

Article

# The Role of Climate Changes in the Spread of Freshwater Fishes: Implications for Alien Cool and Warm-Water Species in a Mediterranean Basin

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## Supplementary Materials

**Table S1.** Models within two Akaike information criterion (AIC) units of the top model for estimating occupancy ( $\psi$ ), colonization ( $\gamma$ ), local extinction ( $\epsilon$ ), and detection ( $p$ ) probabilities for: *Barbus barbus*, *Gobio gobio*, *Padogobius bonelli* and *Pseudorasbora parva*.

a)

Model	AIC	Delta AIC	AIC Weight	Model Likelihood	No.Par.	$-2 \times \text{LogLike}$
$\psi, \gamma(), \epsilon(), p(\text{year})$	207.07	0	0.13	1	6	195.07
$\psi(\text{year}), \gamma(), \epsilon(), p()$	207.18	0.11	0.12	0.95	6	195.18
$\psi, \gamma(\text{year, fragmentation}), \epsilon(), p()$	207.23	0.16	0.12	0.92	7	193.23
$\psi(\text{year, fragmentation}), \gamma(), \epsilon(), p()$	207.49	0.42	0.10	0.81	7	193.49
$\psi, \gamma(), \epsilon(), p()$	207.73	0.66	0.09	0.72	7	193.73
$\psi, \gamma(\text{year, water temperature}), \epsilon(), p()$	207.97	0.9	0.08	0.64	7	193.97
$\psi, \gamma(), \epsilon(\text{year, water temperature}), p()$	208.32	1.25	0.07	0.54	7	194.32
$\psi(\text{year, flow rate}), \gamma(), \epsilon(), p()$	209.05	1.98	0.05	0.37	7	195.05

b)

Model	AIC	Delta AIC	AIC Weight	Model Likelihood	No.Par.	$-2 \times \text{LogLike}$
$\psi, \gamma(), \epsilon(), p(\text{year})$	160.08	0	0.17	1	6	148.08
$\psi(\text{year}), \gamma(), \epsilon(), p()$	160.29	0.21	0.15	0.90	6	148.29
$\psi(\text{year, current speed}), \gamma(), \epsilon(), p()$	160.76	0.68	0.12	0.71	7	146.76
$\psi(\text{year, elevation}), \gamma(), \epsilon(), p()$	161.12	1.04	0.10	0.60	7	147.12
$\psi(\text{year, fragmentation}), \gamma(), \epsilon(), p()$	161.55	1.47	0.08	0.48	7	147.55
$\psi, \gamma(), \epsilon(\text{year, current speed}), p()$	161.57	1.49	0.08	0.48	7	147.57
$\psi, \gamma(\text{year, fragmentation}), \epsilon(), p()$	161.74	1.66	0.07	0.44	7	147.74
$\psi, \gamma(\text{year, water temperature}), \epsilon(), p()$	162.07	1.99	0.06	0.37	7	148.07

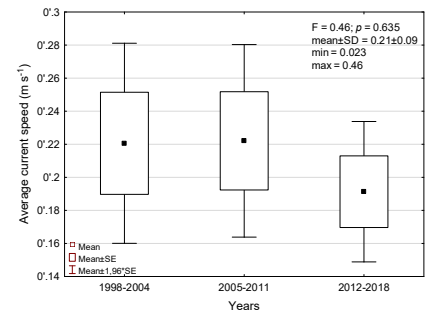
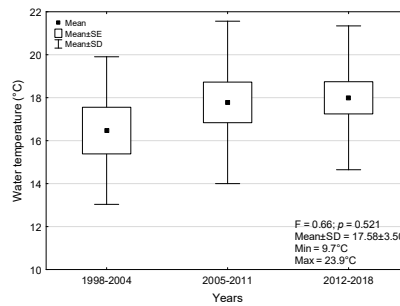
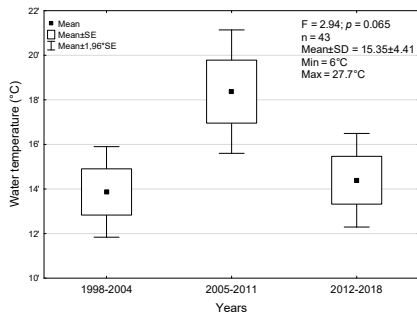
c)

Model	AIC	Delta AIC	AIC Weight	Model Likelihood	No.Par.	-2 × LogLike
$\psi ()$ , $\gamma$ (year, elevation), $\varepsilon ()$ , $p ()$	152.86	0	0.30	1	7	138.86
$\psi ()$ , $\gamma$ (year, current speed)*, $\varepsilon ()$ , $p ()$	153.31	0.45	0.24	0.80	7	139.31
$\psi ()$ , $\gamma ()$ , $\varepsilon$ (year), $p ()$	154.20	1.34	0.16	0.51	6	142.20
$\psi$ , (year, fragmentation), $\gamma ()$ , $\varepsilon ()$ , $p ()$	154.22	1.36	0.15	0.51	7	140.22
$\psi$ , $\gamma ()$ , $\varepsilon$ (year, flow rate), $\varepsilon ()$ , $p ()$	154.39	1.53	0.14	0.47	7	140.39

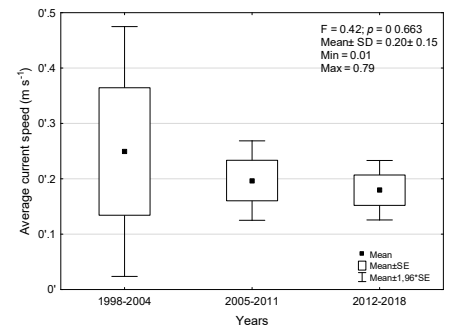
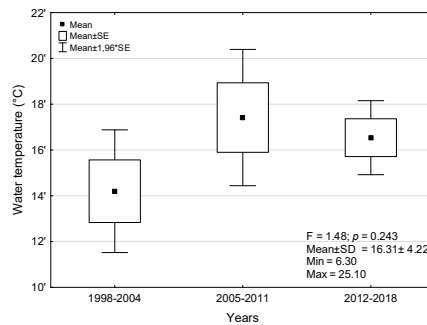
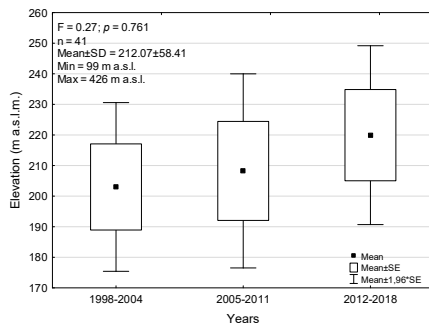
d)

Model	AIC	Delta AIC	AIC Weight	Model Likelihood	No.Par.	-2 × LogLike
$\psi$ , $\gamma ()$ , $\varepsilon ()$ , $p$ (year)	289.04	0	0.17	1	6	277.04
$\psi$ (year, elevation), $\gamma ()$ , $\varepsilon ()$ , $p ()$	289.57	0.53	0.13	0.77	7	275.57
$\psi$ (year, current speed), $\gamma ()$ , $\varepsilon ()$ , $p ()$	290.33	1.29	0.09	0.52	7	276.33
$\psi$ , $\gamma ()$ , $\varepsilon$ (year, elevation), $p ()$	290.53	1.49	0.08	0.47	7	276.53
$\psi$ (year, water temperature), $\gamma ()$ , $\varepsilon ()$ , $p ()$	290.57	1.53	0.08	0.47	7	276.57
$\psi$ , $\gamma$ (year, elevation), $\varepsilon ()$ , $p ()$	290.67	1.63	0.08	0.44	7	276.67

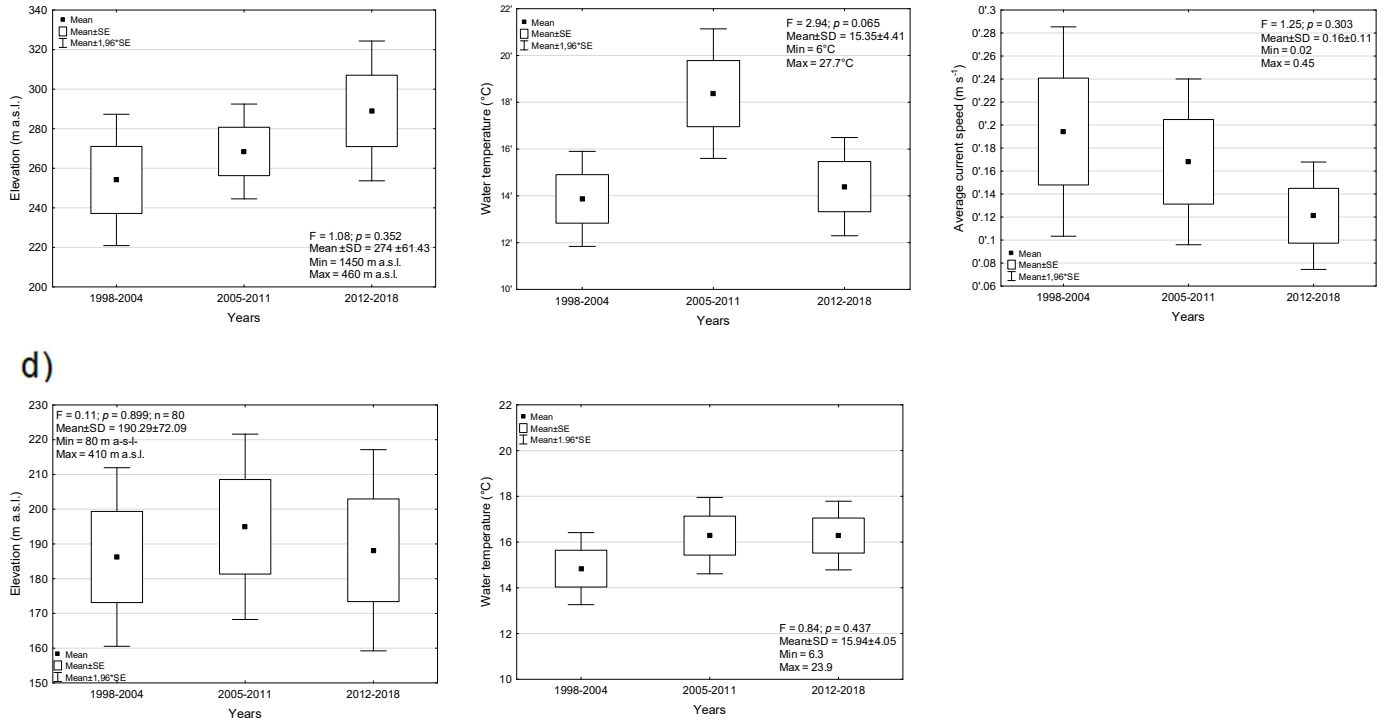
a)



b)



c)



**Figure S1.** ANOVA results. Trend over time of the mean values of: elevation, water temperature and average current speed for: (a) *Barbus barbuis*, (b) *Gobio gobio*, (c) *Padogobius bonelli*, (d) *Pseudoras bora parva*.