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NEW OVIPOSITION AND LARVAL HOSTPLANT RECORDS FOR NORTH AMERICAN HESPERIA (RHOPALOCERA: HESPERIIDAE)[1]

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While many aspects of the genus *Hesperia* (Rhopalocera: Hesperiidae) are not understood, perhaps no area is so deficient as that related to the biology of the group. Dr. C. Don MacNeill conducted an in-depth study of the western members of the genus and their biology, and this extensive body of data was presented in detail in his classic monograph (MacNeill, 1964). Subsequent observations on several of the western *Hesperia*, along with a brief review of previously reported hostplants for the other North American *Hesperia*, were presented more recently by MacNeill (1975); Scott (1975) has described life histories for several of the Colorado species. Much work remains to be done, however, especially with those populations east of California's Sierra Nevada Mountains.

As part of my ongoing study of the genus, particular effort has been directed at further defining the life history aspects of the *Hesperia*. Relative to this, 64 populations of *Hesperia* representing 31 species and subspecies have been reared completely or in part from ova, with all immature stages preserved and maintained in the McGuire reference collection; descriptions of these immature stages along with their biology will be provided in future papers that will sequentially review individual species or species groups. It is the purpose of this paper to formally record oviposition substrates and larval hostplants for a number of species previously unrecorded, as well providing some additional new hostplant records for others.

Several concepts have become apparent regarding *Hesperia* biology and are important to an understanding of that subject. First, a given species may utilize a different oviposition substrate(s) and/or larval hostplant(s) in different geographic areas of the insect's distribution (MacNeill, 1964: 32, 40). Second, within a given population more than one substrate may be used by the same species for oviposition and/or larval foodplant (*Ibid*: 161, 166). Third, as initially noted by MacNeill (*Ibid:* 32, 161) for the northern coastal populations

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of H. *lindseyi* Holland, the oviposition substrate need not be the larval hostplant, nor even a related plant family. Finally, all current data continue to support the fact that all species of *Hesperia* utilize grasses as larval foodplants. With these principles in mind, the following data are presented for specific species and populations, with the understanding that further study undoubtedly will delineate additional oviposition substrates and larval hosts for the species herein noted. For this paper the organization and nomenclature for the *Hesperia* follow that presented by MacNeill (1975: 463-548); the grasses follow Gould (1975) when applicable, and otherwise Hitchcock (1951). Grass determinations were made by Roy O. Kendall and confirmed by Dr. Frank W. Gould unless otherwise indicated.

Hesperia uncas uncas Edwards - Previous reports for *Bouteloua gracilis* (Humboldt, Bonpland, Kunth) Lagasca *ex.* Steuder in Colorado (Scott, 1973: 184, 190) and North Dakota (McCabe and Post, 1977: 32) can be extended to Texas: on 23-VIII-75 at 1500 hours I observed oviposition on *B. gracilis* growing in a small, grassy wash six miles (9.7 km.) west of Victoria Canyon, Sierra Diablo Mountains, Hudspeth County. Subsequently, I observed oviposition on *Erioneuron pilosum* (Buckley) Nash twelve miles (19.3 km.) west of Medicine Lodge, Barber County, Kansas on 5-VI-77. *Bouteloua gracilis* is present at this latter locality and may be utilized along with *E. pilosum,* but no field observations have yet been made to confirm that supposition.

Hesperia uncas lasus (Edwards)- Multiple ovipositions on *B. gracilis* were observed on 18-IX-76 at 1330 hours in a field one mile (1.6 km.) east of Granite Mountain, Yavapai County, Arizona. Based on the density of this grass in the locality, as well as the size of the *H. u. lasus* colony, it is assumed that this grass undoubtedly serves as the larval foodplant.

Hesperia uncas macswaini MacNeill- Initial field work by Don MacNeill at the type locality in the White Mountains of California revealed the oviposition substrate and larval foodplant to be *Stipa nevadensis* B.L. Johnson (MacNeill 1975: 465). Based on studies by MacNeill and myself in July 1978 at the type locality and adjacent areas in the White Mountains, *Stipa pinetorum* Jones (det. Alan R. Smith; Oakland Museum Voucher specimen #077827A1) is also utilized for oviposition and as larval foodplant. Several hundred ova and first instar larvae were collected on *S. pinetorum* at that time, and immatures were subsequently reared to maturity on it in the laboratory.

Hesperia juba (Scudder)- Despite the wide distribution of this western species, relatively little life history data have been recorded. Lindsey (1923) reported an incomplete description of the immature stages but had no oviposition substrate or foodplant data. MacNeill (1964: 69, 70, figure 3a-c, 7, 8) described and illustrated the immature stages but did not mention foodplant or oviposition substrate. Subsequently, he (pers. comm.) observed oviposition and located a feeding first instar larva on *Deschampsia elongata* (Hook) Munro (det. J.T. Howell) near Monitor Pass, Alpine County, California on 25-VI-70. This is a small perennial bunchgrass of damp habitats.

On 23-V-76 a female *H. juba* was observed by Douglas Mullins (pers. comm.) to oviposit on *Stipa* sp. nr. *nevadensis* along Caliente Road from Piute Peak to Bodfish, 5000 ft. (1524 m.), Piute Mountains, Kern County, California. More recently, I observed oviposition on eight occasions along the west facing hill slopes two miles (3.2 km.) southeast of Julian, 4220 ft. (1286 m.), San Diego County, California between 1200 and 1400 hours on 9-X-78. On each occasion the oviposition substrate was a dead stalk of the introduced weed, *Bromus rubens* (L.). It is assumed that the larval foodplant in the locality will prove to be a different grass (or grasses), but no larvae have yet been found in the field to confirm this supposition.

Hesperia comma harpalus (Edwards) - Emmel and Emmel (1962: 36) observed oviposition on an undetermined grass on the lower slope of Mt. Judah, 7240 ft. (2207 m.), Placer County, California, and MacNeill (1975: 467) reported recovering ova from *Stipa Thurberiana* Piper in Mono County, California. On 10-VIII-66 Oakley Shields (pers. comm.) observed a female oviposit on a *Muhlenbergia* sp. (det. Dr. William Hiesey) at 1245 hours at Slate Creek Valley, north of Tioga Pass, Mono County, California.

Hesperia comma leussleri Lindsey - Numerous oviposition observations on this southern California subspecies have demonstrated a broad heterogeneity of oviposition substrate. Of central importance to the substrate selection is the fact that *H. c. leussleri* appears

to overwinter as a mature first instar larvae within the ova (preliminary observations in progress), and hence it is suggested that females select (as an oviposition substrate) sturdy perennials in proximity to the larval food source. This concept is supported by observations made in 1979 at several disjunct populations, reported below.

On 17-VI-79, in cool overcast weather a single oviposition was observed at 1300 hours on a woody outer stem of *Erigonum fasciculatum poliofolium* (Bentham) Stokes near the Gus Weber Picnic Area, 5800 ft., (1768 m.), Mt. Palomar, San Diego County, California; a second female attempted to oviposit, without success, on the ventral side of a leaf of a bracken fern, *Pteridium aquilinum* (L.) Kuhn var. *pubescens* Underwood. No oviposition efforts were noted on the most likely larval foodplant in the area, *Vulpia octaflora* Rydberg *(Festuca octaflora* Walter). Captive females from this area oviposited freely in the laboratory on woody stems of *E. fasciculatum* rather than on grasses.

In open, dry meadows among the pines along Vista Point Road, Mt. Laguna, 6000 ft. (1829 m.) elev., in the Laguna Mts. of San Diego County, *Eriogonum wrightii membranaceum* Stokes was the substrate for over 40 observed ovipositions by numerous *H.c. leussleri* between 1100 and 1400 hours on 23-VI-79. Again, *V. octaflora* was the predominant grass associate, but oviposition efforts were not directed at this or any other substrate; captive females repeatedly oviposited on stems of *E. wrightii membranaceum.* John Emmel (pers. comm.) noted several females ovipositing on several substrates including dead twigs nr. Doble, 6760 ft. (2020 m.), San Bernadino Mts., San Bernadino County, on 13-VI-79 at approximately 1200 hours. Studies are underway that should further define the requirements for these peculiar substrates and the biology of the subspecies.

Hesperia ottoe (Edwards) - Heretofore, oviposition records have been limited to *Leptoloma cognatum* (Shultes) Chase based on the observations of Nielsen (1958: 37 and 1960: 57) in Michigan. In the prairie twelve miles (19.3 km.) west of Medicine Lodge, Barber County, Kansas, I found two ova, that later proved to be *H. ottoe,* on 2-VI-77 on culms of *Schizacharium scoparium* (Michaux) Nash[3]; in July 1980 Mr. Irwin Leeuw (pers. comm.) observed oviposition by *H. ottoe* on this grass in Winnebago County, Illinois and observed pre-oviposition behavior toward it by females in Grant County, Wisconsin. In addition, Robert Dana's extensive observations (Dana, 1981) on *H. ottoe* in southwestern Minnesota in 1978 led to the finding that *H. ottoe* females oviposit on the blossoms of purple coneflower, *Echinacea pallida* Nuttall, and Leeuw repeated this observation at the Winnebago County habitat in July 1979. Accordingly, it is apparent that multiple oviposition substrates are utilized by *H. ottoe* both within a given population and throughout its range; the relative preference for various substrates and the advantages to each are still to be determined. Indeed, no ova were found on *E. pallida* in known *H. ottoe* habitats in western North Dakota in 1979. Completion of Dana's work in Minnesota will likely provide data and statistics on these diverse observations.

It should be added that Leeuw (pers. com.) has noted a strong association between *H. ottoe* and *S. scoparium* in Allegan County, Michigan, and thus it would not be unlikely to find this as an additional oviposition substrate and/or larval host in Michigan.

Hesperia leonardus leonardus Harris - Mogens C. Nielsen (pers. comm.) has previously observed multiple ovipositions by a single female in Otsego County, Michigan on 4-IX-64; each of these involved *Danthonia spicata* (L.) Beuvois *ex.* Roemer & Shultes (det. Dr. William T. Gillis, Michigan State University). Since that time Nielsen has noted that female *H. leonardus* oviposit readily when confined with this grass, and observations of the immatures placed on this grass are currently being made.

Hesperia leonardus montana (Skinner) - Based on independent observations made in 1979 by Ray Stanford and Jim Scott, *Bouteloua gracilis* is the oviposition substrate and probable larval foodplant for this highly restricted Colorado subspecies[4]. Stanford (pers. comm.) noted two ovipositions by female *H. l. montana* on a south-facing slope in open

[3]*Schizachyrium scoparium* is current nomenclature based on Gould (1975); this has been listed in many texts as *Andropogon scoparius* (Michaux) Nash.

[4]The combination placing *montana* (Skinner) as a subspecies of *leonardus* Harris rather than *pawnee* Dodge follows the work of Scott and Stanford (manuscript in preparation), Stanford (Rocky Mountain Butterfly Book, 1979, in press) and my own work with the complex. Such a treatment places *leonardus* as the parent species and *pawnee* and *montana* as subspecies, and is based on phenotypic, genitalic, and immature characters to be discussed in the above-noted works.

ponderosa pine forest above Lone Rock Campground, two miles (3.2 km.) west of Deckers, elevation 6400 ft. (1951 m.), Pike National Forest, Douglas County, Colorado, on 31-VIII-79. Both ova were placed on the upper sides of lower blades of *B. gracilis* growing in the partial shade of ponderosa pine trees. Scott (pers. comm.) similarly observed two ovipositions on *B. gracilis* in this general locality on 2-IX-79. As *B. gracilis* is the predominent grass in the area, it most likely serves as the larval foodplant as well as oviposition substrate. This inference raises significant questions as to the overall biological requirements of this insect, whose distribution is confined to the South Platte River valley in Colorado despite the extensive range of *B. gracilis* in Colorado and the western states. Stanford suggests that the combination of *Liatris* (preferred nectar source), *B. gracilis* and open pine forest with partial shade are requirements for the existence of *H. l. montana* in the area; doubtless, other factors as well are contributory to this limited distribution, which is certainly the most restricted among the North American *Hesperia*.

Hesperia metea licinius (Edwards) - While this insect in Texas is phenotypically distinct when compared with typical eastern *H. metea*, biologically there are remarkable similarities. The oviposition substrate is *Schizachyrium scoparium* at Benbrook Reservoir, Tarrant County, Texas. On 10-IV-77 when oviposition was observed at 1130 hours, several old larval shelters were found in *S. scoparium*, but these could not be differentiated from abandoned shelters of *Atrytonopsis hianna* (Scudder) which utilizes the same host plant at that locality. Larvae of *H. metea licinius* feed readily and develop normally on laboratory plants of *S. scoparium* (M. Rickard and F. Hedges, per. comm.), so all data support this as the larval foodplant as well as oviposition substrate. Numerous prior reports (Shapiro, 1965: 218; Shapiro & Shapiro, 1973: 102) document *S. scoparium* as the host for eastern populations of nominate *H. metea*, as well as *Andropogon glomeratus* (Walter, Britton, Sterns, and Poggenburg) for another population of typical *metea* (Shapiro & Shapiro, 1973: 102) and *A. geradi* Vitman for populations intermediate to *H. m. licinius* (Heitzman & Heitzman, 1970: 187).

Hesperia viridis (Edwards) - Previous oviposition substrate records for *B. gracilis* (MacNeill, 1964: 154 and Scott, 1973: 184, 190) have been expanded for this relatively widespread southwestern and Rocky Mountain species. I have observed oviposition on three additional substrates to date: (1) *Erioneuron pilosum* (Buckley) Nash at 1545 hours 36 miles (58 km.) west of Junction, Sutton County, Texas on 23-IX-76 and at the junction of Loop 1604 and Camp Bullis road, Bexar County, Texas, on 22-IX-77 at 1100 hours; females oviposit freely on this grass in the laboratory. (2) *Tridens muticus* (Torrey) Nash var. *elongatus* (Buckley) Shinners (det. Jack Revel, San Diego Natural History Museum) on 7-VI-78 at 1030 hours on a prairie two miles (3.2 km.) west of the junction of U.S. 281 & Highway 15, Major County, Oklahoma. (3) *Buchloe dactyloides* (Nuttall) Englemann on 6-VI-78 at 1110 hours, ca. 2.5 miles (4.0 km.) west of Belva, Woodward County, Oklahoma. It is of note that *E. pilosum* is well established in the aforementioned Oklahoma prairie habitats, but neither active oviposition nor field-collected ova have been observed yet to document its use as a substrate for these *H. viridis* populations, while it is utilized for that purpose by *H. u. uncas* (see above) in this area.

Hesperia attalus attalus (Edwards) - My observations on oviposition, along with field collected ova, both on 18-V-75, confirm *Leptolma cognatum* as the oviposition substrate and larval foodplant for this species in the area five miles (8.1 km.) west of Buffalo, Freestone County, Texas; additional observed oviposition was on *L. cognatum* at 1430 hours on 4-IX-76, ca. two miles (3.2 km.) west of Groesbeck, Limestone County, Texas. First instar larvae have been found in the basal culms of this grass at the first locality, and immature larvae feed readily on the plant in the laboratory. It is of note that *L. cognatum* ranges throughout the midwest prairies into southern Michigan, where *Hesperia ottoe* utilizes it as an oviposition substrate and larval foodplant (see *H. ottoe).* Despite the broad distribution of this grass, the range of nominate *H. attalus* is considerably more limited, but multiple oviposition substrates apparently are utilized, and the selection criteria remain unknown. Oviposition south of Medicine Lodge in Barber County, Kansas, on 9-VI-78 was observed by me on two different substrates, *Bouleloua curtipendula* (Michaux) Torrey var. *caespitosa* Gould & Kapadia and *Bothriochloa barbinodis* (Lagasca) Herter (this latter substrate may have been an "error" by the female, in that each ovum

was placed on a small stem of *B. barbinodis* growing within a larger clump of *B. curtipendula*). Both ovipositions occurred between 1400 and 1445 hours.

Hesperia attalus slossonae (Skinner) - Based on initial field oviposition observations and laboratory rearings by Robert Godefroi (pers. comm.) at a locality 1.4 miles (2.3 km.) north of the junction of S.R. 337 & S.R. 121, Levy County, Florida, on 1-XI-77, and confirmed by Jeff Slotten 14 miles (22.5 km.) west of Williston, Levy County, Florida, at least one of the hosts for this eastern subspecies is *Artistida virgata* Trinius. This insect inhabits turkey oak *(Quercus laevis* Walter) and slash pine *(Pinus elliottii* Engelmann) barrens in this area of Florida, and reasonable suggestions exist that this *Aristida* species, or a close relative, also serves as a hostplant for the larva of *Hesperia meskei* (Edwards) in these areas. It should be emphasized that the typical *H. a. slossonae* habitat is strikingly different from that occupied by nominate *H. attalus,* with relatively little overlap in the native grass species suitable for utilization.

Hesperia meskei (Edwards) - In study areas *ca.* five miles (8.0 km.) west of Buffalo, Freestone County, Texas, I observed numerous ovipositions on 2-X-77 and 30-V-77; in all instances the oviposition substrate was *S. scoparium* growing on the periphery of sparse oak woodlands; pupal exuviae have been recovered from shelters in the same grass. As previously mentioned, it is probably that a different host(s) is utilized by southeastern populations of *H. meskei,* although *S. scoparium* conceivably may be used there as well. In southern Florida a strong association between *H. meskei* and *Aristida purpurascens* Poiret (det. George Avery) on Big Pine Key, Monroe County, has been noted by David Baggett (pers. comm.), and captive females from that locality oviposit readily on this grass (Frank D. Fee, pers. comm.).

Hesperia sassacus Harris - In two widely separate areas of its range, *S. scoparium* has been confirmed as an oviposition substrate for this common northeastern species. Nielsen (pers. comm.) has observed a single oviposition in Michigan on this grass, and Don Adelberg (pers. comm.) has viewed repeated ovipositions on it by multiple females in Sussex County, New Jersey. At this latter locality, Adelberg's observations suggest that more than one substrate may be utilized for oviposition and/or as larval foodplant, and that *Poa,* which was suggested by Shapiro (1966: 54) to be a possible host for *sassacus,* does not appear to be preferred.

Hesperia miriamae MacNeill - Field observations on females of this species have always been limited, and hence much of the insect's biology remains unknown. MacNeill (1964: 170) suggested that the most likely foodplant, based on evaluation of resident grasses in the vicinity of the type locality, was *Festuca brachyphylla* Shultes, an observation that was confirmed on 29-VII-78 for at least one population. At that time MacNeill and I observed a female oviposit on *F. brachyphylla* (det. Alan R. Smith, Oakland Museum voucher specimen #077829A1) on the west-facing slope of Mt. Barcroft, 13400 ft. (4084 m.), White Mtns., Mono County, California, at 1315 hours. This grass is nestled among the rocks near the summit, and while we saw no larval activity at the time, the density of this grass and the paucity of other possible hosts make this the likely larval foodplant as well. Of interest is the fact that *Polites sabuleti tecumseh* (Grinnell) also was observed to oviposit on this grass in the same locality.

Attention should be called to the fact that the citation by MacNeill in Howe (1975: 479) listing the *H. miriamae* larval foodplant as *Andropogon scoparius* is a printing error where an entire line from page 475 was substituted for the proper one.

SUMMARY

It has been the intent of this paper to note several new pieces of data relating to *Hesperia* biology, as limited as they are at this time; subsequent manuscripts will deal with further aspects of this topic, including immature descriptions and adult and larval habits. In the interim, however, it should be stressed that an immense body of data yet remains to be uncovered even on the restricted subject of oviposition substrate selection and larval foodplants, and this knowledge will be paramount in any comprehensive understanding of the genus and its individual members. It is predicted that great diversity in oviposition substrates and foodplants will be found for many species, as has been previously

noted for *H. dacotae* Skinner by McCabe and Post (1977: 36) and for *H. dacotae, H. ottoe,* and *H. leonardus pawnee* Dodge by Dana (pers. comm.). Basic field observation and field and laboratory rearings will be the cornerstones of this search and must be actively encouraged.

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LITERATURE CITED

Dana, R.F. 1981. An unusual oviposition substrate for *Hesperia ottoe* (Hesperiidae) in southwestern Minnesota. J. Lepid. Soc. 35: 77-78.

Emmel, T.C. and J.F. Emmel. 1962. Ecological studies of Rhopalocera in a high sierran community - Donner Pass, California. I. Butterfly associations and distributional factors. J. Lepid. Soc. 16: 23-44.

Gould, F.W. 1975. The grasses of Texas. Texas A&M University Press, College Station, Texas. 653 p.

Heitzman, J.R., and R.L. Heitzman. 1969 (1970). *Hesperia metea* life history studies (Hesperiidae). J. Res. Lepid. 8: 187-193.

Hitchcock, A.S. 1951. *Manual of the Grasses of the United States.* 2nd ed., rev. by Agnes Chase, U.S. Dept. Agr. Misc. Publ. No. 200. Washington. 1051 p.

Lindsey, A.W. 1923. The egg and larva of *Hesperia juba* Bdv. Denison Univ. Bull., J. Scientific Lab. 20: 121-125, pl. 16.

MacNeill, C.D. 1964. The skippers of the genus *Hesperia* in western North America with special reference to California (Lepidoptera, Hesperiidae). Univ. California Publ. Entom., Vol. 35, 230 p., 8 pl.

—. 1975. Hesperiidae. In Howe, W.H., ed., *The Butterflies of North America.* Garden City: Doubleday & Co. 633 p., 97 pl.

McCabe, T.L. and R.L. Post. 1977. Skippers (Hesperioidea) of North Dakota. North Dakota Insects Publ. No. 11, North Dakota State Univ. 70 p.

Nielsen, M.C. 1958. Observations on *Hesperia pawnee* in Michigan. Lepid. News 12: 37-40.

—. 1960. A correction on *Hesperia pawnee* in Michigan. J. Lepid. Soc. 14: 57.

Scott, J.A. 1973. Adult behavior and population biology of two skippers (Hesperiidae) mating in contrasting topographic sites. J. Res. Lepid. 12: 181-196.

—. 1975. Early stages of seven Colorado *Hesperia* (Hesperiidae). J. Lepid. Soc. 29: 163-167.

Shapiro, A.M. 1965. Ecological and behavioral notes on *Hesperia metea* and *Atrytonopsis hianna* (Hesperiidae). J. Lepid. Soc. 19: 215-221.

— & A.R. Shapiro. 1973. The ecological associations of the butterflies of Staten Island. J. Res. Lepid. 12: 65-128.

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