

AMERICAN MUSEUM *Novitates*

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N.Y. 10024
Number 3020, 14 pp., 29 figures
September 10, 1991

The *Eupithecia* (Lepidoptera, Geometridae) of Chile. II.

FREDERICK H. RINDGE¹

ABSTRACT

The present paper is a supplement to my 1987 revision of the genus *Eupithecia* in Chile. With the description of seven new species herein (*arauco*, *bandurriasae*, *concepcion*, *coquimbo*, *elquiensis*, *guayacanae*, and *juntasae*) the total number of species known from that country is now 50. Of

these, three are endemic to the Juan Fernandez Islands, while the remaining 47 are endemic to the mainland of Chile. Additional distributional data are presented for four taxa, and morphological information is given to supplement my earlier descriptions of four species.

INTRODUCTION

When writing my earlier paper on the *Eupithecia* of Chile (Rindge, 1987) I was under no illusions that it would be the definitive work on this large and difficult genus from that country. The statement was made (p. 272) that "much collecting still needs to be done in Chile, not only to obtain adequate material, but to enable us to get a better idea on the distribution of the taxa that occur there." More collecting has been done, with the addition of more specimens of *Eupithecia* in the collection of the American Museum of Natural History (AMNH). The present paper

summarizes the new information from this material.

Seven new species are described (*arauco*, *banduriassae*, *concepcion*, *coquimbo*, *elquiensis*, *guayacanae*, and *juntasae*), bringing the total number known to 50. Of these, three are endemic to the Juan Fernandez Islands, while the remaining 47 are endemic to the mainland of Chile. Additional distributional data are presented for four taxa, and morphological information is given to supplement my earlier descriptions of four species.

¹ Curator Emeritus, Department of Entomology, American Museum of Natural History.

My thanks go to Mr. Louis Sorkin, of the Department of Entomology, for help with the Olympus BH2 photomicrographic system. I took all the photomicrographs with this, and used a Polaroid MP-3 camera for the moths themselves.

I am also grateful to K. B. Bolte, W. C. McGuffin, and R. S. Peigler for reviewing the manuscript and offering suggestions for its improvement.

MATERIALS AND METHODS

The information presented in this paper is based on moths in the collection of the AMNH. As complete sections on Materials and Methods, and Characters, were given in my earlier paper, that information will not be repeated here, with the exception of a few points that should be stressed.

I reiterate the importance of the male antennae in defining species; many taxa can be recognized by the conformation of this structure. It is strongly recommended that anyone studying males clear and mount an antenna so that it can be studied under a microscope; I routinely mount an antenna on the same slide with the abdomen and genitalia from the same adult.

The revisionary publication of the *Eupithecia* of Canada (Bolte, 1990) makes it possible to do a superficial comparison of some of the external morphological characters of this genus as found in that country and in Chile. The male and female genitalia do not lend themselves to an easy analysis, due to the complexity and variability of these structures, and so are not included.

One obvious difference is the much greater variability found in the southern group, as there are no Canadian species with pectinate antennae. Whereas the northern group has a few species with trifasciculate or distinctly bifasciculate antennae, the great majority have the lower surface basically setose; only a relatively few of the Chilean species have what might be called setose antennae. The eighth sternite, or ventral plate, can be roughly segregated into three basic groups. In one, the lateral pieces are widely separated and are not united anteromedially (Rindge, 1987: figs. 75–78; this paper, fig. 9); a second has long, slender lateral arms but with a median attachment (Bolte, 1990: figs. 228e–247e); and the

third has a median rod, with the posterior end variably shaped (Rindge, 1987: figs. 79–106; this paper, figs. 10, 11; Bolte, 1990: figs. 248e–286e). The first group is found only in the Chilean species; the second is restricted to Canada; and the third occurs in both faunas, as it is the predominant type in both areas.

Whenever possible I designate males as the holotypes of the new species, notwithstanding the often worn and almost scaleless condition of the wings. My reason for this is that males have more characters that can be used for identification, as the antennae and ventral plates have good specific characters which are not present in the females. In addition, the male genitalia are more complex than are the corresponding female structures, and thus usually offer more characters.

The locality information is as given on the specimen labels; all of these refer to the old provinces rather than to the present-day regions, areas, and their (sometimes renamed and redrawn) provinces. It is my feeling that the above data are not only better known to non-Chileans but are more liable to be found on most maps and atlases and therefore should be relatively easy to locate. The distributional data for each species, insofar as is known, are summarized in a paragraph on Distribution. In these sections, the new regions have been utilized, with the revised provinces given in parentheses; they are listed from north to south for each species. The source for the new political terminology is in Davis (1986: map 1), who also gives and defines the major biotic provinces for Chile (1986: 4–15, map 2). I have listed these faunal areas in the information given in my Distribution paragraph, using Davis as the source.

SYSTEMATIC DESCRIPTIONS

Genus *Eupithecia* Curtis

Eupithecia Curtis, 1825: 24. Rindge, 1987: 269–363, 199 figs. (See this reference for comments on the literature and for generic synonymies for Chile.)

In my 1987 paper I subdivided the *Eupithecia* of Chile into two sections; the second of these was subdivided into four groups. This approach avoided proposing new generic or

subgeneric names in a genus already overloaded with them. The two sections are recognized by the nature of the sclerotization of segment VIII of the male abdomen. Section 1 is a small group of presumably monophyletic species. Section 2 is a much larger group of species that have more diverse structures overall, but similar male abdominal characters. Section 2 is subdivided into four groups, based primarily on the nature of the female genitalia. The same system is followed in this paper; the appropriate sections and groups are defined in the text.

SECTION 1

The males are characterized by having the tergite of abdominal segment VIII fully sclerotized; by the ventral plate of the same segment having each lateral piece separate, not united anteriorly by a sclerotized strip; by the vesica having two separate (anterior and posterior) sclerotized pieces; by the valves being simple, elongate, and narrow; and by the uncus terminating in a long, slender point. The females have each bursa copulatrix with longitudinal striations for part or most of its length, which are with or without some inwardly pointing teeth; the ostium bursae is membranous and funnel shaped; and there is no separate ductus bursae.

The male antennae are either ciliate or setose; the segments (when viewed laterally) vary from having the ventral margin more or less flat to having the posterior two-thirds broadly enlarged, with or without setal-bearing lobes; there is usually a small, round area laterally on each side of the segments, clearly defined and having an irregular surface, but occasionally greatly reduced or absent. The eyes of the females are smaller than those of the males. The palpi project beyond the front margin of the eyes from 1.0 to 1.3 times the diameter of the eyes (males) to 1.5 to 2.0 times (females).

Eupithecia seatacama Rindge

Figures 14, 15

Eupithecia seatacama Rindge, 1987: 287, figs. 4, 52, 78, 110.

This species was described from a single male; the type locality is El Convento, Santiago Province, Chile, with the specimen hav-

ing been caught in October. A female has come to hand from Cuesta Pajonales, 1100 m, Atacama Province, Chile, Sept. 27–28, 1989 (L. E. Peña), which belongs to this species. The type locality is in the Region of Valparaíso (San Antonio Province); I was unable to definitely place it in either the Coquimban Desert or the Central Coastal Cordillera Biotic Province. The present female is from the Region of Atacama (Copiapó Province), which may be in the Intermediate Desert Biotic Province.

Palpi pale grayish brown, with a few scattered dark brown scales dorsally and distally. Female palpi extending beyond front of eyes a distance equal to 1.5 times diameter of eyes or 1.0 mm. This reading is rather larger than that for the holotype, but the latter has mostly denuded palps; a better preserved male will probably have slightly longer palpal measurements than does the holotype.

Female genitalia (figs. 14, 15) with elongate bursa copulatrix, tapered posteriorly, medially with parallel sides, anterior end rounded, posterior half with widely spaced longitudinal striations, without inwardly pointing teeth. Ductus seminalis arising on right side from smooth area extending from posterior end of bursa to rounded swelling about one-third length of bursa, ductus directed ventro-posteriorly, then curved dorsoposteriorly.

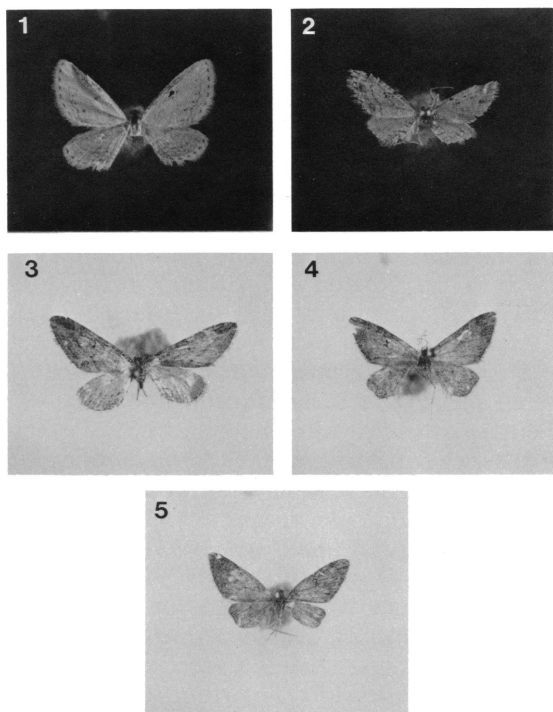
The female structures differ from the other known ones in Section 1 by having a parallel-sided bursa copulatrix with nondentate longitudinal striations. In these details it is most similar to *osornoensis* Rindge, but the bursa of that species is wedge-shaped, and the ductus seminalis arises from a larger projection.

Eupithecia guayacanae, new species

Figures 1, 6, 7, 9, 12

DIAGNOSIS: This species is recognized by the milky white color of the upper surface of the wings, which have greatly reduced maculation. The milky white palpi of the male are 1.15 times the diameter of the eye, extending 0.66 mm in front of the eyes. The ventral plate has each part narrowed apically and curved medially. The male genitalia have a long, evenly tapering uncus. (The females have not been examined.)

DESCRIPTION: *Adult:* Head with palpi milky white, with a very faint pale brown tint; palpi



Figs. 1–5. Holotypes of *Eupithecia*. 1. *E. guayacanae*, n. sp. 2. *E. elquiensis*, n. sp. 3. *E. coquimbo*, n. sp. 4. *E. concepcion*, n. sp. 5. *E. arauco*, n. sp.

extending beyond front margin of eyes by 1.15 times diameter of eyes, or 0.66 mm (male). Antennae of male (figs. 6, 7) with ventral margin flat, ciliate; small, round, lateral areas obsolescent or absent; segments with sparse lateral setae; terminal two-thirds with each segment having single, short, thick seta dorsally at posterior end.

Upper surface of wings (fig. 1): Forewings broadly triangular; unicolorous milky white, with greatly reduced maculation; costa broadly grayish brown, narrowing distally; discal dot small, grayish brown; very faint cross lines indicated between discal dot and partial, geminate t. p. line; latter represented by a few grayish brown scales on veins in lower half of wing on inner side, more complete on outer; terminal line a series of dark brown intravenular marks. Hind wings concolorous with forewings, and having a series

of faint cross lines; discal dot absent; terminal line as on forewings.

Under surface of wings: Forewings white, evenly covered with very pale grayish brown scales, shiny; maculation obsolescent except for terminal line. Hind wings white, with fewer dark scales, not shiny; maculation obsolescent.

Length of forewings: Holotype, male, 10.0 mm.

Segment VIII (fig. 9): Ventral plate with each lateral piece slightly swollen beyond middle, apically narrowed and pointed, lightly sclerotized, and curved medially.

Male genitalia (fig. 12): Uncus elongate, sides evenly tapered. Anellus ovoid, with relatively short arms. Valves broad basally, tapering to elongate apex. Vesica with poorly defined, apparently slender, sclerotized pieces.

Female genitalia: Unknown.

TYPE: Holotype, male, Guayacán, Santiago, Chile, Oct. 1952 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 19,743A, and one antenna and set of legs on FHR 19,743B.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Santiago (Santiago Province); this is in the Central Valley Biotic Province.

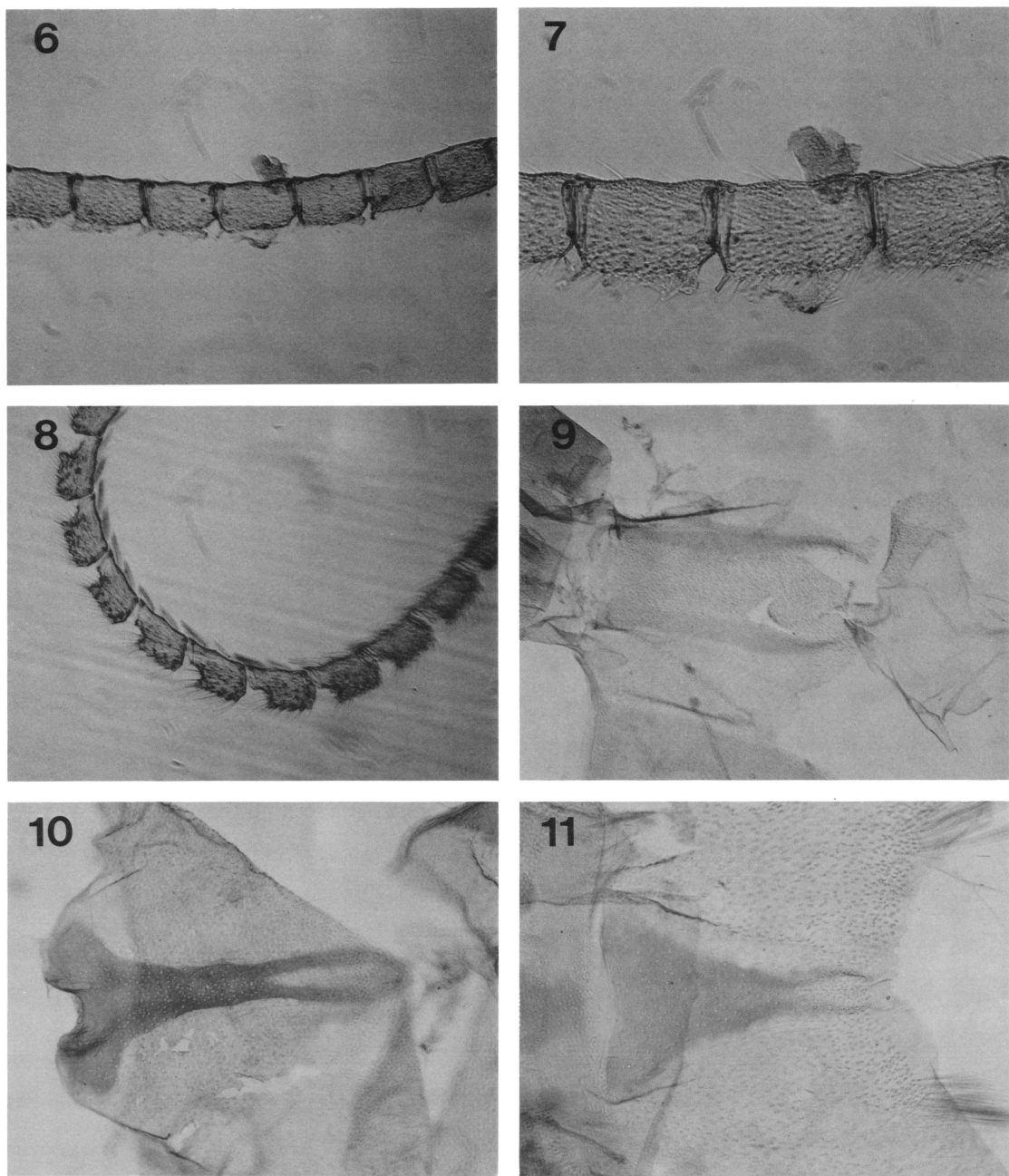
REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and legs have been studied.

This species has the least maculation of any in Section 1 and, in fact, any species in the genus known to me from Chile. It also differs from the other males in the section by the greatly reduced round areas on the antennal segments.

ETYMOLOGY: The specific name is a noun in the genitive case, based on the type locality.

SECTION 2

The males are characterized by having the tergite of abdominal segment VIII reduced to a slender median strip, and by the ventral plate of the same segment having a wide anterior basal portion with a more slender, variably shaped posterior extensions; by the valves being variable in shape, either simple or with the sacculus having a projection; and by the uncus terminating in a single point, a



Figs. 6–11. Male structures of *Eupithecia*. 6–8. Antennae. 6, 7. *E. guayacanae*, n. sp., holotype. 8. *E. juncalensis* Rindge. 9–11. Ventral plates. 9. *E. guayacanae*, n. sp., holotype. 10. *E. frequens* Butler. 11. *E. coquimbo*, n. sp., holotype.

weakly developed bifid apex, or a laterally flattened, sclerotized apex with two widely separated points. The bursae copulatricae of the females vary from entirely membranous,

with the surface spinose and having symmetrical ornamentation, to having a sclerotized strip between the ductus bursae and the ductus seminalis.

The male antennae may be setose, trifasciculate, or variably pectinate. The eyes of the females are either smaller than those of the males or the same size. The palpi project beyond the front margin of the eyes from 1.0 to 1.4 times the diameter of the eyes (males) to 1.0 to 2.3 times (females).

This section is divided into four groups, based primarily on the shape and ornamentation of the bursa copulatrix.

Group A

The females of this group have each bursa copulatrix entirely membranous. The males have variably shaped ventral plates. The uncus (of the two known species) has two widely separated points that are laterally flattened. The sacculus of the valves is simple and rounded. The vesica has an elongate, slender, curved sclerotized piece medially and a small basal piece.

The male antennae have the appearance of being bipectinate. The eyes of both sexes within a species (insofar as known) appear to be of the same size. The palpi of the males project beyond the front margin of the eyes for a distance equal to 1.0 to 1.25 times their diameter; the female palpi extend about 1.1 times the diameter.

Eupithecia valdivia Rindge

Eupithecia valdivia Rindge, 1987: 295, figs. 9, 149, 150.

A second female of this species was caught at Terao, S of Chonchi, Chiloé Island, Nov. 10–20, 1989 (L. E. Peña). This locality is about 325 km south of the type locality, Valdivia, Valdivia Province. Both sites are in the Region of Los Lagos (Chiloé and Valdivia Provinces, respectively), and in the Valdivian Forest Biotic Province.

Group B

The females of this group have each bursa copulatrix with symmetrical ornamentation; the latter consists of areas or strips of minute spines or setae, or elongate spines surrounding or partially encircling the areas of minute spines. The uncus is variable, either with a single point or two widely separated and lat-

erally flattened points. The sacculus of the valves varies from being simple and rounded to having a slight angle. The vesica has one or more variably sized sclerotized pieces, a minutely spinulate membrane, and a small sclerotized basal piece.

The male antennae range from being simple and shortly ciliate to bipectinate. The eyes of both sexes within a species are either of the same size or those of the females are smaller. The palpi of the males project beyond the front margin of the eyes for a distance less than, to nearly twice, the diameter of the eyes, or from 0.50 to 1.35 mm; the female palpi extend about 1.5 times the diameter.

Eupithecia petrohue Rindge

Figures 16, 17

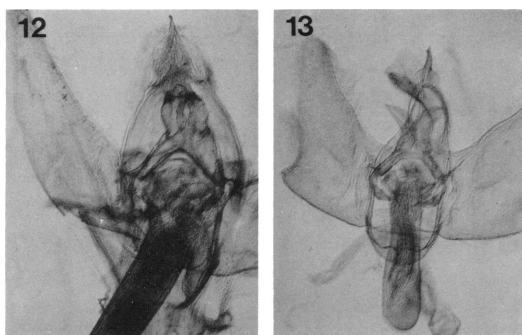
Eupithecia petrohue Rindge, 1987: 317, figs. 22, 62 89, 123.

This species was described from a single male; the type locality is Petrohue, Llanquihue Province, Chile, with the specimen having been caught in early January. A series of one male and six females of this species is now before me from Las Trancas, 500 m, W of La Union, Valdivia, Chile, Feb. 6–10, 1988 (L. E. Peña). Both of these localities are in the Los Lagos Region (Llanquihue and Valdivia Provinces, respectively), and in the Valdivian Forest Biotic Province.

DESCRIPTION: *Adult:* Palpi dark grayish black or dark brownish black, extending beyond front of eyes of males a distance equal to 1.2 times diameter of eyes or 0.8 mm, of females a distance equal to 1.3 to 1.7 times diameter of eyes or 0.7 to 0.8 mm. Eyes of females smaller than those of males.

Female genitalia (figs. 16, 17): Ductus bursae twice as long as broad. Bursa copulatrix weakly ovoid or with sides more or less parallel, membranous; ventral surface on left of midline with rather poorly defined area of small spines, dorsal surface with smaller area of spinules. Ductus seminalis arising from ventral surface posteriorly, curving posteriodorsally.

The female genitalic structures are similar to those of *curacautinae* Rindge, but those of *petrohue* may be distinguished by the more dorsal-ventral placement of the spinose areas



Figs. 12, 13. Male genitalia of *Eupithecia*. 12. *E. guayacanae*, n. sp., holotype. 13. *E. coquimbo*, n. sp., holotype.

(lateral in *curacautinae*) and by the finer, smaller spines.

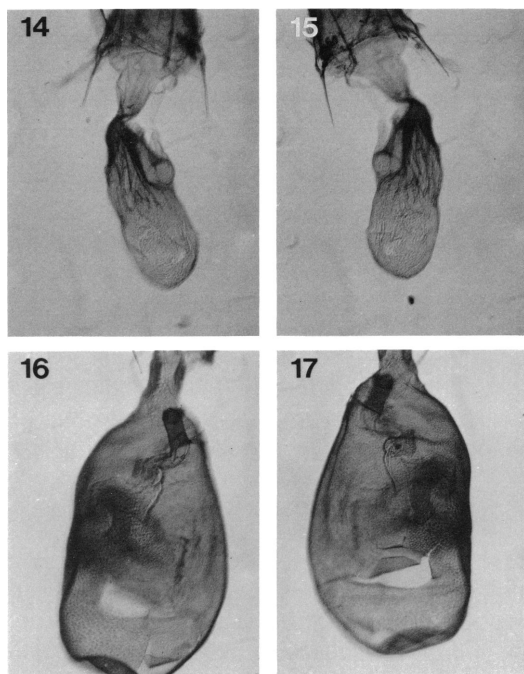
Eupithecia horismoides Rindge

Eupithecia horismoides Rindge, 1987: 323, figs. 26, 66, 92, 126, 170–172.

This very large species was described from a number of specimens from the Region of Los Lagos (the Provinces of Osorno, Llanquihue, and Chiloé); the localities are in the Valdivian Forest Biotic Province. Four additional moths are now at hand from two places in Cautín Province, which extends the known range some 200 km to the north of the previous records. These new localities are in the Region of Araucania (Cautín Province), and are in the Northern Valdivian Forest Biotic Province.

Group C

The females of this group each have a bursa copulatrix with a sclerotized strip between the ductus bursae and the ductus seminalis. The males have their abdominal segments VIII with long, slender ventral plates, with relatively short and rather weakly defined posterior extensions. The uncus terminates in two points, usually widely separated and laterally flattened. The sacculus of the valves may be rounded, or with a projection that varies from being slender and pointed, to elongate, broad and apically rounded. The vesica has one or more sclerotized pieces and a small sclerotized basal piece.



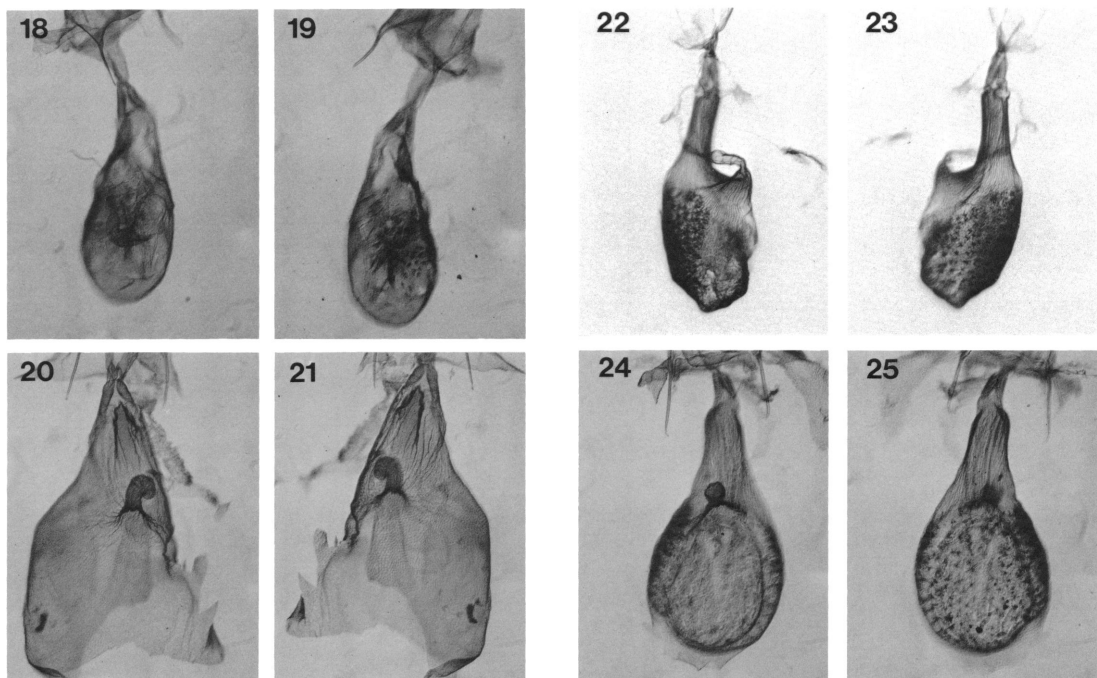
Figs. 14–17. Female genitalia of *Eupithecia*. 14, 15. *E. seatacama* Rindge. 14. Ventral view. 15. Dorsal view. 16, 17. *E. petrohue* Rindge. 16. Ventral view. 17. Dorsal view.

The male antennae may be simple and shortly ciliate, or have two pairs of ventral processes of varying length, symmetrical or asymmetrical, that bear elongate setae. The eyes of the females within each species are smaller than those of the males. The palpi of the males project beyond the front margin of the eyes for a distance that ranges from being less than the diameter of the eyes to about 1.4 times their diameter; the female palpi extend from being slightly longer to 2.3 times the diameter.

Eupithecia sibylla Butler

Eupithecia sibylla Butler, 1882: 405. Rindge, 1987: 325, figs. 28–30, 68, 94, 95 128, 173, 174.

This is the most widespread member of the genus in Chile, as I reported it from about 24° latitude, south to about 37° latitude; this area includes the Northern Desert, Northern Coast, Intermediate Desert, Coquimban Desert, Central Andean Cordillera, Central Valley, and Northern Forest biotic provinces.



Figs. 18–21. Female genitalia of *Eupithecia*. 18, 19. *E. bandurriasae*, n. sp., holotype. 18. Ventral view. 19. Dorsal view. 20, 21. *E. elquiensis*, n. sp., holotype. 20. Ventral view. 21. Dorsal view.

Figs. 22–25. Female genitalia of *Eupithecia*. 22, 23. *E. coquimbo*, n. sp., paratype. 22. Ventral view. 23. Dorsal view. 24, 25. *E. juntasae*, n. sp., holotype. 24. Ventral view. 25. Dorsal view.

A specimen has come to hand from Osorno Province, at about 41°; this is the Region of Los Gatos (Osorno Province), and is in the Valdivian Forest Biotic Province. This record extends the known distribution of *sibylla* some 450 km farther south than previously reported.

Eupithecia juncalensis Rindge

Figure 8

Eupithecia juncalensis Rindge, 1987: 330, figs. 31, 96, 129, 175, 176.

This species was described from the holotype, male, and a paratype, female. The holotype is without its head, and the paratype had its head crushed. Recently collected material of both sexes is now at hand so that additional notes can be added to the description of this species. The male antennae are similar to those of *E. atacama* (Vognits) (Rindge, 1987: fig. 50) and *E. correana* Rindge (Rindge, 1987: fig. 57). The former species was placed in my Section 1, and the latter in

Section 2B. Vojnits (1985) proposed three new genera of Chilean *Eupithecia* based primarily on the structure of the male antennae; these names were placed as synonyms of *Eupithecia* by me in 1987 (p. 276); at that time I pointed out that antennal characters had not proven to be of generic value. The present case, with *juncalensis*, is but another example of what I wrote earlier.

Palpi dark grayish brown, with white scaling ventrally on basal segment and at apex of terminal segment; extending beyond front margin of eyes by distance equal to diameter of eyes or 0.6 mm (males), and 1.2 to 1.4 times or 0.6 to 0.7 mm (females). Antennae of males (fig. 8) with basal 75 percent of segment twice as thick as posterior part (when viewed laterally); laterally with setae arising from small papillae, ventrally without lobes, more thickly setose than on sides.

The type locality is Juncal, Andes, Aconcagua Province, Chile, November. The additional material consists of 11 males and 8 females from Huanta-Elqui, 10 km S Las

Juntas, Coquimbo, Chile, October. The type locality is in the Region of Valparaíso (Aconcagua Province), and is in the Central Valley Biotic Province; the new locality is in the Region of Coquimbo (El Qui Province), and is in the Coquimban Desert Biotic Province.

***Eupithecia bandurriasae*, new species**

Figures 18, 19

DIAGNOSIS: This small species has elongate wings, and a brownish black front; the female genitalia are similar to those of *juncalensis* but differ primarily in having a smoothly sclerotized area between the ductus bursae and the origin of the ductus seminalis. (The males have not been examined.)

DESCRIPTION: *Adult:* Head with front unicolorous brownish black except for a few pale gray scales anteroventrally (pale gray with a few scattered dark scales in *juncalensis*); palpi extending beyond front margin of eyes by slightly more than diameter of eyes, or 0.5 mm (female). Antennae of females shortly ciliate.

Upper surface of wings: Forewings elongate; badly rubbed so pattern indiscernible.

Under surface of wings: Also badly rubbed, but with discal dots on all wings.

Length of forewings: Holotype, female, 8.5 mm.

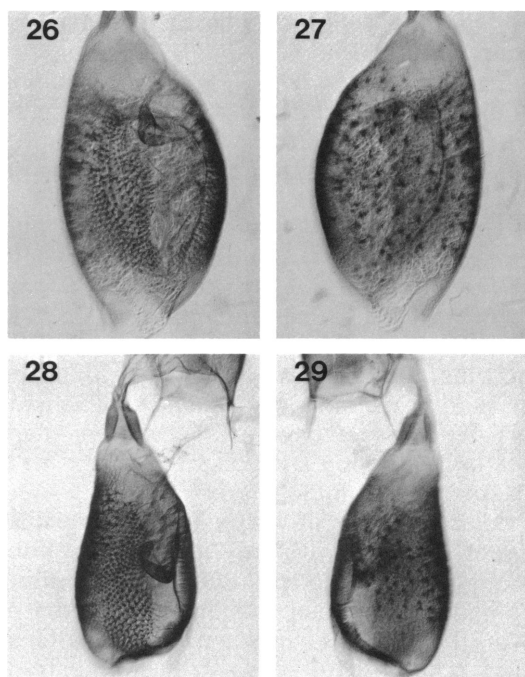
Male genitalia: Unknown.

Female genitalia (figs. 18, 19): Ductus bursae wedge-shaped, slightly longer than wide. Bursa copulatrix relatively short, 2.3 mm long (3.0 to 3.3 mm in *juncalensis*), somewhat laterally flattened; with lightly sclerotized, smooth area posteroventrally not extending anteriorly as far as origin of ductus seminalis, laterally very finely striate on both sides; sides of bursa finely punctate, dorsally with small groups of scattered spines. Ductus seminalis arising ventrally at three-fifths length of bursa copulatrix (at two-fifths in *juncalensis*), curved anteriorly and to left, then angled posteriorly.

TYPE: Holotype, female, Bandurrias, E of Coihaique, Aysen, Chile, Dec. 1–3, 1985 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 19,748.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Campo



Figs. 26–29. Female genitalia of *Eupithecia*. 26, 27. *E. concepcion*, n. sp., holotype. 26. Ventral view. 27. Dorsal view. 28, 29. *E. arauco*, n. sp., holotype. 28. Ventral view. 29. Dorsal view.

(Coihaique Province); this is the Valdivian Forest Biotic Province.

TIME OF FLIGHT: December.

REMARKS: One specimen and one genitalic dissection have been studied.

Based on the female genitalia, the present species has its closest relationships with *juncalensis*. Differences in wing length, color of the front, and in the genitalic structures can be used to separate the two species.

ETYMOLOGY: The specific name is a noun in the genitive case, based on the type locality.

***Eupithecia elquiensis*, new species**

Figures 2, 20, 21

DIAGNOSIS: This species has creamy white wings with a small black discal spot and a narrow t. p. line. The unicolorous creamy white palpi of the female are elongate, being 1.5 times the diameter of the eye, extending 0.75 mm in front of the eyes. The female genitalia have a well defined, narrow sclerotized strip between the ductus bursae and

the bursa copulatrix. (The males have not been examined.)

DESCRIPTION: *Adult:* Head with palpi long and slender, unicolorous creamy white; palpi extending beyond front margin of eyes by 1.5 times diameter of eyes, or 0.75 mm (females). Antennae of females very shortly ciliate.

Upper surface of wings (fig. 2): Forewings elongate; creamy white, with scattered dark gray and grayish black scales, veins with pale brown scaling; discal dot small, black; t. p. line slender, weakly S-shaped; outer portion of wing with grayish black scaling opposite cell and above outer angle. Hind wings slightly paler than forewings, without scattered dark scaling, with very faint discal dots, and with dark maculation along anal margin.

Under surface of wings: Forewings white, evenly suffused with gray scaling; discal dot suffuse, pale; outer portion of wing tending to be slightly darker gray than remainder of wing. Hind wings white, with a few scattered dark scales; discal spot small, dark; extradiscal line weakly indicated.

Length of forewings: Holotype, female, 9.5 mm.

Male genitalia: Unknown.

Female genitalia (figs. 20, 21): Ductus bursae tapered, slightly longer than wide. Bursa copulatrix ovoid, membranous, its surface minutely spinulate; with prominent, concave sclerotized strip having raised, pointed posterior end, gradually increasing in width anteriorly and becoming less sclerotized, with lateral longitudinal striations extending to base of ductus seminalis. Ductus seminalis arising from ventral surface of bursa, prominent, basal area rugose and weakly conical, erect and then curved dorsally and slightly to right.

TYPE: Holotype, female, Huanta-Elqui, 10 km S Las Juntas, Coquimbo, Chile, Oct. 22-24, 1988 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 20,380.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Coquimbo (El Qui Province); this is in the Coquimban Desert Biotic Province.

TIME OF FLIGHT: October.

REMARKS: One specimen and one genitalic dissection have been studied.

The genitalia key out to *pucatrihue* in couplet 27 in my 1987 key. The genitalic struc-

tures of the new species are distinguished by the narrower, higher, and less strongly sclerotized strip anterior of the ductus bursae, and by the different configuration of the ductus seminalis. The color of the wings and palpi, and the pattern, are unique in Group C.

ETYMOLOGY: The specific name is an adjective derived from the type locality.

Eupithecia frequens Butler

Figure 10

Eupithecia frequens Butler, 1882: 404. Rindge, 1987: 344, figs. 38, 39, 73, 105, 135, 185, 186.

When I originally described segment VIII, the material on hand was inadequate for a good description and figure (Rindge, 1987: fig. 105). Two additional males are now before me, and they present a much clearer picture of this somite.

Segment VIII (fig. 10): Ventral plate with broad anterior lobes, posterior extension slightly narrowed medially, apical two-fifths bifurcate, with very narrow arms. Tergite with elongate, slender, biconcave rod anteriorly, an obtuse-angled triangular base, and a long and slender posterior extension slightly swollen distally, with tergite 1.4 times length of plate.

The ventral plate is similar to that of several other species of Group C, such as *rosalia* Butler and *maule* Rindge. Because of the individual variation in this structure, as exemplified by *rosalia* (Rindge, 1987: 343, figs. 101-104), it is questionable if the ventral plate can be used for specific determination in this group. It appears more likely that a general placement is all that can be expected, with other characters being used to recognize the species.

Group D

The females of this group have each bursa copulatrix with prominent spines encircling the structure. The male of the one known species has a tapering ventral plate, slightly more heavily sclerotized laterally than medially, and with weakly convex posterior extensions. The uncus terminates in two points, widely separated and laterally flattened. The valves are elongate and tend to extend medially rather than laterally; the sacculus is an

elongate, broad, and apically rounded projection. The vesica has a single curved sclerotized piece and a very small sclerotized basal piece.

The single known male is without antennae. The eyes of the females are smaller than those of the male in the one species where both sexes are known. The palpi of the male are equal in length to the diameter of the eye; in the female of the same species, the palpi are slightly longer than the diameter of the eye. In other species assigned to this group, the female palpi project beyond the front margin of the eyes by a distance equal to the diameter of the eyes to 1.75 times the diameter.

***Eupithecia coquimbo*, new species**

Figures 3, 11, 13, 22, 23

DIAGNOSIS: This species has elongate, pointed forewings that are dark gray, with a discal dot of slightly raised dull black scales, and a prominent s. t. line. The grayish black palpi have a broad band of white scales ventrally; in the male they are equal in length to the diameter of the eye, and in the females are slightly longer, extending 0.6 mm in front of the eyes. The ventral plate is tapered, with the sides being slightly concave, and terminates in slightly convex arms. The male genitalia have elongate, posterolaterally projecting valves, with a prominent projecting sacculus. The female genitalia have the posterior portion of the ductus copulatrix striate, the anteroventral area rugose, and laterally and dorsally heavily and thickly spinose.

DESCRIPTION: *Adults:* Head with palpi grayish black with broad band of white scales on basal segment ventrally; palpi extending beyond front margin of eyes by distance equal to diameter of eyes or 0.6 mm (males), and 1.1 times or 0.6 mm (females). Eyes of females smaller than those of males. Antennae of male missing; of females very shortly ciliate.

Upper surface of wings (fig. 3): Forewings elongate, pointed, with outer margin almost straight (male) or weakly convex (females); dark gray, with prominent t. p. line curved outwardly from costa, then paralleling outer margin; apex blackish, delimited by t. p. line, and with brown streak extending from that

line to margin of wing; outer portion of wing with faint s. t. line; discal dot of slightly raised dull black scales; terminal line dull black, narrowly interrupted by veins. Hind wings grayish white anteriorly, becoming dark gray distally; without maculation except for trace of discal dot and partial extradiscal line; terminal line similar to that of forewings.

Under surface of wings: Forewings gray, with discal dot of t. p. line present; terminal line similar to that of upper surface. Hind wings grayish white; maculation similar to that of upper surface.

Length of forewings: Holotype, male, 11.0 mm; paratypes, females, 10.5 mm.

Segment VIII (fig. 11): Ventral plate elongate, with wide base, sides tapering, slightly concave, and somewhat more heavily sclerotized than central area, arms slender, convex, one-third length of plate. Tergite 1.3 times length of ventral plate, terminally broad, parallel-sided.

Male genitalia (fig. 13): Uncus with two widely separated, sclerotized, laterally flattened points. Anellus with posterolateral margins tapered, with narrow, sclerotized posterior arms terminating in broad, outwardly curved processes. Valves projecting posterolaterally, tapering distally; sacculus lightly sclerotized, broad, projecting, rounded at end. Aedeagus weakly constricted medially; vesica apparently with single concave sclerotized piece medially, narrowly sclerotized anterolaterally, truncate posteriorly, and with small, curved, sclerotized basal piece.

Female genitalia (figs. 22, 23): Bursa copulatrix elongate, laterally compressed, posteriorly slender, anteriorly swollen with rounded end; posterior portion encircled with numerous longitudinal striations, these extending up lower portion of ductus seminalis and continued anteriorly to about halfway to anterior end; anterior portion thickly set laterally and dorsally with numerous spines, and with ventral surface anterior of striations with rough surface; ductus seminalis arising from prominent conelike projection on ventral surface, terminally narrowed and angled to left.

TYPES: Holotype, male, Huanta-Elqui, 10 km S Las Juntas, Coquimbo, Chile, Oct. 22-24, 1988 (L. E. Peña). Paratypes: Same data as holotype, one female; N of Huasco, 1800

m, Coquimbo, Chile, Nov. 15–18, 1987 (L. E. Peña), one female. The genitalia of the holotype are mounted on slide FHR 20,349.

The type specimens are in the AMNH.

DISTRIBUTION: The Region of Coquimbo (El Qui Province); this is in the Coquimban Desert Biotic Province.

TIME OF FLIGHT: October and November.

REMARKS: Three specimens and three genitalic dissections have been studied.

The only other known species of Group D to have elongate, pointed forewings is *nublae* Rindge (1987: 358, figs. 44, 193, 194). The present species can be distinguished from that taxon by the clearly defined t. p. line of the forewings and, in the female genitalia, by the very different ornamentation of the bursa copulatrix.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

***Eupithecia juntasae*, new species**

Figures 24, 25

DIAGNOSIS: This species has elongate, broad forewings that are dark gray, with a discal dot of slightly raised dull black scales, a grayish brown subapical dash, and obsolescent maculation. The grayish black palpi have a broad band of white scales ventrally, and a white apex; in the females they extend 0.7 mm in front of the eyes. The female genitalia have the posteroventral portion of the bursa copulatrix sclerotized and striate, the anteroventral section broadly membranous, and laterally and dorsally thickly spinose. (The males have not been examined.)

DESCRIPTION: *Adult:* Head with palpi grayish black with broad band of white scales on basal segment ventrally, and with a few white scales apically; palpi extending beyond front margin of eyes by 1.25 times diameter of eyes, or 0.7 mm (female). Antennae of female with very short cilia.

Upper surface of wings: Forewings broad, apically pointed; dark gray, with obscure maculation; discal dot of slightly raised dull black scales; apex blackish, with grayish brown subapical dash; s. t. line weakly indicated; terminal line dull black. Hind wings grayish white anteriorly, becoming dark gray distally; without maculation except for a few gray scales forming obsolescent discal dot,

partial extradiscal line, and terminal line similar to that of forewings.

Under surface of wings: Forewings gray, shiny, without maculation except for discal dot; terminal line similar to that of upper surface. Hind wings grayish white; maculation similar to that of upper surface.

Length of forewings: Holotype, female, 10.5 mm.

Male genitalia: Unknown.

Female genitalia (figs. 24, 25): Bursa copulatrix elongate, posteriorly slender, anteriorly swollen with rounded end; posterior portion encircled with longitudinal striations, having ventral surface sclerotized as far as ductus seminalis; anterior portion with ventral surface broad, membranous, laterally and dorsally with numerous groups of spines. Ductus seminalis arising from prominent swelling on ventral surface, terminally narrowed and angled posteriorly.

TYPE: Holotype, female, Huanta–Elqui, 10 km S Las Juntas, Coquimbo, Chile, Oct. 22–24, 1988 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 20,382.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Coquimbo (El Qui Province); this is in the Coquimban Desert Biotic Province.

TIME OF FLIGHT: October.

REMARKS: One specimen and one genitalic dissection have been studied.

This species is similar to *nublae* Rindge (1987: 358, figs. 44, 193, 194) in the shape of the wings and their coloration, although more maculation is present in the new species than in *nublae*. The present species has longer palpi, and the female genitalia have a differently shaped and ornamented bursa copulatrix. From *coquimbo*, the new species differs by having broader forewings with less maculation, slightly longer palpi, and by the genitalia.

ETYMOLOGY: The specific name is a noun in the genitive case, based on the type locality.

***Eupithecia concepcion*, new species**

Figures 4, 26, 27

DIAGNOSIS: The broad, pointed forewings of this species are grayish brown, have a discal dot of raised dull black scales, and a gem-

inate t. p. line. The dark grayish brown palpi have a narrow band of white scales ventrally and on the apex of the last segment; in the females they extend 0.6 mm in front of the eyes. The female genitalia have the ventral surface of the bursa copulatrix membranous from the ductus bursae to 0.7 mm anterior of the ductus seminalis, ventrolaterally the surface becomes finely spinose, the groups of spines becoming larger and fewer laterally and dorsally. (The males have not been examined.)

DESCRIPTION: *Adult:* Head with palpi dark grayish brown, narrowly white ventrally and at apex of terminal segment; palpi extending beyond front margin of eyes by distance equal to diameter of eyes, or 0.6 mm (female). Antennae of female with very short cilia.

Upper surface of wings (fig. 4): Forewings broad, apically pointed; grayish brown, with obscure maculation; discal dots of slightly raised dull black scales; t. p. line paler than wing, geminate; terminal line dull black. Hind wings unicolorous, concolorous with forewings; without maculation except for faint discal dot, and terminal line similar to that of forewing.

Under surface of wings: All wings pale gray; forewings with faint dark spots on costa above discal dot and at inception of t. p. line, and with nebulous darker gray area distad of t. p. line below apex. Hind wings with maculation similar to that of upper surface but with discal dots more prominent.

Length of forewings: Holotype, female, 10.0 mm.

Male genitalia: Unknown.

Female genitalia (figs. 26, 27): Bursa copulatrix elongate, 1.8 mm long, slender, elliptical, anterior end rounded; ventral surface without striations, membranous, 0.7 mm from ductus bursae to ductus seminalis, with membranous portion tapering anteriorly, having narrow band of slender spines meeting at midline, with anterior end of bursa copulatrix membranous; lateral edges of membranous area finely spinose, with groups of spines becoming larger and more widely spaced laterally and dorsally. Ductus seminalis a membranous tube arising ventrally near middle of bursa copulatrix, terminally narrowed and angled posteriorly.

TYPE: Holotype, female, N of Concepción,

Concepción, Chile, Jan. 12–13, 1988 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 20,372.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Biobío (Concepción Province); this is the Northern Valdivian Forest Biotic Province.

TIME OF FLIGHT: January.

REMARKS: One specimen and one genitalic dissection have been studied.

This species is apparently similar to *usta* Butler (Rindge, 1987: 360, figs. 48, 198, 199), as both have the ornamentation of the bursa copulatrix with the same general pattern. The new species is smaller, darker, and with less distinct maculation than in *usta*. The ornamentation of the bursa copulatrix in the new species has fewer and larger groups of spines laterally and dorsally than in *usta*.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

Eupithecia arauco, new species

Figures 5, 28, 29

DIAGNOSIS: The elongate, pointed forewings of this species are a unicolorous dark grayish brown and have an elongate discal dash. The grayish black palpi have some whitish scaling ventrally and are broadly white at the apex of the last segment; in the females they extend 0.2 mm in front of the eyes. The female genitalia are similar to those of *concepcion* but the bursa copulatrix is shorter and the ductus bursae arises more anteriorly, at 0.8 mm anterior of the ductus bursae. (The males have not been examined.)

DESCRIPTION: *Adult:* Head with palpi grayish black, with some white scaling ventrally and broadly white at apex of last segment; palpi extending beyond front margin of eyes by distance equal to one-third diameter of eyes, or 0.2 mm (female). Antennae of female shortly ciliate.

Upper surface of wings (fig. 5): Forewings elongate, apically pointed; dark grayish brown, maculation obsolescent to absent except for elongate discal dash of raised black scales; terminal line scarcely differentiated. Hind wings concolorous with forewings, unicolorous; without maculation except for faint discal dot.

Under surface of wings: All wings gray;

forewings with faint discal dot and with costal dot at inception of t. p. line. Hind wings with maculation similar to that of upper surface but with discal dots slightly larger.

Length of forewings: Holotype, female, 9.5 mm.

Male genitalia: Unknown.

Female genitalia (figs. 28, 29): Bursa copulatrix elongate, 1.6 mm long, slender, elliptical, anterior end rounded; ventral surface without striations, membranous, 0.8 mm from ductus bursae to ductus seminalis, having membranous area with parallel sides, then rounded to meet at midline, with anterior end of bursa copulatrix narrowly membranous; lateral edges of membranous area finely spinose, with groups of spines becoming larger and more widely spaced laterally and dorsally. Ductus seminalis a membranous tube arising ventrally near middle of bursa copulatrix, curving posteriorly.

TYPE: Holotype, female, W of Pichinahuel, 900 m, Cord[illera] Nahuelbuta, Arauco, Chile, Jan. 14–16, 1988 (L. E. Peña). The genitalia of the holotype are mounted on slide FHR 20,414.

The holotype is in the AMNH.

DISTRIBUTION: The Region of Biobio (Arauco Province); this is the Northern Valdivian Forest Biotic Province.

TIME OF FLIGHT: January.

REMARKS: One specimen and one genitalic dissection have been studied.

This species is similar to *concepcion*, but differs by having shorter palpi, more slender and more pointed forewings, less maculation,

and a shorter bursa copulatrix, with the ductus bursae arising more anteriorly.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

REFERENCES

- Bolte, K. B.
1990. Guide to the Geometridae of Canada (Lepidoptera). VI. Subfamily Larentiinae. 1. Revision of the genus *Eupithecia*. Mem. Entomol. Soc. Can. 151: 253 pp., 286 figs.
- Butler, A. G.
1882. Heterocerous Lepidoptera collected in Chili by Thomas Edmonds, Esq. Part III.—Geometrites. Trans. Entomol. Soc. London 1882: 339–427, pl. 16.
- Curtis, J.
1825. British Entomology, vol. 6, Lepidoptera, part 2. London: Printed for the author.
- Davis, D. R.
1986. A new family of monotrysian moths from austral South America (Lepidoptera: Palaephatidae), with a phylogenetic review of the Monotrysia. Smithsonian. Contrib. Zool. 434: 202 pp., 599 figs., 2 maps.
- Rindge, F. H.
1987. The *Eupithecia* (Lepidoptera, Geometridae) of Chile. Bull. Am. Mus. Nat. Hist. 186: 269–363, 199 figs.
- Vojnits, A. M.
1985. New South American genera and species of Eupithecini (Lepidoptera: Geometridae). Acta Zool. Hungarica 31: 405–418, 2 pls., 22 text figs.

Recent issues of the *Novitates* may be purchased from the Museum. Lists of back issues of the *Novitates*, *Bulletin*, and *Anthropological Papers* published during the last five years are available free of charge. Address orders to: American Museum of Natural History Library, Department D, Central Park West at 79th St., New York, New York 10024.

THIS PUBLICATION IS PRINTED ON ACID-FREE PAPER.