Tests with an R8000 coded wire tag detector on board MAFF Research Vessel "Corystes", September 1996.

Application Note APC10

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Aim

To test and demonstrate the effectiveness of the R8000 detector for recovering coded wire tagged fish from large catches of small fish. This forms part of a wider consideration of the application of cwt to marine fisheries investigations.

Background

In March 1996 I presented a seminar at the MAFF Lowestoft Laboratory on the potential for use of coded wire tags (cwt) in marine fishery investigations. There was significant interest, but scepticism regarding the logistics of tagging and recovering adequate numbers for statistical validity. In discussion with Dr Mike Pawson (who is in charge of young fish surveys at Lowestoft) and Dr Richard Nash (head of the Liverpool University Port Erin Marine Station in the Isle of Man) the idea of a demonstration of the detection technology on a research cruise was explored. Dr Nash is involved with developing studies on the potential for hatchery-produced flatfish to, contribute to commercially exploited stocks as well as with ecological studies of plaice recruitment in the Irish Sea. He had raised the possibility of MAFF young fish surveys being used to sample for cwt fish.

Permission was therefore sought for Dr Solomon and Dr Nash to join one of the young fish survey cruises at a convenient location and time to explore the technicalities of tag recovery from sizeable catches of young fish. Permission was granted. Dr Nash joined the ship at Douglas, IOM, and Dr Solomon joined at Fleetwood, both on the morning of September 5 1996. They were landed back at Fleetwood the same evening.

The equipment

The main piece of equipment "on test" was an R8000 tunnel detector. This detects the presence of a coded wire tag passing through it, and sounds a bleeper. There is provision for the "tag detected" signal to operate other equipment e.g. a diverter gate if the detector was built-into a gravity or conveyor belt system to separate tagged fish from the main flow. However, for these tests the R8000 was supplied "bare" from Shaw Island.

The set-up used is shown in Fig 1. The R8000 was mounted on a stand made from aluminium tubing that holds the tunnel at a suitable angle for gravity feed of fish. A temporary "feed tray" was fabricated before the trials, and was attached with bolts to the front flange. A seawater hose was placed in the feed tray to aid the passage of fish through the detector (Fig 2).

Other detectors (portable sampling detector and wand detector) were also demonstrated. A MkIV and hand-held multishot injector were demonstrated and used to mark a selection of fish for tests of the R8000.

Young fish surveys and the catches involved.

The young fish surveys involve a number of cruises each year using standard gear and fishing grounds around the LTK, to establish the recruitment success of young flatfish and gadoids. All fish caught are counted, and samples taken for a variety of investigations.

The fishing tows are normally 30 minutes duration and 2 miles long, using a 4 m beam trawl. A typical catch from such a tow is shown in Fig 3, comprising perhaps 25 kg of small fish and several hundred kilograms of starfish, other benthos, and debris. The fish are separated from other material on deck (Fig 3) or in the wet lab (Fig 4), and are sorted by species. The total weight of each species is recorded, along with details of length and sex of species of interest. Samples of otoliths are also taken for age determination. Samples of interest are frozen, but most of the catch is returned to the sea dead.

The test performed.

Having set up the equipment, checked its operation and adjusted the gain settings, a series of tests was undertaken. This involved seeding boxes of 30 kg or so of small fish (many hundreds of individuals of mixed species composition) with, variously, zero, one, two or three fish with cwt. The operator was not told how many tagged fish were in each box, and was not told the size or species of the tagged fish.

In order to allow the fish to be passed through the detector, the 30 kg batch was decanted into a number of smaller boxes each holding about 7 kg. Each of these was then poured through the detector, taking just a few seconds per box (Fig 5). The fish were collected into a container at the lower end of the tunnel. When a tag was detected, the top layer from the collecting container was recovered and the fish passed through individually or in small lots until the tagged individual was identified.

Results and discussion.

In the first test, a number of "false signals" occurred, but this was quickly corrected by decreasing the gain control. Once this had been done, all tagged fish were successfully detected, and no false signals were observed. The latter point was particularly important, as the method of pouring fish through the detector involved a considerable degree of "mechanical disturbance" of the detector.

The rate at which fish could be "poured" through the detector without jamming was impressive. There were occasional jams occurred with large fish (e.g. plaice over 35 cm) but these generally occurred at the entrance to the tunnel and were easily cleared by hand. The test operators agreed that with dedicated facilities (e.g. a large flat surface with raised edges, with a gentle slope towards the tunnel onto which fish were tipped) that catches could be scanned at a rate of many tonnes per hour, possibly many tens of tonnes. If an automatic gravity feed of easily-flowing fish (e.g. herring, sprats) were involved such as a scanning rate could be maintained continuously.

Once detected, isolating and recovering the tagged fish took a little time, and the logistics are likely to depend upon the situation. In a high volume situation, such as gravity feed of herring into a hold or on a processing line, automatic deflection of a part of the flow containing a tag would be ideal. For processing RV catches such as those from young fish surveys, collection of the scanned fish into baskets would be adequate. It is likely that tag detection would be an infrequent event (one per day or less?) in which case re-running a basket when a tag

was detected would be little hardship. If frequent tag recoveries were expected e.g. in a more local study, use of smaller samples of fish and smaller, frequently changed, receiving baskets would speed tag recovery.

There would be a number of options for scanning the catches from young fish surveys as presently processed.

- The whole landed catch, including benthos, could be emptied onto a large flat surface and then scooped through a detector.

- each box of sorted fish could be poured through the detector before biological sampling; only those species containing tags (e.g. plaice) would require scanning.

- the whole catch of fish could be scanned after biological sampling was completed, though of course any specimens retained would require separate checking.

Of particular interest was the considerable range of setting of the detector gain control between that where tags might be missed (i.e. set too insensitive) and that where false signals were experienced (i.e. set too sensitive). This indicates that situations with far more "noise" (electrical and mechanical) than was experienced on Corystes could be coped with. In fact the pouring of boxes of fish directly into the funnel attached directly to the detector, a situation that would be avoided with a better-designed installation, caused no false signals once the gain had been set appropriately. Similarly, physically shaking the detector during operation caused no false signals. This indicates that the system would operate successfully on vessels with considerably more vibration than that associated with RV Corystes with her smooth diesel-electric drive.

Other observations

The opportunity was taken to tag very small plaice. Fish down to 35 mm overall length could be tagged in the nape of the neck, and down to 55 mm could be tagged in the cheek muscle. Both these sites have been demonstrated to give very high retention rates in sole and turbot down to 55 mm length in preliminary trials at Conwy Laboratory.

Conclusions

Overall the test were considered very successful in demonstrating the effectiveness of the R8000 detector at recovering coded wire tags in large catches of fish under sea-going conditions.