18

THE FISHES of THE MERSEY ESTUARY

THE FISHES OF THE MERSEY ESTUARY

18.1 Introduction

Merseyside has been one of Britain's foremost trading and industrial regions with a continuous expansion of population and industry over a long period. Liverpool is Merseyside's largest town with recent industrial developments at Ellesmere port and Bebington. The two major rivers that flow into the estuary are the River Mersey and Weaver. The tidal limit is reached at Howley Weir and is occasionally overtopped by exceptionally high tides. The tidal range may be more than 9 metres. It is one of the most seriously polluted estuaries in Britain. The Mersey occupies 8,914 ha. and has a tidal channel of 15.6 km. The whole Mersey estuary has been designated an SSSI. (Popham, 1966; Porter, 1973; Buckley, 1980; Davies *et al.*, 1990).

18.2 Estuarine habitats

The estuary contains sand banks, mud flats, sand and shingle foreshore, rocky shores and salt marshes. The main tidal basin is broad and extremely shallow with mobile low, and midshore sand banks. Rocky shores are likely to be covered by a film of mud. Faunal communities are impoverished (Popham, 1966; Rice & Putwain, 1987; Davies *et al.*, 1990).

18.3 Fish lists

No early fish lists were available for the Mersey. Rice & Putwain (1987) state 35 species of fish are found in the Mersey Estuary, but do not name species. Russell *et al.*, (1983) give names of sixteen estuarine and marine fishes found recorded from a disused dock in the Mersey. The number of fish species recorded from the Mersey Estuary is 22 (see Table 18.1).

18.4 Fish and fisheries

By 1948 all fish had disappeared from the Mersey Estuary, apart from at high water a few pelagic species which were able to tolerate the very poor conditions. In 1972 recommendations were made to make the estuary capable of supporting the benthic fauna essential for sustaining sea fisheries and to allow the passage of migratory fish at all states of the tide. (Buckley, 1980). However, migratory fish have no where to go because the polluted state of the rivers which are heavily locked and canalised and presumably the spawning grounds have gone following industrialisation and development. (Porter, 1973; Buckley, 1980).

The Mersey estuary does not support a significant commercial fishery, even though the condition of the Mersey has undergone improvements in recent years and at least 35 species of freshwater, estuarine and marine fishes have been recorded. Salmon (*Salmo salar*) only enter the Mersey occasionally as a stray, but do not survive (Rice & Putwain, 1987).

Plaice (*Pleuronectes platessa*) have had population parameters and diet of O-group fish investigated (Pugh-Thomas & Eyres, 1977).

Fishes recorded from a disused dock in the Mersey totalled fifteen species with schools of up to 200 cod (*Gadus morhua*) being recorded. Sea trout (*Salmo trutta*) have been introduced into the dock, and it was concluded that disused docks could be justifably retained as aquatic environments for amenity value and possibly as a source of revenue (Russell *et al.*, 1983).

18.5 Impacts

Urbanisation and **industrialisation** has been the source of pollution in the Mersey. The loss of the fishery was owing to the pollution, the depletion of oxygen and loss of benthic invertebrates upon which fishes feed. However, the decline in water quality has been exaggerated in the last few decades and improvements are being made. (Porter, 1973; Rice & Putwain, 1987).

Sewage effluents have their source in the large urban areas with liquid effluents from treatment works coming from more rural districts (Porter, 1973). Sewage treatment schemes and remedial measures are given in Dixon (1985).

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Dredging is carried out to maintain navigation channels, but it has been found that large quantities of silt are being carried back into the Mersey (Rice & Putwain, 1987).

Trade effluents from soap and paper manufacturers, chemical industries, food processing, flour milling, sugar refinery, chocolate and biscuit factories, brewing plants, crude oil refinery, contribute to the pollution load. Improvements have been made since 1972 and there has been a gradual decrease in the polluting load associated with industrial discharges. (Porter, 1973; Buckley, 1980; Russell *et al.*, 1983; Edwards, 1984).

Trace metal levels were determined in the tope (*Galeorhinus galeus*) from Liverpool Bay, but was found to be low (Vas, 1987). The main source of trace metals was identified as the Mersey, with fishes from the Mersey showing high levels of mercury. Burt *et al.* (1992) mapped the distribution of metals contaminating the Estuary.

Radioactive waste is discharged in low levels from a uranium recycling plant (Rice & Putwain, 1987).

Recreational activities are confined to sailing (yachting and dingy sailing). The large tidal range limits inshore sailing to 2-3 hours either side of high tide. (Rice & Putwain, 1987), and renders the area unsuitable for recreational bathing and SCUBA diving.

18.6 Water quality

Water drains into the Mersey from one of the most intensely industrialised regions in Britain. The water is highly polluted before it receives more polluting material in the tidal reaches. The water quality has reached anaerobic conditions in the upper estuary, but in the middle and lower reaches the dissolved oxygen increases. A committee was established in 1971 with the remit to find how to improve the water quality. (Porter, 1973).

An indication of the deteriorating quality of the estuary is the decline in fishing activities and by 1948 all fish had disappeared, apart from at high water a few pelagic species were able to tolerate the conditions (Porter, 1973).

The number of flounder (*Platichthys flesus*) is increasing and is seen as an indication of some improvement of estuarine water quality (Rice & Putwain, 1987).

The NRA (1991) atlas of water quality indicates that the whole of the estuary is of "poor" quality, unsuitable for the passage of fishes (see Figure 18.1). The reason lies in the high degree of urbanisation and the "bad" water quality draining from the industrialised areas of Salford and Manchester. The poor quality of the water is such that a polluted "tongue" extends from the mouth of the estuary some kilometres into the Irish Sea.

18.7 Summary

The Mersey Estuary is one of the most polluted in the United Kingdom as a result of the intense urban and industrial pressures from Liverpool, Salford and Manchester. By 1948 all fish had gone from the Estuary except for the occasional migrant on high water. More recently there has been a recorded increase in flounders which is attributed to an improvement in water quality.

18.8 Recommendations

It is recommended that:

1. serious efforts are taken to address the pollution problem in the upper reaches of the Mersey, as until these are tackled and pollution levels reduced, few fish will survive.

2. it might be worth monitoring the flounder (*Platichthys flesus*) population to relate its abundance and distribution to pollution levels.

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Table 18.1 The Fishes of the Mersey Estuary

Scyliorhinus canicula
Torpedo sp.
Anguilla anguilla
Clupea harengus
Sprattus sprattus
Salmo salar
Salmo trutta
Ciliata mustela
Gadus morhua
Gaidropsarus mediterraneus
Merlangius merlangus
Trisopterus sp.
Gasterosteus aculeatus
Taurulus bubalis
Agonus cataphractus
Dicentrarchus labrax
Chelon labrosus
Liza ramada
Limanda limanda
Platichthys flesus
Pleuronectes platessa
Solea solea

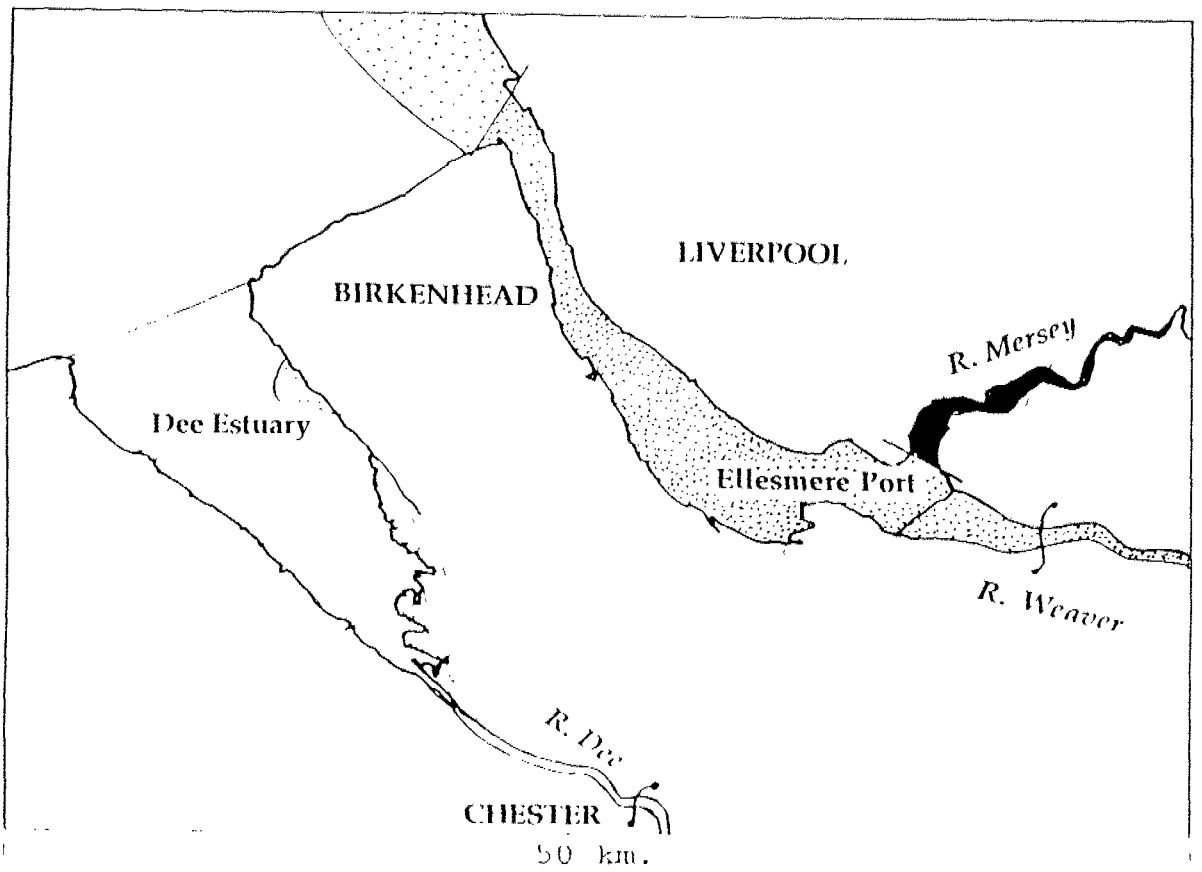

Figure 18.1 Map of the Mersey Estuary showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].

19

THE FISHES of THE RIBBLE ESTUARY

THE FISHES OF THE RIBBLE ESTUARY

19.1 Introduction

The Ribble Estuary is derived from a coastal plain and has a simple estuarine structure facing west and extending approximately 28.4 km. from its mouth to the docks at Preston with a tidal channel. The Ribble is estimated to have a total area of 11,924 ha. and shoreline of 107.5 km. (Davidson *et al.*, 1991). It is sited between Liverpool and Morecambe Bays. To the south are the estuaries of the Dee and Mersey, all within 45 miles of each other. There is a great deal of similarity with Dee and Mersey, in both fauna and habitats, but the Ribble is more exposed to the Irish Sea. The River Ribble is very broad, shallow, and is canalised by training walls of rough stone. It contains an artificial channel some 25km (15 miles) long which has been dredged near its northern shore to allow ship passage. There is a central channel some 200 m wide to which the river is confined at low water. The Ribble is known for a strong flood tide which has an effect on the mobile fauna of the estuary. The habitats studied in this estuary have concentrated on littoral areas (Popham, 1966; Davies, 1992).

The catchment for the Ribble Estuary is from a number of rivers, the main ones being; the Rivers Ribble, Hodder and Calder from the east, and the Darwen and Douglas from the south. In addition, there are a number of other smaller rivers running directly into the estuary. Preston is situated at the head of the Ribble Estuary with two towns, Lytham St. Annes and Southport, either side of the estuary mouth being holiday destinations for the population centres of Manchester and the North West.

The Ribble is of considerable nature conservation importance containing the Ribble marshes NNR and designated a Special Protection Area and containing a SSSI (Popham, 1966; Davies *et al.*, 1990, Davies, 1992) .

19.2 Estuarine habitats.

The main marine habitats found in the Ribble Estuary are described by Davies (1992). The offshore habitat consists of gently shelving coastal areas which lead into sedimentary mud and sand flats at the mouth of the estuary. Salt marshes form an important environment of the Ribble which have undergone an estimated 18 % loss since the beginning of the 19th century (Davidson *et al.*, 1991). The upper tidal limit is said to reach the docks at Preston where the salinity is reported to vary between fully fresh water, 5% (Dent, 1986) and 18%. The estuarine mouth is reported to vary between 13.5% and 34%. The Ribble undergoes considerable scouring as a result of the high current speeds which are responsible for the erosion of the mud banks and the transport of the sediment load down stream. The tidal range is between 8 m at spring tide and 4.3 m. at neap tide. The average sea temperatures are between 5 °C in February and 15 °C in August.

In 1974 there were grounds for "serious concern regarding the low dissolved oxygen concentrations" in the Ribble Estuary, as a result of the need for improvements to the sewage treatment processes in the Rivers Calder and Douglas. The impact on potential fish populations could be significant.

The habitat diversity and the recorded invertebrate communities indicate an environment capable of sustaining significant fish populations.

19.3 Fish lists

No complete fish list has been published for the Ribble estuary, although Conlan *et al.*, (1988) studied disused docks, as habitats for estuarine fishes and Sewell (1983) carried out surveys by netting. Other fishes have been recorded as part of scientific studies or were incidental to other surveys. (Popham, 1966; Holden *et al.*, 1975; Kelley, 1988; Priede, *et al.*, 1988). The number of fish species recorded from the Ribble Estuary is 14 (see Table 19.1).

19.4 Fish and fisheries

There have been a few studies in the Ribble Estuary relating to fishes. Priede *et al.* (1988) studied the behaviour of adult salmon (*Salmo salar*) in relation to variations in dissolved oxygen (DO) and tidal flow, and Conlan *et al.* (1988) examined Preston docks (now disused) as suitable habitats for estuarine fishes.

Priede *et al.* (1988) carried out work on the tracking of adult salmon in the estuary of the Ribble. Most fish were observed to move up the estuary on flood tide and out to sea on the subsequent ebb tide. Fish exploring the mouth of the estuary would inadvertently be carried quickly up river by the strength of the flood tide. They found these fish to be inhibited by low dissolved oxygen concentrations and that salmon in the Ribble were often on migration between other estuaries. The Ribble supports catches of salmon (*S. salar*) and sea trout, (*S. trutta*) with a small commercial drift net fishery. Conlan *et al.* (1988) found sea trout (*Salmo trutta*) were present throughout the year reaching a peak in February.

Popham (1966) mentions that the flounder, *Platichthys flesus*, is found upstream in freshwater. Conlan *et al.* (1988) found flounders to be most abundant in summer which reduced in the autumn as fish migrated seaward. The majority of flounder caught in the Ribble were O-group juveniles , but in Preston Dock the majority were age groups I-III.

Kelley (1988) in his paper on the importance of estuaries for sea-bass (*Dicentrarchus labrax*) mentions the Ribble as known to support stocks of young sea-bass. He adds these fishes are subjected to heavy commerical pressure and are likely to be susceptible to over-exploitation because of their slow growth and late maturation in U.K. waters.

Herring *(Clupea harengus)* is the dominant fish in the Ribble, showing two peaks of O-group fish (September and January-February). Conlan *et al.* (1988) found a very few fish over one year old which is consistent with the migration of young herring out of the estuary.

Smelt *(Osmerus eperlanus)* were present for most of the year, but in small numbers.

The sandy goby *(Pomatoschistus minutus)* has been recorded in large numbers (Sewell, 1983), but Conlan *et al.* (1988) only found them sporadically and in small numbers. This was believed to be a result of differences in the catching techniques.

19.5 Impacts

For the impacts of **commercial fisheries** see 4.1 and 4.3 above. Nets are operated by small one-man boats and catches are usually less than ten salmon (*S. salar*) and sea trout, (*S. trutta*) per tide (Priede *et al.*, 1988).

The Ribble is one of the more developed estuaries and is now primarily **urban**. The towns of Lytham St. Annes and Southport are holiday destinations, with an extensive beach at Southport that attracts visitors from all over the North West. There has been no study of recreational activites on the Ribble.

In the past, training walls were erected and the main channel **dredged** to allow access for ships. However, Preston Docks was closed to shipping in 1981 and converted into a marina. (Davies, 1992).

Progressive **land reclamation** for agriculture has reduced the saltmarsh area by 18% since the beginning of the 19th centuary, and runoff will have some effect on water quality. (Davidson *et al.*, 1991; Davies, 1992).

Trade effluent is deposited into the Ribble from industrial areas of N.E. and Central Lancashire. The Central Electricity Generating Board Penworthy **Power Station** is situated on the estuary, but cooling water was reported to have a minimal thermal effect. British Nuclear Fuels Ltd. discharges a conglomerate of chemical effluent (North West Water Authority, 1974).

The major **sewage** outfall is located 9 km. below the tidal limit, and sewage discharges receive varying degrees of treatment. There has been concern over low dissolved oxygen (North West Water Authority, 1974). This was further born out by Priede *et al.* (1988) in which fish were reported as prone to low dissolved oxygen concentrations in summer months associated with the sewage outfall, and that during the 1984 drought with high temperatures, low dissloved oxygen and low freshwater discharge, fish did not enter the estuary.

Sand extraction is reported by Davies (1992) to be 150,000 m3 per annum.

Heavy metals in estuarine sediments are identified from the Ribble Estuary (Burt *et al.*, 1992)

Mitchell (1969) reported that **radioactive disposals** from Windscale (now Sellafield) could be detected in the Ribble in terms of fission products, but the current status is not known, nor is the effect on fish populations.

19.6 Water quality

Estuaries are dynamic systems subject to significant changes in temperature, salinity dissolved oxygen, and sediment loading, depending upon the climate (particularly precipitation in the catchment areas), season and in tidal fluctuation. All will influence water quality and its suitablilty for the fauna found in estuaries and upon their consequent distribution. In addition to these natural influences on the estuarine environment there are also the human impacts as summarised in Section 19.5.

The water quality in the Ribble has been designated "Fair" according to the NRA scale. Closer examination indicates that the Rivers Hodder and Ribble are both graded of "good" water quality by the NRA (NRA,1991) (see Figure 19.1), but those draining from the industrialised conerbations of Burnley (R. Calder), Blackburn (R. Darwen) and Bolton (R. Douglas) are graded only poor to fair and will have a detrimental influence on the estuarine quality. Popham (1966) stated that the volumes of effluents in the Ribble were relatively small compared with Dee and Mersey, yet in 1974 the Ribble was described as having unacceptable levels of sewage. However, in the 1990 NRA water quality scale the Dee was rated as being of better quality than the Ribble and designated "Good". (NRA, 1991).

19.7 Summary

Only six species have been found to be mentioned in the literature on the Ribble Estuary. Nonetheless it is to be expected that the fish fauna will not differ significantly from the Liverpool and Morecambe Bays to the south and north of the region, and which are described in some detail in the fisheries literature. The main impacts on the region are the result of the high urban population with the attendant problems of land-claim, effluent and sewage discharges, and the industrial effluent from centres such as Burnley, Blackburn and Bolton.

19.8 Recommendations

It is recommended that;

1. a survey of the fishes of the Ribble be carried out to determine which species are present, how they are dependent on the estuary ie. for feeding and other factors, and how they are influenced by the adjacent fish faunas of Liverpool and Morecambe Bays.

2. owing to the absence of published information, local persons (anglers and fishermen etc.) should be contacted to provide preliminary species lists and give details on the effect of anthropogenic threats on the fishes in the Ribble.

19.9 References

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Dicentrarchus labrax
Ammodytes sp.
Hyperoplus lanceolatus
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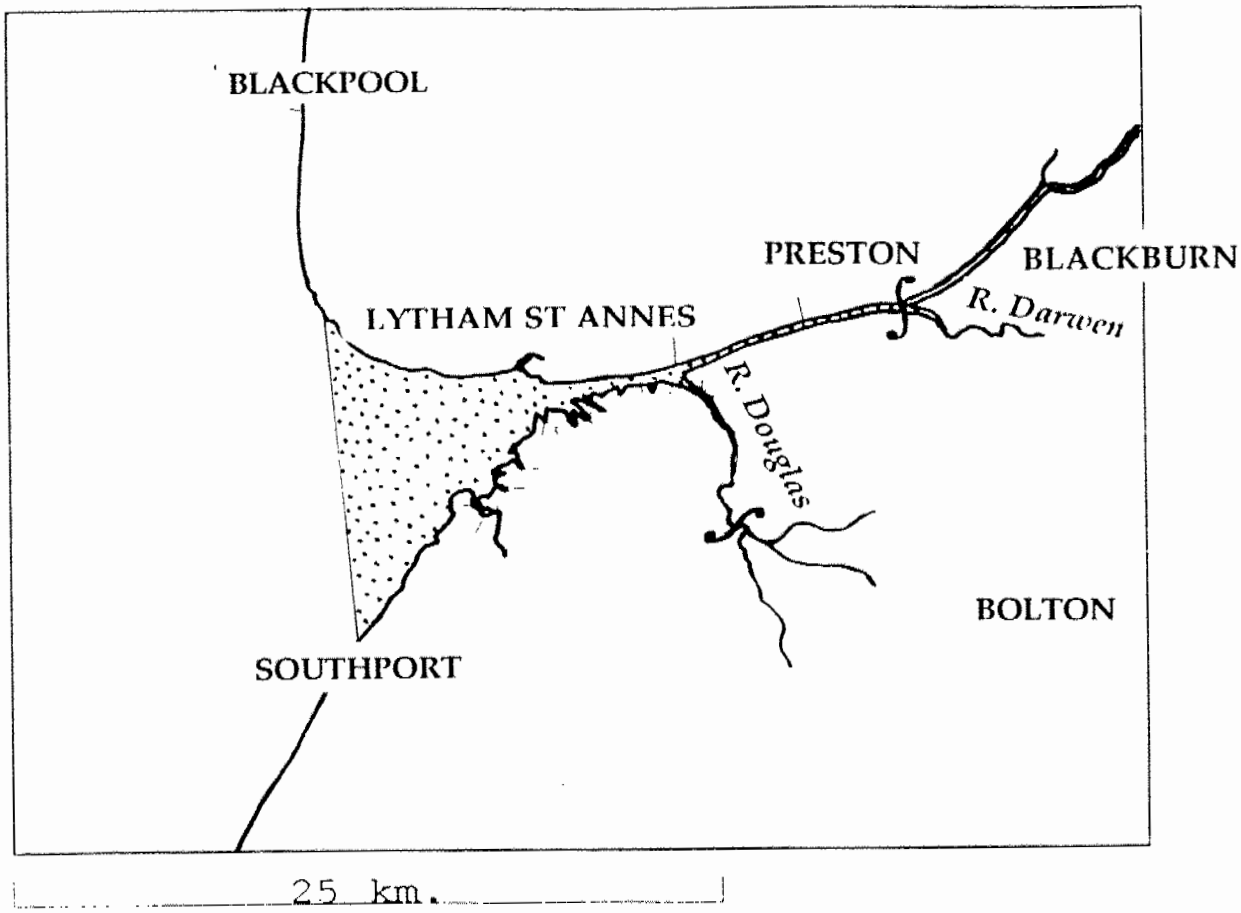
Platichthys flesus
Pleuronectes platessa
Solea solea



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It is recommended that:

1. serious efforts are taken to address the pollution problem in the upper reaches of the Mersey, as until these are tackled and pollution levels reduced, few fish will survive.

2. it might be worth monitoring the flounder (*Platichthys flesus*) population to relate its abundance and distribution to pollution levels.

18.9 References

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Table 18.1 The Fishes of the Mersey Estuary

Scyliorhinus canicula
Torpedo sp.
Anguilla anguilla
Clupea harengus
Sprattus sprattus
Salmo salar
Salmo trutta
Ciliata mustela
Gadus morhua
Gaidropsarus mediterraneus
Merlangius merlangus
Trisopterus sp.
Gasterosteus aculeatus
Taurulus bubalis
Agonus cataphractus
Dicentrarchus labrax
Chelon labrosus
Liza ramada
Limanda limanda
Platichthys flesus
Pleuronectes platessa
Solea solea

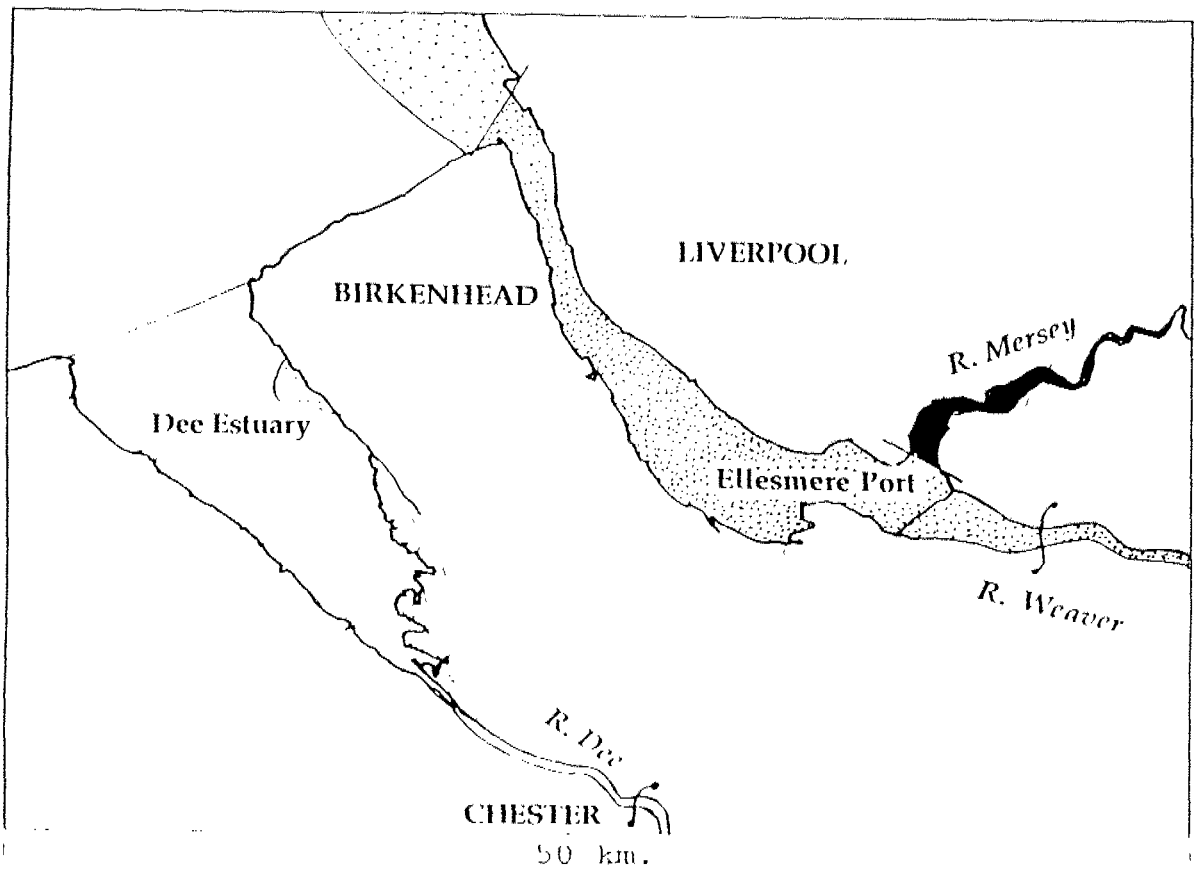

Figure 18.1 Map of the Mersey Estuary showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].