



THE Tweed FOUNDATION

A Tweed Foundation Paper

SECTION 3.6: FISH PREDATORS

(A) Predators of Juvenile Salmonids

"From such facts we draw only one "practical improvement" – that the fact of such great multitudes perishing beyond our help in the wild and wicked sea, is, though not exactly an encouragement, an additional reason why we should take better care of them during the periods when they are our wards and guests".

Russell, 1864, *The Salmon*



Photo 3.6.1 Goosanders, showing the "saw-bills" designed for holding fish.

1 History and background: The predators of the salmonids of the Tweed and the Eye are many. In freshwater there are Herons, Goosanders, Cormorants, Otters, Mink, other fish and, now, crayfish. In the sea, there are Seals and Porpoises as well. In general, numbers and types of predators have been increasing over the years. While Herons are a native bird and must always have lived along the Tweed, when trees became scarce in the catchment (see Section 2.4) Herons must have found nesting places hard to find. Pennecuik (1715) records them even nesting in an orchard at Wester Dawyck:

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"Here, in an old orchard did the Herons in my time build their Nests, upon some large Pear-trees, whereupon in the harvest time are to be seen much fruit growing, and trouts and eels crawling down the body of these trees. These fish the herons take out of the river of Tweed to their nests; and as they go in at the mouth, so they are seen to squirt out again at the draught: And this is the remarkable Riddle that they so much talk of; to have flesh, fish and fruit at the same time upon one tree." [This heronry may have been of very long standing - in 1497, the Lord Treasurer's accounts record payments made for live Herons from Dawyck for King James IV (Barnett, 1937)]

That Herons had become rare and unusual in the Tweed area, and were so even in the 19th century is confirmed in the report (written in the 1830's) for the Parish of Bedrule in the New Statistical Account report in which it is said *"There is a heronry on the estate of Wells These birds build their nests in tall trees, and are preserved with great care, as a thing rare in this part of the country"*. Herons could not be said to be rare at the present day – 40 definite nesting colonies in the Borders are mapped in the latest Atlas of Breeding Birds in South-east Scotland (Murray *et al*, 1998). Cormorants, too, are native, but are said to be moving inland more to feed. Certainly, this cutting from a Carlisle newspaper of 1848 suggests that they were not seen much on rivers in the past :

RARA AVIS.—Another bird of the Penguin species, was shot by Mr. Wilson, of Bilholm, in the river Esk, and has been stuffed by Mr. Thomas Telford, cooper, Langholm: it is about the size of a goose, with beautiful plumage: its breast is of a buff colour, the wings black, and the back rather a blue colour; the head with a large crest, is of a raven black, and the bill is about 2½ inches long, and rather hooked.

Alistair

Maltby

More on the numbers and diet of the Cormorant on the Tweed can be found in Appendix C3. Otters, too, are a native predator of fish in this area, but must have been scarcer in the past, when grazed river banks gave little cover and they were hunted as well. With protection Otters have become common in the Tweed catchment, but as they require large lengths of river channel to support themselves, they can never reach high densities.

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As native predators have become more plentiful, they have been joined by newcomers. The Goosander used to be just a winter visitor to Scotland from Scandinavia, but they started breeding here in 1871 in Argyll (Baxter & Rintoul, 1953) and the same reference states that the only part of the Tweed catchment in which they bred at that time was Selkirkshire, where they had first bred in the 1930's. Summing up the colonisation of Scotland, they write:

"In 1922, when we studied the arrival and dispersal of this species we wrote 'The two salient features about the colonisation of Scotland by the Goosander are the invasion of the country by the bird, practically simultaneously in several localities, and the speed with which it increased its numbers and extended its breeding range. It is worth noting that the first two recorded occurrences of the breeding of the species in Scotland were in one year, 1871, and we find Gray speaking of a great invasion of Goosander which took place in the winter of 1875-76. It seems probable that in view of this and other evidence, the great and sudden increase of the species was largely contributed to by successive waves of immigration from overseas. Within twenty years of the great immigration of which Gray speaks the species had become amazingly common in many parts of Northern Scotland'. The rapidity and intensity of the colonisation of Scotland by the Goosander is in marked contrast to some of the other duck with which we have dealt. In most duck, their increase as winter visitors, before stabilisation and breeding, has been gradual and we find this reflected in their advance as breeding species, which has also been gradual. In the case of the Goosander, we find this enormous and sudden increase, as winter visitors, in the seventies, followed by a large and rapid spread as a breeding bird."

As predators of fish, Goosanders have not been welcome immigrants as Whitlock (1953) points out, saying *"What is more remarkable is that this extension of territory has been accomplished not as result of careful protection, but often in the face of opposition. The Goosander loves fish, including, or perhaps especially, young Salmon, and so is naturally not popular on fishing rivers."*

The reforestation of the Tweed (Section 2.4) must have played a part in creating the conditions suitable for it to colonise here, as these birds nest in holes in trees. Baxter & Rintoul (1953) record a nesting hole in Invernesshire being used for 40 years, and the number of holes suitable for nesting may be

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an important limit on the size of their breeding populations. More details on Goosander numbers, diet and control policy are given in Appendix C3.

2 Damage to Fisheries : The key point in assessing the effects of predation on both Salmon and Trout is the place in the life cycle where it takes place. Salmon in particular hatch vast numbers of young – it only takes 200 average sized female Salmon to deposit a million eggs. With the first three months, about 95% of the young that emerge die, to bring down numbers to the Carrying Capacity of the water (see Section 5). It follows from this that predation at this point in the life cycle is very unlikely to have a significant effect, most Fry will die anyway as they will be unable to take and defend territories. Losses to predators can be compensated for by better survival and growth of the remaining fish which can move into any territories emptied by a predator. While this must be the general case, there must also be specific cases where predation even on the younger stages has a significant effects,

such as when a brood of Goosanders is reared on a small burn. As they cannot fly to other feeding areas, they concentrate on feeding where they are and there can be a dozen youngsters in a brood. Photo 3.6.2 shows some of the 110 fish collected after a brood of seven fledged birds were scared off the Kingledores Burn in the upper Tweed on the 24th July 2004, after they had been feeding for an



estimated 90 minutes. When feeding Goosanders are forced to fly, they often regurgitate their most recently taken food to let them get off the water and these can then be collected - the bill marks on such fish are often obvious (Photo 3.6.3).

Photo 3.6.2 Juvenile Salmon and Trout regurgitated by Goosanders on the Kingledores Burn

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Photo 3.6.3: Goosander bill marks on regurgitated salmon Smolts.

However, as the fish grow older, mortality and competition reduce and the scope for compensation diminishes – there are fewer and fewer “spares” left to fill any gaps created by predation. Once fish have smolted and are on the move downriver, there can be no compensation – Smolts are the sum total of the freshwater stage of the life-cycle and any lost to predators are irreplaceable.

In the foreword to the most comprehensive examination of the diet of predatory birds in Scotland (Marquis *et. al.*, 1998) it is pointed out that

“For species with such a high unit value as Atlantic Salmon, any uncompensated loss may be regarded as serious. Data from monitored rivers suggest that the capacity for compensation diminishes as juvenile life as a parr in the river proceeds and is entirely lost by the smolt stage when the young fish enter the sea.” While a Smolt that does get to sea has, at present, a 5-10% chance of returning as an adult, a Smolt that is eaten on its way down river has no chance at all. The more Smolts that can get to sea therefore the more adults can come back, so predation on Smolt runs is a key factor in the economic value of fisheries. As said above, it only takes 200 females to produce a million salmon eggs, so biological damage to stocks from predation on a healthy population is very unlikely (however, a stock that has been reduced to only small numbers by other factors will be very vulnerable to any predation on its surviving fish). It is the economic damage done by predation, rather than any threat to stocks, that is therefore the key issue with predation on Tweed salmon and trout. This is also why it is not the proportion of the total salmon Smolt run eaten by predatory birds that matters, but the actual number that are eaten. Roughly, every ten Smolts eaten by a predatory bird while on their way down to the sea is one Salmon

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less returning to the river for anglers, and, again roughly, as about one in ten of the Salmon that return is caught by an angler, every hundred Smolts eaten by a bird means one less fish for an angler. If the unit value to the local economy of a Salmon was small e.g. the carcass value of a fish caught in a net, then total damage caused would not be high, but, in fact, the unit value of a rod caught fish is several hundred pounds – and that of a Spring Salmon is considerably higher than that of an average fish.

The same points apply to coastal Seal and Porpoise predation on returning salmon. Every salmon eaten is approximately one less back in the river - and when predation is actually in the estuary on salmon that have survived all other dangers and finally made it back to the river, each fish eaten is definitely one less for the angler and the local economy.

As Goosanders and Cormorants are not exclusive feeders – they do not hold and maintain individual feeding territories as Herons usually do, but will feed in groups - and as the sight of one bird feeding will attract in others there is considerable potential for substantial predation on Smolt runs. Like all generalist predators, these birds will concentrate on feeding on whatever is most plentiful at any particular time of year and on Salmon rivers from March to April, shoals of Smolts are the most obvious fish. At other times of year, other species make up the diet. However, it has become clear that there is a second time of year when predation is heavy, in Autumn and Winter when the numbers of large Parr (“pre-Smolts”) in the diet of Goosanders increases at a time when the total number of Goosanders on the Tweed is at its highest with wintering birds from far and wide joining the local population. Although the numbers of large Parr eaten per bird at that time of year is less than the number of Smolts eaten per bird in the Spring, the fact that there are so many more Goosanders on the river at that time makes the total eaten just as significant (Appendix C.3).

It is for these economic reasons that a licence to cull Goosanders and Cormorants is applied for by the RTC each year as a part of the strategy to reduce damage.

While Smolts and large Parr are the favoured size of food for Goosanders, they can attempt larger fish as shown in Photo 3.6.4, though with fatal results in this case. The interesting thing about this bird is that it might have been thought that it had been starving in order to have attempted to eat such a

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large fish, but its stomach was found to be full, with the remains of seven or eight small salmonids



Photo 3.6.4: Goosander choked to death on a 300mm Grayling and its stomach, which contained the remains of seven or eight small Salmonids.



Cormorants can take much larger fish than Goosanders, up to several pounds in weight, and are a well-known problem on stocked trout fisheries. They too, can be too ambitious and choke themselves to death trying to swallow fish too large for them as shown in Photo 3.6.5

Photo 3.6.5: Cormorant choked on an Eel at The Lees, 8th October 2000

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3 Predator control: For the economic reasons outlined above, and because both Goosanders and Cormorants feed in groups rather than as solitary individuals or territory holders, the RTC obtains a licence each year to control these birds during the Smolt migration period, March to April (May is also a migration month, but as the birds are breeding at that time, licences to shoot them are not given). The aim of the shooting is to protect the Smolt run from the mouth of the Ettrick to the sea by killing enough of the birds to keep them frightened of all human beings so that anyone walking along the river bank will scare the birds off to less important tributaries or to lochs. Without this, Goosanders would become accustomed to humans or even "tame" as can be seen in Hawick where Goosanders will hunt and feed directly below the bridges over the river on which people are walking.

(B) Predators of Adult Salmonids

1 Predation at sea and in the estuary: Seal predation and in particular, the robbing of nets; damage to fish in nets and to the nets themselves was a major economic burden for the netting stations. If numbers of seals were present, fish would stop running and the nets would stop work in the hope that the seals would leave on seeing their easy pickings cease. With the virtual demise of the netting industry, these economic losses have reduced in scale, but damaged fish are still caught in the rod fisheries (See Appendix F5). The estuary continues to be a "choke" point, a narrow gap into which all the salmon and Sea-trout of the river have to funnel and which can, and is, easily patrolled by seals. However, by comparison with some other rivers the Tweed is fortunate in only having a short estuary which has a busy town and harbour on it.

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