



## Local Populations Determine the Seasonal Characteristics of the Salmon Fisheries

### What is a population?

A population is a group of individuals that reproduce freely with one another, but not with the members of other populations. This separation can occur for many reasons. In the case of salmon, precise homing is a major factor sustaining the integrity of populations and perpetuating differences that arise between them. This has important implications for the fisheries.

### Homing

Most salmon home to the rivers from which they originate. Even within river catchments, salmon spawn close to where they were spawned themselves. Tagging studies at the Girnock Burn, a small tributary in the upper part of Dee catchment equipped with a fish-trap, show that 50% of spawners lived in the stream as parr. For these fish, the precision of homing must be less than the length of stream above the trap—about 10 kilometres.



The origin of un-tagged fish caught in the trap is difficult to determine. However, many of these fish probably belong to the part of the stream that lies below the trap. A minor over-shoot will lead to capture.

### Straying

Although many salmon do home with high precision, some exchange of spawners occurs between populations. For example, at various times, brood-stock collected at spawning time in the headwaters of the River Don in Aberdeenshire have included small numbers of tagged salmon from other rivers in eastern Scotland and from Iceland, northern England and Wales.



The adipose fin has been removed from this fish, indicating that it is microtagged.

This is not surprising. All the salmon populations in each of Scotland's rivers were founded by fish straying from distant rivers after the glaciers of the last ice age receded about 12,000 years ago. Presumably, salmon retain this ability to explore and to fill vacant habitat.

Yet most fish do not behave in this way. All the fish caught at the Girnock Burn belong to a single, early-running class. Other classes of fish are notably absent, although they do occur in large numbers in other parts of the Dee catchment. The Girnock population is therefore somewhat discrete and it differs from populations elsewhere in the Dee.

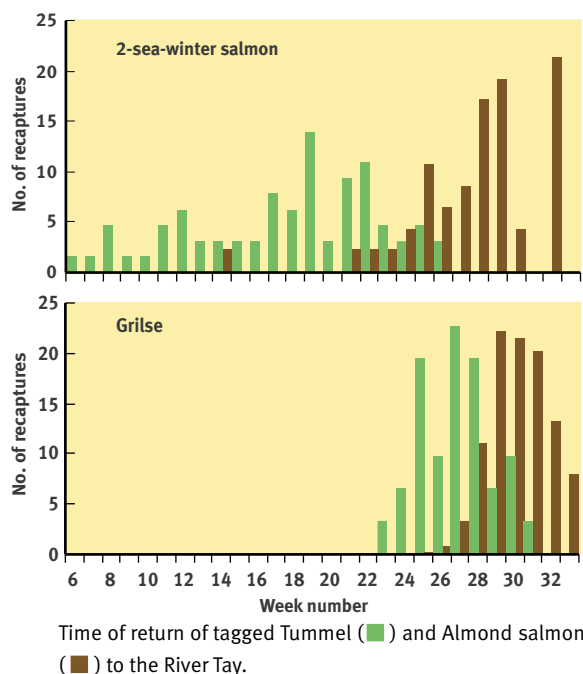


## Populations and diversity

Salmon populations differ from one another in crucially important ways. For example, Scotland's salmon runs are notably the most seasonally diverse of all the countries where salmon occur. Fishing takes place in every month except December. The timings of the various runs that make such an extended season possible depend on the separate seasonal contributions of different populations.

## Differences in run-timing between populations

Smolt-tagging studies show that run-timing differs between populations. The characteristics of the Almond or Tummel populations of the River Tay, for example, differ markedly. Tummel fish return to the Tay earlier in the season than Almond fish. In the case of 2-sea-winter salmon, the difference is very marked. The migration of grilse (1-sea-winter fish) takes place over a much shorter period. In spite of this, Tummel grilse still enter the Tay earlier than Almond grilse. The Tummel generates early-running salmon and grilse, while the Almond generates later-running fish of both groups.



Young fish from the Tummel and the Almond populations were transferred to a third tributary of the River Tay, the Braan, and lived there until smolting. Later, when the adults returned to the Tay, both grilse and 2SW salmon showed the distinct run-timing characteristics of their original population — Almond or Tummel. This experiment proves that run-timing is a genetic characteristic of populations. The special genetic contributions of different populations underpin the spectacular diversity of Scottish salmon runs.

## Summary

- most salmon home with high precision to the parts of river catchments where they belong.
- homing sustains local populations and fosters differences between them.
- the run-timing characteristics of local populations differ.
- these differences are genetic.
- variation in run-timing, associated with population structure, underpins the seasonal diversity of the fisheries.

### For further information see:

A.F. Youngson, W.C. Jordan and D.W. Hay. 1994. Homing of adult Atlantic salmon (*Salmo salar* L.) to a tributary stream in a major river catchment. *Aquaculture* 121: 259-267.

D.C. Stewart, G.W. Smith and A.F. Youngson 2002. Tributary-specific variation in run-timing of adult Atlantic salmon (*Salmo salar*) has a genetic component. *Canadian Journal of Fisheries and Aquatic Sciences*. 59: 276-281.