13

THE FISHES
of
THE FAL AND HELFORD ESTUARIES

THE FISHES OF THE FAL AND HELFORD ESTUARIES

13.1 Introduction

The Helford Estuary has changed usage from a working waterway to a mainly recreational area. The river is fairly narrow, less than 1 km. at its widest but widening to 3km at its mouth. The inlet extends some 10 km. inland and has a number of short side brances and creeks. The salinity ranges from 24.4 to 34.1 parts per thousand. The Helford River is well mixed on a seasonal and tidal basis. There is no main tidal channel. Helford is a voluntary marine conservation area (VMCA) (Covey & Hocking, 1987).

The Fal estuary covers 2,482 ha. and has a tidal channel extending 18 km. to Truro. It is generally fully saline, with a deep central channel and wide shallow banks on either side. It encompasses the Roseland Voluntary Marine Conservation Area (VMCA). The Fal estuary is an SSSI, but not for its marine biological interest. However, St Mawes Inlet was identified as of primary marine biological interest for its maerl beds (Farnham & Bishop, 1985; Davies *et al.*, 1990).

13.2 Estuarine habitats

The habitats in the Helford include stable sandy shores, muddy shores and areas of mud and silt. There are *Zostera* beds, salt marshes and small colonies of *Salicornia sp.* Subtidal habitats are largely mud and silt in the upper part and becomes mixed rock and sand (Thompsett & Turk, pers. comm. 1992). The Helford has been subjected to some changes resulting from high winds redistributing sand and extreme temperatures causing the death of species on the northerly edge of their distribution. (Covey & Hocking, 1987; Rostron, 1987).

Habitats in the Fal include rocky intertidal areas, rockpools, intertidal sediments, and subtidal rocks and sediments, fine muds, sandy muds, and fine muddy sands. *Zostera sp.* beds in lower estuary. Mud deposits contain china clay wastes. There is subtidal maerl debris, muddy shell gravel, and muddy gravel substrates. The Fal has extensive examples of maerl beds which are of marine conservation interest (Farnham & Bishop, 1985; Rostron, 1985).

13.3 Fish lists

Lists of fishes for the Fal and Helford are compiled from references, and personal communications including Holme & Turk (1986), lists from dredge and Agassiz trawl surveys (Spooner & Holme, 1986; Turk & Thomsett, pers. comm. 1992; Driver pers. comm. 1992), and from the database of the Cornish Biological Records Unit (Turk, & French pers. comm. 1992). The number of fish species recorded from the Fal and Helford Estuaries is 110 (see Table 13.1).

13.4 Fish and fisheries

HELFORD

The existence of fish cellars in the Helford Estuary indicates that fishing was once important. Here fish were stacked and pressed to remove the oil prior to packing. However, very little fishing takes place now and catches are landed in other ports (Covey & Hocking, 1987).

Helford Point is the type locality for Couch's goby (*Gobius couchi*) which has been described relatively recently. On repeat visits Dr Miller indicated that couch's goby, although present, was less numerous than on previous surveys, and that human disturbance and the decline in water quality may be contributing factors (Miller & El-Tawil, 1974; Miller, pers. comm. 1990).

The allis shad (*Alosa alosa*) were recorded from July to September in the 1890s in the Helford (Turk, pers. comm. 1993).

FAL

A small fishery exists for bass (*Dicentrarchus labrax*), mullet (*Mugil sp.*) in the Fal. Dabs (*Limanda limanda*) and flounder (*Platichthys flesus*) are also caught, but not in commercial numbers. Falmouth is an exchange port for fish caught in territorial waters by Scottish or other EEC trawlers. These fish, mackerel (*Scomber scombrus*) or pilchards (*Sardina pilchardus*) are sold to freezer trawlers from eastern bloc countries (Rostron, 1985).

The rivers of the Fal support a game fishery for sea trout (*Salmo trutta*) and salmon (*Salmo salar*) which 'run' up the estuary (Rostron, 1985; Driver pers. comm. 1992).

Fishes taken by anglers in the Fal Estuary include pollack (*Pollachius pollachius*), wrasse (*Labridae*), and garfish (*Belone sp.*) (Rostron, 1985).

The twaite shad (*Alosa fallax*) have been recorded from the Fal Estuary in 1985. They are locally common in early to mid summer when spawning migration occurs, and are caught as a by-catch of mullet and bass fishing activities. (Rostron, 1987; Turk & French, pers. comm. 1990).

The sturgeon (*Acipenser sturio*) is recorded in 1820 and 1970 from Falmouth and Falmouth Square - no more details on location is given. (Turk & French, pers. comm. 1992). Another specimen was recorded from St Mawes by Clark, 1907.

13.5 Impacts

HELFORD

Prawning and **shrimping** has been carried out casually and commercially for decades and are not at damaging levels. Trigging (collecting molluscan shellfish) is an ancient custom, that takes place on Good Friday. It is restrained through the rest of the year, but still has an impact on the estuary by the disturbance of surface substrates including important eel grass beds. The Helford also supports a fishery for velvet swimming crabs (*Liocarcinus puber*) for a Spanish market. (Covey & Hocking, 1987).

Bait digging occurs on much the same shores as trigging, causing disturbance and erosion (Covey & Hocking, 1987).

Educational field trips and **research** activities reached a peak in the 1960s - 1970s. The shores have since become depleted and fieldwork is no longer a significant pressure but should the Helford improve then educational activities will need to be controlled. (Covey & Hocking, 1987).

Agricultural waste entering the Helford Estuary mainly stems from a by-product of dairy farming from the use of silage and slurry on pastures adjacent to the estuary (Covey & Hocking, 1987).

Most of Falmouth's **sewage** is discharged at Pennance Point where it may be washed into the Helford. The impact is difficult to determine as disposal levels vary with the state of tide and time of year. (Covey & Hocking, 1987).

Bulb farming practises on hill sides cause soil erosion and run off to channels and thence to the estuaries. (Covey & Hocking, 1987).

The **past industrial activities** at Helford included fish processing which resulted in the deposition of oil and trash fish being deposited in the river. The estuary had been used as a mining port and there is evidence of pollution by mining wastes.

The main people pressure on the estuary is from water recreation activities, which reaches a peak in summer (Covey & Hocking, 1985).

FAL

Oyster fishing is an important activity in the Fal and Duchy of Cornwall Oyster Fishery lease beds in the estuary. It has provided an influencing voice in maintaining water quality and restricting development. There is also some gill-net fishing in the Fal (Farnham & Bishop, 1985).

The Fal estuary is large enough to accommodate **commercial shipping**, with port and harbour facilities based at Falmouth. The impact of a proposed container terminal which would damage maerl beds is discussed in Deeble & Stone (1985). The natural harbour has also been used as a berthing site for oil rigs designed for the channel oil fields. Dredging is carried out to maintain channels.

Recreational activities include sailing, water skiing , wind surfing, fishing, and SCUBA diving (Farnham & Bishop, 1985; Rostron, 1985).

Educational field trips are taken in the Fal (Farnham & Bishop, 1985).

Maerl used as a soil conditioner has been harvested by suction dredging from the estuary and is usually unloaded at Truro. (Rostron, 1985).

Major **sewers** are present at most of the surrounding towns, and there are several hundred small individual sewers and drains which flow into the estuary. (Rostron, 1985).

Industrial effluents that enter the Fal Estuary mostly include mining wastes which have been shown to contaminate bivalve molluscs. (Rostron, 1985). Heavy metals levels are given in Bryan & Gibbs (1983) and Burt *et al.* (1992).

13.6 Water quality

HELFORD

The water quality in the Helford fluctuates greatly. Biochemical oxygen demand (BOD), organic material, nitrate pollution, discharges, and run off and heavy metal pollution are detailed in Covey & Hocking (1987), Edmondson & Watts (1992) and Burt *et al.* (1992).

The apparent decline in Couch's goby is believed to be partly owing to the decline in water quality (Miller pers. comm. 1990).

FAL

The Fal is considered to be one of the cleanest estuaries in Europe (Deeble & Stone, 1985).

Water quality is "good" according to the NRA (1991), as shown in Figure 13.1.

13.7 Summary

Although treated together, the Fal and Helford estuaries are sufficiently different to be treated as separate entities.

The Helford is a relatively small and sheltered estuary with particulate shores including *Zostera* beds, mud, sand and saltmarshes. The fish fauna is generally poorly known, although it does contain the type locality of Couch's goby (*Gobius couchi*). While not subjected to industrial pressures, traditional shrimping, bait digging and shellfish collection are likely to damage the estuarine muds.

The Fal is a large deep estuary used by commercial shipping with the resulting risks of oil spills. Some fishing occurs and the maerl beds at the mouth of the estuary are exploited by dredging.

Both areas are popular for watersports, and generally in the more exposed areas of the estuaries the water quality is good. The diverse range of habitats in the Fal in particular would suggest a significant fish fauna, and angling is one of the popular sports in the region.

13.8 Recommendations

It is recommended that:

1. the Helford and Fal estuaries should be subjected to a detailed survey of the commercial and non-commercial fishes.

2. a reassessment of the impact of maerl dredging should be taken with a view to identifying how habitat destruction might affect fish populations.

3. the large number of small untreated sewage outflows should be stopped or at least subjected to preliminary treatment.

13.9 References

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Table 13.1 The Fishes of the Fal and Helford Estuaries

Cetorhinus maximus
Alopias vulpinus
Galeus melastomus
Scyliorhinus canicula
Scyliorhinus stellaris
Galeorhinus galeus
Squalus acanthias
Squatina squatina
Raja brachyura
Raja clavata
Raja microocellata
Dasyatis pastinaca
Anguilla anguilla
Conger conger
Alosa fallax
Clupea harengus
Sardina pilchardus
Sprattus sprattus
Salmo salar
Salmo trutta
Apletodon dentatus
Diplecogaster bimaculata
Lepadogaster candollei
Lepadogaster lepadogaster
Lophius piscatorius
Ciliata mustela
Enchelyopus cimbrius
Gadus morhua
Gaidropsarus mediterraneus
Gaidropsarus vulgaris
Merlangius merlangus
Phycis blennoides
Pollachius pollachius
Pollachius virens
Trisopterus esmarkii
Trisopterus luscus
Trisopterus minutus
Merluccius merluccius
Cheilopogon sp.
Belone belone
Atherina boyeri
Atherina presbyter
Zeus faber
Gasterosteus aculeatus
Spinachia spinachia
Macroramphosus scolopax
Hippocampus ramulosus
Nerophis lumbriciformis
Nerophis ophidion
Syngnathus acus
Syngnathus typhle
Aspitrigla cuculus
Aspitrigla obscura
Eutrigla gurnardus
Trigla lucerna
Trigloporus lastoviza
Myoxocephalus scorpius
Taurulus bubalis
Agonus cataphractus
Cyclopterus lumpus
Liparis montagui
Dicentrarchus labrax
Trachurus trachurus
Boops boops
Pagellus bogaraveo
Mullus surmuletus
Chelon labrosus
Liza aurata
Liza ramada
Centrolabrus exoletus
Crenilabrus melops
Ctenolabrus rupestris
Labrus bergylta
Labrus mixtus
Trachinus draco
Echiichthys vipera
Blennius ocellaris
Coryphoblennius galerita
Lipophrys pholis
Parablennius gattorugine
Chirolophis ascanii
Pholis gunnellus
Ammodytes marinus
Ammodytes tobianus
Hyperoplus lanceolatus
Callionymus lyra
Callionymus reticulatus
Aphia minuta
Gobius cobitis
Gobius couchi
Gobius niger
Gobius paganellus
Gobiusculus flavescens
Pomatoschistus microps
Pomatoschistus minutus
Pomatoschistus pictus
Thorogobius ephippiatus
Trichiurus lepturus
Scomber scombrus
Centrolophus niger
Psetta maxima
Scophthalmus rhombus
Zeugopterus punctatus
Arnoglossus laterna
Limanda limanda
Microstomus kitt
Platichthys flesus
Pleuronectes platessa
Buglossidium luteum
Solea solea
Balistes carolinensis

Potts & Swaby (1993)

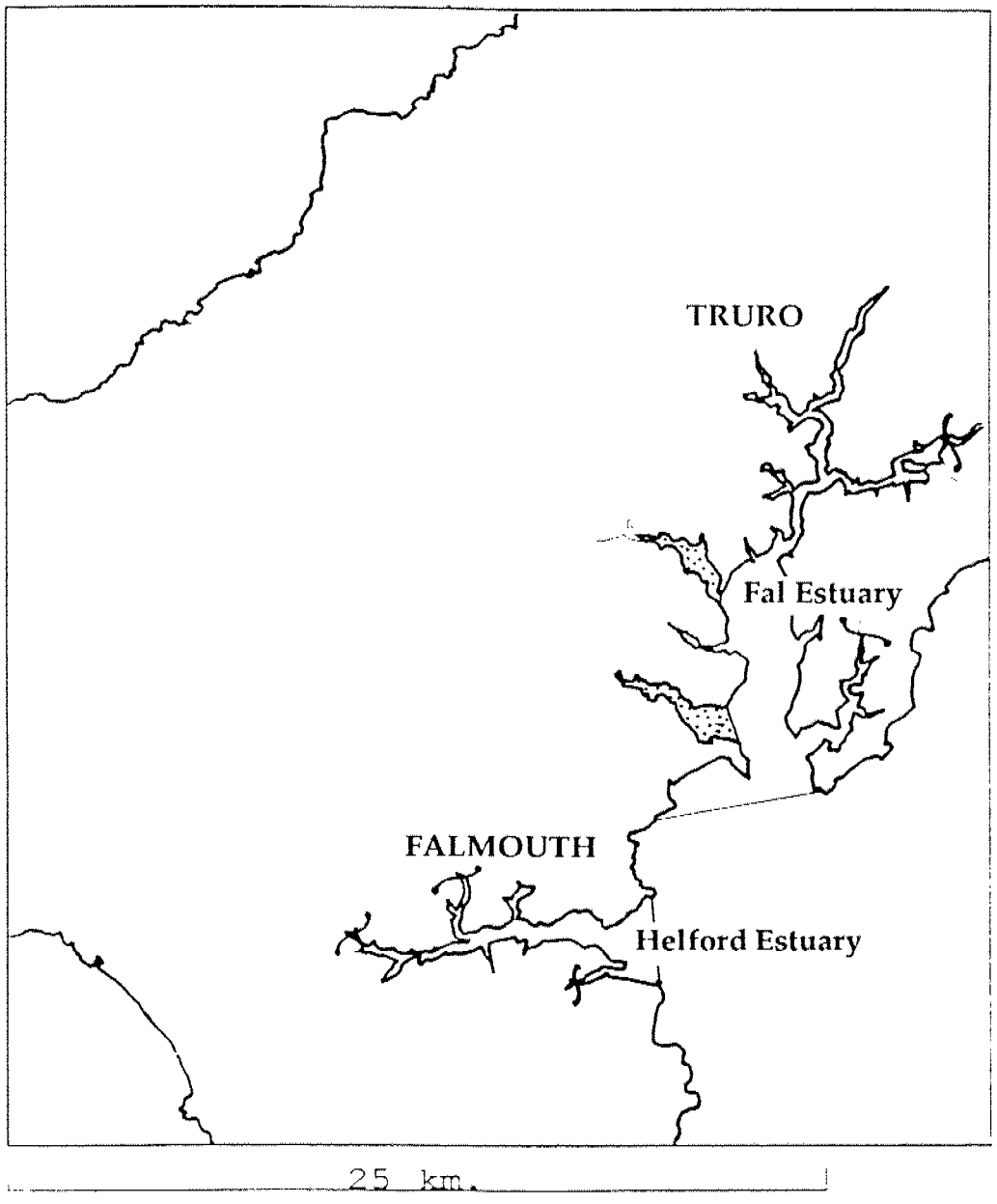

Figure 13.1 Map of the Fal and Helford Estuaries showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].

14

THE FISHES of THE CAMEL ESTUARY

THE FISHES OF THE CAMEL ESTUARY

14.1 Introduction

The Camel Estuary is a drowned river valley or ria of 839 ha. and with a tidal range extending from the mouth for about 16 km to Wadebridge. (Davidson *et al.*, 1991). The estuary has been in use since the 16th century and Padstow was established as a fishing port in the 16th Century. The developments of shipyards and trading links occurred from the 17th century to the 19th century, but is now declining. The fishing industry and, in particular, the pilchard fishery declined after 1899, although there has been some sign of recent recovery.

The hydrographic tidal range at Padstow is between 0.8 and 7.3 m at spring tide, and 2.6 and 5.6 m at neap tides. The yearly temperature range is between 8.5 and 16°C. (Gill & Mercer, 1989).

The Camel Estuary is an area of outstanding natural beauty (AONB), and contains SSSIs (Davies *et al.*, 1991).

14.2 Estuarine habitats

The estuary contains a variety of habitats being typified by mobile particulate sediments, and sand and mudflats on the lower estuary. The rock pools on the eastern shores of the estuary are of regional importance. The sublittoral region has been reviewed by Gill & Mercer (1989) who showed that there was enough habitat diversity (mobile sands to reefs) to ensure a rich fish fauna.

Gill & Mercer (1989) give a detailed breakdown of the primary marine habitats and invertebrate species list.

14.3 Fish lists

The fish list of the Camel Estuary has been compiled by the Cornish Biological Records Unit (Turk, pers. comm. 1992). Other lists included one from an intertidal survey (Gill & Mercer, 1989) and twenty-one species of fish were recorded in Hiscock (1979). The number of fish species recorded from the Camel Estuary is 28 (see Table 14.1).

14.4 Fish and fisheries

The Camel Estuary has been designated a bass (*Dicentrarchus labrax*) nursery area (Kelley, 1986, 1988) with the accompanying restrictions on the use of gill and similar enmeshing nets.

Schools of juvenile fish are found in the estuary including grey mullet (*Mugil sp.*), sand smelt (*Atherina presbyter*) flounder (*Platichthys flesus*) sand eels (*Ammodytes tobianus* and *Hyperoplus lancolatus*) pollack (*Pollachius pollachius*), eel (*Anguilla anguilla*), sole (*Solea solea*), sea trout (*Salmo trutta*), red mullet (*Mullus surmuletus*) the gobies (*Pomatoschistis microps* and *P. minutus*), the three-spined stickleback (*Gasteroteus aculeatus*), five bearded rockling (*Ciliata mustela*) the pipefish (*Syngnathus acus*) and the corkwing wrasse (*Crenilabrus melops*). (Reay, 1992)

Sandeels (*Ammodytes sp.*) are found in large numbers (Reay pers. comm. 1993).

Many young trout (*Salmo trutta*) have been taken from Rivers Camel and Allen (Gill & Mercer, 1989)

Mugil cephalus was recorded for the first time in the Camel (Reay, 1992)

The allis shad (*Alosa alosa*) was recorded from the Camel Estuary in 1907 (Clark, 1909; Turk, pers. comm. 1993)

14.5 Impacts

Commercial fishing activites, include 30 potting boats, 8 to 10 netting boats and 6 trawlers some using monofilament gill nets. Six salmon licences have been issued and 20 poachers have been caught with bass nets. Salmon and bass have been overfished, as have crabs and lobsters. Sea angling and shark fishing also take place (Gill & Mercer, 1989)

Sewage discharges into the estuary from at least 4 outflows, with some treatment taking place at the two highest in the estuary. In July 1988 aluminium sulphate was flushed from sewage works into the river and killed 330,000 fish (Gill & Mercer, 1989)

Industrial effluent is from trade and farm effluents, including slaughterhouse discharges. (Gill & Mercer, 1989)

Heavy metal levels are low, further details are given in Burt *et al.*, (1992).

Port and shipyard facilities are now used for **recreational** purposes such as sailing. Other recreational activities include wind surfing, tourism, bathing and bait digging (Gill & Mercer, 1989)

The estuary is used for **educational** purposes (Gill & Mercer, 1989)

14.6 Water quality

The water quality of the Camel is relatively unpolluted and graded "good" according to the NRA (1991) classification (see Figure 14.1). Burt *et al.* (1992) give details of the metal contaminants from estuarine sediments and Edmondson & Watts (1992) review the temporal distribution of other contaminants.

14.7 Summmary

The Camel Estuary has a long association with the fishing and trading activities of the north coast of Cornwall, although these functions have declined since the beginning of the century. Water leisure activities have taken over and now complement regional tourism. The high conservation value of the area and rich diversity of marine habitats are reflected in a diverse marine/estuarine fish fauna. Some commercial fishing occurs in the estuary with Padstow the main port.

14.8 Recommendations

It is recommended that:

1. a detailed survey is carried out on the fishes of the Camel Estuary to match the invertebrate study by Gill & Mercer (1989).

2. a review is undertaken of existing commercial fisheries.

14.9 References

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Table 14.1 The Fishes of the Camel Estuary

Raja alba
Anguilla anguilla
Salmo salar
Salmo trutta
Lepadogaster lepadogaster
Pollachius pollachius
Pollachius virens
Trisopterus luscus
Trisopterus minutus
Ophidion barbatum
Syngnathus acus
Taurulus bubalis
Dicentrarchus labrax
Chelon labrosus
Liza aurata
Mugil cephalus
Centrolabrus exoletus
Crenilabrus melops
Ctenolabrus rupestris
Labrus bergylta
Labrus mixtus
Lipophrys pholis
Callionymus lyra
Gobiusculus flavescens
Thorogobius ephippiatus
Scomber scombrus
Platichthys flesus
Pleuronectes platessa

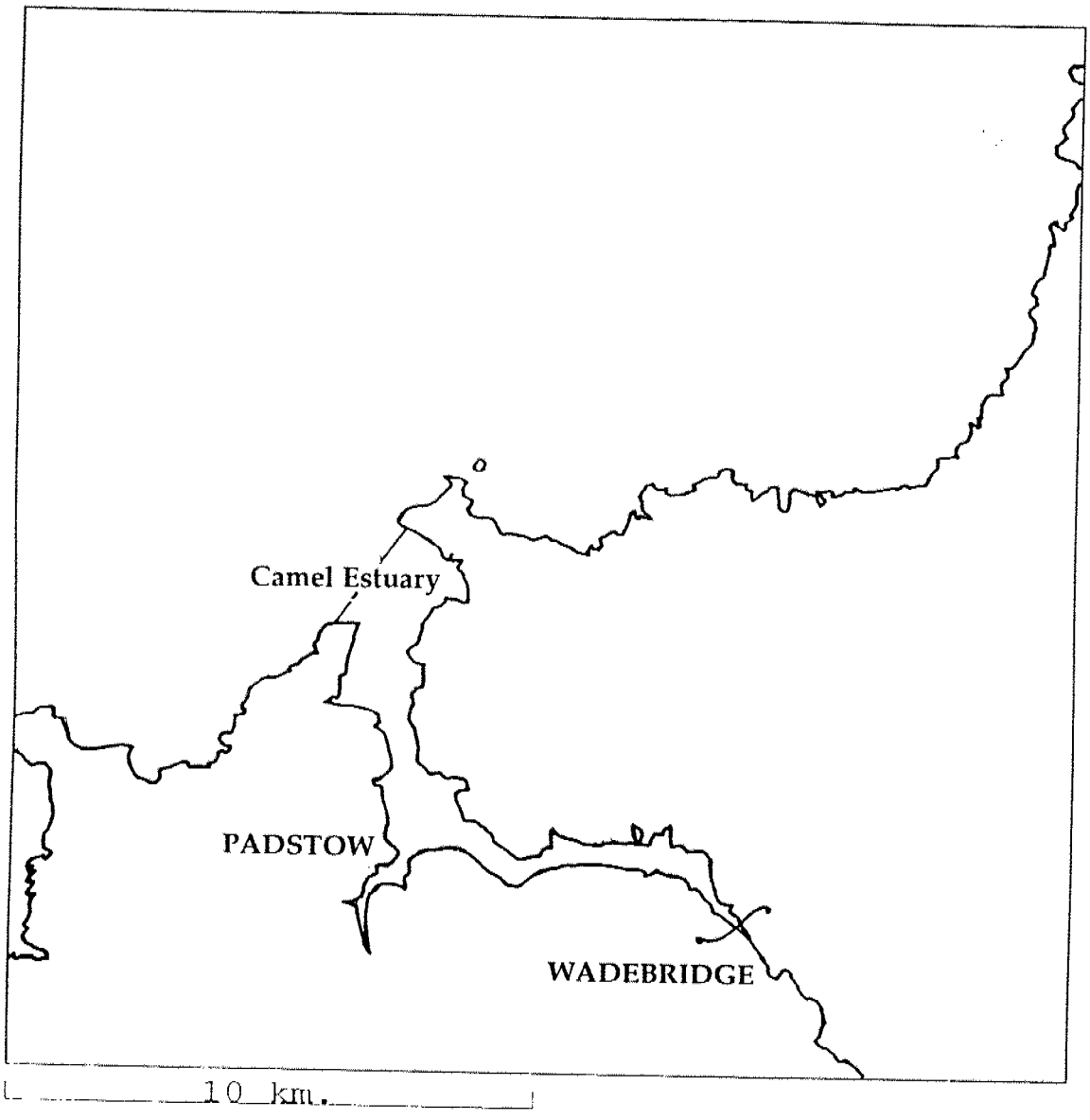

Figure 14.1 Map of the Camel Estuary showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].

15

THE FISHES
of
THE TAW/TORRIDGE ESTUARY

THE FISHES OF THE TAW/TORRIDGE ESTUARIES

15.1 Introduction

The Taw/Torridge is the only major estuary on the north coast of Devon occupying an area of 1592.5 ha. Both rivers flow in scenically attractive, wide, shallow valleys through Barnstaple and Bideford respectively. The rivers converge into a narrow channel which shelters the estuary from strong wave action. Tidal range is 7.5m and there are strong tidal currents. The temperature varies between 7.5 and 16°C. The freshwater input is large owing to the large catchment area, and the estuary can be fully fresh or during extended dry weather, fully saline. It is situated in the North Devon Area of Outstanding Natural Beauty, and is of nature conservation importance, and contains SSSIs (Devon County Council, 1979; Little, 1989; Davidson *et al.*, 1991).

The SSSIs cited in Davies *et al.*, (1990) indicated that estuarine fishes were included in the marine biology of the area.

15.2 Estuarine habitats

Mud is the major sediment in the upper estuary and sand in the lower and middle parts. At the confluence there are broad stretches of sand. The combined channel has ridges of course gravel, and is shallow with deep scoured areas. Shells, pebbles and cobbles in places are held together by mussel beds. There is a sizeable area of beach. There are sand and mudflats, rocky shore platforms, bedrock outcrops and littoral areas. The estuary reaches the sea beyond Bideford Bar (Devon County Council, 1979). Marine habitats have been studied by Little (1989).

15.3 Fish lists

Fish lists have been obtained from Driver, pers. comm. (National River Authority) and Davies, pers. comm. (1992) (South West Federation of Sea Anglers) and other surveys on the Taw/Torridge including Little (1989). The number of fish species recorded from the Taw Torridge Estuaries is 26 (see Table 15.1).

15.4 Fish and fisheries

The estuary and rivers are known to support a variety of fishes (Devon County Council, 1979).

The most important fishery is for salmon (*Salmo salar*) and sea trout (*Salmo trutta*), which takes place from April to August at two hours either side of low water. Commercial fishing for salmon is by seine netting and long-lines with details of catches going back to 1953 (Devon County Council, 1979). Salmon producing areas of Torridge have been shown to be declining as a result of deterioration of water quality. Grilse and sea trout are no longer entering the rivers early enough or in large enough numbers to stem the decline.

Eels (*Anguilla anguilla*) have declined from an estimated 7.5 million passing upstream in the Torridge in the 60s to undetectable numbers in 1985 (Lauder, 1986; Little, 1989).

The Taw and Torridge Estuaries have been identified as nursery for 0-group bass (*Dicentrarchus labrax*) by Kelley (1986, 1988). Bass rely on estuaries, and the increase in human activity on these areas are having an effect on the survival of bass. Sampling from a single site on the Taw in August 1987 held an estimated 24,000 0-group bass in an area of 3.700 m2 (0.1% of Taw/Torridge low tide water area). Threats to bass have been reduced with regulations imposed by the MAFF reducing the minimum landing size to 36 cm.

In winter flounder (*Platichthys flesus*), sole (*Solea solea*), and cod (*Gadus morhua*) are caught. There are occasional good catches of mullet (*Mugil sp.*) between July and October but a viable fishery is not supported.

The main species caught by angling are mackerel (*Scomer scombrus*), bass (*D. labrax*), flounder (*P. flesus*), plaice (*Pleuronectes platessa*), dab (*Limanda limanda*), mullet (*Mugil sp.*), and sprat (*Sprattus sprattus*).

In 1975 high light intensities and temperature were believed to contribute to an algal bloom in the upper reaches of Taw which was reported responsible for the death of migratory fish.

15.5 Impacts

The main **commercial fishery** (see above) is by seining. Trawling in the estuary is forbidden, although trawlers use the estuary to enter the open sea. Commercial fishermen believe their operations are hindered by boating activities (especially power boats). In the Taw there is a sole (and mussel) fishery in private ownership. (Devon County Council, 1979; Little, 1989)

Sewage has given cause for concern in the Torridge since mid 1930s, and sewage pollution is an increasing problem (Little, 1989). It is possible that the algal bloom recorded in 1975 was a result of sewage induced eutrophication.

The Taw Torridge estuary has operated as a **port** bringing in coal, timber, rock salt, fertilizers and petroleum. Fremington Quay was used by sand and gravel extraction business imports for the building trade. It has had a long maritime history, but its importance has declined owing to the difficult natural conditions of the estuary. However, there is still some **ship building** taking place at Appledore (Devon County Council, 1979; Little, 1989).

Sand and **gravel extraction** has occurred over several centuries, with sand extraction on a 15 year lease. Sand and gravel are extracted from Crow Point (Devon County Council, 1979). The **power station** owned by the Central Electricity Generating Board (CEGB) is situated at East Yelland and was operated on a reserve basis. BP **Oil** Limited own important petroleum storage facilities at the jetty north of Instow, East Yelland, which is adjacent to the **power station**.

The **MoD** carry out exercises on the estuary, although the use of the estuary is not excessive. RAF Chivenor is sited nearby.

Recreational pressures are increasing, with Instow, Appledore, and Bideford being tourist centres (Little, 1989). Activities include sailing, motor cruising (with mooring facilities for pleasure boats), rowing, canoeing, water skiiing and SCUBA. Angling is popular and there are two local angling clubs. (Devon County Council, 1979).

The area is extensively **urbanised** below Bideford. Between Bideford and Appledore there are shipyards and associated workings along the waterfront. (Devon County Council, 1979).

Intensive farming is carried out on much of the land surrounding the estuary. (Devon County Council, 1979).

There has been some **land reclamation** of areas of salt marshes (Devon County Council, 1979), an **infill site** at Northern Burrows and **sea defences** at Instow, Appledore with an oil company jetty (Little, 1989).

Mixed industrial wastes from industrial estates at Bideford and Barnstaple enter the estuary. Bleach and scour waste from plant at Barnstaple, effluent from a creamery at Torrington, domestic sewage and industrial effluent from metal plating works and meat processing factory contribute to the pollution of the estuary (Little, 1989).

Educational pressures include field courses at Appledore by the University of Central London who have carried out studies on the estuary. Local schools use the estuary for study and water sports (Little, 1989).

Heavy metal levels are recorded in Burt *et al.*, (1992)

Bait digging takes place in the estuary on a non-commercial basis.

15.6 Water quality

The water was rated "of doubtful quality and needing improvement" in the 1975 in the River Pollution Survey of England and Wales. Although, there have been some improvements associated with the development of Barnstaple Sewage Treatment Works on the Taw. High levels of nitrates have been recorded in both rivers. Water quality has deteriorated between 1981 and 1985 with 31 km. of feeder streams containing "waters which are polluted to such an extent that fish are absent or only sporadically present" (Little, 1989).

Water outfall from the power station has some effect on distribution of fish owing to it being several degrees warmer than river temperature. This effect has diminished as the station load decreased (Devon County Council, 1979). The discharge of aldrin and dieldrin in the River Taw caused mortality of salmonid fry and was reported to have accummulated in fish flesh (Hamilton, 1985). South West Water has commissioned a programme of environmental monitoring to include sampling of fish (Little, 1989).

Water quality according to the NRA (1991) is characterised as "good" (see Figure 15.1).

15.7 Summary

The Taw Torridge estuary is an area of outstanding natural beauty and of nature conservation importance. The diversity of fish habitats makes it potentially very interesting with regard to its fish fauna. The twaite shad is recorded from the estuary. The water quality gave cause for concern in 1989, but there is evidence that there has been some improvement since this survey. There are enough industrial uses on the estuary to pose a serious risk to the marine fauna if tight control is not maintained.

15.8 Recommendations

It is recommended that;

1. a programme is established to identify the commercial and non commercial fish fauna in relation to marine habitats and communities.

2. with records of the twaite shad (*Alosa fallax)* from the Taw/Torridge its status should be examined.

3. presssure is maintained to improve the water quality of the estuary.

15.9 References.

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Table 15.1 The Fishes of the Taw Torridge Estuaries

Raja clavata
Raja microocellata
Anguilla anguilla
Conger conger
Alosa fallax
Clupea harengus
Sprattus sprattus
Salmo salar
Salmo trutta
Gadus morhua
Merlangius merlangus
Agonus cataphractus
Dicentrarchus labrax
Chelon labrosus
Liza aurata
Lipophrys pholis
Pholis gunnellus
Pomatoschistus minutus
Pomatoschistus pictus
Thorogobius ephippiatus
Scomber scombrus
Scophthalmus rhombus
Limanda limanda
Platichthys flesus
Pleuronectes platessa
Solea solea

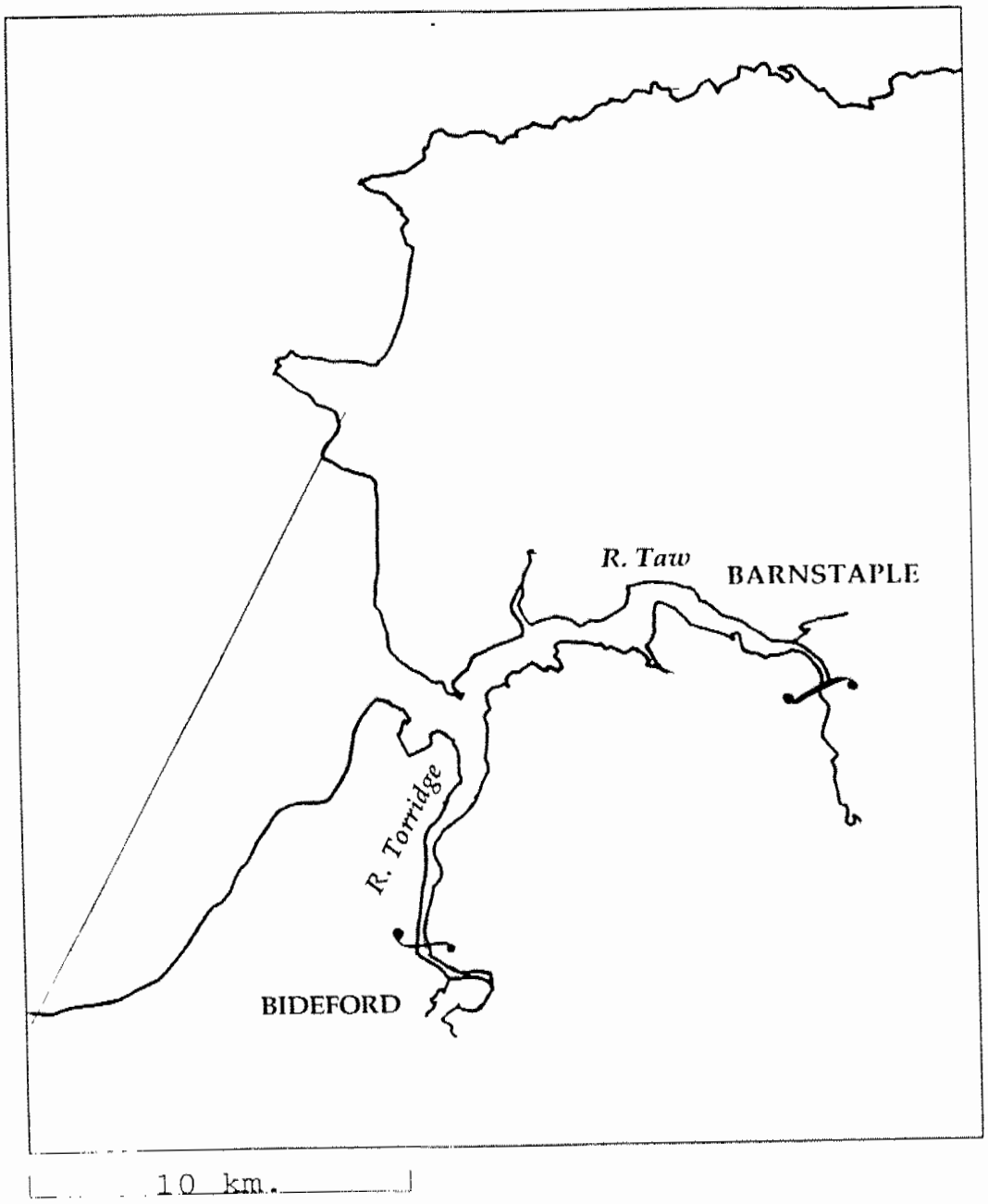

Figure 15.1 Map of the Taw/Torridge Estuaries showing the upper and lower extent of the estuary, the upper tidal limits, and the water quality according to the 1991 NRA Survey. Water quality is characterised as "good" [unmarked], "fair" [medium stipple], "poor" [dense stipple], and "bad" [solid infill].