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THE PYRALID FAUNA OF THE WESTERN UNITED STATES

INTRODUCTION

The western United States is one of the most interesting and complex natural environments in the temperate zone. The north-and-south trending mountains cause not only long southward extensions of cool zones in warm surroundings, but also, because of the rain-shadow effect, sharp contrasts of moisture and precipitation. No less important is the barrier effect of the mountains and valleys, permitting the differentiation of faunas even though their environments may be similar.

These conditions are reflected in the complexity and interest of the pyralid fauna, still imperfectly known. What I shall do in this paper is to discuss certain types of ranges, with examples, and then to try to give a general picture of the fauna, with hints as to promising fields of investigation.

TYPICAL RANGES

1. ARCTIC-ALPINE PYRALIDS. The arctic-alpine region can be defined very roughly as that lying above or north of the limit of trees. In practice it is usually found that the non-arctic or non-alpine fauna penetrates to a certain distance beyond this limit. Typical members of this group have a wide range in the arctic and alpine zones. For historical reasons these were often first described from their relict habitat in Colorado, rather than from their main range in the Arctic. Examples are *Orenaia coloradalis* B. & McD., which proves to have a wide range in the Canadian Arctic, and *Crambus browerellus* Klots, originally described from Colorado in the west and Mt. Katahdin in the east, but now known from Alaska to Baffin Island. In general the alpine ranges of these insects have been poorly studied. They are usually known from isolated collections in Colorado or Wyoming, much less often from British Columbia; usually there is a wide gap in the known range from Colorado or Wyoming to the Arctic. Systematic investigation of the alpine moth fauna in the western U. S. and British Columbia is something that is badly needed. If plants are any guide, interesting and complex distribution patterns will be found.

In addition to the arctic-alpine pyralids already discussed, there are other alpine species that are purely Cordilleran. The ranges of these are usually incompletely known; often they are known only from single collections, as, for instance, my *Orenaia pallidivittalis* from Mt. Stephen, B. C., and *Metaxmeste nubicola* from Colorado. Further discoveries in this group must be expected, with more mountain investigations.

In general, typical arctic-alpine pyralid species have not been found south of Colorado, and they tend to occur in the Rockies rather than in the coastal ranges and Sierras, where heavy snowfall tends to squeeze out their zone.

2. SUBARCTIC-SUBALPINE AND BOREAL-MONTANE PYRALIDS. This large group consists partly of widely ranging species, sometimes associated with conifers, *e.g.*, *Dioryctria reniculella* Grt., but often less obviously limited, *e.g.*, *Pyrausta fodinalis* Led. These species tend to range across Canada and the northern U. S. and to extend southward along the mountains, often to the San Bernardino Mts. and to the Arizona ranges, sometimes — perhaps oftener than we think — far into Mexico and even Central America. Sometimes the wide-ranging northern forms show complex specific or subspecific differentiation in the western mountain region, as in the *Udea itysalis* and *Loxostege commixtalis* groups. Then, too, there is a strong group of purely Cordilleran species or groups, *e.g.*, *Pyrausta tuolumnalis* B. & McD., which ranges from high altitudes in the Sierras to low altitudes in the Yukon, cutting across the transcontinental range of the closely related *P. ochosalis* Dyar. A good example of a Cordilleran group is the large development of the metallic-black group of the phycitine genus *Pyla*. Differentiation, both specific and subspecific, within the Cordillera is important, but is too complex to discuss here.

3. VANCOUVERIAN PYRALIDS. The special group of linear Pacific-coast ranges is less important in Lepidoptera than in beetles or plants, but there are some good examples in Pyralidæ. A striking one is *Udea washingtonalis* (Grt.), which ranges from northern California to the Aleutians and Pribilofs; it is always strictly coastal except for the typical limited re-appearance in the wet interior zone of British Columbia. Another type of linear Pacific-coast range is shown by *Pyrausta ferrubralis* Pack., which is widely distributed to Arizona and Mexico in the south, but which has a ribbon-like range along the Pacific coast as far as Vancouver Island.

4. PLAINS PYRALIDS. A large group of pyralids is characteristic of the grassy plains; these include many Crambinæ, such as *Pyraustinae* as *Loxostege albertalis* B. & McD., and Phycitinæ of several genera, *e.g.*, *Sarata*, *Pyla*, and *Pima*. The plains fauna extends to the foot of the Rockies, and is represented in considerably modified form in the grasslands of the Great Basin and the interior valleys of Washington and British Columbia.

5. CALIFORNIA VALLEY PYRALIDS. A small but special element appears to exist in the interior valley of California; the species of this area may be of eremic affinity, *e.g.*, *Noctuelia atascaderalis* Munroe, or, on the other hand, even aquatic, *e.g.*, *Synclita occidentalis* Lange. *N. atascaderalis* reappears in the valley country of Oregon, but does not extend south to the Mojave desert.

6. SOUTHWESTERN EREMIC PYRALIDS. The desert and subdesert areas of the southwest form an enormous and complex habitat, characterized by many widespread species, *e.g.*, *Palpita gracilalis* Hulst, *Diastictis sperryorum* Munroe, and a large number of others. A considerable number of species are shared with the dry grasslands and extend northward into Canada on the Prairies or in the interior valleys of British Columbia, *e.g.*, *Noctuelia rufofascialis* Steph. and *Microtheoris ophionalis* Zell.

Although the eremic areas are tied together by a common fauna of wide-spread forms, every lepidopterist knows that they are extremely varied both as to habitats and as to details of the fauna. Perhaps the richest area is Arizona, where plateau and coastal Mexican forms abut on those of the Colorado Plateau and the Mojave and Imperial deserts. This assemblage is liberally studded with high mountain ranges and presents a startling mixture of faunas, which, as the recent work of LLOYD MARTIN and his associates shows, is only beginning to be explored. Lepidoptera-wise, what we badly need is thorough collecting in the plateau and mountain regions of Mexico, which will shed tremendous light on our North American problems. To the east, in the mountainous areas of western Texas and southeastern New Mexico, a considerably different desert fauna occurs. This contains a number of endemic species, mostly as yet undescribed. Still farther east, in the Brownsville-Pharr area of Texas is the locality *par excellence* for tropical invaders; here a mixture of "moist" and "dry" forms is found. On the west, in California, the low-level Imperial Desert and the higher Mojave Desert have much in common. Many species, for instance several species of *Noctuelia*, seem confined to this area. Farther north, the Great Basin and the Colorado Plateau are among the least-collected areas in North America, perhaps because they are flanked by more obviously interesting regions. What we know of them suggests that remarkable discoveries await us.

The most general characteristic of the eremic fauna is close adaptation to the harsh environment. Extreme food-plant specialization and elaborate water-conserving and diapause arrangements are the rule. A large group of Phycitinæ is associated with cactus, boring in the fleshy stems. The *Noctuelia* group of Odontiinæ has developed in a manner closely similar to *Schinia* in the Heliolithidinae, being closely tied to flowers, especially of Compositæ, in which the larvæ probably feed, and having developed a number of brightly coloured, diurnal species, with reduced eyes.

NATURE OF THE WESTERN FAUNA

The western fauna consists of a mixture of Holarctic, purely North American, and Neotropical elements. The last, of course, predominate in the south, the first in the north and at high altitudes.

Considering the Pyralidæ group by group, the Glaphyrinæ are well represented, mainly by eremic forms. The species are mostly different from those in the east; they run very close in external appearance, but have striking characters in the male and female genitalia. This is an entirely New-World group. The Nymphulinae, recently monographed by LANGE, are characterized by a predominance of stream forms, as opposed to the greater importance of pond species in the east. Species extend throughout the west; they are mainly of Neotropical affinity. In the Scopariinæ there are both Holarctic and Central American components. The genus *Scoparia*, s.str., is less well represented than in the east, but this is compensated for by other genera. In all three of these subfamilies there are numerous cryptic species and careful collecting in a variety of localities is desirable.

The Pyraustinae are well represented, by genera and species of varied origins. Among the important genera are *Pyrausta*, *Evergestis*, and *Loxostege*, all of which contain numerous extremely close species.

The Odontiinae are very well represented, especially in the drier regions, in contrast to their poor representation in eastern North America. The strong development of *Noctuelia* and allies parallels the similar development in the eremic regions of temperate Asia. The North American forms have little direct affinity with Palæarctic ones, and even less with the Neotropicals.

The Crambinae are well represented, again with important Holarctic and Neotropical components, but also with a large native North American development of the genus *Crambus*, s.l. The water-loving Schœnobiinae, on the other hand, are poorly represented.

Of the pyraline series, the Pyralinae themselves have a moderate representation, but with a number of purely western species, well distributed among the different regions. The Epipaschiinae have a few genera but numerous species. The widely distributed western group centering on *Jocara trabalis* Grt. presents interesting problems, as does the difficult genus *Tetralopha*. The western Epipaschiinae have considerable affinity with the Neotropical fauna, but little with Old World forms. The mainly American subfamily Chrysauginae is represented by a scattering of species and genera, most numerous in the southwest. The general affinities are tropical.

The Galleriinae are poorly represented, but the related Macrothecinae reach their best development in the Southwest, where there are many undescribed species.

The Phycitinae are represented by a rich array of genera and species; they are well developed in both arid and moist areas, and have a good mixture of Holarctic, native and Neotropical elements. Some of the groups have been mentioned above. HEINRICH's recent monograph has opened the door to the study of this fascinating group. The related subfamily Anerastiinae remains the most poorly known pyralid subfamily in North America. It is well represented in the arid southwest and will certainly repay the efforts of an energetic specialist.

CONCLUSION

It should be obvious that our knowledge of the western Pyralidæ is far from satisfactory. Even in the better-known groups such as Pyraustinae and Crambinae, a number of species remain to be discovered. However our distributional and biological knowledge lags far behind that of the taxonomy. What we need is careful and intensive collecting in a wide variety of habitats, to reveal species and establish distributional patterns. Even more do we need life-history studies and careful observations of habits and ecological correlation.

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