Modelling large scale fluctuations in salmonid abundance in the River Tyne (UK) using local resistivity counter data.

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Abstract: Migratory species are particularly challenging to monitor and protect. These species move seasonally between breeding grounds and areas where they develop, so monitoring at a single location typically fails to account for a large proportion of their year.

For instance, in the UK, *Salmo salar* and *Salmo trutta* are anadromous salmonids that migrate seasonally between the River Tyne (UK) and the Atlantic Ocean. Both species cover important distances in the open sea for most of the year, but this part of their life cycle if poorly documented.

Since 2004 in the River Tyne, salmonids were recorded as they return to breed; a resistivity fish counter installed in the river is triggered by each fish passage. The counting device produced a time-series of salmonid count (2003-2011), that was investigated using LME models.

Environmental conditions experienced during the unobserved months (November to April, when at sea) were represented by seasonal harmonics and North Atlantic oscillation values (NAO). River temperature, seasonal harmonics, and lagged effect of oceanic conditions (4 years) were important predictors of the salmonid abundance recorded in the River Tyne.

Large scale effects represented the whole migration cycle (harmonics), or represented and/or influenced the unobserved part (NAO); they were combined with a local effect (temperature).

This study supports the argument (Robinson *et al*., 2009 ; Forchhammer *et al*., 2002) that especially in migratory species, large-scale parameters may be relevant even when modelling local fluctuations in abundance.

The aim of this project was to investigate the extent to which it was possible to use statistical modelling to investigate and then predict the return of salmonids to the River Tyne using covariates associated with their migration.

References

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