Dr. Kate Mathers
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Research Profile

I am an aquatic ecologist with research interests centered on invasive species and in particular invasive crustaceans. I am particularly interested in understanding how environmental controls, interactions between multiple invaders and physiochemical cues control the effects of an invasion for the invaded ecosystem and its native organisms. I am passionate about the management and conservation of freshwater ecosystems, undertaking applied research which has real world applications and contributes to our understanding and sustainable management of freshwater environment.

Research expertise: Invasive species, aquatic biodiversity, ecosystem engineering, management and conservation of freshwater systems, sedimentology, ecohydrology.

Research output metrics: One year after obtaining my PhD I have published 20 peer-reviewed papers and one book chapter. My Google Scholar h-index is 8 and I have 146 citations, with 64 of those citations in 2018.
ORCID ID: 0000-0003-3741-1439
Google Scholar: https://tinyurl.com/scholarKLM
Research Gate: https://www.researchgate.net/profile/Kate_Mathers

Education

Loughborough University **Oct 2013 - Jan 2017 (Awarded Jan 2018)**
PhD entitled 'The influence of signal crayfish on fine sediment dynamics and macroinvertebrate communities in lowland rivers' in collaboration with the Environment Agency. Studentship funded by a Lord Glendonbrook doctoral fellowship. Supervisors: Profs. Stephen Rice and Paul Wood (Loughborough University).

Loughborough University **2012- 2013**
MSc Environmental Monitoring for Management - Awarded Distinction (75%)

Loughborough University **2009- 2012**
BSc (Hons) Geography – Awarded First Class Honours (78%)

Research Positions

Postdoctoral researcher, Eawag (Swiss Federal Institute of Aquatic Science and Technology, part of the ETH domain). **Apr 2018 – Apr 2020**
Employed within the River Restoration research group working on the project entitled "Hydraulic engineering and ecology". My subproject specifically investigates the resilience and resistance of aquatic ecosystems with a particular focus on refugia and instream ecology.

Visiting Research Fellow, Massey University, New Zealand **Mar 2018**
Funded collaborative visit to Prof. Russell Death.

Research Associate in Aquatic Ecology, Nottingham Trent University **Jan 2018 – Feb 2018**

Field study investigating the role of salinization in structuring freshwater macroinvertebrate communities. Collection and processing of macroinvertebrate samples and associated environmental variables.

Research Fellow in Freshwater Ecology, Nottingham Trent University **Jul 2017 – Dec 2017**
Analysis of long term Environment Agency data in project entitled '*Invertebrate community response to flow variability and intermittence in a chalk stream ecosyste*m'

Research Associate, Loughborough University **Feb 2017- Jun 2017**
Implementation of field study investigating the extent of fish foraging impacts on gravel-bed river structures and stability.

Research Assistant, Loughborough University **Jul 2012- Oct 2012**
Processing and identification of aquatic invertebrate samples. Assisted with aquatic ecology and fluvial hydrology / geomorphology fieldwork for numerous departmental research projects.

Nuffield Research Bursary, Loughborough University **Jul 2011- Oct 2011**
Implementation of a research study with Prof. Paul Wood (PI) entitled '*The influence of fine sediment deposition and clogging on macroinvertebrate utilisation of benthic and hyporheic sediments'.*

Relevant publications (20 peer reviewed publications and 1 book chapter)

Mathers, K.L., Rice, S.P. and Wood, P.J. (2019) Predator, prey and substrate interactions – the role of faunal activity and substrate characteristics. *Ecosphere.* 10, e02545.

Clinton, K.E., **Mathers, K.L.,** Constable, D., Gerrard, C. and Wood, P.J. (2018) Substrate preferences of coexisting invasive amphipods, *Dikerogammarus villosus* and *Dikerogammarus haemobaphes,* under field and laboratory conditions. *Biological Invasions.* 20, 2187-2196.

Mathers, K.L., Rice, S.P. and Wood, P.J (2017) Temporal variability in lotic macroinvertebrate communities associated with invasive signal crayfish (*Pacifastacus leniusculus*) activity levels and substrate character. *Biological Invasions.* DOI: 0.1007/s10530-017-1557-3.

Turley, M.D., Bilotta, G.S., Gasparrini, A., Sera, F., **Mathers, K.L.**, Humphreys, I. and England, J. (2017) The effects of non-native signal crayfish (*Pacifastacus leniusculus)* on fine sediment and sediment biomonitoring. *Science of the Total Environment.* 601-602, 186-193.

Rice, S.P., Johnson, M.F., **Mathers, K.L.,** Reeds, J. and Extence, C.A. (2016) The importance of biotic entrainment for base flow sediment transport. *Journal of Geophysical Research: Earth Surface.* 121, 890-906.

Mathers, K.L., Chadd, R.P, Dunbar, M.J, Extence, C.A, Reeds, J., Rice, S.P. and Wood, P.J. (2016) The long-term effects of invasive signal crayfish (*Pacifastacus leniusculus*) on instream macroinvertebrate communities. *Science of the Total Environment*. 556, 207-218.

Mathers, K.L., Chadd, R.P., Extence, C.A., Rice, S.P. and Wood, P.J. (2016) The implications of an invasive species on the reliability of macroinverterbrate biomonitoring tools used in freshwater ecological assessments*. Ecological Indicators*. 63, 23-28. SNIP: 1.643.

Technical Reports

Everall, N. and **Mathers, K.L** (2017) Interim findings of intensive signal crayfish (*Pacifasticus lenuisculus*) removal on invertebrate life in the River Derwent in Derbyshire. Aquascience Consultancy Limited.

Rice, S., Smith, J. and **Mathers, K.L.** (2015) Biological control of invasive Signal Crayfish by European Eel and associated effects on sediment dynamics and flood risk management. Scoping Report for the Environment Agency, Lincolnshire.

Research Grants and Awards

2018 **Swiss Hydrological and Limnological Society** travel grant to present at British Hydrological Society Annual Symposium. Birmingham, UK **CHF 500**

2018 Funds to travel to Massey University, New Zealand as a collaborative **research fellow** **NZ $2,000**

2017 **Santander Mobility Award** for collaborative travel to IGB (Berlin, Germany) and EAWAG (Zurich, Switzerland) **£1,060**

2017 **British Society for Geomorphology Postgraduate Research Grant:** 'Improving the knowledge base on the physical effects of fine sediment for macroinvertebrates (Co-I with Morwenna McKenzie; Coventry University) **£630**

2017 **British Ecological Society Aquatic Ecology Group:** Early Career Research Network on fine sediment and Hydroecology meeting funds (in association with Dr Martin Wilkes and Morwenna Mckenzie; Coventry University) **£930**

2017 **Natural Environment Research Council:** fully funded place on workshop entitled 'Systematic review and meta-analysis for environmental science' **N/A**

2016 **Santander Mobility Award** to enable networking with a number of USA scientists **£1,000**

2016 **British Ecological Society Training and Travel Grant** to present at American Society for Freshwater Science Annual Meeting, Sacramento, USA **£500**

2016 **British Society for Geomorphology Postgraduate Conference Grant** to present at European Geosciences Union in Vienna, Austria **£500**

2015 **National Crayfish Conference Grant** for attendance (Giggleswick, UK) **£185**

2015 **British Hydrological Society Travel Grant** to present at Symposium of European Freshwater Sciences in Geneva, Switzerland **£300**

2015 **Natural Environment Research Council:** fully funded place on workshop entitled 'Data analysis with R statistical software' **N/A**

2014 **Natural Environment Research Council:** fully funded place on Environment Young Entrepreneurs scheme workshop **N/A**

2011 **Nuffield Foundation Undergraduate Research Bursary** **£1,400**

Academic Awards

Loughborough University Graduate School Research Student Prize for outstanding academic performance and achievements **June 2016**

Winner of the **Academic Output Award** in the **Loughborough Students Union Post Graduate Researchers Awards** **June 2016**

Winner of the **PhD Teaching Award** in the **Loughborough Academic Awards** **May 2016**

Loughborough University Graduate School Prize for outstanding academic achievements during Masters **June 2013**

Peer Esteem Indicators

Co-convenor of "Thermal links to hydromorphology and freshwater ecology" at **International Society for River Science**, Vienna, Austria. **8-13th Sept 2019**

Co-convenor of "Effects of environmental stressors on the aquatic biosphere: crossing the boundaries of geomorphology, ecology, engineering, hydrology and biogeochemistry in a changing world" at **European Geosciences Union (EGU)**, Vienna, Austria. **8-13th April 2019**

Co-editor of special issue of **River Research and Applications** centred on the fine sediment conundrum to be published November 2017. **Mathers, K.L.,** Collins, A., England, J., Brierley, B and Rice, S.P (Eds.) (2017) The fine sediment conundrum. *River Research and Applications Special Issue.*

Co-organizer and co-convener of an **Early Career Research (ECR) Network** centered on fine sediment dynamics which held a meeting in July 2017. A resultant WIREs review paper has been accepted.

Organiser and co-convener of a joint National Meeting of the **British Hydrological Society, Environment Agency** and **Freshwater Biological Association** for 71 delegates entitled 'Hydroecology and the fine sediment conundrum: quantifying, mitigating and managing the issues. Loughborough University, UK. **6th July 2016**

Associate Fellow of the Higher Education Academy **June 2016**

Peer Reviewer for: Science of the Total Environment, Ecohydrology, Freshwater Biology, Freshwater Science, River Research and Applications, PLOS ONE, Hydrobiologia, Ethology, Ecology & Evolution, Aquatic Ecology, Knowledge and Management of Aquatic Ecosystems, Limnologica.

Societal Memberships: British Society for Geomorphology, British Hydrological Society, British Ecological Society, Freshwater Biological Association, International Association of Astacology, Society for Freshwater Science, European Geosciences Union.

Skills

- High level of computer literacy**,** proficient in Microsoft Office, 'R', SPSS, PRIMER, Canoco and ArcGIS.
- Proficient in aquatic macroinvertebrate taxonomic identification
- Extensive experience of fluvial geomorphology, sedimentological, hydrological and fluvial ecology field techniques; *in-situ* and *ex-situ* experimental setups and large data-analysis of secondary data.

Relevant conference presentations

19. Mathers, K.L., Patel, C.D., Ashe, A.E., Clinton, K.E., Constable, D. and Wood, P.J. (2019) Invasion dynamics of two Ponto-Caspian amphipods, *Dikerogammarus villosus and Dikerogammarus haemobaphes,* in a lowland reservoir. *British Ecological Society Annual Meeting*. Birmingham, UK. 16-19th December 2018. Poster.

18. Patel, C.D., **Mathers, K.L**., and Wood, P.J. (2019) The influence of drying, substrate and head size on the use of the hyporheic zone by native and non-native amphipods. *British Ecological Society Annual Meeting*. Birmingham, UK. 16-19th December 2018. Poster.

17. Mathers, K.L., Patel, C. and Wood, P.J (2017) Predator avoidance behaviour of freshwater snails to invasive crayfish; the role of physiochemical cues. *Ecology Across Borders: Joint Annual Meeting 2017.* Ghent, Belgium. 11-14th December 2017. Poster.

16. Beatty, C.J.C., **Mathers, K.L.** and Wood, P.J (2017) Substrate mediated predator-prey interactions between invasive crayfish and native and non-native amphipods. *Ecology Across Borders: Joint Annual Meeting 2017.* Ghent, Belgium. 11-14th December 2017. Poster.

15. Mathers, K.L., Rice, S.P. and Wood, P.J. (2016) The interactive influence of fine sediment loading and invasive crayfish presence on macroinvertebrate communities. *British Ecological Society Annual Meeting*. Liverpool, UK. 12-14th December 2016. Oral.

14. Clinton, K.E., **Mathers, K.L**. and Wood, P.J. (2016) Field distribution and substrate preferences of the 'Killer' and 'Demon' shrimps (Dikerogammarus villiosus and Dikerogammarus haemobaphes) in a lowland reservoir. *British Ecological Society Annual Meeting*. Liverpool, UK. 12-14th December 2016. Poster.

13. Rice, S.P, **Mathers, K.L.,** Wood, P.J., Johnson, M.F., Reeds, J., Extence, C. (2016) Crayfish ecogeomorphology: impacts of signal crayfish on river sediment dynamics and trophic interactions. *London Freshwater Group Meeting*, National History Museum London, UK. 4th November 2016. Oral

12. Mathers, K.L., Rice, S.P and Wood, P.J. (2016) Do predator-prey relationships on the river bed affect fine sediment ingress and what are the consequences for prey taxa?. *British Hydrological Society National Meeting: Hydroecology and the fine sediment conundrum*. Loughborough University, UK. 6th July 2016. Poster.

11. Rice, S.P., Johnson, M.F., **Mathers, K.L.,** Reeds, J. and Extence, C. (2016) Biotic contributions to suspended sediment flux: crayfish bioturbation increases baseflow sediment yield. *British Hydrological Society National Meeting: Hydroecology and the fine sediment conundrum*. Loughborough University, UK. 6th July 2016. Poster.

10. Mathers, K.L., Rice, S.P. and Wood, P.J. (2016) The interaction and implications of fine sediment deposition and invasive crayfish predation on the amphipod *Gammarus pulex*. *American Society for Freshwater Science Annual Meeting*, Sacramento, California, U.S.A. 21st – 26th May 2016. Oral.

9. Mathers, K.L., Chadd, R.P., Extence, C., Reeds, J., Johnson, M.F., Rice, S.P. and Wood, P.J. (2016) How do signal crayfish influence fine sediment dynamics and what are the implications for macroinvertebrate communities*? Institute of Fisheries Management Specialist Conference*, Penrith, UK. 10-12th May 2016. Invited oral.

8. Mathers, K.L., Rice, S.P. and Wood, P.J. (2016) Do predator-prey relationships on the river bed affect fine sediment ingress? *European Geosciences Union (EGU)*, Vienna, Austria. 17th – 22nd April 2016. Poster.

7. Mathers, K.L., Rice, S.P. and Wood, P.J. (2015) Avoidance behaviour of a freshwater shrimp to predation by the invasive signal crayfish. *Inspiring Research Conference*. Loughborough University, UK. 11th November 2015. Poster.

6. Mathers, K.L., Rice, S.P. and Wood, P.J. (2015) Predation avoidance behaviour of the amphipod *Gammarus pulex*, to the invasive signal crayfish, *Pacisfastcus lenisculus*. *National Crayfish Conference,* Giggleswick, UK. 17-19th August 2015. Poster.

5. Mathers, K.L., Rice, S.P., Chadd, R.P., Extence, C., Dunbar, M.J., Reeds, J. and Wood, P.J. (2015) The temporal and spatial extent of invasive signal crayfish (*Pacifastacus leniusculus*) effects on instream macroinvertebrate communities. *National Crayfish Conferenc*e, Giggleswick, UK. 17-19th August 2015. Oral.

4. Rice, S.P., **Mathers, K.L.,** Johnson, M.F., Wood, P.J., Reeds, J., Longstaff, H. and Extence, C. (2015) Crayfish ecogeomorphology: Impacts of an invading ecosystem engineer on river sediment dynamics and trophic interactions. *National Crayfish Conference*, Giggleswick, UK, 17-19th August 2015. Oral.

3. Mathers, K.L., Rice, S.P., Chadd, R., Extence, C., Reeds, J. and Wood, P.J. (2015) Long term effects of the invasive signal crayfish, *Pacifastacus leniusculus,* on native lotic macroinvertebrate communities. *9th Symposium of European Freshwater Sciences (SEFS)*, Geneva, Switzerland. 5 – 10th July, 2015. Oral.

2. Rice, S.P. **Mathers, K.L.** Johnson, M.F. Wood, P.J. Reeds, J. and Extence, C. (2015) Alien ecogeomorphology: Impacts of an invading ecosystem engineer on river sediment dynamics and trophic interactions. *American Society for Freshwater Science Annual Meeting*, Milwaukee WI, U.S.A. 17th - 21st May 2015. Oral.

1. Rice, S.P, **Mathers, K.L.** Reeds, J. Extence, C. (2015) Biotic drivers of fluvial sediment transport: Aggregate effects of sediment mobilisation by invasive crayfish on catchment-scale sediment yield. *European Geosciences Union (EGU),* Vienna, Austria. 12 - 17th April 2015. Oral.