Cormorants and the Loch Leven Trout Fishery

Background
Loch Leven, Kinross is a world-renowned sport fishery for brown trout, and an internationally important site for wintering waterfowl. Catches of brown trout have declined since the 1960s, and this has led fishery managers, in consultation with Scottish Natural Heritage, to stock the loch with hatchery-reared brown trout (Salmo trutta) (since 1983), and rainbow trout (Oncorhynchus mykiss) (since 1993). The number of cormorants wintering on Loch Leven increased substantially in the late 1980s, leading to concern over the possible damage that these birds were causing to the fishery. To investigate the diet of cormorants at Loch Leven, stomach contents were recovered from a sample of 96 birds shot under scientific licence in 2001. In addition, approximately half of the stocked brown trout were marked by clipping the adipose fin before they were released into the loch.

Cormorant Diet
Trout made up some 85% of the total cormorant diet (by mass) and perch and sticklebacks accounted for about 7% each (Fig. 1). Both the length range and the proportion of marked brown trout recovered from cormorant stomachs were similar to those sampled from survey gill nets set over the same period. Despite the close proximity of Loch Leven to the coast, no fish of marine origin was found. These findings are evidence that the birds had fed mainly on Loch Leven, and suggested that there was no selection for or against stocked trout by the birds. However, the presence of roach (a species thought to be absent from Loch Leven) in two samples indicated that some birds had foraged elsewhere.

Impact on the fishery
A bioenergetic model was used to estimate that 81,000 (95% confidence limits 42,000-128,000) brown and 5,000

![Pie chart](image)

Figure 1
The importance of different fish to the diets of wintering cormorants sampled at Loch Leven in 2001.
(1,000-12,000) rainbow trout were consumed by cormorants over a seven month period (September to March). These estimates compare with annual average fishery catches (1996-2000) in the region of 6,000 brown and 13,000 rainbow trout and indicate that the level of predation on brown trout is likely to have a greater impact on the fishery than that on rainbow trout.

**Stocking and cormorant numbers**

For the period 1983-1999, there was a significant relationship between the number of yearling brown trout stocked in spring and the average number of cormorants counted the following winter (Fig. 2). There was also a positive relationship between regional cormorant abundance and Loch Leven counts, suggesting that both stocking level and the regional abundance of the birds influenced the number of cormorants using the loch. It is possible that the policy of stocking small trout in spring has attracted cormorants to the site and that the increased number of cormorants may have prevented any improvement in fishery catches.

For further information see: