

**Descriptions of eight new *Pseudolucia* species from Chile  
(Lepidoptera, Lycaenidae: Polyommatinae)**

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**Abstract** – Eight species of *Pseudolucia* NABOKOV, 1945 from Chile are described, five from the *P. andina* species group (*P. barrigai* sp. n. from Maule Region, *P. faundezi* sp. n. from Araucania Region, *P. johnsoni* sp. n. from Bio Bio Region, *P. luzmaria* sp. n. from Coquimbo Region, and *P. munozae* sp. n. from Maule Region), one from the *P. collina* species group (*P. zoellneri* sp. n. from Maule Region), and two from the *P. plumbea* species group (*P. sigal* sp. n. from Coquimbo Region and *P. valentina* sp. n. from Maule Region). Data on biology and distribution of the species described are provided, with additional notes on nomenclature and taxonomy. A list of all known *Pseudolucia* species with basic information on their distributions is also given. With 23 figures.

**Key words** – Polyommatini, new species, Andes.

## INTRODUCTION

Since the seminal work of NABOKOV (1945), when the genus *Pseudolucia* was established, the number of the known species in the genus increased by more than one magnitude. This resulted from the revisional study of literature, type specimens and collection samples (BÁLINT 1993, BÁLINT & JOHNSON 1993, 1995*a, b*, BÁLINT & LUY 1994), plus the ongoing research of the senior author, who extensively travelled in austral South America for exploring remote places not visited before by any entomologist, collecting samples, and rearing caterpillars (BENYAMINI *et al.* 1995, 1995*a, b*).

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Via these pioneer field observations and breeding experiments the myrmecophily of polyommata lycaenids of South America was properly recorded (BENYAMINI & BÁLINT 1995).

NABOKOV (1945) recorded only two *Pseudolucia* species from Chile, but this number was raised to 21 in the first butterfly book of Chile (PEÑA & UGARTE 1997). Until now six *Pseudolucia* species were added by BÁLINT & BENYAMINI (2001) and BÁLINT *et al.* (2001), which brings the figure of the Chilean species to 27, and four previously described taxa were synonymised (PEÑA & UGARTE 2006). However, it became evident, that the actual number of the species is even higher as the most recent expeditions of the senior author resulted in new discoveries in Chile (VILA *et al.* 2011).

In this paper eight *Pseudolucia* species are described representing the species groups *andina*, *collina* and *plumbea* only from Chile raising the number of the species occurring in that country to 35. Our aims are (1) to complete the taxonomic knowledge of the Chilean *Pseudolucia* fauna as known today, (2) to provide more information about the biology of this genus endemic for austral South America and (3) to point out certain peculiarities hoping that these drive our knowledge towards a better understanding of the genus.

As the montane and austral biota in the Andes is determined by complex environmental variables resulting highly specialized local floras and faunas (*cf.* PYRCZ 2010), still undiscovered *Pseudolucia* species may exist in various remote areas in Chile, despite intensive sampling by the senior author on the western side of the Andes. Compared to what is believed to be an almost complete knowledge of the Chilean species, on the eastern side further taxa await to be named. This will be the subject of another paper dedicated to the Argentinian *Pseudolucia* fauna.

## MATERIALS AND METHODS

The study is based on the *Pseudolucia* material deposited in the collection of the senior author (> 1200 specimens) and in the Hungarian Natural History Museum (342 specimens).

Taxa are listed according to species groups which were established previously by the authors (BÁLINT & BENYAMINI 2001, BENYAMINI *et al.* 1995a). Their keys can be applied from the paper referred. Within the species groups taxa are listed in alphabetical order according to their species group names.

Methods and terminologies are compatible with the previous papers published on the genus (BÁLINT & BENYAMINI 2001). Label data are cited verbatim for the holotype specimens between quotation marks, the handwritten characters are given in italics and the sign “[/ ]” indicates line break in the labels. Species are diagnosed in comparison to the most similar species, and only the characteristic traits are given. Detailed descriptions of colours and patterns, plus genital morphology typical for the species groups are avoided as these can be gathered from the literature mentioned or the illustrations provided.

Genital structures in dissected holotype specimens were measured by an OLYMPUS SZX12 binocular microscope with ocular accessory GSWH X/22 under magnification  $\times 50$  as AB = valval length line measured from valva base to lower projection terminus, C = point on valval length where the highest distance is measured on valval length line perpendicularly to lower costa, CD = highest valval width measured from C; E = point on valval length line where the highest distance is measured perpendicularly to upper costa; EF = highest valval width measured from E (all in mm).

Distribution and biology of the species are compiled according to the data available with the type material and on the basis of field observations of the senior author.

*Abbreviations of depositories* – CB = Collection BENYAMINI (Bet Arye, Israel) (primary type specimens will be deposited in Museo Nacional de Historia Natural, Santiago, Chile); CUC = Concepción University, Concepción, Chile; HNHM = Hungarian Natural History Museum (Budapest, Hungary); FMC = Field Museum of Natural History, Chicago, USA.

### *Pseudolucia andina* species group

#### ***Pseudolucia barrigai* sp. n.**

(Figs 1–2, 17)

*Type material* – Holotype male, forewing length 11 mm: “*Pseudolucia barrigai* [ / ] Chile, Maule, 07/01/2003 [ / ] Estero del Fiero, Rio Teno, [ / ] Mina Bio Bio 2200 m [ / ] Leg. Dubi Benyamini”, deposited in CB. Paratypes (nos 1–66): Chile, Los Queñes, Curicó-Chile, 2000 m. I.80, J. E. BARRIGA (HNHM paratype male no. 1; CB paratype male no. 2); Chile, Vs. Del Flaco, Cord. Talca, 29.XI.1957, L. E. L. PEÑA (FMC paratype female no. 3, HNHM paratype female no. 4); Argentina: Mendoza, Las Leñas, 7000', 3.XII.1989, leg. A. M. SHAPIRO (HNHM paratype male no. 5, gen. prep. No. 827, BÁLINT; HNHM paratype female no. 6, gen. prep. no. 828, BÁLINT); males with data as holotype (CB paratype nos 7–16); Argentina: Mendoza, Las Leñas, 2100 m, 18–19.XII.1999 leg. D. BENYAMINI (CB paratype nos 17–21); Argentina: Mendoza, Las Leñas, 2100–2150 m, 25.XII.2001, leg. D. BENYAMINI (CB paratype nos 18–36); Argentina: Mendoza, Las Leñas, 2130 m, 26.XII.2001, leg. D. BENYAMINI (CB paratype no. 37); Argentina: Mendoza, Valle Hermoso 2800 m, 6.I.2002, leg. D. BENYAMINI (CB paratype nos 38–47); Argentina: Mendoza, Las Leñas, 2150 m, 5.I.2003, leg. D. BENYAMINI (CB paratype nos 48–60); Argentina: Mendoza, Valle Hermoso, 3150 m, 2.II.2004, leg. A. M. SHAPIRO (CB paratype no. 61); Argentina: Mendoza, Las Leñas, 2100 m, 13.XII.2010, leg. O. TOMER (CB paratype nos 62–66).

*Diagnosis and description* – Habitus (Figs 1–2): it is a small species, which resembles *P. andina* (CALVERT, 1893) but both male and female give an orange-silvery impression with longer forewings. The bronze gloss is restricted to the dorsal wing surface basal areas, the submarginal orange colouration is more marked (*andina* males do not have any orange colouration), and the marginal border is somewhat narrower in the males, especially in the forewing from the apex to the vein Cu1 compared to *P. andina*; the ventral wing surfaces are light grey but with orange tint, hindwing basal area darker, hindwing median area with reduced spots in the discal cell and cell Sc+R1-Rs, where the white elements of the pattern are darkened. Female is similar but with more extensive orange and hindwing silvery scaling. Genitalia: male organ as that of *Pseudolucia andina* species group (see BÁLINT & JOHNSON 1995a: figures 3, 9 and 11), in lateral view with robust valva possessing slightly humped upper costa, lower terminus longer and more pronounced than that of upper (Fig. 17); juxta strong with half valval length, vinculum narrow and as long as juxta, tegumen strongly sclerotized with bulbous uncus (but horseshoe shaped and pointed in ventral or dorsal view); female tubular organ with large sclerotized terminalia marked by smaller sclerotized elliptic tube, showing thickened terminal nodule. Measurements: forewing costal length: 9–13 mm (n = 60); male genital valva AB = 2.90, C = 1.16, CD = 0.20, E = 2.24, EF = 0.66.

*Distribution* – In Chile it is known from several localities along Paso Vergara (Los Queñes, vers del Flaco, Estereo del Rio Teno) between Curico and the Argentinian border. In Argentina it is common in Las Leñas and Valle Hermoso, Mendoza. The butterflies fly at 2000 m and above.

*Biology* – Flight period from November to January in one generation. For the species in Chile there are two potential larval hosts, *Astragalus cruckshanksii* (HOOK. & ARN.) GRISEB. and *Astragalus pehuenches* NIEDERL. (Fabaceae). In Paso Vergara many more adults were observed around *A. cruckshanksii* which seems to be the preferred one. The habitats where this *Astragalus* abundantly grows are the slopes of the valley sides. The altitudinally higher situated riverbanks are suitable only for *A. pehuenches*, where specimens were also collected.

*Etymology* – Dedicated to the Chilean coleopterist Eng. Agr. JUAN ENRIQUE BARRIGA of Los Niches, Curico, who was the first to collect this species in Paso Vergara. On 13 November 2009 he inaugurated the best current side cite for Neotropical beetles ([www.Coleoptera-Neotropical.org](http://www.Coleoptera-Neotropical.org)), and he updates to continuously.

*Notes* – It was remarked that the Cordillera Talca and the Las Leñas populations of “*andina*” are somewhat different from *P. andina*, and the identity of *andina* was fixed objectively by a lectotype designation of “*Scolitantides andina*” by BÁLINT *et al.* (2001: 161–162). The typical *andina* phenotype was illustrated (as figures 13–16 in BÁLINT *et al.* 2001). The *andina* type locality is situated in the Metropolitan area in Chile. The “Las Leñas” (and “Paso Vergara”) specimens were differentiated as a distinct taxon under the name *P. barrigai*. The “Talca andina” is being described below.

The imagines of *P. barrigai* are more pigmented with orange (probable carotene) colouration, some different larval hosts support the hypothesis that these populations are indeed biologically distinct, and that *P. andina* is restricted to the western slopes of the Andes and Paso Bermejo in Argentina as an extension from Chile. In Chile *P. andina* is distributed mainly above and east of the Metropolitan area where isolated populations were located and reared by BENYAMINI (1995).

Although *P. barrigai* is recorded only in one generation there is time and available host plant for developing a second brood. Hitherto there was no field work in the type locality in late January, but we remark that the actual flight period should be like in the case of *P. andina* where there is a second brood in similar altitudes.

### ***Pseudolucia faundezi* sp. n.**

(Figs 3–4, 18)

*Type material* – Holotype male, forewing length 9.5 mm, abdomen removed (dissected, placed in plastic microvial with glycerol) labelled as “CHILE, Bio Bio [/] Araucania Region. Vc. Lonquimay [/] 22 Nov. 1990, leg. [/] L. Peña” [printed], “*Pseudolucia* [/] *andina* /id. [/] Balint/Johnson” [printed], “gen. prep. No. [/]816 [/] det. Zs. Bálint” [printed and handwritten], deposited in CB.

*Diagnosis and description* – Habitus (Figs 3–4): it is a small species, which resembles *P. andina* but in comparison it gives a darker impression with broader wing shape; there is no submarginal orange tint in the dorsal wing surface, and the bronze gloss is restricted to the basal and median regions; the ventral wing surfaces are light coffee brown with bronze tint, hindwing basal area much darker than in any *andina* group species, hindwing median area with reduced spots in the discal cell and cell Sc+R1-Rs, with light wing pattern elements light coffee grey coloured (white in other *andina* group species). Genitalia: typical of *andina* group (see above), but in lateral view male organ with more deeply bent lower costa and more inwardly curved terminus (Fig. 18), uncus angular. Measurements: forewing costal length: 9.5 mm (n = 1); male genital valva AB = 2.50, C = 1.12, CD = 0.20, E = 1.80, EF = 0.70.

*Distribution* – Known only from the type locality, Volcano Longuimay, Region Araucania.

*Biology* – The type was collected in November. The larval host plant is presumably an *Astragalus* species (Fabaceae, see notes).

*Etymology* – Dedicated to the Chilean field botanist Prof LUIS FAUNDEZ of Universidad de Chile. He is best known to his friends as “El Chino”. Mr FAUNDEZ has supported the senior author with plant determinations since he started working in Chile in the early 1990’s.

*Notes* – Although this species resembles *P. andina* on the first sight the different dark coloured forewing dorsal surface with other wing pattern and genital traits suggests that the unique specimen represents a different taxon. This is also supported by the fact that its habitat is completely different from that of all other species of the *andina* group. JUAN ENRIQUE BARRIGA who escorted LUIS PEÑA to the type locality when the type was collected well remembers the *Astragalus* patches near the hotel in the forest. The senior author did not locate any *Astragalus* during his several visits to the type locality and the adjacent slopes of Volcano Longuimay (the last one in December 2010); and therefore did not collect more specimens there. The search for this species should continue in a wider circle to the south and southeast of the type locality because the record is relatively recent (“only” twenty years old) and because this area is poorly collected. The type locality is in the upper edge of an open forest of *Araucaria* trees. The soil is volcanic ash. The dominating plants are low *Adesmia emarginata* CLOS bushes (Fabaceae) and *Montiopsis gayana* (BARNÉOUD) D. I. FORD (Portulacaceae) which is the host plant of *Pseudolucia vera* BÁLINT et JOHNSON, 1993, described from this very same region.

### ***Pseudolucia johnsoni* sp. n.**

(Figs 5–6)

*Type material* – Holotype male, forewing length 9.0 mm, abdomen tip missing, labelled as “*Las Cabras* [/] *Chillán* [/] 10/23.XII.52 [/] col. *L.E. Peña*” [handwritten]; “*Stylos plumbea* [/] *grata* (Koehler) [/] det. Peña 1980” [printed]; “D/18 [/] *collection* [/] *L. Peña*” [printed and handwritten]; deposited in CB.

*Diagnosis and description* – Habitus (Figs 5–6): it is a small species, which gives the impression of a brown *P. plumbea* (BUTLER, 1881) as its ventral hindwing pattern is less zigzagged, but it possesses a marked discoidal line in the ventral forewing surface, a general trait of species representing the *andina* group in *Pseudolucia*. It resembles a small and dark *P. andina* but the dorsal wing surfaces are deep brown, forewing outer margin is shorter resulting a more acute apex compared to *andina*. Ventral forewing surface submarginal area is richly patterned until the vein M3. Ventral hindwing surface is also more richly patterned, the median spots in the costal cell and cell Sc+R1-Rs form a large V-shaped mark, median intercellular spots are supplemented distally by conspicuous white arrow-head shaped spots; submarginal area is more richly ornamented what means that the intercellular ante marginal spots and arrow-head markings are rendered from costa to tornus. Genitalia: not examined (see notes). Measurements: forewing costal length: 9 mm (n = 1).

*Distribution* – Known only from the type locality, Chillán, Bio Bio Region.

*Biology* – The type was collected in December. The larval host plant is possibly an *Astragalus* species (Fabaceae), which is not common around Las Cabras (see notes).

*Etymology* – Dedicated to KURT JOHNSON, American lepidopterist, by whom we were both introduced to the fascinating world of Neotropical lycaenids.

*Notes* – It is a singleton “*andina*” specimen among hundreds of other *Pseudolucia* individuals which were collected during a long period spent in eastern Chillán by the late LUIS PEÑA. It is testified by the handwritten locality label. The abdominal tip was most probably destroyed by museum pest or removed by someone.

Some sixty years passed since the collection of this singleton. Termas de Chillán and its vicinity were visited many times by the senior author and other lepidopterists. Intensive efforts were made in December 2010 to find *Astragalus* plants and additional *P. johnsoni* adults around the type locality. But even climbing to the mountains over Termas de Chillán and a careful transect along the track to Shangrila did not bring any new evidence as to the occurrence of this species there.

### ***Pseudolucia luzmaria* sp. n.** (Figs 7–8, 19)

*Type material* – Holotype: male, forewing length 11 mm, set ventrally, abdomen removed (dissected, placed in plastic microvial with glycerol), labelled as: “*Pseudolucia luzmaria* [/] Ex larva on *Astragalus pehuenches* [/] Tres Quebradas, Hda. Illapel 2850 m [/] Coquimbo, Chile, adult: 25.2.2002 [/] Breeder: Alfredo Ugarte [/] Larvae collected: Ugarte & Benyamini” [printed]; “gen. prep. No. [/] 1153 [/] det. Zs. Bálint” [printed, handwritten]; deposited in CB. Paratypes (nos 1–17): female with holotype data but “adult: 22.2.2002, breeder DB”, reared in Israel by the senior author (CB allotype (paratype no. 1)); Rio Medio, Tres Quebradas, Illapel, Coquimbo, Chile, 2850 m, 8.I.2002, leg. A. UGARTE (CB paratype no. 2); with allotype data, but “adult: 11.VI.2002” (HNHM paratype male no 3; wings are not fully developed, gen. prep. BÁLINT no. 1354); all males with allotype data (CB paratype nos. 4–12, but different exlosures as no. 4: 11.II.2002, no. 5: 14.II.2002, no. 6: 18.II.2002, no. 7: 19.II.2002, no. 8: 22.II.2002, no. 9: 26.II.2002, no. 10: 7.VI.2002, no. 11: 15.VI.2002 and no. 12: 27.VII.2002); Rio Yerba Loca, Upper Rio Illapel, Coquimbo, Chile, 2865 m, 11.1.2003, leg. D. BENYAMINI (CB paratype no. 13); Rio Tascadero 2424–2750 m, 50 km east of Talahuen, Coquimbo, Chile, 16.XII.2010 (CB paratype males nos 14–17; no. 14: 2424 m, leg. D. BENYAMINI; nos 15–17: 2750 m, leg. O. TOMER).

*Diagnosis and description* – Habitus (Figs 7–8): it is a small species, which superficially resembles *P. andina*, but the dorsal wing surface is silvery grey in male and female, and the ventral wing surfaces are far more delicately ornamented. Dorsal forewing black margin is not continuous, but comprised by independent intercellular spots. Ventral forewing surface submarginal area is richly patterned to the anal margin. Ventral hindwing surface median spots are separate and thin, submarginal area with pale brown intercellular triangle patterns supplemented by grey arrowhead marks basally. Genitalia: typical of *andina* group (see above), but in lateral view male organ with long and narrow valva (Fig. 19),

uncus with rounded terminus. Measurements: forewing costal length: 8–12 mm ( $n = 17$ ); male genital valva AB = 2.72, C = 1.14, CD = 0.14, E = 1.80, EF = 0.56.

*Distribution* – Known from upper slopes and river bed of Rio Tres Quebradas, Coquimbo (type locality), and river bed of Rio Yerba Loca, Upper Rio Illapel, Coquimbo, both above 3000 m. A third colony was discovered 30 km to the north of the type locality at Rio Tascadero 2424–2750 m, about 50 km east of Talahuén, Coquimbo. Here adults were observed and collected in the bottom of the valley at 2424 m and on the slopes farther up at 2750 m.

*Biology* – Flight period starts from early to mid December at 2750 m to late February above 3000 m. This is a single brooded species of the central high Andes in the Chilean Coquimbo Region. Three different *Astragalus* species (Fabaceae) are used as the larval host plants; *Astragalus pehuenches* NIEDERL in the north facing slopes of Rio Tres Quebradas at 2850–3000 m. *Astragalus looseri* I. M. JOHNST. in the bottom of the dry river bed of Rio Yerba Loca (upper Rio Illapel) at 2865 m, on the wet banks of Rio Tres Quebradas, 2850 m and Rio Tascadero 2424 m. On the slopes of Rio Tascadero over 2750 m *Astragalus cruckshanksii* seems to be serving as larval host. The larvae live usually in the host plant's pods, and feed on the seeds. During the winter the last instar larva diapauses under stones near the host plant. In lack of food when the host plant is dry, younger larvae will enter diapause as well.

*Etymology* – Dedicated to LUZMARIA UGARTE, the wife of ALFREDO UGARTE, an ardent explorer of the insect fauna of austral South America. Señor UGARTE accompanied the senior author on the January 2002 expedition to Rio Tres Quebradas when the species was discovered, and collected the first male specimen on 8 January 2002 along the river bank.

*Notes* – The size and superficial similarity of the imagines to *P. andina* suggest that they are in close (probably sister) relationship, which is also underlined by the high altitude habitat they occupy. The appearance of silvery gloss in the dorsal wing surfaces recalls an undescribed member of the group discovered recently in Argentina. This testifies the importance of the scale layers in the dorsal surface of the wing membrane, which are maintained specifically by the populations forced to live in highly specialized habitats.

The three male paratypes from Rio Tascadero, 2750 m are smaller having forewing lengths 8, 9 and 10 mm, respectively. This phenomenon probably indicates that the population lives in conditions extreme for the species.

The larval host plant *Astragalus pehuenches* is toxic for grazing livestock. The senior author witnessed the death of a cow at the type locality. The butterfly is endangered by local farmers who intend to eradicate the host plants by spraying herbicides, making the pasture safer for grazing. This kind of activity also threatens *Pseudolucia asafi* BENYAMINI, BÁLINT et JOHNSON, 1995 in its type locality (La Olla) which is over Cespedes, near Rio Illapel.



***Pseudolucia munozae* sp. n.**  
(Figs 9–10, 20)

*Type material* – Holotype male, forewing length 11.5 mm, abdomen removed (dissected, placed in plastic microvial with glycerol), labelled as: “EL RADAL [/] Cord. Talca [/] 900,1180 m [/] 23,30-Nov-1957 [/] Coll: L. E. Peña” [printed]; “*Stylos andina* [/] (Calvert) [/] det. Peña 1980” [printed]; gen. prep. No. [/] 822 [/] Zs. Bálint” [printed, handwritten], deposited in FMC. Paratypes (nos 1–7): Prov. Talca, Alto Vilche, 2–24.XI. 1964, Coll. L. E. PEÑA (FMC paratype female no. 1); same data, but dissected as no. 821, BÁLINT (HNHM paratype female no. 2); El Radal, Cord. Talca, 1100 m, X.1957 (CUC paratype female no. 3; specimen without forewings, side pinned, not set); El Radal, Cord. Talca, 1100 m, VI.1957, leg. L. E. PEÑA (CB paratypes nos 4–5); “Parque Nacional Alto de Lircay, Alto Vilches, 1450 m, 5.XII.1999, leg. D. BENYAMINI (CB male paratype nos 6–7).

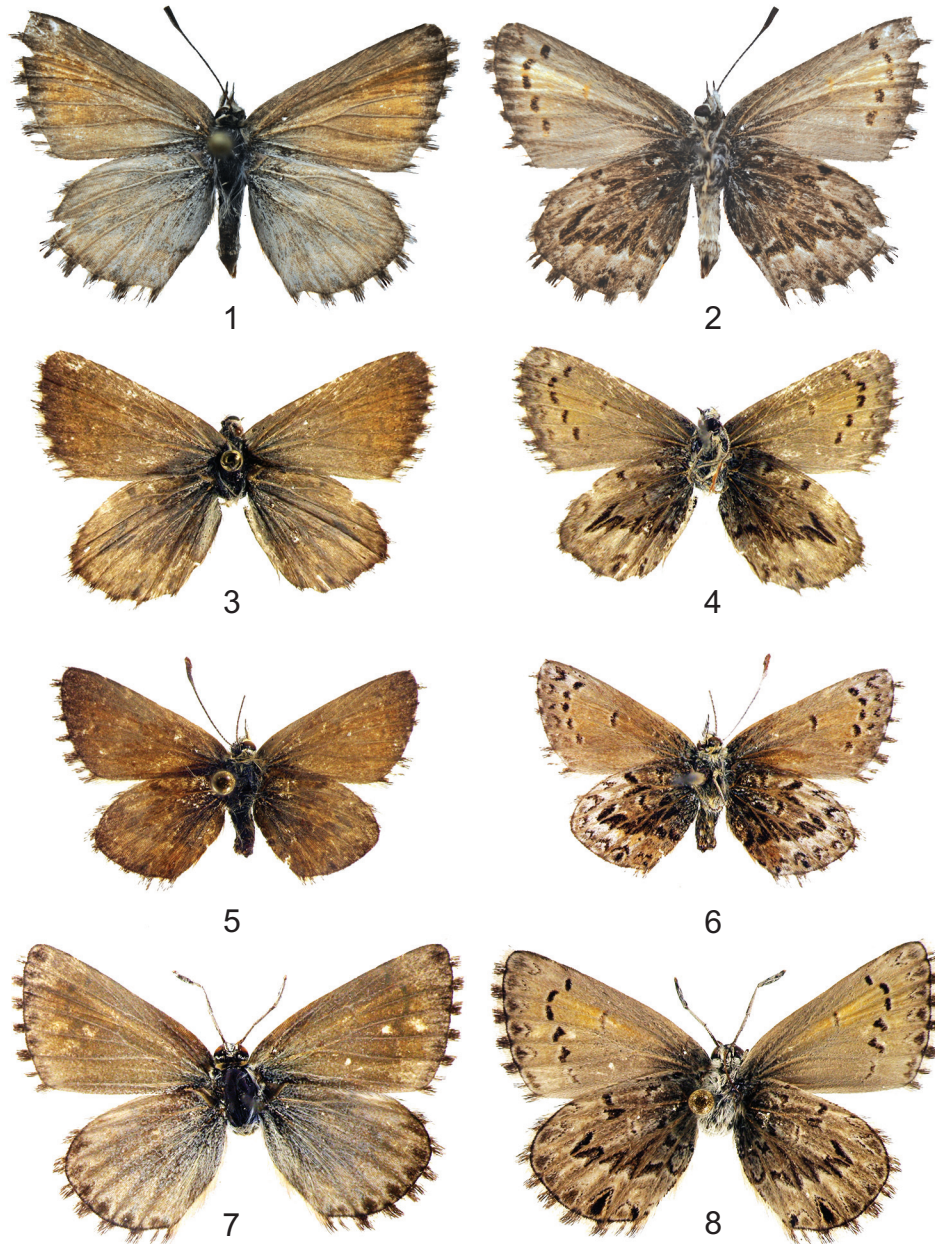
*Diagnosis and description* – Habitus (Figs 9–10): it is a larger species, which superficially resembles *P. neuqueniensis* BÁLINT et JOHNSON, 1995 but it is lighter and tan coloured in both wing surfaces with more conspicuous ventral wing pattern; hence the dorsal wing surface submedian areas in both sexes are orange; the ventral forewing surface is also orange, the submedian spots are large and conspicuous, the submarginal area is ash grey with delicate pattern; the ventral wing surface is ash grey, and the submarginal area is much lighter. Genitalia: typical of *andina* group (see above) but in lateral view male organ with more slender and narrow shaped valva, lower terminus less developed than in *andina* (Fig. 20), uncus rounded. Measurements: forewing costal length: 11–12 mm (n = 4); male genital valva AB = 3.50, C = 0.70, CD = 0.36, E = 2.44, EF = 0.76.

*Distribution* – Known from forested areas east of Talca (El Radal, Parque Inglese, Siete Tasas and Parque Nacional Alto de Lircay, Alto Vilches), Region Maule.

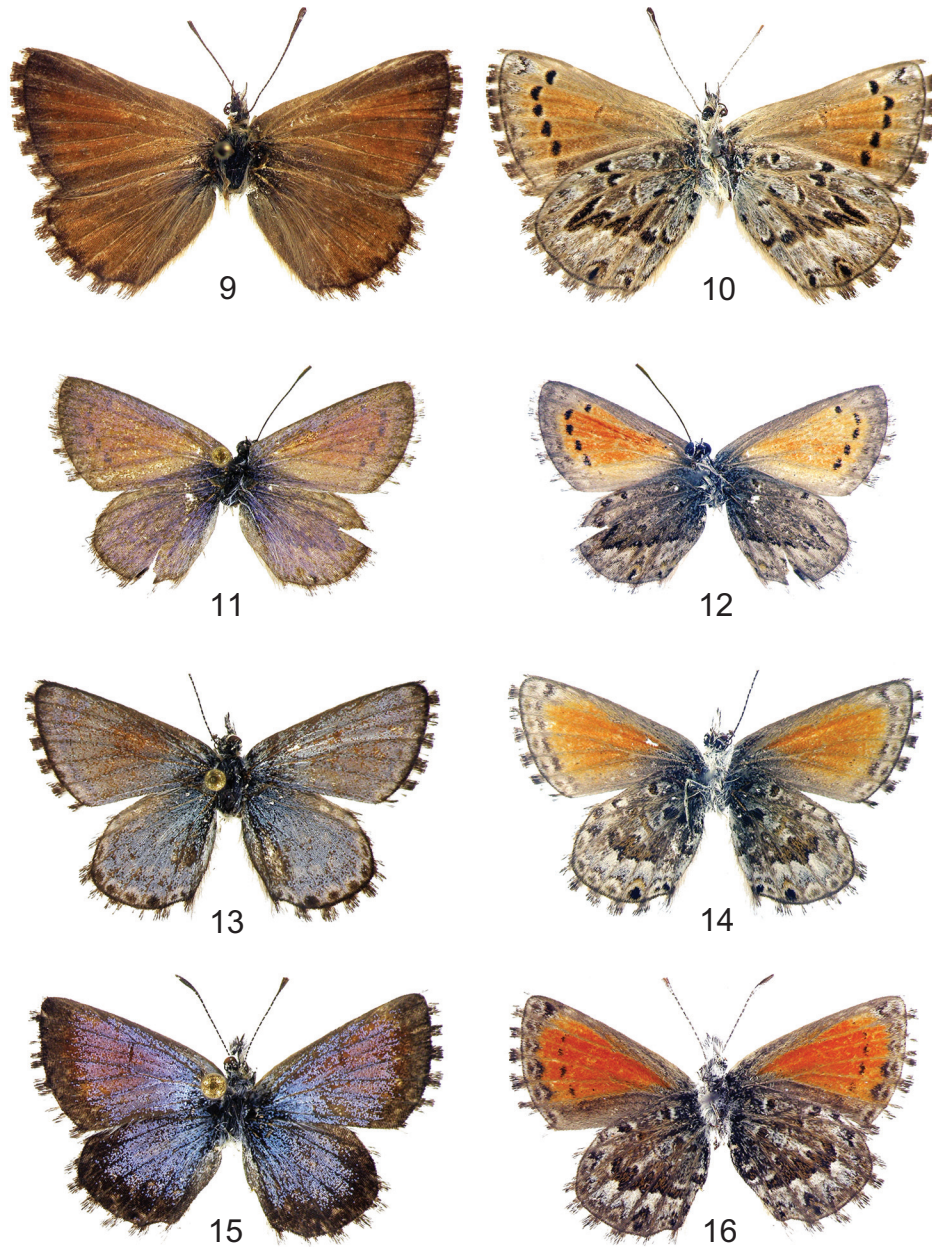
*Biology* – The types were collected in October, November and early December. This middle-land flying “*andina*” is recorded between 900 and 1500 meters flying usually at the edge of the forests, in lawns and barren slopes around its host plant identified by Dra EDITH GOMEZ-SOSA (Instituto de Botánica Darwinion, San Isidro, Buenos Aires, Argentina) as *Astragalus cruckshanksii* (HOOK. & ARN.) GRISEB. The pods of these plants in Alto Vilches are unusually red and the larvae feed on the seeds inside the pods.

According to temporal data the flight period starts at the 900–1000 m in October–November and proceeds to 1500 m in early December suggesting a single annual brood. As only very few specimens are available in collections the flight period of the species needs further field works and studies.

*Etymology* – Dedicated to the botanist Eng. Agr. MELICA MUÑOZ, ex curator of Botany for many years in the National Museum of Natural History, at Quinta Normal, Santiago de Chile. Señora MUÑOZ identified hundreds of plants for the senior author’s request and was always of prompt and great support.



**Figs 1–8.** *Pseudolucia* type images. 1–2: *P. barrigai* sp. n., 1 = holotype, dorsum, 2 = ventrum. 3–4: *P. faundezi* sp. n., 3 = holotype, dorsum, 4 = ventrum. 5–6: *P. johnsoni* sp. n., 5 = holotype, dorsum, 6 = ventrum. 7–8: *P. luzmaria* sp. n., 7 = holotype, dorsum, 8 = ventrum



**Figs 9–16.** *Pseudolucia* type images. 9–10: *P. munozae* sp. n., 9 = holotype, dorsum, 10 = ventrum. 11–12: *P. zoellneri* sp. n., 11 = holotype, dorsum, 12 = ventrum. 13–14: *P. sigal* sp. n., 13 = holotype, dorsum, 14 = ventrum. 15–16: *P. valentina* sp. n., 15 = holotype, dorsum, 16 = ventrum

*Notes* – This species is the representative of a subgroup in the *andina* group which unites larger species with extensive orange pigmentation. The species *P. neuqueniensis* was the first described member of this assemblage. There is at least another still undescribed member of the subgroup, which has been recorded from Argentina.

### *Pseudolucia collina* species group

#### ***Pseudolucia zoellneri* sp. n.**

(Figs 11–12, 21)

*Type material* – Holotype male, forewing length 8.5 mm, abdomen removed (dissected, placed in plastic vial with glycerol), labelled as “Paso Vergara, Curico [/] 1800 m, 12.I.2002 [/] Talca, CHILE [/] Leg. Dubi Benyamini” [printed], “gen. prep. No. [/] 1050 [/] det Zs. Bálint” [printed, handwritten], deposited in CB. Paratypes (nos 1–38): female, with holotype data, (CB paratype (allotype) no. 1); seven males with data as holotype (CB paratype nos 2–8); female with data as holotype (HNHM paratype no. 9, gen. prep. BÁLINT no. 1049); four females with data as holotype (CB paratype nos 10–13); four males with data as holotype but leg. J. E. BARRIGA (CB paratype nos 14–17; four females with data as holotype but leg. J. E. BARRIGA (CB paratype nos 18–21); Paso Vergara, Estero del Fiero, Rio Teno, Mina Bio Bio, Maule, Chile, 1900 m, 7.1.2003, leg. D. BENYAMINI (CB paratype male no. 22); three females with data as paratype no. 22 (CB paratype nos 23–25; Termas cerro Campanario, 3000 m, 31.1.2004, Mendoza, Argentina leg. A. M. SHAPIRO (CB paratype males nos 26–30); three females with data as paratype no. 26 (CB paratype nos 31–33); Paso Pehuenche, Maule, Chile, 1500 m, 26.II.2005, ex larva, breeder D. BENYAMINI (CB male paratype no. 34); Paso Pehuenche, Maule, Chile, 1500 m, 1.III.2005, ex larva, breeder D. BENYAMINI (CB female paratype no. 35); Laguna del Maule, 2264 m, 21.XII.2010, Maule, Chile, leg. D. BENYAMINI (CB male paratype nos 36–37); female with data as paratype no. 36 but leg. O. TOMER (CB paratype no. 38).

*Diagnosis and description* – Habitus (11–12): it is a species, which resembles *P. scintilla* (BALLETO, 1993), the male is pale violet blue dorsally typical for the group, the female forewing dorsum is orange with gleaming blue basal area. The forewing is orange ventrally with conspicuous black spots of submedian markings (less extensive in *scintilla*); hindwing area from base to medial part is dark and almost without pattern having only the postbasal and median spots along the radial vein, the median V-shaped pattern is straight and narrow (not undulate and relatively wide in *scintilla*) and runs from anal area almost to outer margin. Genitalia: typical of *Pseudolucia collina* species group (see BÁLINT & JOHNSON 1995a: figures 7 and 16) in lateral view male organ with long and narrow valva, upper terminus sclerotized, curved ventrad and pointed, lower terminus membranous and rounded (Fig. 21); uncus with slightly pointed outer terminus turned inside towards aedeagus; female ostium with sclerotized edges without additional anterior bifurcate structure. Measurements: forewing costal length: 8–10 mm (n = 39); male genitalia valva AB = 1.56, C = 1.20, CD = 0.20, E = 0.90, EF = 0.22.

*Distribution* – The main habitat is Paso Vergara, east of Curico, Maule, Chile from 1300 m to 1900 m. Fewer specimens were observed in Paso Pehuenche up to 2250 m near Laguna del Maule, about 60 km south of Paso Vergara. On the Argentinian side of this pass at 3000 m close to the border with Chile Prof. A. M. SHAPIRO collected a few adults on the slopes near Termas Campanario.

*Biology* – Flight period is December to early March. On 5 January 2002 the senior author found six empty eggs of an unknown lycaenid on *Montiopsis capitata* (HOOK. et ARN.) D. I. FORD (Portulacaceae) at Paso Pehuenche, 1212 m. On 12 January 2002 at Paso Vergara 1800 m adults, larvae and eggs were found on *Montiopsis umbellata* (RUIZ et PAV.) D. I. FORD; and a third host plant, *Montiopsis andicola* (GILLIS) D. I. FORD was found near Lago del Maule of Paso Pehuenche at 2250 m. The last instar larva hibernates in the ground.

*Etymology* – Dedicated to the late Chilean botanist OTTO ZÖLLNER (1909–2007), who helped the senior author identify Chilean *Pseudolucia* larval host plants of the genus *Chorizanthe* (Polygonaceae).

*Notes* – This is the second species among the Chilean representatives of the *Pseudolucia collina* species group, where the female forewing dorsal surface is orange-blue coloured and having female genital terminalia (ostium) without bifurcation. The other species in Chile is *P. scintilla*, therefore we compared the two taxa in our diagnosis. However, this not necessarily implies that they are sister species.

### *Pseudolucia plumbea* species group

#### ***Pseudolucia sigal* sp. n.**

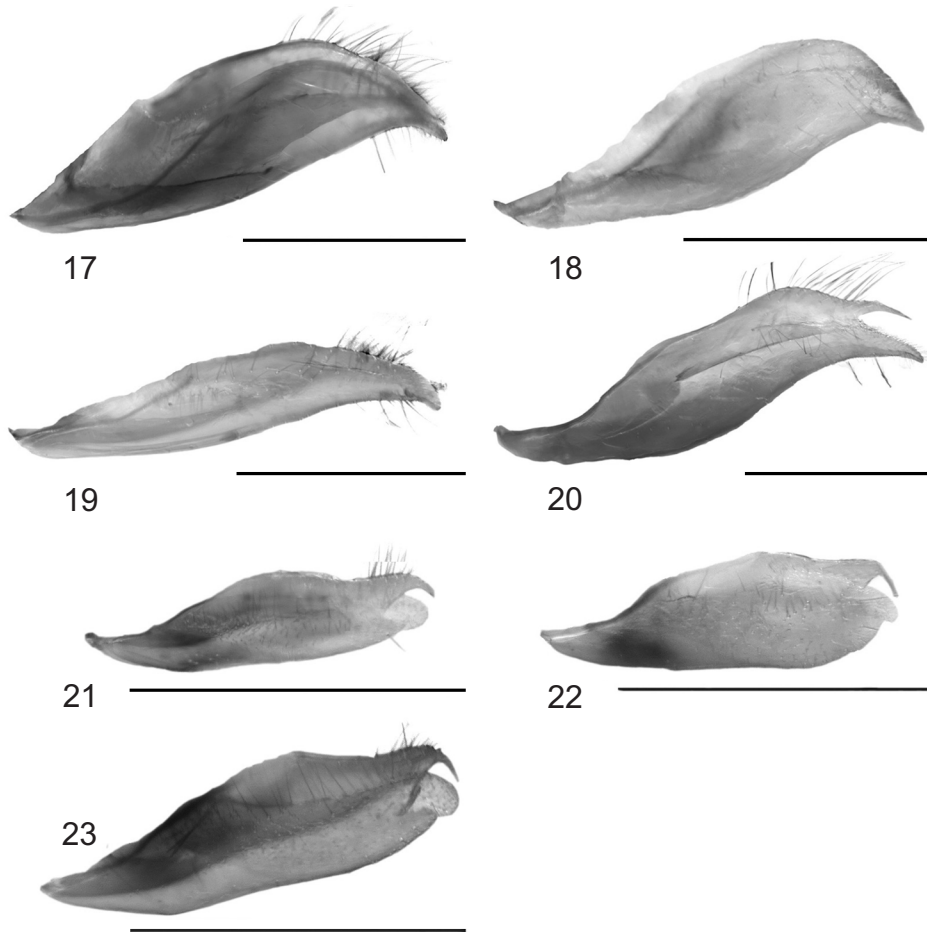
(Figs 13–14, 22)

*Type material* – Holotype, male, forewing length 9.0 mm, abdomen removed (dissected, placed in plastic microvial with glycerol), labelled as: “Rio El Encanto [/] 3200–3300 m, 9.1.2002 [/] Tres Qdas Cespedes [/] Illapel, Coq., CHILE [/] Leg. Dubi Benyamini” [printed]; “gen. prep. No. [/] 1355 [/] det. Zs. Bálint” [handwritten, printed], deposited in CB. Paratypes (nos 1–10): female, with data as holotype (HNHM paratype (allotype) no. 1; dissected, gen. prep. BÁLINT no. 1356); males with data as holotype data (CB paratype nos 2–6); females with data as holotype (CB paratype nos 7–10).

*Diagnosis and description* – Habitus (Figs 13–14): the species superficially resembles *P. talia* BÁLINT, BENYAMINI et JOHNSON, 1995, but the male is vivid silvery greenish blue dorsally, the female with extensive orange pigmentation in forewing subcostal area and blue basal suffusion. The ventral forewing submarginal area is patternless (*talia* is with submedian spots), the ventral hindwing median band comprised by intercellular spots of different size (whilst these are more or less equal in *P. talia*), the tornal black spot is more conspicuous. Genitalia: typical of the *sibylla* species subgroup (see BÁLINT & JOHNSON

1995a: figures 6 and 14) (see notes below) male organ in lateral view with long and less narrow shaped valva, upper terminus sclerotized and pointed, curved ventral and highly pointed, lower terminus membranous and rounded (Fig. 22); uncus with slightly pointed outer terminus turned inside towards aedeagus; female terminal ostium in later view with sclerotized ventral edges and pointed terminus. Measurements: forewing male costal length: 9.0 mm (n = 6), female costal length: 8.0 mm (n=5); male genital valva AB = 1.70, C = 1.30, CD = 0.26, E = 1.04, EF = 0.32.

*Distribution* – Only known from Rio El Encanto, 3200–3300 m.



**Figs 17–23.** *Pseudolucia* male genital valva structures in lateral view. 17 = *P. barrigai* sp. n., 18 = *P. faundezi* sp. n., 19 = *P. luzmaria* sp. n., 20 = *P. munozae* sp. n., 21 = *P. zoellneri* sp. n., 22 = *P. sigal* sp. n., 23 = *P. valentine* sp. n. Scale bar = 2 mm

*Biology* – The type series was collected on 9 January 2002. A single brooded, high altitude species. The sole known larval host plant is *Adesmia aegiceras* PHIL. (Fabaceae). This spiny cushion-like plant dominates the narrow vegetational belt at the type locality. The closely related (probably sister) species *P. talia* flies on the other side of the continental divide in Argentina (but 140 km to the north). Both share the same host plant. Last instar caterpillar diapauses.

*Etymology* – Dedicated to SIGAL BENYAMINI, younger daughter of the senior author.

*Notes* – Only known from Rio El Encanto, western slopes between 3200–3300 m. Rio El Encanto is one of the three rivers running into Rio Tres Quebradas. A deserted copper mine exists in the upper part of Rio El Encanto. Similar habitats between Rio Tres Quebradas and Rio Illapel with *Adesmia aegiceras* patches may extend the distribution of this species.

This species together with *P. argentina* (BALLETO, 1993), *P. aureliana* BÁLINT et JOHNSON, 1993, *P. oligocyanea* (URETA, 1956), *P. sibylla* (KIRBY, 1871) and *P. talia* forms a subgroup in the *Pseudolucia plumbea* species group, all of them occurring in high altitudes, the males in lateral view have somewhat more narrow genitalia valval shape without ventral angulation at the dorsal edge.

### ***Pseudolucia valentina* sp. n.** (Figs 15–16, 23)

*Type material* – Holotype, male, forewing length 9.0 mm, abdomen removed (dissected, placed in plastic microvial with glycerol), labelled as: “Chile, Maule, [/] Paso Pehuenche o Del Maule, [/] Laguna del Maule 2264 m [/] 21/12/2010 [/] Leg. Dubi Benyamini” [printed]; “gen. prep. No. [/] 1369 [/] det. Zs. Bálint” [handwritten, printed], deposited in CB. Paratypes (nos 1–25): female with data as holotype (HNHM paratype (allotype) no. 1; dissected, gen. prep. BÁLINT no. 1370); males with data as holotype (CB paratype nos 2–18); females with data as holotype (CB paratype nos 19–25).

*Diagnosis and description* – Habitus (Figs 15–16): the species superficially resembles *P. grata* (KÖHLEN, 1934) but the male is somewhat darker blue dorsally with wider and more contrasting black margin; female forewing with blue scaling restricted to basal and subbasal areas. The ventral forewing submarginal spots are obsolete or missing (*patago* is with well developed markings). Genitalia: typical of the *Pseudolucia plumbea* species group (see BÁLINT & JOHNSON 1995a: figures 7 and 16) in lateral view male organ with long and narrow valva, upper terminus sclerotized, curved ventrad and pointed, lower terminus membranous and rounded (Fig. 23); uncus with slightly pointed outer terminus turned inside towards aedeagus; female ostium with sclerotized edges without additional anteriorly bifurcate structure. Measurements: forewing male costal length: 8–11 mm (n = 17), female costal length: 9–11 mm (n=7); male genital valva AB = 1.90, C = 1.30, CD = 0.22, E = 1.16, EF = 0.34.

*Distribution* – Known only from the type locality.

*Biology* – The host plant is *Adesmia emarginata* CLOS (Fabaceae).

*Etymology* – Named for the memory of the Chilean entomologist JOSÉ VALENTÍN HERRERA GONZÁLES (1913–1992), the first reviser of Chilean butterflies (DON MACNEILL 1992).

## DISCUSSIONS AND CONCLUSIONS

The recorded *Pseudolucia* life zone spans from about 1200 km north of Santiago over San Pedro de Atacama, Antofagasta Region to about 2000 km south of it near Rio Baquales, Magallanes (BENYAMINI 1995, BÁLINT *et al.* 2001). As mentioned in the Introduction there are still places over 2000 m not visited by any lepidopterists along the Andes. Similarly, most of the austral region of Patagonia and Tierra Fuego below the southern latitude 40° is unexplored. In most of these regions the geographical and climatic conditions are unique and extreme, and several visits are necessary to secure botanical or entomological records. Therefore we are almost sure that even in Chile there are still *Pseudolucia* taxa waiting for discovery.

The Argentinian *Pseudolucia* fauna is far less explored compared to that of Chile, and only the first steps have been made (see BÁLINT & JOHNSON 1995a). The authors are preparing a paper which describes the findings of the senior author and discusses the status and the probable identity of the mysterious “Falkland Blue” (WAKEHAM-DAWSON 2006). Here we present a check-list of all the *Pseudolucia* taxa listed by LAMAS (2004) in alphabetical order, placing them in their respective species groups or subgroups. Taxa marked with “AC” have been recorded both in Argentina and Chile, “C” only in Chile, “A” and “B” not recorded in Chile but have been exclusively collected in Argentina or southeast Brazil (states Paraná, Santa Catarina and Rio Grande do Sul), respectively. No *Pseudolucia* species is known to occur in Bolivia, Columbia, Ecuador, Uruguay, Peru, Venezuela and most of the states of Brazil.



***Pseudolucia andina* species group***andina* subgroup

- andina* (CALVERT, 1893): AC
- avishai* BENYAMINI, BÁLINT et JOHNSON, 1995: C
- asafi* BENYAMINI, BÁLINT et JOHNSON, 1995: C
- barrigai* sp. n.: AC
- faundezi* sp. n.: C
- johnsoni* sp. n.: C
- kechico* BÁLINT, BENYAMINI et JOHNSON, 2001: C
- luzmaria* sp. n.: C
- magellana* BÁLINT, BENYAMINI et JOHNSON, 2001: C

*neuqueniensis* subgroup

- henyah* BÁLINT, BENYAMINI et JOHNSON, 2001: C
- munozae* sp. n.: C
- neuqueniensis* BÁLINT et JOHNSON, 1995: A

***Pseudolucia charlotte* species group**

- charlotte* BÁLINT et JOHNSON, 1993: AC
- lanin* BÁLINT et JOHNSON, 1993: AC

***Pseudolucia chilensis* species group**

- chilensis* (BLANCHARD, 1852): C
- jujuyensis* BÁLINT, EISELE et JOHNSON, 2000: A
- parana* BÁLINT, 1993: B

***Pseudolucia collina* species group***collina* subgroup

- benyamini* BÁLINT et JOHNSON, 1995: A
- collina* (PHILIPPI, 1859): AC
- dubi* BÁLINT, 2001: C
- oraria* BÁLINT et BENYAMINI, 2001: C
- ugartei* BÁLINT et BENYAMINI, 2001: C
- vera* BÁLINT et JOHNSON, 1993: C

*scintilla* subgroup

- humbert* BÁLINT et JOHNSON, 1995: A
- scintilla* (BALETTI, 1993): C
- shapiro* BÁLINT et JOHNSON, 1995: A
- tamara* BÁLINT et JOHNSON, 1995: A
- zoellneri* sp. n.: AC

***Pseudolucia plumbea* species group***plumbea* subgroup

- annamaria* BÁLINT et JOHNSON, 1993: C  
*arauco* BÁLINT, BENYAMINI et JOHNSON, 2001: C  
*grata* (KÖHLER, 1934): AC  
*hazeorum* BÁLINT et JOHNSON, 1993: C  
*patago* (MABILLE, 1899): AC  
*plumbea* (BUTLER, 1881): C  
*whitakeri* BÁLINT et JOHNSON, 1995: A  
*valentina* BENYAMINI et BÁLINT, sp. n.: C  
*zina* BENYAMINI, BÁLINT et JOHNSON, 1995: C

*sibylla* subgroup

- argentina* (BALLETO, 1992): A  
*aureliana* BÁLINT et JOHNSON, 1993: C  
*oligocyanea* (URETA, 1956): C  
*sibylla* (KIRBY, 1871): C  
*sigal* sp. n.: C  
*talia* BÁLINT, BENYAMINI et JOHNSON, 1995: A

\*

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