



## The Use of DNA to Investigate the Occurrence of Salmon and Sea Trout in the Diet of Seals



**Management of seal predation on salmon and sea trout requires information on the occurrence of salmon and trout in the diets of seals.**

### Salmon or sea trout?

Examination of bones specific to individual prey species recovered from seal scats (faeces) has so far suggested that salmon and trout together comprise a very small component of the diets of seals around Scotland. In instances where bones have been found, it has seldom been possible to distinguish between salmon and sea trout. However, the use of fish hard parts in scat samples to infer seal diet may underestimate the incidence of salmonids if, as has been claimed, seals often consume only the fleshy parts of large fish. Furthermore, the bones of salmon and sea trout are more fragile, and therefore less likely to occur in scats, than those of other prey.

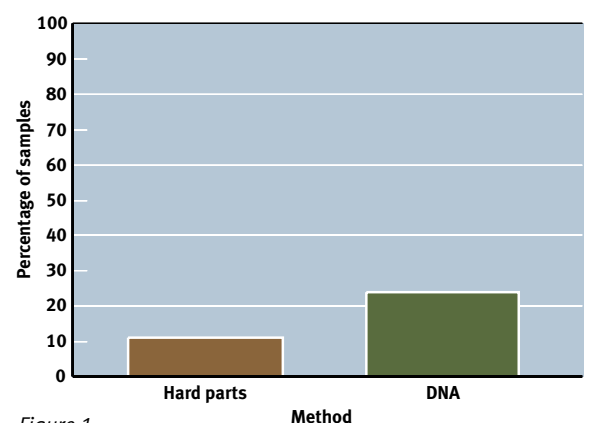
### DNA analysis

To overcome these problems, a molecular method (termed quantitative real time polymerase chain reaction: qPCR) was devised to allow the detection of prey DNA in scats. The technique has the advantages that it does not rely on the consumption of bones, and allows remains of salmon and sea trout to be differentiated. The new approach was tested, and shown to work, on scats collected from captive seals fed on a known diet. Both salmon and sea trout qPCR assays were shown to give no erroneous results when tested using DNA extracted from another 31 species of prey commonly found in seal scats.

The assays were then applied to samples of scats from wild seals collected in the Moray Firth during May and July 2003. This combination of sites and months was chosen to give the best chance of detecting salmon and sea trout in the diet. One hundred and sixty one scats were examined for the presence of bones and also for DNA of salmon and/or sea trout.

### Results

DNA was found in a higher proportion of scat samples than bones, doubling the number of scats with salmon or sea trout to 24% of the sample. In the case of Cromarty samples collected in May, DNA also provided evidence of seals consuming sea trout which would have been missed had the analysis relied on the presence of hard parts alone.



*Figure 1*  
The percentage of scat samples collected in the Moray Firth during 2003 in which remains of salmon and/or trout were detected using hard parts and DNA.



## Prevalence of sea trout

Unlike hard parts analysis, the DNA technique allows the occurrence of both salmon and sea trout to be measured. In the samples analysed, both species were more prevalent in July than May, and overall sea trout was detected in more scats than salmon.

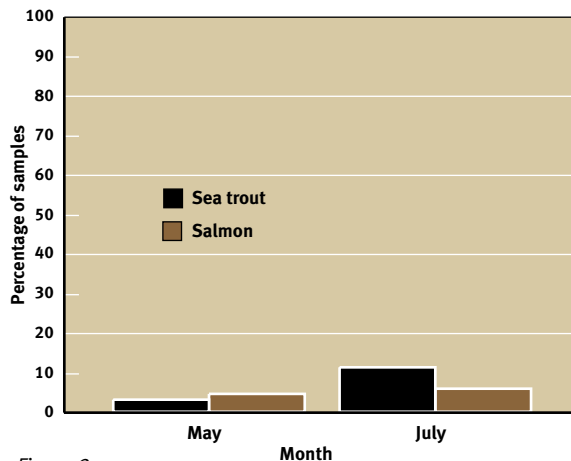


Figure 2  
The percentage of scat samples collected in the Moray Firth during 2005 in which remains of salmon and trout were detected using DNA.

## The future

Currently the qPCR technique only allows researchers to confirm only the presence of salmon and sea trout in scat samples. It does not provide information on how many fish have been consumed. Further work is required before such a quantitative assessment of the diet can be obtained.

The application of these molecular methods represents a major step forwards in studying the occurrence of salmon and sea trout in the diet of seals. In particular, the qPCR



Selection of bones from salmon and sea trout

analysis revealed that seals had been consuming both salmon and sea trout. This was not possible to do using only hard parts analysis. It is now necessary to develop the capacity to identify other species besides salmon and trout from their DNA remains, to obtain a better perspective of the importance of salmon and trout in the seal diets. Overall, although the DNA evidence suggests that salmon and sea trout may be more prevalent in the diet of seals than previous work has suggested, they were nevertheless detected in a minority of the scats examined.

## For further information:

Matejusová 1987 *et al.* (2008) Using quantitative real-time PCR to detect salmonid prey in scats of grey *Halichoerus grypus* and harbour *Phoca vitulina* seals in Scotland – an experimental and field study. *Journal of Applied Ecology* 45, 630-640.



FW34|07|08