

A REVISION OF THE GENUS *ZORA* (ARANEAE, ZORIDAE) IN NORTH AMERICA

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Abstract. The genus *Zora* C.L. Koch, 1848 in North America includes two species: *Zora pumila* (Hentz) and *Zora hespera* new species. Diagnoses, descriptions, distributions, and natural history notes are presented.

The genus *Zora* consists of small to medium entelegyne, cribellate spiders. They may be recognized by having two claws with claw tufts, distinct longitudinal bands on the cephalothorax, 4-2-2 arrangement of the eyes and a series of long overlapping spines on the first two tibiae and metatarsi. The color pattern on the abdomen is distinct and, in unfaded specimens, may be useful in distinguishing the species.

The 17 species in the genus have a Holarctic distribution with most of the species reported from Europe and the Middle East. One species is cited from the United States. Neither the genus nor the family has been revised.

Zora has been placed in the Lycosidae (Dahl & Dahl 1927), the Ctenidae (Petrunkevitch 1928; Homann 1947), the Clubionidae (Kaston 1948) and the Zoridae (Dahl 1912; Tullgren 1945; Lehtinen 1967; Kaston 1981). Currently several other genera, whose relationships are debatable, are also placed in the Zoridae.

METHODS

Specimens were examined and measured under a stereo dissecting microscope with an ocular micrometer mounted in one eyepiece. Micrometer units were converted to metric units and these rounded to the nearest 0.01 mm. Drawings were made with the aid of a squared-grid reticle in one eyepiece of the dissecting microscope. A total of 172 specimens was examined. Epigyna were removed and cleared in clove oil.

Abbreviations for eyes: are as follows: AME (anterior median eye), ALE (anterior lateral eye), PME (posterior median eye), PLE (posterior lat-

eral eye), MOQ (median ocular quadrangle). Dimensions are given in the form: range, mean (\bar{X}) and standard error (SE).

Abbreviations for collections cited in text are: AMNH = American Museum of Natural History, CAS = California Academy of Sciences, MCZ = Museum of Comparative Zoology, USNM = United States National Museum, SIUC = Southern Illinois University at Carbondale, JAB = Joseph A. Beatty.

Genus *Zora* C. L. Koch, 1848

Lycaena Sundevall, 1832:265. Type species by monotypy, *L. spinimana* Sundevall. Preoccupied.

Hecaege Blackwall, 1833:193. Type species *Lycaena spinimana* (Sundevall). Preoccupied.

Lycodia (lapsus ?) Sundevall, 1833:22.

Dolomedes Walckenaer, 1837:348. (part) (3e race: *Rupiariae*).

Zora C. L. Koch, 1848:91. Type species *Lycaena spinimana* Sundevall.

Psilothra Gistel, 1848: IX. Proposed replacement for *Hecaege*, preoccupied.

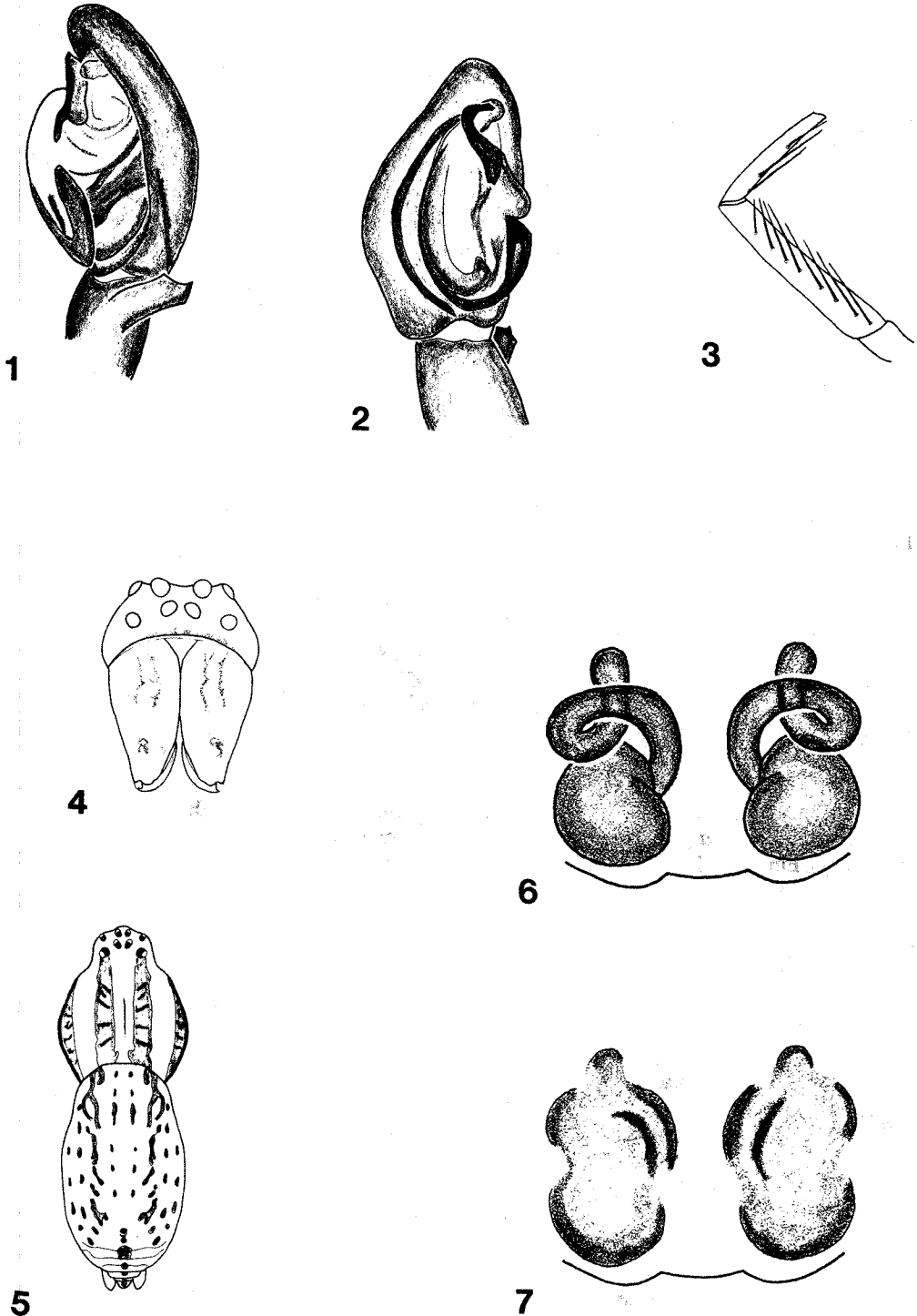
Katadysas Hentz, 1850:287. Type species by monotypy *K. pumilus* Hentz.

Catadysas Thorell, 1869:43. Emendation of *Katadysas* Hentz.

Diagnosis.— *Zora* can be distinguished from most other eight-eyed spiders by the nearly straight anterior eye row, and the strongly recurved posterior eye row, the eyes forming three rows. They have 2 claws with claw tufts. The presence of 6-8 pairs of long, overlapping spines on tibiae I and II separate them from the Ctenidae and Lycosidae.

Description.— Small spiders with a general orange-brown color. A wide band extending back from each posterior lateral eye (Figs. 5, 11). A marginal band on each side of the cephalothorax. Carapace highest in the region of thoracic groove.

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Figures. 1-7.—*Z. pumila*: 1, 2, male palpus; 1, retrolateral aspect; 2, ventral aspect; 3-7, female; 3, tibia and metatarsus leg I; 4, chelicerae; 5, dorsal view of female; 6, 7, epigynum; 6, dorsal aspect, cleared; 7, ventral aspect.

Sternum with a dark spot near each coxa (Fig. 10). Labium wider than long. The legs heavily spotted, leg IV longest, followed by I, II, III. Tarsi with 2 claws and tufts. Tibiae I and II with 6-8 pairs of long, overlapping ventral spines. Metatarsi I and II with 2-3 pairs of long, overlapping ventral spines. Palpal tarsus of females and juveniles with a pair of ventral spines. Retromargin of chelicerae usually with two teeth, promargin usually with 3 teeth. Apical segment of the posterior spinnerets short and indistinct.

Distribution.— Holarctic. Specimens have been reported from Mexico and Brazil by Marx (1890) under the *nomina nuda* *Zora californica* and *Z. latithorax*. The localities are likely to be in error.

Zora pumila (Hentz)

Figs. 1-7. Map 1

Katadysas pumilus Hentz, 1850:287, plate X, fig. 16, 1 male imm. Type destroyed.

Catadysas pumilus Thorell, 1869:43.

Zora pumila Holmberg, 1882:156.

Z. spinimana Emerton, 1911:403, plate V, figs. 5a-5b, 1 female. Not *Z. spinimana* (Sund.)

Z. pumilus Comstock, 1912:403, fig. 651; 1940:587, fig. 651.

Diagnosis.— Males of *Z. pumila* are distinguished from males of *Z. hespera* by the larger palp, and the angular conductor (Fig. 2). Females have sperm ducts coiled anterior to the spermathecae (Fig. 6). *Zora pumila* has been confused with the European *Zora spinimana* (Sund.). Examination of specimens of *Z. spinimana* showed that they are distinct. The tibial apophysis of the male palp of *Z. spinimana* and *Z. nemoralis* (Blackwall) has a broad base and is bent distally. The distal end of tibial apophysis in *Z. spinimana* is bifurcate and in *Z. nemoralis* it is truncate. In female *Z. spinimana* the receptacles are closer together than in *Z. pumila* and *Z. hespera* and the sperm ducts turn forward and parallel with the long axis of the body at their anterior end. The course of ducts in *Z. nemoralis* is different from *Z. pumila* and *Z. hespera*.

Description.— A wide marginal band on each side of cephalothorax, wide paramedial band extending back from each posterior median eye and a thin Y-shaped mark on abdomen. Legs heavily spotted. Chelicerae as in Fig. 4.

Males: Measurements of 10 specimens (mm). Total length 3.54-4.10 (3.74, 0.06). Carapace length 1.69-1.95 (1.81, 0.03), width 1.25-1.54 (1.40, 0.03). Eye sizes and interdistances AME

0.08, ALE 0.08, PME 0.10, PLE 0.10; AME-AME 0.08, AME-ALE 0.08, PME-PME 0.10, PME-PLE 0.13, ALE-PLE 0.16; MOQ length 0.23-0.31 (0.28, 0.01), front width 0.23-0.28 (0.24, 0.01), back width 0.15-0.31 (0.28, 0.02). Clypeus height 0.05-0.10 (0.09, 0.01). Chelicera length 0.31-0.54 (0.46, 0.03), width 0.23-0.33 (0.27, 0.01). Total lengths of legs; I: 5.28-6.51 (5.74, 0.12), II: 4.92-6.05 (5.45, 0.12), III: 4.21-5.92 (5.14, 0.15), IV: 5.38-8.31 (7.39, 0.27). Total length of palp 1.36-1.95 (1.79, 0.06). Leg spination; tibiae I and II with 6-7 pairs of long, overlapping ventral spines, metatarsi I and II with 2 pairs of long, overlapping ventral spines.

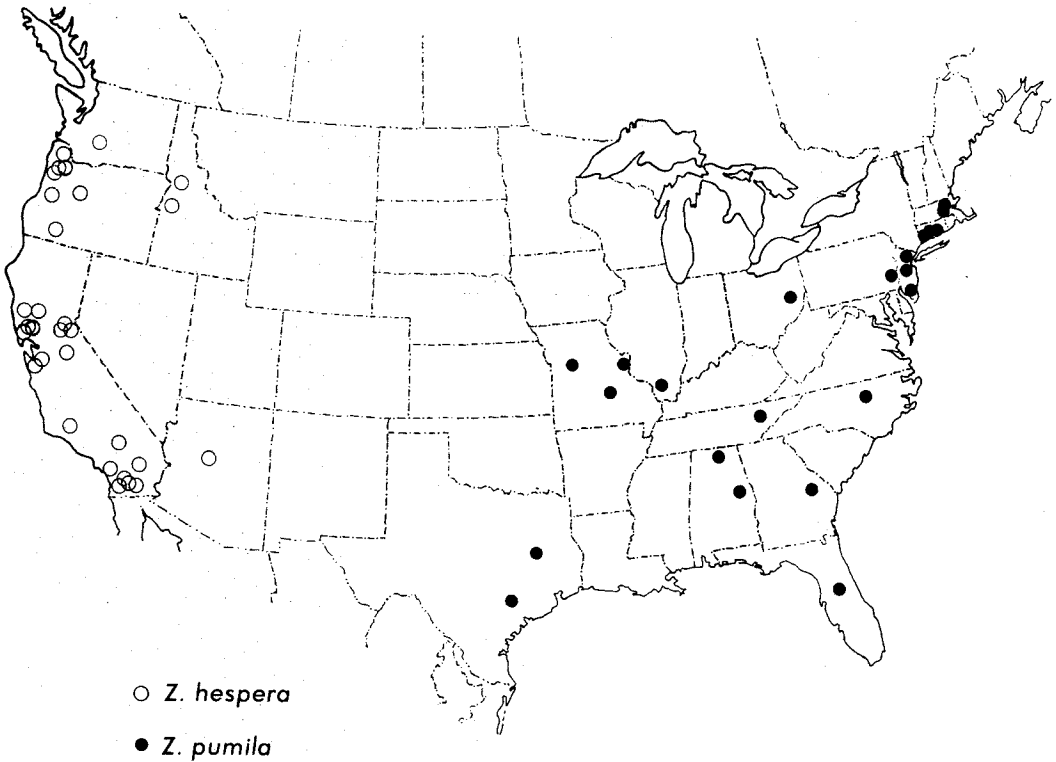
Females: Measurements of 10 specimens (mm). Total length 4.00-6.00 (4.78, 0.22). Carapace length 1.29-2.31 (1.94, 0.10), width 1.10-1.80 (1.49, 0.11). Eye sizes and interdistances AME 0.08, ALE 0.08, PME 0.10, PLE 0.10; AME-AME 0.08, AME-ALE 0.10, PME-PME 0.13, PME-PLE 0.15, ALE-PLE 0.16; MOQ length 0.26-0.35 (0.30, 0.01), front width 0.24-0.31 (0.27, 0.01), back width 0.28-0.37 (0.33, 0.01). Clypeus height 0.05-0.13 (0.10, 0.01). Chelicera length 0.30-0.77 (0.57, 0.04), width 0.26-0.33 (0.30, 0.01). Total length of legs; I: 5.59-6.90 (6.20, 0.15), II: 5.08-6.62 (5.89, 0.19), III: 4.49-6.08 (5.41, 0.15), IV: 5.46-9.10 (8.02, 0.36). Total length of palp 1.62-3.31 (2.25, 0.17). Leg spination; tibiae I and II with 8 pairs of long, overlapping ventral spines, metatarsi I and II with 3 pairs of long, overlapping ventral spines.

Distribution.— Eastern United States from Massachusetts south to Florida, and west to Missouri and Texas.

Natural history.— This spider hunts in tall grass and bushes during daylight. The egg sac is guarded by the female, but no protective retreat is built (Kaston 1981). Females have been taken from January through October, and males from April through July. Immatures can be found year round.

Specimens have been collected in pitfall traps from a pond pine community in central Florida (Corey & Taylor 1988) and from a brushy prairie in Johnson Co., Missouri. In North Carolina they have been collected in broomsedge and young pine litter with a Berlese funnel. A juvenile was found in foam skimmed from Indian Creek, Jackson Co., Illinois.

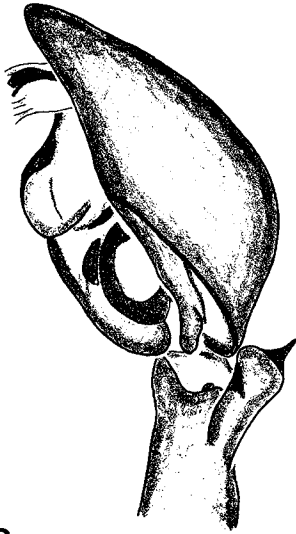
Material examined.— USA: *Alabama*; Lee Co., Auburn (N. Banks), immature (MCZ); Madison Co., Monte Sano, December 1940 (A. F. Archer),



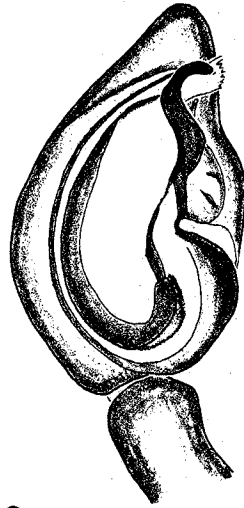
Map 1.—Distribution of *Zora* in North America.

immature (AMNH). *Connecticut*; Middlesex Co., Killingworth, 23 June 1935 (B. J. Kaston), 3 females, immature (USNM); New Haven Co., vicinity of Norwalk, 2 July 1933 (W. Ivie), female, immature (AMNH), Norwalk, August 1933 (W. Gertsch), female (AMNH), Seymour, 30 May 1965 (J. & W. Ivie), female, 2 immature (AMNH). *Florida*; Orange Co., Univ. of Central Florida Campus, May 1983 (D. T. Corey), female (USNM). *Georgia*; Emanuel Co., N of Swainsboro, 23 December 1952 (W. Ivie), immature (AMNH). *Illinois*; Jackson Co., R1W, T10S, S25, NW 1/4, 21 March 1975 (R. Parkin), immature (SIUC). *Massachusetts*; Middlesex Co., Holliston, 5 May and 1 July 1923 (J. H. Emerton), 2 females, 2 immatures (MCZ), August 1928, female (MCZ), 9 September 1928 (N. Banks), immature (MCZ), 15 September 1928 (N. Banks), female (MCZ), 16 June 1929 (N. Banks), female, 3 immature (MCZ), Tyngsboro, 16 October 1908 (J. H. Emerton), female (MCZ), 23 January 1910 (J. H. Emerton), female, immature (MCZ). *Missouri*; Johnson Co., Knob Noster State Park, 15-22 May 1978 (Peck), female (CAS), 16-26 May 1978 (Peck), immature (CAS), 11-16 April 1979

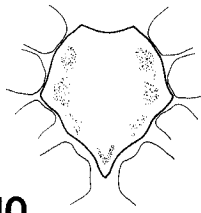
(PECK), 3 immatures (CAS); Phelps Co., Rolla, Dry Fork Cr., 8-11 May 1951 (HEF, DLF), female (CAS); St. Louis, St. Louis Co., 13 May 1950 (W. Dowdy), immature (AMNH). *New Jersey*; Atlantic Co., Great Egg Harbour River between Penny Pot and Weymouth, 3 May 1947 (H. Van Deusen), female (AMNH); Bergen Co., Ramsey, 23 June 1934 (W. J. Gertsch), female, immature (AMNH), 5 June 1938 (B. J. Kaston), 4 females, 3 males, 2 immature (USNM), 5 July 1938 (W. Gertsch), male and female pieces (AMNH); Hunterdon Co., Lambertville, May 1952 (W. Ivie), male (AMNH), June 1953 (W. Ivie), immature (AMNH). *North Carolina*; Durham Co., Duke forest, Durham, 11-28 April 1935 (A. M. Chickering), male (MCZ), SE corner of Co. road 1116 and Chapel Hill Blvd. junction, 1 October 1963 (J. W. Berry), immature (JAB), 11 November 1963 (J. W. Berry), immature (JAB), 1 May 1964 (J. W. Berry), male (JAB), 3 June 1964 (J. W. Berry), female (JAB). *Ohio*; Harrison Co., Hopedale, 17 May 1979 (R. Urbanek), male (JAB). *Pennsylvania*; Bucks Co., E of Jamison, Horseshoe Bend of Neshaminy Cr., November (W. Ivie), 2 immature (AMNH), Au-



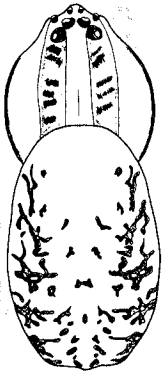
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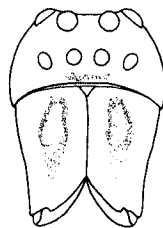
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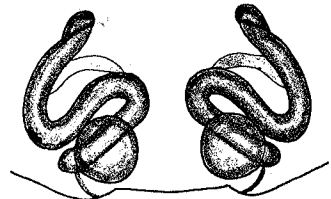
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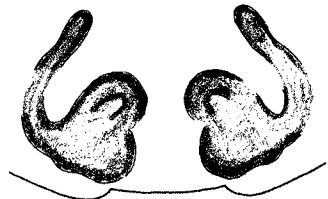
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Figures. 8-14.—*Z. hespera*: 8, 9, male palpus; 8, retrolateral aspect; 9, ventral aspect; 10-14, female; 10, sternum; 11, dorsal view of female; 12, chelicerae; 13, 14, epigynum; 13, dorsal aspect, cleared; 14, ventral aspect.

gust 1953 (W. Ivie), 5 females, 19 immatures (AMNH), September 1953 (W. Ivie), female, 9 immatures (AMNH), October 1953 (W. Ivie), female (AMNH), April 1954 (W. Ivie), 2 immatures (AMNH), May 1954 (W. Ivie), 4 females, 7 males (AMNH), June 1955 (W. Ivie), 11 females (CAS). *Tennessee*: Knox Co., 29 January 1982 (G. Tolbert), immature (CAS). *Texas*: Anderson Co., 7 mi. E of Palestine, 17 July 1938 (Davis), 3 immature (AMNH); Fayette Co., 11 mi. N of La Grange, 18 July 1966 (J. & W. Ivie), female (AMNH).

Zora hespera, new species

Figs. 8-14, Map 1

Types. — Female holotype from east of Pollock Pines, El Dorado Co., California, in a pine forest, 25 June 1953 collected by V. Roth. In American Museum of Natural History.

Etymology. — Name is derived from the Latin word for west.

Diagnosis. — Males and females can be distinguished from *Z. pumila* by the genitalia (Figs. 1, 2, 6, 9, 13, 14). Conductor of male rounded anteriorly. Sperm ducts in female S-shaped. See *Z. pumila* for differences between *Z. hespera* and *Z. spinimana* and *Z. nemoralis*.

Description. — Narrow marginal band on each side of the cephalothorax. Wide paramedial band extends back from each posterior median eye. Wide, lateral, longitudinal light colored bands on the abdomen. Chelicerae as in Fig. 12.

Males: Measurements of 3 specimens (mm). Total length 2.80-3.14 (2.95, 0.12). Carapace length 1.40-1.62 (1.27, 0.08), width 1.24-1.32 (1.27, 0.03). Eye sizes and interdistances: AME 0.06, ALE 0.06, PME 0.06, PLE 0.08; AME-AME 0.05, AME-ALE 0.04, PME-PME 0.08, PME-PLE 0.11, ALE-PLE 0.16. MOQ length 0.14-0.26 (0.22, 0.05), front width 0.16-0.18 (0.17, 0.01), back width 0.24. Clypeus height 0.06. Chelicera length 0.36-0.42 (0.38, 0.02), width 0.20-0.22 (0.21, 0.00). Total lengths of legs; I: 4.00-4.98 (4.49, 0.69), II: 3.80-4.72 (4.26, 0.65), III: 4.58 ($N=1$), IV: 5.32-5.98 (5.65, 0.46). Total length of palp 1.64-1.74 (1.68, 0.04). Leg spination tibiae I and II with 6-7 pairs of long, overlapping ventral spines, metatarsi I and II with 2 pairs of long, overlapping ventral spines.

Females: Measurements of 10 specimens (mm). Total length 3.54-6.79 (4.77, 0.37). Carapace length 1.53-2.13 (1.88, 0.07), width 1.23-1.72 (1.51, 0.05). Eye sizes and interdistances AME 0.08, ALE 0.08, PME 0.10, PLE 0.10; AME-

AME 0.05, AME-ALE 0.08, PME-PME 0.10, PME-PLE 0.13, ALE-PLE 0.18. MOQ length 0.28-0.36 (0.31, 0.01), front width 0.18-0.26 (0.23, 0.01), back width 0.28-0.36 (0.31, 0.01). Clypeus height 0.08-0.13 (0.10, 0.01). Chelicera length 0.44-0.67 (0.56, 0.02), width 0.20-0.42 (0.30, 0.02). Total lengths of legs; I: 4.03-6.28 (5.21, 0.22), II: 4.56-5.82 (4.97, 0.15), III: 3.97-5.69 (4.58, 0.17), IV: 5.36-7.36 (6.48, 0.17). Total length of palp 1.56-2.17 (1.89, 0.08). Leg spination, tibiae I and II with 6-7 pairs of long, overlapping ventral spines, metatarsi I and II with 2 pairs of long, overlapping ventral spines.

Distribution. — Washington, Oregon, California, Idaho, and Arizona.

Natural history. — *Zora hespera* has been collected throughout the year: adult males taken in April, May, and June, females from February through December. They have been found by sifting through oak leaves or by using a Berlese funnel.

Material examined. — All adults are paratypes. **USA:** *Arizona*: Yavapai Co., 5 mi. S of Prescott, 23 April 1936 (Bishop), 2 immature (AMNH). *California*: El Dorado Co., Riverton, 15 July 1934 (W. Ivie), female (AMNH), E Pollock Pines, 25 June 1953 (V. Roth), female (AMNH); Los Angeles Co., Tanbark Flats, San Gabriel Mts., 20 June 1952 (M. Cazier, W. Gertsch, R. Schrammel), female (AMNH); Mariposa Co., Wawona Camp, Yosemite Park, 17 September 1941 (W. Ivie), 3 females, 2 immatures (AMNH); Napa Co., Monticello Dam, 23 October 1957 (R. O. Schuster), immature (AMNH), Toll road on Mount St. Helena, 31 December 1953 (G. A. Marsh, R. O. Schuster, V. Roth), female, 2 immatures (AMNH); Orange Co., Santa Ana Mts., 13 September 1941 (W. Ivie), 3 immatures (AMNH); Riverside Co., Idyllwild, San Jacinto Mts., 18 June 1952 (W. J. Gertsch, M. Cazier, R. Schrammel), immature (AMNH), 17 March 1957 (I. Newell), female (AMNH); San Bernardino Co., 1.6 mi. E of Seven Oaks, 23 March 1958 (I. Newell), female (AMNH), Arrowhead Lake, 6 May 1936 (Bishop), immature (AMNH); San Diego Co., 4.8 mi. S of Julian, 26 April 1959 (I. Newell), female (AMNH), Sweetwater River, 1 1/2 mi. N of Descanso, 26 March 1967 (E. & R. Musillo & J. Ivie), female (AMNH); San Mateo Co., S of Woodside, 17 September 1964 (J. & W. Ivie), female (AMNH); Sonoma Co., 3 mi. W of Glen Ellen, 31 December 1953 (Marsh, Schuster, Roth), immature (AMNH), 15 February 1954 (Roth, Schuster), female, immature

(AMNH), Sugarloaf Ridge State Park, Bald Mt. Trail (450m), 20 November 1982 (V. F. Lee), immature (CAS); Yolo Co., 5.4 mi. SW of Winters, 29 May 1939 (FCR, LMS, ROS), immature (AMNH), 23 April 1959 (F. C. Ramey), 2 females (AMNH). *Idaho*; Adams Co., 7 mi. NE of Council, 17 October 1944 (W. Ivie), 3 immature (AMNH); Idaho Co., Clearwater Creek near Kooskia, 23 August 1940 (W. Ivie), female, immature (AMNH). *Oregon*; Benton Co., W of Corvallis, 20 March 1937 (JCC), female (AMNH); Columbia Co., Goble, 22 March 1938, female (AMNH), 23 April 1938, female, male, immature (AMNH); Coos Co., Charleston, 17 June 1952 (B. Malkin), male (AMNH); Josephine Co., Grave Cr., 30 May 1952 (V. Roth), female (AMNH); Lane Co., 8 mi. S of Divide Guard Sta., 27 July 1955 (V. Roth), female (AMNH); Marion Co., St. Benedict, 2 May 1954 (J. Roth), male (AMNH); Yamhill Co., Peavine Ridge, near McMinnville, November-December 1946 (K. M. Fender), female, 7 immatures (AMNH). *Washington*; Yakima Co., Tieton River, about 10 mi. E of Rimrock, 13 September 1965 (J. & W. Ivie), immature (AMNH).

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LITERATURE CITED

- Blackwall, J. 1833. Characters of some undescribed genera and species of Araneidae. *Lond. Phil. Mag. J. Sci.*, 3:187-197.
- Comstock, J. H. 1912. *The Spider Book*. Garden City, New York.
- Comstock, J. H. 1940. *The Spider Book*. Revised and edited by W. J. Gertsch. New York.
- Corey, D. T. & W. K. Taylor. 1988. Ground surface spiders in three central Florida plant communities. *J. Arachnol.*, 16:213-221.
- Dahl, F. 1912. Arachnoidea. *In* Handwort. Naturw., 1:485-514.
- Dahl, F. & M. Dahl. 1927. Spinnentiere oder Arachnoidea. II. Lycosidae s. lat. (Wolfspinnen im weiteren sinne). *Tierw. Deuts.*, 5:1-80.
- Emerton, J. H. 1911. New spiders from New England. *Trans. Connecticut Acad. Arts Sci.*, 16:385-407.
- Gistel, J. 1848. *Naturgeschichte des Tierreichs für höhere Schulen*. Stuttgart.
- Hentz, N. M. 1850. Descriptions and figures of the Araneides of the United States. *Boston J. Nat. Hist.*, 6:271-295.
- Holmberg, E. L. 1882. Observations a propos du sous-ordre des Araignees territoriales, specialement du genre nordamericain *Catadysas* Hentz et de la sous-famille Mecicobothrioidae. *Bol. Acad. Arg.*, 4: 153-174.
- Homann, H. 1947. Die Nebenaugen der Spinnen (Aranea). *Ztschr. Naturforsch.*, 2b:161-167.
- Kaston, B. J. 1948. Spiders of Connecticut. State Geological and Natural History Survey of Connecticut. Bull. 70.
- Kaston, B. J. 1981. Spiders of Connecticut. State Geological and Natural History Survey of Connecticut. Second edition, Bull. 70.
- Koch, C. L. 1848. Die Arachniden. Vierzehnter Band. Nürnberg, 210 pp.
- Lehtinen, P. 1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. *Ann. Zool. Fenn.*, 4:199-468.
- Marx, G. 1890. Arachnida in Scientific results of explorations by the U. S. Fish Commission steamer "Albatross". *Proc. U. S. Nat. Mus.*, 12:207-211.
- Petrunkévitch, A. 1928. *Systema Araneorum*. Trans. Connecticut Acad. Arts Sci., 29:1-270.
- Sundevall, J. C. 1832. Svenska Spindlarms beskrifning. Fortsättning och slut. *N. Act. Reg. Soc. Sci. Upsal.*, 171-272.
- Sundevall, J. C. 1833. *Conspectus arachnidum*. Londini Eothorum.
- Thorell, T. 1869. On European spiders. *N. Act. Reg. Soc. Sci. Upsal.*, 7:1-108.
- Tullgren, A. 1945. Svensk spindlar fauna 3. Egentliga spindlar. Araneae Fam. 5-7, Clubionidae, Zoridae och Gnaphosidae. Stockholm.
- Walckenaer, C. A. 1837. *Histoire naturelle des insectes. Apteres*. Paris. Tome 1.
- Walker, F. 1851. List of spiders captured by F. Walker. *Ann. Mag. Nat. Hist.*, 7:157-158.

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