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THE NORTH ESK: SCOTLAND'S MONITORED SALMON RIVER

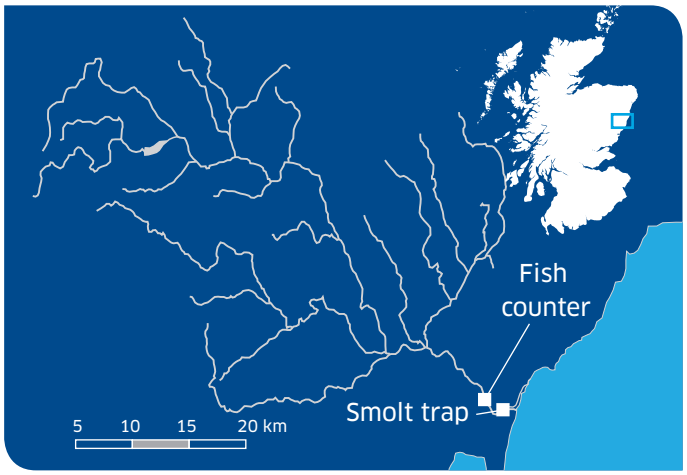

FIGURE 1.

Monitoring salmon populations

Marine Scotland Science (MSS) Freshwater Laboratory collects information on the status of salmon populations in Scotland. This information enables the Scottish Government to formulate appropriate management policies. Salmon assessment is based on many sources of data but one of the ways to build up an overall picture is to study salmon populations in a monitored river. Estimates are made of the numbers of individuals at the various stages in the life cycle. Meticulous work over many years on the North Esk provides important insights into population trends and can help scientists identify those phases of the life cycle where there are problems.

The monitoring programme

The North Esk is one of Scotland's most important east coast salmon rivers. It drains a catchment area of 778 km^2 and enters the North Sea between Aberdeen and Dundee (*see* Fig. 1). Wild salmon have been monitored throughout their life cycle on this river since the mid-1960s.

Each year the number of smolts leaving the river and the number of adults returning are estimated. Scales are used to determine the ages of both smolts and adults so that individuals can be grouped according to the year in which they began life as fry emerging from the spawning beds.

Annual smolt production has been estimated since 1964. A proportion of the smolts leaving the river are caught in a fish trap on the Kinnaber Mill Lade off the lower reaches of the main river. The fish are tagged and released back into the main river above the off-take for the lade. A proportion of the tagged fish is recaptured in the fish trap. This number is used to estimate trap efficiency and the trap catch is adjusted upwards to estimate of the total run of smolts from the river.

Since work began, the annual smolt production of the river has shown fluctuations among years. However, no trend is evident indicating that the North Esk's smolt production has remained relatively stable since the 1960s.

Since 1981, the number of adult fish returning to the North Esk each year has also been

estimated. These estimates are based on the fish counter at Logie, in the lower reaches of the river (Plate 1). The counter consists of an array of three electrodes on the downstream face of a weir that spans the whole width of the river. Fish have an electrical resistance that differs from the surrounding water. Fish moving over the counter are detected by monitoring changes in the resistance across the electrode array. The direction in which the fish are moving is determined from the sequence in which the array responds. Their size is estimated according to whether they activate one or more electrodes simultaneously.

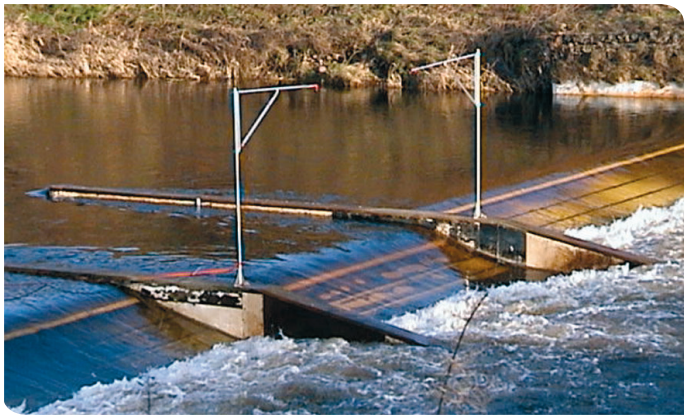

PLATE 1.

The annual net upstream count of adult fish has shown a substantial increase over the period of the fish counter's operation.

Using these annual estimates of smolt production and returning adult numbers, together with detailed information on the catches of local net and rod fisheries, a range of performance indicators for North Esk salmon stocks have been built up. These include:

- Smolt production
- Marine survival to home waters
- Net fishery exploitation rates
- Survival to fresh water
- Numbers of adults entering the river
- Rod exploitation rates
- Spawning escapement (i.e. the number of fish which reach the spawning redds)

The value of having a suite of performance indicators, as opposed to a single measure, is that it allows both the mechanisms and timing of events that cause changes in abundance to be identified. For example, on the North Esk, a stable smolt production and an increasing trend in spawning escapement presents a healthy view of the stock as a whole. However, marine survival of North Esk salmon to Scottish homewaters shows a downward trend. This apparent contradiction is explained by considering exploitation rates in the local fisheries. Exploitation has decreased markedly over the years allowing a greater number of salmon to reach the river. Thus, although natural marine mortality is at present unusually high, the number of fish spared by the reducing fisheries has exceeded the extra numbers dying in the sea. As a result, more fish are surviving to reach the river.

Placing the North Esk in context

The information collected on the North Esk enables the major factors affecting stock abundance to be identified. Further, understanding the relative importance of the mechanisms involved makes it possible to use the knowledge gained on the North Esk to assess the situation in Scotland as a whole. The North Esk project underpins much of the advice which MSS provides to the Scottish Government and to international clients such as the North Atlantic Salmon Conservation Organisation (NASCO).

An expanding range of information, including information leaflets, reports and papers, is available from the library at:

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