



Unlocking the archive

Extracting new insights from fish scales

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Unlocking the archive

- 4 year project, funded under the Marine Research Programme by the Irish Government (Grant-Aid Agreement No. PBA/FS/16/03)



Marine and Freshwater Research Centre
GMIT



Marine Institute Newport Catchment Facility, Burrishoole Mayo

Objectives

- Establish Ireland's first biochronology repository
- Create digital database of multidecadal growth information
- Provide infrastructure to support new research opportunities
- Develop capacity in biological and environmental time series analysis
- Develop methods for analysing the composition of scales and otoliths
- Investigate responses of migratory fish to environmental change

Project team



Cóilín Minto
Statistics and
modelling



Christina O'Toole
PhD student



Elizabeth Tray
Research scientist



Aidan Long
Post-doc



Louise Vaughan
Post-doc



Deirdre Brophy
Otolith growth
and chemistry



Niall
O'Maoiléidigh
Salmonid ecology
and management



Conor Graham
Stable isotope
ecology



Elvira D'Eyto
Long term
ecological
monitoring



Philip White
Environmental
Chemistry



Adam Leadbetter
Data
management



Russell Poole
eel and salmonid
ecology and
management



The collections



Marine Institute Newport, catchment research facility



1. Burrishoole Scale & Otolith Collection
2. National Micro Tag Program
3. National Scale Archive

Consolidating the collections

Design Database

1

Populate
Database

2

Re-house Existing
Collection

3

Create Work-flow
for Incoming
Samples

4

Database

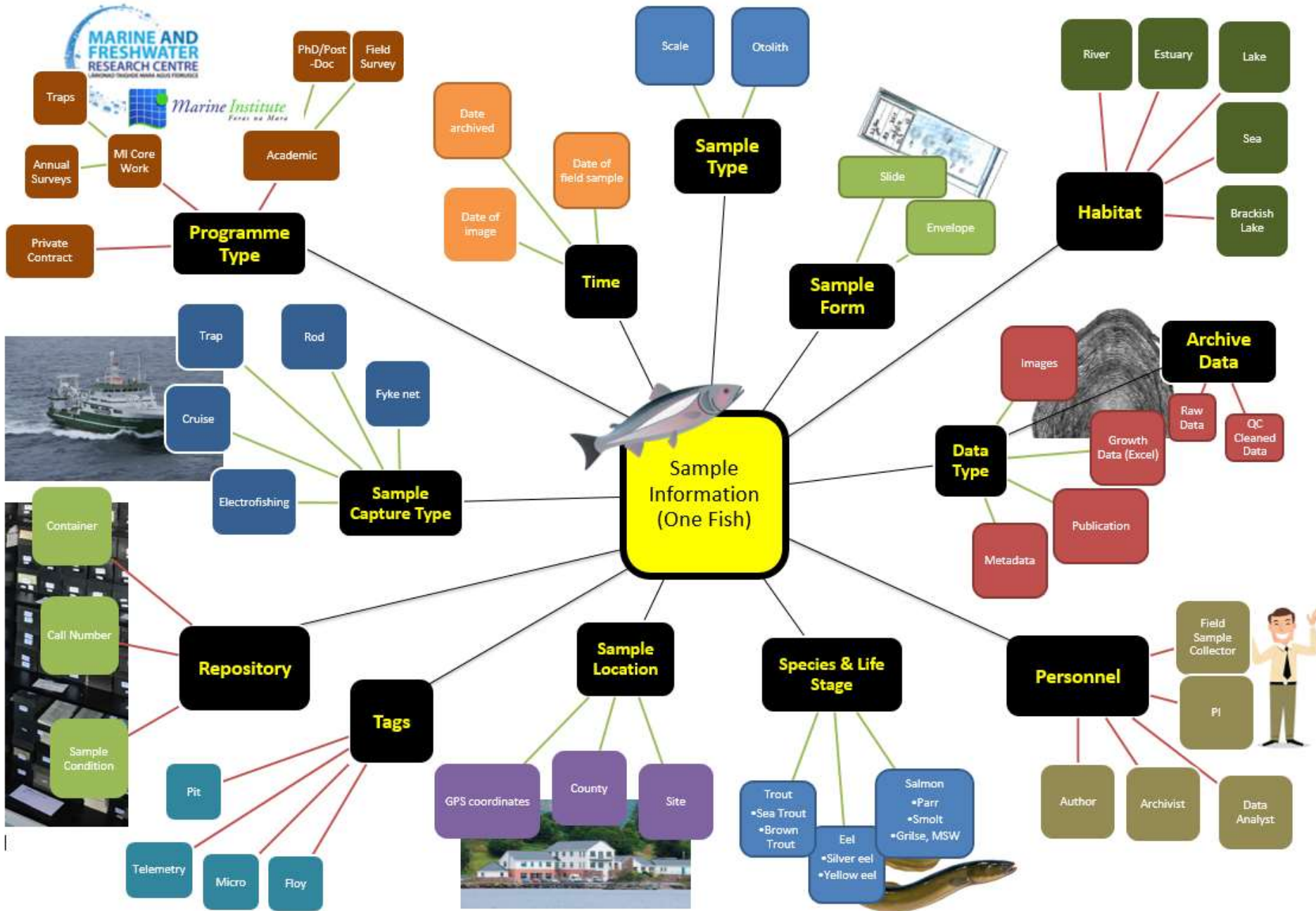
Repository

Unlocking The Archive WP1

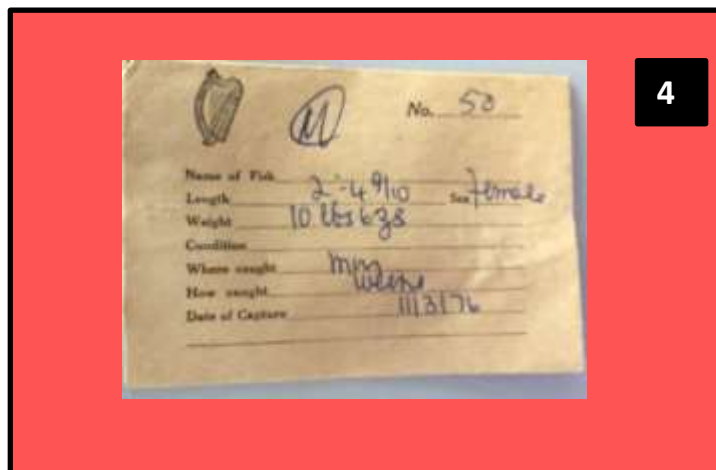
Issues with collections

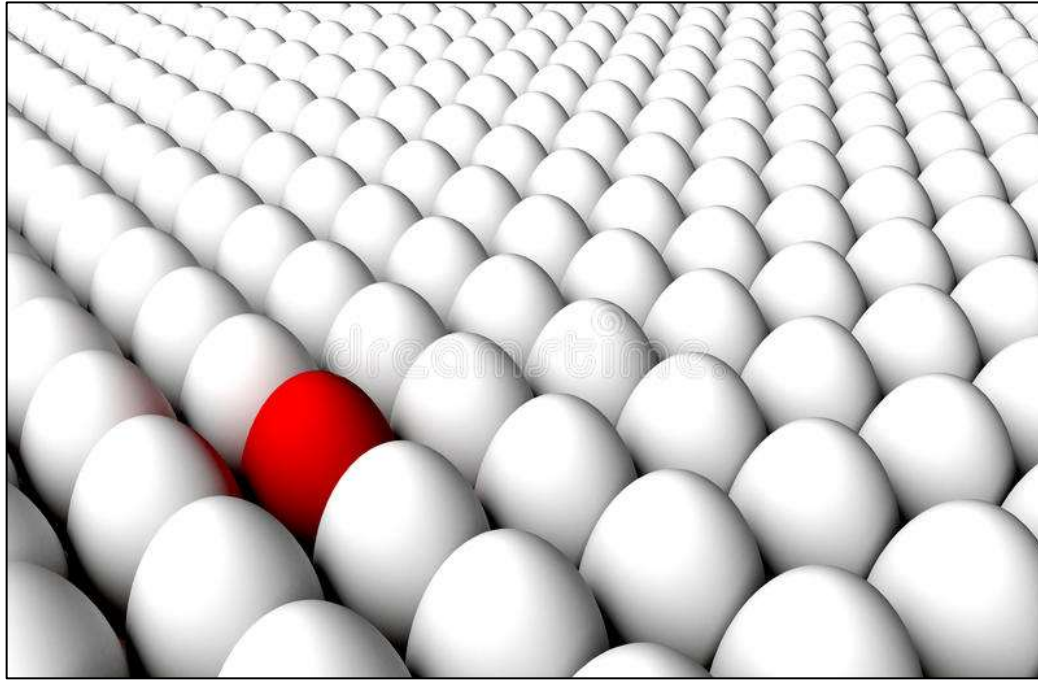
- Decades worth of material, with numerous sample identifier codes
- Degraded & compromised samples (mold, broken glass)
- Lack of consistency in formats
- No single place designated for long term sample storage
- Hard to decipher handwriting
- Multiple inventories have been made, with new identifiers
- Sample intake has grown exponentially in the past 5 years





Minimum criteria for useable samples

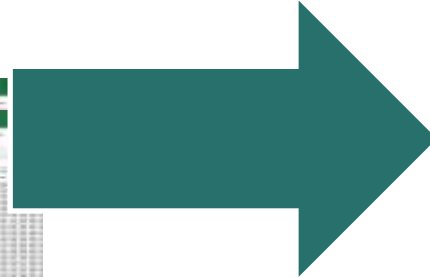
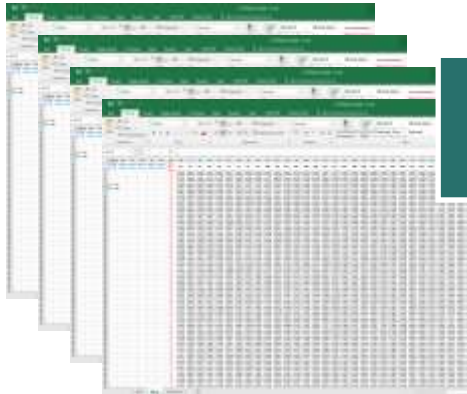




Prioritized **useable** bundles of envelopes, rather than trying to account for every sample




The collections management system



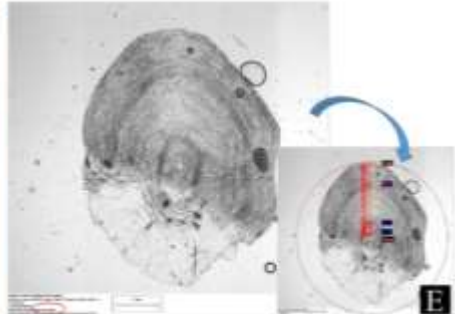


Sample Set Container: 609 **14369**

Sample Set Container Envelopes
Sample Type Fish scales
Sample Set State Ingested
Sample Set Compromised No
Archive Location (SIA) FBA Unit 5
Contact Email fba@marine.ie
Date Archived 2018-01-30
Programme Burrishoole Fish Stock Assessment Programme

Species Atlantic Salmon
Date Collected 2017-07-20



Approximate Sample Amount 5
Fish Length 0.523m
Sex Male Sex Determination Method Field
Maturity Gr1 Sex Maturity Determination Method Field Observation
Life Stage Adult
Fish Origin Local Wild Stock
Fate Released
Contained In Sample Set Container: 609
Lab Number 260428



[Tray, E., Leadbetter, A., Meaney, W., Conway, A., Kelly, C., Maoiléidigh, N.Ó., de Eyto, E., Moran, S., Brophy, D., 2020. An open-source database model and collections management system for fish scale and otolith archives. Ecological Informatics, 101115.](#)

The collections management system

Layer 1: Groups of samples (common species, year, location)



Home Discover Connect About

Sample Set Container: 611

Sample Set Container Envelopes
Sample Type Fish scales
Sample Set State Imaged
Sample Set Compromised No
Archive Location [On Loan](#)
Contact Email ifba@marine.ie
Date Archived 2019-07-26
Archivist Comments
Demonstration Container for Aug 2nd 2019 meeting with DB, AL, and NOM.
Programme Scale & Otolith Collection Programme
Number of Samples in Container
49


Years represented in this sample set

Layer 2: The individual samples

capture Configuration Help

16373

Species Atlantic Salmon
Date Collected 1983-09-02

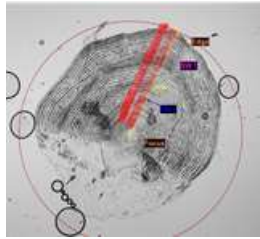


Approximate Sample Amount 10
Fish Length 0.550m
Fish Weight 1723.65g
Sex Male **Sex Determination Method** Unknown
Maturity Grilse **Maturity Determination Method** Field Observation
Life Stage Adult
Fish Origin Local Wild Stock
Fate Unknown
Contained In [Sample Set Container: 611](#)
Archivist Comments
Demo Scale for Aug 2nd 2019
Lab Number 41
Is the sample in the IFBA Time Series table?

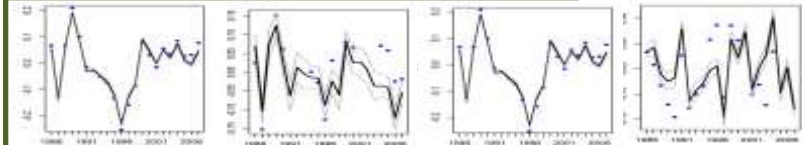
SALMON RESEARCH TRUST OF IRELAND 41

SPECIES	GRILSE	LAB No.	WILD
TAG No.		FINCLIP	BRAND MARK
LENGTH	45	WEIGHT	3.8
SEX			5
CAPTURE DETAILS	FURNACE		
DATE	D M Y	REWARD TO	
	21 9 83		

sample 4, 16373



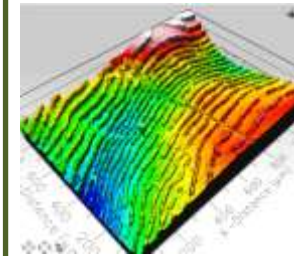
Comparison of marine growth in Burrishoole ranched and wild salmon populations (*in prep*). relating marine growth to survival in coded wire tagged fish (Doogan et al *in prep*)



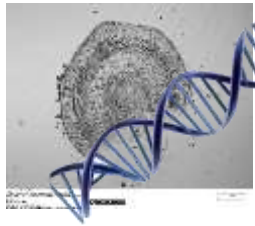
Pan-European analysis of variability in marine growth of salmon and associations with environmental drivers. (Vaughan et al *in prep*)



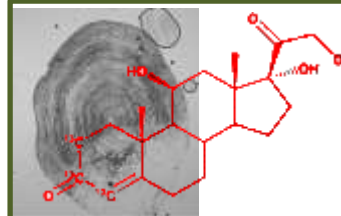
Stable isotope analysis of Atlantic salmon scales; validating protocols ([O'Toole et al 2020](#)), ground-truthing isoscape approach (scale stable isotope signatures as geolocators) (O'Toole et al *in prep*)



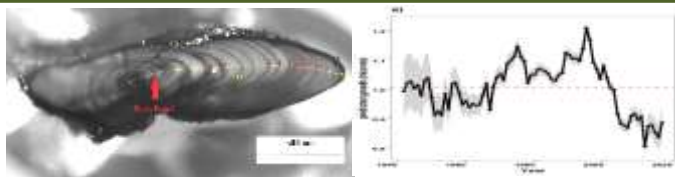
Trace elemental composition of salmon scales; developing and ground-truthing methodologies, discriminating populations (Tray et al *in review*)



Genetic analysis of archived Atlantic salmon scales; Temporal trends in population structure, Trans-generational relationships between growth and survival, (McGinnity et al *in prep*)



Cortisol as a marker of stress in archived Atlantic salmon scales; Experimental validation of method, application to archived time series (O'Toole et al *in prep*)



8 decade eel growth chronologies; partitioning effects of age, sex, temperature ([Vaughan et al 2020](#))



Eel habitat use; relating strontium patterns to otolith growth marks (Vaughan et al *in prep*)

Future plans

- Secure resources to support maintenance and expansion of IFBA
- Expand IFBA to include other scale and otolith collections
- Link with similar collections internationally
- Stimulate new research activities supported by IFBA

Acknowledgements

- This study was funded through a Grant-Aid Agreement No. PBA/FS/16/03 (unlocking the archive: using scale and otolith chronologies to resolve climate impacts) under the Marine Research Programme by the Irish Government.

