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Distribution of immature Plecoptera genera (Arthropoda: Insecta) in streams of Brazilian Federal District

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Abstract: This study aimed to analyze the distribution and diversity of immature Plecoptera in the Distrito Federal (DF), Brazil, based on specimens deposited in the Aquatic Invertebrate Collection of the University of Brasília. Sampling was conducted between 2005 and 2018 in streams of the DF, within the São Bartolomeu, Paranoá, Preto, Maranhão and Descoberto river basins. D-nets, sieves and Surber samplers were employed for collection. Specimens were preserved in 70% ethanol, identified to genus level, and deposited in the collection. A total of 514 Plecoptera specimens were identified, 394 belonging to the family Perlidae and 120 to Gripopterygidae. The most representative genus was *Anacroneuria* (266 individuals), followed by *Tupiperla* (65), *Kempnyia* (60), *Gripopteryx* (46), *Macrogynoplax* (32) and *Paragripopteryx* (9). Perlidae showed a wide distribution, being recorded in all sampled basins. In contrast, Gripopterygidae was recorded in only three basins (Paranoá, Maranhão and São Bartolomeu), suggesting a possibly narrower distribution within the Distrito Federal. The predominance of Perlidae in the analyzed material may reflect its broad distribution and representation in Brazilian Plecoptera, although differences in sampling effort and habitat availability should also be considered. Although data on the order Plecoptera alone do not allow conclusions regarding the conservation status of the region's basins, they provide relevant information for understanding the structure of local benthic communities.

Palavras-chave: benthonic, macroinvertebrates, assemblages, Cerrado.

Resumo: (Distribuição e diversidade de gêneros de imaturos de Plecoptera (Arthropoda: Insecta) em riachos do Distrito Federal, Brasil). O estudo teve como objetivo analisar a distribuição e diversidade de imaturos de Plecoptera do Distrito Federal (DF), com base nos espécimes depositados na Coleção de Invertebrados Aquáticos da Universidade de Brasília. As coletas foram realizadas entre 2005 e 2018 em córregos do DF, nas bacias dos rios São Bartolomeu, Paranoá, Preto, Maranhão e Descoberto. Redes tipo D, peneiras e Subers foram empregados para coleta. Os espécimes foram conservados em álcool 70%, identificados até nível de gênero e depositados no acervo. Foram identificados 514 espécimes de Plecoptera, 394 da família Perlidae e 120 da família Gripopterygidae. O gênero mais representativo foi *Anacroneuria* (266 indivíduos), seguido por *Tupiperla* (65), *Kempnyia* (60), *Gripopteryx* (46), *Macrogynoplax* (32) e *Paragripopteryx* (9). Perlidae apresentou ampla distribuição, sendo registrada em todas as bacias amostradas. Por outro lado, Gripopterygidae foi registrada em apenas três bacias (Paranoá, Maranhão e São Bartolomeu), sugerindo uma distribuição menor dentro do Distrito Federal. A predominância de Perlidae dentre o material analisado pode refletir sua ampla distribuição e representatividade dentre os Plecoptera brasileiros, mas diferenças no esforço amostral e disponibilidade de habitats também devem ser consideradas. Embora os dados referentes à ordem Plecoptera, por si só, não permitam conclusões sobre a conservação de bacias da região, eles fornecem informações relevantes para a compreensão da estruturação de comunidades bentônicas locais.

Keywords: bentos, macroinvertebrados, assembleias, Cerrado.

Introduction

Plecoptera, popularly known as Stoneflies, is a small order of insects and is considered one of the most basal groups within Neoptera. They have a cosmopolitan distribution, occurring worldwide except in Antarctica, with more than 420 species described for the Neotropical re-

gion (Hamada & Silva, 2014; Pessacq et al., 2019; South et al., 2021).

Their feeding habits are diverse; they may function as detritivores, filter feeders, shredders, collectors, or predators (Dorvillé & Froehlich, 2001; Reynaga et al., 2017). Many Plecoptera nymphs are associated with cold, flowing, well-oxygenated waters and are sensitive to environmental degradation (Bispo & Froehlich, 2012). For this reason, together with Ephemeroptera and Trichoptera, they are widely used as bioindicators in aquatic biomonitoring (Amaral et al., 2015; Varella & Pinto, 2026). They are usually found on rocky river substrates or near the roots of riparian vegetation (Giller & Malmqvist, 1998; Bispo & Froehlich, 2012). The immature stages of Plecoptera play a significant role in maintaining the ecological balance of aquatic ecosystems, contributing to nutrient cycling through their participation in various ecological niches (Lecci & Righi-Cavallaro, 2017).

Between the 16 recognized families of Plecoptera, only two are recorded in Brazil, Perlidae and Gripopterygidae, with nine genera and more than 200 valid species documented in the country (Froehlich, 2010; Hamada & Silva, 2014; Gonçalves et al., 2017; Pessacq et al., 2019; Varella & Pinto, 2023). Among these, two genera exhibit restricted distributions outside the central portion of the Cerrado: *Enderleina* Jewett 1960, found only in basins of Amazon region, and *Guaranyperla* Froehlich 2001, limited to the Atlantic Forest (Avelino-Capistrano & Nessimian, 2013; Ribeiro & Gorayeb, 2016). The genera *Onychoplax* Klapálek 1914, has an uncertain geographic distribution, and its biology remains poorly understood; it is currently regarded as a monotypic genus endemic to Brazil (Duarte & Lecci, 2023). The remaining six genera are more widely distributed across Brazil and also occur in the Cerrado biome.

Brazil's Federal District (DF), located in the central region of the Cerrado Domain, encompasses eight hydrographic basins that are part of three major hydrographic regions (CODEPLAN, 2020). The Cerrado is Brazil's second-largest biome, surpassed only by the Amazon Rainforest, and is characterized by a high diversity of phytophysiognomies and rich biodiversity (Klink & Machado, 2005; Ribeiro & Walter, 2008). Due to its location at the core of the Brazilian tropical savanna, the DF represents an ecologically important area with high biodiversity.

This study aims to analyze data on the distribution and diversity of immature Plecoptera specimens from Brazil's Federal District, preserved in the Aquatic Invertebrate Collection at the University of Brasília (CIAqUnB).

Material and Methods

All the material used is part of the University of Brasília's Aquatic Invertebrate Collection (CIAqUnB) and was collected between 2005 and 2018 from streams and rivers in five hydrographic basins of the Federal District, during the morning hours, using Surber samplers, D-nets, and sieves. A total of 59 sampling sites were surveyed across these basins. Of these, 16 sites were located in the Maranhão River basin, all within the Cafuringa Environmental Protection Area. In the Paranoá River basin, 23 sites were sampled, nine of which were located in Brasília National Park, one in Samambaia stream, one in Cana do Reino stream, five in the Jardim Botânico Ecological Station, five in the Roncador Ecological Station (IBGE), and two in the Água Limpa Farm of the University of Brasília. In the São Bartolomeu River basin, 15 sites were sampled, four of which were located in the Águas Emendadas Ecological Station, one in the Paranoazinho stream, three in the Pau de Caixeta stream, and seven distributed along the Taboca stream. Two sites were sampled in the Descoberto River basin, one in the Rodeador stream and the other in the Descoberto River itself. Finally, three sites were sampled in the Preto River basin: one in the Taquara stream, one in the São Bernardo stream, and one in the Várzea do Buracão stream.

In the field, individual insects were separated into Falcon tubes containing 70% ethanol. Substrate samples were stored in transparent plastic bags and transported to the laboratory at the University of Brasília. Upon arrival, the samples were washed under running water using sieves with mesh sizes of 0.63 mm and 1.16 mm. The sieved material was sorted under a stereoscopic microscope to locate and isolate immature Plecoptera associated with the benthic substrates of the water bodies. The specimens found were preserved in glass vials containing 70% ethanol.

Plecoptera nymphs were identified at genera-level using the identification keys provided by Hamada & Silva (2014) and Lecci & Froehlich (2007) and subsequently deposited in the Aquatic Invertebrate Collection of the University of Brasília (CIAqUnB).

Results

A total of 180 lots of Plecoptera nymphs from Brazil's Federal District are deposited in the Aquatic Invertebrate Collection of the University of Brasília (CIAqUnB), representing 514 specimens. Perlidae is the most representative family, with 134 lots (74.44% of the total) and 394 specimens (76.65%), followed by Gripopterygidae, with 46 lots (25.56%) and 120 specimens (23.35%).

In total, six genera of Plecoptera are represented in the collection, three belonging to the family Perlidae and three to Gripopterygidae. Within Perlidae, *Anacroneuria* Klapálek 1909 is the most representative genus, with 78 lots (58.21% of the family's total) and 266 specimens (67.51%). *Kempnyia* Klapálek 1914 is the second most represented genus, with 30 lots (22.39%) and 60 individuals (15.23%), followed by *Macrogynoplax* Enderlein 1909, with 17 lots (12.69%) and 32 specimens (8.12%). Additionally, 9 lots containing 36 individuals were identified only to the family level due to insufficient morphological features as represented in the graph (Fig. 1).

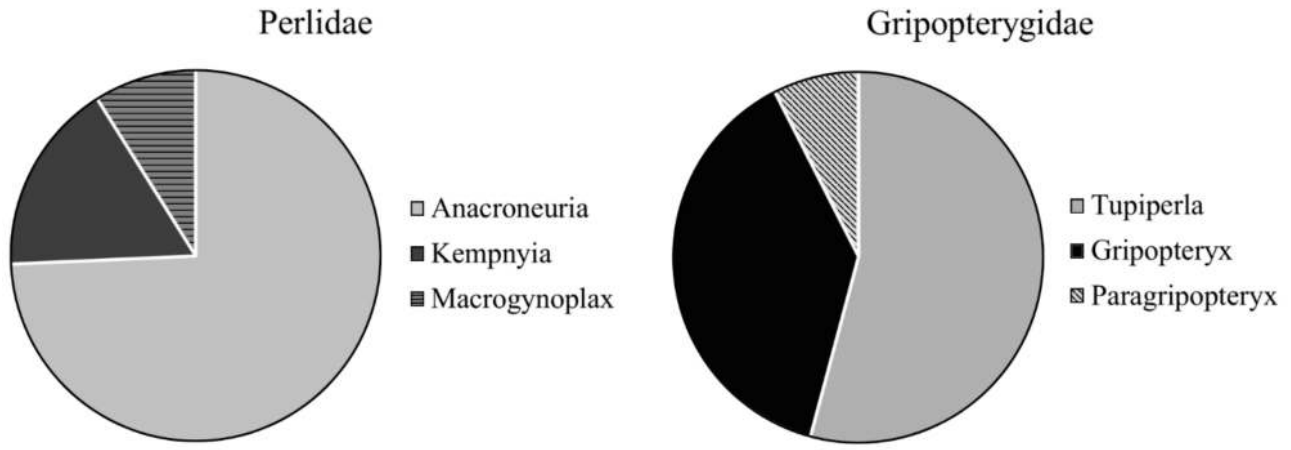


Figure 1: Percentage representation of each Plecoptera genus within the Aquatic Invertebrate Collection of the University of Brasília (CIAqUnB).

For Gripopterygidae, *Tupiperla* Froehlich 1969 is the most representative genus, with 31 lots (67.39%) and 65 individuals (54.17%), followed by *Gripopteryx* Pictet 1841 with eight lots (17.39%) and 46 specimens (38.33%), and *Paragripopteryx* Enderlein 1909 with seven lots (15.22%) and nine individuals (7.50%).

Perlidae showed a wide distribution across the hydrographic basins of the Distrito Federal, being recorded in all five basins sampled in this study (Fig. 2). Gripopterygidae, on the other hand, showed a more limited distribution, occurring mainly in the Paranoá River basin, but also recorded at sites in the Maranhão and São Bartolomeu river basins.

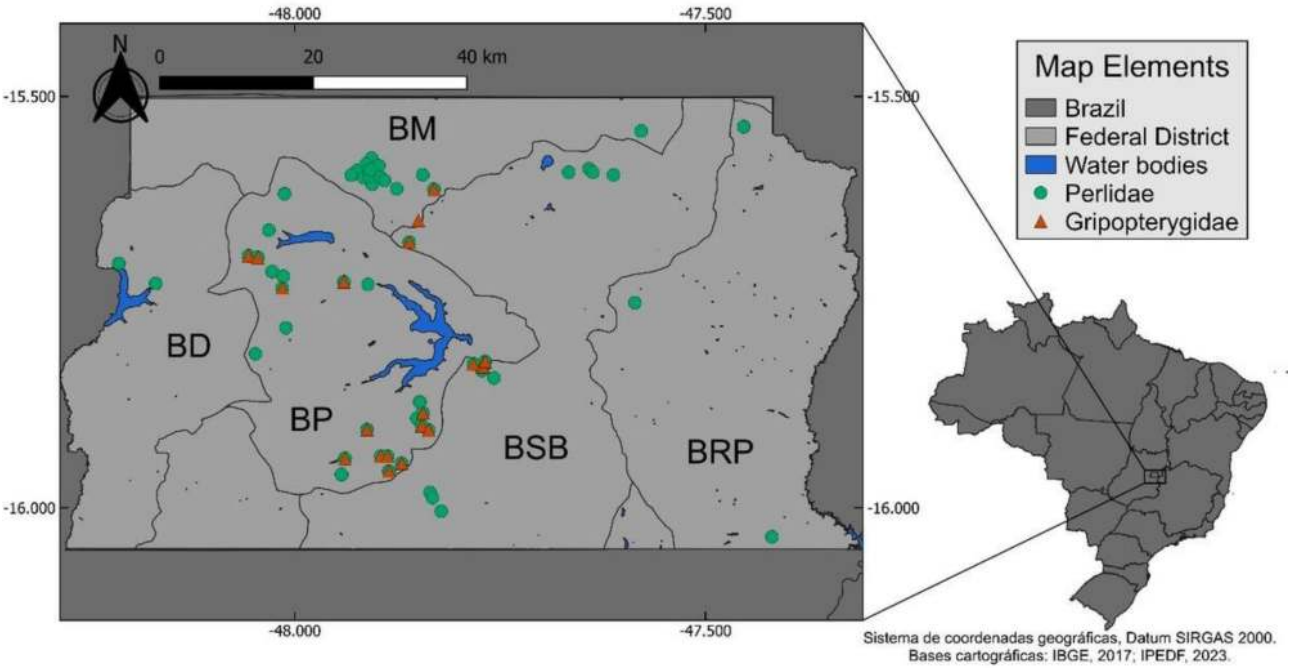


Figure 2: Distribution of Perlidae and Gripopterygidae (Insecta: Plecoptera) across the hydrographic basins of the Federal District. BM = Maranhão River Basin, BD = Descoberto River Basin, BP = Paranoá River Basin, BSB = São Bartolomeu River Basin, BRP = Preto River Basin.

On the other hand, some genera showed a limited distribution within the Distrito Federal (Fig. 3 and 4). Among them, *Anacroneuria* was the most abundant and widely distributed, being present in all sampled basins. Next is *Kempnyia*, also present in all five basins, but occurring at fewer sites and in lower abundance than the previous genus. *Macrogynoplax* was present in four basins (Maranhão, Paranoá, São Bartolomeu and Descoberto river basins), *Tupiperla* in three (Maranhão, Paranoá and São Bartolomeu river basins), *Gripopteryx* in two (Paranoá and São Bartolomeu river basins), and *Paragripopteryx* in only one, being restricted to the Paranoá River basin (Fig. 5).

Discussion

The distribution of Plecoptera is well known for some portions of Brazil, with studies focusing mainly on Atlan-

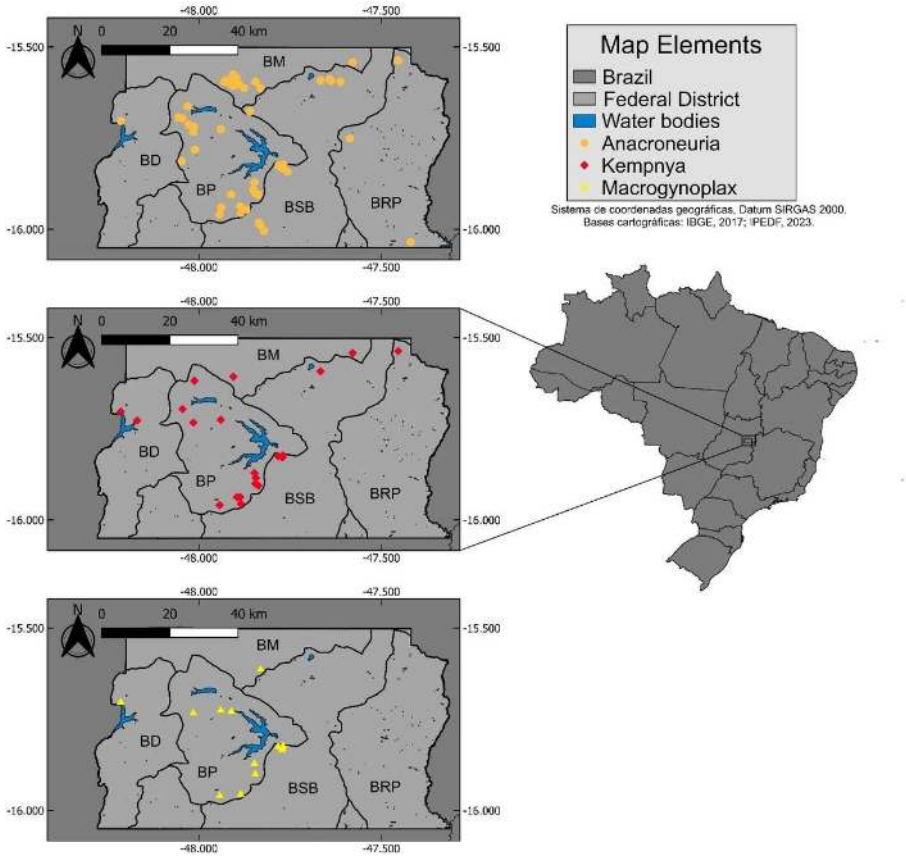


Figure 3: Distribution of Perlidae genera (Insecta: Plecoptera) across the hydrographic basins of the Federal District. BM = Maranhão River Basin, BD = Descoberto River Basin, BP = Paranoá River Basin, BSB = São Bartolomeu River Basin, BRP = Preto River Basin.

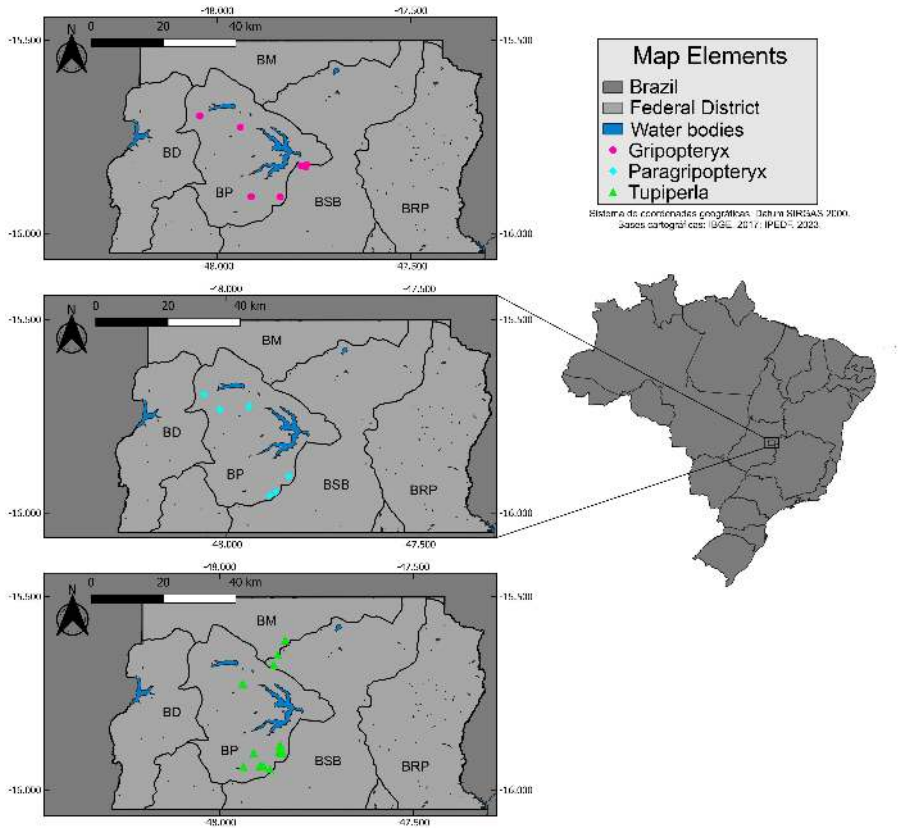


Figure 4: Distribution of Gripopterygidae genera (Insecta: Plecoptera) across the hydrographic basins of the Federal District. BM = Maranhão River Basin, BD = Descoberto River Basin, BP = Paranoá River Basin, BSB = São Bartolomeu River Basin, BRP = Preto River Basin.

tic Forest regions (Avelino-Capistrano & Nessimian, 2013; Avelino-Capistrano & Nessimian, 2014; Froehlich, 2010; Froehlich, 2011; Duarte & Lecci, 2023; Taniguti et al., 2023). Some studies have aimed to survey the diversity of the Cerrado, including studies conducted in the state of Goiás, which borders the Distrito Federal (Bispo et al., 2002; Bispo & Froehlich, 2004; Bispo & Froehlich, 2007). However, the diversity occurring in the DF remains poorly studied, with no species described as occurring in the territory to date (Lecci et al., 2026).

Accordingly, our data represents the first occurrence records for Plecoptera genera in the DF. Nine genera of this order are described for Brazil, with *Enderleina* being mainly restricted to Amazonian portions of the country, with no confirmed occurrence in the central Cerrado, and *Guaranyperla* being endemic to southeastern forests, with no records for areas adjacent to the DF (Froehlich, 2010; Hamada & Silva, 2014; Ribeiro & Gorayeb, 2016; Gonçalves et al., 2017; Pessacq et al., 2019; Varella & Pinto, 2023). There is also the case of *Onychoplax*, a monotypic genus endemic to Brazil, whose distribution within the country remains uncertain (Duarte & Lecci, 2023). Among the remaining genera not mentioned above, all were sampled in the present study.

Among the genera of Perlidae, *Anacroneuria* is the most diverse and widely distributed across the national territory, being known from all Brazilian states except Alagoas, Paraíba and Rio Grande do Norte, in addition to the Distrito Federal until now (Miguel et al., 2022; Duarte & Lecci, 2023; Almeida et al., 2025; Sousa et al., 2025).

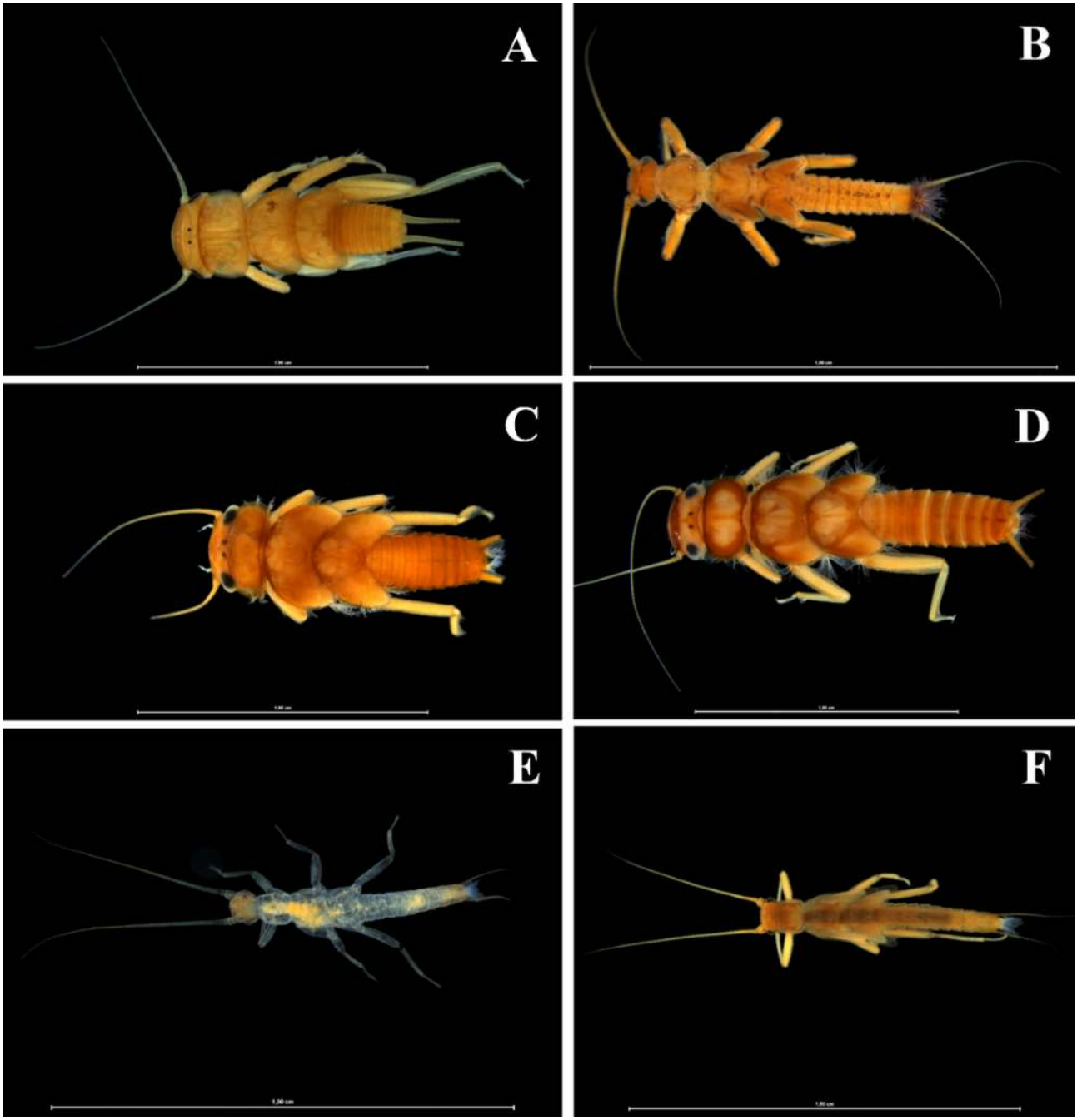


Figure 5: Plecoptera individuals collected during the sampling period. A. *Anacroneuria* (Perlidae); B. *Gripopteryx* (Gripopterygidae); C. *Kempnyia* (Perlidae); D. *Macrogynoplax* (Perlidae); E. *Paragripopteryx* (Gripopterygidae); F. *Tupiperla* (Gripopterygidae).

Kempnyia has a known distribution spanning the states of Santa Catarina, Rio Grande do Sul, Paraná, São Paulo, Rio de Janeiro, Minas Gerais, Espírito Santo, Goiás, Bahia and Tocantins (Duarte & Lecci, 2023; Almeida et al., 2024). Lastly, *Macrogynoplax* is recorded for São Paulo, Espírito Santo, Mato Grosso, Goiás, Bahia, Tocantins, Roraima, Pará, Amazonas and Amapá (Almeida et al., 2023; Duarte & Lecci, 2023; Sousa et al., 2025). This represents the first record of these genera for the Distrito Federal.

In contrast to Perlidae, the genera of Gripopterygidae showed narrower known distributions. *Tupiperla* has a known distribution in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Rio de Janeiro, Espírito Santo, Minas Gerais, Bahia, Pernambuco and Goiás (Bispo & Froehlich, 2007; Duarte & Lecci, 2023; Duarte et al., 2024; Lecci et al., 2025). *Gripopteryx* is recorded for the states of Santa Catarina, Rio Grande do Sul, São Paulo, Rio de Janeiro, Minas Gerais, Espírito Santo and Bahia (Duarte & Lecci, 2023; Duarte et al., 2024). Lastly, *Paragripopteryx* is known from the states of Santa Catarina, São Paulo, Rio de Janeiro, Minas Gerais, Espírito Santo and Bahia (Duarte & Lecci, 2023; Duarte et al., 2024). This also represents the first record of these genera for the Distrito Federal.

The presence of Perlidae in all sampled basins was expected. This family corresponds to the most abundant one occurring in Brazil, with more than 150 described species, representing at least 60% of Plecoptera diversity in the country (Pessacq et al., 2019; Duarte & Lecci, 2023). Its genera are distributed throughout the national territory, occurring in virtually all Brazilian biomes (Duarte & Lecci, 2023; Almeida et al., 2025). Gripopterygidae, in contrast, shows a distribution centered on Atlantic Forest regions, where its diversity peak occurs (Duarte & Lecci, 2023; Duarte et al., 2024; Lecci et al., 2025). Furthermore, the predominance of *Anacroneuria* reflects its status as the most abundant and dominant genus in the Neotropical region. Alone, it accounts for approximately 100 described species in Brazil, with new species being described annually (Pessacq et al., 2019; Duarte & Lecci, 2023; Almeida et al., 2026).

The Paranoá River basin was the sampled area with the highest number of individuals recorded, in addition to having registered all genera within its area. This result may be associated with the habitat preferences of these insects. Nymphs show a preference for greater vegetation cover, the presence of macrophytes, and the presence and diversity of microhabitats (Bispo et al., 2006; Schmitt et al., 2019; Araujo et al., 2023). This can explain the lower diversity and abundance recorded in the Preto and Descoberto river basins, areas characterized by intense agricultural activity and urban expansion and, consequently, aquatic habitat degradation. The Paranoá basin, on the other hand, harbors part of the main environmental conservation areas of the DF, such as Brasília National Park and the Roncador and Jardim Botânico Ecological Stations, indicating a greater potential for preserved habitats that could be used by these insects. However, it should be noted that our data cannot describe the different conservation states among the basins due to the disparity in the number of sampling points. The lower diversity found in the Rio Preto and Descoberto basins may be an artifact of the smaller sampling effort at these sites.

The specimens deposited in the CIAqUnB represent an important temporal, geographic, and spatial record for the order Plecoptera in the Distrito Federal and the Cerrado. Such collections play a fundamental role in biodiversity research, preserving long temporal series and enabling the identification of ecological and distributional patterns (Barroso et al., 2002; Zaher & Young, 2003). This importance is further amplified in the case of undersampled taxa and regions, such as Plecoptera and the Cerrado, serving as a reliable record of diversity that enables the description of new species and improves understanding of environmental changes in the sampled regions (Barroso et al., 2002; Meineke et al., 2019).

This study makes an important contribution to filling knowledge gaps regarding the diversity of Plecoptera occurring in the Distrito Federal and its distribution across streams and hydrographic basins. Nevertheless, genus-level results alone are not sufficient to fully fill these gaps. Therefore, studies addressing species-level diversity in DF are still needed for a complete understanding and filling of the Wallacean shortfall.

References

Almeida, L. H., Gonçalves, M. C., & Bispo, P. C. (2024). An Integrative Approach to the Study of *Kempnyia* Klapálek, 1914 (Plecoptera: Perlidae) from Brazil: Support for the Description of Four New Species and a Basis For Future Studies. *PLOS ONE*, *19*(7), 1–30. https://doi.org/10.1371/journal.pone.0305824

Almeida, L. H., Gonçalves, M. C., & C., B. P. (2025). Reducing the Linnean and Wallacean shortfalls to *Anacroneuria* Klapálek, 1909 (Plecoptera: Perlidae) from Brazil: two new species and several new distributional records. *Biologia*, *80*, 597–614. https://doi.org/10.1007/s11756-024-01858-4

Almeida, L. H., Novaes, M. C., & Bispo, P. C. (2026). *Anacroneuria* (plecoptera: perlidae) from southern brazil: new findings and a new species. *Zootaxa*, *5810*(3), 573–580. https://doi.org/10.11646/zootaxa.5810.3.9

Almeida, L. H., Taniguti, P. N., Lopez, V. M., & Bispo, P. C. (2023). Taxonomic Contributions on *Macrogynoplax* Enderlein and *Enderleina* Jewett (Plecoptera: Perlidae) from Brazil, including a new species supported by molecular and morphological data. *Neotropical Entomology*, *52*, 1119–1128. https://doi.org/10.1007/s13744-023-01084-8

Amaral, P. H. M., Silveira, L. S., Rosa, B. F. J. V., Oliveira, V. C., & Alves, R. G. (2015). Influence of Habitat and Land Use on the Assemblages of Ephemeroptera, Plecoptera, and Trichoptera In

Neotropical Streams. *Journal of Insect Science*, *15*(1), 60. https://doi.org/10.1093/jisesa/iev042

Araujo, D. S. S., Brasil, L. S., Pozzobom, U. M., Azevêdo, C. A. S., & Lima, L. R. C. (2023). The Presence Of Macrophytes Changes The Beta Diversity of Ephemeroptera, Plecoptera, and Trichoptera (EPT) Assemblages in Cerrado Streams in Northeastern Brazil. *Limnology*, *24*, 161–169. https://doi.org/10.1007/s10201-023-00714-9

Avelino-Capistrano, F., & Nessimian, J. L. (2013). A New Species and New Records of Gripopterygidae (Plecoptera) from the Serra dos Órgãos, Rio de Janeiro state, Brazil. *Zootaxa*, *3683*(2), 185–191. https://doi.org/10.11646/zootaxa.3683.2.7

Avelino-Capistrano, F., & Nessimian, J. L. (2014). Novos Registros da Fauna de Plecoptera (Insecta) para o Estado do Espírito Santo, Brasil. *Boletim do Museu de Biologia Mello Leitão*, (33), 5–18. https://boletim.sambio.org.br/ns33.html

Barroso, C. X., Salani, S., Arruda, M. O., Silva, M. Q. M. d., Silva, M. V. d., & Mathews-Cascon, H. (2002). The Porifera, Cnidaria, Bryozoa, and Echinodermata Collections of the Universidade Federal do Ceará: Contributions to the Marine Biodiversity Knowledge of Northeastern Brazil. *Arquivos de Ciência do Mar*, *55*(1), 78–90. https://doi.org/10.32360/acmar.v55i1.78058

Bispo, P. C., & Froehlich, C. G. (2004). *Anacroneuria* (plecoptera: perlidae) from serra da mesa, northern goiás state, brazil, with descriptions of new species. *Aquatic Insects*, *26*(3–4), 191–197. https://doi.org/10.1080/01650420412331327277

Bispo, P. C., & Froehlich, C. G. (2007). Stoneflies (Plecoptera) from northern Goiás state, Central Brazil: new record of *Kempnyia oliveirai* (Perlidae) and a new species of *Tupiperla* (Gripopterygidae). *Aquatic Insects*, *29*(3), 213–217. https://doi.org/10.1080/01650420701411184

Bispo, P. C., & Froehlich, C. G. (2012). Plecoptera Burmeister, 1839. In J. A. Rafael, G. A. R. Melo, C. J. B. Carvalho, S. Casari, & R. Constantino (Eds.), *Insetos do Brasil: Diversidade e Taxonomia* (pp. 249–253). Manaus: Instituto Nacional de Pesquisas da Amazônia. https://doi.org/10.61818/56330464

Bispo, P. C., Froehlich, C. G., & Oliveira, L. G. (2002). Spatial Distribution of Plecoptera nymphs in streams of a mountainous area of Central Brazil. *Brazilian Journal of Biology*, *62*(3), 409–417. https://doi.org/10.1590/S1519-69842002000300003

Bispo, P. C., Oliveira, L. G., Bini, L. M., & Sousa, K. G. (2006). Ephemeroptera, Plecoptera and Trichoptera Assemblages from Riffles In Mountain Streams of Central Brazil: Environmental Factors Influencing the Distribution and Abundance of Immatures. *Brazilian Journal of Biology*, *66*(2b), 611–622. https://doi.org/10.1590/S1519-69842006000400005

CODEPLAN. (2020). *Um Panorama das Águas no Distrito Federal*. Brasília: Companhia de Planejamento do Distrito Federal. https://www.codeplan.df.gov.br/wp-content/uploads/2020/07/Estudo-Um-Panorama-das-%C3%81guas-no-Distrito-Federal.pdf

Dorvillé, L. F., & Froehlich, C. G. (2001). Description of the Nymph Of *Kempnyia tijucana* Dorville and Froehlich (Plecoptera, Perlidae), with notes on its development and biology. In E. Dominguez (Ed.), *Trends in research in Ephemeroptera & Plecoptera* (pp. 285–392). New York: Kluwer/Plenum.

Duarte, T., Froehlich, C. G., & Bispo, P. C. (2024). Neotropical species of gripopterygid stoneflies (Plecoptera: Gripopterygidae). *Anais da Academia Brasileira de Ciências*, *96*(4), e20231362. https://doi.org/10.1590/0001-3765202420231362

Duarte, T., & Lecci, L. S. (2023). A Scientometric Approach to the Taxonomy of Brazilian Plecoptera: an overview of data. *Revista Brasileira de Entomologia*, *67*(spe), e20230056. https://doi.org/10.1590/1806-9665-RBENT-2023-0056

Froehlich, C. G. (2010). *Anacroneuria* (plecoptera, perlidae) from the mantiqueira mountains, são paulo state, brazil. *Zootaxa*, *2365*(1), 55–68. https://doi.org/10.11646/zootaxa.2365.1.3

Froehlich, C. G. (2011). Checklist dos Plecoptera (Insecta) do Estado de São Paulo, Brasil. *Biota Neotropica*, *11*, 601–606. https://doi.org/10.1590/S1676-06032011000500026

Giller, P. S., & Malmqvist, B. (1998). *The Biology of streams and rivers*. Oxford: Oxford University Press.

Gonçalves, M. C., Novaes, M. C., & Salles, F. F. (2017). New species and records of Perlidae (Plecoptera) from Espírito Santo State, Brazil. *Zootaxa*, *4273*(1), 141–150. https://doi.org/10.11646/zootaxa.4273.1.11

Hamada, N., & Silva, J. O. (2014). Ordem Plecoptera. In N. Hamada, J. L. Nessimian, & R. B. Querino (Eds.), *Insetos Aquáticos na Amazônia Brasileira: Taxonomia, Biologia e Ecologia* (pp. 283–288). Manaus: Editora INPA.

Klink, C. A., & Machado, R. B. (2005). A Conservação do Cerrado brasileiro. *Megadiversidade*, *1*, 147–155. https://doi.org/10.1111/j.1523-1739.2005.00702.x

Lecci, L. S., Duarte, T., Almeida, L. H., & Bispo, P. C. (2026). *Plecoptera*. Catálogo Taxonômico da Fauna do Brasil. http://fauna.jbrj.gov.br/fauna/faunadobrasil/304

Lecci, L. S., & Froehlich, C. G. (2007). *Plecoptera*. Guia On-Line: Identificação de Larvas de Insetos Aquáticos do Estado de São Paulo. https://sites.ffclrp.usp.br/aguadoce/guia_online/Guia_identifica%C3%A7%C3%A3o_larvas_Plecoptera.pdf

Lecci, L. S., & Righi-Cavallaro, K. O. (2017). Checklist de Plecoptera (Insecta) do Estado do Mato Grosso do Sul, Brasil. *Iheringia*, *107*, e2017118. https://doi.org/10.1590/1678-4766e2017118

Lecci, L. S., Sarmento, F. R. P., & Bispo, P. C. (2025). *Tupiperla tessellata* (brauer, 1866) (plecoptera: gripopterygidae): description of the nymph with morphological and distributional notes. *Zootaxa*, *5642*(6), 551–561. https://doi.org/10.11646/zootaxa.5642.6.3

Meineke, E. K., Davies, T. J., Daru, B. H., & Davis, C. C. (2019). Biological Collections for understanding Biodiversity in the Anthropocene. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *374*(1763), 20170386. https://doi.org/10.1098/rstb.2017.0386

Miguel, M., Almeida, L. H., Novaes, M. C., & Bispo, P. C. (2022). *Anacroneuria* (plecoptera: Perlidae) from central brazil: New species, new geographic records, and taxonomic notes. *Zootaxa*, *5162*(5), 487–506. https://doi.org/10.11646/zootaxa.5162.5.2

Pessacq, P., Zuñiga, M. C., & Duarte, T. (2019). An updated checklist of Neotropical Plecoptera. *Zoosymposia*, *16*, 182–209. https://doi.org/10.11646/zoosymposia.16.1.15

Reynaga, M. C., Dávalos, N., & Molineri, C. (2017). Variaciones Espaciales Y Ontogenéticas en la Dieta de un Plecóptero de Amplia Distribución *Claudioperla tigrina*. *Revista de Biología Tropical*, *65*(3), 1174–1184. https://doi.org/10.15517/rbt.v65i3.23865

Ribeiro, J. F., & Gorayeb, I. S. (2016). Key To Plecoptera nymphs from the Brazilian Amazon (Insecta). *Zootaxa*, *4208*(5), 433–445. https://doi.org/10.11646/zootaxa.4208.5.2

Ribeiro, J. F., & Walter, B. M. T. (2008). As Principais Fitofisionomias do Bioma Cerrado. In S. M. Sano, S. P. Almeida, & J. F. Ribeiro (Eds.), *Cerrado: Ecologia e Flora* (pp. 151–196). Planaltina: Embrapa Cerrados.

Schmitt, R., Silva, A. L. L., Soares, L. C. P. M., Petrucio, M. M., & Siegloch, A. E. (2019). Influence of Microhabitat on Diversity and Distribution of Ephemeroptera, Plecoptera, and Trichoptera in subtropical forest streams. *Studies on Neotropical Fauna and Environment*, *55*(2), 129–138. https://doi.org/10.1080/01650521.2019.1704984

Sousa, I. B., Santos, S. E., Ribeiro, J. M. F., & Couceiro, S. E. M. (2025). New Records and Taxonomic Notes on *Anacroneuria* and *Macrogynoplax* (Plecoptera: Perlidae) from Western Pará, Brazil. *Zootaxa*, *5692*(3), 541–554. https://doi.org/10.11646/zootaxa.5692.3.6

South, E. J., Skinner, R. K., DeWalt, E. R., Davis, M. A., Johnson, K. P., Teslenko, V. A., Lee, J. J., Malison, R. L., Hwang, J. M., Bae, Y. J., & Myers, L. W. (2021). A New Family of Stoneflies (Insecta: Plecoptera), Kathroperlidae, *fam. n.*, with a phylogenomic analysis of the Paraperlinae (Plecoptera: Chloroperlidae). *Insect Systematics and Diversity*, *5*(4), 1. https://doi.org/10.1093/isd/ixab014

Taniguti, P. N., Sarmento, F. R. P., Lopes, V. M., Kobal, R. O. A. C., & Almeida, L. H. (2023). Perlidae (Plecoptera) do Estado de São Paulo, Brasil: lista de espécies, problemas taxonômicos e amostragem. *Acta Biologica Brasiliensia*, *6*(2), 5–14. https://doi.org/10.18554/acbiobras.v6i2.7256

Varella, R. C., & Pinto, A. P. (2023). In honor of the Claudio Gilberto Froehlich's Career: *Tupiperla claudius sp. nov.* (Plecoptera: Gripopterygidae), a new stonefly from Pico do Marumbi State Park, Paraná state, southern Brazil. *Revista Brasileira de Entomologia*, *67*(spe), e20230072. https://doi.org/10.1590/1806-9665-RBENT-2023-0072

Varella, R. C., & Pinto, A. P. (2026). Ephemeroptera, Trichoptera, and Plecoptera with Bioindicator Potential In Streams Across a Mosaic of Land Uses. *Hydrobiologia*, *853*, 3649–3661. https://doi.org/10.1007/s10750-026-06173-4

Zaher, H., & Young, P. S. (2003). As Coleções Zoológicas Brasileiras: Panoramas e Desafios. *Ciência & Cultura*, *55*(3), 24–26. https://cienciaecultura.bvs.br/pdf/cic/v55n3/a17v55n3.pdf

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