

A new species of *Nasusina* Pearsall from Colorado (Lepidoptera: Geometridae: Eupitheciini)

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Abstract

Nasusina vallis, new species, is described from Mesa Co., Colorado and compared with its apparent closest relative *Nasusina inferior* Hulst. The adults and male and female genitalia of both species are illustrated, along with pertinent head and leg structures.

Key words: *Nasusina vallis*, *Nasusina inferior*, Colorado, Eupitheciini, Geometridae, taxonomy

Introduction

Moth collecting in John Brown Canyon, Mesa Co., Colorado by UV-fluorescent-light traps during the night of 23 May 2003 yielded a series of 56 specimens of a *Nasusina* species not familiar to the author. Subsequent dissection of individuals of both sexes and comparison of genitalic preparations with the illustrations in McDunnough (1949) indicated that the moths were an undescribed species. To confirm this conclusion, examples of the two species, *N. inferior* (Hulst) and *N. vaporata* (Pearsall), that have male genitalia features closest to the new moth, were obtained from a colleague, Ron Leuschner, in California. In size, habitus, and genitalic characters, *N. vaporata* was found to be quite different from the new species. Although there are some superficial similarities to *N. inferior* in terms of size and maculation, genitalic characters of the new species immediately separate it. The biology of the new species is unknown. A general description of *N. inferior* is provided for comparison purposes prior to the diagnosis and description of *N. vallis*.

The diameter of the aedoeagus in males of the genus *Nasusina* is extremely small in comparison to that in most of the species in the associated genera *Eupithecia* Curtis and *Prorella* Barnes and McDunnough, which precludes insertion of the usual 33 gauge or

larger hypodermic needle to evert and inflate the vesica following maceration in 10% KOH to soften and clear the tissues. Because the sheath is also very fragile and tears easily, it was not possible to evert the vesica with a custom made 36 gauge needle. The partially incomplete vesica eversions shown in Figs. 12 and 16 were produced by means of fine-tipped forceps and small dissection needles to tease the membranes from the sheaths.

Two stains were used to enhance genitalic features: chlorazole black E (bluish) and ponceau S (red).

All of the images were taken with a Fuji S1 Fine Pix Pro digital SLR camera. The genitalic, head, and leg images were taken through an Olympus SZ60 stereo-zoom microscope with the Fuji camera body attached to the microscope photo tube. Post processing of all of the images was done in Adobe Photoshop® 5.5.

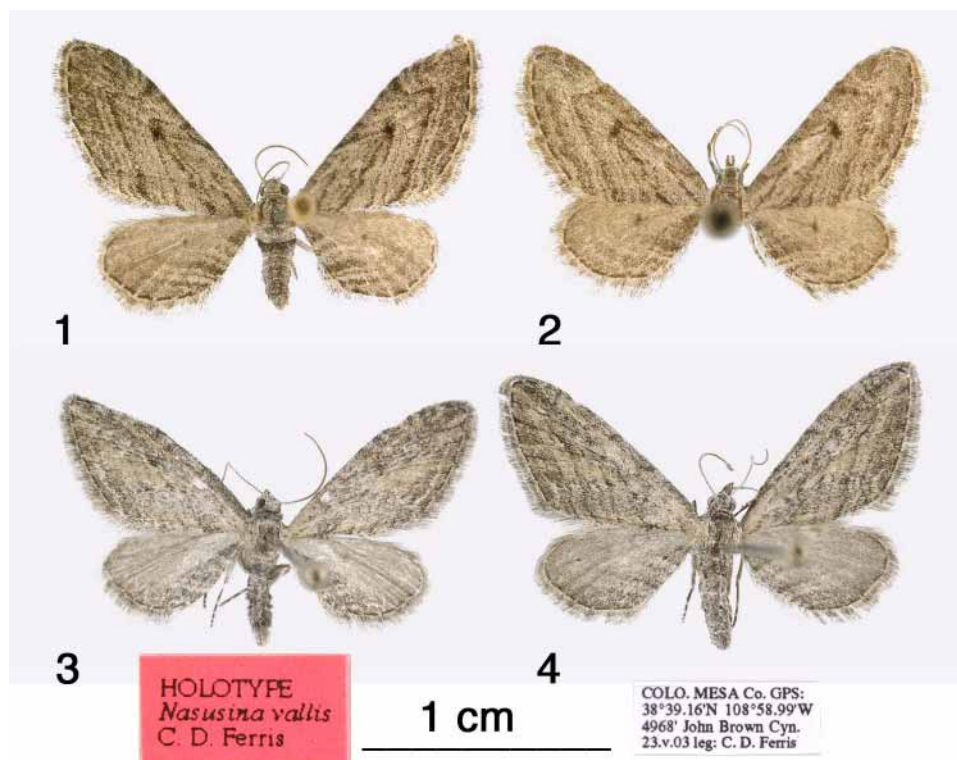
Nasusina inferior Hulst

(Figs. 1–2, 9–13, 21)

Gymnocelis inferior Hulst, 1896:264. *Nasusina inferior*, Barnes and McDunnough, 1918:141; pl. 25 fig. 7 adult.—Complete diagnosis and description by McDunnough, 1949:688–89; fig. 12 adult; fig. 19A male and female genitalia.

General description of pertinent characters: *Forewing length* (base to apex): 9–10 mm. *Head:* The male antennae are finely and evenly ciliate, the palpi are short and bushy. *Body:* Abdominal segment II has a black band (both sexes). *Wings* (both sexes): Forewing light smoky brown in color, moderately narrow with pointed apex; the discal dot is prominent. Numerous fine cross lines exist, which are sharply angled below the costa, thence oblique inwardly and essentially parallel to the outer margin until intersection with the inner margin. A pale and irregular st. line traverses the darker marginal area. The hindwings are slightly paler than the forewings and marked by numerous darker lines and bands of varying widths (Figs. 1–2). **Male genitalia** (Figs. 9–13) [4 specimens dissected]: Hair pencils on abdominal segment IX well developed (not illustrated). Ventral plate (eighth sternite) on abdominal segment VIII is partially bifurcated distally and tapers from base to apex. McDunnough (1949:689) described the aedoeagus as follows: “Vesica armed with two small, dentate, apically situated pieces of chitin [arrows in Fig. 11a, b] and a long, twisted piece down the left side, more or less attached to an obscure end piece; a spiculate band runs through the center of the apical half.” **Female genitalia** (Fig. 21) [4 specimens dissected]: McDunnough described the corpus bursae as either sack shaped or almost globular depending upon the degree of inflation. In ventral view, the ductus seminalis arises proximally on the right side and curves clockwise over the front of the corpus bursae. At the base of the ductus bursae there is a narrow band of robust spines; otherwise the proximal portion of the bursa is membranous and slightly strigate. Most of the lower portion is covered dorsally and ventrally by two large spinose patches, separated by nar-

row membranous bands on either side and at the fundus. The spines in these patches are long and well developed proximally, but diminish in size gradually toward the fundus.



FIGURES 1–4. Adults. 1, *Nasusina inferior*, male, California, Los Angeles Co. Pasadena-Eaton-Canyon; 2, *N. inferior*, female, California, Lake Co. Cobb Mtn., Anderson Springs; 3, *N. vallis*, male, **Holotype**, Colorado, Mesa Co. John Brown Canyon; 4, *N. vallis*, female, paratype, Colorado, Mesa Co. John Brown Canyon.

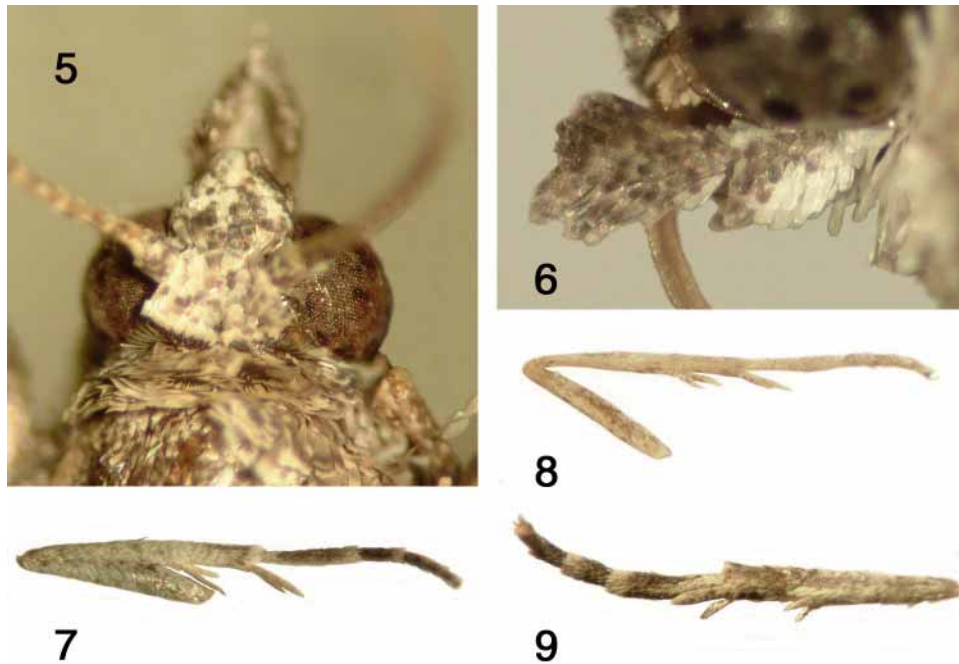
Type material. Holotype male in collection of Rutgers University, New Brunswick, New Jersey. Type Locality: California.

Material Examined. All specimens collected by R. A. Leuschner. **CALIFORNIA:** LAKE CO. Anderson Springs, Cobb Mtn., 20 May, 1955 (2♀). LOS ANGELES CO. Mt. Lowe, 25 May, 1957 (1♀); Pasadena-Eaton Canyon, 23 March, 1984 (1♂); Red Box Station on Angeles Crest Highway, 29 April, 1979 (1♂). RIVERSIDE CO. Aguanga, 25 April, 1993 (1♂); Pinyon Flats above Palm Desert, 14 April, 1962 (1♂) SAN BERNARDINO CO. 4 mi. S. Big Bear City, 26–28 June, 1998 (1♂); Crestline near Lake Arrowhead, 24 April, 1965 (1♀). SAN LUIS OBISPO CO. Morro Bay, 2 April, 1960 (1♂).

Biology. Unknown.

Flight period. March through June, based on material in the author's collection.

Distribution. Southern California.



FIGURES 5–9. Adult structures. 5, *Nasusina vallis*, male, head and frons, dorsal view; 6, *N. vallis*, male, labial palpus; 7, *N. vallis*, male, leg showing hind tibial spurs; 8, *N. vaporata*, male, leg showing hind tibial spurs; 9, *N. inferior*, male, leg showing hind tibial spurs.

Nasusina vallis New Species

(Figs. 3–7, 14–20)

Diagnosis. The forewings of *N. vallis* are light smoky gray as opposed to the light smoky brown of *inferior*, and there is only a very slight suggestion of the discal dot that is prominent in *inferior*. The ventral plate in males of *vallis*, often visible without dissection by brushing away the abdominal scales, displays flared tips and an expanded base, as opposed to pointed tips and gently tapered base in *inferior*. The two tips are smooth, and not strongly chitonized and formed into needles as in *E. annulata* Hulst.

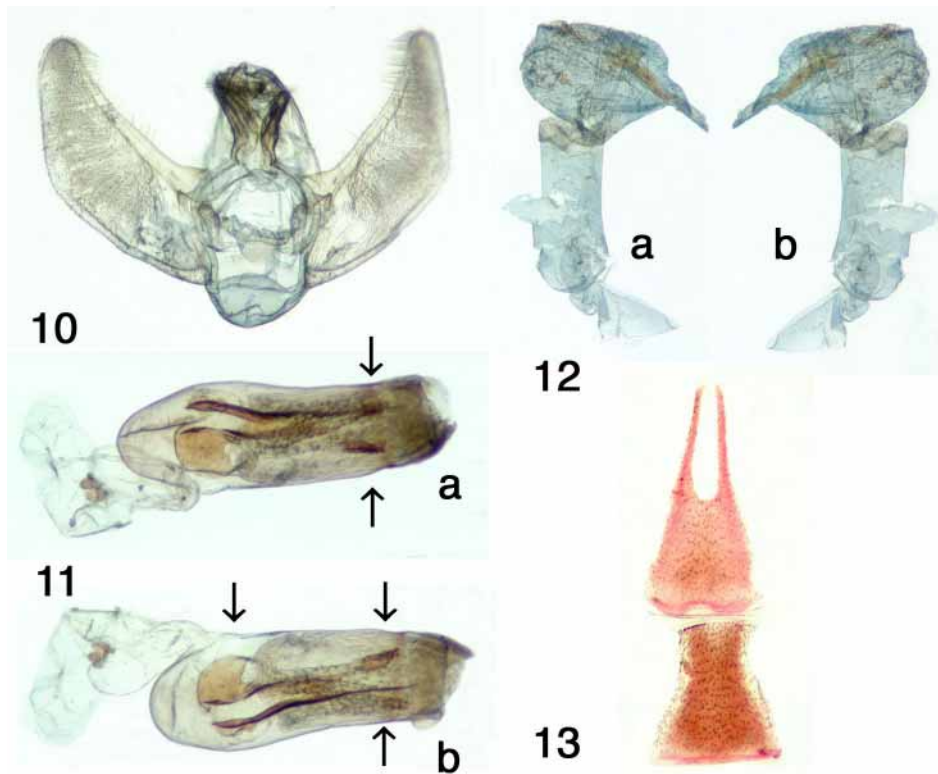
Description. **MALES** (Fig. 1): *Forewing length* (base to apex): 9–10 mm, mean = 9.3 mm; holotype = 9 mm. *Head* (Fig. 5): *Nasusina*-type; frons vertically truncate, clothed with appressed scales, mostly very pale gray with speckling of brownish-gray; short, bushy, brownish-gray labial palpus approximately as long as eye width (Fig. 6); antennae weakly and evenly ciliate, with alternately brown and pale gray segments. *Body*: Thorax, abdomen, and legs covered with mixture of pale gray and brownish scales. Ventral surface of the abdomen paler than the dorsal surface, with suggestion of dark band on segment II. Upper hind tibial pair of spurs slightly reduced in size over the lower pair (Fig. 7), consistent with the genus. *Wings*: Forewing light smoky gray, moderately narrow with pointed

apex with only very slight suggestion of discal dot. Numerous fine cross lines, slightly curved below the costa, thence extending oblique inwardly and essentially parallel to the outer margin until they intersect the inner margin. Narrow pale band, whose width varies across individuals, just distad from the poorly defined pm. line, extending from apex to inner margin and essentially parallel to the outer margin. In very fresh specimens, color of latter band pale brownish or tawny because of overlying diffuse pale brown scales, which apparently slough off during the flight period. Same coloration basally and in central areas of wing where maculation is reduced. In most individuals, a very narrow, pale, and weakly defined st. line. Fringes pale-tipped and inwardly peppered with mixture of white and dark scales that produces a weak checkered aspect. Hindwings slightly paler than forewings only because more lightly maculated; marked by numerous darker lines and bands of varying widths without discal dark spot. Fringes as in the forewings, but less peppered with dark scales (Fig. 3). Wings ventrally uniformly gray with very slight suggestion of forewing discal spot and slight repetition of darker dorsal striations. **Male genitalia** (Figs. 14–19) [6 specimens dissected; the holotype was not dissected, but only checked to verify species by lightly brushing the eighth sternite]: Hair pencils on abdominal segment IX poorly developed (not illustrated); eighth sternite partially bifurcated distally, tapering from base to apex; apically the two tines are expanded, but no more sclerotized than other portions (Fig. 18); uncus short, bifid, with lower tine slightly broader and more rounded apically than upper tine (Fig. 19); valva (length 2.6 X width) medially broad, with smooth ventral margin, tapering to rounded apex (Fig. 14); saccus rounded; transitilla typical of other members of the genus; aedoeagus about 90% the valve length and 30% as wide as long. Vesica armed with seven sclerites (Figs. 15–17): three roughly oval dentate pieces; one larger elongate ovoid dentate piece; a small, smooth, curved piece; a smooth shovel-like plate; a smooth disc. *N. vallis* is immediately recognized by the chitonized disc located in the aedoeagus at the entrance of the ductus ejaculatorius (arrows Figs. 15, 17). A small curved sclerite lies just above the disc.

FEMALES (Fig. 4): *Forewing length* (base to apex): 8.5–10 mm, mean = 9.2 mm. Maculation of wings and characters of head, thorax, body, and legs generally as in male; antenna slightly setose (as in *N. inferior*). **Female genitalia** (Fig. 20) [5 specimens dissected]: Ovipositor lobes broad, rounded, moderately setose; anterior apophyses very long and moderately wide; posterior apophyses of normal length; caudal spur short, terminating on the laterocephalic edge of the ventral plate; ventral plate very lightly shagreened centrally; ostium bursae a broad irregularly shaped membranous funnel and very finely shagreened dorsally; ductus bursae short, terminating in a well developed and rounded colliculum. Corpus bursae: nearly globular; encircled by a narrow band of moderately robust spines at the base of the ductus bursae; most of remaining surface covered by spines with open areas below the upper narrow band and on right and left sides; spines long and well developed proximally, while toward the fundus, they become more diffuse and directed inwardly, producing star-like patterns on membrane surface. Ductus seminalis arises prox-

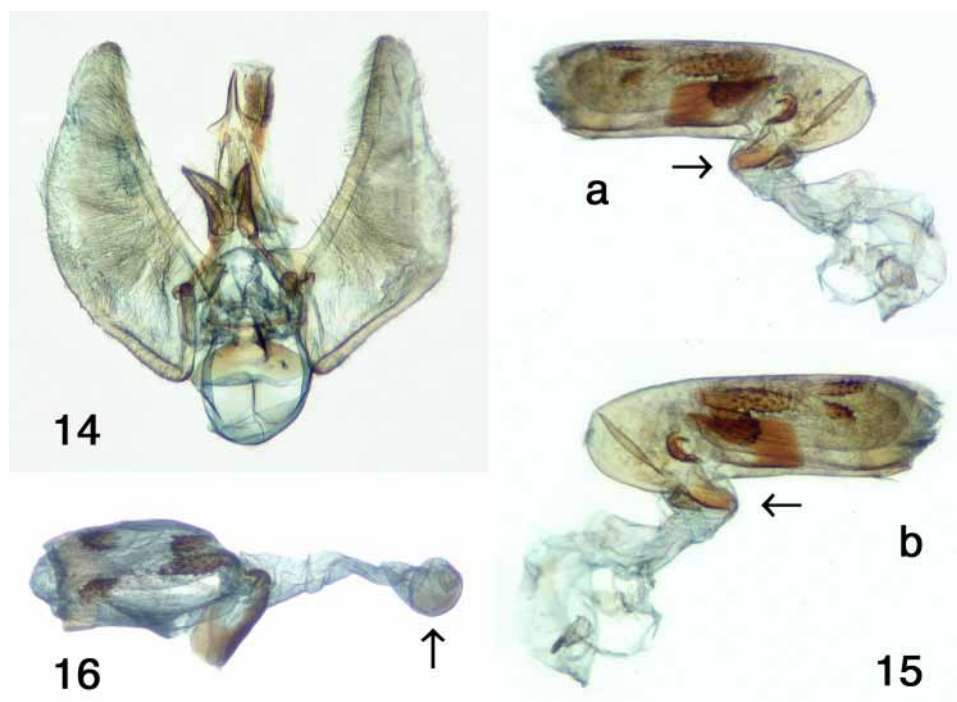
imally, as a broad membranous tube, on right side and curves clockwise over the front of corpus bursae, as in *N. inferior*.

Type material. Holotype male and paratype female to be deposited in USNM. Additional paratypes (15♂, 40♀) to be deposited in other public museums and in the collection of the author. All specimens from the type locality, John Brown Canyon, S. of Gateway, Mesa Co., Colorado; GPS: 38° 39.16'N, 108° 58.99'W, 1515 m, 23 May 2003.

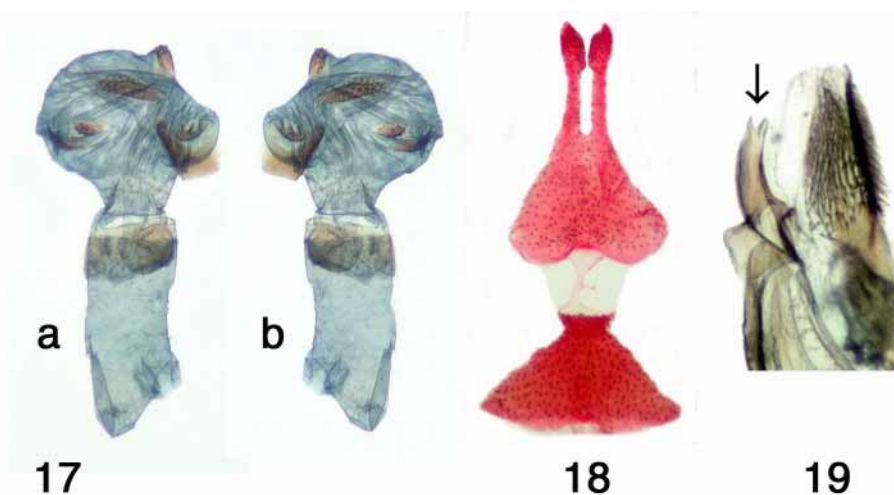


FIGURES 10-13. Male genital structures of *Nasusina inferior*. 10, genitalia less aedeagus; 11 a, b, lateral views of aedeagus (arrows point to sclerites described in text); 12, a, b lateral views of incompletely everted and uninflated vesica; 13, 7th and 8th (top) abdominal sternites (digitally enhanced image).

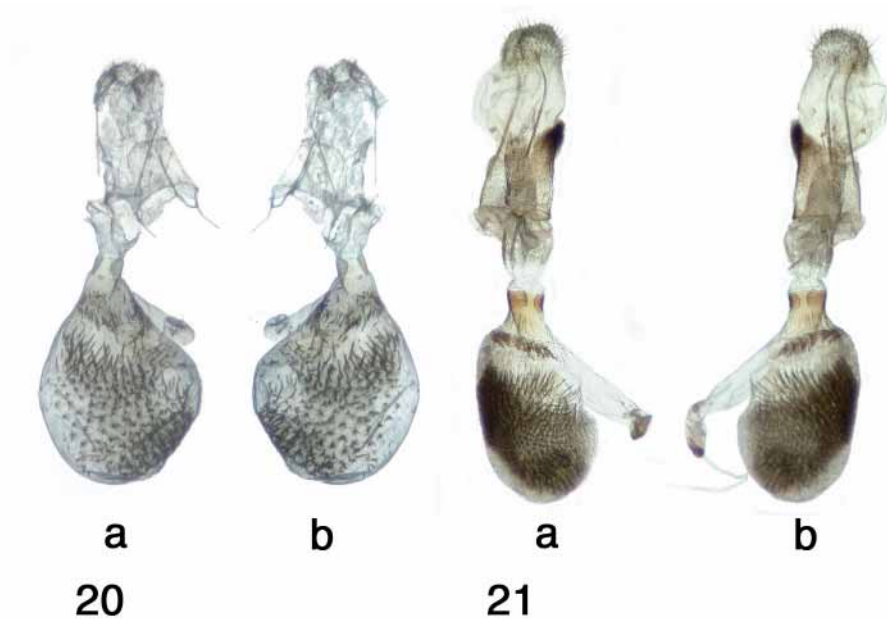
Biology. Unknown. The type locality is located in an arid region of mesas and canyons. Fig. 22 is a general view of the type locality habitat on 23 May, 2003, and Fig. 23 shows the intermittent stream that lies behind and below the trees shown in Fig. 22. Vegetation includes *Acer negundo* L., *Juniperus* sp., *Pinus edulis* Engelman, *Populus* sp., *Quercus gambelii* Nuttall, *Artemisia* sp., *Ericameria* sp., *Lupinus* sp., *Ribes* sp., *Yucca* sp., various other woody and herbaceous plants, and grasses.



FIGURES 14–16. Male genital structures of *Nasusina vallis*. 14, genitalia less aedeagus; 15 a, b, lateral views of aedeagus (arrows point to sclerotized disc at entrance of ductus ejaculatorius); 16, vesica extracted from sheath of aedeagus (arrows point to sclerotized disc at entrance of ductus ejaculatorius).



FIGURES 17–19. Male genital structures of *Nasusina vallis*. 17, a, b lateral views of incompletely everted and uninflated vesica; 18, 7th and 8th (top) abdominal sternites (digitally enhanced image); 19, bifid uncus (arrow).



FIGURES 20-21. Female genitalia. 20, *Nasusina vallis*, a, ventral view, b, dorsal view; 21, *N. inferior*, a, ventral view, b, dorsal view.



FIGURES 22-23. John Brown Canyon type locality on 23 May, 2003. 21, general view from primitive road; 23, intermittent stream that lies below and parallel to the road.

Flight period. Probably mid to late May; perhaps variable on an annual basis subject to environmental conditions. Considering the worn condition of the males and preponderance of females, the first appearance of males was projected to be about 15 May, 2003.

Distribution. Presently known only from the type locality.

Etymology. The epithet *vallis* is derived from the Latin feminine noun meaning valley to reflect the narrow canyon habitat of this species. There is no Latin word for canyon.

Variation. In addition to the variation in forewing length, the forewing dorsal discal spot varies from absent to a small point consisting of from six to twelve black scales (typically); otherwise there is little discernible variation in habitus.

Discussion. As has been noted previously by McDunnough (1949), the separation of *Nasusina* into a genus distinct from *Eupithecia* is tenuous and based upon very weak characters: reduction in size of the upper pair of hind tibial spurs; frons bulging, usually truncate vertically, and clothed in closely appressed scales. Within the genus *Eupithecia* (*s.s.*) there is some variation in size of the hind tibial spurs. The range of variation within *Nasusina* is extensive as is shown in Figs. 8 (*vaporata*) and 9 (*inferior*). In many specimens of *N. minuta* (Hulst) (not illustrated), the upper pair of spurs is often vestigial at best. McDunnough recognized four species of *Nasusina*, and the most recent catalog of the World Geometridae by Scoble (1999) lists the same four species (page 622). I have elected to place *vallis* in *Nasusina* because of the similarity to other members of the genus in the general form of the genitalia in both sexes and the habitus of the adults. The habitat is also consistent with other *Nasusina* species.

Acknowledgements

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