Widespread Wanderers: using otolith microchemistry to determine the natal source of whitebait
Inanga: diadromous and widespread

Adults – lowland streams

Spawning - estuarine

Larvae - marine
Why do we need to know the source of inanga?

- Threat classification: “At risk – declining”
- Degradation of adult and spawning habitats has formed sink populations
- Where are the source populations?
- Targeted restoration and protection
Widespread production of inanga larvae
6 month planktonic phase
Widespread recruitment of Whitebait

Genetics = homogeneous
Otolith microchemistry
Egg collections (May & June 2009)

Locations:
- Oparara
- Little Wanganui
- Bradshaws
- Orowaiti
- Fox
- Punakaiki
- Awatere
- Courtenay
- Avon
- Te Kawa
- Barrys
- Robinsons
Otoliths removed from hatchlings
Elemental concentrations in whole otolith

Laser Ablation Inductively Coupled Plasma - Mass Spectrometry
Hatchling single element concentrations

West Coast

<table>
<thead>
<tr>
<th>Element</th>
<th>May 2009</th>
<th>June 2009</th>
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<tr>
<td>56Fe (x10^-6)</td>
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<tr>
<td>27Al (x10^-6)</td>
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<tr>
<td>56Fe (x10^-6)</td>
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<tr>
<td>24Mg (x10^-3)</td>
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Hatchling multivariate signatures

Overall re-classification rate: 85%

95% confidence ellipses
6 months later…
Whitebait collections (November 2009)

Oparara
Little Wanganui
Punakaiki
Orowaiti
Awatere
Courtenay
Barrys Robinsons
Elemental signatures at whitebait otolith core

- Discriminant model from hatchling otoliths can be used to classify elemental signature at the core of whitebait otoliths → predict a likely natal origin
West Coast whitebait come from West Coast

- Oparara (n = 29)
- Elsewhere
- Unknown West Coast
- Fox
- Punakaiki
- Little Wanganui

High $^{27}$Al & $^{56}$Fe

50 km
Some East Coast whitebait come from West Coast Awatere (n=28) 50 km Oparara 1

Unknown West Coast 6 Elsewhere 19

Fox

50 km
Some whitebait are retained locally

Barrys (n=33)
Unknown West Coast 3
Unknown East Coast 2
Elsewhere 25

Robinsons 2
Leaky larval pools
Summary

• Inanga show little evidence of natal homing
• Unproductive rivers with degraded spawning habitat still attract whitebait
• No ecological feedback
• Some west coast larvae enter east coast rivers as whitebait
• Modifications to east coast river mouths/spawning habitat may have increased their dependence on the subsidy of whitebait from the west coast
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