Supplementary Material

Table S1: Environmental variables for the 43 ponds from Atlantic Forest. Communities with more than one species and more than one individual per species for each population are selected to perform T-statistic (♦). Classification of amount of aquatic vegetation 1 = low; 2 = medium; 3 = high. The sequence of substrate type indicates their predominance in descending order. Abbreviations: BER = Bertioga; ITA = Itanhaém; JUR = Jureia/Iguape; UPI = Ubatuba/Picinguaba; Lat = latitude; Long = longitude; SR = species richness; AB = abundance; NSM = number of species measured; TNIM = total number of individuals measured; MNIMS = minimal number of individuals measured by species; WAD = water depth; LG = length; WD = width; AAV = amount of aquatic vegetation; CC = canopy cover.

Site	Lat	Long	SR	AB	NSM	TNSM	MNIMS	WAD (m)	LG (m)	WD (m)	AAV	CC (%)	Substrate type
BER2 ♦	-23.7433	-45.8655	4	396	4	23	2	1.5	172.0	52.1	3	0	sand = mud > boulders
BER3 ♦	-23.740	-45.7673	4	175	3	11	2	1.1	110.2	6.2	3	0	sand = mud > leaf litter
BER4	-23.7438	-45.7634	2	2415	1	7	7	1.1	20.0	8.0	3	54	sand = mud > leaf litter
BER6	-23.7355	-45.9312	11	199	5	16	1	1.2	30.0	8.0	3	69	sand > mud > boulders = leaf litter
BER7	-23.7544	-45.9265	4	312	1	7	7	1.1	16.0	16.0	3	64	mud > sand > leaf litter
BER9	-23.762	-45.9163	7	95	3	11	1	1.6	100.0	3.5	3	33	mud > sand > leaf litter
BER10	-23.7265	-45.7528	10	510	4	16	1	0.4	50.0	20.0	3	0	sand = mud > leaf litter
BER11 ♦	-23.7336	-45.7476	5	443	2	18	8	1.1	50.0	10.0	3	78	sand = mud > leaf litter
BER12	-23.7362	-45.7471	5	622	2	7	1	0.6	50.0	30.0	3	0	sand = mud
ITA1	-24.1986	-46.9394	12	770	6	32	1	0.3	69.0	2.5	3	0	sand = mud = leaf litter > cobbles = gravel
ITA2	-24.2173	-46.8946	2	371	1	8	8	0.4	65.0	90.0	3	0	leaf litter > sand = mud
ITA3	-24.2249	-46.8944	1	137	1	8	8	1.5	118.0	35.0	3	0	sand = mud = leaf litter > cobbles = gravel
ITA4	-24.2341	-46.9264	2	4	1	2	2	0.5	30.0	2.5	3	81	mud = leaf litter
ITA5	-24.2407	-46.9144	6	122	4	15	1	0.3	49.0	7.8	3	0	mud > sand > boulders

Table S1: Continued.

Site	Lat	Long	SR	AB	NSM	TNSM	MNIMS	WAD (m)	LG (m)	WD (m)	AAG	CC (%)	Substrate type
ITA6	-24.2412	-46.9313	1	313	1	2	2	0.6	14.8	4.6	3	51	sand > mud = leaf litter
ITA7	-24.2463	-46.9311	3	357	2	8	1	2.0	195.0	16.0	3	0	sand = mud
ITA8	-24.2326	-46.9265	1	246	1	7	7	1.6	14.3	8.2	3	70	mud > leaf litter
JUR1	-24.4444	-47.0903	11	1141	5	16	1	1.0	50.0	41.3	3	65	leaf litter > sand = mud
JUR2	-24.4621	-47.1104	11	772	6	27	1	0.8	50.0	9.3	3	74	mud = leaf litter > sand
JUR3	-24.4747	-47.1266	2	30	1	6	6	4.0	50.0	14.2	3	0	sand = mud
JUR4 ♦	-24.5338	-47.2039	6	1108	4	22	2	1.0	95.0	12.0	3	0	sand = mud > leaf litter
JUR6	-24.5728	-47.2478	4	513	1	8	8	0.7	51.2	22.1	3	43	mud > sand > boulders = leaf litter
UPI1 ♦	-23.3701	-44.8170	6	94	3	16	3	0.3	13.77	6.4	1	78.4	mud > leaf litter > boulders = clay
UPI2	-23.3591	-44.8336	12	2084	9	51	1	0.5	115.3	48.0	2	8.4	mud > leaf litter
UPI3	-23.3607	-44.8335	3	23	1	4	4	0.7	12	23.4	2	64.9	mud > leaf litter > sand = boulders
UPI4 ♦	-23.3556	-44.8158	3	15	2	12	2	0.2	1.56	1.0	1	0	clay = mud = leaf litter
UPI5	-23.3459	-44.8483	8	2243	8	59	1	0.3	11.69	5.3	1	74.15	mud = leaf litter > sand
UPI6 ♦	-23.3571	-44.8508	5	144	2	15	5	0.3	3.62	0.8	1	74.15	mud > sand = leaf litter > clay
UPI7	-23.3640	-44.8265	1	15	1	10	10	0.6	7.8	4.2	2	95.8	mud > leaf litter

Table S1: Continued.

Site	Lat	Long	SR	AB	NSM	TNSM	MNIMS	WAD (m)	LG (m)	WD (m)	AAG	CC (%)	Substrate type
UPI8	-23.3633	-44.8214	1	207	1	19	19	0.6	17.7	3.2	2	95.3	mud > leaf litter > gravel = sand
UPI9	-23.3583	-44.8172	1	42	1	18	2	0.2	10.9	6.9	2	86.1	mud > leaf litter
UPI10	-23.3769	-44.8185	1	32	1	18	18	0.9	13.8	3.8	1	91.9	mud > leaf litter > sand
UPI11	-23.3628	-44.8249	1	1	1	1	1	0.2	13.6	2.4	1	97.5	mud = leaf litter > sand
UPI12	-23.3538	-44.8149	3	82	1	8	8	0.8	7.06	3.0	1	96.1	mud > clay = leaf litter
UPI13 ♦	-23.3588	-44.8335	12	6322	9	65	5	0.4	17.2	7.1	2	0	mud = leaf litter > sand
UPI14	-23.3522	-44.8533	3	176	1	3	3	0.5	50.0	50.0	3	40	mud > leaf litter
UPI15 ♦	-23.3602	-44.8498	5	2994	4	32	7	1.3	180.0	6.5	3	58	mud > leaf litter > boulders = gravel = sand
UPI16	-23.3589	-44.8507	8	262	4	10	1	0.6	18.0	5.1	3	69	sand = mud = leaf litter > boulders = gravel
UPI17	-23.3593	-44.8327	2	2290	1	3	3	0.1	6.9	8.5	3	0	mud > sand
UPI18	-23.3563	-44.8266	4	8	1	5	5	0.6	100.0	2.7	3	72	leaf litter > sand
UPI19 ♦	-23.3447	-44.8542	4	312	2	9	4	2.0	180.0	17.2	3	37	mud > sand
UPI20	-23.3644	-44.8324	5	303	4	26	1	0.5	80.0	50.0	3	0	sand = mud
UPI21 ♦	-23.3564	-44.8536	4	250	4	17	2	0.3	40.0	20.0	3	82	leaf litter > sand

Table S2: Larval anuran species found in 43 ponds in the Atlantic Rain Forest lowlands (São Paulo state, Brazil). Number of individuals net-caught (all development stages, SISBIOTA project) and measured (development stages 27- 37) individuals. Taxonomy and nomenclature follow Frost (2018).

Family	Species	N of net-caught individuals	N of measured individuals
Bufonidae	*Rhynella ornata*	3039	36
Hylidae	*Aplastodiscus eugenioi*	43	63
	Dendropsophus berthalutzae	33	18
	Dendropsophus elegans	230	42
	*Dendropsophus gisleris**	3	3
	Dendropsophus microps	18	6
	Dendropsophus minutus	165	10
	Dendropsophus werneri	72	14
	Boana albomarginata	3477	97
	Boana faber	1505	15
	Boana semilineata	3176	29
	Itapothyla langsdorffii	3159	16
	Scinax argyreornatus	349	23
	Scinax hayii	452	27
	*Scinax littoralis**	125	1
	Scinax perereca	124	15
	*Scinax perpusillus**	1	0
	Scinax trapicheiroi	450	49
	Scinax tymbamirim	1078	119
	Trachycephalus mesophaeus	444	19
Leptodactylidae	*Leptodactylus latrans*	9272	20
	Physalaemus atlanticus	45	46
	*Physalaemus cuvieri**	1	0
Microhylidae	*Chiasmocleis carvalhoi**	9	2
	Elachistocleis bicolor	26	13

***** *not included in the statistical analysis*

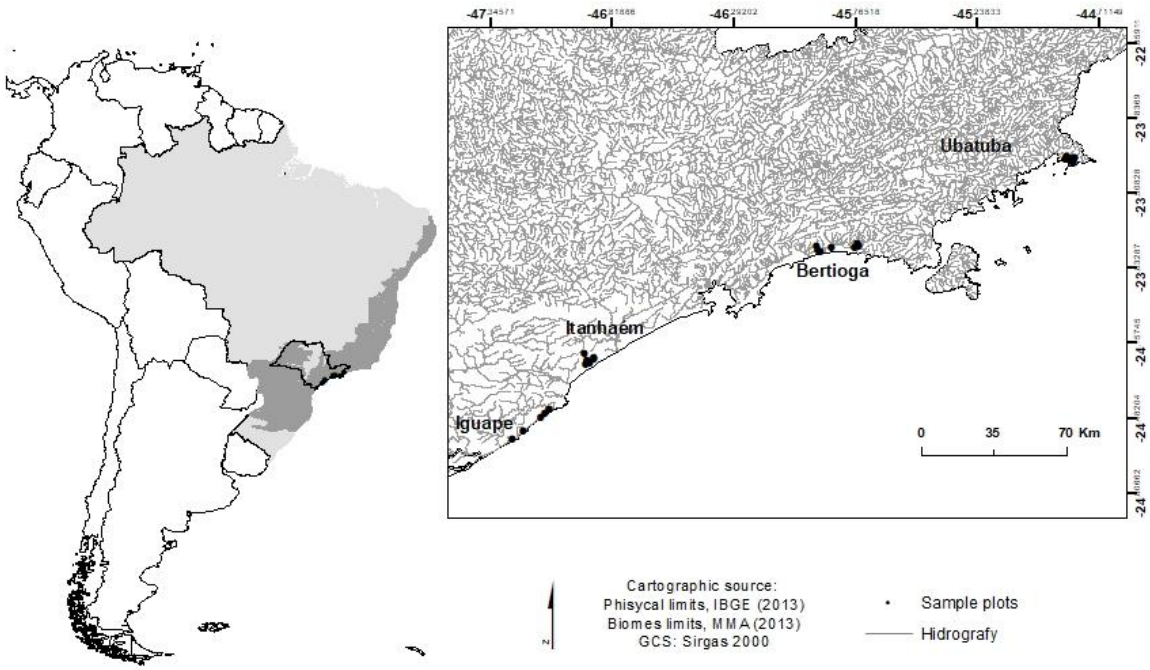

Figure S1: Geographical distribution of the 43 ponds in Atlantic Forest, sampled in four localities (Bertioga, Iguape, Itanhaém, and Ubatuba), in São Paulo state, Brazil

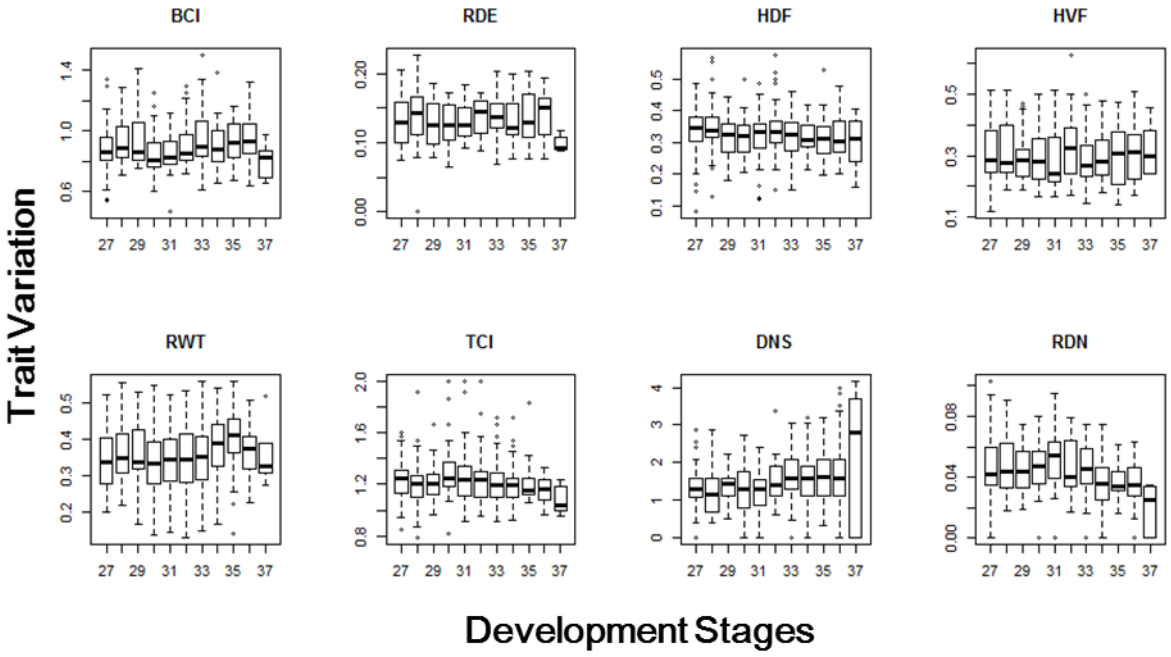

Fig S2: Variance of tadpoles traits (BCI = Body compression index; RDE = Relative diameter of the eyes; HDF= Relative height of the dorsal fin; HVF = Relative height of the ventral fin; RWT = Relative width of the tail; TCI = Tail compression index; DNS = Distance from nares to snout; RDN = Relative diameter of the nares) according to development stages, considering all species together.

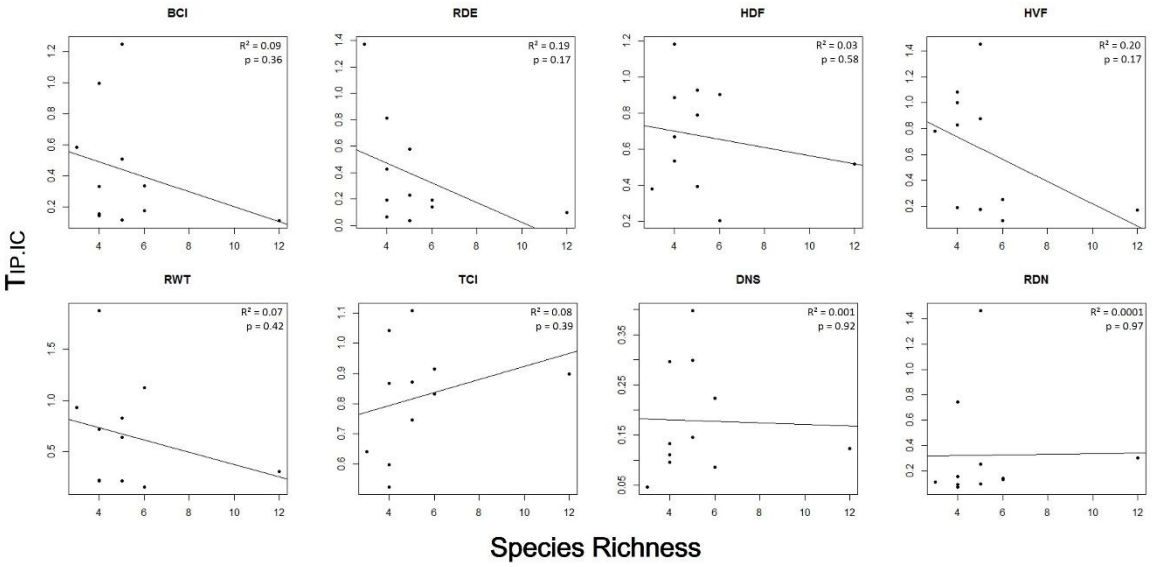

Figure S3: Relationship between $T_{IP.IC}$ and species richness in 11 ponds, for each tadpole trait (BCI = Body compression index; RDE = Relative diameter of the eyes; HDF= Relative height of the dorsal fin; HVF = Relative height of the ventral fin; RWT = Relative width of the tail; TCI = Tail compression index; DNS = Distance from nares to snout; RDN = Relative diameter of the nares).

Supplementary – Amazonia dataset

We sampled tadpoles communities in three different localities (Iranduba, Manaus, and Presidente Figueredo cities) in Amazonas state, Northern Brazil. Tadpoles from the Amazon Forest were deposited in “Paulo Bührnheim” collection from the Universidade Federal do Amazonas (CZPB collection - UFAM), Manaus, Amazonas, Brazil. From that collection, we randomly selected and measured, from 1 to 10 individuals (depending on availability) in the developmental stages 33-37 (Gosner 1960), for each species occurring in each pond. In the total, we measured traits of 60 tadpoles from 13 species (Table S3), found in 31 ponds.

For single-trait analysis the tail compression index (TCI) showed a high contribution of intraspecific variability (>85%) while for all remaining traits the contribution of intraspecific variability to total trait variation was low (<25%, Table S4). For multi-trait analysis, the trait variability within-species was mainly structured by a first axis (56% of variation) driven by tail compressed index (TCI), and by a second axis (13% of variation) driven by the height of dorsal fin (Fig. S4a). Between species, the trait variability was structured by a first axis (62% of variance) driven by relative width of the tail (RWT), distance from nares to snout (DNS), height of ventral fin (HVF), relative diameter of the nares (RDN), and diameter of eyes (RDE), and a second axis (17% of variation) driven by body compression index (BCI) and height of dorsal fin (HDF; Fig. S4b).

Table S3: Larval anuran species found in 31 ponds in Central Amazon (Amazonas state, Brazil). Numbers of net-caught in project SISBIOTA (all stages of development) and measured (33 to 37 development stages) individuals. Taxonomy and nomenclature follow Frost (2018).

Family	Species	N of net-caught individuals	N of measured individuals
Aromobatidae	*Allobates femoralis**	1	0
	Allobates sumtuosus	533	30
Bufonidae	*Amazophrynella manaos*	11	3
	*Rhinella proboscidea**	22	1
Dendrobatidae	*Ameerega hahneli**	2	0
Hylidae	*Boana cinerascens**	1	1
	Boana fasciata	37	4
	*Boana raniceps**	3	1
	Dendropsophus brevifrons	4	2
	Dendropsophus walfordi	27	9
	Osteocephalus taurinus	7	2
	*Phyllomedusa bicolor**	26	1
	*Sphaenorhynchus carneus**	1	1
Leptodactylidae	*Leptodactylus rhodomystax*	24	3
Microhylidae	*Chiasmocleis hudsoni*	2	2

***** *not included in the statistical analysis*

Table S4: Decomposition of tadpole trait from Amazon in intra- and interspecific components. Relative proportions of variance are given for each of eight tadpole traits separately (after a re-sampling procedure), an average across traits (single-trait analysis), and for all traits together (multi-traits analysis). Square brackets represent the 95% confidence intervals from the resampling procedure. The largest (intra- or interspecific) component is in bold.

Functional traits	**Amazon**	
	Intraspecific variability	**Interspecific variability**
Body compression index	0.250 [0.246 - 0.253]	**0.750 [0.747 - 0.754]**
Relative diameter of the eyes	0.095 [0.088 - 0.101]	**0.905 [0.899 - 0.911]**
Relative height of the dorsal fin	0.165 [0.163 - 0.166]	**0.835 [0.833 - 0.837]**
Relative height of the ventral fin	0.231 [0.230 - 0.233]	**0.768 [0.767 - 0.769]**
Relative width of the tail	0.017 [0.017 - 0.018]	**0.982 [0.982 - 0.984]**
Tail compression index	**0.868 [0.859 - 0.877]**	0.131 [0.122 - 0.140]
Distance from nares to snout	0.077 [0.072 - 0.082]	**0.923 [0.917 - 0.928]**
Relative diameter of the nares	0.136 [0.133 - 0.139]	**0.864 [0.860 - 0.867]**
Average of single-trait analysis	0.229 [0.226 - 0.234]	0.769 [0.766 - 0.773]
Average of multi-trait analysis	0.154 [0.153 - 0.155]	0.847 [0.845 - 0.848]

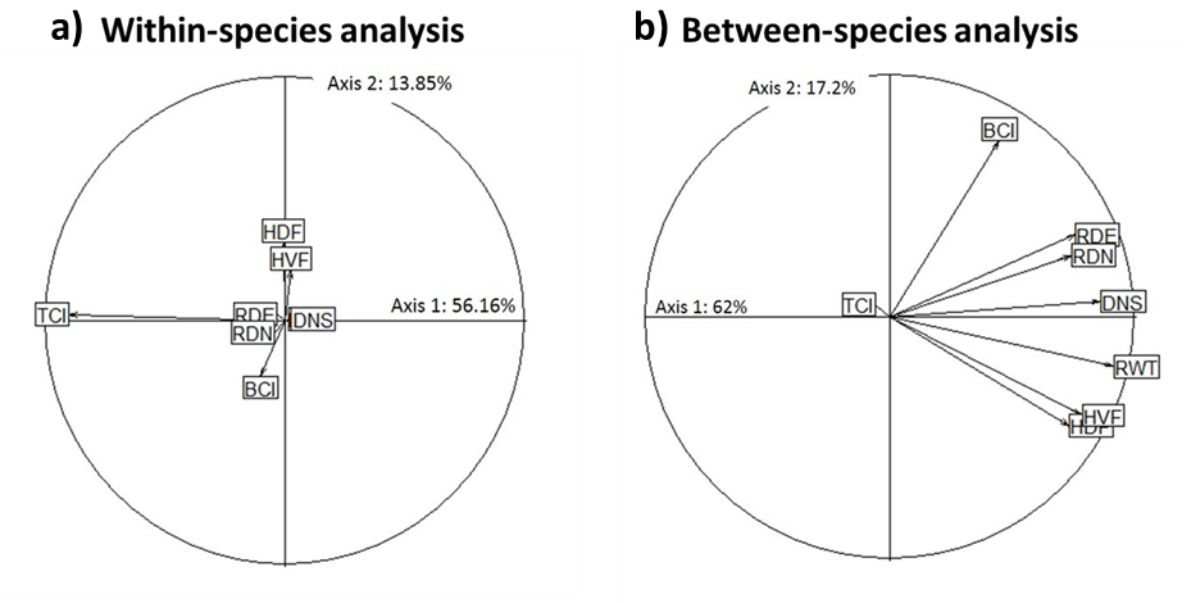

Figure S4: Correlation circles regarding the first two axes of (a) within-species and (b) between-species PCA on functional traits for tadpoles communities from Amazon. Abbreviations: BCI = Body compression index; RDE = Relative diameter of the eyes; HDF= Relative height of the dorsal fin; HVF = Relative height of the ventral fin; RWT = Relative width of the tail; TCI = Tail compression index; DNS = Distance from nares to snout; RDN = Relative diameter of the nares.

Literature cited

Frost, D. R. (2018) Amphibian Species of the World: an online reference. Version 6.0 (Date of access). Electronic Database accessible at http://research.amnh.org/herpetology/amphibia/index.html. American Museum of Natural History, New York, USA.