

Supplementary Information – Urban Ecosystems

Urban parrots in sothern south america: conservation challenges and opportunities

Daiana N. Lera^{1*}, Natalia Cozzani¹, Julia L. Camina, José L. Tella² & Sergio Zalba¹

¹GEKKO, Grupo de Estudios en Conservación y Manejo, Departamento de Biología, Bioquímica y Farmacia, Universidad Nacional del Sur, San Juan 670, CP 8000, Bahía Blanca, Buenos Aires, Argentina

²Estación Biológica de Doñana (EBD), Americo Vespucio s/n, 41092-Isla de la Cartuja, Sevilla (España).

*Address corresponding to Daiana N. Lera, E-mail: daiana.lera@conicet.gov.ar.

Supplementary Information, 1 Links to the Google Forms used for the survey in each country/state:

Ar

https://docs.google.com/forms/d/e/1FAIpQLSd5Ui6eGuQeAqFnr0VSZxRCBzwEZNYN7qox7OrvR2cysGPV2A/viewform?usp=sf_link

Ch

https://docs.google.com/forms/d/e/1FAIpQLSce72zHv4gSgSghauxFnV288enipKXKml7oYH9o-gjcrQwUQ/viewform?usp=sf_link

Py

https://docs.google.com/forms/d/e/1FAIpQLSc2FTJLbbSS5kdtxbq-DvyBXMdXqBoWdLYzzF6tdpvee73Pcg/viewform?usp=sf_link

Uy

https://docs.google.com/forms/d/e/1FAIpQLSdbE7rbUdqapo7b0vGZidYnnNbCPaH7hhacgZTgSECP9LUh6Q/viewform?usp=sf_link

RS

https://docs.google.com/forms/d/e/1FAIpQLScmyWJnxFfHz-EQnN1VIB5nUb6vYuaDyTOdoxtAdE43QOuJqA/viewform?usp=sf_link

Supplementary Information, Table 2 Cities with Psittaciformes records in the southern cone of South America as surveyed between 2020 and 2021. Population numbers are based on the most recent official census data for each country

Country-State	Area [km ²]	Urban population [%]	Total population (data year)	Total population projection (year 2020)	Province/Region/ Department/ Microregion	City	Population
Argentina	3.761.274	92	40.117.096 (2010)	45.376.763	Buenos Aires	CABA + AMBA	14.800.000
					Córdoba	Córdoba Capital	1.329.604
					Santa Fe	Rosario	948.312
					Mendoza	Mendoza	937.154
					Buenos Aires	Mar del Plata	593.337
					Tucumán	San Miguel de Tucumán	548.866
					Salta	Salta	521.483
					Santa Fe	Santa Fe	391.231
					Buenos Aires	Bahía Blanca	291.327
					Misiones	Posadas	275.028
					Santiago del Estero	Santiago del Estero	252.192
					Entre Ríos	Paraná	247.863
					Mendoza	Godoy Cruz	189.578
					La Rioja	La Rioja	178.872
					Mendoza	Maipú	172.332
					Córdoba	Ciudad de Río Cuarto	158.298
					Entre Ríos	Concordia	152.282
					Mendoza	San Rafael	118.850
					Buenos Aires	Tandil	116.916
					Río Negro	San Carlos de Bariloche	109.305
					San Juan	Gran San Juan	109.123
					La Pampa	Santa Rosa	102.860
					Chubut	Trelew	99.430
					Río Negro	General Roca	90.607
					Buenos Aires	Necochea	84.784
					Entre Ríos	Guaaleguaychú	83.116
					Chubut	Puerto Madryn	81.995
					Entre Ríos	Concepción Del Uruguay	73.729
					Santa Fe	Santo Tomé	66.133
					Buenos Aires	Punta Alta	58.315
					Tucumán	Yerba Buena	58.001
					Misiones	El Dorado	57.323
					Tierra del Fuego	Ushuaia	56.956

Tucumán	Concepción	52.073
Santa Fe	Esperanza	42.082
Misiones	Puerto Iguazú	41.062
Tucumán	Tafí Viejo	39.601
Santa Fe	Casilda	35.058
Córdoba	Bell Ville	34.439
Chubut	Esquel	32.758
Neuquén	Zapala	32.097
Córdoba	Villa Dolores	31.853
La Rioja	Chilecito	29.459
Neuquén	San Martin de los Andes	27.956
Buenos Aires	Pinamar	25.397
Mendoza	Coquimbito	19.972
Santa Fe	Gálvez	19.309
Buenos Aires	General Madariaga	18.089
Río Negro	El Bolsón	17.061
Córdoba	Las Varillas	16.316
Río Negro	San Antonio Oeste	16.265
Córdoba	Villa del Rosario	15.394
Santa Fe	San Cristobal	14.922
Santa Cruz	Puerto Deseado	14.183
Buenos Aires	Lobería	13.005
Neuquén	Junín de los Andes	12.621
Santa Fe	Laguna Paiva	12.443
Mendoza	Chacras de Coria	12.428
La Pampa	Toay	11.626
Buenos Aires	Coronel Dorrego	11.510
Neuquén	Villa la Angostura	11.063
Misiones	San Pedro	10.397
Mendoza	La Paz	10.012
Buenos Aires	Carhué	9.660
Buenos Aires	Pedro Luro	9.494
Mendoza	Vistalba	8.771
Santa Fe	Monte Vera	8.284
Santa Cruz	Puerto san Julián	7.894
Mendoza	Tulumaya	7.870
Salta	San Lorenzo	7.004
Buenos Aires	Tornquist	6.473
Córdoba	Las Higueras	6.202

					Buenos Aires	Darregueira	5.547
					San Juan	Barreal	5.398
					Buenos Aires	Mayor Buratovich	5.372
					Buenos Aires	Carlos Tejedor	5.178
					Córdoba	Santa Catalina – Holmberg	3.898
					Buenos Aires	Hilario Ascasubi	3.427
					Santa Fe	Soldini	3.212
					Chubut	Río Mayo	2.791
					San Juan	San Agustín de Valle Fértil	2.731
					Buenos Aires	Villa Cacique	2.689
					Buenos Aires	Saavedra	2.276
					San Juan	Valle de Calingasta	2.039
					Buenos Aires	Stroeder	1.998
					Buenos Aires	Chapadmalal	1.633
					Santa Cruz	El Chaltén	1.627
					La Rioja	Anillaco	1.573
					Buenos Aires	Barker	1.241
					Corrientes	San Cayetano	872
					Buenos Aires	Bordenave	852
					Río Negro	El Cóndor	746
					Buenos Aires	Atalaya	720
					Buenos Aires	Mar Chiquita	487
					Córdoba	Cabalango	475
					San Juan	La Majadita	40
					San Juan	Los Bretes	40
Chile	2.006.096	87,8	17.574.003	19.458.310	Metropolitana	Santiago	5.250.565
			(2017)		Valparaíso	Viña del Mar	334.248
					Valparaíso	Valparaíso	296.655
					La Araucanía	Temuco	282.415
					Coquimbo	Coquimbo	227.730
					Bío Bío	Concepción	223.574
					Coquimbo	La Serena	221.054
					Los Ríos	Valdivia	166.080
					Los Lagos	Osorno	161.460
					Magallanes	Punta Arenas	133.282
					Valparaíso	San Antonio	91.350
					Bío Bío	Tomé Coliumo	54.946
					Los Lagos	Castro	43.807
					Bío Bío	Lota	43.535
					Valparaíso	La Ligua	35.390
					Coquimbo	Monte Patria	30.751

					Coquimbo	Vicuña	27.771
					Bío Bío	Comuna Hualqui	24.333
					Los Lagos	Frutillar	18.428
					La Araucanía	Curacautin	17.413
					Maule	Romeral	15.187
					Los Lagos	Chonchi	14.858
					Los Lagos	San Pablo	10.030
					La Araucanía	Comuna de Ercilla	7.733
					Los Ríos	Máfil	7.095
					O'Higgins	Litueche	6.294
					O'Higgins	Bucamelu, Paredones	6.188
					Ñuble	Trehuaco	5.401
					Atacama	Alto del Carmen	5.299
					Aysén	Chile Chico	4865
					Ñuble	San Fabian	4.308
					Aysén	Tortel	523
					Los Lagos	Quinched rural	326
Paraguay	406.750	62,9	6.461.041 (2012)	7.252.672	Central	Asunción	521.559
					Central	San Lorenzo	258.919
					Central	Fernando de la Mora	180.186
					Itapua	Encarnacion	136.308
					Cordillera	Caacupé	57.682
					San Pedro	San Pedro del Ycuamandyyu	35.518
					Alto Paraná	Yguazú	11.391
Uruguay	176.220	93	3.286.314 (2011)	3.530.912	Montevideo	Montevideo	1.304.729
					Canelones	Ciudad de la Costa	112.449
					Salto	Salto	104.011
					Tacuarembó	Ciudad de Tacuarembó	54.755
					Durazno	Durazno	34.368
					Colonia	Colonia del Sacramento	26.231
					Maldonado	Punta del Este	9.277
					Canelones	Salinas	8.626
					Rocha	La Paloma	3.495
					Canelones	Soca	1.797
Rio Grande do Sul (Brazil)	281.707.156	85,1	10.693.929 (2010)	11.422.973	Porto Alegre	Porto Alegre	1.488.252
					Pelotas	Pelotas	343.132
					Litoral Lagunar	Rio Grande	211.965

Santo Angelo	Santo Ângelo	77.568
Santa Cruz do Sul	Venâncio Aires	71.973
Carazinho	Carazinho	62.265
Osorio	Osório	46.414
Campanha Central	Rosário do Sul	39.314
Osorio	Torres	39.064
Gramado-Canela	Igrejinha	37.340
Gramado-Canela	Gramado	36.555
Lajeado-Estrela	Teutônia	33.766
Litoral Lagunar	Santa Vitória do Palmar	29.483
Gramado-Canela	Ivoti	24.690
Vacaria	São Francisco de Paula	21.801
Erechim	Getúlio Vargas	16.184
Osorio	Mostardas	12.847
Porto Alegre	Glorinha	8.204
Guapore	Paráí	7.727
Santo Angelo	Sao Miguel das Missões	7.683
Frederico Westphalen	Iraí	7.141
Ijuí	ajuricaba	6.987
Cachoeira do Sul	Passo do Sobrado	6.574
Pelotas	Cerrito	6.047
Santa Maria	Itaara	5.537
Campanha Ocidental	Maçambará	4.562
Passo Fundo	Vila Maria	4.363
Campanha Ocidental	Barra do Quaraí	4.227
Montenegro	Pareci Novo	3.862
Caxias do Sul	Nova Roma do Sul	3.717
Guapore	Nova Alvorada	3.663
Vacaria	Jaquirana	3.662
Erechim	Severiano de Almeida	3.631
Santa Maria	Dilermando de Aguiar	3.002
Osorio	Mampituba	2.973
Nao-Me-Toque	Victor Graeff	2.860
Caxias do Sul	Monte Belo do Sul	2.530
Guapore	Itapuca	2.065
Erechim	Ipiranga do Sul	1.880

Supplementary Information, Table 3 Psittacine species breeding in urban centres in the southern cone of South America. Numbers represent the cities where the species nests and, in brackets, the countries/states for which it was mentioned. Ar: Argentina, Ch: Chile, Py: Paraguay, RS: State of Rio Grande do Sul, Brazil, Uy: Uruguay and Al: All

Species	City size (inhabitants)						
	>1.000.000	500.000 - 1.000.000	100.000 - 500.000	50.000 - 100.000	10.000 - 50.000	5.000 - 10.000	< 5.000
<i>Amazona aestiva</i>	3(Ar-RS)	1(Py)			2(Ar)		1(RS)
<i>Ara chloropterus</i>		1(Py)	1(Py)				
<i>Aratinga nenday</i>	1(Ar)						
<i>Brotogeris chiriri</i>	2(Ar-RS)	2(Ar-Py)	2(Ar-Py)				
<i>Brotogeris tirica</i>					1(RS)		
<i>Brotogeris versicolurus</i>	1(Ar)						
<i>Cyanoliseus patagonus</i>		1(Ar)	2(Ar)	1(Ar)	1(Ar)	1(Ar)	6(Ar)
<i>Enicognathus leptorhynchus</i>					1(Ch)		
<i>Forpus xanthopterygius</i>		1(Py)	2(Ar-Py)				
<i>Myiopsitta monachus</i>	5(Ar-Ch-Uy-RS)	6(Ar-Py)	31(Al)	16(Ar-Uy-RS)	26(Ar-Py-Uy-RS)	15(Ar-Uy-RS)	20(Ar-Uy-RS)
<i>Phyrrura frontalis</i>	1(Ar)				1(RS)	1(RS)	1(RS)
<i>Pionus maximiliani</i>					1(Ar)		1(RS)
<i>Psilopsiagon aymara</i>			1(Ar)				
<i>Psittacara acuticaudatus</i>			1(Ar)		1(Ar)		3(Ar)
<i>Psittacara leucophthalmus</i>	1(Ar)						1(RS)

Supplementary Information, Table 4 Psittacine species for which juvenile observations are reported in urban centres in the southern cone of South America. Numbers represent cities and, in brackets, countries/states

Species	City size (inhabitants)						
	> 1.000.000	500.000 - 1.000.000	100.000 - 500.000	50.000- 100.000	10.000 - 50.000	5.000 - 10.000	< 5.000
<i>Amazona aestiva</i>	4(Ar-Py-Uy)	1(Py)	1(Py)		1(Ar)		
<i>Amazona brasiliensis</i>					1(RS)		
<i>Amazona pretrei</i>				1(RS)			
<i>Amazona vinaceae</i>				1(RS)			
<i>Ara chloropterus</i>		1(Py)	1(Py)				
<i>Aratinga nenday</i>	2(Ar-Py)			1(Py)			
<i>Brotogeris chiriri</i>	2(Ar-RS)	1(Py)					
<i>Brotogeris tirica</i>					3(RS)	1(RS)	
<i>Brotogeris versicolurus</i>	1(Ar)						
<i>Cyanoliseus patagonus</i>	1(Ar)	1(Ar)	2(Ar)	2(Ar)	2(Ar)	3(Ar)	8(Ar)
<i>Cyanoliseus patagonus bloxami</i>			1(Ch)		3(Ch)		
<i>Enicognathus ferrugineus</i>			1(Ch)		1(Ch)		
<i>Enicognathus leptorhynchus</i>			2(Ch)		1(Ch)	1(Ch)	
<i>Eupsittula aurea</i>					1(RS)		
<i>Forpus xanthopterygius</i>		1(Py)		1(Ar)			
<i>Myiopsitta monachus</i>	5(Ar-Ch-Uy-RS)	4(Ar-Py)	19(Ar-Ch-Py-Uy-RS)	10(Ar-Ch-RS)	19(Ar-Uy-RS)	17(Ar-Uy-RS)	17(Ar-Uy-RS)
<i>Phyrrura frontalis</i>	1(Ar)			1(RS)	2(Ar-RS)	1(RS)	1(RS)
<i>Phyrrura molinae</i>			1(Ar)				
<i>Pionus maximiliani</i>		1(Ar)				1(RS)	1(RS)
<i>Psilopsiagon aymara</i>			1(Ar)			1(Ar)	1(Ar)
<i>Psittacara acuticaudatus</i>			1(Ar)		1(Ar)	1(Ar)	3(Ar)
<i>Psittacara leucophthalmus</i>	1(Ar)						1(RS)

Supplementary Information, Table 5 Presence of psittacines associated to habitats in cities of different size in the southern cone of South America. a- Urban areas with high population density, b- suburban areas with medium to low population density and c- public parks

Species	City size (inhabitants)						
	> 1.000.000	500.000 - 1.000.000	100.000 - 500.000	50.000- 100.000	10.000 - 50.000	5000 - 10.000	<5000
<i>Amazona aestiva</i>	abc	abc	abc	bc	abc	bc	abc
<i>Amazona brasiliensis</i>				c		bc	
<i>Amazona pretrei</i>	c				abc	b	bc
<i>Amazona tucumana</i>			bc	c			
<i>Amazona vinacea</i>				b	abc		
<i>Anodorhynchus hyacinthinus</i>		bc	bc				
<i>Ara chloropterus</i>	c	bc	bc				
<i>Aratinga nenday</i>	abc	bc	bc	b	abc		
<i>Bolborhynchus orbygnesi</i>					bc		
<i>Brotogeris chiriri</i>	abc	abc	abc	abc	abc	bc	
<i>Brotogeris tirica</i>					b	bc	bc
<i>Brotogeris versicolurus</i>	ac						b
<i>Cyanoliseus patagonus bloxami</i>			b		bc	c	
<i>Cyanoliseus patagonus</i>	abc	abc	abc	abc	abc	bc	abc
<i>Enicognathus ferrugineus</i>			abc	bc	abc		bc
<i>Enicognathus leptorhynchus</i>			abc	c	bc	bc	
<i>Eupsittula aurea</i>		bc			ab	bc	
<i>Forpus xanthopterygius</i>		abc	bc	bc	bc		
<i>Melopsittacus undulatus</i>	abc	abc	abc	b	b		
<i>Myiopsitta monachus</i>	abc	abc	abc	abc	abc	abc	abc
<i>Phyrrura frontalis</i>	abc		bc	abc	bc	bc	bc
<i>Phyrrura molinae</i>	ac		ac				
<i>Pionopsitta pileata</i>	c				abc		
<i>Pionus maximiliani</i>	ac	bc	bc	abc	abc		
<i>Primolius maracana</i>					c		
<i>Psilopsiagon aymara</i>		c	b			b	bc
<i>Psittacara acuticaudatus</i>	c	bc	abc	c	abc	bc	bc
<i>Psittacara leucophthalmus</i>	abc	bc	bc	abc	abc		bc
<i>Psittacara mitratus</i>	c	bc		bc	a		
<i>Triclaria malachitacea</i>	c			b	b		

Supplementary Information, Table 6 Psittacine species reported using resources in cities of the southern cone of South America. Numbers represent observations for each species and, in brackets, the countries/states for which it was mentioned. Ar: Argentina, Ch: Chile, Py: Paraguay, RS: State of Rio Grande do Sul, Brazil, Uy: Uruguay and Al: All

Species	Forests	Urban structures	Food resources
<i>Amazona aestiva</i>	66 (Al)	10 (Ar-RS)	32 (Al)
<i>Amazona brasiliensis</i>	2 (RS)	0	1 (RS)
<i>Amazona pretrei</i>	6 (Ar-RS)	0	3 (Ar-RS)
<i>Amazona tucumana</i>	2 (Ar)	0	2 (Ar)
<i>Amazona vinacea</i>	3 (Ar)	0	2 (Ar-RS)
<i>Anodorhynchus hyacinthinus</i>	5 (Py)	1 (Py)	1 (Py)
<i>Ara chloropterus</i>	10 (Ar-Py)	1 (Py)	8 (Py)
<i>Aratinga nenday</i>	29 (Ar-Py)	2 (Ar)	20 (Ar-Py)
<i>Bolborhynchus orbygniesius</i>	1 (Ar)	0	0
<i>Brotogeris chiriri</i>	43 (Ar-Py-RS)	4 (Py-RS)	27 (Ar-Py-RS)
<i>Brotogeris tirica</i>	6 (RS)	1 (RS)	4 (RS)
<i>Brotogeris versicolurus</i>	2 (Ar)	1 (Ar)	1 (Ar)
<i>Cyanoliseus patagonus bloxami</i>	5 (Ch)	0	2 (Ch)
<i>Cyanoliseus patagonus</i>	59 (Ar)	24 (Ar)	24 (Ar)
<i>Enicognathus ferrugineus</i>	35 (Ar-Ch)	2 (Ar)	24 (Ar-Ch)
<i>Enicognathus leptorhynchus</i>	16 (Ch)	1 (Ch)	7 (Ch)
<i>Eupsittula aurea</i>	2 (Py-RS)	1 (Ar)	2 (Py-RS)
<i>Forpus xanthopterygius</i>	8 (Ar-Py)	1 (Py)	6 (Ar-Py)
<i>Melopsittacus undulatus</i>	15 (Ar-Ch-Py-Uy)	3 (Ar-Ch-Py)	4 (Ar-Ch-Py)
<i>Myiopsitta monachus</i>	253 (Al)	70 (Al)	167 (Al)
<i>Phyrrura frontalis</i>	24 (Ar-RS)	8 (Ar-RS)	15 (Ar-RS)
<i>Phyrrura molinae</i>	2 (Ar)	1 (Ar)	1 (Ar)
<i>Pionopsitta pileata</i>	3 (Ar-RS)	0	2 (Ar-RS)
<i>Pionus maximiliani</i>	25 (Ar-Py-RS)	0	10 (Ar-Py-RS)
<i>Psilopsiagon aymara</i>	7 (Ar)	0	3 (Ar)
<i>Psittacara acuticaudatus</i>	35 (Ar-Py-Uy)	1 (Ar)	21 (Ar-Py)
<i>Psittacara leucophthalmus</i>	34 (Ar-Py-Uy-RS)	2 (Ar)	16 (Ar-Py-RS)
<i>Psittacara mitratus</i>	7 (Ar)	0	3 (Ar)
<i>Triclaria malachitacea</i>	3 (RS)	0	0

Supplementary Information, table 7 Species reported as pets in the southern cone of South America Ar: Argentina, Ch: Chile, Py: Paraguay, RS: State of Rio Grande do Sul, Brazil and Uy: Uruguay

Species	Ar	Ch	Py	RS	Uy
<i>Agapornis</i> sp.	*	*			
<i>Amazona aestiva</i>	*		*	*	*
<i>Amazona pretrei</i>				*	
<i>Anodorhynchus hyacinthinus</i>			*		
<i>Ara ararauna</i>			*		
<i>Ara chloropterus</i>	*		*		
<i>Ara ararauna</i> x <i>Ara chloropterus</i>			*		
<i>Ara glaucogularis</i>			*		
<i>Aratinga nenday</i>	*		*		
<i>Brotogeris chirirí</i>	*		*	*	
<i>Brotogeris tirica</i>				*	
<i>Cyanoliseus patagonus</i>	*				*
<i>Enicognathus ferrugineus</i>		*			
<i>Enicognathus leptorhynchus</i>		*			
<i>Eupsittula aurea</i>	*				
<i>Forpus xanthopterygius</i>	*				
<i>Melopsittacus undulatus</i>	*	*	*		*
<i>Myiopsitta monachus</i>	*	*	*	*	*
<i>Nymphicus hollandicus</i>	*				
<i>Phyrura frontalis</i>	*				
<i>Phyrura molinae</i>	*				
<i>Pionopsitta pileata</i>	*				
<i>Pionus maximiliani</i>	*		*		
<i>Platycercus eximius</i>		*			
<i>Psittacara acuticaudatus</i>	*		*		
<i>Psittacara leucophthalmus</i>	*		*		
<i>Psittacara mitratus</i>	*				