Mysis salemaai in Ireland: more and less

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Background

- *M. salemaai* is a glacial relict crustacean
- Sensitive to high temperatures (Penk 2011; Griffiths, 2007)
- Associated with cold, deep, waterbodies
- Found in northern Europe, including Ireland and Siberia

How has *M. salemaai* survived since the last glaciation in the relatively shallow, ‘warm’ water lakes of Ireland?
Background

- *M. salemaai* is a glacial relict crustacean
- Sensitive to high temperatures (Penk 2011; Griffiths, 2007)
- Associated with cold, deep, waterbodies
- Found in northern Europe, including Ireland, and Siberia
- Only native member of its taxonomic order in Irish freshwaters
- Important food web component
  - Fish (especially Pollan) in winter months
- Conservationally important
Overview

• Purpose of the study:
  • To build on the work of previous studies on *M. salemaai*
  • Document two new occurrences of *M. salemaai* in Ireland

• Examine:
  • Effect of maximum lake depth on *M. salemaai* density
  • Influence of lake area and maximum depth on *M. salemaai* occurrence
  • Temporal trends of *M. salemaai* in Loughs Neagh and Erne
Methodology

• Data was compiled from the following sources:
  
  • *DOLMANT Project*
    • 51 lakes sampled between 2012 - 2013
  
  • *Penk (2011)*
  
  • *Duck and Cawardine (2005) – North South Share*
    • Area and depth data for 136 lakes in Ireland
  
  • *AFBI – Environmental Change Network*
    • Lough Erne data set (1986 - 2012: sampled monthly)
    • Lough Neagh data set (2005 - 2012: sampled monthly)
  
  • *Griffiths (2007)*
    • Lough Neagh data set (1993 - 2005: sampled weekly)
  
• All *M. salemaai* collected using vertical net hauls
New occurrences of *M. salemaai*

• DOLMANT project
  • Small lakes work package

• **Castlewellan Lake:**
  • Max depth = 21 m; Area = 0.36 km$^2$
  • Occurrence of *M. salemaai* unusual as not linked to Shannon, Corrib, Erne or Neagh catchments
  • Natural or intentional/accidental introduction?

• **Scolban Lough:**
  • Max depth = 30 m; Area = 0.58 km$^2$
  • *M. salemaai* also found in the gut contents of perch
  • Linked to the Erne system

• Are more populations yet to be discovered in Ireland???
Scolban Lough:
• Max depth = 30 m;
• Area = 0.58 km²

Castlewellan Lake:
• Max depth = 21 m;
• Area = 0.36 km²
Factors influencing *M. salemaai* density

- *M. salemaai* net catch density increased with vertical haul distance
  - \( r = 0.55, n = 20, P = 0.01 \)
- *M. salemaai* net catch density increased with maximum lake depth
  - \( r = 0.65, n = 11, P < 0.05 \)
- Lake area & trophic state were not significant predictors of *M. salemaai* density

Factors influencing *M. salemaai* occurrence

- Lakes with *M. salemaai* had significantly greater areas and maximum depths than those without
- Lake mean depths did not differ
- *M. salemaai* tend to occur in larger, deeper, lakes

Temporal trends of *M. salemaai*

- Both lakes show a statistical decline in *M. salemaai* density over time
  - Lough Neagh \( r = -0.74, n = 20, P < 0.001 \); Lough Erne \( r = -0.39, n = 24, P < 0.05 \)
- Lough Neagh *M. salemaai* mean abundance has declined by 96%
- Lough Erne *M. salemaai* mean abundance has declined by 58%
- Decline possibly linked to climate change, eutrophication and invasive species

Conclusions

- Two new occurrences of *M. salemaai* in Ireland:
  - Castlewellan Lake
  - Lough Scolban

- *M. salemaai* tend to occur in larger, deeper, lakes

- Lough Neagh *M. salemaai* mean abundance has declined by 96%

- Lough Erne *M. salemaai* mean abundance has declined by 58%

- What does the future hold for this Irish glacial relict?
  - Climate change
  - Eutrophication
  - Invasive species (e.g. *Hemimysis anomala* in Lough Erne)
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Questions??

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http://www.afbini.gov.uk/dolmant