

**A NEW CLOUD FOREST SPECIES OF *CALYDNA* (LEPIDOPTERA:
RIODINIDAE) FROM PERU, WITH A REVISED PHYLOGENY
FOR THE *C. HIRIA* GROUP**

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Abstract.—A new rioidinid species in the *Calydna hiria* group, *Calydna pichita*, n. sp., is described and illustrated from east Andean cloud forest in the central Peruvian department of Junín. A revised phylogeny for the *Calydna hiria* group is presented based on an analysis of twenty-one characters of adult morphology.

Key Words: Andes, *Calydna*, cladogram, cloud forest, Peru

The genus *Calydna* Doubleday, 1847, currently placed in the *incertae sedis* section (Harvey 1987) of the Riodininae, was recently characterized and revised by Hall (2002). It contains eighteen described species of small to medium-sized rioidinids with intricately marbled wing patterns that occur in a wide range of predominantly lowland habitats from northern Mexico to northern Argentina and southeastern Brazil. The existence of an additional undescribed species was noted by Hall (2002), but because the species was then known from only a single female, with damaged genital structures, it was not named. The recent *collection of additional material of this new species*, including males, from the same locality in the Peruvian Andes, now enables us to adequately describe and name it, and to determine more precisely its phylogenetic placement within the *Calydna hiria* group. A significant number of new rioidinid species continue to be discovered in montane and cloud forest habitats in the Andes (Salazar and Constantino 1993; Hall and Willmott 1995a, b, c, 1996, 1998a, b,

c, in press; Callaghan and Salazar 1997; Callaghan 1999; Hall and Lamas 2001; Hall and Harvey 2001, in press), but the new *Calydna* species described here is notable for being the only member of the genus to occur in such habitats.

***Calydna pichita* Hall and Lamas,
new species
(Figs. 1; 2A, B)**

Description.—Male: Forewing length 14 mm. Forewing costal margin approximately straight, distal margin slightly convex, apex slightly falcate; hindwing rounded, apex strongly falcate. *Dorsal surface:* Ground color of both wings black, with a wide-spread scattering of bluish gray scaling; discal cell of forewing with one small white spot in middle and one large white rectangle at end, with one small white spot at costa immediately distal to it, discal cell of hindwing with one large white rectangle at end that is medially indented ventrally, with a single small white spot above and below it; two vertical bands of black spots surrounded with reddish brown below discal

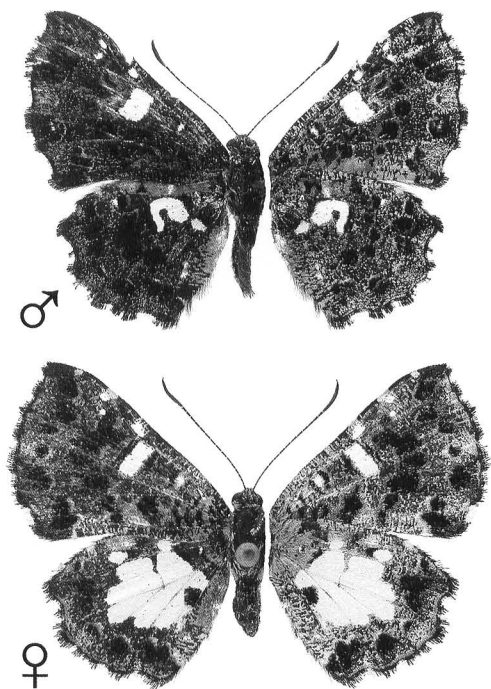


Fig. 1. Paratype male (top) and holotype female (bottom) of *Calydna pichita* (dorsal surface on left, ventral surface on right) from Mina Pichita, central Peru.

cell of forewing, and one such band postdiscally on both wings; two small white spots in subapex of forewing, one in subapex of hindwing; entire costal margin and middle of anal margin of hindwing reddish brown; submarginal spots on both wings black and fringed proximally with a narrow line of bluish gray; fringe on both wings checkered black and white. *Ventral surface:* Differs from dorsal surface as follows: ground color of both wings brown, with a more prominent scattering of pale gray scaling, black submarginal spots on both wings fringed proximally with a narrow line of pale gray and distally with a similar line of red, reddish scaling at costal and anal margins of hindwing absent.

Head: Eyes brown and bare, marginal scaling black and white; frons black with two broken horizontal white bands; first and second palpal segments black, third segment black with a few white scales; anten-

nal segments black with prominent white scaling at base, clubs black with orange tips.

Body: Dorsal surface of thorax and abdomen black, ventral surface brown with some whitish scaling, ventral tip of abdomen orange; all legs with alternating brown and whitish bands.

Genitalia (Fig. 2A): Uncus moderately elongate and rounded, falces relatively long and narrow; vinculum broadly continuous at anterior margin of tegumen, posteriorly swollen medially, and formed into a small saccus ventrally; aedeagus long and narrow, with a pointed tip and no cornuti, pedicel short and strap-like; valvae with a small rectangular basal section, a flat dorsum, a relatively weakly sclerotized transtilla, a posteriorly elongate and rectangular dorsal posterior section, and a ventral posterior corner that forms an approximately 90° angle.

Female: Differs from male as follows: forewing length 14.5 mm. Distal margin of forewing more convex. *Dorsal surface:* Ground color of both wings pale brown, with scattered yellow instead of bluish gray scaling; reddish brown on both wings slightly paler and more prominent, and visible around submarginal spots; pale markings on forewing cream instead of white, pale markings on hindwing pale yellow instead of white, and greatly expanded to form an almost continuous patch that includes an additional broad postdiscal area between cells Cu_2 and M_1 ; white fringe elements less prominent. *Ventral surface:* Same as dorsal surface except ground color of both wings paler brown, with a more prominent scattering of yellow scaling, some submarginal spots fringed proximally with yellow scaling, reddish scaling at costal and anal margins of hindwing absent.

Head: Scaling at eye margins yellowish; two broken horizontal bands on frons yellow instead of white; second and third palpal segments slightly more elongate, all segments a mixture of brown and yellow scaling.

Body: Thorax and abdomen dark brown dorsally and pale yellow ventrally, all legs with alternating brown and pale yellow bands.

Genitalia (Fig. 2B): Corpus bursae round, spinelike signa covered with raised nodules, asymmetrically positioned at wall of corpus bursae and different in shape, one with a narrow constriction before an up-turned tip and one with an abruptly downturned tip; ductus bursae narrow and membranous except for a small, sclerotized, ventral, rectangular plate immediately before ostium bursae; membranous ductus seminalis exits ductus bursae dorsally near anterior margin of sclerotized rectangle; ostium bursae consists of a membranous pouch with a narrow band of sclerotization along dorsal posterior margin.

Type material.—Holotype, ♀, PERU: *Junín*, 0–1 km S of Mina Pichita, 11°05'S 75°25'W, 2100 m, 12 Sept 2001 (G. Lamas) (Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru [MUSM]).

Paratypes, PERU: *Junín*, 1 ♂: same data as HT (MUSM); 1 ♀: 0–1 km. E. of Mina Pichita, Hacienda Naranjal, 2000 m, 18 Nov 1984 (G. Lamas & J. E. Pérez) (deposited in National Museum of Natural History, Smithsonian Institution, Washington, DC).

No additional specimens have been located in the major museums of Europe and North America (as listed in Hall 1999, 2002).

Etymology.—The species name is a feminine noun derived from the name of the type locality.

Diagnosis.—The male of *Calydna pichita* is very similar to that of the *hiria* group species *C. sturnula* (Geyer 1837), but it differs in its slightly larger size, and by having a slightly more rounded wing shape and a less falcate forewing apex. The male of the east Andean *C. pichita* additionally differs from males of the geographically variable *C. sturnula* from the neighboring western Amazon by having a more prominent scat-

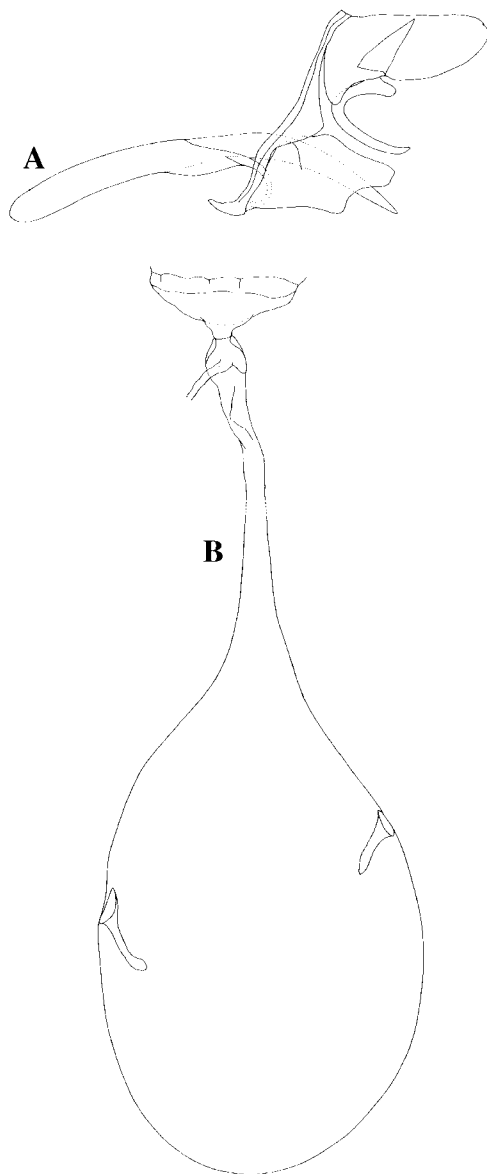


Fig. 2. Male genitalia of *Calydna pichita* in lateral view (A), and female genitalia in dorsal view (B).

tering of bluish gray scaling on both dorsal wings and pale gray scaling on both ventral wings, more prominent reddish brown scaling surrounding all black spots on both the dorsal and ventral wings, and a white rectangle in the discal cell of the hindwing that is medially indented ventrally. The male genitalia of *C. pichita* also differ little from

those of *C. sturnula*, but, in the single male genital example of *C. pichita* examined, the medial posterior projection of the vinculum is considerably larger.

The female of *C. pichita* is externally most similar to the females of the *hiria* group species *C. cea* Hewitson, 1859, and *C. sturnula*, but is readily distinguished by its larger size, rounded instead of falcate forewing tips, cream instead of white forewing markings, prominent scattering of yellow scaling on both ventral wings, and by the very large pale yellow patch occupying the middle of the hindwing. This last striking character is unique in *Calydna*, with no other species having a sizeable, pale hindwing patch. The female genitalia of *C. pichita* are essentially identical to those of *C. cea*.

Systematic position.—With the addition of *C. pichita* to *Calydna*, we take this opportunity to revise the phylogenetic hypothesis for the *Calydna hiria* group originally presented by Hall (2002). The monophyly of the *hiria* group, which now contains nine species, is well supported by the presence of well-defined dark and pale banding on the male hindlegs, crescent-shaped submarginal ocelli that have round black pupils, and patches of dense black androconial scales at the anterior margins of abdominal tergites six and seven, and the absence of the distal white element to the submarginal markings on both dorsal wings. A phylogenetic analysis, performed using the methods given by Hall (2002), included only the nine *hiria* group species, with *C. thersander* (Stoll 1780), from the very homogeneous, sister *thersander* group, as the outgroup taxon. Twenty-one characters of adult morphology were used from the appendages, wing shape and pattern, and male and female genitalia (see Tables 1 and 2). These predominantly consist of those characters in Hall (2002) (some of which have been slightly modified here) that were relevant to resolving *hiria* group relationships, but a small number of new characters were also included.

The heuristic search generated two most parsimonious cladograms with a length of 32 steps (consistency index = 0.75; retention index = 0.84). The strict consensus cladogram is shown in Fig. 3. This phylogenetic hypothesis differs from that presented by Hall (2002) in three ways. First, *C. carneia* Hewitson, 1859, now appears as the sister taxon to *C. catana* Hewitson, 1859 + *C. cabira* Hewitson, 1854, instead of forming part of an unresolved trichotomy with those two species and the clade *C. candace* Hewitson, 1859 + *C. hiria* (Godart [1824]). This is the result of character 16 in Hall (2002) being divided into two characters here (7 and 8), to allow the absence/presence of a particular wing pattern trait to be coded for each sex separately. Second, the added *C. pichita* is positioned as the sister species to *C. cea*, because both species uniquely possess female genital signa that are of different shapes (character 20) and positioned asymmetrically at the wall of the corpus bursae (character 19). The great similarities between the males of *C. pichita* and *C. sturnula* appear to be plesiomorphies. Third, as a result of adding *C. pichita*, the phylogenetic position of *C. sturnula* has become uncertain. Although *C. sturnula* shares several symplesiomorphies with *C. pichita* and *C. cea* (characters 11, 13 and 14), no synapomorphies of adult morphology could be found to unite *C. sturnula* either with these two species or the remaining *hiria* group clade. It is possible that *C. sturnula* is the most basal species in the *hiria* group.

Biology.—*Calydna pichita* is unique within the genus in being confined to cloud forest, where it is currently known from about 2000 to 2100 m. This is near the upper elevational limit of the Riodinidae, and 600 m above the highest elevation of any other *Calydna* species (*sturnula*). The male was collected at mid-morning perching on top of a leaf ca. 2.5 m above the ground in a sunny area inside a patch of cloud forest. The female holotype was captured in mid-

Table 1. List of characters used in the phylogenetic analysis of the *Calydna hiria* group. Most characters are from Hall (2002), but with many modified for a *hiria* group only analysis; new characters are marked with an asterisk.

Appendages

1. *Scaling at eye margins*: (0) mottled black and white; (1) entirely black. CI = 1; RI = 1.
2. *Male frons*: (0) black with one or two pale, broken, horizontal bands; (1) black. CI = 1; RI = 1.
3. *Male forelegs*: (0) with multiple pale and dark bands; (1) black. CI = 0.5; RI = 0.67.

Wing shape and pattern

4. *Falcate forewing apex in male*: (0) present; (1) absent. CI = 1; RI = 1.
5. *A pale bar extending across entire width of forewing discal cell end in male*: (0) present; (1) absent. CI = 1; RI = 1.
6. *Two prominent white spots immediately distal to forewing discal cell end in male*: (0) present; (1) absent. CI = 0.5; RI = 0.5.

Note that although the vast majority of male *C. cea* specimens exhibit character state (1), a very few exhibit character state (0).

7. **A large pale block in forewing cell Cu₁ of male*: (0) absent; (1) present. CI = 1; RI = 1.
8. **A large pale block in forewing cell Cu₁ of female*: (0) absent; (1) present. CI = 1; RI = 1.
9. *Two prominent white subapical spots on forewing of male*: (0) present; (1) absent. CI = 0.5; RI = 0.75.
10. *White fringe element in forewing cell M₃ of male*: (0) considerably longer than fringe elements in adjacent cells; (1) approximately same length as fringe elements in adjacent cells. CI = 0.5; RI = 0.67.
11. *Reddish brown at costal and anal margins of dorsal hindwing in male*: (0) present; (1) absent. CI = 1; RI = 1.
12. *A large white block in discal cell of hindwing in male*: (0) absent; (1) present. CI = 0.25; RI = 0.
13. *Variably prominent blue to bluish-gray scaling at distal margin of dorsal hindwing in male*: (0) present; (1) absent. CI = 1; RI = 1.
14. *White fringe elements in hindwing cells M₂ and M₁ in male*: (0) considerably longer than intervening black section; (1) approximately same length as intervening black section. CI = 1; RI = 1.

Male genitalia

15. *Medial upward kink in pedicel, which recontacts aedeagus*: (0) absent; (1) present. CI = 0.5; RI = 0.67.
16. *Dorsal portion of valvae*: (0) straight to convex; (1) concave. CI = 1; RI = 1.

Female genitalia

17. *Signa*: (0) long, narrow and spinelike; (1) large and approximately rectangular; (2) very long, wide and spinelike; (3) small and triangular; (4) short, narrow and spinelike. CI = 1; RI = 1.
18. *Nodules or spines over surface of signal invagination*: (0) present; (1) absent. CI = 1; RI = 1.
19. **Signa positioned*: (0) symmetrically; (1) asymmetrically. CI = 1; RI = 1.
20. **Shape of signa*: (0) same; (1) different. CI = 1; RI = 1.
21. *Region between eighth tergite and papillae anales*: (0) short; (1) elongate. CI = 1; RI = 1.

Table 2. Character matrix for the phylogenetic analysis.

Taxon	5	10	15	20
<i>thersander</i>	0	0	0	0
<i>cea</i>	0	0	1	0
<i>pichita</i>	0	0	0	0
<i>sturnula</i>	0	0	0	0
<i>micra</i>	0	0	0	0
<i>candace</i>	1	1	1	1
<i>hiria</i>	1	1	1	1
<i>carneia</i>	1	1	1	1
<i>catana</i>	1	1	1	1
<i>cabira</i>	1	1	1	1

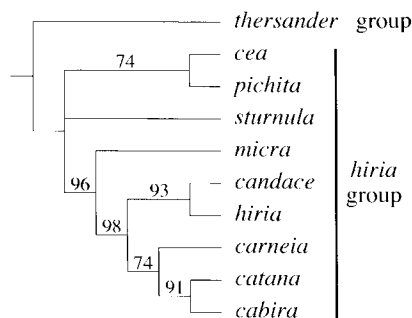


Fig. 3. Phylogenetic hypothesis for the *Calydna hiria* group, revised from Hall (2002) to include *C. pichita*, with bootstrap values above branches.

afternoon of the same day at almost the same spot, while resting under a leaf.

Distribution.—This species is currently known only from the type locality in the central-eastern Peruvian Andes, but it is presumably more widespread along the central Andes.

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