Evolutionary history of Australian Salmon (Arripidae) in Australian waters

Preliminary results of PhD study

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Arripidae

- Endemic to temperate waters of Australia & New Zealand region
- 4 species in a single genus – *Arripis*
- Neritic predators
- Obligate schoolers
- Perciformes
A. trutta (Eastern)
A. truttaceus (Western)
A. xylabion (Northern)
A. georgianus (Herring)
West-East geminate species

Hutchins (1994) lists 25 species pairs
Western (to 95 cm)

Eastern (to 85 cm)
Herring (adult)
(to 40 cm)

Eastern (juvenile)
Aims

• Primarily Eastern versus Western Australian Salmon

1. Compare population genetic structures

2. Compare aspects of recent demographic history
Sample Sites

http://researchrepository.murdoch.edu.au/20473/
**Methods**

**mtDNA**
- Cytochrome b sequence (483 bp)

**nDNA**
- EPIC, length polymorphism
- universal primers
Results
Haplotype Network

Western (N = 36)

Herring (N = 30)

Northern (N = 11)

Eastern (N = 25)

61 steps
Population Genetic Structure

- pelagic larvae
- highly vagile at all post-settlement stages
Movement of *Arripis* species in Australia

I  Larval
II  Juvenile
III Immature
IV Adult

Western

Eastern

Herring

Population Genetics

- large potential for movement of individuals during life

prediction of

no genetic subdivision
Population Genetic Structure

- No evidence of genetic subdivision in any species across the Australian distribution

<table>
<thead>
<tr>
<th>EPIC loci</th>
<th># loci</th>
<th># sites</th>
<th>N</th>
<th>$F_{ST}$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern</td>
<td>3</td>
<td>3</td>
<td>92</td>
<td>0.000</td>
<td>0.73</td>
</tr>
<tr>
<td>Western</td>
<td>2</td>
<td>5</td>
<td>169</td>
<td>0.005</td>
<td>0.22</td>
</tr>
<tr>
<td>Herring</td>
<td>4</td>
<td>7</td>
<td>231</td>
<td>0.005</td>
<td>0.13</td>
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</table>
Recent Demographic History

- Star shape phylogeny
- Population expansion in both salmon

61 steps
Recent Demographic History

- evidence of recent population expansion in both Eastern and Western Australian Salmon

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<thead>
<tr>
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<th>Fu’s Fs</th>
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<tbody>
<tr>
<td>Eastern</td>
<td>-9.31*</td>
</tr>
<tr>
<td>Western</td>
<td>-3.69*</td>
</tr>
<tr>
<td>Herring</td>
<td>0.06</td>
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* p<0.001
Time of expansion

- population expansion may have been more recent in the Western Australian Salmon

<table>
<thead>
<tr>
<th></th>
<th>years</th>
<th>95% C.I.</th>
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<tbody>
<tr>
<td>Eastern</td>
<td>53,200</td>
<td>(29,000 – 87,000)</td>
</tr>
<tr>
<td>Western</td>
<td>8,600</td>
<td>(0 – 38,000)</td>
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</tbody>
</table>

estimated using ‘standard’ rate of mutation for cytochrome b in marine fish (2%/Mya) and equation $T = 2ut$ (Li, 1977)
Conclusions

• Eastern and Western Australian Salmon appear to be panmictic across their Australian distribution

• Both Eastern and Western Australian Salmon appear to have undergone recent population expansion
  - the latter possibly more recently
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