

American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK 24, N.Y.

NUMBER 2188

SEPTEMBER 10, 1964

The Spider Genus *Zygiella* in North America (Araneae, Argiopidae)

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The present paper is a systematic study of the North American spiders of the genus *Zygiella* F. Pickard-Cambridge, a group for many years known by the familiar name *Zilla* C. L. Koch. The *zygiellas* are small to medium-sized araneine orbweavers, with oval abdomens of gray, silvery, or yellowish coloration. Two species (*x-notata* and *atrica*), introduced into our fauna, presumably from Europe, are now among our most common spiders in the areas that they have colonized. These widespread species have been studied intensively by many European and American students. A third species has long gone under the specific name *montana* C. L. Koch because of a misidentification by J. H. Emerton in 1884, subsequently followed faithfully by American authors. For many years I have been aware that the species we assigned to *montana* was not the same as the European species. During the course of this study I found that Embrik Strand also, more than 50 years ago, in 1906, concluded that Emerton's *montana*, as well as *dispar* which he was discussing, were both distinct from the European relatives. The pattern of distribution of this misidentified species, herein named *nearctica*, indicates clearly that it is a true endemic. Two additional, seemingly endemic species from the Californian region bring our total fauna to five species.

Adults of several well-known species of *Zygiella* spin incomplete orb-webs by omitting sticky spiral lines and radii from a sector about equal

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to the space between two or three radii, which is accomplished by their spinning back and forth many times in rounded loops instead of complete circles. A strong trap line is strung from the hub through this free zone, but not always in the same plane, to the retreat, which is an open silken tube hidden in a crevice or under bark. These mostly nocturnal spiders hang from their webs at night and lie hidden in their retreats by day. It is known that young spiders frequently, and older spiders occasionally, spin complete webs. *Zygiella carpenteri* of the far western United States seems to spin only complete orbwebs, but reinvestigation of this conclusion is desirable.

The genus *Zygiella* is represented in Europe by about eight species. The biologies and systematics of some of these were described in excellent fashion for Germany by Wiehle (1931, pp. 29–41) and for the British Isles by Locket and Millidge (1953, vol. 2, pp. 159–164). Species of *Zygiella* have been described from most of the large world areas, but probably many of them should be assigned to other genera.

The present paper is based largely on collections in the American Museum of Natural History. I am grateful to Dr. Herbert Levi of the Museum of Comparative Zoölogy at Harvard College for the loan of some of the specimens in his charge. A substantial portion of the material on which this paper is based was secured during field trips made possible by grants from the National Science Foundation (G-9036 and G-24384).

GENUS *ZYGIELLA* F. PICKARD-CAMBRIDGE

Zygiella F. PICKARD-CAMBRIDGE, 1902, p. 15. KASTON, 1948, p. 242. ROEWER, 1942 (1942–1954, vol. 1), p. 883. BONNET, 1959 (1945–1961, vol. 2), p. 4997.

Zilla: EMERTON, 1902, pp. 184–186, figs. 431–435. WIEHLE, 1931, pp. 29–41, figs. 33–53.

DIAGNOSIS: The zygiellas are araneine orbweavers with short, oval, moderately sclerotized abdomens unadorned by humps or spinose outgrowths. The eyes of the posterior row are subequal in size and subequidistantly spaced. The legs of males lack heavy spines or other secondary sexual modifications. The patella of the male palpus bears a single large spine. The genus is best separated from others of similar appearance, such as *Singa*, *Metazygia*, and *Neosconella*, by features of the relatively complex genitalia which are described and illustrated below.

DESCRIPTION: Carapace suboval, of moderate height and convexity; median groove a deep linear depression. Eyes eight, placed in two essentially straight rows and mostly subequal in size. Eyes of front row subequidistantly spaced; slightly larger anterior median eyes separated by diameter at most, frequently only by radius. Posterior eye row usually

very gently recurved; median eyes typically a little closer together than their distance from lateral eyes. Median ocular quadrangle as broad as or slightly broader than long, narrowed behind; front eyes slightly to clearly larger in size. Clypeus low, equaling about radius of anterior median eye. Clothing of carapace sparse, consisting of pale covering hairs and weak bristles mostly on pars cephalica. Sternum subtriangular, much longer than broad. Chelicerae toothed on both margins. Legs of medium length, first pair longest, without notable secondary sexual modifications in males, except for greater length in *atrica*. Spines numerous on legs, especially in males. Males lacking spur on first coxa and accessory groove on second femur. Male palpus complicated in appearance and with following features: patella typically with single dorsal spine; paracymbium a conspicuous, flattened, lamellate process; embolus a thin spine lying in depressed conductor; terminal apophysis present in *montana* group, absent from *x-notata* group; other bulbal apophyses often strongly developed. Abdomen large, oval somewhat flattened above, smooth except for thin covering of inconspicuous hairs. Colulus a distinct, pointed appendage. Epigynum of many species without free scape, typically an elevated lobe or tubercle, with more or less developed caudal fovea enclosing low median septum at sides of which lie slitlike, atriobursal orifices; in *stroemi*, *kochi*, and others caudally directed scape present.

TYPE OF GENUS: *Zygiella atrica* C. L. Koch.

KEY TO NORTH AMERICAN SPECIES OF *ZYGIELLA*

MALES

1. Bulb of male palpus with terminal apophysis 2
 Bulb of male palpus without terminal apophysis 4
2. Tegular apophysis of palpus in lateral view a triangular spur about as long as broad 3
 Tegular apophysis longer, a curved blade *carpenteri* Archer
3. Apical apophysis of palpus a massive lobe (fig. 8) *dispar* Kulczynski
 Apical apophysis less developed (fig. 3) *nearctica*, new species
4. Tibia of palpus scarcely twice as long as broad *x-notata* Clerck
 Tibia greatly elongated (fig. 19) *atrica* Koch

FEMALES

1. Epigynum broad, elevated lobe much wider than width of labium 2
 Epigynum small lobe about as wide as labium 4
2. Posterior fovea of epigynum scarcely visible from below 3
 Posterior fovea and details of epigynum as shown in figures 4 and 5
 *nearctica*, new species
3. Epigynum as shown in figures 7 and 9 *dispar* Kulczynski
 Epigynum as shown in figures 11 and 13 *carpenteri* Archer
4. Epigynum with rounded posterior lobe conspicuously visible from below (figs.

18 and 20).....*atraca* Koch
 Epigynum broader, with posterior lobe less visible from below (figs. 15, 17)...
*x-notata* Clerck

Zygiella nearctica, new species

Figures 1, 3–6

Zilla montana: EMERTON, 1884, p. 323, pl. 34, fig. 14, pl. 37, figs. 22, 23, 26, 28; 1894, p. 406; 1902, p. 185; 1909, p. 201, pl. 5, fig. 4b; 1914, pp. 148, 156, map p. 154; 1918, pp. 128, 129; 1920, p. 323; 1921, p. 107. MARX, 1890, p. 550. MCCOOK, 1894 (1889–1894, vol. 3), p. 239, pl. 18, figs. 3, 4. SLOSSON, 1898, p. 248. BANKS, 1910, p. 39; 1911, p. 450. COMSTOCK, "1912" [1913], p. 460, figs. 471c, 472c. CROSBY AND BISHOP, 1928, p. 1058. CHICKERING, 1934, p. 579.

Araneus montanus: COMSTOCK, 1903, p. 39. BRYANT, 1908, p. 57. PETRUNKEVITCH, 1911, p. 304.

Zygiella montana: GERTSCH AND JELLISON, 1939, p. 5. LEVI AND FIELD, 1954, p. 452.

DIAGNOSIS: This species has long been confused with the European *Zygiella montana* Koch, from which it differs in being smaller in size, lighter in color, and in having a pale stripe on the dark sternum. It is easily separated from the much larger *Zygiella dispar* Kulczynski by differences in the various apophyses of the male palpus and features of the epigynum, all of which are illustrated.

COLORATION: Carapace and appendages yellowish to orange in both sexes. Pars thoracica dusky as usual but in not many cases showing sharp contrast with rest of carapace. Margins of pars thoracica with narrow, marginal, blackish seam. Labium, maxillae, and sternum dark brown, but sternum with median pale stripe running back two-thirds of length. Coxae dull yellow. Legs marked with narrow brown rings and with small brown spots at alveoli of spines. Abdomen white in base color, reticulated with gray and presenting typical variable patterns of group. Dorsum with elongate folium of black chevrons reduced in most specimens to submarginal row of patches. Sides of abdomen whitish, with gray reticulations and small black spots. Venter with narrow black band from base to and around brown spinnerets and on each side a white stripe.

STRUCTURE: Female from Seba, Alberta: Length, 6.5 mm.; carapace, 2 mm. long, 1.7 mm. wide; abdomen, 4.7 mm. long, 3.5 mm. wide. Clypeus equal in height to one-third of diameter of anterior median eye. First eye row essentially straight, strongly recurved as seen from above; median eyes separated by not fully their radius, as far from subequal lateral eyes. Posterior eye row weakly recurved; quite round median eyes separated by seven-tenths of their diameter, a little farther from subequal lateral eyes. Median ocular quadrangle about as broad as long,

very slightly narrower behind; anterior median eyes slightly larger. First leg: femur, 2.2 mm.; patella, 0.9 mm.; tibia, 1.7 mm.; metatarsus, 1.9 mm.; tarsus, 0.8 mm.; total length, 7.5 mm. Spination of first leg: femur, one prolateral; patella, none; tibia, three prolateral, two retrolateral; one ventral pair at apex; metatarsus, two subdorsal, two retrolateral.

Epigynum a rounded lobe which in ventral view (fig. 4) presents semi-circular fovea enclosing broad septum and in caudal view (fig. 5) gives details of this.

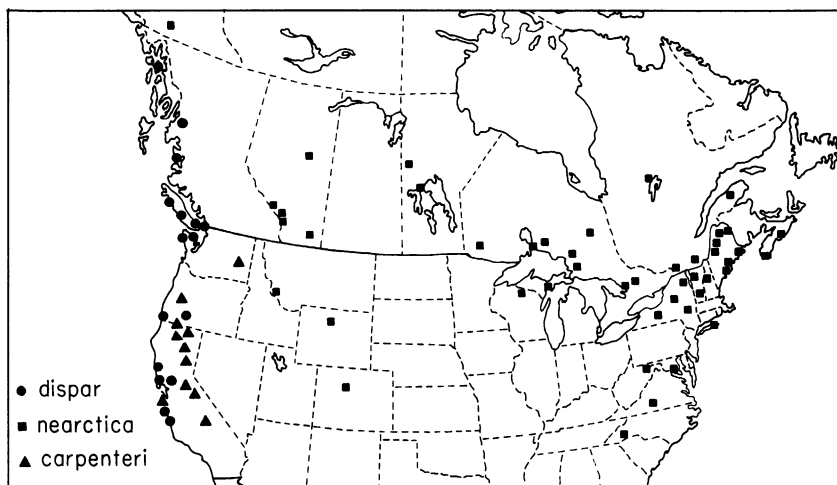


FIG. 1. Map showing distribution of *Zygiella dispar*, *nearctica*, and *carpenteri*.

Male from Seba, Alberta: Length, 4.8 mm.; carapace, 2.5 mm. long, 2.1 mm. wide; abdomen, 3 mm. long, 2.3 mm. wide. Structure essentially like that of female, but carapace somewhat broader and head narrower in front. Posterior eye row slightly recurved; round median eyes separated by three-fourths of their diameter and slightly more than full diameter from lateral eyes. Median ocular quadrangle about as broad as long but wider in front; anterior median eyes clearly larger than posterior median eyes and also larger than other eyes. First leg: femur, 2.6 mm.; patella, 1.1 mm.; tibia, 2.3 mm.; metatarsus, 3 mm.; tarsus, 0.9 mm.; total length, 9.9 mm. Spination of first leg: femur, two dorsal, two prolateral, one retrolateral; patella, one prolateral, one retrolateral; tibia, three dorsal, three prolateral, two retrolateral, three ventral pairs, the last apical; metatarsus, two subdorsal, two retrolateral, none apical.

Male palpus as illustrated in figures 3 and 6.

TYPE DATA: Male holotype from Seba, Alberta, in the American Museum of Natural History.

DISTRIBUTION: Widespread in Canada and the northern United States, southward in the eastern mountains to North Carolina and in the Rocky Mountains into Colorado (see map, fig. 1).

RECORDS: *Nova Scotia:* Ship Harbor (Emerton, 1894). *Quebec:* Rousseau Peak, Otish Mountains, border of Lake Pomerleau, August 6, 1949 (J. Rousseau), female. St. Anne des Monts, Gaspé; Montgomery Falls, Montfort (Emerton, 1920). *Ontario:* Lake Opeongo, Algonquin Park, August 17, 1948 (W. J. Gertsch; T. B. Kurata), female, immature. Nipigon, August 12, 1948 (W. J. Gertsch; T. B. Kurata), immature. Minaki (Emerton, 1920). Cochrane (Emerton, 1918). Victoria Island, Lake Temagami, August 15–25, 1949 (W. J. Gertsch; W. Ivie; T. B. Kurata). *Manitoba:* Clearwater Lake, July; Le Pas, July 2, 1917 (Emerton, 1920), seven males, two females. Kettle Rapids (Emerton, 1918). *Alberta:* Medicine Hat, July, female. Seba, July–August, 1934 (W. Rowan), males, females, immature. Jackpine Ridge, Fawcett, July, female. Moraine Lake, Banff, July, two males. Devils Lake, July, males and females. Athabasca Landing (Emerton, 1920). *British Columbia:* Metlakatla (Emerton, 1920). *Yukon:* Whitehorse, July 1–12, 1948, female, immature. *Maine:* Moosehead Lake (Bryant, 1908; Emerton, 1914). Mt. Katahdin; Fort Fairfield; Machias (Emerton, 1914). Deer Island (Emerton, 1909). Mt. Desert Island, August 21, 1901 (H. W. Britcher), female. *New Hampshire:* Crawford Notch (Emerton, 1914). Hermit Lake on Mt. Washington (Emerton, 1884). Mt. Washington, October 17, 1940 (R. H. Crandall), female. Franconia (Slosson, 1898). *Vermont:* Mt. Mansfield; Ascutney (Emerton). *New York:* Dormansville, June; Mt. McIntyre, July; Thatcher Peak, June (Crosby and Bishop, 1928). Orient, Long Island, September, 1955 (R. Latham). Old Forge, August, 1905 (J. Needham), female. Caroline Center, May 21, 1921 (J. Needham), female. *Maryland:* Swallow Falls Park, September 13, 1943 (M. H. Muma), male, female. *Virginia:* Mountain Lake, June 22, 1956 (H. K. Wallace), male. *District of Columbia:* Female (Fox). *North Carolina:* Roan Mountain (Emerton, 1909; Banks, 1911). *Michigan:* Northern part of state (Chickering, 1934). *Wyoming:* Eighteen miles southwest of Big Horn, July 17, 1959 (F. and P. Rindge), male. *Montana:* Gird's Creek, Ravalli County, June 3, 1934 (Gertsch and Jellison, 1939), two females. *Colorado:* Pingree Park, August 20, 1924, female, immature.

BIOLOGY: What we know about this species is to be credited largely to J. H. Emerton, who first studied it in 1884 under the name of *montana* and later mentioned it in several papers. It lives in bushes and trees, on

rocks and cliffs, and readily accepts habitats on bridges, houses, barns, and other outbuildings provided by man. Its snare was described by Emerton as having a "narrow segment without crosslines" and it thus conforms to the typical "*Zilla*" pattern.

Zygiella dispar (Kulczynski)

Figures 1, 7–10

Zilla dispar KULCZYNSKI, 1885, p. 24, pl. 9, figs. 7a, 7b, 7d. REIMOSER, 1919, p. 190. CHARITONOV, 1932, p. 122.

?*Aranea dispar*: BÖSENBERG AND STRAND, 1906, p. 238. STRAND, 1906, p. 460.

Araneus dispar: KULCZYNSKI, 1926, p. 35. BONNET, 1955 (1945–1961, vol. 2), p. 498.

Zygiella dispar: ROEWER, 1942 (1942–1954, vol. 1), p. 883.

Zygiella montana: EMERTON, 1920, p. 323. LINDROTH, 1957, p. 102.

DIAGNOSIS: This handsome species, first described from Siberia, is a close relative of the European *Zygiella montana* Koch. It is easily separated by the presence of a yellow stripe on the dark sternum and by distinctive features of the genitalia in both sexes. The epigynum is larger and has the caudal fovea broad and scarcely at all visible from above. The apical apophysis of the male palpus is much more massive and forms a broad lobe.

COLORATION: Carapace and appendages yellowish to orange in both sexes. Pars cephalica dusky throughout, outlined by darker lines and presenting a dark triangular marking in front of median groove. Side margins of pars thoracica with narrow black seam. Labium and maxillae brown. Sternum brown but enclosing conspicuous, yellow, triangular stripe which does not project full length. Coxae yellowish. Legs strongly marked with brown rings on most segments and with brown spots at base of spines, these being particularly conspicuous on tibiae and metatarsi of males because of more numerous spines. Abdomen gray to yellowish in base color and presenting usual variable color pattern as follows: dorsum with elongate folium of transverse blackish chevrons, which may be interrupted, reduced, or entirely missing from median area; whole of dorsum white-flecked, but flecks forming distinct spots and bands when dark pattern is extensive. Sides of abdomen yellowish, with black flecks or, in melanic specimens, mostly blackish with numerous small yellowish spots. Venter with narrow, median, blackish stripe running from pedicel to and around brownish spinnerets and more or less distinct whitish band on each side.

STRUCTURE: Female from Kyuquot, British Columbia: Length, 10 mm.; carapace, 4 mm. long, 3 mm. wide; abdomen, 7 mm. long, 5.5

mm. wide. Clypeus equal in height to about radius of anterior median eye. First eye row essentially straight, strongly recurved as viewed from above; median eyes separated by their radius, as far from subequal lateral eyes. Posterior eye row slightly recurved; broadly oval median eyes separated by seven-tenths of their diameter, somewhat more than full diameter from subequal lateral eyes. Median ocular quadrangle about as broad as long, only slightly narrowed behind; front eyes slightly larger. Sternum, 1.8 mm. long, 1.35 mm. wide. First leg: femur, 4 mm.; patella, 1.7 mm.; tibia, 3.6 mm.; metatarsus, 4.1 mm.; tarsus, 1.4 mm.; total length, 14.8 mm. Spination of first leg: femur and patella, none; tibia, three prolateral, one ventral pair at apex; metatarsus, two subdorsal, two retrolateral, none of these apical.

Epigynum in ventral view (fig. 7) a broad, rounded lobe with rounded fovea behind. Openings visible on each side of quite broad median septum as shown in posterior view (fig. 9).

Male from Kyuquot, British Columbia: Length, 7 mm.; carapace, 3.5 mm. long, 3 mm. wide; abdomen, 4.3 mm. long, 3 mm. wide. Structure essentially like that of female, but carapace more broadly oval and head somewhat narrower. Posterior eye row essentially straight. Median ocular quadrangle about as broad as long, broader in front, and front eyes clearly larger than round posterior median eyes. First leg: femur, 4.2 mm.; patella, 1.7 mm.; tibia, 4.2 mm.; metatarsus, 5.2 mm.; tarsus, 1.5 mm.; total length, 16.8 mm. Spination of first leg: femur, two median, three prolateral, two retrolateral, all in distal half; patella, one prolateral, one retrolateral; tibia, three or four dorsal, four prolateral, two retrolateral, two, two, one, two, two ventral, the last pair apical; metatarsus, one median at base, three subdorsal, two retrolateral.

Male palpus as illustrated in figures 8 and 10.

TYPE DATA: Male and female cotypes from Kamtschatka, Siberia, presumably in the Warsaw Zoological Museum.

DISTRIBUTION: Siberia; Japan; central California northward to Alaska, chiefly near the coast as shown on the map (fig. 1).

AMERICAN RECORDS: *California*: Carmel, September 3, 1953, female. Mill Valley, June, 1905 (J. H. Emerton collection), female. Pebble Beach, March 25, 1957, October 11, 1956 (A. M. Nadler), male and female. Pacific Grove, April 3, 1906 (W. J. Gertsch; W. Ivie), female. Fairfield, Solano County, April–August, 1955 (K. W. Haller), male. Gurnewood, July 5, 1958 (V. Roth), female. Anchor Bay, Mendocino County, June 28, 1952 (W. J. Gertsch), female. *Oregon*: Pistol River, Curry County, May 22, 1957 (B. Malkin), female. Lake Trail, Crater Lake National Park, August 2, 1951 (D. Lowrie), two females, two im-

mature. *British Columbia*: Terrace (W. E. Clark), male, three females. Ocean Falls, July 11, 1960 (E. Schlinger), male, two females. Vancouver Island: Wellington, March, October 5, September (R. Guppy), females; Tofino, May 10 (R. Guppy), female; Mt. Benson, September 18 (R. Guppy), two females; Kyuquot, March 21, April 22, May 4 (S. L. Neave), females; Waller's Cove, Kyuquot, April 9 (S. L. Neave), female; Amos Island, Kyuquot, July 29 (S. L. Neave), females. *Alaska*: Admiralty Islands: Middle Harbor, June 20, 1932 (A. Hasselborg), three females; Mole Harbor, June 3, 1932 (A. Hasselborg), female.

Zygiella carpenteri Archer

Figures 1, 11–14

Zygiella carpenteri ARCHER, 1951, p. 18, fig. 34.

DIAGNOSIS: This small species is readily separated from *dispar* and *nearctica* by substantial differences in the genitalia. The epigynum presents a small, transversely suboval depression at the posterior edge not present in other species. The male palpus has several distinctive features, as follows: The embolus is much longer, and its thin tip lies in a shallow conductor much lower down on the bulb. The terminal apophysis is a relatively small, winged, transversely directed spur. The radix has its ventral face produced into a heavy curved blade. The paracymbium is larger and is truncated at the apex.

COLORATION: Carapace and appendages dusky yellow to bright orange in both sexes. Pars cephalica somewhat dusky but in not many cases presenting strong contrast with rest of carapace. Margins of pars thoracica with narrow dusky seam. Sternum yellow or orange, with sides somewhat dusky, to leave irregular, median, pale maculation for whole length. Legs quite uniform in color, without distinct darker marking except on femora where indistinct dusky rings or spots are present. Abdomen dusky yellow in base color, with somewhat variable pattern as follows: Dorsum with dusky to black chevrons for total length, typically reduced to submarginal row of patches or spots, and forming narrow transverse bands only at apex; whole of dorsum with white flecks, these concentrated in two median bands and one band on each side margining black patches. Sides marked with numerous small black spots. Venter with median dusky band margined by white stripes from base nearly to orange spinnerets which are ringed with black.

STRUCTURE: Females vary from 4 to 7 mm., but average 5.5 mm., in total length.

Female from Gold Lake, California: Length, 6 mm.; carapace, 2.6 mm.

long, 2 mm. wide; abdomen, 4 mm. long, 3.2 mm. wide. Carapace thinly clothed with pale hairs and with a few longer bristles on pars cephalica. Clypeus equal in height to two-thirds of diameter of anterior median eye. Front eye row essentially straight, strongly recurved as viewed from above; median eyes separated by somewhat less than radius, about as far from subequal lateral eyes. Posterior eye row slightly recurved; broadly oval median eyes separated by five-sixths of their diameter, little more than full diameter from subequal lateral eyes. Median ocular quadrangle about as broad as long but slightly narrowed behind; posterior median eyes smaller. Sternum, 1.5 mm. long, 1.1 mm. wide. First leg: femur, 2.3 mm.; patella, 1.4 mm.; tibia, 2 mm.; metatarsus, 2.4 mm.; tarsus, 1.9 mm.; total length, 10 mm. Spination of first leg: femur, two dorsal, two prolateral and one retrolateral, all these near distal end; patella, one prolateral; tibia, three prolateral, two retrolateral, and one apical pair; metatarsus, two subdorsal, two retrolateral, and one ventral.

Epigynum a broad, rounded lobe with oval depression and thin posterior lip as seen in ventral view (fig. 13). Openings visible on each side of median septum as shown in the posterior view (fig. 11).

Male from Gold Lake, California: Length, 5 mm.; carapace, 2.5 mm. long, 2 mm. wide; abdomen, 2.8 mm. long, 2.2 mm. wide. Structure essentially like that of female. Carapace more broadly oval and less constricted at sides of head. Eye relations nearly same, but posterior row straight. First leg: femur, 2.6 mm.; patella, 1.3 mm.; tibia, 2.5 mm.; metatarsus, 3.1 mm.; tarsus, 1.1 mm.; total length, 10.6 mm. Legs proportionately longer and thinner, with more numerous spines. Spination of first leg: femur, two median, two prolateral, and one retrolateral, all near distal end; patella, one prolateral, one retrolateral; tibia, two median dorsal, two prolateral, two retrolateral, none of these apical, and three ventral pairs, the third pair apical; metatarsus, three subdorsal, two retrolateral, and one ventral.

Male palpus as illustrated in figures 12 and 14.

TYPE DATA: Female holotype from Del Monte Forest, Pacific Grove, Monterey County, California, taken October 8, 1945, by Alan F. Archer, in the American Museum of Natural History.

DISTRIBUTION: California and north into Washington, chiefly in the interior mountains but also known from the coast at Pacific Grove (see map, fig. 1).

RECORDS: *California*: Big Bend Campground, 5 miles west of Lee Vining, Mono County, September 21, 1961 (W. J. Gertsch; W. Ivie), males and females. Deer Creek, Tehama County, September 19, 1961 (W. J. Gertsch; W. Ivie), males and females. Wilson Lake, September 4, 1959

(W. J. Gertsch; V. Roth), female. Strawberry, Tuolumne County, September 10, 1959 (W. J. Gertsch; V. Roth), female. Strawberry, Yuba County, July 12, 1952 (W. J. Gertsch), male and females. Cedar Creek Camp, Tulare County, April 26, 1950 (E. Schlinger), female. Hat Creek Park, 7 miles east of Burney, Shasta County, September 18, 1961 (W. J. Gertsch; W. Ivie), males and females. Dickson Flat, northeastern Shasta County, July 21, 1941 (W. M. Pearce), female. Sisson, Siskiyou County, male. Ney Springs, 5 miles west of Mt. Shasta, Siskiyou County, September 2, 1959 (W. J. Gertsch; V. Roth), female. Hotel Rock, Lava Beds

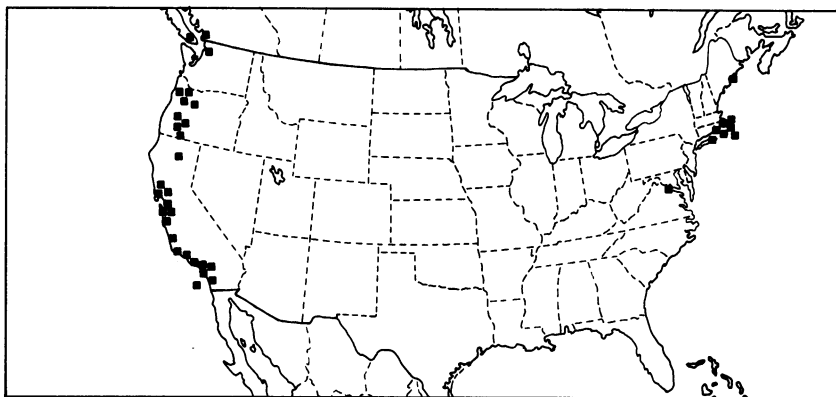


FIG. 2. Map showing distribution of *Zygella x-notata*.

National Monument, Siskiyou County, March 3, 1961 (J. Schuh), males and females from cracks in rock. Gold Lake, Sierra County, July 7, 1952 (W. J. Gertsch), males and females. *Oregon*: McKenzie Bridge, Lane County, May 3, 1947 (B. Malkin), male. *Washington*: Fishtrap Lake, 35 miles southwest of Spokane, August 14, 1951 (Kohls and Hughes).

BIOLOGY: This interesting species lives in cracks on rock walls and especially on the trunks of yellow pines and other large coniferous trees of the California Sierras. The rough bark provides numerous deep depressions over which the spiders hang their orbwebs. A dozen or more spiders frequently were noted on a single tree, with webs placed near the base and upward to a dozen feet or more. The orbwebs average little more than 2 inches in width, but where space is available they may attain 5 or 6 inches in width. The extremely fine lines are difficult to see by day, and even with the aid of a headlamp at night when the spiders are sitting in the hubs of their webs. Many webs were studied, and all seemed to be complete, i.e., provided with viscid lines in all sectors.

Zygiella x-notata (Clerck)

Figures 2, 15–17

Araneus x-notatus CLERCK, 1758, p. 46, pl. 2, fig. 5.

Zilla x-notata: EMERTON, 1877, p. 69; 1884, p. 324, pl. 36, fig. 13, pl. 37, figs. 24, 25, 27, pl. 40, fig. 2; 1902, p. 185; 1911, p. 399; 1914, pp. 152, 157, map p. 154; 1920, p. 323; 1930, pp. 166, 167. MCCOOK, 1889 (1889–1894, vol. 1), pp. 142–144, 211; 1890 (1889–1894, vol. 2), pp. 225, 292, 328, 388; 1894 (1889–1894, vol. 3), pp. 100, 237. MARX, 1890, p. 550; 1892, p. 158. COMSTOCK, "1912" [1913], p. 460, fig. 471b. BANKS, 1910, p. 39. PETRUNKEVITCH, 1928, p. 141. MOLES, 1921, p. 42. CROSBY AND BISHOP, 1928, p. 1058. WORLEY AND PICKWELL, 1927, p. 58. PROCTER, 1946, p. 518.

Zygiella x-notata: LINDROTH, 1957, p. 102. BONNET, 1959 (1945–1961, vol. 2), p. 5007.

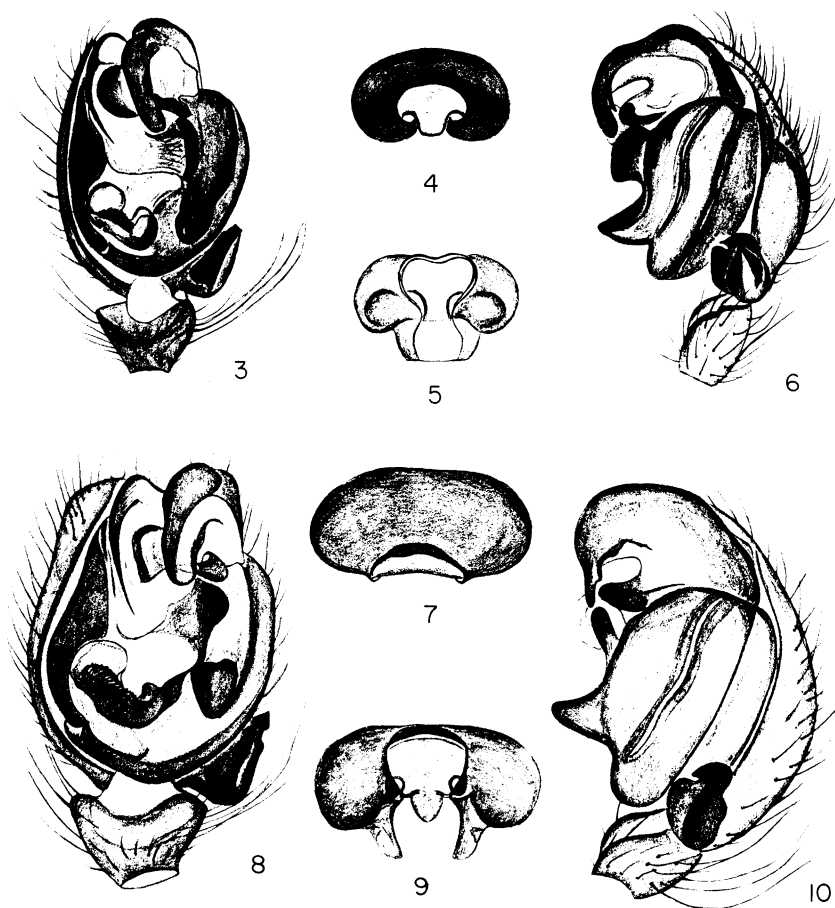
Zilla californica BANKS, 1896, p. 90; 1900, p. 482; 1904, p. 349; 1910, p. 39. COOLIDGE, 1907, p. 375; 1910, p. 393. COMSTOCK, "1912" [1913], p. 460. MOLES, 1921, p. 42.

Zygiella litterata ROEWER, 1942 (1942–1954, vol. 1), p. 885. KASTON, 1948, p. 243, pl. 35, fig. 747, pl. 36, figs. 767–769.

DIAGNOSIS: This species is readily separated from *atraca* by genitalic differences. The epigynum is much wider and presents in dorsal view a gently rounded or weakly angled caudal lobe. The tibia of the male palpus is not fully so long as the oval cymbium. Other differences in the paracymbium and bulbal apophyses are shown in the figures.

COLORATION: Carapace and appendages dull yellow to orange in both sexes. Pars cephalica dusky, often strongly lined with black and presenting a variably distinct triangular black patch in front of median groove. Sides of pars thoracica with narrow, black, marginal seam. Labium and maxillae yellowish brown. Sternum dark brown on sides, with conspicuous triangular yellow stripe running most of length but narrowed to thin point behind. Legs with more or less distinct brown rings, less noticeable on front darker pairs. Abdomen gray to yellow, quite silvery in most specimens, with typical variable pattern as follows: Dorsum with black folium, scalloped on margins, with dark chevrons usually faintly visible behind as transverse lines or spots. Sides of abdomen silvery white, with a variable amount of duskiess and dark spotting. Venter with narrow, median, dark band enclosing brown spinnerets and flanked by white stripe on each side.

STRUCTURE: Female from Eugene, Oregon: Length, 6 mm.; carapace, 2.3 mm. long, 1.8 mm. wide; abdomen, 4.5 mm. long, 3.5 mm. wide. Clypeus equal in height to scarcely radius of anterior median eye. Front eye row essentially straight, strongly recurved as seen from above; median eyes separated by three-fourths of their diameter, somewhat nearer subequal lateral eyes. Posterior eye row straight; somewhat oval



FIGS. 3-6. *Zygiella nearctica*, new species. 3. Left male palpus, ventral view. 4. Epigynum, ventral view. 5. Epigynum, posterior view. 6. Left male palpus, retrolateral view.

FIGS. 7-10. *Zygiella dispar* (Kulczynski). 7. Epigynum, ventral view. 8. Left male palpus, ventral view. 9. Epigynum, posterior view. 10. Left male palpus, retrolateral view.

median eyes separated by four-fifths of their diameter, nearly one and one-half diameters from subequal lateral eyes. Median ocular quadrangle slightly broader than long, broader in front; front eyes only a trifle larger. First leg: femur, 2.7 mm.; patella, 1.3 mm.; tibia, 2.3 mm.; metatarsus, 2.7 mm.; tarsus, 0.8 mm.; total length, 9.8 mm. Spination of first leg: femur, one or two median, two prolateral, one retrolateral; tibia, one

dorsal, two prolateral, two retrolateral, and two ventral pairs, one of these apical; metatarsus, two subdorsal, two retrolateral.

Epigynum small, equal in width to labium, as shown in figures 15 and 17.

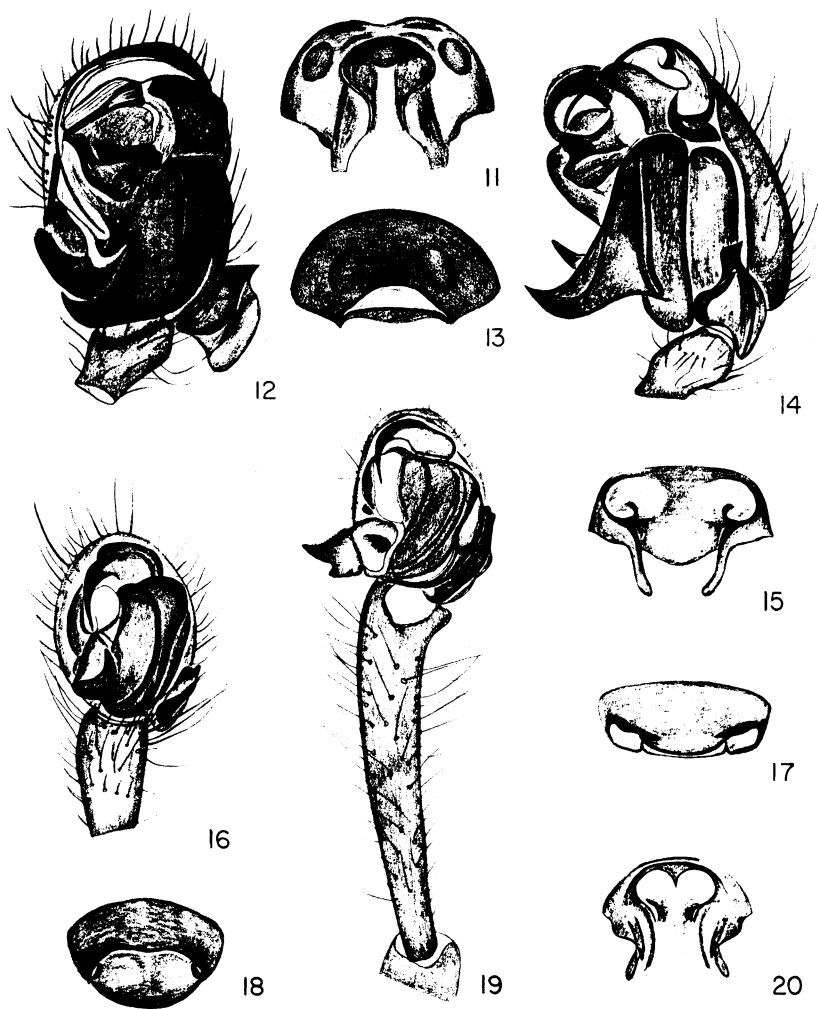
Male from Greenport, Long Island, New York: Length, 6.4 mm.; carapace, 3 mm. long, 2.3 mm. wide; abdomen, 3.5 mm. long, 2.7 mm. wide. Structure essentially like that of female. Posterior eye row gently recurved; median eyes separated by three-fourths of their diameter, twice as far from subequal lateral eyes. Median ocular quadrangle as broad as long, narrowed behind; front eyes somewhat larger. First leg: femur, 3.9 mm.; patella, 1.5 mm.; tibia, 3.9 mm.; metatarsus, 4.7 mm.; tarsus, 1.2 mm.; total length 15.2 mm. Spination of first leg: femur, two or three dorsal, two prolateral, one retrolateral; patella, one dorsal, one retrolateral; tibia, two dorsal, two prolateral, two retrolateral, one, two, two ventral, the last pair apical; metatarsus, two subdorsal, two retrolateral.

Male palpus as shown in figure 16. Tibia a much longer than broad, cylindrical segment, equaling about two-thirds of length of cymbium. Bulb without apical apophysis.

TYPE LOCALITIES: Original material of *Araneus x-notatus* Clerck from Sweden, presumably lost; female type of *Zilla californica* Banks in the Museum of Comparative Zoölogy.

DISTRIBUTION: Widely distributed in the Palearctic Region from the British Isles to Himalaya Mountains; Sumatra; Sakhalin Island; an introduced species in the Americas, known from Chile and Argentina and from widely separated centers on the east and west coasts of North America. (See map, fig. 2.)

AMERICAN RECORDS: *Maine*: Mt. Desert Island, August 21, 1901 (H. Britcher), males, females. Bar Harbor (Procter, 1946). *Massachusetts*: Woods Hole (Emerton, 1884); widespread on Cape Cod and eastern part of state (Emerton, 1911, 1914, 1920). *Rhode Island*: Newport (Emerton, 1911). *New York*: Long Island (Emerton, 1930). Greenport, September, 1957 (R. Latham), male. *District of Columbia*: Potomac Hills (Marx, 1892). *British Columbia*: Vancouver (Emerton, 1920). Wellington, August 15, 1949 (R. Guppy), female. *Washington*: Seattle (Emerton, 1920); May, 1951 (B. Malkin), female. *Oregon*: Common in western part of state; 30 collections from about 15 localities; males from August 1 to September 12, females from February 8 to November 2. *California*: San Diego [McCook, (1889–1894)]. Abundant along west coast; 50 collections from numerous localities; mature males from February to September 29, females from January 1 to October 29.



FIGS. 11-14. *Zygiella carpenteri* Archer. 11. Epigynum, posterior view. 12. Left male palpus, ventral view. 13. Epigynum, ventral view. 14. Left male palpus, retrolateral view.

FIGS. 15-17. *Zygiella x-notata* (Clerck). 15. Epigynum, posterior view. 16. Left male palpus, ventral view. 17. Epigynum, ventral view.

FIGS. 18-20. *Zygiella atrica* (C. L. Koch). 18. Epigynum, ventral view. 19. Left male palpus, ventral view. 20. Epigynum, posterior view.

BIOLOGY: This species was known to occur in North America well before the turn of the century. In 1883 J. H. Emerton found it in numbers at Woods Hole, Massachusetts, where its neat nests were spun under wharves. He was prompted to remark: "Many trees have been brought to Wood's Hole from the north of Europe for cultivation, so it is possible for these spiders to be imported. I have not seen them nor heard of their presence elsewhere in New England" (Emerton, 1884, p. 325). By 1911 he reported that *x-notata* had become abundant all over Cape Cod and the south shore of Massachusetts and Rhode Island. In New England *x-notata* is largely a house spider and prefers the outside of houses and barns, wharves, bridges, fences, and other structures provided by man. Along the west coast of North America, where it is especially abundant, it lives on shrubs and trees, and rock cliffs and dirt banks along streams, in addition to the domestic situations mentioned above.

The web of this species typically has a narrow segment without viscid cross lines, but some may be complete. It has been studied by Emerton (1884) and McCook [1889 (1889–1894)] in this country and by many Europeans.

Zygiella atrica (C. L. Koch)

Figures 18–20

Eucharia atrica C. L. KOCH, 1845, p. 103.

Zilla atrica: MCCOOK, 1889 (1889–1894, vol. 1), p. 144; 1894 (1889–1894, vol. 3), pp. 106, 238, figs. 65, 66. MARX, 1890, p. 550. EMERTON, 1902, p. 185, figs. 431, 432; 1909, p. 201; 1911, p. 399; 1914, pp. 152, 157, map p. 156; 1920, p. 323; 1924, pp. 123, 124. COMSTOCK, "1912" [1913], p. 459, figs. 471a, 472a; 1940, p. 473, figs. 471a, 472a. BANKS, 1910, p. 39. PRATT, 1916, p. 426. PROCTER, 1933, p. 276; 1938, p. 457; 1946, p. 518.

Zygiella atrica: KASTON, 1948, p. 243, pl. 35, figs. 748, 749, pl. 36, fig. 770, pl. 121, figs. 2040, 2041.

Zygiella (*Zilla*) *calophylla* ROEWER, 1942 (1942–1954, vol. 1), p. 884. LINDROTH, 1957, p. 102.

DIAGNOSIS: This species agrees closely in size and general coloration with *x-notata* but is readily separated by features of the genitalia, which are illustrated. The epigynum has the caudal fovea filled with a rounded lobe. The tibia of the male palpus is greatly elongated, being about twice as long as the tarsus.

COLORATION: General appearance essentially like that of *x-notata*. Carapace and appendages yellow to orange in both sexes. Pars cephalica dusky, with conspicuous triangular black marking in front of median groove, from which three quite distinct dark lines pass forward to eyes.

Males in many cases with single linear stripe from median groove to median eyes. Sides of pars thoracica with distinct black marginal seam. Sternum brown, with conspicuous yellow hastate marking for most of length. Legs usually distinctly ringed with brown and with alveoli of spines brown spotted. Abdomen silvery white, in many cases tinged with yellow and in some with pinkish. Pattern like that of *x-notata*.

STRUCTURE: Female from Patchogue, Long Island, New York: Length, 8 mm.; carapace, 2.8 mm. long, 2.2 mm. wide; abdomen, 5.3 mm. long, 4.3 mm. wide. Clypeus and eye relations essentially like those in *x-notata*. Posterior eye row gently recurved; median eyes separated by about two-thirds of their diameter, twice as far from smaller lateral eyes. Median ocular quadrangle broader than long, narrowed behind; front eyes a little larger. First leg: femur, 3.3 mm.; patella, 1.4 mm.; tibia, 3.1 mm.; metatarsus, 3.2 mm.; tarsus, 1.1 mm.; total length, 12.1 mm. Spination of first leg: femur, two dorsal, two prolateral, one retrolateral; patella, one weak retrolateral; tibia, two dorsal, two prolateral, two retrolateral, three ventral pairs, the last one apical; metatarsus, two subdorsal, two prolateral.

Epigynum (figs. 18 and 20) a small suboval elevation about as broad as labium, with basal ring and rounded posterior lobe visible from above.

Male from Patchogue, Long Island, New York: Length, 5.5 mm.; carapace, 2.8 mm. long, 2.2 mm. wide; abdomen, 3 mm. long, 2 mm. wide. Structure essentially like that of female. First leg: femur, 3.7 mm.; patella, 1.3 mm.; tibia, 3.8 mm.; metatarsus, 4.3 mm.; tarsus, 1.2 mm.; total length, 14.3 mm. Palpus: femur, 2.2 mm.; patella, 1 mm.; tibia, 1.4 mm.; tarsus, 0.75 mm. long. Spination of first leg: femur, two dorsal, two prolateral, two retrolateral; patella, one retrolateral, one prolateral; tibia, two dorsal, three prolateral, two retrolateral, three ventral pairs, the last one apical; metatarsus, two subdorsal, two retrolateral.

Measurements of male palpus: femur, 2.2 mm.; patella, 1 mm.; tibia, 1.4 mm.; tarsus, 0.75 mm. Basal segments greatly elongated, cylindrical; thin tibia twice as long as suboval cymbium. Bulb without apical apophysis. Palpal details as shown in figure 19.

TYPE DATA: Original material of C. L. Koch from Germany and France, presumably lost.

DISTRIBUTION: Widespread in Palearctic Region from British Isles into Russia; Sakhalin Island; introduced into North America where it is locally abundant in New England, Nova Scotia, and southern Ontario; also Vancouver, British Columbia.

AMERICAN RECORDS: *Nova Scotia*: Lequille, September 10, 1956 (C. Dondale), male, females. Truro; Digby (Emerton, 1920); Barrington

(Emerton, 1924). *Ontario*: Port Credit, September 20, 1941 (S. Harrod), males, females. *British Columbia*: Stanley Park, Vancouver, August 11, 1949 (A. Ivie), males, females. *Maine*: Eastport; Mt. Desert (Emerton, 1914). Mt. Desert, August 21, 1901 (H. W. Britcher), males, females. Bar Harbor, September 1, 1930 (Wm. Procter), male. *Massachusetts*: Annisquam (McCook, 1889 [1889–1894]). Woods Hole (Marx, 1894). Ipswich; Salem; Boston; Fall River; Cape Ann (Emerton, 1902, 1911, 1914). *New York*: Patchogue, October 14, 1943 (R. H. Crandall), males and females. *Rhode Island*: Providence (Emerton, 1914). *California*: (Marx, 1894); probably a spurious record.

BIOLOGY: This species is also a house spider introduced into this country from Europe. It was first noticed by H. McCook at Annisquam, Massachusetts, about 1885, and by 1911 was reported by Emerton to be abundant in coastal situations. It has been taken from far fewer localities than has *x-notata* and is known only from Vancouver Island on the west coast. Although its habits are much the same as those of *x-notata*, it is said to prefer trees and shrubs for snare situations. The webs are incomplete as in typical species of the group.

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