

**A NEW SPECIES OF *TRIASPIS* HALIDAY (HYMENOPTERA: BRACONIDAE)
PARASITIC ON THE PEPPER WEEVIL, *ANTHONOMUS EUGENII* CANO
(COLEOPTERA: CURCULIONIDAE)**

ROBERT A. WHARTON AND VICTOR LÓPEZ-MARTÍNEZ

(RAW) Department of Entomology, Texas A&M University, College Station, TX 77843, U.S.A. (e-mail: rawbaw2@acs.tamu.edu); (VL-M) Colegio de Postgraduados, IFIT-Entomologia Km 35.5 carr. México-Texcoco Montecillo, edo. de México C.P. 56230 Mexico

Abstract.—A new species of braconid wasp, *Triaspis eugenii*, is described. This species is a parasitoid of the pepper weevil, *Anthonomus eugenii*, in Nayarit, Mexico. It is being investigated as part of a classical biological control program directed against this pest in Florida. Diagnostic features are provided for separating this species from other species of *Triaspis* attacking weevil pests. The overall similarity to another pepper weevil parasitoid in the genus *Urosigalphus* is also noted.

Key Words: Braconidae, Helconinae, Brachistini, pepper weevil, parasitoid, biological control, Mexico

The genus *Triaspis* was first described by Haliday (1835), and is currently placed in the tribe Brachistini of the subfamily Helconinae by most workers (Mason 1974, Sharkey 1997). Though confused with *Sigalphus* Latreille for nearly 80 years, the true identity of *Triaspis* was fixed in the early 1900s and has remained stable ever since (Martin 1955). *Triaspis* is characterized by the presence of a completely fused carapace and the absence of the r-m cross-vein in the fore wing. In typical *Triaspis*, the carapace retains the two transverse furrows: all that remain of the sutures that originally separated the three segments comprising the carapace. *Schizoprymnus* Foerster, sometimes recognized as a separate genus and sometimes treated as a subgenus of *Triaspis*, is separated from typical *Triaspis* by the absence of the two transverse furrows, at least dorsally. Most other brachistines have at least the first two metasomal segments separated by a flexible suture. The only exception in the New

World is the genus *Urosigalphus* Ashmead, otherwise distinguished by having the outer tarsal claw of the hind leg much larger than the inner claw. In the New World, various species of *Triaspis* have been reared from the same weevil hosts as other brachistines in the genera *Urosigalphus*, *Nealiolus* Mason, and/or *Aliolus* Say.

The most recent revisions or reviews of *Triaspis* include those of Martin (1955) for North America, Papp (1984) for Australia, Tobias (1986) for the European part of the former USSR, Priore and Tremblay (1987) for Italy, Chou and Hsu (1996) for Taiwan, and Belokobylskij (1998) for Eastern Russia. The neotropical fauna has never been revised and isolated descriptions of only five species have been published to date (Shenefelt 1970). A Palaearctic species attacking the pea weevil, *Bruchus pisorum* (L.), has also been introduced to the Neotropics (Shenefelt 1970).

In general, members of the genus *Triaspis* are poorly known biologically (Shaw

and Huddleston 1991). Nevertheless, a few species have been reared from weevils, bruchids, and anthribids, and those that are best studied oviposit in the host egg and emerge from late instar larvae. The species described here has been reported as the most abundant parasitoid of the pepper weevil, *Anthonomus eugenii* Cano, in the Mexican state of Nayarit, attaining 50% parasitism in some of the samples from commercial hot pepper crops there (Mariscal et al. 1998). The species is currently being tested for possible use in the biological control of the pepper weevil in Florida. Information on the host weevil has recently been summarized by Clark and Burke (1996).

MATERIAL AND METHODS

All of the material used for this study was collected in Nayarit, Mexico, and was reared from peppers containing the pest weevil *A. eugenii*. The majority of the specimens were collected by Eugenio Mariscal and by Marco Toapanta and Phil Stansly as part of a biological control program through the University of Florida, in cooperation with Mario Urias of the National Institute of Agriculture and Forestry Research (INIFAP).

Terminology for the description generally follows Sharkey and Wharton (1997). Additionally, the 3 segments of the carapace are referred to as T1, T2, and T3. Total length of ovipositor was determined by dissection of 10 individuals, and comparing the total length with that of the dissected metasoma. Approximate length of ovipositor is also indicated in the description, as distance protruding beyond apex of carapace. The carapace is bordered by a thin flange called the marginal lamella (Martin 1955). Variation in quantitative traits is indicated by a range and mean, based on 10 males and 10 females.

Figures were produced using a scanning electron microscope (SEM). All SEM images were shot at 10kv on a JOEL JSM-5600. Specimens were coated with about 20

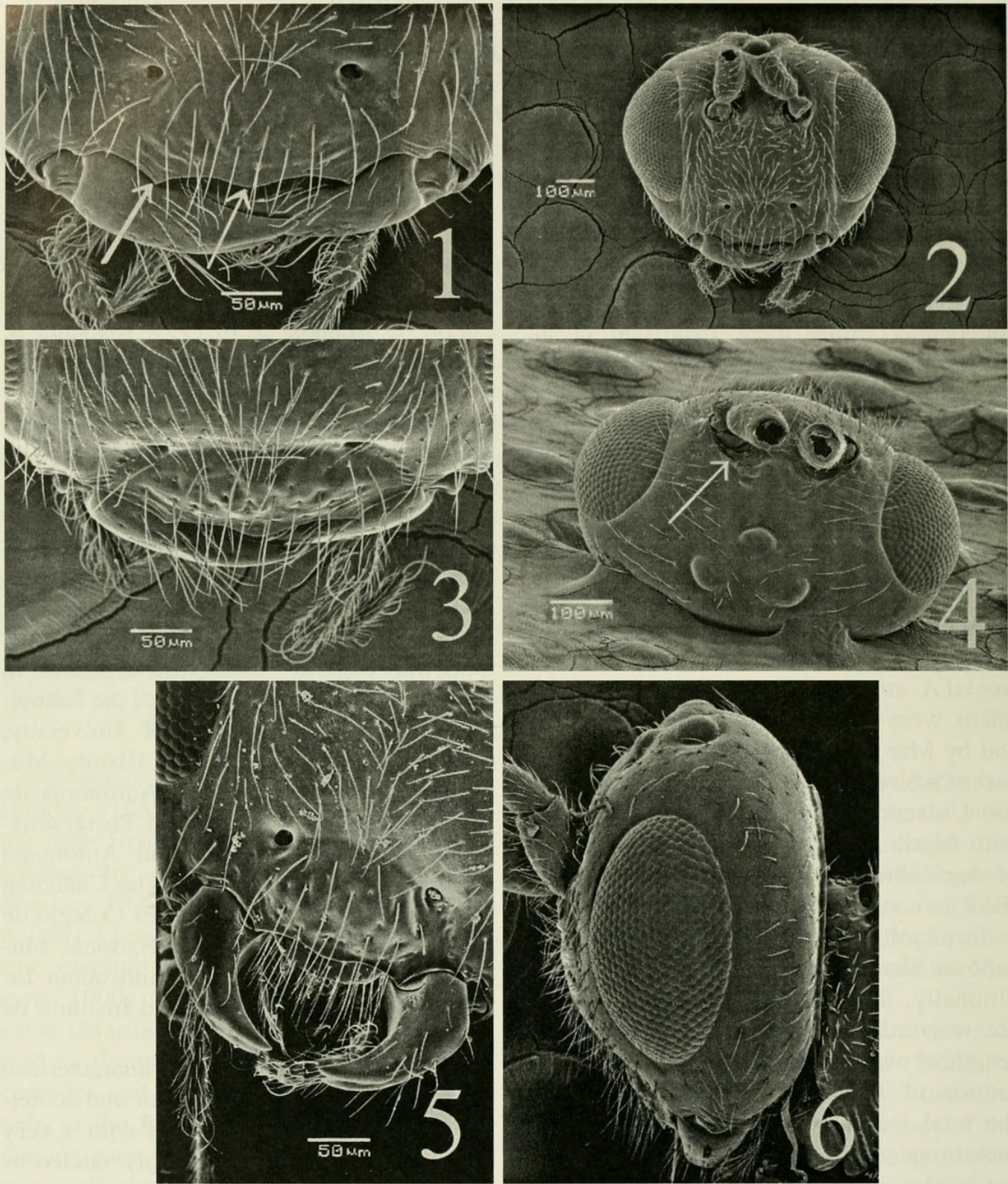
nm gold, using a Hummer 6.2 sputtering unit with argon as a source gas.

RESULTS

Triaspis eugenii Wharton and López-Martínez, new species (Figs. 1–17)

Holotype female.—Top label = “MEXICO: Nayarit Mpio. Santiago Ixcuintla, Puerta de Mango, 24.iii.1999 Toapanta & Stansly” Second label = “reared from *Anthonomus eugenii* on Serrano pepper emerged 7.iv.1999”. Deposited in collection of Universidad Nacional Autónoma de México, Mexico City. Paratypes: 9 females, 10 males, same data as holotype. 25 females, 26 males, “MEXICO: Nayarit Baladero 2.ii.1997 E. Mariscal”; 3 females, “Santiago Ixc. Nay. 23 febrero 1997 E. Mariscal Chile Serrano 11 msnm Hosp. *Anthonomus eugenii*”. Paratypes deposited in the entomological collections of the following institutions: Texas A&M University, College Station; The Natural History Museum, London; Universidad Autónoma de Yucatán, Mérida; Universidad Postgraduada, Montecillos; Universidad Autónoma de Nuevo León, Monterrey; The Canadian National Collection, Ottawa; El Colegio de la Frontera Sur, Tapachula; National Museum of Natural History, Smithsonian Institution, Washington, DC; and Instituto de Ecología, Xalapa.

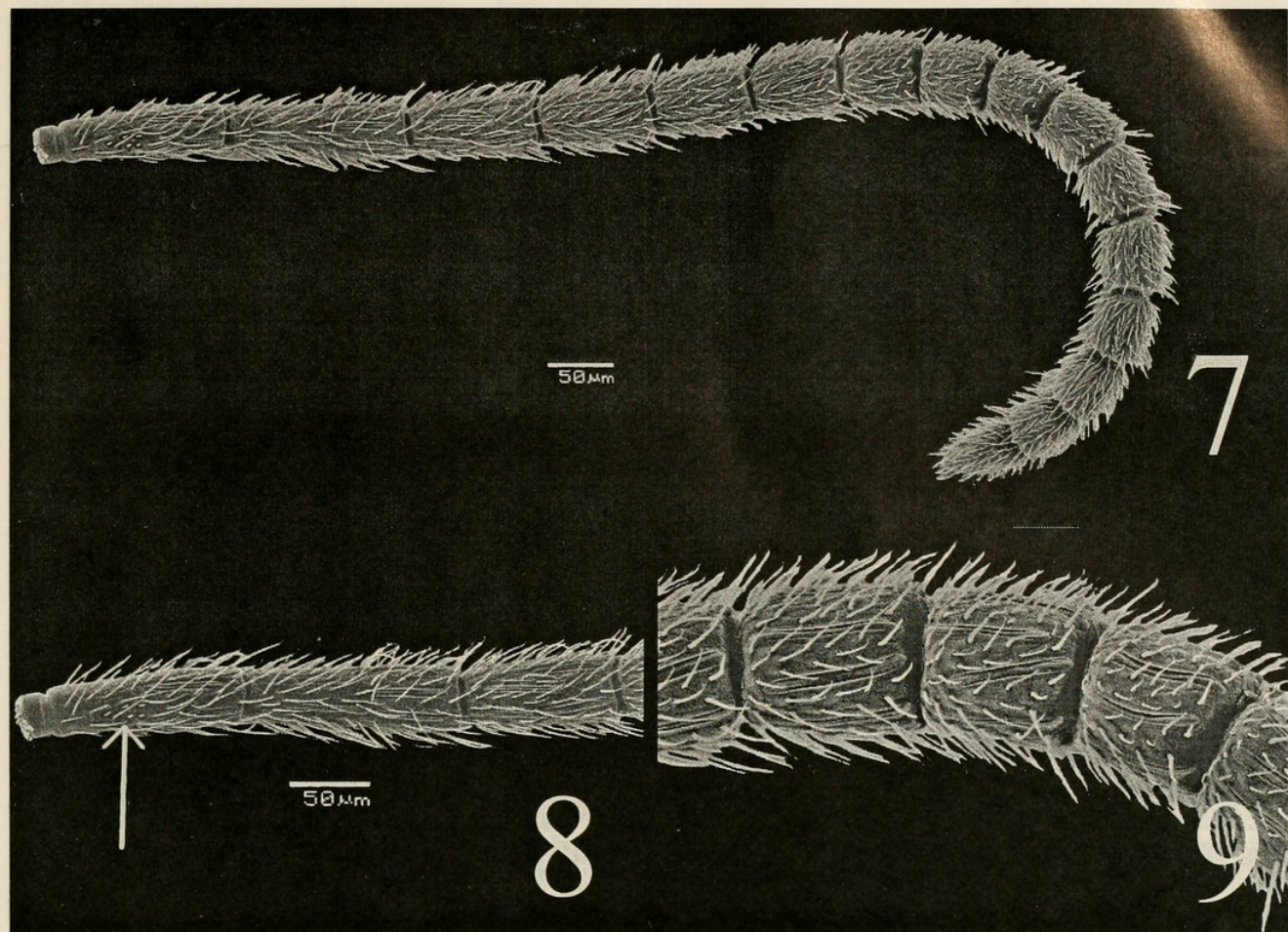
Diagnosis.—This species is characterized by the nearly bare mesoscutum and scutellum (Fig. 13), the propodeum with a very short anterior face and sharply declivous posterior face (Figs. 10–11), the pattern of sculpture on the metasoma (Figs. 14–17), and a clypeus that is twice wider than high (Figs. 1–2). *Triaspis eugenii* is most similar to *Triaspis azteca* Martin from Mexico and especially *Triaspis vestitica* Viereck from Peru. The flagellum is uniformly dark in *T. azteca* but the basal flagellomeres are pale (especially ventrally) in *T. eugenii* and most specimens of *T. vestitica*. The mesonotum is almost uniformly sparsely setose in *T.*



Figs. 1–6. Head of *Triaspis eugenii*. 1, Clypeus in frontal view, arrows showing median and lateral lobes. 2, Face in frontal view showing setal pattern. 3, Anterior-dorsal view of clypeus showing rugulose and pitted surface. 4, Head in dorsal view, arrow showing depression on frons immediately posteriorad antennal base. 5, Mandible. 6, Lateral view of head.

vestiticida but largely bare in *T. eugenii*. Of the North American species treated by Martin (1955), *T. eugenii* most closely resembles *Triaspis virginensis* Ashmead and *Triaspis rectangulata* Martin. From *T. vir-*

giniensis, the species described here differs in having more extensive sculpture on the carapace, and a taller, narrower clypeus (clypeus “transverse” in *T. virginensis*, about 0.75 × width of face). From *T. rec-*



Figs. 7–9. Antenna of female *Triaspis eugenii*. 7, Composite view of flagellum (scape and pedicel absent). 8, Basal 3 flagellomeres showing relative lengths of the 3 segments and patch of short sensilla (arrow) on flagellomere 1. 9, Flagellomeres 7–9, showing patch of irregular setae and placode sensilla; see Fig. 7 for scale.

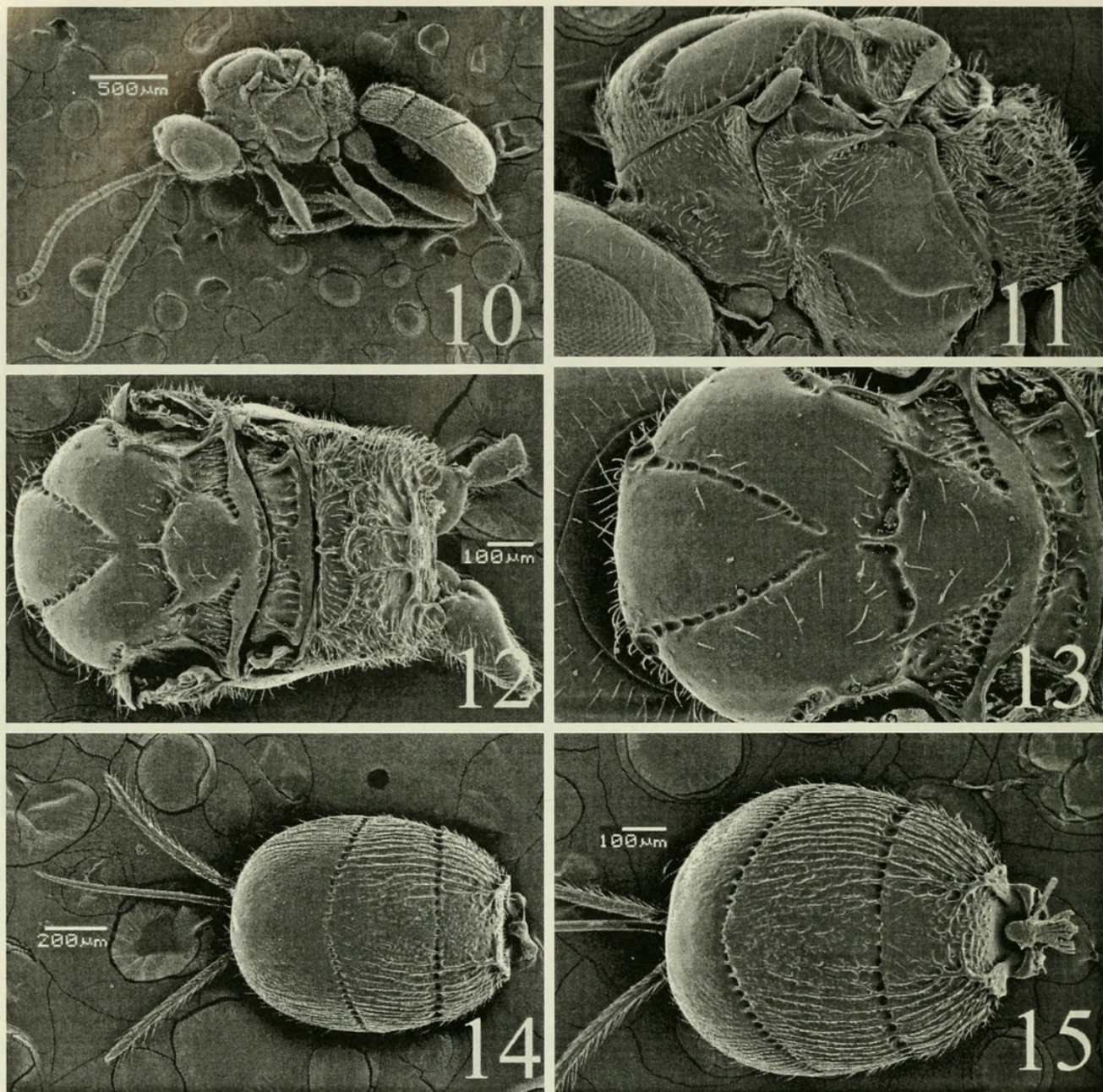
tangulata, it differs in antennal coloration and shape of the head.

Description.—Female. *Length*: 1.85–2.15 mm.

Head: Polished; somewhat trapezoidal, slightly narrowed ventrally in frontal view (gena thus not inflated: Fig. 2); vertex, occiput, temple, and gena sparsely setose (Figs. 4, 6), the setae arising from indistinct punctures; face smooth, more densely covered with ventrally and ventral-medially directed setae (Fig. 2); frons (Fig. 4) sparsely setose laterally, bare medially, with shallow depressions posteriorad scape on either side of a low, median ridge, depressions weakly sculptured in part, frons otherwise polished; eye large, about twice longer than temple in dorsal view, with temple strongly receding behind eye; malar space $0.25\text{--}0.3 \times$ eye height, $0.4\text{--}0.45 \times$ height of face; face $1.65\text{--}1.85$ ($m = 1.75$) $\times$ wider than high;

epistomal suture deeply impressed throughout; clypeus narrow: width $0.57\text{--}0.65$ ($m = 0.62$) $\times$ width of face, about twice wider than high, surface uneven and distinctly punctate (Fig. 3), ventral margin sinuate: with weak, broadly rounded median lobe and a large, very obtuse angulation near the base of each mandible (Figs. 1, 5), weakly convex in profile; mandible (Fig. 5) lacking obvious sculpture; ocelli not surrounded by an impressed groove; antenna (Fig. 7) with 18–19 segments; first two flagellomeres equal in length (Fig. 8), flagellomeres 3–9 gradually shortening towards apex, flagellomeres 9 through 14–15 bead-like (Fig. 9), nearly as wide as long; maxillary palps short, about equal in length to eye height, 6-segmented; labial palps with only three apparent segments.

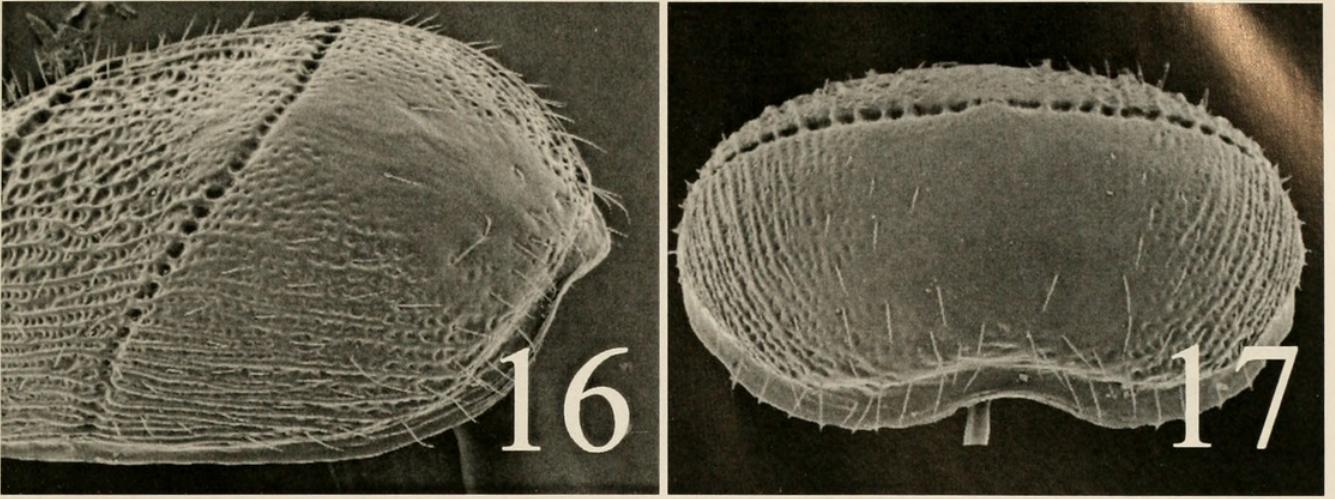
Mesosoma: Pronotum dorsally deeply pitted along posterior margin, the sculpture



Figs. 10–15. *Triaspis eugenii*. 10, Lateral view of body, showing relative lengths of antenna and ovipositor. 11, Lateral view of thorax and propodeum. 12–13, Dorsal view of mesosoma. 14–15, Dorsal view of metasoma showing slightly different degrees of development of sculpture.

weakening laterally, extending for a varying distance ventrally as a crenulate line; lateral face of pronotum (Fig. 11) bare medially, largely unsculptured in most specimens except at extreme ventral and posterior corners. Mesoscutum with anterior declivity and extreme base of notauli setose (Fig. 11), with 1–2 rows of scattered setae along notauli and around lateral margin of scutum (Figs. 12–13), median and lateral lobes otherwise bare and highly polished; notauli very finely crenulate and weakly

impressed throughout, very narrowly separated posteriorly, the area of convergence completely impunctate (Fig. 13); scutellar sulcus finely rugulose and with a distinct midridge; scutellum polished, nearly bare; mesopleuron (Fig. 11) bare medially, setose only along anterior and posterior margins, dorsally along subalar depression, and ventrally beneath sternaulus; sternaulus shallow, sinuate, unsculptured or nearly so. Metanotum (Figs. 11, 13) short, length along midline, when viewed in profile (Fig. 11),



Figs. 16–17. Metasoma of *Triaspis eugenii* showing marginal lamella and apically sinuate carapace margin. 16, Posterior-lateral view. 17, Posterior view.

equal to or shorter than median carina of propodeum; metapleuron densely and uniformly rugose beneath a mat of short, white setae. Propodeum (Figs. 10–12) very short anteriorly, steeply declivous posteriorly; short-setose throughout, the sculpture readily visible through the setae; with well-defined pentagonal areola occupying roughly median third of declivity, declivity (including areola) otherwise irregularly carinate-rugulose, the sculpture varying in intensity, posterior-lateral ridge distinctly protruding. Hind femur short, broad, $2.85\text{--}3.1$ ($m = 3.0$) $\times$ longer than wide; tarsal claw with distinct basal tooth. Fore wing $2.4\text{--}2.5$ $\times$ longer than maximal width; basal cell sparsely setose; 1M distinctly bowed; R1a $1.55\text{--}2.1$ ($m = 1.8$) $\times$ longer than R1b, the latter not extending to wing tip; m-cu $1.7\text{--}2.3$ ($m = 1.9$) $\times$ longer than (RS+M)b; 1cu-a distinctly postfurcal, $1.15\text{--}2.5$ ($m = 1.5$) $\times$ longer than 1CUa; 2cu-a absent, 2-1A usually very short, thus 1st subdiscal cell broadly open posterior-distally.

Metasoma: Approximately equal in length to mesosoma. Carapace short and broadly oval, in dorsal view $1.25\text{--}1.35$ ($m = 1.27$) $\times$ longer than maximum width; extensively sculptured; T1 and T2 carinate over a finely rugulose and variously pitted background, the surface of T1+T2 usually (80%) completely sculptured (Figs. 15–16), more rarely with sculpture evanescent pos-

terior-medially adjacent T2/T3 suture (Fig. 14), sculpture usually more strongly carinate laterally, with at least some carinae extending across the foveolate T1/T2 suture; T3 polished and unsculptured over medial $0.2\text{--}0.4$ (Fig. 17), strigose laterally, T2/T3 suture (Figs. 14–15) complete, very broadly u-shaped, finely crenulate; dorsal carinae of T1 distinctly elevated above surrounding sculpture and weakly converging over basal half, separated by about $0.4 \times$ carapace width at this point, parallel-sided and gradually weakening over distal half, usually reaching suture as a pair of simple carinae similar in appearance to adjacent carinate sculpture; carapace somewhat truncate posteriorly, with distinct concavity mid-ventrally (Fig. 17); marginal lamella (Figs. 10, 16–17) present as a very narrow ridge along T1 and T2, widening posteriorly on T3, extending completely around posterior margin of carapace as a broad, thin flange. Ovipositor $1.15\text{--}1.4$ ($m = 1.25$) $\times$ longer than metasoma; at rest, extending roughly $0.7 \times$ carapace length beyond apex (Fig. 14).

Color: Black; tegula mostly black except outer margin brown; antenna dark brown with scape, pedicel, and basal 3–6 flagellomeres yellowish ventrally; clypeus variously dark reddish brown; mandible yellow except apically; palps pale yellow to whitish; legs patterned as follows: hind coxa dark brown to black basally and posteriorly,

yellow anteriorly and apically, fore and mid coxae more extensively yellow; trochanters yellow; hind femur yellow with broad, subapical brown band, band somewhat more diffuse and largely limited to dorsal and posterior sides of mid femur, fore femur yellow with dark brown spot dorsally over much of basal half; hind tibia gradually darkening from base to apex, at least basal fourth dark brown, fore and mid tibiae yellow; tarsi brown to light brown dorsally, yellowish ventrally.

Male.—As in female except face $1.75\text{--}2.0$ ($m = 1.85$) $\times$ wider than high; antenna with 19–20 segments, flagellomeres gradually becoming shorter towards apex, but subapical flagellomeres longer and usually not as distinctly bead-like as in female, first flagellomere shorter, $0.75\text{--}0.9$ ($m = 0.8$) $\times$ length of second. Hind femur somewhat more slender, $2.95\text{--}3.55$ ($m = 3.25$) $\times$ longer than maximum width. Carapace distinctly narrower, in dorsal view $1.3\text{--}1.45$ ($m = 1.4$) $\times$ longer than maximum width. Subapical brown band on hind femur often more diffuse, fore and mid femora more extensively yellow.

Discussion.—Martin (1955), in his revision of the North American species, delineated several species groups in *Triaspis*. The species described here, however, is not readily assignable to any of Martin's informal groups. To accommodate the neotropical species in general, species groups will have to be re-defined using a larger suite of characters including the propodeal structure and shape of the clypeus. The sculpture of the carapace is of value in separating some species and species groups, but examination of the large amount of reared material available to us indicates that caution is needed when using sculpture alone to identify isolated individuals. In *T. eugenii*, for example, the sculpture underlying the carinations may vary from rugulose and distinctly punctate to nearly smooth.

The two previously described neotropical species that most closely resemble *T. eugenii* have both been reared. *Triaspis azteca*

attacks the bean pod weevil, *Apion godmani* Wagner (Martin 1952, Perez 1985), and the description of *T. vestitica* was based on material reared from *Anthonomus vestitus* Boheman infesting cotton (Viereck 1912).

Members of the genus *Triaspis* are superficially similar to members of the genus *Urosigalphus*, since both have a carapace-like abdomen and similar wing venation. Since both can be reared from the same weevil hosts (including pepper weevil), it is important to exercise care when identifying reared material. As noted above, the species of *Urosigalphus* have an unusually large outer claw on the hind leg.

Etymology.—The species epithet is taken from the only known host, *Anthonomus eugenii*.

ACKNOWLEDGMENTS

We are grateful to Ed Riley and Horace Burke (Texas A&M University) for information on weevil hosts of *T. azteca*, Terry Juneck for assistance with the literature, and Dave Smith (USDA/ARS, Systematic Entomology Laboratory) for facilitating examination of the *Triaspis* collection at the National Museum of Natural History. Phil Stansly, Marco Toapanta, Eugenio Mariscal, José Antonio Sanchez-Garcia, and Jorge Leyva-Vázquez kindly made material available for the description, and provided additional information on hosts and the biological control program. Special thanks to Matt Buffington (Texas A&M University) and Jim Ehrman for preparation of the images. All SEM work was done by Jim Ehrman at the Digital Microscopy Facility, Mount Allison University, Sackville, NB, Canada. This work was supported in part by the Texas Agricultural Experiment Station. The Texas Parks and Wildlife Department is gratefully acknowledged for permission to collect in state parks (permits 39-49, 41-95, and 10-98), from which we obtained specimens of *Triaspis* useful for comparison of species-level characteristics.

LITERATURE CITED

- Belokobyl'skij, S. A. 1998. 12 Subfamily Brachistinae (Calyptinae), pp. 440–489. In Ler, P. A., ed., Key to the Insects of Russian Far East, Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera. Pt. 3. Vladivostok: Dal'nauka, 708 pp. [In Russian]
- Chou, L.-y. and T.-C. Hsu. 1996. The Braconidae (Hymenoptera) of Taiwan. 7. Subtribe Triaspina. Journal of Agricultural Research of China 45: 436–497.
- Clark, W. E. and H. R. Burke. 1996. The species of *Anthonomus* Germar (Coleoptera: Curculionidae) associated with plants in the family Solanaceae. Southwestern Entomologist Supplement 19: 1–114.
- Haliday, A. H. 1835. Essay on parasitic Hymenoptera of the Ichneumonones Adsciti (cont.). Entomological Magazine 3: 121–147.
- Mariscal Mejorado, E., J. L. Leyva Vázquez, and R. Bujanos Muñiz. 1998. Parasitoides del picudo del chile, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae), en Nayarit, México. Vedia 5: 39–46.
- Martin, J. C. 1952. A new braconid from Mexico. The Canadian Entomologist 84: 30–31.
- . 1955. A taxonomic revision of the triaspine braconid wasps of Nearctic America (Hymenoptera). Canada Department of Agriculture, Science Service, Entomology Division. 157 pp.
- Mason, W. R. M. 1974. A generic synopsis of Brachistini (Hymenoptera: Braconidae) and recognition of the name *Charmon* Haliday. Proceedings of the Entomological Society of Washington 76: 235–246.
- Papp, J. 1984. First survey of the Triaspidini species of the Indo-Australian region (Hymenoptera: Braconidae, Calyptinae) 1. The genus *Triaspis* Haliday. Acta Zoologica Academiae Scientiarum Hungaricae 30: 137–158.
- Pérez, G. 1985. Himenópteros parasitoides de *Apion* spp. (Coleoptera: Curculionidae: Apionidae) en Tepoztlán, Morelos. Folia Entomológica Mexicana 63: 39–46.
- Priore, R. and E. Tremblay. 1987. Contributo alla revisione delle specie italiane dei generi *Triaspis* Haliday e *Schizoprymnus* Foerster (Hymenoptera Braconidae). Bollettino del Laboratorio di Entomologia Agraria "Filippo Silvestri" di Portici 44: 47–61.
- Sharkey, M. J. 1997. Subfamily Helconinae, pp. 260–272. In Wharton, R. A., P. M. Marsh, and M. J. Sharkey, eds., Manual of the New World Genera of the Family Braconidae (Hymenoptera). International Society of Hymenopterists. Special publication 1, 439 pp.
- Sharkey, M. J. and R. A. Wharton. 1997. Morphology and Terminology, pp. 19–37. In Wharton, R. A., P. M. Marsh, and M. J. Sharkey, eds., Manual of the New World Genera of the Family Braconidae (Hymenoptera). International Society of Hymenopterists. Special publication 1, 439 pp.
- Shaw, M. R. and T. Huddleston. 1991. Classification and biology of braconid wasps. Handbooks for the Identification of British Insects 7(11): 1–126.
- Shenefelt, R. D. 1970. Braconidae 2: Helconinae [sic], Calyptinae, Mimagathidinae, Triaspinae. In Ferrière, Ch. and J. Van der Vecht, eds., Hymenopterorum Catalogus (nov. ed.) 5: 177–306.
- Tobias, V. I. 1986. 7. Subfam. Brachistinae (Calyptinae). Handbook to the Insects of the European Part of the USSR, 3, Hymenoptera, Part 4: 158–180. Akademia Nauk, Leningrad, 501 pp. [In Russian]
- Viereck, H. L. 1912. Contributions to our knowledge of bees and ichneumon-flies, including the description of twenty-one new genera and fifty-seven new species of ichneumon-flies. Proceedings of the United States National Museum 42: 613–648.



Wharton, Robert and Lopez-Martinez, V. 2000. "A new species of *Triaspis* Haliday (Hymenoptera: Braconidae) parasitic on the pepper weevil, *Anthonomus Eugeniei* cano (Coleoptera: Curculionidae)." *Proceedings of the Entomological Society of Washington* 102, 794–801.

View This Item Online: <https://www.biodiversitylibrary.org/item/54765>

Permalink: <https://www.biodiversitylibrary.org/partpdf/54829>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Smithsonian

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Entomological Society of Washington

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.