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Systematics, zoogeography and bionomics of high Andean pedalioidines,  
Part 3: Revisional notes on the generic status and a new subspecies of  
*Pedaliodes puma* (THIEME)  
(Lepidoptera: Nymphalidae: Satyrinae)

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ABSTRACT. The generic status of *Pedaliodes puma* Thieme (Nymphalidae, Satyrinae), recently transferred to *Panyapedaliodes* FORSTER, is discussed and reinstated. The splitting of *Pedaliodes* by FORSTER (1964) into several smaller genera based solely on adult morphology, the male genitalia and wing underside colour pattern in particular, is considered as not sufficiently justified. A new subspecies, *P. puma ernsti*, is described from the valley of Kosñipata (Cuzco, Peru). Geographic and altitudinal distribution patterns of *P. puma* are discussed.

Key words: entomology, taxonomy, Lepidoptera, Nymphalidae, Satyrinae, Pronophilina  
*Panyapedaliodes*, *Pedaliodes*, Andes, cloud forests, Peru.

#### INTRODUCTION

*Pedaliodes puma* THIEME (1905) is one of the least known taxa of the speciose genus *Pedaliodes* BUTLER (+200 species) and in fact, the entire neotropical Satyrinae tribe Pronophilini (*sensu* MILLER, 1968) (considered by some authors as a subtribe (LAMAS *et al.* 2004)). Described almost exactly a hundred years ago, it was known until this study exclusively from a few historical specimens collected by GARLEPP in Bolivia and OCKENDEN in Peru by the break of 19<sup>th</sup> and 20<sup>th</sup> century. The research carried out by the author in south Peruvian provinces of Cuzco and Puno resulted in the re-discovery of *Pedaliodes puma*, allowing the setting up of its geographic and altitudinal distribution pattern, and the description of a new subspecies. It also lead to the reconsidering of its generic status.

## MATERIALS AND METHODS

Type material was examined in ZMHB, MUSM and TWP. Additional material was examined in BMNH and in other collections. Male genitalia were dissected according to standard procedure, preserved in glycerol, and examined, alongside other morphological microstructures, under Olympus SZX9 stereomicroscope. Adults were photographed with 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));

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 incorporated into MZUJ);

ZMHB: Zoologische Museum, Humboldt Universität, Berlin, Germany.

***Pedaliodes puma* THIEME, 1905, comb. reinst.**

*Pedaliodes puma* THIEME, 1905: 52, 58-59, pl. 2, fig. 19.

*Pedaliodes puma* THIEME; WEYMER 1912: 251-252, pl. 53, row c; GAEDE 1931: 503; FORSTER 1964: 160, 161, fig. 204 (male genitalia); D'ABRERA 1988: 848, figs.

*Panyapedaliodes puma* (THIEME); LAMAS *et al.* 2004: 211.

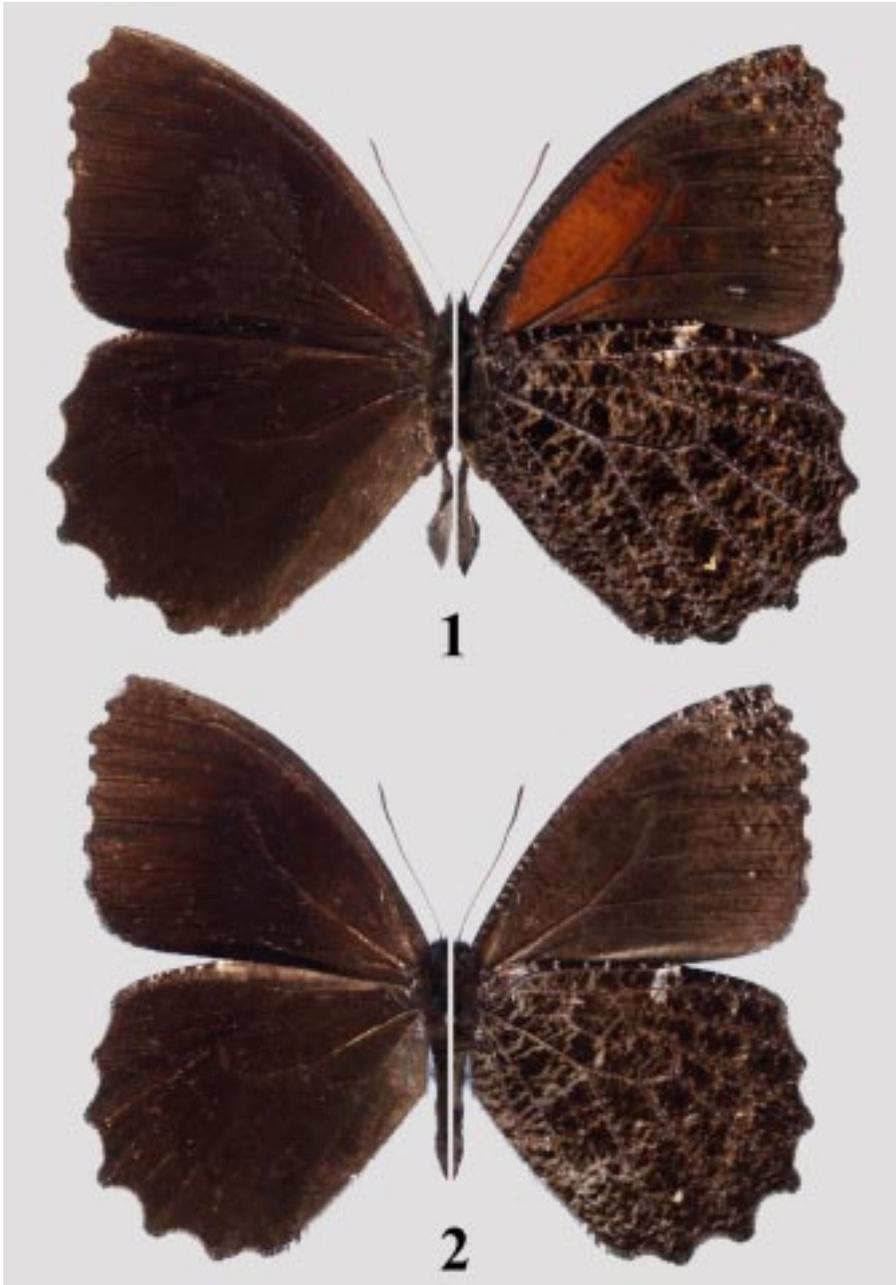
Type locality: [Cerro] Cillutincara, 3000 m, Bolivia.

FORSTER (1964) carried out a taxonomic revision of *Pedaliodes* BUTLER and described 13 new related genera. Their diagnoses were strongly biased on a few simple characters of male genitalia. FORSTER's work was somewhat counterproductive, and instead of organising the systematics of the mega-diverse *Pedaliodes* complex, it contributed in further complicating it. Subsequent searchers tried to deal with the "Forsterian revolution" by clumping, revalidating and redescribing some of his genera (ADAMS 1986; VILORIA & PYRCZ 2002; PYRCZ 2004b), or eventually by raising new related taxa (ADAMS & BERNARD 1977, 1979, 1981; VILORIA & PYRCZ 1994). Some genera proposed by FORSTER (*op. cit.*) are consistent enough, and apparently monophyletic clades, particularly *Pherepedaliodes*, *Praeppronophila* and *Praepedaliodes*. Others, however, are loose assemblages of

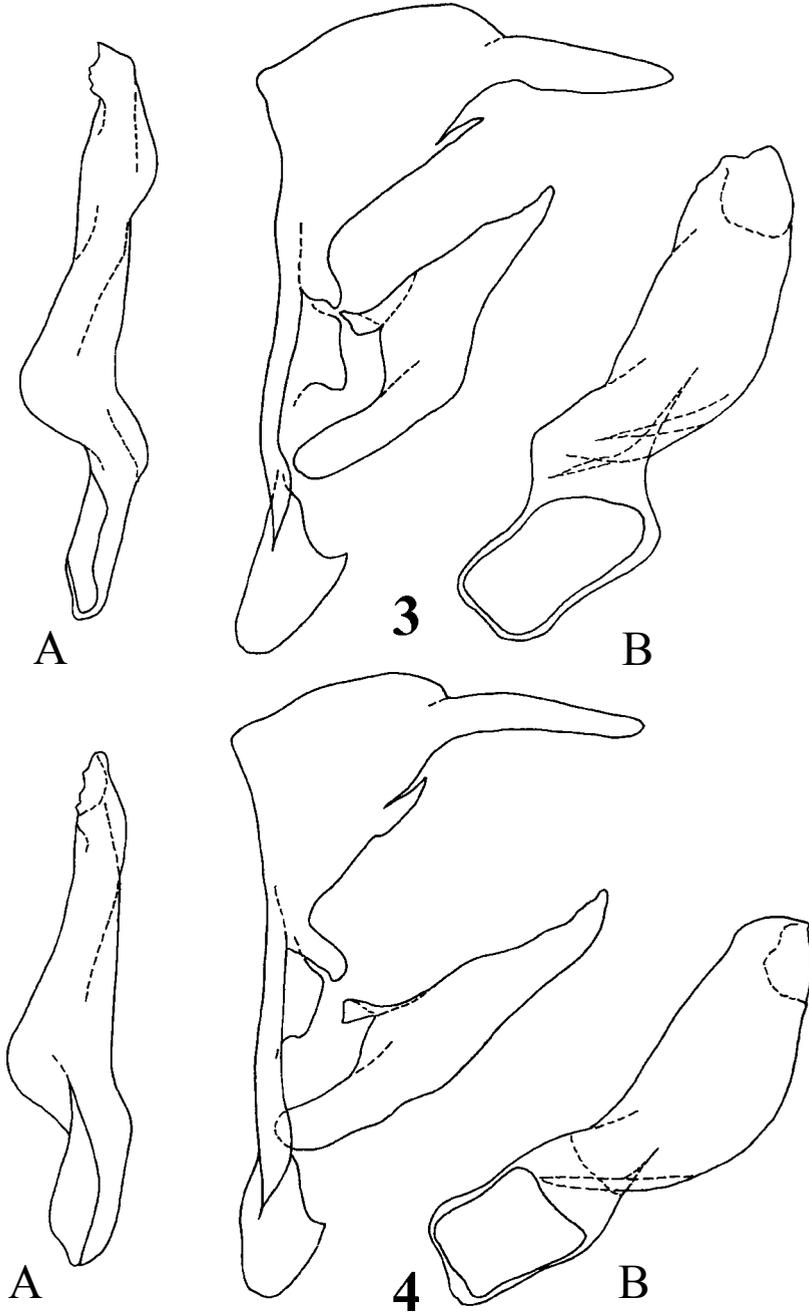
superficially resembling taxa sharing some common features of doubtful phyletic validity, such as *Punapedaliodes*, *Altopedaliodes*, *Panyapedaliodes* (see: PYRCZ 2004b; PYRCZ & RODRÍGUEZ 2005) and others.

*P. puma* was transferred arbitrarily to the genus *Panyapedaliodes* by LAMAS *et al.* (2004). This action was anchored in the systematic status attributed to *P. puma* by VILORIA in his unpublished doctoral thesis. According to Viloria (Ph.D.), partly quoted by PYRCZ (2004a), the butterflies of the genus *Panyapedaliodes* are recognised from other genera of *Pedaliodes sensu lato* by the hindwing underside mossy-like or marble-patterned, and male genitalia with no or rudimentary subunci, semi-rectangular or semi-fusiform valvae without prominent dorsal tooth-like processes, and rarely a serrate ampulla. The subunci were considered an important taxonomic character within the *Pedaliodes* complex, and several new genera were described based mostly on their presence or absence. Recent research demonstrates however, that this taxonomic character has been overemphasized. For example, in the genus *Redonda* ADAMS & BERNARD (1981), subunci can vary between rudimentary and absent among the subspecies of *R. empetrus* (THIEME), and present in *R. bordoni* VILORIA & PYRCZ or absent in an undescribed, closely related species (VILORIA & PYRCZ in prep). *P. puma* has short subunci adhered to the ventral surface of tegumen, contrary to VILORIA (Ph.D.), who claims that subunci are absent in this species. It has a smooth ampulla and no dorsal process on the valvae, which is an unfrequent character in the *Pedaliodes* complex. Such a shape of the valvae is found in several smaller genera, including *Pherepedaliodes* and *Panyapedaliodes*, but also in some species belonging to *Pedaliodes sensu stricto* (PYRCZ 2004a). Strongly contorted, somewhat flattened, rather short aedeagus of *P. puma* is typical of *Pedaliodes sensu stricto*. Hindwing underside colour pattern is marble-like, without any prominent postdiscal band, nor ocellar elements, somewhat reminiscent of *Panyapedaliodes*. *P. puma* is however considerably larger than any species associated with *Panyapedaliodes*. It has a large forewing upperside scent patch made of darker androconial scales, but this character is extremely variable within the genus *Panyapedaliodes*, and indeed in *Pedaliodes sensu stricto*. The lack of androconial patches in such genera as *Altopedaliodes* and *Punapedaliodes* can be considered as an adaptation to windy conditions of their habitat, paramo grassland, where this kind of sexual signalling is functionally ineffective (see: PYRCZ 2004b, on this issue).

Reassuming, *P. puma* presents some atypical features for *Pedaliodes sensu stricto* - rudimentary subunci, thin and smooth ampulla, a marble-like HWV. However, the characters of adult morphology alone of the males of *Pedaliodes sensu lato* are too simple and not varied enough as to allow to associate them with confidence with the genera raised by FORSTER (1964). Their validity needs to be confirmed by additional characters from the early stages, female morphology and molecular data. The status of *P. puma* within the genus *Pedaliodes* is therefore provisionally reinstated.



1, 2. Adults (males, dorsum/venter): 1 - *Pedaliodes puma puma* (Carcel Punco, Puno), 2 - *Pedaliodes puma ernsti* (paratype)



3, 4. Male genitalia (aedeagus extracted in lateral (A) and dorsal (B) view): 3 - *Pedaliodes puma puma* (Carcel Punco, Puno), 4 - *Pedaliodes puma ernsti* (holotype)

***Pedaliodes puma puma* THIEME**

(Figs. 1, 3)

## MATERIAL EXAMINED

**BOLIVIA:** 1♂: La Paz [?], Cillutincara, 3000 m, I-1896, Garlepp, (genit. vial 9006 male, Lee D. Miller), [red label, LECTOTYPE of *Pedaliodes puma* Thieme, selected by Lee D. Miller, herein designated], ZMHB; 2♂♂: same data [red label, PARALECTOTYPES of *P. puma* Thieme, selected by A. Viloria, herein designated], ZMHB; **PERU:** 4♂♂: Carabaya, Limbani, 9500 ft., V-'04, G. Ockenden, (1 wing prep. A. Viloria), JB; 6♂♂, 1♀: same data, IV-'04, RB, BMNH; 1♂: same data, 10000', XI-'01, wet, BMNH; 1♂: SE. Peru, R, Inambari to Limbani, III-'04, (G. Ockenden), RB, BMNH; 3♂♂: Carabaya, Oconoque to Agualani, 6-9000 ft., III-'05, G. Ockenden, (1 genit. prep. ALV278-97), BMNH; 1♂: SE. Peru, Agualani, 10000 feet, G. Ockenden, JB, BMNH; 9♂♂: Puno, Carcel Punco, 2700-2750 m, IV.2005, J. Boettger *leg.*, (1 genit. prep. T. Pyrcz 02-07.XI.2005), TWP; 1♂: Depto. Puno, Carcel Punco, Nord de Limbani, 2700 m, J. Bottger *leg.*, PBPF; 2♂♂: Aquele, vallée de Limbani, Puno, 2200-2400m, J. Bottger *leg.*, PBPF; 1♂: Depto. Puno, Pacchani, Qda. Aquele, vallée de Limbani, 2200-2500 m, J. Bottger *leg.*, PBPF; 1♂: Depto. Puno, Carcel Punco, Agualani, 8 km nord de Limbani, 2500-2700 m, P. Boyer *leg.*, PBPF.

***Panyapedaliodes puma ernsti* ssp. nov.**

(Figs. 2, 4)

## DESCRIPTION

**MALE** (Fig. 2): Differs from the nominate subspecies as follows: Slightly smaller (FW length 28-29 mm, n=2; nominate: 28-30 mm, mean: 29.5 mm, n=9). Wing margins more undulated, particularly on the HW. FWD and HWD ground colour lighter, dark brown instead of blackish. FWV ground colour considerably lighter, medium brown instead of blackish brown; no trace of brick red brown suffusion covering the basal half, the entire discal cell and, in most examined individuals, spreading into postdiscal area in the nominate. HWV ground colour medium brown instead of blackish brown; lighter beige and whitish scaling more prominent. **MALE GENITALIA** (Fig. 4): Not differing noticeably from the nominate subspecies (Fig. 3). Observed differences such as the slightly more robust subuncus and wider valvae in the apical half are quantitative features and may prove to be individual variation.

**FEMALE:** Hitherto unknown.

## TYPE MATERIAL

**PERU:** HOLOTYPE ♂: Cuzco, Kosñipata Valley, Acjanaco – Pillcopata, Qda. Toccahuayco, 2700-2750 m, 24.V.2003, T. Pyrcz *leg.*, prep. genit. 03, 07.XI.2005, currently in MZUJ, to be deposited in MUSM; PARATYPE ♂: Cuzco, Kosñipata, via Pillcopata, 2500 m, II.1996, ex coll. E. Brockmann, TWP.

## ETYMOLOGY

This subspecies is dedicated to Ernst BROCKMANN, a German lepidopterist specialising in the HesperIIDae (Skippers).

## DISTRIBUTION

*P. puma* is not rare in the field but has a particularly narrow altitudinal range. All known individuals (bearing reliable data) were collected at 2500-2800 m asl. in high elevation cloud forests, some 300-400 m below timberline. Currently, the nominate subspecies is known to be distributed from the Bolivian Yungas de La Paz in the south to the valleys of the affluents of Huari Huari in the Peruvian department of Puno. Its southern distribution limit is an open issue, and possibly extends to the Yungas of Cochabamba. To the north, the nominate subspecies occurs as far as the valley of Ollachea. The new subspecies, *ernsti*, is known so far exclusively from the valley of Kosñipata but it probably occurs in faunistically similar, parallel valley of Marcapata (PYRCZ 2005). *P. puma* has not been found so far further north, in the well sampled valley of Urubamba and its tributaries, and considering the actual knowledge on the distribution patterns of south Peruvian Pronophilini, its presence there has to be considered unlikely (LAMAS 2003; PYRCZ 2005; PYRCZ & BOYER 2006).

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