1

Fisheries in prehistory and in antiquity

The relics of the past lie in the earth and in documents. They include accounts of fishing as sport, or as industry and the remains of fishing gear. Necessarily they are incomplete as compared with information collected today. The evidence, however, is positive and can be used with care. Before the material is presented, the four standard gears in use today throughout the world will be described briefly (many others will be described in more detail in later chapters), and this will help to illustrate the material from the more distant past.

The four gears

The simplest gear is a hook on the end of a line; today hooks vary widely in shape and in material and lines are usually made of synthetic fibres, which have replaced the original flax and hemp. Long lines, with hooks every fathom or so, are laid on the sea bed and the great lines used off Iceland and Greenland extended for many kilometres. Each hook in such a system has to be baited as it flies from the drum, perhaps with mussels or herring. A larger system is the pelagic long line used for catching tuna-like fishes in the subtropical ocean; the barbs are bare, the lines are suspended from floats at the surface and the whole system is up to 80 km in length (Figure 1(*a*)).

A drift net is floated up by buoys from a heavy messenger rope attached to a vessel, a drifter. The vessel and the long curtain of nets drifts, or drives with the tide. The system must drag a little in the sea, and fish migrating with the tide swim into it and are meshed by their gill covers. In the old East Anglian herring fishery in the southern North Sea, about seventy nets were used, a curtain of up to 2.5 km in length. Such nets are now costly, and if heavy with fish they need a crew of about ten men to haul them for many hours. The set net is anchored to the sea bed and herring swim into them on their spawning grounds; the method is quite distinct from that of the drifter (Figure 1(*b*)), which drives with the tide.

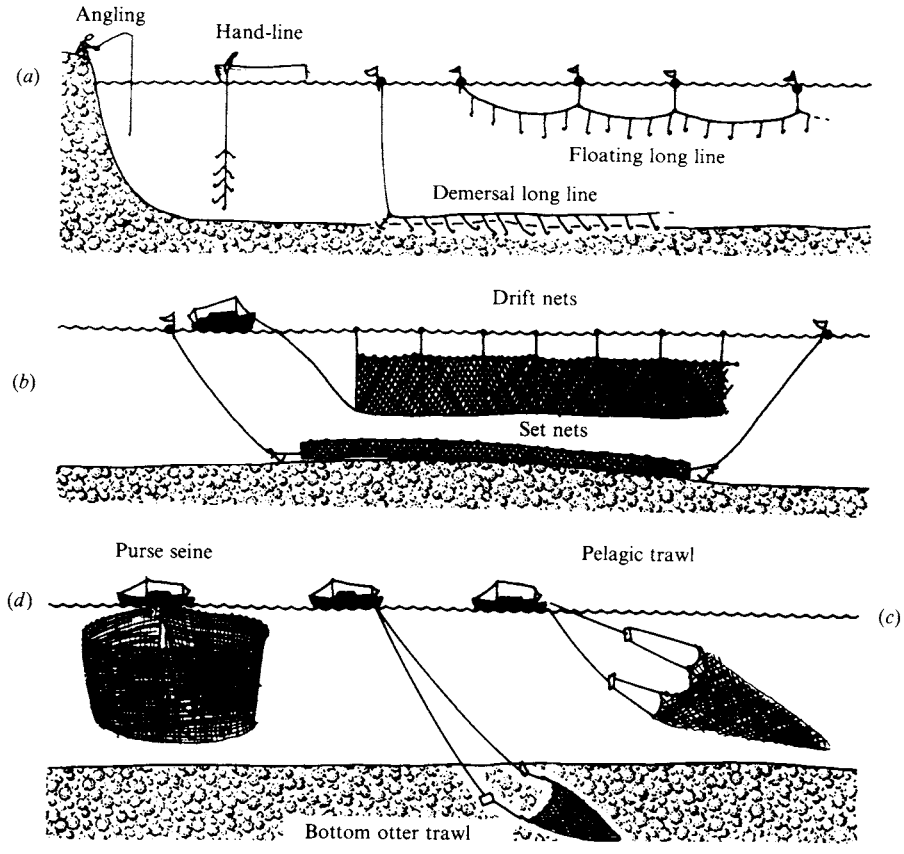

Figure 1. The main types of fishing gear, seines, trawls, gill nets and lines, all of which exist today; traps are illustrated in chapter 2 (from Cushing 1975).

(*a*) Lines: hooks are attached to lines to catch fish; they may be hand lines, demersal long lines a few kilometres in length or pelagic lines up to 80 km in length (Cushing 1975).

(*b*) Gill nets: long curtains of netting into which the fish swim and become caught by their gills. A drift net, perhaps 2.5 km in length is suspended from the surface or floated up from a heavy rope attached to the vessel; the whole system drifts or drives with the tide. Set nets are anchored to the sea bed.

(*c*) Trawl: a conical net with a broad low mouth dragged along the sea bed. The otter trawl is kept spread with doors or otter boards and the headline is lifted with spherical floats. In a beam trawl, the same functions are carried out by a beam fastened to iron trawl heads. A pelagic trawl is a large net with a roughly square mouth, towed in midwater.

(*d*) Seines: a purse seine is an enclosing net shot around a shoal, which is closed or pursed below by ropes from the vessel, laced through rings at the bottom of the net. With a Danish seine, a circle of net laid on the sea bed is hauled from the vessel and herds the fish into the net.

There are many varieties of trawl in use today developed from the dredges and beam trawls of earlier times. The beam trawl was that used by the North Sea smacks in the nineteenth century; the beam was attached to triangular trawl heads. The net was a long conical bag spread back from the beam to the cod end, which collected the fish as the trawl was towed through the sea on a single warp; advanced forms of this trawl are used today in the southern North Sea. The otter trawl is spread by 'doors' on two warps which are handled by a double-barrelled winch on the trawler's deck. Most trawls are worked on the seabed for bottom-living or demersal fish, but there are also trawls that are operated in the midwater for pelagic fish (Figure 1(*c*)).

The seines are encircling nets, shot from the shore or out in the open sea. A curtain of net is shot in a circle until the ring is closed at the surface and is 'pursed' below. Such nets are today very large and hundreds of tons of herring-like or sardine-like fishes can be taken with them. The Danish seine works in an analogous way on the sea bed, where the ring is closed by ropes laid on the bottom (Figure 1(*d*)).

Around the seas of the world, traps, pots and creels are used; fish and crustaceans swim into them to take the bait provided. Salmon and tuna are taken in corridors of netting, the salmon in fixed engines in British waters and the tuna in *madragues* in the Mediterranean.

The prehistoric evidence (Rau 1884)

Hooks, barbed harpoon heads and gorges have been found in palaeolithic remains at Kesslerloch (near Zürich). Bones of salmon, trout, pike, bream, white bream, dace and chub have been found in the valleys of the Dordogne and the Vézère in France. Drawings of carp, pike, eel and spurdogs on reindeer horn have been recovered. Compound fish hooks like those used by the North American Indians to catch the halibut off Cape Flattery were taken from Kesslerloch.

Neolithic remains of oyster, cockle, mussel, periwinkle, herring, cod, dab and eel were found in Danish middens; remnants of salmon, pike, perch, carp, dace, chub, turbot and rudd have been taken from the Swiss lake dwellings. From the same areas have been recovered bone fish hooks, bark floats, grapnels for recovering lines, deep horn harpoon heads and fragments of nets made of flax with sinkers. Dug out boats were found with anchor stones and what appeared to be netsmen's needles. From the bronze age, hooks of different shapes were recovered from the Lake of Neuchâtel; the Romanshorn was a large 15 cm hook. At Cudrefin (near the lake), a well-shaped boat was found, made of oak, 7–10 cm thick

with cross ribs. Lhote (1959) published reproductions of cave drawings from the Sahara which show a fisherman working hook and line from a canoe (*c.* 3500 BC).

From the prehistoric evidence we conclude that some of the fish we eat today were taken by hook and line long ago, with nets from the banks of rivers, from the shores of seas and from boats. In other words the fisheries in the dawn of history on rivers and close to the sea shore may not have differed very much from those which we know today in the same places.

Fisheries in ancient Egypt

Radcliffe (1921 and references therein) gives an account of the fisheries of the Old, Middle and New Kingdoms. Spears, harpoons and bidents (which are still in use in Lebanon and Syria today) with long lines for recovery were used from river banks or papyrus punts in about 2000 BC. Copper hooks, both barbed and barbless, of 2–6 cm in length were found in tombs of the first dynasty, the earliest period. Nets appear as bags in remains dating from the third and fourth dynasties of the Old Kingdom. In the rock tomb of Deir el Gebrawi, there is a picture of seven fishermen hauling a seine from a boat, with eight species of fish in the catch. Needles are shown in all ages, with spindles; handnets, double handnets, cast nets, stakes and seines were used. The seines were weighted down with stones. Nets were made with flax in double and triple strands with meshes of from 0.3 cm to 1.2 and 1.9 cm. Weels (or wicker fish traps) were small (1.5 m) or very large (3–4 m, for several men).

Certain fishes were venerated; *Lepidotus* and *Phagrus* are recorded as such by Herodotus, and Strabo noted a respect for the Nile perch. Parts of the god Osiris were said to be eaten by the shark (*Oxyrhynchus*). In Ptolemaic times, the catch was taxed up to one quarter of its value; there was also a tax on the right to fish, particularly in waters owned by the temples. The nets in the marsh country were 'engines of encirclement' or purse-seine-type nets; the fisherman used it by day to catch fish and by night as a bedspread. Fish were dressed on the boat and dispatched quickly to market; indeed they were exported to Palestine in baskets or in barrels.

Assyrian fisheries

Handlines and nets were used from light boats, according to Radcliffe (1921), but there appear to be no records of spears or rods. Creels were used and a 'double knotted surrounding net'. As long ago as 2500 BC,

there was a fish pond in each town, under the charge of a keeper. Sea fish – turbot, sole, swordfish, shark, flying fish and sturgeon – were kept in *vivaria*.

Jewish fisheries

As in Assyria, rods were absent. But handlines, spears, bidents and cast nets were certainly used. Scaleless fish were initially excluded by law (siluridae, skates, lampreys, eels and shellfish); weirs and fences were forbidden, and nets were made in the main worked from river banks. Fish ponds were a late development (Radcliffe 1921).

Fisheries in classical antiquity

One of the difficulties in examining the classical texts is that the names of fishes do not always correspond with those of today; I have used d'Arcy Thompson's (1947) *A glossary of Greek fishes* (and references therein). Aristotle refers to 110 species in his *Natural history*, but only fifty can be identified, of which all save six came from the sea. Homer (quoted by Radcliffe 1921) refers to spears, a net (a beach seine) of 'all ensnaring flax', rods and hooks and lines. Theocritus in the *Fishermen's dream* refers to the instruments of their toilsome hands, the fishing creels, the rods of reed, the hooks, the sails bedraggled with sea spoil, the lines, the weels, the lobster pots woven of rushes and the seines. Leonidas wrote of a well-bent hook, a long rod and a line of horse hair.

Aelian (AD 170–230; Hercher 1971) recorded four gears – nets, spears, weels and hooks; artificial flies made of red wool round a hook were bound with two feathers from under a cock's wattle. He wrote that grayling can be caught only with a hook baited with a particular gnat. The method of catching young tuna is obviously a form of trolling, lines with hooks trailed from the stern of the fishing vessel, with bait wrapped in red wool and gull feathers. Ausonius (*c.* AD 310–393; Hosius 1967) wrote of fishing, perhaps for salmon or trout, in the Moselle. Men in boats drag nets in mid stream, watch the corks of little nets in shallower water and on rocks, anglers with rods scan the floats bobbing in the water. He also referred to a knotty seine and to drag nets buoyed on their cork floats.

Nets were of all sorts and kinds in shape, make and size. Alciphron wrote that 'scarce a fathom in the harbour of Ephesus but held a net'; once the sole haul was the putrid carcass of a camel, so the net was fairly large. Rods were jointed. Lines were usually woven of horsehair, flax and broom; hooks were made of iron or of hard bronze (i.e. of tin and copper,

not zinc and copper) and there were one or two sharp barbs. Lines were used with floating cork and lead attached close to the hook; sliding corks were used to regulate the position of the lure. Myrrh dissolved in wine was used on the bait to intoxicate and cyclamen was used with bread to poison. Istrian fishermen caught silurus (*Parasilurus aristotelis* Agassiz) of about 180 kg and hauled it in with oxen (Radcliffe 1921).

Probably the fullest single account of Roman fishing is given in the Halieutica of Oppian (1928) (*c.* AD 170). He lists the fishes that can now be identified: red mullet, *Trachurus*, sole, mormyrids, mackerel, carp, blenny, grey mullet, bass, conger, sea horse, gurnard, perch, rainbow wrasse, *Sciaena*, dory, parrot wrasse, *Muraena*, *Serranus gigas*, *Glaucus*, *Dentex*, *Scorpaena*, *Sphyraena*, *Balistes*, tuna, swordfish, pilot fish (*Naucrates*), pilchard, shad, sucker, spiny crayfish, lobster, crab, prawn, hermit crab, octopus, cuttlefish, oysters, sea urchins, mussels, razor shell, nautilus, sawfish, dogfish, spiny dogfish, spotted dogfish, dolphin, whale, seal and turtle, amongst others.

> Some delight in hooks and, of these, some fish with a well twisted line of horse hair fastened to long reeds, others simply cast a flaxen cord attached to their hands, another rejoices in leaded lines or lines with many hooks. Others prefer to array nets; and of these there are those called casting nets, and those called draw-nets, drag nets and round bag nets and seines. Others they call cover nets, and with the seines, there are those called ground nets and ball nets and the crooked trawl; innumerable are the various sorts of such crafty bosomed nets. Others again have their minds set rather upon weels which bring joy to their masters while they sleep. Others with the long pronged trident wound the fish from the land or from the ship, as they will (Oppian; see Mair 1928).

Some sharks bit through the lines, grey mullet leapt over the cork lines, the moray eel circled for a wide mesh to slip through, a hooked bass enlarged the wound and escaped and deep sea fishes were landed with onions or with bare hooks. There was a large variety of odours used in the lures; broiled octopus or crayfish were said to raise bream; parched vetches moistened with fragrant wine yielded shad, pilchard and horse mackerel; red mullet were said to like smelly baits and grey mullet a floury bait with mint. Mackerel rushed into the (drift) nets, some landed in the wider meshes and leapt out, but others, penned in the narrow openings suffered a bitter fate by strangling. At three places, off Sicily, off the mouth of the Rhone and off the Spanish coast, the men fishing for tuna found places neither open to the wind nor 'straitened under beetling banks'; a watcher from a hill told his comrades of the sizes, shapes and direction of shoals and the tuna poured into the *madragues*.

Oppian (see Mair 1928) describes the capture of whales with a line of

many strands of well-woven cords, as thick as the forestay of a ship. The well wrought hook was rough and sharp with barbs, alternately on either side. A coiled chain was cast about the butt of the hook, a stout chain of beaten bronze. Well-benched ships were used with quiet oars. The hook was baited with liver. The whale took the hook and dived, whereupon the fishermen let large bladders go, fastened to the line. When the bladder rose to the surface the whale was tiring. When he surfaced he was attacked with strong harpoons, stout tridents, bills and axes and 'with the end of his tail, he ploughs up the waves of the deep'. The whale was towed ashore by its teeth. Fin whales and sperm whales live in the Mediterranean (Viale 1981) as do pilot whales; perhaps the ancient Greeks caught pilot whales.

Oppian is very interesting on the capture of dolphins: 'the hunting of dolphins is immoral . . . for equally with human slaughter the gods abhor the deathly doom of the monarchs of the deep; for like thoughts with men have the attendants of the god of the blooming sea; wherefore they practise love of their offspring and are friendly one to another.' I shall return to this succinct statement in a later chapter on whaling. Off Euboea, fishermen took their catches under 'the swift gleam of the brazen lantern'; the dolphins chased the fish towards the 'well pronged tridents' and subsequently came to ask for their share.

Homer (see Radcliffe 1921) does not refer to fish in banquets, but the Romans did. They took fish from the Tiber, the Po, the Danube, the Rhine and from the north Italian lakes, but they preferred sea fish; in Diocletian's edict of AD 301, the best-quality sea fish were considered to be twice as valuable as the best-quality freshwater fish. The most valuable fish were red mullets, sturgeon and turbot and the prices of red mullet were very high indeed. The Roman nobles spent large quantities of money on aquaria (Radcliffe 1921).

Fish were used in sacrifices and formed the basis of a trade in salted and pickled fish (indeed salsamentum was also used to prevent scurvy); Olbia in Sardinia was an important market for this trade. Archimedes (see Radcliffe 1921) refers to an aquarium of 95 470 l on board ship (part of the corn traffic between Sicily and Egypt), which was lead lined.

Roman law illuminates the nature of the fisheries. Fish and wild animals were among *res nullius*, things belonging to no one. They become the property of the person who first 'reduces them to their possession'. The seas and public rivers could not be owned by individuals and so no individual could be prevented from fishing in the sea and in such rivers; however, a cove alongside private property might be enclosed by stakes and a backwater of a public river could be acquired by prescription. Such

a structure is very like that in British waters in the nineteenth and early twentieth centuries, which implies that the fisheries were fairly well developed (Radcliffe 1921).

Smith (1876) discussed the distribution of fisheries in so far as they were known. The Black Sea and the Sea of Azov were the most important sources of fish. Fishermen's societies worked large vessels which sailed to Spain, Portugal and North Africa. They used lines, nets, seines and harpoons; hooks were made of copper, or iron covered with tin and iron chains were used to catch sharks. Tuna were taken from the Straits of the Bosphorus, Italy, Sicily, Sardinia, the Straits of Bonifacio, the Straits of Messina, the Straits of Cadiz (*sic*), off Elba, off France and off Spain. Mullets were taken from the Straits of Gibraltar. Salted tuna came from Euboea, Icaria, Cefalu, Samos, Icaria, Orbetello, San Stefano and Malaga (Malach means 'to salt'). There is argument about *Asellus*, a gadoid, which might be hake or a smaller one; whatever it was it was highly valued.

According to d'Arcy Thompson (1947) turbot was caught mainly in the Black Sea, but it was excellent off Ravenna (the northern Adriatic is a relict sea). *Oreochromis nilotica* was taken in the Nile. The sturgeon was celebrated in Rhodes; it was a costly luxury in Rome. It was also caught at holes in the ice in some lakes, as it is today in Lake Winnebago in the State of Wisconsin. The bonito was gregarious and migratory and spent its summer in the Black Sea; it was best in Istanbul. Dolphins were regarded as a grievous enemy of lesser fishes and to hunt them was sinful and displeasing to the gods; they were, however, taken by the Thracians and off Pharnacia in Chaldea, where they chased the tuna and were caught for their blubber. Eels were kept over winter in clean water in small tanks; they were caught in great numbers where the Mincius flows from Lake Garda. Tame eels were found in the fountain of Arethusa at Chalcis in Euboea. Tuna were taken by a seine net paid out by six boats at the entrance to the Gulf of Argolis. The 'hooers' (the Cornish name) or *speculatori* on tall masts or high cliffs had to be loud voiced, sharp sighted and quick at figures. Bass provided excellent food 'between the bridges' in Rome. The Nile perch dried and salted was considered the prize fish, except for *Tilapia*. Swordfish were caught of Scilla as they are today from swordfish-shaped boats. Bluefin tuna were taken with great iron hooks on strong ropes; when hooked they try to enlarge the wound in order to escape. They migrate past the Pillars of Hercules and were caught plentifully in the Iberian and Tyrrhenian Seas. Young Tuna (or 'pelamys') gathered at the entrance to the Sea of Azov; they were caught by an engine armed with hooks and weighted with lead, which was

dropped on the fish as they lay in deep water. Aelian (see Hercher 1971) wrote of swift boats with ten rowers and of hooks baited with a coloured rag and trimmed with a gull's feather 'so as to flicker gently at the surface of the sea'; this is one method used today for mackerel in the waters off western Europe and off North America. Oysters were grown on hurdles and were transplanted to Chios from Ryrrha in Lesbos, but 'maiora Lucrinis, dulciora Britannicis, suaviora Medulis, acriora Ephesiis, pleniora Lucrensibus, sicciora Coryphantenis, teneriora Histricis, candidiora Circeiensibus . . . rufa Hispaniae, fusca Illyrico, nigra et carne et testa circeiis.' d'Arcy Thompson's evidence is most valuable because he was a fisheries biologist and at the same time a notable classical scholar; hence his survey is of some importance.

Arrianus (Iliffe Robson 1929–30) refers to the ichthyophagi in the Arabian Gulf. They ate nothing but fish, ground to a meal for themselves and their cattle; they were said to be dressed in fish-skin clothes and to live in huts made of whale skeletons. Perhaps, in fact, they lived in the Hadramaut in Southern Arabia on the shore of a notable upwelling area. They had nets which could cover two stadia (0.4 km) and which were made of the inner bark of palm trees. The *dictymum* was a cast net, the *amphiblestoon* was a seine (perhaps a shore seine); *sagenai* resembled modern seines which stretched many roods to seaward; *sphaerenoci* were pockets in a seine; *hypochaei* were small round nets and *gangamai* were drag nets or dredges; *gryphai* and *kurtai* were traps of bent osier twigs; *panagreas* were nets, generally.

Conclusion

Most classical writers, apart from Oppian, were not interested in fisheries as such, and many modern translators are concerned with angling. Yet from their material and the prehistoric evidence emerges a picture of fisheries in the distant past which is quite compatible with accounts today. The four gears were there, the same fish were taken as can be found in any Mediterranean restaurant today, there was trade across considerable distances and there was a legal basis to the practices of fishermen.

2

The preindustrial fisheries

By 1987 it has become difficult to describe the fisheries before industrialization. However, some historians and some observers give a reasonable picture, if only a qualitative one. The historians are Parona (1919), who described the tuna fishery in the Mediterranean in the nineteenth century and Cadoret *et al.* (1978), who gave an account of the Breton fisheries for sardines and albacore in the nineteenth and twentieth centuries. The observers were: Duhamel du Monceau (1769), who described gear and fisheries in France in the eighteenth century; Brown Goode (1879, 1887*a*), who wrote histories of various fisheries of the coasts of the United States; and Hornell (1905, 1914, 1916*a*, *b*, 1917, 1925, 1938, 1950), who was a fisheries administrator in India from the first decade of the present century until the Second World War.

Fishing gear as illustrated by Duhamel du Monceau (1769)

There are two main groups of gear, those based from shore and those worked mainly at sea. The two groups overlap to some degree.

Gear used from shore

The simplest nets are the cast net and lift net (Figure 2). Both can be seen today in many parts of the world. Cast nets are thrown over small shoals of little fish in shallow water. Shrimps, prawns and crayfish are caught with lift nets on the rising tide. Figure 3 illustrates the familiar crab and lobster pots used off rocks and from small boats throughout the world. Figure 4 shows traps left at low tide with fish retained in them.