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


DOLMANT LAKES
Kindrum
Fad
an tSeiscinn
Glen
Keel
Akibbon
Anure
Bartan
Dunglow
Barra
Nasnahida
Kiltooris
Mourne
Eske
Auva
Berg
Lough Neagh
Madral
Shivnagh
Lee
Golagh
Veatry
Scolban
Lower Lough Erne
Ballysaggart
Martray
Legane
Cowey
Begny
Finnebrogue
Screeby
Formal
Drumgay
Lattone
Glencar
Ballydugan
Nadarra
Jenkin
Castlewellan
MacNean Lower
Gill
Upper Lough Erne
Kilturk
Nalughoo
Easky
Bunerky
White
Mackno
Cashel Upper
Templehouse
Talt
Egish
Corglass
Bavan
DOLMANT PROJECT
DEVELOPMENT OF LAKE MANAGEMENT TOOLS
Legend
Lakes
Lake Outlines
N
0 5 10 20 30 40
Kilometers
Based upon Land & Property Service's data with the permission of the Control of Her Majesty's Stationery Office (c) Crown copyright and database rights NIMA ES&LA201.3
Lough Neagh and Lough Erne polygons based upon NIEA data (c)
Republic of Ireland databases copyright (c) Central Statistics Office.
European Union
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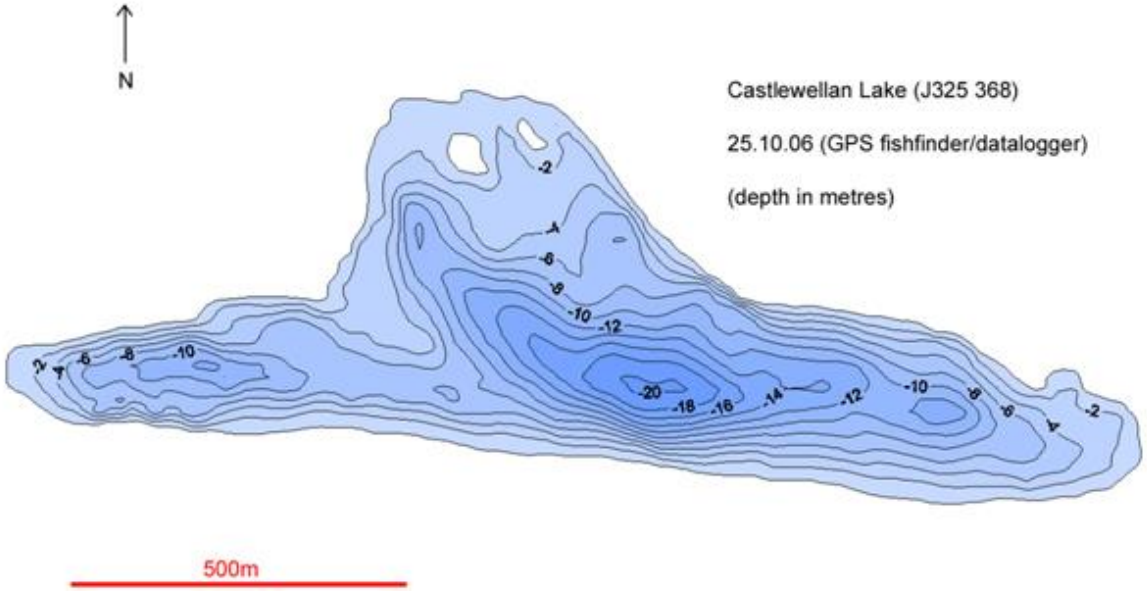
Investing in your future

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???

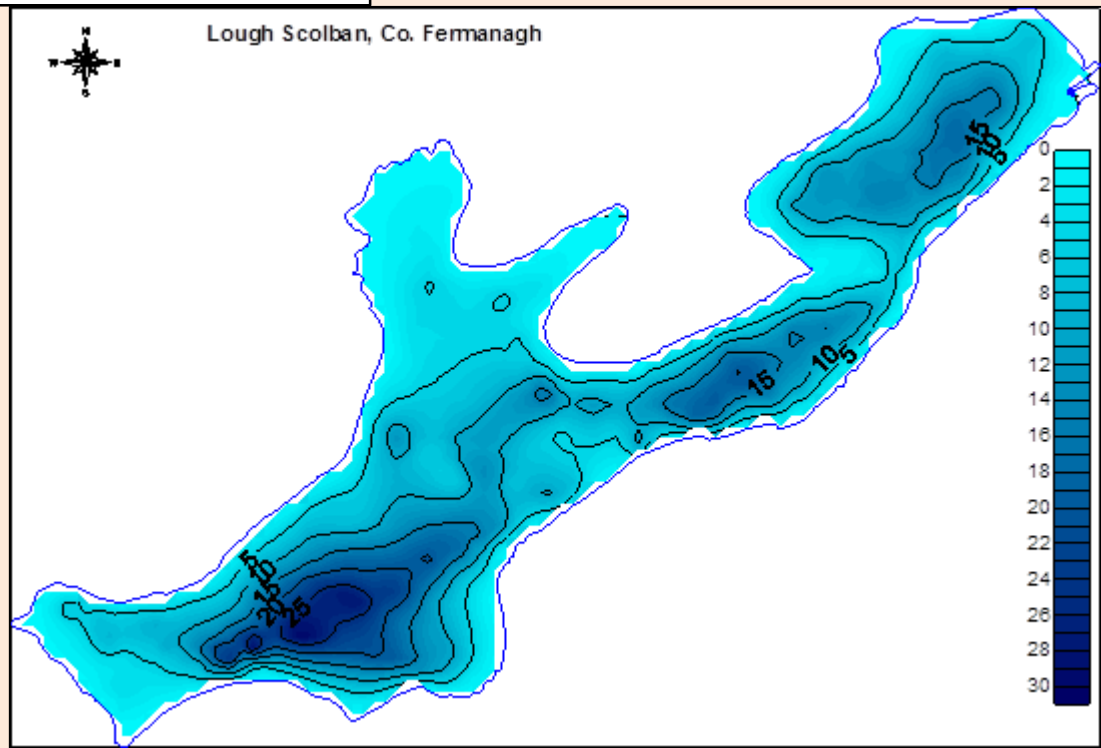


Castlewellan Lake:

- Max depth = 21 m;
- Area = 0.36 km^2

Scolban Lough:

- Max depth = 30 m;
- Area = 0.58 km^2



Penk, M.R. (2011) A review of the current distribution of the freshwater opossum shrimp Mysis salemaai Audzijonyte and Väinölä, 2005 in Ireland. *Biology & Environment: Proceedings of the Royal Irish Academy*, 111B, 1-9.

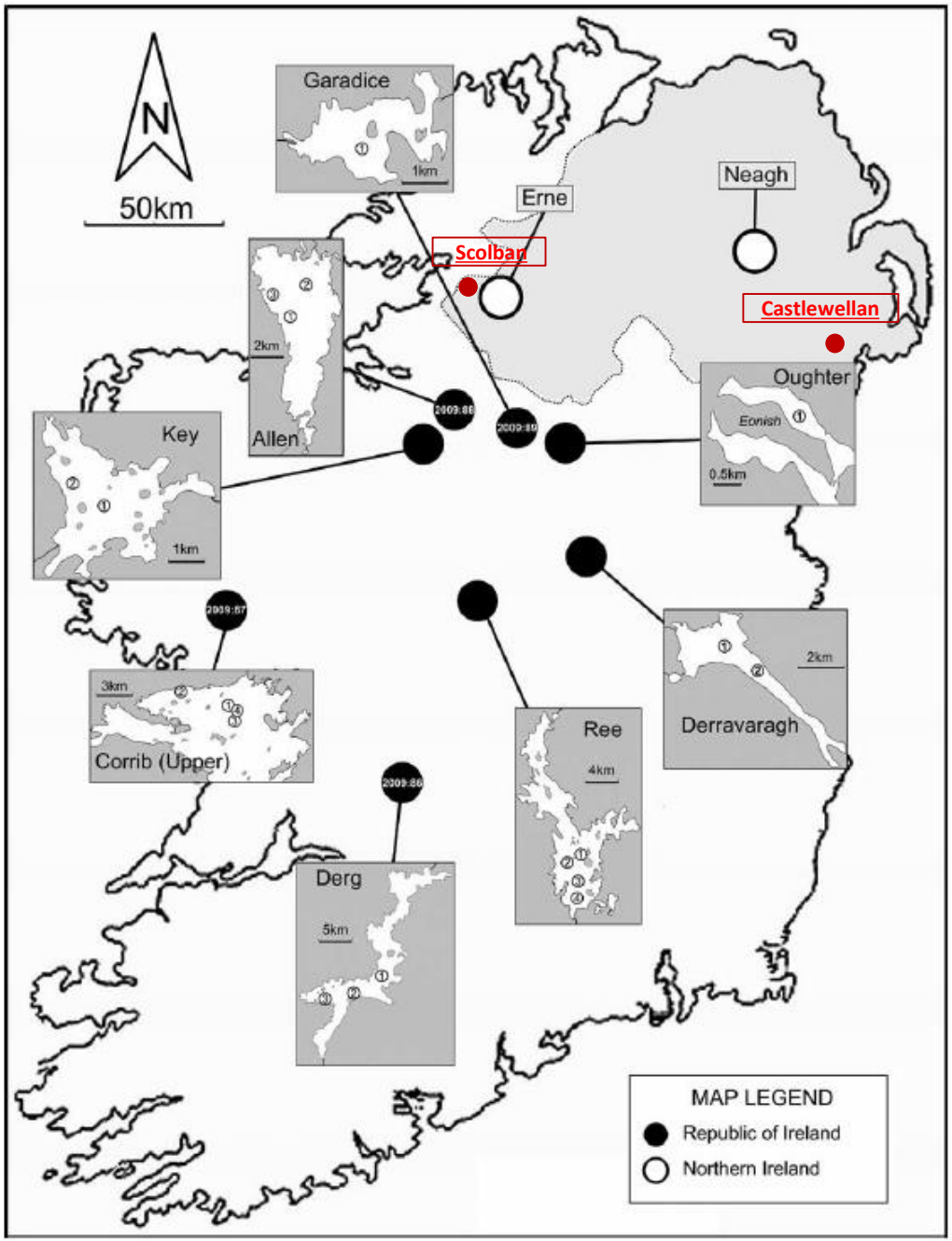
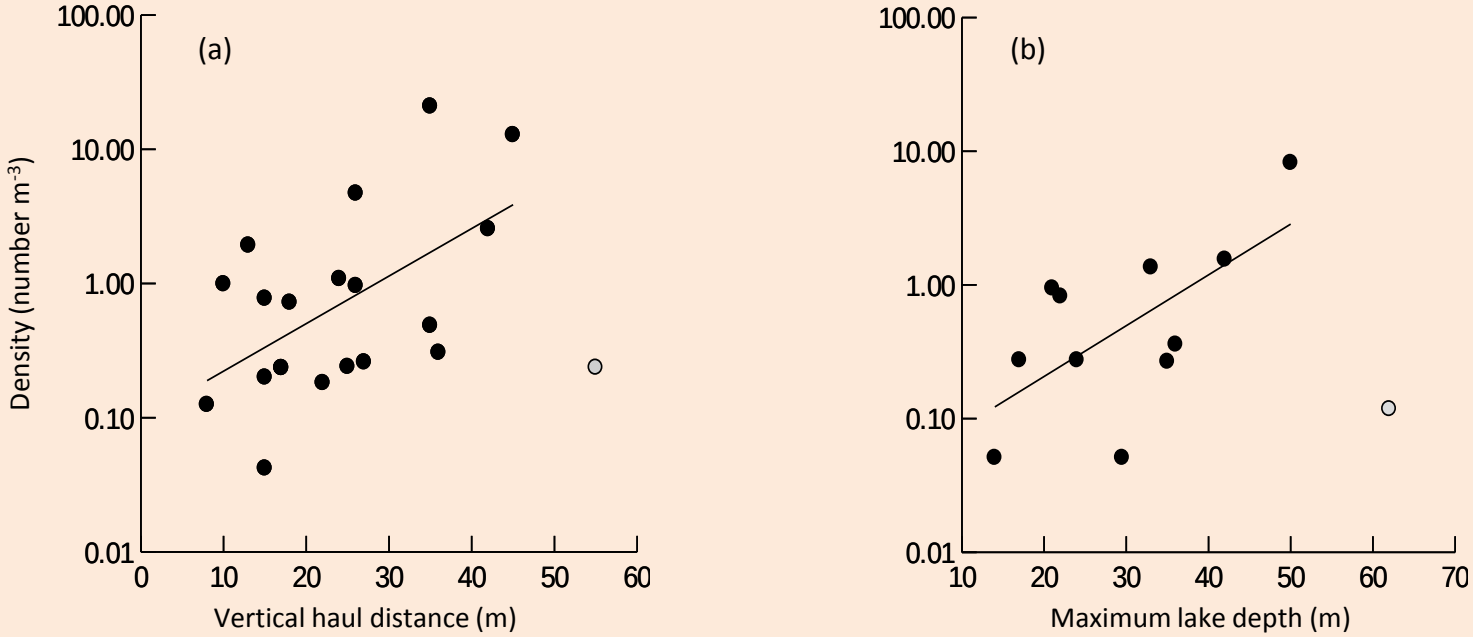


Fig. 1—Distribution of *Mysis salemaai* on the island of Ireland in March 2009, and indicative locations of the sampling sites within each of the lakes sampled in this study (lakes in Northern Ireland were not sampled). Numbers in lake markers are reference numbers of specimens lodged with the Natural History Museum in Dublin.

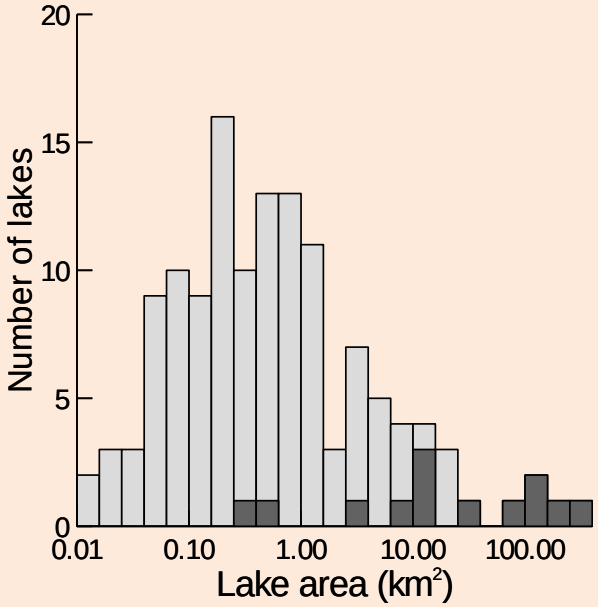
Factors influencing *M. salemaai density*

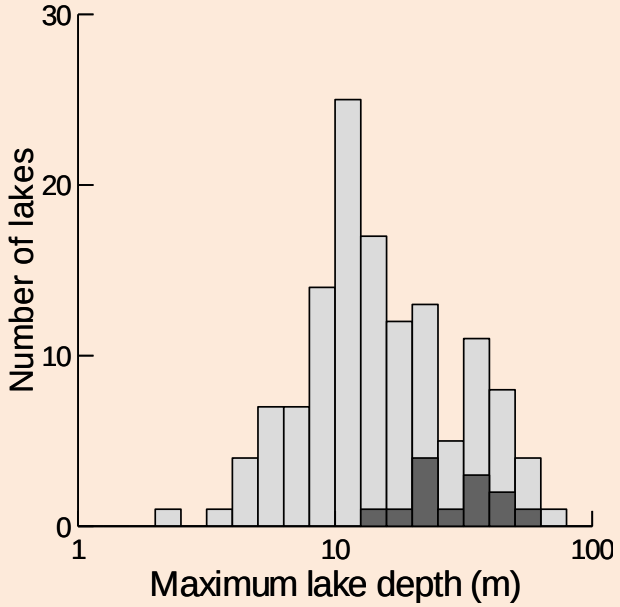


- *M. salemaai* net catch density increased with vertical haul distance
  - (r = 0.55, n = 20, P = 0.01)
- *M. salemaai* net catch density increased with maximum lake depth
  - (r = 0.65, n = 11, P<0.05)
- Lake area & trophic state were not significant predictors of *M. salemaai* density

Griffiths, D., Macintosh, K.A., Forasacco, E., Rippey, B., Vaughan, L., McElarney, Y.R. and Gallagher, K. (in press) *Mysis salemaai* in Ireland: new occurrences and existing population declines. *Biology & Environment: Proceedings of the Royal Irish Society*

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

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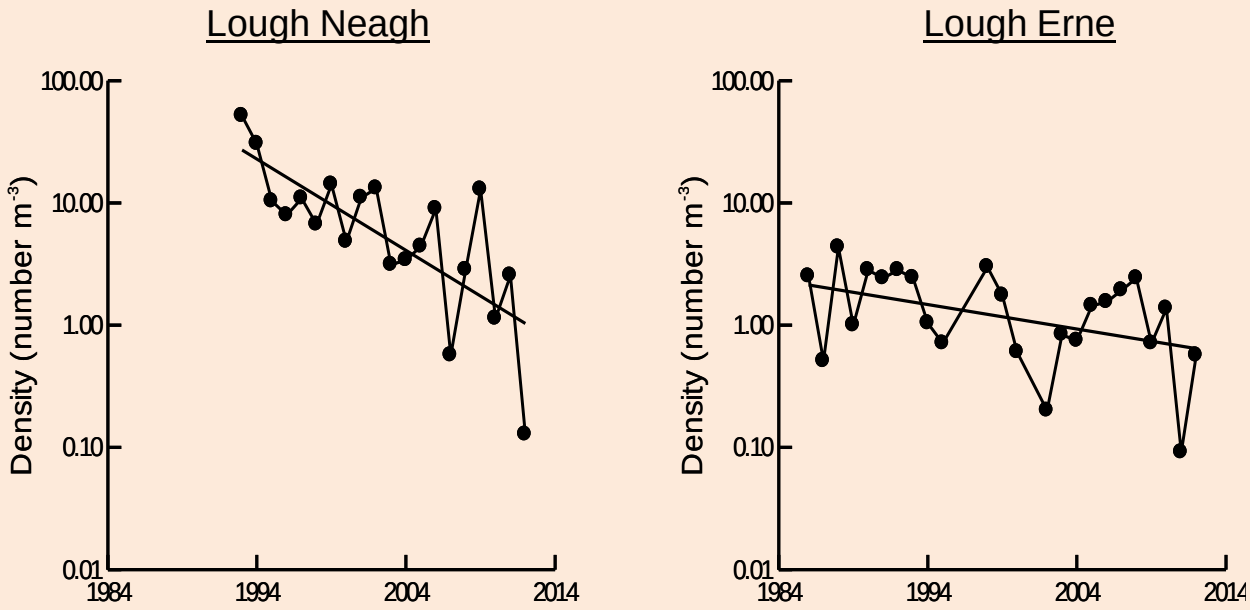
Temporal trends of *M. salemaai*



- 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

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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)

Acknowledgements

- This work was part-financed by the European Union's INTERREG IVA Cross-border Programme managed by the Special EU Programmes Body under the project "Development of targeted ecological modelling tools for lake management; DOLMANT" (Ref. No: 002862) and the Department of Agriculture Northern Ireland.

- The Lough Neagh and Lough Erne 2005-2012 samples were collected by the Agri-Food and Biosciences Institute as part of the Environmental Change Network, which is funded by the Department of Agriculture Northern Ireland.

Questions??

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