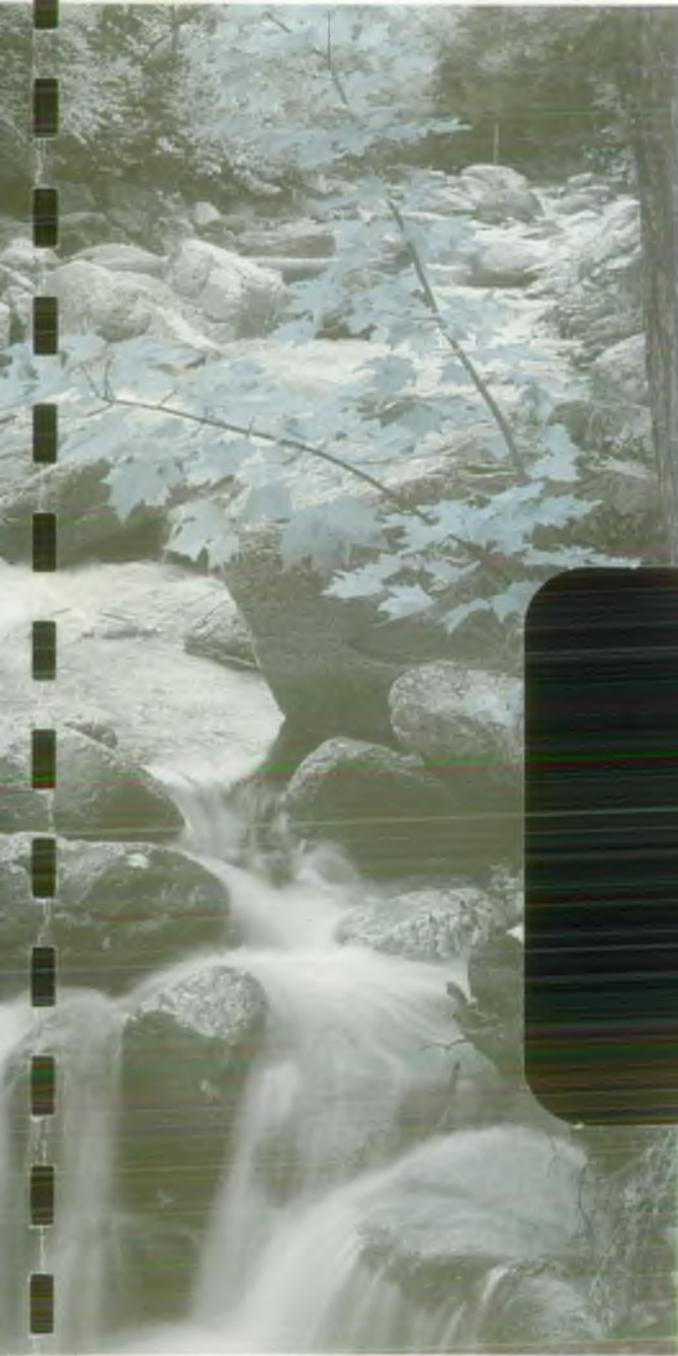


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Biological Report of the 1992
Coastal & Estuarine Survey
from Crosby to Glasson

by Elizabeth Potter MSc.MIBiol.

ENVIRONMENT AGENCY



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1992 COASTAL AND ESTUARINE SURVEY

BIOLOGY CENTRAL AREA

Report written by Elizabeth Potter, November 1992

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APPENDIX A: Abundance scales

1. Site Modifications

Following the extensive 1991 Baseline survey, some estuary sites have been altered. The coastal stretch points have remained the same. Additional sites were introduced on the Alt, Ribble and Wyre estuaries, to give better coverage of the varying estuarine habitat.

2. METHODS

The methods used are consistent with the 1991 Baseline survey. The *Enteromorpha* and coloniser tests were omitted.

2.1 Sediment Sieving

A randomly selected quadrat measuring 1 by 0.5m was dug to a depth of 10 cm and washed through a 1mm mesh Endecotts sieve. The sieve contents were collected and fixed in ethanol for later examination in the laboratory.

2.2 Hand netting

Shallow shelving beaches were sampled by running a flatbased net over the bed for three minutes. Tidal pools were swept over with the net and organisms were fixed in ethanol for later analysis.

2.3 General observation

This method provided a good overall picture of the diversity and abundances of more prominent organisms over a large area and in a number of different habitats. Where applicable, saltmarsh vegetation maps were drawn, stones turned and posts or groynes were examined for organisms.

2.4 Fish trawl

The Wyre and Ribble Estuaries were trawled as described in the 1991 Baseline survey. Due to the extensive data collected and the increase in frequency of trawl surveys, these results will in future be reported separately.

The scales of abundance used in this text follow a commonly used notation and have been assigned values as given in Appendix A.

3. Coastal Stretches

3.1 Crosby to Altmouth

Sampled off Coastguard Station, Crosby

(i) Spring Survey. 23-04-92

A rocky area occupying the top of the shore was found to support mainly *Enteromorpha*. Sewage litter was also present at the top of the shore. The majority of the upper shore was sandy, with an anoxic layer extending approximately 10 cm immediately beneath the surface. Here, *Arenicola*, *Lanice* & *Cerastoderma* were found in roughly equal numbers. On the middle shore, *Arenicola* became the dominant species, with *Nereis* populations gradually increasing seawards. The East cardinal marker was examined as a part of the site. This was found to support mostly barnacles and a few mussels.

The marsh area at the landward edge of the site showed good colonisation by Plantain and Spurry, with grass making up the majority of the remaining flora.

Shore Organisms:

- (A) *Semibalanus balanoides*
- (A) *Enteromorpha intestinalis*
- (A) *Arenicola marina*
- (O) *Nereis diversicolor*
- (O) *Mytilus edulis*
- (O) *Cerastoderma edule*
- (R) *Littorina littorea*
- (R) *Lanice conchilega*

Marsh Flora:

- (A) *Plantago maritima*
- (A) *Spergularia marina*
- (C) *Carex arenaria*
- (R) *Honkenya peploides*
- (R) *Torilis japonica*

(ii) Autumn survey, 05-11-92

The survey was conducted much later than planned, thereby encountering some seasonal and storm-caused variation. The marsh flora had died back, leaving a covering of grass and remnant species of thrift and chamomile. There was a large amount of sewage debris on the shore, particularly on the strand line.

Shore Organisms;

- | | |
|-----------------------------------|-----------------------------------|
| (A) <i>Semibalanus balanoides</i> | (F) <i>Ectocarpus siliculosus</i> |
| (O) <i>Macoma balthica</i> | (F) <i>Enteromorpha</i> sp. |
| (O) <i>Corophium volutator</i> | (R) <i>Cerastoderma edule</i> |
| (C) <i>Mytilus edulis</i> | (R) <i>Bathyporeia pelagica</i> |
| (C) <i>Lanice conchilega</i> | (R) <i>Ulva lactuca</i> |

Marsh Flora; (O) *Aremeria maritima*

3.2 Altmouth to Southport Pier
Sampled at Mad Wharf, Formby

(i) Spring Survey. 23-04-92

The site was visited at the end of the ebb tide.

No sewage litter was seen in the area examined. The sandy bed was inhabited by sand masons and a number of empty shells littered the beach and strand line. The netted and sieved samples from the lower shore indicated dominant populations of *Bathyporeia*.

Shore Organisms;

- (F) *Lanice conchilega*
- (O) *Ensis ensis*
- (O) *Eurydice pulchra*
- (O) *Bathyporeia pelagica*

(ii) Autumn Survey. 08-11-92

The survey was conducted two hours before low water. The beach profile was less uniform than during the Spring survey and had left a large pool of water, of depth 20cm, across the survey area.

Shore organisms;

- (O) *Lanice conchilega*
- (O) *Arenicola marina*
- (R) *Bathyporeia pelagica*

3.3 Southport Pier to Crossens Marsh
Sampled off Hesketh Road and Pier Supports, Southport

(i) Spring Survey. 24-11-92

Off the Pier, the substratum was a wet, compact sand, with an average anoxic layer lying 4cm below the surface. The Pier Supports provided the only major colonising substrata for settling organisms, such as barnacles, which were present at capacity. The remainder of this sandy/ muddy site was inhabited by polychaete worms and sandmasons.

The more muddy stretch off Hesketh Road showed early saltmarsh colonisation. Isolated clumps of *Spartina* occupied the upper shore, with *Corophium* abundant on the middle shore.

Shore Organisms; Pier site

(A) *Semibalanus balanoides*
(F) *Lanice conchilega*
(R) *Enteromorpha* sp.
(R) *Nereis diversicolor*

Hesketh Rd Site.

(A) *Corophium volutator*
(C) *Lanice conchilega*
(R) *Ensis ensis*
(R) *Enteromorpha* sp.

Marsh flora; (O) *Spartina* sp.

(ii) Autumn Survey. 06-11-92

The Pier site included a very muddy, anoxic stretch on the middle shore, beneath the pier. On either side of this area, cockles were found immediately beneath the surface. The pier legs supported the usual colonies of barnacles and green alga, although the populations appeared somewhat limited in density. This may be a seasonal change (the survey was conducted later than intended). The lower shore was densely populated by *Arenicola* and *Corophium*.

The Hesketh Road site also indicated high populations of *Corophium*, although many of the shore pools contained high numbers of these dead. Additionally, high density areas of *Hydrobia* were found across the middle shore. Sewage litter was present, as usual, at this site.

Shore organisms; Pier site

(A) *Arenicola marina*
(A) *Corophium volutator*
(A) *Semibalanus balanoides*
(C) *Cerastoderma edule*
(C) *Lanice conchilega*
(O) *Enteromorpha* sp.
(R) *Ensis ensis*

Hesketh Rd. site

(A) *Corophium volutator*
(A) *Hydrobia ulvae*

Marsh flora;
(O) *Spartina* sp.

3.4 St. Annes Pier to Blackpool North Pier
Sampled off Blackpool promenade (A5073) and South Pier.

(i) Autumn survey 03-12-92

The beach profile was very similar to that observed in the 1991 survey. The survey was conducted at low water neaps. There was a remarkable absence of sewage litter this survey. Large numbers of sand mason shells formed a line at the recent high water mark. Numerous sand masons were also found throughout the middle shore. The pier legs were inhabited by the usual barnacles and mussels, but supported a less dense growth of *Enteromorpha* than usual. This may be due partly to storm damage and to seasonal growth patterns.

Shore Organisms;

- (A) *Lanice conchilega*
- (O) *Hydrobia ulvae*
- (O) *Bathyporeia pelagica*
- (R) *Crangon vulgaris*

On Pier Supports;

- (D) *Semibalanus balanoides*
- (A) *Mytilus edulis*
- (R) *Enteromorpha* sp.

3.5 Blackpool North Pier to Rossall Point.
Sampled at Cleveleys, off marine lake promenade.

(i) Autumn Survey 23-09-92

The shingle/sand beach and groynes were examined as per the 1991 survey. A reasonable representation of the vertical zone succession was accessible, and associated populations were recorded. The varied substrate enabled recordings of the mud-dwelling species, such as *Nereis*, *Arenicola* and *Carcinus*, to surface colonisers, i.e barnacles and periwinkles.

Shore Organisms;

- (A) *Semibalanus balanoides*
- (A) *Enteromorpha* sp.
- (C) *Mytilus edulis*
- (C) *Corophium volutator*
- (C) *Littorina littorea*
- (C) *Nereis diversicolor*
- (O) *Carcinus maenas*
- (O) *Crangon vulgaris*
- (O) *Lanice conchilega*
- (R) *Porphyra umbilicalis*
- (R) *Arenicola marina*

3.6 Rossall Point to Knott End
Sampled at Fleetwood, off the marine lake.

(i) Autumn survey. 09-09-92
The site included a wide range of habitats, from shingle, to sand, to groyne. At the neap low tide line, a rocky area in a sandy/muddy sediment was also sampled.

On Groynes;

- (A) *Semibalanus balanoides*
- (A) *Enteromorpha* sp.
- (C) *Fucus spiralis*
- (C) *Mytilus edulis*
- (O) *Littorina littorea*
- (R) *Porphyra umbilicalis*

Shore Organisms;

- (C) *Lanice conchilega*
- (F) *Macoma balthica*
- (O) *Enteromorpha* sp.
- (O) *Bryozoa* sp.
- (R) *Carcinus maenas*
- (R) *Lepidopleurus asellus* (chiton)

3.7 Knott End to Pilling Channel
Sampled at Fluke Hall

(i) Autumn Survey. 09-09-92

The grazed marsh occupying the upper shore supported a sparse flora. *Spartina* was still present in isolated clumps, interspersed with growths of *Salicornia* on the lower areas of shore.

The mud-lined pools and creeks supported large populations of *Hydrobia* and *Corophium*. The mud burrowing *Macoma* and *Arenicola* were also present.

Shore Organisms;

- (A) *Hydrobia ulvae*
- (A) *Corophium volutator*
- (O) *Enteromorpha sp.*
- (R) *Arenicola marina*
- (R) *Macoma balthica*

Marsh flora;

- (C) *Spartina sp.*
- (C) *Salicornia sp.*
- (R) *Armeria maritima*
- (R) *Aster tripolium*

3.8 Pilling Channel to Cocker Channel
Sampled off Lane Ends, Pilling

(i) Autumn Survey. 09-09-92

This site continued to support a typically "grazed" community. Grass accounted for a large part of the vegetation, even though it had been heavily cropped.

The tidal pools were found to contain dense colonies of *Hydrobia* and occasional *Corophium*. Gobies were also netted in these samples.

Shore organisms;

- (C) *Gobius sp.*
- (F) *Hydrobia ulvae*
- (R) *Corophium volutator*

Marsh Flora;

- (A) *Puccinellia maritima*
- (C) *Aster trifolium*
- (C) *Spartina sp.*
- (C) *Glaux maritima*
- (F) *Triglochin maritima*
- (O) *Salicornia sp.*
- (O) *Armeria maritima*
- (R) *Halimione portulacoides*
- (R) *Sueada maritima*

3.9 Cocker Channel to Lune Mouth
Sampled East of Plover Scar Lighthouse.

(i) Autumn Survey. 03-11-92

This varied site was examined for each of the four distinctive habitats represented.

A. The marsh was mostly limited to isolated clumps of *Spartina*, particularly in the middle and lower areas. *Salicornia* persisted as the solitary coloniser on the extreme lower marsh. A more varied flora occupied the upper marsh.

B. The sandy/mud area lying between the marsh and the lighthouse was very limited in diversity, but supported reasonable populations of *Hydrobia* and *Littorina* on the upper areas. Where the sediment became more muddy, *Arenicola* and *Nereis* became more dominant. Wetter areas of sand supported *Cerastoderma* and *Macoma*.

C. To the East of the lighthouse, the mussel scar was found also to support dense populations of barnacles. Reasonable populations of *Nereis*, *Corophium*, *Lanice* and *Littorina* were found to be established.

Shore Organisms;

- (A) *Mytilus edulis*.
- (A) *Semibalanus balanoides*
- (A) *Hydrobia ulvae*
- (A) *Nereis diversicolor*
- (C) *Littorina littorea*
- (O) *Macoma balthica*
- (O) *Arenicola marina*
- (O) *Cerastoderma*
- (O) *Enteromorpha* sp.
- (O) *Lanice conchilega*
- (F) *Corophium volutator*
- (R) *Carcinus maenas*

Marsh flora;

- (A) *Spartina* sp.
- (F) *Aster trifolium*
- (O) *Glaux maritima*
- (O) *Halimione portulacoides*
- (O) *Triglochin maritima*
- (R) *Sueada maritima*
- (R) *Atriplex* sp.
- (R) *Sagina nodosa*
- (R) *Limonium vulgare*
- (R) *Salicornia* sp.

3.10 Northern Area limit. Glasson Dock.
Sampled off Sailing Club Slipway.

(1) Autumn Survey. 03-09-92

This site provides a restricted and fairly uniform substrate. The upper shore represented the majority of the sampleable habitat. The brief and compact marsh was populated by *Aster*; *Triglochin*; *Limonium* and *Armeria*. The zones of *Halimione* and *Sueada* were much reduced through lack of suitable substrate. The remaining stretch of shore to the Lune was impassable for soft, dangerous mud.

A small area of shingle on the extreme upper shore was also examined. Here, thriving populations of *Nereis*, *Corophium* and *Hydrobia* were found.

Shore Organisms;

- (A) *Nereis diversicolor*
- (A) *Corophium volutator*
- (F) *Enteromorpha* sp.
- (F) *Hydrobia ulvae*
- (F) *Carcinus maenas*

Marsh Flora

- (O) *Sueada maritima*
- (O) *Aster trifolium*
- (O) *Cochlearia officinalis*
- (O) *Triglochin maritima*
- (R) *Limonium vulgare*
- (R) *Halimione portulacoides*
- (R) *Armeria maritima*

4. Estuaries

4.1 Alt Estuary

4.11 Lower Estuary off Hightown Sailing Club.

This is a new site which was added after the 1991 survey, to represent the lower part of the Estuary.

The site exists upon a relic forest. The bed is mainly sand on the upper shore, giving way to areas of raised muddy plains. Five centimetres beneath the surface lies an anoxic peaty layer, which is fairly impenetrable for burrowing organisms.

(i) Spring Survey 23-04-92

The slipway was used to examine the soft, muddy shore upto the main Alt channel. The anoxic layer on the lower shore was 8cm below the surface. This provided a better habitat for *Nereis*, *Corophium* and numerous sand masons. Barnacles covered the lower jetty planks, as did *Enteromorpha*

Shore Organisms;

- (A) *Nereis diversicolor*
- (A) *Corophium volutator*
- (A) *Lanice conchilega*
- (A) *Semibalanus balanoides*
- (A) *Enteromorpha sp.*

(ii) Autumn Survey 05-11-92

The survey was conducted much later than originally planned, so that storm flows and equinoctial high tides may have severely affected the site. Numbers of organisms were reduced compared to the Spring Survey results, although the diversity was consistent.

Shore Organisms;

- (A) *Enteromorpha sp.*
- (A) *Corophium volutator*
- (C) *Semibalanus balanoides*
- (O) *Lanice conchilega*
- (R) *Nereis diversicolor*

4.12 Upper Estuary, off rifle range.

(i) Spring survey. 23-03-92

During the Spring survey, the low flow in the river Alt enabled a closer look at the muddy banks of the upper estuary. Sandhoppers, *Corophium*, Lugworms, Sand Masons and Nematodes were found beneath boulders and living on the muddy substrate. The marsh was well supported by grasses, spurge, scurvy grass and at the lower edges, *Spartina*. Purslane accounted for 25% of all growth.

Shore Organisms;

- (A) *Corophium volutator*
- (A) *Nematodes*
- (O) *Arenicola marina*
- (R) *Lanice conchilega*

Marsh Flora;

- (A) *Halimione portulacoides*
- (A) *Spartina anglica*
- (F) *Cochleria officinalis*
- (F) *Rumex crispus*
- (F) *Euphorbia portlandica*
- (O) *Bromus mollis*
- (O) *Carex arenaria*

4.2 Conder Estuary
Sampled at Old Railway

(i) Autumn Survey. 03-09-92

The upper shore had recently been washed over by high tides; piles of driftwood and debris were present on the lower half of the sea defence. The marsh itself appeared to be healthy and was represented by at least 11 species. The general pattern of distribution was very similar to the last survey; *Spartina* dominating the middle and lower areas, with a more mixed flora in the upper marsh. A distinct Lavender zone was present on the mid-upper marsh.

At the seaward end of the marsh, the 1m drop-off marks a contrasting change of environment. The muddy sand was colonised by *Corophium* and *Enteromorpha*, with *Carcinus* hiding beneath the occasional rocks. Further along the shore, *Hydrobia* and *Arenicola* were also found. As the mud content increased, *Nereis* became increasingly dominant.

The lower shore was characterised by a dense Furoid zone, represented mainly by *Fucus ceranoides* and *Fucus vesiculosus*. Rock pools netted at the bottom of the shore yielded gobies, shrimps and an elver.

Shore Organisms;

- (A) *Corophium volutator*
- (A) *Nereis diversicolor*
- (A) *Semibalanus balanoides*
- (A) *Fucus ceranoides*
- (A) *Fucus vesiculosus*
- (C) *Carcinus maenas*
- (F) *Hydrobia ulvae*
- (F) *Enteromorpha* sp.
- (O) *Arenicola marina*
- (R) *Ulva lactuca*
- (R) *Macoma balthica*

Marsh flora;

- (A) *Aster trifolium*
- (C) *Halimione portulacoides*
- (C) *Salicornia* sp.
- (C) *Spartina* sp.
- (F) *Plantago maritima*
- (F) *Sueada maritima*
- (O) *Atriplex* sp.
- (R) *Juncus* sp.
- (R) *Triglochin maritima*
- (R) *Glaux* sp.
- (R) *Cochlearia officinalis*

4.3 Cocker Estuary
Sampled off Cockerham Sands Caravan Park

(i) Autumn Survey. 03-09-92

The upper marsh supported a mixed flora, giving way to a zone dominated by *Spartina* and *Salicornia*. The *Spartina* zone continued until the marsh gave way to a muddy/sandy sediment.

The middle shore was marked by a moderate growth of *Enteromorpha*, beyond which dense populations of *Hydrobia* and *Corophium* were found. *Arenicola* and *Nereis* were also present where the substrate became increasingly muddy.

Shore Organisms;

- (A) *Hydrobia ulvae*
- (A) *Corophium volutator*
- (A) *Arenicola marina*
- (C) *Enteromorpha* sp.
- (F) *Macoma balthica*
- (F) *Nereis diversicolor*
- (O) *Cerastoderma edule*
- (O) *Scrobicularia plana*
- (R) *Carcinus maenas*

Marsh Flora;

- (A) *Spartina* sp.
- (F) *Salicornia* sp.
- (R) *Sagina nodosa*
- (R) *Atriplex* sp.
- (R) *Triglochin maritima*
- (R) *Limonium vulgare*
- (R) *Armeria maritima*
- (R) *Plantago maritima*

4.4 Ribble Estuary

4.41 Lytham

Sampled off Fairhaven Lake.

(i) Spring Survey. 28-04-92

The upper pebbled marshy area of this site was dominated by grassy outcrops, supporting Plantain and Scurvy grass, with a few specimens of sea aster and orache. A *Spartina* band was most prominent in the middle marsh and was mixed with occasional patches of seablite. On the muddy/sand lower shore, sandmasons and *Enteromorpha* were abundant. *Nereis* and *Hydrobia* were also present.

Shore Organisms;

- (A) *Lanice conchilega*
- (A) *Enteromorpha* sp.
- (C) *Hydrobia ulvae*
- (F) *Nereis diversicolor*
- (O) *Cerastoderma edule*
- (R) *Ulva lactuca*
- (R) *Carcinus maenas*
- (R) *Macoma balthica*

Marsh Flora;

- (A) *Spartina* sp.
- (A) *Cochlearia officinalis*
- (A) *Plantago maritima*
- (F) *Sueada maritima*
- (R) *Atriplex* sp.

(ii) Autumn Survey. 04-12-92

The Autumn survey was conducted much later than planned. For this reason, much of the marsh flora had died back for the winter. Of the marsh remaining, grass with occasional specimens of plantain, spurry and thrift were recorded. On the middle marsh, the *Spartina* band was still prominent, but plants were reduced in form and many appeared storm damaged. The summer's growth of *Sueada* was still standing amidst *Spartina*, but the plants were now obviously dead.

Beyond the marsh, the fauna appeared to be thriving. Periwinkles were abundant beneath stones and at the base of small pools. Cockles and tellin were also evident.

Shore Organisms;

- (A) *Littorina littorea*
- (A) *Corophium volutator*
- (C) *Cerastoderma edule*
- (C) *Nereis diversicolor*
- (F) *Enteromorpha* sp.
- (R) *Ulva lactuca*
- (R) *Macoma balthica*
- (R) *Arenicola marina*
- (R) *Lanice conchilega*

Marsh FLora;

- (A) *Spartina* sp.
- (O) *Atriplex* sp.
- (R) *Armeria maritima*
- (R) *Halimione portulacoides*
- (R) *Plantago maritima*
- (R) *Spergularia marina*

4.42 Ribble Estuary, Naze Mount
Sampled opposite Douglas Estuary.

(i) Spring Survey, 28-04-92

The site provides a very mixed habitat, ranging from saltmarsh, mud and mussel scar on the Northern bank, to sand on the Southern bank. The site is partially influenced by the Douglas, possibly explaining the heavy deposition of sediment on the lower shore.

The upper marsh showed a mixture of Sea Aster, grasses and Orache. A 0.5m shelf marks the divide of the lower marsh, where *Sueada* was found in the more water-logged areas. Towards the middle shore, *Sueada* gradually gave way to populations of *Spartina*, with *Aster* returning occasionally where grassy patches have developed.

The muddy sediments are dominated by oligochaetes and *Nereis*.

Shore Organisms;

- (A) *Nereis diversicolor*
- (F) *Oligochaetes*

Marsh Flora;

- (A) *Spartina* sp.
- (F) *Plantago maritima*
- (F) *Sueada maritima*
- (O) *Atriplex* sp.
- (R) *Cochlearia officinalis*
- (R) *Aster trifolium*
- (R) *Euphorbia* sp.

4.43 Ribble Estuary, off Sewage Works

(i) Spring Survey. 28-04-92

This site was visited by foot from the North side (as opposed to both shores which were visited by hovercraft in the 1991 survey.)

The upper part of the shore was marked by a strandline, beyond which, rocks led to a lower marsh. The rocks provided a substrate for lichens, sea aster and scurvy grass. The sea aster zone continued for some distance down the shore. *Spartina* was present in sparse colonies on the upper shore. As the sediment became increasingly muddy, the sea aster population declined and *Spartina* increased in density.

Oligochaetes and *Nereis* were abundant across the lower shore.

Shore Organisms;

- (A) *Enteromorpha sp.*
- (A) *Nereis diversicolor*
- (A) *Oligochaetes*

Marsh flora;

- (F) *Spartina sp.*
- (O) *Atriplex sp.*
- (O) *Cochlearia officinalis*

4.44 Ribble Estuary, off Preston Dock
Sampled from Northern Shore, off Dock Road.

(i) Spring Survey. 28-04-92

This was a new site for 1992. The estuary is very narrow at this site and shows its characteristic muddy sediments. A thin band of sandy mud exists on the upper shore and this has been colonised by a limited saltmarsh. A netted narrow rocky shelf divides the saltmarsh from the soft mud which lines the bank.

The saltmarsh was represented by a surprisingly diverse flora. The upper marsh was composed mainly of grass, with almost equal amounts of Scurvy grass and Orache. A single clump of *Spartina* was located in the site. Sea asters had colonised the area around the rocky shelf; Lichens covered about 75% of these rocks. On the middle shore, *Enteromorpha* was widespread, with growth gradually tapering off towards the muddy sediments, where diatom growths became abundant. *Oligochaetes* persisted throughout the middle and lower shore.

Shore Organisms;

(C) *Enteromorpha* sp.

(R) *Lanice conchilega*

Marsh Flora;

(A) *Cochlearia officinalis*

(C) *Atriplex* sp.

(F) *Aster trifolium*

(R) *Spartina* sp.

4.5 Wyre Estuary

4.51 Lower Estuary, Knott End

Sampled off promenade, South of the jetty.

This extra site, representing the lower estuary, was introduced for 1992. The concrete sea defence beneath the promenade gives way to a cobbled muddy beach, which becomes more sandy with exposure.

(i) Spring Survey 27-04-92

The upper and middle shore was dominated by *Corophium* and Nematodes. Periwinkles were abundant throughout. The lower shore supported *Nereis* and, where a solid substrata was available, Barnacles, Mussels and *Enteromorpha*.

Shore Organisms;

(A) *Littorina littorea*
(A) *Corophium volutator*
(A) Nematodes
(C) *Semibalanus balanoides*
(C) *Gammarus* sp.
(O) *Mytilus edulis*
(O) *Nereis diversicolor*
(O) *Ulva lactuca*
(R) *Enteromorpha* sp.
(R) *Cerastoderma edule*
(R) *Carcinus maenas*

Marsh Flora;

(O) *Cochlearia officinalis*
(O) *Halimione portulacoides*
(R) *Spartina* sp.

(ii) Autumn Survey 21-09-92

The site showed little change over the Spring Survey. The sandbank making up the lower shore had become higher, thereby decreasing the slope of the beach somewhat.

Shore Organisms;

(A) *Semibalanus balanoides*
(A) *Corophium volutator*
(A) *Littorina littorea*
(C) *Fucus ceranoides*
(C) *Enteromorpha* sp.
(F) *Nereis diversicolor*
(F) *Actinia equina* (Anemone)
(O) *Hydrobia ulvae*
(O) *Arenicola marina*
(O) *Carcinus maenas*
(R) *Cerastoderma edule*
(R) *Ulva lactuca*
(R) *Fucus vesiculosus*
(R) *Porphyra umbilicalis*
(R) *Scrobicularia plana*

Marsh Flora;

(R) *Halimione portulacoides*
(R) *Triglochin maritima*

4.52 Upper Wyre Estuary, Shard Bridge
Sampled on North Shore, footpath from pub.

(i) Spring Survey 27-04-92

The site continues to show excellent diversity of habitats and associated varied species listing.

The upper marsh was represented by a mixed population which appeared unrestricted to band or distinct zonation. *Spartina* and *Halimione* dominated the lower area of marsh.

The upper shore was dominated by *Nereis* and supported reasonable numbers of shore crab. Species more typical of brackish conditions, such as *Gammarus duebeni* were also found in high numbers.

Shore organisms;

- (A) *Nereis diversicolor*
- (C) *Carcinus maenas*
- (C) *Semibalanus balanoides*
- (C) *Asellus sp.*
- (C) *Gammarus duebeni*
- (O) *Fucus ceranoides*
- (O) *Enteromorpha sp.*
- (O) *Ectocarpus siliculosus*

Marsh Flora;

- (C) *Spartina sp.*
- (C) *Halimione portulacoides*
- (O) *Atriplex sp.*
- (O) *Diplotaxis tenuifolia*
- (O) *Aster trifolium*
- (R) *Plantago maritima*
- (R) *Vinca major* (Greater periwinkle)
- (R) *Cymbalaria muralis* (Ivy-leaved toad flax)

(ii) Autumn Survey 21-09-92

This time, a more distinctive banding of *Spartina*, sea aster and sedge was observed on the upper shore. This is probably as a result of the establishment of the earlier Spring growths.

Shore Organisms;

- (A) *Corophium volutator*
- (C) *Fucus ceranoides*
- (C) *Ulva lactuca*
- (C) *Nereis diversicolor*
- (F) *Carcinus maenas*
- (F) *Semibalanus balanoides*
- (F) *Enteromorpha sp.*
- (O) *Gammarus duebeni*

Marsh Flora;

- (A) *Spartina sp.*
- (A) *Aster trifolium*
- (A) *Scirpus maritima*
- (C) *Triglochin maritima*
- (C) *Halimione portulacoides*
- (F) *Sueada maritima*
- (O) *Salicornia sp.*
- (O) *Atriplex sp.*

Appendix A

Relative Scale of Abundances

(i) Flora: (Saltmarsh species, & marine algae)

Abundant	Plants mostly less than 50cm apart, or more than 20% cover over most of the area
Common	Plants 1 to 2m apart, or less than 20% cover. Many plants present in zone.
Frequent	Plants 1 to 2m apart, or < 20% cover, with patchy or scattered distribution.
Occasional	Plants more than 2m apart, or scattered distribution.
Rare	Few plants present.

(ii) Sedentary Fauna: (Barnacles, mussels but also incorporating burrowing organisms i.e. *Arenicola*, *Macoma* etc where burrows are visible, rather than organisms.

Abundant	More than 50% cover or more than 100/cm
Common	10 to 50% cover - many small or a few large patches; or 1 to 99/cm .
Frequent	Scattered patches, 1 to 10% cover. 1 to 99 per 10cm .
Occasional	Scattered patches, less than 1% cover. 1 to 9 per m .
Rare	Widely scattered patches or individuals. Less than 1 per m .

(iii) Small Mobile fauna: (amphipods, polychaetes, periwinkles)

Abundant	More than 50 organisms per sample/scan
Common	20 to 49 organisms per sample / scan
Frequent	10 to 19 organisms per sample / scan
Occasional	5 to 9 organisms per sample / scan
Rare	1 to 4 organisms per sample / scan

(iv) Large Mobile fauna: (crabs, shrimps, small fish)

Abundant	More than 20 organisms per sample.
Common	10 to 19 organisms per sample.
Frequent	5 to 9 organisms per sample.
Occasional	2 to 4 organisms per sample.
Rare	A single specimen in sample.

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