

SUPPLEMENTARY MATERIAL

Rojo et al. The river influence controls water quality and spatio-temporal microalgal distribution in Pacific estuaries (Padre Ramos and Salinas Grandes) of Nicaragua

Table S1. Name of sampled sites and their coordinates in Estero Padre Ramos and Estero Salinas Grandes (Nicaragua). When in the site there are a cage of culture of *Lutjanus* spp. their installation data is indicated.

PADRE RAMOS				
Code	Site	Latitude	Length	Cages of <i>Lutjanus</i>
P1	El Tintal	12°46'31.04"	87°27'34.42"	End of 2017
P2	El Sistema	12°45'32.98"	87°27'33.24"	End of 2018
P3	Abraham Moreno	12°47'7.84"	87°29'0.84"	Start of 2019
P4	Quilaca	12°49'16.83"	87°30'23.53"	
P5	La Bayona	12°49'58.35"	87°30'16.73"	End of 2013
P6	Poza de la vaca	12°49'58.35"	87°32'38.57"	End of 2017
SALINAS GRANDE				
P1	Garita	12°16'22.0"	86°52'47.3"	End of 2018
P2	Gasolina	12°16'47.0"	86°52'52.5"	
P3	Manzano	12°16'56.5"	86°53'15.1"	
P4	Guácimo	12°17'29.92"	86°53'31.75"	
P5	La Flor	12°17'36.43"	86°53'54.67"	
P6	Calzoncillo	12°17'51.43"	86°53'55.19"	
P7	Nacascolo	12°17'49.9"	86°54'18.8"	
P8	Las Navajas	12°18'06.3"	86°54'33.1"	
P9	Corcovado	12°17'52.2"	86°54'56.2"	

Table S2.

Results of repeated measures ANOVA (F and post-hoc Tukey's pairwise test) or H, the Kruskal-Wallis (post-hoc Mann-Whitney's test) comparing values of physicochemical variables between sampling data and between sampling sites. The lower-case letters indicate significant differences in pair-wise comparisons. Significant values when $p < 0.001$.

<i>E. Padre Ramos</i>	Temperature	pH	Dissolved Oxygen (mg/l)	Salinity (ppm)	Nitrate (mg/l)	Ammonium (mg/l)	Ortophosphate (mg/l)
Data	F=28.7	H=24.1	H=27.3	H=29.9	H=29.8	n.s.	H=20.1
abr-18	a	a	a	ab	ab		b
sep-18	a	a	ab	a	a		a
oct-18	b	a	ab	a	a		a
nov-18	b	b	b	ab	a		b
ene-19	b	b	b	b	b		b
feb-19	b	ab	b	b	b		ab
Sites	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
<i>E. Salinas Grandes</i>							
Data	H= 47.5	H= 18.4	n.s	H=33.4	H=44.6	n.s	n.s
sep-18	a	a		a	a		
oct-18	ab	b		ac	a		
nov-18	ab	c		b	ab		
dic-18	bc	cb		bc	b		
ene-19	c	cb		bc	b		
feb-19	c	cb		c	b		
Sites	n.s	F=7.7	H=47.2	n.s	n.s	H=26.5	H=35.0
Garita		ab	ab			a	a
Gasolina		a	a			a	a
Manzano		a	a			a	a
Guazimo		ad	a			a	a
La Flor		ab	ab			a	ab
Calzoncillo		ab	ab			a	ab
Nacascolo		bcd	bc			b	b
Las Navajas		cd	c			ab	b
Corcovado		c	c			ab	b

Table S3. Mean and standard deviation of density (ind/ml) of main MIC groups in both studied estuaries (Estero de Padre Ramos and Estero de Salinas Grandes). Cyanobacteria and Dinophytes were undetectable in Estero Salinas Grandes.

E. Padre Ramos	Apr-18	Sep-18	Oct-18	Nov-18	Jan-19	Feb-19
CHLOROPHYTES	396±491	92±76	109±46	199±85	64±21	109±41
DIATOMS	114±103	105±68	372±173	328±172	129±34	193±43
CYANOBACTERIA	99±198	4±10	0	0	0	9.5±23
E. Salinas Grandes	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19
CHLOROPHYTES	606±345	580±271	486±167	372±232	394±242	300±181
DIATOMS	161±126	171±79	319±272	50±40	150±67	286±194

Table S4. Genera and some species of microalgae and cyanobacteria observed in samples of Estuario de Padre Ramos. It is reported their reached maxima density and percentage, their occurrence as percentage of samples where they were found, their more probable functional group and habitat and their potential toxicity.

	Max. density	Max. percentage	Occurrence (%)	Funct. group	Main habitat	Toxicity
CHLOROPHYTES						
<i>Coelastrum reticulatum</i>	59.2	25	24	Plankton	Freshwater	no
<i>Coenocystis</i>	421.3	26	24	Plankton	Freshwater	no
<i>Cosmarium</i>	27.0	49	3	Plankton	Freshwater	no
<i>Crucigeniella</i>	202.0	25	28	Plankton	Freshwater	no
<i>Dictyosphaerium</i>	139.0	36	62	Plankton	Freshwater	no
<i>Gonatozygon</i>	96.2	20	7	Benthos	Freshwater	no
<i>Monoraphidium</i>	200.0	38	34	Plankton	Freshwater	no
DIATOMS						
<i>Asterionella kariana</i>	31.6	20	17	Plankton	Marine	no
<i>Aulacoseira</i>	29.9	4	21	Plankton	Freshwater	no
<i>Biddulphia</i>	89.6	74	7	Plankton	Marine	no
<i>Coscinodiscus</i>	63.1	11	45	Plankton	Marine	no
<i>Coscinosira polychordan</i>	179.2	54	10	Plankton	Marine	no
<i>Cyclotella</i>	0.8	0	24	Plankton	Freshwater	no
<i>Chaetoceros affinis</i>	69.5	15	14	Plankton	Marine	no
<i>Chaetoceros convolutus</i>	34.8	9	45	Plankton	Marine	no
<i>Diademsis</i>	31.6	5	3	Benthos	Marine & Freshwater	no
<i>Diploneis</i>	0.3	0	7	Benthos	Marine & Freshwater	no
<i>Ditylum</i>	0.2	0	3	Plankton	Marine	no
<i>Fragilaria</i>	34.8	9	21	Benthos	Freshwater	no
<i>Gomphonema parvulum</i>	94.7	59	10	Benthos	Freshwater	no
<i>Guinardia</i>	50.0	9	7	Plankton	Brackish	no
<i>Melosira granulata</i>	106.4	30	86	Plankton	Freshwater	no
<i>Navicula</i>	179.2	27	66	Benthos	Freshwater	no
<i>Nitzschia</i>	270.8	36	97	Benthos	Marine & Freshwater	no
<i>Nitzschia sigma</i>	44.3	17	10	Benthos	Brackish	no
<i>Nitzschia sinuata</i>	325.0	49	86	Benthos	Brackish	no
<i>Pinnularia nobilis</i>	17.4	10	14	Benthos	Freshwater	no
<i>Pleurosigma</i>	94.7	16	34	Benthos	Brackish	no
<i>Rhizosolenia castracanci</i>	29.9	10	69	Plankton	Marine	no
<i>Skeletonema costatum</i>	76.9	21	45	Plankton	Marine	no
<i>Surirella</i>	451.4	27	41	Benthos	Brackish	no
<i>Thalassionema</i>	0.2	0	3	Plankton	Marine	no
<i>Thalassiothrix</i>	0.2	0	3	Plankton	Marine	no
CYANOBACTERIA						
<i>Anabaena</i>	56.7	18	7	Benthos & Plankton	Marine & Freshwater	yes
<i>Oscillatoria</i>	34.8	8	3	Benthos & Plankton	Marine & Freshwater	no
DINOPHYTES						
<i>Alexandrium</i>	0.2	0	7	Plankton	Marine	yes
<i>Ceratium</i>	0.8	0	34	Plankton	Marine & Freshwater	yes
<i>Cochlodinium</i>	0.7	0	21	Plankton	Marine	yes
<i>Gymnodinium</i>	0.5	0	17	Plankton	Marine & Freshwater	yes
<i>Noctiluca</i>	3.3	1	21	Plankton	Marine	yes
<i>Prorocentrum</i>	0.5	0	24	Plankton	Marine	yes
<i>Pyrodinium</i>	2.5	1	48	Plankton	Marine	yes
<i>Tripos fusus</i>	0.7	0	14	Plankton	Marine	yes

Table S5. Genera and some species of microalgae observed in samples of Estuario Salinas Grandes. It is reported their reached maxima density and percentage, their occurrence as percentage of samples where they were found, their more probable functional group and habitat and their potential toxicity.

	Max. density	Max. percentage	Occurrence (%)	Funct. group	Main habitat	Toxicity
CHLOROPHYTES						
<i>Coelastrum reticulatum</i>	96.9	19	13	Plankton	Freshwater	no
<i>Coenocystis</i>	593.8	65	50	Plankton	Freshwater	no
<i>Cosmarium</i>	63.8	8	4	Plankton	Freshwater	no
<i>Crucigeniella</i>	282.9	32	28	Plankton	Freshwater	no
<i>Dictyosphaerium</i>	1041.7	87	72	Plankton	Freshwater	no
<i>Dunaliella</i>	50.5	12	2	Plankton	Brackish	no
<i>Gonatozygon</i>	33.3	5	4	Benthos	Freshwater	no
<i>Monoraphidium</i>	214.6	56	28	Plankton	Freshwater	no
<i>Pandorina</i>	202.0	39	4	Plankton	Freshwater	no
<i>Pediastrum</i>	111.1	11	6	Plankton	Freshwater	no
<i>Volvox</i>	67.3	9	2	Plankton	Freshwater	no
<i>Tetraedron</i>	17.0	2	2	Plankton	Freshwater	no
DIATOMS						
<i>Asterionella kariana</i>	1.8	8	30	Plankton	Marine	no
<i>Aulacoseira</i>	23.1	3	46	Plankton	Freshwater	no
<i>Biddulphia</i>	81.5	8	41	Plankton	Marine	no
<i>Coscinodiscus</i>	361.1	30	87	Plankton	Marine	no
<i>Coscinosira polychordan</i>	115.7	13	80	Plankton	Marine	no
<i>Cyclotella</i>	17.0	13	30	Plankton	Freshwater	no
<i>Chaetoceros affinis</i>	138.9	12	52	Plankton	Marine	no
<i>Chaetoceros convolutus</i>	73.2	6	13	Plankton	Marine	no
<i>Diploneis</i>	2.2	5	24	Benthos	Marine & Freshwater	no
<i>Entomoneis</i>	0.2	0	6	Benthos	Brackish	no
<i>Fragilaria</i>	2.3	14	6	Benthos	Freshwater	no
<i>Gomphonema parvulum</i>	0.7	4	2	Benthos	Freshwater	no
<i>Guinardia</i>	1.7	2	20	Plankton	Brackish	no
<i>Melosira granulata</i>	298.9	30	83	Plankton	Freshwater	no
<i>Navicula</i>	151.0	21	80	Benthos	Freshwater	no
<i>Nitzschia</i>	67.6	53	76	Benthos	Marine & Freshwater	no
<i>Nitzschia sinuata</i>	244.6	33	87	Benthos	Brackish	no
<i>Pinnularia nobilis</i>	0.8	6	2	Benthos	Freshwater	no
<i>Pleurosigma</i>	4.2	35	17	Benthos	Brackish	no
<i>Rhizosolenia castracanci</i>	31.4	28	83	Plankton	Marine	no
<i>Skeletonema costatum</i>	100.6	29	48	Plankton	Marine	no
<i>Surirella</i>	277.8	34	93	Benthos	Brackish	no
<i>Thalassionema</i>	0.7	0	11	Plankton	Marine	no
<i>Thalassiosira</i>	0.0	7	9	Plankton	Marine	no
DINOPHYTES						
<i>Alexandrium</i>	0.5	0	6	Plankton	Marine	yes
<i>Ceratium</i>	0.5	0	11	Plankton	Marine & Freshwater	yes
<i>Cochlodinium</i>	5.8	1	19	Plankton	Marine	yes
<i>Dinophysis</i>	0.2	0	2	Plankton	Marine	yes
<i>Gymnodinium</i>	18.3	2	30	Plankton	Marine & Freshwater	yes
<i>Noctiluca</i>	1.8	0	9	Plankton	Marine	yes
<i>Prorocentrum</i>	13.0	4	39	Plankton	Marine	yes
<i>Pyrodinium</i>	1.3	1	19	Plankton	Marine	yes
<i>Tripos fusus</i>	2.5	1	35	Plankton	Marine	yes