NOTES ON THE EARLY STAGES OF THE BARBERRY GEOMETRID MOTHS, GENUS *CORYPHISTA*, AND THE DESCRIPTION OF A NEW SUBSPECIES OF *C. MEADII* (LEPIDOPTERA)

JOHN ADAMS COMSTOCK

1373 Crest Road
Del Mar, California 92014

Several forms of the moths now included in the genus *Coryphista* were originally described in other genera, such as *Triphosa*, *Philereme* and *Scotosia*.

The first to be named was *Scotosia meadii*, by Packard (1874: 41) who published it, "from three males, Colorado, August 23, T. L. Mead." In his original description it is spelled *meadii*.

Packard (1876: 176) for some unaccountable reason described *Philereme meadiata*, listing his own species, *Scotosia meadii* as a synonym. According to rule, his *meadiata* becomes the synonym. Dyar (1902: 276) lists it correctly as *Coryphista meadii*.

Edwards (1885: 50) described what he thought was a new species, *Triphosa badiaria*. His type was a female from Shasta County, California. This proved to be the dimorphic form *badiaria* of *Coryphista meadii*.

Strecker (1899: 11) named *Philereme optimata* from one female taken near Seattle, Washington, and two examples, male and female, taken by Bruce in Colorado. *Optimata* proved to be synonymous with *Coryphista meadii* f. *badiaria*.

Munroe (1954: 282) named an eastern subspecies *Coryphista meadi atlantica*, and clarified certain points concerning this variable moth. This was followed in the same publication by MacKay (1954) with a well illustrated paper on its life history.

In 1935 the late Commander Charles M. Dammers of Riverside, California, reared numerous examples of the moth on "*Mahonia aquifolium*" (now *Berberis aquifolium* Pursh.), and made colored illustrations of the larva and pupa which were not published.

Later, in June of 1940, while in Santa Rosa, California, I was able to obtain eggs and larvae of *C. meadii*, and made notes, but no drawings.

My real interest in *Coryphista* came alive in the spring of 1965, in Del Mar, when an infestation of larvae threatened to defoliate bushes of *Berberis pinnata Lag.*, in my garden.

I reared the local colony continuously from February to September. The result was a series of imagos, all uniformly darker than all other examples of typical *meadii* I had seen. A small number only showed tendency toward the form *badiaria.*

I mailed examples to Drs. Munroe and Rindge, requesting their opinions. Specimens were also sent to Carl W. Kirkwood of Summerland, California, and to Lloyd M. Martin, of the Los Angeles County Museum of Natural History. The responses were most cooperative. Munroe sent me examples of *C. meadii* and *badiaria* from British Columbia, and paratypes of his *Coryphista atlantica* from Ottawa, Ontario, for comparison, hinting (*in litt.*, June 8, 1964) that, if seasonal variation could be ruled out, it "may well be that your population represents a distinct race or subspecies." He suggested caution on the basis of the great variability in the species, but admitted that mine were "darker than the material we have from British Columbia, Washington, Oregon, and the Bay region of California."

Dr. Rindge evidenced his never-failing helpfulness in stating that "your examples from Del Mar, California, are darker than, and less conspicuously marked than other western populations of *meadii.* While I have not dissected any of the four specimens you sent me, it does seem likely that you do have a valid subspecies."

The responses from Kirkwood and Martin were of similar import, in addition to which they gave valuable information on the range of *Coryphista meadii.*

From this it would seem that the typical insect ranges from British Columbia southward and southeastward through the Cordilleras of North America to Arizona and California. In the Baja California border area the very dark (smoky) race occurs. For this dark race I propose herein the subspecific name *fumosa.*

Along the eastern seaboard, from Ontario, Canada, southward—possibly as far as Georgia, the subspecies *atlantica* ranges.

How far westward *atlantica* extends is yet to be determined but probably it occurs in a gradually modifying form to the Rocky Mountain foothills where it becomes typical *meadii.* The type locality of *meadii* is Colorado.

In order to determine its possible great plains distribution a study should be made of the plant genus *Berberis.* The holly-like species of this are exclusively the food plant of *Coryphista.*

My drawings, photographs and notes on the life history of *Coryphista meadii fumosa* will supplement to some extent the account of the life history of *C. atlantica* by Margaret MacKay.

These figures will facilitate a description of the new subspecies, since comparison with the other forms will save wordy details.

Coryphista meadii fumosa, new subspecies

Figures 1, D and E

Holotype male (Fig. 1 D).

Ground color of upper surfaces of both wings, sooty black, with occasional slight irregular mottlings. The only distinct line on each wing is the serrated narrow black line along the base of the fringes,

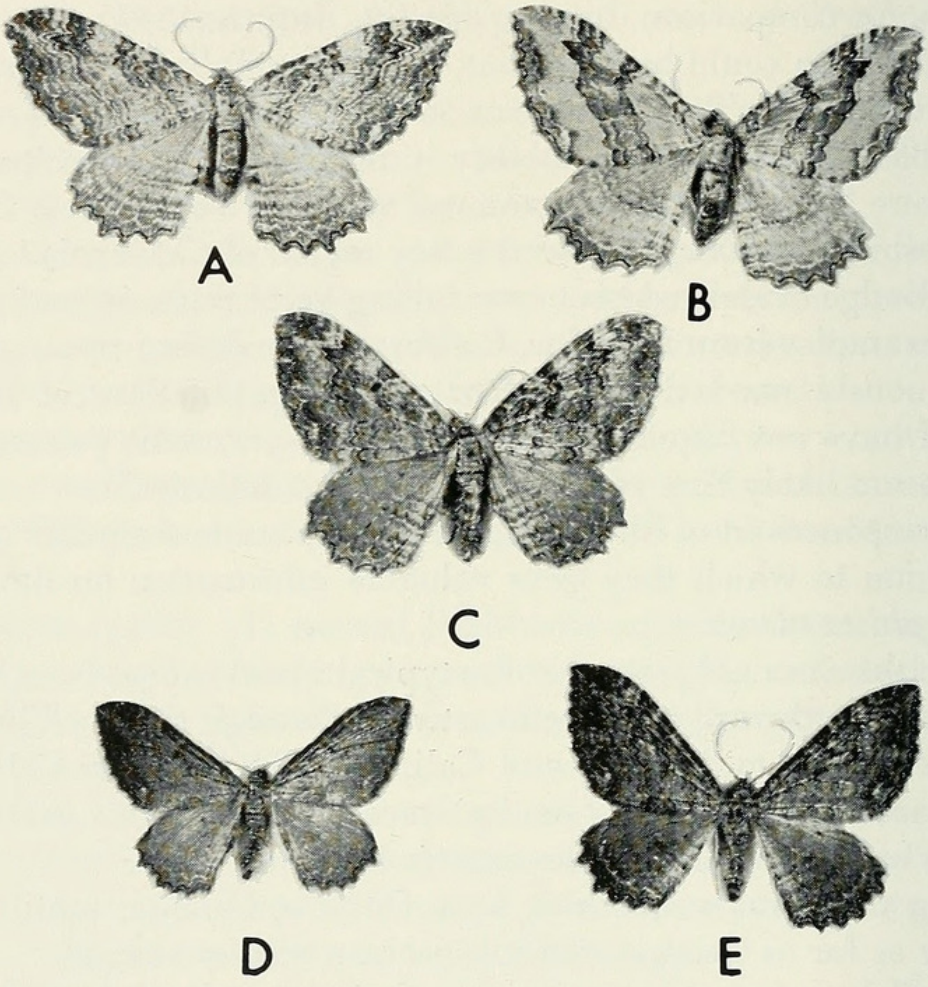

Figure 1. Geometrid Moths of the genus *Coryphista.* A. *Coryphista meadii* (Packard), Seton Lake, Lillooet, British Columbia, Canada, June 15, 1926, J. McDunnough. Det. E. G. Munroe. 1964. B. *Coryphista meadii badiaria* (Hy. Edw). Seton Lake, Lillooet, British Columbia, Canada, June 21, 1926. J. McDunnough. Det. E. G. Munroe. 1964. C. *Coryphista meadii atlantica* Munroe. Paratype. Ottawa, Ontario, Canada, July 30, 1952. W. Krivda. No. 6132. D. *Coryphista meadii* subsp. *fumosa* Comst., new subspecies. Holotype male. Del Mar, California, August 2, 1964. Ex pupa. The example is somewhat smaller than average males, but was chosen for its perfect condition. The average male measures approximately 32 mm., apex to apex of forewing. E. *Coryphista meadii* subsp. *fumosa* Comst., new subspecies. Allotype female. Del Mar, California, September 15, 1964. Ex pupa.

and a slight darkening of the veins with a few light spots, seen best with a lens. On the forewing the costal margin is black. A black spot occurs at the outer edge of the cell. Near the outer inferior angle of the primary there is a faintly defined white spot. Near the outer margin of the secondaries there is a faint suggestion of a sinuous line. Otherwise there are none of the transverse wavy or crenulate lines which are such a distinctive feature of typical *meadii*.

The underside of the wings in the male holotype are a uniform gray-brown. The black spot at the outer end of the cell is very distinct, and larger than it is superiorly.

Head, thorax and abdomen, unicolorous with the wings.

Allotype female (Fig. 1 E).

Ground color of all surfaces, similar to that of the male, but with the female it is overlaid by several indistinct black blotches and dots. Along the costal margin of primaries these black blotches are interspersed with a few lighter brown areas. The white dot on inner angle of forewing is somewhat more conspicuous than in the male. The serrated marginal black line is interrupted at its point of contact with each vein by a minute whitish dot.

On the secondaries internal to the serrated marginal line is a sinuous line paralleling it, which is light in color (nearly gray-white). Along the inner margin of secondaries there is a suggestion of a few transverse lines, but these fade out at about the M-1 median nervule.

Other than these features, the sexes are alike. With the high degree of variation in this species it is frequently difficult to distinguish the sexes without dissection.

Distribution of Types and Paratypes

Holotype and allotype deposited in the Los Angeles County Museum of Natural History. 18 paratypes will be distributed between the Los Angeles County Museum of Natural History, the Canadian National Collection, the American Museum of Natural History and the United States National Museum.

Metamorphosis

The life history of typical *Coryphista meadii* was briefly recorded by Dyar (1902) under the title *Coryphista badiaria* Hy. Edw. At that time he did not realize that *badiaria* was a dimorphic form of *meadii*.

His specimens were reared on *Berberis repens* Lindl., taken from "various places in the foothills of the Rocky Mountains; back of Golden and Boulder, Colorado and in the Platte Canyon."

My reared material was all from Del Mar, California.

Egg: (Fig. 2, A and B)

A flattened oval; length, 0.75 mm.; width at widest end, 0.50 mm., at narrow end approximately 0.35 mm. Surface covered by a network of raised walls enclosing hexagonal cells.

Color, glistening light yellow. Eggs collected Feb. 23, 1964 hatched in five days.

Larva, First Instar: (Fig. 2 C).

Head, yellow; ocelli, black. Mouth parts brownish. Body, translucent light yellow with occasionally a slight greenish tinge.

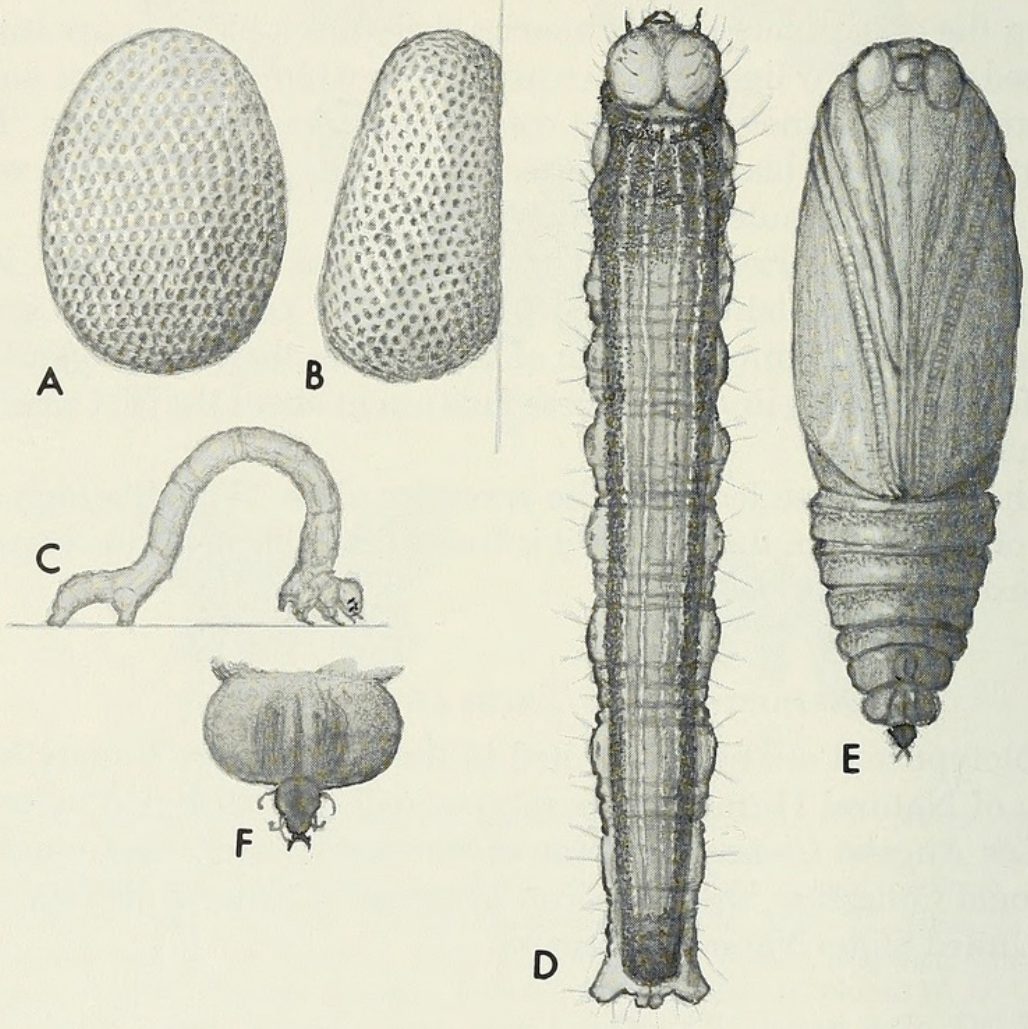

Figure 2. Egg, larva and pupa of *Coryphista meadii fumosa*, new subspecies A and B, Egg, highly magnified. C. First instar larva, enlarged. D. Final (4th) instar larva, dorsal aspect, enlarged. E. Pupa, ventral aspect, enlarged. F. Caudal segment and cremaster, enlarged.

All figures reproduced from water color drawings by the author.

Posture when resting, body in a complete loop, the head and cauda close together, more exaggerated even than in our figure.

Measurements were approximately those given by Margaret MacKay (1954) for *C. meadii atlantica.*

Second instar:

Length, 4 to 5 mm. Head width, 0.65 mm.

Color of head, light orange. Ocelli, nearly black.

The body color completely different from 1st instar. The dorsum has a wide band of brown to blackish, lighter along its center, darkening towards the margins; central area with a paired middorsal line of light yellow. Spiracular area with a wide longitudinal white band, narrowing at each segmental juncture, bulging outwardly at the middle of each segment. This band takes on a yellow tinge near head and cauda.

Legs, spotted black and yellow. Prolegs and anal prolegs, predominantly yellow.

Third instar:

Length of larva not measured, but considerable disparity in individuals was noted.

Head width, 1.1 mm. Ocelli, black. Mouth parts tinged with brown. Color of head, glistening yellow.

Body: Cervical shield, dark yellow. Along the dorsum, a wide band of reddish-brown, margined with black. Throughout the length of this band there are four narrow, barely discernible yellow stripes, faintly margined with gray. Spiracularly, a longitudinal wide yellow band, lobulated, expanding in the area of each spiracle, and contracting on segmental junctures. This band is conspicuous only from the 4th to 8th segments. It narrows toward the head and there becomes pink. On the 9th to 11th segments it becomes pink. In the center of each lobulated portion the black spiracles are conspicuous.

Legs, black proximally and translucent distally. Prolegs, pink. Venter, light yellow.

Fourth Instar: (Fig. 2 D).

Length ranging from 9 mm. to 20 mm. Head width approximately 1.4 mm.

The dorsal aspect of this final instar is accurately shown in the figure. There is generally little difference from that of the preceding instar. The wide stigmatal band extends the entire length of the body, and its lower margin tends to become pinkish.

The four longitudinal middorsal white stripes are more clearly defined.

Pupa: (Fig. 2 E).

Eight examples examined. Length, 10 to 13.8 mm. Width, 3.2 to 4.2 mm. Fusiform, the head rounded. Eyes, oval, protruding ventrally, length, 0.8 mm.

Body, red-brown. Texture, predominantly granular. Antennae and maxillae reaching to wing tips. Spiracles, small, dark, and relatively inconspicuous.

Cremaster (Fig. 2 F); black, pyramidal; length, 0.5 mm., terminating in a pair of black spurs, pointing caudo-laterally. There are three small yellow hooklets on each side of the pyramidal cremasteric body.

All specimens were reared on *Berberis pinnata* Lag.

A dipterous parasite, *Madremyia saundersii* (Will.) was recovered from some of the pupae.

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