

1 **Supplementary Table 1** Taxa that displayed significant correlations with specific
2 temporal dynamics of diatom assemblages from January 2011 to December 2016 at
3 each sampling site.

Taxon	JC01	JC02	XX01	XX02
<i>Achnanthes rossii</i> Hustedt		RDA2		
<i>Achnanthes subexigua</i> Hustedt				RDA2
<i>Achnanthidium deflexum</i> (Reimer)Kingston	RDA1	RDA1	RDA1	RDA1
<i>Achnanthidium lineare</i> Smith		RDA2		RDA1
<i>Achnanthidium minutissimum</i> (Kützing) Czarnecki	RDA1	RDA1	RDA1	RDA1
<i>Achnanthes ingratiformis</i> Lange Bertalot	RDA1		RDA3	
<i>Adlafia minuscula</i> (Grunow) Lange-Bertalot				RDA2
<i>Amphora coffeaeformis</i> var. <i>transcaspica</i> Petersen			RDA3	
<i>Amphora pediculus</i> (Kützing) Grunow		RDA2	RDA1	RDA2
<i>Aulacoseira ambigua</i> (Grunow) Simonsen				RDA2
<i>Aulacoseira granulate</i> (Ehrenberg) Simonsen			RDA1	
<i>Aulacoseira granulata</i> f. <i>curvata</i> (Hustedt) Simonsen		RDA2		
<i>Brevisira arentii</i> (Kolbe) Krammer	RDA1			RDA3
<i>Caloneis bacillum</i> (Grunow) Cleve				RDA2
<i>Cocconeis pediculus</i> Ehrenberg	RDA1	RDA1	RDA1	RDA3
<i>Cocconeis placentula</i> Ehrenberg	RDA1	RDA2	RDA2	RDA1
<i>Cyclotella kuetzingiana</i> var. <i>planetophora</i> Fricke	RDA3			
<i>Cymbella affinis</i> Kützing		RDA2		
<i>Cymbella cymbiformis</i> C.Agardh		RDA2		
<i>Cymbella cymbiformis</i> var. <i>nonpunctata</i> Fontell		RDA3		
<i>Cyclotella meneghiniana</i> Kützing	RDA2			RDA1
<i>Cymbella hantzschiana</i> Krammer				RDA3
<i>Cymbella laevis</i> Guide	RDA3	RDA2		RDA2
<i>Cymbella</i> sp.		RDA2		
<i>Cymbella vulgate</i> Guide	RDA1			
<i>Cymbella excise</i> Kützing	RDA3		RDA1	
<i>Cymbellopsis apiculate</i> Krammer			RDA1	
<i>Delicata delicatula</i> (Kützing) Krammer		RDA2		
<i>Delicata judaica</i> (Lange-Bertalot & Krammer) Krammer & Lange-Bertalot		RDA2	RDA1	
<i>Diadesmis contenta</i> var. <i>biceps</i> (Grunow) P.B.Hamilton				RDA2
<i>Diatoma vulgaris</i> Bory				RDA3
<i>Diploneis boldtiana</i> Cleve				RDA2
<i>Discostella stelligera</i> (Cleve & Grunow) Houk & Klee				RDA1
<i>Discostella pseudostelligera</i> (Hustedt) Houk & Klee			RDA1	
<i>Ellerbeckia arenaria</i> (D.Moore ex Ralfs) R.M.Crawford				RDA2
<i>Encyonema brehmii</i> (Hustedt) D.G.Mann		RDA2		RDA1

<i>Encyonema cespitosum</i> Kützing			RDA2	
<i>Encyonema elginense</i> (Krammer) D.G.Mann				RDA3
<i>Encyonema perpusillum</i> (Cleve-Euler) D.G.Mann				RDA4
<i>Encyonema silesiacum</i> (Bleisch) Mann	RDA1		RDA1	RDA2
<i>Encyonopsis behrei</i> (Foged) Krammer & Metzeltin in Krammer	RDA3			RDA2
<i>Eunotia praenana</i> Cleve-Euler		RDA2		
<i>Eunotia tridentula</i> var. <i>perpusilla</i> Ant.Mayer		RDA2		
<i>Fragilaria capucina</i> Desmazières	RDA1		RDA1	RDA4
<i>Fragilaria socia</i> (J.H.Wallace) Lange-Bertalot				RDA4
<i>Fragilaria vaucheriae</i> (Kützing) J.B.Petersen			RDA2	
<i>Fragilariforma virescens</i> (Ralfs) D.M.Williams & Round	RDA1			
<i>Gomphonema apicatum</i> Ehrenberg		RDA3		
<i>Gomphonema berggrenii</i> Cleve			RDA1	
<i>Gomphoneis clevei</i> (Fricke) Gil	RDA2			RDA2
<i>Gomphonema carolinense</i> Hagelstein	RDA1			
<i>Gomphonema curtum</i> Hustedt				RDA2
<i>Gomphonema intricatum</i> var. <i>pumilum</i> Grunow	RDA1	RDA1		RDA2
<i>Gomphonema minutum</i> (C.Agardh) C.Agardh	RDA2	RDA3		
<i>Gomphonema parvulum</i> (Kützing) Kützing			RDA3	RDA1
<i>Gomphonema parvulum</i> var. <i>subellipticum</i> Cleve	RDA1	RDA3	RDA3	RDA2
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst			RDA3	
<i>Gomphonema angustatum</i> var. <i>citera</i> (M.H.Hohn & J.Hellerman) R.M.Patrick			RDA3	
<i>Gomphonema intricatum</i> Kützing	RDA2	RDA2		RDA2
<i>Gomphonema simum</i> M.H.Hohn & J.Hellerman	RDA3			
<i>Gomphonema sphaerophorum</i> Ehrenberg			RDA3	
<i>Gomphonema subclavatum</i> (Grunow) Grunow			RDA1	
<i>Gyrosigma attenuatum</i> (Kützing) Rabenhorst				RDA4
<i>Hannaea linearis</i> (Holmboe) Álvarez-Blanco & S.Blanco	RDA2			RDA2
<i>Hantzschia amphioxys</i> (Ehrenberg) Grunow	RDA3			
<i>Humidophila contenta</i> (Grunow) Lowe, Kociolek, Johansen, Van de Vijver, Lange-Bert. & Kopalová			RDA3	RDA1
<i>Halamphora exigua</i> (W.Gregory) Levkov				RDA1
<i>Melosira varians</i> Agardh	RDA3		RDA1	RDA4
<i>Navicula antonii</i> Lange-Bertalot	RDA3			
<i>Navicula cryptotenella</i> Lange-Bertalot	RDA1		RDA1	RDA2
<i>Navicula microcari</i> Lange-Bertalot				RDA2
<i>Navicula radiosa</i> Kützing			RDA3	RDA2
<i>Navicula veneta</i> Kützing			RDA3	
<i>Nitzschia brevissima</i> Grunow		RDA2	RDA2	
<i>Nitzschia palea</i> (Kützing) W.Smith		RDA2		
<i>Nitzschia desertorum</i> Hustedt				RDA4
<i>Nupela impexiformis</i> (Lange-Bertalot) Lange-Bertalot		RDA3		

<i>Pantocsekiella kuetzingiana</i> (Thwaites) K.T.Kiss & E.Ács			RDA2
<i>Planothidium frequentissimum</i> (Lange-Bertalot)			
Lange-Bertalot		RDA1	RDA3
<i>Psammothidium helveticum</i> (Hustedt) Bukhtiyarova & Round			RDA2
<i>Psammothidium marginulatum</i> (Grunow) Bukhtiyarova & Round	RDA3		
<i>Psammothidium pseudoswazii</i> (J.R.Carter) L.Bukhtiyarova & Round		RDA3	
<i>Psammothidium ventral</i> (Krasske) Bukhtiyarova & Round		RDA1	RDA4
<i>Reimeria sinuate</i> (Gregory) Kociolek & Stoermer	RDA1	RDA3	RDA3
<i>Rhoicosphenia abbreviate</i> (C.Agardh) Lange-Bertalot		RDA3	
<i>Sellaphora medioconvexa</i> (Hustedt) C.E.Wetzel	RDA3		
<i>Surirella angusta</i> Kützing			RDA3
<i>Surirella arctica</i> (R.M.Patrick & Freese) Veselá & Potatova	RDA1	RDA1	
<i>Surirella minuta</i> Brébisson ex Kützing	RDA1	RDA1	
<i>Surirella subsalsa</i> W.Smith			RDA4
<i>Tetracyclus rupestris</i> (Kützing) Grunow	RDA1	RDA1	
<i>Tetracyclus rostratus</i> Hustedt			RDA2
<i>Ulnaria contracta</i> (Østrup) E.A.Morales & M.L.Vis		RDA2	
<i>Ulnaria ulna</i> var. <i>spathulifera</i> (Grunow) Aboal	RDA1	RDA1	RDA2
<i>Ulnaria ulna</i> (Kützing) Compère		RDA3	RDA3

4

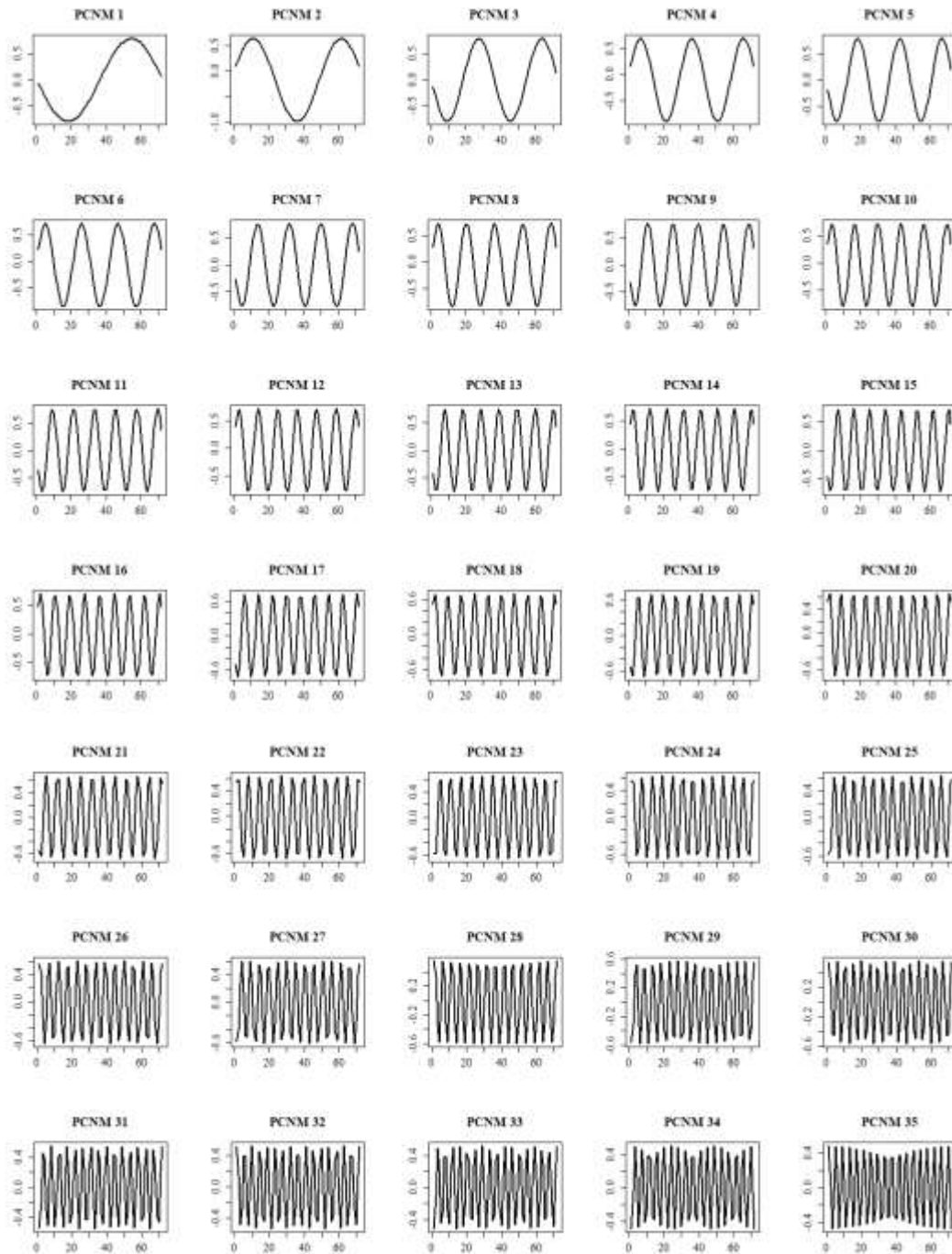
5

6 **Supplementary Table 2** Percentage of taxa that displayed significant correlations
7 with specific temporal dynamics of diatom assemblages from January 2011 to
8 December 2016 at each site.

Site	RDA axis (%)				Total
	1	2	3	4	
JC01	16.1	4.2	8.5		28.8
JC02	4.3	14.7	6.9		25.9
XX01	16.7	4.2	9.2		30.0
XX02	6.1	14.7	5.6	4.9	31.3

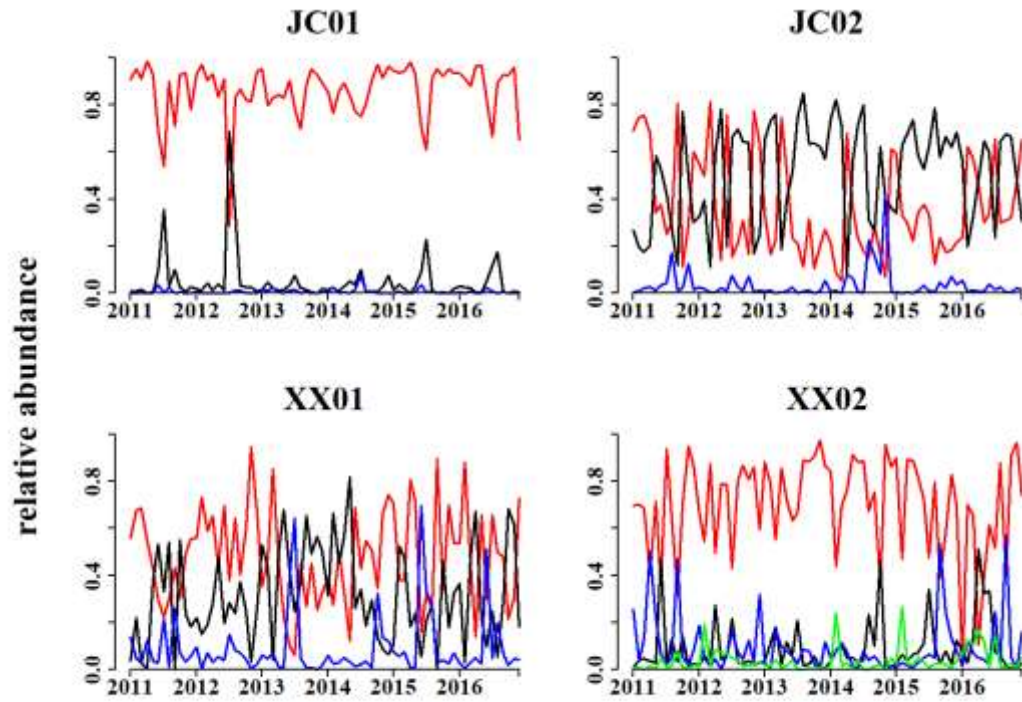
9

10



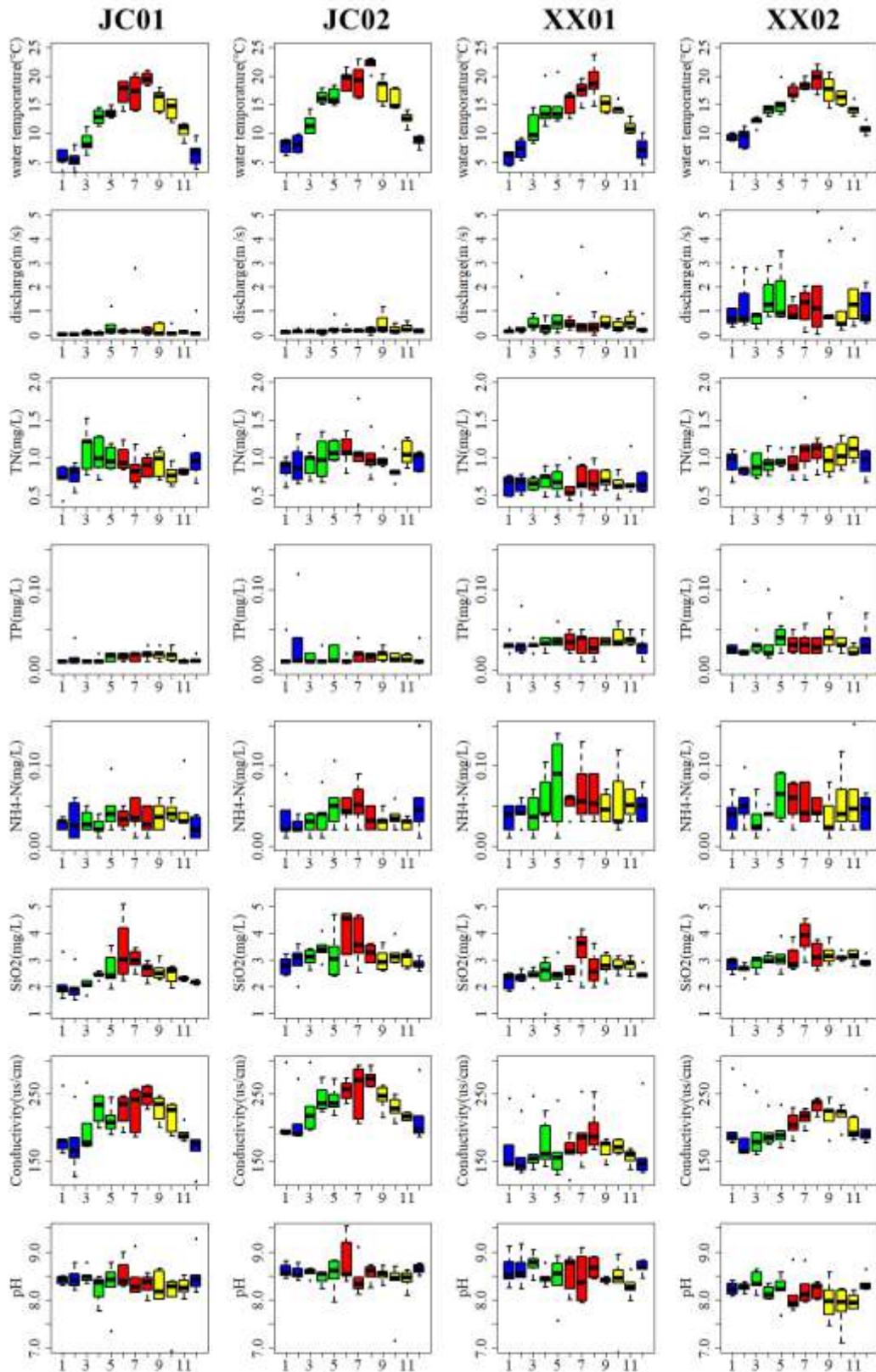
11

12 **Supplementary Fig 1.** Temporal fluctuations of significant principal coordinates of
 13 neighborhood matrices (PCNM) variables conversion for the 72-month linear time
 14 variables.



15

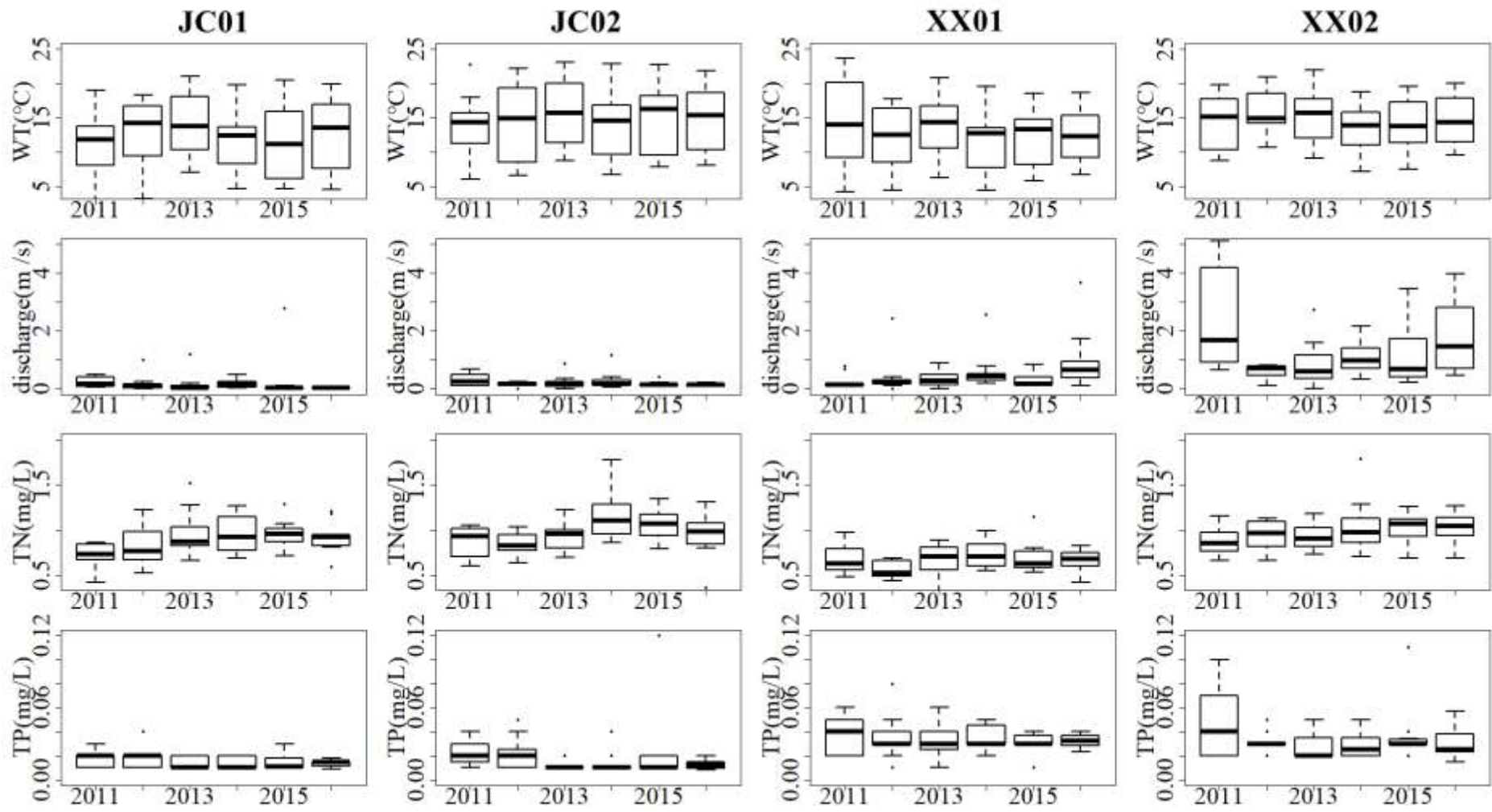
16 **Supplementary Fig 2.** Temporal fluctuations of relative abundance of RDA-taxa
17 groups from January 2011 to December 2016 at each sampling site (Red-1; Black-2;
18 Blue-3; Green-4).



19

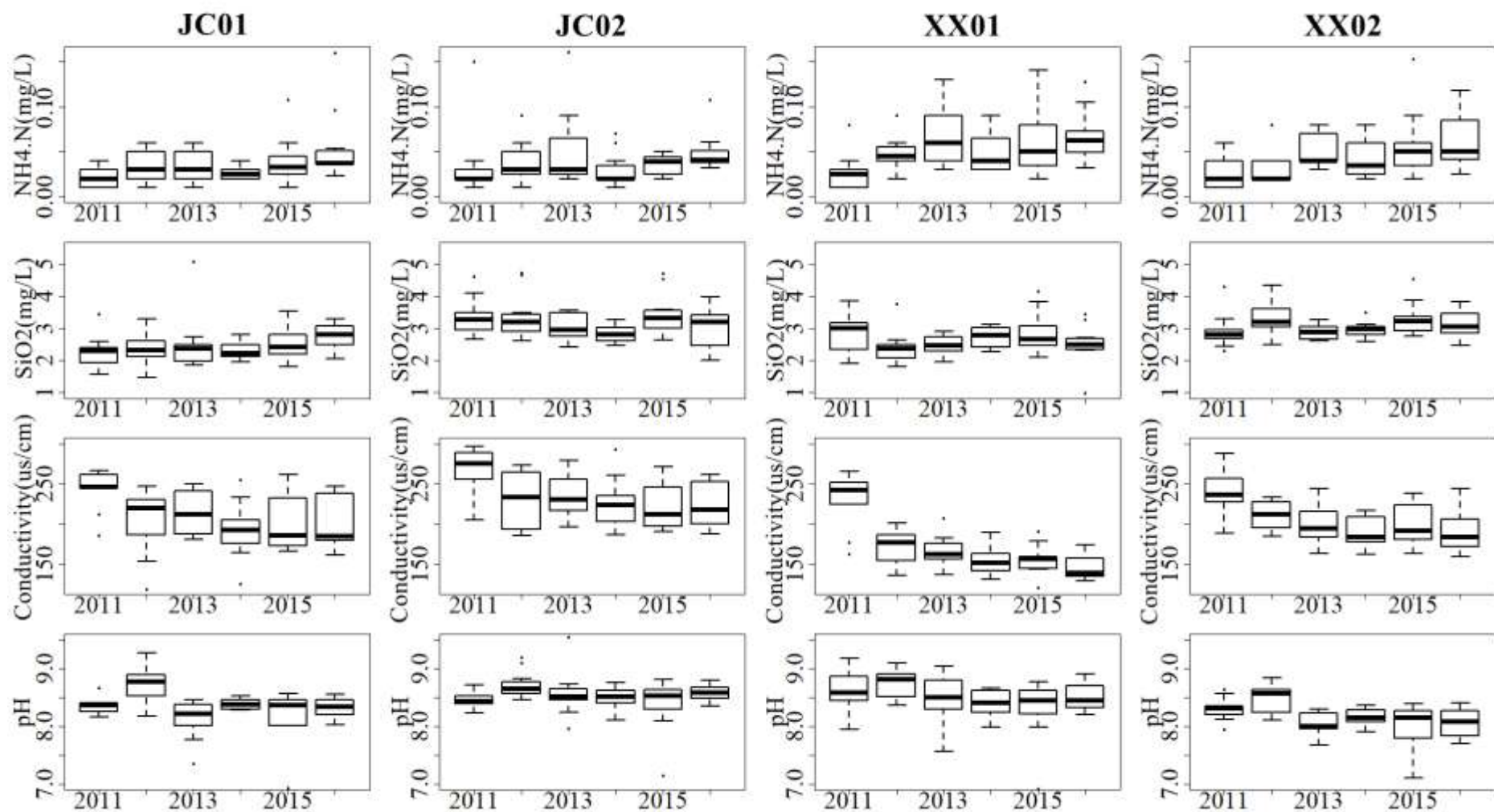
20 **Supplementary Fig 3.** Intra-annual dynamics of environmental variable in each

21 sampling site.



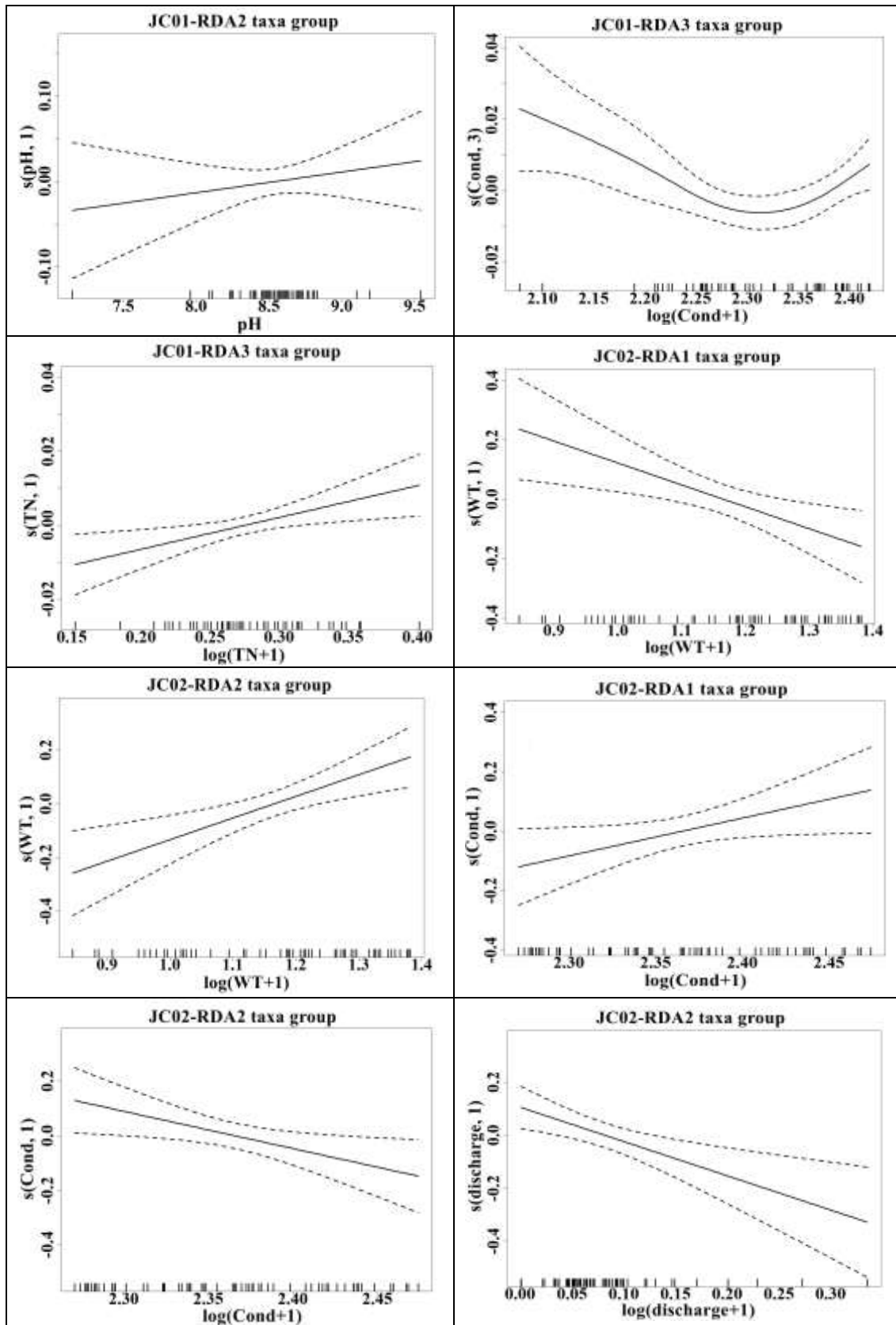
22

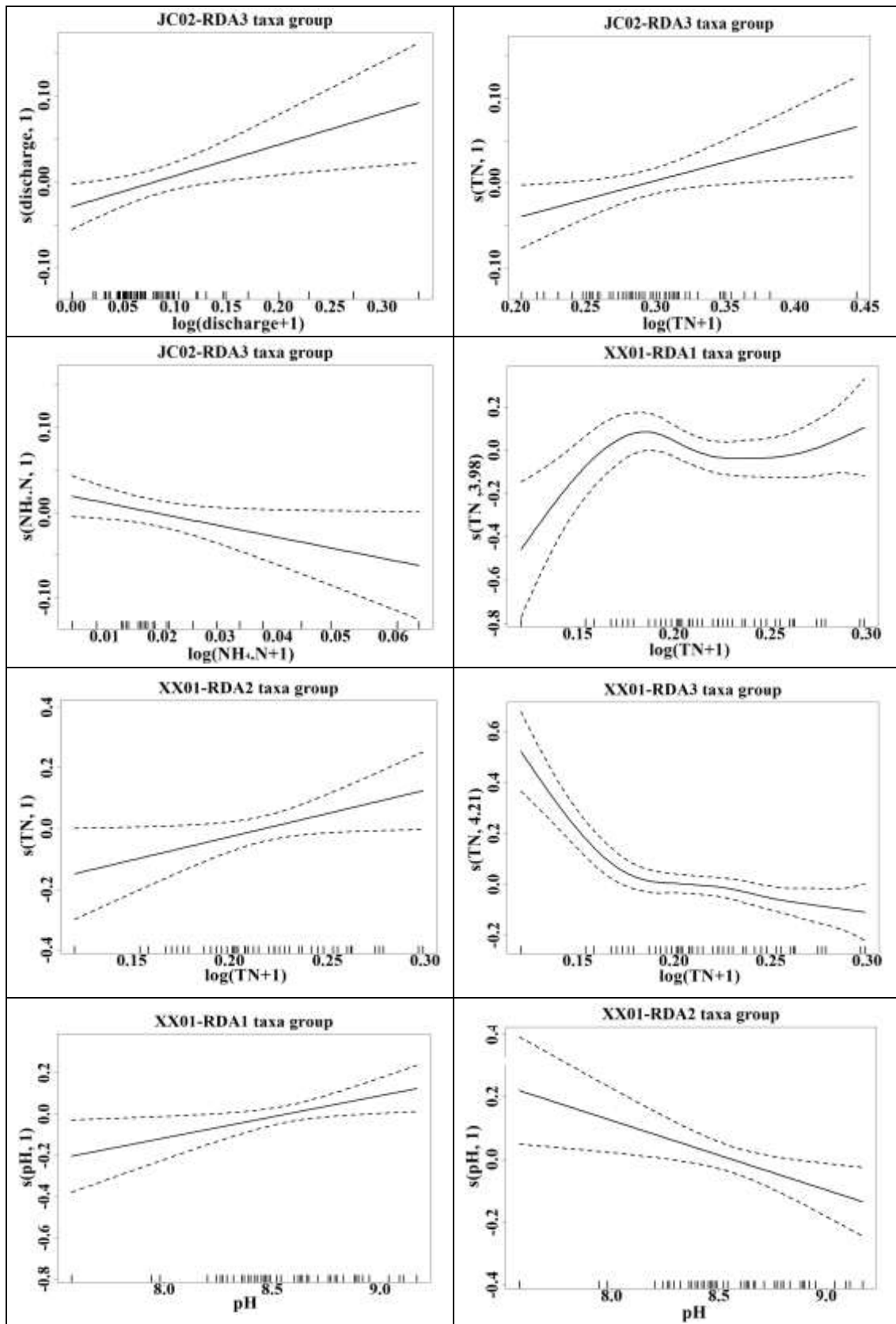
23 **Supplementary Fig 4.** Inter-annual dynamics of environmental variable in each sampling site.

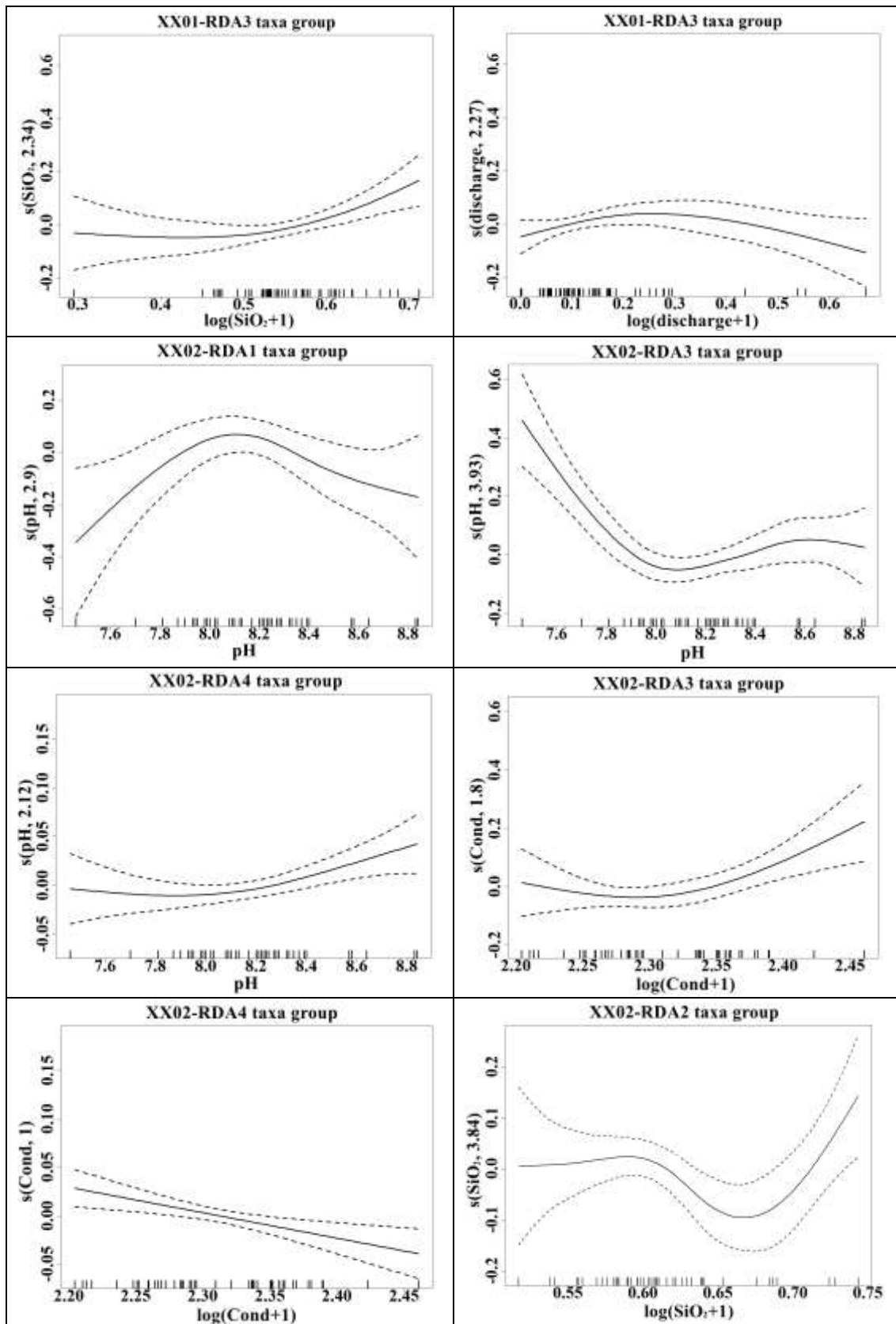


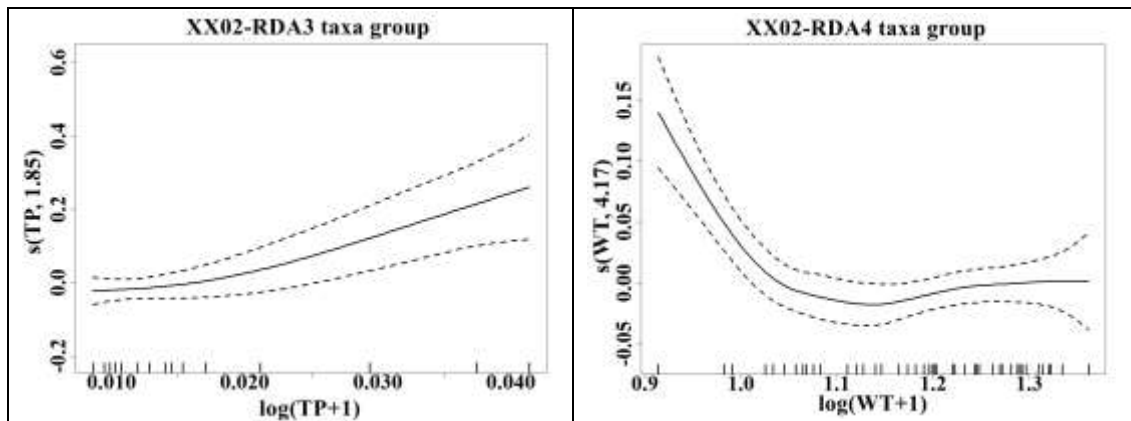
24

25 **Supplementary Fig 5.** Inter-annual dynamics of environmental variable in each sampling site









26

27 **Supplementary Fig 6.** Results of fitted smooth functions for the significant
 28 environment factors from the general additive mixed models for the relative abundance
 29 of each RDA-group at each sampling site. The area within the dotted lines indicate the
 30 approximate 95% confidence intervals for the fitted functions (LOESS). The tick marks
 31 inside the panels on the x-axis show the distribution of the observed values for the two
 32 covariates. The numbers in brackets on the y-axis are the effective degrees for each
 33 smoother.