

PROFILES

Journal of the Lepidopterists' Society
44(4), 1990, 273-284

HARTFORD H. KEIFER—PIONEER CALIFORNIA MICROLEPIDOPTERIST

JERRY A. POWELL

Department of Entomological Sciences, University of California,
Berkeley, California 94720

ABSTRACT. H. H. Keifer was the first person to study Microlepidoptera extensively in California, but after a series of excellent papers in 1927-37, he decided at the age of 35 to devote the remainder of his career to eriophyid mites. Keifer's early career and Lepidoptera work is summarized. He described 46 new taxa (1 genus, 44 species, 1 race), primarily Gelechioidea, all but one from California, 87% from specimens that he reared from larval collections. He characterized larvae and often pupae of about 40 additional species and for others he reported occurrences in California or hostplants or both. A bibliographic list of the total of about 150 species is presented.

Additional key words: Gelechiidae, larval hostplants, bibliography, biography.

The first person to study Microlepidoptera extensively in California was Hartford Hammond Keifer, who published a series of papers in 1927-37. His approach emphasized biologies and immature stages, his techniques were superb, and his analysis of systematic placements was far ahead of his time, employing hostplant and ecological specificity as well as morphological features of larvae, pupae and adults, which he illustrated in great detail. His work has served as a beacon for standards of quality for those of us who were familiar with it. However, at the age of 35, Keifer decided to study eriophyid mites, and he terminated his work on the taxonomy of Lepidoptera.

Hartford Keifer was born in 1902 in Oroville, California, where an interest in natural history and insects, especially butterflies, was encouraged by his aunt, Dr. Cordelia Burt Leggett. He attended the University of California, Berkeley in 1920-24 and earned a B.S. degree in entomology. After working for the Forest Service for a few months, Keifer took a position as Assistant to the Curator, E. P. Van Duzee, at the California Academy of Sciences, San Francisco, mounting and labeling accumulated material. He was the entomologist on the Academy's expedition to the Revillegigedo and Tres Marias Islands, Mexico, in April-June 1925, returning with more than 10,000 specimens (Keifer 1926).

We do not know why Keifer decided to study Microlepidoptera—there was no lepidopterist at the University or the Academy—but it seems likely it was because nobody else in California was interested in

them. He is described by his wife, Mary, as a kind of loner who liked to branch out and work on his own. This interest was evident already in 1925 by a large number of spread micros among his collections from the Revilleggedos expedition, an effort that general collectors do not make. Van Duzee, although a hemipterist, had worked with A. R. Grote in New York, and was an industrious moth collector who made considerable progress in building up the Academy's collection by exchange and identifications from Barnes and McDunnough. He helped and encouraged Keifer to build the micro collection at the Academy (Keifer 1935a:197), although much of the work was carried out during weekends and evenings (Van Duzee 1927).

The first species that Keifer described, *Recurvaria bacchariella*, was reared from larvae, and from the beginning his approach emphasized life histories (Keifer 1927). In a letter to Annette Braun (October 1926), he noted that San Francisco was a place for the person wishing to do life history work because net collecting usually is poor and light collecting out of the question most of the time due to the fog and cool winds.

The situation that Keifer faced, beginning a study of Microlepidoptera in California in the 1920's, is almost unimaginable. There was no collection, and the literature consisted largely of isolated descriptions without illustrations of genitalia. In a letter to Braun in February 1927, two years after Keifer began his studies, he enthused over a gift of specimens representing 58 eastern species, which "more than double our number of named species"! Evidently, he attempted taxonomic placements primarily using *Genera Insectorum* by Meyrick, and Forbes' *Lepidoptera of New York*, which were based on wing venation.

In early 1928, Keifer returned to the University of California and began taking classes towards a higher degree. However, his father became ill and died, which upset Hartford's plans. He then stayed at the family home in Oroville for a few months, during which he made collections in the foothills of the Sierra Nevada and Sutter Buttes (which had not been sampled for Microlepidoptera before and have not since). After returning to the Academy for a brief time, Keifer was appointed as the first laboratory assistant in charge of the collection and identifications for the California State Department of Agriculture (Mackie 1928), and, newly married, he moved with his wife, Mary, to Sacramento, in August 1928.

There he again started with no collection, inadequate library facilities, and isolated from professional colleagues. Again, the lack of comparative material is impossible to comprehend: in February 1931, more than two years later, Keifer responded to a return of Tortricidae that August Busck identified, "This is the largest number of named tortricids I have yet had the opportunity to examine." The lot contained *eight*

species of the 80+ Tortricinae that we now recognize in California! He remained at Sacramento for the duration of his career, at first as the only systematic entomologist and ultimately becoming Program Supervisor of the Insect Identification Laboratory, until his retirement in 1967.

The scope of administrative responsibilities at Sacramento grew staggeringly during Keifer's 39-year tenure, yet he continued a productive research career through nearly all of that period. Insect identifications provided by the lab increased in concert with California's growth as the richest agricultural State. In the early years (1928–42), IDs averaged 2300/year, all recorded in log books in longhand by Keifer; discovery of the Oriental Fruit Moth in California late in 1942 resulted in extensive trapping programs and an increase in IDs to 45,000/year during 1943–52; another quantum jump resulted from Khapra Beetle and fruit fly surveys in the late 1950's, increasing the load to 146,000/year and the taxonomists under Keifer's direction to five, an average of 87 IDs per taxonomist per day! (Harper 1963). With the spread of Pink Bollworm to California, a massive light trapping program was carried out, and identifications averaged 188,000/year in the 1960's, handled by eight taxonomists (Harper 1965).

Keifer's expertise extended over all orders of insects, and his early reports in the *Bulletin of The California Department of Agriculture* treated larvae of Diptera, weevils, and other insects in addition to Lepidoptera. He recorded biologies, geographical distributions, or first occurrences in California of hundreds of insect species, including many moths, in the annual reports published in the *Bulletin* between 1935 and 1953 (Appendix 1). After R. W. Harper became Bureau Chief in 1955, however, the sections of the Annual Report no longer credited Program Supervisors with authorship, and after 1962 records of insect species ceased to be included in the reports of the Insect Identification Laboratory.

In addition to his other duties, Keifer served for 30 years as Secretary to the California Entomology Club, producing the minutes of meetings, which appeared in the *Bulletin*, and he was its president in 1964. In 1943 he served as president of The Pacific Coast Entomological Society, and in 1972 he was presented the C. W. Woodworth Award by the Pacific Branch of the Entomological Society of America (Carter 1972).

His fieldwork, which was done primarily on weekends and vacations, did not extend beyond Los Angeles, and much of it was in the nearby Sierra Nevada. He returned occasionally for family visits to San Francisco and made additional collections, although by early 1934, he noted in a letter to Busck that "These San Francisco collecting grounds, which have yielded so many new species, are rapidly being destroyed."

During 1927–37 Keifer published a series, "California Microlepidop-

tera" in parts I–XII, in which he described 46 new taxa (1 genus, 44 species, 1 race) (Appendix 2) in painstaking detail and increasingly profusely illustrated. All but two of the species are Gelechioidea, mainly Gelechiidae, all but one from California, and 39 of them (87%) had been reared from larval collections. In addition, he characterized the larvae and often pupae of more than 40 previously described species that he reared. More than half of the new taxa were described in the last three years (1935–37), and during this time he emphasized analysis of relationships among the groups of "*Gelechia*," "*Gnorimoschema*," and the higher taxa of Gelechioidea. Based on larval and pupal characters, he was the first to point out the gelechioid relationships of the Scythridae and confirmed them for the ethmiids, which were considered to be Yponomeutoidea by Meyrick and others. Hence, his work was increasing in breadth as well as quantity, rather than waning, when he abruptly terminated it. After 1937, Keifer's contributions to Lepidoptera knowledge were limited to reports of newly discovered occurrences and foodplants in California, in connection with his work in the Department of Agriculture. Altogether, he published on more than 150 species of moths representing virtually all superfamilies (Appendix 2).

It is a tribute to the meticulous care with which he worked that despite the handicaps of isolation from collections and type specimens, literature and contemporary specialists, Keifer described only five species that are now considered to be subjective synonyms of names that he did not recognize. One of these, *Keiferia elmorei*, is questionably synonymous.

Throughout the Microlepidoptera period, Keifer maintained an active correspondence with colleagues, particularly Braun and Busck. Both were extremely responsive to requests for identifications and confirmation of his suspected new species, as well as in exchanging specimens. Both repeatedly encouraged his requests, stating that it was a pleasure to work with his excellent, reared material, and both encouraged him to describe his species, welcoming "the good work based on reared material such as you are doing" (Busck, May 1932) and complimented him, e.g., "your descriptions of new species are much ahead of most of those made by the last generation, including my own, due to your rearing notes and to your genitalia figures" (Busck, January 1934, which was prior to most of Keifer's descriptions and more detailed larval and pupal diagnoses). Keifer noted that without their help, work on micros in the West would be impossible (Keifer 1932:73).

Ultimately, I suspect that it was this dependence upon the collections and specialists in the East that caused Keifer to give up the study of Microlepidoptera. He wanted to work on his own, and this simply was impossible in an era when travel was too costly and time-consuming to

permit visits to the major museums of the world to which we are now accustomed.

The primary types representing Lepidoptera names proposed by H. H. Keifer are nearly all at the California Academy of Sciences, San Francisco, along with most of the specimens from his early years of fieldwork. Paratypes of many of his species are in the Braun collection at the Academy of Natural Sciences, Philadelphia, and in the National Museum of Natural History, Washington, D.C. His private collection of Microlepidoptera, which was assembled mostly between 1928 and 1936 and is estimated to have contained 5–6000 specimens, was donated to the California State Department of Agriculture, Sacramento, in 1974.

In 1937, when an outbreak of Citrus Bud Mite occurred in southern California, Keifer was assigned to the identification of eriophyid mites. Soon he perceived that little was known and there were no other “experts” on which he would need to depend. All the literature was available at the University of California, and he turned his limitless energy to a wide open field that lay before him. Starting in 1938 he began extensive descriptive taxonomy of this economically important group of mites, and he became the world authority. A similarity in approach carried over from his work with the micros—host plant specificity as a key to discovery of species, coupled with detailed and profusely illustrated descriptions. Because his descriptive work on Eriophyidae spanned more than 30 years and produced more than 630 new taxa, in 56 publications including comprehensive works (Arnaud & Blanc 1988), we can only speculate on the impact Keifer might have had on our knowledge of western Nearctic Microlepidoptera had his decision in 1937 been otherwise.

Although he was not directly associated with students, Keifer assisted in the early interests of them in the 1930's, including W. H. Lange Jr. and J. W. Tilden (whose fine early work on life histories of micros was terminated for the same reason, I believe), and later Keifer encouraged G. T. Okumura's larval studies and my early efforts. Throughout, as in his own work, he urged the broadening of the basis of taxonomy to include as many character sets as possible: larval, pupal, adult, and biological features. Ultimately, this philosophy has been inherited by more recent students: P. A. Opler, D. L. Wagner, J. A. De Benedictis, and others. It is no coincidence that the knowledge of biology of California Microlepidoptera is advanced over that of almost any other region of the New World.

ACKNOWLEDGMENTS

I thank the following, who provided information on various aspects of Hartford Keifer's career: P. H. Arnaud Jr., California Academy of Sciences, San Francisco; Martin Barnes,

University of California, Riverside; T. D. Eichlin, California Department of Food and Agriculture, Sacramento, and especially Mary Keifer, Sacramento, and John Keifer, San Jose, California.

LITERATURE CITED

- ARNAUD, P. H. JR. & F. L. BLANC. 1988. Hartford Hammond Keifer, 1902–1986. *Bull. Entomol. Soc. Amer.* 34:46.
- CARTER, R. D. 1972. Proceedings of the Fifty-sixth Annual Meeting, Pacific Branch—Entomological Society of America. *Bull. Entomol. Soc. Amer.* 18:185–186.
- HARPER, R. W. 1963. Annual Report of the Bureau of Entomology (1962). *Calif. Dept. Agric., Bull.* 52:98–109.
- . 1965. Annual Report of the Bureau of Entomology (1964). *Calif. Dept. Agric., Bull.* 54:81–89.
- KEIFER, H. H. 1926. Report on the California Academy of Sciences Expedition to the Revillegigedo Islands, Mexico, in 1925. *Proc. Pacific Coast Entomol. Soc.* 2(5):67–69.
- . 1927. California Microlepidoptera. *Pan-Pacific Entomol.* 3:136–138.
- . 1932. California Microlepidoptera V. (Gelechiidae). *Pan-Pacific Entomol.* 8:61–74 (1931).
- . 1935. California Microlepidoptera VII. *Calif. Dept. Agric., Mo. Bull.* 24:195–218.
- MACKIE, D. B. 1928. Entomological services. In Jacobsen, W. C. (ed.), Annual Report of the Bureau of Plant Quarantine and Pest Control. *Calif. Dept. Agric., Mo. Bull.* 17:672–683.
- VAN DUZEE, E. P. 1927. Department of Entomology, Report for 1926:3–4. *Calif. Acad. Sci., San Francisco* [unpublished].

APPENDIX 1

Annotated Bibliography of Publications on Lepidoptera by H. H. Keifer¹

- KEIFER, H. H. 1925. *Coloradia pandora* in Oregon. *Pan-Pacific Entomol.* 1:143.
- . 1926. Report on the California Academy of Sciences Expedition to the Revillegigedo Islands, Mexico in 1925. In Blaisdell, Minutes of 100th Meeting, Aug. 29, 1925. *Proc. Pacific Coast Entomol. Soc.* 2(5):67–69. [Itinerary with notes on the insects taken; 10,700 specimens were collected including many Lepidoptera from Clarion, Socorro, and the Tres Marias Islands]
- . 1927a. California Microlepidoptera. *Pan-Pacific Entomol.* 3:136–138. [New species of Gelechiidae and life history notes on *Gelechia occidentella*, *Gnorimoschema chenopodiella* and *Mnemonica cyanosparsella* (=auricyanea)]
- . 1927b. California Microlepidoptera II. *Pan-Pacific Entomol.* 3:160. [Life history of *Aristotelia argentifera*]
- . 1927c. [Note that Keifer had collected Microlepidoptera, to build up the collection of the Academy, and to work up the life histories of the species.] In Blaisdell, Minutes of 105th Meeting, Sept. 11, 1926. *Proc. Pacific Coast Entomol. Soc.* 2(6):90.
- . 1928a. California Microlepidoptera III. *Pan-Pacific Entomol.* 4:129–132. [New species of Gelechiidae]
- . 1928b. [Observations on *Mnemonica cyanosparsella* (=auricyanea)]. In Martin, Minutes of 110th Meeting, Sept. 3, 1927. *Proc. Pacific Coast Entomol. Soc.* 2(7):101–103.
- . 1929. [Report on studies of life histories of Microlepidoptera]. In Martin, Minutes of 114th Meeting, Sept. 15, 1928. *Proc. Pacific Coast Entomol. Soc.* 2(8):114.
- . 1930a. California Microlepidoptera IV. *Pan-Pacific Entomol.* 7:27–34. [New species of Ericaceae-feeding Gelechiidae, with comparison of adult and larvae to *Gelechia panella*]

¹ Nomenclatural changes reflecting current use are given for species (in parentheses) but not genera.

- 1930b. *Argyresthias* found in Golden Gate Park, San Francisco. Pan-Pacific Entomol. 7:76. [Synopsis of adults and larval biologies of four pine- and cypress-feeding species]
- 1931a. Notes on some California Lepidoptera of economic interest. Calif. Dept. Agric., Mo. Bull. 20:613–626. [Photos of adults, larval biologies, and geographic occurrence of 4 Noctuidae, 7 Pyralidae, 1 Tortricidae, 4 Gelechiidae]
- 1931b. *Gelechia versutella* Zell. Pan-Pacific Entomol. 8:54. [First record in California]
- 1932a. California Microlepidoptera V (Gelechiidae). Pan-Pacific Entomol. 8: 61–74 (1931). [New species and biological notes on *Gelechia sistrella*]
- 1932b. *Ephestia kuehniella fuscofasciella* Rag. in California. Pan-Pacific Entomol. 8:156. [Reared from woodpecker-stored acorns in the foothills of the Sierra Nevada]
- ESSIG, E. O. & H. H. KEIFER. 1933. A pest of Sierra plums. Calif. Dept. Agric., Mo. Bull. 22:153–155. [*Mineola scitulella* (= *Acrobasis tricolorella*) reared, with comparisons of larval characters to *A. indigenella* and *Ambesa mirabella*]
- KEIFER, H. H. 1933a. Insect notes. Pan-Pacific Entomol. 9:62. [*Paraneura simulella* (= *Lindera tessalatelya*) and *Homeosoma electellum* common in California, rearing records]
- 1933b. California Microlepidoptera VI. Calif. Dept. Agric., Mo. Bull. 22:351–365. [*Clepsis busckana* n. sp. (= *fucana* Wlsm.) and first report of *Batodes angustiorana* in California; new species of Gelechiidae and biological records of 8 others]
- 1933c. The lesser apple worm (*Grapholitha prunivora* Walsh) in California. J. Econ. Entomol. 26:509.
- KEIFER, H. H. & L. S. JONES. 1933. Some parasites of *Anarsia lineatella* Zell. in California. Calif. Dept. Agric., Mo. Bull. 22:387–388.
- KEIFER, H. H. 1935a. California Microlepidoptera VII. Calif. Dept. Agric., Mo. Bull. 24:195–218. [New species of Gelechiidae and “Borkhausenia” (*Anoncia*); relationships of Gelechioid taxa based on larval setae; foodplant of *Gelechia scabrella*; first report of *Aristotelia elegantella* in California]
- 1935b. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 24:427–430. [First report of *Paraleucoptera albella* in California; status of 3 phycitine Pyralidae, as well as *Celerio lineata*, *Xylomiges curialis*, and *Vanessa cardui* populations in California]
- 1936a. California Microlepidoptera VIII. Bull. So. Calif. Acad. Sci. 35:9–29. [Descriptions of new *Agonopteryx*, *Pyramidobela*, and Gelechiidae; relationships of oecophorids, ethmiids, based on larval and pupal characters]
- 1936b. California Microlepidoptera IX. Calif. Dept. Agric., Bull. 25:235–259. [Description of *Argyrolacia*, new genus, and species of several genera of Gelechiidae; relationships within “*Gnorimoschema*” (*s. lat.*) and the enigmatic systematic placement of *Deoclona*, based on larval and pupal characters]
- 1936c. California Microlepidoptera X. Calif. Dept. Agric., Bull. 25:349–359. [New species and relationships of the *Gnorimoschema lycopersicella* group (= *Keiferia* Busck, 1939); redescription and larval description of *Setiostoma fernaldella*]
- 1937a. California Microlepidoptera XI. Calif. Dept. Agric., Bull. 26:177–203. [New species and relationships in *Gnorimoschema* (*s. lat.*); new *Scythris* and evidence for relationship of scythrids to Gelechioidea; biology, larval and pupal descriptions of *Lineodes integra*]
- 1937b. California Microlepidoptera XII. Calif. Dept. Agric., Bull. 26:334–338. [New species including larval and pupal descriptions of *Antaeotricha* and *Choreutis*]
- 1937c. Systematic entomology. In Mackie, Ann. Rept. of Entomol. Service. Calif. Dept. Agric., Bull. 26:433–435. [First reports of *Gracilaria azaleella*, *Ephestia elutella*, *Callopietria floridensis* in California; distribution of *Synanthedon exitiosa* and *Gnorimoschema lycopersicella*]
- 1938. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 27:661–664. [Interceptions of introduced *Grapholitha molesta*, *Laspeyresia caryana*, and *Pyrausta nubilalis*]

- 1939. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 28:538–539. [First report of *Spilonota ocellana* in California]
- 1940. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 29:241–245. [Discovery of a parthenogenetic psychid; *Ancylys comptana* intercepted]
- 1941. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 30:352–354. [First report of *Aphomia gularis* in California]
- 1942. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 31:175–178. [First reports of *Grapholita molesta* and *Symmoca signatella* in California; distribution and larval hosts of *Paraneura stimulella* (= *Lindera tessellatella*), *Pyramidobela angelarum* Keif., *Pyroderces rileyi*, *Myelois venipars* (= *Amyelois transitella*), and *Grapholita prunivora*]
- 1943a. Discovery of *Grapholitha molesta* (Busck) in Orange Co., Calif. In Linsley, Minutes 176th Meeting Pacific Coast Entomol. Soc. Pan-Pacific Entomol. 19:40.
- 1943b. Systematic entomology. In Mackie, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 32:256–260. [Report on the Oriental Fruit Moth Survey: more than 60,000 identifications of 50+ species of Lepidoptera from ca. 600,000 specimens based mainly on dimalt bait traps; flight periods given for *Tinea fuscipunctella* (= *Niditinea spretella*), *Bondia comonana*, 8 Tortricidae, 3 phycitine Pyralidae]
- 1944a. Applied entomological taxonomy. Pan-Pacific Entomol. 20:1–6. [Presidential address: Oriental Fruit Moth as an example of the importance of accurate taxonomic identification in pest detection leading to survey and control]
- 1944b. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 33:248–252. [More than 80,000 identifications, 85% from the Oriental Fruit Moth Survey, yielded the first California record of *Anthophila pariana*; *Apterona crenulella* (= *A. helix*) identified]
- 1945. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 34:186–191. [Over 30,000 identifications from the Oriental Fruit Moth Survey yielded 41 records of *G. molesta*; *Chilo loftini* first record in California; biology of *Hepialus behrensi* (= *californicus*) and *Litoprosopis coachella*]
- 1946. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 35:208–210. [*Aristotelia urbaurea* defoliating blue oaks; *L. coachella* in Central Valley]
- 1947. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 36:168–173. [Spread of *Apterona crenulella* to Placer Co.; *Myelois venipars* (= *Amyelois transitella*) in walnut packing houses; *Argyrotaenia citrana* in economic levels]
- 1948. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 37:205–209. [*Apterona crenulella* biology and spread; first report of *Cnephasia longana* in California; *Zale lunata* reported as a pest of berries in widely scattered localities]
- 1949. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 38:166–170. [Range extensions of *Cnephasia longana* and *Myelois venipars* (= *Amyelois transitella*)]
- 1950. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 39:181–186. [Biology and county records of *Myelois venipars* (= *Amyelois transitella*)]
- 1952. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 41:238–241. [First report of *Coleophora spiscicornis* (Haw.) in California; spread of *Apterona crenulella*]
- 1953. Systematic entomology. In Armitage, Ann. Rept. Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 42:227–230. [First report of *Pyrausta* (= *Ostrinia*)

penitalis in California (but it is recorded at Buena Vista Lk., Kern Co., in 1920 by Munroe 1976)]

— 1954. Systematic entomology. In Armitage, Ann. Rept. of Bur. Entomol. & Plant Quar., Calif. Dept. Agric., Bull. 43:190–192. [First report of *Thyridopteryx ephemeriformis* in California; *Melissopus latiferreanus* principal species doing damage to walnuts; spread of *Coleophora spissicornis* into San Joaquin Valley]

APPENDIX 2

Lepidoptera Described and Recorded by and Named in Honor of H. H. Keifer

New genus:

Argyrolacia (1933b) (Type species, *bifida* Keifer, 1933)

New species (present generic assignment, status given in parentheses):

- acrina*, *Gelechia* (1933b) (*Chionodes*)
adceanotha, *Aristotelia* (1935a) (*Aristotelia*)
adenostomae, *Aristotelia* (1933b) (*Aristotelia*)
altisierrae, *Scythris* (1937a) (n. genus, Landry ms)
altisolani, *Gnorimoschema* (1937a) (*Tildenia*)
angelarum, *Pyramidobela* (1936a; 1942 geogr. distr.) (*Pyramidobela*)
arbutina, *Gelechia* (1930a) (*Pseudochelaria*)
bacchariella, *Recurvaria* (1927a; 1933b larva & genitalia figd.) (*Recurvaria*)
bifida, *Argyrolacia* (1933b) (*Argyrolacia*)
braunella, *Gelechia* (1932a) (*Chionodes*)
burkei, *Exoteleia* (1932a) (*Exoteleia*)
busckana, *Clepsis* (1933b) (*Clepsis*, subjective syn. of *fucana* Wlsm.)
californica, *Epitheatis* (1930a; 1935a genitalia figd.) (*Leucogoniella*)
chrysopyla, *Gelechia* (1935a) (*Chionodes*)
clarkei, *Agonopteryx* (1936a) (*Agonopteryx*)
crinella, *Agnippe* (1927a) (*Agnippe*)
dammersi, “*Gelechia*” (1936b) (*Chionodes*)
demissae, *Gelechia* (1932a; 1936b larva) (*Filatima*)
distincta, *Leucogonia* (1935a) (*Leucogoniella*)
eldorada, *Aristotelia* (1936a) (*Aristotelia*)
eldorada, “*Gelechia*” (1936b) (*Aroga*)
elmorei, *Gnorimoschema* (1936c) (*Keiferia*, doubtful subjective syn. of *lycopersicella* Wlsm.)
ericameriae, *Gnorimoschema* (1933b) (*Gnorimoschema*)
francisca, *Recurvaria* (1928a; 1936a pupa) (*Recurvaria*)
huntella, *Eucordylea* (1936a) (*Coleotechnites*)
langei, *Gelechia* (1936a) (*Chionodes*, subjective syn. of *retiniella* Barnes & Bsk.)
mackiei, *Eucordylea* (1932a) (*Coleotechnites*)
manzanitae, *Antaeotricha* (1937b) (*Antaeotricha*)
manzanitae, *Gelechia* (1930a; 1937a larva) (*Pseudochelaria*)
marinensis, *Gelechia* (1935a) (*Chionodes*, subjective syn. of *ceanothiella* Braun)
marinensis, “*Borkhausenia*” (1935a) (*Anoncia*)
melanifera, *Choreutis* (1937b) (*Caloreas*, subjective syn. of *multimarginata* Braun)
neopetrella, *Gnorimoschema* (1936b) (*Exceptia*)
ontariensis, *Xenolechia* (1933b) (*Xenolechia*)
pasadena, *Duwita* (1935a) (*Battaristis*)
potentella, *Gnorimoschema* (1936b) (*Scrobipalpula*)
querciphaga, *Xenolechia* (1933b) (*Xenolechia*)
rhamnina, *Aristotelia* (1933b) (*Aristotelia*)
sacramento, *Anacampsis* (1933b) (*Anacampsis*)
saliciphaga, “*Gelechia*” (1937a) (*Filatima*)
sphacelina, “*Borkhausenia*” (1935a) (*Anoncia*)
stanfordia, *Recurvaria* (1933b) (*Coleotechnites*)

urbaurea, *Aristotelia* (1933b; 1946 biol., geogr. distr.) (*Aristotelia*)
vanduzeei, *Gelechia* (1935a) (*Chionodes*)

New race:

arborei, *Gelechia braunella* (1932a) (*Chionodes*, subsp. of *braunella* Keif.)

Reports on previously named species (current generic assignments):

aesculana Riley, *Proteoteras* (1940, biol., geogr. distr.)
agrytodes Meyr., *Pyramidobela* (1936a, genitalia figd.)
albella (Chamb.), *Paraleucoptera* (1935b, geogr. distr.)
albitogata Wlsm., *Ethmia* (1936a, pupa figd.; 1937b, compared)
algidella (Wlk.), *Antaeotricha* (1937b, larva)
angustiorana (Haw.), *Ditula* (1933b, biol., geogr. distr.)
arctostaphylella (Wlsm.), *Ethmia* (1936a, larva)
argentifera Bsk., *Aristotelia* (1927b, larva, pupa; 1935a, figd.)
argyllacea (Hbn.), *Alabama* (1945, intercepted in California)
argyrospilus (Wlk.), *Archips* (1943b, phenology)
azaleae (missp.) = *azaleella* (Brants), *Caloptilia* (1937c, geogr. distr.)
baldiana (B. & Bsk.), *Teleiopsis* (1933b, geogr. distr.)
behrensi Stretch, *Hepialus* (1945, biol., geogr. distr.)
bibionipennis (Bvd.), *Synanthedon* ("strawberry crown moth") (1946, biol.)
bonifatella (Hlst.), *Tehama* (1931a, geogr. distr.)
brillians B. & McD., *Harrisina* (1942, biol., geogr. distr.)
cardui (L.), *Vanessa* (1935b, biol., geogr. distr.)
caryana (Fitch), *Cydia* (1937c, 1938, 1941, 1943b, 1944b, 1945, intercepted in California)
caryanae (missp.) = *caryana*, *Cydia* (1937c)
cautella Wlk., *Ephestia* (1931a, adult figd., larva)
ceanothiella Braun, *Recurvaria* (1928a, larva, pupa)
cecropia (L.), *Hyalophora* (1944b, 1945, intercepted in California)
chenopodiella Bsk., (= *atriplicella* Roesl.) *Scrobipalpa* (1927a, biol.; 1937a, larva, pupa)
citrana (Fern.), *Argyrotaenia* (1947, biol., geogr. distr.)
coachelli, *coachellae* (missp.) = *coachella* Hill, *Litoprosopis* (1945, 1946, biol., geogr. distr.)
comonana Kft., *Bondia* (1943b, biol., geogr. distr., phenology)
comptana (Froh.), *Ancylys* (1940, intercepted in California)
crenulella Brouard (= *helix* Siebold), *Apterona* (1940, discovery in California, biol.; 1944b, biol., geogr. distr.; 1947, 1948, 1952, geogr. distr.)
cupressana Kft., *Cydia* (1943b, biol.)
cupressella Wlsm., *Argyresthia* (1930b, biol.)
curialis (Grt.), *Egira* (1935b, geogr. distr.)
cyanosparsella (Williams) (= *auricyanea* Wlsm.), *Dyseriocrania* (1927a, 1928b, biol.)
desiliens Meyr., *Gelechia* (1931a, adult figd., biol.)
discostrigella (Chamb.), *Ethmia* (1936a, larva)
diversella (Bsk.), *Arla* (1936b, larva, pupa, systematic relationships)
electellum Hlst., *Homoeosoma* (1933a, 1935b, biol., geogr. distr.)
elegantella Chamb., *Aristotelia* (1935a, geogr. distr.)
elutella (Hbn.), *Ephestia* (1937c, 1941, 1943b, biol., geogr. distr.)
ephemeraeformis (Haw.), *Thyridopteryx* (1954, geogr. distr.)
exigua (Hbn.), *Spodoptera* (1931a, adult figd., biol.)
finalis L., *Pyralis* (1942, biol.)
fernaldella Riley, *Setiostoma* (1936c, adult, larva, pupa)
figulilella Gregson, *Ephestia* (1931a, adult figd., biol., geogr. distr.; 1935b, geogr. distr.; 1943b, phenology, abundance)
floridensis (Gn.), *Callopietria* (1937c, geogr. distr.)
franciscella Bsk., *Argyresthia* (1930b, biol.)
frugiperda (Smith), *Spodoptera* (1931a, adult figd., biol., geogr. distr.)

- fuscipunctella* Haw. (= *spretella* (D. & S.)), *Niditinea* (1943b, geogr. distr., phenology)
gallicola (Bsk.), *Coleotechnites* (1936a, biol., larva)
glandiferella (Z.), *Deltophora* (1933b, geogr. distr.)
gossypitella (Saunders), *Pectinophora* (1945, intercepted in California, larval survey)
gracilis (Hlst.), *Palpita* (1931a, biol., geogr. distr.)
gularis (Z.), *Paralipsa* (1941, geogr. distr.)
iceryaeella (Riley) (?), *Holcocera* (1937a, larva, pupa)
indiginella (Z.), *Acrobasis* (Essig & Keifer, 1933, larva; 1935b, geogr. distr.)
integra Z., *Lineodes* (1937a, adult, larva, pupa)
interpunctella Hbn., *Plodia* (1931a, adult, larva)
kuehniella Rag., *Anagasta* (1932b, biol.)
latiferranus (Wlsm.), *Cydia* (1931a, adult figd., biol.; 1943b, 1954, biol.)
leachellus, not *Zincken* (= *sperryellus* Klots, 1940), *Crambus* (1931a, adult figd., geogr. distr.)
lineata (F.), *Hyles* (1935b, geogr. distr.)
lineatella Z., *Anarsia* (1935a, larva; 1931a, abundance; Keifer & Jones, 1933, parasites)
loftini (Dyar), *Eoreuma* (1945, geogr. distr.)
longana (Haw.), *Cnephasia* (1948, 1949, biol., geogr. distr.)
lunata (Drury), *Zale* (1948, biol., geogr. distr.)
lycopericella (Bsk.), *Keiferia* (1936b, larva, tax. relationships, geogr. distr.)
marginata (Harris), *Pennisetia* ("raspberry root borer") (1946, biol., geogr. distr.)
marginella (F.), *Dichomeris* (1944b, biol., geogr. distr.)
metadesma (Meyr.), *Syncopacma* (1933b, larva)
mirabella Dyar, *Ambesa walsinghami* (Essig & Keifer, 1933, larva)
molesta (Bsk.), *Grapholita* (1937c, 1938, 1941, 1944b, intercepted in California; 1942, 1943b, 1944b, 1945, geogr. distr.; 1943b, 1944b, biol.)
nigrella (Hlst.) (= *gilvescentella* Rag.), *Ephesiodes* (1931a, adult figd., larva)
niveopulvella (Chamb.), *Anacamptis* (1933b, biol.)
nubilalis (Hbn.), *Ostrinia* (1938, intercepted in California; 1944b, 1945)
obsolata (F.), (= *zea* Boddie), *Heliothis* (1931a, adult figd., abundance; 1936b, larva)
obsoletella (Roel.), *Scrobipalpa* (1931a, adult figd., biol.; 1937a, larva, pupa) (= *psitiella* H.-S. sensu Povolny?)
occidentella, not Chamb. (= *vanduzeei* Keifer), *Chionodes* (1927a, biology; 1933b, biol., larva)
occidentella (Chamb.), *Chionodes* (1935a, larva)
ocellana (D. & S.), *Spilonota* (1939, 1943b, geogr. distr., phenology)
ochreistrigella (Chamb.), *Chionodes* (1933b, larva)
opalescens (H. Edw.) (= *exitiosa* Say), *Synanthedon* (1937c, geogr. distr.)
operculella (Z.), *Phthorimaea* (1936b, adult, larva)
panella Bsk., *Gelechia* (1928a, larva; 1930a, geogr. distr.)
pariana (Clerck), *Choreutis* (1944b, geogr. distr.)
penitalis (Grt.), *Ostrinia* (1953, biol., geogr. distr.)
pilatella Braun, *Argyresthia* (1930b, biol.)
plaesiosema (Turner) (= *tangolias* Gyen), *Symmetrischema* (1936b, adult, larva; 1937a, adult, larva, pupa figd., biology, geogr. distr.)
prunivora (Walsh), *Cydia* (1942, 1943b, biol., geogr. distr.)
pyrusana Kft., *Pandemis* (1943b, phenology)
quinquecristata (Braun), *Pyramidobela* (1936a, genitalia figd.)
reversalis (Gn.), *Urestiphita* (1931a, adult figd., larva, biol.)
rileyi (Wlsm.), *Pyroderces* (1942, biol., geogr. distr.)
rosaceana (Harris), *Choristoneura* (1943b, phenology)
scabrella (Bsk.), *Pseudochelaria* (1933b, geogr. distr.; 1935a, biol.)
scitulella (Hlst.) (= *tricolorella* Grt.), *Acrobasis* (Essig & Keifer, 1933, biol., larva)
semifuneralis (Wlk.), *Euzophera* (1931a, adult figd., biol.)
serratilineella Rag., *Vitula edmansae* (1943b, geogr. distr.)
signalata (H.-S.), *Symmoca* (1942, geogr. distr.)
simulella Dietz (= *tessalata* Blanch.), *Lindera* (1933a, 1942, biol., geogr. distr.)

sistrella (Bsk.), *Chionodes* (1932a, larva)
sororia (Z.), *Anadesmus* (1937b, larva)
spissicornis (Haw.), *Coleophora* (1952, 1954, geogr. distr.)
striatella (Murtf.), *Symmetrischema* (1936b, adult, larva; 1937a, genitalia, larva, pupa
 figd.)
subsimella (Chamb.), *Leucogoniella* (1935a, genitalia char.)
testulalis (Geyer), *Maruca* (1945, intercepted in California)
trichostola (Meyr.), *Chionodes* (1931a, adult figd., biol., larva)
trifasciae Braun, *Argyresthia* (1930b, biol.)
venipars Dyar (= *transitella* Wlk.), *Amyelois* (1942, 1947, 1949, 1950, biol., geogr.
 distr.)
vernella Murtf. (= *formosella* Murtf.), *Chionodes* (1933b, larva)
versutella Z., *Gelechia* (1931b, geogr. distr.)
vitrana (Wlsm.), *Grapholita* (1943b, biol., geogr. distr.)
yuccasella Bsk., *Deoclona* (1936b, biol., larva, pupa)

Patronyms in Lepidoptera named for H. H. Keifer:

Keiferia Busck, (Type species: *Gnorimoschema lycopersicella*), 1939, Proc. U.S. Natl.
 Museum 86:571.
keiferana Lange, *Epinotia*, 1937, Pan-Pacific Entomol. 13:118.
keiferi Benjamin, *Amphipoea*, 1935, Pan-Pacific Entomol. 11:55.
keiferi Powell, *Acleris*, 1964, Univ. Calif. Publ. Entomol. 32:83.

Received for publication 5 February 1990; revised and accepted 14 September 1990.