

## Bulletin of Insectology Supplemental Material

Title: **A contribution to *Cerataphis* molecular taxonomy and ecology: the Costa Rican case**

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Bulletin of Insectology, Volume 75 June 2022 pages 137-149

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### References in supplemental materials

**Table S1.** Species information and accession number for sequences retrieved from public databases included in phylogenetic analysis<sup>(a)</sup>.

Species	Country	Specimen ID	GenBank accession numbers		
			<i>COI</i>	<i>EF1-α</i>	<i>COI-tRNA-COII</i>
<i>Aleurodaphis asteris</i>	China	15371	JN032729	DQ493867	KX698275
<i>Aleurodaphis blumeae</i>	China	15597	JX282771	JX282844	---
<i>Aleurodaphis blumeae</i>	Japan	---	---	---	L27325
<i>Aleurodaphis mikaniae</i>	China	15060	JN032725	DQ493863	---
<i>Aleurodaphis mikaniae</i>	---	13559	---	---	KX698270
<i>Astegopteryx bambucifoliae</i>	China	13322	JN032708	DQ493848	---
<i>Astegopteryx bambucifoliae</i>	China	HL20170205_7	---	MK028332	---
<i>Astegopteryx bambucifoliae</i>	India	RO-NBAIR-114	AGIRI114-17 <sup>(b)</sup>	---	---
<i>Astegopteryx bambucifoliae</i>	Taiwan	---	---	---	L27324
<i>Astegopteryx bambusae</i>	China	HLzId20171108_6	---	MK028326	---
<i>Astegopteryx bambusae</i>	China	14592	JX489624	JX489690	---
<i>Astegopteryx bambusae</i>	India	ORP-2010-61	HQ112196	---	---
<i>Astegopteryx formosana</i>	China	HLzId20171103_19	---	MK028330	---
<i>Astegopteryx formosana</i>	Taiwan	CNC#HEM054803	EU701518	---	---
<i>Astegopteryx formosana</i>	Taiwan	---	---	---	L27326
<i>Astegopteryx muiri</i>	---	DLS 92-97	---	---	L39992
<i>Astegopteryx muiri</i>	Malaysia	DLS 92-136	---	---	U58038
<i>Astegopteryx rhapsidis</i>	China	Y8927	JX489625	JX489691	KX698283
<i>Astegopteryx styracophila</i>	China	26615	JX489626	JX489692	---
<i>Cerataphis bambusifoliae</i>	China	14553	JN032723	DQ493861	---
<i>Cerataphis bambusifoliae</i>	China	14523	---	DQ493850	---
<i>Cerataphis bambusifoliae</i>	Taiwan	CNC*HEM054804	EU701569	---	---
<i>Cerataphis bambusifoliae</i>	---	---	---	---	L27327
<i>Cerataphis brasiliensis</i>	China	26637	KX698136	KX698154	---
<i>Cerataphis brasiliensis</i>	Malaysia	DLS 92-407	---	---	L38298
<i>Cerataphis freycinetiae</i>	China	VT008	JX489627	JX489693	---
<i>Cerataphis freycinetiae</i>	Malaysia	DLS 93-17	---	---	U58041
<i>Cerataphis lataniae</i> <sup>(c)</sup>	India	---	---	KU048060	---
<i>Cerataphis lataniae</i>	India	KBRIHR-190	JX051426	---	---
<i>Cerataphis lataniae</i>	India	IIHR-BT-25	HQ632647	---	---
<i>Cerataphis lataniae</i>	Malaysia	DLS 93-21	---	---	U58042
<i>Cerataphis pothophila</i>	Indonesia	DLS 93-136	---	---	U58043
<i>Cerataphis</i> sp.	España	Val1010	---	FM174690	---
<i>Cerataphis vandermeermohri</i>	Indonesia	DLS 93-155	---	---	L38299
<i>Ceratoglyphina roepkei</i>	Indonesia	---	---	---	L38297
<i>Tuberaphis coreana</i>	Japan	CNC*HEM054817	EU701940	---	---
<i>Tuberaphis coreana</i>	---	DLS 42-97	---	---	L40000
<i>Tuberaphis leeuweni</i>	---	DLS 93-149	---	---	L40008
<i>Tuberaphis</i> sp.	---	GXQ-2006	---	DQ493855	---
<i>Tuberaphis</i> sp.	---	1 TTX-2016 (20365)	KX698134	KX698151	KX698277
<i>Tuberaphis</i> sp.	---	2 TTX-2016 (20431)	KX698135	KX698152	KX698278
<i>Tuberaphis</i> sp.	---	3 TTX-2016 (26809)	KX698138	KX698156	KX698281
<i>Tuberaphis</i> sp.	China	XH-2011	JN032717	---	---
<i>Tuberaphis styraci</i>	Japan	DLS 91-17B	---	---	L38307
<i>Tuberaphis taiwana</i>	Japan	DLS 92-47	---	---	L38304
<i>Tuberaphis takenouchii</i>	---	---	---	---	L27338
<i>Tuberaphis xinglongensis</i> <sup>(d)</sup>	China	Y8928	JX489633	JX282847	KX698284
<i>Tuberaphis xinglongensis</i>	India	RO-NBAIR-Tubxing-1	MG197811	---	---

<sup>(a)</sup> --- = No data available.<sup>(b)</sup> BOLD Systems record identification number.<sup>(c)</sup> Record title: "UNVERIFIED".<sup>(d)</sup> The same specimen identification ZMIOZ Y8928 in GenBank appears as *Tuberaphis xinglongensis* (JX489633, JX489701) and as *Astegopteryx xinglongensis* (JX282767, JX282847).

**Table S2.** Uricase (urate oxidase) partial sequences for YLS obtained from *C. brasiliensis* and *C. orchidearum*, and four Fulgoroidea species samples in Costa Rica.

Species	Sample ID	GenBank accession number	Description <sup>(a)</sup>	First BLAST hit in GenBank	% Identity (% coverage)
<i>Cerataphis brasiliensis</i>	CR14-008 d	MT647617	AB038706, <i>Cerataphis fransseni</i> <sup>(b)</sup> yeast-like		99.84 (99)
<i>Cerataphis brasiliensis</i>	AE a	MT647618	symbiont gene for uricase, complete cds		100.00 (99)
<i>Cerataphis orchidearum</i>	CR14-400 c	MW115615	AB038708, <i>Tolypocladium inflatum</i> gene for uricase, complete cds <sup>(c)</sup>		84.55 (97)
<i>Peregrinus maidis</i>	PM	MT647619			98.09 (100)
<i>Sogatella</i> sp.	S1	MT647620	AB038700, <i>Ricania japonica</i> yeast-like		98.58 (100)
<i>Sogatella</i> sp.	S2	MT647621	symbiont gene for uricase, complete cds		98.43 (100)
<i>Tagosodes</i> sp.	T1	MT647622			98.75 (100)

<sup>(a)</sup> Sequences from Hongoh and Ishikawa (2000).

<sup>(b)</sup> *Cerataphis fransseni* is a synonym of *C. brasiliensis* (Russell, 1996).

<sup>(c)</sup> Second hit with megablast algorithm, NCBI, NIH, with 99% coverage and 84.08% identity was, AB038706, *Cerataphis fransseni* yeast-like symbiont gene for uricase, complete cds.

**Table S3.** Ant species associated with colonies of *Cerataphis* spp. and plant host combinations observed in Costa Rica and/or reported worldwide.

Associated Ant Species	<i>Cerataphis</i> spp.	Plant Host	Country	Reference
<i>Anoplolepis gracilipes</i> (F. Smith 1857)	<i>C. brasiliensis</i>	<i>Areca catechu</i> L.	India	Vanavasan, 2008
<i>Brachymyrmex heeri</i> Forel 1874	<i>C. brasiliensis</i>	<i>Alpinia purpurata</i> (Vieill.) K.Schum.	Costa Rica	This work
<i>Brachymyrmex obscurior</i> Forel 1893	<i>C. brasiliensis</i>	<i>Cyrtostachys renda</i> Blume	Costa Rica	This work
<i>Camponotus atriceps</i> (F. Smith 1858)	<i>C. brasiliensis</i>	<i>Chamaedorea costaricana</i> Oerst.	Costa Rica	Espadaler <i>et al.</i> , 2012
<i>Camponotus planatus</i> Roger 1863	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Costa Rica	This work
<i>Camponotus</i> spp. (2 species)	<i>C. fransseni</i> <sup>(a)</sup>	secondary hosts	Malaysia	Stern <i>et al.</i> , 1995
<i>Camponotus striatus</i> (F. Smith 1862)	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Costa Rica	This work
<i>Dolichoderus bispinosus</i> (Olivier 1792)	<i>Cerataphis</i> sp.	<i>Paullinia</i> sp.	Colombia	Ramírez <i>et al.</i> , 2001
<i>Dolichoderus</i> spp. (2 species)	<i>C. fransseni</i> <sup>(a)</sup>	secondary hosts	Malaysia	Stern <i>et al.</i> , 1995
<i>Dolichoderus thoracicus</i> (F. Smith 1862)	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf. and <i>Cocos nucifera</i> L.	West Java	Maharani <i>et al.</i> , 2020
<i>Iridomyrmex</i> sp.	<i>C. orchidearum</i>	<i>Korthalsia echinometra</i> Becc.	Singapore	Chang <i>et al.</i> , 2012
<i>Myrmecaria brunnea</i> Saunders 1842	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	West Java	Maharani <i>et al.</i> , 2020
<i>Myrmecaria</i> sp.	<i>C. fransseni</i> <sup>(a)</sup>	secondary hosts	Malaysia	Stern <i>et al.</i> , 1995
<i>Oecophylla smaragdina</i> Fabricius 1775	<i>C. brasiliensis</i>	<i>Cocos nucifera</i> L. (var. Malayan Dwarf)	India	Josephrajakumar <i>et al.</i> , 2011
<i>Oecophylla smaragdina</i> Fabricius 1775	<i>C. brasiliensis</i>	<i>Areca catechu</i> L.	India	Vanavasan, 2008
<i>Oecophylla smaragdina</i> Fabricius 1775	<i>C. fransseni</i> <sup>(a)</sup>	secondary hosts	Malaysia	Stern <i>et al.</i> , 1995
<i>Paratrechina fulva</i> (Mayr 1862)	<i>C. brasiliensis</i>	<i>Archontophoenix alenxandrae</i> (F.Muell.) H.Wendl. & Drude	Brazil	Campos-Farinha and Zorzenon, 2005
<i>Paratrechina longicornis</i> (Latreille 1802)	<i>C. brasiliensis</i>	<i>Cocos nucifera</i> L.	Costa Rica	This work
<i>Paratrechina longicornis</i> (Latreille 1802)	<i>C. brasiliensis</i>	<i>Cyrtostachys renda</i> Blume	Costa Rica	This work
<i>Paratrechina longicornis</i> (Latreille 1802)	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Costa Rica	This work
<i>Paratrechina yerburyi</i> (Forel 1894)	<i>C. brasiliensis</i>	<i>Areca catechu</i> L.	India	Vanavasan, 2008
<i>Pheidole megacephala</i> (Fabricius 1793)	<i>C. brasiliensis</i>	<i>Chrysalidocarpus lutescens</i> H.Wendl.	Costa Rica	Espadaler <i>et al.</i> , 2012
<i>Pheidole megacephala</i> (Fabricius 1793)	<i>C. lataniae</i>	<i>Epidendrum</i> sp.	Hawaii	Zimmerman, 1948
<i>Pheidole megacephala</i> (Fabricius 1793)	<i>C. orchidearum</i>	<i>Paphiopedilum</i> sp.	Costa Rica	This work
<i>Pheidole radoszkowskii</i> Mayr 1884	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Costa Rica	This work
<i>Solenopsis geminata</i> (Fabricius 1804) (black form)	<i>C. brasiliensis</i>	<i>Bismarckia nobilis</i> Hildebr. & H.Wendl.	Costa Rica	This work
<i>Solenopsis geminata</i> (Fabricius 1804) (black form)	<i>C. brasiliensis</i>	<i>Cyrtostachys renda</i> Blume	Costa Rica	This work
<i>Solenopsis geminata</i> (Fabricius 1804) (black form)	<i>C. brasiliensis</i>	<i>Dypsipates lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Costa Rica	This work
<i>Solenopsis</i> sp.	<i>C. brasiliensis</i>	<i>Astrocaryum aculeatum</i> G.Mey.	Brazil	Lunz <i>et al.</i> , 2011
<i>Solenopsis</i> sp.	<i>C. brasiliensis</i>	<i>Astrocaryum vulgare</i> Mart.	Brazil	Lunz <i>et al.</i> , 2011
<i>Solenopsis</i> sp.	<i>C. brasiliensis</i>	<i>Cocos nucifera</i> L. (var. Malayan Dwarf)	India	Josephrajakumar <i>et al.</i> , 2011
<i>Solenopsis</i> sp.	<i>C. brasiliensis</i>	<i>Euterpe oleraceae</i> Mart.	Brazil	Lunz <i>et al.</i> , 2011
<i>Solenopsis</i> sp.	<i>C. brasiliensis</i>	<i>Euterpe precatoria</i> Mart.	Brazil	Lunz <i>et al.</i> , 2011
<i>Tapinoma melanocephalum</i> (Fabricius 1793)	<i>C. orchidearum</i>	<i>Guarianthe skinneri</i> (Bateman) Dressler & W.E. Higgins	Costa Rica	This work
<i>Tapinoma melanocephalum</i> (Fabricius 1793)	<i>C. orchidearum</i>	<i>Vanilla planifolia</i> Jacks. ex Andrews	India	Prakash <i>et al.</i> , 2006
<i>Wasmannia auropunctata</i> (Roger 1863)	<i>C. brasiliensis</i>	<i>Alpinia purpurata</i> (Vieill.) K.Schum.	Costa Rica	Espadaler <i>et al.</i> , 2012
<i>Wasmannia auropunctata</i> (Roger 1863)	<i>C. brasiliensis</i>	<i>Alpinia purpurata</i> (Vieill.) K.Schum.	Costa Rica	This work

<sup>(a)</sup> *Cerataphis fransseni* is a synonym of *C. brasiliensis* (Russell, 1996).

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