DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title:	Phylogenetics and population genomics of *Comanthera* L.B.Sm. (Eriocaulaceae) Expedition to the Brazilian campos rupestres
Travel Dates:	17th June 2024 – 17th July 2024
Location:	Brazil, in the states of Minas Gerais, Goiás and Bahia
Group Members:	Thales Moreira de Lima Flávia Fonseca Pezzini Laís Couto Zeferino Lívia Echternacht Thiago Moreira de Lima
Aims:	Assemble a geographically representative collection of *Comanthera* samples, which will be used to infer a densely-sampled phylogenetic tree and past demographic events using population genetics methods.

Photography consent form attached: (*please refer to your award letter)*
☒ Yes
☐ No

Outcome (a minimum of 500 words):-

The field trip was overall quite successful. We covered over 7,000 km by car, traversing the states of Minas Gerais, Bahia, and Goiás (Figure 1). During the expedition, we collected around 100 specimens, most of them from *Comanthera* L.B.Sm., along with various other Eriocaulaceae species. This significantly enhances the E collection, as the herbarium's existing Eriocaulaceae specimens mostly consist of Asian *Eriocaulon* L. specimens. For a detailed list of collected specimens, refer to Table 1 at the end of this document. Additionally, we already had 48 *Comanthera* samples in silica from our collaborator, Prof. Lívia Echternacht, who was also part of the field team. These samples accounted for approximately 45% of our goal of 105 samples, spread across 37 species. Our fieldwork has raised this number to 76, meaning we are now at 72% of our target. The remaining 28% includes species located in remote regions, such as the Amazon and the Tepuis.

Due to the extended duration of the expedition, different participants joined and left throughout its course. Laís Zeferino and I were the permanent members, usually accompanied by one additional team member. I arrived in Brazil on May 17, 2024, and stayed in my hometown, Rio de Janeiro (RJ), where I prepared for the fieldwork—this involved building a portable electric stove to dry specimens, obtaining silica gel to preserve DNA, and printing maps and species identification sheets. We set off from Ouro Preto (MG) on June 1, 2024, which also served as our starting and finishing point.

We reached the Canastra sector of the Campos rupestres on June 3 and spent a week there (Figures 1 and 2). On June 10, we arrived in the Planalto Central sector of Goiás, where we collected samples from the westernmost population of *C. euschemus*, one of the two *Comanthera* species in the region (Figures 1–3). Our next stop was the Northern

Espinhaço sector in Bahia, which we reached on June 17 and where we spent 20 days (Figures 1 and 2). This sector, along with the Southern Espinhaço, is particularly rich in *Comanthera* and Eriocaulaceae species and was the most productive in terms of specimen collection.

By July 9, we were back in Ouro Preto (MG), where we stayed for the remainder of the expedition. During this time, we reviewed the collected specimens, prepared them for deposit in the OUPR herbarium, and cross-checked our field notes. In compliance with Brazilian law, all specimens must be deposited in a national herbarium before duplicates can be sent abroad. Each specimen had at least two duplicates—one for OUPR and the other for *E*. The paperwork for sending the duplicates to *E* is currently being prepared and should be completed within 3–6 months. Our time in Ouro Preto was also invaluable for interacting with Prof. Lívia Echternacht, one of my supervisors and the leading authority on the *Comanthera* genus.

Together with the specimen samples for drying and herbarium deposition, we also collected leaf material in silica gel for DNA sequencing. These samples are also in Brazil at the moment waiting for the export paperwork. We also collected fresh material for C. centauroides and C. bisulcata, which was frozen right away for high molecular weight DNA extraction. We established a cold chain, starting at Feira de Santana, in the state of Bahia, where these samples were collected. From there, the samples were shipped to Rio de Janeiro using the LogLife company services, where they stayed in a -80°C freezer for some time. A few days before returning to Edinburgh, I went to Rio, packed those samples in an EPS container with dry ice and shipped them to Edinburgh via FedEx. These samples have already arrived, and we are currently starting DNA extraction.

Unfortunately, due to some unexpected delays, we could not visit the Southern Espinhaço sector as originally planned. However, we did manage to collect some samples around Ouro Preto, including a potentially new species. The expedition was cut short on July 17, as most participants needed to return to Europe for the XX International Botanical Conference. Nevertheless, Prof. Echternacht has extensively collected in the Southern Sector over the past decade, meaning we already have all the necessary samples for our phylogenetic study from that region. The only unmet goal was collecting population-level samples for *C. centauroides* and *C. bisulcata* (Figure 3) from the area. Fortunately, we collected population-level samples for these species in the Northern Espinhaço sector, and we are exploring alternative methods to gather the remaining samples. We may also consider a second, much shorter expedition next year, as the Southern Sector is more accessible, being close to large cities, airports, and well-maintained highways.

To conclude, there are a few important highlights from the trip. First, we collected DNA samples from a new species, currently being described by Prof. Echternacht. We hope to publish a paper describing the species that includes genetic analysis of these samples. This species is a microendemic, found only in iron outcrops at the edge of Gandarela National Park (MG) (Figure 4). Unfortunately, it is at significant risk, as some individuals are located outside the park in areas designated for iron ore mining. We hope the species' description will prompt legal protection measures. Additionally, we visited regions that have seen little botanical attention in recent decades. For instance, at Grão Mogol State Park, we collected *C. bisulcata* individuals—this species is widespread, but the last recorded collection in Grão Mogol, and in the entire municipality, was in 1978. These examples highlight the importance of this expedition in advancing the conservation and study of Brazil's flora.

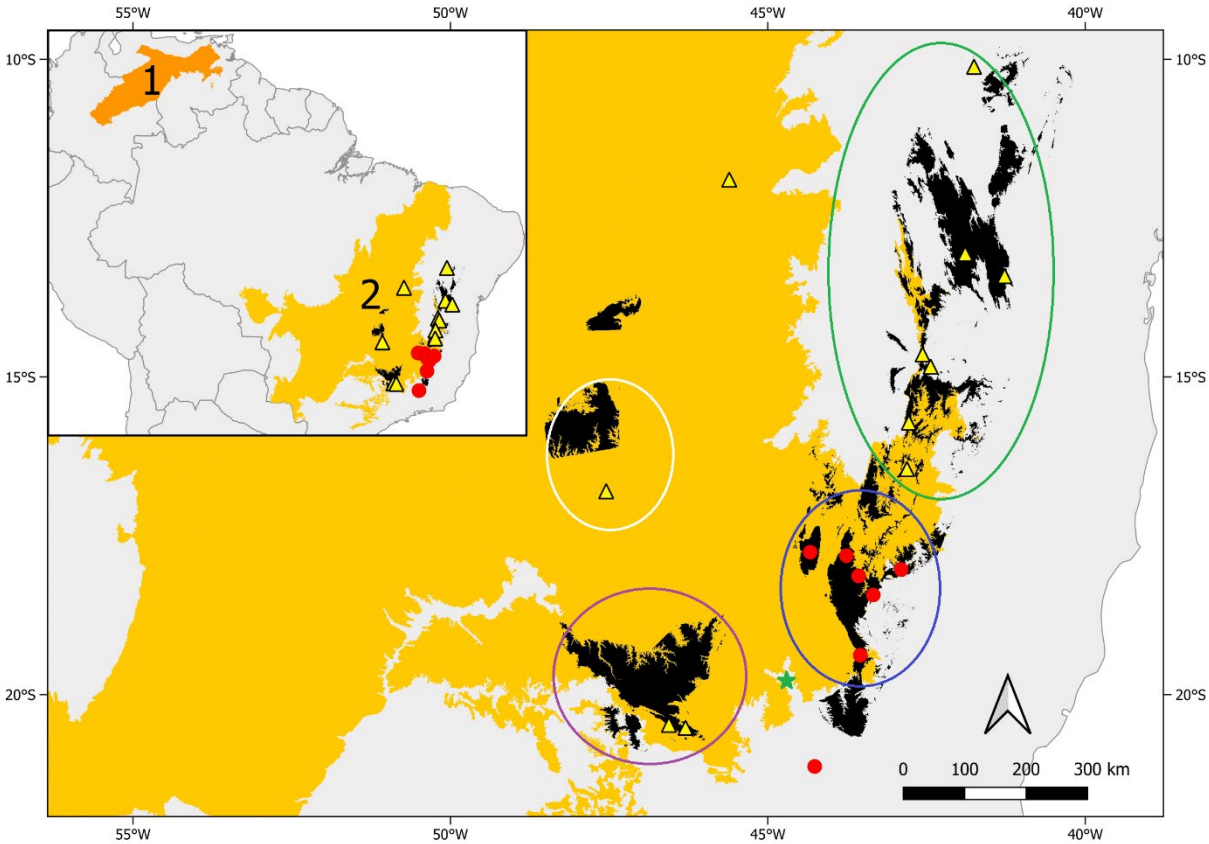

Figure 1. Map detailing the samples collected. The inset map shows the two main savannas of South America: the Llanos (1) and the Cerrado (2). The areas in black are campos rupestres areas (usually above 900m). The yellow triangles mark the collection sites visited; the red dots mark the collection sites which we planned to visited but could not. The trip started in Ouro Preto (green star) and followed a clockwise route, starting at the Canastra sector (purple ellipsis), followed by the Planalto Central sector (white ellipsis) and finally the Northern Espinhaço sector (green ellipsis). We could not systematically collect in the Southern Espinhaço sector (blue ellipsis).

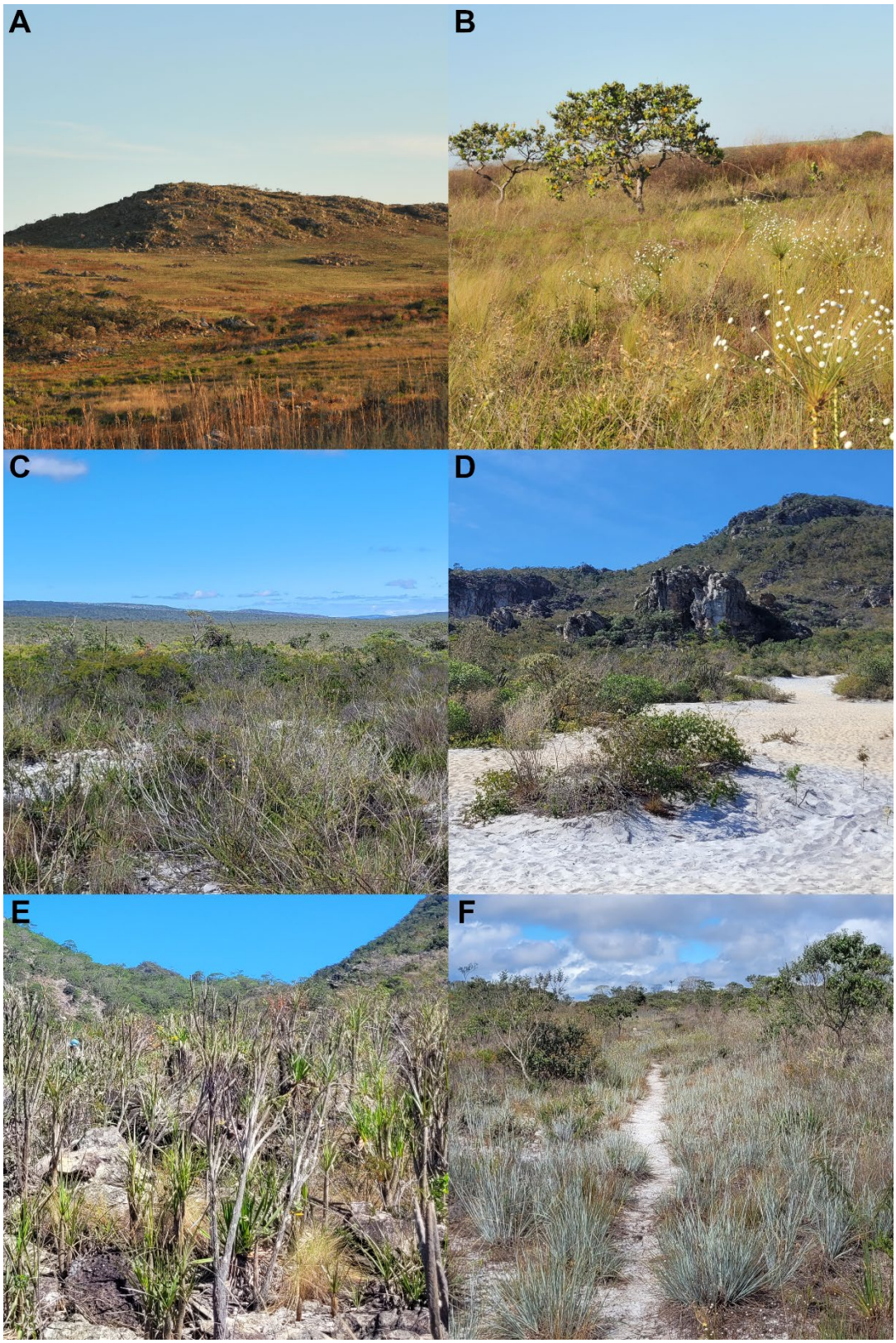

Figure 2. Areas visited. A) Canastra sector (São Roque de Minas municipality), B) Planalto Central sector (Cristalina municipality), C) Northern Espinhaço sector (Umburanas municipality), D) Northern Espinhaço sector (Jacaraci municipality), E) Northern Espinhaço sector (Rio Pardo de Minas municipality), F) Northern Espinhaço sector (Grão Mogol municipality).

Figure 3. Some of the *Comanthera* species collected during the field expedition. A) *C. euschemus*, B) *C. giuliettiae*, C) *C. harleyi*, D) *C. borbae*, E) *C. aurifibrata*, F) *C. centauroides*.

Figure 4. Two of the expedition highlights. A) A new species of *Comanthera* collected during the field expedition. This species is currently under description by Prof Lívia Echternacht. B) *C. bisulcata* collected in the State Park of Grão Mogol, in Grão Mogol municipaly. The last time this species was collected at this municipality was in 1978, by the Brazilian botanist Gerdt G. Hatschbach.

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Family	Genus	cf	Specifc epiteth	Author	State	Municipality	Latitude	Longitude
Eriocaulaceae	*Comanthera*		*centauroides*	(Bong.) L.R.Parra & Giul.	Minas Gerais	São Roque de Minas	-20.25902	-46.42526
Arecaceae	*Geonoma*		*pohliana*	Mart.	Minas Gerais	São Roque de Minas	-20.25806	-46.41572
Eriocaulaceae	*Comanthera*		*dealbata*	(Silveira) L.R.Parra & Giul.	Minas Gerais	São Roque de Minas	-20.26629	-46.55650
Eriocaulaceae	*Paepalanthus*		*elongatus*	(Bong.) Körn.	Minas Gerais	São Roque de Minas	-20.26629	-46.55650
Eriocaulaceae	*Syngonanthus*				Minas Gerais	São Roque de Minas	-20.26629	-46.55650
Eriocaulaceae	*Comanthera*		*centauroides*	(Bong.) L.R.Parra & Giul.	Minas Gerais	São Roque de Minas	-20.25857	-46.55226
Eriocaulaceae	*Comanthera*		*euschemus*	(Ruhland) L.R.Parra & Giul.	Minas Gerais	Delfinópolis	-20.43397	-46.64546
Eriocaulaceae	*Comanthera*		*nivea*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Delfinópolis	-20.42814	-46.64355
Eriocaulaceae					Minas Gerais	Delfinópolis	-20.43361	-46.64605
Eriocaulaceae	*Comanthera*		*euschemus*	(Ruhland) L.R.Parra & Giul.	Goiás	Cristalina	-16.80444	-47.53936
Eriocaulaceae	*Paepalanthus*	cf.	*trichophyllus*	(Bong.) Körn.	Goiás	Cristalina	-16.79393	-47.52577
Eriocaulaceae	*Syngonanthus*				Goiás	Cristalina	-16.79473	-47.52584
Eriocaulaceae	*Syngonanthus*	cf.	*humboldtii*	(Kunth) Ruhland	Goiás	Cristalina	-16.74452	-47.68294
Eriocaulaceae	*Syngonanthus*		*gracilis*	(Bong.) Ruhland	Bahia	Barreiras	-11.89528	-45.60275
Eriocaulaceae	*Syngonanthus*		*widgrenianus*	(Körn.) Ruhland	Bahia	Barreiras	-11.89528	-45.60275
Eriocaulaceae	*Syngonanthus*		*caulescens*	(Poir.) Ruhland	Bahia	Barreiras	-11.99110	-45.58097
Bignoniaceae					Bahia	Gentio do Ouro	-11.30464	-42.67116
Eriocaulaceae	*Leiothrix*				Bahia	Sento Sé	-10.33348	-41.40535
Orchidaceae	*Epidendrum*		*secundum*	Jacq.	Bahia	Sento Sé	-10.33152	-41.40342
Eriocaulaceae					Bahia	Sento Sé	-10.33642	-41.42221
Eriocaulaceae					Bahia	Sento Sé	-10.33642	-41.42221
Eriocaulaceae	*Comanthera*		*giuliettiae*	L.R.Parra	Bahia	Sento Sé	-10.33221	-41.40334
Eriocaulaceae	*Paepalanthus*		*tortilis*	(Bong.) Mart.	Bahia	Sento Sé	-10.33725	-41.44156
Eriocaulaceae					Bahia	Sento Sé	-10.33725	-41.44156
Eriocaulaceae	*Comanthera*		*curralensis*	(Moldenke) L.R.Parra & Giul.	Bahia	Sento Sé	-10.33725	-41.44156
Eriocaulaceae					Bahia	Sento Sé	-10.33725	-41.44156
Eriocaulaceae	*Comanthera*		*harleyi*	(Moldenke) L.R.Parra & Giul.	Bahia	Sento Sé	-10.34465	-41.46391
Eriocaulaceae	*Comanthera*		*harleyi*	(Moldenke) L.R.Parra & Giul.	Bahia	Sento Sé	-10.34465	-41.46391

Eriocaulaceae	*Comanthera*		*harleyi*	(Moldenke) L.R.Parra & Giul.	Bahia	Sento Sé	-10.34465	-41.46391
Eriocaulaceae	*Comanthera*		*curralensis*	(Moldenke) L.R.Parra & Giul.	Bahia	Sento Sé	-10.34481	-41.46432
Eriocaulaceae	*Comanthera*		*borbae*	A.C.S.Pereira & Giul.	Bahia	Sento Sé	-10.33397	-41.43176
Bromeliaceae	*Hohenbergia*	cf.	*catingae*	Ule	Bahia	Sento Sé	-10.33397	-41.43176
Orchidaceae	*Acianthera*				Bahia	Sento Sé	-10.33397	-41.43176
Eriocaulaceae	*Paepalanthus*		*tortilis*	(Bong.) Mart.	Bahia	Piatã	-13.05238	-41.95249
Eriocaulaceae	*Comanthera*		*lanosa*	L.R.Parra & Giul.	Bahia	Piatã	-13.05274	-41.95380
Eriocaulaceae	*Comanthera*		*bisulcata*	(Körn.) L.R.Parra & Giul.	Bahia	Piatã	-13.05246	-41.95390
Eriocaulaceae	*Comanthera*		*paepalophylla*	(Silveira) L.R.Parra & Giul.	Bahia	Piatã	-13.05241	-41.95338
Eriocaulaceae	*Comanthera*				Bahia	Piatã	-13.05241	-41.95338
Eriocaulaceae					Bahia	Piatã	-13.05230	-41.95295
Eriocaulaceae	*Paepalanthus*				Bahia	Piatã	-13.05250	-41.95147
Eriocaulaceae	*Comanthera*		*bisulcata*	(Körn.) L.R.Parra & Giul.	Bahia	Piatã	-13.05239	-41.95204
Eriocaulaceae	*Leiothrix*				Bahia	Piatã	-13.05241	-41.95338
Arecaceae	*Allagoptera*	cf.	*campestris*	(Mart.) Kuntze	Bahia	Piatã	-13.05249	-41.95169
Arecaceae	*Allagoptera*	cf.	*campestris*	(Mart.) Kuntze	Bahia	Piatã	-13.05249	-41.95169
Eriocaulaceae					Bahia	Piatã	-13.05226	-41.95285
Eriocaulaceae					Bahia	Piatã	-13.07564	-41.90823
Eriocaulaceae					Bahia	Piatã	-13.07509	-41.90769
Eriocaulaceae					Bahia	Piatã	-13.07509	-41.90736
Eriocaulaceae					Bahia	Piatã	-13.07509	-41.90736
Solanaceae	*Solanum*				Bahia	Piatã	-13.07509	-41.90736
Eriocaulaceae	*Paepalanthus*				Bahia	Piatã	-13.07693	-41.90670
Eriocaulaceae	*Comanthera*		*paepalophylla*	(Silveira) L.R.Parra & Giul.	Bahia	Piatã	-13.07509	-41.90769
Eriocaulaceae					Bahia	Piatã	-13.07564	-41.90823
Eriocaulaceae	*Comanthera*		*mucugensis*	(Giul.) L.R.Parra & Giul.	Bahia	Iramaia	-13.43097	-41.21644
Fabaceae	*Zornia*		*flemmingioides*	Moric.	Bahia	Iramaia	-13.43107	-41.21641
Arecaceae	*Syagrus*	cf.	*harleyi*	Glassman	Bahia	Iramaia	-13.42933	-41.21750
Eriocaulaceae	*Comanthera*		*centauroides*	(Bong.) L.R.Parra & Giul.	Bahia	Iramaia	-13.43318	-41.21694
Eriocaulaceae	*Paepalanthus*				Bahia	Iramaia	-13.43318	-41.21694

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Eriocaulaceae	*Comanthera*		*aurifibrata*	(Silveira) L.R.Parra & Giul.	Bahia	Licínio de Almeida	-14.53455	-42.53032
Malvaceae	*Pseudobombax*				Bahia	Licínio de Almeida	-14.53408	-42.53092
Eriocaulaceae					Bahia	Licínio de Almeida	-14.53426	-42.53027
Eriocaulaceae					Bahia	Licínio de Almeida	-14.53426	-42.53027
Eriocaulaceae	*Paepalanthus*		*tortilis*	(Bong.) Mart.	Bahia	Licínio de Almeida	-14.53426	-42.53027
Eriocaulaceae	*Comanthera*		*pignalii*	Echtern.	Bahia	Jacaraci	-14.83548	-42.42493
Orchidaceae	*Pseudolaelia*	cf.	*vellozicola*	(Hoehne) Porto & Brade	Bahia	Jacaraci	-14.8341	-42.4245
Eriocaulaceae	*Comanthera*				Minas Gerais	Rio Pardo de Minas	-15.64134	-42.73735
Malvaceae	*Pseudobombax*		*campestre*	(Mart.) A.Robyns	Minas Gerais	Serranópolis de Minas	-15.78697	-42.76873
Orchidaceae	*Bulbophyllum*				Minas Gerais	Serranópolis de Minas	-15.78694	-42.76873
Eriocaulaceae	*Paepalanthus*				Minas Gerais	Serranópolis de Minas	-15.78694	-42.76873
Eriocaulaceae	*Comanthera*		*aurifibrata*	(Silveira) L.R.Parra & Giul.	Minas Gerais	Serranópolis de Minas	-15.78694	-42.76873
Eriocaulaceae	*Comanthera*		*bisulcata*	(Körn.) L.R.Parra & Giul.	Minas Gerais	Serranópolis de Minas	-15.77785	-42.77273
Eriocaulaceae	*Leiothrix*		*prolifera*	(Bong.) Ruhland	Minas Gerais	Serranópolis de Minas	-15.77785	-42.77273
Eriocaulaceae	*Paepalanthus*		*elongatus*	(Bong.) Körn.	Minas Gerais	Serranópolis de Minas	-15.73722	-42.79687
Eriocaulaceae	*Leiothrix*		*fluitans*	(Mart.) Ruhland	Minas Gerais	Porteirinha	-15.70937	-42.80108
Arecaceae	*Allagoptera*				Minas Gerais	Porteirinha	-15.70959	-42.80189
Eriocaulaceae	*Comanthera*		*centauroides*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Porteirinha	-15.67719	-42.82058
Arecaceae	*Syagrus*				Minas Gerais	Porteirinha	-15.70165	-42.80519
Eriocaulaceae	*Comanthera*		*aciphylla*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Serranópolis de Minas	-15.74128	-42.79398
Eriocaulaceae	*Eriocaulon*				Minas Gerais	Serranópolis de Minas	-15.77782	-42.77393
Eriocaulaceae	*Comanthera*		*aciphylla*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Rio Pardo de Minas	-15.64534	-42.73678
Eriocaulaceae	*Leiothrix*		*flavescens*	(Bong.) Ruhland	Minas Gerais	Rio Pardo de Minas	-15.64804	-42.74021
Eriocaulaceae	*Comanthera*		*bisulcata*	(Körn.) L.R.Parra & Giul.	Minas Gerais	Rio Pardo de Minas	-15.64534	-42.73678
Eriocaulaceae	*Syngonanthus*		*polyaxis*	Echtern. & M.T.CWatan.	Minas Gerais	Rio Pardo de Minas	-15.6158	-42.7332
Eriocaulaceae	*Comanthera*		*bisulcata*	(Körn.) L.R.Parra & Giul.	Bahia	Jacaraci	-14.881	-42.519
Malvaceae	*Ceiba*		*pubiflora*	(A.St.-Hil.) K.Schum.	Minas Gerais	Janaúba	-15.75533	-43.26164
Eriocaulaceae	*Leiothrix*		*flagellaris*	(Guill.) Ruhland	Minas Gerais	Grão Mogol	-16.55504	-42.89935
Bromeliaceae	*Aechmea*				Minas Gerais	Grão Mogol	-16.55435	-42.89875
Eriocaulaceae	*Leiothrix*		*flagellaris*	(Guill.) Ruhland	Minas Gerais	Grão Mogol	-16.54963	-42.90454
Eriocaulaceae	*Paepalanthus*				Minas Gerais	Grão Mogol	-16.55573	-42.89843

Eriocaulaceae	*Leiothrix*	*flavescens*	(Bong.) Ruhland	Minas Gerais	Grão Mogol	-16.55573	-42.89843
Eriocaulaceae	*Paepalanthus*	*sessiliflorus*	Mart. ex Körn.	Minas Gerais	Grão Mogol	-16.55573	-42.89843
Eriocaulaceae	*Paepalanthus*	*tortilis*	(Bong.) Mart.	Minas Gerais	Grão Mogol	-16.5577	-42.8959
Eriocaulaceae	*Paepalanthus*	*denudatus*	Körn.	Minas Gerais	Grão Mogol	-16.54856	-42.89145
Eriocaulaceae	*Comanthera*	*dealbata*	(Silveira) L.R.Parra & Giul.	Minas Gerais	Grão Mogol	-16.54842	-42.89142
Eriocaulaceae	*Comanthera*	*bisulcata*	(Körn.) L.R.Parra & Giul.	Minas Gerais	Grão Mogol	-16.53160	-42.89338
Eriocaulaceae	*Comanthera*	*centauroides*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Grão Mogol	-16.52684	-42.89753
Eriocaulaceae	*Comanthera*	*dealbata*	(Silveira) L.R.Parra & Giul.	Minas Gerais	Grão Mogol	-16.58914	-42.89711
Orchidaceae				Minas Gerais	Grão Mogol	-16.54350	-42.89020
Bromeliaceae	*Tillandsia*			Minas Gerais	Grão Mogol	-16.53961	-42.89003
Eriocaulaceae	*Leiothrix*	*fluitans*	(Mart.) Ruhland	Minas Gerais	Grão Mogol	-16.52673	-42.89762
Eriocaulaceae	*Comanthera*	*centauroides*	(Bong.) L.R.Parra & Giul.	Minas Gerais	Grão Mogol	-16.52369	-42.89909
Crassulaceae				Minas Gerais	Grão Mogol	-16.51853	-42.89909
Malvaceae	*Pseudobombax*			Minas Gerais	Grão Mogol	-16.51631	-42.89903
Eriocaulaceae	*Paepalanthus*			Minas Gerais	Grão Mogol	-16.51631	-42.89903
Orchidaceae	*Epidendrum*	*secundum*	Jacq.	Minas Gerais	Grão Mogol	-16.51056	-42.90143
Orchidaceae				Minas Gerais	Grão Mogol	-16.50297	-42.90372
Eriocaulaceae	*Comanthera*			Minas Gerais	Santa Bárbara	-20.110	-43.653
Solanaceae				Minas Gerais	Santa Bárbara	-20.117	-43.658
Solanaceae				Minas Gerais	Santa Bárbara	-20.117	-43.658

Table 1. Specimens collected during the field expedition.