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A Key to Arboreal Spiders of Douglas-Fir and True Fir Forests of the Pacific Northwest

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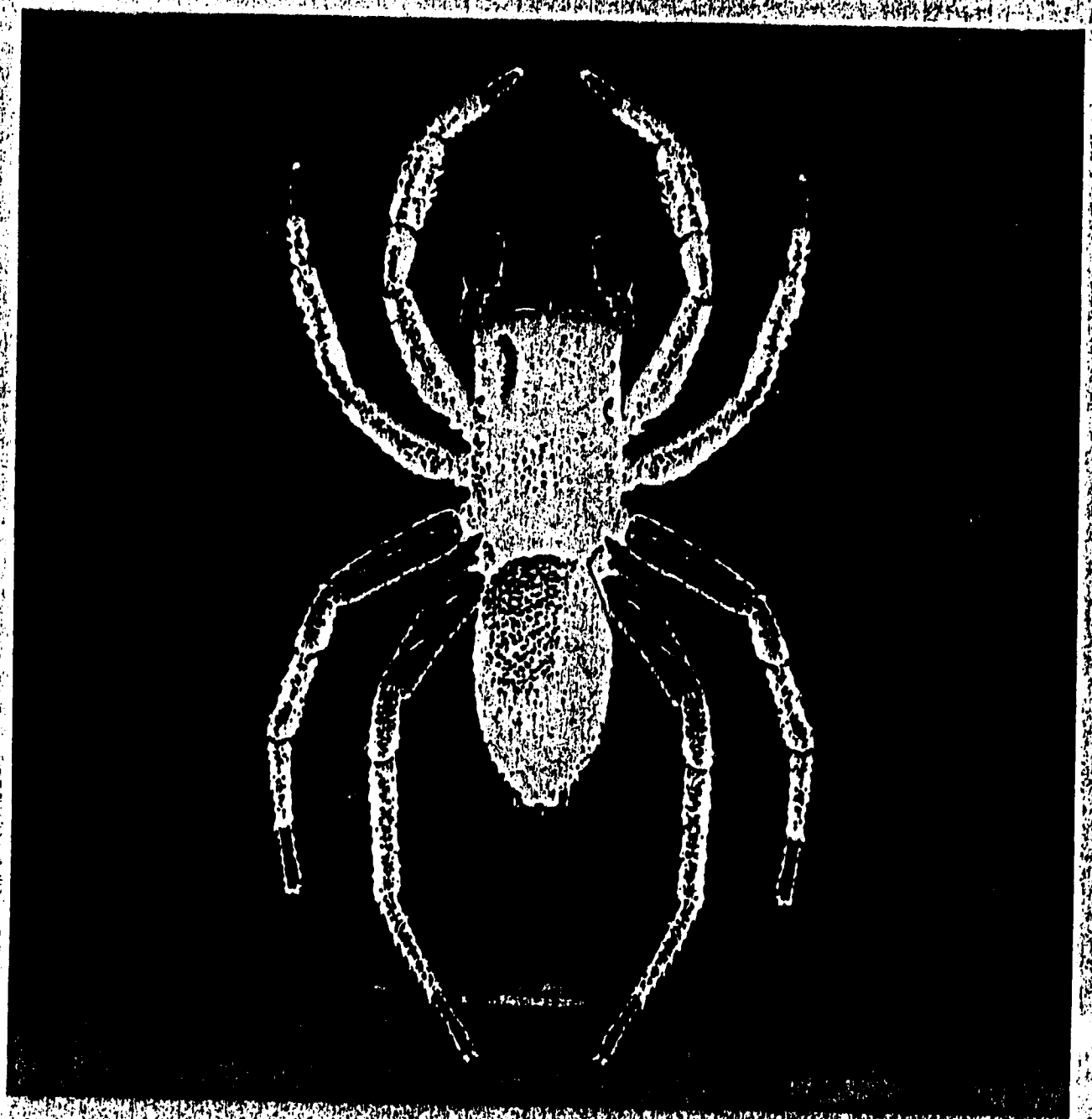

Abstract

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This illustrated key for identifying spiders inhabiting true fir and Douglas-fir is based on extensive collections from throughout the three North American Pacific Coast States. Details of the age classes present at budburst and the season in which to expect adults are presented for all species. This paper is written for people unfamiliar as well as familiar with spider taxonomy; a glossary of all technical terms is included. References to pertinent technical literature are also included.

Keywords: Keys (spider), spiders, Douglas-fir, true fir, Pacific Northwest.

Contents

Introduction

An intensive study of the population dynamics and arthropod associates of larval Douglas-fir tussock moth, (*Orgyia pseudotsugata* (McDunnough)), was conducted from 1976 to 1981 in the El Dorado National Forest, California. Arthropod predation on early instars of this moth has been documented as a key factor in intergeneration survival (Dahlsten et al. 1977; Mason 1976, 1981; Mason and Overton 1983; Mason et al. 1983). The lack of consolidated information on the identity and biology of arboreal spiders, the most abundant arthropod predators in this system, led to development of this key.

Study of the arthropod inhabitants of the Coniferous Biome of the montane Pacific Slope, in cooperation with D.L. Dahlsten, University of California, Berkeley, and R.R. Mason, USDA Forest Service, La Grande, Oregon, revealed that the arboreal spider fauna of the Pacific Northwest is not diverse. Of the more than 500 samples taken from the 15 most abundant tree species throughout this three-State region (more than 100,000 spiders), only 55 species ever constituted more than 5 percent of the total spider population at any site. Most arboreal spiders in this region belong to about 30 abundant, widespread species; only about 150 species were ever collected.

In 1976-77, Dahlsten began intensive sampling of *Abies concolor* in El Dorado National Forest. One-third of the branches of each of 20 trees were individually cut at the bole and all arthropods removed. Species were identified in the field by many people who referred to a simplified synoptic series prepared by C. Griswold. Preliminary results of this study are presented in Dahlsten et al. (1977, 1978).

During 1979-81, eight randomly selected plots were sampled; each plot contained 10 permanently marked 12-m white fir on each of two to four ridges. After dispersal of first-instar tussock moth at budburst, two branches were removed from low, mid, and high canopy of each tree and beaten over a ground cloth. Spiders were preserved, identified, and analyzed for predation on tussock moth larvae (Fichter 1984). In 1981, the relative abundance of spider species on different tree genera and shrubs were analyzed at budburst and again in late fall; these specimens were preserved for permanent reference.

Oregon spider studies were initiated in spring 1981 at McDonald State Forest in the Coast Range and the H. J. Andrews Experimental Forest in the Cascade Range. Monthly samples were gathered to assess the turnover of species through the year, plant-habitat choice, and the relative abundance and constancy of each species from year to year. In 1982, these studies were expanded to include coastal forests and the forests of the eastern slope of the Cascade Range and the Blue Mountains. The results of these samples are presented in table 1. Research on tussock moth by R.R. Mason resulted in spider samples from the montane Great Basin, including southern British Columbia to southern Oregon.

Table 1—The frequency of occurrence and relative abundance of spiders collected from Douglas-fir and true firs in all seasons throughout the Pacific Northwest and their average density at budburst for 3 years on *Abies concolor* in El Dorado National Forest, California [1]

Family, genus, and species	Occurrence	Samples with over 5-percent relative abundance [2]	Density per square meter [2]
	Percent	*Percent*	*Number*
ANYPHAENIDAE:			
Anyphaena pacifica	70	16	0.91
ARANEIDAE:			
Araneus gemmoides	76	4	0.18
Araneus saevus	27	1	0.03
Araniella displicata	69	11	0.09
Cyclosa conica	68	5	0.03
Metepeira grandiosa	4	+	+
Nuctenea patagiata	15	5	-
Tetragnatha versicolor	84	38	0.02
CLUBIONIDAE:			
Cheiracanthium sp.	8	0	+
Clubiona canadensis	31	5	0.01
DICTYNIDAE:			
Dictyna peragrata/uintana	67	30	0.01
Mallos pallidus	5	0	0.05
GNAPHOSIDAE:			
Sergiolus montanus	12	0	0.05
LINYPHIIDAE:			
Bathyphantes spp.	15	5	-
Ceraticelus atriceps	36	14	-
Erigone spp.	6	3	-
Frontinella communis	8	3	-
Gnathantes ferosa	47	29	3.37
Neriene digna	23	1	-
Neriene litigiosa	13	1	0.15
Pityohyphantes brachygynus	59	45	0.90
Pityohyphantes rubrofasciata	53	31	-
Spirembolus mundus	30	18	-
Miscellaneous Micryphantinae	50	11	+
OXYOPIDAE:			
Oxyopes scalaris	38	13	+

See footnotes at end of table.

Table 1—The frequency of occurrence and relative abundance of spiders collected from Douglas-fir and true firs in all seasons throughout the Pacific Northwest and their average density at budburst for 3 years on *Abies concolor* in El Dorado National Forest, California [1] (continued)

Family, genus, and species	Occurrence	Samples with over 5-percent relative abundance [2]	Density per square meter [2]
	Percent	*Percent*	*Number*
PHILODROMIDAE:			
Apollophanes margareta	56	3	0.55
Philodromus rufus pacificus	89	39	0.47
Philodromus speciosus	62	23	0.08
Philodromus spectabilis	80	23	0.51
Philodromus spp.	28	6	+
Tibellus oblongus	4	+	+
SALTICIDAE:			
Eris marginata	10	1	-
Metaphidippus aeneolus	94	69	1.30
Metaphidippus watonus	16	2	0.08
THERIDIIDAE:			
Dipoena nigra	67	13	0.01
Euryopis formosa	6	+	0.02
Enoplognatha ovata	6	0	-
Theridion californicum	20	+	-
Theridion crispulum	10	+	-
Theridion differens	36	7	+
Theridion lawrencei	77	34	0.08
Theridion murarium	21	6	0.01
Theridion neomexicanum	16	0	0.13
Theridion sexpunctatum	20	9	-
THOMISIDAE:			
Misumena vatia	18	0	0.01
Misumenops celer	16	0	0.02
Tmarus angulatus	9	+	0.01
Xysticus locuples	29	+	0.44
ULOBORIDAE:			
Hyptiotes gertschi	34	4	+

[1] Number of spiders collected at El Dorado in 3 years (over 1100 m^2 of foliage examined) was 11,000. Number of spiders collected throughout the rest of the Pacific Northwest, in 221 separate collections, was 40,000.

[2] + = present but rare; - = not collected.

This key is designed for persons unfamiliar with spider taxonomy. Technical terminology has been kept to a minimum; necessary terms are diagramed in figure 1 and explained in the glossary. Rough identifications can be made using the pictures and notes provided. Though many species vary in color pattern, especially when specimens from extremes of the range are compared, color and pattern are useful discriminators for localized studies. Adult females and immatures often look similar; mature males, distinguished by enlarged copulatory palps, are frequently different in size, shape, and pattern. Species included are reasonably sized immatures and adults found on Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, and true fir, *Abies* spp. Rarely collected species have not been included in the couplet format but are discussed in the comments. Genitalia of mature specimens are usually necessary for positive identification; instances of similar cohabiting species are noted, but genitalia are not illustrated.

Convenient sources of additional information on taxonomy and natural history are *American Spiders* (Gertsch 1979), *How To Know the Spiders* (Kaston 1978), and *Handbook for Spider Identification* (Roth 1986, printed privately and available from the American Arachnological Society, Department of Entomology, University of Florida, Gainesville, Florida).

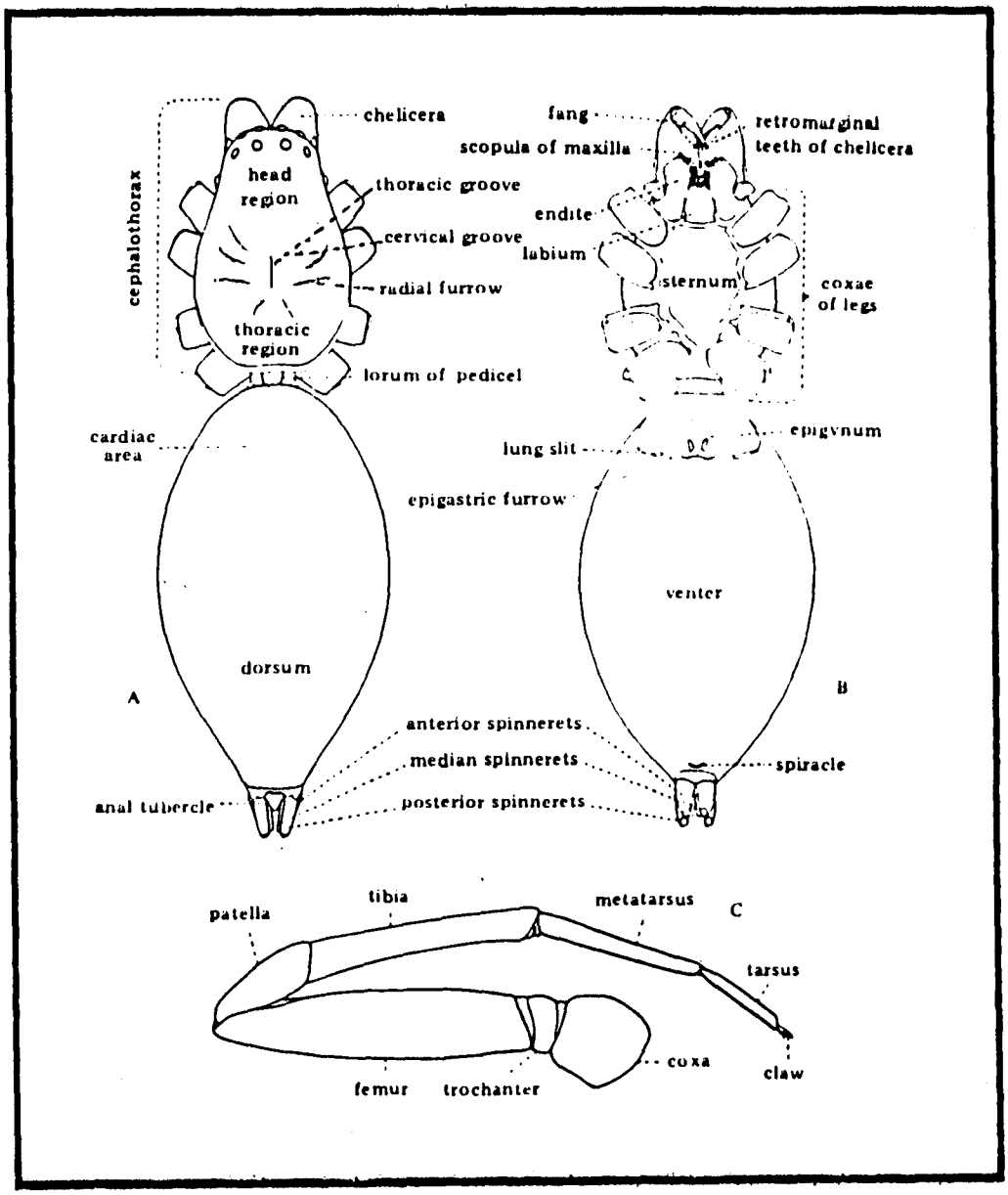


Figure 1--Female spider; dorsal view (A), ventral view (B), leg segmentation (C).

Key to the Genera of Arboreal Spiders

1A Eyes differentially enlarged, two pairs of eyes huge (figs. 2 and 3) 2

1B Eyes subequal (fig. 4) 3

2A Two pairs of forward-directed huge eyes (fig. 3); body elongate; height of abdomen never distinctly greater than that of cephalothorax; legs short, robust (the jumping spiders; plates I, J) . . . . . see key, p. 35

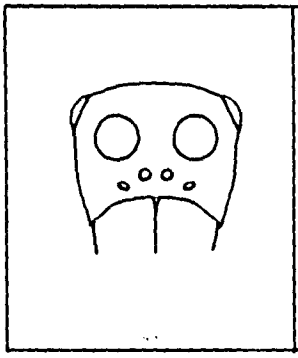


Figure 2—Eye arrangement of the Lycosidae. Note the four small anterior eyes and the enlarged posterior row, two of which are directed anteriorly and two laterally.

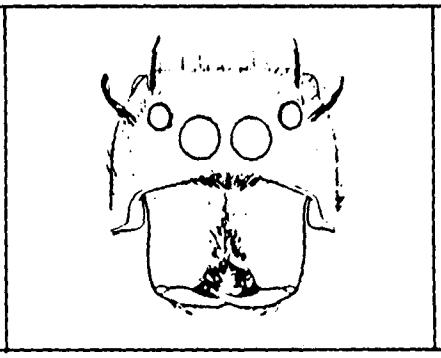


Figure 3—Eye arrangement in the Salticidae. Note the enlarged anterior row, all four directed forwards, and the posterolateral enlarged pair pointing laterally.

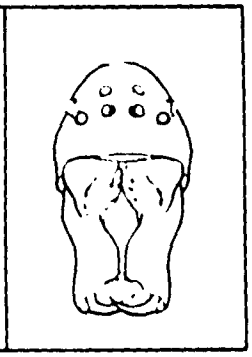


Figure 4—Eye arrangement of the more typical spider, as exemplified by *Dictyna*; note the curved chelicerae (A) of the male.

2B Two pairs of huge eyes, one directed forward over row of four small eyes and one directed laterally (fig. 2; plate B: 8) . . . . . Lycosidae

Many species of this abundant, ground-dwelling family are present in El Dorado National Forest. Only small immatures of unknown species are collected, infrequently, from trees.

3A First two pairs of legs held parallel to substrate and usually distinctly longer than last two pairs; legs laterigrade, that is, with the morphologically anterior surface directed dorsad (crab spiders) (plates K, L) . . . . . see key, p. 39

3B All legs held principally in the vertical plane; legs prograde, the morphologically anterior surface directed anteriorly 4

4A Six equal-sized eyes arranged in a hexagon (the anteromedial pair very small and inconspicuous, clypeus very high; fig. 5); abdomen pointed posteriorly; legs with prominent spines ..... Oxyopidae

Figure 5—Face and chelicerae of *Oxyopes scalaris*.

Only *Oxyopes scalaris* (plate L: 7) is native to this region. (*Oxyopes salticus*, native to the Eastern and Central United States, is encountered infrequently in disturbed regions; it has distinct black lines on the ventral surfaces of femora I and II.) This species, more frequently found in shrubs than in trees, has comprised more than 40 percent of spiders from early regrowth conifers. Adults are polymorphic in color pattern and are most abundant in June, with many adult females lasting through July. Adults are fast runners and jumpers, attaining a body length of 5 to 8 mm; in spring, immatures 2.0 mm in length are also present.

4B Eyes not in hexagonal pattern, many other patterns possible 5

5A Height of abdomen greater than width; legs usually several times length of body and thin; abdomen often largely white, with or without a median dorsal longitudinal band ..... Linyphiidae (in part)

A. Abdomen white, with or without median contrasting band ..... B

AA. Abdomen orange-brown with contrasting black longitudinal median band and subadjacent chevrons ..... *Pimoa altioculata*

B. Carapace with median, anteriorly pointed Y-shaped band C

BB. Carapace unmarked; legs bright yellow, without black maculations; midline of venter not darkened; cuticle of abdomen without markings (except for tenuous gray midline in some adult and subadult males) but reflective (not shining in latter species) with numerous small spherical white deposits under cuticle ..... *Gnathantes ferosa*

C. Legs with black maculations along entire length; abdomen of submatures with a wide, brownish-black and evenly wavy band ..... *Pityohyphantes brachygynus*

CC. Legs with pale red bands; abdomen with wide, purplish-red evenly wavy band ..... *Pityohyphantes rubrofasciata*

Several species of *Pimoa* live in the Western United States, but only *P. altioculata* (plate C: 6) has been found arboreally. Though an abundant species, it occurs only rarely in the canopy and then in old growth.

Gnathantes ferosa (plate D: 2) is consistently one of the most abundant arboreal spiders. It is small (2.0-2.5 mm body length at maturity); males are present in September, females principally in October. It is easily confused with more lightly colored immature *Pityohyphantes*. By mid-July, most submales have cream-colored bulbous palps half the size of the cephalothorax, which distinguish them from immatures of other species that are much larger when palps start to enlarge. Little growth occurs between immatures at budburst and fall adults. The height of the abdomen is noticeably greater than its width only in adults and subadults. Smaller immatures will key to 22A.

Pityohyphantes, a very diverse genus in North America, has not been revised recently. Though several species occur in abundance throughout forests of the Pacific States, only *P. brachygynus* (=*P. costatus* in Dahlsten et al. 1978) has been collected in our El Dorado and Stanislaus National Forest studies. Larger individuals of this species are characteristically pigmented (plate C: 7), but small immatures are often almost entirely white and easily confused with the former species. Adults reach a body length of 5.0-6.5 mm and are found in greatest abundance just after budburst; immatures 2.8-3.3 mm long are also numerous then. *Pityohyphantes rubrofasciata* (plate C: 8) is often abundant in forests below 1300 m in the Oregon Coast and Cascade Ranges, where it largely replaces *P. brachygynus*.

5B Abdomen not distinctly higher than broad, at most circular in cross section . . . 6

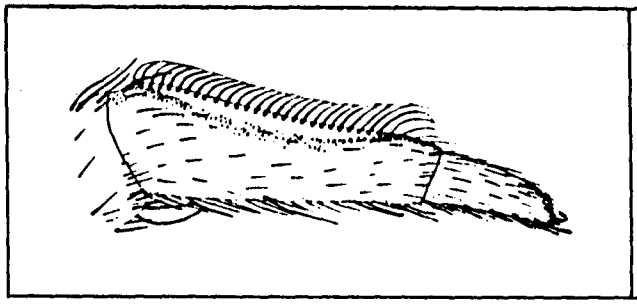


Figure 6—Hind leg of *Hyptiotes* with specialized row of setae on the metatarsus, termed the calamistrum.

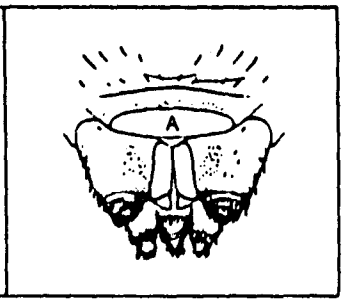


Figure 7—Spinnerets and cribellum (A) of *Hyptiotes*.

6A Metatarsus IV with a calamistrum (a comblike row of strong bristles along the margin; figs. 6, 8) and with a cribellum (a broad sclerotized plate) in front of the spinnerets (fig. 7); abdomen usually densely hairy 7

6B Metatarsus IV without calamistrum; cribellum absent 10

7A Eyes all light colored; tarsi with a single dorsal row of trichobothria (long sensory hairs perpendicular to the axis of the leg; fig. 8); local species have a red-brown cephalothorax, gray and orange-patterned abdomen, and robust chelicerae ..... Amaurobiidae

Although not collected at Iron Mountain, *Callobius* (plate A: 6) and related genera are abundant in the region and may be encountered in trees. *Callobius* is commonly found on trunks and in epiphytic moss in more mesic forests in the Pacific Northwest. It is recognized by the double calamistrum and prominent trichobothria on both metatarsi and tarsi. A monograph by Leech (1972) treats all species of the Pacific Northwest; adult genitalia are necessary for identifying species and separating *Callobius* from *Amaurobius*. As adults, many of our species of amaurobiids are large, formidable predators (ca. 15-20 mm long).

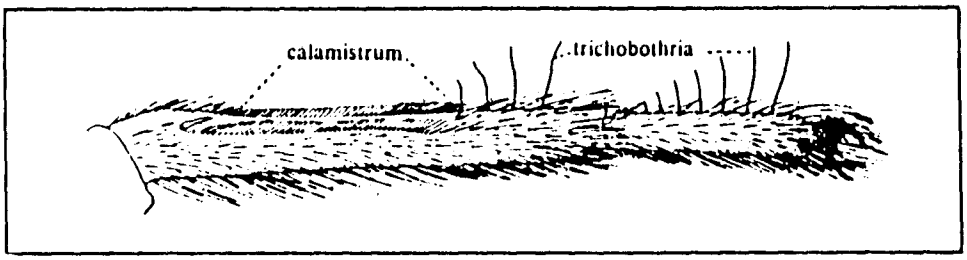


Figure 8—Hind tarsus of *Callobius*, showing the apparently double calamistrum and trichobothria.

7B Eyes all dark or heterogeneous (that is, some light and some dark) 8

8A Eyes heterogeneous, only anterior medians dark; anterior row of eyes nearly straight; small and hairy body (Dictynidae) 9

8B Eyes all dark, both rows strongly recurved, posterior lateral eyes pointing laterally (fig. 9); carapace angular, as wide medially as long; abdomen with 2-8 lateral tubercules; metatarsus IV depressed and concave above; variable in coloration, ranging from predominantly yellow to entirely dark brown, often with contrasting light-colored designs ..... *Hyptiotes gertschi*

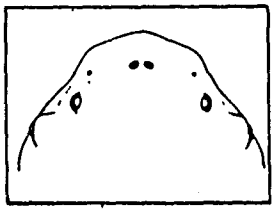


Figure 9—Eye placement of *Hyptiotes*.

This is the only species of uloborid likely in El Dorado. *Uloborus diversus* and *H. tehama* may be present but have not yet been collected (see revision by Muma and Gertsch 1964). *Uloborus* is distinguished by a vertical clypeus (equal in height to one diameter of anterior median eye) and a dense brush of hairs on tibia I of larger stages; *H. tehama*, as variably colored as *H. gertschi*, is distinguished only by the broad, spatular tip of the median genital apophysis.

Adult female *H. gertschi* (plate A: 1-2) are found year-round and average 3-4 mm in body length; males are much smaller, about 2 mm at maturity, and peak in abundance in August and September. *Hyptiotes* generally feign death when beaten from branches; their irregular profile and cryptic coloration make detection on a beating sheet difficult.

9A White-to-yellow stripe on carapace at base of legs; posterior margin of cheliceral fang furrow with 2-3 teeth (fig. 10) ..... *Mallos pallidus*

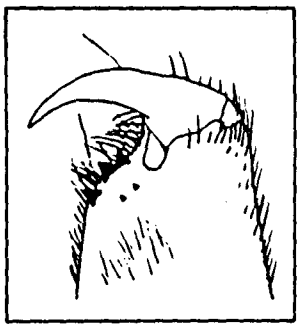


Figure 10—Left chelicera of *Drassodes*, showing distinct teeth on the posterior margin of the fang furrow.

Though not a monotypic genus, *M. pallidus* (plate A: 5) is the only species likely to key here. Females average 3.5 mm long, males 3 mm. This species, uncommon at our research areas, is widespread but always in low abundance in arboreal samples throughout the montane west coast.

9B Carapace without contrasting marginal stripe; posterior margin of cheliceral fang furrow with a single tooth ..... *Dictyna* spp.

Several dozen species of this diverse genus are found in this region (Chamberlin and Gertsch 1958); the habits of nearly all species are unknown. Color pattern on the abdomen varies considerably between sexes and within a population. Species are identified by adult genitalia. *Dictyna peragrata* (plate A: 4) has been collected at El Dorado: white or dusky abdomen (never yellowed), carapace with anteriorly blackened margin, sternum without black midline, abdomen with basomedial spot and apical chevrons (missing in small immatures), carapace light red-brown to chestnut. Adults of both sexes are found throughout the year, females 2.5 mm, males 2.0 mm long. Though abundant in *Abies* forests in the Pacific Northwest, this species is uncommon in California.

This species group, which includes *D. peragrata*, seems primarily arboreal (especially on *Picea* and *Abies* in moist sites) throughout the Pacific Northwest; most other species in the diverse genus are inhabitants of shrubs or low forbs. *Dictyna francisca* inhabits the coast from San Diego to northern California; *D. peragrata* in the major mountain axes from northern Alaska to central California and Montana; *D. chitina* in the Alaska panhandle; and *D. uintana* (plate A: 3) in the montane Great Basin and Rocky Mountains from central Idaho south to Arizona. These largely allopatric species are distinguished by minute genitalic differences (see Chamberlin and Gertsch 1958). *Mallos trivittatus*, also keying out in 9B, can be distinguished from *Dictyna* by two teeth on the promargin of the chelicerae (one in *Dictyna)* and by the much larger adult (4-8 mm long).

10A Tibia and metatarsus I and II with a prolateral row of long spines, each long spine separated by a set of smaller spines that are apically curved and increase in length distally (fig. 11) ..... Mimetidae

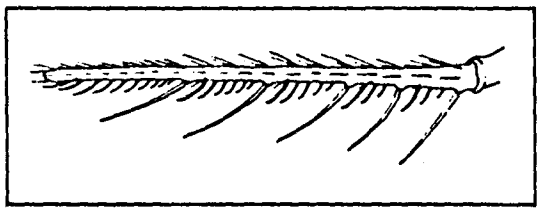


Figure 11—First metatarsus of *Mimetus* showing pattern of spination.

The genus *Mimetus* (plate D: 8), not recently revised, reportedly feeds primarily on other spiders. An araneid species, *Metellina mimetoides* (plate D: 7), may be confused in this couplet, although the spine pattern lacks the intervening spines; this species also has two small tubercles on the summit of the abdomen, easily visible in profile. Both genera were rarely collected in our studies.

10B Front tarsi without this unique spine arrangement 11

11A Tarsi with two claws and a terminal tuft of conspicuous hair (fig. 13); elongate spiders with relatively short, thick legs; abdomen roughly cylindrical 12

11B Tarsi with three claws but no tuft of hair (fig. 12; the tuft of 11A is easier to see than third claw of 11B); legs often thin and long; abdomen often rotund and distinctly taller or distinctly wider than carapace (except for Agelenidae, couplet 14A) 14

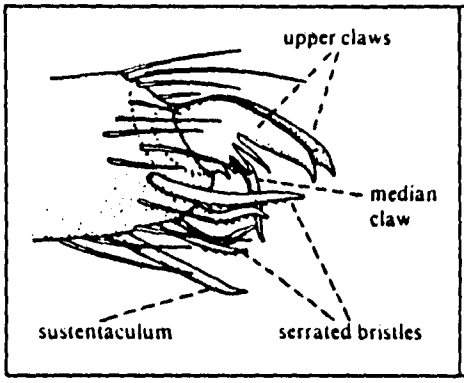


Figure 12—Tip of hind tarsus of *Araneus* showing the bristles and three claws.

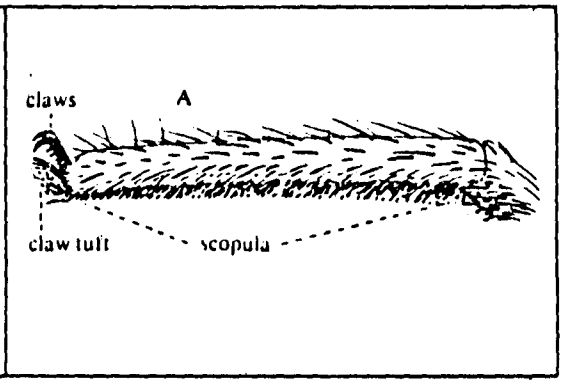


Figure 13—Tarsus of *Tibellus* showing only two claws and a dense tuft of scales.

12A Anterior spinnerets truncate, cylindrical, longer and more heavily sclerotized than the posterior, separated basally by width of a single spinneret (fig. 14); eyes heterogeneous, only anterior medians dark, posterior medians often oblique; basal segment of pedipalpi with oblique depression on ventral face . . . . . Gnaphosidae

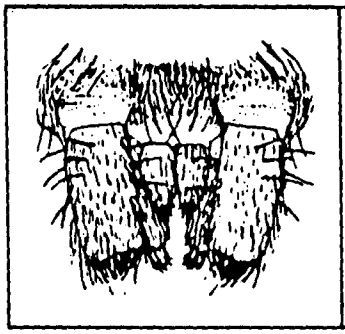


Figure 14—The truncate cylindric spinnerets of the Gnaphosidae.

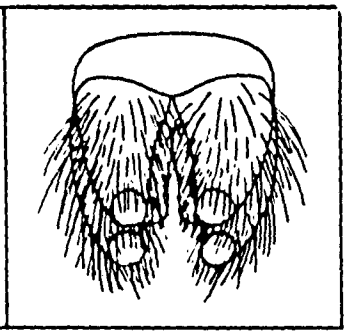


Figure 15—The conical spinnerets of the Clubionidae.

The only genus we have consistently encountered in Pacific conifers is *Sergiolus (=Poecilochroa)*, recognized in all but its most immature stages by a dark gray-black body with a medial set of transverse white bars (plate A: 8). *Sergiolus montanus* is not abundant in arboreal samples. Adults (6-9 mm long) are most numerous in July, but are seldom beaten from trees; small immatures (2 mm long) are the stage usually collected near budburst. *Sergiolus columbianus* may also be encountered arboreally; it usually has a largely white abdominal venter (as a basal, posteriorly pointing triangle) and dark femora.

Many other species of gnaphosids are found on the forest floor and in low vegetation. The closely related genera *Herpyllus* (reported by Dahlsten et al. 1978 from Iron Mountain) and *Scotophaeus (S. blackwalli,* cited in Platnick and Shadab 1977 as occasionally arboreal—plate A: 7) have notched trochanters. *Zelotes*, also reported by Dahlsten et al. (1978), may be distinguished by the dense comb of setae—used for preening—on the apex of metatarsi III and IV. *Orodrassus canadensis* (uniformly light gray), reported by Platnick and Shadab (1978) as living arboreally, may be distinguished by the straight transverse posterior eye row; the four eyes are equidistant, with the posteromedial ones small and circular. *Nodocion voluntarius (=N. florissantinus)*, a uniformly light-tan species, may be distinguished by the strong carina along the promargin of the chelicerae (instead of separate teeth like the preceding genera) and has been captured arboreally. All of these species should be expected in low abundance in Pacific Northwest conifers, but all are primarily ground dwellers.

12B Anterior spinnerets conical with pointed apices, bases nearly contiguous and as sclerotized as posterior ones (fig. 15); eyes homogeneous 13

13A Spiracle halfway between spinnerets and epigastric furrow (fig. 16; plate B: 3) (difficult to see on live or frozen specimens); tarsal tuft of prominent lamelliform hairs; carapace with faint but definite allatal stripes; abdomen with pink to lavender hue or whitish with indefinite pattern of gray spots . . . . *Anyphaena* spp.

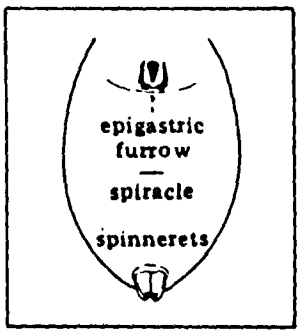


Figure 16—The venter of *Anyphaena* indicating the forward placement of the spiracle.

Four species of *Anyphaena* occur in this region: two are distinctively maculated species, one has a variable color pattern, and one has not been collected but is cited in the literature. A more southerly species, *Aysha incursa*, collected from oak in California, is distinguished by the spiracle one quarter of the distance from the epigastric furrow to the spinnerets.

Anyphaena aperta (plate B: 1), primarily a species of the coastal rain forests, may be distinguished by a single pair of ventral spines on metatarsi I and II. *Anyphaena gibboides* from the Great Basin, *A. californica* primarily from the coastal mountasins, and the widespread *A. pacifica* are not readily distinguishable in all stages; Platnick (1974) should be consulted for genital details.

The only species encountered in the Iron Mountain area is *A. pacifica;* it is variable in color pattern, the abdomen ranging from uniform tan to pink (plate B: 2) with numerous scattered maculations (contiguous posteromedially, plate B: 4). This species is consistently present and abundant at Iron Mountain, though seldom exceeding 10-percent relative abundance from arboreal samples throughout the Pacific Northwest. Adults average 5.0-5.5 mm in length; males are present in greatest numbers in June, females remain through summer. At budburst, immatures about 2 mm long are also abundant. Because members of this genus are reportedly nocturnal hunters, daytime collecting may underestimate their actual abundance if they refuge during the day close to the bole.

13B Spiracle located in normal position just in front of spinnerets; tarsal tuft simple . . . . . Clubionidae

The Clubionidae have not been revised recently (except those in British Columbia by Dondale and Redner, 1982; this volume is very useful for most specimens from the Pacific States) and most genera are taxonomically confused. Three genera have consistently been collected in the Pacific States. *Trachelas* (Platnick and Shadab 1974a, b) has a dark red-brown carapace and sternum with a light tan to yellow abdomen; *T. pacificus* and *T. californicus*, distinguished most easily by genitalia, have occasionally been beaten from trees in the coastal rain forests of northern California and Oregon.

Occasional *Cheiracanthium* (two species: *C. inclusum* and *C. mildei)* have been collected arboreally. These yellow-tan spiders are more frequent on shrubs; they are distinguished from other clubionids by the absence of a blackened thoracic groove on the carapace. *Clubiona* (plate B: 6) is abundant on deciduous trees and shrubs in mesic habitats, not infrequently straying to conifers in the same locality. Species of *Clubiona* are entirely yellow-tan with differing patterns of red stippling on the abdomen, most frequently a longitudinal cardiac stripe with or without apical chevrons. Reference to adult genitalia of some of these species is in Edwards (1958).

14A Tarsi with a dorsal row of trichobothria, which usually increase in length distally (fig. 17); posterior spinnerets longer than anterior; distal segment of anterior spinnerets conical ..... Agelenidae

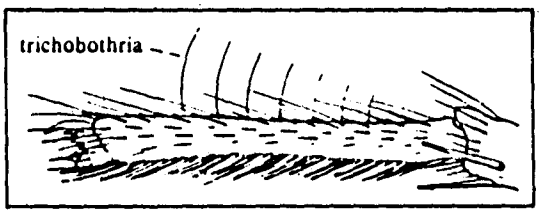


Figure 17—Tarsus showing a row of trichobothria.

This abundant and diverse ground-dwelling family is collected only occasionally from trees in the Pacific States. A representative of one abundant ground-dwelling genus is shown in plate B: 7. Roth and Brame (1972) should be consulted for adult specimens. The predominantly arboreal and rare genera *Dirksia (D. cinctipes,* plate B: 5) and *Ethobuella (E. tuonops)* inhabit coastal rain forests from British Columbia to Oregon. *Ethobuella* has four pairs of ventral spines on tibia I; other genera of agelenids have three or fewer. *Hololena* and *Novalena* are also found arboreally; both genera have strongly procurved eye rows, which result in a 2-4-2 design in frontal view. The distal segment of the posterior spinnerets of *Hololena* is two-thirds as long as the basal one; the distal segment is at least as long as the basal one in *Novalena*. Both genera currently need revision.

14B Tarsi without trichobothria 15

15A Height of clypeus less than or equal to height of median ocular area (fig. 19; region of face delimited by outer borders of the four median eyes) 24

15B Height of clypeus greater than height of median ocular area (fig. 18) 16

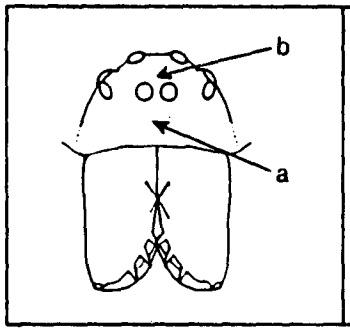


Figure 18—Face and chelicerae of *Pityohyphantes* (Linyphiidae) showing the clypeus (a) and the broad median ocular area (b).

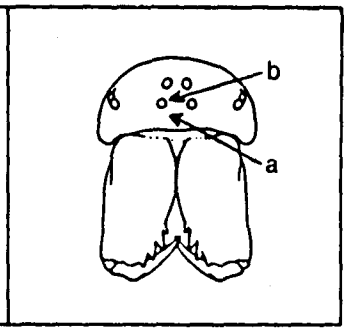


Figure 19—Face and chelicerae of *Araneus* (Araneidae) showing the clypeus (a) and narrow median ocular area (b).

16A Abdomen greatly extended beyond spinnerets; beige with silver reflections; posterior eye row procurved, posterior medians much further from each other than from posterior laterals; matures 5-10 mm long; infrequent; thought to invade webs of *Araneus* spp. and kill the resident spider (= *Rhomphaea lacerta)* (plate D: 3) . . . . . *Argyrodes fictilium*

16B Abdomen not greatly elongated and vermiform 17

17A Abdomen with a dorsomedial brown-black triangle on reflective silver; eyes all light-colored; abdomen subtriangular, pointed posteriorly; leg IV longer than leg I . . . . . *Euryopis formosa*

The widespread and common *E. formosa* (plate C: 2) can be distinguished from *E. coki*, a rarer species inhabiting the montane Great Basin, by the dark brown-black carapace and sternum and the almost entirely blackened abdominal venter. *Euryopis coki* has a yellow carapace and sternum with prominent silver stripes bordering the venter of the abdomen. The genus is reported to feed primarily on ants.

17B Abdomen not subtriangular; anterior median eyes dark 18

18A Abdomen largely pale brown to black 19

18B Abdomen white, at least on dorsum, with or without extensive superimposed markings (Linyphiidae, in part) 21

19A Posterior carapace distinctly overhung by abdomen; abdomen more than twice as high as carapace; clypeus of adults strongly concave and recessed under eye region (Theridiidae) 20

19B Cephalothorax and abdomen of roughly equal height; facial region of males often distorted . . . . . Linyphiidae (Micryphantinae or Erigoninae)

This is a diverse group of minute spiders, rarely over 2 mm long as adults. Adult specimens should be sent to taxonomic specialists for species and even generic determinations. Several species have been collected arboreally at Iron Mountain; the most common is *Erigone*. Immature *Erigone* are gray with yellow legs; adults are black, often with yellow-orange legs (plate D: 4). Males have numerous prominent spines bordering the carapace. Another abundant arboreal genus that resembles *Erigone* females and immatures is *Spirembolus;* the male carapace is unarmed and the palps resemble a "plumbers helper," with a prominent spiral embolus at the apex. Some arboreal species of *Meioneta* will also key to this couplet, as will the abundant, gray *Ceraticelus atriceps*. Males of this latter species are distinguished by a large orange scutum on the abdomen; females have two pairs of orange ostial spots and an inconspicuous white herringbone on the posterior abdomen. The orange color appears in alcohol-preserved specimens; live spiders like the one illustrated are generally darker. Most micryphantine spiders are dark gray or black (plate D: 6). They are abundant and most diverse on the ground or in low vegetation.

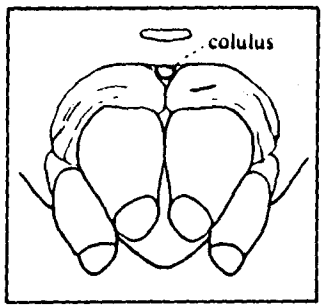


Figure 20—Spinnerets and colulus of *Xysticus*.

20A Abdominal venter with a colulus (a tiny wartlike appendage anteromedial to the spinnerets; fig. 20), at least half as long as the setae arising from it; abdomen with light band across the base of the dorsum; adults longer than 4.0 mm (plate C: 1); male abdomen with basal stridulating organ . . . . . *Steatoda hesperos*

20B Abdominal venter with two setae where colulus would be; eye region of males extended dorsally to resemble the conning tower of a submarine; height of carapace (vertex to coxal bases) equals or exceeds carapace width; less than 4.5 mm . . . . . *Dipoena* spp.

This genus has been revised by Levi (1953); two species are abundant in this region. *Dipoena nigra* (plate E: 5), adult length 1.5-4.5 mm, has an entirely black abdomen, a yellowish-brown carapace, and orange legs with apical black annulations. *Dipoena malkani* (adults 1.5-3.0 mm) has a bright orange carapace with a distinctive U-shaped depression on the top, orange legs, and a brown abdomen with a faint but distinctive pattern of orange ostial markings. Adults of both species are most frequent in June and July. Species of this genus are reported to be ant predators.

21A Legs greenish-yellow and unspotted; all of venter black, with a longitudinal white stripe on either side of the ventral flank; femora I and II without dorsal and lateral spines; patella of male palp without a spur . . . . . *Neriene litigiosa*

This spider spins the most conspicuous web a hiker in this region will encounter. Adults are 5-6 mm long (plate C: 5) and their dome-shaped webs, up to 30 cm deep and 100 cm wide, are scattered in lower branches of trees and tall shrubs. At budburst, they are pre-adult. This species is cited in Dahlsten (1978) as *Prolinyphia sierrensis*. Another abundant species of the herb layer in mature forests is *Frontinella communis;* immatures are occasionally beaten from conifers.

21B Legs with yellow or buff background; venter unpigmented or with a uniformly black, median longitudinal band (small spiders not keying out in couplet 5) . . 22

22A Abdomen shiny, cuticle colorless, venter not blackened; abdomen underlain by white spheres; carapace unmarked . . . . . *Gnathantes ferosa*

Also keying out here are other genera of micryphantine Linyphiidae. Less abundant than *Gnathantes* (plate D: 2) are species of *Meioneta* and *Microlinyphia*. These spiders are all poorly studied; specimens keying out here should be sent to specialists for identification.

22B Abdomen with black pigmentation 23

23A Abdomen with black pigmentation along sides; dorsum with a conspicuous medial black band with parallel sides *(Lepthyphantes* spp.) or black chevrons *(Linyphantes* spp.) . . . . . Linyphiidae

Neriene digna, 3.5-5.0 mm long, has a white abdominal dorsum with a variable pattern of brown pigmentation on the posterior half, similar to that of *Cyclosa.*

23B Abdomen white laterally ..... *Meioneta, Bathyphantes,* or immature *Pityohyphantes*

A diverse assemblage of tiny linyphiid spiders, all unstudied, will key out here. Even small immature *Pityohyphantes* has a distinctive Y-mark on the carapace.

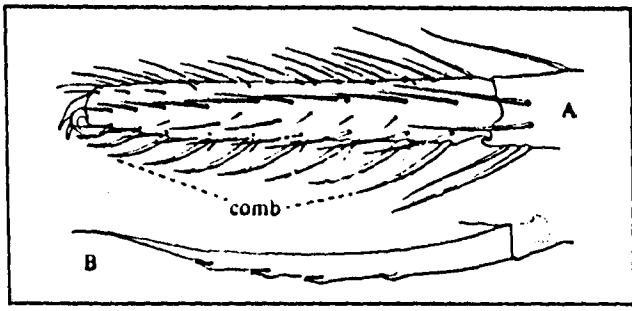


Figure 21—A: Entire hind tarsus of *Theridion* with position of tarsal comb indicated; B: A single serrated bristle of the comb.

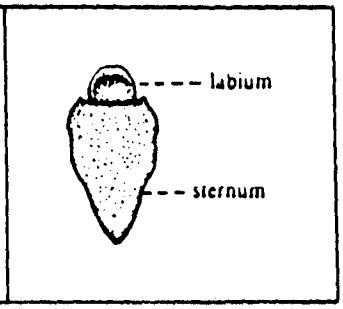


Figure 22—Sternum and labium of *Tetragnatha* showing the rebordered front margin of the labium.

24A Labium not rebordered (without thickened anterior edge); tibiae and metatarsi without prominent spines (some species with a slender dorsal spine on tibiae I and IV); tarsus IV with a ventral row of serrated bristles, the "tarsal comb" (difficult to see except under high power; fig. 21); eyes homogeneous or heterogeneous. (Immature *Tetragnatha* may seem to key out here, although it is not a theridiid; see couplet 25A. They may be distinguished by allatal stripes on the carapace, a silver abdominal dorsum and a median dark band flanked by silver commas on the abdominal venter.) ..... Theridiidae

A. Abdomen creamy-white with five pairs of caudally converging black spots; carapace and sternum yellow-white; abdominal venter white with a median ventral black band (plate E: 3); an introduced spider frequenting deciduous shrubbery; adult length 4.0-6.0 mm (plate E: 4) ..... *Enoplognatha ovata*

AA. Abdomen not white or with five pairs of small discrete black spots posterolaterally; venter of abdomen without parallel-sided black median band ..... B

B. Carapace orange; abdomen orange-brown (plate F: 1-2), with white-bordered longitudinal stripe of brighter orange; submatures with a thin transverse white stripe; adults (1.5-3.5 mm) peak in abundance in June ..... *Theridion differens*

BB. Carapace buff to yellow with a medial black Y or V C

C. Abdomen mostly white with faint pattern of paramedial interrupted stripes apparently not underlain by white deposits and hence translucent; abdomen with pair of black spots just posterior to the spinnerets; adults 3-4 mm long; abdomen not setose; adults peak in abundance during June and July ..... *T. neomexicanum*

CC. Abdomen with black dorsal markings, usually as a black yoke on anteromedial portion; with setae on abdomen ..... D

D. Anterior abdomen with anteriorly pointing black triangle with triangle width exceeding length; bases of abdominal setae surrounded by prominent blackened pustules; legs strongly annulated with black; venter of abdomen gray; adults (1.5 mm long) present throughout summer (plate E: 7) ..... *T. crispulum (=T. intervallatum)*

DD. Anteromedial portion of abdomen without prominent black triangle; surface of abdomen not black pustulate ..... E

E. Sternum with black midline and spots around border; black border on carapace; legs with distinct annulations, even in youngest spiders; adults (2-4 mm) peak in abundance during June and July (plate E: 8) ..... *T. murarium*

EE. Sternum without black midline or border; leg annulations weak or absent ..... F

F. Sternum without black markings; carapace lacking black margin; legs unmarked; adult 1.5-2.5 mm; adults peak in abundance during winter (plate F: 5-6) ..... *T. sexpunctatum*

FF. Sternum lacking black midline but usually with black border; carapace with tenuous black margin; leg annulations often weak; adult 2.0-3.0 mm long; adults peak in abundance during June and July (plate F: 7-8) ..... *T. lawrencei*

Other species that might be found include *Theridion melanurum*, an introduced spider frequenting disturbed habitats, which has a gray-black abdominal dorsum with a median scalloped parallel-sided white band; the dark venter has a white triangle between the spinnerets and the epigastric line. *Theridion montanum* is a sibling species of *T. lawrencei*, found in the Rocky Mountains and distinguished only by male genitalia. *Theridion aurantium (s. str.)*, *T. agrifoliae*, and *T. californicum* (plate E: 6) are strictly coastal and encountered in large numbers on ericaceous shrubs; all three species are light-colored with yellow cephalothoraces, yellow to white unmarked legs, and predominantly white abdomens. All three species are variable in coloration; *T. aurantium* (plate F: 3-4) may have much of the abdominal dorsum obscured by paramedial stripes or a bull's-eye of black; genital characters (Levi 1951) are the only reliable species discriminators. The closely related *Thymoites (=Paidisca) pictipes* has been recorded from tree bark; it has an orange carapace and sternum and a uniformly gray to black abdomen.

24B Labium rebordered (fig. 22); tibiae and metatarsi with two or more well-developed spines; tarsus IV without row of serrated bristles; eyes homogeneous 25

25A Femora with trichobothria; epigastric furrow (fig. 23) between lung slits procurved; venter of abdomen with median black band; adults large with elongate legs I and II and long cylindric abdomen; carapace with dark allatal stripes; silvery integument dorsally and laterally on abdomen; venter of abdomen with a dark center band and silver commas on each side (Tetragnathidae) . . . . . *Tetragnatha* spp

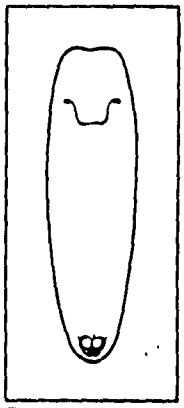


Figure 23—*Tetragnatha*, venter showing procurved epigastric furrow.

Adults of the endemic species of this genus usually inhabit foliage overhanging running water; immatures wander far from water. The two most common species in the region (Levi 1981) may be distinguished as follows: *T. laboriosa* (plate C: 4) with lateral eyes not contiguous, separated by more than their diameters, abdomen in side view nearly cylindrical, dorsum of abdomen silvery, adult length 4-9 mm; *T. versicolor* (plate C: 3) with lateral eyes nearly contiguous; abdomen in side view somewhat oval, anterior height 1.5-2.5 times height of carapace; dorsum of abdomen with variable darkened midline on silvery background, adult 4.5-13.5 mm. *T. versicolor* is one of the most frequently encountered arboreal spiders of the Pacific Northwest; *T. laboriosa* is primarily a species of open meadows and disturbed areas, infrequently collected in climax forests.

25B Femora without trichobothria; epigastric furrow straight; venter with or without median longitudinal band; chelicerae held vertically; without color patterns described above (Araneidae) 26

26A Little black on venter; abdomen white with eight posterolateral black spots arranged in two converging lines; carapace and legs bright yellow or orange; median ocular area as wide behind as in front with posterior eyes slightly larger than anterior medians . . . . . *Araniella displicata*

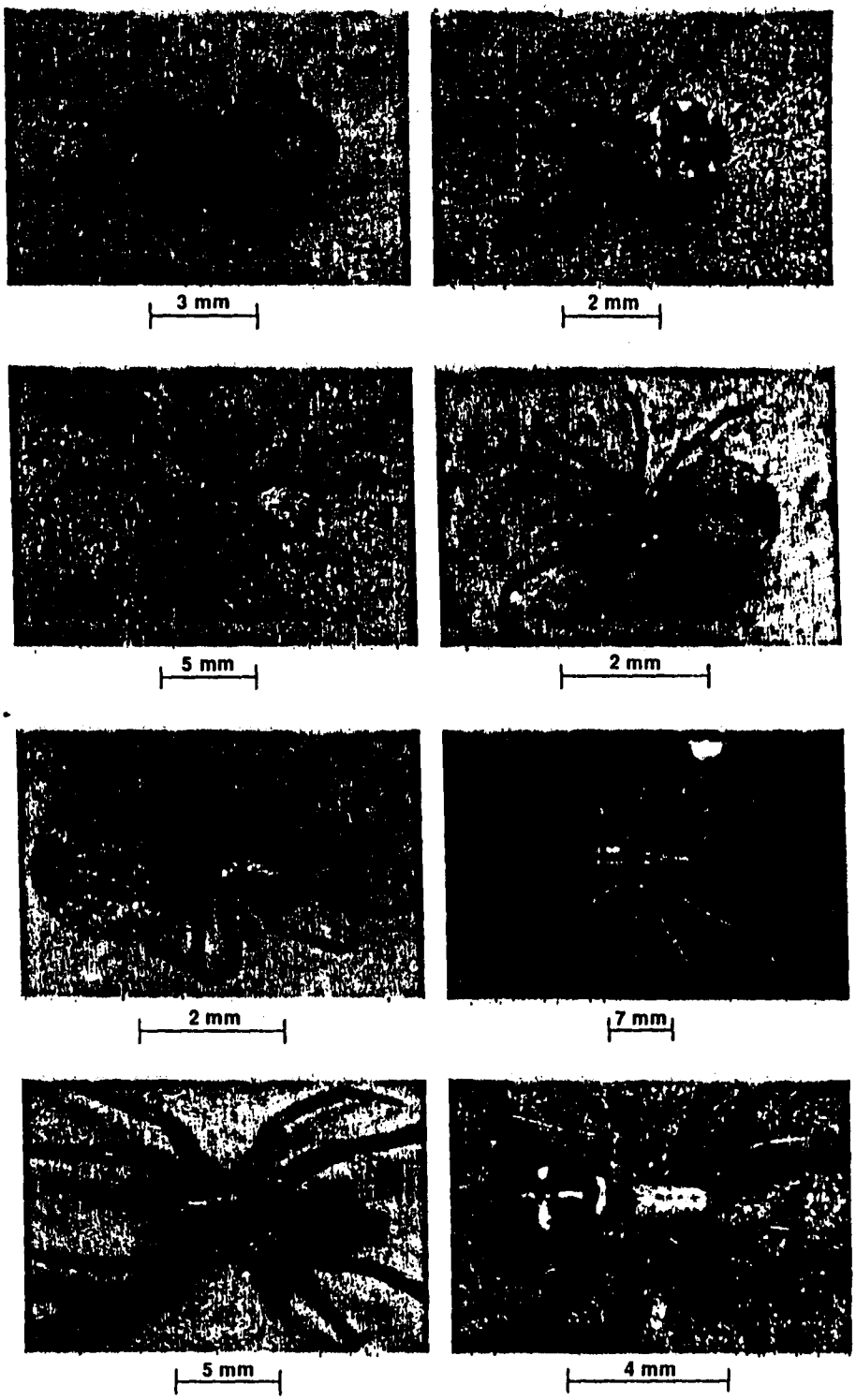
This distinctly colored spider (plate G: 4) is abundant and widespread. The abundant arboreal theridiid *Enoplognatha ovata* is similar (plate E: 4) but has not been collected in the central Sierra Nevada (Levi 1957). During colder months, larger *A. displicata* have additional dark red-orange smudges sublaterally on the abdomen (plate G: 3). Adult males (4-5 mm) are half the size of adult females (6-8 mm) and are usually encountered only in early spring; females may be found throughout summer. Immatures, present throughout the year, are most abundant in early fall.

26B Venter with prominent black pigmentation, or, if nearly light-colored throughout, at least with a median gray stripe contrastingly flanked by white 27

27A Two white comma-shaped maculations adjacent to black abdominal midventral line (plate H: 6) 29

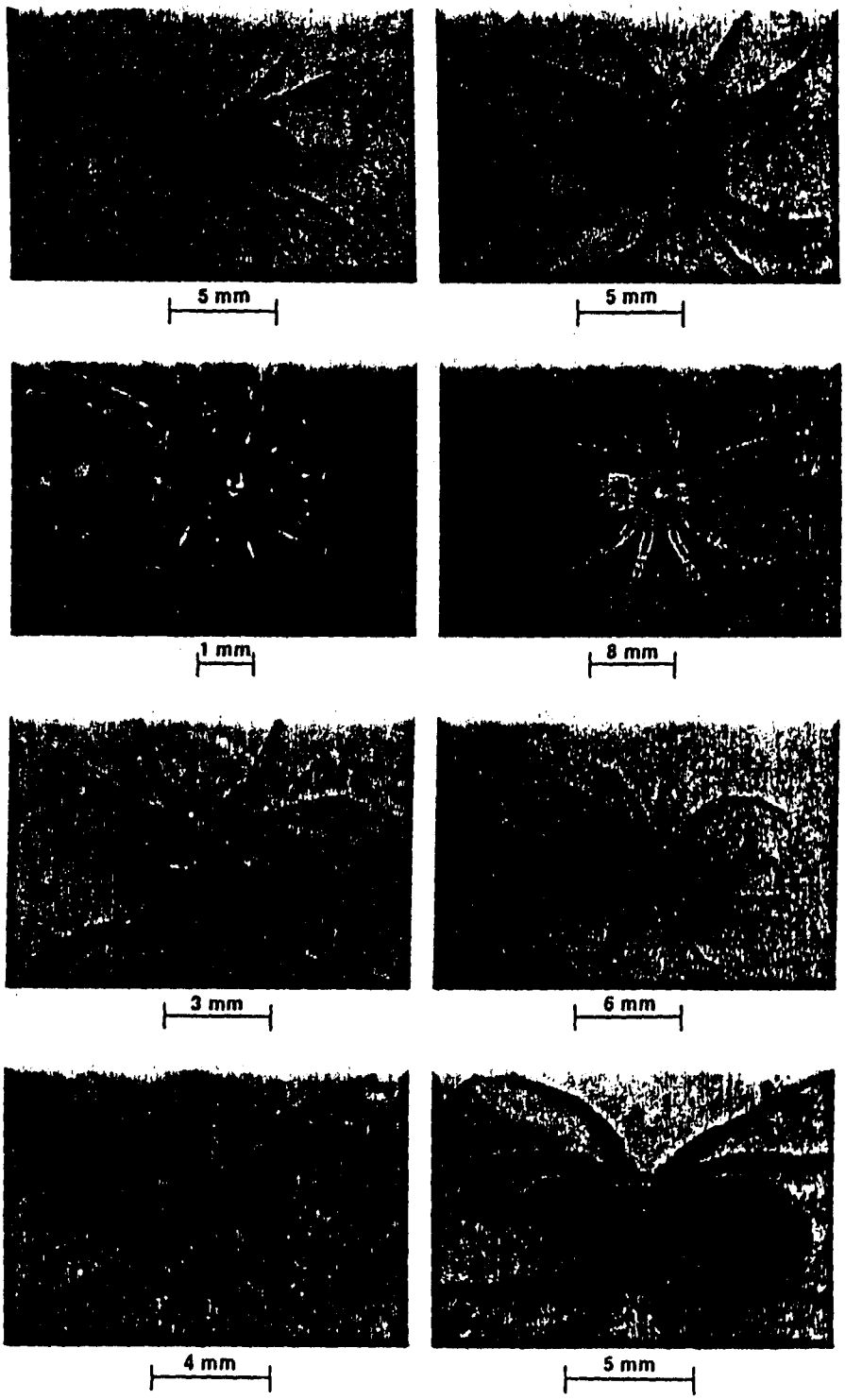
27B Abdominal venter not narrowly black or flanked by two white commas (plate H: 8) 28

Plate A



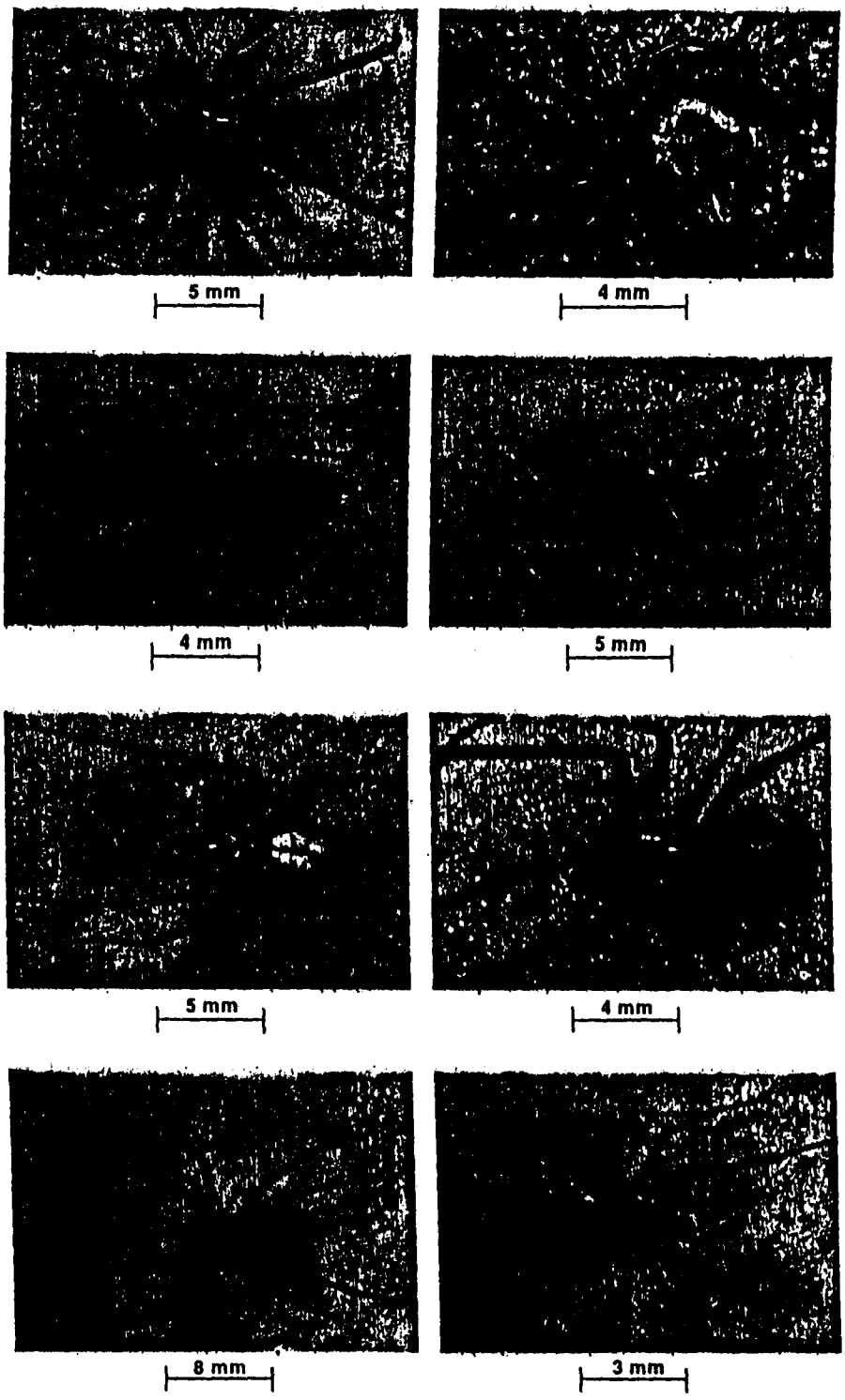
1—*Hyptiotes gertschi,* female; 2—*Hyptiotes gertschi,* subfemale; 3—*Dictyna uintana,* male; 4—*Dictyna peragrata,* female; 5—*Mallos pallidus,* female; 6—*Callobius severus,* female; 7—*Scotophaeus blackwalli,* female; 8—*Sergiolus montanus,* male.

Plate B



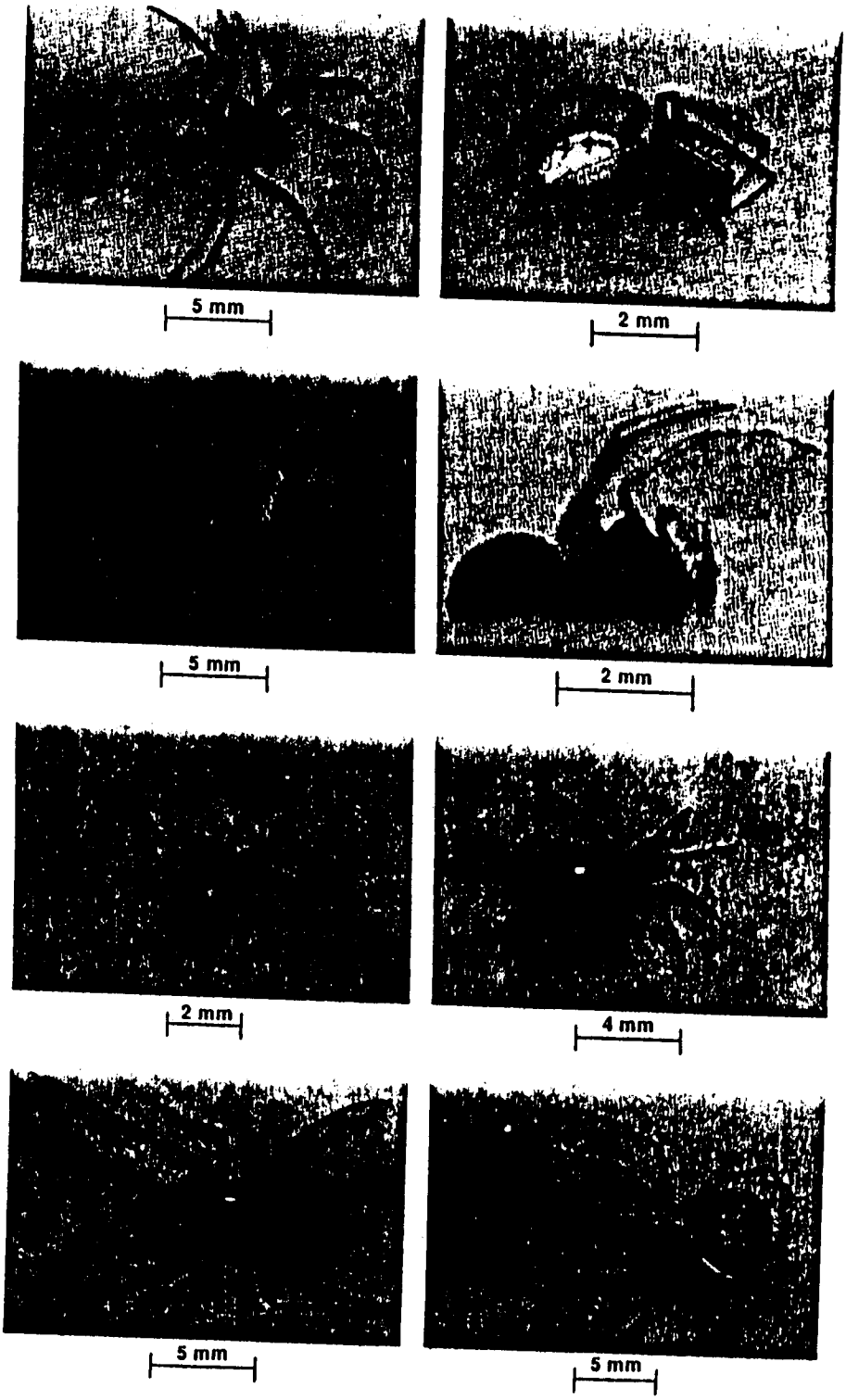
1—*Anyphaena aperta*, male; 2—*Anyphaena pacifica*, submale; 3—*Anyphaena pacifica*, female spiracular region; 4—*Anyphaena pacifica*, spotted female morph; 5—*Dirksia cinctipes*, female; 6—*Clubiona canadensis*, subfemale; 7—*Agelenopsis oregonensis*, immature; 8—*Pardosa* sp., immature.

Plate C



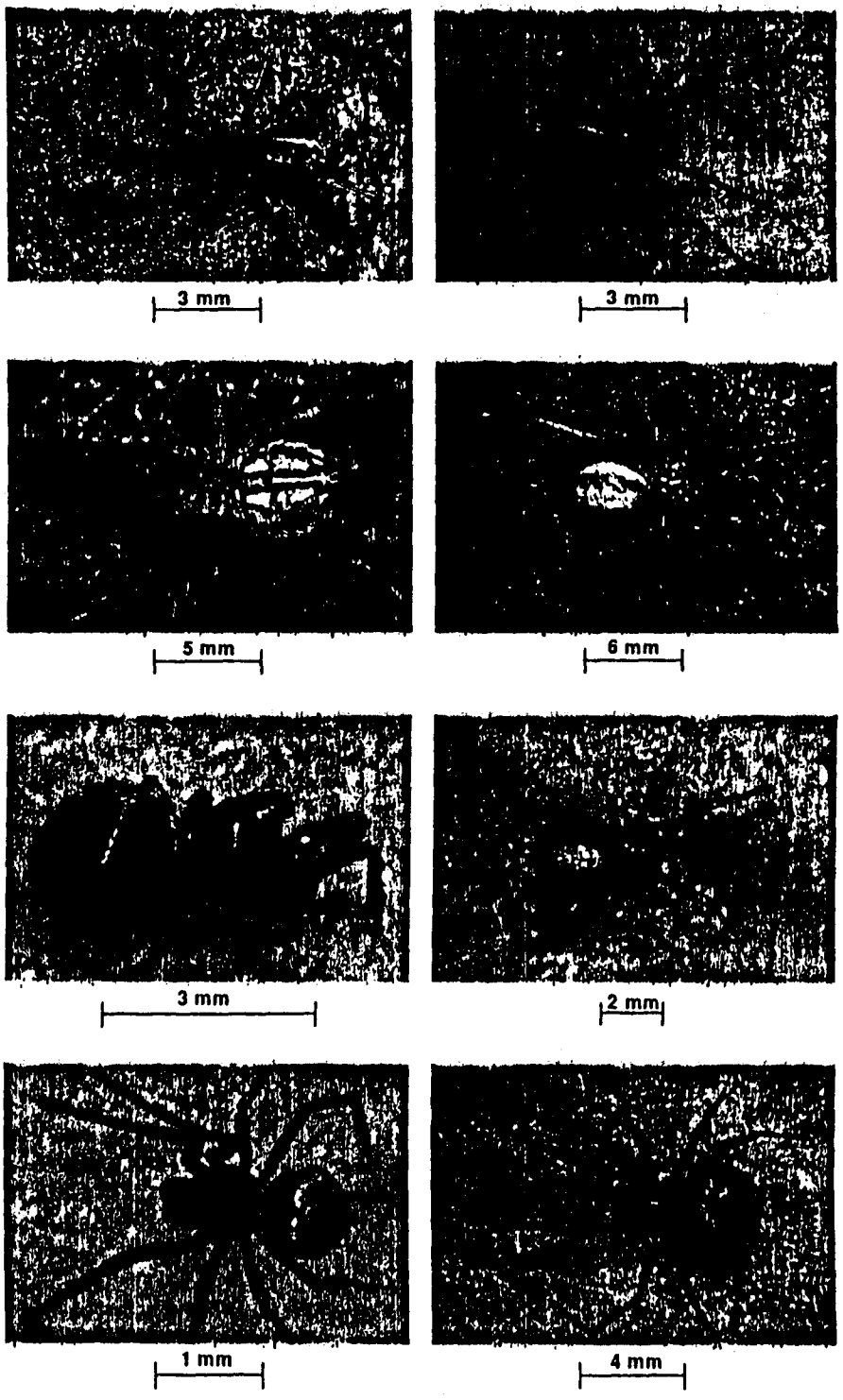
1—*Steatoda hesperos*, large immature; 2—*Euryopis formosa*, female; 3—*Tetragnatha versicolor*, subfemale; 4—*Tetragnatha laboriosa*, female; 5—*Neriene litigiosa*, female; 6—*Pimoa altioculata*, female; 7—*Pityohyphantes brachygynus*, subfemale; 8—*Pityohyphantes rubrofasciata*, subfemale.

Plate D



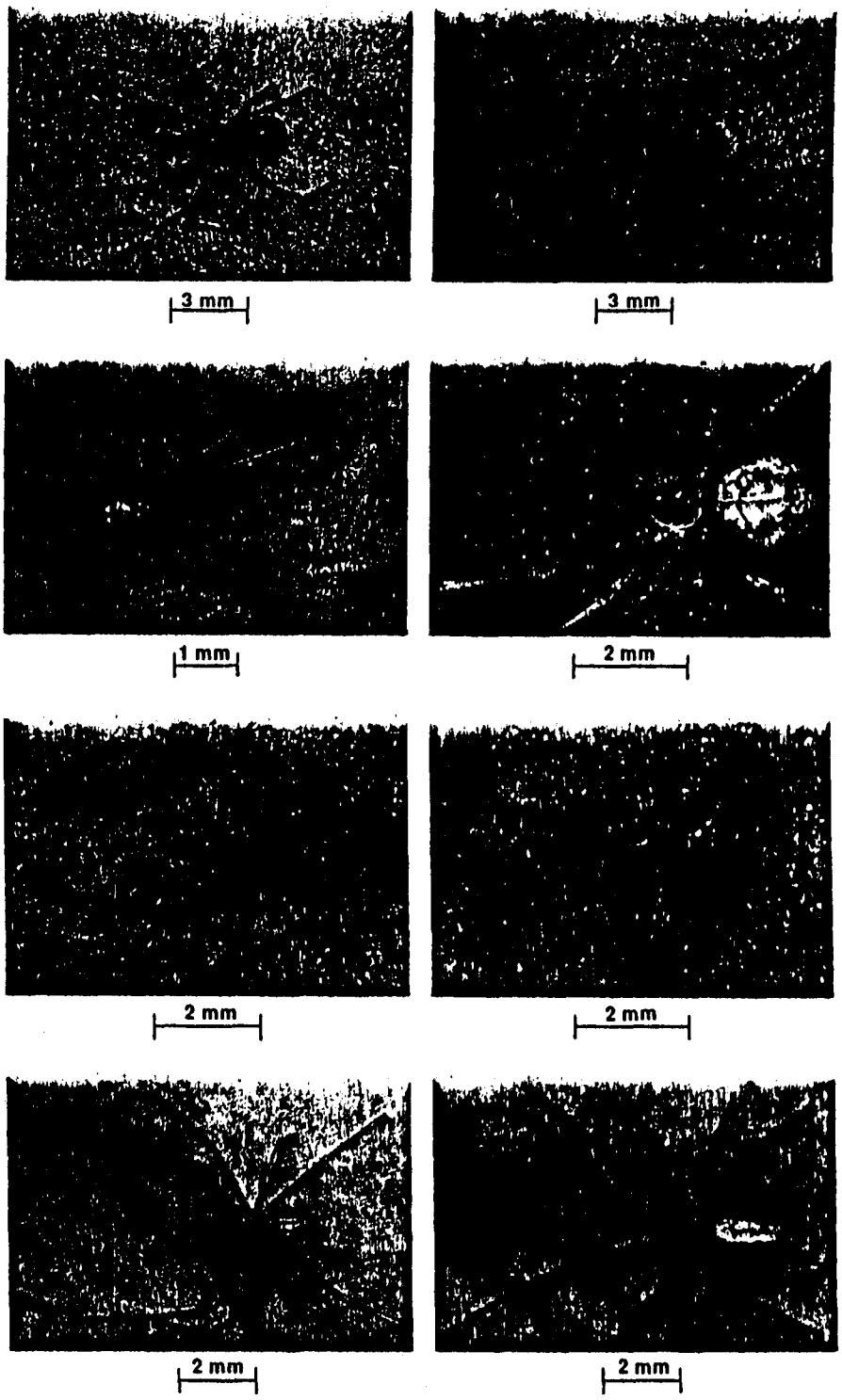
1—*Linyphantes* sp., female; 2—*Gnathantes ferosa*, male; 3—*Argyrodes fictilium*, subfemale; 4—*Erigone californica*, male; 5—*Ceraticelus atriceps*, female; 6—*Bathyphantes* sp., female; 7—*Metellina mimetoides*, female; 8—*Mimetus hesperus*, submale.

Plate E



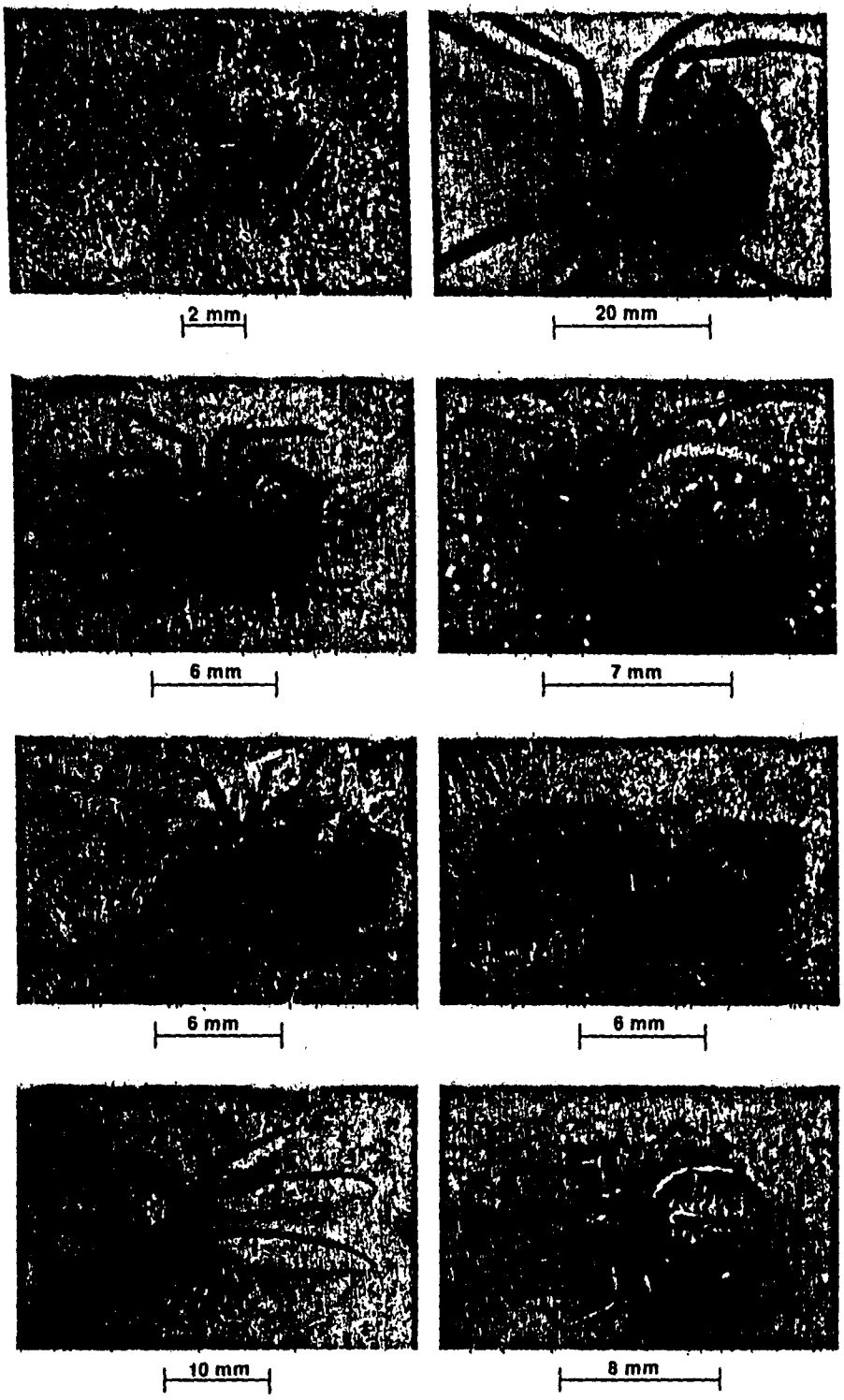
1—*Frontinella communis,* immature; 2—*Neriene digna,* submale; 3—*Enoplognatha ovata,* ventral view of female; 4—*Enoplognatha ovata,* female; 5—*Dipoena nigra,* female; 6—*Theridion californicum,* subfemale; 7—*Theridion crispulum,* male; 8—*Theridion murarium,* female.

Plate F



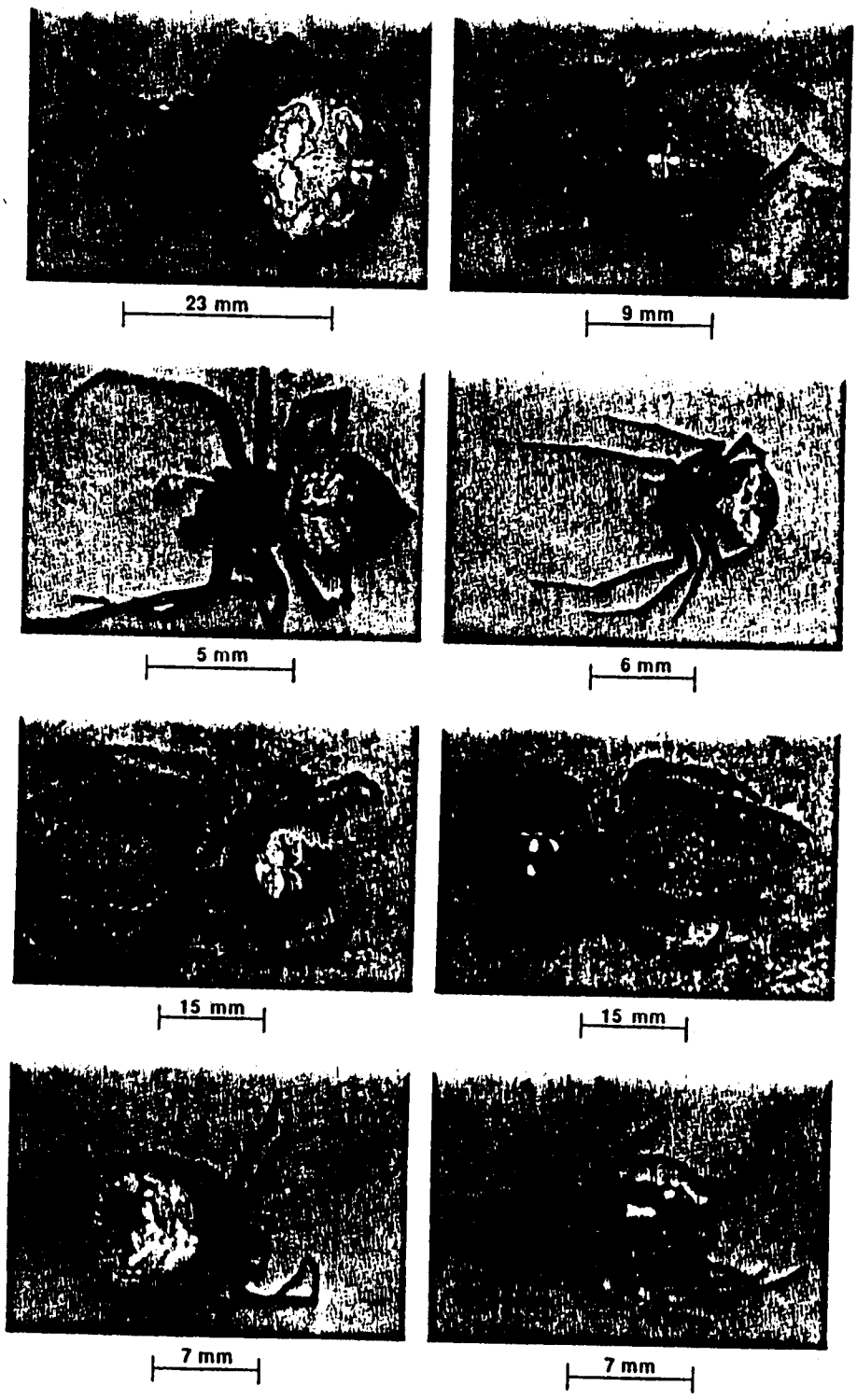
1—*Theridion differens*, male; 2—*Theridion differens*, female; 3—*Theridion aurantium*, male; 4—*Theridion aurantium*, female; 5—*Theridion sexpunctatum*, male; 6—*Theridion sexpunctatum*, female; 7—*Theridion lawrencei*, submale; 8—*Theridion lawrencei*, female.

Plate G



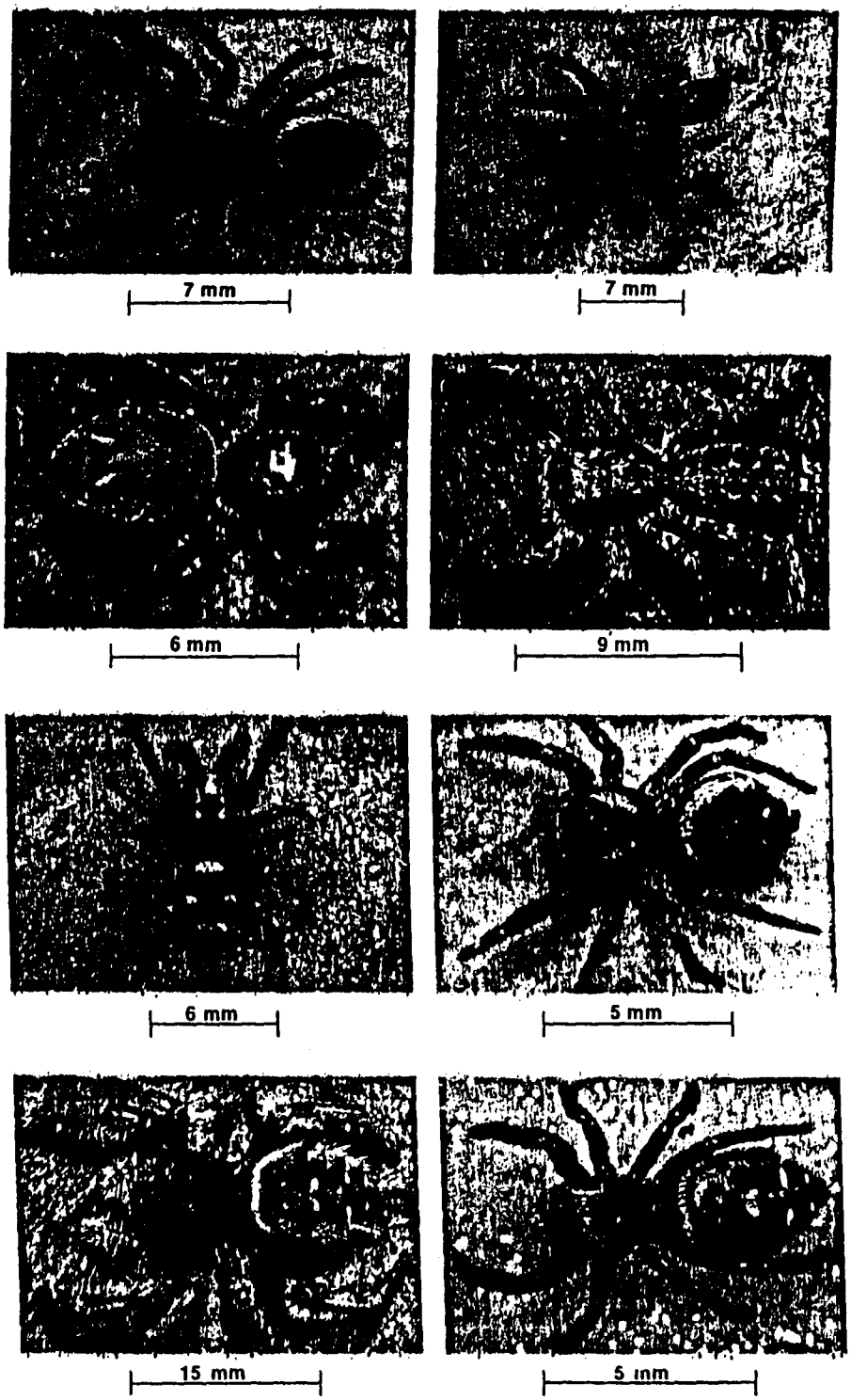
1—*Araneus gemmoides*, immature; 2—*Araneus gemma*, female; 3—*Araniella displicata*, subfemale in winter color; 4—*Araniella displicata*, female in summer color; 5—*Cyclosa conica*, female; 6—*Cyclosa conica*, female; 7—*Nuctenea patagiata*, female; 8—*Zygiella carpenteri*, female.

Plate H



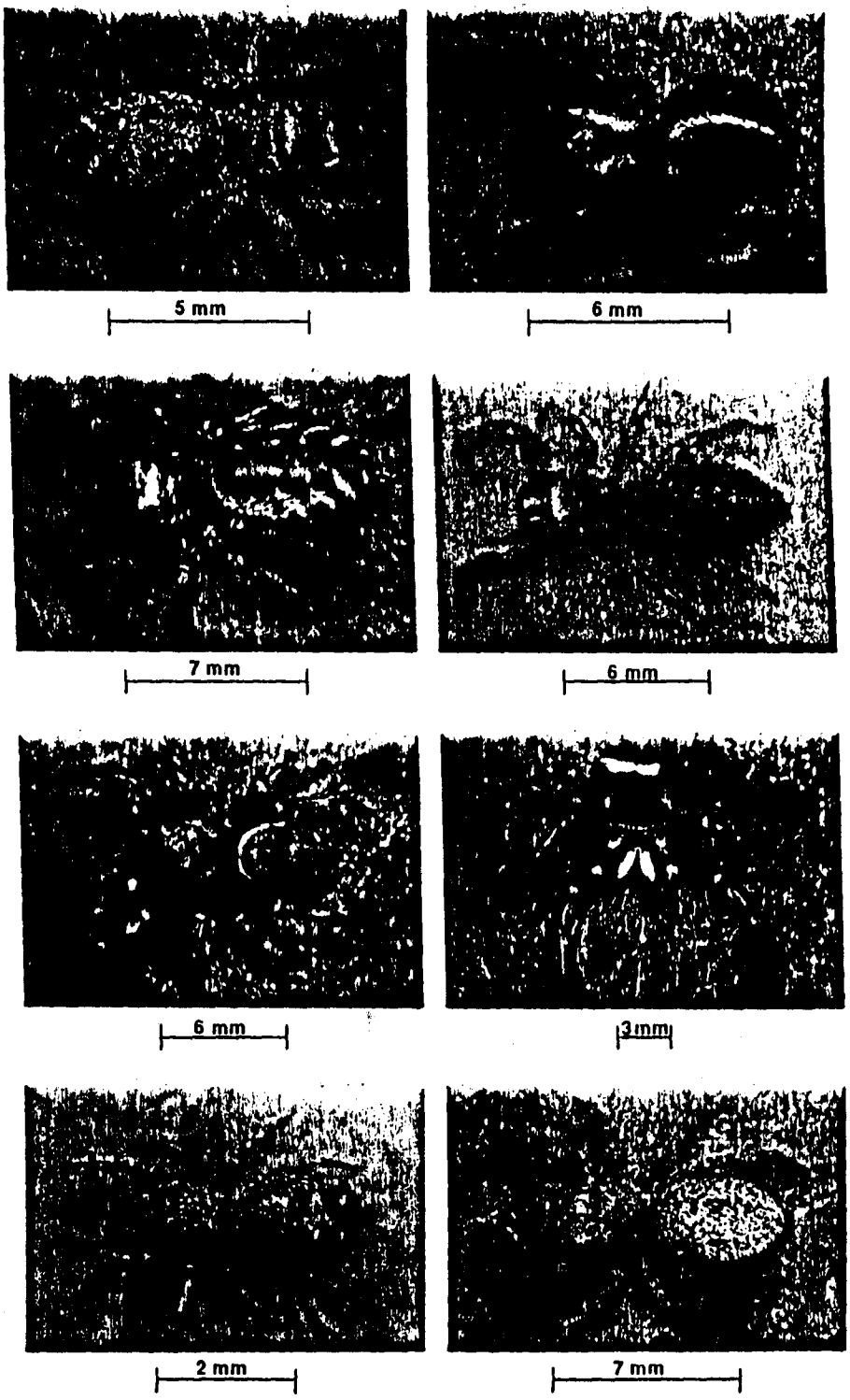
1—*Araneus marmoreus*, female; 2—*Araneus diadematus*, male; 3—*Eustala rosae*, submale; 4—*Araneus montereyensis*, female; 5—*Araneus saevus*, subfemale; 6—*Araneus saevus*, subfemale venter; 7—*Metepeira grandiosa*, female; 8—*Metepeira foxi*, female.

Plate I



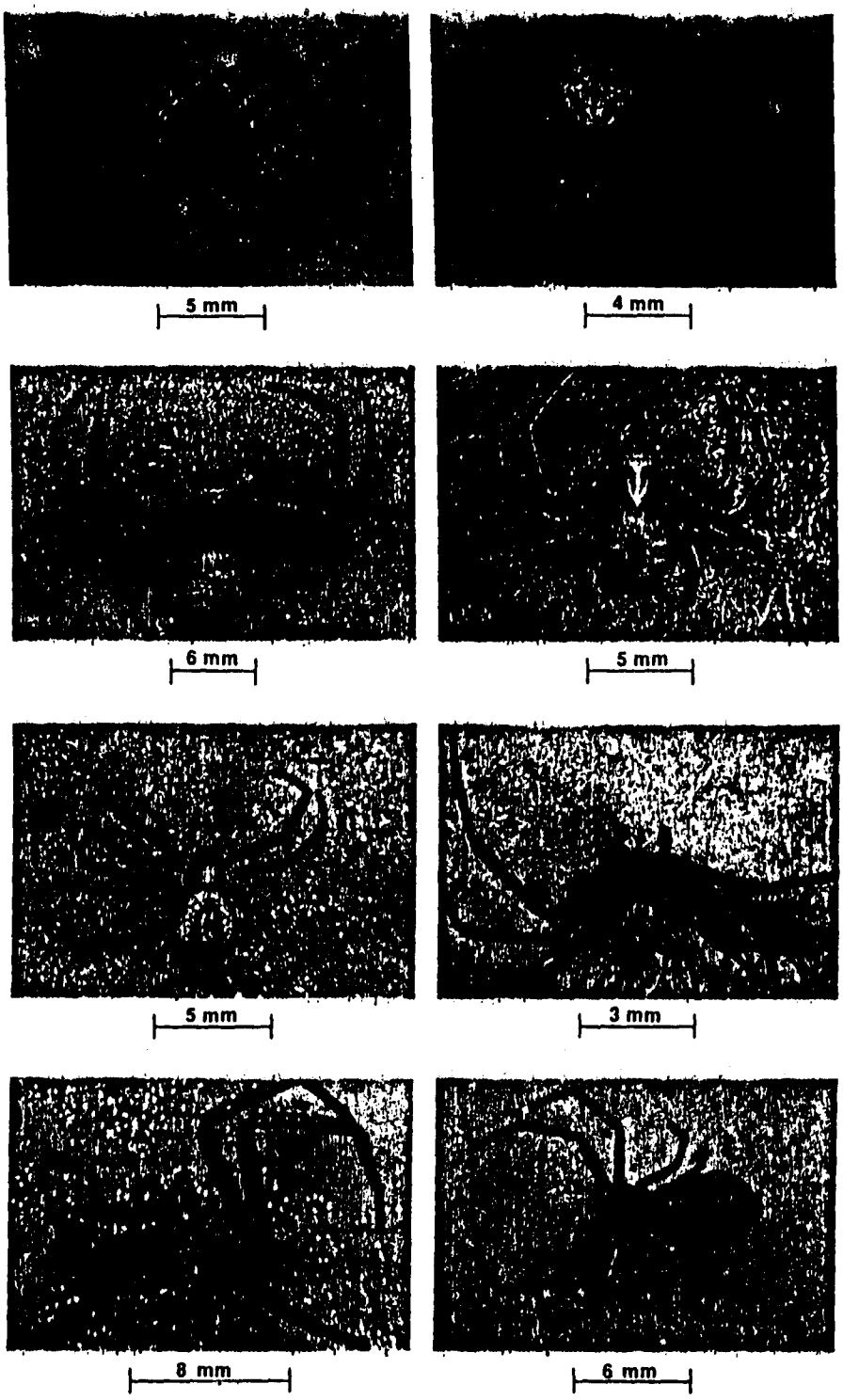
1—*Eris marginata*, male; 2—*Habronattus jucundus*, male; 3—*Evarcha hoyi*, female; 4—*Metacyrba californica*, female; 5—*Salticus scenicus*, male; 6—*Evarcha hoyi*, submale; 7—*Phidippus johnsoni*, female; 8—*Phidippus* sp., immature.

Plate J



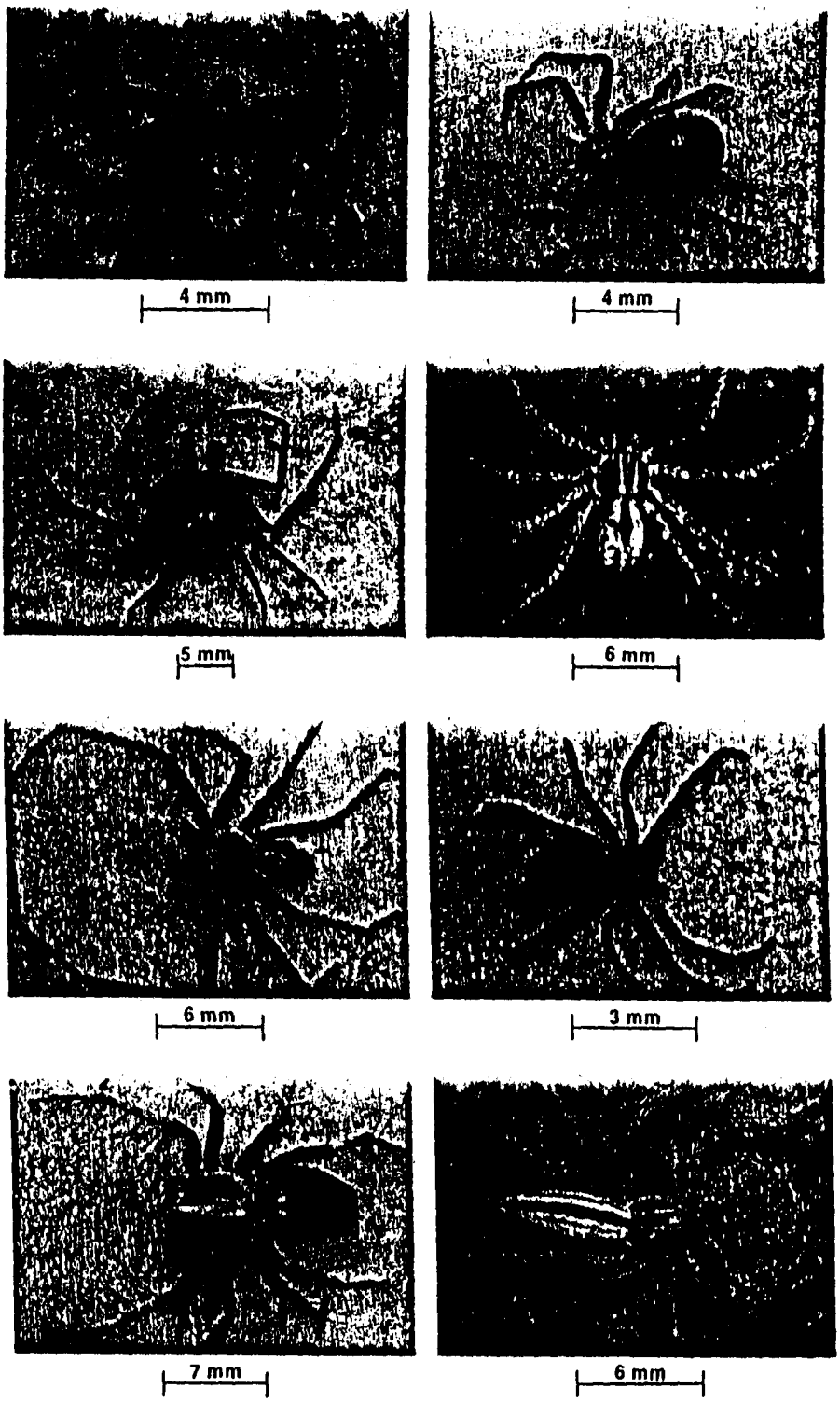
1—*Metaphidippus aeneolus,* subfemale; 2—*Metaphidippus albeolus,* male; 3—*Metaphidippus aeneolus,* worn female; 4—*Metaphidippus watonus,* female; 5—*Metaphidippus aeneolus,* male; 6—*Metaphidippus manni,* male facial view; 7—*Metaphidippus aeneolus,* immature; 8—*Metaphidippus* n. sp., female.

Plate K



1—*Coriarachne utahensis,* female; 2—*Xysticus gosiutus,* female; 3—*Misumena vatia,* subfemale; 4—*Xysticus locuples,* male: 5—*Misumena vatia,* submale; 6—*Misumenops celer,* male; 7—*Tmarus angulatus,* female; 8—*Tmarus angulatus,* immature.

Plate L



1—*Philodromus rufus*, female; 2—*Philodromus quercicola*, female; 3—*Philodromus spectabilis*, subfemale; 4—*Thanatus altimontis*, male; 5—*Apollophanes margareta*, male; 6—*Philodromus gertschi*, submale; 7—*Oxyopes scalaris*, female; 8—*Tibellus oblongus*, submale.

28A Abdomen strongly triangular, with subapical projection overhanging the posterior; venter of abdomen posteromesally white with submedial irregular blackenings; markings of abdominal dorsum variable, generally resembling a black deltoid leaf with petiole pointing anteriorly on a white background (laterally with numerous brown flecks); adults 4.5-7.5 mm long; infrequent in samples ..... *Eustala* spp.

The introduced *E. anastera* (with only one caudal hump, dark brown carapace with prominent white cloak of hairs) is found throughout the region. *Eustala rosae* (plate H: 3) has three caudal humps and a yellow-brown carapace; it is widely distributed in the montane Pacific Northwest. Both species are nocturnal.

28B Abdomen smoothly oval, without basolateral or subapical projections; abdomen with a large foliar design characterized by rounded lobes; all legs of both sexes with length of tarsus plus the metatarsus greater than the length of the patella plus the tibia; abdominal venter with white midline flanked by a wide field of black ..... *Metepeira* spp.

Two frequent species with black sterna are found throughout the region, usually in association with deciduous shrubby vegetation. *Metepeira foxi* (plate H: 8) is found primarily east of the Cascade-Sierra axis, and *M. grandiosa* (plate H: 7) lives primarily west of the mountain backbone; the only reliable method of separating the species uses genital characters (Levi 1974). *Metepeira gosoga, M. ventura, M. crassipes,* and *M. grinnelli* might stray into this area; all of these species have a longitudinal white band on the black sternum.

29A Prominent apical tubercle on abdomen (plate G: 6); abdomen cylindric, sides not strongly converging posteriorly, and white with a dissected black longitudinal design; youngest immatures with a trapezoidal abdominal maculation instead ..... *Cyclosa conica*

This is a widespread species consistently encountered in arboreal samples throughout the Pacific States. Adults average 4-7 mm in length. All but minute immatures can be identified by the distorted abdomen and the abdominal markings (plate G: 5-6); the only other arboreal spider with a similarly tuberculate abdomen is the crab spider, *Tmarus angulatus* (plate K: 7).

29B Abdomen without prominent subapical tubercle 30

30A Thoracic groove (linear darkened depression on summit of carapace) apparent; abdomen highest at middle; irregular foliar design entire length of abdomen ..... *Zygiella* spp.

Two native species, *Z. carpenteri* (plate G: 8) and *Z. dispar,* are found throughout the Pacific Northwest; two introduced species *Z. atrica* (rare) and *Z. x-notata* (abundant) also primarily inhabit deciduous trees in disturbed regions. Species can be reliably distinguished only by adult genitalia (Levi 1977). The orb-weavers are nocturnal.

30B Thoracic groove inconspicuous; abdomen highest subbasally, usually oval or triangular in outline 31

31A Carapace setose; abdomen not triangular, without basal lateral humps except in adult males; abdomen with posteriorly pointing black triangle flanked by brown; legs with black annulations; abundant winter spider, especially on dead conifer twigs or deciduous branches in deep shade (plate G: 7) . . . . *Nuctenea patagiata*

31B Carapace not setose; abdomen triangular, highest basally . . . . . *Araneus* spp.

A. Width of abdomen between strong basolateral projections much greater than length; dorsum and sides of abdomen principally light yellow or tan, occasionally with black posteriorly pointing triangle on dorsum; chaparral shrub inhabitants seldom found in trees; adults 4-6 mm long, active during winter (plate H: 4) . . . *A. montereyensis, A. bispinosus, or A. mariposa*

AA. Abdomen longer than wide; adults more than 10 mm long . . . . . B

B. Abdomen brown or black and mottled; large lateral humps; legs dark brown, indistinctly banded (plate H: 5) . . . . . *A. saevus, A. andrewsi, or A. nordmanni*

BB. Abdomen not entirely brown to black C

C. Abdomen with black and white contrasting patterns; carapace brown (plate H: 1) . . . . . *A. marmoreus*

CC. Abdomen orange with brown foliar markings; carapace orange (plates G: 1-2, H: 2) . . . . . *A. diadematus, A. gemmoides, or A. gemma*

Coloration of the species within each group varies; species determinations should be made by referring to the genital diagrams in Levi (1971, 1973). The most common and widespread species encountered in conifers are in the *A. gemma* group. The introduced *A. diadematus* is widespread in native forests and can be distinguished by the white crucifix on the base of the abdomen; the other two species are difficult to distinguish. Larger *Araneus* take 2 years to mature so that two size-classes are normally encountered (4.5-5.5 mm and 2.5 mm at budburst).

Key to the Jumping Spiders (Salticidae)

1A Gray with white stripes on abdomen: basal stripes continuous, three other pairs of stripes interrupted along middorsal region, slanting obliquely posterolaterally; tibia I without ventral spines (plate I: 5) ..... *Salticus scenicus*

1B Abdomen not gray with slanting white stripes 2

2A Tibia plus patella III equal to or longer than tibia plus patella IV 3

2B Tibia plus patella III shorter than tibia plus patella IV 4

3A Leg I longer than leg III; infrequent in trees; adults 5-6 mm long (plate I: 3, 6) ..... *Evarcha hoyi*

3B Leg I shorter than leg III (plate I: 2) ..... *Habronattus* spp.

Immatures of a few species have been collected infrequently in our samples. This genus has been revised (Griswold in press). *Habronattus oregonensis* and *H. hirsutus* are occasionally found arboreally in El Dorado National Forest. Female *H. oregonensis* are uniformly fawn-colored without white stripes on the carapace or on the base of the abdomen; males are dark in Oregon and are covered dorsally with iridescent red hairs, with white pubescence over the first row of eyes. Both sexes of *H. hirsutus* have prominent diverging white bands on the anterior carapace. Females have a dark abdomen covered with tawny gray pubescence, a basal transverse white band and longitudinal bands of four triangular white spots. Males have a dark abdomen covered with reddish pubescence; they lack a basal band, but have oblique lateral white bands and tiny white chevrons posteriorly. The males of both species have very modified front legs with heavy fringes of hair.

4A Legs with longitudinal black stripes the entire length of dorsal surfaces; dark gray or black with contrasting color around margin of the carapace and abdomen; occasionally immatures have been encountered arboreally ..... *Tutelina similis*

Tutelina similis is black in alcohol, but living specimens have a covering of greenish-yellow metallic scales. Adults are 4.5-5.5 mm long.

4B Legs without longitudinal dorsal black stripes 5

5A Sternum narrowed anteriorly; front coxae separated by less than their diameter; carapace elongate (plate I: 4) ..... *Metacyrba* spp.

Two species of *Metacyrba* (=? *Platycryptus)* may be found arboreally in this region. *Metacyrba taeniola* (southern edge of area only) has a dark brown to black carapace with a thin white marginal band; a brown sternum; all femora with a pair of longitudinal light stripes on the dorsal surfaces; dorsum and sides of abdomen black with a pair of white longitudinal paramedial irregular lines. *Metacyrba californica* (a closely related species found throughout the region) has an orange-brown carapace, yellowish sternum, dark brown abdomen with five connected irregular diamond-shaped pale areas forming a longitudinal band to the posterior (the central three diamonds are laterally extended as thin oblique lines).

5B Sternum not strongly narrowed anteriorly 6

6A Dark integument with iridescent pink or gold scales; carapace and abdomen with white marginal band; infrequent immatures encountered so far; primarily a shrub species of open country; adults 4.5-5.5 mm long . . . . *Sassacus papenhoei*

6B Not with above combination of characters 7

7A Carapace less than two-thirds as wide as long; ocular area appearing wider in front, especially in male; ventral spines on tibia I not crowded into distal two-thirds of segment; carapace black or brown; abdomen dark with a pair of closely set rows of white spots in center on posterior two-thirds of female, all black in male (see fig. 24); sexes strongly dimorphic; labium wider than long; infrequently collected arboreally; adults 4-5 mm long . . . . . *Euophrys monadnock*

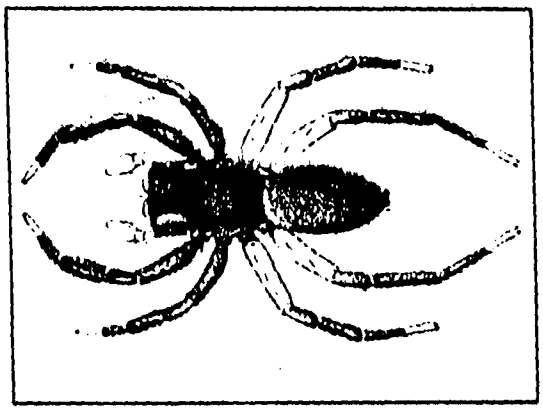


Figure 24—*Euophrys monadnock*, male.

7B Carapace greater than seven-tenths as wide as long; ocular area appearing wider behind, especially in adult *Phidippus* and *Eris*; ventral spines on tibia I crowded into distal two-thirds of segment; carapace rust to buff with black markings connecting eyes; abdominal color variable, but not as above 8

8A Carapace sides strongly bowed, widest medially; small eyes (posterior medians) closer to anterior than to posterior row 9

8B Carapace sides nearly parallel; small eyes nearly equidistant between anterior and posterior rows 10

9A Abdominal dorsum red-brown, sides with three pairs of strong, oblique white bands in females and immatures, males with longitudinal sublateral white stripes; carapace and abdomen with transparent iridescent scales; adult males with forward-projecting chelicerae, fangs strongly sinuous, front leg densely fringed; 5-7 mm long; carapace with pair of longitudinal white stripes; females 6-8 mm long, without black abdominal spots, with three pairs of oblique white bands and prominent marginal band (immatures colored like females); infrequently encountered arboreally in this region; usually on deciduous shrubs (plate I: 1) . . . . . *Eris marginata*

9B Cephalothorax and abdomen dark; scale covering not entirely iridescent; abdominal dorsum with central white mark and two pairs of transverse white marks posteriorly or with extensive area of red scales; ocular area with tufts of setae; small eyes much closer to first than third row . . . . . *Phidippus* (part)

This genus is poorly studied in California. Very few individuals are encountered in the trees, mostly immature. *Phidippus johnsoni*, adults 8-13 mm long, do occur locally (plate I: 7-8).

10A Less than 4 mm long; carapace and abdomen dark; abdomen may have a few white scales (plate I: 8) . . . . . *Phidippus* (young immatures)

10B Not with above combination of characters; body red to yellow or, if dark, abdomen with angular brown or white markings distally (plate J) . . . . . *Metaphidippus* spp.

A. Males with enlarged palps for retention of sperm . . . . . B

AA. Females and immatures without enlarged palps . . . . . F

B. Clypeus and base of chelicerae with dense white pubescence; inhabits Coast Range of Oregon (plate J: 2) . . . . . *M. albeolus*

BB. Clypeus dark or with infrequent white scales C

C. Body mainly yellow with scattering of pink spots dorsally; clypeus with scattered white scales; femur of first leg distinctly paler than more distal segments . . . . . *M. watonus*

CC. Body predominantly reddish with black markings; clypeus without white scales . . . . . D

D. Chelicerae with diagonal stripes of white scales; inhabits Oregon Coast Range and Willamette Valley (plate J: 6) . . . . . *M. manni*

DD. Chelicerae without white markings . . . . . E

E. Carapace with broad cream-colored bands just below posterior eyes, extending onto thorax; inhabits Great Basin, frequent on juniper (plate J: 8) . . . . . *Metaphidippus* n. sp.

EE. Carapace dark, with at most a few white scales; abundant throughout entire montane Western North America (plate J: 5) . . . . . *M. aeneolus*

F. With a tuft of stiff black setae below the small pair of eyes; abdomen nearly cylindrical; lightly pigmented, primarily yellow or pink . . . . . G

FF. Without a tuft of black setae below smallest eyes; abdomen robust . . . . H

G. Pink; restricted to coast and Coast Range ..... *M. albeolus*

GG. Yellow; widely distributed in conifer forests (plate J: 4) (best distinguished from the preceding by genital characters) ..... *M. watonus*

H. Carapace densely covered with yellow scales; scales between central pair of front eyes tan to orange; inhabits Great Basin, frequent on juniper ..... *Metaphidippus* n. sp.

HH. Carapace with white, transparent, or gray scales on top I

I. Carapace with copper sheen and transparent scales; scales between central pair of anterior eyes orange, distinctly darker than white scales on clypeus; abdomen without prominent central white patch; inhabits Oregon Coast Range and Willamette Valley ..... *M. manni*

II. Carapace with white or gray scales; scales between central pair of anterior eyes white, similar to scales on clypeus; abdomen with a conspicuous central white patch; widespread and abundant throughout Western North America (plate J: 1, 3, 7) ..... *M. aeneolus*

Some of the most abundant and widespread arboreal spiders in the Pacific Northwest are members of the genus *Metaphidippus*, currently under study by Wayne Maddison of Harvard University, who has helped us greatly in preparing this section. By far the most abundant species is *M. aeneolus*, known as *M. uteanus* in the Rocky Mountains (Maddison, pers. comm.). At budburst, two size-classes are expected: subadults 4.5 mm long and immatures about 2 mm long. Patterning varies with age (plate J: 1, 3 compared to J: 7), and the transformation to adult male is so striking that it appears to be a different species.

Metaphidippus albeolus is the dominant species in the coastal forests of lodgepole pine and is in turn replaced by *M. californicus* on dense windswept branches on edges of coastal bluffs. *Metaphidippus californicus* is normally found on rock surfaces of the coastal bluffs and tidepools but strays onto the branches of adjacent trees; the male has a gray to black abdomen with two pairs of small, diverging, white diagonal stripes; the female abdomen is gray with two brown spots near the front and two wide, angular, brown bands posteriorly.

Pseudiscius monticola and *Marchena minuta* are small species, generally similar in appearance to immature *Metaphidippus aeneolus;* they are rare and apparently inhabit tree trunks rather than the foliage of conifers. Both species are elongate and dorsoventrally flattened, with nearly parallel sides; they are easily mistaken for the highly variable forms of the youngest *M. aeneolus* or *Metacyrba*. *Marchena minuta* is distinguished by a diagonal row of five bristles arising from prominent tubercles on the first femur.

Key to the Crab Spiders (Thomisidae, Philodromidae)

Recently revised by Schick (1965) for all of California; specimens not fitting the key, descriptions, or illustrations in every detail should be checked in this reference. Adults are necessary for use of the keys in Schick's monograph.

1A Abdomen with prominent apical tubercle on dorsum (plate K: 7); clypeus strongly sloping, clypeal height far exceeding interocular distance . . . *Tmarus angulatus*

Body a variable mixture of black and white splotches (plate K: 7-8); adults 4.5-6.0 mm long; at budburst, most are submature.

1B Abdomen without medial tubercle; clypeal region not strongly sloping 2

2A Ocular region contrastingly whitened; eye bases tuberculate and prominently confluent; carapace and abdomen white to yellow 3

2B Eye bases not of contrasting white nor confluent, though occasionally tuberculate individually 4

3A Abdomen strongly spinose throughout; anterior lateral eyes and their tubercles larger than anterior median eyes and tubercles; legs strongly spinose . . . . . *Misumenops* spp.

This is a diverse genus with many potential species in the Pacific Northwest. Most species inhabit shrub and forb vegetation. The most abundant and widespread species, though infrequent on trees, is *M. celer* (=*M. lepidus sensu* Schick 1965) (plate K: 6); this species is distinguished by black setae on the carapace. *Misumenops quercinus* (arboreal in oak woodlands), *M. sierrensis*, and *M. importunus* have pale setae on the carapace; they are distinguished only by genital characters. Sexual dimorphism of color pattern is pronounced.

3B Abdomen nearly without pubescence, never spinose (small immatures with scattered black abdominal dorsal pubescence); anterior eyes subequal; legs with a few dorsal or lateral spines . . . . . *Misumena vatia*

Male 4.0 mm long; female 8.0 mm long; coloration dimorphic (plate K: 3, 5). This is the only local species and is unlikely to be confused with other genera. *Misumena vatia* is abundant in the forb layer of disturbed forests and infrequently strays into trees.

4A Carapace longer than wide (generally 1.5-2.0 times in larger individuals; 1.2 times in small immatures); abdomen 2.5-5.0 times longer than wide (plate L: 8) . . . . . *Tibellus oblongus*

A distinctive genus, its length-to-width ratio is equaled or exceeded only by *Tetragnatha* (plate C: 3, 4). Adults are 6.0-8.5 mm long. *Tibellus oblongus*, principally inhabiting the forb layer, is only occasionally found in trees.

4B Carapace length at most slightly greater than width; abdomen at most 1.5 times longer than wide 5

5A Body bare except for setae; legs III and IV less than two-thirds length of leg I (less pronounced difference in small immatures); black forward-projecting setae around eyes and clypeus 6

5B Body covered with dense pubescence; legs III and IV similar in length to legs I and II; clypeus and eye region without prominent forward-projecting setae (Philodromidae) 8

6A Green (fading to yellow in alcohol) with four small red spots on carapace; eye tubercles pale yellow; legs green but pale amber distally; abdomen, particularly of mature individuals, with a large darkly bordered red patch; a black cardiac mark and bright yellow sides . . . . . *Diaea pictilis*

This magnificent species is restricted to the California Coast Ranges; data in Schick (1965) confirm a habitat preference for live oak.

6B Light orange-brown to brown or black; mottled 7

7A Carapace flattened, thoracic groove distinct; anterior eye row nearly straight . . . . . *Coriarachne* spp.

Two species of these bark-dwelling spiders are abundant throughout the region. The carapace of *Coriarachne brunneipes* is largely dark brown with a few scattered white maculations, but that of *C. utahensis* (plate K: 1) is extensively marked with white.

7B Carapace distinctly convex, thoracic groove indistinct or absent; anterior eye row distinctly procurved . . . . . *Xysticus* spp.

This genus is abundant in many habitats throughout the region, but only two species are common in the trees: *Xysticus punctatus* has an abdominal dorsum with paired orange-brown patches separated by a broad pale median area and an orange-brown carapace. The abdominal dorsum of *X. locuples (=X. malkani)* has paired brown areas separated by an off-white median line and transverse lines; the carapace is dull red-brown. The genitalia of these two species are very distinct (Schick 1965). Adult males of *X. locuples* occur at budburst, but females live through summer. *Xysticus gosiutus*, a species abundant in deciduous shrubs, is frequently found in early regrowth conifers (plate K: 2).

8A Carapace basically unicolored; medial portions dark, nearly as dark as allata; legs with uniform, dense, equidistant spots throughout (plate L: 5) . . . . . *Apollophanes margareta*

This common species occurs as subadults, 5-6 mm, and as 2-mm immatures at budburst. Adults are the largest of arboreal crab spiders (6-10 mm), second only to female *Araneus* of all arboreal spiders in the Pacific Northwest. Schick (1965) erects a monotypic genus, *Pelloctanes*, for this species, but the consensus of more recent workers (Dondale and Redner 1975) is to retain it in the genus *Apollophanes*. This species, most easily confused with *Philodromus spectabilis* (plate L: 3), can be distinguished by the absence of contrasting white leg joints in small immatures and the presence of a uniformly brown carapace and a strong anterior cardiac mark in larger immatures.

8B Carapace with darkened sides (allata) bordering a light-colored center ..... *Philodromus* spp.

A. Cream-colored, with buff to bright orange or pink (often suffused with tan in preserved specimens) allata and lateral abdominal regions (particularly contrasting in mature males) (plate L: 1) ..... *P. rufus pacificus*

AA. White with purple to maroon markings (often suffused with tan in preserved specimens) ..... B

B. Abdomen with distinct posterolateral corners and hence strongly diamond-shaped (plate L: 6) C

BB. Abdomen without distinct posterolateral protrusions, definitely not diamond-shaped; posterolateral portions of abdomen without short, dark, dorsally projecting bands; posterior half of abdomen covered by herringbone bands, anteromedially with fainter cardiac stripe; legs often with irregular splotches on most surfaces of femora; small immatures with contrasting white annulations at leg joints; posterior median eyes surrounded by dark maculations (plate L: 3) ..... *P. spectabilis*

C. Abdomen largely white, pattern indistinct or absent; legs mostly white with dense small maculations (female - plate L: 2) or uniform brown (male), never splotched or banded ..... *P. quercicola*

CC. Abdomen with small purplish maculations; legs with large splotches or annulations; posterolateral portions of abdomen with contrasting short, dark, dorsally projecting bands; bases of femora with large contrasting regions devoid of purple maculations; with prominent cardiac stripe on all but smallest immatures, with or without a herringbone pattern; posterior median eyes surrounded by clear white integument ..... *P. speciosus*

Keying out with *P. rufus* is the infrequent *P. rodecki,* found at the western edge of the Great Basin; the abdominal dorsum of *P. rodecki* is covered with patches of orange pubescence interspersed with dark, round punctations. Keying to *P. speciosus* are the similar (and likewise variable in color pattern) *P. josemitensis, P. gertschi* (plate L: 6), and *P. oneida. Philodromus josemitensis* primarily inhabits coastal mountains and is distinguished by the completely darkened ventral surfaces of femora I and II. *Philodromus gertschi* is a similar species of the major mountain axis, but lacks the purple to white blotch pattern on the femora. *Philodromus oneida* inhabits more northern boreal forests and is reliably separated from the other two species only by genital characters. *Philodromus pernix* and *P. californicus* may also be encountered arboreally in the region; these species have a rounded abdomen like *P. spectabilis* but lack pigmentation in the carapace behind the eyes (*P. californicus* has spotted legs; *P. pernix* has splotched legs and black abdominal sides). Genitalia are shown in Schick (1965).

Philodromus, though a diverse genus in this region, has only three species abundant on *Abies*. *Philodromus rufus pacificus* is 3.0-4.5 mm long as an adult and readily distinguished by coloration; this form is sometimes referred to as *P. rufus* or *P. pacificus*. *Philodromus spectabilis*, adult length 4.5-6.0 mm, can also be distinguished from most other sympatric species on the basis of coloration. Both *P. rufus pacificus* and *P. spectabilis* are abundant arboreal spiders in the Placerville region; both species occur in two size-classes at budburst, adults and small immatures. Many other local arboreal species are not readily separable from *P. speciosus* without reference to adult genitalia.

Thanatus is a similar genus usually characterized by a prominent white-margined cardiac spot. It generally inhabits the ground and shrub layers. *Thanatus altimontis* (plate L: 4) is abundant on the desert shrubs of the Great Basin and can occasionally be collected from lower branches of conifers.

Acknowledgments

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Glossary

Allata: region of the carapace flanking the middorsal longitudinal axis, frequently contrasting in color to rest of carapace.

Anterior: directed towards the front of the body.

Apophysis: a projection, frequently referring to a bizarre modification of the male palp.

Calamistrum: a comblike row of strong bristles along the margin of metatarsus IV (see figs. 6, 8).

Carapace: the dorsal shield of the anterior half of a spider body.

Cardiac region: middorsal anterior portion of the abdomen, containing the heart; frequently marked externally by a distinctive design.

Chelicerae: most anterior of the body's appendages (see figs. 3, 4, 5); bearing the fangs at their tip.

Chevrons: geometric design of nested, progressively decreasing angle-marks.

Clypeus: region of the carapace between the base of the chelicerae and the anterior median pair of eyes (= upper lip) (see figs. 18, 19).

Colulus: a median, often wart-like appendage just anterior to the spinnerets (see fig. 20).

Cribellum: a broad sclerotized plate medially in front of the spinnerets, functioning as a composite spinneret (see fig. 7); when reduced in size, referred to as a colulus.

Embolus: the elongate spine-shaped tip of the male genital palp, usually darkly melanized and contrasting with the rest of the intromittent organ.

Epigastric furrow: the transverse fold on the anterior portion of the abdomen of most spiders stretching between the entry portals for the two book lungs (see figs. 16, 23).

Femur (plural femora): the third leg joint, usually the longest and most robust leg joint.

Genitalia: the organs of reproduction; the external genitalia of female spiders lie medially between the book lungs and along the epigastric furrow; in male spiders, the apical segment of the palps is modified as an intromittent organ.

Herringbone pattern: frequently used terminology for a long series of angle-markings resembling the axial skeleton of a fish.

Heterogeneous: refers to the coloration pattern of the eyes; some dark and others light.

Homogeneous: refers to the coloration pattern of the eyes; all eight are black or all eight are transparent.

Laterally: towards the side of the body.

Laterigrade: refers to the condition of the first two pairs of legs in crab spiders, in which the anterior legs are rotated with respect to the body so that they lie parallel to the substrate and their morphologically lateral surfaces point dorsally.

Longitudinal: along the midline of the body extending from the eyes to the anus.

Maculated: spotted, splotched.

Median: along the main longitudinal axis of the body.

Median ocular area: the region of the carapace defined with its corners at the two anterior median and two posterior median eyes.

Metatarsus (plural metatarsi): the sixth and next-to-last leg segment.

Ostial markings: contrasting paired markings on the paramedial anterior abdominal dorsum located over the cardiac ostia and therefore subadjacent to the cardiac spot.

Palps: the most anterior pair of leg-like appendages, located between the chelicerae and the first pair of walking legs; modified in adult males as intromittent organs.

Paramedial: adjacent to the median longitudinal axis of the body.

Patella: the fourth leg segment, located between the major femur and tibia segments and resembling a short "knee-joint."

Posterior: towards the rear of the body.

Procurved: referring to a transverse line (such as an eye row or the epigastric furrow) that is deflected posteriorly along the midline and hence the ends point forward (see fig. 23).

Prograde: referring to the usual leg placement of spiders, in which all legs are held in the vertical plane and the morphologically anterior faces all point forward.

Pubescence: a body covering of hair-like structures.

Rebordered: refers to the condition of the labium ("lower lip") in which the anterior edge is greatly thickened and projects ventrally over the surface of the sternum as a ridge (see fig. 22).

Recurved: referring to a transverse line (such as an eye row or the epigastric furrow) that is deflected anteriorly at the midline and hence the ends point backwards.

Spinneret: any of the three pairs (usually) of silk-producing short appendages located at the posterior terminus of the venter (see figs. 14, 15).

Spiracle: of the ventral surface of the body leading into the tracheal system, normally located just anterior to the bases of the anterior spinnerets.

Sternum: sclerotized body surface on the ventral face of the cephalothorax between the leg bases (see fig. 22).

Stridulating organ: any of various noise-making structures on the surface of the body, consisting of a series of adjacent parallel ridges on one body part against which a series of pegs on another body part is rubbed.

Sub- (used as a prefix): almost, close-to.

Subadult: the next-to-last moult in which the reproductive organs are often well developed but still afunctional.

Tarsal comb: the row of comb-like or feather-like setae on tarsi IV of the Theridiidae (see fig. 21).

Tarsal tuft: the tuft of adhesive pubescence between the tarsal claws of most climbing and foliage-dwelling spiders (see fig. 13).

Tarsus (plural tarsi): the final leg joint bearing the claws.

Thoracic groove: a medial thickening in the dorsal cuticle, often accompanied by a depression in the vault of the carapace and strong melanization, from which an internal apodeme extends to anchor the leg muscles.

Tibia (plural tibiae): the fifth leg segment, usually the second longest and second most robust.

Trichobothria: a series of extremely long setae on the apical leg segments extending out at right-angles from the leg (see figs. 8, 17).

Trochanter: the second leg segment, tiny and at the base of the femur; in some groups, a conspicuous notch along its basal border with the coxa is used as a prominent diagnostic character.

Vermiform: irregularly elongate, "worm-shaped."

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