

A species list of the insect subgenus *Leucochrysa* (s. str.)

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Abstract

In this study, data on type localities, ditribution records, available DNA sequences of *Leucochrysa* (s. str.) species are provided. With these data, statistical analysis is carried out to present the diversity in the countries and even in the regions of the continent. The results exhibit that: (1) type localities were most recorded in Cuba, Guatemala and Brazil from the Caribbean, North and Central America, and South Ameica respectively; (2) the highest diversity was recorded in South Ameica and was discovered in Cuba, Guatemala, and Brazil from the Caribbean, North and Central America, and South Ameica; (3) distribution data in most countries are lacking. Key points on results of the study is also discussed.

Keywords

Type localities, distribution records, DNA sequences, divesity, key points.

1. Introduction

The genus *Leucochrysa* was proposed firstly by McLachlan [1]. Two subgenera exist in this genus, which are *Leucochrysa* (s. str.) and *Nodita* Navás, 1916. There are 36 species in the subgenus *Leucochrysa*. Though the number of *Leucochrysa* (s. str.) species is not so large, the comprehensive study on *Leucochrysa* (s. str.) species is sill poor and only known for Adams [2], de Freitas and Penny [3], Penny [4, 5], Oswald et al. [6], Tauber [7], Tauber et al. [8], and Tauber et al. [9]. These previous researches were regional and/or focus on some species of this subgenus. Goals of the study are: (1) providing data on type localities, geographical distribution and available DNA sequences; (2) conducting statistical analysis on the the diversity in each country and region of the continent to present the well studied areas and poorly studied areas.

2. Materials and methods

The basis of the study is the vaild names of *Leuchochrysa* (s. str.) species, which were obtained from Oswald [10]. Relevant pulished papers was downloaded from a digital Library provided by Oswald [10]. Data on type localities, geographical distribution, and sequence accession numbers were acquired from the known literature and National Center for Biotechnology Information (NCBI) respectively, which were listed in the tables 1-2 below. Central America and North America were regarded to be a whole region (North and Central America)and Panama was thought to be a country from North and Central America in this study. With all the information, Statistical analysis was conducted to explore the diverity of regions and countries.

Table 1. Recorded species of *Leucochrysa* (s. str.) species in the world.

No.	Species	Synonym	Type locality	Distribution	Available DNA sequence accession numbers
1	<i>Leucochrysa</i> (s. str.) <i>adamsi</i> Penny, 2001	<i>L. antennata</i> Navás, 1921; Penny proposed a new name to replace <i>L. antennata</i> Navás, 1921, which is a junior homonym of <i>L. antennata</i> Navás, 1913.	Cuba (Santiago de las Vegas) [11]	Cuba [5, 10, 11, 12, 13, 14, 15]; Costa Rica [5, 10]; Honduras [5, 10, 15]	-
2	<i>L. (s. str.) angrandi</i> (Navás, 1911)	-	Guatemala [16]	Guatemala [10, 16]	-
3	<i>L. (s. str.) arizonica</i> (Banks, 1906)	-	United States ("palmerlee" [= Reef] [10]) [17]	Mexico [2, 6, 7, 10]; United States [2, 7, 10, 17, 18, 19]	-
4	<i>L. (s. str.) bedoci</i> Navás, 1924	-	Cuba (Sierra Maestra) [20]	Cuba [12, 15, 10, 20]	-
5	<i>L. (s. str.) benoisti</i> Navás, 1933	-	Ecuador (Santo Domingo de los Colorados) [21]	Ecuador [10, 15, 21]	-
6	<i>L. (s. str.) benoistina</i> Navás, 1934	-	Ecuador (Santo Domingo de los Colorados) [22]	Ecuador [10, 15, 22]	-
7	<i>L. (s. str.) bolivari</i> Banks, 1944	-	Colombia (Rio Dagna, Inmtas) [23]	Colombia [10, 23]	-
8	<i>L. (s. str.) boliviana</i> (Banks, 1915)	-	Bolivia ("Rio Longo" [= Zongo Riv. [10]]) [24]	Bolivia [10, 15, 24]	-
9	<i>L. (s. str.) boxi</i> Navás, 1930	<i>Hemerobius lonicornis</i> G. Gray, 1832; G. Gray in Cuvier 1832; (somewhere in South America) [32]; Tauber et al. (2011) synonymized it with <i>L. (s. str.) boxi</i> . <i>L. loretana</i> Banks Navás, 1935; Argentina (Loreto) [26]; Tauber et al. [8] synonymized it with <i>L. (s. str.) boxi</i> .	Argentina (Tucúman) [25]	Argentina [8, 10, 15, 25, 26, 27, 28]; Bolivia [8, 10]; Brazil [3, 8, 10, 15, 29, 30, 31]; Peru [8, 10]	-
10	<i>L. (s. str.) brasilica</i> (Navás, 1913)	-	Brazil [33]	Brazil [10, 15, 33, 34, 35]	-
11	<i>L. (s. str.) bruneola</i> de Freitas & Penny, 2001	-	Brazil (Itiquira) [3]	Brazil [3, 10]	-
12	<i>L. (s. str.) catarinae</i> de Freitas & Penny, 2001	-	Brazil (Fraiburgo) [3]	Brazil [3, 10]	KY039058.1 (16S rRNA)
13	<i>L. (s. str.) christophei</i> Banks, 1938	-	Haiti (Desbarriere) [36]	Haiti [10, 15, 36, 37]	-
14	<i>L. (s. str.) clara</i> (McLachlan, 1867)	<i>Allochrysa scioptera</i> Navás, 1913; Guatemala (Buyaba) and Panama (Chiriqui) [39]; Kimmins [41] synonymized it with <i>L. (s. str.) clara</i> .	Brazil ("Ega" [= Tefé = Tefé] [10]) [38]	Brazil [10, 15, 33, 38]; Colombia [5, 10, 15, 23]; Costa Rica [5, 10]; Ecuador [5, 10]; Guatemala [10, 39]; Panama [10, 39, 40]	-
15	<i>L. (s. str.) colombia</i> (Banks, 1910)	<i>L. claveris</i> Navás, 1927; Colombia (San Antonio de Tena) [43]; Colombia (Santa Margarita) Adams [2] synonymized it with <i>L. (s. str.) colombia</i> . <i>Allochrysa</i>	Colombia (Santa Margarita) [43]; Costa Rica [5, 10]; Ecuador [5, 10]; United States [44]	Colombia [5, 10, 23, 33, 42, 43]; Costa Rica [5, 10]; Ecuador [5, 10]; United States [44]	-

No.	Species	Synonym	Type locality	Distribution	Available DNA sequence accession numbers
		<i>californica</i> Navás, 1928b; United States (California) [44] (Probably Colombia proposed by Adams [2]); Adams [2] synonymized it with <i>L. (s. str.) colombia</i> .			
16	<i>L. (s. str.) dolichocera</i> - (Navás, 1913)		Guatemala ("San-Geronimo" [= Jerónimo]) [10]] [39]	Guatemala [10, 39]	-
17	<i>L. (s. str.) duarte</i> - Banks, 1946		Costa Rica (Pedrogoso) [40]	Costa Rica [5, 15, 40]	-
18	<i>L. (s. str.) ehrhardti</i> Navás, - 1929		Brazil ("Colonie Hansa" [near Joinville]) [30]	Brazil [10, 15, 30]	-
19	<i>L. (s. str.) geminata</i> Navás, - 1913		Paraguay (San Bernardino) [33]	Paraguay [10, 15, 33]	-
20	<i>L. (s. str.) ignatii</i> - Navás, 1923		Argentina (Villa Lutecia) [45]	Argentina [10, 15, 27, 45, 46]	-
		<i>Chrysopa virginica</i> Fitch, 1854 [1855]; United States [Somewhere near Cartersville] [49]; Adams [2] synonymized it with <i>L. (s. str.) insularis</i> .			
		<i>Nothochrysa phantasma</i> MacGillivray, 1894; United States (West Chop) [55].			
21	<i>L. (s. str.) insularis</i> (Walker, 1853)	<i>L. cerverai</i> , Navás1924a; Cuba (Santiago de las Vegas) [13]; Alayo [12] synonymized it with <i>L. (s. str.) insularis</i> . <i>L. joannisi</i> Navás1925a; Cuba (Santiago de las Vegas) [14]; <i>Allochrysa virginica</i> var. <i>ocala</i> Banks, 1938b; United States ("Lloyd Sink" [near Lloyd] [10]) [54] The author(s) who synonymized <i>N. phantasma</i> , <i>L. joannisi</i> and <i>A. virginica</i> var. <i>ocala</i> is (are) unknown.	Jamaica [47]	Cuba [2, 7, 10, 12, 13, 14, 19]; Dominican Republic [7, 10]; Jamaica [2, 7, 10, 47, 48]; Mexico [7, 10]; United States [2, 7, 10, 15, 18, 19, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62]	MN34471 3.1 (COI); MN34461 1.1 (COI)
22	<i>L. (s. str.) lestagei</i> Navás, - 1922		Brazil (Muriguy) [63]	Brazil [5, 10, 15, 63]; Costa Rica [5, 10, 64]; Ecuador [5, 10, 64]	-
23	<i>L. (s. str.) magnifica</i> - (Banks, 1920)		Brazil (Chapada) [65]	Brazil [5, 10, 15, 65]; Costa Rica [5, 10]; French Guiana [5, 10, 23]; Guyana [10, 23]; venezuela [10, 23]	-
24	<i>L. (s. str.) negata</i> (Navás, 1913)	<i>L. singularis</i> Navás, 1913b; "Guatemala" ("Amula, Guerrero") [39] (Actually Mexico (Guerrero) [2]); Adams (1977) proposed it as a junior synonym of <i>L. (s. str.) negata</i> .	"Guatemala" ("Amula, Guerrero") [39] [Actually Mexico (Guerrero)] [2]	Mexico [2, 6, 7, 10]; Panama [10, 40]	-
25	<i>L. (s. str.) nigrilabris</i> - (Banks, 1915)		Colombia (St. Antonio) [24]	Colombia [10, 15, 23, 24]	-
26	<i>L. (s. str.) notha</i> - Navás, 1913		Guatemala (Zapote) [39]	Guatemala [10, 39]	-

No.	Species	Synonym	Type locality	Distribution	Available DNA sequence accession numbers
27	<i>L. (s. str.) phaeocephala</i> - Navás, 1929		"Niederl. Guayan. Obere Commaryne" [= Suriname [10]] [66]	Suriname [9, 10, 15, 66]	-
28	<i>L. (s. str.) pretiosa</i> (Banks, 1910)	<i>L. erminea</i> Banks, 1945 [1946]; Panama (Barro Colorado) [40]; Tauber et al. [9] synonymized it with <i>L. (s. str.) pretiosa</i> . <i>L. delicata</i> Navás, 1925b; Costa Rica (Turrialba) [68]; Tauber et al. [9] synonymized it with <i>L. (s. str.) pretiosa</i> .	Colombia ("Inmba" [= Yumbo] [10]) [9, 42]	Belize [9, 10]; Brazil [3]; Colombia [10, 15, 23, 33, 42, 67]; Costa Rica [5, 9, 10, 15, 40, 67, 68]; Ecuador [5, 9, 10]; Guatemala [5, 10, 15, KY587201. 1 40, 67]; Mexico [5, 9, 10, 67, 69]; Nicaragua [10]; (mitochon Panama [5, 9, 10, 15, 40, drion) 67]; Paraguay [9, 10]; Trinidad and Tobago [9, 10]; Venezuela [5, 10, 15, 23, 67]	-
29	<i>L. (s. str.) reedi</i> - Navás, 1919		Argentina (San Juan) [70]	Argentina [10, 15, 27, 70]	-
30	<i>L. (s. str.) riveti</i> - (Navás, 1913)		Ecuador (Santo Domingo de los Colorados) [71]	Colombia [10, 24]; Ecuador [10, 15, 33, 71]; Panama [10, 24]	-
31	<i>L. (s. str.) serrula</i> - Adams, 1979		Mexico (Carapan) [72]	Mexico [6, 10, 72]	-
32	<i>L. (s. str.) tavaresi</i> Navás, - 1916		Brazil (Nueva Friburgo) [73]	Brazil [10, 15, 73]	-
33	<i>L. (s. str.) varia</i> (Schneider, 1851)	<i>Chrysopa ampla</i> Walker, 1853; "Georgia" [47]; Tauber et al. [9] synonymized it with <i>L. (s. str.) varia</i> . <i>C. internata</i> Walker, 1853; Brazil [47]; Tauber et al. [9] synonymized it with <i>L. (s. str.) varia</i> . <i>L. wakerina</i> Navás 1913a; Brazil [33]; Tauber et al. [9] synonymized it with <i>L. (s. str.) varia</i> . <i>L. vegana</i> Navás 1917; Colombia (La Vega) [79]; Kimmins [41] synonymized it with <i>L. (s. str.) varia</i> .	Brazil [74]	Argentina [9, 10]; Brazil [3, 10, 15, 23, 29, 30, 31, 33, 39, 47, 48, 74, 75, 76]; Bolivia [64, 78]; Colombia [10, 15, 79]; Ecuador [9, 10]; Guatemala [44]; Mexico [39, 48, 72]; Panama [80]; Peru [9, 10, 80, 81]; Suriname [15, 23]; United States [10, 19, 50]	KY039017. 1 (COI); KY039050. 1 (16S rRNA)
34	<i>L. (s. str.) variata</i> - (Navás, 1913)		Panama (Chiriqui) [9]	Mexico [10, 39]; Panama [9, 10, 39]	-
35	<i>L. (s. str.) vigo</i> - (Navás, 1913)		Brazil ("Ega" [= Teffé = Tefé] [10]) [33]	Brazil [10, 15, 33]	-
36	<i>L. (s. str.) vulnerata</i> - (Navás, 1914)		Guatemala ("Amula" [= Almolonga] [10]) [82]	Guatemala [10, 15, 40, 82]	-

Table 2. Distribution of *Leucochrysa* (s. str.) of each region and country.

Regions	Species per region	Country	Species per country
Caribbean	<i>L. (s. str.) adamsi</i> Penny, 2001	Cuba	<i>L. (s. str.) adamsi</i> Penny, 2001
-	<i>L. (s. str.) bedoci</i> Navás, 1924	-	<i>L. (s. str.) bedoci</i> Navás, 1924
-	<i>L. (s. str.) christophe</i> Banks, 1938	-	<i>L. (s. str.) insularis</i> (Walker, 1853)

Regions	Species per region	Country	Species per country
-	<i>L. (s. str.) insularis</i> (Walker, 1853)	Dominican Republic	<i>L. (s. str.) insularis</i> (Walker, 1853)
-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)	Haiti	<i>L. (s. str.) christophe</i> Banks, 1938
-	-	Jamaica	<i>L. (s. str.) insularis</i> (Walker, 1853)
-	-	Trinidad and Tobago	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
North and Central Ameica	<i>L. (s. str.) adamsi</i> Penny, 2001	Belize	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	<i>L. (s. str.) angrandi</i> (Navás, 1911)	Costa Rica	<i>L. (s. str.) adamsi</i> Penny, 2001
-	<i>L. (s. str.) arizonica</i> (Banks, 1906)	-	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	<i>L. (s. str.) clara</i> (McLachlan, 1867)	-	<i>L. (s. str.) colombia</i> (Banks, 1910)
-	<i>L. (s. str.) colombia</i> (Banks, 1910)	-	<i>L. (s. str.) duarte</i> Banks, 1946
-	<i>L. (s. str.) dolichocera</i> (Navás, 1913)	-	<i>L. (s. str.) lestagei</i> Navás, 1922
-	<i>L. (s. str.) duarte</i> Banks, 1946	-	<i>L. (s. str.) magnifica</i> (Banks, 1920)
-	<i>L.(s. str.) insularis</i> (Walker, 1853)	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	<i>L. (s. str.) lestagei</i> Navás, 1922	Guatemala	<i>L. (s. str.) angrandi</i> (Navás, 1911)
-	<i>L. (s. str.) magnifica</i> (Banks, 1920)	-	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	<i>L.(s. str.) negata</i> (Navás, 1913)	-	<i>L. (s. str.) dolichocera</i> (Navás, 1913)
-	<i>L. (s. str.) notha</i> Navás, 1913	-	<i>L. (s. str.) notha</i> Navás, 1913
-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	<i>L.(s. str.) riveti</i> (Navás, 1913)	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	<i>L. (s. str.) serrula</i> Adams, 1979	-	<i>L. (s. str.) vulnerata</i> (Navás, 1914)
-	<i>L. (s. str.) varia</i> (Schneider, 1851)	Honduras	<i>L. (s. str.) adamsi</i> Penny, 2001
-	<i>L. (s. str.) variata</i> (Navás, 1913)	Mexico	<i>L. (s. str.) arizonica</i> (Banks, 1906)
-	<i>L. (s. str.) vulnerata</i> (Navás, 1914)	-	<i>L. (s. str.) insularis</i> (Walker, 1853)
-	-	-	<i>L.(s. str.) negata</i> (Navás, 1913)
-	-	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)

Regions	Species per region	Country	Species per country
-	-	-	<i>L. (s. str.) serrula</i> Adams, 1979
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	-	<i>L. (s. str.) variata</i> (Navás, 1913)
-	-	Nicaragua	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	-	Panama	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	-	-	<i>L. (s. str.) negata</i> (Navás, 1913)
-	-	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	-	-	<i>L. (s. str.) riveti</i> (Navás, 1913)
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	-	<i>L. (s. str.) variata</i> (Navás, 1913)
-	-	United States	<i>L. (s. str.) arizonica</i> (Banks, 1906)
-	-	-	<i>L. (s. str.) colombia</i> (Banks, 1910)
-	-	-	<i>L. (s. str.) insularis</i> (Walker, 1853)
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
South America	<i>L. (s. str.) benoisti</i> Navás, 1933	Argentina	<i>L. (s. str.) boxi</i> Navás, 1930
-	<i>L. (s. str.) benoistina</i> Navás, 1934	-	<i>L. (s. str.) ignatii</i> Navás, 1923
-	<i>L. (s. str.) bolivari</i> Banks, 1944	-	<i>L. (s. str.) reedi</i> Navás, 1919
-	<i>L. (s. str.) boliviana</i> (Banks, 1915)	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	<i>L. (s. str.) boxi</i> Navás, 1930	Bolivia	<i>L. (s. str.) boliviana</i> (Banks, 1915)
-	<i>L. (s. str.) brasilica</i> (Navás, 1913)	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	<i>L. (s. str.) bruneola</i> de Freitas & Penny, 2001	Brazil	<i>L. (s. str.) boxi</i> Navás, 1930
-	<i>L. (s. str.) catarinae</i> de Freitas & Penny, 2001	-	<i>L. (s. str.) brasilica</i> (Navás, 1913)
-	<i>L. (s. str.) clara</i> (McLachlan, 1867)	-	<i>L. (s. str.) bruneola</i> de Freitas & Penny, 2001
-	<i>L. (s. str.) colombia</i> (Banks, 1910)	-	<i>L. (s. str.) catarinae</i> de Freitas & Penny, 2001

Regions	Species per region	Country	Species per country
-	<i>L. (s. str.) ehrhardti</i> Navás, 1929	-	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	<i>L. (s. str.) geminata</i> Navás, 1913	-	<i>L. (s. str.) ehrhardti</i> Navás, 1929
-	<i>L. (s. str.) ignatii</i> Navás, 1923	-	<i>L. (s. str.) lestagei</i> Navás, 1922
-	<i>L. (s. str.) lestagei</i> Navás, 1922	-	<i>L. (s. str.) magnifica</i> (Banks, 1920)
-	<i>L. (s. str.) magnifica</i> (Banks, 1920)	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	<i>L. (s. str.) nigrilabris</i> (Banks, 1915)	-	<i>L. (s. str.) tavaresi</i> Navás, 1916
-	<i>L. (s. str.) phaeocephala</i> Navás, 1929	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	<i>L.(s. str.) pretiosa</i> (Banks, 1910)	-	<i>L. (s. str.) vigo</i> i (Navás, 1913)
-	<i>L. (s. str.) reedi</i> Navás, 1919	Colombia	<i>L. (s. str.) bolivari</i> Banks, 1944
-	<i>L.(s. str.) riveti</i> (Navás, 1913)	-	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	<i>L. (s. str.) tavaresi</i> Navás, 1916	-	<i>L. (s. str.) colombia</i> (Banks, 1910)
-	<i>L. (s. str.) varia</i> (Schneider, 1851)	-	<i>L. (s. str.) nigrilabris</i> (Banks, 1915)
-	<i>L. (s. str.) vigo</i> i (Navás, 1913)	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	-	-	<i>L. (s. str.) riveti</i> (Navás, 1913)
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	Ecuador	<i>L. (s. str.) benoisti</i> Navás, 1933
-	-	-	<i>L. (s. str.) benoistina</i> Navás, 1934
-	-	-	<i>L. (s. str.) clara</i> (McLachlan, 1867)
-	-	-	<i>L. (s. str.) colombia</i> (Banks, 1910)
-	-	-	<i>L. (s. str.) lestagei</i> Navás, 1922
-	-	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	-	-	<i>L. (s. str.) riveti</i> (Navás, 1913)
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	French Guiana	<i>L. (s. str.) magnifica</i> (Banks, 1920)
-	-	Guyana	<i>L. (s. str.) magnifica</i> (Banks, 1920)
-	-	Peru	<i>L. (s. str.) boxi</i> Navás, 1930

Regions	Species per region	Country	Species per country
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	Paraguay	<i>L. (s. str.) geminata</i> Navás, 1913
-	-	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)
-	-	Suriname	<i>L. (s. str.) phaeocephala</i> Navás, 1929
-	-	-	<i>L. (s. str.) varia</i> (Schneider, 1851)
-	-	Venezuela	<i>L. (s. str.) magnifica</i> (Banks, 1920)
-	-	-	<i>L. (s. str.) pretiosa</i> (Banks, 1910)

3. Results

3.1. Literature

A total of 82 published articles were collected. The number of publication before the year of 2000 was 70, while it was 15 after 2000. This phenomenon reflects the decrease of interest in study of this subgenus.

3.2. Type localities (Table 1)

Cuba, Haiti and Jamaica were recorded as type localities for twice, once and once in the Caribbean. In North and Central America, Guatemala has four species reported from type localities, two are from Mexico, one is from Costa Rica, one is from Panama, and one is from United States. In South America, Brazil has nine species from type localities, Colombia has four records, Ecuador has four records, Paraguay has one record and Suriname has one record.

3.3. Distribution and diversity (Table 2)

South America has 23 species, which has the highest diversity. North and Central America has the second highest diversity with 18 species. The Caribbean is the last with single 5 records.

Fourteen species have a wide geographical distribution. In contrary, the others may narrow distributed and only known from one country. Ten species, *L. adamsi*, *L. antennalis*, *L. clara*, *L. colombia*, *L. insularis*, *L. lestagei*, *L. magnifica*, *L. pretiosa*, *L. riveti* and *L. varia* were reported on two or three regions of the continent.

3.4. Distribution of *Leucochrysa* (s. str.) species per country (Table 2)

In the Caribbean, the highest diversity is found in Cuba with occurrence of three species. In Dominican Republic, Jamaica, Haiti and Trinidad and Tobago, one species occurs. In North and Central America, seven species were reported from Guatemala (the highest in this region). Other distribution details: one species was described from Belize, one was from Honduras, seven were from Mexico, one was from Nicaragua, six were from Panama and four were from United States. In South America Brazil has 12 species, which is the highest. This is followed by Ecuador with eight species, Colombia with seven species, Argentina with four species, Bolivia with three species, Peru with two species, Paraguay with two species, Suriname with two species, Venezuela with two species, French Guiana with one species and Guyana with one species. Other American countries lack records of this subgenus.

3.5. DNA sequences of *Leucochrysa* (s. str.) (Table 1)

A total of four species have available DNA sequences in NCBI. The details are as follow: *L. catarinae* has one available 16S ribosomal genes (16S rRNA) sequence, *L. insularis* has two cytochrome oxidase subunit I genes (COI) sequences, and *L. varia* has one 16S rRNA sequence and one COI sequence. For *L. pretiosa*, a partial genome of mitochondrion sequence is known.

4. Discussion

Most countries lack records of this subgenus, especially for the Caribbean. Only five countries have records. In the five countries, Cuba has the highest diversity with three records (versus one record from Dominican Republic, Jamaica, Haiti and Trinidad and Tobago) based on the data. In consideration of these information, investigation on species diversity in this area was probably insufficient. Thus, the diversity presented herein may not reflect the true regional diversity. Though in North and Central American and South America there also exist countries without any records of this subgenus, the investigation covered most countries. Therefore, the diversity showed in this study is relatively reliable compared with it in the Caribbean.

Available DNA sequences is absolutely limited. With these, study on phylogeny could not be conducted at present. In order to prompt the molecular study and taxonomy of this subgenus, broaden molecular coverage is necessary at the moment.

5. Conclusion

Several countries has records of *Leucochrysa* (s. str.) species, but none of them have been reported in other countries. It has a high possibility to found more record species previously discovered in other countries and/or new species. Available DNA sequences are only known for four species, which will affect the development of taxonomy, limit the phylogenetic study, and even decrease the speed of progress on integrated study of the subgenus. Taking all these into consideration, scholars still have a long way to have a deep understanding in the field.

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