Insights into the black box of a widely dispersing Galaxiid. What can otolith microstructure reveal?

Eimear Marie Egan
David Schiel
John Quinn
Michael Hickford
Complex life cycle

Eggs
The black box

- Impeded conservation/management
The Fishery

- >90% whitebait fishery
  - Cultural
  - Recreational
  - Commercial

- Multispecies fishery
  - 5 migratory Galaxiids

- Department of Conservation
  - “Precautionary approach”

- Control whitebaiters behaviour
  - No quotas
  - Licences
  - Fishing pressure
  - Monitoring
Fishery management

• Management units
  – “Rarer whitebait”

• Conservation status 2013 “at risk”

• Biology
  – “One size fits all”
  – Homogenous
  – 13° latitude
Populations are not homogenous

- Genetic
  - Panmixia
  - Structure (allozymes)
- West to east exchange
- Freshwater/Estuarine residents
- Discrete populations
  - Mean vertebrae no.
- Batch vs Total spawners
- Spawning time
Marine Life

- Population variability
  - Biocomplexity

- Platform
  - Temperature
  - Food

- Larval history
  - Precursor to adult growth
  - Slow growth
  - Fast growth

Mean SST
1993-2002
Aims

• Explore the “black box” of marine dispersal

• Characterise larval traits of populations throughout New Zealand

• $H_0$; There is no intra-regional difference in the larval traits of *G. maculatus* in space or time
Methods

- 4 key fisheries
  - 3 rivers
  - Sept- Dec
- Length & weight
- Extracted
- Polished
- Photographed

400µm
Otolith microstructure

Counts → Pelagic larval duration

Width (µm) → Growth per day
Growth relationship

\[ R^2 = 0.8234 \]
Size at recruitment

September

October

November
Pelagic larval duration differs

September

Bay of Plenty: 95 days
Buller: 134 days
PLD vs otolith growth
Conclusion

• Larval histories are different

• Bay of Plenty
  – Smaller size
  – Faster growth
  – Shorter PLD

• Buller
  – Larger size
  – Slower growth
  – Longer PLD

• Geographic variation
Consequences

- Demographic structure
  - Size selective mortality
  - Age at sexual maturity
  - Reproductive mode
  - Fecundity
  - Survival probability

- Management
  - Temporal
  - Spatial
Future Research

• Otolith shape
  – Discriminate populations

• Construct demographic models
  – Distribution of life history traits
  – Age adult populations
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