

EGU2020-22021

<https://doi.org/10.5194/egusphere-egu2020-22021>

EGU General Assembly 2020

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An open-source database and collections management system for fish scale and otolith archives

Elizabeth Tray^{1,2}, Adam Leadbetter³, Will Meaney³, Andrew Conway³, Caoimhín Kelly³, Niall O'Maoileidigh², Elvira De Eyto², Siobhan Moran³, and Deirdre Brophy¹

¹Marine and Freshwater Research Centre, Galway-Mayo Institute of Technology, Co. Galway, Ireland

²Marine Institute, Furnace, Newport, Co. Mayo

³Marine Institute, Rinville, Oranmore, Co. Galway, Ireland

Scales and otoliths (ear stones) from fish are routinely sampled for age estimation and stock management purposes. Growth records from scales and otoliths can be used to generate long-term time series data, and in combination with environmental data, can reveal species specific population responses to a changing climate. Additionally, scale and otolith microchemical data can be utilized to investigate fish habitat usage and migration patterns. A common problem associated with biological collections, is that while sample intake grows, long-term digital and physical storage is rarely a priority. Material is often collected to meet short-term objectives and resources are seldom committed to maintaining and archiving collections. As a consequence, precious samples are frequently stored in many different and unsuitable locations, and may become lost or separated from associated metadata. The Marine Institute's ecological research station in Newport, Ireland, holds a multi-decadal (1928-2020) collection of scales and otoliths from various fish species, gathered from many geographic locations. Here we present an open-source database and archiving system to consolidate and digitize this collection, and show how this case study infrastructure could be used for other biological sample collections. The system utilizes the FAIR (Findable Accessible Interoperable and Reusable) open data principals, and includes a physical repository, sample metadata catalogue, and image library.