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RESEARCH ARTICLE
TAXONOMIC CATALOG OF THE BRAZILIAN FAUNA

Coleoptera of Brazil: what we knew then and what we know now. Insights from the Catálogo Taxonômico da Fauna do Brasil

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ABSTRACT. In 2000, Cleide Costa published a paper presenting the state of knowledge of the Neotropical Coleoptera, with a focus on the Brazilian fauna. Twenty-four years later, thanks to the development of the Coleoptera section of the Taxonomic Catalog of the Brazilian Fauna (CTFB – Catálogo Taxonômico da Fauna do Brasil) through the collaboration of 100 coleopterists from all over the globe, we can build on Costa's work and present an updated overview of the state of knowledge of the beetles from Brazil. There are currently 35,699 species in 4,958 genera and 116 families known to occur in the country, including representatives of all extant suborders and superfamilies. Our data show that the Brazilian beetle fauna is the richest on the planet, concentrating 9% of the world species diversity, with some estimates accounting to up to 15% of the global total. The most diverse family in numbers of genera is Cerambycidae (1,056 genera), while in number of species it is Chrysomelidae (6,079 species). *Conotrachelus* Dejean, 1835 (Curculionidae) is the most species-rich genus, with 570 species. The French entomologist Maurice Pic is the author who has contributed the most to the naming of species recorded from Brazil, with 1,794 valid names in 36 families, whereas the Brazilians Ubirajara R. Martins and Maria Helena M. Galileo are the only ones among the top-ten authors to have named species in the 21st century. Currently, approximately 144 new species of Brazilian beetles are described each year, and this average is projected to increase in the next decade to 180 species per year, or about one new Brazilian beetle every two days.

KEY WORDS. Beetles, biodiversity, list, Neotropical, South America, CTFB.

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INTRODUCTION

Beetles make up one of the most successful and species-rich clades of animals, with approximately 30,000 genera and 387,000 species described worldwide (Ślipiński et al. 2011, Cai et al. 2022). One of the most widely accepted hypotheses explaining their evolutionary radiation concerns the development of protective elytra, which allow these insects to occupy spaces not commonly used by other land arthropods (McKenna et al. 2015, Boudinot et al. 2022, Goczał and Beutel 2023, Ferreira et al. 2023).

The body length of adults varies widely, ranging from 0.3 mm for a species of Ptiliidae to 200 mm for a species of Cerambycidae (Casari et al. 2024), and several morphological and physiological adaptations allow them to live in virtually all terrestrial and freshwater ecosystems (Cai et al. 2022). This wide variation is, among other factors, a result of the ancient age of the group, about 306 to 322 million years old (Cai et al. 2022), which gives Coleoptera the status of one of the oldest holometabolous orders.

Brazil is the world's fifth largest country, with an area of 8.5 million km^2, occupying almost half of South America, and harbors a megadiverse biota (MMA 2023). The country encompasses six major biogeographic provinces: the Amazon rainforest, the Caatinga dry forests, the Pampa grasslands, the Pantanal wetlands, the Cerrado savanna, and the Atlantic rainforest. The latter two are known as biodiversity hotspots due to their high concentration of endemic vertebrate and plant species, and their threatened conservation status (Myers et al. 2000, MMA 2023). The Amazon, in turn, comprises about 50% of Brazil's territory, occupying approximately 4.2 million km^2 in the northern part of the country, and congregates the richest biota on Earth (Lewinsohn and Prado 2005, MMA 2023).

Costa (2000) produced the first list of Brazilian Coleoptera, comparing the Brazilian fauna with that of the rest of the Neotropical region and the world. For that work, the author listed the number of genera and species recorded from Brazil for each known family at that time. Species numbers were subsequently updated for the species by Casari and Ide (2012) and Casari et al. (2024). In 2015, an initiative was started by Brazilian zoologists and overseas partners to build a website named Taxonomic Catalog of the Brazilian Fauna (or Catálogo Taxonômico da Fauna do Brasil, hereafter shorten to its Portuguese abbreviation CTFB), aiming at cataloging the entire fauna of the country. The Coleoptera section is captained by Marcela L. Monné and Cleide Costa, and since then, the CTFB has been constantly updated and a growing number of coleopterists have been involved.

The present survey brings together the most up-to-date data on the Brazilian beetle fauna, the result of the collaboration of 100 Brazilian and foreign researchers, the latter based in as varied countries as Argentina, Australia, Canada, Colombia, the Czech Republic, France, Germany, Italy, Latvia, New Zealand, Poland, Peru, Spain, and the USA (Supplementary Material 1). We also provide an updated classification for the beetle families found in Brazil, a brief historical overview of beetle studies in Brazil, and a projection of the expected advancements in discovering new species for the fauna in the coming years.

MATERIAL AND METHODS

Data was retrieved from the Coleoptera section of the CTFB website (http://fauna.jbrj.gov.br/) (Monné and Costa 2023). An Excel spreadsheet containing all Coleoptera data was extracted from the website on March 7, 2023 (Supplementary Material 2), which served as the basis for the analyses performed in this study. The higher-level classification and family-group names of Coleoptera follow Cai et al. (2022), with the changes indicated in Table 1 and discussed in the following section.

RESULTS AND DISCUSSION

Our catalog differs from Costa's (2000) list in that we follow the updated classification recently established by Cai et al. (2022). The following changes have accordingly been made for the CTFB family-level classification: 1) all three families in Archostemata are included in Cupedoidea; 2) In Adephaga, Rhysodinae is now treated as a subfamily of Carabidae; 3) Scirtoidea now includes only Scirtidae, with Clambidae and Eucinetidae transferred to Clamboidea; 4) Nosodendridae is moved from Derodontoidea (now a junior synonym of Clamboidea) to Nosodendroidea; 5) Histeridae is moved from Hydrophiloidea to Histeroidea; 6) Rhadalidae is raised from subfamily status under Melyridae to full family; 7) Byrrhoidea includes just Byrrhidae, with 10 other families previously included in it now transferred to Dryopoidea (Elmidae, Dryopidae, Lutrochidae, Limnichidae, Heteroceridae, Psephenidae, Cneoglossidae, Ptilodactylidae, Chelonariidae and Callirhipidae); and 8) Cucujoidea now consists of seven families (Cryptophagidae, Silvanidae, Cucujidae, Cavognathidae, Passandridae, Phalacridae and Laemophloeidae), having Erotyloidea (with only Erotylidae) and Nitiduloidea (Sphindidae, Monotomidae, Kateretidae, Nitidulidae) removed from it. The three points which we differ from

Figure 1. Habitus of species of the top-ten richest beetle genera in Brazil. (A, B) *Conotrachelus camelus* Fiedler, 1940, dorsal and lateral view, courtesy of DZUP; (C, D) *Plectris variipennis* (Moser, 1921), lateral and dorsal view, DZUP; (E, F) *Chlamisus chapadensis* Bokermann, 1962, dorsal and lateral view, DZUP, paratype; (G, J) *Agrilus oceanicus* Cobos, 1959, dorsal and lateral view, DUZP, holotype; (H, K) *Chauliognathus flavipes* (Fabricius, 1781). Hentz, 1830 dorsal and lateral view, DZUP; (I, L) *Strongylium militare* Mäklin, 1864, dorsal and lateral view, DZUP; (M) *Agra* sp. Fabricius, 1801, dorsal view, CELC; (N) *Statira* sp. Saint-Fargeau and Audinet-Serville, 1828, dorsal view, CELC; (O) *Platyphora fulvovittata* (Bechyné, 1948), dorsal view, MNRJ; (P) *Euconnus* sp. Thomson, 1859, dorsal view, CESP. Scale-bars: E, F, G, J, P = 1 mm, A, C, D, I, L, M = 2 mm; H, K, N = 5 mm; O = 10 mm. See Acknowledgements for full photo credits.

Figure 2. Top-ten authors of beetle species occurring in Brazil. (A) Maurice Pic (Groll 2016a); (B) Carl Henrich Boheman (Bauer 2021); (C) Jan Karel Bechyné (Schubert 2022); (D) Carl Fiedler, courtesy of Editha Schubert, from the archives of the SDEI; (E) Ubirajara Ribeiro Martins (Galileo and Santos-Silva 2015); (F) Henry Walter Bates (Ulbrich 2022); (G) Thomas Lincoln Casey (Smetana and Herman 2001); (H) David Sharp (Smetana and Herman 2001); (I) Alphonse-Adrien Hustache (Maldes and Péricart 1979); (J) Maria Helena Mainieri Galileo (Souza et al. 2022).

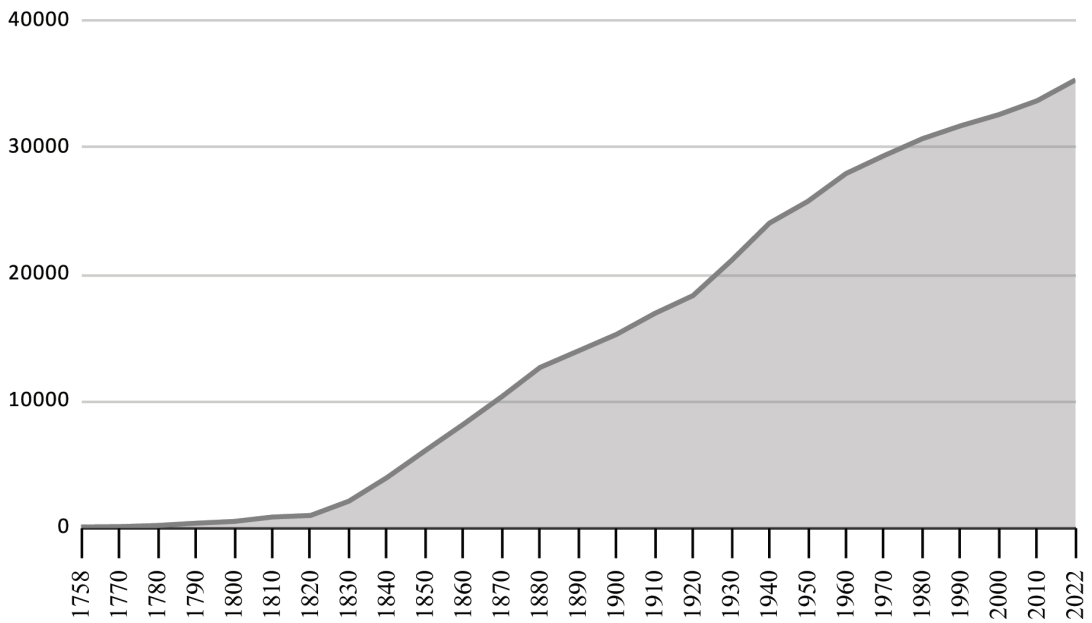

Figure 3. Accumulation curve of Brazilian Coleoptera species by decade from 1758 to 2022.

Table 1. Coleoptera of Brazil. Data from Costa (2000) and CTFB, the latter as of March 7, 2023. All world beetle families are included on the list following the Cai et al. (2022) classification. Full reference of each taxa name see Bouchard et al. (2011) or Cai et al. (2022). The world's genera and species percentages were calculated using Ślipiński et al. (2011). Additional comments are indicated by superscripts.

Suborder/Series/Superfamily/Family	Costa (2000)		CTFB		Growth percentage		World's percentage	
	Genera	Species	Genera	Species	Genera	Species	Genera	Species
Archostemata Kolbe, 1908								
Cupedoidea Laporte, 1838								
Cupedidae Laporte, 1838	1	2	1	1	0	-50	2	1
Micromalthidae Barber, 1913	1	1	1	1	0	0	50	50
Ommatidae Sharp and Muir, 1912	1	2	1	2	0	0	10	2
Myxophaga Crowson, 1955								
Sphaeriusoidea Erichson, 1845								
Torridincolidae Steffan, 1964	3	29	3	34	0	17	43	57
Hydroscaphidae LeConte, 1874	2	5	2	4	0	-20	67	18
Adephaga Claireville, 1806								
Gyrinidae Latreille, 1810	4	48	3	168	-25	250	12	17
Carabidae[1] Latreille, 1802	205	1139	226[2]	1841[2]	10	62	15	5
Haliplidae Aubé, 1836	1	5	1	14	0	180	20	6
Noteridae Thomson, 1860	6	42	12	75	100	79	86	30
Dytiscidae Leach, 1815	21	161	38	315	81	96	20	8
Polyphaga Emery, 1886								
Staphyliniformia Lameere, 1900								
Histeroidea Gyllenhaal, 1808								
Histeridae Gyllenhal, 1808	85	352	129	598	52	70	37	14
Hydrophiloidea Latreille, 1802								
Hydrophilidae Latreille, 1802	22	121	39	307	77	154	20	9
Epimetopidae[3,18] Zaitzev, 1908			1	13			33	18
Georissidae[3,19] Laporte, 1840			1	1			100	1
Hydrochidae[3,20] Thomson, 1859			1	70			100	35
Spercheidae[3,21] Erichson, 1837			1	1			100	6
Staphylinoidea Latreille, 1802								
Hydraenidae Mulsant, 1844	1	2	4	33	300	1550	10	2
Ptiliidae Erichson, 1845	4	9	8	25	100	178	10	4
Leiodidae Fleming, 1821	4	22	11	54	175	145	3	1
Staphylinidae[4] Latreille, 1802	308	1635	474	2829	54	73	13	5
Scarabaeoidea Latreille, 1802								
Geotrupidae Latreille, 1802	5	44	9	76	80	73	13	8
Passalidae Leach, 1815	6	72	12	113	100	57	19	14
Trogidae MacLeay, 1819	1	10	2	15	100	50	40	5
Glaresidae Prudhomme de Borre, 1886	1	2	1	1	0	-50	33	2
Lucanidae Latreille, 1804	11	70	14	76	27	9	12	5
Ochodaeidae Streubel, 1846	1	1	2	3	100	200	13	3
Hybosoridae[5] Erichson, 1847	12	72	19	88	58	22	25	15
Scarabaeidae Latreille, 1802	204	1777	120	930	-41	-48	6	3
Melolonthidae[6] Leach, 1819			161	1592				
Cetoniidae[6] Leach, 1815			30	85				
Clambiformia Cai and Tihelka, 2022								
Clamboidea Fischer, 1821								
Eucinetidae Lacordaire, 1857	1	1	2	4	100	300	18	8
Clambidae Fischer, 1821			1	4			17	2
Scirtiformia Lawrence, S´lipin´ski et al., 2011								
Scirtoidea Fleming, 1821								
Scirtidae Fleming, 1821	4	31	4	46	0	48	11	6

Continues

Suborder/Series/Superfamily/Family	Costa (2000)		CTFB		Growth percentage		World's percentage	
	Genera	Species	Genera	Species	Genera	Species	Genera	Species
Elateriformia Crowson, 1960								
Dascilloidea Guérin-Méneville, 1843								
Rhipiceridae Latreille, 1834	2	6	2	5	0	-17	29	7
Buprestoidea Leach, 1815								
Buprestidae Leach, 1815	68	1459	83	1562	22	7	18	11
Dryopoidea Billberg, 1820								
Elmidae Curtis, 1830	15	70	26	197	73	181	17	13
Dryopidae Billberg, 1820	5	25	7	29	40	16	21	10
Lutrochidae Kasap and Crowson, 1975	1	3	1	3	0	0	100	27
Limnichidae Erichson, 1846	3	6	6	19	100	217	16	5
Heteroceridae MacLeay, 1825	1	3	3	19	200	533	20	6
Psephenidae Lacordaire, 1854	1	3	2	8	100	167	6	3
Cneoglossidae Champion, 1897	1	5	1	5	0	0	100	50
Ptilodactylidae Laporte, 1836	4	25	4	36	0	44	12	7
Chelonariidae[7] Blanchard, 1845	1	12	1	112	0	833	33	45
Callirhipidae Emden, 1924	1	11	2	11	100	0	22	7
Byrrhoidea Latreille, 1804								
Byrrhidae Latreille, 1804	1	1	1	1	0	0	3	0
Elateroidea Leach, 1815								
Artematopodidae Lacordaire, 1857	1	6	1	6	0	0	13	13
Cerophytidae Latreille, 1834	1	3	1	7	0	133	33	33
Eucnemidae Eschscholtz, 1829	40	143	42	144	5	1	21	10
Throscidae Laporte, 1840	1	4	1	4	0	0	20	3
Elateridae Leach, 1815	81	590	95	759	17	29	24	8
Lycidae Laporte, 1836	22	150	30	183	36	22	19	4
Phengodidae LeConte, 1861	12	48	17	61	42	27	55	24
Lampyridae Rafinesque, 1815	31	350	36	377	16	8	33	17
Cantharidae Imhoff, 1856	19	389	28	458	47	18	18	9
Jurasaidae[22] Rosa et al., 2020			2	7[25]			100	100
Nosodendriformia Cai and Tihelka, 2022								
Nosodendroidea Erichson, 1846								
Nosodendridae Erichson, 1846	1	3	1	5	0	67	100	10
Bostrichiformia Forbes, 1926								
Bostrichoidea Latreille, 1802								
Dermestidae Latreille, 1802	8	46	11	59	38	28	22	5
Bostrichidae Latreille, 1802	15	34	20	46	33	35	22	8
Ptinidae[8] Latreille, 1802	14	81	28	148	100	83	12	7
Cucujiformia Lameere, 1938								
Lymexyloidea Fleming, 1821								
Lymexylidae Fleming, 1821	2	7	3	11	50	57	30	16
Cleroidea Latreille, 1802								
Rhadalidae[9] LeConte, 1861			1	1				
Trogossitidae Latreille, 1802	9	76	11	87	22	14	22	15
Cleridae Latreille, 1802	25	317	71	506	184	60	36	15
Melyridae Leach, 1815	10	68	12	85	20	25	4	1
Biphyllidae LeConte, 1861	1	2	1	2	0	0	14	1
Erotyloidea Latreille, 1802								
Erotylidae[10] Latreille, 1802	35	401	34	513	-3	28	13	15
Nitiduloidea Latreille, 1802								
Sphindidae Jacquelin du Val, 1860	2	3	2	3	0	0	22	5

Continues

Suborder/Series/Superfamily/Family	Costa (2000)		CTFB		Growth percentage		World's percentage	
	Genera	Species	Genera	Species	Genera	Species	Genera	Species
Monotomidae Laporte, 1840	3	7	5	11	67	57	15	4
Kateretidae[11] Kirby, 1837	2	2	2	2	0	0	14	2
Nitidulidae Latreille, 1802	40	208	45	223	13	7	13	5
Cucujoidea Latreille, 1802								
Cryptophagidae Kirby, 1826	6	22	3	3	-50	-86	5	1
Silvanidae Kirby, 1837	12	30	11	27	-8	-10	19	5
Cucujidae Latreille, 1802	1	1	1	1	0	0	25	2
Cavognathidae Sen Gupta & Crowson, 1966			1	1			100	11
Passandridae Blanchard, 1845	2	15	6	20	200	33	67	18
Phalacridae Leach, 1815	9	21	7	24	-22	14	14	4
Laemophloeidae Ganglbauer, 1899	4	40	11	56	175	40	30	13
Coccinelloidea Latreille, 1807								
Bothrideridae Erichson, 1845			4	13			11	3
Cerylonidae Billberg, 1820	7	23	4	13	-43	-43	8	3
Murmidiidae[12,23] Jacquelin du Val, 1857			1	3			25	9
Discolomatidae Horn, 1878	3	15	3	15	0	0	19	4
Endomychidae Leach, 1815	10	94	15	150	50	60	12	8
Coccinellidae Latreille, 1807	49	325	106	776	116	139	29	13
Corylophidae LeConte, 1852	3	4	2	4	-33	0	7	2
Latridiidae Erichson, 1842	6	22	4	6	-33	-73	14	1
Tenebrionoidea Latreille, 1802								
Mycetophagidae Leach, 1815			5	5			28	4
Archeocrypticidae Kaszab, 1964	1	1	2	2	100	100	20	3
Ciidae Leach, 1819	7	16	12	60	71	275	29	9
Tetratomidae[13] Billberg, 1820			1	15			8	10
Melandryidae Leach, 1815	12	41	9	24	-25	-41	15	6
Mordellidae Latreille, 1802	8	125	18	129	125	3	18	9
Ripiphoridae Laporte, 1840	4	43	4	37	0	-14	11	9
Zopheridae[14] Solier, 1834	29	72	28	108	-3	50	15	6
Tenebrionidae Latreille, 1802	147	1234	166	1328	13	8	7	7
Oedemeridae Latreille, 1810	12	47	14	70	17	49	14	14
Meloidae Gyllenhal, 1810	10	155	21	140	110	-10	18	5
Mycteridae Oken, 1843	11	48	11	54	0	13	38	34
Pythidae Solier, 1834			1	1			14	4
Salpingidae Leach, 1815	5	10	6	10	20	0	13	3
Anthicidae Latreille, 1819	9	69	17	129	89	87	17	4
Aderidae Csiki, 1909	1	40	2	45	100	13	4	5
Scraptiidae Gistel, 1848	1	9	1	8	0	-11	3	2
Lagrioididae[15,24] Abdullah and Abdullah, 1968			1	1			100	17
Chrysomeloidea Latreille, 1802								
Vesperidae[16] Mulsant, 1839			5	15			29	20
Disteniidae[16] Thomson, 1861			12	48			38	14
Cerambycidae Latreille, 1802	1000	4000	1056	4366	6	9	20	15
Megalopodidae Latreille, 1802	8	124	11	153	38	23	37	44
Orsodacnidae Thomson, 1859			1	1			33	3
Chrysomelidae Latreille, 1802	356	4362	562	6079	58	39	27	19
Curculionoidea Latreille, 1802								
Nemonychidae Bedel, 1882	1	1	2	2	100	100	10	3
Anthribidae Billberg, 1820	36	233	38	293	6	26	10	8
Belidae Schönherr, 1826	2	12	4	14	100	17	11	4

Continues

Suborder/Series/Superfamily/Family	Costa (2000)		CTFB		Growth percentage		World's percentage	
	Genera	Species	Genera	Species	Genera	Species	Genera	Species
Attelabidae Billberg, 1820	5	16	13	96	160	500	9	4
Brentidae Billberg, 1820	32	222	46	316	44	42	12	8
Curculionidae Latreille, 1802	648	5041	737	5904	14	17	16	12
Total	3851[17]	26755	4958	35699	29	33	17	9

[1]Including Rhysodinae, treated as Rhysodidae in Costa (2000); [2]Data by Leticia M Vieira on September 28, 2023; [3]Not listed in Costa (2000); [4]Including Scydmaeninae Leach, 1815 and Silphinae Latreille, 1806, treated as Scydmaenidae and Silphidae in Costa (2000); [5]Including Ceratocanthinae Martínez, 1968, treated as Ceratocanthidae in Costa (2000); [6N]ot listed in Costa (2000), treated as a subfamily of Scarabaeidae in Cai et al. (2022), and here adopted as a family following Cherman and Morón (2014); [7]Typo in the number of species in Costa (2000); [8]As Anobiidae Fleming, 1821 in Costa (2000); [9]Included in Melyridae in Costa (2000); [10]Including Languriinae Hope, 1840, treated as Languriidae in Costa (2000); [11]As Brachypteridae in Costa (2000); [12]Included in Cerylonidae in Costa (2000) and in Supplementary Material 1, family status following Jaloszyński and Ślipiński (2022); [13]Not in Supplementary Material 1; [14]Including Colydiinae Billberg, 1820 and Monommatini Blanchard, 1845 (Bouchard et al. 2011), treated as Colydiidae and Monommatidae in Costa (2000); [15]Included in Anthicidae in Costa (2000) and in Supplementary Material 1, treated as an incertae sedis subfamily of Tenebrionidae in Cai et al. (2022), and family status following Lawrence et al. (2023); [16]Included in Cerambycidae in Costa (2000); [17]Cited erroneously as 4,351 in Costa (2000); [18-24]World's genera and species percentages following: Fikáček et al. (2021), Yasuda and Yoshitomi (2022), Prokin and Strelnikova (2021), Short et al. (2023), Nunes et al. (2023), Jaloszyński and Ślipiński (2022) and Lawrence et al. (2023); [25]Data by E. Caron on January 19, 2024.

Cai et al. (2022), however, relate to the following taxa: 1) Cicindelinae remains a subfamily of Carabidae, following Gough et al. (2019), and not a distinct family; 2) Melolonthidae and Cetoniidae are treated as separate families from Scarabaeidae following Cherman and Morón (2014) instead of subfamilies of the latter; and 3) Lagrioididae is classified as a family following Lawrence et al. (2023) instead of an incertae sedis subfamily of Tenebrionoidea as interpreted by Cai et al. (2022). These different treatments adhere to more detailed and, sometimes, recent classificatory studies.

Of the 235 families of Coleoptera (Cai et al. 2022, with Cicindelinae in Carabidae, and considering Cetoniidae, Melolonthidae, and Lagrioididae as families), 116 have so far been recorded from Brazil (Table 1). They belong to all the living suborders and superfamilies, but no family known exclusively from the fossil record has been found in the country. All fossil species so far described from Brazil belong to extant families. For example, in Staphylinidae, there are three fossil species recorded from Brazil: *Carirriderma pilosa* Martins-Neto, 1990, *Apticax solidus* Schomann and Solodovnikov, 2012, and *A. volans* Schomann and Solodovnikov, 2012 (Supplementary Material 2). Passalidae has *Protopassalus araripensis* Santos et al., 2020, the oldest known passalid fossil (Santos et al. 2021), whereas Curculionoidea encompasses two fossil species from the Santana Formation, *Preclarusbelus vanini* Santos et al., 2007, in Nemonychidae, and *Arariperhinus monnei* Santos et al., 2011, in Curculionidae (Santos et al. 2007, 2011, Anderson et al. 2014, Caldara et al. 2014).

Costa (2000) listed 104 families for Brazil, 97 if based on the current classification (Table 1, notes 1, 4, 5, 10 and 14). Our numbers, therefore, record 12 (or 19) more families. This in part reflects a more "splitter" classification adopted here: Melolonthidae, Cetoniidae, Vesperidae and Disteniidae, for example, were all present on Costa's list not as families, but as subfamilies. Others, however, are genuine additions: Clambidae was first recorded from the country by Casari and Ide (2012), whereas Jurasaidae was described as a new family endemic to Brazil only four years ago (Rosa et al. 2020).

A number of families are known to occur in the Neotropical region, but have so far failed to be collected in Brazil: Lepiceridae*, Sphaeriusidae* (= Microsporidae), Trachypachidae, Meruidae*, Synteliidae, Glaphyridae, Dascillidae*, Derodontidae, Protocucujidae, Hobartiidae, Smicripidae*, Ulodidae, Promecheilidae (= Perimylopidae), Pyrochroidae and Caridae (Costa 2000, Spangler and Steiner 2005). We expect, however, that the ones indicated by an asterisk (*) will eventually prove to be present in the country as they are known from neighboring areas (e.g., Meruidae) or their species inhabit warm tropical climates in other parts of the globe. The remaining families have rather restricted distributions and tend to live in temperate regions and may be true absentees (e.g., Caridae, which has been recorded in South America solely from Chile and southern Argentina).

Concerning the number of genera, Brazil currently counts 4,958 of them. In comparison with Costa (2000), there was an increase of nearly 30% (Table 1, note 17). The five

most diverse families in the number of genera are Cerambycidae (1,056 genera), Curculionidae (737), Chrysomelidae (562), Staphylinidae (474) and Carabidae (226). Together, these five families represent 61% of the genera so far recorded from Brazil.

As for the species, Brazil currently records 35,699 of them. Compared with Costa (2000), the increase was in the same proportion as that observed for the genera, approximately 30% (Table 1). The list of the five most diverse families in number of species shares the same members as the one for the genera: Chrysomelidae (6,079 species), Curculionidae (5,904), Cerambycidae (4,366), Staphylinidae (2,829) and Carabidae (1,841). Following the latter closely, Melolonthidae (1,592) and Buprestidae (1,562 species) join the list of the seven families with over 1,500 species recorded from Brazil. These seven families encompass 67% of the Brazilian beetle fauna.

Only a small number of countries have had their beetle fauna recently counted and cataloged and our data show that the Brazilian fauna is the richest among them, both in terms of genera and species. For example, the Australian fauna accounted for 22,901 species in 3,265 genera, while New Zealand had 5,525 species in 1,094 genera, Chile 3,947 species in 1,196 genera and Peru with about 10,000 species (Klimaszewski and Watt 1997, Elgueta 2000, Yeates et al. 2003, Chaboo 2015, Bouchard et al. 2017). Our beetle fauna confirms Brazil's status as a megadiverse country. Brazil harbors a beetle fauna that is actually roughly 40% higher than that listed for the entire North American continent, including Canada, the USA, and northern Mexico combined (Marske and Ivie 2003).

And what about the world's fauna? Brazil boasts approximately 9% of the described species and 17% of the genera (see Table 1). While estimating the entire beetle biodiversity of the country poses challenges, we can use a conservative approach by selecting a large and relatively well-inventoried group, Cerambycidae, as a proxy. This method suggests that our fauna may actually contribute up to 15% of the world's beetle species. This estimation prompts the identification of families requiring taxonomic advancement to align with this potential global representation. Notably, families such as Carabidae (5% of the world's species), Staphylinidae (5%), and Tenebrionidae (7%) emerge as candidates for further taxonomic attention.

The knowledge of the Brazilian fauna for certain groups has greatly improved since Costa (2000). For example, Hydraenidae shows a staggering 1,550% increase in the number of species, something also observed for Attelabidae (500%), Heteroceridae (300%), Ciidae (275%), Gyrinidae (250%), Limnichidae (217%) and Coccinellidae (139%). In stark contrast, none of the families of Archostemata and Myxophaga has received taxonomic attention, the same situation of a handful of Polyphaga families such as Glaresidae, Cneoglossidae, Chelonariidae (see note 7 in Table 1), Byrrhidae, Artematopodidae, Throscidae, Biphyllidae, Sphindidae, Kateretidae, Cucujidae, Discolomatidae, Corylophidae, Salpingidae and Scraptiidae. They may be promising groups for study.

Another challenge would be to explore genera with a large number of species (Table 2). Among the top-ten genera, *Conotrachelus* Dejean, 1835 (Curculionidae) is the richest, with 570 species in the country (Table 2, Fig. 1), followed by *Agrilus* Curtis, 1825 (Buprestidae), with 450 species, the latter representing about 30% of the diversity of its family in Brazil. Similarly, *Chauliognathus* Hentz, 1830 (Cantharidae), with 169 species, represents 37% of the Brazilian fauna of the family. The family Tenebrionidae has two genera on the top-ten list, *Statira* Saint-Fargeau and Audinet-Serville, 1828 and *Strongylium* Kirby, 1819, which together account for 26% of the family in Brazil. Chrysomelidae is also represented on the top-ten list by two genera, *Chlamisus* Rafinesque, 1815 and *Platyphora* Gistel, 1857, but their combined share in the family's richness is not as significant, merely 6.5% of its species diversity. Other families making the list, each with one representative, are Carabidae (*Agra* Fabricius, 1801), Melolonthidae (*Plectris* Saint-Fargeau and Audinet-Serville, 1828), and Staphylinidae (*Euconnus* Thomson, 1859). Chelonariidae has a single genus of 112 species, *Chelonarium* Fabricius, 1801 (Table 1). Unfortunately, none of these genera has a taxonomic revision that clarifies their phylogenetic status, species limits, and distribution in Brazil.

Table 2. Ten most speciose genera in the Brazilian beetle fauna.

Family	Genus	Species
Curculionidae	*Conotrachelus* Dejean, 1835	570
Buprestidae	*Agrilus* Curtis, 1825	450
Carabidae	*Agra* Fabricius, 1801	242[1]
Melolonthidae	*Plectris* Saint-Fargeau and Audinet-Serville, 1828	228
Chrysomelidae	*Chlamisus* Rafinesque, 1815	218
Tenebrionidae	*Statira* Saint-Fargeau and Audinet-Serville, 1828	190
Chrysomelidae	*Platyphora* Gistel, 1857	176
Cantharidae	*Chauliognathus* Hentz, 1830	169
Staphylinidae	*Euconnus* Thomson, 1859	167
Tenebrionidae	*Strongylium* Kirby, 1819	165

[1]Data by Leticia M. Vieira on September 28, 2023.

Concerning the authors who have named species living in Brazil (Fig. 2), the French entomologist Maurice Pic (1866–1957) is the most productive, with 1,794 valid names in 36 families of beetles (Table 3). The list of the ten most productive authors is completed by another Frenchman, a Swede, a German, an American, two British, a Czech, and two Brazilians. Remarkably, two of these authors have over 1,000 valid names in a single family, the Czech Jan Karel Bechyné (1920–1973) in Chrysomelidae and the German Carl Fiedler (1864–1955) in Curculionidae. The two sole Brazilian authors on this list, Ubirajara Ribeiro Martins (1932–2015) and Maria Helena Mainieri Galileo (b. 1950), the only ones to provide names in the 21st century and the latter the only still living, were responsible for the description of hundreds of new species of Cerambycidae. A consequence of the fact that most of the prolific authors were foreigners is that the type specimens they established are usually held in overseas institutions, far from where taxonomic studies on the fauna are now mostly performed, in Brazil. The study of this material is becoming easier through image and data sharing by curators and travel funding. Despite being competitive, this funding enables taxonomists to travel globally.

In the inaugural work of modern zoological nomenclature, the Swedish naturalist Carl Linnaeus (1758) described 69 species that we now know to occur in the Brazilian territory, these belonging to 23 families. Around the 1820s, this number had grown to 1,000. A hundred years later, approximately half of the Brazilian beetle fauna had been described, totaling 18,000 species (Fig. 3). Over the last 30 years, the description of new species present in Brazil has increased by more than 25% per decade (Table 4). Currently, approximately 144 new species are described each year. If this trend continues, the next decade, 2022–2031, is expected to see an average of about 180 new species described per year, equating to a new Brazilian beetle discovery about every two days. These results show how much we still have

Table 3. Top ten authors with the most valid names for species recorded from Brazil.

Author	Nationality	Family	Number of species	Years of publication
Maurice Pic[1] (1866–1957)	French	Aderidae, Anthicidae, Archeocrypticidae, Artematopodidae, Byrrhidae, Callirhipidae, Cantharidae, Chelonariidae, Chrysomelidae, Ciidae, Cleridae, Cneoglossidae, Dermestidae, Endomychidae, Georissidae, Lampyridae, Limnichidae, Lycidae, Lymexylidae, Megalopodidae, Melandryidae, Meloidae, Melyridae, Mordellidae, Mycteridae, Oedemeridae, Phengodidae, Ptilodactylidae, Ptinidae, Ripiphoridae, Salpingidae, Scirtidae, Scraptiidae, Staphylinidae, Tenebrionidae and Zopheridae	1,794	1894–1956
Carl Henrich Boheman[2] (1796–1868)	Swedish	Anthribidae, Belidae, Brentidae, Buprestidae, Cantharidae, Carabidae, Cerambycidae, Chrysomelidae, Coccinellidae, Curculionidae, Histeridae, Hydrophilidae, Mordellidae, Nitidulidae, Ptilodactylidae, Scarabaeidae, Staphylinidae and Tenebrionidae	1,309	1829–1862
Jan Karel Bechyné[3] (1920–1973)	Czech	Chrysomelidae	1,229*	1944–1983
Carl Fiedler[4] (1864–1955)	German	Curculionidae	1,074	1932–1954
Ubirajara Ribeiro Martins[5] (1932–2015)	Brazilian	Cerambycidae, Disteniidae and Erotylidae	1,008*	1959–2016
Henry Walter Bates[6] (1825–1892)	English	Carabidae, Cerambycidae, Chrysomelidae, Disteniidae, Endomychidae, Geotrupidae, Hybosoridae, Megalopodidae, Melolonthidae, Scarabaeidae and Tenebrionidae	738	1861–1891
Thomas Lincoln Casey[8] (1857–1925)	American	Coccinellidae, Curculionidae, Melolonthidae and Staphylinidae	657	1890–1922
David Sharp[7] (1840–1922)	English	Attelabidae, Bothrideridae, Brentidae, Carabidae, Chrysomelidae, Dytiscidae, Elmidae, Epimetopidae, Hydrochidae, Hydrophilidae, Laemophloeidae, Limnichidae, Melolonthidae, Monotomidae, Nitidulidae, Noteridae, Staphylinidae and Zopheridae	623	1874–1905
Alphonse-Adrien Hustache[1] (1872–1949)	French	Attelabidae, Belidae and Curculionidae	611	1922–1951
Maria Helena Mainieri Galileo (b. 1950)	Brazilian	Cerambycidae and Disteniidae	535*	1977–2018

*Some species-group names published with co-authors. [1]Constantin (1992); [2]Stål (1869); [3]Anonymous (1974); [4]Groll (2016b); [5]Galileo and Santos-Silva (2015); [6]Ferreira (2004); [7]Smetana and Herman (2001).

to learn about the Brazilian beetle fauna, most evidently demonstrated by the description from material exclusively collected in the country of the most recently discovered living Coleoptera family, Jurasaidae (Rosa et al. 2020, Nunes et al. 2023).

Table 4. Annual average and percentage increase in the description of new Coleoptera species occurring in Brazil over the past three decades, 1992 to 2021.

Decade	Average per year	Percentage increase
1992–2001	90	
2002–2011	115	28%
2012–2021	144	26%

To continue improving our knowledge about the Brazilian beetle fauna, we must advance in taxonomic studies of all families. Particularly promising are families with substantial species numbers but whose described Brazilian fauna represents less than 10% of the world's diversity (refer to Table 1), for this situation likely betrays an understudied taxonomy. Also worthy of close attention are those neglected groups showing low growth rates since Costa (2000), typically involving families with small-sized species (also noted by Navarrete-Heredia et al. 2022 for Mexico), as well as highly speciose genera (Table 2). Finally, it would likely pay to be alert to the potential presence of families that have not yet been recorded from Brazil, such as Meruidae, Sphaeriusidae, and others.

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Competing Interests

The authors have declared that no competing interests exist.

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Supplementary material 1

Supplementary S1. Beetle groups recorded in the CTFB and the authors responsible for them. Classification and taxon names follow Table 1.

Authors: E. Caron, M.L. Monné, V.S. Ferreira, et al.

Data type: Authors of beetle groups.

Link: https://doi.org/10.3897/zoologia.41.e23072

Supplementary material 2

Supplementary S2. Excel spreadsheet containing all Coleoptera data extracted from the website on March 7, 2023. Data obtained from the Coleoptera section of the CTFB website (http://fauna.jbrj.gov.br/ – Monné and Costa 2023).

Authors: E. Caron, M.L. Monné, V.S. Ferreira, et al.

Data type: Species data.

Link: https://doi.org/10.3897/zoologia.41.e23072

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