A LITERATURE REVIEW AND FIELD TEST ON THE ROLE OF BAIT TYPE ON CAPTURE SUCCESS OF ARBOREAL SMALL MAMMALS

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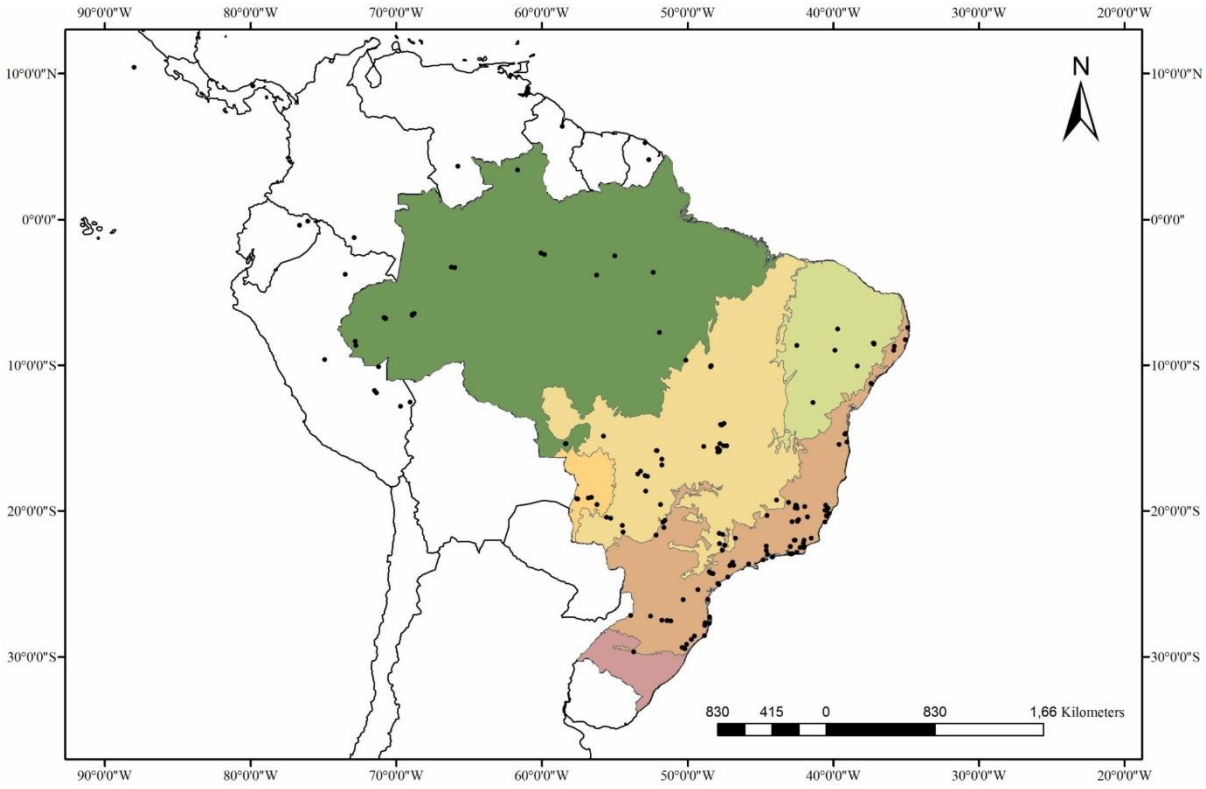
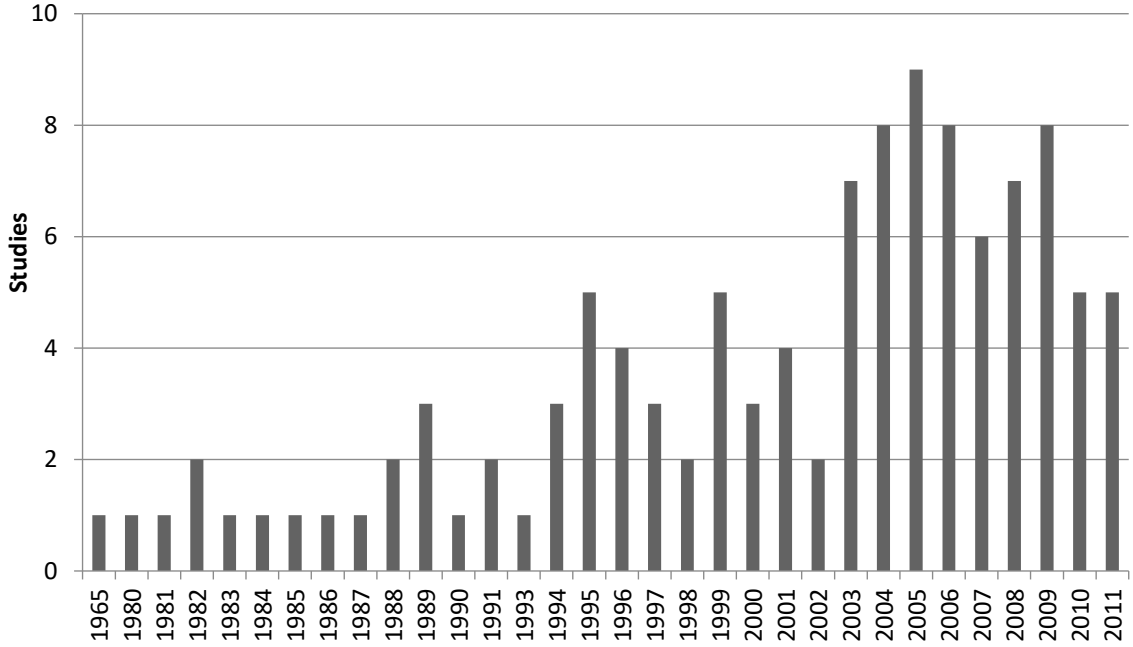
Supplementary material - A

Geographic distribution of the studies evaluated in the literature review (black spots). Colored areas sign the main Brazilian biomes.



Number of studies per year regarding the ecology of small mammals. During 1966-1979 and in 1992 years we did not find any report.



Studies developed in Brazil on small mammals, the respective baits and traps used, and strata sampled. * Reference numbering for the location on the map with the locations where the studies were developed, presented in Annex V. AM - amazônia; CA - caatinga; EC - closed; PA - pantanal; MA - Atlantic Forest; Af - photographic traps; Ag - galvanized wire traps; Hv - traps of the havahart type; Mv - movart; Ni - not informed by the authors; Pt - pitfalls; Sh - shermans; St - snap traps; Tw - Tomahawks; Yn-young; (1) - traps placed on the ground; (2) - sub-forest; (3) canopy. Studies that used canopy traps for specific sampling of arboreal species are highlighted in bold. The full references of the studies consulted are presented at the end of the Annex.

Study	#	Biome	Bait items																								Traps	Forest strata
			Banana	Pineapple	Orange	Papaya	Mango	Sweet potato	Pumpkin	Manioc	Peanut	Brazil nuts	Cocoa	Coconut	Bacon	Meat	Cod liver oil	Vanilla	Oil	Animal food	Sardine	Corn	Oat	Seeds	Corn meal	Raisins	Honey		
Alho 1981	1	CE									X																	Ag	1
Alho & Souza 1982	2	CE	X								X																	Ni	Ni
Alho & Pereira 1985	3										X													X				Ag	1
Alho *et al.* 1986	4	CE									X													X				Ag	1
Antunes et al 2010	5	MA	X								X																	Ag	1,2
Asfora & Pontes 2009	6	MA		X							X																	Ag	1,2
Astúa de Moraes *et al.* 2006	7	MA									X				X													Sh, Tw	1,2
Barnett & Cunha 1994	8	AM	X				X														X		X					St	1, 2
Barros-Battesti *et al.* 2000	9	MA													X							X						Ag	1
Bergallo 1994	10	MA	X							X	X																	Ag	1
Bergallo 1996	11	MA	X							X	X																	Ag	1
Bergallo & Magnusson 1999	12	MA	X							X	X																	Ni	1
Bittencourt & Rocha 2003	13	MA	X																									Sh, Yn	1
Briani *et al.* 2001	14	MA	X							X	X						X						X		X			Ag, Sh	1
Briani *et al.* 2004	15	CE	X								X										X	X						Sh	1
Bonecker *et al.* 2009	16	MA	X								X				X								X					Sh, Tw	1
Bonvicino *et al.* 1997	17	MA	X								X											X		X				Ag, Sh, St, Tw	1
Bonvicino *et al.* 2005	18	CE	X								X				X								X					Sh, Tw	1
Borchert & Hansen 1983	19	CE									X																	Sh	1
Cáceres *et al.* 2008	20	CE - MA							X						X		X											Ag, Pt, Sh	1
Cáceres *et al.* 2011	21	CE							X		X				X		X											Ag, Pt, Sh	1, 2
Cáceres *et al.* 2011	22	PA	X												X		X											Ag, Pt, Sh	1
Cáceres & Monteiro-Filho 1998	23	MA	X								X						X											Ag	1
Cademartori *et al.* 2004	24	MA	X								X											X						Tw	1
Caldara & Leite 2007	25	MA		X							X												X					Mv	1, 2
Câmara & Lessa 1994	26	CE		X	X												X											Mv	1, 2
Carvalho 1965	27	MA								X	X											X						Ag	1
Cerqueira *et al.* 1990	28	MA	X					X		X	X				X							X						Ag	1
Cerqueira *et al.* 1993	29	MA	X							X	X				X							X						Ag	1
Cherem 2005	30	MA	X								X				X							X						Sh, Tw	1, 2
Cherem & Perez 1996	31	MA	X	X	X	X					X					X						X						Ag	1, 2
Dalmagro & Vieira 2005	32	MA	X								X						X	X				X						Ag, Sh	1
D'Andrea *et al.* 1999	33	MA	X							X	X				X								X					Ag	1
D'Andrea *et al.* 2007	34	MA	X							X	X				X								X					Ag	1
Emmons 1984	35	AM	X																									Ag	1
Feliciano *et al.* 2002	36	MA	X	X						X	X				X		X						X					Sh	1
Freitas *et al.* 2005	37	CA	X								X																	Hv, Sh, Tw	1, 2
Fonseca & Kierulff 1989	38	MA		X													X						X					Sh, Tw	1, 2
Geise *et al.* 2004	39	MA	X							X	X																	Sh	1, 2
Geise & Pereira 2008	40	MA	X								X		X															Sh, Tw	1, 2
Geise *et al.* 2010	41		X							X	X																	Sh, Tw	1, 2
Gentile & Fernandez 1999	42	MA	X							X	X				X								X					Ag	1
George *et al.* 1988	43	AM	X			X					X												X					Ag	Ni
Gheler-Costa *et al.* 2002	44	MA	X								X																	Ag	1
Gomes *et al.* 2003	45	MA	X								X				X								X					Ag, Sh, Tw	1
Goulart *et al.* 2006	46	MA	X								X																	Yn	1, 2
Graipel 2003	47	MA	X								X																	Ag	1, 2, 3
Graipel *et al.* 2003	48	MA	X								X																	Ag	1, 2
Graipel & Santos-Filho 2006	49	MA													X													Yn	1
Grelle 2003	50	MA		X													X						X					Ag	1, 2, 3
Hannibal & Caceres 2010	51	CE	X						X						X		X											Ag, Sh	1, 2, 3
Henriques *et al.* 2006	52	CE	X								X										X	X	X					Sh	1

Herrera et al 2005	53	CA	X								X			X									X				Sh, Tw	1
Lacher & Alho 1989	54	CE									X														X			Ni	1
Lacher & Alho 2001	55	AM									X											X						Ag, Sh	1
Lambert *et al.* 2005	56	AM	X								X												X					Sh, Tw	1, 2
Leiner & Silva 2007	57	MA	X								X			X									X					Sh	1, 2
Leite *et al.* 1996	58	MA	X												X								X					Ag, Sh	1, 2, 3
Lima *et al.* 2010	59	MA						X						X						X								Ag, Pt	1
Lyra-Jorge & Pivello 2001	60	CE							X		X								X	X		X						Ag, Pt	1
Macedo *et al.* 2007	61	MA	X								X			X									X					Sh, Tw	1, 2, 3
Magnusson *et al.* 1995	62	AM - CE									X	X											X					Sh	1
Malcolm 1988	63	AM	X								X																	Sh, Tw	1, 2
Malcolm 1991	64	AM	X								X																	Sh, Tw	1, 2, 3
Malcolm 1997	65	AM	X								X																	Sh, Tw	1, 2, 3
Mares & Ernest 1995	66	CE		X							X	X											X					Sh, Tw	1, 2
Melo 1980	67	CE	X			X		X	X	X												X						Yn	1
Melo *et al.* 2011	68	MA							X		X			X														Ag, Pt, Sh	1, 2
Modesto *et al.* 2008	69	MA	X								X						X		X						X			Pt, Sh, Tw	1, 2
Moraes *et al.* 2003	70	MA	X							X	X																	Sh	1
Moraes Jr. & Chiarello 2005	71	MA	X												X													Ag	1, 2
Moreira *et al.* 2009	72	MA	X																		X	X						Sh, Tw	1
Nitikman & Mares 1987	73	CE									X												X					Sh	1, 2
Olifiers *et al.* 2007	74	MA	X								X			X									X					Sh, Tw	1, 2, 3
Oliveira-Santos *et al.* 2008	75	MA	X								X																	AF	2
Olmos 1991	76	MA	X							X	X																	Ni	1
Paglia *et al.* 1995	77	MA	X												X							X	X					Ag , Sh	1, 2
Pardini 2004	78	MA	X								X										X		X		X			Pt, Sh	1, 2
Pardini & Umetsu 2006	79	MA	X								X										X				X			Pt, Sh	1, 2
Passamani 1995	80	MA	X												X													Ag	1, 2, 3
Passamani 2004	81	CE	X							X	X				X								X		X			Ag , Pt, Sh	1, 2
Passamani *et al.* 2000	82	MA	X	X							X				X	X												Ag	1, 2
Passamani *et al.* 2005	83	MA	X												X													Ag , Sh	1, 2, 3
Passamani & Ribeiro 2009	84	MA	X												X													Ag , Sh	1, 2
Passamani & Fernandez 2011	85	MA	X												X													Ag , Sh	1, 2, 3
Patton *et al.* 2000	86	AM	X								X						X						X				X	Sh, Tw	1, 3
Pedó *et al.* 2010	87	MA								X	X										X	X		X			X	Ag	1
Pereira & Geise 2009	88	CA	X							X	X																	Pt, Sh, Tw	1, 2
Pinheiro & Geise 2008	89	MA	X							X	X				X													Sh, Tw	1, 2
Pinto *et al.* 2009	90	MA	X																									Ag, Sh	1, 2
Prevedello *et al.* 2009	91	MA	X												X							X						Ag	1, 2
Püttker *et al.* 2008	92	MA	X								X										X		X					Sh	1, 2
Rademaker *et al.* 2009	93	PA	X								X				X								X					Sh, Tw	1, 2
Ribeiro & Marinho-Filho 2005	94	CE	X								X										X				X			Sh	1
Rocha *et al.* 2011	95	CE		X							X																	Pt, Sh, Tw	1, 2
Santos-Filho *et al.* 2006	96	CE	X								X																	Pt, Sh, St, Tw	1, 2
Santos-Filho *et al.* 2008	97	CE - AM	X								X																	Pt, Sh, St, Tw	1, 2
Sousa & Gonçalves 2004	98	MA									X										X							Pt, Sh	1
Stallings 1989	99	MA		X											X								X					Ag , Sh	1, 2, 3
Stevens & Husband 1998	100	MA																	X			X	X			X		Sh, Tw	1, 2
Streilen 1982	101	CA		X							X	X										X						Ag, Sh	1
Talamoni & Dias 1999	102	CE	X		X						X																	Ag	1
Umetsu *et al.* 2006	103	MA	X								X										X		X		X			Pt, Sh	1, 2
Umetsu & Pardini 2007	104	MA	X								X										X	X						Sh	1, 2
Vera y Conde & Rocha 2006	105	MA	X																									Mv, Sh	1, 2
Vieira & Baumgarten 1995	106	CE									X										X	X						Ag	1
Vieira & Monteiro-Filho 2003	107	MA	X								X				X	X						X						Ag, Sh	1, 2, 3
Vieira *et al.* 2004	108	CE, MA	X	X				X		X	X				X	X							X					Ni	1, 2
Vieira 1997	109	CE	X					X																				Tw	1
Vieira 1999	110	CE									X											X						Ag	1
Viveiros de Castro & Fernandes 2004	111	MA	X							X	X				X								X					Sh, Tw	1, 2, 3
Voss & Emmons 1996	112	AM	X																									Tw	1, 2
Voss *et al.* 2001	113	AM	X											X														Pt, Sh, Tw	1, 2
Total			**81**	**13**	**3**	**2**	**1**	**3**	**5**	**22**	**84**	**3**	**1**	**1**	**27**	**2**	**24**	**2**	**2**	**2**	**16**	**23**	**34**	**5**	**7**	**1**	**2**		

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Supplementary material - B

Number of studies per biome in Brazil, mean ± SE of food items used as baits (Baits), classification according to main subject areas (Ecol – Ecological studies; Surv – Faunal surveys), application of methodological tests (MT); use of complementary sampling methods (CM), and use of traps for arboreal small mammals (Can).

	Total	Baits	Ecol.	Surv.	MT	CM	Can.
Amazônia	13	2.58 ± 1.24	8	5	0	2	3
Caatinga	5	3.2 ± 0.84	2	3	0	1	0
Cerrado	27	3.26 ± 1.68	19	5	3	7	1
Mata Atlântica	69	3.49 ± 1.51	49	16	4	9	11
Pantanal	2	-	2	0	0	1	0
Total	113	3.32 ± 1.51	80*	29*	7*	20**	15

* one of the studies comprised two biomes, so it was counted twice.
** two studies were developed at two biomes, thus we counted both twice.

Quantitative data concerning Ecological and Fauna Survey studies. D – Duration; F/y – Field trips per year; S – Success; E – Sampling effort (trap*nights); SD – Standard deviation.

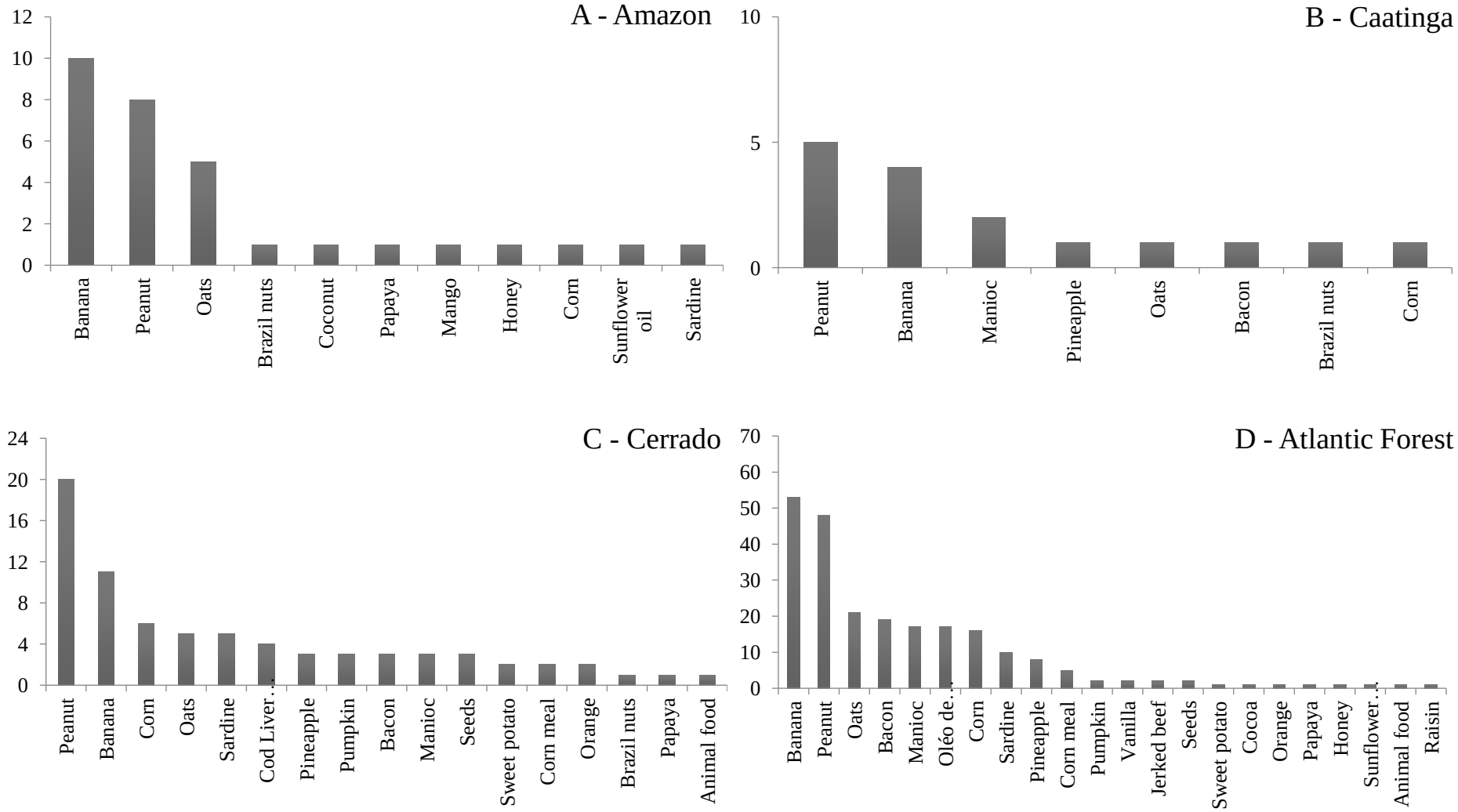
	Ecological Studies				Fauna Surveys			
	D	F/y	S	E	D	F/y	S	E
Mean	19.5	9.3	7.12%	12,287	9.8	4.3	5.42%	7,423
SD	16.9	5.8	6.94%	13,740	11.6	3.5	4.37%	11,246
Maximum	82	48	39.05%	57,120	48	12	20.32%	46,000
Minimum	1	2	0.44%	880	1	1	0.37%	616

Small mammal studies per Brazilian biomes from 1965 to 2011 that only used peanut (P), only banana (B) or that used both baits (PB); SampE – Mean ± SE sampling effort (total trap-nights); CS - capture success (number of studies/SampE).

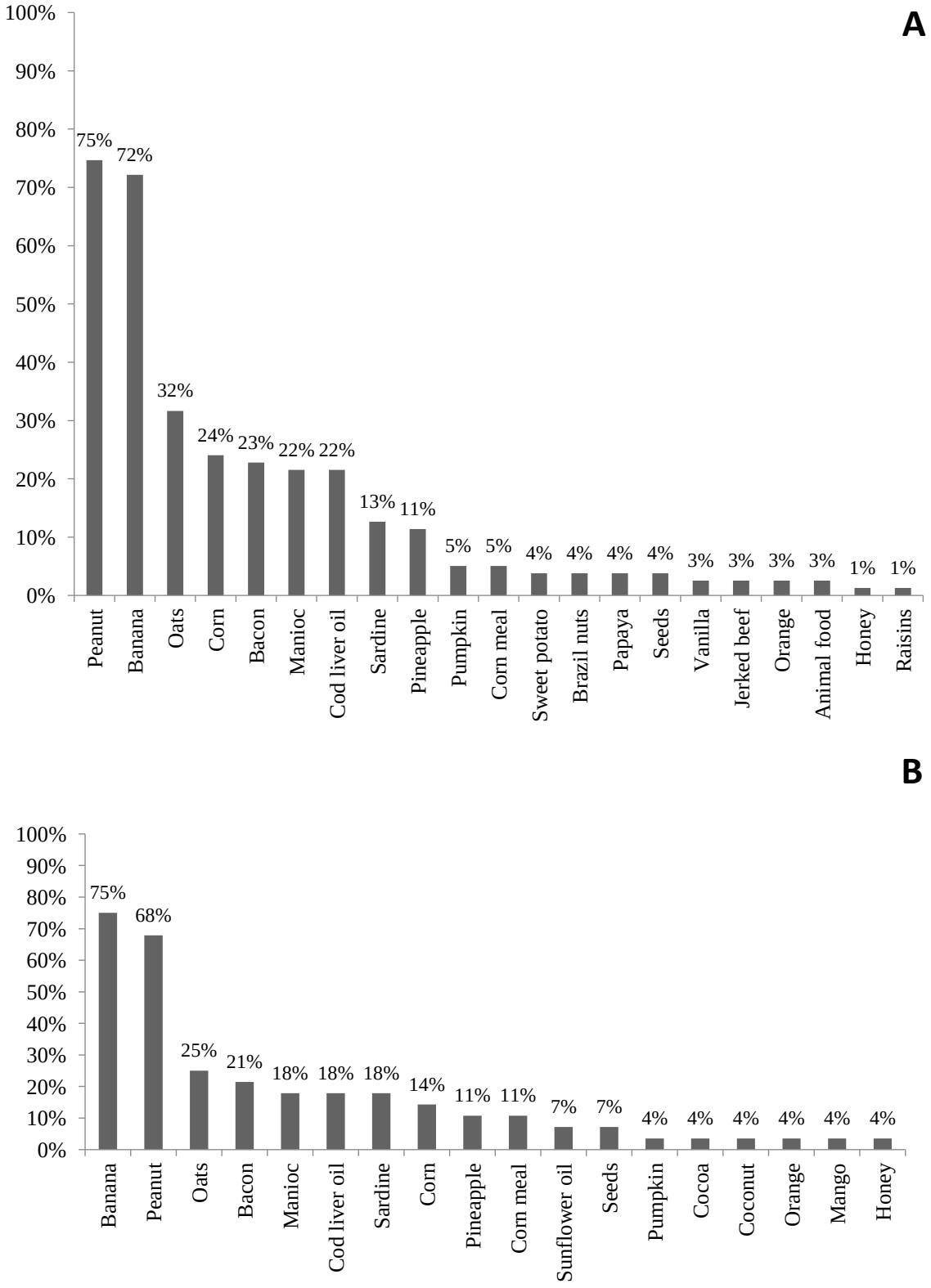
	P	B	PB	$SampE_P$	$SampE_B$	$SempE_{PB}$	CS_P	CS_B	CS_{PB}
Amazon	2	4	6	7,818 ± 4,521	5,783 ± 2,122	21,966 ± 18,844	4.02%*	2.41 ± 0.91%	8.06 ± 7.12 %
Caatinga	1	0	4	24,874	-	6,478 ± 4,171	**	-	3.45 ± 2.46 %
Cerrado	12	3	8	15,769 ± 17,120	7,176 ± 4,336	8,308 ± 7,740	5.36 ± 4.8 %	4.48 ± 3.32 %	5.61 ± 2.29%
Atlantic Forest	7	12	41	4,012 ± 2,101	6,951 ± 9,982	11,362 ± 12,772	6.68 ± 6.53%	6.29 ± 5.38%	9.05 ± 8.15%

* Just one study clearly showed capture success.
** Not given by authors.

Supplementary material - C



Bait use frequency for attraction and capture of small mammals in Brazil. Figures A, B, C and D indicate the situations in each biome.



Bait use frequency for attracting and capturing small mammals in Ecological studies (A) and Fauna surveys (B) performed in Brazil during the last 35 years.

Supplementary material - D

Table VI. Data summary of the small mammal population-monitoring program (PMP) developed at Garrafão locality, Serra dos Órgãos National Park, Rio de Janeiro, Brazil. We also present the data summary of the bait test carried out at the same site. Bait test data are presented combined, and splited, to the pasta results (bait test pasta), bait shared with the PMP. US – understory; Can – canopy; Sample effort – showed in total traps-nights; PMP – 12 campaigns (Feb 2009 to Dec 2010); Restricted PMP – 3 field trips (Apr, Jun, Aug 2010); in parenthesis – number of exclusive species per stratum.

Study	**Abundance**		**Captures**		**Effort**		**Capture Success**		**Richness**	
	US	Can	US	Can	US	Can	US	Can	US	Can
PMP	85	43	159	92	4.500	4.680	3,53 %	1,97%	7(2)	6(1)
PMP (restricted)	29	16	45	30	1.125	1.170	4%	2,5%	4(0)	6(2)
Bait test (*pasta*)	16	15	27	23	360	360	7,5%	6,39%	7(4)	5(2)
Bait test	51	46	78	80	1.440	1.440	5,41 %	5,55%	10(5)	5(0)

Captured individuals (Ind.) in the understory and canopy during 12 PMP field trips (Feb 2009 - Dec 2010), at Garrafão locality, Serra dos Órgãos National Park, Rio de Janeiro, Brazil. Capt. - number of captures; CS - Capture success. Capture events on the ground are only presented for arboreal species.

Species	**Ind.**	**Ground**			**Understory**			**Canopy**		
		Ind.	Capt.	SC*	Ind.	Capt.	SC*	Ind.	Capt.	CS*
Caluromys philander	1	-	-	-	-	-	-	1	2	0,04%
Didelphis aurita	5	-	-	-	4	4	0,09%	1	1	0,02%
Juliomys pictipes	4	-	-	-	4	4	0,09%	-	-	-
Marmosa paraguayana	56	9	10	0,10 %	24	59	1,30%	23	58	1,24%
Marmosops incanus	86	50	66	0,67 %	35	55	1,20%	1	1	0,02%
Philander quica	4	-	-	-	2	2	0,05%	2	4	0,08%
Rhipidomys itoan	43	12	15	0,15 %	16	35	0,78%	15	26	0,56%
Total	-	*71*	*91*	*0,92 %*	*85*	*159*	*3,53%*	*43*	*92*	*1,97%*

* Sampling effort: ground – 9,900 trap-nights; understory – 4,500; canopy – 4,680.

Total number of captures of arboreal small mammal per trap and stratum during the Population Monitoring Program (PMP) and the bait test (Test*), at Garrafão locality, Serra dos Órgãos National Park, Rio de Janeiro, Brazil. Understory captures were not included, since only Sherman traps were employed in this stratum. Sh – Sherman traps; Tw – Tomahawk traps.

Species	**PMP (ground)**		**PMP (canopy)**		**Test (*pasta*)**		**Test (*banana*)**		**Test (pineapple)**	
	Sh	Tw	Sh	Tw	Sh	Tw	Sh	Tw	Sh	Tw
Caluromys philander	-	-	1	1	2	2	19	7	-	4
Marmosa paraguayana	9	1	44	14	5	-	10	2	2	1
Marmosops incanus	61	5	1	-	-	-	-	-	-	-
Rhipidomys itoan	13	2	13	13	2	5	1	-	4	2
Total	*83*	*8*	*59*	*28*	*9*	*7*	*30*	*9*	*6*	*7*

*we excluded, for simplicity, the only 3 captures obtained with meat bait.