

Summary of the operation of the Manse trap

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Introduction

There is a long history of fish trapping within Scotland, with interested people dabbling in trap construction and maintenance for centuries, mainly for purposes of harvesting fish. More recently, the development of fish traps to monitor different aspects of fish populations has occurred and traps now form a very useful tool in fisheries management throughout the world. Within the Manse system, a two-way trap was devised to allow an assessment of all stages of the fish population.

The West Sutherland Fisheries Trust, in conjunction with Assynt Crofters Trust, has operated a trap in the Manse system, near Lochinver, since 1999. The trap evolved over time, but the data produced have proven valuable, both to the management of the Manse system and to general fisheries management within Sutherland. The design, construction and fishing effort of the trap has been variable over time, with the history listed in Table 1.

Table 1. Historical sequence of trap usage in the Manse system from 1999 to 2006.

DATE	EVENT
1998 - 2000	System stocked with 50,000 fed trout fry per annum by Assynt Crofters Trust
1999	First trap installed in the out flow of the Manse system. This was a two-way box trap with a net in the middle to direct fish into the appropriate box (Fig. 1)
2001	Trap moved to the entrance to Loch Roe and a new design utilised. The downstream unit remained relatively unchanged, with 3 versions of the upstream unit being developed before the adoption of the final design (Fig. 2)
Feb 02 – June 02	Upstream unit fished continually
Nov 2002	Downstream trap dismantled (smolt unit only)
20.02.03	Downstream trap reinstalled, netting on both units replaced
2003	St. Andrews University began a 3-year European project to assess the impact of sea lice infestations on marine survival. To be reported on in 2006 by St. Andrews.
2004	Trap disconnected on 26 th November
2005	Few fish taken, fish observed to bypass the upstream trap
2006	Trap dismantled by the spring

The trap was established in the Manse system to determine the effectiveness of the stocking policy undertaken by Assynt Crofters Trust and to provide information on marine survival within the area. As the system is relatively small and not located near any fish farms, it was also felt that this would serve as a 'natural' system. It was hoped that it would give a fundamental understanding of the target species, therefore producing a sound management strategy, gain a detailed knowledge of local stock population dynamics and form a foundation upon which to implement actions to ensure future conservation.

Annual reports were produced and are available on request. This report aims to give a summary of the operation of the trap over its lifetime within the Manse system.

Methods

Daily monitoring by the WSFT and a volunteer workforce consisted of cleaning and checking the structure for any net damage by predators or breakage due to environmental impact. Water temperature and height were also recorded. Fish within the downstream trap were removed, anaesthetised using 2-phenoxyethanol, measured (\pm mm) and tagged with elastomer dye behind the eye prior to release. After the involvement of St. Andrews University, all fish were also weighed (\pm g) and sea trout smolts PITT

tagged and adipose clipped. Fish caught in the upstream unit were measured and checked for tags. All sea lice found on the fish were also noted.

In addition to the trap, the system was also electrofished annually, giving an indication of the juvenile populations. This, combined with the smolt data, allowed the different cohorts to be followed and the freshwater mortality at each stage to be estimated. These data are transferable to other systems, giving a more detailed assessment of the fish populations within Sutherland.

Results

1999 - 2001

Little upstream trap data are available for 1999 or 2000, with the fish taken in 1999 being smolts moving within the system (Table 2). Data for 2001 is also limited, both upstream and downstream, as a result of the experimental nature of the trap. However there is evidence from this period that the trap worked well and that all sizes of fish were captured. The trap was installed into the system near the start of the 1999 smolt run, and this, coupled with a long drought in 2000, means that the data from these years is not complete. In fact, the 2000 smolt run was deemed to have failed, an assumption supported by the finding in August 2000 of some sea trout kelts still remaining within the system

Data from the three years of operation show the upstream returning adult and the downstream smolt run numbers. However, as a result of the experimental nature of the trap mechanism in its first year, the results for 2001 are not a true reflection of the Manse system. These figures indicate the effectiveness of the traps rather than the number of fish in the system.

Table 2. Fish numbers showing the effectiveness of the Manse trap.

Year	Upstream			Downstream		
	Salmon	Brown trout	Sea trout	Salmon	Brown trout	Sea trout
1999	9	0	3	245	31	324
2000	-	-	-	1	1	25
2001	3	12	53	120	0	201

In spring of 2001 the WSFT instigated the first experimental trap which operated until mid-May. After the installation of a new trap, fishing continued until the beginning of June whereby version one of the upstream unit was installed and allowed to fish until the start of August, at which point it was removed for repair. On re-installation the trap fished until November.

Of the fish taken in the upstream trap, 5 were tagged going downstream during 2001 and a fish farm salmon was taken in October. In May several kelts, both salmon and sea trout, were found. These fish were quite thin and demonstrates that the Manse system may have late running kelts. Much of the smolt run was missed, but from the figures it can be assumed that the main run is in May. This agrees with previous findings and information from around the area. It was also assumed that due to operational difficulties few fish would be observed in the upstream unit. However, sea trout were still re-entering the system in October and November showing they will run during spawning time. The fish were found to be of varied length and weight demonstrating the effectiveness of the upstream catch unit while allowing for the run to proceed without interference.

2002 - 2004

Data for this 3 year period is shown in Figures 1 (upstream) & 2 (downstream). This gives an indication of population structure of the system, and demonstrates that sea trout form the dominant species. The low numbers of returning adults, particularly salmon, would suggest a problem within the marine environment. However, data on the juvenile populations within the system suggest that it is more likely to be an issue of trap avoidance. This was further demonstrated within the St Andrews sampling, where PITT tagged fish were recorded as kelts moving downstream, but had not been recorded in the upstream unit the previous year. These data indicates that there was an upstream rate of capture of approximately 7 % for sea trout.

Of the upstream returning fish in 2001, 67 sea trout had been tagged in 2001. This represents a 33% marine survival rate for fish returning that year which compares favourably with other studies. Further, from the available habitat the number of smolts that could be produced from the Manse system is

calculated at 952 fish, this approximates to the downstream migration of all species recorded in 2002 (Figure 2).

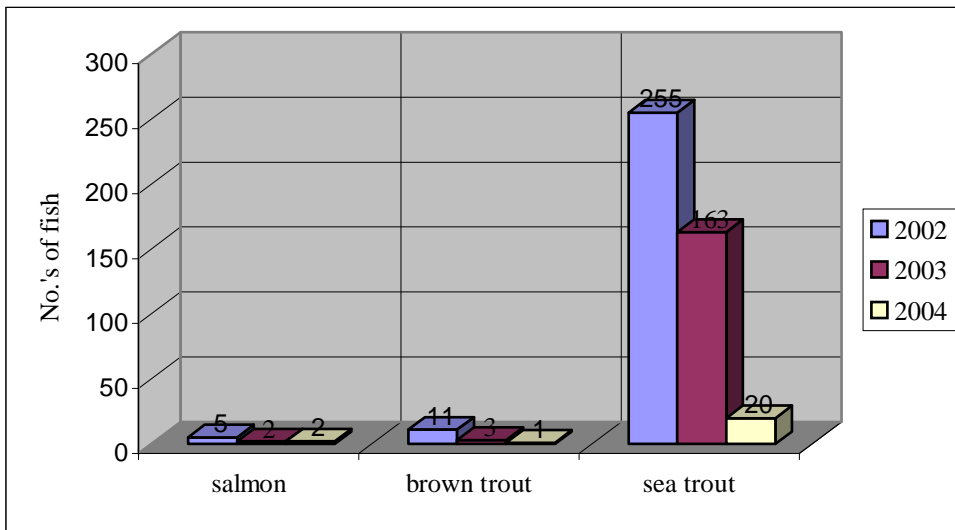


Figure 1. Upstream movement of salmon, brown trout and sea trout within the Manse system.

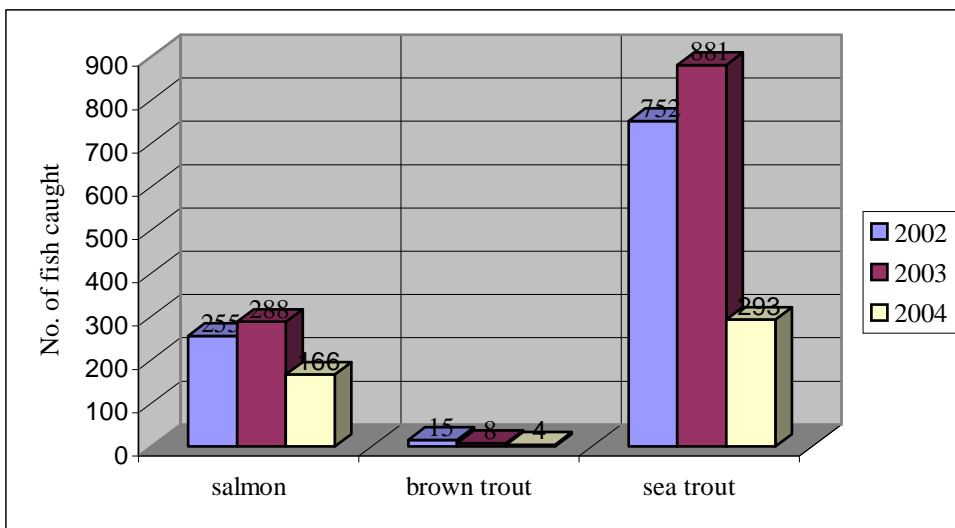


Figure 2. Downstream movement of salmon, brown trout and sea trout within the Manse system.

The number of sea trout smolts captured in 2002 compares favourably to those of 2001. However, as a consequence of exceptionally dry conditions few fish were witnessed entering the river despite being observed in Loch Roe, this indicates the Manse is a spate system, with adult fish dependent on water height to allow movement. From this year's data it can be concluded that this system retains a healthy population of migratory fish, predominately sea trout, and marine survival rate is good compared to other rivers in Great Britain, Ireland and Norway.

Of the sea trout taken in 2003 in the upstream trap 40% had been tagged, 8 were tagged in 2001, none from 2002 and 58 in 2003. This represents a return rate of 7% for the 2003 run. Of the fish caught in the downstream trap it was determined that 590 were smolts and 191 were kelts, of which 58 had been tagged in 2001. No fish from the 2002 smolt run was recorded.

Additional evidence was found that sea trout are late to run in this system, supporting the view that the Manse is a spate river and as such the population may be more mobile than fish in other areas. The majority of fish sampled were not tagged which indicates either a poor tag retention or a particularly mobile population regards river use. Previous studies undertaken with this tag in west Sutherland found a high retention rate of nearly 100 %, it is therefore likely that the system is populated by a high number of 'strays', particularly finnock.

Of the recaptures for 2003, 41 contained PITT tags that enabled marine growth rate to be calculated. From these figures a growth rate of 21.46 mm and 30.44 g per month was determined. This is significantly greater than the estimates of growth from the Polla and Laxford estuaries, although more in line with growth rates in the Polla during 2001. This would suggest good feeding within Loch Roe and around the coast and is contradictory to the visual impression of relatively thin fish within the trap.

Overall, the trap appears to be a good record of descending and ascending fish, kelt survival appears good and the sea trout run appears to be dominated by stray fish suggesting the population is mobile and not restricted to their natal rivers. Salmon populations are fragile even vestigial or maintained by strays. Growth rates are good indicating adequate coastal feeding and shelter. A European project to assess the impact of sea lice infestation on marine survival was initiated in 2003, involving treatment of sea trout smolts to control the sea lice. St. Andrews University will report this on at a later date.

2004 results:

Of the sea trout in the upstream trap 30% had been PITT tagged, 3 of these were tagged in 2003 and 3 in 2004, representing a return rate of 0.5% for 2003 and 1.3% in 2004. This represents a considerably lower return rate suggesting the 2004 sea trout run was exceptionally poor.

Of the downstream fish, 231 were smolts and 62 were kelts. Twenty-six of the kelts had been tagged in 2003 and 1 in 2001. No fish from the 2002 cohort were found. Compared to the 58 tagged fish in 2003, the kelt survival for 2004 is low. The sea trout numbers caught in the downstream trap this year is significantly lower than the previous year; this might be due to trap avoidance at high flow levels or during trap blockage. Again the majority of fish sampled were not tagged.

Overall, kelt survival was down to 45%, although this may not be a true reflection because trap avoidance could not be eliminated. Again the sea trout run appears to be dominated by stray fish and the salmon population remains small. Marine growth rate appears good within the coastal area around Loch Roe.

During 2005 very few fish were captured in the trap. There were problems experienced with regards to the integrity of the netting in the upstream unit. Water flow was also such that trap avoidance was high, again in the upstream direction. However, the low number of smolts captured would indicate that the smolt run in this year had failed as smolts have been taken in every other year of the traps operation. This is of some concern, and it is to be hoped that this was an abnormal year with regards to the migratory populations.

Conclusions

1. The Manse system is a sea trout system with a small salmon population. As a spate river, it is likely that the salmon population is weather dependent. In addition, many of the sea trout using the system appear to be migrants rather than 'Manse' fish.
2. Marine survival appears to be average to good compared to values found in the literature. This may be partly the result of the good feeding within the coastal areas, as indicated by the high growth rates observed.
3. Trap avoidance was high, particularly in an upstream direction. This is flow dependent and it is likely that this has affected the estimates of marine survival. This is indicated by the variability of the survival rates found over the period of the trap.

Acknowledgements

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