

Table S1. Result of the calibration of the Bělehrádek and Kontodimas equations representing the temperature (and food concentration) effect on the development of each growth stage, LT and EDT. Bělehrádek temperature-dependent equation was applied to N1N3, Adult, LT and EDT, whereas Kontodimas equation was applied to other stages. The table provides the constants and r^2 values.

Stage	a	b	λ	$T_{\min}$	$T_{\max}$	R^2
N1N3	0	-1.568	379			0.9401
N4N6	1.892×10^{-5}			2.57×10^{-8}	Eq. (3)	0.9032
C1	1.1199×10^{-4}			2.01	Eq. (3)	1
C2	1.027×10^{-4}			2.363	Eq. (3)	1
C3	1.492×10^{-4}			2.699	Eq. (3)	1
C4	6.218×10^{-5}			5.699×10^{-4}	Eq. (3)	0.9563
C5f	4.778×10^{-5}			1.865×10^{-8}	Eq. (3)	0.8099
C5m	4.701×10^{-5}			5.677×10^{-8}	Eq. (3)	0.8973
adult	0	-1.953	1.58×10^4			0.9653
LT	0	$-3.39 \times 10^{-0.07955}$	1.372×10^5			0.9977
EDT	-0.2172	-1.794	518.2			0.9969

Table S2. The coefficients of the Gaussian function incorporated into Equation (2).

Stage	a	b	c	R ²
N4N6	8.296×10 ¹⁶	6891	1158	0.9128
C1	33.2	24.78	29.36	0.9349
C2	33.67	22.98	21.74	0.633
C3	32.04	32.61	39.65	0.9747
C4	34.92	24.36	18.7	0.9912
C5f	40.04	44.71	53.84	0.9912
C5m	37.31	24.28	24.94	0.9785

Table S3. Equations and r^2 value for CS, NormCS, PL and NormAd.

Parameter	Equation	R ²
CS	$CS = 0.04641PL - 29.96$	0.659
NormCS	$NormCS = -0.001017Age^{1.36} + 1$	0.908
PL	$PL = 6850T^{-0.014} / \left\{ 1 + \exp\left(\frac{-F}{26.0565}\right) \right\} - 1792F^{0.2364}$	0.845
NormAd	$Norm Ad = -2.267 \times 10^{-4}Predators + 1$	0.777

Table S4. Phytoplankton species used in the experiments of Liu et al. (2014, 2015) and the coefficients (ln a and b) for converting the unit of food concentration from cells/mL to log pgC/mL. The biomass (in log pgC/mL) was computed using these coefficients values and the conversion formula.

Species	ln a	b	μm ³ / cell	Reference
<i>Chlamydomonas reinhardtii</i>	-1.026	1.088	650	Hsieh et al. 2010
<i>Cyptomonas tetrapyrenoidosa</i>	-8.477	0.996	1700	
cell / mL			log (pgC / mL)	
10 ³			→	17.9038
5×10 ³			→	21.2579
10 ⁴			→	22.7024
5×10 ⁴			→	26.0565

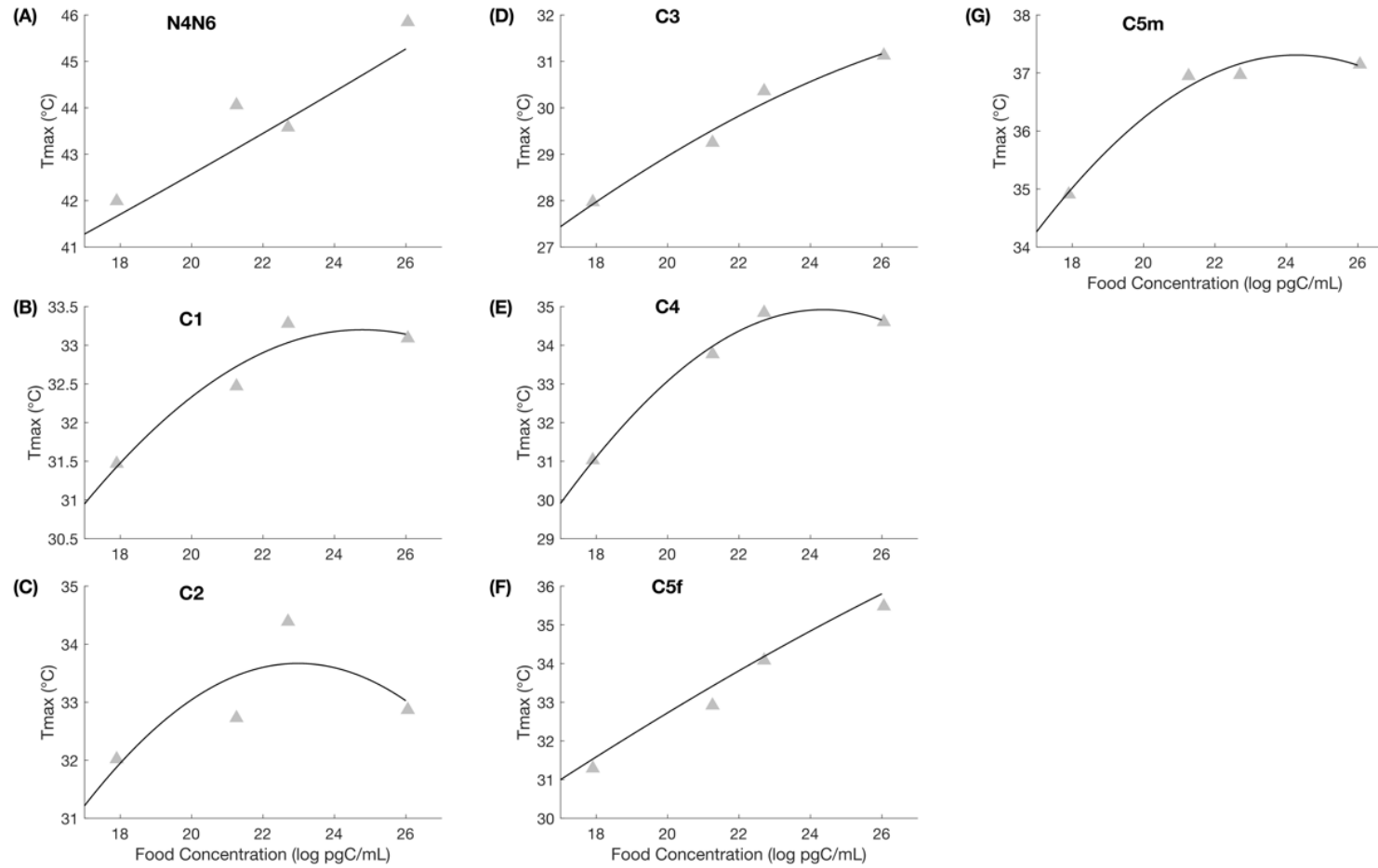


Figure S1. Calibration results depicting the effect of food concentration on the T_{max} value in Equation (2), which simulates the effect of temperature on the development of *E. japonicus*. The parameters of Equation (3) and the goodness of fit metrics are provided in Table S2.

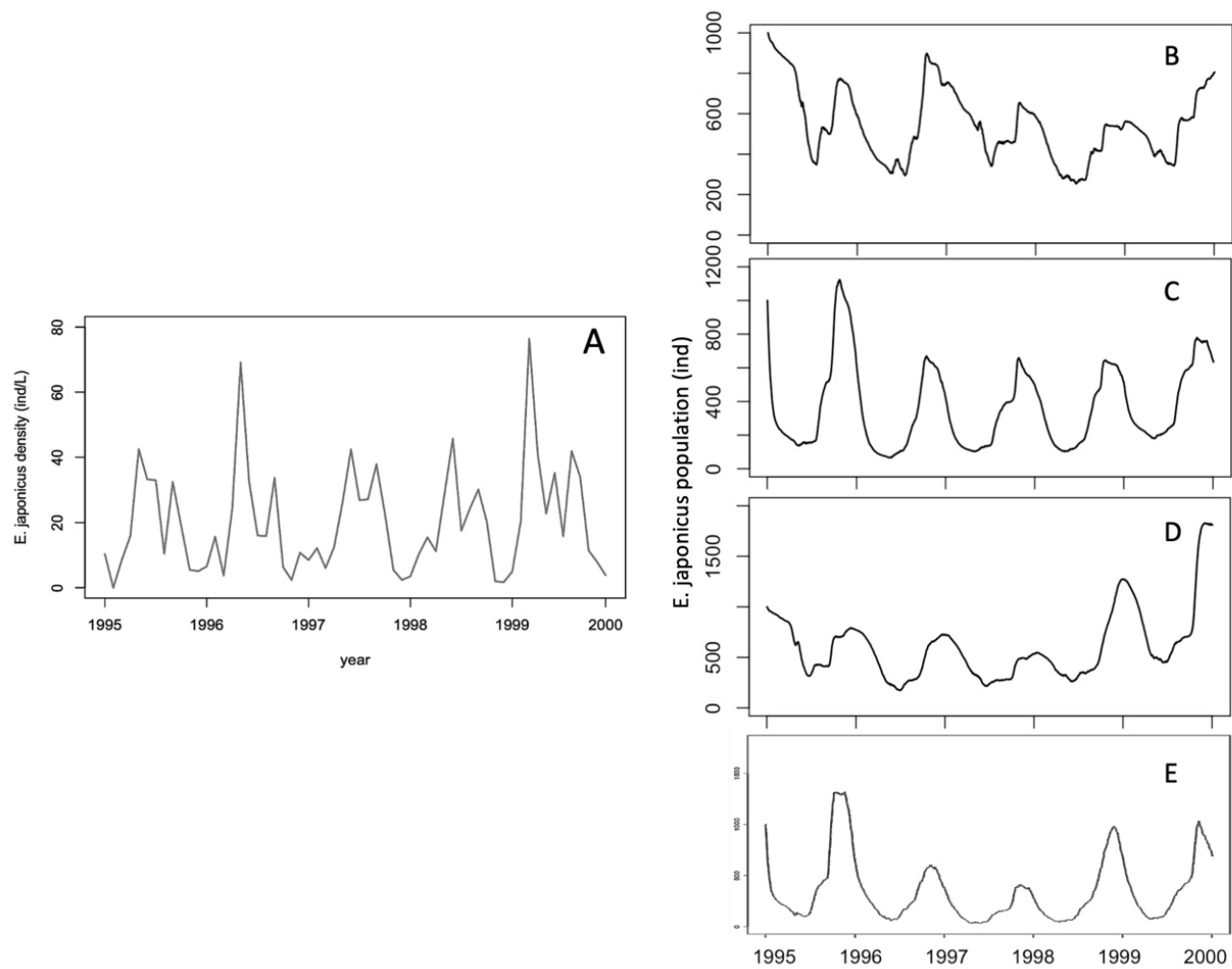


Figure S2 (A) is the field data of *E. japonicus*' density obtained from SPFES. (B) is the simulation result for the stable period when water temperature, food, and predators were input into the model. (C) is the simulation result when water temperature and food were input. (D) is the simulation result when water temperature and predators were input. (E) is the simulation result when only water temperature was input into the model. The graph (B), (C), (D), and (E) represent the mean values of 15 simulations.

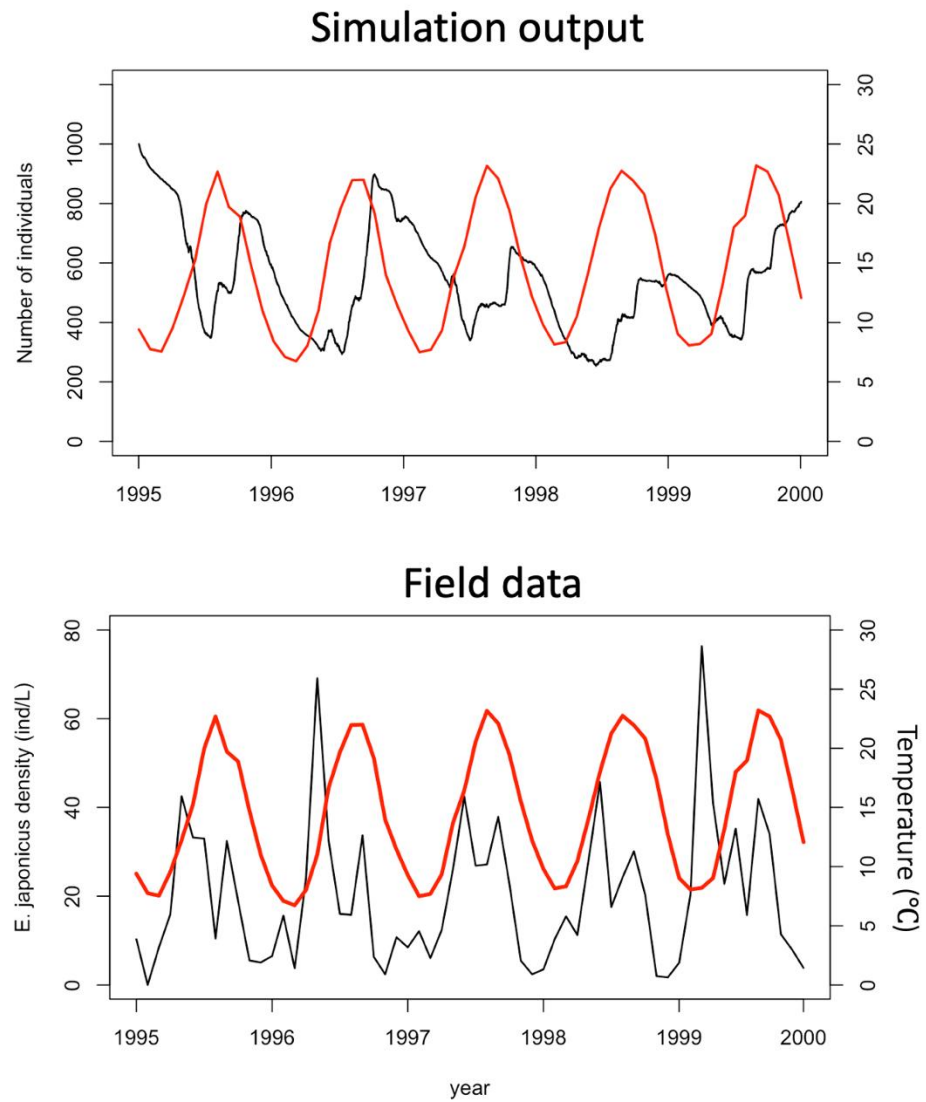


Figure S3 The upper graph is the simulated population of *E. japonicus* (ind, black line) and the water temperature of Lake Biwa (°C, red line). The lower graph is the population density of the species in Lake Biwa (ind/L, black line) obtained from SPFES and the water temperature (°C, red line).