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Systematics, bionomics and zoogeography of high Andean pedalioidines;  
Part 7: A sister species of *Pedaliodes paneis* (HEWITSON) from Central  
Peru  
(Lepidoptera: Nymphalidae: Satyrinae)

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ABSTRACT. A new species *P. derisoris* is described from the Huánuco department in central Peru. It is found to be closely related to *P. paneis* (HEWITSON) occurring in northern Peru. The two share a striking synapomorphy, elongated ocellar elements on the hindwing underside. Their male genitalia are closely similar, whereas more conspicuous elements of wing colour pattern are widely divergent.

Key words: entomology, taxonomy, Satyrinae, *Pedaliodes*, new species, redescription, Carpish, Huánuco, Junin, ocellar elements.

#### INTRODUCTION

Ocelli are eye-like colour pattern elements compound of (usually) white pupils and concentric rings of red, orange, yellow and black. They are one of the most typical and conspicuous wing colour pattern elements of satyrine (Nymphalidae) butterflies. In fact, the common name of this subfamily in several languages refers to this feature (for example *Oczennice* – *Eye-butterflies* – in Polish). According to SCHWANWITSCH (1924) and NIJHOUT (1991) ocelli are part of the so-called “Nymphalid ground plan”, a pattern of wing design independent from cover scales making up larger portions of colours, such as, for example, postmedian patches or subapical bands. Originally,

ocelli are situated in each cell of the forewings and hindwings between postmedian and submarginal lines, also part of the Nymphalid ground plan defined by NIIHOUT (1991) as elements of the “ocellar symmetrical system”. They are however rarely fully developed. The presence/absence of ocelli, their shape and relative position are important taxonomic characters, and were used frequently to describe genera or even higher taxa, especially in the subfamily Satyrinae (PYRCZ 1995; PYRCZ et. al. 1999 etc.). In the genus *Pedaliodes sensu stricto* ocelli are either absent or expressed as small dots (VILORIA 1998; PYRCZ 2004). The presence of fully developed ocelli on the forewing is one of the discriminating characters of the genus *Praepronophila* FORSTER, previously associated with *Pedaliodes* (PYRCZ & VILORIA 2006). In *Pedaliodes paneis* (HEWITSON), a northern Peruvian species, hindwing ocelli are singularly transformed into intravenal stripes. A new species discovered in central Peru, despite having a completely different “cover scales” pattern, also shows such a transformation of ocelli. We describe it herein and evaluate its affinities with *P. paneis*. We also assess the validity of this feature as a possible synapomorphy.

#### MATERIALS AND METHODS

Type material was examined in BMNH, ZMHB, MUSM and MZUJ. Additional material was examined in BMNH and in other collections. Male genitalia were dissected according to standard procedures, 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 9. The following abbreviations and collection codes were used:

FW: forewing;

HW: hindwing;

V: ventral surface;

D: dorsal surface;

BMNH: Natural History Museum, London, UK (formerly British Museum (Natural History));

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 Réparate, France;

TWP: collection of Tomasz Wilhelm PYRCZ, Warsaw, Poland (to be integrated into MZUJ);

#### SYSTEMATIC OVERVIEW

*Pedaliodes paneis* (HEWITSON, 1862)

*Pedaliodes derisoris* VILORIA, LAMAS & PYRCZ n. sp.

***Pedaliodes paneis* (HEWITSON, 1862)**

(Figs. 1, 2, 5)

*Pronophila paneis* HEWITSON, 1862: 8-9, pl. 4, fig. 27.*Pronophila paneis* HEWITSON; HERRICH-SCHÄFFER, 1865: 66; HEWITSON, 1872: 58; KIRBY, 1879: 112; RILEY & GABRIEL, 1924: 43.*Pedaliodes paneis* (HEWITSON); BUTLER, 1867: 267; 1868: 174; KIRBY, 1871: 104; HOPFFER, 1874: 361; SCUDDER, 1875: 242; GODMAN & SALVIN, 1880: 130; STAUDINGER, 1888: 233; 1894: 74; DOGNIN, 1891: 34; WEEKS, 1905: 17; THIEME, 1905: 99-110; GAEDE, 1931: 493; FORSTER, 1964: 168.*Pedaliodes pancis* [sic] (HEWITSON); DRUCE, 1876: 214; Gaede, 1931: 493 (as a synonym).[*Pedaliodes paneis* (HEWITSON); FASSL, 1910: 118, 132; 1911: 26 (misidentifications of *P. fassli* WEYMER); 1915: 11 (misidentification of *P. polusca* (HEWITSON)); WEYMER, 1912: 258, pl. 54, row e; LEWIS, 1973: 62, 234, fig. 3; D'ABRERA, 1988: 857, fig. (all misidentifications of *P. demathani* PYRCZ – several subspecies); MORENO et al., 2000: 153. (misidentification)].*Pedaliodes paucis* [sic] (HEWITSON); FORSTER, 1964: 167, fig. 234 (male genitalia).*Pedaliodes paneis* (HEWITSON); PYRCZ, 2004: 558; LAMAS et al., 2004: 212.

Type locality: “Peru”, Amazonas.

## MATERIAL EXAMINED

**PERU:** 8 ♂♂ and 8 ♀♀: Molinopampa – Granada, Amazonas, 3000-3200 m, VII-VIII.1998. T. Pyrcz & J. Wojtusiak leg. [MZUJ]; 68 ♂♂ and 19 ♀♀: Molinopampa – Granada, Amazonas, 3000-3200 m, IX.2002, B. Calderón leg. [TWP]; 1 ♂: Amazonas, Pomacochas, Peña Blanca, 3000 m, 11.VI.2000, B. Calderón leg.; 1 ♂: Amazonas, Pomacochas, El Oso, 2900 m, 6.VII.2000, B. Calderón leg.; 1 ♂: Amazonas, Molinopampa, vía Granada 3040 m, 26.VIII.1998, T. Pyrcz leg.; 2 ♂♂: Amazonas, Molinopampa, vía Granada, 2600-3100 m, 23.VIII.1998, T. Pyrcz leg.; 2 ♀♀: Amazonas, La Sonada, Pomacochas, 1500-3000 m, IX-X.2000, B. Calderón leg.; 1 ♀: Amazonas, Molinopampa, 2900-3000 m, IX.2002, B. Calderón leg. [PBF].

## DIAGNOSIS

HWV postmedian yellow similar to the sympatric *P. demathani*, which differs by the conspicuously truncate FW outer margin below apex, and all rounded HWV submarginal whitish dots, elongated in Rs-M1 to M2-M3 in *P. paneis*.

## REDESCRIPTION

**MALE** (Fig. 1): Eyes: chocolate brown; antennae reaching two-fifths the length of costa, club slender, slightly thicker than shaft, dorsally brown, ventrally orange brown; labial palpi twice the length of head, covered with chocolate brown and sparse yellow hair. Thorax: blackish brown; legs covered with dark brown, chestnut and grayish scales. Abdomen: dorsally and laterally blackish brown, ventrally pale brown. Wings: FW length: 25-26mm; (mean: 25.4mm, n=5) FW apex subacute, outer margin very slightly truncate below apex, otherwise straight. HW rounded, outer margin slightly undulated. FWD uniform dark brown, lustrous; androconial patch moderately large, compact, slightly entering discal cell, with a separate elongate patch along 1A; fringes alternately dark brown and yellow. HWD uniform dark brown, lustrous, hairy in basal

one-third; fringes dark brown with some yellowish scales from apex to space M2-M3. FWV pale dark brown, a shade lighter than on the upperside; a faint, diffused dirty white postdiscal streak from costa to vein M3; subapical area dusted with lighter brown; three minute, violet and white subapical dots in R5-M1, M1-M2 and M2-M3; marginal area suffused with chocolate brown, denser towards apical area. HWV chocolate brown; a yellow postmedian band with a nearly straight basal and slightly arched distal edge, some six millimeters wide at anal margin, extending towards wing median area and gradually narrowing to a tip ending at vein M2, suffused with some brown ripple-like pattern. Especially towards anal margin; submarginal area suffused with light brown, more so in subapical area; a row of five minute, violet and white subapical dots, those in Rs-M1, M1-M2 and M2-M3 elongated, as intravenul stripes; the area delimited by a submarginal zigzagging line and outer margin chocolate brown. **Male genitalia** (Fig. 5): Uncus one-fourth longer than tegumen, slightly curved downwards distally; subunci thin, two-thirds the length of uncus; saccus moderately deep and wide; valvae slender, gradually tapering from the middle towards apex, dorsal surface slightly irregular, dorsal teeth-like process pointing apically, apical part of valvae elongated, tip subacute; aedeagus the length of valva+saccus, slightly contorted and slightly curved in the middle, approximately the same width throughout, proximal opening less than one-third the length of aedeagus, apical part covered with numerous spines.



1-4. Adults (left: dorsum, right: venter): 1 – *Pedaliodes paneis* male (Molinopampa – Granada); 2 – *P. paneis* female (Molinopampa – Granada); 3 – *P. derisoris* male, Paratype (Carpish); 4 – *P. derisoris* female, Paratype (Carpish)

FEMALE (Fig. 2): FW length: 27-29mm; (mean: 28.5 mm, n=22) Sexual dimorphism slight and expressed in the lighter and paler brown ground colour of FW and HW dorsal and ventral surface, and HWV yellow postmedian band.

#### REMARKS

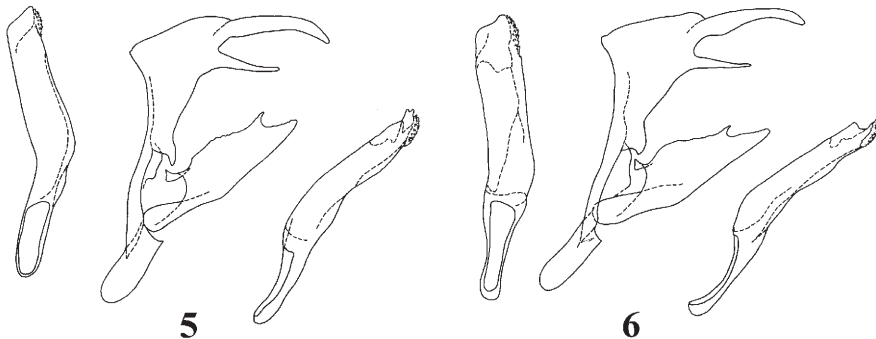
Three supposed syntypes from the HEWITSON collection at the BMNH (KIRBY 1879) represent three different species of *Pedaliodes*, none of them corresponding well to the original illustration. However, the specimen placed in the type collection is the only one bearing a label with the locality "Upper Amazon" and it has almost the same wing pattern as figured by HEWITSON (fig. 27) except for having lineal rather than rounded submarginal dots on the HWV. The locality "Amazon, Nauta" given by the author in his text is certainly an inaccuracy, since the true Nauta is on the confluence of the Rivers Marañon and Ucayali (130 m). However, it corresponds to that HEWITSON called "Upper Amazon", which could well be the area between Moyobamba (San Martín) and Chachapoyas (Amazonas), as inferred from other types in the Hewitson collection. We assume that HEWITSON's illustration is altered since no other specimen with a similar pattern has been found in the whole BMNH collections, and therefore we herein designate the mentioned specimen as Lectotype. Because of the long confusion after the deficient original illustration, most of the references to *P. paneis* have been misidentifications of *Pedaliodes demathani*.

*P. paneis* occurs in northern Peru in the departments of Amazonas and northern San Martín, and in north-central Peru in southern San Martín and eastern La Libertad. It is one of the co-dominant species of the *Pedaliodes* community at 2800-3000 m (PYRCZ 2004).

#### *Pedaliodes derisoris* VILORIA, LAMAS et PYRCZ n. sp.

(Figs. 3, 4, 6)

[*Pedaliodes* [n. sp.] LAMAS & VILORIA, MS; LAMAS et. al., 2004: 213].



5, 6. Male genitalia (aedeagus removed, in lateral and dorsal view): 5 – *Pedaliodes paneis* (Molinopampa – Granada); 6 – *P. derisoris* Paratype (Carpish)

Type locality: 5 km N Carpish, 0942/7605, 2500 m, Huánuco, Peru.

#### MATERIAL EXAMINED

**PERU:** HOLOTYPE ♂: Huánuco, 5 km N Carpish, 0942/7605, 2500 m, 24.IX.1996, J. Grados *leg.* [**MUSM**]; PARATYPES (37 ♂♂ and 13 ♀♀): 1 ♂ and 1 ♀: Carpish, HU, 2700 m, 26.XI.1965, P. Hocking *leg.*; 1 ♂: same data, 27.XI.1965 (genit. prep. ALV001-96); 1 ♂ and 1 ♀: HU, Carpish, 2700-2800 m, 0943/7606, 08.VI.1995, G. Lamas *leg.*; 1 ♂: Carpish, 2700-2800 m, 0943/7606, 23.IX.1996, G. Lamas *leg.*; 1 ♂ and 1 ♀: same locality, 24.IX.1996, J. Grados *leg.*; 1 ♂: same data, 26.IX.1996; 2 ♂: same data [**MUSM**]; 6 ♂ and 3 ♀♀: Huánuco, Carpish, 2700-3000m, 25-27.VII.2002, T. & C. Pyrcz *leg.* [**TWP**]; 4 ♂♂: Huánuco, Carpish, 2600-2700 m, 26.X.2004, P. Boyer *leg.*; 5 ♂♂: Huánuco, Carpish, 2800-3000 m, 19.I.2003, P. Boyer *leg.*; 1 ♂: Huánuco, Carpish, 2800-3000 m, 19.II.2003, P. Boyer *leg.*; 1 ♂ and 5 ♀♀: Huánuco, Carpish, 2500-2700 m, 26.X.2004, P. Boyer *leg.*; 11 ♂♂ and 2 ♀♀: Huánuco, au dessus de Huanacaure km 43 de Pachachupan, est de Acomayo, 3000-3100 m, 23.X.2006, P. Boyer *leg.*; 1 ♂: Huánuco, Huanacaure, 3000 m, XII.2006, J. Bottger *leg.* [**PBF**].

#### DIAGNOSIS

This species is easily distinguished from other Peruvian congeners by the large, snow white HWV wedge. The only species with a somewhat similar colour pattern is the Colombian *P. pedacia* (HEWITSON), whose wedge is however not as wide and is totally white, without the silver sheen of *P. derisoris*.

#### DESCRIPTION

(Fig. 3): MALE: Head: eyes blackish-brown, covered with short setae; frons with a tuft of short, dark brown hair; labial palpi approximately 3mm long, grey-brown, first and second segment with a crest of rather sparse black hair pointing ventrally, third segment covered with very short black hair; antennae half the length of costa, dorsally blackish-brown, ventrally orange-brown, club formed gradually, subcylindrical, over one-third the length of antennae, twice as thick as shaft. Thorax: dorsally and ventrally blackish-brown, hairy, legs dull brown. Abdomen: dorsally and laterally blackish-brown, ventrally dull brown. Wings: forewing apex blunt, outer margin slightly truncated below apex, outer margin slightly undulated, hindwing outer margin scalloped; FW length: 24-26 mm; (mean: 25.6 mm, n=30) blackish-brown (fuscous), lustrous, nearly uniform except for a shade slightly lighter outer one-third; basal third hairy; scent patch small, androconial scales restricted to discal cell and basal one third of veins Cu1, Cu2 and 1A; fringes short of same colour as dorsum; HWD black-brown, same as the forewing, lustrous, basal one-third hairy, fringes short of same colour as dorsum; FWV dull brown, darker from base to wavy postdiscal line, a shade lighter distally, a faint lighter costal streak along distal edge of postdiscal line, fading in cell M2-M3, sparse lighter subapical scales, the area between submarginal line and outer margin chocolate-brown, more intense towards apex; HWV ground colour chocolate-brown, a short lighter streak at mid-costa, a shining snow-white wedge distal to wavy postdiscal line, appearing at vein M2, gradually widening, at vein Cu2 doubling its width to about 6mm, extend-



ing over roughly half the length of anal margin, with outer edge diffuse from M2 to Cu2 and sharp from Cu2 to tornus, the area distally from white wedge to submarginal line liberally suffused with whitish and light brown scales, three white streaks in cells Rs-M1, M1-M2 and M2-M3 plus two white dots in M3-Cu1 and Cu1-Cu2, the area between the wavy, irregular submarginal line and outer margin chocolate-brown. **Male genitalia:** Uncus one-fourth longer than tegumen, slightly curved downwards distally; subunci thin, half the length of uncus; saccus moderately deep and narrow; valvae slender, gradually tapering from the middle towards apex, dorsal surface slightly irregular, dorsal teeth-like process pointing apically, apical part of valvae elongated, tip subacute; aedeagus the length of valva+saccus, very slightly contorted and almost straight, gradually widening towards apex, proximal opening narrow, one-third the length of aedeagus, apical part covered with numerous spines.

**FEMALE** (Fig. 4): Similar to the male except that larger and lighter brown on both dorsal and ventral surface of the wings, and for the presence of a reddish sheen in the postmedian area of the HWV; FW length: 27-28 mm, mean: 27.3 mm, n=9.

#### ETYMOLOGY

The underside colour pattern of this fantastic butterfly looks like a human smile. So, we name it *derisoris*, meaning smiling in Latin.

#### DISTRIBUTION

*P. derisoris* has been reported up to date exclusively from the Carpish (tunnel) area along the Acomayo - Tingo María road in the department of Huánuco in Central Peru, and from Huanacaure, some 25 to 30 kilometres SE of Carpish, as a crow flies. So far, its presence could not be confirmed in the adjacent southerly departments of Pasco (Milpo, Cordillera de Yanachaga) or Junín (Valle de Chanchamayo) despite of rather extensive sampling. Its northern distribution limit is also unknown. In the Abiseo area (San Martín) *P. derisoris* and further north in the highlands of Chachapoyas (Amazonas), it is replaced by its sister-species *P. paneis* (HEWITSON).

#### DISCUSSION

The two species discussed in this paper present widely dissimilar HWV colour patterns. *P. paneis* closely resembles the sympatric *P. demathani*, particularly on the HWV, whereas *P. derisoris* shows striking similarity with the Colombian *P. pedacia*. They share however an unusual, subtle character of the colour pattern: their HWV submarginal ocellar elements (*sensu* NIJHOUT 1991) are not rounded or oval whitish dots as in other congeners but transformed into light blue intravenal stripes. This feature is not found in any other congener and is considered as a synapomorphy of *P. paneis* and *P. derisoris*. Also, *P. paneis* and *P. derisoris* have very similar male genitalia. A number of common genital characters specified in the description of *P. derisoris* indicate their affinities. This further supports the hypothesis that they are closely related, apparently sister-species. It also confirms a general rule that in diurnal Lepidoptera and in the genus

*Pedaliodes* in particular, most conspicuous elements of the colour pattern compound of cover scales are often products of local, habitat driven or mimicry related convergences, and do not necessarily reflect any closer phyletic affinity (VILORIA 2007).

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