Checklist and New Occurrences of Odonata (Insecta) from Volta Grande do Xingu, Pará, Brazil

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Abstract: The order Odonata (Insecta) is composed of aquatic insects popularly known as dragonflies and damselsflies. Members of this order are closely linked to the conservation status of their habitats; however, the Wallacean shortfall in some regions still remains high. The Volta Grande do Xingu region is known to have high endemism of some groups, such as Actinopterygii (fish), which can be applied to other groups that do not yet have their fauna known at the site, such as the order Odonata. The Wallacean shortfall and constant anthropic changes (for example, the construction of the Belo Monte Hydroelectric) have been obstacles in the preservation of these and other groups. In that regard, the main aim of this paper is to provide a checklist of Odonata (Insecta) adult species from the streams of Volta Grande do Xingu, Pará, Brazil. The collections were carried out in 19 streams in the Volta Grande do Xingu region in September 2019, corresponding to the drought period. A total of 526 specimens were collected, where two suborders, six families, 26 genera and 43 species were identified. Three species of Odonata were registered for the first time in the state of Pará: Erythrodiplax famula (Erichson in Schomburgk, 1848); Acanthogomphus chacoense Calvert, 1909 and Epipleoneura lamina Williamson, 1915. These data allow us to help increase the knowledge of Odonata fauna in the streams of Volta Grande do Xingu, a region that is under intense anthropic pressure. This helps to reduce the Wallacean shortfall, with another area sampled for the state of Pará.

Keywords: aquatic insects; Anisoptera; Zygoptera; inventory; Amazon

1. Introduction

The order Odonata, belonging to the class Insecta, is composed of aquatic insects popularly known as dragonflies and damselsflies [1]. Currently, the order has approximately
6322 species, with more than 600 genera and 39 families belonging to three suborders: Anisoptera, Anisozygoptera and Zygoptera, and has representatives in tropical, subtropical and temperate regions [2,3]. In Brazil, there are 862 species and 146 genera, 15 families and the suborders Anisoptera and Zygoptera registered [4]. The Zygoptera and Anisoptera suborders have high rates of endemism, about 87% and 64% of the genera groups, respectively, occur only in the Neotropical realm [5,6].

During adulthood, individuals of the suborders Anisoptera and Zygoptera can be easily distinguished by their body morphology [7]. Adult Zygoptera usually have a smaller and slimmer body; the fore and hind wings of Zygoptera are similar in terms of shape, size and venation, and, when at rest, they usually arrange their wings closed over the abdomen [7,8]. The adult Anisoptera representatives have a more robust body; the wings are widened at the base and differ in size, shape and venation, and, when at rest, generally, the wings are arranged on the sides of the body [8,9].

In addition, Odonata adults differ in their ecophysiology, they are divided into “Fliers” and “Perchers”. Fliers are endothermic individuals that produce endogenous heat and are able to control the circulation of hemolymph between the chest and abdomen, and perchers are usually ectothermic using sunlight and ambient temperature [10]. Individuals classified as fliers are commonly part of the Anisoptera suborder, and perchers are mostly part of the Zygoptera suborder [11].

The thermoregulation of Odonata adults also influences their habitat preference. Most Zygoptera species are restricted to areas where canopy cover and shading are more present, while Anisoptera are present in greater abundance and richness in open areas with large sunlight inputs [12–14].

In a study by De Marco and Vianna [15] on the effort to collect Brazilian odonatofauna, they found that only 29% of the territory had data on Odonata richness, and only about 3.5% of the Brazilian area had more than 50 samples by location. In the same paper, the authors note that the main states with information are in the Southeast region and in small isolated points where there is a presence of Odonata researchers. Furthermore, the difficulty of collecting some taxa, such as Aeshnidae and Gomphidae [16], and the lack of investment in taxonomy professionals to identify individuals deposited in collections [17] interfere in the solving of the Wallacean shortfall.

In Miguel et al. [14], 12 years after the work of De Marco and Vianna [15], it was found that the north region still has a large Wallacean shortfall. Even with the growing number of studies in the field of odonatology [18–28] and recent checklists for other states in the region (Amazonas: Koroiva et al. [29]; Amapá: Garcia Junior et al. [30]), the state of Pará still does not present a checklist. In addition, many areas still have unknown biodiversity; the region of Volta Grande do Xingu is one of them. This lack of knowledge is worrisome since this area is under the impact of the reduction in the level of the Xingu River, which will modify the water functioning of its streams and generate changes in the biological communities present in these places, e.g., family Loricariidae (Siluriformes) [31], which may result in the loss of species before they are even known.

Faced with the rapid advancement of human activities on ecosystems, seeking information on the diversity and distribution of species is necessary, in order to have a basis for the planning of conservation of these species [32]. The lack of information in certain regions represents an obstacle mainly in the assessment of the conservation status of Odonata species, such as on the IUCN (International Union for Conservation of Nature) red list [33]. Therefore, this study aims to present a checklist of species of adults of the order Odonata present in streams in the region of Volta Grande do Xingu, Pará, as well as to provide the distribution of these species and the characterization of the microhabitat of new occurrences for the state of Pará, Brazil.
2. Materials and Methods
2.1. Study Area

The study was carried out by scanning in 19 streams in the region of Volta Grande do Xingu, in the municipalities of Anapu, Senador José Porfírio and Vitória do Xingu, in the southwest of the state of Pará, Brazil (Figure 1, Table 1). These streams, according to Strahler’s classification [34], are considered small because they are classified as 1st to 3rd order streams (Figure 2). According to the Köppen–Geiger classification, the predominant climate in the region is Am, a tropical monsoon climate, with dry seasons usually lasting from June to November, and rainy seasons from December to May [35]. The average annual temperature in the region is 26.5 °C; the average annual rainfall is close to 2044 mm/year, and the average number of hours of sunshine per year is approximately 2453.73 h/year. In September of 2019, the monthly average number of hours of sunshine was 249 h/month (Climatedata.org, accessed on 17 May 2021) [36].

Figure 1. Location of adult Odonata collection points in Volta Grande do Xingu, Pará, Brazil (in 2019).

Table 1. Location and abbreviation of collection points (P), coordinates and their respective municipalities in the region of Volta Grande do Xingu, Pará, Brazil.

| Collection Points | Coordinates          | Municipality               |
|-------------------|----------------------|---------------------------|
| P1                | 03°19.601’ S, 051°46.967’ W | Vitória do Xingu          |
| P2                | 03°05.166’ S, 051°38.097’ W | Anapu                     |
| P3                | 03°03.623’ S, 051°39.957’ W | Altamira                  |
| P4                | 03°02.993’ S, 051°48.438’ W | Senador José Porfírio     |
| P5                | 03°01.315’ S, 051°47.936’ W | Senador José Porfírio     |
| P6                | 03°02.818’ S, 051°47.809’ W | Senador José Porfírio     |
| P7                | 03°00.953’ S, 051°45.401’ W | Senador José Porfírio     |
| P8                | 03°09.530’ S, 051°35.343’ W | Anapu                     |
Table 1. Location and abbreviation of collection points (P), coordinates and their respective municipalities in the region of Volta Grande do Xingu, Pará, Brazil.

| Collection Points | Coordinates                  | Municipality         |
|-------------------|------------------------------|----------------------|
| P9                | 03°01.211′ S, 051°41.114′ W  | Senador José Porfírio |
| P10               | 03°10.487′ S, 051°40.855′ W  | Vitória do Xingu     |
| P11               | 03°15.856′ S, 051°30.142′ W  | Anapu                |
| P12               | 03°01.428′ S, 051°44.103′ W  | Senador José Porfírio |
| P13               | 03°01.511′ S, 051°43.345′ W  | Senador José Porfírio |
| P14               | 03°00.549′ S, 051°46.102′ W  | Anapu                |
| P15               | 03°32.798′ S, 051°36.785′ W  | Anapu                |
| P16               | 03°26.095′ S, 051°37.275′ W  | Anapu                |
| P17               | 03°23.664′ S, 051°34.643′ W  | Anapu                |
| P18               | 03°11.780′ S, 051°40.371′ W  | Vitória do Xingu     |
| P19               | 03°09.529′ S, 051°45.132′ W  | Vitória do Xingu     |

Figure 2. Streams sampled in Volta Grande do Xingu, Pará, Brazil (in 2019): (A) P9; (B) P15; (C) P20; (D) P19; (E) P17; and (F) P18.

2.2. Data Collection

The collections were carried out in September 2019, corresponding to the dry season at the site, due to the logistics of accessing the sites. A 100-m transect was delimited in each stream, and each transect was subdivided into 20 segments of 5-m each (Figure 3). The collection was carried out using the methodology of scanning in fixed areas, with the aid of an entomological net [37,38].
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After collection, the adult individuals of Odonata were placed in parchment paper envelopes, identified with the aid of taxonomic keys [7,9,39–49], and stored at the Laboratório de Ecologia—LABECO of the Universidade Federal do Pará—UFPA, Campus Altamira.

2.3. List Elaboration
For the elaboration of the list, 27 indexed publications were used, published between 1991 and 2021, on the distribution of families, genera and species, bibliographic reviews and lists of species from other Brazilian states. Additionally, the websites Fauna Taxonomic Catalog of Brazil (http://fauna.jbrj.gov.br/, accessed on 22 April 2021; Pinto [4]) and Global Biodiversity Information Facility—GBIF (https://www.gbif.org/, accessed on 13 April 2021) were used [50], and, to verify the conservation status of species on the list, we used the Red Book of the Brazilian Fauna Threatened with Extinction: Volume VII Invertebrates (Odonata) [51] (Table 2).

Table 2. References used to elaborate the distribution of adult species of Odonata from Volta Grande do Xingu (Pará, Brazil) and their numbers. GBIF = Global Biodiversity Information Facility.

| Citation | References |
|----------|------------|
| Bastos et al., 2019 | [32] |
| Garcia Junior et al., 2021 | [30] |
| Dalzochio et al., 2018 | [52] |
| Costa and Oldrini 2003 | [53] |
| Rodrigues and Roque 2017 | [33] |
| Ferreira-Peruquetti and Trivinho-Strixino 2003 | [54] |
| Assis et al., 2004 | [55] |
| Koroiva et al., 2017 | [56] |
| Machado et al., 1991 | [57] |
| Ferreira-Peruquetti and De Marco 2002 | [58] |
| Storari et al., 2019 | [59] |
| Souza et al., 2015 | [60] |
| Oliveira-Junior et al., 2013 | [61] |
| Pereira et al., 2019 | [62] |
| Pessaçq et al., 2012 | [63] |
| Koroiva et al., 2020 | [29] |
Table 2. Cont.

| Citation                        | References |
|---------------------------------|------------|
| Lencioni 2017                   | [47]       |
| Carvalho et al., 2018           | [21]       |
| Miguel et al., 2017b            | [18]       |
| Nobre and Carvalho 2014         | [64]       |
| Lencioni 2005                   | [43]       |
| Lencioni 2006                   | [44]       |
| Ellenrieder 2009                | [65]       |
| Pessacq 2014                    | [49]       |
| Vilela et al., 2020             | [66]       |
| Pinto 2021                      | [4]        |
| GBIF                            | [50]       |
| Calvão et al., 2016             | [67]       |
| Monteiro-Júnior et al., 2016    | [68]       |

2.4. Statistical Analysis

To measure the sampling effort and the number of species collected, the non-parametric Chao 1 estimator was used. This estimator is used for abundance data, and it gives weight for rare species [69]. The accumulation curve of species was generated from the estimator. Chao 1 and the species accumulation curve were calculated using the R software [70] using the vegan package [71].

3. Results

In total, 526 individuals belonging to seven families, 26 genera and 43 species were collected. From this, a total of three species were new records for the state of Pará: two species of Zygoptera and one species of Anisoptera. Among the sampled families, Coenagrionidae had the highest species richness ($n = 18$), followed by Libellulidae ($n = 17$), Calopterygidae ($n = 4$), Megapodagronidae ($n = 2$), Dicteriadiidae and Polythoridae, each with only one species (Table 3).

The suborder Zygoptera had the highest abundance ($n = 374$), followed by Anisoptera ($n = 152$). Among Anisoptera, the family with the highest number of individuals was Libellulidae ($n = 151$). In Zygoptera, the most abundant family was Coenagrionidae ($n = 177$), followed by Calopterygidae ($n = 175$) and Polythoridae ($n = 10$).

The most abundant genera were Mnesarete ($n = 92$), Hetaerina ($n = 83$) and Erythrodiplax ($n = 71$). Regarding richness, the most species-rich genera were Argia ($n = 7$), Epipleoneura ($n = 5$), Acanthagrion, Erythrodiplax and Neoneura with four species each. Among the species collected, Mnesarete williamsoni ($n = 39$), Hetaerina auripennis ($n = 37$), Neoneura sylvatica ($n = 35$), Epipleoneura metallica ($n = 24$) and Mnesarete cupraea ($n = 24$) presented the largest numbers of specimens collected.
Table 3. List of species recorded for Volta Grande do Xingu, Pará, Brazil. Location of collection points present in Table 1. Distribution of species in Brazilian states: AC = Acre; AM = Amazonas; AP = Amapá; BA = Bahia; CE = Ceará; DF = Distrito Federal; ES = Espírito Santo; GO = Goiás; MA = Maranhão; MG = Minas Gerais; MS = Mato Grosso do Sul; MT = Mato Grosso; PA = Pará; PB = Paraíba; PE = Pernambuco; PR = Paraná; RJ = Rio de Janeiro; RO = Rondônia; RR = Roraima; RS = Rio Grande do Sul; SC = Santa Catarina; SP = São Paulo; TO = Tocantins. References used to elaborate the distribution of species present in Table 2. Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) red book status [72]. LC = Least Concern. * = New records for the state of Pará.

| Suborders/Families/Species | Occurrence Points | Distribution in Brazil | References | ICMBio Status |
|----------------------------|-------------------|------------------------|------------|---------------|
| ANISOPTERA                 |                   |                        |            |               |
| Libellulidae               |                   |                        |            |               |
| Argyrothemis argentea      | P14               | AM. MT. PA. RO.        | [29,30,56,64,67] | LC            |
| Dasymatula esmeralda       | P14               | AM. CE. GO. MS. PA. RO.| [29,33,34,64] | LC            |
| Dasiostomus obscura        | P5, P8, P9, P10, P13 | AC. AM. AP. BA. ES. GO. MA. MG. MS. MT. PA. | [21,29,32,59,61] | LC            |
| Elasmotheremis cannaeioides | P10, P11         | BA. ES. MG. MS. MT. PA. PR. RJ. RR. RS. SP. TO. | [18,54,55,59,61] | LC            |
| Elasmotheremis williamsoni | P9                | AM. BA. MG. PA.        | [29,36,56,62] | LC            |
| Erythrodiplax fusca        | P8, P5, P7, P9    | AC. AM. GO. MA. MS. MT. PA. PE. PR. RJ. AP. RO. RR. RS. SP. | [29,36,61] | LC            |
| Micrathyria artemis        | P9                | AM. AP. GO. MG. MS.    | [29,30,56,68] | LC            |
| Orthemis attenuata         | P12, P14, P15, P16 | AM. MT. PA.            | [29,61,62] | LC            |
| Oligotoma walkeri Geijskes  | P11               | AM. AP. PA. RO.        | [29,30,56,65] | LC            |
| Perithemis lais            | P2, P5, P8, P11, P12, P13, P14, P18 | AM. ES. MA. MS. MT. PA. RR. | [29,32,56,57,61,62,67] | LC            |
| Perithemis taiasi Kirky     | P8, P11, P15, P16 | AM. AP. ES. MA. MS. MT. RJ. RO. SP. | [4,29,32,67] | LC            |
| Zenithoptera lanei Santos   | P7, P9, P13       | AM. BA. GO. MA. MT. PA. RR. SC. SP. TO. | [4,29,32,62] | LC            |
| Suborders/Families/Species | Occurrence Points | Distribution in Brazil | References | ICMBio Status |
|---------------------------|-------------------|------------------------|------------|---------------|
| Zygoptera                |                   |                        |            |               |
| Calopterygidae            |                   |                        |            |               |
| *Hetaerina auripennis* (Burmeister, 1839) | P19 | AM. BA. ES. MG. MT. PA. RO. SP. | [29,47,58,59,62] | LC |
| *Mnesarete aenea* (Selys, 1853) | P9 | AM. MT. PA. RO. | [18,29,61,67] | LC |
| *Mnesarete cuprea* (Selys, 1853) | P4, P6, P10, P15, P16, P19 | AM. MA. MT. PA. RO. | [18,29,62] | LC |
| *Mnesarete williamsoni* Garrison, 2006 | P5, P7, P9, P11, P13 | PA. | [21,62] | LC |
| Coenagrionidae            |                   |                        |            |               |
| *Acanthagrion descends* Calvert, 1909 | P2, P8, P11, P15 | GO, MG, MS, MT, PA, PR, RS, SP. | [33,47,52,62] | LC |
| *Acanthagrion chacoense* Calvert, 1909* | P9 | MG. MS. | [33,43] | LC |
| *Acanthagrion kennedi* Williamson, 1916 | P8, P9, P13 | AM. AP. GO. MA. MT. PA. | [18,29,30,32,61] | - |
| *Argia collita* Selys, 1865 | P9, P14, P15, P16, P17 | AM. PA. | [18,29] | LC |
| *Argia fumigata* Hagen in Selys, 1865 | P4, P6, P9, P10, P11, P15, P16, P17, P19 | AM. AP. MT. PA. RO. | [28,30,62] | LC |
| *Epipleoneura kaxurae* Machado, 1985 | P1, P4, P9, P13 | AM. AP. PA. RO. | [18,29,30,63,68] | - |
| *Epipleoneura lamina* Williamson, 1915* | P11, P15, P16, P17, P19 | AM. RO. RR. | [29,49,57] | LC |
| *Epipleoneura metallica* Rádenis, 1955 | P2, P4, P5, P6, P8, P9, P11, P13, P15, P19 | AM. BA. DF. GO. MA. MS. MG. MT. PA. PE. RO. TO. | [4,29,32,49,61–63] | LC |
| *Epipleoneura vestfalli* Machado, 1986 | P1, P17 | MA. MT. PA. RO. | [32,61–63] | LC |
| *Mecistogaster lucertia* (Drury, 1773) | P16 | AM. AP. PA. | [28,30] | LC |
| *Neoneura bilinaris* Selys, 1860 | P1 | AM. AP. ES. MS. PA. SP. | [29,30,33,44] | LC |
| *Neoneura luzmarina* De Marmels, 1989 | P6, P9, P13 | AM. MT. PA. | [29,61,62] | LC |
| *Neoneura rubricrinis* Selys, 1860 | P17, P19 | MS. PA. RO. RR. RS | [33,37,62,63] | LC |
| *Neoneura sylvatica* Hagen in Selys, 1886 | P1, P2, P4, P6, P8, P10, P11, P15, P17 | AM. BA. CE. ES. GO. MA. MG. MT. MS. PA. PE. PR. RJ. RO. | [29,33,50,58,61,63,64] | LC |
| *Phasoneura exigua* (Selys, 1886) | P12 | AM. AP. MT. PA. | [29,30,61,62] | LC |
| *Proctoneura tenens* Selys, 1860 | P16 | AM. MA. PA. RO. | [29,62,63] | LC |
| *Tigriagrion aurantiimun* Calvert, 1909 | P11, P13, P15 | ES. MG. MS. MT. PA. SP. | [18,47,56,58,61] | LC |
| Dicteriadidae              |                   |                        |            |               |
| *Hetaerina amazona* Selys, 1853 | P4, P5, P16 | AM. AP. GO. MG. MT. PA. RO. SP. | [29,30,50,57,61,62] | LC |
| Megapodagrionidae          |                   |                        |            |               |
| *Heteragrion icterops* Selys, 1862 | P4, P9 | AM. GO. MG. MT. PA. SP. | [28,30,61,62,67] | LC |
| Polypoideidae              |                   |                        |            |               |
| *Chalcopryx rutilus* (Rambur, 1832) | P4 | AM. GO. MT. PA. RO. | [1,29,55] | LC |
The species accumulation curve (Figure 4), based on the individuals collected and the estimate, suggests that the richness of Odonata in the region has not yet been fully sampled and that in new collections it should be possible to collect more species.

![Graph showing species accumulation curve]

**Figure 4.** Accumulation curve of Odonata species collected in Volta Grande do Xingu, Pará, Brazil.

4. Discussion

A total of 43 species were identified in Volta Grande do Xingu, suggesting that the species richness in the area is similar to that found in some studies in other biomes and in the Amazon Rain Forest [30,32,73,74]. Our species accumulation curve (Figure 4) is still rising; therefore, further sampling may add more species.

About 71% of the individuals collected belonged to the suborder Zygoptera, while the other 29% were from the suborder Anisoptera. De Marco et al. [75] suggested that Zygoptera are usually predominant numerically at streams that are shaded and have well-developed riparian vegetation. The conservation of Odonata species is very important for natural aquatic ecosystems since these organisms are predators of other populations and balance the system. Many anthropic activities advance in the streams and destroy the necessary habitat for species, such as riparian vegetation and microclimatic conditions, changes in physical and chemical parameters and the presence of substrates [19,67]. Thus, many species are locally extinct without even being recorded. As our area, the number of estimated species continues to rise, and long-term and periodic monitoring are necessary to record more species.

The most diverse families in this study were Coenagrionidae ($n = 18$) and Libellulidae ($n = 17$), a fact that corroborates the work of Olaya et al. [76], where, respectively, both families are the most diverse of the Odonata order, as well as that of Lencioni [44], who states that the Coenagrionidae family is the most diverse found in Brazil. The Coenagrionidae
family presented about 33% of the total specimens collected and 47% of the total Zygoptera. In several studies, the family Coenagrionidae is sampled as the family with the greatest abundance and richness among the suborder Zygoptera and Libellulidae in the suborder Anisoptera [16,29,30,32,33,56,73,77–79].

_Erythrodiplax famula_ (Erichson in Schomburgk, 1848), _Acanthagrion chacoense_ Calvert, 1909 and _Epipleoneura lamina_ Williamson, 1915 had their occurrences recorded for the first time in the state of Pará, thus expanding the known occurrence of these species. _E. famula_ was previously registered for the states of AM, AP, GO, MG and MS, and has not yet been registered in the south and northeast regions. Even with its distribution in two states in the north region, it had not yet been registered for the state of Pará. With the record of this work, its distribution was the one with the greatest expansion, as it is the first time it has been recorded in the Brazilian Amazon Rainforest, the north region and the state of Pará. _A. chacoense_ considerably expands its distribution, as it had been registered only for the states of Mato Grosso, Mato Grosso do Sul and Minas Gerais. Thus, this is the first record for the north region [33,43]. _E. lamina_ has been registered in the states of AM, RO and RR already, with records for the biome and for the northern region, but it had not yet been registered in the state of Pará.

The species _E. famula_ and _A. chacoense_ were found only at Point 9. P9 was the point at which more individuals of the suborder Anisoptera were collected (n = 33). The stream had large areas with light entry and areas where the riparian vegetation was not the original, which suggests that the area underwent changes. This may explain the presence of species in the aforementioned suborder. _A. chacoense_ was found in shaded segments of the stream where its width was smaller than the total average (6.53 m). _E. lamina_ was found in several streams in the study. This species was observed only where the stream was almost entirely shaded and shallow (depth 0.17–0.56 m), with constant water flow and presence of substrate. These types of environments are conducive to oviposition and successful larval development, as observed in other Coenagrionidae species [80].

5. Conclusions

These results highlight the importance of collections in areas not sampled because each region has specific characteristics that allow for the establishment of a species, or not. There are several collection points registered in others studies in the state of Pará, and, even so, in nineteen sampling points in Volta Grande do Xingu, we have four new occurrences. Without proper knowledge of the distribution of described species, it is not possible to direct efforts towards their preservation. Therefore, inventory work such as this, the formation of research groups in the interior of the Amazon and the sampling of other areas become increasingly important to reduce the Wallacean shortfall so that we can propose effective conservation measures.

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**References**

1. Brasil, L.S.; Vilela, D.S. Peculiaridades regionales en la percepción de brasileños sobre las libélulas: Nomenclatura popular y conservación. *Hetaira* **2019**, *1*, 15–20.
2. Bybee, S.M.; Kalkman, V.J.; Erickson, R.J.; Frandsen, P.B.; Breinholt, J.W.; Suvorov, A.; Dijkstra, K.B.; Cordero-Rivera, A.; Skevington, J.H.; Abbott, J.C.; et al. Phylogeny and classification of Odonata using targeted genomics. *Mol. Phylogenet. Evol.* **2021**, *160*, 107115. [CrossRef] [PubMed]
3. Schorr, M.; Paulson, D. World Odonata List. 2021. Available online: [www.pugetsound.edu/academics/academic-resources/slater-museum/biodiversity-resources/dragonflies/world-odonata-list2/](http://www.pugetsound.edu/academics/academic-resources/slater-museum/biodiversity-resources/dragonflies/world-odonata-list2/) (accessed on 6 April 2021).
4. Pinto, A.P. Odonata in Catálogo Taxonômico da Fauna do Brasil. PNUD. 2021. Available online: [http://fauna.jbri.gov.br/fauna/faunadobrasil/171](http://fauna.jbri.gov.br/fauna/faunadobrasil/171) (accessed on 6 April 2021).
5. Von Ellenrieder, N.A. Synopsis of the Neotropical genus Nepheleptia (Odonata: Libellulidae), including description of a new species, synonymies, and a key to males. *Zootaxa* **2014**, *3796*, 121–146. [CrossRef] [PubMed]
6. Pessacq, P.; Muzón, J.; Neiss, U.G. Order Odonata. In Thorp and Covich’s Freshwater Invertebrates: Volume 3: Keys to Neotropical Hexapoda; Hamada, N., Thorp, J.H., Rogers, D.C., Eds.; Academic Press: Cambridge, MA, USA, 2018; pp. 355–366.
7. Garrison, R.W.; Von Ellenrieder, N.; Louton, J.A. Damselfly Genera of the New World: An Illustrated and Annotated Key to the Zygoptera; The John Hopkins University Press: Baltimore, MD, USA, 2010; 490p.
8. Neiss, U.G.; Hamada, N. Ordem Odonata. In *Insetos Aquáticos na Amazônia Brasileira: Taxonomia, Biologia e Ecologia*; Hamada, N., Nessimian, J.L., Querino, R.B., Eds.; Editora do INPA: Manaus, Brazil, 2014; pp. 217–282.
9. Garrison, R.W.; Von Ellenrieder, N.; Louton, J.A. Dragonfly Genera of the New World: An Illustrated and Annotated Key to the Anisoptera; The John Hopkins University Press: Baltimore, MD, USA, 2006; 368p.
10. May, M.L. Thermoregulation and adaptation in temperature in dragonflies (Odonata: Anisoptera). *Ecol. Monogr.* **1976**, *46*, 1–32. [CrossRef]
11. Corbet, P.S.; May, M.L. Fliers and perchers among Odonata: Dichotomy or multidimensional continuum? A provisional reappraisal. *Int. J. Odonatol.* **2008**, *11*, 155–171. [CrossRef]
12. Monteiro-Júnior, C.S.; Juen, L.; Hamada, N. Effects of urbanization on stream habitats and associated adult dragonfly and damselfly communities in central Brazilian Amazonia. *Landsc. Urban Plan.* **2014**, *127*, 28–40. [CrossRef]
13. Juen, L.; Oliveira-Júnior, J.M.B.; Shimano, Y.; Mendes, T.P.; Cabette, H.S.R. Composição e riqueza de Odonata (Insecta) em rios com diferentes níveis de conservação em um ecotone Cerrado-Floresta Amazônica. *Acta Amaz.* **2014**, *44*, 223–233. [CrossRef]
14. Miguel, T.B.; Calvão, L.B.; Vital, M.V.C.; Juen, L. A scientometric study of the order Odonata with special attention to Brazil. *Int. J. Odonatol.* **2017**, *20*, 27–42. [CrossRef]
15. De Marco, P., Jr; Vianna, D.M. Distribuição do esforço de coleta de Odonata no Brasil—Subsidios para escolha de áreas prioritárias para levantamentos faunísticos. *Lundiana* **2005**, *6*, 13–26. [CrossRef]
16. Bedê, L.C.; Machado, A.B.M.; Piper, W.; Souza, M.M. Odonata of the Serra de São José–Brazil’s first Wildlife Reserve aimed at the conservation of dragonflies. *Not. Odonatol.* **2015**, *8*, 117–155.
17. Cardoso, P.; Erwin, T.L.; Borges, P.A.; New, T.R. The seven impediments in invertebrate conservation and how to overcome them. *Biol. Conserv.* **2011**, *144*, 2647–2655. [CrossRef]
18. Miguel, T.B.; Oliveira-Júnior, J.M.B.; Ligeiro, R.; Juen, L. Odonata (Insecta) as a tool for the biomonitoring of environmental quality. *Ecol. Indic.* **2017**, *71*, 555–566. [CrossRef]
19. Oliveira-Júnior, J.M.B.; Shimano, Y.; Gardner, T.A.; Hughes, R.M.; de Marco Júnior, P.; Juen, L. Neotropical dragonflies (Insecta: Odonata) as indicators of ecological condition of small streams in the eastern Amazon. *Austral Ecol.* **2015**, *40*, 733–744. [CrossRef]
20. Oliveira-Júnior, J.M.B.; De Marco, P.; Dias-Silva, K.; Leitão, R.P.; Leal, C.G.; Pompeu, P.S.; Gardner, T.A.; Hughes, T.A.; Juen, L. Effects of human disturbance and riparian conditions on Odonata (Insecta) assemblages in eastern Amazon basin streams. *Limnologica* **2017**, *66*, 31–39. [CrossRef]
21. Carvalho, F.G.; De Oliveira Roque, F.; Barbosa, L.; Montag, L.F.A.; Juen, L. Oil palm plantation is not a suitable environment for most forest specialist species of Odonata in Amazonia. *Anim. Conserv.* **2018**, *21*, 526–533. [CrossRef]
22. Silva, E.C.; Rocha, T.S.; Lo, J.S.; Lima, A.K.A.; Oliveira-Júnior, J.M.B. Diversidade de Odonata (Insecta) em igarapés na Reserva Extrativista Tapajós-Arapiuns (PA). *Rev. Ibero-Am. De Ciências Ambient.* **2018**, *9*, 109–119. [CrossRef]
23. Oliveira-Junior, J.M.B.; Dias-Silva, K.; Teódisio, M.A.; Juen, L. The response of Neotropical dragonflies (Insecta: Odonata) to local and regional abiotic factors in small streams of the Amazon. *Insects* **2019**, *10*, 446. [CrossRef]

24. Oliveira-Junior, J.M.B.; Juen, L. The *Zygoptera*/*Anisoptera* ratio (Insecta: Odonata): A new tool for habitat alterations assessment in Amazonian streams. *Neotrop. Entomol.* **2019**, *48*, 552–560. [CrossRef]

25. Oliveira-Junior, J.M.B.; Juen, L. Structuring of dragonfly communities (Insecta: Odonata) in eastern Amazon: Effects of environmental and spatial factors in preserved and altered streams. *Insects* **2019**, *10*, 322. [CrossRef]

26. Oliveira-Junior, J.M.B.; Teódisio, M.A.; Juen, L. Patterns of co-occurrence and body size in dragonflies and damselflies (Insecta: Odonata) in preserved and altered Amazonian streams. *Austral. Entomol.* **2021**, *60*, 436–450. [CrossRef]

27. Pereira-Moura, L.; De Sena, W.S.; Neiss, U.G.; Couceiro, S.R.M. Environmental integrity as a modeler of the composition of the Odonata community. *Environ. Monit. Assess.* **2021**, *203*, 160. [CrossRef] [PubMed]

28. Bastos, R.C.; Brasil, L.S.; Oliveira-Junior, J.M.B.; Carvalho, F.G.; Lennox, G.D.; Barlow, J.; Juen, L. Morphological and phylogenetic factors structure the distribution of damselfly and dragonfly species (Odonata) along an environmental gradient in Amazonian streams. *Ecol. Indic.* **2021**, *122*, 107257. [CrossRef]

29. Koroiva, R.; Neiss, U.G.; Fleck, G.; Hamada, N. Checklist of dragonflies and damselflies (Insecta: Odonata) of the Amazonas state, Brazil. *Biota Neotrop.* **2020**, *20*, e20190877. [CrossRef]

30. Garcia Junior, M.D.N.; Damasceno, M.T.S.; Martins, M.J.L.; Costa, T.S.; Ferreira, R.M.A.; Souto, R.N.P. New records of dragonflies and damselflies (Insecta: Odonata) from Amapá state, Brazil. *Biota Neotrop.* **2021**, *21*, e20201074. [CrossRef]

31. Pérez, M.S. Where the Xingu bends and will soon break. *Am. Sci.* **2015**, *103*, 395–403. [CrossRef]

32. Bastos, R.C.; Brasil, L.S.; Carvalho, F.G.; Calvão, L.B.; Silva, J.O.A.; Juen, L. Odonata of the state of Maranhão, Brazil: Wallacean shortfall and priority areas for faunistic inventories. *Biota Neotrop.* **2019**, *19*, e20190734. [CrossRef]

33. Rodrigues, M.E.; Roque, F.O. Checklist of Odonata of the estado de Mato Grosso do Sul, Brazil. *Iheringia Sér. Zool.* **2017**, *107*, 107–111. [CrossRef]

34. Strahler, A.N. Quantitative analysis of watershed geomorphology. *Trans. Am. Geophys. Union* **1957**, *38*, 913–920. [CrossRef]

35. Silva, C.S.; Augusto, S.G.; Andrade, A.U. Caracterização agrometeorológica de Altamira, PA. In *Anais Semana de Integração das Ciências Agrárias* 9; Anais: Altamira, Brazil, 2009; pp. 148–154.

36. Climate-Data.Org. 2020. Available online: https://pt.climate-data.org/america-do-sul/brasil/para-189/ (accessed on 29 November 2020).

37. De Marco, P.; Latini, A.O.; Resende, D.C. Thermoregulatory constraints on behavior: Patterns in a Neotropical dragonfly assemblage. *Neotrop. Entomol.* **2005**, *34*, 155–162. [CrossRef]

38. Juen, L.; De Marco, P. Odonate biodiversity in terra-firme forest streamlets in Central Amazonia: On the relative effects of neutral and niche drivers at small geographical extents. *Insect Conserv. Divers.* **2011**, *4*, 265–274. [CrossRef]

39. Williamson, E.B. The genus *Neoneura* (Odonata). *Trans. Am. Entomol. Soc.* **1917**, *43*, 211–246.

40. Borró, D.J. The genus *Oligochalda* (Odonata). *Misc. Publ. Mus. Zool. Univ. Mich.* **1931**, *22*, 1–64.

41. Borró, D.J. *A Revision of the Libellulinae Genus Erythemidux* (Odonata); The Ohio State University: Columbus, OH, USA, 1942.

42. Garrison, R.W. The genus *Neoneura*, with keys and description of a new species, *Neoneura jurzitzai* spec. nov. (Zygoptera: Protoneuridae). *Odonatologica* **1999**, *28*, 343–375.

43. Lencioni, F.A.A. The Damselflies of Brazil: An Illustrated Identification Guide 1—The Noncoenagrionidae Families; All Print Editora: São Paulo, Brazil, 2005; 524p.

44. Lencioni, F.A.A. The Damselflies of Brazil: An Illustrated Identification Guide 2—Coenagrionidae; All Print Editora: São Paulo, Brazil, 2006; 419p.

45. Machado, A. Studies on neotropical Protoneuridae: 19. Two new species of *Neoneura* from Southern Brazil (Odonata, Protoneuridae). *Iheringia. Sér. Zool.* **2005**, *95*, 405–409. [CrossRef]

46. Lencioni, F.A.A. Diagnoses and discussion of the group 1 and 2 Brazilian species of *Heteragrion*, with descriptions of four new species (Odonata: Megapodagrionidae). *Zootaxa* **2013**, *3685*, 1–80. [CrossRef]

47. Lencioni, F.A.A. Damselflies of Brazil—An Illustrated Identification Guide—Southeast Region; E-book: São Paulo, Brazil, 2017; 599p.

48. Wasscher, M.T.; Van’t Bosch, J.G. The true identity of *Neoneura bilinaris* Selys, 1860, with the synonymy of *N. guia* Rácinis, 1953, and the description of *N. confundens* sp. nov. (Odonata: Protoneuridae). *Zootaxa* **2013**, *3599*, 19–36. [CrossRef]

49. Pessacq, P. Synopsis of *Epipleoneura* (Zygoptera, Coenagrionidae, “Protoneuridae”), with emphasis on its Brazilian species. *Zootaxa* **2014**, *3872*, 201–234. [CrossRef]

50. Global Biodiversity Information Facility—GBIF. 2021. Available online: https://www.gbif.org/ (accessed on 15 April 2021).

51. De Marco, P.; Juen, L.; Batista, J.D.; Furieri, K.S.; Neiss, U.G. *Livre Vermelho da Fauna Brasileira Ameaçada de Extinção: Volume VII. Invertebrados* (Odonata); ICMBio/MMMA: Brasília, Brazil, 2018.

52. Dalzochio, M.S.; Renner, S.; Sganzaerla, C.; Prass, G.; Ely, G.J.; Salvi, L.C.; Dametto, N.; Périco, E. Checklist of Odonata (Insecta) in the state of Rio Grande do Sul, Brazil with seven new records. *Biota Neotrop.* **2018**, *18*, e20180551. [CrossRef]

53. Costa, J.M.; Oldrini, B.B. Descrição da fêmea de *Argyrothemis argentea* (Odonata, Libellulidae). *Iheringia. Sér. Zool.* **2003**, *93*, 271–276. [CrossRef]

54. Ferreira-Peruquetti, P.; Trivinho-Strixino, S. Notas sobre relações forêtricas entre espécies de Chironomidae e Odonata do Estado de São Paulo, Brasil. *Entomotropica* **2003**, *18*, 569–572.
Hydrobiology 2022, 1

55. Assis, J.C.; Carvalho, A.L.; Nessimian, J.L. Composição e preferência por microhábitat de imaturas de Odonata (Insecta) em um trecho de baixada do Rio Ubatita, Maricá-RJ, Brasil. Rev. Bras. De Entomol. 2004, 48, 273–282. [CrossRef]

56. Koroiva, R.; Rodrigues, M.E.; Valente-Neto, F.; Roque, F.O. Odonates from Bodoquena Plateau: Check-list and information about endangered species. Biota Neotrop. 2017, 17, e20160310. [CrossRef]

57. Machado, A.; Mesquita, H.G.; Machado, P.A.R. Contribuição ao conhecimento dos Odonatos da Estação Ecológica de Maracá-Roraima. Acta Amaz. 1991, 21, 159–173. [CrossRef]

58. Ferreira-Perequetti, P.; De Marco, P. Efeito da alteração ambiental sobre comunidades de Odonata em riachos de Mata Atlântica de Minas Gerais, Brasil. Rev. Bras. De Zool. 2019, 36, 317–327. [CrossRef]

59. Oliveira-Junior, J.M.B.; Cabette, H.S.R.; Pinto, N.S.; Juen, L. As variações na comunidade de Odonata (Insecta) em córregos podem ser explicadas pelo Paradoxo do Plâncton? Explicando a riqueza de espécies pela variabilidade ambiental. Entomobrasilis 2013, 6, 1–8. [CrossRef]

60. Pereira, D.F.G.; Oliveira-Junior, J.M.B.; Juen, L. Environmental changes promote larger species of Odonata (Insecta) in Amazonian streams. Ecol. Indic. 2019, 98, 179–192. [CrossRef]

61. Pessacq, P.; Santos, T.C.; Costa, J.M. Checklist and updated distribution of Protoneuridae from Brazil. Int. J. Odonatol. 2012, 15, 59–73. [CrossRef]

62. Nobre, C.E.; Lago Carvalho, A. Odonata of Itatira, a Brazilian semi-arid area in the state of Ceará, Brazil. Rev. Bras. Gest. Amb. Sustent. 2019, 6, 481–497. [CrossRef]

63. Souza, A.M.; Fogaça, F.N.O.; Cunico, A.M.; Higuti, J. Does the habitat structure control the distribution and diversity of the Odonatofauna? Braz. J. Biol. 2015, 75, 598–606. [CrossRef]

64. Vilela, D.S.; Koroiva, R.; Tosta, T.H.A.; Novaes, M.C.; Guillermo-Ferreira, R. Dragonflies and damselflies from the West of Minas Gerais, Brazil. Biota Neotrop. 2020, 20, e20190851. [CrossRef]

65. Calvário, L.B.; Nogueira, D.S.; Montag, L.F.A.; Lopes, M.A.; Juen, L. Are Odonata communities impacted by conventional or reduced impact logging? For. Ecol. Manag. 2016, 382, 143–150. [CrossRef]

66. Monteiro-Júnior, C.S.; Esposito, M.C.; Juen, L. Are the adult odonate species found in a protected area different from those present in the surrounding zone? A case study from eastern Amazonia. J. Insect Conserv. 2016, 20, 643–652. [CrossRef]

67. Borges, L.R.; Barbosa, M.S.; Carneiro, M.A.A.; Vilela, D.S.; Santos, J.C. Dragonflies and damselflies (Insecta: Odonata) from a Cerrado area at Triângulo Mineiro, Minas Gerais, Brazil. Biota Neotrop. 2018, 19, e20180609. [CrossRef]

68. Renner, S.; Périco, E.; Ely, G.J.; Sahlé, G. Preliminary dragonfly (Odonata) species list from the Pampa biome in Rio Grande do Sul, Brazil, with ecological notes for 19 new records for the State. Biota Neotrop. 2017, 17, e20170374. [CrossRef]

69. De Marco, P.; Batista, J.D.; Cabette, H.S.R. Community assembly of adult odonates in tropical streams: An ecophysiological hypothesis. PLoS ONE 2015, 10, e0123023. [CrossRef]

70. Olaya, M. Odonatos en Latinoamérica: La riqueza de nuestra región. Heteroptera 2019, 1, 4–5.

71. De Souza, M.M.; Pires, E.P.; Brunismann, Á.G.; Milani, L.R.; Pinto, Â. Dragonflies and damselflies (Odonata) from the wetland of the Rio Pandeiros, northern region of Minas Gerais State, Brazil, with a description of the male of Archaeogomphus vanbrinki Machado (Anisoptera: Gomphidae). Int. J. Odonatol. 2017, 20, 13–26. [CrossRef]

72. Sigutowá, H.; Sipoš, J.; Dohný, A. A novel approach involving the use of Odonata as indicators of tropical forest degradation: When family matters. Ecol. Indic. 2019, 104, 229–236. [CrossRef]

73. Mendoza-Penagos, C.C.; Calvário, L.B.; Juen, L. A new biomonitoring method using taxonomic families as substitutes for the suborders of the Odonata (Insecta) in Amazonian streams. Ecol. Indic. 2021, 124, 107388. [CrossRef]

74. Purse, B.V.; Thompson, D.J. Oviposition site selection by Coenagrion mercuriale (Odonata: Coenagrionidae). Int. J. Odonatol. 2009, 12, 257–273. [CrossRef]