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Systematics, bionomics and zoogeography of high Andean pedaliodines; Part 5: Revisional notes on *Pedaliodes chrysotaenia* with the description of a related species (Lepidoptera: Nymphalidae: Satyrinae)

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Abstract. *Pedaliodes chrysotaenia* Hopffer, a little known central Peruvian species, is discussed and compared with *P. spina* Weymer and *P. jelskii* Pyrcz. Its new subspecies is described from southern Junín. A new, similarly patterned, sympatric species is described from Pasco.

Key words: entomology, taxonomy Huánuco, Junín, Pasco, *Pedaliodes chrysotaenia tortuga* n. ssp., *P. jozefi* n. sp., uppermost cloud forests.

INTRODUCTION

P. chrysotaenia is a very little known species, whose identity has generated some confusion, particularly in recent publications. It was described, but not illustrated, by Hopffer (1874) from Chanchamayo (Junín) in central Peru. Thieme (1905) had no problems with the correct identification of this species and published an excellent photograph of the ventral surface of a male from Huancabamba (Pasco) from his collection. A colour drawing showing a similar specimen was published again by Weymer in Seitz (1912). Krüger (1924) was the first author to misidentify *P. chrysotaenia*, and claimed that it occurred in Colombia, obviously confusing it with *P. spina* Weymer. Forster (1964) showed a correct, although lacking enough detail, drawing of male genitalia (p. 172, fig. 243). Adams (1986) incorrectly speculated about the close relationship of *P. chrysotaenia* with *P. spina*. The widely consulted d'Abrera's (1988) album further contributed with

the confusion, as its author misidentified again the two species, and illustrated an Ecuadorian specimen of *P. spina* as *P. chrysotaenia*. Salazar (1996), relying in d'Abrera, considered that the Colombian population belongs to *P. chrysotaenia*. Also Racheli & Racheli (2001) report *P. chrysotaenia* among Ecuadorian butterflies, again obviously referring to *P. spina*. The identity of *P. spina* was discussed by Pyrcz (2006). In this paper, we describe a new subspecies of *P. chrysotaenia* and one related new species, both from central Peru. We also illustrate and discuss *P. jelskii* Pyrcz (Pyrcz, 2004) a superficially similar but anatomically quite distinct species from northern Peru.

MATERIALS AND METHODS

Type material was examined in BMNH, ZMHB, MUSM and MZUJ. Additional material was examined in the BMNH and in other collections. Male genitalia were dissected according to standard procedure, preserved in glycerol, and examined, alongside other morphological microstructures, under an Olympus SZX9 stereomicroscope. Adults were photographed with an Olympus E-500 digital camera, and colour plates were composed using Adobe PhotoShop version 7 software. The following abbreviations and collection codens were used:

FW: forewing;
HW: hindwing;
V: ventral surface;
D: dorsal surface;
BMNH: Natural History Museum, London, UK (formerly British Museum (Natural History));
GRM: collection of Gabriel Rodríguez, Medellín, Colombia;
MBLI: collection of Maurizio Bollino, Lecce, Italy;
MUSM: Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru;
MZUJ: Muzeum Zoologiczne Uniwersytetu Jagiellońskiego, Kraków, Poland;
PBF: collection of Pierre Boyer, Le Puy Sainte Réparade, France;
TWP: collection of Tomasz Wilhelm Pyrcz, Warsaw, Poland (to be integrated into MZUJ);
ZSBS: Zoologisches Staatssammlung München, Munich, Germany.

SYSTEMATIC OVERVIEW

Pedaliodes chrysotaenia Hopffer, 1874
Pedaliodes chrysotaenia tortuga Pyrcz & Boyer n. ssp.
Pedaliodes jelskii Pyrcz, 2004
Pedaliodes jozefi Pyrcz n. sp.

***Pedaliodes chrysotaenia* Hopffer**

(Figs. 3, 4, 9)

Pronophila chrysotaenia Hopffer, 1874: 361.
Pronophila chrysotaenia Hopffer; Kirby, 1879: 112.
Pedaliodes chrysotaenia (Hopffer); Kirby, 1877: 709; Staudinger, 1887: 233; Thieme, 1905: 108, 111-112, pl. 2, fig. 11; Weymer, 1912: 259, pl. 55, row b; Gaede, 1931: 489; Forster, 1964: 172, fig. 243 (male genitalia); Adams, 1986: 304-305; Pyrcz, 2004: 563.
[*Pedaliodes chrysotaenia* Hopffer; Krüger, 1924: 24; d'Abrera, 1988: 859, fig.; Salazar, 1996: 18; Racheli & Racheli, 2001: 339 (misidentifications of *P. spina* Weymer)].

Type locality: Chanchamayo, Peru.

Material examined

PERU: LECTOTYPE [herein designated] ♀: Perú, Philippi **[ZMHB]**; 1 ♂: [no data]; 2 ♂♂: Peru, RB; 2 ♂♂: Prov. Huánuco, Río Palcazu, (W. Hoffmanns), RB; 2 ♂♂: Huancabamba, Ex Grose Smith 1910, (1 genit. prep. ALV109-96), JB; 2 ♂♂: N. Peru, Huancabamba, 6-10000 feet, JB; 3 ♂♂: Nord Pérou, Huancabamba, 6-10000 pieds, 1903, OC **[BMNH]**; 1 ♂: Maraynioc, JU, 3500 m, 02.X.1985, P. Hocking **[MUSM]**; 1 ♂: N. Perú, Huancabamba, 3000 m, E. A. Bottcher, *ex* coll. O. Thieme, (präparat Nr. SA392) **[ZSBS]**; 3 ♂♂ and 1 ♀: Milpo-Iccho, Huancabamba, Pasco, 3000-3200 m, IV.2006, J. Bottger *leg*.; 4 ♂♂: Qda. Mansha, Cachiyacu-Casca, Junín, 3450-3500 m, 05.VII.2003, T. Pyrcz *leg*. **[TWP]**; 2 ♂♂: Chulla, au dessus de Milpo et Cueva Blanca, Huancabamba, Pasco, 3200-3400 m, 30.X.2006, P. Boyer *leg*.; 4 ♂♂: Milpo, Huancabamba, Pasco, 3000-3400 m, IX.2006, J. Bottger *leg*.; 1 ♂: Milpo, Huancabamba, Pasco, 3000-3400 m, XI.2006, J. Bottger *leg*.; 1 ♂ and 3 ♀♀: Iccho, au dessus de Milpo, Huancabamba, Pasco, 3100-3300 m, 3.XI.2004, P. Boyer *leg*. **[PBF]**.

Redescription

MALE (Fig. 3): Head: Frons with a tuft of blackish hair; eyes blackish-brown, hairy; labial palpi one and half the length of head, medium brown, covered with short, chocolate brown hair; antennae two-fifths the length of costa, dorsally blackish-brown, ventrally chocolate brown, club very slightly thicker than shaft. Thorax: dorsally and ventrally blackish; legs medium brown, tibiae covered with chocolate brown hair. Abdomen: dorsally and laterally blackish, ventrally medium brown. Wings: FW length 23-25 mm (mean: 24 mm, n=16), triangular, apex subacute, outer margin very slightly concave. HW rounded with an undulated outer margin. FWD uniform dark brown, lustrous; androconial patch medium sized entering discal cell, with a separate unit along vein 1A; fringes brown at vein ends and pale yellow scales in the interveins. HWD uniform dark brown, lustrous, hairy along anal margin; fringes dark brown with some pale yellow scales in the interveins from apex to vein M2. FWV medium brown, a shade lighter from postdiscal to submarginal area; a faint, in some individuals barely noticeable, sinuate dark brown submarginal line gradually fading away from costa to vein Cu2; some delicate whitish suffusion in apical area and along outer margin to vein Cu2. HWV dark brown, liberally suffused with delicate sandy yellow scaling,

to varying degree; a conspicuous median band, sandy yellow dusted with some dark brown, gradually widening form costa to anal margin, with a noticeable curve following the shape of discal cell from vein M1 to Cu1; a faint, slightly lighter than the background, dentate submarginal line; a row of five submarginal ocelli from Rs-M1 to Cu1-Cu2, tiny, dark brown with a minute pupil, not noticeable in some individuals. **Male genitalia** (Fig. 9) Uncus nearly straight, the length of tegumen; subunci stout and long, two-thirds the length of uncus; saccus shallow and wide, at a shallow angle to vinculum; valvae as long as uncus+tegumen, with a prominent dorsal hump in the middle, entirely covered with minute spines, producing a blunt tip pointing distally, apical part considerably thinner than basal part with a blunt apex; aedeagus slightly longer than valva, slender, straight and slightly contorted, with the proximal opening one-third its length and a pointed apical tip.

FEMALE (Fig. 4): FW length 24-25 mm (mean: 24.6 mm, n=3); sexual dimorphism slight; a shade lighter brown on both the upper and underside, particularly on the HWV; FWV with a faint brick red shade in postmedian area, somewhat more noticeable towards anal margin; HWV median yellow band paler and with brown scale dusting somewhat more prominent.

Remarks

P. chrysotaenia is found only in central Peruvian departments of Junín, Pasco and Huánuco (on the right bank of the upper Río Huallaga). To the South, the valleys of Ene and Apurímac have not been sufficiently sampled as to speculate on its presence in the department of Ayacucho. *P. chrysotaenia* is restricted to the uppermost cloud forest close to timberline. All precisely labeled specimens were collected at 3200-3600 m. *P. jelskii* Pyrcz (2004) is superficially similar and is found in same habitat in northern Peru (San Martín, Amazonas, La Libertad). It differs considerably from *P. chrysotaenia* in male genitalia ruling out any closer phyletic affinity. *P. chrysotaenia* is microsympatric with *P. auristriga* Thieme and *P. franzi* Pyrcz, but is less commonly observed that its congeners.

Pedaliodes chrysotaenia tortuga Pyrcz & Boyer n. ssp.

(Figs. 5, 6, 10)

Type locality: Puente Carrizales, Satipo – Concepción road, Junín, Peru.

Material examined

PERU: HOLOTYPE ♂: Puente Carrizales, Route Satipo vers Concepción via Mariposa km 77, Junín, 3300-3350 m, 12.XI.2006, P. Boyer *leg*. **[MUSM]**; PARATYPES: 1 ♂ and 1 ♀: same data as the holotype **[PBF]**.

Description

MALE (Fig. 5): Head, thorax and abdomen: not differing from those of the nominotypical. Wings: FW length 26-27 mm, (mean: 26.5, n=2), triangular, apex subacute, outer margin concave. HW rounded with a slightly undulated outer margin. FWD

1-8. Adults (left: dorsum, right: venter): 1 – *P. jozefi* male, Holotype (Milpo); 2 – *P. jozefi* female, Paratype (Milpo); 3 – *P. chrysotaenia chrysotaenia* male (Milpo-Iccho); 4 – *P. chrysotaenia chrysotaenia* female (Milpo-Iccho); 5 – *P. chrysotaenia tortuga* male, Holotype (Puente Carrizales); 6 – *P. chrysotaenia tortuga* female, Paratype (Puente Carrizales); 7 – *P. jelskii* male, Paratype (Molinopampa-Granada); 8 – *P. jelskii* female, Paratype (Molinopampa-Granada)

uniform dark brown, lustrous; androconial patch medium sized entering discal cell, with a separate patch along vein 1A; fringes brown with some sparse yellow scales in the interveins. HWD uniform dark brown, lustrous, hairy along anal margin; fringes dark brown. FWV dark brown, slightly lighter than on the upperside; a barely visible diffuse lighter postdiscal band from costa to Cu2; a faint, barely noticeable, sinuate dark brown submarginal line; some delicate whitish suffusion in apical area. HWV dark brown, with some delicate sandy yellow scaling in postdiscal area; a conspicuous median band, sandy yellow dusted with some dark brown, gradually widening from costa to anal margin, with a basal notch at M1, nearly straight from M2 to anal margin; a row of five submarginal ocelli from Rs-M1 to Cu1-Cu2, tiny, dark brown with a minute pupil, not noticeable in some individuals. **Male genitalia** (Fig. 10): Do not differ noticeably from the nominotypical subspecies, except for the even slightly longer subunci, this feature may be subject to some individual variation though.

FEMALE (Fig. 6): FW length 26 mm, sexual dimorphism slight; lighter brown on both the upper and underside, particularly on the HWV; FWV with a faint brick red shade in postmedian area, somewhat more noticeable towards anal margin; HWV median band pale yellow and with brown scale dusting more prominent.

Etymology

This subspecies is called after the pass Abra Tortuga on the Cochas - Mariposa road, situated a few kilometres from the site where it was collected.

Remarks

P. chrysotaenia tortuga differs most immediately from the nominotypical in the considerably larger size, and in the wider HWV yellow band. It is known so far exclusively from the type locality, which is separated from the area where the nominotypical subspecies occurs by the valley of Chanchamayo.

***Pedaliodes jelskii* Pyrcz**

(Figs. 7, 8, 12)

Pedaliodes jelskii Pyrcz, 2004: 562-563, figs. 107 (male), 108 (female), 177 (male genitalia).

Type locality: Molinopampa-Granada, Amazonas, Peru.

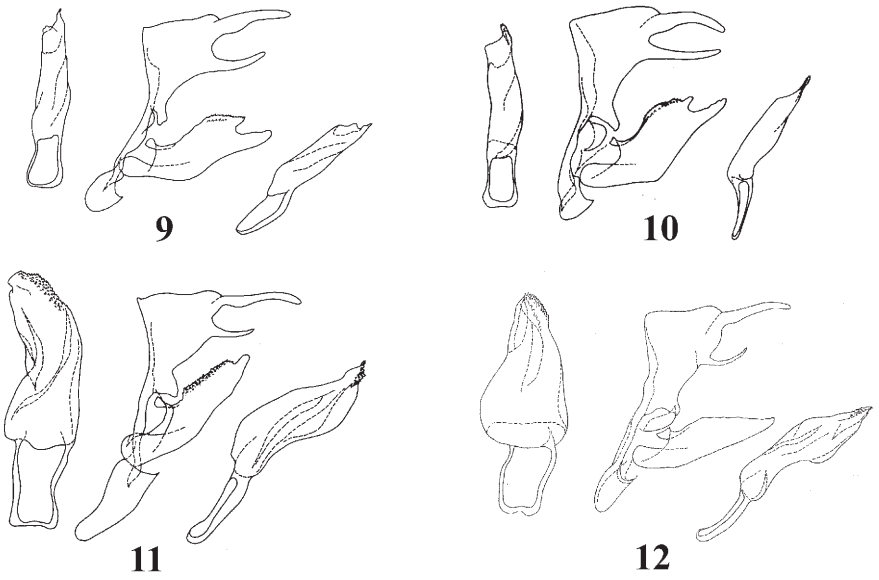
Material examined

PERU: HOLOTYPE ♂: Amazonas, Molinopampa - Granada, 3000-3300 m, 01.VII.1998, T. Pyrcz & J. Wojtusiak *leg*. **[MUSM]**; ALLOTYPE ♀: Amazonas, Molinopampa - Granada, 3000-3200 m, IX.2002, B. Calderón *leg*. **[TWP]**; 1 ♂: Molinopampa - Granada, 2650-3250, 27.VI.1998; 3 ♂♂: same data but 2650-3250 m, 29.VI.1998; 1 ♂: same data but 3115 m, 01.VII.1998; 2 ♂♂: same data but 3000-3250, 01.VII.1998; 1 ♂: same data but 3100-3400 m, 03.VII.1998; 1 ♂: same data but 3215m, 04.VII.1998; 1 ♂: same data but 2650-3100 m, 04.VII.1998; 1 ♂: same data but 3115m, 05.VII.1998; 1 ♂: same data but 3215m, 06.VII.1998 **[TWP]**; 4 ♂♂: same data but 2650-3250 m,

06.VII.1998, 2 **[MZUJ]**, 2 **[BMNH]**; 3 ♂♂: same data but 3100-3250 m, 20.VIII.1998, 1 **[TWP]**, 1 **[MZUJ]**, 1 **[BMNH]**; 1 ♂: same data but 3215m, 26.VIII.1998; 1 ♂: same data but 3265m, 26.VIII.1998 **[TWP]**; 12 ♂♂: 2 km. from Granada, 3400 m, X.2001, B. Calderón *leg*.; 4 ♂♂: Molinopampa - Granada, 3150-3250 m, X.2000, B. Calderón *leg*. **[MBLI]**; 8 ♂♂: Molinopampa, Granada, 3000-3200 m, IX.2002, B. Calderón *leg*., 6 **[TWP]**, 2 **[GRM]**; 2 ♂♂: Molinopampa 2900-3100 m, I.2001, B. Calderón *leg*.; 1 ♂: same data but IX.2002 **[PBF]**; 2 ♂♂: same data but 3100-3250 m, III.2003, M. Tafur *leg*. **[TWP]**; 1 ♂: Pomacochas, La Sonada, 1500-3000 m, IX-X.2000, B. Calderón *leg*. **[PBF]**; 15 ♀♀: Road Leimebamba - Balsas, 3550-3650 m, 1-15.XII.2001, B. Calderón *leg*.; 15 ♀♀: same data **[MBLI]** (all PARATYPES); 2 ♂♂: Mashua, cerca de Cumpang, LL, 3350 m, 28.IX.1979, T. A. Parker *leg*. **[MUSM]**.

Description

(Partly quoted from Pyrcz, 2004): MALE (Fig. 7): FW (length: 23-25mm; mean: 24,4mm; n=22) triangular, costa very slightly arched towards apex; apex sub-acute; outer margin very slightly concave; fringes uniform dark-brown. HW round; outer margin wavy; fringes grayish-brown. FWD uniform dark-brown, glossy. HWD uniform dark-brown, basal one third hairy. FWV dark-brown, lustrous, lighter brown towards inner margin, dusted with gray scales along costa and on apex. HWV dark-brown, a tone darker than the FW; blackish-brown and dusted with sparse beige scales between a dentate submarginal line and outer margin; a wide yellow median band from costa near apex to anal margin near tornus, gradually wider towards anal margin with sharp



9-12. Male genitalia (aedeagus removed, in lateral and ventral position): 9 – *Pedaliodes chrysotaenia chrysotaenia* (Cachiyacu-Casca); 10 – *P. chrysotaenia tortuga* Paratype (Puente Carrizales); 11 – *P. jozefi* Paratype (Milpo); 12 – *P. jelskii* Paratype (Molinopampa-Granada)

basal and diffused outer margin between costa and vein Cu2, curving basally at vein M1. **Male genitalia** (Fig. 12): Uncus thin, slightly less than half the length of the tegumen; subunci long, more than half the length of the uncus and thin; valvae without dorsal process, with a slightly wavy dorsal surface; saccus long, tubular; aedeagus massive, slightly contorted and flattened, wide in median part.

FEMALE (Fig. 8): Sexual dimorphism slight, except that considerably lighter brown; HWV median band milky white, the area between its diffused distal edge and dentate submarginal line light brown dusted with white.

Remarks

P. jelskii is externally very similar to *P. chrysotaenia*, particularly to the nominotypical subspecies. The two species can be recognised by the narrower HWV yellow median band and the presence of submarginal ocelli in *P. chrysotaenia*. These differences are not apparent between *P. jelskii* and the southern subspecies *P. chrysotaenia tortuga*, which is on the other hand noticeably larger. Male genitalia of *P. jelskii* and *P. chrysotaenia* present however important differences and indicate that these two species are not closely related. Dorsal surface of valvae in *P. jelskii* is slightly irregular but has no prominent, spiny hump, which is a synapomorphy of *P. chrysotaenia* and *P. jozefi* n. sp. On the other hand, the male genitalia of *P. jelskii* and *P. jozefi* present some similarities, in particular the massive aedeagus with a spiny apical part and a deep saccus. *P. jelskii* was confused by d'Abrera (1988) with *P. auristriga* Thieme. This species has a considerably narrower and mostly straight HWV yellow median band, and very different male genitalia. *P. jelskii* is found in northern Peru (Amazonas, San Martín) and is not sympatric with either *P. chrysotaenia* or *P. jozefi*.

Lamas & Viloria (in litt.) and Viloria (Ph.D.) previously considered the individuals of *P. jelskii* from the Abiseo National Park (southern San Martín, eastern La Libertad) as representing a separate taxon. We examined both known specimens of this population and compared them with the paratypes of *P. jelskii*. We concluded that there are minor differences in the colour pattern, specifically the slightly narrow HWV yellow band of the Abiseo specimens. This, however, does not justify elevating them to the subspecific rank, especially that this particular feature is subject to noticeable individual variation within the type series. Abiseo is widely separated geographically from Molinopampa, and some faunal differences are known (particularly *P. sztolcmani* Pyrcz, which occurs in the same habitat as *P. jelskii* occurs as two separate subspecies in the two localities (Pyrcz, 2004)), therefore we cannot exclude that a larger series from Abiseo would eventually reveal consistent morphological differences.

Pedaliodes jozefi Pyrcz n. sp.

(Figs. 1, 2, 11)

Type locality: Milpo-Iccho, Huancabamba, Pasco, Peru.

Material examined

PERU: HOLOTYPE ♂: Milpo-Iccho, Huancabamba, Pasco, 3000-3200 m, IV.2006, J. Bottger *leg*. **[MUSM]**; PARATYPES (7 ♂♂ and 2 ♀): 1 ♂ and 1 ♀: same data as the holotype **[TWP]**; 3 ♂♂: "Pasco, Chulla", au dessus de Milpo et Cueva Blanca, Huancabamba, 3200-3400m, 30.X.2006, P. Boyer *leg*.; 1 ♂: Milpo, Huancabamba, Pasco, 3000-3400m, IX.2006, J. Bottger *leg*.; 1 ♂: Milpo, Huancabamba, Pasco, 3000-3400 m, XI.2006, J. Bottger *leg*.; 1 ♂ and 1 ♀: Shuyhua, (Ichco), au dessus de Milpo, Huancabamba, Pasco, S 10 22 968, W 075 38 021, 3100-3300m, 27.V.2005, P. Boyer *leg*. **[PBF]**.

Diagnosis

This species is much bigger than the similarly patterned on the HWV, *P. chrysotaenia*, and its median yellow band has a distinctive notch at vein Cu2 and is curved at right angle in M2-M3, at open angle in *P. chrysotaenia*.

Description

MALE (Fig. 1): Head: eyes chocolate brown, lustrous; labial palpi light brown covered with brown hair; antennae reaching 2/3 the length of costa, slender, dorsally brown, ventrally orange brown, club formed gradually, slightly thicker than shaft, terminal segments blackish brown. Thorax: dorsally black and hairy, ventrally black, legs chestnut. Abdomen: dorsally and laterally black, ventrally lighter, dull brown. Wings: FW length: 26-28mm (mean : 26.9mm, n=8), apex blunt, outer margin slightly concave. HW rounded, outer margin slightly undulated from apex to M3. FWD uniform chocolate brown; androconial patch large, entering discal cell; fringes alternately grey brown and milky white. HWD chocolate brown, hairy in basal half and along anal margin; fringes grey brown with some white scales towards apex. FWV medium brown, lustrous, a shade lighter in outer half; costa from postdiscal area to apex dusted with sandy yellow scales; a faint dark brown submarginal line parallel to outer margin from costa to Cu1-Cu2. HWV medium brown, liberally suffused with chestnut and yellow scales; a faint sandy yellow post-basal costal streak extending into discal cell; a sandy yellow postmedian band curved at right angle in M2-M3, some 3-4 mm wide at anal margin, gradually narrowing toward median area, approximately 1-2 mm wide from M2 to costa, suffused with brown scales, heavily between M2 and costa, with a distinctive basal notch at vein Cu2; five tiny postmedian milky white dots in Rs-M1 to Cu1-Cu2; marginal area slightly darker. **Male genitalia** (Fig. 11): Uncus as long as tegumen, rather slender, apex very slightly curved downwards; subunci well developed, slender, half the length of uncus; saccus sub-conical, approximately aligned to vinculum, very deep, two-thirds the length of valvae; valvae slightly shorter than tegumen + uncus, with dorsal surface straight, without any hump or process, and covered with numerous tiny spines; aedeagus as long as valva + saccus, massive, slightly contorted, laterally flattened with a wide, spiny crest in distal area, proximal opening wide and rectangular.

FEMALE (Fig. 2): Sexual dimorphism slight, expressed in the lighter and duller FW and HWD, and particularly in the heavier yellow dusting of the HWV and paler yellow median band; FW length 27 mm.

Etymology

This species is dedicated to Józef Razowski, an eminent Polish entomologist, author of dictionaries of entomology and discoverer of numerous new species of Tortricidae from South America, many of which are from Peru.

Remarks

P. jozefi is more closely allied to the allopatric *P. jelskii* than to the sympatric *P. chrysotaenia* as indicated by male genitalia similarities (see under *P. jelskii*). This rare species has been found only in the type locality, above Milpo in Pasco in central Peru. It inhabits the uppermost cloud forest, at 3200 m. Given its inaccessible habitat and apparently narrow altitudinal range it is premature to speculate on its geographic range.

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