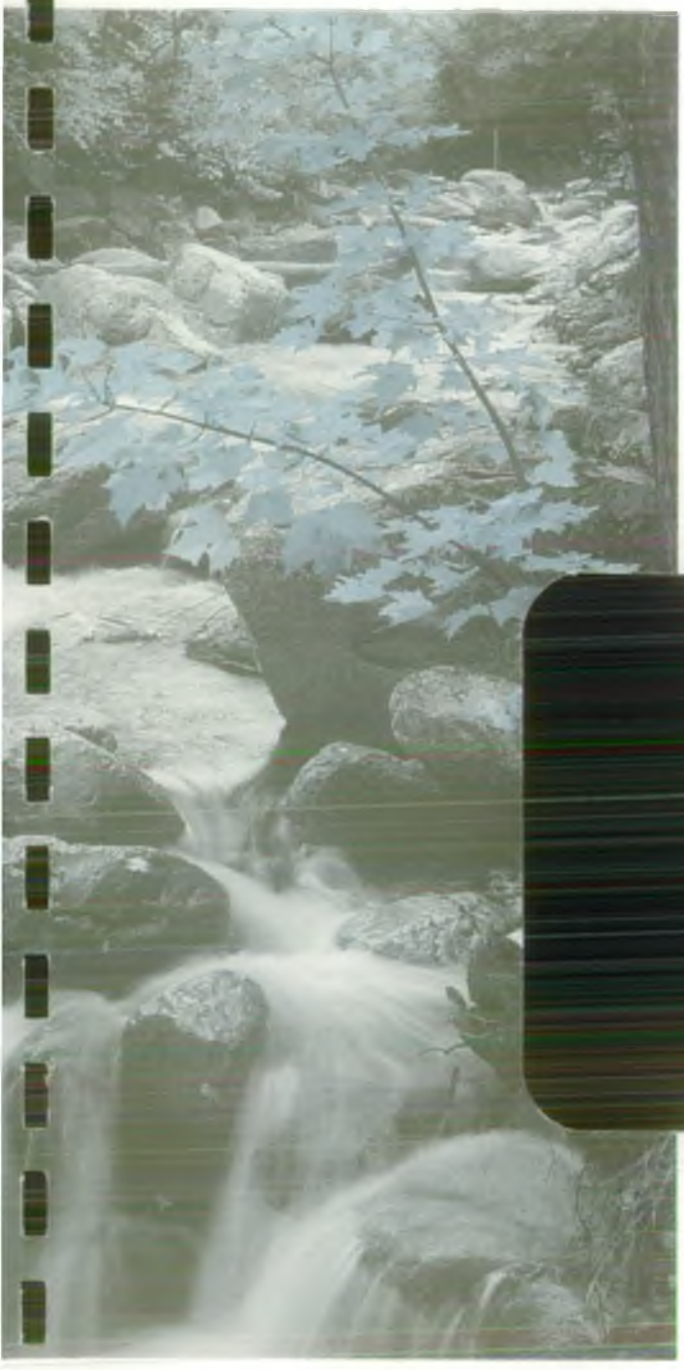

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National Rivers Authority
North West Region

GUARDIANS OF THE WATER ENVIRONMENT

BIOLOGICAL REPORT OF THE 1991 COASTAL SURVEY, FROM CROSBY TO GLASSON

By Elizabeth Potter MSc. MIBiol.

Crab zoea larva

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1991 BASELINE COASTAL AND ESTUARINE MONITORING

BIOLOGY CENTRAL AREA

Report written by Elizabeth Potter, February 1992

CONTENTS:

1. SITE SELECTION

1.1 Coastal Sites

The coastline from Crosby to Glasson was divided into 9 stretches, on the basis of individual uniformity. i.e an individual stretch consisted of fairly consistent substrates and exposure levels throughout. A sampling site which was deemed typical of the stretch was selected for monitoring purposes. The stretches and sites are listed in Appendix B.

1.2 Estuary Sites

Seven estuaries are covered in this baseline survey. Sample points were selected to represent the different types of habitat available throughout the salinity regime. Again, these are listed in Appendix B.

2. METHODS

The continual changes in physical characteristics of some intertidal regions is a phenomenon which may greatly affect data repeatability, particularly where a single sampling method is used. The coastline and estuaries covered in this report are particularly susceptible to change, as the sandy and muddy substrates typically found in this area are the most mobile of sediments and can vary greatly according to season. Instead, the use of a combination of techniques can more effectively sample a changing beach profile or new sediment deposition. There is also increased scope for inclusion of a wider range of habitats within a site, through the use of a variety of sampling methods. Of the methods used, the following were the most successful and are recommended for future surveys in this area.

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 prominant 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 Core samples

Two 2cm cylindrical sediment cores were taken to a depth of 10 cm (or 5 cm for muddy / clay substrates). Both samples were frozen at the laboratory; one for particle size analysis and the other for total organic carbon analysis. The depth of the anoxic layer was also recorded.

2.5 Fish trawl

The Wyre and Ribble Estuaries were trawled using an Otter trawl for the Wyre and a Beam trawl for the Ribble. Local fishermen, their on boats and equipment, were used. This proved to be a successful and cost-effective method of survey. The other advantages of using these survey means were in the expertise of the fishermen, through handling their own equipment and in information available on optimal fishing areas and as to whether the catch was typical for that time of year.

2.6 Plankton trawl

A one minute plankton trawl was conducted during the beam trawl, using a standard conical net of diameter 30cm and mesh size 60um. Samples were transferred into clear jars and fixed using Lugol's Iodine.

2.7 Artificial colonisers

The Ribble was selected as the trial area for implanting artificial colonisers. Six lengths of hardwood measuring 7 by 30cm were cut and labelled. A 5mm hole was drilled in each corner for attachment with heavy duty fishing line. The wood was tied onto the the mile posts along a stretch of the Ribble from Lytham to a point East of the sewage works discharge area. The posts are still in situ on the date of writing this report and will be examined periodically. The results will be reported at a later date.

2.8 Algal analysis for heavy metals

Enteromorpha was collected from a number of sites along the Coast and Estuaries. The exercise was carried out throughout the region, in the same week, by the three area offices. Samples were sent to the chemistry laboratories and tested for the following suite of determinands;

Copper ; Zinc ; Cadmium ; Mercury ; Lead

These results are reported separately.

RESULTS

This initial survey provided the beginning of the database for this area, so qualitative data was used rather than placing too much emphasis on numbers. Notes on relative abundances are given, where appropriate, using the following notation: A - abundant, C - common, F - frequent, O - ocassional, R - rare.

The scale of abundance follows a commonly used notation and has been assigned values, for this survey, as given in Appendix A.

3. Coastal Stretches

3.1 Crosby to Altmouth
Sampled off Coastguard Station

General synopsis: The stretch is influenced by the River Alt at the Northern limit and the Mersey from the South. The coastline is mainly sandy, often combined with a muddy, clay sediment. The site visited is a high amenity area, with good parking facilities. The coastal footpath to Formby is popular with dog owners. The site is strongly influenced by water from the Mersey, which was apparent at the time of survey. The shore was aesthetically poor, with much sewage debris and litter distributed. The coastal path supported a small, but encouraging marsh fauna. The upper shore was composed of a firm, compacted sand with underlying thick, black anoxic layer. The middle shore supported ridge pools which were densely colonised by fine algae and diatoms. The lower shore became increasingly muddy and anoxic and was not safe for access at the time of survey.

Marsh Flora:
[A] *Carex arenaria* (sand sedge)
[O] *Chamaemelum nobile* (wild chamomile)
[O] *Atriplex sp.* (orache)
[O] *Diplotaxis sp.* (wall rocket)
[O] *Lavatera sp.* (mallow)

Shore Organisms:
[A] *Eurydice pulchra* (isopod)
[A] *Corophium sp.* (amphipod)
[C] *Macoma balthica* (baltic tellin)
[F] *Mytilus edulis* (common mussel)
[O] *Nereis diversicolor* (rag worm)
[O] *Carcinus maenas* (common shore crab)
[O] *Enteromorpha intestinalis* (green alga)

3.2 Altmouth to Southport Pier
Sampled at Mad Wharf

General synopsis; This stretch covers part of the continuous Sefton Coast dune complex, which extends from Crossens to Formby. Prior to this survey, a large proportion of this coastal stretch was nominated a SSSI "Land of Special Interest" by English Nature. The selected site consists of vast expanses of compacted sand with a fine sand, mobile surface. Shallow tidal pools separate the upper and lower shores and the beach becomes more ridged towards the middle shore. The pools formed in these ridges were devoid of algal or diatom films, also implying continuous sediment transport. The shallow tidal pools contained reasonable numbers of small flatfish and crustacea, which were also found in the sieved samples.

Dune flora: see SSSI notification report.

Shore organisms:
[A] *Lanice conchilega* (sand mason)
[C] *Bathyporeia pelagica* (amphipod)
[O] *Macoma balthica* (baltic tellin)
[O] *Eurydice pulchra* (isopod)
[O] *Crangon vulgaris* (common shrimp)
[O] *Carcinus maenas* (common shore crab)
[R] *Corophium volutator* (amphipod)
[R] *Scophthalmus maximus* (turbot)

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

General synopsis; The nature of the shore changes considerably in this stretch, as a transition is made from fine, shifting sands at the Southern limit, to a compact mud/clay sand at the Northern end. The selected site off Hesketh Road is an example of the more muddy-type substrate and proved very difficult to sieve. The middle shore is divided by muddy creeks which do not retain much water with the recessing tide.

The anoxic layer was well-defined in the sediments at the time of survey and traces of sewage litter were present throughout. The top of the shore supported a limited marsh which was mainly dominated by 2m diameter clumps of *Spartina*, spread some 8m apart. The flora diversified as it continued on the shore side of the road.

The pier support legs were surveyed in addition to the muddy site in order to cover the biological diversity offered throughout this stretch.

Marsh Flora:
[C] *Spartina sp.* (cord-grass)
[C] *Ammophila arenaria* (marram grass)
[O] *Epipactis palustris* (marsh helliborine)
[O] *Sagina maritima* (sea pearlwort)
[O] *Atriplex sp.* (orache)
[O] *Spergularia marina* (sand spurry)
[O] *Hordeum marinum* (sea barley)

Shore Organisms:
[C] *Semibalanus balanoides* (acorn barnacle)
[O] *Mytilus edulis* (common mussel)
[O] *Hydrobia ulvae* (laver spire shell)
[O] *Enteromorpha sp.* (green alga)
[R] *Corophium volutator* (amphipod)

3.4 St. Annes Pier to Blackpool North Pier
Sampled off the promenade at A5073 and Pier Supports.

General synopsis: The beach is composed of a fine, compact sand. The middle shore often contains dips which fill with standing water with the receeding tide. Occasionally dense masses of the sand mason, *Lanice conchilega* are washed onto the shore following severe weather.

During the survey, traces of sewage litter and faeces were present on the shore. The pier support legs were also included in the survey and were found to support a high density but low diversity population.

Shore organisms:
[C] *Bathyporeia pelagica* (amphipod)
[C] *Haustorius arenaria* (amphipod)
[O] *Scolelepis squamata* (spionid worm)
[O] *Polydora ciliata* (spionid worm)
[O] *Capitella capitata* (capitellid worm)
[O] *Scoloplos armiger* (orbinid worm)
[O] *Crangon vulgaris* (common shrimp)
[O] *Hydrobia ulvae* (laver spire shell)
[O] *Lanice conchilega* (sand mason)
[R] *Carcinus maenas* (common shore crab)

On pier legs:
[D] *Mytilus edulis* (common mussel)
[A] *Semibalanus balanoides* (acorn barnacle)
[O] *Balanus crenatus* (barnacle)
[O] *Enteromorpha sp.* (green alga)

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

General synopsis: The site consists of a gravel / shingle beach, extending some 50m from the promenade. Beyond this, compacted sand with a fine sand top layer dominates the middle shore. The lower shore is a soft mud and clay, restricting access somewhat. The drainage is poor, particularly around the beach groynes, leaving tidal pools in isolation.

Shore organisms:
[A] *Nereis diversicolor* (ragworm)
[C] *Eurydice pulchra* (isopod)
[C] *Arenicola marina* (lugworm)
[F] *Bathyporeia pelagica* (amphipod)

On groynes:
[A] *Semibalanus balanoides* (acorn barnacle)
[A] *Enteromorpha sp.* (green alga)
[O] *Porphyra umbilicalis* (purple laver - red alga)
[O] *Carcinus maenas* (common shore crab)
[R] *Ulva lactuca* (sea lettuce - green alga)

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

General synopsis: The area is composed of a very mixed substrate which alters with season and weather conditions. At the time of survey, the upper shore was characterised by fine sand, followed by an area of shingle and mud. Within the latter region, small mussel scars were present. Moving seaward, a band of *Enteromorpha* was mixed with the mussel beds. A small stream running parallel to the shore divided the mussel zone from the vast tidal sand flats beyond.

The groynes and tidal pools were also examined in this survey.

Shore organisms:
[A] *Mytilus edulis* (common mussel)
[C] *Enteromorpha sp.* (green alga)
[O] *Corophium volutator* (amphipod)
[R] *Nereis diversicolor* (ragworm)
[R] *Cerastoderma edule* (common edible cockle)
[R] *Carcinus maenas* (common shore crab)

On groynes:
[A] *Mytilus edulis*
[A] *Semibalanus balanoides* (acorn barnacle)
[C] *Enteromorpha sp.*
[F] *Fucus vesiculosus* (bladder wrack - brown alga)
[O] *Littorina littorea* (edible periwinkle)
[O] *Littorina saxatilis* (rough periwinkle)
[O] *Porphyra umbilicalis* (purple laver - red alga)
[R] *Ulva lactuca* (sea lettuce - green alga)

3.7 Knott End to Pilling Channel
Sampled at Fluke Hall

General synopsis: The Northerly-facing Fylde coast from Knott End takes on a very different aspect, compared to the open, exposed and transient mud, sand and scar at Fleetwood. Morecambe Bay has sheltered this part of the coastline. This has resulted in the deposition of silted sediments, which have compacted into dense mud and subsequently been colonised by marsh vegetation.

The colonising process is still in progress. *Spartina* was found to be co-dominant with *Salicornia* on isolated raised mud clumps; a pattern which was repeated for most of the Pilling marsh. The anoxic layer was present immediately beneath the surface, further indicating static conditions.

Marsh Flora:
[A] *Spartina sp.*
[A] *Salicornia sp.* (marsh samphire or glasswort)
[O] *Halimione portulacoides* (sea purslane)
[O] *Aster tripolium* (sea aster)

Shore organisms:
[C] *Corophium volutator* (amphipod)
[O] *Carcinus maenas* (common shore crab)
[O] *Nereis diversicolor* (ragworm)
[R] *Macoma balthica* (baltic tellin)

3.8 Pilling Channel to Cocker Channel
Sampled off Lane Ends

General synopsis: This area forms part of an important ecological habitat, as it is dominated by extensive marshes. The vegetation is typical of a West coast grazed saltmarsh and shows a marked contrast to the non-grazed marshes of the Wyre estuary.

The vegetation showed a characteristic marsh succession, with six defined zones from seaward to landward as follows:

1. Glasswort
2. Saltmarsh grasses
3. Thrift / grasses
4. Fescue / grasses
5. Fescue / mud rush
6. Sea rushes

Marsh flora:

Zones 1 to 3;
Salicornia (glasswort)
Puccinellia maritima (sea manna grass)
Aster tripolium (sea aster)
Armeria maritima (thrift)

In creeks;
Cochleria officinalis (scurvey grass)
Spergularia maritima (sea spurrey)

Zones 4 to 5;
Puccinellia maritima
Juncus gerardii (mud rush)
Juncus maritima (sea rush)
Plantago maritima (sea plantain)
Triglochin maritima (sea arrow grass)
Carex maritima (sea sedge)
Festuca rubra (fescue)

Zone 6;
Aster tripolium
Cochleria officinalis
Carex maritima

Shore organisms:
[A] *Corophium volutator* (amphipod)
[O] *Nereis diversicolor* (ragworm)
[O] *Carcinus maenas* (common shore crab)
[R] *Hydrobia ulvae* (laver spire shell)

3.9 Cocker Channel to Lune Mouth
Sampled at Cockersands Abbey.

General synopsis: The site provides a reasonable range of habitats. The upper shore is colonised by a relict salt marsh flora. This gives way to a muddy, stony ground, which provides a good habitat for barnacles and mussels.

The sandy mud areas were found to support good populations of lugworms, ragworms and tellins. The muddier areas of the site have been colonised by *Spartina* and *Enteromorpha*. Sewage litter was present on the strand line at the time of survey. *Corophium* was abundant here as the solitary species.

Shore organisms:
Mytilus edulis (common mussel)
Arenicola marina (lugworm)
Macoma balthica (baltic tellin)
Nereis diversicolor (ragworm)
Corophium volutator (amphipod)
Chthamalus montagui (barnacle)
Enteromorpha sp. (green alga)
Tellina tenuis (thin tellin)
Littorina littorea (edible periwinkle)
Carcinus maenas (shore crab)
Hydrobia ulvae (laver spire shell)

Marsh flora:
Spartina sp. (cord grass)

4. Estuaries

Of the eight estuaries listed in Appendix B, the Wyre and Ribble were studied in detail. Both are of economic importance as shrimp fisheries and as passages for migratory salmonids. The Wyre additionally has a considerable amenity value. The Ribble was selected as a case study for the use of artificial colonisers as there were moderate amounts of previous chemical data and biological studies for reference. Bothe estuaries were trawled to examine resident fish species and variations in size and abundance.

The Crossens marsh was not visited this survey due to limitations in time and access.

The Alt, Conder and Cocker were sampled at one site each, using methods employed during the coastal surveys.

4.1 Alt Estuary

The Alt estuary comprises some 1,412 hectares, all of which is considered intertidal. There is 14km shoreline and 5.2km of tidal channel.

Two sites were selected for monitoring, of which only the Hightown site (representing the upper estuary) was readily accessible for sampling purposes. It may be possible to include an alternative lower estuary site for the next survey, if time permits. The Alt emerges from Altmouth in a narrow, deep muddy creek. The banks are barren and inaccessible from the shore. The shore path passes through a well-established upper marsh flora, which is dominated at the seaward side by *Spartina* and *Salicornia*. The landward side is heavily colonised by curled dock and lop-grass.

It was not possible to sieve bank sediments or net water pools, for restricted access in deep mud.

Marsh flora:

[A] *Spartina sp.* (cord grass)
[A] *Salicornia sp.* (samphire or glasswort)
[C] *Halimione portulacoides* (sea purslane)
[F] *Plantago maritima* (sea plantain)
[F] *Atriplex sp.* (orache)
[F] *Rumex crispus* (curled dock)
[F] *Bromus mollis* (lop grass)
[O] *Carex arenaria* (sand sedge)
[O] *Spergularia marina* (sand spurry)

4.2 Conder
Sampled at old railway

The upper shore supports a moderately diverse marsh flora, which is dominated by *Spartina*. The marsh becomes increasingly muddy and drops away to a muddy shingle interspersed with small boulders at the seaward edge.

Marsh flora:
Spartina sp. (cord grass)
Salicornia sp. (glasswort)
Suaeda maritima (seablite)
Halimione portulacoides (sea purslane)
Aster tripolium (sea aster)
Atriplex sp. (orache)
Triglochin maritima (sea arrow grass)

Shore organisms:
Corophium volutator (amphipod)
Nereis diversicolor (ragworm)
Arenicola marina (lugworm)
Macoma balthica (baltic tellin)
Hydrobia ulvae (laver spire shell)
Semibalanus balanoides (acorn barnacle)
Carcinus maenas (shore crab)
Fucus ceranoides (brown alga)
Mytilus edulis (common mussel)
Enteromorpha sp. (green alga)

4.3 Cocker
Sampled at Bank End Farm

The site comprises a marsh and varied sediment, including; sand, mud, and stony ground.

The extreme upper shore had been colonised by *Spartina*, which dominated the marsh flora. A narrow band of sparse *Salicornia* plants had persisted on the seaward fringe of the marsh. Both lugworm and *Corophium* were found in mud lining the intertidal channels. *Corophium* dominated further up the muddy part of the shore, whereas numbers of lugworm increased towards the seaward limit.

The Cocker channel itself was composed of a firm, compact sand. The lugworm population had become sparse, but increased again on the far side of the channel.

The stony sediments supported moderate populations of *Corophium* and provided a protected habitat for shore crabs, and topshells.

Marsh Flora:
[A] *Spartina sp.* (cord-grass)
[F] *Salicornia sp.* (glasswort)
[F] *Suaeda maritima* (annual seablite)
[O] *Puccinellia maritima* (sea manna grass)
[R] *Aster tripolium* (sea aster)

Shore organisms:
[A] *Corophium volutator* (amphipod)
[A] *Arenicola marina* (lugworm)
[F] *Nereis diversicolor* (ragworm)
[O] *Carcinus maenas* (common shore crab)
[R] *Littorina littorea* (edible periwinkle)

4.4 Ribble Estuary

The Ribble covers 11,924 hectares, of which 10,674 are intertidal. There are 107.5km of shoreline and 28.4km of tidal channel. The sediment of the majority of the estuary is mud, with an increasing tendency to sand towards the mouth. For sampling purposes, the outer estuary is delimited by sandbanks off Lytham to the North and by the saltmarshes of Crossens to the South.

Three sites were designated for sampling purposes, although additional sites were visited by hovercraft.

(i) Church Scar

Sampled off Fairhaven Lake.

This site represents the true outer estuary. A small marsh is struggling at the extreme upper shore. The muddy substrate rapidly gives way to vast expanses of sandbanks, which are interspersed by deep drainage channels. Mussel scars line the edge of the main channel.

The beach contained a moderate coating of sewage litter at the time of survey.

Marsh vegetation:

[C] *Spartina sp.* (cord grass)
[C] *Salicornia sp.* (glasswort)
[F] *Suaeda maritima* (seablite)
[O] *Spergularia marina* (sand spurry)

Shore organisms:

[A] *Corophium volutator* (amphipod)
[C] *Nereis diversicolor* (ragworm)
[F] *Carcinus maenas* (shore crab)
[F] *Cerastoderma edule* (edible cockle)
[F] *Mytilus edulis* (common mussel)
[O] *Macoma balthica* (baltic tellin)
[O] *Hydrobia ulvae* (laver spire shell)
[R] *Lipura maritima* (insect)
[R] *Enteromorpha sp* (green alga)

(ii) Douglas

The sampling area has poor access, consisting of a narrow muddy channel and expanses of marsh turf, extensively grazed by sheep. Samples were difficult to sieve; the short species list may reflect this.

Shore organisms:

[O] *Nereis diversicolor* (ragworm)
[O] *Polydora ciliata* (Spionid worm)

(iii) Main Drain
Unsuitable for access at time of survey.

(iv) Up-estuary of Savick Brook

The site is typical of much of the Ribble, with steep sloping muddy banks exposing some 50m shoreline at low water. There is a small condensed marsh on the Northern upper shore and grazed land on the Southern shore. The muddy banks are covered with a green algal slime and rubbish is heaped at the high strand line.

Marsh flora:
[F] *Salicornia* (glasswort)
[F] *Atriplex sp.* (orache)

(v) Other Stations Visited:

The stretch of Ribble between Lea Marsh and Warton Bank was visited by hovercraft. Brief surveys of each site were made, noting visible specimens and their abundances. The sites are as follows and are numbered from the seaward to Preston Dock end.

Site Location	Post	Bank	Waypoint
1 Hesketh Sands	9	South	53 43.72 2 58.29
2 Warton Bank.	8.5	North	53 43.73 2 56.74
3 Warton Airfield	6	North	53 44.07 2 52.63
4 Off STW	4	North	53 44.30 2 51.33
5 Clifton Marsh	3	North	53 44.71 2 49.29
6 Lea Marsh	Pier	North	53 45.25 2 46.91

Additional Ribble sites, survey summaries.

1. Hesketh Sands.

The extensive stretches of sandbanks are open and exposed at low water. The sand is soft and waterlogged in places. The mile post supported reasonable populations of typical fouling organisms.

[F] *Mytilus edulis* (common mussel)
[F] *Semibalanus balanoides* (acorn barnacle)
[O] *Enteromorpha sp.* (green alga)

2. Warton Bank.

A mud bank extending some 200m to the low water line. Impoverished marsh on upper shore - mostly Spartina.

[C] *Semibalanus balanoides*
[O] *Enteromorpha sp.*
[F] *Spartina sp.* (cord grass)

3. Warton airfield.

Same type of site as (2). *Spartina* clumps.

4. Off Sewage Works.

Barren muddy banks, with underlying deep anoxic layer. *Spartina* dominant on the upper shore and co-dominant with *Suaeda* on the middle shore. the extreme upper marsh was composed of saltmarsh grasses, which were intensively grazed by cattle. The mile post was colonised by typical fouling organisms, dominated by barnacles. Small, slate-shaped rocks covered the extreme lower shore, providing cover for small shore crabs and numerous ragworms.

[A] *Semibalanus balanoides*
[A] *Nereis diversicolor* (ragworm)
[F] *Enteromorpha sp.*
[O] *Carcinus maenas* (shore crab)
[R] *Ectocarpus siliculosa* (brown alga)

5. Clifton Marsh

Muddy banks extend some 150m from the low water line. In contrast, the Southern banks are sandy. The lower shore is a compact mud and boulders line the low water channel. *Spartina* reaches a peak density, with 40% cover on the top shore.

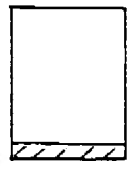
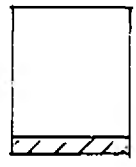
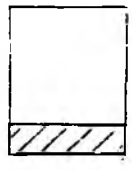
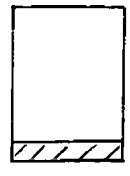
[A] *Spartina sp.*
[C] *Semibalanus balanoides*
[O] *Enteromorpha sp.*

6. Lea Marsh

The site features a steeply shelving, muddy bank of 50m. There is a short marsh with poorly established glasswort, mixed with equal numbers of orache. Again, a grazed upper marsh.

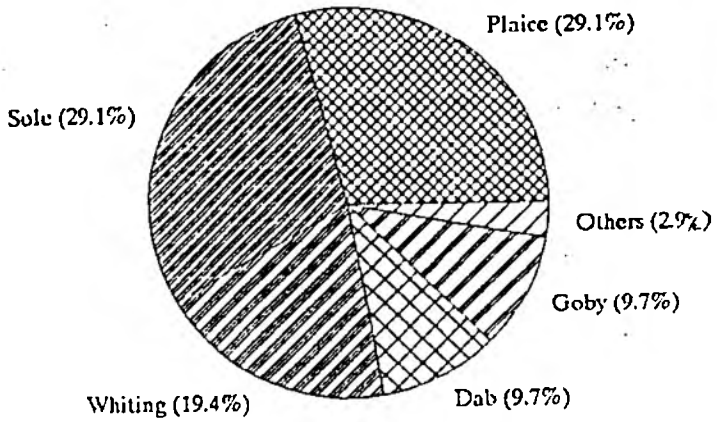
[F] *Salicornia sp.* (glasswort)
[F] *Atriplex sp.* (orache)

4.4.1 Results of Ribble Fish and Plankton Trawl.

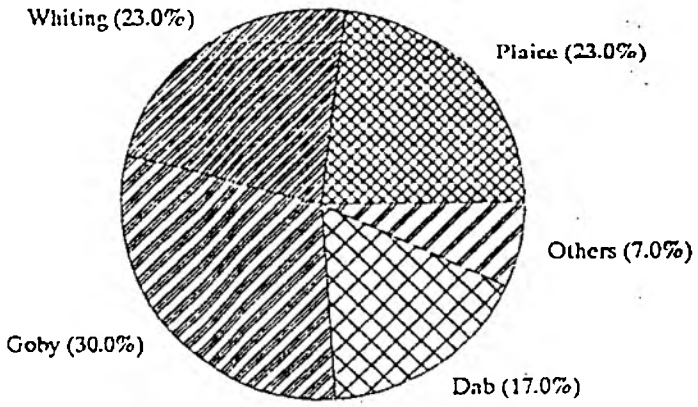
TRAWL LOCATION	PLANKTON SPECIES	TRAWL COMPOSITION
Off Fairhaven	No trawl	 90 % Shrimp 10 % Fish * Others: Crab, Pipefish, Red Gurnard
Off Church Scar	Microcalanus sp. (1°) Pseudocalanus sp. (1°) Biddulphia sinensis Navicula sp. Pleurosigma sp. Coscinodiscus radiatus Carcinus maenas zoea Lamellibranch larva Nematodes	 90 % Shrimp 10 % Fish * Others: Crab, Weaver, Red Gurnard
Warton Bank	Microcalanus sp. (1°) Coscinodiscus sp. Biddulphia sp. Lamellaria sp. Nematodes	 80 % Shrimp 20 % Fish * Others: Crab, Plaice
Off R.Douglas	Nematodes (1°) Microcalanus sp. (2°)	 60 % Shrimp 40 % Fish * Others: Crab
Off S.T.W.	Nematodes (1°)	 90 % Shrimps 10 % Fish

* "Others" refers to species listed thus on Pie-Charts (Often represented by a single specimen)

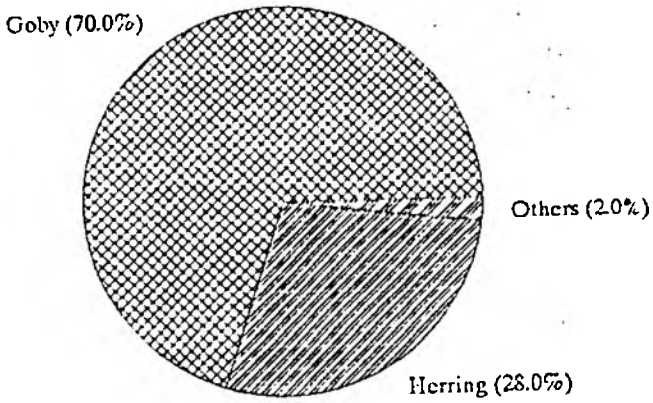
TRAWL 1. Off Fairhaven Lake



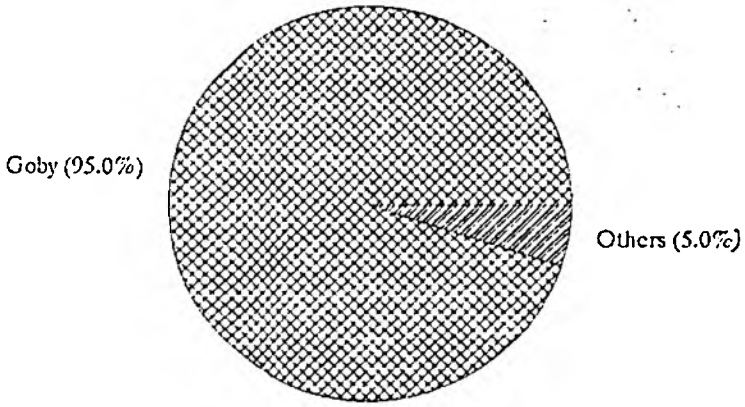
TRAWL 2. Off Church Scar



TRAWL 3. Warton Bank



TRAWL 4. Douglas Estuary Mouth



TRAWL 5. Off Sewage Works

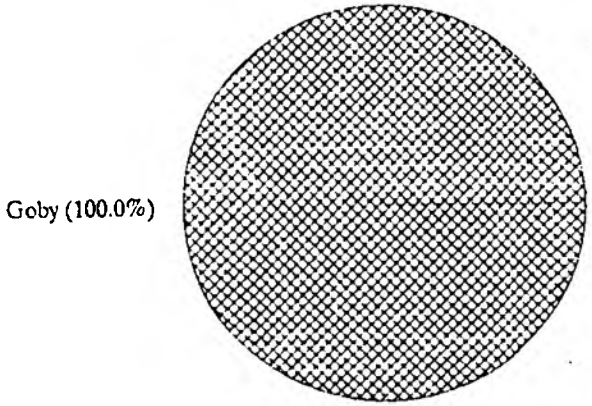


TABLE SHOWING SIZE OF FISH (cm) IN TRAWL

	F Haven	Ch.Scar	Warton	Douglas	STW
Plaice (no.)	10.3 (9)	13.1 (4)	17.5 (1)		
Dab (no.)	5.7 (6)	6.5 (3)			
Sole (no.)	9.5 (6)	11 (1)			
Whiting (no.)	14.1 (7)	16.1 (4)			
Goby (no.)	6.7 (3)	6.6 (5)	6.7 (10)	6.92 (10)	6.6 (10)
Herring (no.)			6.6 (9)	5.75 (2)	
Flounder (no.)				12.67 (3)	
Total no. of species: (incl. those not on table)	9	9	5	5	2

Notes on species recorded in the table:

Plaice *(Pleuronectes platessa)*; Feed on bristleworms *(Nepthys)* and tellins *(Macoma)*

Dab *(Limanda limanda)*; compete with Plaice - similar diet.

Sole (*Solea solea)*; Feed on crustacea, bristleworms, tellins and small gobies.

Whiting (*Merlangius merlangius*); Feed on prawns / small herring.

Herring (*Clupea harengus)*; Principle food are copepods and crustacean larvae.

Flounder (*Platichthys flesus)*; Food - chironomids/worms/gobies.

4.5 Wyre Estuary

This Northerly-facing estuary is positioned at the SouthWest edge of Morecambe Bay. The mouth and majority of the 3km seaward stretch are of a sandy nature. Towards the upper estuary, the substratum becomes increasingly muddy and interspersed with large, cobbled mussel scars which stand prominent at low tide. The large chemical plant is a noticeable feature on the Western bank.

Four sites were monitored this survey.

(i) Wyre Light

This site represents the extreme outer estuary. The light is situated on a vast, rippled , flat sandbank on the Fleetwood side of the estuary mouth. The light support provides an ideal colonising structure for monitoring purposes. A vertical plan of the structure, showing percentage cover of the key species, is given below.

Species, % cover

	1 Ulv	2 Ent	3 Bal	4 Myt	5 Lit	6 Fuc	7 Asc	8 Ect	9 Por
4m		60	40						
3.5m		60	50						
3m		50	60						
2.5m		30	60	30					
2m			40	60	7			60	5
1.5m		5	20	60	2			33	3
1m	2			60		2	4	5	3
0.5m TIDAL POOL	1			30				2	3

Key Species:
1. *Ulva lactuca* (sea-lettuce)
2. *Enteromorpha sp.*
3. *Semibalanus balanoides* (acorn barnacle)
4. *Mytilus edulis* (common mussel)
5. *Littorina sp.* (periwinkle)
6. *Fucus serratus* (toothed wrack)
7. *Ascophyllum nodosum* (knotted wrack)
8. *Ectocarpus siliculosus*
9. *Porphyra umbilicalis* (purple laver)

The table shows a fairly typical vertical zonation plan, with a succesion of green algae; cirripedia; molluscs; brown algae and red algae. A few anomalies occur in the low level distribution of *Fucus serratus* and *Ascophyllum nodosum*. This could be attributed to differences in tolerance to exposure through wave action and tidal scouring. A permanent tidal pool of 0.5 to 1m in depth surrounds the structure. The surrounding sandbanks would offer a degree of shelter from wave action, which would favour the less exposure-tolerant forms, such as the above-mentioned brown algae and the delicate green *Ulva lactuca*.

(ii) Barnaby Sands

The site is designated a SSSI. The area is an expanse of sandbanks with occasional muddy gravel substrate. The latter areas commonly support mussel scars. The nature of the estuary varies considerably on the eastern shore also giving rise to extensive marshlands. The western shore is a short beach of sand mixed with mud. Pale bleached forms of *Fucus ceranoides* straggle the lower shore and small barnacles inhabit rock surfaces, where available.

Marsh flora:

- *Spartina sp* (cord grass)
- *Salicornia sp* (glasswort)
- *Armeria maritima* (thrift)
- *Limonium vulgare* (sea lavender)
- *Triglochin maritima* (sea arrow grass)
- *Aster tripolium* (sea aster)
- *Plantago maritima* (sea plantain)
- *Halimione portulacoides* (sea purslane)
- *Cochleria officinalis* (scurvy grass)
- *Suaeda maritima* (seablite)
- *Atriplex sp.* (orache)

Shore organisms:

- *Enteromorpha sp.* (green alga)
- *Semibalanus balanoides* (acorn barnacle)
- *Fucus ceranoides* (brown alga)

(iii) Stannah

An extensive well-developed marsh, showing distinct vegetation banding patterns. *Spartina* is well established on the upper shore and creeping seawards. The majority of the middle shore is dominated by *Halimione*. Detailed marsh survey details reported seperately (annual survey in October)

(iv) Shard Bridge

This site represents a truly estuarine picture, with a mixture of organisms present representing a variety of salinity regimes. The Southern banks are muddy with overlying sand. The Northern shore was sampled in preference as it represented a wider variety of habitats. The survey area consisted of a narrow, but flourishing marsh and a shingle-covered, muddy beach.

Marsh flora:

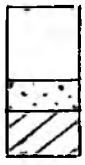
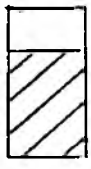
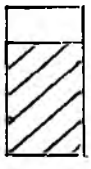
upper shore;
[A] *Spartina sp.* (cord grass)
[A] *Scirpus maritima* (bull rush)
[F] *Atriplex sp.* (orache)
[O] *Calystegia soldanella* (Sea bindweed)
[R] *Chamaemelium nobile* (wild chamomile)

mid-shore
[A] *Aster tripolium* (sea aster)
[A] *Scirpus maritimus* (bull rush)
[C] *Spartina sp.*
[F] *Suaeda maritima* (seablite)
[F] *Halimione portulacoides* (sea purslane)
[F] *Triglochin maritima* (sea arrow grass)
[F] *Agropyron pungens* (sea couch grass)
[O] *Juncus*

lower shore
[C] *Salicornia sp*
[C] *Atriplex sp.* (orache)
[F] *Halimione portulacoides*
[O] *Spartina*
[O] *Aster tripolium*

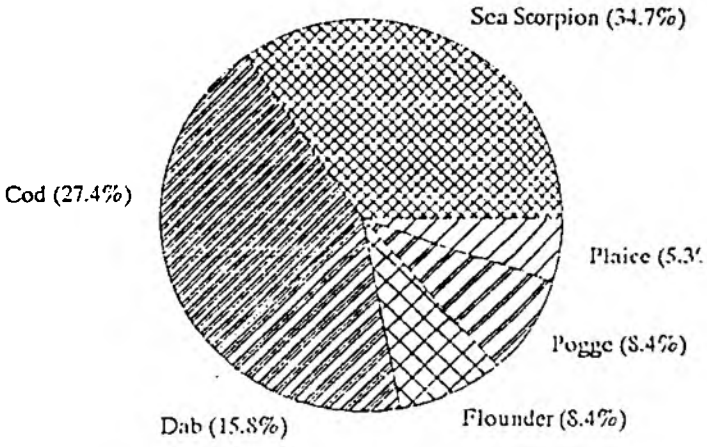
Shore organisms:
[A] *Nereis diversicolor* (ragworm)
[A] *Crangon crangon* (common shrimp)
[F] *Semibalanus balanoides* (acorn barnacle)
[O] *Tubifex* larva
[O] *Cerastoderma edule* (edible cockle)
[O] *Hydrobia ulvae* (laver spire shell)
[O] *Fucus spiralis* (spiral wrack)
[R] *Gobius sp.* (goby)
[R] *Carcinus maenas* (shore crab)
[R] *Ulva lactuca* (sea lettuce)

4.5.1 Results of Wyre Fish and Plankton Trawl.

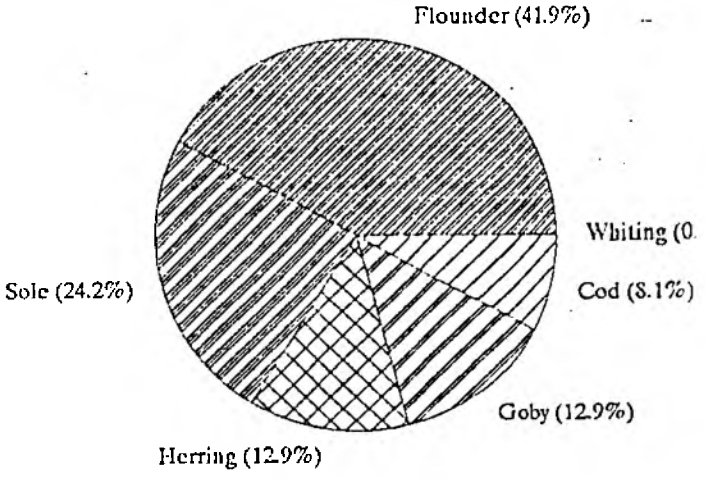
TRAWL LOCATION	PLANKTON SPECIES	TRAWL COMPOSITION
Off Fleetwood Nr. Power Sta.	No trawl	 50 % Shrimp 20 % Crab 30 % Fish *Others: Whiting Goby Ling
Off Skippool Creek	Biddulphia sinensis (1°) Pseudocalanus sp. (2°) Navicula sp. Eucampia zoodiacus Pleurosigms sp. Coscinodiscus radiatus Rhizosolenia sp. Chaetoceros Ceratium sp. Lamellibranch larvae Nematodes	 30 % Shrimp 70 % Fish
Off I.C.I.	Biddulphia sinensis (1°) Microcalanus sp. (2°) Coscinodiscus sp. Harpactacoid copepods Navicula sp. Ceratium sp. Chaetoceros sp. Nematodes	 25 % Shrimp 75 % Fish * Others: Sea goosebury

*See Comment p 19

TRAWL 1. Harbour Mouth



TRAWL 2. Off ICI



TRAWL 3. Skippool Creek

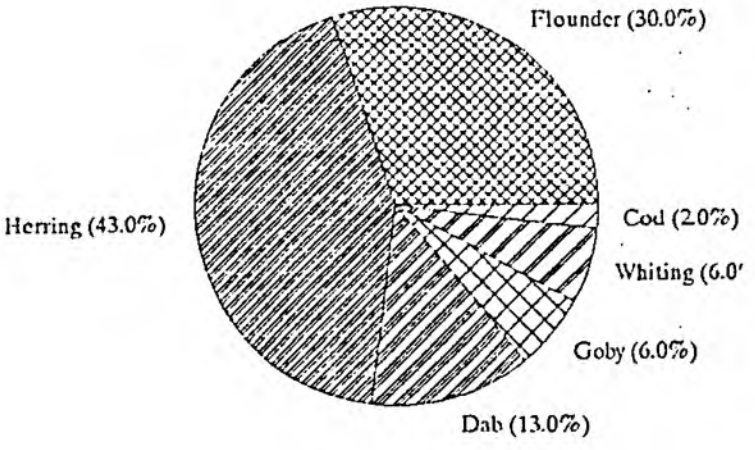


TABLE SHOWING SIZE OF FISH (cm) IN TRAWL

	Fleetwood	I.C.I	Skippool
Pogge no.	9.7 (6)		
Sea scorp no.	7.7 (11)		
Cod no.	17.4 (11)	8 (2)	10.5 (2)
Whiting no.	10.5 (1)	15.7 (10)	11.6 (4)
Goby no.	8 (2)	7.4 (6)	7.5 (4)
Flounder no.	14.1 (6)	7.8 (10)	8.35 (10)
Plaice no.	12.75 (4)		
Dab no.	5.55 (10)		7.1 (6)
Ling no.	13 (3)		
Herring no.		10.5 (3)	10.2 (11)
Sole no.		14 (2)	
Total no. of species: (incl. those not on table)	11	8	7

4.6 Comparison of Sizes of Fish Caught on The Ribble and Wyre Estuaries.

		Approximate Distance from Mouth (km)			
		0	2	4	6
Site:	Ribble Wyre	Church Scar Fleetwood	Warton No trawl	Douglas I.C.I.	S.T.W. Skippool
Species: Plaice	Ribble Wyre	13.1 12.75	17.5 No data		
Dab	Ribble Wyre	6.5 5.55	No data		7.1
Sole	Ribble Wyre	11.0	No data	14	
Whiting	Ribble Wyre	16.1 10.5	No data	15.7	11.6
Goby	Ribble Wyre	6.6 8.0	6.7 No data	6.92 7.4	6.6 7.5
Herring	Ribble Wyre		6.6 No data	5.75 10.5	 10.2
Flounder	Ribble Wyre	 14.1	 No data	12.67 7.8	 8.35
No. of Species:	Ribble Wyre	9 11	5 No data	5 8	2 7
% shrimps in catch:	Ribble Wyre	90% 50%	80% No data	60% 30%	90% 25%

The results of the Ribble and Wyre trawls highlight a considerable variation in both fish and plankton abundance and diversity. Due to the limitations of the survey, i.e a single set of results - replicates were not possible in the time available, there are shortfalls in the data, but a trend towards greater species diversity in the Wyre is apparant.

Other variables which must be considered when comparing trawls on the Wyre and Ribble are the different tidal states at the time of trawl. The Wyre trawl was conducted on the bottom of the flood tide, as was the Upper Ribble. However, the outer Ribble was trawled on the low water slack.

The Ribble showed a fairly static community to be present, both in the plankton and fish populations. Shrimps were present at all sites, always accounting for at least 50 % of the catch. The species diversity had dropped considerably at approximately 2 km from the estuary mouth, being represented almost exclusively by shrimps and gobies.

In contrast, the Wyre supported a more varied fish population, even at 4 km from the estuary mouth. Shrimps were present throughout the survey, but never at levels greater than 50% of the catch. The absence of Dab in the middle part of the Wyre (sampled off ICI) was noted, but again, no conclusions can be drawn at this stage based on these non-replicate set of data. A few specimens of Dab found at the Skippool site had widespread body lesions and bleeding tumours. This condition is believed to affect about one in two hundred fish caught in the Wyre and occurs more commonly in Morecambe Bay, according to local fishermen.

Plankton trawls showed considerable variation both between estuaries and with distance from estuary mouth.

Diatoms dominated plankton populations in the Wyre, supported by Calanoid copepods. In the Ribble, a reasonably balanced population resembling that of the Wyre was found only at the outer estuary site. Here, copepods were the dominating organism. Thereafter, the population became increasingly dominated by nematodes, with a monoculture present off the Sewage Works. The results of the plankton survey may partially account for the poor diversity in fish population in the upper Ribble estuary. The absence of Herring at the STW site may be attributed to the lack of copepods in the plankton, as this is its principle food source. Herring accounted for approximately one-half of all fish caught at the corresponding site (6km from mouth) in the Wyre.

5. Recommendations and Improvements Arising from the 1991 Survey.

The report has outlined the variety of survey work carried out in the Autumn of 1991. Experimentation with the methodology was required in order to find a technique, or a combination of techniques that would be efficient and reproduceable. Since reviewing the survey procedures and results, the following points have been brought forward.

1. Garber analysis. The team felt that a single set of data generated on the day of survey was fairly meaningless, given the considerable day-to-day changes observed at many sites. It is recommended that such data should be collected on a more routine basis (Can be done by non-biologists). if required.

1. In the light of the success of the fishing trawls in both the Wyre and the Ribble, it is recommended that 3 seasonal trawls should be conducted in 1992. Numbers of trawls per survey should also be increased.

2. Two surveys of the coastal and estuarine sites should be conducted for 1992; one in Spring and another in Autumn. This should reduce seasonal variability and begin to build up our database.

4. The results of the plankton trawls indicated that there is scope for a more intensive plankton studies of both estuaries over a full tidal cycle. This should be feasible with the arrival of the new survey vessel.

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 encorporating 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 50 organisms per sample / scan
Frequent	10 to 20 organisms per sample / scan
Occasional	5 to 20 organisms per sample / scan
Rare	1 to 5 organisms per sample / scan

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

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

Appendix B

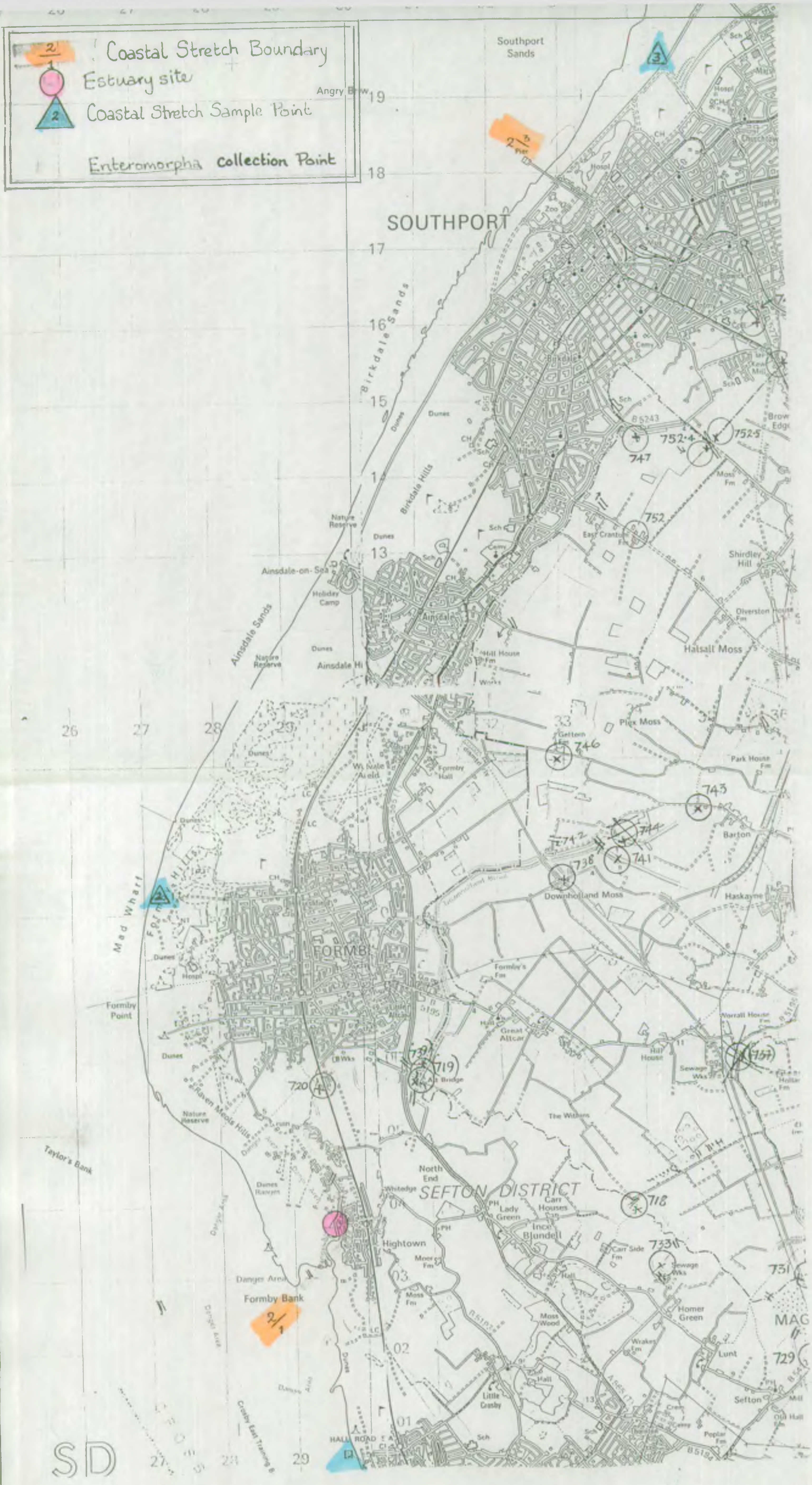
ESTUARY & COASTAL MONITORING, CENTRAL REGION
LIST OF CLASSIFIED STRETCHES AND SAMPLING POINTS.

1. Coastal

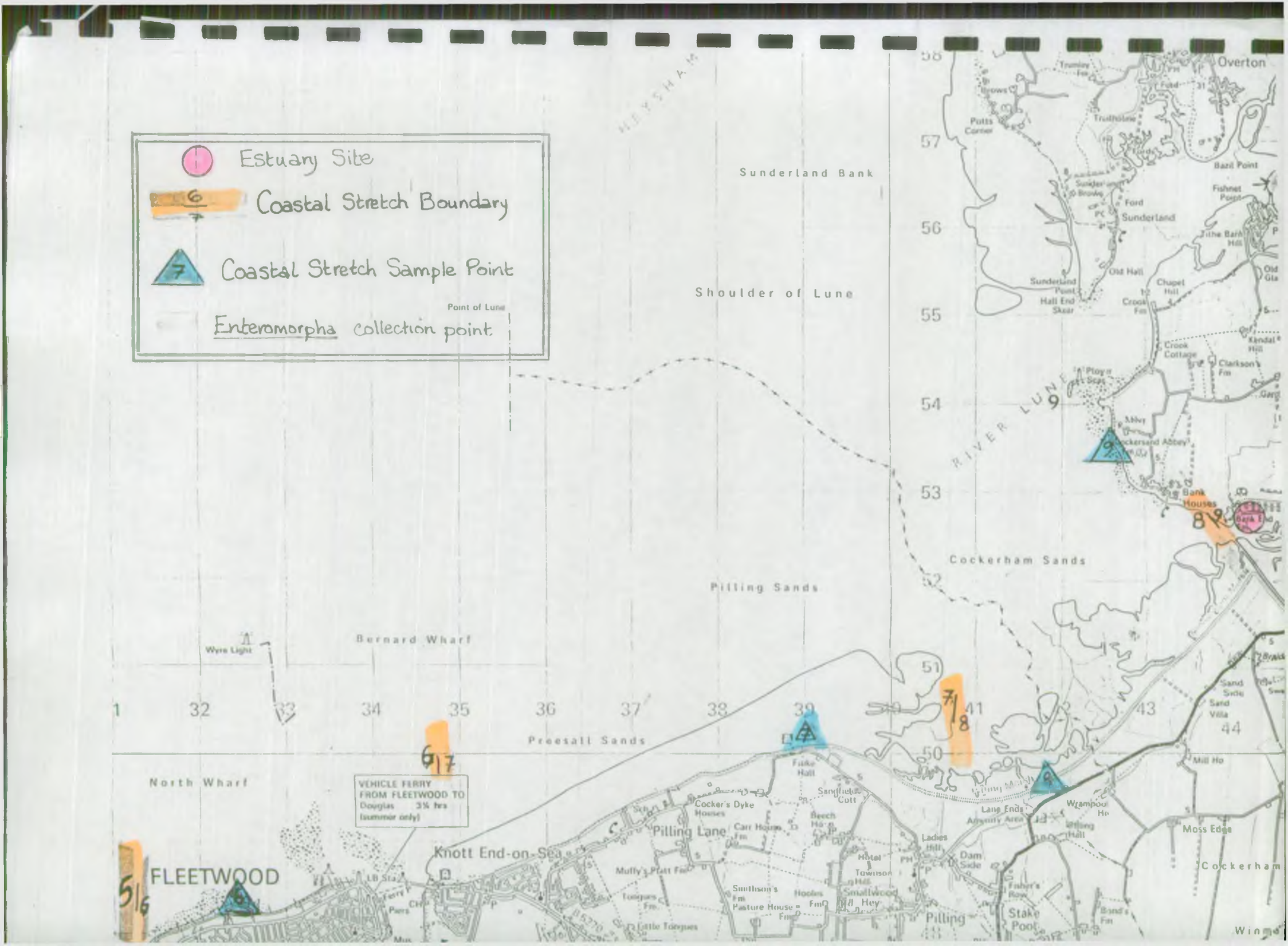
Stretch	Sample point	Grid Ref
Crosby Baths - Altmouth	(Southern Region)	
Altmouth - Southport Pier	Mad Wharf, Formby, Victoria Rd.	SD273083
Southport Pier - Crossens	Southport , off Hesketh Rd.	SD345195
St.Annes Pier - BPool N.Pier	BPool, opposite A5073	SD300340
BPool N.Pier - Rossall Point	Cleveleys, off marine lake	SD310435
Rossall Point - Knott End	Fleetwood, off marine lake	SD322482
Knott End - Piling Channel	Fluke Hall	SD389500
Piling Chnl - Cocker Channel	Lane Ends amenity area	SD416495
Cocker Chnl - Lune mouth, at Plover Scar.	Cockersands Abbey	SD430530

2. Estuarine

Estuary	Sample Points	Survey Method	Grid Ref
Alt	(i) d/s Altmouth P.S.	Shoreline	SD297037
	(ii) South Hightown, Gorsey Lane	Shoreline	SD293021
Crossens	(i) End of Crossens Marsh	Hovercraft	SD368230
Douglas	(i) u/s Longton Sands	Trawler	SD440265
Ribble	(i) Church Scar	Shoreline/Trawl	SD353267
	(ii) Main Drain	Boat	SD380270
	(iii) u/s Savick Brook	Boat	SD490289
Wyre	(i) Wyre Light	Boat	SD326513
	(ii) Barnaby Sands	Shoreline	SD348456
	(iii) Stannah	Shoreline	SD356432
	(iv) Shard Bridge	Shoreline	SD396410
Conder	(i) Old Railway	Shoreline	SD455560
Cocker	(i) Bank End Farm	Shoreline	SD442528



2/1
Coastal Stretch Boundary
Estuary site
Coastal Stretch Sample Point
Enteromorpha collection Point
Southport Sands
Angry Brow
19
18
17
16
15
13
SOUTHPORT
2/3 Pier
Birkdale Sands
Birkdale Hills
Birkdale
Hillside
Dunes
Nature Reserve
Ainsdale-on-Sea
Holiday Camp
Ainsdale
Ainsdale Sands
Ainsdale Hi
East Cranton Fm
Shirdley Hill
Moss Fm
Halsall Moss
B 5243
747
752·4
752·5
752
26
27
28
29
33
Plex Moss
Gettern Fm
746
743
744
741
738
Park House Fm
Barton
Downholland Moss
Haskayne
Formby Hall
Formby Hills
Mad Wharf
FORMBY
Formby Point
Formby's Fm
Great Altcar
Worrall House Fm
Hill House
Sewage Wks
757
739
719
720
Alt Bridge
Raven Meols Hills
Taylor's Bank
The Withins
North End
SEFTON DISTRICT
Lady Green
Carr Houses
Ince Blundell
718
Carr Side Fm
733
Hightown
Moor Fm
Moss Fm
Danger Area
Formby Bank
2/1
Moss Wood
Homer Green
Wrakes Fm
Lunt
731
729
MAG
Little Crosby
Sefton
Poplar Fm
HALL ROAD
SD
02
01


Estuary Site
6
Coastal Stretch Boundary
7
Coastal Stretch Sample Point
Point of Lune
Enteromorpha collection point
Sunderland Bank
Shoulder of Lune
Pilling Sands
Cockerham Sands
Preesall Sands
Bernard Wharf
North Wharf
Wyre Light
RIVER LUNE
Overton
Sunderland
Knott End-on-Sea
FLEETWOOD
Pilling Lane
Pilling
Cockerham
VEHICLE FERRY
FROM FLEETWOOD TO
Douglas 3¼ hrs
(summer only)
5/6
6/7
7/8
8/9
9


CLEVELEYS
THORNTON
Little Thornton
POULTON LE FYLDE
BLACKPOOL
BLACKPOOL DISTRICT
LYTHAM
ST ANNE'S
Preesall
Stalmine
Hambleton
Little Singleton
Singleton
Stanah
RIVER WYRE
Barnaby's Sands
Rossall School
Anchorsholme
Little Bispham
Norbreck
Castle Hotel
Bispham
North Shore
North Pier
Tower
Central Pier
South Pier
South Shore
Pleasure Beach
Normoss
Newton
Staining
Hardhorn
Stanley Park
Great Marton
Little Marton
Mereside
Marton Moss Side
Mythop
Weeton
Weeton Camp
Great Plumpton
Little Plumpton
Peel Hill
Westby
Lower Ballam
Higher Ballam
Moss Side
Lytham Moss
Blackpool Airport
St Annes
Ansdell
Fairhaven
Fairhaven Lake
Lytham
Lytham Hall
Saltcotes
Warton Hall
Mud & Sand
Salter's Bank
Starr Hills
North Hollow
5/4
4/3
Coastal Stretch Boundary
coastal stretch sample point
Estuary site