Predicting the habitat expansion of the invasive roach (*Rutilus rutilus*), in Great Britain

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The Roach (Rutilus rutilus)



- Fourth most recorded fish species in the UK Database and Atlas of Freshwater Fish (DAFF)
- Eurythermal cyprinid (4 to >30 °C)
- Preference for warmer temperatures: growth occurs only >12 °C
- Omnivorous
- Known to have significant impacts on ecosystems





Roach in Great Britain (10 km² grid)







Predicting GB expansion

- Aim: To create and use an ecological niche modelling to examine how roach habitat in the GB may change over this century
- Method:



Creating the model – Step 1



Creating the model – Step 2







Compare to observed 1990-2006 DAFF

Range of temperature drivers tested: Annual, Seasonal, Monthly, Daily

Model	Grids	% Match	FPE	FNE
	tested			
EncRoach-S*	All	82%	7%	11%

*EncRoach-S = Environmental Change & Roach (Seasonal)





Sensitivity to increasing air temperature

Air temperature increase (°C)







Sensitivity to increasing air temperature

Area of			Increase in air temperature (°C)					
GB	No. of	0	1	2	3	4		
(total no.	grids							
grids)								
All GB	Presence	842	1005	1214	1509	1810		
(2470)	% cover	34.1	40.7	49.1	61.1	73.3		





Future testing: 11 scenarios







Future scenario testing



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Conclusions

- If temperature has been restricting Roach habitat range, we could see over this century a rapid increase in their distribution
- The greatest impact will be in Wales and Scotland







Read all about it:

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PRIMARY RESEARCH PAPER

Predicting the habitat expansion of the invasive roach *Rutilus rutilus* (Actinopterygii, Cyprinidae), in Great Britain

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Abstract The roach is influential ecologically and has a preference for water temperatures >12°C. In this study, we attempted to predict its habitat expansion in response to global warming, hypothesing its increase in Great Britain. Historical data for air temperature over different time scales (annual, seasonal, monthly and daily) and for the presence of roach in Great Britain were used to create four Ecological Niche Models. Mean seasonal air temperature (EncRoach-S) was the best predictor. Using EncRoach-S, two future climate scenarios were tested: a sensitivity test (i.e. incrementally increasing temperature values by 1°C), and using air temperature data from UKCIP 11-memEngland, the rate of expansion was initially slow but rapidly increased mid-century leading to 88% coverage by the century end. In Wales, there was a greater increase by the century end and a similar trend in Scotland. This study supports the conjecture that a rise in air temperature over the next few decades will lead to an increase in potential roach habitat.

Keywords Habitat model · Climate change · Temperature · EncRoach · Ecological niche model



