22

THE FISHES of THE SOLWAY FIRTH

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22.1 Introduction

The Solway Firth is one of the largest estuarine marine inlets in the United Kingdom, occupying 42,056 ha. and with a tidal influence 46 km. from the mouth of the Firth (Davidson *et al.*, 1991). The Solway Firth is divided by a naural border which contains different administrative systems on each side that could pose problems when coordinating environmental assessment studies. The region is predominantly rural in nature, although there is a risk of increased industrialisation with the accompanying pollution.

The whole system of the upper Solway flats and marshes and Rockliffe Marshes are SSSIs. The Solway Flats and marshes are of marine biological importance for its rich infaunal communities and extensive bivalve beds (Davies *et al.*, 1990)

22.2 Estuarine Habitats

The substrata of the Solway flats are predominantly sedimentary, fine sand becoming coarser near to low water with occasional scar grounds. The sediments shift and transfer from the Irish Sea into the inner Solway with deep flood channels and shallow ebb channels that run alternately and mould the sediments. (Perkins, 1978; Davies *et al.*, 1990). A wide variety of marine habitats occur towards the mouth of the estuary.

22.3 Fish lists

Early fish lists include Gladstone (1912), Gordon (1921) Birrell, (1930) and Rae (1955). The most recent and complete fish list is that of Perkins (1971). The number of fish species recorded from the Solway Firth is 130(see Table 22.2).

22.4 Fishes

The Solway Firth is an important nursery ground for flatfish and supports a commerical fishery with small and large boats working in the estuary. Haf netting occurs on both the English and Scottish banks in the Upper Solway and is the only legal method of netting migratory fish (Ingham, pers. comm. 1993; Lancaster, pers. comm. 1993).

A regular beam trawl survey has been in progress since 1920. The typical catch has been epibenthic, even so a wide variety of fish have been sampled. A marked seasonal abundance is noted in whiting (*Merlangius merlangus*) and solenette (*Buglossidium luteum*). The grey and red gurnards (*Eutrigla gurnardus* and *Aspitrigla cuculus*), the sprat (*Sprattus sprattus*) and cod (*Gadus morhua*) also occur seasonally but generally in smaller numbers (Nottage & Perkins, 1979). Results from the beam trawl survey are much the same as previous years with plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*) being the most abundant (Perkins, 1985; Lancaster, pers. comm. 1993).

Adult plaice (*Pleuronectes platessa*) spawn in the St. Bees Head ground in the early months of the year and gradually make their way up to the Solway to feed. The banks are reached by May and July where they feed heavily on shellfish and polychaete worms. In the early autumn they stop feeding and start the spawning migration to St. Bees Head. Once the eggs have hatched the larvae move up to the nursery grounds of the Inner Solway. Here they remain until adult when they move to St. Bees Head ground to spawn (Perkins, 1978).

Sole (*Solea solea*) juveniles have also been found in the inner Solway and are fished for off Abbey Head and the Cumbria coast (Perkins, 1978).

The solenette (*Buglossidium luteum*) is on occasion extremely abundant. It mainly inhabits the outer estuary and the inner in small numbers. The populations form highly aggregated, mobile groupings (Nottage & Perkins, 1978).

The thornback ray (or roker) (*Raja clavata*) provides a valuable commercial fishery. It is abundant in the Solway Firth, for most of the year, but do not penetrate up the inner Solway. Spawning fishes are found in Allonby Bay between October and January. Studies of this fish cover the general biology and growth and maturation (Perkins, 1978; Nottage & Perkins, 1980, 1983).

Fishes of indirect commercial importance include the sand goby (*Pomatoschistus minutus*) which may occur abundantly in trawls during colder months. It migrates inshore in warmer months where it may mix with the common goby (*Pomatoschistus microps*).

The bib (*Trisopterus luscus*) caught as immature fish are reported as a common inshore fish. The lesser weever (*Echiichthys vipera*) is recorded as being abundant. The dragonet (*Callionymus lyra*) has been recorded in the Solway up to a maximum size of 210mm. and only penetrates the Solway Firth during warmer months. The pogge (*Agonus cataphractus*) is commonly taken on the inner grounds of the Solway, and gurnards (grey and red) (*Eutrigla gurnardus* and *Aspitrigla cuculus*) appear in small numbers in trawls also during the summer months (Perkins, 1985).

Allis shad (*Alosa alosa*) are being caught regularly, although few in number, in the Wigtown Bay area during May and early June. This suggests that a spawning population may exist in on one or more of the rivers draining into the Solway (Aprahamian & Aprahamian, 1990). The twaite shad (*Alosa fallax*) has been recorded from the Solway Firth, but its status is not known

The sturgeon (*Acipenser sturio*) has been recorded from the Solway Firth, but has not been recorded for a number of years. It was still being taken on the Scottish west coast as reported by Rae (1955).

The sea bed to the north east from Workington through Maryport Roads and Allonby Bay to Dubmill Point should be carefully managed and protected in order that the food supply of the fish taken off much of the Cumbrian coast and hence the fisheres are secured. (Perkins & Nottage, 1983).

22.5 Impacts

The shrimp (*Crangon crangon*) forms a small, but valuable **fishery**, and is an important food source for fishes in the estuary (Perkins, 1978; Lancaster, pers. comm. 1993). Cockle fishing is believed to take place on the Scottish shore (Ingham, pers. comm. 1993).

Industrialised areas are centred around the coast of Cumbria, when in the past, activities such as mining and smelting occurred. Coal washery waste was dumped over cliffs from a coal board plant, but this has now ceased. More recently industries include chemical, motor manufacture, textiles and nuclear power (Perkins, 1976; Perkins, 1985; Lancaster, pers. comm. 1993).

Industrial effluents include detergents (which result in plumes of foam stretching for long distances), discharges from steelworks, a cigarette filter manufacturer and a paper plant. They are discharges that go straight into the estuary not from rivers flowing into it. (Lancaster, pers. comm. 1993).

Heavy metals are discharged into the Solway Firth from works on the English side (Lancaster, pers. comm. 1993). Further details of heavy metal levels are given in Burt *et al.* (1992).

Recreational activities include sailing, sea angling and large holiday sites. (Perkins, 1976, 1978).

Bait digging is also carried out on the estuary, and is still a problem in some areas (Perkins 1976; 1985).

Mineral extraction may become important if reserves are to be tapped (Perkins, 1978).

Untreated Sewage from the English side is discharged from a variety of outfalls into the Solway Firth. Water samples taken reveal high feacal bacteria counts (Lancaster, pers. comm. 1993).

22.6 Water quality

The Solway Firth is Britain's sole remaining large estuary which is relatively unpolluted (Perkins, 1976). A mixture of contaminants in the Solway are reviewed by Edmondson & Watts (1992) and metals by Burt *et al.* (1992)

22.7 Summary

The Solway Firth is the largest relatively unpolluted estuary in the United Kingdom and provides important nursery and feeding grounds for estuarine fishes. As a large body of water opening to the Irish Sea little effort has, in the past, been paid to the treatment of industrial and urban effluents. Several important work on the fishes of the region have been carried out.

22.8 Recommendations

It is recommended that:

1. a detailed survey of the Solway Firth is carried out to provide baseline material for monitoring the fish populations and the areas as a flatfish nursery ground.

2. a review of effluent treatment is undertaken to ensure it does not exceed current levels.

22.9 References

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Table 22.1 The Fishes of the Solway Firth

Lampetra fluviatilis
Petromyzon marinus
Lamna nasus
Cetorhinus maximus
Alopias vulpinus
Galeus melastomus
Scyliorhinus canicula
Scyliorhinus stellaris
Galeorhinus galeus
Mustelus mustelus
Prionace glauca
Squalus acanthias
Squatina squatina
Torpedo nobiliana
Raja batis
Raja brachyura
Raja clavata
Raja fullonica
Raja microocellata
Raja montagui
Raja naevus
Raja oxyrinchus
Raja undulata
Dasyatis pastinaca
Acipenser sturio
Anguilla anguilla
Conger conger
Alosa alosa
Alosa fallax
Clupea harengus
Sprattus sprattus
Engraulis encrasicholus
Salmo salar
Salmo trutta
Argentina sphyraena
Diplecogaster bimaculata
Lophius piscatorius
Ciliata mustela
Enchelyopus cimbrius
Gadus morhua
Gaidropsarus mediterraneus
Melanogrammus aeglefinus
Merlangius merlangus
Micromesistius poutassou
Molva molva
Phycis blennoides
Pollachius pollachius
Pollachius virens
Raniceps raninus
Trisopterus luscus
Trisopterus minutus
Merluccius merluccius
Belone belone
Scomberesox saurus
Zeus faber
Lampris guttatus
Spinachia spinachia
Entelurus aequoreus
Hippocampus ramulosus
Nerophis lumbriciformis
Syngnathus acus
Syngnathus rostellatus
Syngnathus typhle
Sebastes marinus
Aspitrigla cuculus
Eutrigla gurnardus
Trigla lucerna
Trigloporus lastoviza
Myoxocephalus scorpius
Taurulus bubalis
Agonus cataphractus
Cyclopterus lumpus
Liparis liparis
Liparis montagui
Dicentrarchus labrax
Polyprion americanus
Trachinotus ovatus
Trachurus trachurus
Pagellus bogaraveo
Spondyliosoma cantharus
Argyrosomus regius
Mullus surmuletus
Chelon labrosus
Liza ramada
Centrolabrus exoletus
Crenilabrus melops
Ctenolabrus rupestris
Labrus bergylta
Labrus mixtus
Trachinus draco
Echiichthys vipera
Lipophrys pholis
Pholis gunnellus
Ammodytes tobianus
Hyperoplus lanceolatus
Callionymus lyra
Callionymus maculatus
Callionymus reticulatus
Gobius niger
Gobiusculus flavescens
Pomatoschistus microps
Pomatoschistus minutus
Pomatoschistus pictus
Auxis rochei
Euthynnus alletteratus
Katsuwonus pelamis
Sarda sarda
Scomber japonicus
Scomber scombrus
Thunnus alalunga
Thunnus thynnus
Xiphias gladius
Centrolophus niger
Psetta maxima
Scophthalmus rhombus
Zeugopterus punctatus
Arnoglossus laterna
Glyptocephalus cynoglossus
Hippoglossoides platessoides
Hippoglossus hippoglossus
Limanda limanda
Microstomus kitt
Platichthys flesus
Pleuronectes platessa
Buglossidium luteum
Microchirus variegatus
Solea lascaris
Solea solea
Balistes carolinensis
Mola mola

Potts & Swaby (1993)

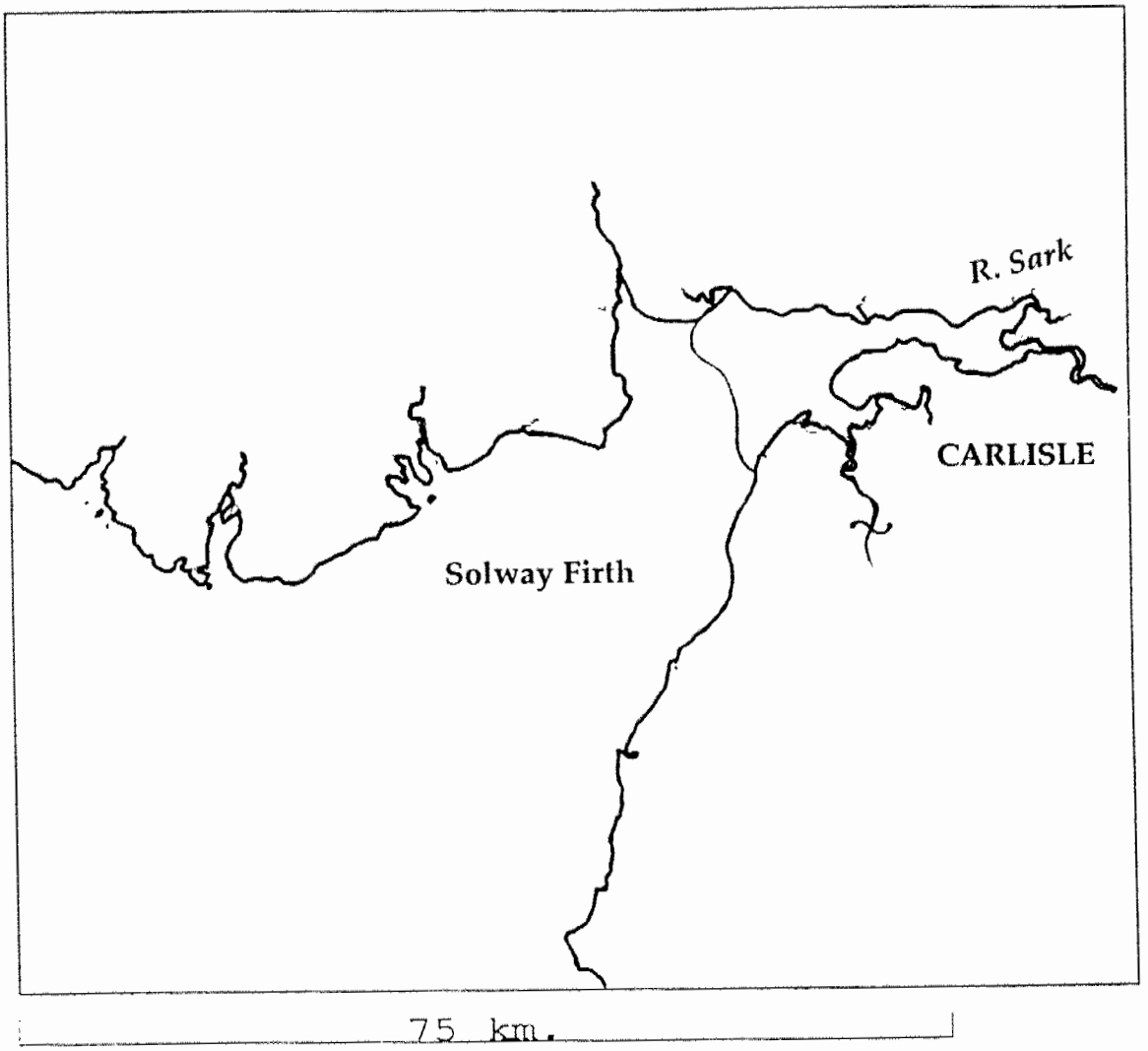

Figure 22.1 Map of the Solway Firth showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].