2003. The Journal of Arachnology 31:8–19

HAWAIIAN SPIDERS OF THE GENUS *TETRAGNATHA* (ARANEAE, TETRAGNATHIDAE): V. ELONGATE WEB-BUILDERS FROM OAHU

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ABSTRACT. This study continues documentation of the adaptive radiation of species in the genus *Tetragnatha* in the Hawaiian archipelago. The four new species described here are similar in gross appearance, all being brown and elongate. They all build orb webs low down in shrubby vegetation, and have disjunct or abutting ranges. The new species are *T. limu*, *T. lena*, *T. palikea*, and *T. uluhe*. Different species occur in middle and high elevations, and in wet and dry habitats. Similar to other representatives of Hawaiian *Tetragnatha*, they are strictly nocturnal web-builders.

Keywords: Hawaii, *Tetragnatha*, descriptions, taxonomy

The Hawaiian Islands are well known for having numerous radiations of closely related species (Roderick & Gillespie 1998; Simon 1987; Wagner & Funk 1995). Groups of spiders that appear to have undergone extensive species radiations in the islands include *Tetragnatha* Latreille 1804 (Tetragnathidae) (Gillespie 1991, 1992; Karsch 1880; Okuma 1988; Simon 1900), *Mecaphesa* Simon 1900 (Thomisidae) (Garb 1999; Lehtinen 1993; Simon 1900; Suman 1970), *Argyrodes* Simon 1864 (Theridiidae) (Simon 1900), *Theridion* Walckenaer 1805 (Theridiidae) (Simon 1900), *Orsonwelles* Hormiga (2002) (Linyphiidae), and a lineage of jumping spiders (Salticidae) (Gillespie et al. 1998).

This paper, the fifth in a series documenting the radiation of *Tetragnatha* spiders in the archipelago, describes new species of spiders in the genus *Tetragnatha* that are confined to similar microhabitats in different habitat types on the island of Oahu, the second oldest of the currently high Hawaiian Islands. The spiders are similar in gross appearance, all being elongate and brown, and construct large orb webs low down in the shrub vegetation. In low elevation habitats, where the environment has been disturbed, these spiders are found on grassy verges, where they can sometimes be quite numerous. At high elevations, the spiders are generally found in mossy hollows close to the ground. The single species found at high elevations on Oahu is quite similar on both mountain ranges, although there are features unique to each mountain range. The allopatric distributions of taxa are shown in Figure 1.

METHODS

Characters examined.—Morphological measurements taken were the same as those described in Gillespie (1991, 1992, 1994): eye separation; cheliceral tooth pattern; form and setation of the first and third legs (I and III representing the greatest divergence in leg function); and form and pattern of the dorsum, venter, carapace, and sternum. In order to estimate variability within a taxon and determine which features best characterize a species, where possible, measurements were taken on six individuals of each sex of each species with additional observations on other individuals once diagnostic characters had been identified. Genitalia of both sexes were examined using the methods described in Gillespie (1991).

Terminology.—The terminology for the teeth on the cheliceral margins of the males is that used in previous papers (Gillespie 1991, 1992, 1994; see Okuma 1987, 1988 and Figs. 2, 3, 9, 10). Setation on femora, tibiae and metatarsi of legs I and III is denoted by: fI, fIII, tI, tIII, mI & mIII. CITR refers to the cheliceral inter-tooth ratio, the ratio of 3 lengths: (1) between distal end of male chelicerae to sl; (2) s1 to T; and (3) T to rsu1.

The majority of the specimens were col-

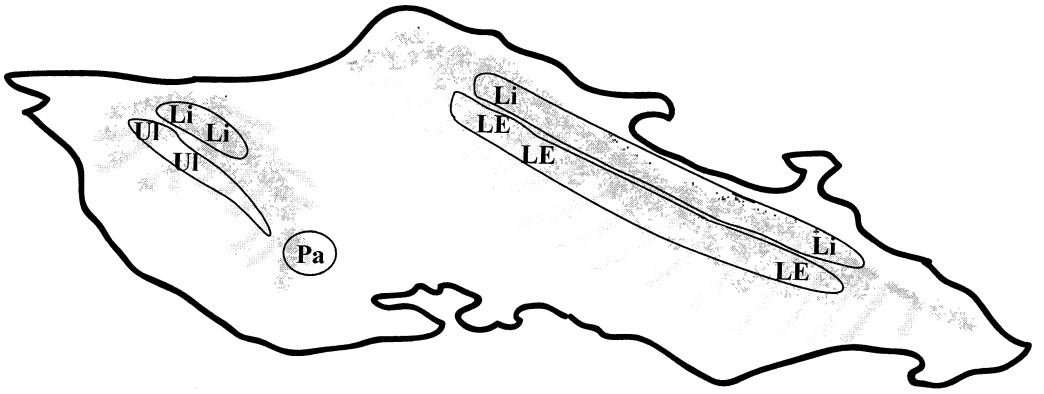
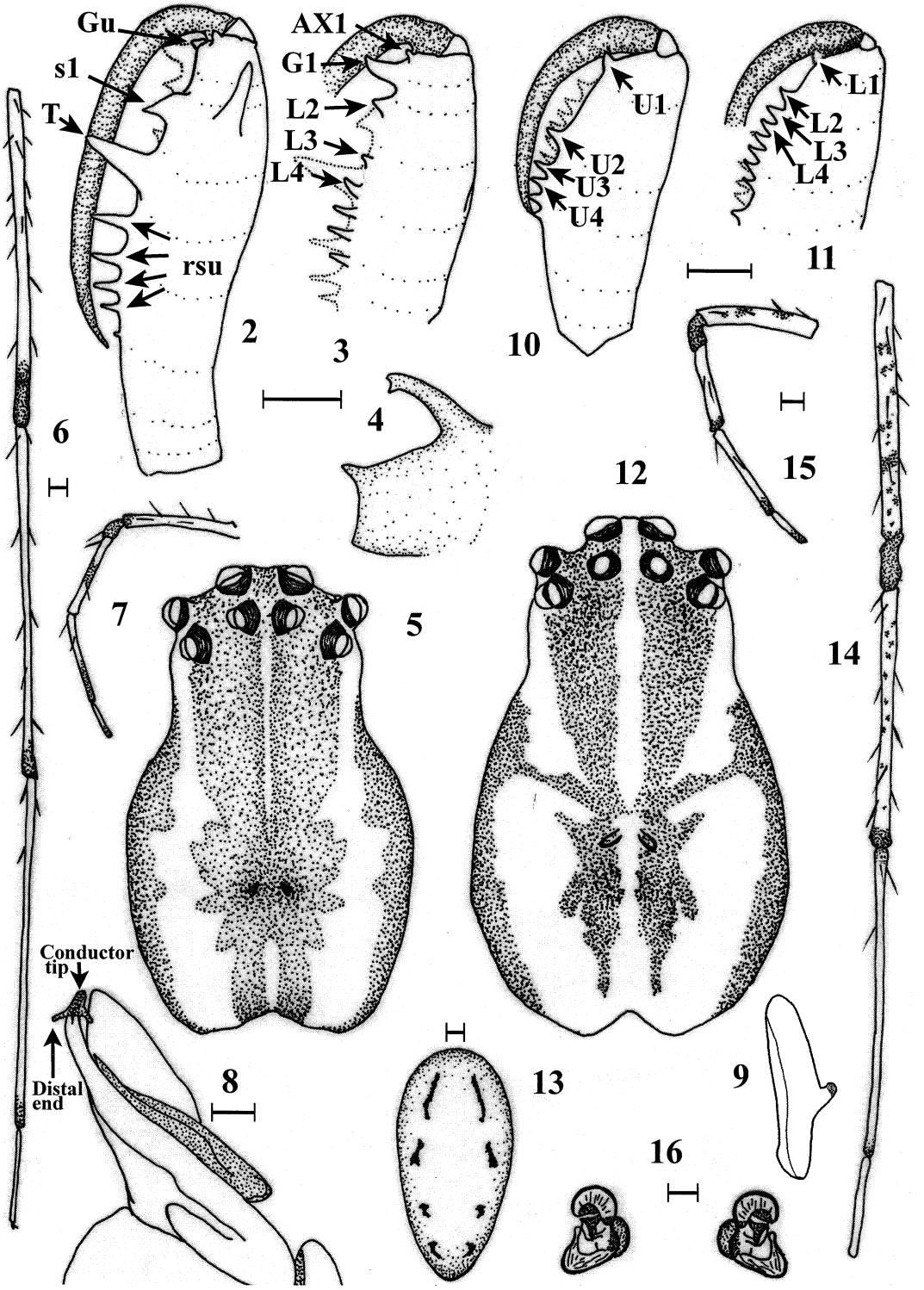


Figure 1.—Map showing allopatric distributions of elongate web-building species of Hawaiian *Tetragnatha* on Oahu. Li = *T. limu* (summits of both Waianae and Koolau mountain ranges); LE = *T. lena* (lower elevation forests of the Koolau mountains); Ul = *T. uluhe* (lower elevation/ drier forests of the Waianae mountains); and Pa = *T. palikea* (mid elevation mesic forests of the Waianae mountains).

lected by me (RGG) and George Roderick (GKR). All holotypes and allotypes have been deposited in the Bishop Museum, Honolulu (BPBM) and all paratypes will be deposited in the Essig Museum of Entomology of the University of California, Berkeley (EMUC). Unless indicated otherwise, all measurements are in mm.

KEY TO *TETRAGNATHA* SPECIES FROM OAHU

1. Lateral eyes well separated (Figs. 51, 59); chelicerae shorter than carapace . . . . . *Tetragnatha uluhe* new species
   Lateral eyes contiguous or almost so (Figs. 5, 12, 20, 27, 35, 43); chelicerae longer than carapace 2
2. Males 3
   Females 5
3. Backward projection of conductor well below distal projection, having appearance of Legionnaire hat (Figs. 23, 65); individuals large (9–10 mm) and robust, pale brown in life . . . . . *Tetragnatha lena* new species
   Backward projection of conductor at same level as distal projection (Figs. 64, 66, 67); individuals usually dark-colored in life 4
4. Conductor cap broadly convex on top and constricted into a papilla at distal end (Figs. 8, 64); legs banded at distal ends of segments (Figs. 6, 7) . . . . . *Tetragnatha limu* new species
   Conductor drawn to point at apex and not constricted at distal end (Figs. 39, 66); legs mostly uniform in color (Figs. 37, 38) . . . . . *Tetragnatha palikea* new species
5. Diameters of PLEs and PMEs smaller than the distance between the PLEs (Fig. 27); cheliceral teeth large, 2nd tooth on upper cheliceral margin larger than others (Fig. 25) . . . . . *Tetragnatha lena* new species
   Diameters of PLEs and PMEs larger than the distance between the PLEs (Figs. 12, 43); cheliceral teeth otherwise, with 2nd tooth on upper cheliceral margin smaller than 1st tooth (Fig. 41) or similar in size (Fig. 10) 6
6. Seminal receptacles compact, separated by more than width (Fig. 16); no tubercle on distal end of upper cheliceral surface (Fig. 10) . . . . . *Tetragnatha limu* new species
   Seminal receptacles large, separated be less than width (Fig. 47); distinct tubercle on distal end of upper cheliceral surface (Fig. 41) . . . . . *Tetragnatha palikea* new species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L2
L3
L4
11
6
12
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7
5
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Conductor tip
Distal end
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Tetragnatha limu new species
(Figs. 2–16, 64)

Types.—Holotype male from Oahu, Mt. Kaala 1220 m, 21.511°N, 158.145°W, RGG, 12 August 1991 (BPBM); allotype female from Oahu, Mt. Kaala 1220 m, 21.511°N, 158.145°W, RGG, 29 April 1990 (BPBM). Paratypes (EMUC): Oahu, Waianae Mountains: Mt Kaala: 1220 m, 21.511°N, 158.145°W, 16 August 1988, RGG, 1 male; 29 April 1990, 1 ♀; 12 August 1991, 1 ♂; Pahole (Peacock Flats) 600 m, 21.548°N, 158.187°W, RGG, 18 August 1988; Oahu, Koolau Mountains: Konahuanui 1030 m, 21.356°N, 157.791°W, RGG, 22 September 1990, 2 ♂; Poamoho 800 m, 21.547°N, 157.924°W, RGG, 10 April 1999.

Etymology.—The specific epithet, regarded as a noun in apposition, is the Hawaiian word for ''moss'' or ''lichen'' and refers to the microhabitat in which this species generally occurs.

Diagnosis.—*Tetragnatha limu* can be distinguished from other species based on the contiguity and relatively large size of the lateral eyes (Figs. 5, 12), the convex shape of the male conductor with a constriction at the distal end (Figs. 8, 64), and the compact shape and separation of the female seminal receptacles (Fig. 16).

Description.—*Holotype male* (Figs. 2–9, 64)*:* Length of carapace 2.9, total length 8.0. Chelicerae 96% length of carapace. Cheliceral fang slightly shorter than base, bent over at both proximal and distal ends. Promargin of chelicerae (Fig. 2): distance between Gu and s1 slightly greater than between s1 and T, CITR approx. 0.4:0.3:0.3; Gu distinct; s1 broad hook, width about equal to length (approximately equal width and 35% height of T); T large, pointing straight out from margin of chelicerae; rsu 5 straight spikes, decreasing in size. Retromargin of chelicerae (Fig. 3): total of 7 teeth; AX1 distinct; G1 large and pointing straight out, L2–L7 showing slight increase in size proximally until second to last tooth. Dorsal spur quite long, bent (24% length of carapace); tip bifurcated (Fig. 4). Thoracic fovea distinctly marked around depression (Fig. 5). Coloration and eye pattern as in female. Leg setation similar to female (Figs. 6, 7). Conductor (Figs. 8, 64): conductor cap broad at base with flange projecting behind cap, and highly peaked. Paracymbium mitten-shaped (Fig. 9).

Allotype female (Figs. 10–16)*:* Length of carapace 3.3, total length 9.5. Chelicerae 73% length of carapace. Cheliceral fang slightly greater than half length of base, tapering to smooth point distally. Promargin of chelicerae (Fig. 10): 6 teeth, U1 prominent, as wide but shorter than U2 and well separated (28% cheliceral length) from U2; U2 taller than other teeth; U3-U5 decreasing in size proximally. Retromargin of chelicerae (Fig. 11): series of 8 teeth: L1 approximately same size as U1, similar in size and quite well separated from L2. Remaining retromarginal teeth approximately similar in size. Eyes larger than distance separating them. Median ocular area square (Fig. 12); lateral eyes contiguous. Carapace brown with very pronounced markings including dark margins, and pair of dark lines running from behind PLE's and converging broadly towards fovea; sternum dusky. Abdomen elongate oval; dorsum brown with discrete paired markings down sides (Fig. 13); venter speckled silver with brown medial, longitudinal bar. Legs with dark spots below most spines and at distal margins of joints (Figs. 14, 15). Leg spines short and robust; setation: fI 2/3/5; tI 3/2/3; mI 1/1/1; fIII with 2 dorsal, 1 prolateral and no ventral, and tIII and mIII each with 1 prolateral, macrosetae. Seminal receptacles (Fig. 16): oval anterior bulb; angular and slightly larger posterior bulb.

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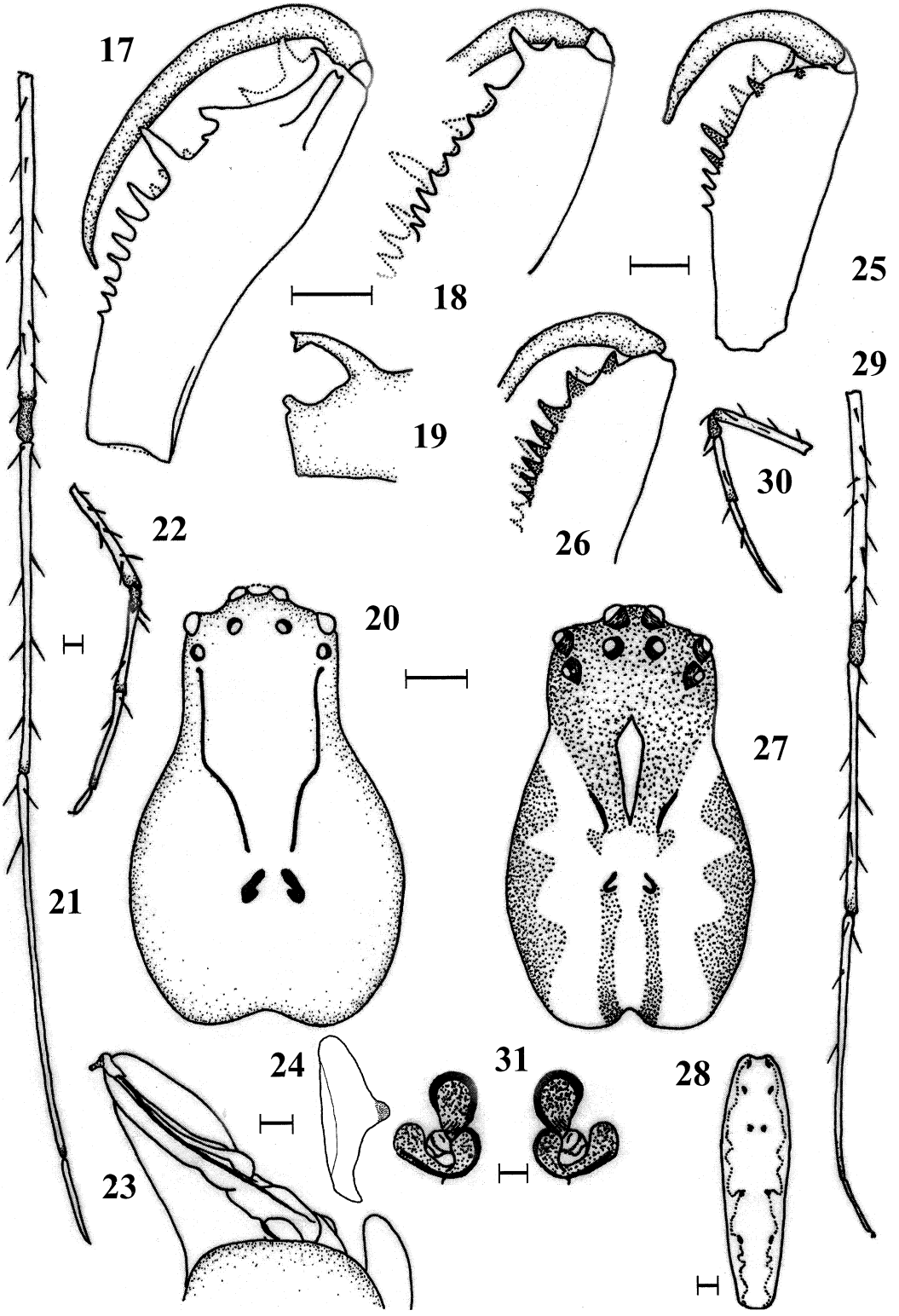
Figures 2–16.—*Tetragnatha limu*; Male. 2. Promargin of right chelicera; 3. Retromargin of left chelicera; 4. Dorsal spur of right chelicera, lateral view; 5. Carapace, dorsal; 6. Right leg I, dorsal; 7. Right leg III, prolateral; 8. Distal end of left palpus. 9. Left paracymbium. Female allotype. 10. Promargin of right chelicera; 11. Retromargin of left chelicera; 12. Carapace, dorsal; 13. Abdomen, dorsal; 14. Right leg I, dorsal; 15. Right leg III, prolateral; 16. Seminal receptacles, ventral. Scale bars = 0.5 for all except Figs. 8, 9 & 16, for which scale bars = 0.1. Scale bar between at Fig. 16 applies to Figs. 9 & 16; that between Figs. 2 & 4 applies to Figs. 2, 3, 4, 5 & 12; that between Figs. 10 & 11 applies to Figs. 10 & 11; that at Fig. 6 applies to Figs. 6 & 7; that at Fig. 15 applies to Figs. 14 & 15.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Variation.—(n = 6 ♂, 6 ♀).—Male: Carapace 2.9–3.3. CITR little variation, 0.4:0.3:0.3; rsu usually 5, sometimes 4. Tip of dorsal spur can be more indented. Female: Length of carapace 3.2–3.6. Color patterns vary slightly; no polymorphism.

Natural history.—*Tetragnatha limu* is found mostly in wet and cloud forest on the summits of the Waianae and Koolau mountain ranges of Oahu. In the Koolaus it has been found along the summit ridge (800–1030 m); in the Waianaes it has been found on the summit of Mt. Kaala, and (very rarely) lower down to 600 m in Pahole. They are mostly found at night in webs, spun deep in the moss and lichen layer that covers the base of shrubs in the dwarf cloud forest.

Tetragnatha lena new species
(Figs. 17–31, 65)

Types.—Holotype male, allotype female from Oahu, Pua Ohia Trail 500 m, RGG, 13 April 1990 (BPBM). Paratypes (EMUC): Oahu, Koolau Mountains: Pua Ohia Trail (Tantalus) 500 m, 21.336°N, 158.158°W, W.D. Perriera, 23 July 1989, 1 ♂ RGG, 13 April 1990, 1 ♂, 3 ♀; Schofield-Waikane 630 m, 21.514°N, 157.933°W, RGG, 30 September 1989, 1 ♂; Poamoho 600 m, 21.537°N, 157.974°W, RGG, 10 April 1999.

Etymology.—The specific epithet, regarded as a noun in apposition, is the Hawaiian word for ''yellowish'', and refers to the light yellowish brown color of this spider.

Diagnosis.—*Tetragnatha lena* can be distinguished from other species based the small size and contiguity of the lateral eyes (Figs. 20, 27), and the shape of the male conductor (form of Legionnaire's hat) (Figs. 23, 65).

Description.—*Holotype male* (Figs. 17–24, 65)*:* Length of carapace 3.4, total length 9.6. Chelicerae 80% length of carapace. Cheliceral fang shorter than base, bent over at both proximal and distal ends. Promargin of chelicerae (Fig. 17): distance between Gu and s1 greater than between s1 and T, CITR approx. 0.5:0.3:0.2; Gu distinct hook; s1 angled straight down and out, narrower than long (narrower and 80% height of T); T large, pointing straight out from margin of chelicerae; rsu 7 straight spikes, decreasing in size. Retromargin of chelicerae (Fig. 18): total of 9 teeth; AX1 distinct nipple-shape; G1 large and pointing straight out, L2–L9 similar in size. Dorsal spur quite long, bent (20% length of carapace); tip bifurcated (Fig. 19). Thoracic fovea discretely marked around depression (Fig. 20). Coloration and eye pattern as in female. Leg setation similar to female (Figs. 21, 22). Conductor (Fig. 23, 65): conductor cap broad at base with broad, long flange projecting behind cap. Paracymbium with lateral notch approximately at midline, projecting out (Fig. 24).

Allotype female (Figs. 25–31)*:* Length of carapace 3.5, total length 10.0. Chelicerae 70% length of carapace. Cheliceral fang slightly greater than half length of base, tapering to smooth point distally. Promargin of chelicerae (Fig. 25): 7 teeth, U1 small and inconspicuous, separation between U2 and U3 greater than between U1 and U2; U3 taller than other teeth; U3–U5 decreasing in size proximally. Retromargin of chelicerae (Fig. 26): series of 8 teeth: L1 much larger than U1, similar in size and close to L2. Remaining retromarginal teeth decreasing in size proximally. Eyes smaller than distance separating them. Median ocular area slightly wider posteriorly (Fig. 27); lateral eyes loosely contiguous. Carapace light brown with slightly darker markings including dark margins and pair of dark lines running from behind PLE's and converging broadly towards fovea. Abdomen elongate; dorsum pale fawn with discrete brown paired markings down sides (Fig. 28); venter speckled silver along midline with pair

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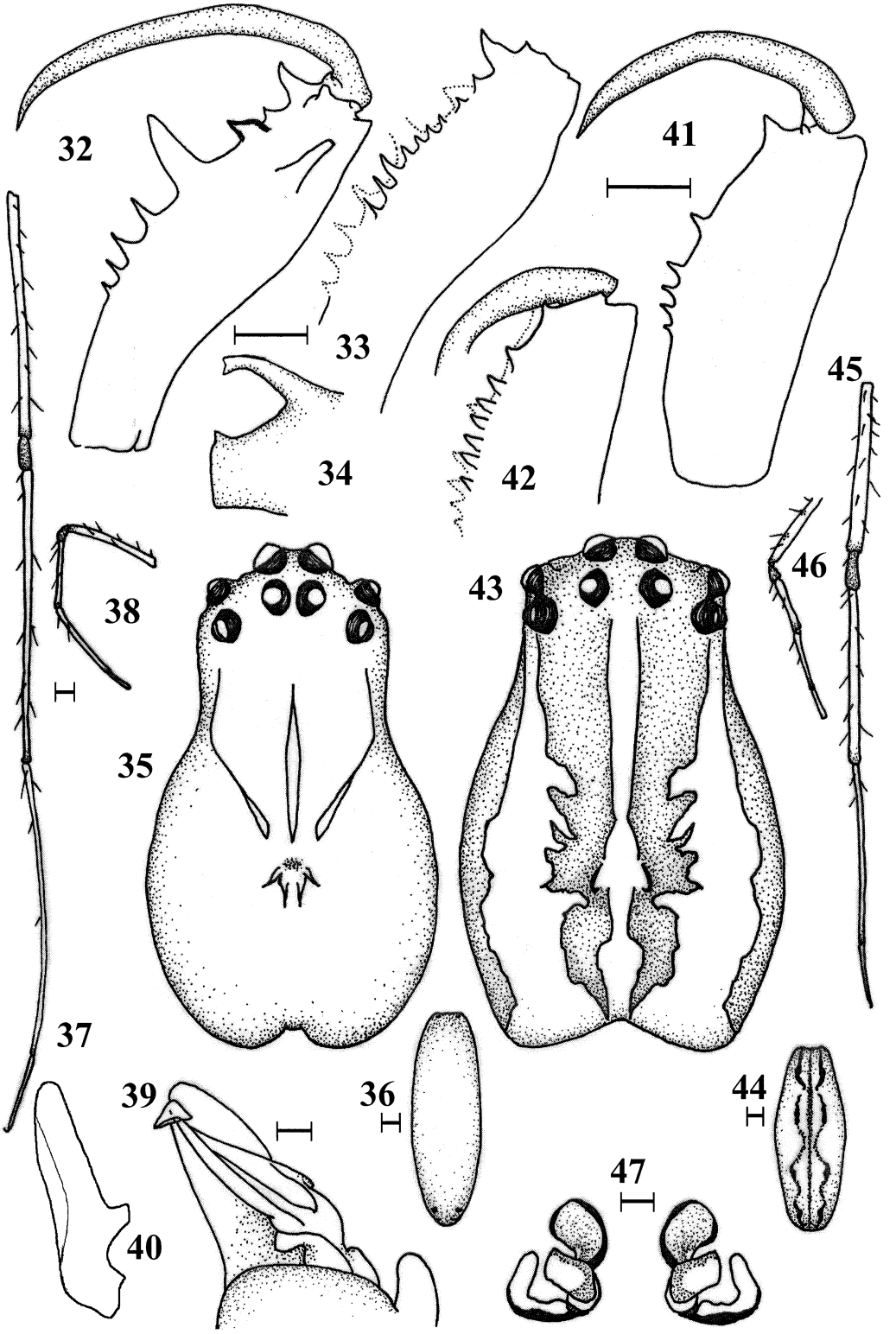
Figures 17–31.—*Tetragnatha lena*; Male. 17. Promargin of right chelicera; 18. Retromargin of left chelicera; 19. Dorsal spur of right chelicera, lateral view; 20. carapace, dorsal; 21. Right leg I, dorsal; 22. Right leg III, prolateral; 23. Distal end of left palpus; 24. Left paracymbium. Female allotype. 25. Promargin of right chelicera; 26. Retromargin of left chelicera; 27. Carapace, dorsal; 28. Abdomen, dorsal; 29. Right leg I, dorsal; 30. Right leg III, prolateral; 31. Seminal receptacles, ventral. Scale bars = 0.5 for all except Figs. 23, 24 & 31, for which scale bars = 0.1; scale bar between Figs. 23 & 24 applies to Figs. 23 & 24; that between Figs. 17 & 18 applies to Figs. 17, 18 & 19; that between Figs. 20 & 27 applies to Figs. 20 & 27; that between Figs. 21 & 22 applies to Figs. 21, 22, 29 & 30.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of brown longitudinal bars on sides. Legs pale brown. Leg macrosetae short and robust; setation: fI 3/4/3; tI 3/2/3; mI 2/1/1; fIII with 3 dorsal, 2 prolateral and no ventral, tIII with 1 dorsal, 1 prolateral, and mIII with 2 dorsal and 1 prolateral, macrosetae (Figs. 29, 30). Seminal receptacles (Fig. 31): large, oval anterior bulb; smaller, oval posterior bulb.

Variation.—(n = 6 ♂, 6 ♀).—Male: Carapace 3.1–3.4. CITR little variation, 0.5:0.3:0.2; rsu 5–7. Degree of indentation of tip of dorsal spur can vary. Female: Length of carapace 3.5–4.0. Color patterns vary slightly; no polymorphism.

Natural history.—*Tetragnatha lena* is found in middle elevation (500–700 m) mesic forest in the Koolau mountains of Oahu. It is exclusively nocturnal, and builds large orb webs at night. Because it occurs at relatively low elevations, it is often found associated with secondary growth native vegetation and alien grasses.

Tetragnatha palikea new species
(Figs. 32–47, 66)

Types.—Holotype male, allotype female from Oahu, Palikea (Honouliuli) Trail 930 m, 21.417°N, 158.103°W, RGG, 18 February 1990 (BPBM). Paratypes (EMUC): Oahu, Waianae Mountains: Palikea 930 m, 21.417°N, 158.103°W, RGG, 18 February 1990, 1 ♀, 2 ♂; 920 m, 21.416°N, 158.102°W, RGG, 12 April 1999, 1 ♂, 3 ♀.

Etymology.—The specific epithet, regarded as a noun in apposition, refers to the area (Palikea) in which this spider is found. It is part of the Nature Conservancy of Hawaii's Honoluliuli Preserve (3,692 acres) on the southeast slope of the Waianae Mountains.

Diagnosis.—*Tetragnatha palikea* can be distinguished from other species based the contiguity and relatively large size of the lateral eyes (Figs. 35, 43), the convex shape of the male conductor with no distal constriction (Figs. 39, 66) and the shape of the female seminal receptacles (close, bulbs angular, Fig. 47).

Description.— *Holotype male* (Figs. 32–40, 66)*:* Length of carapace 2.9, total length 8.8. Chelicerae 87% length of carapace. Cheliceral fang shorter than base, bent over at both proximal and distal ends. Promargin of chelicerae (Fig. 32): distance between Gu and s1 slightly greater than between s1 and T, CITR approx. 0.4:0.3:0.3; Gu distinct; s1 broad hook, width slightly greater than length (approximately equal width and 35% height of T); T large, pointing straight out from margin of chelicerae; rsu 4 straight spikes, decreasing in size proximally. Retromargin of chelicerae (Fig. 33): total of 10 teeth; AX1 distinct; G1 large and pointing almost straight out, L2–L7 small, similar in size, L8–L10 large, similar in size. Dorsal spur quite long, bent (24% length of carapace); tip bifurcated (Fig. 34). Thoracic fovea distinctly marked around depression (Fig. 35). Abdomen similar to female but duller in color (Fig. 36). Eye pattern as in female. Leg setation similar to female (Figs. 37, 38). Conductor (Figs. 39, 66): conductor cap broad and flat at base with flange projecting behind cap, not highly peaked. Paracymbium with lateral notch below midline, angular, projecting out (Fig. 40).

Allotype female (Figs. 41–47)*:* Length of carapace 3.0, total length 8.9. Chelicerae 75% length of carapace. Cheliceral fang slightly greater than half length of base, tapering to smooth point distally. Promargin of chelicerae (Fig. 41): small tubercle at apex; 6 teeth, U1 prominent, wider and higher than U2 and well separated (31% cheliceral length) from U2; U2–U5 decreasing in size proximally. Retromargin of chelicerae (Fig. 42): series of 8 teeth: L1 smaller than U1, similar in size and quite well separated from L2. Remaining re-

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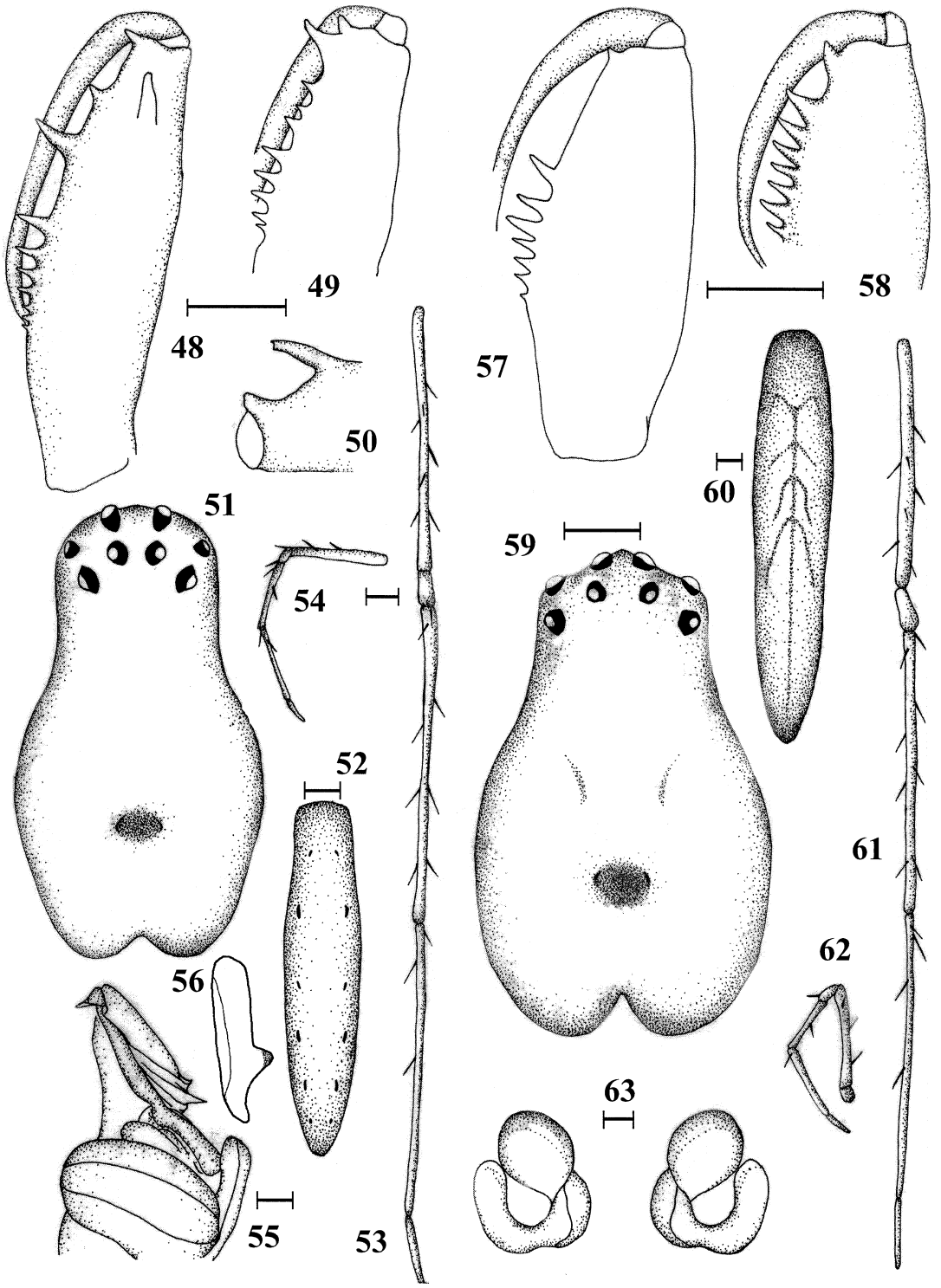
Figures 32–47.—*Tetragnatha palikea*; Male. 32. Promargin of right chelicera; 33. Retromargin of left chelicera; 34. Dorsal spur of right chelicera, lateral view; 35. Carapace, dorsal; 36. Abdomen, dorsal; 37. Right leg I, dorsal; 38. Right leg III, prolateral; 39. Distal end of left palpus; 40. Left paracymbium. Female allotype. 41. Promargin of right chelicera; 42. Retromargin of left chelicera; 43. Carapace, dorsal; 44. Abdomen, dorsal; 45. Right leg I, dorsal; 46. Right leg III, prolateral; 47. Seminal receptacles, ventral. Scale bars = 0.5 for all except Figs. 39, 40 & 47, for which scale bars = 0.1; scale bar between Figs. 32 & 33 applies to Figs. 32–35; that between Figs. 37 and 38 applies to Figs. 37, 38, 45 and 46; that at Fig. 41 applies to Figs. 41–43.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tromarginal teeth slightly larger. Eyes larger than distance separating them. Median ocular area square (Fig. 43); lateral eyes contiguous. Carapace brown with very pronounced markings including dark margins, and pair of dark lines running from behind PLE's and converging broadly towards fovea; sternum dusky. Abdomen elongate oval; dorsum brown with discrete paired markings down sides (Figs. 44). Legs with small dark spots below many spines (Figs. 45, 46). Leg macrosetae short and robust; setation: fI 3/4/5; tI 3/2/3; mI 1/1/1; fIII with 2 dorsal, 1 prolateral and no ventral, and tIII and mIII each with 1 dorsal and 1 prolateral, macrosetae. Seminal receptacles (Fig. 47): large, oval anterior bulb; narrow, angular and smaller posterior bulb.

Variation.—(n = 6 ♂, 6 ♀).—Male: Carapace 2.6–3.1. CITR little variation, 0.4:0.3:0.3; rsu usually 4. Female: Length of carapace 2.9–3.2. Color patterns vary slightly; no polymorphism.

Natural history.—*Tetragnatha palikea* is found mostly in webs built over the leaf litter, or low in the vegetation, on the south end of the Waianae mountain range of Oahu.

Tetragnatha uluhe new species
(Figs. 48–63, 67)

Types.—Holotype male from Halona Valley, 460 m, 21.427°N, 158.159°W, D.J. Preston, 31 January 1996 (BPBM); allotype female from Pahole, 550 m, 21.552°N, 158.199°W, T. Blackledge and RGG, 19 August 2000 (BPBM). Paratypes (EMUC): Oahu, Waianae Mountains: Halona Valley, 460 m, D.J. Preston, 31 January 1996, 1 ♂; Waianae Kai, 550 m, 21.508°N, 158.170°W, RGG & GKR, 2 March 1999, 1 ♂; Pahole, 550 m, 21.552°N, 158.199°W, RGG, GKR, T. Blackledge, 19 August 2000, 2 ♀, 1 ♂.

Etymology.—The specific epithet, regarded as a noun in apposition, is the Hawaiian word for false staghorn fern (*Dicranopteris*), a native species most abundant in second growth and mesic forest. This is where the spider is most commonly found.

Diagnosis.—*Tetragnatha uluhe* cannot easily be confused with other species as its eye configuration (lateral eyes well separated) is very distinctive (Figs. 51, 59).

Description.—*Holotype male* (Figs. 48–56, 67)*:* Length of carapace 3.0, total length 8.0. Chelicerae 75% length of carapace. Cheliceral fang slightly shorter than base, bent over at both proximal and distal ends. Promargin of chelicerae (Fig. 48): distance between Gu and s1 similar to that between s1 and T, CITR approx. 0.33:0.33:0.33; Gu and sl both distinct but small, similar in size (sl narrower and 30% height of T); T large, pointing slightly up and out from margin of chelicerae; rsu 7 straight spikes, decreasing in size proximally. Retromargin of chelicerae (Fig. 49): total of 10 teeth; AX1 large point; G1 very large, pointing slightly up and out, L2–L4 small, similar in size; L5–L7 larger, and L8–L9 smaller. Dorsal spur quite long, curved over (32% length of carapace); tip slightly bifurcated (Fig. 50). Thoracic fovea distinctly marked around depression (Fig. 51). Coloration and eye pattern as in female. Abdomen similar to female but plain (Fig. 52). Leg setation similar to female (Figs. 53–54). Conductor (Figs. 55, 67): conductor cap pointed out, with minimal flange projecting behind cap, and not highly peaked. Paracymbium with lateral notch below midline, projecting out (Fig. 56).

Allotype female (Figs. 57–63)*:* Length of carapace 3.1, total length 11.2. Chelicerae 58% length of carapace. Cheliceral fang slightly greater than half length of base, tapering to smooth point distally. Promargin of chelicerae (Fig. 57): 8 teeth, U1 prominent,

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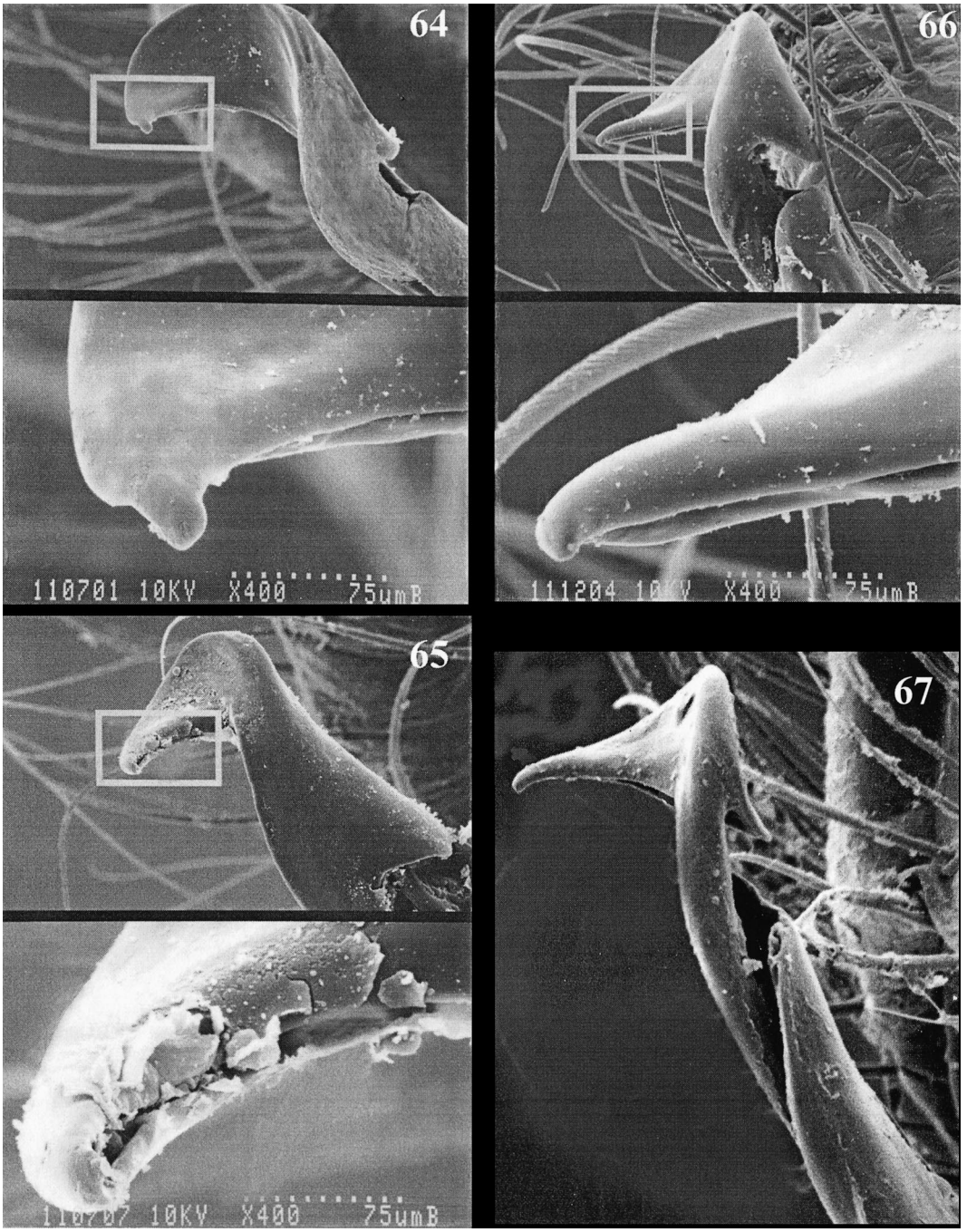
Figures 48–63.—*Tetragnatha uluhe*; Male. 48. Promargin of right chelicera; 49. Retromargin of left chelicera; 50. Dorsal spur of right chelicera, lateral view; 51. Carapace, dorsal; 52. Abdomen, dorsal; 53. Right leg I, dorsal; 54. Right leg III, prolateral; 55. Distal end of left palpus; 56. Left paracymbium. Female allotype. 57. Promargin of right chelicera; 58. Retromargin of left chelicera; 59. Carapace, dorsal; 60. Abdomen, dorsal; 61. Right leg I, dorsal; 62. Right leg III, prolateral; 63. Seminal receptacles, ventral. Scale bars = 0.5 for all except Figs. 55, 56 & 63, for which scale bars = 0.1; scale bar between at Fig. 55 applies to Figs. 55 & 56; that between Figs. 48 & 49 applies to Figs. 48–50; that at Fig. 59 applies to Figs. 51 & 59; that between Figs. 53 & 54 applies to Figs. 53, 54, 61 & 62; that between Figs. 57 & 58 applies to Figs. 57 & 58.



Figures 64–67.—Scanning electron micrographs of conductor of male palps. 64. *T. limu*; 65. *T. lena*; 66. *T. palikea*; 67. *T. uluhe*.

small, much smaller than U2 and well separated (33% cheliceral length) from U2; U2–U4 large, U5-U8 decreasing in size proximally. Retromargin of chelicerae (Fig. 58): series of 8 teeth: L1 than U1, smaller and quite well separated from L2. Remaining retromarginal teeth gradually decreasing in size proximally. Diameter of eyes smaller than distances sep-

arating them. Median ocular area wider posteriorly (Fig. 59); lateral eyes well separated. Carapace brown with indistinct markings. Abdomen elongate; dorsum light brown with indistinct markings (Fig. 60). Legs without spots. Leg spines short and robust; setation: fI 2/3/3; tI 3/1/3; mI 2/1/1; fIII with 2 dorsal, 2 prolateral and no ventral, and tIII with 1 prolateral, and mIII with 1 dorsal, macrosetae (Figs. 61–62). Seminal receptacles (Fig. 63): anterior bulb almost spherical, posterior oblong, tightly coiled together.

Variation.—(n = 6 ♂, 2 ♀).—Male: Carapace 2.7–3.1. CITR little variation; rsu 5–7. Female: Length of carapace 2.9–3.1. Color patterns vary slightly; no polymorphism.

Natural history.—*Tetragnatha uluhe* is confined to mesic/dry forest on the west side of the Waianae mountain range of Oahu. Its distribution is interesting, because it abuts *T. limu* in the north east, and *T. palikea* in the south. However, the species have never been found to co-occur.

ACKNOWLEDGMENTS

The work reported here was supported by grants from the National Science Foundation, US Fish and Wildlife Service, and the University of Hawaii Research Council. Additional support was provided by the Bishop Museum, the Nature Conservancy of Hawaii, the State Department of Land and Natural Resources, and the Hawaii Natural Areas Reserve System. For help with collecting I owe particular thanks to B. Gagne, D. Preston, G. Roderick, and T. Blackledge, and also to Will and Mel. The manuscript benefited greatly from comments from Herb Levi and Mark Harvey.

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Manuscript received 28 September 2001, revised 16 October 2002.