

Supplementary material

Seasonal variation in basal resources supporting fish biomass in longitudinal zones of the Usumacinta River Basin, southern Mexico

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Table S1. Average values (and standard errors) of physico-chemical parameters recorded for during surveys in three zones of the Usumacinta Basin

TSS, total suspended solids

Zone	<i>n</i>	Temperature (°C)	Dissolved oxygen (mg L ⁻¹)	Conductivity (μS cm ⁻¹)	pH	TSS (mg L ⁻¹)	Suspended organic material (%)	Phosphorous total (μg L ⁻¹)	Nitrate (μg L ⁻¹)	Suspended chlorophyll- <i>a</i> (μg L ⁻¹)
Dry season										
Upper	12	25.8 (0.5)	8.3 (0.2)	644.3 (42.7)	8.0 (0.1)	13.4 (2.6)	43.1 (10.4)	17.5 (3.1)	201.3 (24.7)	6.1 (2.1)
Middle	6	30.9 (0.4)	7.5 (0.2)	833.3 (204.2)	8.2 (0)	51 (13.7)	22.8 (1.5)	16.5 (1.8)	125.9 (30.5)	22.6 (8.1)
Lower	6	28.2 (1)	6.3 (1.4)	675.3 (26.7)	7.9 (0.2)	9.4 (3.7)	23.9 (7.1)	17.2 (1.3)	60.9 (17.2)	17.7 (6.9)
Wet season										
Upper	12	26.2 (0.4)	7.9 (0.2)	438.6 (28.4)	7.8 (0.1)	88.1 (11.7)	13.8 (1.4)	10 (1.8)	433.8 (29.5)	5.6 (0.8)
Middle	6	30 (0.2)	7.2 (0.1)	953.2 (203.4)	8.0 (0)	48.3 (6.1)	11.7 (1.4)	5.5 (0.7)	194.1 (64.7)	8.9 (1.4)
Lower	6	28.5 (0.1)	5 (0.9)	7628.7 (3216.3)	8.2 (0.1)	54.7 (19.6)	18.6 (5.3)	27.1 (1.5)	218.2 (67.1)	5.4 (0.6)

Table S2. Families and species of fish in samples from the Usumacinta Basin

Diadromous species (*), marine species (+), non-native species (E)

Family	Species
Ariidae	<i>Cathorops</i> spp.
Ariidae	<i>Potamarius nelsoni</i> (Evermann & Goldsborough 1902)
Ariidae	<i>Potamarius usumacintae</i> Betancur-R. & Willink 2007
Ariidae	<i>Ariopsis felis</i> (Linnaeus 1766) +
Batrachoididae	<i>Batrachoides goldmani</i> Evermann & Goldsborough 1902
Belonidae	<i>Strongylura hubbsi</i> Collette 1974
Bryconidae	<i>Brycon guatemalensis</i> Regan 1908
Catostomidae	<i>Ictiobus meridionalis</i> (Günther 1868)
Centropomidae	<i>Centropomus parallelus</i> Poey 1860 *
Centropomidae	<i>Centropomus poeyi</i> Chávez 1961 *
Centropomidae	<i>Centropomus undecimalis</i> (Bloch 1792) *
Characidae	<i>Astyanax</i> spp.
Characidae	<i>Hyphessobrycon compressus</i> (Meek 1904)
Cichlidae	<i>Atherinella alvarezi</i> (Díaz-Pardo 1972)
Cichlidae	<i>Chuco intermedium</i> (Günther 1862)
Cichlidae	<i>Cincelichthys pearsei</i> (Hubbs 1936)
Cichlidae	<i>Cribroheros robertsoni</i> (Regan 1905)
Cichlidae	<i>Kihnichthys ufermanni</i> (Allgayer 2002)
Cichlidae	<i>Maskaheros argenteus</i> (Allgayer 1991)
Cichlidae	<i>Mayaheros urophthalmus</i> (Günther 1862)
Cichlidae	<i>Oreochromis mossambicus</i> (Peters 1852) E
Cichlidae	<i>Oreochromis niloticus</i> (Linnaeus 1758) E
Cichlidae	<i>Oscura heterospila</i> (Hubbs 1936)
Cichlidae	<i>Parachromis friedrichsthalii</i> (Heckel 1840)
Cichlidae	<i>Parachromis managuensis</i> (Günther 1867) E
Cichlidae	<i>Petenia splendida</i> Günther 1862
Cichlidae	<i>Rheoheros lentiginosus</i> (Steindachner 1864)
Cichlidae	<i>Theraps irregularis</i> Günther 1862
Cichlidae	<i>Thorichthys helleri</i> (Steindachner 1864)
Cichlidae	<i>Thorichthys meeki</i> Brind 1918
Cichlidae	<i>Thorichthys passionis</i> (Rivas 1962)
Cichlidae	<i>Trichromis salvini</i> (Günther 1862)
Cichlidae	<i>Vieja bifasciata</i> (Steindachner 1864)
Cichlidae	<i>Vieja melanurus</i> (Günther 1862)
Cichlidae	<i>Wajpamheros nourissati</i> (Allgayer 1989)
Clupeidae	<i>Dorosoma anale</i> Meek 1904
Clupeidae	<i>Dorosoma petenense</i> (Günther 1867)
Cyprinidae	<i>Ctenopharyngodon idella</i> (Valenciennes 1844) E
Cyprinidae	<i>Cyprinus carpio</i> Linnaeus 1758 E
Eleotridae	<i>Gobiomorus dormitor</i> Lacepède 1800 *
Gerreidae	<i>Diapterus auratus</i> Ranzani 1842 +
Gerreidae	<i>Eucinostomus melanopterus</i> (Bleeker 1863) +
Gerreidae	<i>Eugerres mexicanus</i> (Steindachner 1863)

Family	Species
Hemiramphidae	<i>Hyporhamphus mexicanus</i> Álvarez 1959
Heptapteridae	<i>Rhamdia guatemalensis</i> (Günther 1864)
Ictaluridae	<i>Ictalurus meridionalis</i> (Günther 1864)
Lepisosteidae	<i>Atractosteus tropicus</i> Gill 1863
Loricariidae	<i>Pterygoplichthys disjunctivus</i> (Weber 1991) E
Loricariidae	<i>Pterygoplichthys pardalis</i> (Castelnau 1855) E
Loricariidae	<i>Pterygoplichthys</i> sp. E
Megalopidae	<i>Megalops atlanticus</i> Valenciennes 1847 *
Mugilidae	<i>Mugil curema</i> Valenciennes 1836 *
Poeciliidae	<i>Gambusia sexradiata</i> Hubbs 1936
Poeciliidae	<i>Heterophallus echeagarayi</i> (Álvarez 1952)
Poeciliidae	<i>Poecilia mexicana</i> Steindachner 1863
Poeciliidae	<i>Xiphophorus maculatus</i> (Günther 1866)
Sciaenidae	<i>Aplodinotus grunniens</i> Rafinesque 1819
Synbranchidae	<i>Ophisternon aenigmaticum</i> Rosen & Greenwood 1976

Table S3. Carbon isotopic ratios (mean $\delta^{13}\text{C} \pm \text{s.d.}$; n is sample size) of muscle tissue of fishes from three zones of the Usumacinta Basin during the dry and wet seasons

Species	Upper-dry			Middle-dry			Lower-dry			Upper-wet			Middle-wet			Lower-wet		
	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.
<i>Aplodinotus grunniens</i>				3	-31.60	(0.57)	1	-30.86					3	-29.63	(1.51)	4	-31.12	(0.51)
<i>Ariopsis felis</i>																2	-21.93	(2.24)
<i>Astyanax</i> spp.	27	-27.38	(1.48)	5	-27.43	(0.90)	11	-26.46	(0.97)	42	-26.70	(2.53)	15	-26.87	(1.51)			
<i>Atherinella alvarezi</i>	1	-32.67																
<i>Atractosteus tropicus</i>	4	-28.54	(2.04)	3	-32.38	(0.31)				6	-27.66	(2.03)	1	-27.03				
<i>Batrachoides goldmani</i>				1	-30.96					2	-28.22	(1.08)						
<i>Brycon guatemalensis</i>	27	-25.95	(1.61)				3	-26.17	(1.27)	35	-26.01	(1.30)				2	-26.89	(0.22)
<i>Cathorops</i> spp.	18	-26.94	(0.95)	12	-32.74	(1.33)	4	-31.04	(1.04)	12	-26.65	(0.95)	13	-30.69	(2.01)	16	-27.41	(3.21)
<i>Centropomus parallelus</i>															1	-24.16		
<i>Centropomus poeyi</i>	2	-26.16	(1.12)															
<i>Centropomus undecimalis</i>	5	-25.90	(1.27)	4	-26.33	(5.16)	2	-27.36	(3.41)				1	-28.06		1	-22.35	
<i>Chuco intermedium</i>	4	-28.82	(1.91)							3	-28.28	(0.55)						
<i>Cincolichthys pearsei</i>	6	-24.79	(2.13)							6	-29.08	(2.00)	2	-26.83	(4.81)			
<i>Cribroheros robertsoni</i>				9	-31.58	(1.20)										3	-30.54	(0.91)
<i>Ctenopharyngodon idella</i>	7	-17.98	(5.79)				1	-25.71		1	-16.40							
<i>Cyprinus carpio</i>	5	-29.07	(3.15)							2	-28.06	(0.28)						
<i>Diapterus auratus</i>																1	-27.18	
<i>Dorosoma anale</i>	9	-29.96	(1.04)	12	-32.57	(1.29)	4	-30.87	(2.13)	17	-29.94	(2.73)	12	-28.23	(2.99)	8	-28.40	(0.95)
<i>Dorosoma petenense</i>	3	-31.67	(1.09)	6	-25.93	(2.35)	5	-27.33	(4.15)	2	-27.75	(1.32)	1	-31.85		6	-29.37	(1.48)
<i>Eucinostomus melanopterus</i>																2	-26.02	(1.71)
<i>Eugerres mexicanus</i>	5	-28.30	(1.37)				1	-29.03		20	-29.09	(2.19)						
<i>Gambusia sexradiata</i>				1	-31.88		5	-27.92	(0.38)	4	-32.48	(1.87)	4	-28.56	(4.51)			
<i>Gobiomorus dormitor</i>	1	-26.91		1	-32.85					1	-27.32					1	-25.06	
<i>Heterophallus echeagarayi</i>													1	-32.30		5	-26.18	(0.59)
<i>Hyphessobrycon compressus</i>	6	-28.99	(2.35)							8	-32.46	(2.56)						
<i>Hyporhamphus mexicanus</i>				1	-30.82		1	-30.83										
<i>Ictalurus meridionalis</i>	4	-25.70	(2.51)							12	-25.35	(1.99)	7	-27.50	(1.55)	5	-29.08	(1.97)
<i>Ictiobus meridionalis</i>	2	-27.99	(0.97)							1	-31.52		1	-31.12				
<i>Kihnichthys ufermanni</i>										7	-35.08	(1.19)						
<i>Maskaheros argenteus</i>	6	-27.14	(1.11)				1	-31.93		6	-27.81	(0.50)	5	-28.74	(1.47)			
<i>Mayaheros urophthalmus</i>	2	-28.21	(1.15)				15	-28.73	(1.87)							2	-29.43	(1.87)
<i>Megalops atlanticus</i>	1	-29.03																
<i>Mugil curema</i>							1	-25.13										
<i>Ophisternon aenigmaticum</i>				1	-30.06													
<i>Oreochromis mossambicus</i>	1	-29.74																
<i>Oreochromis niloticus</i>	1	-37.85		1	-30.10					16	-25.98	(3.91)				2	-30.26	(1.84)
<i>Oscura heterospila</i>				1	-29.34		1	-30.51								1	-30.58	

Species	Upper-dry			Middle-dry			Lower-dry			Upper-wet			Middle-wet			Lower-wet		
	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.
<i>Parachromis friedrichsthalii</i>																1	-31.93	
<i>Parachromis managuensis</i>				8	-31.33	(1.86)				1	-28.83							
<i>Petenia splendida</i>	7	-29.02	(2.67)	6	-32.50	(1.60)	2	-29.94	(1.89)	5	-27.31	(1.66)	1	-31.21		1	-27.91	
<i>Poecilia mexicana</i>	2	-31.53	(5.30)							16	-28.18	(1.76)	4	-24.46	(1.50)			
<i>Potamarius nelsoni</i>	4	-29.84	(2.12)				1	-29.88		5	-26.67	(1.43)	6	-28.07	(1.98)	1	-29.67	
<i>Potamarius usumacintae</i>	2	-27.53	(0.80)							7	-26.93	(1.11)				3	-28.23	(0.11)
<i>Pterygoplichthys disjunctivus</i>	1	-30.15								3	-30.69	(2.58)	9	-29.92	(2.44)			
<i>Pterygoplichthys pardalis</i>	4	-30.11	(1.12)	1	-27.17								7	-30.16	(2.69)	5	-31.14	(1.57)
<i>Pterygoplichthys</i> sp.	2	-28.41	(0.34)															
<i>Rhamdia guatemalensis</i>				3	-28.84	(0.83)	1	-31.14		3	-27.72	(1.21)						
<i>Rheoheros lentiginosus</i>	23	-32.98	(2.30)							32	-30.57	(2.29)						
<i>Strongylura hubbsi</i>	2	-26.24	(1.13)	6	-31.20	(1.10)	2	-28.13	(0.05)				1	-26.58		1	-28.40	
<i>Theraps irregularis</i>	4	-30.94	(3.71)							10	-30.84	(2.18)						
<i>Thorichthys helleri</i>	24	-26.91	(2.04)	5	-31.67	(1.66)	16	-31.42	(1.35)	18	-28.36	(1.27)	5	-30.90	(0.53)	5	-29.38	(1.44)
<i>Thorichthys meeki</i>				1	-31.76					2	-23.57	(1.29)						
<i>Thorichthys pasionis</i>				3	-32.81	(0.05)							5	-27.90	(2.41)			
<i>Trichromis salvini</i>				6	-33.42	(1.41)	7	-28.90	(1.96)	1	-33.08		1	-28.93		2	-29.98	(1.66)
<i>Vieja bifasciata</i>	6	-25.52	(0.91)	1	-29.68		3	-30.39	(1.00)	5	-29.88	(1.82)	1	-24.90				
<i>Vieja melanurus</i>	6	-28.34	(3.93)	4	-31.82	(2.99)	7	-32.12	(2.11)	11	-31.50	(2.51)	1	-28.11				
<i>Wajpamheros nourissati</i>	4	-28.01	(1.70)							10	-27.94	(1.61)						
<i>Xiphophorus maculatus</i>										3	-33.48	(3.52)						

Table S4. Nitrogen isotopic ratios (mean $\delta^{15}\text{N} \pm \text{s.d.}$; n is sample size) of muscle tissue of fishes from three zones of the Usumacinta Basin during the dry and wet seasons

Species	Upper-dry			Middle-dry			Lower-dry			Upper-wet			Middle-wet			Lower-wet		
	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.
<i>Aplodinotus grunniens</i>				3	11.93	(0.35)	1	10.78					3	11.12	(1.33)	4	11.14	(0.32)
<i>Ariopsis felis</i>																2	11.57	(1.03)
<i>Astyanax</i> spp.	27	9.38	(0.94)	5	10.24	(0.63)	11	8.33	(0.79)	42	9.34	(1.07)	15	10.04	(1.02)			
<i>Atherinella alvarezi</i>	1	8.70																
<i>Atractosteus tropicus</i>	4	11.73	(0.57)	3	12.40	(0.49)				6	12.06	(0.74)	1	11.56				
<i>Batrachoides goldmani</i>				1	9.66					2	8.63	(1.76)						
<i>Brycon guatemalensis</i>	27	7.95	(0.76)				3	8.47	(0.90)	35	8.18	(1.01)				2	9.33	(0.04)
<i>Cathorops</i> spp.	18	9.88	(0.62)	12	10.89	(0.86)	4	10.57	(0.50)	12	10.49	(0.63)	13	11.76	(0.58)	16	10.79	(0.69)
<i>Centropomus parallelus</i>																1	11.25	
<i>Centropomus poeyi</i>	2	11.56	(0.12)															
<i>Centropomus undecimalis</i>	5	10.83	(1.30)	4	11.08	(0.80)	2	11.45	(1.21)				1	12.61		1	11.49	
<i>Chuco intermedium</i>	4	8.04	(0.19)							3	8.40	(0.71)						
<i>Cincolichthys pearsei</i>	6	9.62	(0.88)							6	8.65	(0.32)	2	9.78	(0.60)			
<i>Cribroheros robertsoni</i>				9	10.37	(0.35)										3	7.45	(0.05)
<i>Ctenopharyngodon idella</i>	7	8.50	(0.80)				1	7.41		1	7.48							
<i>Cyprinus carpio</i>	5	8.18	(0.85)							2	9.16	(0.48)						
<i>Diapterus auratus</i>																1	10.38	
<i>Dorosoma anale</i>	9	7.47	(0.42)	12	8.47	(1.17)	4	7.73	(1.64)	17	8.12	(0.86)	12	9.02	(1.79)	8	9.06	(1.34)
<i>Dorosoma petenense</i>	3	8.40	(0.28)	6	9.68	(1.30)	5	9.96	(0.99)	2	7.06	(0.34)	1	9.53		6	10.10	(0.67)
<i>Eucinostomus melanopterus</i>																2	10.20	(0.60)
<i>Eugerres mexicanus</i>	5	9.47	(1.10)				1	10.39		20	9.95	(0.69)						
<i>Gambusia sexradiata</i>				1	9.02		5	7.74	(0.34)	4	9.70	(0.84)	4	11.25	(0.53)			
<i>Gobiomorus dormitor</i>	1	9.66		1	11.92					1	10.19					1	9.68	
<i>Heterophallus echeagarayi</i>													1	9.57		5	8.17	(0.36)
<i>Hyphessobrycon compressus</i>	6	8.46	(0.51)							8	9.19	(0.49)						
<i>Hyporhamphus mexicanus</i>				1	11.16		1	10.12										
<i>Ictalurus meridionalis</i>	4	10.23	(0.72)							12	10.63	(0.78)	7	10.34	(0.82)	5	9.80	(0.44)
<i>Ictiobus meridionalis</i>	2	9.70	(0.51)							1	8.96		1	10.44				
<i>Kihnichthys ufermanni</i>										7	7.99	(0.35)						
<i>Maskaheros argenteus</i>	6	8.60	(0.79)				1	9.00		6	9.03	(0.56)	5	10.37	(0.85)			
<i>Mayaheros urophthalmus</i>	2	9.58	(0.40)				15	7.73	(0.87)							2	7.54	(1.51)
<i>Megalops atlanticus</i>	1	10.85																
<i>Mugil curema</i>							1	8.05										
<i>Ophisternon aenigmaticum</i>				1	12.11													
<i>Oreochromis mossambicus</i>	1	9.36																
<i>Oreochromis niloticus</i>	1	7.66		1	9.75					16	7.25	(0.99)				2	8.54	(1.27)
<i>Oscura heterospila</i>				1	10.39		1	9.46								1	8.04	

Species	Upper-dry			Middle-dry			Lower-dry			Upper-wet			Middle-wet			Lower-wet		
	<i>n</i>	Mean	s.d.	<i>n</i>	Mean	s.d.	<i>n</i>	Mean	s.d.	<i>n</i>	Mean	s.d.	<i>n</i>	Mean	s.d.	<i>n</i>	Mean	s.d.
<i>Parachromis friedrichsthalii</i>																1	8.10	
<i>Parachromis managuensis</i>				8	11.48	(0.70)				1	10.50							
<i>Petenia splendida</i>	7	11.12	(0.32)	6	12.39	(0.12)	2	9.20	(0.81)	5	10.83	(0.67)	1	10.85		1	9.47	
<i>Poecilia mexicana</i>	2	6.63	(0.64)							16	7.38	(0.84)	4	5.85	(0.53)			
<i>Potamarius nelsoni</i>	4	10.26	(0.18)				1	10.65		5	11.02	(0.45)	6	10.28	(0.18)	1	9.91	
<i>Potamarius usumacintae</i>	2	11.46	(0.13)							7	11.55	(0.37)				3	11.28	(0.13)
<i>Pterygoplichthys disjunctivus</i>	1	7.63								3	7.46	(0.24)	9	8.85	(1.29)			
<i>Pterygoplichthys pardalis</i>	4	6.93	(0.47)	1	7.97								7	8.48	(0.93)	5	7.42	(1.02)
<i>Pterygoplichthys</i> sp.	2	8.10	(0.56)															
<i>Rhamdia guatemalensis</i>				3	11.78	(0.36)	1	8.08		3	10.75	(0.65)						
<i>Rheoheros lentiginosus</i>	23	9.83	(0.62)							32	9.77	(0.78)						
<i>Strongylura hubbsi</i>	2	12.01	(0.23)	6	12.71	(0.54)	2	10.86	(0.11)				1	10.39		1	12.53	
<i>Theraps irregularis</i>	4	9.30	(1.06)							10	9.76	(0.57)						
<i>Thorichthys helleri</i>	24	10.82	(0.86)	5	10.78	(0.56)	16	8.91	(0.84)	18	9.30	(0.59)	5	10.97	(0.62)	5	8.91	(0.68)
<i>Thorichthys meeki</i>				1	11.24					2	8.59	(0.80)						
<i>Thorichthys pasionis</i>				3	11.06	(0.35)							5	9.35	(1.07)			
<i>Trichromis salvini</i>				6	11.04	(0.63)	7	8.10	(0.75)	1	8.61		1	11.75		2	9.43	(1.99)
<i>Vieja bifasciata</i>	6	8.94	(0.86)	1	9.89		3	8.46	(0.30)	5	9.20	(0.50)	1	9.59				
<i>Vieja melanurus</i>	6	9.14	(1.14)	4	10.59	(0.63)	7	6.48	(0.64)	11	9.02	(0.69)	1	9.42				
<i>Wajpamheros nourissati</i>	4	10.18	(1.10)							10	9.52	(0.67)						
<i>Xiphophorus maculatus</i>										3	7.76	(0.40)						

Table S5. Means and 2.5th–95th percentile ranges (in parenthesis) of estimated contributions of basal resources to fish biomass in three zones of the Usumacinta Basin during the dry season

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
Upper zone						
<i>Astyanax</i> spp.	0.02 (0–0.06)	0.01 (0–0.03)	0.61 (0.48–0.72)	0.09 (0–0.21)	0.26 (0.13–0.37)	0.01 (0–0.03)
<i>Atractosteus tropicus</i>	0.01 (0–0.05)	0.01 (0–0.03)	0.84 (0.66–0.96)	0.05 (0–0.16)	0.09 (0.01–0.20)	0.01 (0–0.03)
<i>Brycon guatemalensis</i>	0.07 (0–0.29)	0.02 (0–0.07)	0.49 (0.35–0.64)	0.10 (0–0.32)	0.30 (0.06–0.47)	0.03 (0–0.12)
<i>Cathorops</i> spp.	0.03 (0–0.10)	0.02 (0–0.08)	0.64 (0.47–0.80)	0.12 (0–0.34)	0.19 (0.03–0.35)	0.01 (0–0.05)
<i>Centropomus poeyi</i>	0.02 (0–0.07)	0.01 (0–0.04)	0.81 (0.62–0.95)	0.06 (0–0.19)	0.10 (0.01–0.23)	0.01 (0–0.04)
<i>Centropomus undecimalis</i>	0.02 (0–0.08)	0.01 (0–0.06)	0.78 (0.60–0.92)	0.07 (0–0.22)	0.11 (0.01–0.23)	0.01 (0–0.04)
<i>Chuco intermedium</i>	0.03 (0–0.11)	0.02 (0–0.07)	0.34 (0.19–0.47)	0.23 (0–0.63)	0.38 (0.05–0.59)	0.01 (0–0.05)
<i>Cincolichthys pearsei</i>	0.05 (0–0.19)	0.02 (0–0.09)	0.40 (0.26–0.53)	0.17 (0–0.53)	0.33 (0.05–0.52)	0.02 (0–0.10)
<i>Ctenopharyngodon idella</i>	0.26 (0–0.60)	0.01 (0–0.04)	0.50 (0.29–0.83)	0.03 (0–0.08)	0.05 (0.01–0.11)	0.15 (0–0.45)
<i>Cyprinus carpio</i>	0.03 (0–0.10)	0.01 (0–0.05)	0.41 (0.28–0.53)	0.10 (0–0.34)	0.44 (0.17–0.58)	0.01 (0–0.04)
<i>Dorosoma anale</i>	0.02 (0–0.07)	0.01 (0–0.05)	0.24 (0.11–0.35)	0.25 (0–0.60)	0.47 (0.17–0.67)	0.01 (0–0.04)
<i>Dorosoma petenense</i>	0.02 (0–0.08)	0.01 (0–0.04)	0.41 (0.26–0.55)	0.10 (0–0.32)	0.45 (0.17–0.62)	0.01 (0–0.03)
<i>Eugerres mexicanus</i>	0.02 (0–0.09)	0.01 (0–0.05)	0.58 (0.42–0.74)	0.12 (0–0.38)	0.25 (0.04–0.41)	0.01 (0–0.04)
<i>Hyphessobrycon compressus</i>	0.03 (0–0.09)	0.01 (0–0.06)	0.42 (0.29–0.54)	0.16 (0–0.49)	0.38 (0.08–0.55)	0.01 (0–0.04)
<i>Ictalurus meridionalis</i>	0.03 (0–0.11)	0.02 (0–0.08)	0.70 (0.52–0.87)	0.09 (0–0.28)	0.15 (0.02–0.30)	0.01 (0–0.06)
<i>Ictiobus meridionalis</i>	0.03 (0–0.11)	0.02 (0–0.06)	0.61 (0.40–0.81)	0.12 (0–0.38)	0.22 (0.03–0.41)	0.01 (0–0.05)
<i>Maskaheros argenteus</i>	0.04 (0–0.13)	0.02 (0–0.10)	0.43 (0.28–0.56)	0.22 (0–0.56)	0.27 (0.03–0.48)	0.02 (0–0.07)
<i>Mayaheros urophthalmus</i>	0.03 (0–0.11)	0.02 (0–0.06)	0.59 (0.39–0.81)	0.12 (0–0.39)	0.23 (0.03–0.43)	0.01 (0–0.05)
<i>Oreochromis niloticus</i>	0.02 (0–0.07)	0.01 (0–0.03)	0.41 (0.07–0.84)	0.05 (0–0.17)	0.50 (0.03–0.83)	0.01 (0–0.03)
<i>Petenia splendida</i>	0.01 (0–0.05)	0.01 (0–0.04)	0.79 (0.63–0.92)	0.06 (0–0.18)	0.12 (0.02–0.25)	0.01 (0–0.03)
<i>Poecilia mexicana</i>	0.02 (0–0.09)	0.01 (0–0.04)	0.18 (0.05–0.31)	0.07 (0–0.22)	0.71 (0.48–0.86)	0.01 (0–0.03)
<i>Potamarius nelsoni</i>	0.02 (0–0.07)	0.01 (0–0.05)	0.68 (0.51–0.85)	0.09 (0–0.28)	0.20 (0.03–0.36)	0.01 (0–0.04)
<i>Potamarius usumacintae</i>	0.02 (0–0.07)	0.01 (0–0.05)	0.80 (0.61–0.94)	0.06 (0–0.19)	0.11 (0.01–0.24)	0.01 (0–0.04)
<i>Pterygoplichthys pardalis</i>	0.03 (0–0.10)	0.02 (0–0.06)	0.19 (0.06–0.30)	0.19 (0–0.59)	0.57 (0.22–0.76)	0.01 (0–0.05)
<i>Pterygoplichthys</i> sp.	0.03 (0–0.12)	0.02 (0–0.08)	0.37 (0.17–0.55)	0.21 (0–0.64)	0.36 (0.05–0.60)	0.02 (0–0.07)
<i>Rheoheros lentiginosus</i>	0.01 (0–0.05)	0.01 (0–0.03)	0.64 (0.48–0.81)	0.06 (0–0.19)	0.28 (0.06–0.44)	0.01 (0–0.03)
<i>Strongylura hubbsi</i>	0.02 (0–0.06)	0.01 (0–0.04)	0.83 (0.66–0.95)	0.05 (0–0.17)	0.08 (0.01–0.19)	0.01 (0–0.03)
<i>Theraps irregularis</i>	0.02 (0–0.07)	0.01 (0–0.04)	0.59 (0.43–0.75)	0.07 (0–0.25)	0.30 (0.06–0.46)	0.01 (0–0.03)
<i>Thorichthys helleri</i>	0.02 (0–0.06)	0.01 (0–0.04)	0.81 (0.64–0.94)	0.06 (0–0.19)	0.10 (0.01–0.23)	0.01 (0–0.03)
<i>Vieja bifasciata</i>	0.05 (0–0.19)	0.04 (0–0.18)	0.49 (0.34–0.64)	0.18 (0–0.46)	0.22 (0.03–0.39)	0.03 (0–0.12)
<i>Vieja melanurus</i>	0.02 (0–0.09)	0.01 (0–0.04)	0.58 (0.44–0.71)	0.09 (0–0.29)	0.29 (0.08–0.44)	0.01 (0–0.04)
<i>Wajpamheros nourissati</i>	0.02 (0–0.08)	0.01 (0–0.05)	0.68 (0.51–0.85)	0.09 (0–0.30)	0.18 (0.03–0.34)	0.01 (0–0.04)
Middle zone						
<i>Aplodinotus grunniens</i>		0.75 (0.52–0.91)	0.15 (0.02–0.33)	0.04 (0–0.14)	0.05 (0–0.13)	0.02 (0–0.08)
<i>Astyanax</i> spp.		0.50 (0.34–0.65)	0.31 (0.12–0.47)	0.06 (0–0.17)	0.11 (0.02–0.19)	0.02 (0–0.06)
<i>Atractosteus tropicus</i>		0.82 (0.63–0.94)	0.10 (0.01–0.24)	0.03 (0–0.11)	0.04 (0–0.10)	0.01 (0–0.05)
<i>Batrachoides goldmani</i>		0.42 (0.08–0.74)	0.27 (0.03–0.65)	0.12 (0–0.42)	0.17 (0.01–0.41)	0.02 (0–0.09)

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
<i>Cathorops</i> spp.		0.73 (0.51–0.89)	0.10 (0.01–0.25)	0.07 (0–0.25)	0.09 (0–0.22)	0.01 (0–0.04)
<i>Centropomus undecimalis</i>		0.27 (0.04–0.51)	0.64 (0.32–0.89)	0.03 (0–0.10)	0.04 (0–0.09)	0.02 (0–0.10)
<i>Cribroheros robertsoni</i>		0.54 (0.29–0.72)	0.18 (0.03–0.39)	0.13 (0–0.37)	0.14 (0.01–0.29)	0.02 (0–0.06)
<i>Dorosoma anale</i>		0.29 (0.04–0.48)	0.13 (0.01–0.34)	0.10 (0–0.65)	0.47 (0.01–0.64)	0.01 (0–0.03)
<i>Dorosoma petenense</i>		0.16 (0.03–0.35)	0.62 (0.23–0.88)	0.06 (0–0.20)	0.12 (0.01–0.27)	0.05 (0–0.24)
<i>Gambusia sexradiata</i>		0.37 (0.06–0.72)	0.23 (0.03–0.63)	0.15 (0–0.55)	0.23 (0.01–0.50)	0.02 (0–0.08)
<i>Gobiomorus dormitor</i>		0.71 (0.33–0.92)	0.16 (0.02–0.43)	0.05 (0–0.19)	0.06 (0–0.17)	0.02 (0–0.06)
<i>Hyporhamphus mexicanus</i>		0.58 (0.14–0.86)	0.25 (0.03–0.63)	0.06 (0–0.22)	0.08 (0–0.22)	0.02 (0–0.09)
<i>Ophisternon aenigmaticum</i>		0.66 (0.21–0.89)	0.22 (0.02–0.58)	0.04 (0–0.15)	0.06 (0–0.15)	0.02 (0–0.10)
<i>Oreochromis niloticus</i>		0.40 (0.08–0.75)	0.31 (0.04–0.71)	0.10 (0–0.36)	0.16 (0.01–0.40)	0.03 (0–0.11)
<i>Oscura heterospila</i>		0.44 (0.09–0.75)	0.34 (0.04–0.72)	0.08 (0–0.27)	0.11 (0.01–0.29)	0.03 (0–0.13)
<i>Parachromis managuensis</i>		0.70 (0.48–0.87)	0.18 (0.02–0.37)	0.05 (0–0.16)	0.06 (0–0.14)	0.02 (0–0.07)
<i>Petenia splendida</i>		0.85 (0.68–0.95)	0.09 (0.01–0.21)	0.03 (0–0.10)	0.03 (0–0.08)	0.01 (0–0.04)
<i>Pterygoplichthys pardalis</i>		0.18 (0.03–0.38)	0.39 (0.07–0.77)	0.09 (0–0.34)	0.30 (0.01–0.55)	0.04 (0–0.21)
<i>Rhamdia guatemalensis</i>		0.60 (0.33–0.79)	0.28 (0.04–0.52)	0.04 (0–0.11)	0.05 (0–0.12)	0.04 (0–0.18)
<i>Strongylura hubbsi</i>		0.83 (0.66–0.94)	0.11 (0.01–0.25)	0.02 (0–0.07)	0.02 (0–0.06)	0.02 (0–0.08)
<i>Thorichthys helleri</i>		0.62 (0.38–0.80)	0.18 (0.03–0.39)	0.09 (0–0.27)	0.10 (0.01–0.23)	0.02 (0–0.06)
<i>Thorichthys meeki</i>		0.62 (0.19–0.88)	0.22 (0.02–0.60)	0.06 (0–0.23)	0.08 (0–0.22)	0.02 (0–0.08)
<i>Thorichthys pasionis</i>		0.69 (0.43–0.88)	0.13 (0.01–0.32)	0.09 (0–0.31)	0.08 (0–0.21)	0.01 (0–0.05)
<i>Trichromis salvini</i>		0.73 (0.51–0.90)	0.09 (0.01–0.23)	0.09 (0–0.30)	0.08 (0–0.19)	0.01 (0–0.03)
<i>Vieja bifasciata</i>		0.40 (0.08–0.72)	0.33 (0.04–0.70)	0.09 (0–0.35)	0.15 (0.01–0.38)	0.03 (0–0.13)
<i>Vieja melanurus</i>		0.56 (0.20–0.81)	0.26 (0.03–0.61)	0.07 (0–0.24)	0.09 (0.01–0.22)	0.01 (0–0.05)
Lower zone						
<i>Aplodinotus grunniens</i>	0.03 (0–0.10)	0.85 (0.67–0.96)		0.04 (0–0.11)	0.02 (0–0.08)	0.07 (0–0.18)
<i>Astyanax</i> spp.	0.05 (0–0.15)	0.65 (0.50–0.81)		0.08 (0.02–0.16)	0.04 (0–0.11)	0.18 (0.02–0.27)
<i>Brycon guatemalensis</i>	0.07 (0–0.25)	0.58 (0.37–0.78)		0.08 (0.01–0.20)	0.05 (0–0.16)	0.23 (0.03–0.34)
<i>Cathorops</i> spp.	0.02 (0–0.07)	0.90 (0.78–0.97)		0.02 (0–0.06)	0.01 (0–0.05)	0.05 (0–0.12)
<i>Centropomus undecimalis</i>	0.02 (0–0.06)	0.85 (0.64–0.97)		0.02 (0–0.06)	0.01 (0–0.05)	0.10 (0–0.27)
<i>Ctenopharyngodon idella</i>	0.11 (0–0.43)	0.48 (0.16–0.82)		0.13 (0.01–0.34)	0.07 (0–0.27)	0.23 (0.02–0.37)
<i>Dorosoma anale</i>	0.04 (0–0.16)	0.73 (0.52–0.91)		0.12 (0.01–0.29)	0.06 (0–0.25)	0.05 (0.01–0.12)
<i>Dorosoma petenense</i>	0.02 (0–0.07)	0.82 (0.67–0.95)		0.02 (0–0.06)	0.01 (0–0.05)	0.12 (0–0.24)
<i>Eugerres mexicanus</i>	0.03 (0–0.13)	0.80 (0.58–0.95)		0.04 (0–0.13)	0.03 (0–0.10)	0.10 (0.01–0.24)
<i>Gambusia sexradiata</i>	0.14 (0–0.46)	0.49 (0.30–0.65)		0.15 (0.01–0.32)	0.08 (0–0.27)	0.15 (0.02–0.24)
<i>Hyporhamphus mexicanus</i>	0.03 (0–0.12)	0.82 (0.63–0.96)		0.05 (0–0.13)	0.03 (0–0.10)	0.07 (0.01–0.19)
<i>Maskaheros argenteus</i>	0.04 (0–0.14)	0.80 (0.58–0.95)		0.07 (0–0.20)	0.03 (0–0.13)	0.07 (0–0.16)
<i>Mayaheros urophthalmus</i>	0.09 (0–0.33)	0.58 (0.45–0.68)		0.15 (0.01–0.29)	0.07 (0–0.27)	0.11 (0.02–0.18)
<i>Mugil curema</i>	0.08 (0–0.32)	0.52 (0.20–0.83)		0.10 (0.01–0.27)	0.05 (0–0.21)	0.25 (0.01–0.41)
<i>Oscura heterospila</i>	0.04 (0–0.15)	0.79 (0.57–0.94)		0.06 (0–0.17)	0.03 (0–0.12)	0.08 (0.01–0.20)
<i>Petenia splendida</i>	0.04 (0–0.15)	0.80 (0.60–0.94)		0.05 (0–0.16)	0.03 (0–0.11)	0.08 (0.01–0.19)
<i>Potamarius nelsoni</i>	0.03 (0–0.12)	0.83 (0.63–0.96)		0.04 (0–0.11)	0.02 (0–0.08)	0.08 (0–0.21)
<i>Rhamdia guatemalensis</i>	0.05 (0–0.21)	0.73 (0.46–0.93)		0.10 (0–0.30)	0.05 (0–0.19)	0.08 (0.01–0.18)

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
<i>Strongylura hubbsi</i>	0.02 (0–0.08)	0.83 (0.63–0.96)		0.03 (0–0.08)	0.02 (0–0.06)	0.11 (0–0.25)
<i>Thorichthys helleri</i>	0.04 (0–0.14)	0.80 (0.68–0.92)		0.09 (0.01–0.19)	0.04 (0–0.15)	0.04 (0–0.08)
<i>Trichromis salvini</i>	0.08 (0–0.29)	0.65 (0.49–0.81)		0.11 (0.01–0.24)	0.06 (0–0.21)	0.11 (0.01–0.18)
<i>Vieja bifasciata</i>	0.05 (0–0.21)	0.74 (0.53–0.91)		0.09 (0–0.25)	0.04 (0–0.18)	0.07 (0.01–0.16)
<i>Vieja melanurus</i>	0.02 (0–0.08)	0.51 (0.40–0.62)		0.40 (0.05–0.52)	0.04 (0–0.18)	0.02 (0–0.05)

Table S6. Means and 2.5th–95th percentile ranges (in parenthesis) of estimated contributions of basal resources to fish biomass in three zones of the Usumacinta Basin during the wet season

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
Upper zone						
<i>Astyanax</i> spp.	0.67 (0.40–0.79)	0.03 (0–0.09)	0.15 (0.08–0.22)	0.07 (0–0.26)	0.06 (0–0.14)	0.03 (0–0.07)
<i>Atractosteus tropicus</i>	0.56 (0.43–0.67)	0.01 (0–0.03)	0.37 (0.13–0.47)	0.03 (0–0.09)	0.03 (0–0.08)	0.01 (0–0.03)
<i>Batrachoides goldmani</i>	0.67 (0.23–0.92)	0.03 (0–0.14)	0.11 (0.01–0.23)	0.09 (0–0.42)	0.07 (0–0.27)	0.03 (0–0.14)
<i>Brycon guatemalensis</i>	0.61 (0.06–0.91)	0.07 (0–0.29)	0.09 (0.01–0.24)	0.10 (0–0.64)	0.05 (0–0.15)	0.09 (0–0.28)
<i>Cathorops</i> spp.	0.51 (0.29–0.68)	0.03 (0–0.10)	0.29 (0.16–0.37)	0.08 (0–0.27)	0.08 (0–0.24)	0.03 (0–0.10)
<i>Chuco intermedium</i>	0.53 (0.19–0.82)	0.04 (0–0.16)	0.13 (0.03–0.22)	0.13 (0–0.47)	0.13 (0–0.43)	0.05 (0–0.17)
<i>Cincolichthys pearsei</i>	0.55 (0.30–0.79)	0.04 (0–0.14)	0.14 (0.03–0.21)	0.12 (0–0.40)	0.13 (0–0.37)	0.04 (0–0.13)
<i>Ctenopharyngodon idella</i>	0.29 (0.04–0.92)	0.16 (0–0.61)	0.20 (0.01–0.38)	0.05 (0–0.17)	0.04 (0–0.12)	0.26 (0–0.65)
<i>Cyprinus carpio</i>	0.58 (0.23–0.85)	0.03 (0–0.13)	0.17 (0.02–0.28)	0.10 (0–0.37)	0.09 (0–0.32)	0.04 (0–0.13)
<i>Dorosoma anale</i>	0.75 (0.28–0.94)	0.03 (0–0.13)	0.05 (0.01–0.12)	0.08 (0–0.46)	0.07 (0–0.24)	0.03 (0–0.11)
<i>Dorosoma petenense</i>	0.42 (0.09–0.80)	0.06 (0–0.28)	0.08 (0.01–0.17)	0.18 (0–0.64)	0.19 (0–0.59)	0.06 (0–0.23)
<i>Eugerres mexicanus</i>	0.65 (0.44–0.81)	0.02 (0–0.08)	0.21 (0.05–0.30)	0.05 (0–0.20)	0.05 (0–0.16)	0.02 (0–0.07)
<i>Gambusia sexradiata</i>	0.78 (0.50–0.93)	0.01 (0–0.05)	0.10 (0.01–0.21)	0.05 (0–0.21)	0.04 (0–0.15)	0.01 (0–0.05)
<i>Hyphessobrycon compressus</i>	0.78 (0.47–0.93)	0.02 (0–0.06)	0.08 (0.01–0.16)	0.06 (0–0.25)	0.05 (0–0.19)	0.01 (0–0.06)
<i>Ictalurus meridionalis</i>	0.53 (0.34–0.68)	0.02 (0–0.09)	0.33 (0.20–0.42)	0.05 (0–0.16)	0.05 (0–0.14)	0.02 (0–0.08)
<i>Kihnichthys ufermanni</i>	0.80 (0.35–0.97)	0.01 (0–0.05)	0.03 (0–0.07)	0.07 (0–0.30)	0.08 (0–0.32)	0.01 (0–0.04)
<i>Maskaheros argenteus</i>	0.44 (0.20–0.67)	0.03 (0–0.13)	0.20 (0.08–0.28)	0.14 (0–0.43)	0.16 (0–0.41)	0.03 (0–0.13)
<i>Oreochromis niloticus</i>	0.67 (0.06–0.94)	0.08 (0–0.35)	0.04 (0.01–0.10)	0.09 (0–0.74)	0.05 (0–0.15)	0.08 (0–0.26)
<i>Petenia splendida</i>	0.54 (0.35–0.68)	0.02 (0–0.07)	0.31 (0.14–0.40)	0.06 (0–0.20)	0.06 (0–0.17)	0.02 (0–0.07)
<i>Poecilia mexicana</i>	0.56 (0.14–0.82)	0.06 (0–0.25)	0.05 (0.01–0.12)	0.15 (0–0.62)	0.12 (0–0.44)	0.06 (0–0.22)
<i>Potamarius nelsoni</i>	0.50 (0.30–0.65)	0.02 (0–0.07)	0.34 (0.16–0.42)	0.06 (0–0.21)	0.06 (0–0.19)	0.02 (0–0.07)
<i>Potamarius usumacintae</i>	0.51 (0.35–0.63)	0.01 (0–0.05)	0.37 (0.20–0.46)	0.05 (0–0.15)	0.05 (0–0.14)	0.01 (0–0.05)
<i>Pterygoplichthys disjunctivus</i>	0.60 (0.21–0.90)	0.04 (0–0.15)	0.06 (0.01–0.12)	0.13 (0–0.50)	0.14 (0–0.47)	0.03 (0–0.13)
<i>Rhamdia guatemalensis</i>	0.56 (0.35–0.73)	0.02 (0–0.08)	0.29 (0.08–0.39)	0.05 (0–0.20)	0.06 (0–0.18)	0.02 (0–0.08)
<i>Rheoheros lentiginosus</i>	0.77 (0.45–0.93)	0.02 (0–0.07)	0.10 (0.01–0.19)	0.05 (0–0.23)	0.05 (0–0.15)	0.02 (0–0.07)
<i>Theraps irregularis</i>	0.73 (0.49–0.89)	0.02 (0–0.06)	0.14 (0.02–0.24)	0.05 (0–0.21)	0.05 (0–0.17)	0.02 (0–0.06)
<i>Thorichthys helleri</i>	0.57 (0.32–0.77)	0.03 (0–0.12)	0.20 (0.05–0.28)	0.09 (0–0.32)	0.08 (0–0.27)	0.03 (0–0.10)
<i>Vieja bifasciata</i>	0.65 (0.38–0.85)	0.02 (0–0.10)	0.14 (0.03–0.22)	0.08 (0–0.31)	0.08 (0–0.26)	0.03 (0–0.09)
<i>Vieja melanurus</i>	0.73 (0.41–0.91)	0.02 (0–0.09)	0.10 (0.02–0.19)	0.07 (0–0.28)	0.06 (0–0.22)	0.02 (0–0.08)
<i>Wajpamheros nourissati</i>	0.56 (0.30–0.75)	0.03 (0–0.12)	0.22 (0.09–0.30)	0.08 (0–0.30)	0.08 (0–0.25)	0.04 (0–0.12)
<i>Xiphophorus maculatus</i>	0.73 (0.27–0.95)	0.02 (0–0.09)	0.04 (0.01–0.09)	0.09 (0–0.41)	0.08 (0–0.33)	0.02 (0–0.07)
Middle zone						
<i>Aplodinotus grunniens</i>	0.10 (0–0.32)	0.13 (0–0.38)	0.20 (0–0.58)	0.47 (0.02–0.84)	0.08 (0–0.24)	0.02 (0–0.08)
<i>Astyanax</i> spp.	0.14 (0.01–0.31)	0.16 (0.01–0.35)	0.14 (0.01–0.33)	0.38 (0.08–0.60)	0.14 (0–0.31)	0.03 (0–0.10)
<i>Atractosteus tropicus</i>	0.09 (0–0.30)	0.14 (0–0.46)	0.17 (0–0.56)	0.48 (0.03–0.87)	0.09 (0–0.26)	0.04 (0–0.15)
<i>Cathorops</i> spp.	0.08 (0–0.24)	0.05 (0–0.15)	0.31 (0–0.68)	0.50 (0.03–0.91)	0.04 (0–0.12)	0.02 (0–0.06)
<i>Centropomus undecimalis</i>	0.07 (0–0.22)	0.14 (0–0.48)	0.20 (0–0.70)	0.49 (0.02–0.89)	0.06 (0–0.20)	0.03 (0–0.12)

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
<i>Cincolichthys pearsei</i>	0.15 (0–0.48)	0.20 (0–0.55)	0.15 (0–0.43)	0.32 (0.02–0.69)	0.15 (0–0.42)	0.04 (0–0.14)
<i>Dorosoma anale</i>	0.13 (0–0.46)	0.31 (0–0.62)	0.12 (0–0.35)	0.18 (0.02–0.42)	0.24 (0–0.58)	0.02 (0–0.07)
<i>Dorosoma petenense</i>	0.21 (0–0.64)	0.14 (0–0.47)	0.17 (0–0.48)	0.29 (0.02–0.66)	0.17 (0–0.49)	0.02 (0–0.08)
<i>Gambusia sexradiata</i>	0.08 (0–0.26)	0.11 (0–0.35)	0.28 (0–0.67)	0.44 (0.02–0.87)	0.07 (0–0.20)	0.03 (0–0.10)
<i>Heterophallus echeagarayi</i>	0.22 (0–0.65)	0.14 (0–0.47)	0.17 (0–0.49)	0.28 (0.02–0.68)	0.16 (0–0.49)	0.02 (0–0.07)
<i>Ictalurus meridionalis</i>	0.13 (0–0.35)	0.13 (0–0.32)	0.11 (0–0.33)	0.47 (0.06–0.73)	0.12 (0–0.28)	0.04 (0–0.13)
<i>Ictiobus meridionalis</i>	0.16 (0–0.49)	0.13 (0–0.42)	0.19 (0–0.53)	0.38 (0.03–0.78)	0.12 (0–0.36)	0.02 (0–0.09)
<i>Maskaheros argenteus</i>	0.15 (0–0.40)	0.12 (0–0.31)	0.15 (0–0.42)	0.45 (0.05–0.72)	0.12 (0–0.29)	0.02 (0–0.09)
<i>Petenia splendida</i>	0.14 (0–0.43)	0.13 (0–0.41)	0.21 (0–0.58)	0.40 (0.02–0.82)	0.11 (0–0.33)	0.02 (0–0.09)
<i>Poecilia mexicana</i>	0.07 (0–0.24)	0.31 (0–0.83)	0.05 (0–0.14)	0.10 (0.01–0.22)	0.44 (0–0.87)	0.03 (0–0.15)
<i>Potamarius nelsoni</i>	0.18 (0–0.43)	0.10 (0–0.25)	0.14 (0–0.37)	0.44 (0.07–0.70)	0.12 (0–0.28)	0.04 (0–0.12)
<i>Pterygoplichthys disjunctivus</i>	0.25 (0–0.73)	0.17 (0–0.47)	0.14 (0–0.36)	0.18 (0.02–0.41)	0.26 (0–0.57)	0.02 (0–0.05)
<i>Pterygoplichthys pardalis</i>	0.32 (0–0.81)	0.12 (0–0.42)	0.11 (0–0.32)	0.15 (0.01–0.37)	0.27 (0–0.60)	0.02 (0–0.05)
<i>Strongylura hubbsi</i>	0.14 (0–0.41)	0.16 (0–0.47)	0.14 (0–0.44)	0.41 (0.03–0.78)	0.12 (0–0.35)	0.04 (0–0.17)
<i>Thorichthys helleri</i>	0.14 (0–0.37)	0.08 (0–0.22)	0.25 (0–0.58)	0.43 (0.03–0.80)	0.08 (0–0.22)	0.02 (0–0.06)
<i>Thorichthys pasionis</i>	0.18 (0–0.53)	0.18 (0–0.46)	0.11 (0–0.33)	0.30 (0.03–0.58)	0.20 (0–0.46)	0.03 (0–0.10)
<i>Trichromis salvini</i>	0.09 (0–0.29)	0.13 (0–0.43)	0.18 (0–0.62)	0.48 (0.03–0.86)	0.08 (0–0.25)	0.03 (0–0.11)
<i>Vieja bifasciata</i>	0.14 (0–0.45)	0.20 (0–0.56)	0.12 (0–0.37)	0.34 (0.03–0.71)	0.16 (0–0.45)	0.05 (0–0.22)
<i>Vieja melanurus</i>	0.18 (0–0.55)	0.16 (0–0.47)	0.12 (0–0.37)	0.33 (0.02–0.69)	0.17 (0–0.47)	0.03 (0–0.13)
Lower zone						
<i>Aplodinotus grunniens</i>	0.02 (0–0.07)	0.03 (0–0.08)	0.03 (0–0.09)	0.89 (0.77–0.95)	0.02 (0–0.05)	0.02 (0–0.05)
<i>Brycon guatemalensis</i>	0.04 (0–0.17)	0.04 (0–0.13)	0.05 (0–0.23)	0.81 (0.46–0.98)	0.03 (0–0.12)	0.04 (0–0.15)
<i>Cathorops</i> spp.	0.02 (0–0.07)	0.12 (0–0.42)	0.03 (0–0.11)	0.79 (0.34–0.98)	0.02 (0–0.07)	0.03 (0–0.10)
<i>Centropomus parallelus</i>	0.03 (0–0.12)	0.07 (0–0.31)	0.04 (0–0.16)	0.78 (0.35–0.98)	0.03 (0–0.10)	0.05 (0–0.24)
<i>Cribroheros robertsoni</i>	0.03 (0–0.16)	0.02 (0–0.07)	0.04 (0–0.20)	0.86 (0.51–0.98)	0.03 (0–0.13)	0.02 (0–0.06)
<i>Centropomus undecimalis</i>	0.03 (0–0.13)	0.11 (0–0.42)	0.04 (0–0.14)	0.71 (0.24–0.97)	0.03 (0–0.10)	0.09 (0–0.38)
<i>Dorosoma anale</i>	0.04 (0–0.17)	0.02 (0–0.09)	0.05 (0–0.22)	0.84 (0.52–0.98)	0.03 (0–0.12)	0.03 (0–0.09)
<i>Diapterus auratus</i>	0.03 (0–0.14)	0.04 (0–0.14)	0.04 (0–0.17)	0.84 (0.46–0.98)	0.02 (0–0.10)	0.03 (0–0.13)
<i>Dorosoma petenense</i>	0.02 (0–0.08)	0.02 (0–0.06)	0.03 (0–0.11)	0.91 (0.71–0.99)	0.02 (0–0.06)	0.01 (0–0.05)
<i>Eucinostomus melanopterus</i>	0.03 (0–0.12)	0.05 (0–0.19)	0.04 (0–0.16)	0.82 (0.48–0.98)	0.02 (0–0.10)	0.05 (0–0.17)
<i>Gobiomorus dormitor</i>	0.04 (0–0.15)	0.05 (0–0.21)	0.05 (0–0.19)	0.79 (0.38–0.98)	0.03 (0–0.11)	0.05 (0–0.20)
<i>Heterophallus echeagarayi</i>	0.07 (0–0.27)	0.05 (0–0.16)	0.09 (0–0.32)	0.66 (0.35–0.88)	0.04 (0–0.16)	0.10 (0–0.21)
<i>Ictalurus meridionalis</i>	0.02 (0–0.09)	0.02 (0–0.07)	0.03 (0–0.12)	0.90 (0.67–0.99)	0.02 (0–0.08)	0.02 (0–0.06)
<i>Mayaheros urophthalmus</i>	0.04 (0–0.16)	0.03 (0–0.10)	0.04 (0–0.20)	0.84 (0.48–0.98)	0.03 (0–0.13)	0.02 (0–0.08)
<i>Oscura heterospila</i>	0.03 (0–0.15)	0.03 (0–0.11)	0.04 (0–0.18)	0.85 (0.48–0.98)	0.03 (0–0.11)	0.02 (0–0.08)
<i>Oreochromis niloticus</i>	0.03 (0–0.12)	0.02 (0–0.09)	0.04 (0–0.16)	0.87 (0.57–0.98)	0.02 (0–0.09)	0.02 (0–0.06)
<i>Parachromis friedrichsthalii</i>	0.03 (0–0.12)	0.03 (0–0.12)	0.04 (0–0.18)	0.86 (0.46–0.98)	0.02 (0–0.10)	0.02 (0–0.06)
<i>Potamarius nelsoni</i>	0.03 (0–0.13)	0.03 (0–0.11)	0.04 (0–0.17)	0.86 (0.53–0.98)	0.02 (0–0.10)	0.02 (0–0.09)
<i>Pterygoplichthys pardalis</i>	0.02 (0–0.10)	0.02 (0–0.07)	0.03 (0–0.15)	0.89 (0.60–0.99)	0.02 (0–0.10)	0.01 (0–0.04)
<i>Petenia splendida</i>	0.03 (0–0.15)	0.03 (0–0.12)	0.04 (0–0.18)	0.84 (0.45–0.98)	0.03 (0–0.11)	0.03 (0–0.11)
<i>Potamarius usumacintae</i>	0.02 (0–0.08)	0.02 (0–0.10)	0.02 (0–0.09)	0.90 (0.67–0.99)	0.02 (0–0.06)	0.02 (0–0.07)

	Filamentous algae	Seston	Periphyton	Aquatic macrophytes	Riparian C ₃ plants	C ₄ plants
<i>Sciades felis</i>	0.03 (0–0.13)	0.15 (0–0.49)	0.04 (0–0.14)	0.60 (0.21–0.97)	0.03 (0–0.11)	0.16 (0–0.49)
<i>Strongylura hubbsi</i>	0.02 (0–0.09)	0.04 (0–0.20)	0.03 (0–0.11)	0.87 (0.48–0.98)	0.02 (0–0.08)	0.02 (0–0.09)
<i>Thorichthys helleri</i>	0.03 (0–0.13)	0.02 (0–0.07)	0.04 (0–0.18)	0.87 (0.61–0.98)	0.02 (0–0.10)	0.02 (0–0.06)
<i>Trichromis salvini</i>	0.02 (0–0.11)	0.02 (0–0.08)	0.03 (0–0.14)	0.88 (0.57–0.98)	0.02 (0–0.09)	0.02 (0–0.07)