribution to the East Kent economy of the leisure and business interests using the Great Stour Estuary and navigation.
- Keystone species – which are they?
- How are turnstones protected if dog walkers decide not to take into account their presence?
- Likely effects of silting Pegwell Bay and changes of sea level and global warming.
- All groups need to be singing from the same hymn sheet.
- Limits to ecosystem function.
- Understanding of variety and distribution of biotopes in wide area around NE Kent.
- Re: ecosystem approach.
  How are the priorities of national /international scientific / wildlife importance taken into account / weighted in and management system de-centralised to its lowest appropriate level?
- Ecosystem function
- Little terns in SPA – It only takes one group in the summer to land on Shellness Point when little terns are nesting with jet-skis, speedboats, outboard, for a BBQ, and with their dogs, and the species fails in nesting.

Questions and answers: before lunch

Do we talk to people where there are perceived problems?

- TC Coastal codes not always working – few people upset balance.
- Meeting proposed at Pegwell re kite surfing (and other activities) eg water skiing on Stour, dog walking.
- Thanet Water Users Group: barrier/membership scheme is effective.
- Jet Skiing: less controls in Dover DC area re. launching.
- New club at Beresford Gap, Thanet: self-regulation proposed – will this control disturbance to seals?
- Western Undercliff proposed – possible Pegwell conflicts?
- Approaching users – care with how they are tackled.
- Fishermen: Y.Ota's study found them approachable once detail of project explained, but. some shy. Importance of explaining nature-culture links.
- Bait Digging contact: PR found no hostility – respect for their knowledge is important.
- RL has found few difficult situations with bait diggers– not all co-operative.
- Feeling that interests threatened may make people cautious/hostile.
- Lack of info may make people cautious/hostile.
- 'Amateurs' perceive 'professionals' don't have single approach to kite surfing problem at Pegwell. English Nature are aware this is a significant problem:
  - need more facts and figures;
  - meeting with all interested parties to try to solve problem;
  - legal issues – require hard evidence;
  - Kite surfing "new" sport – mentioned in Management Scheme;
  - Principle agreed in Management Scheme: share problem and try to solve by consensus approach;
  - if this fails, legal action possible;
  - Kite surfers not involved in previous workshops so need a chance for discussion prior to further action.

Cockle harvesting banned in Holland – will this have a knock on effect and increased pressure at Thanet?

- Fishing in Thames governed by stocks.
- Private grounds are not so well managed.
- Maybe can learn from Dutch experience – about management issues and monitoring, legislation.
- Do we know if cockle stocks are declining?
- Cockles in Pegwell bay are not important to fishermen.
- Surveys by SFC in Essex – stocks there have remained stable over last 10 years 1994 onwards. Also some data goes back further than that.

- Morecambe Bay: Sea Fisheries Committee closed some of cockle areas – due to sustainability issues.
- Locally a change in season now.
- New machines – assumed cockily fisheries would decline but this is not what happened.
- Machines not damaging areas in the way people think.
- Sustainability model – take longer term view of fisheries. Historic changes in gear mean can fish new areas – so looks as if stocks are stable but need to look at bigger picture.
- Sustainable decisions need to take on cultural and historical heritage issues as well.

Questions and answers: after lunch

How important is seasonality?

- Very important: winter and summer give different info.
- Work on Carbon 14 on Stour Estuary and Saltmarsh – late June/July important for flowering plants.

Did Foreness work show periwinkle shell size increased independently of nutrients?

- No, but if animal stressed, amount of soft body to shell can vary greatly
- Implications of this for feeding birds

Issues covered today (and at NEKCAG meetings) from local to international level

- Most of us are practitioners – message that we need to **record change**: we can get out there and do it

Can we really operate on an ecosystem level?

How much of what we are monitoring is random?

- eg Mytilus at Whiteness: spat fall 2-3 years ago could be random/freak event. Shore very dynamic.
- IT: Norfolk work: core of continuity around which much "noise".
- 40 years data shows Whiteness and Fulsam have same spp composition now as they did then.
- Other areas have changed – randomness likely to be part of picture.
- Algae go ‘cryptic’ – static – until conditions right, then can suddenly change.
- Benthic data: much variability.
- Data collected in past can be used to inform now but need to co-ordinate future research with needs of sustainable decision- making.

NEKCAG 'tension' – pure science *vs* policy needs: how to bring together?

Are we missing info at local scale?

- Need to stand back and look at data to see change, but do need that local data.
- List of animal/plant communities only just starting to be monitored (eg seals) – important to look wider than just requirements of legislation / protected species.
- Ecosystem approach driver – lots of species-specific projects – fragmented approach – not enough resources and not a holistic view at present.
- Needs to be careful not to make wrong decisions eg for nature conservation, while trying to satisfy fundholders.
- Can we have a "Composite research team?" - importance of networking in science.
- How to do this practically – scientists to go out and do research together?

100 years from now what would the picture be?

- Stour Estuary: last 30-40 years changed from being "a dump"!
- Data on which to base today's management decisions is relatively recent – we are muddling along.
- Muddy boots to inform policy.
- Ensure we don't miss areas.
- Positive change here over last 10 years: info sharing and collaboration have increased.
- Pubic institutions: implications of Freedom of Information Act (Jan 2005) – info sharing.
- Duplication avoided by sharing info.
- English Nature Ecosystem Approach Report stresses scientific coherence: better aligned science, helping society to be more harmonious with natural environment.

Ecosystem approach workshop session: 3-4pm

The ecosystem approach has been raised at recent NE Kent Coastal Advisory Group meetings over the past year. The group has agreed that it seems sensible to consider our coastal and marine environment in a more holistic way and not purely in terms of conserving certain features of high nature conservation value. **However, we have not discussed what this means for us in practical terms as managers, researchers and users of the coastal and marine environment.**

Today we want to start that discussion process.

Below are some questions to help you consider what the ecosystem approach means for coastal and marine areas of NE Kent:

The review of the **NE Kent European marine sites Management Scheme** will start in April 2005 and a new scheme needs to be in place by April 2006. We want to consider to what extent we can bring the new scheme in line with the 12 principles of the ecosystem approach.

- What does the Ecosystem Approach mean for us?
- What does it mean for science?
- What does it mean for management?
- What does it mean for other plans, strategies and policies?
- What does it mean for the next draft of the Management Scheme?

Group 1. Ecosystem approach discussion session
(facilitator: Susannah Peckham, English Nature)

What does the ecosystem approach mean for us?

- It's a starting point for gathering of data and answering future questions
- Science can't always answer questions easily – it has limitations
- Approach will take time and needs to evolve gradually
- Will need to be validated
- Current Management Scheme already adheres to some EA principles – what are gaps?
- Detailed scientific data is needed but consider in broader context
- Local Authority view: need something to "hang" work on to justify funding
- Need to show it's part of the bigger picture
- This approach is credible in wider world of science so valid approach
- We can "pick and choose" what elements we use
- Allows human and business factors to be accounted for eg seal trips, other tourism efforts.
- Can monitor activities, put policy in place in holistic way
- Useful to many interests

What does it mean for management?

- "Hub" with all scientific disciplines linked to it
- Concern over definition of geographical area – in isolation from surroundings?
- Connectivity: influence of River Stour – how would this be considered?
- MW: scientific view: this is a scientific concept which has been "hijacked"
- We perceive boundaries of operation and management
- Social dimension needed to interpret science and implement
- It means integration of many disciplines, not just science
- Broadens environmental management into social and political dimensions
- The term may not have direct meaning for many people

- Feels like just another layer within a scheme that's already working
- Will it inform decision-making legislation?
- Danger of "intellectual bureaucracy" with this approach
- Setting boundaries – need to take calculated risk that you won't have the whole picture
- Gives opportunity for more holistic approach – framework
- But some sectors of society not involved
- If it means we can refer back to framework – network, multi-layer – can make more informed decisions.
- NEKEMS Management Scheme: we are already doing well on some of the principles of the ecosystem approach (eg principle 12 and some others)
- Importance of education and awareness raising: Thanet Coast Project doing this
- Principle 8: set objectives for long-term: need to do better but funding issues can dictate
- Difficult to define – need to pick indicator species etc
- Need to engage with users and managers so time meetings to be accessible to eg fishermen
- Marine knowledge limited – developed scientific methodologies on land and applying to sea. Foreshore is "meeting point" – we may get it wrong
- Lack of marine recording and issue
- Info from commercial fishermen, bait diggers etc – engage with them!

Key Points to feed back to whole group:

Holistic Framework

- Provides framework for holistic approach
- Less focus on "science" and more on humanities: "holistic"
- Overview must be holisitc
- Holistic
- Holistic approach will win a wider acceptance

Accountability

- There is a need for overall monitoring and accountability
- Key indicator species – 1st step
- System must provide a "measuring stick" for stakeholders

Engage others

- Make strenuous efforts to include others – eg fishermen, those who are often not included/ unable to attend
- Need to address ways of pulling others in – tailoring event times etc.
- Better engagement with core users (hold evenings in meetings)
- Engage others in meetings not just conservationists
- Holistic approach will win a wider acceptance

Long term

- Emphasizes long(er) term objectives
- Only achievable with long term funding

Limits / boundaries

- Ecosystem boundaries.
- It needs accepted limits to be workable

Focus on what we're not doing well

- As so many points are already covered in management scheme, eco approach is obviously working. Can we concentrate on points not covered?
- Ecosystems approach – probably following this approach in many ways already – formalise this plus find where it is not being followed
- Current EMS Management plan already adheres to EA. Good start!

Group 2. Ecosystem approach discussion session
(facilitator: Tony Child, Thanet Coast Project)

1. What does the ecosystem approach mean for us?

- Already aware of it – not a lot of difference to the way we will do things
- More data collection
  - Essential scientific info as basis of decision-making
- Needs more for comparison with elsewhere
  - Standard methodology
    and description of habitats
- Collation of datasets
  - aware of all factors affecting the site/wildlife etc

  Connectivity is important – esp migrant birds
  Defining boundaries?
- Do we know what is of interest to study / know?
- Factors affecting populations eg jet-skis and birds
  - who/what takes priority?
- Communicate with bodies outside our area of interest eg neighbours such as France
  Short term: needs to be long term plans -eg sea defences and erosion
- Adding series of additional projects
- Major factors affecting system need to be defined: recreational boat use – human activities
- Climate changes occurring and global warming
- Can be as detailed as we want? Can have all factors! Almost infinite.
  - could be broad-brushed to include factors eg nutrient input (sewage/organic inputs)
- Need to consider broader consequences
  - but may need to consider other impacts

  eg energy flows seaweed removal on beaches
  impact on bird populations
  more research / assessments required

  Note: energy changes (sewage to land based disposal)

2. What does it mean for science?
• ID projects and get local sponsorship (Pfizer) and supervision • Standardising / streamlining wider data libraries and collection methods – monitoring data - student projects (SBBOT) • Would be better for informing scientists - overseeing: collating/standardising • Thames and other areas – multiple layers of systems • Ecosystem systems – recruitment of organisms • Better communicate policy to people - getting argument across
3. What does it mean for management?
• Management can adapt to change better - look at long term rather than short and take into account the science, community and integrate all aspects • Making resources available eg £/€ • Management more open here than elsewhere - decisions made around the community here • Simplifying it – to allow people to understand; - reporting to stakeholders • Monitoring? – NEKCAG • Management Group communication with other areas eg KCC networking newsletter shows many organisations that didn't know exist Links – shingle movements – EA/ English Nature/Local Authority -dredging – fluid injection is unlicensed!
4. What does it mean for other plans, strategies and policies?
• Make sure don't conflict • Loopholes • Communication awareness is important
5. What does it mean for the next draft of the Management Scheme?
• Big impact – more wording • More questions will have objectives/conditions to be addressed • Prioritising is important
Key points to feed back to whole group:
• Availability of data • Making funding resources available

Standard data collection
• Standardising scientific methods • Educating locals and potential plans • Need to standardise data collection to make it comparable on a large scale • Need to make meta-data available to all (as a list of projects, studies) & abstract & contact details • Will influence research project by adding supplementary data • Invited new research project • Science guided / student guided data collection
Scope
• Need to identify boundaries of ecosystem • Decide on what the scope of the ecosystem actually covers for NEKCSAG
Prioritise/Management
• Prioritise nature conservation importance • This may mean using strict zonations • Long term approach by management • Need to consider indirect as well as direct effects on ecosystem • Level of detail to be established for initial phase at least • Need to consider broader consequences
Communication and information
• Greater communication between groups and organisations – integration • Communication between different bodies • Standardisation of data formats • Share information with other areas and learn from each other – (helps avoid duplication and reduces waste of costs)

Group 3 ecosystem approach discussion session (facilitator: Diana Pound)
What does the ecosystem approach mean for us?
• Need to consider NEK in wider context, eg regional seas • Who are ecosystem managers? - BAP? - do manager need educating? • Is new legislation needed for the ecosystem approach? • It is a very ambitious thought • What is motivation/reasons/needs for ecosystem - everyone's ecosystem is different! • Are we trying to put straight jacket on things – fix at one point in time? • What is the objective for an ecosystem – is it an ideal or just reactionary? • What happens to concept of "flagship species" – protect this, protect everything?

• Species-specific management has been done for certain flagship species. These are usually high PR species. Tends to result in a focus on species – this skews management. • What about biotope conservation? This focuses on species or habitat, misses out socio-economic aspects. • Word "ecosystem" as a word seems biased towards nature conservation. • Sea change temp will result in loss of kelp forest – just 4˚C. But can't stop this, hard to manage especially given uncertainty eg could have Gulf Stream switch off – so we end up like Newfoundland • How are we going to find an appropriate scale? • Fishermen don't think "ecosystem" includes them • Ecosystem approach may be mistaken as a political position – pro or anti-environment • Does change matter? – it's our attitude to environmental change that is an issue – our attitude is to "grab what you can"! • People's attitude is not 'man against nature' but "If I don't take this resource someone else will", eg Kyoto and USA
What does the ecosystem approach mean for science?
• We need to be more holistic: share, exchange, collaborate; put the jigsaw together • £ affects research – so an Interreg bid to take an ecosystem approach locally? • Science tends to focus into detail • Will the ecosystem approach ring bells for Brussels and funding? • Trophic networks – need a work flow/mind map of connections • Cross-discipline approach will result in data problems • We need a knowledge map which would drive research • We need to know information gaps • Need to see links and where they are missing
What does it mean for the next draft of the management scheme?
• Encourage integration of activities • This group is biology dominated - what about social science, industrial science? • Knowledge map – action for a library, data/meta data resource • Standardise research ethics where possible eg use of data • It needs to look at all species and habitats in North East Kent area • Scheme needs to use language which makes it accessible • Take a wider view of area – and direction of change and trends • Take into account climate change • Self critical – look at what didn't work and move on

Key points to feed back to whole group:
Holistic approach/knowledge map • Integration of research activities and knowledge • Holistic approach to future research – knowledge map • Encourage integration of activities management • We need a knowledge map • Clarify "ecosystem" objectives • Knowledge map and practical applications • Knowledge map Sectoral Trophic networks
• Information gap – relates to points above
• Research ethics
• Recognise that ecosystem approach can be a political concept
• Social attitude to environment and nature – education?
• The dynamic environment:- change is maybe natural; - need to understand it
• Money
• NE Kent EMS Management Scheme • Look at all species and habitats in North East Kent Area • Consider NE Kent in wider context • Management scheme to take broader view of habitats and species • Who is the target of management scheme? Who will scheme persuade?
• Sandwich Bay as focus for data collection

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Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
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Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
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