



Potential for deployment of NMT Mass Marking Technology in Baltic salmon

Application Note APC06

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Background

Wild salmon stocks in the Baltic are declining, and most (94%) of the commercial catch is of hatchery origin. The current high exploitation rate causes little problem for the hatchery stocks but is a major factor in the decline of wild stocks of which about 35-40 remain from a historic total of about 70. Most of the catch is taken on the feeding grounds in the main Baltic basin where the hatchery and wild stocks intermingle. It is virtually impossible at present to discriminate between wild and hatchery fish.

Both the International Baltic Sea Fishery Commission and the ICES Baltic Salmon and Sea Trout Working Group have been exploring the possibility of using an adipose fin clip for released fish to differentiate between wild and hatchery stocks. This would allow immediate identification of the hatchery/wild composition of catches in various areas at various times, and would facilitate the development of selective fisheries. This approach is being developed on the Pacific coast of North America for coho salmon, and is likely to be adopted also for chinook salmon.

To be effective, all hatchery-produced fish released to the Baltic each year would have to be clipped every year. Present production between the nine countries bordering the Baltic is about 5 million fish per year, and is likely to increase.

In response to the development of a selective fishery policy for Pacific salmon NMT have developed a mass marking machine that can fin-clip fish at a rate appropriate for the requirement for many millions of marks per year. The machine can also coded wire tag (microtag) the fish and with suitable development could be adapted to vaccinate fish as well.

The IBSFC have become aware of development of this technology and have asked NMT to provide further details of relevance to its possible deployment in the Baltic.

The NMT Mass Marking Machine

The MMM is designed to automatically sort and mark fish at a rate of 2 fish per second, or 50,000 per eight-hour shift. Details of its operation are shown in the video entitled "Development of a Mass Marking and Tagging Machine" produced by NMT.

The equipment is permanently housed in a caravan or portable building to allow easy transfer between sites.

Fish are conveyed to the MMM by hand net or fish pump. The machine comprises four tagging lines that are each adjusted to handle a particular size range of fish. If the fish are of uniform size all the lines may be set to

deal with a particular length range, but if the range is greater the lines may be set to handle different sizes. The fish are automatically sorted for size – if any lie outside the capacity of the lines as set, they are rejected.

The fish are automatically orientated to enter the machine line head first and are then gently held for marking. Video imaging is used to locate the adipose fin, direct the cutting tool to it, and check that an affective clip has been achieved. Fish may also be coded wire tagged in the nose at the same time. The fish is then returned to a holding tank. The whole process is accomplished without the fish being anaesthetized or touched by hand at any stage. It therefore represents a much more satisfactory process than marking by hand, as well as being considerably faster and cheaper for large numbers

Current status of development and production

The first prototype unit of four lines is currently under evaluation by the Washington Department of fish and Wildlife. This is working well but development is continuing on improving the automatic grading equipment on the inlet side of the machine. The fish must be graded into one of seven length categories between 60 and 200 mm in length.

The proposal is that up to twenty machines will be deployed in Washington to tag 100 million juvenile coho within an eight-week period each year. NMT is also committed to supplying machines to fin clip and coded wire tag 8 million juvenile Chinook in California in January 1999.

Costs and availability

For deployment in North America it is proposed that the equipment will not be sold, but a charge will be made for each fish clipped or tagged. This ensures that the equipment is continually maintained, modified and adapted as appropriate.

Arrangements for deployment outside North America have not yet been decided and will be subject to negotiation. It may be that a subsidiary company or agency would be established. If a realistic large-scale deployment in the Baltic Region is at stake NMT will be happy to consider all options for arrangements that satisfy all parties involved.

Permanent deployment of a unit in the Baltic area for adipose clipping 5 million fish per year should prove economically viable but it would not be so if the number was substantially less. It is likely that additional deployment e.g. for farmed salmon (see report entitled “Feasibility of a scheme to mark all farmed Atlantic salmon using coded wire tags”) or the addition of coded wire tagging for Baltic salmon (see below) would render deployment in the area more cost-effective.

Because of the uncertainty regarding arrangements outside North America it is difficult to quote definitive costs. Current estimates for North American deployment are about US \$30 per thousand fish for fin clipping only, and \$50 per thousand for fin clip and coded wire tagging (excluding the cost of the tags – this would add another \$50 or so per thousand fish for 1 million tags per year or more). Marking at multiple sites may add to the costs. However, these prices would appear to be well within the estimate made by the ICES Working Group of about 140 ECU (about US \$142) per thousand fish for adipose fin clipping by hand.

Regarding availability, in the short term all development is committed to deployment in the US. This will of course allow all problems to be sorted out locally so that when equipment is available for overseas it will have the advantage of extensive field testing and evaluation. The timing of availability is uncertain and is to a large

extent dependent upon the level of commitment by potential users. A lead-in of one to two years is the minimum that would appear realistic at present.

Coded wire tagging

As already described, having the fish processed for adipose clipping also allows coded wire tagging to be undertaken simultaneously at minimal extra cost.

The opportunity that the MMM represents for realistic and economic coded wire tagging of all or a large proportion of hatchery production is exciting. It is known from the use of Carlin tags that different hatchery stocks are distributed differently in the Baltic Basin feeding areas. Further, the possibility of using delayed smolt releases to influence feeding area is currently being evaluated. If all or a substantial proportion of hatchery fish were to be coded wire tagged the composition of catches throughout the Baltic could be determined by a series of strategically planned and statistically robust catch sampling programmes. There are of course precedents for large-scale deployment of coded wire tags in salmonids. On the Pacific Coast of North America about 50 million juvenile salmon are tagged each year, and recoveries run at about 300,000 per year. Nearly twenty years ago Childerhose and Trim (1979) stated:

“In 1974 more than 25,000 [coded wire] tags of Canadian and US origin were recovered in British Columbia. More information about ocean distribution, and the numbers of fish from hatcheries in specific fisheries, was gathered in 12 months than in the previous 12 years”.

An opportunity to achieve similar, or better, results now presents itself for the Baltic Salmon Fishery exactly when the need is at its greatest.

In addition, large-scale deployment of coded wire tags in Baltic hatcheries would allow evaluation of a wide range of genetic and husbandry factors, for example the contribution of different families and sub stocks to different fisheries, effectiveness of delayed release in modifying distribution and survival, and effect of size and time and size at release.

Vaccination facilities have not yet been trialed in the MMM but it would appear to add little technical complication to the processing of fish. The video imaging of exact fish size could be used to achieve very accurate needle placement.

Please contact Dr D J Solomon at NMT for further information on any aspect of this report.

Reference

Childerhose, R.J. and Trim, M. (1979). Pacific salmon and steelhead trout. University of Washington Press, Seattle. 158pp.