Table S1. Mean water physicochemical parameters from six *P. canalicuata* populations in the Poyang Lake Basin collected October 2016 and January, May and August 2017. DO: dissolved oxygen concentration (mg/L), pH: concentration of hydrogen ions, TURB: turbidity (NTU), T: water temperature (°C), NH_4^+: ammonium concentration (mg/L), NO_3^-: nitrate concentration (mg/L), TDS: total dissolved solids (mg/L), Chl-a: chlorophyll-a concentration (units?), TP: total phosphorus (mg/L), TN: total nitrogen (mg/L). The value of all parameters were mean ± standard error.

	Gongshui River	Tao River	Shangyou River	Shushui River	Gan River	Xinjiang River
T(°C)	22.8±6.7	22.6±6.5	23.5±7.1	18.8±5.5	23.5±7.3	21.9±6.7
TDS(mg/L)	72.5±1.5	128.5±9.7	47.0±1.2	33.7±1.4	69.3±1.5	69.9±12.3
DO(mg/L)	8.9±1.4	8.7±1.2	8.4±1.1	9.7±1.2	9.3±1.3	9.3±1.5
TURB(NTU)	16.0±0.3	9.9±0.2	36.0±0.2	5.8±0.3	12.3±0.1	11.3±0.2
pH	6.4±0.1	6.3±0.2	6.3±0.2	6.3±0.2	6.3±0.3	6.9±0.1
Chl-a(mg/L)	25.4±0.2	6.3±0.3	34.9±0.2	16.2±0.2	20.3±0.5	15.7±0.2
TN(mg/L)	1.80±0.14	2.82±0.17	0.67±0.15	1.11±0.13	1.66±0.12	1.10±0.07
NO_3^-(mg/L)	1.05±0.09	2.54±0.07	0.41±0.08	0.64±0.05	1.34±0.10	0.98±0.07
NH_4^+(mg/L)	0.16±0.02	0.09±0.01	0.04±0.01	0.05±0.01	0.06±0.01	0.10±0.01
TP(mg/L)	0.22±0.01	0.12±0.02	0.14±0.02	0.18±0.02	0.19±0.02	0.10±0.01

Table S2. Analysis of genetic differentiation coefficient (*F*st) calculated using COI, 16S and COI+16S datasets among six populations of *P. canaliculata*. Bold type indicates statistical significance ($p < 0.001$). GS: Gongshui River; TR:Tao River; SY: Shangyou River; SS: Shushui River; GR: Gan River; XR: Xinjiang River.

COI						
	GS	TR	SY	SS	GR	XR
GS						
TR	**0.7875**					
SY	**0.0119**	**0.0962**				
SS	**0.4725**	**1.0000**	**0.0132**			
GR	**0.1644**	**0.5768**	**0.3133**	**0.1148**		
XR	**0.0001**	**0.0129**	**0.0546**	**0.0001**	**0.0440**	
16S rRNA						
GS						
TR	**1.0000**					
SY	**1.0000**	**-1.0000**				
SS	**0.6221**	**1.0000**	**1.0000**			
GR	**1.0000**	**-1.0000**	**-1.0000**	**1.0000**		
XR	**0**	**0.0201**	**0.0177**	**0**	**0.0012**	
COI+16S rRNA						
GS						
TR	**0.6296**					
SY	**0.0838**	**0.4554**				
SS	**0.6483**	**0.7782**	**0.1893**			
GR	**0.7541**	**1.0000**	**0.2313**	**0.8586**		
XR	**0**	**0.0785**	**0**	**0**	**0.0022**	

Table S3. Summary statistics for the first 4 axes of RDA performed between physicochemical parameters and genetic parameters.

Correlation	First axis	Second axis	Third axis	Fourth axis
Eigenvalues	0.842	0.138	0.020	0.000
Cumulative percentage variance of species–environment relation	84.2	98.0	100.0	100.0