

Oral Presentations

PSE.13

Migration behaviour of eels from the Baltic and Skagerrak region

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A total of 80 silver eels with buoyant, implanted data storage tags and 40 externally attached data storage tags with programmable release were released at the Swedish westcoast and in the Sound connecting the Baltic with Kattegat. The releases were made in 2008, 2009 and 2010. Until the autumn 2011 20 % of the external tags and 2.5 % of the implanted tags have been recovered. Two internal DSTs and three external gave reasonably long records of active migration, of from approximately 20 to 90 days. All showed a similar diurnal diving behaviour; shallow - in some cases immediately at the surface - in the nighttime and deeper during daylight. The maximum depth was 400 to 600 meters for all eels. Geopositioning was made by a combination of longitude estimates from the diurnal depth cycle, assuming that it follows the local rise and setting of the sun, and the restrictions given by maximum depth and the temperature profile. Additional point positions were obtained from the passage across the Scotland-Island Ridge and from the sea surface temperature at the day when the tag popped up to the surface. The migration route of all the eels was along the Norwegian Trench into the Norwegian Sea at 62-63 N and then southwest into the Atlantic west of Scotland. The observed migration route and the diurnal diving behaviour is representative for a normal silver eel migration. This is shown by a comparison with independent data on the temporal and spatial occurrence of migrating eels in scientific bottom trawl surveys. The eel moved actively also at temperatures close to zero. In the night the eels moved at water temperatures between 8 and 10 C.

PSE.15

Spawning migration of American eel from pristine (1843 1872) to contemporary (1963 1990) periods in the St. Lawrence Estuary, Canada

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Catadromous American eel, *Anguilla rostrata*, has a complex life history including two large scale migrations between oceanic spawning grounds and continental freshwater growth habitats. At the onset of the maturing phase, silvering eel undertake their 4,500-km long spawning migration. In the St. Lawrence River (SLR), this migration starts in early summer in the freshwater course (500 km long), before reaching the brackish estuary during the fall, on their way to the Sargasso Sea. Recently, we discovered private archives of daily eel landings statistics in the brackish estuary for the period 1843-1872. These historical data are used to compare migration patterns in this portion of the SLR before and after the industrial development, which led to major human modifications such as habitat fragmentation by dams, water flow regulation, dredging of a wide and deep navigation channel, etc. Daily eel catches and their dates of passage (starting, median and ending dates) were compared between pristine and contemporary periods (1963-1990) to measure the effects of hydroclimatic variables and water discharge regulation. Timing and duration of eel migration patterns differed significantly between the two periods. In the contemporary period, migration started 18 days earlier than in pristine times, and ended at the same average period. Early eel migration was also significantly related to high spring flow and secondarily to high spring temperature, while migration ended later when high temperature or low water level occurred during the fall period. A recent slight increase in the water temperature of the SLR could partially explain the earlier eel migration observed during the contemporary period. In return, the effect of high spring flow should have been more contrasted if the river would have not been regulated. Recent eel production being now mainly restricted to the lower part of SLR mainstream, shorter travelling distance to the estuary may explain why migrating progress was earlier during the contemporary period.

PSE.14

Multiple approaches to elucidate the migration of the American eel from the St. Lawrence River to the Sargasso Sea

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Although listed as special concern in Canada, estuarine and oceanic migrations that characterize the American eel's life cycle remain largely unknown. This project aims to establish the migration routes taken by adult eels from the St. Lawrence River to the spawning area as well as to identify the dominant conditions that prevail along these routes. A system-wide effort to capture and acoustically tag individuals was conducted in 2010 and 2011. Acoustic hydrophones were deployed from the upper St. Lawrence River to Cabot Strait and the Atlantic Ocean. 18 eels are to be fitted with archival tags in a first attempt to track their horizontal and vertical migrations towards the spawning site in the Sargasso Sea. The first and second year of acoustic tracking generated novel and interesting data that are discussed in this presentation. Also, through the use of POKM (Platform for Ocean Knowledge Management), a web-based tool that allows OTN researchers conduct joint analyses of oceanographic and animal tracking data, models are being developed to examine the oceanic phase of eel migration patterns. Once completed, both these models and physical data will be used to assess the potential impact of climate change on eel migration.

PSE.16

Migratory history of Japanese eels collected from their spawning area

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Various studies have examined the migratory history and habitat use of the silver eels that leave freshwater and estuarine habitats on their way to the spawning area using their otolith strontium (Sr) and calcium (Ca) concentrations, but which eels actually reach the spawning area and eventually spawn has remained unknown. In order to examine the variation in migratory history and habitat use of the spawning-condition Japanese eels, *Anguilla japonica*, that were recently collected from their spawning area along the southern part of the West Mariana Ridge in the western North Pacific during 2008 - 2010, we measured their otolith Sr/Ca ratios using X-ray electron microprobe analysis. Of the 7 males (43.2 \bar{n} 63.9 mm TL) and 6 females (55.5 \bar{n} 76.7 mm TL) examined, their Sr/Ca ratios beyond the elver stage indicated that they could be classified into four migratory types based on the habitats they used during their yellow eel stage. Type 1 eels lived mainly in freshwater and partly brackish water (2 males). Type 2 lived mainly in freshwater to brackish water habitats, with some seawater exposure (4 males and 1 female). Type 3 lived mainly in seawater with some time in freshwater (2 males). Type 4 lived in seawater or some brackish water, without entering freshwater (1 male and 3 females). The low proportion of traditionally catadromous river eels in these collections at the spawning area suggested that the estuarine and sea eels that mostly inhabit the estuarine and coastal areas of East Asia might make a larger reproductive contribution to the next generation, but the sample sizes were too small to reach clear conclusions of overall spawner contributions. However about 50% of these spawning eels had experienced some freshwater habitats, suggesting many eels may enter freshwater even if they don't remain there throughout their whole yellow eel growth phase. This suggests that all different types of habitats are important for maintaining the Japanese eel population, and preservation of the continuum from river to estuarine habitats is important.