



## SECTION 3: THE FISHES OF THE TWEED AND THE EYE

### A.5 to 7: Lampreys

"Lampreys in galantine ... Lampreys baked"

Two of the dishes served to King William 1<sup>st</sup> of Scotland at Norham Castle during Lent of the year 1200 (Maxwell 1909). "Galantine" was a spicy sauce.

### THE THREE BRITISH SPECIES OF LAMPREY: RIVER, BROOK AND SEA

**(A) Taxonomy:** Though Lampreys look like Eels, they are not actually fish. They belong to a completely different Order of vertebrates, called the Agnatha, a name that describes the fact that they have no jaws. The suckers that they have instead are their most obvious feature and are used to cling on to fish while flesh and body fluids are extracted for their food, and such attacks can be fatal to the host fish.



Photo A: The scar of a Lamprey sucker on a Sea-trout found in the Eye Water in August 2002

Their other obvious difference from Eels is that they have no gills, the water that they "breathe" in, is "breathed out" through seven "holes" on each side of the head (Photo B). They are much more primitive than fish, and indeed, are the most primitive living vertebrates, with a fossil record dating back some 450 million years. Their skeletons, like those of sharks, are made of cartilage, not bone.

The three British species are the Brook Lamprey (*Lampetra planer*), the River Lamprey (*Lampetra fluviatilis*) and the Sea Lamprey (*Petromyzon marinus*).



*Photo B: The gill holes of lamprey*

**(B) Life History:** The three British species have similar life histories. Spawning is in spring or early summer, the sticky eggs being deposited in gravel in communal nests excavated by moving stones with their suckers. On hatching 15 to 30 days later (depending on water temperature) the eyeless larvae, called Ammocoetes (Photo C), are washed downstream into quiet silty areas where they burrow into the soft substrate and start to filter-feed taking tiny organic particles and micro-organisms out of the water that they pass through their "mouths". The different species take different periods of time to reach the size at which they metamorphose into the next stage, the "macrophthalmia" at which their eyes and rasping suckers develop (Photo D), a process that occurs in late summer and autumn.



*Photo C: Ammocoete larvae taken at a sampling site*

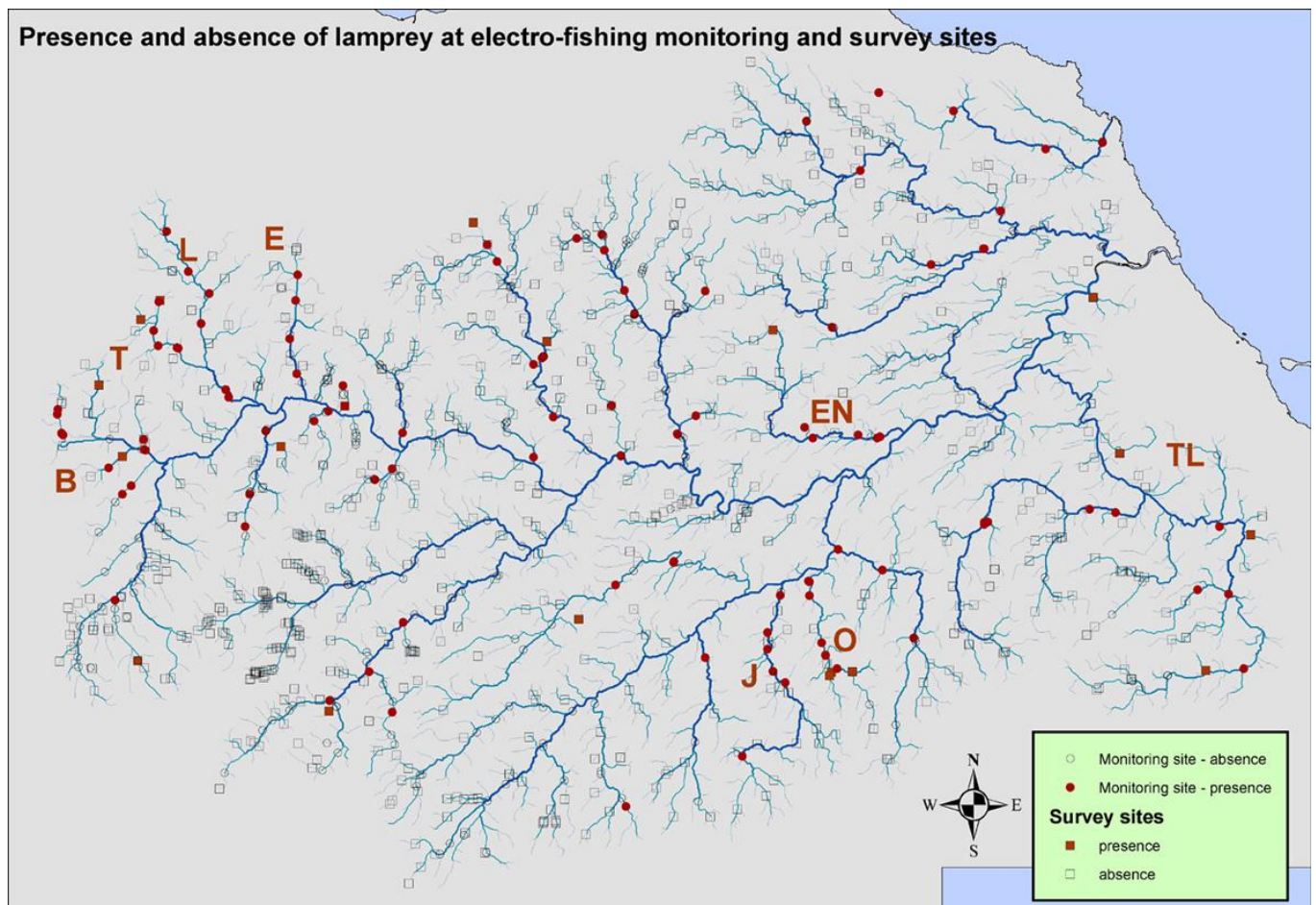


*Photo D: The Macrophthalmia stage of the lamprey life cycle*

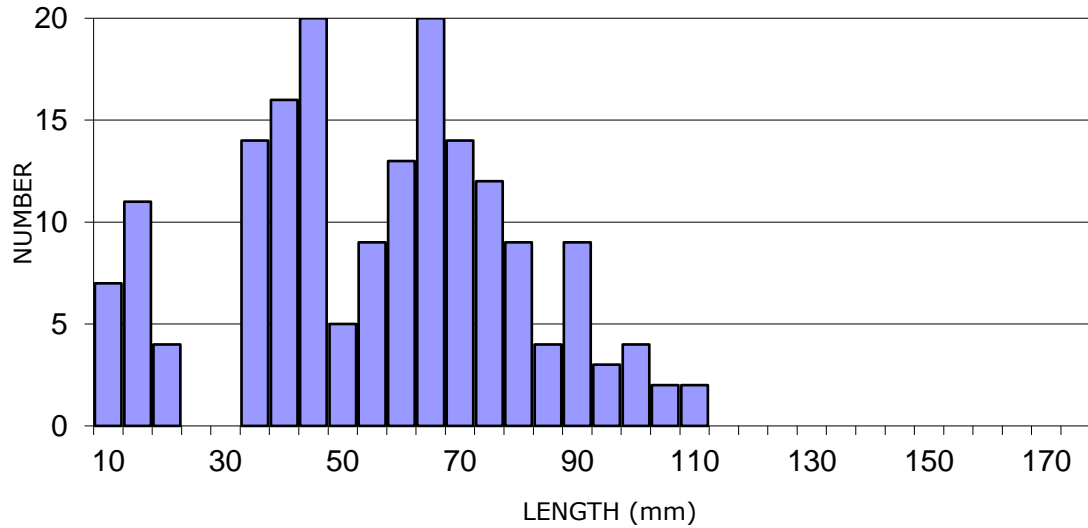


Brook Lamprey do not feed as adults and are generally larger at this stage (12 to 15cms), but the smaller (10 to 12cms) macrophthalmia of the other species turn silvery at this point, ready for their migration down to the sea. All the British species die after spawning.

**(C) Recent records of Ammocoete larvae within the Tweed Catchment:** Almost all records from electro-fishing surveys have been simply of indeterminate "Lamprey larvae". Although quite distinct as adults, the larvae of the River and Brook lampreys are not easily distinguishable, and those of the Sea Lamprey are only so with care. Ammocoetes have been found throughout the Tweed catchment as shown on the map below. However, as fisheries survey work has inevitably concentrated on Salmon and Trout, these records are from faster flowing stream stretches rather than the slower backwaters actually preferred by the larvae. The concentrations of observations in the slower flowing Lyne, Tarth, Biggar and Eddleston ( L, T, B and E on the map) in the North-west, the Oxnam and Jed (O and J on the map) in the central South and the Eden (EN) in the centre-east reflect these habitat preferences of the Ammocoete larvae. A specific survey for Ammocoetes on the Till (TL) in 2002 found them to be abundant throughout the larger channels there though this does not show up on this map, which is of presence at Salmon and Trout juvenile electro-fishing sites. Main channels are too large to be surveyed with the usual electro-fishing techniques used for juvenile Salmon and Trout, so there are no such electro-fishing sites in such areas and they are not represented on this map. Casual electro-fishing observations however, have shown Lamprey larvae to be present in quiet areas along the banks of the main Tweed in the Wark area.

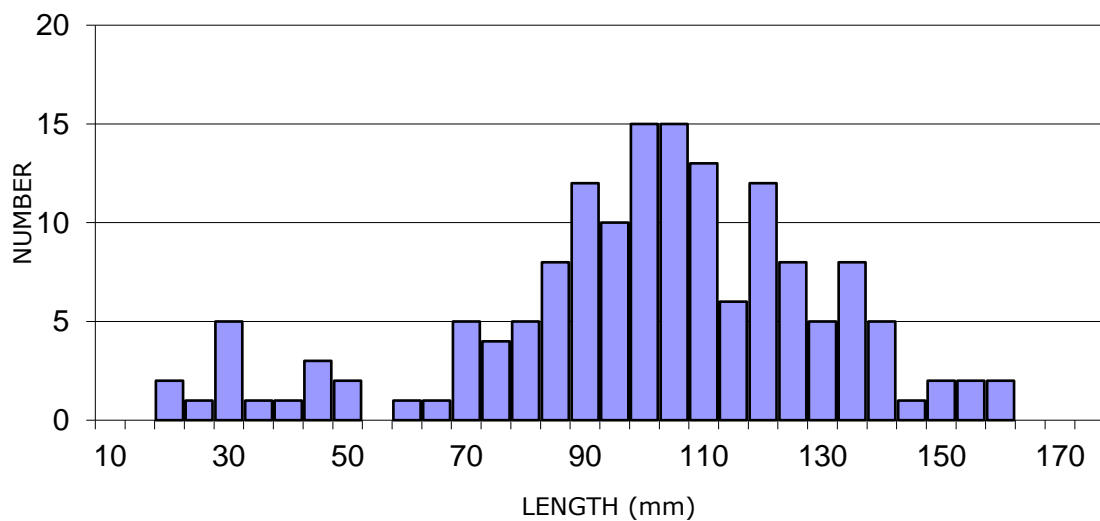


Although the Ammocoetes of River and Brook Lamprey are difficult to tell apart as individuals, populations in the same areas can be distinguished by their size and the number of year groups in them: River Lamprey larvae take four or five years to reach the size at which they metamorphose, which is from 90 to 120mm whilst Brook Lamprey larvae take six to eight years to reach their size of 120 to 160mm. A population of River Lamprey larvae will therefore have fewer age groups and smaller individuals than a population of Brook Lampreys.



Graph A: Ammocoete lengths: Lower Till

This appears to be the case on the Till where, as shown in Graph A, there are four age groups and no individuals larger than 110 mm while, as shown Graph B, on the upper Bowmont, there are about eight age groups and many individuals well over 110mm.



Graph B: Ammocoete lengths: Upper Bowmont

This pattern would fit with what is known of the distribution of River and Brook Lampreys with the former found more in the lower areas of catchments and the latter in the upper.



**A.5: Brook Lamprey**  
*Lampetra planeri*



*Photo A.5.1: The Brook Lamprey*

The Brook Lamprey (Photo A.5.1) does not feed as an adult, and after metamorphosis spawns and dies. Its Ammocoete larvae therefore reach the adult size of 12 to 15 cm (4.5" to 6") before changing into the adult stage. However, dwarf populations where the adults are less than 10cms in length are known, as are places where the adults reach 16 or 17cms. It may be that the Brook Lamprey is not a single species, but that its populations are simply non-migratory offshoots of the River Lamprey, a similar relationship to that of Brown trout and Sea-trout. This would mean that each river's Brook Lamprey population was an individual offshoot of its River Lamprey population and so unconnected with Brook Lamprey populations elsewhere. However, whilst Brown trout and Sea-trout spawn with each other, there is no evidence that River and Brook Lampreys do so in the wild, showing them to be somewhat further apart, though artificial hybridisation is easily achieved. Their larvae are not easily distinguishable from those of the River Lamprey and they can be found in lochs as well as in rivers; the large Ammocoetes found during a Tweed Foundation electro-fishing survey in the short channel connecting the Loch of the Lowes with St. Mary's Loch in September 2002 will almost certainly have been those of Brook Lamprey. Identification as adults is the surest method and a list of places where these have been found is given in Table A.5.1. Brook Lampreys can also be found upstream of physical barriers that prevent the migration of River and Sea Lampreys. The populations found upstream of Stichill Linn on the Eden Water, a tributary of the middle Tweed, could be an example of such an isolated population as these falls are impassable for both Salmon and Sea-trout, though not for Eel.

Though they live all their lives in rivers and streams, Brook Lampreys are seldom visible except during spawning in April and May, when the congregations at their nests can be very obvious (Photo A.5.2). Being small and soft-bodied, they are extremely vulnerable, and Herons, gulls and Sawbill Ducks can eat large numbers of them. Though the commonest of the British lampreys, it is regarded as being in decline in some parts of Europe and therefore has some legal protection.



Photo A.5.2: Brook Lamprey nesting in the Turfford Burn, Earlston on the 10<sup>th</sup> April 2007

Bolam (1919) records the "Mud Lamprey" as being "common and abundant in many of our streams, Till for example, where it usually attains about 6" (15cms) in length" and records the local names as being "Lampern, Nine-eyes and Blind Eel".

<u>DATE</u>	<u>WATERCOURSE</u>	<u>PLACE</u>	<u>NOTES</u>
1991 April	Tweed	Walkerburn - Ettrickmouth	Goosander stomach
1991 April	Tweed	Coldstream - Estuary	Goosander stomach
1992 February	Tweed	Upstream of Melrose	Goosander stomach
1992 March	Tweed	Downstream of Melrose	Goosander stomach
1995 March-April	Tweed		Cormorant stomach
2001 May	Leader	Drygrange	Spawning nest
2007 April	Turfford Burn (Leader)	Earlston	Spawning nest

Data from Marquis, Carss, Armstrong & Gardiner (1998) and The Tweed Foundation

Table A.5.1: Recent records of adult Brook Lamprey in the Tweed and Eye catchments



#### **A.6: River Lamprey** *Lampetra fluviatilis*

The River Lamprey's average length as an adult is 30cms (12") but it can reach 40cms (14"). There is some evidence that the River Lamprey has declined in Britain over the past 100 years, though it is not thought to be under threat of extinction. Pollution is a threat to River Lampreys, especially in and around estuaries as it can prevent upstream migration to the spawning areas. Dams and other physical barriers can also exterminate populations by preventing migration.

The life-history of the River Lamprey is similar to that of Sea-trout. The adults spent 1 to 2 years feeding mainly in river estuaries: Herring (*Clupea harengus*), Sprat (*Sprattus sprattus*) and Flounder (*Platichthys flesus*) are regarded as being their main hosts, though other species can be attacked. When ready to migrate, feeding stops in the autumn and they begin to move up the main channels of rivers, continuing upstream through winter and spring, travelling mainly at night and hiding during the day. Spawning starts when water temperatures reach 10° or 11°C, in March or April, communal "nests" being made amongst small stones and gravel by up to a dozen or more spawners working together shifting the stones with their suckers. These nests can be up to 70cms (2' 6" wide) and 10cms (4") deep. Females spawn over several days, the eggs being shed into the nest where they stick on to the stones, and all the adults die after spawning. As with Trout and Salmon, gravel banks at the tails of pools are the preferred spawning sites.

Incubation lasts 15 to 30 days, depending on water temperatures. After hatching, the eyeless larvae, called Ammocoetes (Photo C, Appendix II) which are around 7mm long (0.25") are washed downstream into silt beds, where they burrow in and start feeding (they can be found in suitable areas in lakes as well as in rivers). At this stage, they are filter feeders, sucking in a current of water and filtering out tiny organic particles and micro-organisms such as single-celled algae as food. They grow to around 50mm (2") or so after their first year, taking 3 to 5 years to reach 9 to 12cms (3.5" to 5") in length, the size at which they change ("metamorphose") into their adult form. At metamorphosis, their eyes and rasping sucker develop and they are then called "*macrophthalmia*" (Photo D, Appendix II). These are sexually mature but non-feeding and in contrast to the larvae, they are active and large-eyed (hence the name) and move from silty to stony areas. Like smolts, these are silvery in appearance in preparation for their move down to the sea.

The River Lamprey is of considerable commercial value in other countries, particularly in Sweden and Finland, where there are large scale fisheries that catch them as they migrate upriver to spawn; in the late 1970's, the total catch from 28 Finnish rivers was between 2 and 2.5 million lampreys. In the past, they were fished on larger rivers in the British Isles, and it was lampreys from the River Severn that King Henry I of England famously and fatally over-ate. Lampreys were provided for King William I of Scotland at Norham Castle in Lent of the year 1200 (Maxwell 1909). There are no known records of it being fished locally. Bolam (1919) regarded it as being less frequently found in the Tweed than the Sea Lamprey and gives "*Barling, Cunning and Spanker Eel*" as being the Northumbrian names for it, though he had personally only heard the last of these in actual use. Sir Thomas Dick Lauder, reminiscing in 1848 (Lauder 1874), wrote that at the Bridge of Yarrow: "*It is remarkable that lampreys used to come up here to spawn, and if we do not mistake, we ourselves saw several sticking to the stones, near the bridge, like floating pieces of tangle*". This is more likely to be a reference to River Lamprey given the comparison with "tangle" (Kelp, *Laminaria* spp) as the stems of this are really too thick to be compared with Brook Lamprey and the Bridge of Yarrow is further from the sea than Sea Lamprey usually travel.





<u>DATE</u>	<u>WATERCOURSE</u>	<u>PLACE</u>	<u>NOTES</u>
1992 April	Tweed	Melrose-Coldstream	Cormorant stomach
1991 April	Tweed	Coldstream - Estuary	Goosander stomach
1991 November	Leader & Tweed	Tweed below Ettrickmouth	Goosander stomach
1992 February	Tweed lower	Coldstream - Estuary	Goosander stomach
1992 March	Tweed	Melrose- Estuary	Goosander stomach
1992 April	Tweed	Melrose - Coldstream	Goosander stomach
1992 April	Tweed middle	Ettrickmouth - Teviotmouth	Goosander stomach
1992 August	Tweed	Melrose - Estuary	Goosander stomach
1993 March	Tweed lower	Coldstream - Estuary	Goosander stomach
1993 April	Tweed lower	Coldstream - Estuary	Goosander stomach
1993 April	Teviot		Goosander stomach
1994 March	Tweed	Upstream of Melrose	Goosander stomach
1994 April / May	Tweed	Melrose - Coldstream	Goosander stomach
1995 March	Tweed	Melrose - Coldstream	Goosander stomach
1999 April	Leader	Drygrange	Smolt trap
2000 March	Leader	Drygrange	Smolt trap
2000 April	Leader	Drygrange	Smolt trap

Data from Marquis, Carss, Armstrong & Gardiner (1998) and The Tweed Foundation

*Table A.6.1: Recent Records of adult River Lamprey in the Tweed Catchment*

A point to note is that most of these records come from upstream of barriers on the main river: Drygrange, Selkirk and Mertoun are all upstream of the caulds at Coldstream, Hendersyde and Kelso, and the first two are also upstream of the cauld at Mertoun.



**A.7: Sea Lamprey**  
*Petromyzon marinus*



The differences between the ammocoete larvae of River / Brook Lamprey and Sea Lamprey:

A = More black pigment on the tail fluke of the Sea Lamprey than on that of the River / Brook Lamprey (the Sea Lamprey is the lower)

B = More black pigment on the lower hood of the Sea Lamprey than on the Brook / River Lamprey (the Sea Lamprey is the lower)

The Sea Lamprey is the largest of the British species, reaching a metre in length, and is found in larger rivers on both sides of the north Atlantic; occasional specimens are taken in mid-ocean. Its life cycle and freshwater habitat requirements are generally similar to those of the River Lamprey, though they spawn slightly later, in May or June when the water is reaching 15°C or so - it is generally June on the Tweed when they are seen. Other differences are that their period of upstream migration is spring rather than autumn and winter, and that they spawn as pairs or small groups rather than in large congregations. Males establish territories from which they expel other males. Little is known of their life at sea, they appear to feed on a wide variety of fish, including Cod (*Gadus morhua*), Haddock (*Melanogrammus aeglefinus*) and Salmon (*Salmo salar*) and Sea-trout (*S. trutta trutta*).

Though difficult to age, it seems that it takes 4 to 7 years for Sea Lamprey larvae to reach metamorphosis, with an average of 5 years. They appear to be able to spawn in deeper and faster water than the other species, one of their sites within the Tweed catchment is reported to be in the middle of Kelso, just downstream of the original road bridge.

Though formerly fished in the British Isles, as River Lamprey were, they are now exploited in only a few European rivers, particularly in Portugal, where it is an expensive delicacy. Bolam (1919) reported "one or two" Sea Lamprey as being taken at the mouth of the Tweed every March or April (presumably in Salmon nets) and as late as the 28th of June "at which season it is usually found higher up the river". He also records that:

*"Some years ago, a friend of mine who was very anxious to make a study of this Lamprey, lay in his yacht at Berwick for nearly a month without being able to secure a single specimen. This was during July, which is late for it here, but I thought we should have had no difficulty in getting one or two from some of the salmon-netting stations up the river. At length, an old fisherman advised my friend to go and try for them off St. Abbs Head, which he said was 'the place for them in summer'. He went, and soon had as many as he wanted, caught on lines baited with dead fish".*



The local names recorded by Bolam were “*Lampern*” and “*Sookers*”.

<u>DATE</u>	<u>WATERCOURSE</u>	<u>PLACE</u>	<u>NOTES</u>
1993 July	Jed Water	Jedburgh	Taken at the Anna Cauld
2000 May	Tweed	Mertoun	Part eaten by Otter. Gravid
2000 June	Ettrick Water	Selkirk	Found in Philiphaugh Fish Farm

*Table A.7.1: Recent records of adult Sea Lamprey in the Tweed and Eye catchments*

The Sea Lamprey from Selkirk came down into the fish farm through the lade leading from the upstream side of the Murray Cauld at Philiphaugh and so must have gone through its fish ladder or over its face to reach the intake. Whether they use the fish ladders or slaps in these cauld or go over the faces is unknown. The Sea Lamprey found at Jedburgh shows the possibility of spread into the smaller tributaries of the system, the Jed Water being a secondary tributary, part of the Teviot system. There is also a report of a Sea Lamprey having been captured at the now disused netting station on the Till at Twizel Mill (John Burnett, *pers. com.*).

(The results of the 2004 baseline survey for the SAC, the EIA for the restored railway down the Gala Water, and the National Survey have not yet been incorporated into this section.)