

## A new alien species in Brazil: *Heliophanus hamifer* Simon, 1886

Alexandre S. Michelotto<sup>1,2,3</sup> and Adalberto J. Santos<sup>2,4</sup>

<sup>1</sup> Pós-graduação em Zoologia, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

<sup>2</sup> Departamento de Zoologia, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

<sup>3</sup> **corresponding author**, email alexandremichelotto@gmail.com

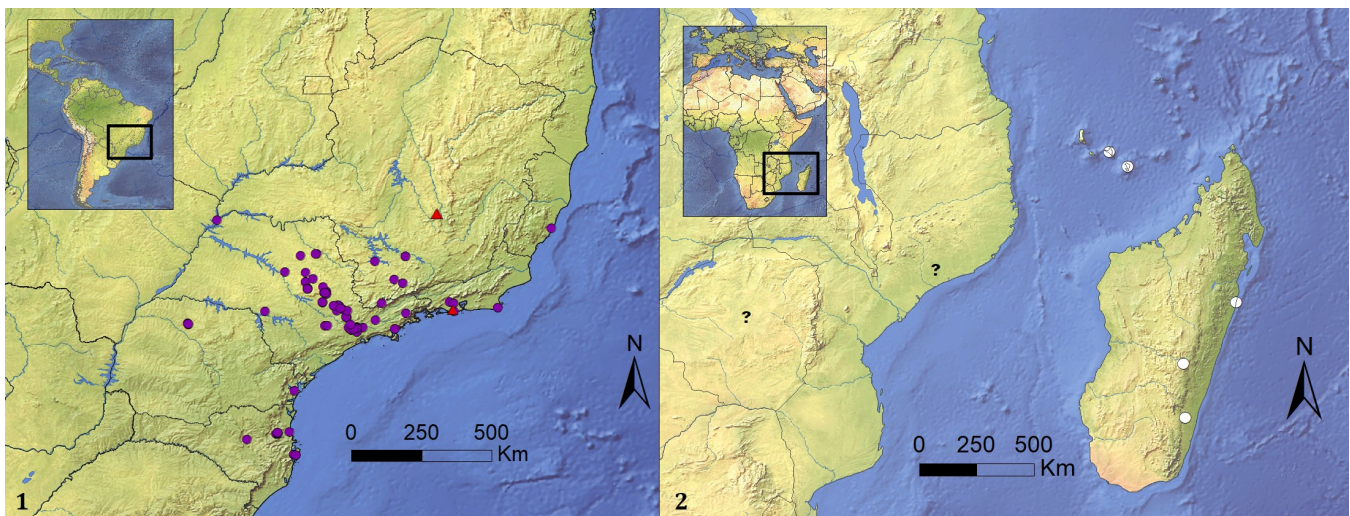
<sup>4</sup> email oxyopes@yahoo.com

**Abstract.** The jumping spider *Heliophanus hamifer* Simon, 1886 (Chrysillini) is reported for the first time in Brazil. Worldwide museum and iNaturalist records show the species is currently known from 7 states and 46 municipalities from southern, southeastern and central-western regions of Brazil, and 5 countries in Africa. Copulatory organs and living specimen images of *H. hamifer* are provided for the first time, along with notes on its natural history.

**Keywords.** Africa, Araneae, Chrysillini, citizen science, iNaturalist, introduced species, Saltafresia, Salticidae

### Introduction

Introduced synanthropic Salticidae in Brazil were recently revised by Pupin & Brescovit (2023), comprising 5 species easily differentiated from the country's native species. For example, *Thyene coccineovittata* (Simon 1886) is a large African plexippine with golden iridescent scales in males (Mariante & Hill 2018, 2019). However, since 2016 the iNaturalist community (2023) assembled records of an unidentified weird, green iridescent jumping spider living in urban areas of southeastern Brazil. As far as we know, the morphology of that species does not fit any of the known, native Brazilian species. After searching for similar habitats in urban areas (See natural history notes), we found it in Belo Horizonte and identified it as *Heliophanus hamifer* Simon, 1886 (Figure 1).



**Figure 1.** Known distribution records of *Heliophanus hamifer*. **1**, iNaturalist records (purple circles) and from UFMG collection (red triangles). **2**, African records from the literature and collections, with coordinates (white circles) and imprecise continental country records (question marks) (WCS, 2023; GBIF, 2023). Map imaging by ArcGIS 10.3.

*Heliophanus* is a speciose and widespread chrysilline genus, representing 170 species hitherto recorded in Africa, Europe, Asia, and Oceania, with two of them introduced to North America (WSC 2023). As with other chrysillines, male and female *Heliophanus* have a stridulatory apparatus, with a bare patch below the lateral eyes (the file) and seta-bearing tubercles (the rasp) on the anterior face of femur I (Fig. 4.6). This stridulatory apparatus, in addition to nest aggregation, suggest social communication and communality within the group (Maddison 1987, 2015).

The behavior and ecology of *H. hamifer* have never been studied. Hence, there are no data to support how it was introduced in Brazil, but it is probably a result of human activity as it is mainly found in urban areas. In this note we formally record the species in the New World, and for the first time provide information on habitat, feeding habits, and courtship behavior for the species.

### Material and methods

The specimens were collected opportunistically and deposited in the Arachnida collection of the CCT-UFMG (curator A. J. Santos). Coordinates were taken in loco with GPS, from iNaturalist and GBIF data (2023). Soft tissues around the female internal genitalia were digested on a pancreatin solution following Álvarez-Padilla & Hormiga (2008) and bleached by immersion under 6% creamy hydrogen peroxide solution. Photographs of the living specimens were taken with a Nikon Coolpix P100 on a millimetric graph paper to show body dimensions. Photographs of genitalia were taken on Leica DFC-29 digital camera coupled to a Leica M250-C stereomicroscope, and stacked on multifocus images using Leica Application Suite 4.1.

### *Heliophanus hamifer* Simon, 1886

#### Figures 2-4

*Material examined.* 1 ♂ and 1 ♀ (UFMG 27922) From BRAZIL: Rio de Janeiro: Vargem Pequena (22°58'55"S, 43°28'3"W), March 2021, Rafael Mariante leg. 1 ♂ (UFMG 29234) Belo Horizonte: Parque Municipal Américo Renné Giannetti (19°55'24.6"S, 43°56'2.5"W), November 2022, A. S. Michelotto & P. H. Souza leg., dwelling on herbaceous vegetation. 2 ♀♀ (UFMG 29242) Belo Horizonte: Mata da PUC (19°55'16.4"S, 43°59'32.1"W), December 2022, A. S. Michelotto leg. 124 iNaturalist records (Table 1).

*Diagnosis.* *H. hamifer* can be distinguished from other chrysillines present in Brazil by the green iridescence in both sexes (Figure 2), heavily sclerotized bulbus and embolus, large apophysis on male palpal femur and an epigyne with two smaller openings separated by a median septum (Figure 3). To distinguish it from other species of the genus, see Wesołowska (1986).

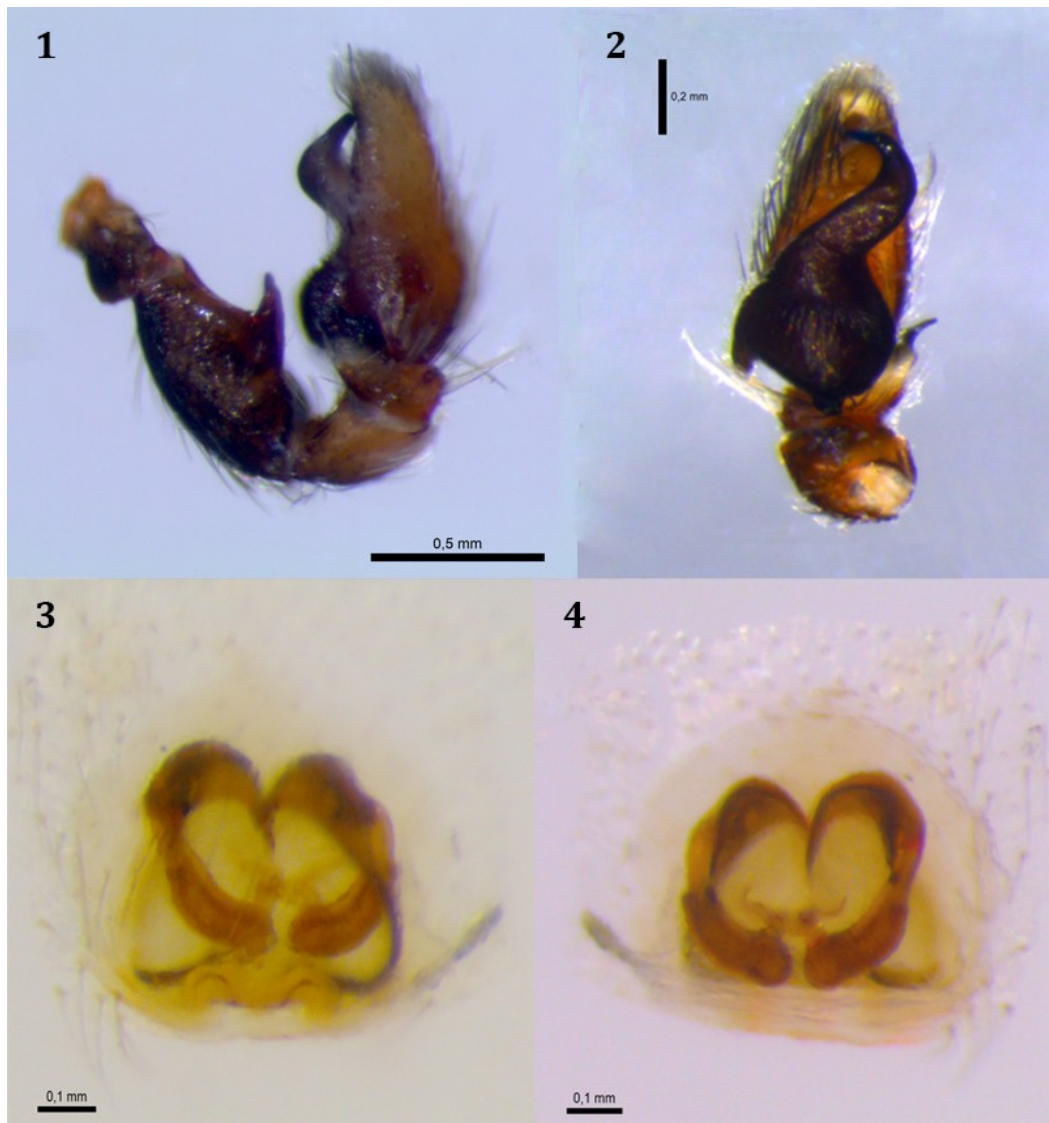
*Distribution.* Mozambique, Zimbabwe, Madagascar, Comoros, Mayotte, Seychelles (WSC, 2023), and Brazil (present data).

*Natural history.* Specimens from Brazil were collected from low level herbaceous vegetation in urban areas. In most of the iNaturalist records (Table 1), they were found on branches or leaves of herbaceous vegetation or human buildings (Figure 4), often feeding on dipterans. One record shows the standard courtship display observed for jumping spiders, in which the male exhibits elevated first legs to the female (Figure 4.9).





**Figure 2.** Habitus in life of *Heliophanus hamifer*. **1**, Dorsal view of the male (UFMG 27922). **2**, Same, frontal view. **3**, Frontal view of the female (UFMG 27922). **4**, Same, dorsal view. **5**, Male over millimetric graph paper (UFMG 29234). **6**, Female over millimetric graph paper (UFMG 29242). Photographs 1-4: Rafael Mariante (used with permission).



**Figure 3.** *Heliophanus hamifer* copulatory organs. **1**, Male left palp (UFMG 29242), retrolateral view. **2**, Same, ventral view. **3**, Cleared female genitalia (UFMG 29234), ventral view. **4**, Same, dorsal view.

**Table 1.** iNaturalist records of *Heliophanus hamifer* up to May 20, 2023 in Brazil. URL code is preceded by “<<https://www.inaturalist.org/observations>>”.

Date	User	City	State	Longitude	Latitude	URL
3/7/2016	@euqueromorange	Brasilotas	São Paulo	-48.1254845	-22.2807812	/59567227
1/20/2017	@euqueromorange	Brasilotas	São Paulo	-48.1254845	-22.2807812	/60652745
11/22/2017	@tamiranda	Rio Claro	São Paulo	-47.5596215	-22.4107652	/138310704
11/2/2018	@josev_ge	Valinhos	São Paulo	-46.98381167	-22.95647833	/18036902
6/9/2019	@josev_ge	São Paulo	São Paulo	-46.70407042	-23.59152739	/26693347
6/16/2019	@eduardo_rex	São Carlos	São Paulo	-47.937784	-21.980853	/27108475
11/14/2019	@euqueromorange	Brasilotas	São Paulo	-48.1254401	-22.2862718	/102402174
2/22/2020	@gussoni	Rio Claro	São Paulo	-47.546873	-22.404433	/39069192
4/26/2020	@rogeriomachado	Rio Claro	São Paulo	-47.56513931	-22.41490227	/43664534
5/30/2020	@flaviomendes	Vila Velha	Espírito Santo	-40.30397285	-20.36099431	/47905414
6/14/2020	@gussoni	Rio Claro	São Paulo	-47.5476013	-22.4053169	/49590689
7/14/2020	@rogeriomachado	Corumbataí	São Paulo	-47.6232221	-22.2229445	/53118079
7/15/2020	@euqueromorange	Brasilotas	São Paulo	-48.1254401	-22.2862718	/106118178
8/10/2020	@stellas	Campinas	São Paulo	-47.06263315	-22.90901871	/56597381
9/28/2020	@josev_ge	São Paulo	São Paulo	-46.69044167	-23.61081333	/61116122
11/12/2020	@euqueromorange	Brasilotas	São Paulo	-48.1254401	-22.2862718	/105363142
12/25/2020	@biaveroneze	São Paulo	São Paulo	-47.17459393	-22.98487728	/67335679
1/8/2021	@gussoni	Rio Claro	São Paulo	-47.52284167	-22.36661667	/67758086
1/25/2021	@laisacraupp	Blumenau	Santa Catarina	-49.07173309	-26.91597646	/68620404
1/28/2021	@rogeriomachado	Rio Claro	São Paulo	-47.57302472	-22.41890142	/68736792
1/29/2021	@allan240120	São Paulo	São Paulo	-46.68221746	-23.51969502	/127347597
2/4/2021	@euqueromorange	Brasilotas	São Paulo	-48.1254845	-22.2807812	/69066170
2/5/2021	@mewcael	Taió	Santa Catarina	-50.05604553	-27.11008833	/69098473
2/9/2021	@nbec	São Paulo	São Paulo	-46.7539347	-23.56448775	/69323975



Date	User	City	State	Longitude	Latitude	URL
2/11/2021	@rogeriomachado	Rio Claro	São Paulo	-47.57306333	-22.41891667	/69411472
2/17/2021	@stellas	Campinas	São Paulo	-47.06263315	-22.90932229	/69726245
2/18/2021	@koralousntak	São Paulo	São Paulo	-46.6333094	-23.5505199	/69791648
2/23/2021	@josev_ge	São Paulo	São Paulo	-46.69055833	-23.61077833	/70039028
3/5/2021	@rogeriomachado	Rio Claro	São Paulo	-47.57321167	-22.41867256	/70621166
3/6/2021	@biaveroneze	São Paulo	São Paulo	-47.13773943	-22.8025168	/70712800
3/10/2021	@marinacarvalho	Lambari	Minas Gerais	-45.34446973	-21.98533258	/71302814
3/21/2021	@josev_ge	São Paulo	São Paulo	-46.69262833	-23.61232167	/71752773
3/29/2021	@josev_ge	São Paulo	São Paulo	-46.690505	-23.61077167	/72371825
3/30/2021	@gussoni	Rio Claro	São Paulo	-47.54760833	-22.40527222	/72448168
5/3/2021	@josev_ge	São Paulo	São Paulo	-46.69309667	-23.61314167	/77055639
5/23/2021	@thiagoantunes2018	São Paulo	São Paulo	-46.71934834	-23.59162211	/80102351
6/1/2021	@azambolli	Jundiá	São Paulo	-46.864455	-23.2171093	/81244825
7/27/2021	@fracettx	Piracicaba	São Paulo	-47.64806449	-22.73423936	/88843157
9/12/2021	@gabli12	Jacareí	São Paulo	-45.93754135	-23.29819638	/94583424
9/24/2021	@rogeriomachado	Rio Claro	São Paulo	-47.57297897	-22.41884039	/96008290
11/20/2021	@rodrigodepes	Cabo Frio	Rio de Janeiro	-42.02529509	-22.88328972	/101609063
11/20/2021	@rodrigodepes	Cabo Frio	Rio de Janeiro	-42.02529509	-22.88328972	/102909512
11/29/2021	@josev_ge	São Paulo	São Paulo	-46.69051333	-23.61087	/102168159
11/29/2021	@jvitor_os	Jaboticabal	São Paulo	-48.34261918	-21.2383874	/102193260
12/4/2021	@isismedri	Maringá	Paraná	-51.94818738	-23.39216019	/102740832
12/29/2021	@lucas_lauretto	Araçoiaba da Serra	São Paulo	-47.56370444	-23.47970058	/104127113
1/1/2022	@jpirolla	Araraquara	São Paulo	-48.17926425	-21.77906752	/104099576
1/5/2022	@luaras_jona	Bernardino de Campos	São Paulo	-49.4731864	-23.0147985	/109140109
1/10/2022	@pedro750	Itatiba	São Paulo	-46.83994845	-23.0007234	/104701394
1/15/2022	@uedagrill	São Paulo	São Paulo	-46.64039997	-23.57075997	/105066952
1/23/2022	@caiosnunes	Piracicaba	São Paulo	-47.6328752	-22.7103575	/105365843
2/4/2022	@padraicflood	Lavras	Minas Gerais	-44.98349838	-21.2457786	/106117633
2/4/2022	@padraicflood	Lavras	Minas Gerais	-44.98344765	-21.24573009	/106180223
3/22/2022	@marceloassuncao10	Florianópolis	Santa Catarina	-48.55692867	-27.59443959	/109272639
3/24/2022	@rogeriomachado	Rio Claro	São Paulo	-47.572994	-22.4188	/109365773
3/25/2022	@josev_ge	São Paulo	São Paulo	-46.69075833	-23.61087167	/109496185
3/26/2022	@entomologist-hemulen	Maringá	Paraná	-51.93432301	-23.42565809	/123346600
4/8/2022	@maquino81	São Lourenço	Minas Gerais	-45.06241597	-22.10613	/110898910
5/1/2022	@gbieging	Blumenau	Santa Catarina	-49.11523987	-26.92498783	/114302628
5/4/2022	@josev_ge	São Paulo	São Paulo	-46.69045	-23.61086667	/115489178
5/10/2022	@gbieging	Blumenau	Santa Catarina	-49.11532469	-26.92491549	/116426512
5/11/2022	@marceloassuncao10	Florianópolis	Santa Catarina	-48.55692867	-27.59443959	/116609387
6/7/2022	@mari_neko	Sorocaba	São Paulo	-47.48514377	-23.47088637	/120677165
6/12/2022	@sun_narizo	Osasco	São Paulo	-46.7915243	-23.5326334	/125475227
6/24/2022	@chatonov	Pacaembu	São Paulo	-46.6705746	-23.5550857	/123359696
7/4/2022	@daniel_schelesky	Ribeirão Bonito	São Paulo	-48.17657702	-22.06854618	/124765358
7/11/2022	@mayconu7	Queimados	Rio de Janeiro	-43.56011532	-22.70995845	/125823024
7/18/2022	@luisfelipe4	Cunha	São Paulo	-44.95966667	-23.07515833	/126842697
7/28/2022	@marceloassuncao10	Florianópolis	Santa Catarina	-48.50398333	-27.60506667	/131494217
8/5/2022	@gussoni	Alfenas	Minas Gerais	-45.96650314	-21.42181014	/129543990
8/9/2022	@rafaela_lapa	Sumaré	São Paulo	-47.2707792	-22.8244116	/137848589
9/21/2022	@pe_aga_ka	Jundiá	São Paulo	-46.88926052	-23.18529664	/135960402
10/11/2022	@pe_aga_ka	Jundiá	São Paulo	-46.88926052	-23.18529664	/138375246
10/31/2022	@josev_ge	São Paulo	São Paulo	-46.690045	-23.61035333	/140665353
11/7/2022	@josev_ge	São Paulo	São Paulo	-46.69327167	-23.61309667	/141377028
11/7/2022	@pe_aga_ka	Jundiá	São Paulo	-46.88926052	-23.18529664	/141378588
11/11/2022	@andressa_mzerbinatti	Poá	São Paulo	-46.3439347	-23.5243205	/142839289
11/14/2022	@limarrudandre	Piracicaba	São Paulo	-47.63683697	-22.71086	/144190105
11/21/2022	@pe_aga_ka	Jundiá	São Paulo	-46.88926052	-23.18563103	/142542667
11/27/2022	@rodrigodepes	Nova Iguaçu	Rio de Janeiro	-43.449505	-22.759464	/143041412
11/27/2022	@rodrigodepes	Nova Iguaçu	Rio de Janeiro	-43.449505	-22.759464	/143041534
11/28/2022	@rogeriomachado	Rio Claro	São Paulo	-47.57299197	-22.41882297	/143224525
12/5/2022	@marceloassuncao10	Florianópolis	Santa Catarina	-48.50400833	-27.60505556	/143739305
12/10/2022	@marcoantoniozamith	Rio De Janeiro	Rio de Janeiro	-43.42150339	-23.00481125	/144141211
12/21/2022	@daniel_schelesky	Ribeirão Bonito	São Paulo	-48.17499451	-22.06338111	/144813269
12/25/2022	@moalbar	Sapucaá-Mirim	Minas Gerais	-45.7465633	-22.748077	/145063582
1/11/2023	@rafaela_lapa	Sumaré	São Paulo	-47.27077927	-22.82438872	/146343587
1/24/2023	@fabiobabi	Caraguatatuba	São Paulo	-45.32171197	-23.57994197	/147291171
1/25/2023	@josev_ge	São Paulo	São Paulo	-46.690005	-23.61029167	/147330135
1/27/2023	@fabiobabi	Caraguatatuba	São Paulo	-45.32173197	-23.57995897	/147494554
2/5/2023	@rogeriomachado	Santa Gertrudes	São Paulo	-47.520839	-22.45361497	/148135441
2/13/2023	@princeofdarkness	Ibitinga	São Paulo	-48.83258834	-21.75567896	/149371088
2/15/2023	@juliofilipino	Ribeirão Preto	São Paulo	-47.81108547	-21.16937247	/148915024
2/17/2023	@antonio1120	São Paulo	São Paulo	-46.75908333	-23.56444722	/148990465
2/18/2023	@gussoni	Rio Claro	São Paulo	-47.57307814	-22.41886711	/149051364
2/20/2023	@rafapsilva	São Paulo	São Paulo	-46.54665157	-23.53880547	/149261714
2/20/2023	@paularomano	Santo André	São Paulo	-46.53563122	-23.66023177	/149344263
2/21/2023	@leticia_cavalcanti	São Paulo	São Paulo	-46.54783063	-23.53853984	/149320335
2/26/2023	@loolooop	Paranaguá	Paraná	-48.54374	-25.547379	/149746680
2/26/2023	@rafapsilva	São Paulo	São Paulo	-46.53829146	-23.55062884	/149751565
2/27/2023	@isismedri	Maringá	Paraná	-51.93382083	-23.40658225	/153378627
3/9/2023	@rogeriomachado	Santa Gertrudes	São Paulo	-47.521241	-22.45380797	/150666629
3/18/2023	@josev_ge	São Paulo	São Paulo	-46.723655	-23.565125	/151553698
3/29/2023	@juliocastellain	Blumenau	Santa Catarina	-49.06005476	-26.92929357	/152733007
4/2/2023	@rogeriomachado	Rio Claro	São Paulo	-47.5731422	-22.418866	/153176787
4/17/2023	@luanmazzeo	Ribeirão Preto	São Paulo	-47.85984166	-21.16472328	/155358784
4/27/2023	@rogeriomachado	Santa Gertrudes	São Paulo	-47.52076997	-22.453693	/156935806
4/29/2023	@paolaetevi	Blumenau	Santa Catarina	-49.07047246	-26.89538549	/157732046
4/29/2023	@paulo_simaozinho	Itajaí	Santa Catarina	-48.70919466	-26.8756649	/159913481
4/30/2023	@paolaetevi	Blumenau	Santa Catarina	-49.07056248	-26.89516576	/158231852
5/1/2023	@vitor_sagui	São Paulo	São Paulo	-46.73854444	-23.43423889	/158849626
5/7/2023	@pe_aga_ka	Jundiá	São Paulo	-46.88926052	-23.18563103	/160366252
5/8/2023	@rogeriomachado	Aparecida do Taboado	Mato Grosso do Sul	-51.02210397	-20.097985	/160952103
5/15/2023	@jeanloprete	São Paulo	São Paulo	-46.53669052	-23.52021549	/161838750



**Figure 4.** iNaturalist records of *Heliophanus hamifer*. **1**, Male dwelling on grass, by @laisacraupp (used with permission). **2**, Male over a thorny herbaceous stem, by @gussoni (CC-BY-NC). **3**, Male jumping over low herbaceous leaves, by @euqueromorango (used with permission). **4**, Female under an herb leaf, by @chatonov (CC-BY-NC). **5**, Female over a dry herbaceous stem, by @isimedri (CC-BY-NC). **6**, Same, in detail. The arrow points to the bare patch related to stridulation. **7**, Female preying on a fly, by @euqueromorango (used with permission). **8**, Male preying on a midge over a wall, by @daniel\_schelesky (used with permission). **9**, Male displaying courtship behavior to a female over a plant vase (used with permission).



## Acknowledgments

We thank Rafael M. Mariante for sampling specimens in Rio de Janeiro and allowing our use of high-quality photographs, and Pedro Henrique de Souza for assistance with sampling in Belo Horizonte. We are grateful for all of the 59 iNaturalist users who provided data for this species, improving its known distribution in Brazil. Kin Master Produtos Químicos is acknowledged for providing the pancreatin to our laboratory. ASM was financially supported by FAPEMIG and APOIA.se/michelotto8legs; AJS received grants from FAPEMIG (PPM-00605-17), CNPq (311843/2022-0), and Instituto Nacional de Ciência e Tecnologia dos Hymenoptera Parasitóides da Região Sudeste Brasileira (<http://www.hympar.ufscar.br/>, CNPq 465562/2014-0, FAPESP 2014/50940-2). We also thank Pedro H. Martins and Richard A. Torres for valuable suggestions on the manuscript.

## References

- Álvarez-Padilla & Hormiga 2008.** Fernando Álvarez-Padilla and Gustavo Hormiga. 1 DEC 2007. A protocol for digesting soft tissues and mounting spiders for scanning electron microscopy. *Journal of Arachnology* 35 (3): 538-542.
- GBIF.org. 2023.** GBIF Occurrence, *online at* <https://doi.org/10.15468/dl.dq9eum>, *last accessed* 20 May 2023.
- iNaturalist community.** Observations of *Heliophanus* from Brazil, observed between 5/20/2023 and 3/7/2016, *exported from* <https://www.inaturalist.org> on 20 May 2023.
- Maddison 1987.** Wayne P. Maddison. *Marchena* and other jumping spiders with an apparent leg-carapace stridulatory mechanism (Araneae: Salticidae: Heliophaninae and Thiodinae). *Bulletin of the British Arachnological Society* 7: 101-106.
- Maddison 2015.** Wayne P. Maddison. SEP 2015. A phylogenetic classification of jumping spiders (Araneae: Salticidae). *Journal of Arachnology* 43 (3): 231-292.
- Mariante & Hill 2018.** Rafael M. Mariante and David E. Hill. 5 NOV 2018. First report of *Thyene* cf. *pulchra* (Araneae: Salticidae: Plexippina) in Brazil. *Peckhamia* 173.1: 1-6.
- Mariante & Hill 2019.** Rafael M. Mariante and David E. Hill. 14 JUN 2019. First report of the African jumping spider *Thyene coccineovittata* (Araneae: Salticidae: Plexippina) in Brazil. *Peckhamia* 173.2: 1-23.
- Pupin & Brescovit 2023.** Giovanni B. Pupin and Antonio D. Brescovit. 7 APR 2023. The alien synanthropic Salticidae in Brazil (Araneae). *Iheringia, Série Zoologia* 113: 1-16.
- Simon 1886.** Eugène Simon. Études arachnologiques. 18<sup>e</sup> Mémoire. XXVI. Matériaux pour servir à la faune des Arachnides du Sénégal. (Suivi d'une appendice intitulé: Descriptions de plusieurs espèces africaines nouvelles). *Annales de la Société Entomologique de France* (6) 5: 345-396.
- Wesołowska 1986.** Wanda Wesołowska. A revision of the genus *Heliophanus* C. L. Koch, 1833 (Aranei: Salticidae). *Annales Zoologici, Warszawa* 40: 1-254.
- WSC 2023.** World Spider Catalog, Natural History Museum Bern 24, *online at* <https://wsc.nmbe.ch>, *last accessed* 20 May 2023.