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A NEW GENUS OF WINTER MOTHS (GEOMETRIDAE) FROM EASTERN CALIFORNIA AND WESTERN NEVADA

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ABSTRACT. *Tescalsia*, a new genus of Geometridae, is described and assigned to the subfamily Larentiinae. It is represented by two new species: ***Tescalsia giulianiata* Ferguson,** known from 3 localities in and adjacent to the Owens Valley, Inyo Co., California, and ***T. minata* Ferguson,** from Mineral Co., Nevada. The female of *T. giulianiata* has linear, straplike forewings, vestigial hindwings, and long, slender legs that enable agile climbing in shrubs; the female of *T. minata* is unknown. Both sexes lack the proboscis and tympana. Adults of *T. giulianiata* are active at sundown and nocturnally in November and December, despite near freezing temperatures.

Additional key words: brachypterous, flightless, Larentiinae, tympana.

In 1976 Mr. Derham Giuliani, a keen naturalist of Big Pine, California, brought a brachypterous moth to Berkeley that he had collected in Deep Spring Valley, east of Big Pine, in early December 1973. So bizarre was the specimen, with peculiarly bristled, straplike forewings and vestigial hindwings and mouthparts, that Powell could not identify it to family. The taxonomic placement remained a mystery after Ferguson and other lepidopterists at the National Museum of Natural History (NMNH) examined the specimen in 1977.

Two additional females were taken in pitfall traps at Deep Spring Valley in December 1978, one of which laid eggs that produced first instar geometrid larvae. After additional visits by Giuliani, Powell, and others during November and December 1978–82, we had assembled 9 winged males and 8 females, a sufficient sample to provide convincing circumstantial evidence for the association of the sexes. The males indicate that the mystery moth is an undescribed species best assigned to the Larentiinae (Geometridae).

Later, males of a congeneric species, from Mina, Mineral Co., Nevada, that had been collected in 1914, were discovered by Ferguson in unidentified material at the NMNH. Although descriptions of the new genus and species were written several years ago, we delayed publication, anticipating that the larva and host plant might be discovered; but that hope has not been realized. Hence, we present the descriptions, and characterize the egg, together with observations on the habitats and adult behavior.

MATERIALS AND METHODS

Trapping method. The first female was observed on the sand, and a few males were netted near sundown; but most of the series was taken in pitfall traps. This technique is widely used for sampling ground-dwelling insects in various habitats and is particularly effective for nocturnal insects such as many beetles. Cups may be deployed empty, baited with truly disgusting materials, or partially filled with anti-freeze (ethylene glycol), which allows long-term sampling. If deployed empty, traps need to be checked frequently because many predators, spiders, scorpions, carabid beetles etc., are trapped.

We used 9 oz. squat plastic tumblers (7 cm deep and 9 cm diameter at the rim); they are inexpensive and nest in compact packages for transport. We deployed them in transect lines of 50–100, about 2 m apart, usually situated at the bases of shrubs. We trapped with empty cups during single nights (when two of three females were killed by a predaceous mite and spider) or with anti-freeze over a several day period. Specimens taken from the latter were washed in water, then transferred to alcohol, and later dried for pinning. Understandably, lepidopterists rarely are familiar with the method, but it is an effective one for brachypterous forms. Winged males are also sometimes trapped, and most of our male *Tescalsia* were collected this way. The holotype was taken in early morning in an empty trap about 50 m from the nearest trapped female.

SYSTEMATICS

Tescalsia Ferguson, new genus

Type species: *Tescalsia giulianiata* Ferguson, new species.

Diagnosis. Characterized by the following combination of unusual characters: 1) in male, veins Sc and Rs fused for half length of hindwing, forking just before end of the very long cell, and beyond that point Rs and M_1 stalked together for ¼ or ⅓ of distance from end of cell to outer margin; 2) female with greatly reduced forewing, linear and straplike, with numerous setae longer than width of wing along entire length of both fore and hind margins; 3) female with hindwing present only as a vestige concealed beneath base of forewing; 4) tympanic cavities in base of abdomen, characteristic of nearly all Geometridae, missing in both sexes; 5) proboscis missing in both sexes, as is true of some other winter moths.

Description. MALE: Length of forewing: 12.0–17.5 mm. Head: Antenna bipectinate, extremely delicate, with slender shaft and long, widely spaced, setose branches and large scape 3–4 times thickness of shaft;

shaft scaled dorsally. Labial palpus short, hardly extending beyond front. Eye not very large, its vertical length almost equal to width of front at narrowest point, but strongly protuberant in the type-species, less so in the other. Ocellus absent. Front protuberant, rounded. Chaetosema normal, moderately to well developed, the two chaetosemata not extended transversely to meet behind head as in many Larentiinae. Tongue absent. Vestiture untufted. Legs slender, normal except that foretibia is extremely reduced and bears a large, conspicuous, double claw (Fig. 9), and foretarsus much more elongated than mid- or hindtarsus; hindtibia with one or two pairs of spurs.

Fore- and hindwing somewhat elongated, produced especially toward apex; tornus of both wings rounded; forewing length/width ratio about 2.4/1.0, narrower than the 2.0/1.0 ratio of *Operophtera* (length = base to apex; width = length of line through anal angle meeting costa at 90°); wing pattern mostly diffuse and indistinct, variable between and within species; hindwing maculation differing from that of forewing in its reduced pattern consisting of discal spot only or discal spot and diffuse postmedial band only; fringes of both wings unusually long; wings covered with wide, tulip-shaped to almost round scales, dentate with 3–5 short points distally or simple. Venation as described and figured (Fig. 8); Sc of forewing free from radials; discal cells long, that of forewing more than half and of hindwing about half length of wing, closed off almost straight transversely at ends; forewing with two large accessory cells; hindwing with discal cell unusually wide because of long fusion of Sc and Rs, with M_2 a fully developed, tubular vein, and with 1st A a well-developed fold, 2nd A a well-developed vein, and 3rd A entirely lost. Frenulum well developed and very long.

Male genitalia (Figs. 10, 11). Valva and uncus simple; uncus appearing to be fused to tegumen, forming a solid unit; gnathos absent; transtilla distinct, forming slender, complete bridge; manica spinulate, heavily so in one species, flanked by pair of knoblike, setose processes, the derivation of which is unclear; each knoblike process with delicate, sclerotized connections both to juxta and base of costa of valva; juxta appearing to have a large, pointed, conical or thornlike medial process adjoining its posterior margin, seemingly apposed to end of aedeagus, and derivation of this structure also unclear. Vesica with clumps of small cornuti.

FEMALE (Fig. 14, type species only): Head: Antenna simple, slender, sparsely setose, with scape much smaller than that of male. Labial palpus small, not exceeding front. Eye nearly as large as that of male. Ocellus absent. Tongue absent. Front, chaetosema, and legs similar to those of male. Brachypterous; forewing 6–7 mm long, ½ to ⅔ length of body, narrow, straplike, tapering to a pointed end, roughly clothed with scales narrower than those of male and with both margins fringed with long, straight, bristlelike setae slightly longer than width of wing; hindwing present as small vestige beneath base of forewing and bearing long setae distally. Venation (Fig. 12) very reduced but bearing three longitudinal elements that are probably the stems of Sc, R, and Cu.

Female genitalia (Fig. 13). Simple and without very significant features except an extremely long ostial cavity, with a pair of lateral sclerotized supports at base or in what may be a funnel-like posterior section of the ductus bursae, that on right side the larger; corpus bursae ovoid, membranous, delicate, without signum; ductus seminalis arising from bursa near ductus bursae. Sclerotized parts darkly pigmented.

Distribution. Known only from arid habitats of eastern California, and western Nevada.

Early stages. Eggs and first instar larvae were obtained, but larvae would not feed. Food plant unknown. Young larva typically geometroid, with no indication of a third pair of prolegs such as might indicate a relationship to the *Alsophila* group.

Remarks. Sattler (1991) has reviewed wing reduction in Lepidoptera and analyzed implications of flightlessness. Examples of brachyptery in female winter moths in the Northern Hemisphere are known in several families; they are particularly numerous in Geometridae (e.g., *Alsophila*, Oenochrominae; *Phigalia*, Ennominae; and *Operophtera*, Larentiinae). The taxonomic relationships of *Tescalsia* proved difficult to determine and are still not clear. A combination of such features as the double accessory cell, free subcosta, extremely long fusion of Sc + Rs in the hindwing, and condition of the anal veins, points to a probable connection with the Larentiinae. Because of the elongate discal cells, loss of the proboscis, and reduced tympanic cavities, the possibility of relationship to the *Alsophila* group (currently in the Oenochrominae but probably misplaced) was also considered. All species of *Alsophila*, as well as the similar *Phthorarcha primigera* Staudinger (Central Asia) and *Inurois tenuis* Butler (Japan), were examined. These agree with one another in venation, especially with respect to the anal veins of the hindwing consisting of a weak 1st anal fold and well-developed 2nd and 3rd anals. *Tescalsia* clearly differs in having a strong 1st anal fold, well-developed 2nd anal, but no 3rd anal. This would seem to relate *Tescalsia* to the Larentiinae, in which the Hydriomenini and Operophterini have anal veins of this type. Surprisingly, *Phthorarcha* has wide, rounded wing scales almost exactly like those of *Tescalsia,* although other members of the *Alsophila* group and Larentiinae examined do not.

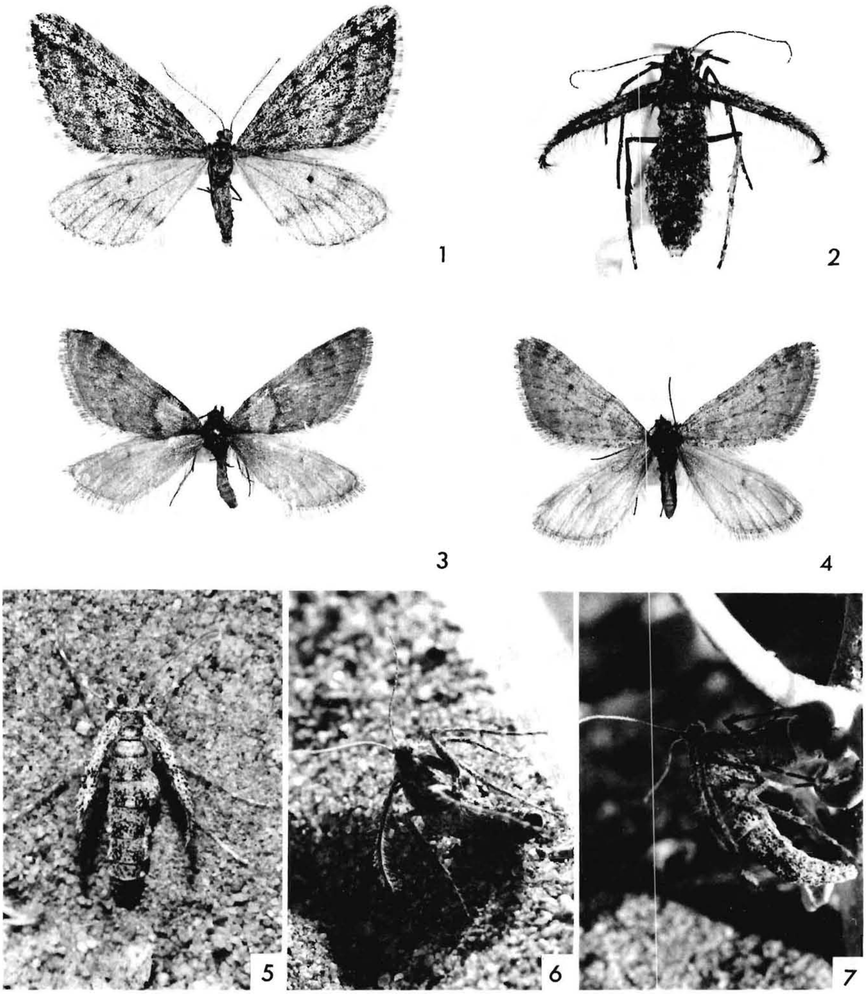
The venation agrees best with that of the Larentiinae, although it is of an exaggerated type with two large accessory cells, elongated discal cells, and elongated fusion of Sc and Rs in the hindwing, and the almost straight, transverse closure of the ends of the cells is unusual. The genitalia, both male and female, seem closer to those of *Operophtera* than anything else, the male genitalia are quite like those of *Operophtera* in general form, in the shape of the valvae, and in the apparent homology of all components of the anellus. In female *Operophtera*, the beginnings of the same kind of large ostial cavity and short, sclerotized ductus bursae are apparent, and the simple, membranous corpus bursae, lacking a signum, agrees exactly. *Operophtera* has fairly well-developed tympanic cavities in the base of the abdomen, but their loss, together with the loss of the tongue, extremely wide pectinate male antennae, and curiously specialized female wings are adaptations to an extreme habitat. The large foretibial claw appears here and there in many groups of geometrids and noctuids, especially of desert habitats, and it has no important systematic significance. A palearctic geometrid that occurs in winter in Turkmenia and Kazakhstan, *Cheimoptera pennigera* Danil. (Danilevskiy 1969) shows many of the same features, including the foretibial claw and loss of the tympanic cavities, although it is unrelated to *Tescalsia* and believed to belong to the Ennominae. *Tescalsia* should, for the present, be assigned to the tribe Operophterini of the Larentiinae, although there are notable differences. For example, other species of Operophterini possess a reduced proboscis, large chaetosemata that meet in the middle in some instances, coarsely ciliate rather than bipectinate antennae in the male, lack the foretibial claw, and have either one accessory cell in the forewing (*Operopthtera*), or two (*Epirrita*) as in *Tescalsia*.

The superficially similar, gray, long-winged *Chesiadodes morosata* Hulst (Ennominae) flies in the same area near Lone Pine, Inyo County, California, in December, and also has a foretibial claw, although of different shape. It differs in having a proboscis. The two are not closely related, and the female of *Chesiadodes* has fully developed wings.

Tescalsia giulianiata Ferguson, new species
(Figs. 1, 2, 5–9, 11–14)

Diagnosis. Males large, forewing length 16.0–17.5 mm; wings gray with blackish markings; hindtibia with two pairs of spurs. Female as described for genus and illustrated.

Description. MALE: Head: labial palpus small, not surpassing front; eye of about same dimensions as that of *T. minata* but more protuberant, its form exceeding that of half a sphere; front bulging, roundly convex, with large, broad, gray-brown or whitish scales, tending to be oriented toward middle of front; eye rimmed anteriorly and ventrally with



FIGS. 1–7. **1**, *Tescalsia giulianiata* Ferguson, holotype male. **2**, *T. giulianiata*, paratype female (same data as holotype). **3**, *T. minata* Ferguson, holotype male; **4**, *T. minata*, paratype male. 5–7, *T. giulianiata*, female (Deep Spring Valley, CA, XII-15-78): **5**, perched on sand; **6**, in repose balanced on wingtips; **7**, climbing on *Chenopodium* branch.

contrastingly pale border of radiating whitish scales. Thorax beneath without long, hairlike scales; legs similar to those of *T. minata* except that femora lack long, hairlike scales, and hindtibia has two pairs of spurs. Wings whitish, dusted with blackish scales and thus appearing gray, although forewing sometimes so heavily suffused that markings are obscured; forewing normally with diffuse, slightly dentate or sinuous dark antemedial and postmedial bands, the former slightly convex and subparallel to postmedial, which is nearly parallel to outer margin; subterminal shade, if present, indistinct, similarly parallel to outer margin; some veins, especially in medial area, faintly outlined with dark scales; black discal spot present; fringe white, checkered with dark brown and preceded by weak terminal line of diffuse dark spots. Hindwing paler gray, almost unmarked except for small discal spot and diffuse but complete transverse band crossing just beyond middle of wing; fringe whitish, unmarked, preceded by faint, broken terminal line in some specimens. Underside with fore- and hindwing nearly alike, light gray with discal spots, diffuse postmedial bands, and variable, black, interrupted, terminal lines. Length of forewing: holotype, 17.0 mm; other ♂, 16.0–17.5 mm. Genitalia (Fig. 11), differing from those of *T. minata* mainly in their wider, blunt or obtusely pointed medial juxtal process, less heavily spined manica, and smaller, paired, setose processes attached to bases of costal sclerite. Eighth sternite rectangular, not triangular, and eighth tergum without a posterior border of persistent scales.

FEMALE: As described for genus. Antenna simple, covered with whitish scales. Hindtibia with two pairs of spurs. Body gray, variably dusted with black scales; in paler specimens a pair of dark subdorsal spots toward posterior margins of abdominal segments 2–5. Legs gray brown with each tarsal segment pale-tipped. Forewing with light and dark scales almost evenly mixed and no other markings. Length of forewing: 5–6 mm. Genitalia (Fig. 13) as illustrated and described for genus.

Types. Holotype male and allotype female: CALIFORNIA, Inyo Co., Alabama Hills, 4 miles [5 airline km] southwest of Lone Pine, 4550′ [1390 m elev.], 6/7-XII-1982, in pitfall traps (J. De Benedictis & J. Powell); deposited in Essig Museum of Entomology, U. California, Berkeley. Paratypes (15), all Inyo Co., CA: 4 ♂, 3 ♀, same data as holotype, 7/11-XII-1982 (D. Giuliani, De Benedictis, Powell); 1 ♂, Alabama Hills, N. fork Lubkin Cr., 4 mi. S, 1 mi. W of Lone Pine, 4300′, 11-XII-1982 (Giuliani); 1 ♀, Deep Spring Valley, 8-XII-1973, sand dunes (Giuliani); 2 ♀, same locality, 15/16-XII-1978, pitfall traps (Powell); 1 ♂, same locality, 17-XI-1980, flying at sundown (Giuliani); 2 ♂, same data, 17-XI-1982; 1 ♀, Owens Lake, mid XI to mid XII-1978, ethylene glycol pit trap, *Atriplex-Franseria* assoc. (Giuliani, F. Andrews, D. Hardy); paratypes deposited in California Dept. Food & Agric., Sacramento, Essig Museum, and U.S. National Museum of Natural History, Washington, D.C.

Habitats. *Tescalsia giulianiata* is known from three sites in the Owens Valley region, California, which are similar in general aspects of veg-

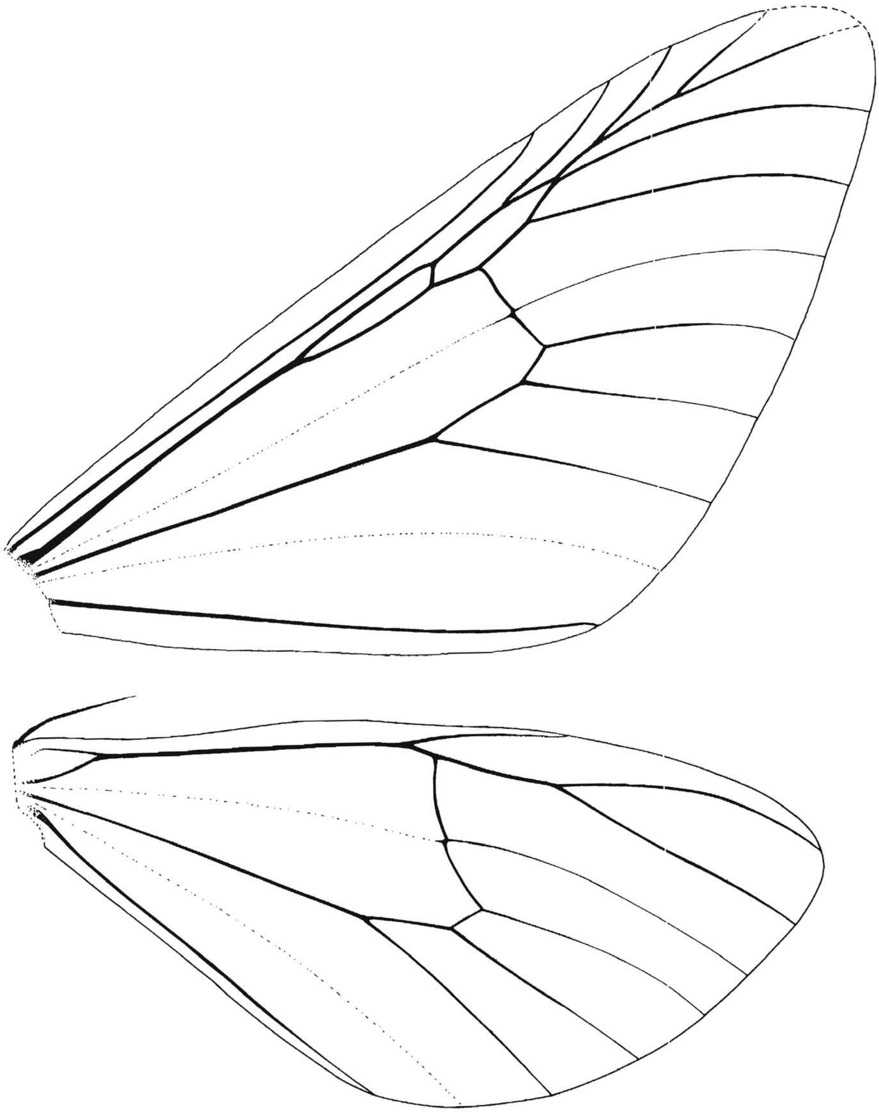


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FIG. 8. *Tescalsia giulianiata* Ferguson, male, wing venation.

etation architecture, with a low scrub of scattered shrubs interspersed with open patches of sand, yet they differ in dominant plant species.

1) Deep Spring Valley is a closed basin at 1500–1600 m elevation, situated southeast of the White Mountains and surrounded by arid

mountain ridges. To the west the valley is separated from the Owens Valley by Westgard Pass (2225 m) and to the east from the valleys of Nevada by Gilbert Summit (1950 m). From the highway along the north edge of the valley, the terrain slopes southward towards Deep Spring Lake, which is dry except following winter storms. Fine aeolian sand from the dry lakebed has been deposited to form low ridges and dunes that are stabilized by low scrub dominated by *Atriplex confertifolia* (Chenopodiaceae), *Thamnosma montana* (Rutaceae) and scattered patches of *Chrysothamnus nauseosus* (Asteraceae). Female moths were taken from open sand and in pitfall traps placed at the base of *Atriplex* and *Thamnosma*, about 1 km north of the lakebed.

The valley is about 300 m above the floor of Owens Valley, and it evidently acts as a basin for cold air drainage, with snow patches persisting much longer than at comparable elevations on the hills around Owens Valley. During our December visits, daytime temperatures of 10–13°C fell rapidly, to 4.5–5.0°C towards sundown and 1.6–4.5° by dusk.

2) The Alabama Hills are remnants of an ancient uplift that has eroded to low hills of decomposed granitic, alluvial sand subtending weathered, granite outcrops. The collecting site is situated at 1390 m elevation about 5 airline km southwest of Lone Pine, off Indian Springs Road. This area is characterized by gently sloping expanses of coarse, granitic sand stabilized by a low scrub consisting mainly of *Tetradymia glabrata* (Asteraceae), a low spiny *Atriplex*, and scattered *Chrysothamnus nauseosus*. Most of the type series was taken at this site, December 7/11, 1982, in pitfall traps deployed December 6. Although the locality is only about 100 m lower than Deep Spring Valley, it is a much warmer habitat during winter.

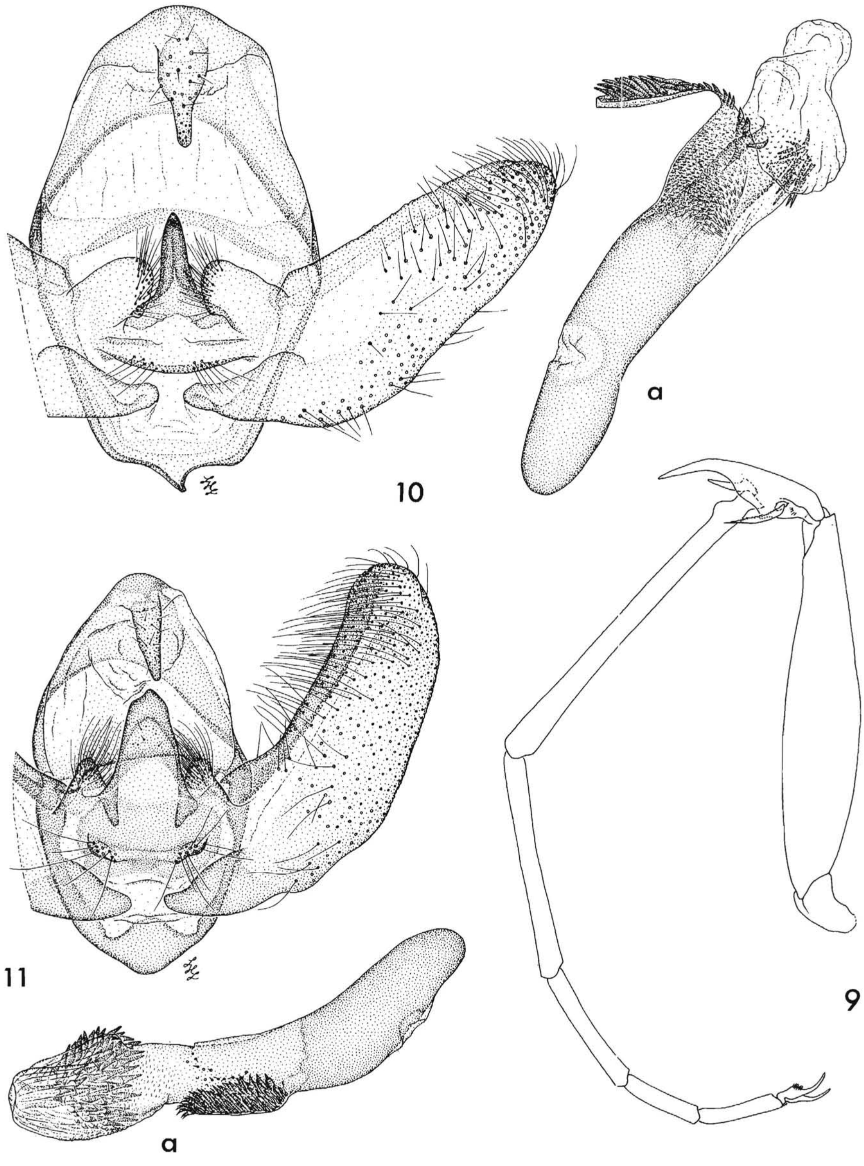
3) The former Owens Lake was drained by the Los Angeles water district, beginning in the 1920's, and has long been a dry lakebed. Aeolian sand is deposited in low ridges along its east margin. One female of *T. giulianiata* was taken here in a pitfall trap. Giuliani and F. G. Andrews had monitored the area by pitfall trapping, with 12 traps in each of 7 vegetation types for one year. The site that yielded the *Tescalsia* is about 3 km northwest of Keeler (1100 m). The traps were set east of a few low sandhills at the margin of the lakebed, in a low area that acts as a catch basin for the sparse rainfall runoff. It is characterized by shadscale scrub, alkaline tolerant species of Chenopodiaceae, including *Atriplex hymenelytra*, the spiny *Atriplex* of the Alabama Hills, *Allenrolfia occidentalis*, and *Sarcobatus vermiculatus*, as well as *Tetradymia glabrata*. Thus the dominant vegetation is more similar to the Alabama Hills site than to Deep Spring Valley. We did not deploy additional pitfall traps at this locality after 1978.

Diel rhythm. Temperatures in December in the Owens Valley area typically drop to 2–10°C below freezing at night but rise well above freezing during the day, often to 10–15°C. Nonetheless, our observations suggest that *Tescalsia giulianiata* is not diurnal and begins activity near sundown. Its period of activity may vary daily with a low temperature threshold and may exclude some evenings. Males were observed flying only twice, by Giuliani on November 17, 1980 and Nov. 17, 1982, near sundown. One female was found on open sand in late afternoon, and one was trapped in a pitfall between 1530–1615 PST (ca. 8–10°C; sunset at 1610), and another between 1630 and 1030 PST the following day, in temperatures below 5°C. Other individuals were trapped during longer intervals, including one male and a female at the Alabama Hills between 1230 and 0930 the following day. Mating was not observed.

On each of the four dates in December, 1977–82, we made continuous observations for 2–8 h, on days when temperatures rose from 0.5–2.7°C at 0930–1030 PST to 15°C in mid afternoon, dropping to 4.5–5.0°C by sundown. No males were seen, and just one female was trapped during these intervals, which included extensive pitfall trapping, beating of shrubs, sifting and net brushing of the sand. *T. giulianiata* evidently is not adapted to diurnal flight when temperatures are highest. We ran a blacklight trap just once; the temperature was 4.5°C at dusk, and not one insect was trapped.

One captive female survived more than 4 days, with lab temperatures at 10–14°C at night to 21°C diurnally. Activity periods were sporadic, but in absence of disturbance, she seemed most active during evening, 1800–2100 h, moved only slowly when viewed by flashlight at 0500–0700, and rarely during morning hours.

During periods of activity, the female held the antennae and forewings at about a 45° angle to the plane of the body (Figs. 5–7). When quiescent, she positioned the antennae back along the body, and the wings were curled downward. On the sand surface, she seemed very awkward, scarcely able to ambulate forward or walk evenly. Walking on the sand, she dragged her abdomen, leaving linear tracks, but this did not seem to be a part of oviposition behavior. By contrast, when debris or the branchlet was encountered, she climbed quickly with agile movement from twig to twig and often hanging by one or two legs, reminiscent of a miniature orangutan. She frequently perched on the highest reach of the branchlet and moved quickly to maintain that position if the branch was moved. It seems that the species is adapted to life in shrubs rather than on the sand, which fails to explain why females were trapped in pitfalls but none could be beaten from shrubs. In fact, there may be strong selection against life on the sand at that time of year because predaceous mites and lycosid spiders appeared in



FIGS. 9–11. **9,** *Tescalsia giulianiata* Ferguson, female, right prothoracic leg; small process arising near middle of double clawed tibia is a vestigial epiphysis. **10,** *T. minata* Ferguson, male genitalia; a, aedeagus. **11,** *T. giulianiata,* male genitalia; a, aedeagus.

33–50% of our pitfall traps. Two of the female *T. giulianiata* fell victim to these predators overnight, when we used dry cups.

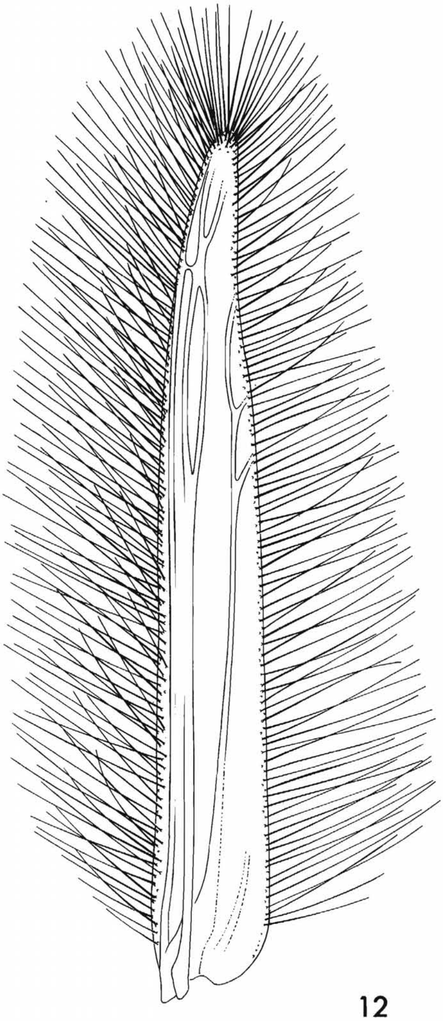
Whether on sand or on twigs, the fore tarsi were extended, so that the tibial hooks were well back from the substrate; evidently they are not employed in adult locomotion. Upon disturbance, the female consistently feigned death, falling on her side with all legs retracted, and remained so for 10–20 seconds. Also, at times the female assumed a repose stance, balancing on her wingtips and curled abdomen, with the legs partially folded (Fig. 6). This may have been an abnormal behavior in confinement, but it was repeated several times for lengthy periods.

Oviposition. The single female retained alive was housed in a plastic box with sand and a dry branch of *Atriplex* (JAP 78M1). A cotton wick was provided, but there was no indication that the female ever imbibed moisture or touched the cotton with her vestigial mouthparts. She deposited 10 eggs in captivity, none during the first 48 h, 7 in the 3rd 24-h period, and 3 the following day. Eggs were deposited between 0940–1000 PST (1), 1055–1125 (1), 1400–1700 (6), and one later. Most were placed on loose sand, but the female was not observed to probe the sand with her abdomen. Two eggs were deposited on the damp cotton wick after the female had been coaxed onto it, and one egg was affixed to a dry *Atriplex* leaf.

Cuming (1961) reported the activity periods of the related larentiine winter moth, *Operophtera brumata* (L.), to be nocturnal. Caged moths in outdoor conditions mated between 1730–2305 at temperatures of −0.8 to +12.2°C, and females oviposited between 1515–0020 at −1.6 to +12.2°C. *T. giulianiata* displays a comparable diel rhythm and temperature tolerance.

Eggs. The eggs (n = 10), which were deposited singly, were oblong, slightly variable in shape, 0.80–0.90 mm long × 0.60 mm wide × 0.48 mm thick, somewhat flattened on the side away from the substrate. The chorion was opaque, white, very weakly rugose, appearing smooth under low magnification. When first deposited the eggs were pale greenish, similar in color and shape to new leaves of *Atriplex confertifolia*.

The eggs were confined in individual gelatin capsules; five were placed in a tightly covered plastic container in refrigeration each night (ca. 8:16 h, 1.6°: 15–20°C), while the remainder were retained at lab temperatures (10–20°C), for 30 days. During development, eggs darkened and most showed a depressed area away from the micropylar end as though collapsing. Larvae began eclosing in the refrigerated sublot January 21, after 34 days; the others were refrigerated 8:16 h from day 36 to 46, and first instar larvae emerged February 2–4, after 46–48 days.



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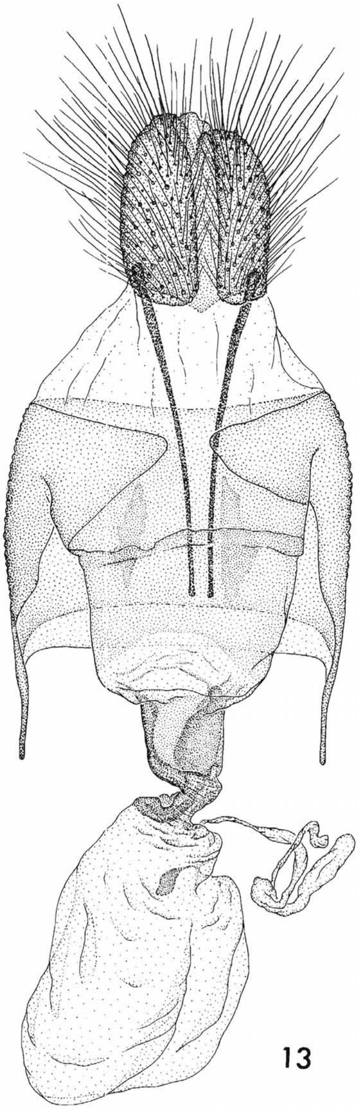

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FIGS. 12–13. **12,** *Tescalsia giulianiata* Ferguson, female, forewing showing setation of margins and rudimentary venation. **13,** *T. giulianiata,* female genitalia.

First instar larvae. The eclosing larva ate a ragged, round hole at the micropylar end but did not continue to feed on the chorion. Each was placed in a small cup with synthetic diet (modified Shorey Diet used for *Choristoneura*) and a sprig of fresh *Atriplex* (but not *A. confertifolia*) from the U. C. Botanic Garden. None fed. After two days,

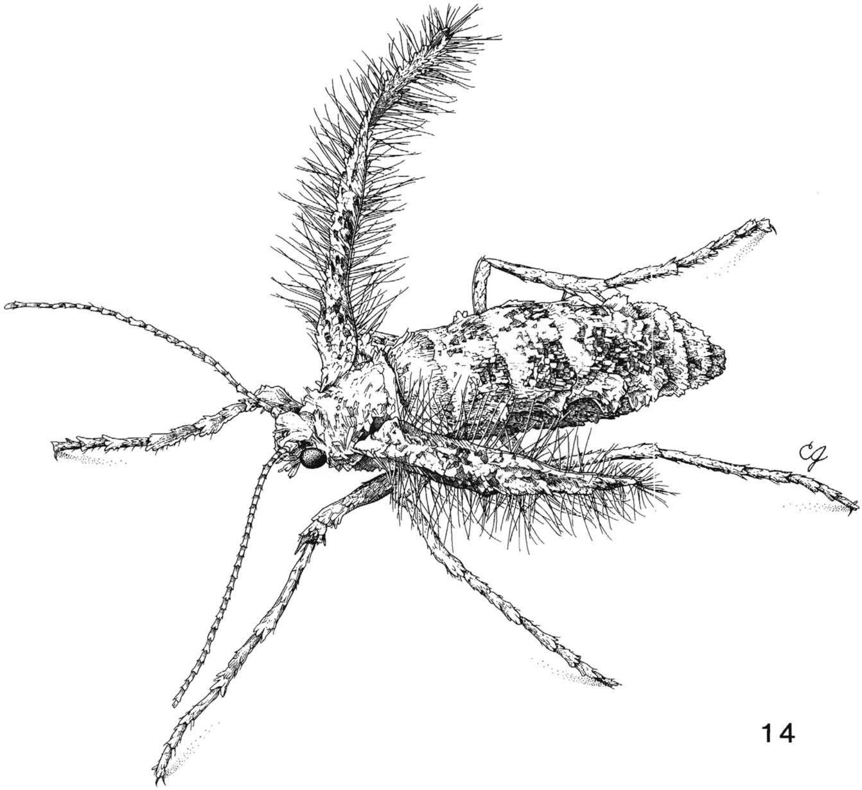

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FIG. 14. Adult female of *Tescalsia giulianiata*.

some larvae also were offered a sprig of *Prunus* or *Salix*, but by that time they likely were too weak to feed. All died by the 3rd day after eclosion.

If failure to accept synthetic diet and the plants provided indicates a narrow host specificity, we cannot suggest a probably food plant. In retrospect, after observing the three habitats from which the flightless females were taken (just the one site was known at the time the eggs were obtained), *Atriplex* is the most plausible of the dominant, woody shrubs, with one or more species occurring in all three habitats. *Chrysothamnus*, which was present only in scattered patches, or some herbaceous perennial are possible alternative candidates.

Tescalsia minata, Ferguson, new species
(Figs. 3, 4, 10)

Diagnosis. Males small, forewing length 12–15 mm; wings brown with mostly indistinct, darker brown markings; hindtibia with one pair of spurs. Female unknown.

Description. MALE: Head: labial palpus slender and delicate, but with its terminal scales clearly surpassing front; eye about as in the other species but much less protuberant, its shape distinctly less than that of half a sphere; front somewhat protuberant but flattened rather than roundly convex, with large, broad scales tending to be oriented toward middle of front; eye rimmed anteriorly and ventrally with brown scales concolorous with those of front, not contrasting. Thorax beneath and tegulae above sparsely clothed with long, brown, hairlike scales; legs similar in the two species except that femora of *T. minata* have long, hairlike scales, and the hindtibia only one pair of spurs. Wings gray brown with variable, darker brown markings; forewing with antemedial band often strongly convex and enclosing a paler area toward base; faint basal band also may be present; postmedial not always distinct but, if present, not parallel to outer margin, more curved, concave in posterior half of wing and convex in costal half; a vague, pale, subterminal band may be present; dark-brown discal spot present but weak; fringe brown, concolorous with wing, unmarked; terminal line wanting. Hindwing brown, hardly paler than forewing, unmarked except for weak discal spot; fringes concolorous. Underside much like upperside except that a faint, diffuse, convex, transverse band may cross just beyond discal spot, and veins on underside of hindwing may in part be faintly outlined with darker brown scales. Length of forewing: holotype, 13 mm; other ♂, 12–15 mm. Genitalia (Fig. 10), similar to those of *T. giulianiata*; the most obvious difference is in the shape of the large medial process of juxta. In *T. minata* it has an abruptly acuminate, thornlike shape, with a sharp-pointed apex. Spines on manica more numerous and larger, and paired, setose processes flanking manica and adjoining base of costal sclerite of valva are larger. Eighth sternite small and triangular rather than quadrate, and eighth tergum with wide, dense tuft of short, persistent scales along its posterior margin, not easily removed in dissection.

FEMALE: Unknown.

Types. Holotype ♂, Mina [Mineral County], Nevada, November 17, 1914, A. Wetmore. Paratypes: 4 ♂, same data. Type series in collection of U.S. National Museum of Natural History, Washington, D.C.

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