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Abstract

Evaluating Silver Eel Escapement at a Large Scale Using Eel Density Analysis (EDA) †

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Abstract: The European eel population has declined over the last 50 years and is outside safe biological limits. In 2007, the European Commission enforced a regulation to ensure that all Member States implement Management Plans to achieve an escapement rate of 40% for silver eels. However, escapement is assessed using diverse methods, and therefore, estimates of different countries are not comparable. Thus, European scientists and managers face the challenge of finding a method that could be applied all along the European eel distribution range using widely available data. During the SUDOANG project, the Eel Density Analysis model (EDA) was used to estimate the silver eel escapement in Spain, France, and Portugal. EDA can estimate silver eel escapement at different scales (basin, EMU, country, international) using data from routine electrofishing surveys, such as those collected for the Water Framework Directive (WFD). EDA is based on open-source software and is widely applicable to European rivers. A chained river network in the three countries was built, including the hydrological attributes, the location, and the characteristics of 10,574 obstacles. A total of 46,118 electrofishing operations from 1985 to 2019 were also compiled and projected to the hydrographic network. Finally, EDA was implemented through the sub-models on eel presence-absence, density, size structure, and silvering. EDA estimated a total fluvial population of 12.3, 11.7, and 5.8 million silver eels for 2015 in France, Spain, and Portugal, respectively. Eel presence and abundance decreased as the altitude and the distance to the sea increased. Finally, by setting the

accumulated height of dams to zero, EDA provided an estimate of the effect of habitat loss due to dams on the eel population. These results correspond to the first assessment of silver eels carried out simultaneously and with the same methodologies in three European countries.

Keywords: European eel; silver escapement; EDA model; habitat loss

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Conflicts of Interest: The authors declare no conflict of interest.