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# *Trichogramma* (Hymenoptera: Trichogrammatidae) of Hawaii

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*Abstract.* Ten species of *Trichogramma* are recorded from the Hawaiian Islands. Three of these are described as new. Descriptions, host data, and a key to species are included. The name *T. perkinsi* is clarified. It is a Hawaiian species and its assignment to certain North American populations by previous authors is in error. A neotype for *T. perkinsi* and a lectotype for *T. japonicum* are designated.

In a previous study (Pinto et al. 1978), the identities of several species of North American *Trichogramma* were clarified. This work led to investigations of 2 Hawaiian species, *T. semifumatum* (Perkins) and *T. perkinsi* Girault, names first attributed to island forms that were used inappropriately for various mainland populations (Pinto et al. 1978; also see below). Investigations of the taxonomy of these species prompted a study of the *Trichogramma* fauna of Hawaii. This was initiated by the senior author, who made extensive collections from the major islands (Hawaii, Kauai, Maui, Molokai, and Oahu) of the Hawaiian chain while there on sabbatical leave in 1977. This material was supplemented by an important slide collection, representing material collected in Hawaii from the early part of this century to present, from the Hawaii State Department of Agriculture. More recently, live and preserved specimens of *Trichogramma* were obtained from Dr J. W. Beardsley and Mr Dantje Sembel, Department of Entomology, University of Hawaii at Manoa, and from Dr F. G. Howarth, Bishop Museum, Honolulu, Hawaii.

Ten species of *Trichogramma* are herein reported from Hawaii. Three of these are described as new. A key to species, geographical distribution, and host records are included. Also, a neotype for *T. perkinsi* and a lectotype for *T. japonicum* Ashmead are designated. Additionally, 13 females that we are unable to assign to species are characterized but not treated formally. Crossbreeding studies were conducted with populations of some of the species to corroborate species limits based on morphological structure.

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## MATERIALS AND METHODS

A total of 190 collections were made, of which 138 were from Oahu, 19 from Maui, 15 from Hawaii, 13 from Kauai, and 5 from Molokai. The collections were made between July 8, 1977 and January 20, 1978. Host eggs were isolated individually in size "000" gelatin capsules to insure purity of each *Trichogramma* culture. Soon after the host eggs showed evidence of parasitization (turned black), capsules were streaked inside with pure, diluted honey and shipped by air to the Division of Biological Control, University of California, Riverside. After processing through quarantine, cultures of apparent species (based primarily on gross morphological characters, but also on host egg, host plant, and collection locality) were isolated individually in glass culture tubes (25 × 200 mm). The mouths of the tubes were capped with filter paper discs held in place by snap-on plastic caps from which the central areas had been removed to provide ventilation. To establish a culture, a male and female *Trichogramma* from a single, isolated egg were selected and exposed to fresh *Trichoplusia ni* (Hübner) (Lepidoptera, Noctuidae) eggs. Host eggs were replaced daily until the adults died. The resulting parasitized eggs were held for $F_1$ emergence to initiate the culture. Each culture was kept isolated to assure its purity. Descriptions were based on $P_1$ and $F_1$ material.

Figures of all species in the Hawaiian Islands are provided. Detailed redescriptions, based on Hawaiian material, are included where existing descriptive data are incomplete (e.g., *T. perkinsi*), or where the Hawaiian material deviates somewhat from conspecific populations elsewhere (e.g., *T. pretiosum* Riley).

Descriptions are based primarily on males but, with the exception of antennal and genital structures, apply equally to females. The setal vein tracts and setal patterns in the fore- and hindwings and the mesoscutellar setae are the same in both sexes and thus help separate females.

The *Trichogramma* material we collected was reared, mounted, and preserved as discussed previously (Pinto et al. 1978). Also, the terminology and anatomical traits used here are the same as used previously (Pinto et al. 1978). Acronyms used in the key and descriptions are DEG (dorsal expansion of gonobase), MVP (median ventral projection), and CS (chelate structures). Procedures used in crossbreeding studies were detailed in an earlier paper (Oatman & Platner 1973).

Since collections of the various *Trichogramma* species are limited in their geographic coverage, the range of intraspecific variation is unappreciated for most. Because of this, there is a temptation to consider relatively small differences in disparate populations as indicative of new species. We have taken a conservative approach. The only new species named (*T. vargasi, T. sembeli,* and *T. higai*) are those with relatively major and objectively defined anatomical differences. Populations with differences more conceivably within the range of yet unappreciated variation (e.g., *T. pretiosum* and *T. ostriniae* Pang & Chen) presently are not given formal status.

## RELATIONSHIPS

A detailed classification of the species of *Trichogramma* has never been proposed, and it is premature to articulate one here. However, concepts of relationship are slowly emerging and those presented below are based primarily on male genitalia, size of the mesoscutellar setae, and hindwing venation.

The Hawaiian *Trichogramma* fauna is a mixture of species representing diverse sections of the genus. Five of the 10 species (*T. vargasi,* n. sp., *T. perkinsi, T. sembeli,* n. sp., *T. higai,* n. sp., and *T. semifumatum*) are known only from Hawaii. The remainder are primarily Asian species.

*T. chilonis* Ishii is the most common *Trichogramma* in Hawaii. It is widespread in Asia and belongs to a group of several closely related species (see *Remarks* under *T. chilonis*). The group is characterized by the broad male genital capsule and the prominent lobes of the DEG.

*T. perkinsi* and *T. vargasi,* n. sp., are primarily characterized by the very narrow posterior extension of the DEG and the short MVP. Although known only from Hawaii, they apparently are related to other species from Asia and North America (see *Remarks* under *T. vargasi,* n. sp.). *T. higai,* n. sp., apparently is related to these 2 species on the basis of the narrow DEG, although its MVP is well developed.

*T. japonicum, T. sembeli,* n. sp., and *T. semifumatum* are of doubtful affinity but are tentatively treated together on the basis of their dark body coloration, long anterior mesoscutellar setae, and well-developed vein tracts in the hindwing. *T. japonicum* is widespread in Asia (Nagarkatti 1974). *T. sembeli,* n. sp., and *T. semifumatum* are known only from Hawaii.

*T. pretiosum, T. papilionis* Nagarkatti and *T. ostriniae* belong to a large and ill-defined group of species which includes *T. evanescens* Westwood and *T. minutum* Riley. They are characterized by average tendencies of the male genitalia (i.e., shallowly notched DEG, moderately wide posterior extension of the DEG, well-developed but narrow MVP), short and fine anterior mesoscutellar setae, and poorly developed anterior and posterior vein tracts in the hindwing. Of the 3 representatives in Hawaii, *T. papilionis* also is known from Japan (Nagarkatti 1974), *T. ostriniae* from China (Pang & Chen 1974), and *T. pretiosum* is widespread in the New World (Pinto et al. 1978).

Most of the common species of Hawaiian *Trichogramma* are also known to occur elsewhere. These are either widespread throughout the islands, as in *T. chilonis,* or they are at least locally abundant, as in *T. papilionis.* The rare species on the islands are *T. vargasi,* n. sp., *T. sembeli,* n. sp., *T. semifumatum, T. higai,* n. sp., and *T. perkinsi,* all known only from the Hawaiian Islands. *T. sembeli,* n. sp., although apparently rare, has been collected recently. The other 4 species have not been collected since 1927. *T. semifumatum* is known only from 2 females collected at an unspecified locale on Oahu prior to 1910, and *T. vargasi,* n. sp., is known only from a single collection made in the southern Waianae Mts of Oahu in 1914. *T. perkinsi* is known only from

2 collections, 1 without data and the other from Mt Olympus on Oahu, collected in 1912. *T. higai,* n. sp., is known from a single 1927 collection from Kaala, Oahu. These species are either truly rare, or common in the more inaccessible and infrequently collected higher elevations of the islands. It also is possible that they were once more abundant but have been displaced by more recent adventives.

## Key to the species of Hawaiian *Trichogramma*

Both sexes are needed for optimal use of the following key. A relatively common uniparental form, which we tentatively assign to *T. chilonis* (see below), consequently will not key. *T. semifumatum* also is known from females only; however, females are sufficiently distinct to allow identification. The sex ratio of *T. sembeli,* n. sp., is highly female biased. Unfortunately, males are needed for identification since females are easily confused with those of *T. japonicum.*

1. Females black; ovipositor short, ca. $^{9}/_{10}$ as long as hind tibia; hindwing with anterior and posterior vein tracts prominent and extending to near apex of wing (Fig. 8b); mesoscutellum with anterior pair of setae long, at least ½ length of posterior pair ..... **semifumatum**
   Females without above combination of characters ..... 2
2. Mesoscutellum with anterior pair of setae long, at least ⅓ as long as posterior pair (Fig. 7f, 9f) ..... 3
   Mesoscutellum with anterior pair of setae short, $^{1}/_{6}$–¼ as long as posterior pair (Fig. 1c, 6c) ..... 5
3. DEG with posterior extremity ca. 30% wider than aedeagus, and extending almost to apex of genital capsule; MVP distinct (Fig. 9g) ..... **sembeli, n. sp.**
   DEG with posterior extremity more narrow, if slightly wider than aedeagus then MVP inconspicuous; DEG attaining, at most, apical $^{9}/_{10}$ of genital capsule (Fig. 4e, 7d) ..... 4
4. DEG with posterior extremity distinctly more narrow than aedeagus; MVP distinct (Fig. 4e); flagellum with length of longest seta less than 2× maximum width of flagellum (Fig. 4d) ..... **perkinsi**
   DEG with posterior extremity subequal in width to aedeagus; MVP indistinct (Fig. 7d); flagellum with length of longest seta ca. 3½× maximum width of flagellum (Fig. 7c) ..... **japonicum**
5. Hindwing with posterior and anterior vein tracts well developed, similar to middle tract, attaining apex of wing (Fig. 6b) ..... **higai, n. sp.**
   Hindwing with anterior and, usually, posterior vein tracts poorly developed, composed of few setae, not attaining apex of wing (Fig. 2c) ..... 6
6. DEG with prominent lateral lobes (Fig. 10d) ..... **chilonis**
   DEG without prominent lateral lobes (Fig. 5d, 6e) ..... 7
7. DEG with posterior extremity very narrow, its width less than ½ that of aedeagus (Fig. 5d) ..... **vargasi, n. sp.**

DEG with posterior extremity not as narrow, its width distinctly greater than ½ that of aedeagus (Fig. 1d, 2e, 3d) ..... 8

8. DEG with posterior extremity subtriangular, distinctly pointed at apex, and extending beyond apex of MVP (Fig. 2e) ..... **ostriniae**
   DEG with posterior extremity not subtriangular, rounded at apex, attaining approximately same level as MVP (Fig. 1d) ..... 9

9. Aedeagus ca. $^{9}/_{10}$ length of hind tibia; MVP length subequal to width of middle tibia; ovipositor ca. $^{1}/_{5}$ longer than hind tibia ..... **papilionis**
   Aedeagus no more than $^{4}/_{5}$ length of hind tibia; MVP length distinctly less than width of middle tibia; ovipositor subequal in length to hind tibia ..... **pretiosum**

**Trichogramma pretiosum** Riley Fig. 1a–g

*Trichogramma pretiosa* Riley, 1879: 161.
*Trichogramma pretiosum:* Pinto et al., 1978: 172.

*T. pretiosum* was recently redescribed (Pinto et al. 1978). It is a widespread species known from Costa Rica, Colombia, Australia, and numerous locales in North America. A Hawaiian population from Kilauea, Kauai, failed to interbreed with one of *T. pretiosum* from Irvine, California. However, since no anatomical differences could be found to distinguish Hawaiian specimens, they are treated as *T. pretiosum.*

Quantitative characteristics of the Hawaiian populations are given below. Although within the range of variation already established for *T. pretiosum* (Pinto et al. 1978), Hawaiian populations differ from most North American populations in having shorter flagellar setae, fewer setae in the anterior vein tract of the hindwing, a slightly shorter ovipositor, and slightly darker body color.

♂. *Antenna* (Fig. 1f) with flagellum relatively long, basally arcuate, 0.17 ± 0.004 (0.15–0.20) ($n$=14) as wide as long, and 1.24 ± 0.01 (1.17–1.31) ($n$=14) as long as hind tibia; flagellar setae relatively long, tapering evenly to sharp apex, 46.9 ± 1.7 (36–57) ($n$=14) in number, length of longest seta 2.76 ± 0.03 (2.60–3.00) ($n$=14) maximum width of flagellum. *Forewing* (Fig. 1a) with vein tracts distinct, area between 4th and 5th tracts (i.e., the 2 tracts posterior to the $RS_2$) with 18.9 ± 2.0 (10–34) ($n$=14) setae; length of longest postapical seta on margin of forewing 1.79 ± 0.02 (1.46–2.22) ($n$=10) maximum width of hind tibia. *Hindwing* (Fig. 1b) with middle vein tract prominent and complete to apex; anterior tract short, usually consisting of 3 setae but occasionally with 2 or 4, and extending less than ⅓ length of middle tract; posterior tract with 8–10 setae, extending just past anterior tract and ca. ⅓ length of middle tract. *Mesoscutellum* (Fig. 1c) with anterior pair of setae short and fine, 0.24 ± 0.01 (0.18–0.31) ($n$=14) length of posterior pair. *Genital capsule* (Fig. 1d) 0.33 ± 0.003 (0.31–0.35) ($n$=14) as wide as long; DEG well sclerotized with distinctly notched base and rounded apex; apex of DEG, CS and MVP at nearly same level, attaining 0.86 ± 0.005 (0.82–0.88) ($n$=14), 0.87 ± 0.003 (0.84–0.88) ($n$=14), and 0.86 ± 0.01 (0.82–0.89) ($n$=13) length of genital capsule, respectively; MVP long, narrow, and distinctly pointed. Aedeagus (Fig. 1e) 0.75 ± 0.01 (0.70–0.81) ($n$=14) length of hind tibia (Fig. 1g) with apodemes comprising 0.48 ± 0.01 (0.46–0.57) ($n$=14) its total length.

♀. Ovipositor 0.96 ± 0.01 (0.93–1.00) ($n$=11) as long as hind tibia (Fig. 1g).

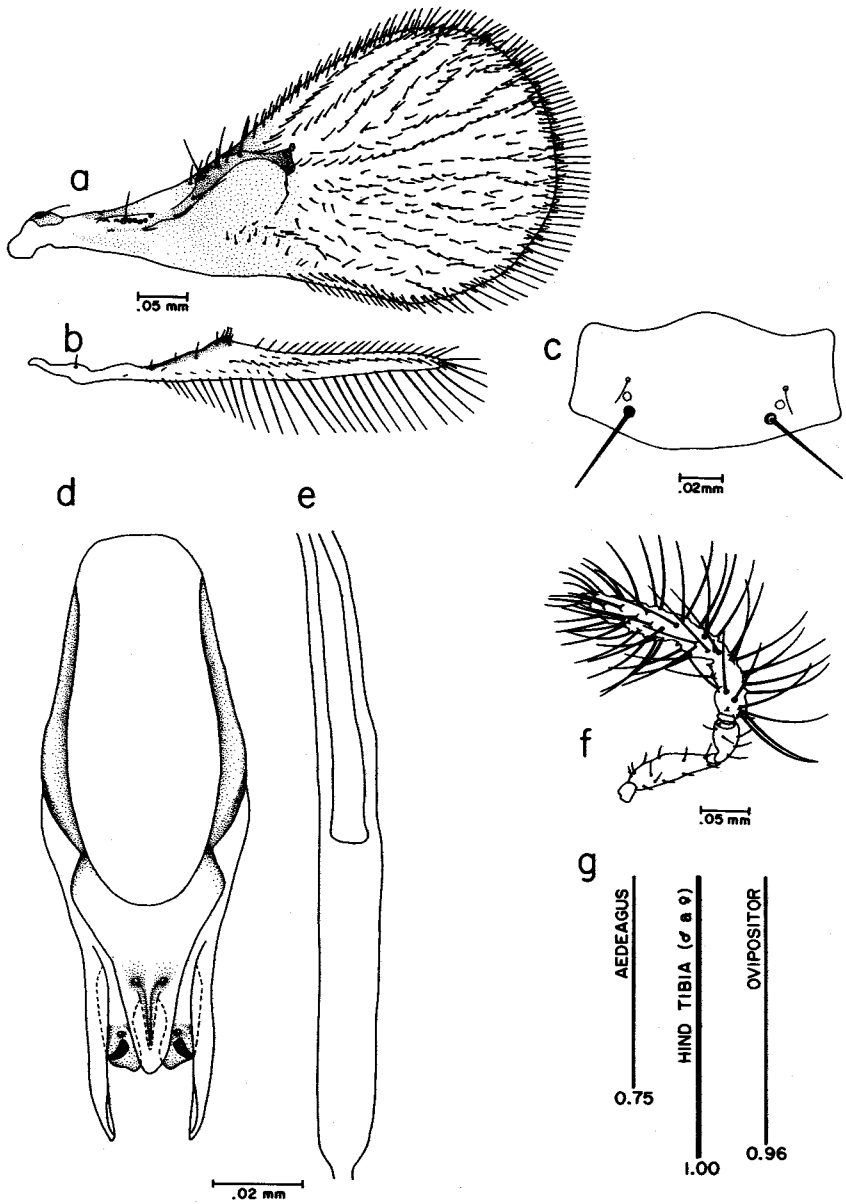


FIG. 1. *Trichogramma pretiosum:* **a,** forewing; **b,** hindwing; **c,** mesoscutellum; **d,** ♂ genital capsule; **e,** aedeagus; **f,** ♂ antenna; **g,** ratio of aedeagus and ovipositor to hind tibia.

*Hawaiian records.* 24♂,16♀ ($P_1$ & $F_1$) representing the following locales. HAWAII I: Kalapana, ex *Macroglossum pyrrhostictum* (Butler) eggs on *Paederia foetida* L. KAUAI I: Kilauea, ex *Heliothis zea* eggs on sweet corn. All material collected in 1977–78, E.R. Oatman.

*Geographical distribution.* Widespread in the New World; also occurs in Australia and Hawaii.

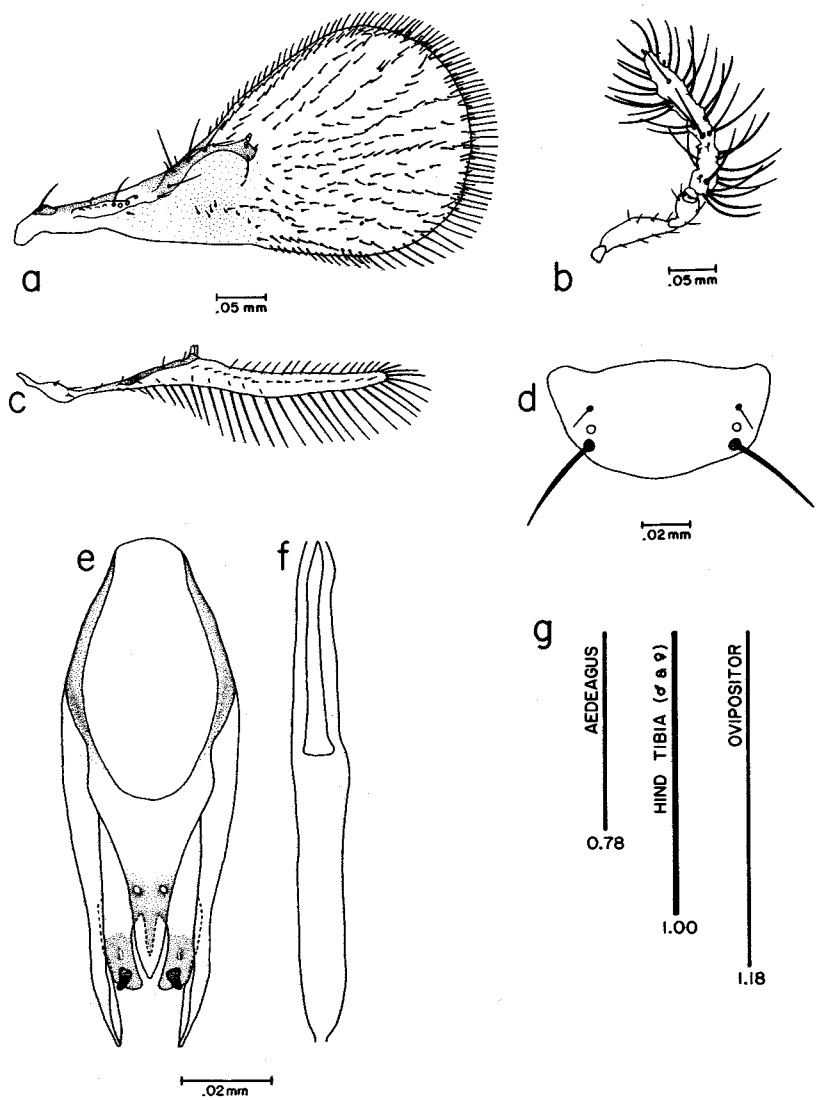


FIG. 2. *Trichogramma ostriniae:* **a,** forewing; **b,** ♂ antenna; **c,** hindwing; **d,** mesoscutellum; **e,** ♂ genital capsule; **f,** aedeagus; **g,** ratio of aedeagus and ovipositor to hind tibia.

**Trichogramma ostriniae** Pang & Chen Fig. 2a–g

*Trichogramma ostriniae* Pang & Chen, 1974: 448, 453.

This species was described by Pang & Chen (1974) from material collected ex eggs of *Ostrinia nubilalis* in Peking, China. We have not examined their material and, consequently, place Hawaiian populations here tentatively on the basis of the original description and included figures.

The original description does not include several of the characters that we utilize. Also, our material differs somewhat from the Peking material insofar as we can determine from the original description. For these reasons a complete description of the Hawaiian populations is presented here.

Based on freshly killed specimens in 70% ethyl alcohol, the color is as follows: similar in both sexes, males generally darker; head capsule light yellow, lightly infuscate; thorax light yellow except pronotum dark brown; abdomen dark brown; legs light yellow, with hind femora lightly infuscate; antennae light yellow in ♂, infuscate except scape light yellow in ♀.

♂. *Antenna* (Fig. 2b) with flagellum moderately long, basally arcuate, 0.18 ± 0.004 (0.15–0.20) ($n$=15) as wide as long, and 1.08 ± 0.01 (1.03–1.13) ($n$=15) as long as hind tibia; flagellar setae moderately long, tapering gradually from base to near apex, then rather abruptly to sharp point, 41.7 ± 1.2 (34–50) ($n$=15) in number, length of longest seta 2.25 ± 0.04 (1.93–2.58) ($n$=15) maximum width of flagellum. *Forewing* (Fig. 2a) with vein tracts well defined, areas between tracts nearly devoid of setae, area between 4th and 5th tracts with 11.7 ± 0.7 (6–15) ($n$=15) setae; length of longest postapical seta on margin of forewing 1.51 ± 0.01 (1.36–1.80) ($n$=9) maximum width of hind tibia. *Hindwing* (Fig. 2c) with middle vein tract prominent and complete to apex; anterior tract usually absent but occasionally with one seta; posterior tract has 5–8 widely spaced setae, extending ½ length of middle tract. *Mesoscutellum* (Fig. 2d) with anterior pair of setae short and fine, 0.26 ± 0.01 (0.18–0.31) ($n$=15) length of posterior pair. *Genital capsule* (Fig. 2e) 0.34 ± 0.004 (0.32–0.37) ($n$=15) as wide as long; DEG well sclerotized, subtriangular, acuminate at apex, abruptly narrowed posterior to basal constriction; apex of DEG and CS at nearly same level, attaining 0.87 ± 0.01 (0.84–0.90) ($n$=15) and 0.88 ± 0.01 (0.84–0.96) ($n$=15) length of genital capsule, respectively; MVP long, narrow, distinctly pointed apex distinctly below that of DEG and CS, attaining 0.83 ± 0.004 (0.80–0.85) ($n$=15) length of genital capsule. Aedeagus (Fig. 2f) 0.70 ± 0.004 (0.66–0.78) ($n$=15) length of hind tibia (Fig. 2g) with apodemes comprising 0.41 ± 0.004 (0.39–0.44) ($n$=15) its total length.

♀. Ovipositor 1.18 ± 0.01 (1.14–1.22) ($n$=13) as long as hind tibia (Fig. 2g).

*Hawaiian records.* 50♂,13♀ ($P_1$ & $F_1$) representing the following locales. OAHU I: Ewa Beach, ex *Danaus plexippus* (L.) eggs on crown flower; Manoa (University of Hawaii campus), ex *Agraulis vanillae* L. eggs on passion vine; Kaneohe; Nuuanu Pali; upper Kalihi Val; upper Manoa Val; all ex *Macroglossum pyrrhostictum* eggs on *Paederia foetida.* All records of *T. ostriniae* were taken from September 1977 through January 1978 by E.R. Oatman.

*Geographic distribution.* Known only from Peking, China, and Hawaii (Oahu I).

*Remarks.* The only trait used to characterize *T. ostriniae* by Pang & Chen (1974) that differs from the Hawaiian population is ovipositor length. The original description states that the ovipositor is slightly shorter than the hind tibia. In the Hawaiian material it is at least 1.14 as long as the hind tibia. Considering the rather extensive variation of ovipositor length in 1 relatively well-collected species, *T. pretiosum* (see Pinto et al. 1978), we hesitate to consider the difference taxonomically significant at this time. However, several traits of *T. ostriniae* (e.g., mesoscutellar setal length, hind wing setation) were not considered by Pang & Chen. Consequently, the assignment of our material to *T. ostriniae* is tentative until a comparison with Peking material can be made.

*T. ostriniae* apparently is closest to *T. chilotraeae* Nagaraja & Nagarkatti from India (Nagaraja & Nagarkatti 1969). In the latter species, the longest setae of the male

flagellum are more than 3× as long as the maximum width of the flagellum. In *T. ostriniae,* they are substantially less than 3× as long.

*T. ostriniae* and *T. chilotraeae* also appear close to *T. minutum* (Pinto et al. 1978) and *T. platneri* Nagarkatti (Nagarkatti 1975). They are best separated from these species by the shape of the DEG. In both *T. ostriniae* and *T. chilotraeae* the DEG narrows abruptly immediately posterior to the basal constriction and is distinctly pointed at its apex (Fig. 2e). In *T. minutum* and *T. platneri* the DEG is of similar width on either side of the basal constriction and its apex is rounded rather than acuminate. *T. ostriniae* also can be separated by the position of the MVP, which is distinctly anterior to the CS. It is only slightly so in *T. minutum* and *T. platneri.* Also, the anterior vein tract in the hindwing is absent or with only 1 seta in the Hawaiian material of *T. ostriniae,* whereas *T. minutum* and *T. platneri* have 2 to 3 setae in the anterior tract.

Populations of *T. ostriniae* from upper Manoa Valley, Oahu, failed to interbreed with those of *T. minutum* from Chula Vista, California, and *T. platneri* from Riverside, California.

**Trichogramma papilionis** Nagarkatti Fig. 3a–g

*Trichogramma papilionis* Nagarkatti, 1974: 391.

This species was recently described from material collected in Fukuoka, Japan (Nagarkatti 1974). It is extremely close to *T. pretiosum* (Pinto et al. 1978) but is separated by the somewhat longer genitalia and ovipositor (see *Key to species*), and the better developed posterior tract of the hindwing (Fig. 3b) which extends ca. ¾ the length of the middle tract compared to slightly less than ½ its length in *T. pretiosum.*

Starting about November 1979, *T. papilionis* replaced *T. chilonis* Ishii as the dominant species in areas being intensively surveyed for *Trichogramma* on Oahu (Dantje Sembel, pers. commun.).

*Hawaiian records.* 55♂,30♀ ($P_1$ & $F_1$) representing the following locales. OAHU I: Manoa (University of Hawaii campus), ex *Danaus plexippus* eggs on crown flower, 1980; Waikiki, ex *Deilephila nerii* (L.) eggs on oleander, 1980; and Waimanalo, ex *Macroglossum pyrrhostictum* eggs on *Paederia foetida,* 1979–80. All material collected by D.T. Sembel.

*Geographical distribution.* Japan and Hawaii.

**Trichogramma perkinsi** Girault Fig. 4a–g

*Pentarthron flavum* Perkins, 1910: 660, not *Trichogramma flavus* Ashmead.
*Trichogramma perkinsi* Girault, 1912: 94, n. n. for *P. flavum* Perkins.

Based on specimens removed from Canada balsam and remounted in Hoyer's medium on glass slides, both sexes are light brownish yellow.

♂. *Antenna* (Fig. 4d) with flagellum basally arcuate, short, 0.26 ± 0.01 (0.24–0.29) ($n$=5) as wide as long, and 0.79 ± 0.01 (0.76–0.81) ($n$=6) as long as hind tibia; flagellar setae short, tapering almost imperceptibly to near apex, then abruptly to sharp point, ca. 35 in number, length of longest seta 1.20 ± 0.06 (1.00–1.39) ($n$=5) maximum width of flagellum. *Forewing*

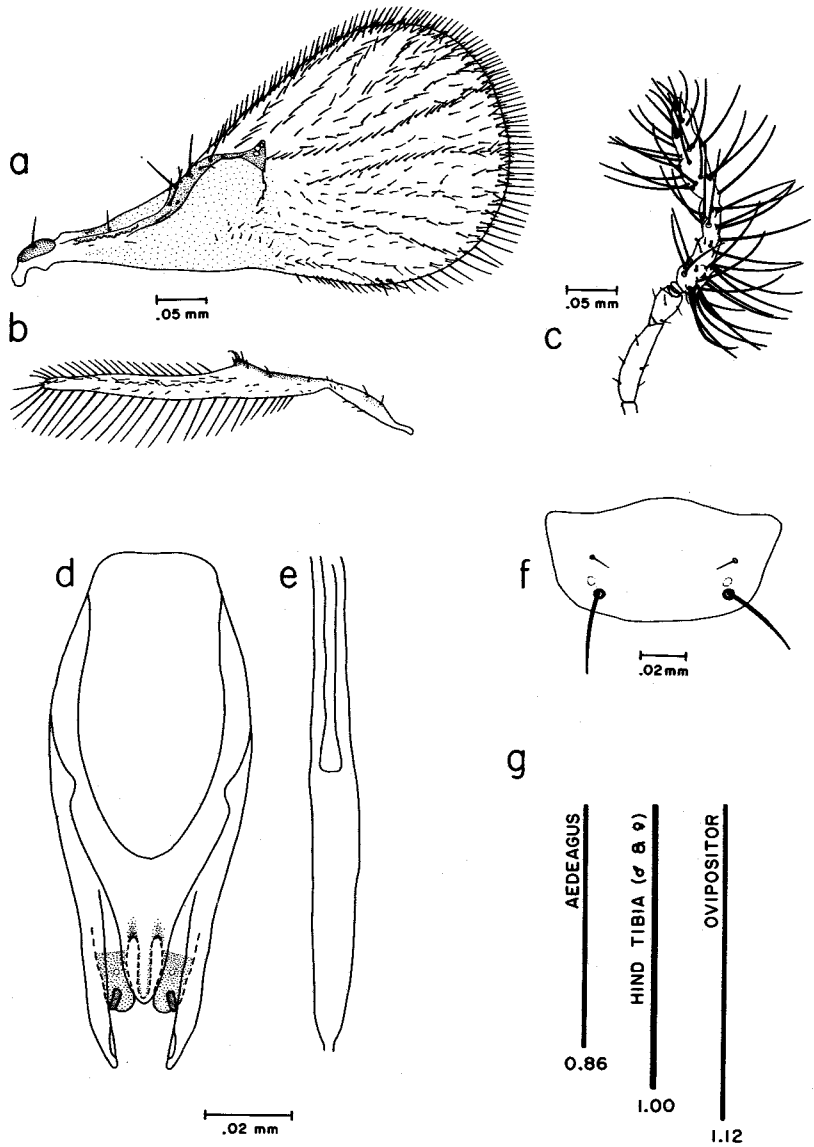


FIG. 3. *Trichogramma papilionis:* **a,** forewing; **b,** hindwing; **c,** ♂ antenna; **d,** ♂ genital capsule; **e,** aedeagus; **f,** mesoscutellum; **g,** ratio of aedeagus and ovipositor to hind tibia.

(Fig. 4a) with well-defined vein tracts, areas between tracts relatively devoid of setae, area between 4th and 5th tracts with 23.2 ± 2.3 (14–28) ($n$=6) setae; length of longest postapical seta on margin of forewing 1.16 ± 0.04 (1.08–1.27) ($n$=5) maximum width of hind tibia. *Hindwing* (Fig. 4b) with middle vein tract prominent and complete to apex; anterior tract with 5–6 setae, extending at least ½ length of middle tract; posterior tract extending almost to apex;

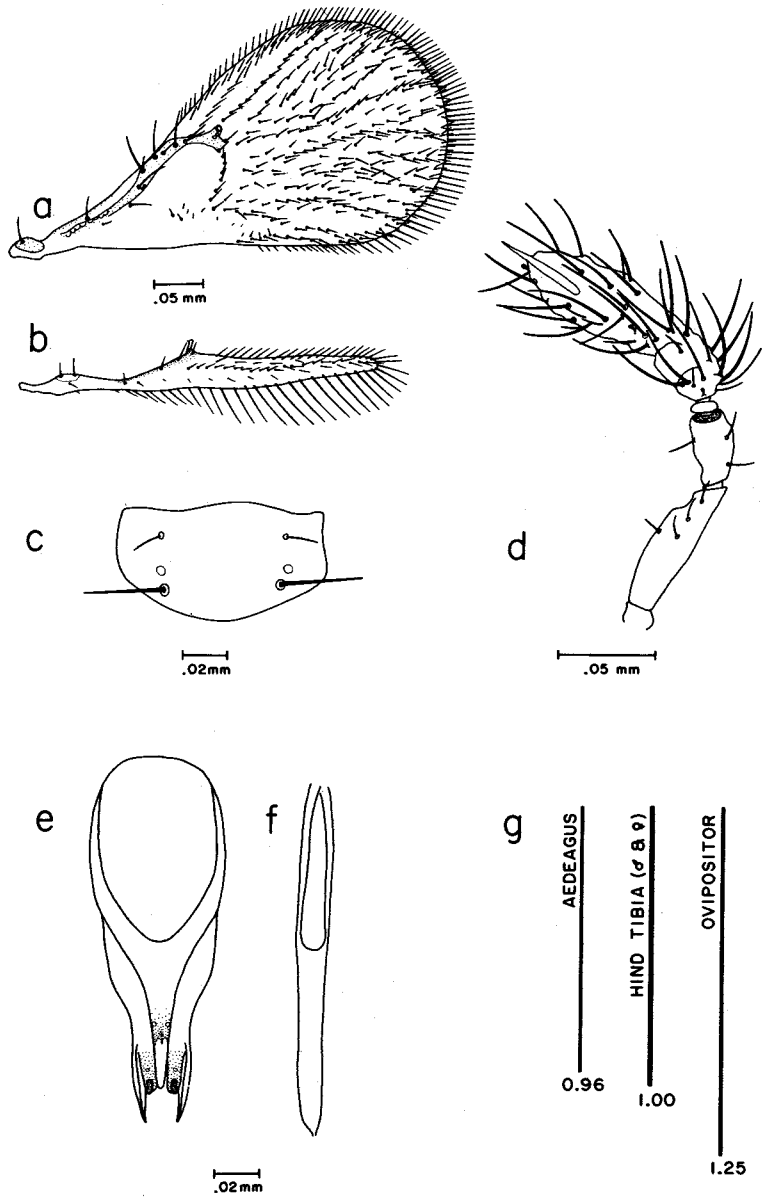


FIG. 4. *Trichogramma perkinsi:* **a,** forewing; **b,** hindwing; **c,** mesoscutellum; **d,** ♂ antenna; **e,** ♂ genital capsule; **f,** aedeagus; **g,** ratio of aedeagus and ovipositor to hind tibia.

setae in all tracts subequal in length. *Mesoscutellum* (Fig. 4c) with anterior pair of setae ca. ½ length of posterior pair. *Genital capsule* (Fig. 4e) 0.35 ± 0.01 (0.34–0.37) ($n$=5) as wide as long; DEG not constricted or notched basally, narrowing abruptly from base to narrow, rounded apex attaining 0.90 ± 0.01 (0.89–0.92) ($n$=5) length of genital capsule; CS attaining 0.91 ±

0.003 (0.90–0.92) ($n$=6) length of genital capsule; MVP very short, subtriangular, attaining 0.77 ± 0.004 (0.76–0.79) ($n$=6) length of genital capsule. Aedeagus (Fig. 4f) 0.96 ± 0.01 (0.94–1.02) ($n$=5) length of hind tibia (Fig. 4g), with apodemes comprising 0.45 ± 0.004 (0.44–0.46) ($n$ = 5) its total length.

♀. Ovipositor 1.25 ± 0.02 (1.20–1.30) ($n$=6) as long as hind tibia (Fig. 4g).

*Type information.* Neotype, herein designated, ♂, HAWAIIAN IS: OAHU I: Mt Olympus, ex egg of *Vanessa kamehameha* Escholtz, 21.I.1912 (collector not specified). Neotype deposited in Bishop Museum. 14 (5♂,9♀) additional specimens from this series are in the collections of the Hawaii State Department of Agriculture and the University of California, Riverside.

*Geographical distribution.* Presently known only from Mt Olympus, Oahu, Hawaii.

*Remarks. T. perkinsi* is similar to *T. vargasi,* n. sp. (see *Remarks* for *T. vargasi* below). *T. perkinsi* is a replacement name for *T. flavum* (Perkins 1910) that has been erroneously applied to certain North American populations of *Trichogramma* (e.g., Nagarkatti & Nagaraja 1971, Nagaraja & Nagarkatti 1973) without attempting to reconcile the fact that it clearly was based on material from Hawaii (Perkins 1910). We now believe that material redescribed as *T. perkinsi* by Nagarkatti & Nagaraja (1971) is what was described as *T. exiguum* Pinto & Platner (Pinto et al. 1978). This species is not related to *T. perkinsi* as herein defined. Instead, it is close to *T. minutum.*

Perkins (1910) based his description of *Pentarthron flavum* on 1 or more females from Honolulu, Oahu. Attempts to locate this material in Bishop Museum, British Museum of Natural History and United States National Museum of Natural History have failed. Our concept of this species is based on the original description and, more importantly, on a slide in the Perkins collection (British Museum) identified as *T. flavum* (Slide No. 1955-742). Although both sexes are represented, we have not chosen a neotype from this material, as it lacks collection data. However, we feel reasonably certain that the specimens were collected in Hawaii, since the host egg is identified on the slide as *Omiodes* (=*Hedylepta*), a common Hawaiian genus.

**Trichogramma vargasi** Oatman & Platner, **new species** Fig. 5a–g

Based on specimens removed from Canada balsam and remounted in Hoyer's medium on glass slides, both sexes are light brownish yellow; males are slightly darker.

♂. *Antenna* (Fig. 5f) with flagellum basally arcuate, 0.23 ± 0.02 (0.21–0.25) ($n$=2) as wide as long, and 0.85 ± 0.04 (0.77–0.90) ($n$=3) as long as hind tibia; flagellar setae moderately long, tapering evenly to apex, ca. 40 in number, length of longest seta 2.27 ± 0.16 (2.11–2.44) ($n$=2) maximum width of flagellum. *Forewing* (Fig. 5a) with well-defined vein tracts, areas between tracts nearly devoid of setae, area between 4th and 5th tracts with 31.3 ± 2.3 (27–35) ($n$=3) setae; length of longest postapical seta on margin of forewing 1.22 ± 0.06 (1.17–1.33) ($n$=3) maximum width of hind tibia. *Hindwing* (Fig. 5b) with middle vein tract prominent and complete to apex; anterior tract with 2–6 setae, extending ca. ½ length of middle tract; posterior tract extending almost to apex; setae on all tracts subequal in length. *Mesoscutellum* (Fig. 5c) with anterior pair of setae short and fine, ca. $^1/_5$ length of posterior pair. *Genital capsule* (Fig. 5d) 0.31 ± 0.004 (0.306–0.314) ($n$=2) as wide as long; DEG not constricted or notched

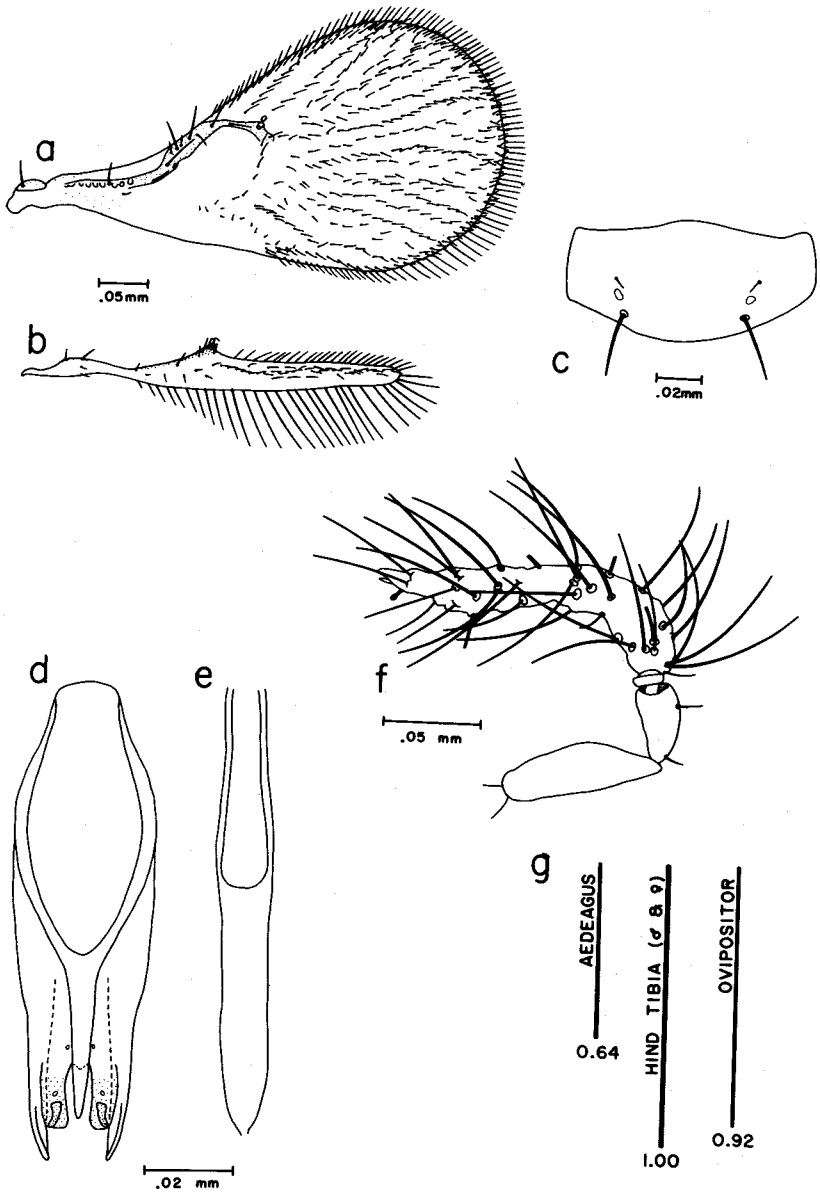


FIG. 5. *Trichogramma vargasi:* **a,** forewing; **b,** hindwing; **c,** mesoscutellum; **d,** ♂ genital capsule; **e,** aedeagus; **f,** ♂ antenna; **g,** ratio of aedeagus and ovipositor to hind tibia.

basally, narrowing abruptly from base to narrow, rounded apex, attaining 0.86 ± 0.03 (0.80–0.90) ($n$=3) length of genital capsule; CS attaining 0.92 ± 0.002 (0.91–0.92) ($n$=3) length of genital capsule; MVP very short, subtriangular, attaining 0.78 ± 0.01 (0.76–0.80) ($n$=3) length of hind tibia (Fig. 5g), with apodemes comprising 0.46 ± 0.01 (0.44–0.47) ($n$=3) its total length.

♀. *Forewing* with area between 4th and 5th vein tracts with 31.3 ± 2.0 (28–35) ($n$=3) setae; length of longest postapical seta on margin of forewing 1.13 ± 0.05 (1.08–1.18) ($n$=2) maximum width of hind tibia. *Ovipositor* 0.92 ± 0.02 (0.89–0.95) ($n$=3) as long as hind tibia (Fig. 5g).

*Type information.* Holotype ♂ (BISHOP 12,422), HAWAIIAN IS: OAHU I: S Waianae Mts, from egg of *Amorbia* sp., 26.IV.1914 (collector not specified). Allotype ♀, same data as holotype. Holotype and allotype deposited in Bishop Museum. 4 (2♂,2♀) additional specimens from the type series are in the collection of the Hawaii State Department of Agriculture and the University of California, Riverside.

*Geographical distribution.* Presently known only from S Waianae Mts, Oahu, Hawaii.

*Remarks.* Among Hawaiian species, *T. vargasi* is most similar to *T. perkinsi.* The 2 are easily separated by the length of the flagellar setae. In *T. perkinsi* the longest seta is only ca. 1.2× the maximum width of the flagellum, whereas in *T. vargasi* they are more than 2× the flagellar width. Additionally, the anterior pair of mesoscutellar setae in *T. vargasi* is short, ca. 1/5 the length of the posterior pair, whereas in *T. perkinsi* they are ca. ½ the length of the posterior setae.

Both Hawaiian species are similar to 3 others in which the posterior extremity of the DEG is also long and narrow, and the MVP is reduced. These are *T. parkeri* Nagarkatti, 1975, from North America, *T. principia* Sugonjaev & Sorokina, 1976, from Asia Minor, and *T. raoi* Nagaraja, 1973, from India.

*T. raoi* is easily separated by its extremely reduced MVP, which is barely visible in slide preparations. *T. principia* is separable by the subacute rather than truncate base of the genital capsule, and the long apodemes of the aedeagus, which comprise ca. ⅔ the total aedeagus length. *T. parkeri* is separated from *T. perkinsi* by its longer flagellar setae which are ca. 2½× as long as the maximum width of the flagellum rather than only 1.2× as long as in *T. perkinsi.* Also, in *T. parkeri* the ovipositor is subequal to the length of the hind tibia, but 1.3× as long in *T. perkinsi. T. vargasi* can be separated from *T. parkeri* by its much shorter aedeagus (⅔ the length of the hind tibia) as compared to that of *T. parkeri* (subequal in length to the hind tibia). Also, the genital capsule of *T. parkeri* is longer and more slender (ca. ¼ as wide as long) than that of *T. vargasi* (ca. ⅓ as wide as long).

**Trichogramma higai** Oatman & Platner, **new species** Fig. 6a–g

Based on specimens removed from Canada balsam and remounted in Hoyer's medium on glass slides, both sexes are dark brown.

♂. *Antenna* (Fig. 6d) with flagellum basally arcuate, 0.25 ± 0.002 (0.250–0.253) ($n$=2) as wide as long, and 0.90 ± 0.003 (0.89–0.90) ($n$=2) as long as hind tibia; flagellar setae short, tapering imperceptibly to near apex, then abruptly to sharp point, ca. 44 in number; length of longest seta 1.37 ± 0.02 (1.35–1.38) ($n$=2) maximum width of flagellum. *Forewing* (Fig. 6a) with well-defined vein tracts, area between vein tracts with numerous setae, area between 4th and 5th tracts with 56.5 (45–68) ($n$=2) setae; length of longest postapical seta on margin of forewing 1.37 ± 0.07 (1.29–1.44) ($n$=2) maximum width of hind tibia. *Hindwing* (Fig. 6b) with middle vein tract prominent and complete to apex; anterior and posterior tracts extending to

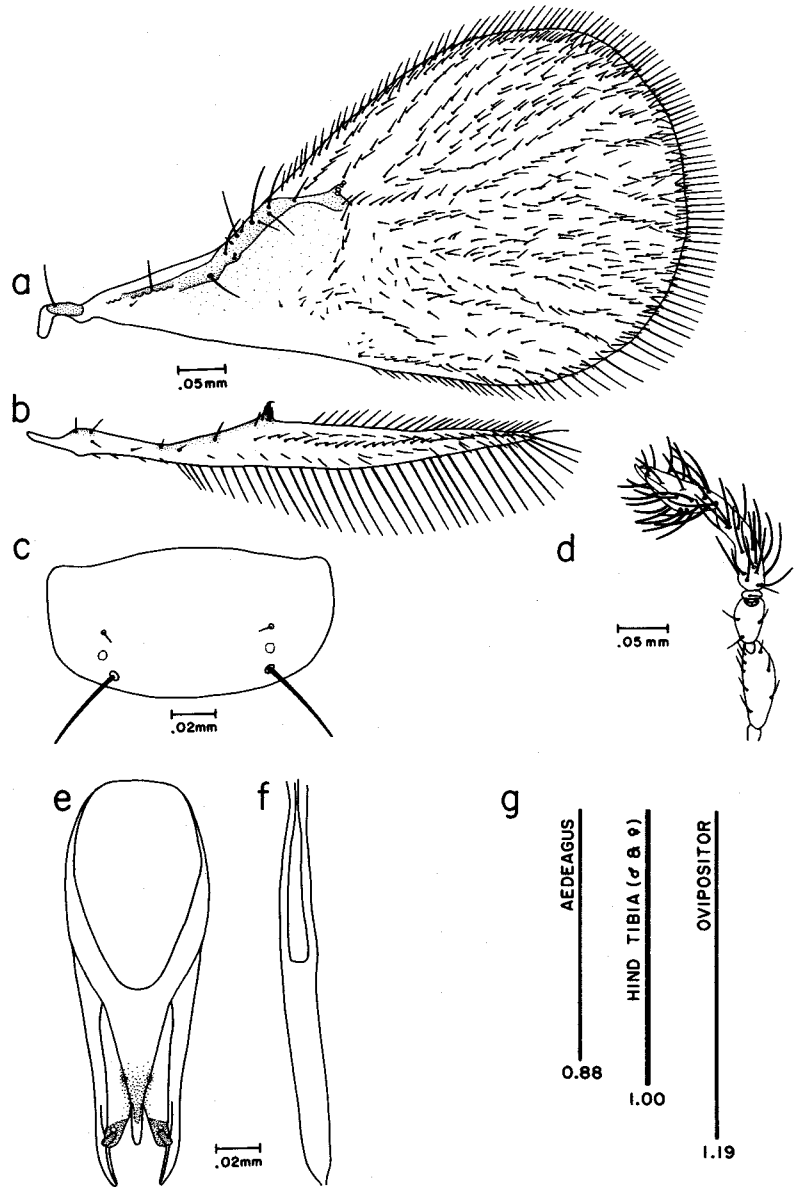


FIG. 6. *Trichogramma higai:* **a,** forewing; **b,** hindwing; **c,** mesoscutellum; **d,** ♂ antenna; **e,** ♂ genital capsule; **f,** aedeagus; **g,** ratio of aedeagus and ovipositor to hind tibia.

near apex; setae on all tracts subequal in length. *Mesoscutellum* (Fig. 6c) with anterior pair of setae short and fine, ca. ⅛ length of posterior pair. *Genital capsule* (Fig. 6e) with DEG narrowing gradually from base to narrow, rounded apex (last ⅓ of structure), attaining 0.89 ± 0.03 (0.86–0.92) ($n$=2) length of genital capsule; CS attaining 0.93 ± 0.01 (0.92–0.94) ($n$=2) length

of genital capsule; MVP moderately short, attaining 0.87 ± 0.002 (0.866–0.871) ($n$=2) the length of genital capsule. Aedeagus (Fig. 6f) 0.89 ± 0.01 (0.87–0.90) ($n$=2) length of hind tibia (Fig. 6g), with apodemes comprising 0.45 ± 0.01 (0.44–0.46) ($n$=2) its length.

♀. *Forewing* area between 4th and 5th vein tracts with 68.4 ± 5.5 (40–81) ($n$=7) setae; length of longest postapical seta on margin of forewing 1.33 ± 0.05 (1.31–1.5) ($n$=7) maximum width of hind tibia. *Ovipositor* 1.19 ± 0.02 (1.12–1.29) ($n$=6) as long as hind tibia (Fig. 6g).

*Type information.* Holotype ♂ (BISHOP 12,423), HAWAIIAN IS: OAHU I: Mt Kaala, from eggs of *Spheterista pleonectes* (Walsingham) (as *S. asaphopis* Meyrick) (Tortricidae), collected on *Cheirodendron* sp., 14.VIII.1927, O.H. Swezey. Allotype ♀, same data as holotype. Holotype and allotype deposited in Bishop Museum. 8 (1♂,7♀) additional specimens from the type series are in the collection of the Hawaii State Department of Agriculture and the University of California, Riverside.

*Geographical distribution.* Presently known only from Mt Kaala, Oahu, Hawaii.

*Remarks. T. higai* is similar to *Trichogramma plasseyensis* Nagaraja, 1973. It can be separated by the anterior and posterior vein tracts in the hindwing. They extend to near the apex in *T. higai,* whereas in the holotype male of *T. plasseyensis,* the anterior tract consists of only 1 seta on 1 hindwing and none on the other; the posterior tract extends only about ½ the length of the middle tract. Also, the apex of the DEG in *T. higai* is longer and more narrow than that in *T. plasseyensis.*

### **Trichogramma japonicum** Ashmead Fig. 7a–g

*Trichogramma japonicum* Ashmead, 1904: 165.—Ishii, 1941: 171.—Nagarkatti & Nagaraja, 1971: 22.—Nagaraja, 1973: 280.—Pang & Chen, 1974: 451.
*Neotrichogramma japonicum:* Girault, 1911: 192.

This species was recently redescribed by Nagarkatti & Nagaraja (1971).

*Type information.* Ashmead's original description was based on numerous specimens from Gifu, Japan, "bred by Mr. Y. Nawa from unknown lepidopterous eggs," and deposited in the United States National Museum of Natural History. All of these specimens were placed on a single piece of cardboard. We have mounted a single male from this material on a glass slide in Hoyer's medium and herein designate it as lectotype (USNM Type #7218).

*Hawaiian records.* KAUAI I: Hanapepe, ex *Sepedon* eggs, 1970. MAUI I: Waiehu, ex *Sepedon* eggs, 1975; Waihee, ex *Sepedon* eggs, 1970. OAHU I: Waipahu, ex *Chilo* eggs, 1928.

*Geographical distribution.* Occurs in India and China and throughout much of southeastern Asia to Japan, the Philippines, and Hawaii.

*Remarks. T. japonicum* resembles *T. sembeli,* n. sp., most closely. Characteristics separating these species are listed in the treatment of *T. sembeli,* n. sp.

### **Trichogramma semifumatum** (Perkins) Fig. 8a, b

*Pentarthron semifumatum* Perkins, 1910: 659.
*Trichogramma semifumatum:* Pinto et al., 1978: 170.

*T. semifumatum* is known only from the 2 type females from Oahu. A redescription and lectotype designation were provided by Pinto et al. (1978). Like *T. perkinsi,* the

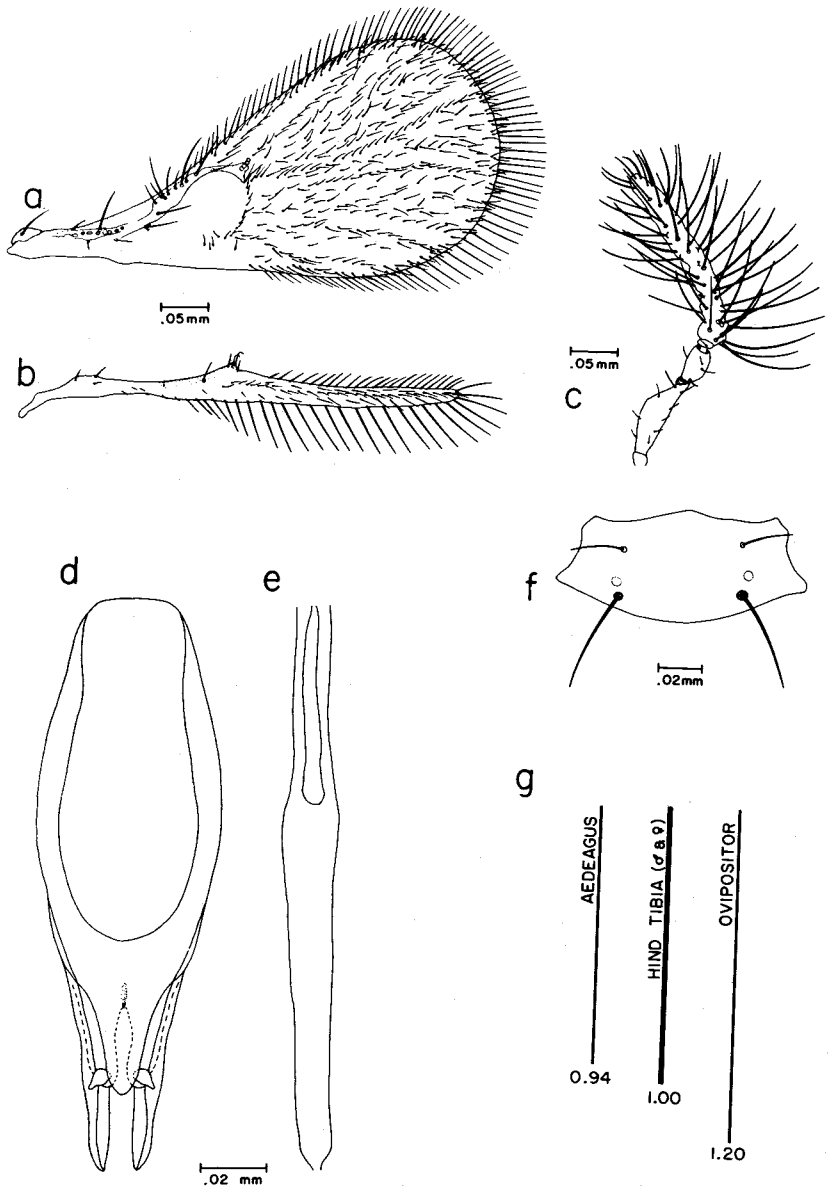


FIG. 7. *Trichogramma japonicum:* **a,** forewing, **b,** hindwing; **c,** ♂ antenna; **d,** ♂ genital capsule; **e,** aedeagus; **f,** mesoscutellum; **g,** ratio of aedeagus and ovipositor to hind tibia.

name *T. semifumatum* had previously been applied erroneously to a common North American species, in this case *T. pretiosum* (see Pinto et al. 1978).

Dark body coloration, short ovipositor ($^{9}/_{10}$ as long as the hind tibia), long anterior mesoscutellar setae, and relatively well-developed anterior and posterior vein tracts

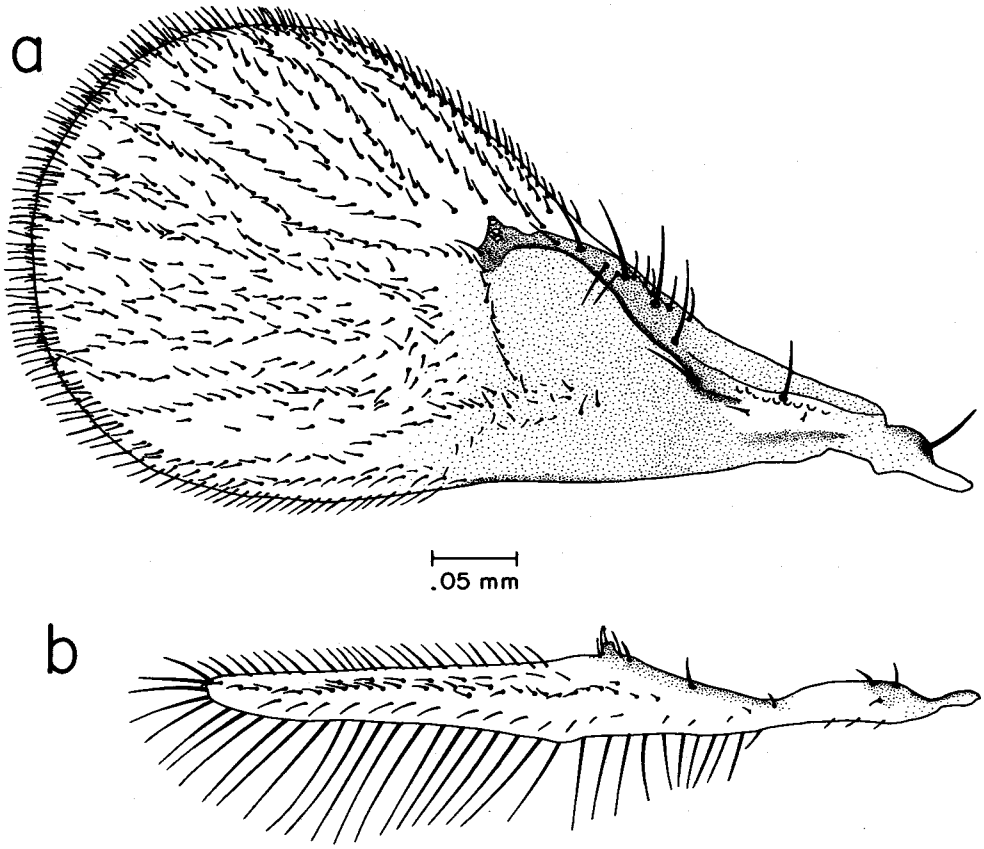


FIG. 8. *Trichogramma semifumatum:* **a,** forewing; **b,** hindwing.

in the hindwing (Fig. 8b) separate females of *T. semifumatum* from other Hawaiian *Trichogramma* (also see *Remarks* for *T. sembeli,* n. sp.).

*Geographical distribution.* Known only from the island of Oahu, Hawaii.

**Trichogramma sembeli** Oatman & Platner, **new species** Fig. 9a–h

Based on specimens mounted in Hoyer's medium, the color is as follows: similar in both sexes; head capsule dark brown with lighter band, containing numerous small, dark, rodlike spots across head below ocelli; thorax and abdomen dark brown; hind legs dark brown, except trochanter of ♀ infuscate; front and middle legs infuscate; tarsi yellow, with last segment infuscate; antennae infuscate; head and abdomen darker than rest of body.

♂, *alate. Antennae* (Fig. 9e) with flagellum relatively short and straight, 0.22 as wide as long, and 0.89 as long as hind tibia; flagellar setae short, tapering gradually and evenly from base to sharp apex, 68 in number, length of longest seta 1.32 maximum width of flagellum. *Forewing*

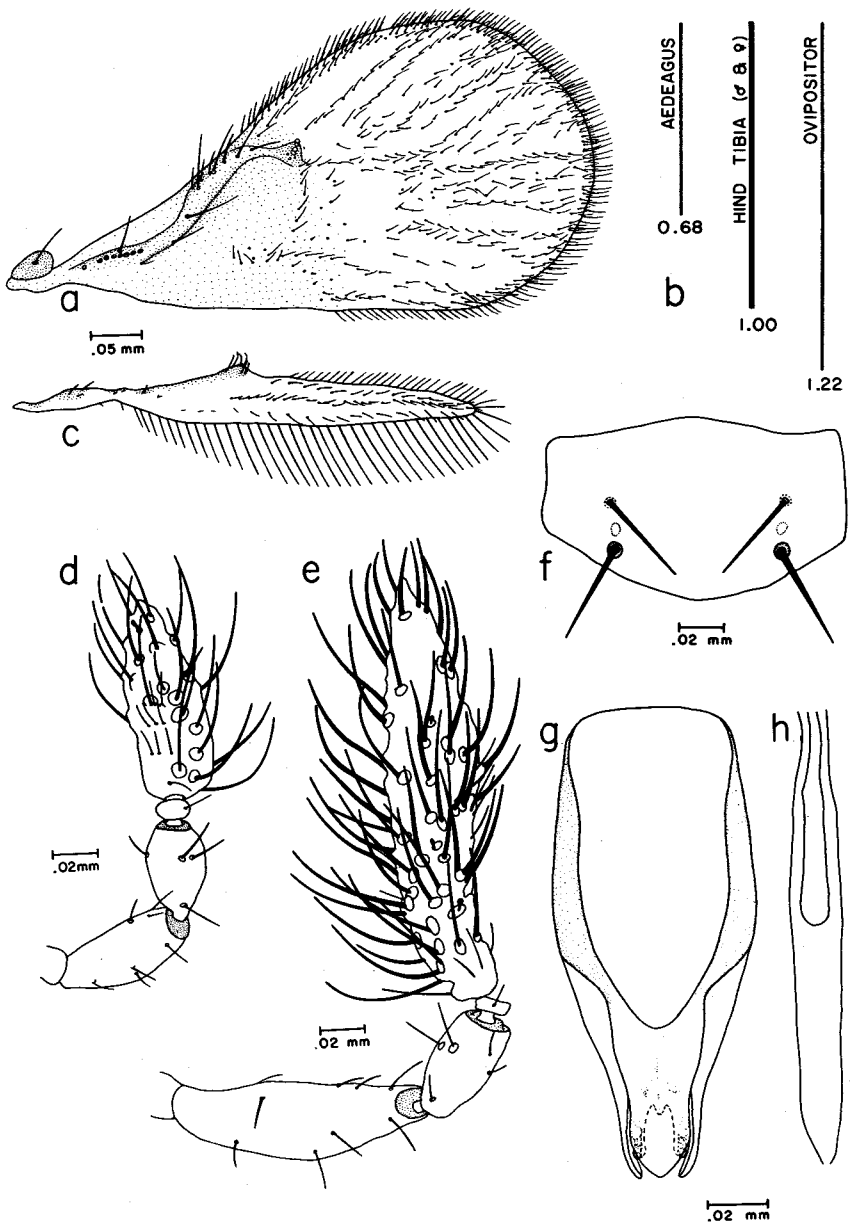


FIG. 9. *Trichogramma sembeli:* **a,** forewing; **b,** ratio of aedeagus and ovipositor to hind tibia; **c,** hindwing; **d,** ♂ (apterous) antenna; **e,** ♂ (alate) antenna; **f,** mesoscutellum; **g,** ♂ genital capsule; **h,** aedeagus.

(Fig. 9a) with vein tracts distinct, area between tracts with moderate number of setae, area between 4th and 5th tracts with 19 setae; length of longest postapical seta on margin of forewing 0.64 maximum width of hind tibia. *Hindwing* (Fig. 9c) with middle vein tract prominent and complete to apex; anterior and posterior tracts with setae subequal in length to those

of middle tract, both terminating just short of apex. *Mesoscutellum* (Fig. 9f) with anterior pair of setae long and thick, 0.91 length of posterior pair. *Genital capsule* (Fig. 9g) 0.41 as wide as long; DEG well sclerotized, large, wide with rounded blunt apex extending beyond CS, attaining 0.98 length of genital capsule; CS nearly reaching apex of gonoforceps, 0.96 length of genital capsule; MVP short and poorly developed, 0.87 length of genital capsule. Aedeagus (Fig. 9h) 0.68 length of hind tibia (Fig. 9b) with apodemes comprising 0.42 its total length.

♂, *apterous. Antenna* (Fig. 9d) gynecoid; flagellum short, thick and straight, 0.34 as wide as long, and 0.55 as long as hind tibia; flagellar setae short, shape as in alate form, 22 in number; length of longest seta 1.62 maximum width of flagellum. *Mesoscutellum* with anterior setae as in alate form, 0.80 length of posterior pair. *Genital capsule* 0.43 as wide as long; DEG, CS, and MVP as in alate form, attaining 0.96, 0.95, and 0.86 length of genital capsule, respectively. Aedeagus 0.84 length of hind tibia with apodemes comprising 0.43 its total length.

♀. *Forewing* with area between 4th and 5th vein tracts with 23.3 ± 0.91 (20–27) ($n$=10) setae; length of longest postapical seta on margin of forewing 0.81 ± 0.03 (0.71–0.92) ($n$=7) the maximum width of hind tibia. *Mesoscutellum* with anterior pair of setae long and thick, 0.96 ± 0.01 (0.88–1.00) ($n$=10) the length of posterior pair. *Ovipositor* 1.23 ± 0.003 (1.22–1.24) ($n$=10) as long as hind tibia (Fig. 9b).

*Type information.* Holotype ♂ (BISHOP 12,424) (alate), HAWAIIAN IS: OAHU I: upper Manoa Val, from *Macroglossum pyrrhostictum* egg on *Paederia foetida,* 3.VIII.1978, D.T. Sembel; allotype ♀, same data as holotype. Holotype and allotype deposited in Bishop Museum. 17 (1 apterous ♂, 16♀) additional specimens from the type-locality are in the University of California, Riverside collection.

*Hawaiian records.* 3 alate ♂, 3 apterous ♂ and 27♀ representing the following locales: OAHU I: upper Manoa Val (type-locality, see above); Waikiki, ex *Deilephila nerii* eggs on oleander, 1978, D.T. Sembel; Honolulu, ex *Protoparce cingulata,* 1910, D.T. Fullaway.

*Geographical distribution.* Presently known only from Oahu I.

*Remarks.* When first collected, *T. sembeli* was thought to be *T. semifumatum* (Pinto et al. 1978) because of the long, thick anterior pair of setae on the mesoscutellum and the very dark brown coloration of the adult. However, upon close examination of females (only sex available at that time), it was noted that the ovipositor to hind tibia ratio and vein tracts in the hindwing were different. The ovipositor of *T. sembeli* is 1.22 the length of the hind tibia; that of *T. semifumatum* is only 0.89 the length of the hind tibia. In *T. sembeli,* the anterior and posterior vein tracts in the hindwing are nearly the same length and extend almost to the apex, whereas in *T. semifumatum,* the anterior tract is shorter than the posterior tract and neither extends as far towards the apex.

*T. sembeli* is also similar to *T. japonicum* Ashmead (Nagarkatti & Nagaraja 1971), both having very dark coloration, a long ovipositor, and almost identical hindwing vein tracts. However, the 2 species can easily be separated by genitalic structure. In *T. sembeli* the MVP is short but distinct; in *T. japonicum* it is inconspicuous. Also, the apex of the CS and DEG are considerably posterior to the apex of the gonoforceps in *T. japonicum* (attaining ca. 0.80 the length of the genital capsule), whereas in *T. sembeli,* they approach the apex of the gonoforceps very closely. The shape of the DEG also differs in these species (see Fig. 7d, 9g).

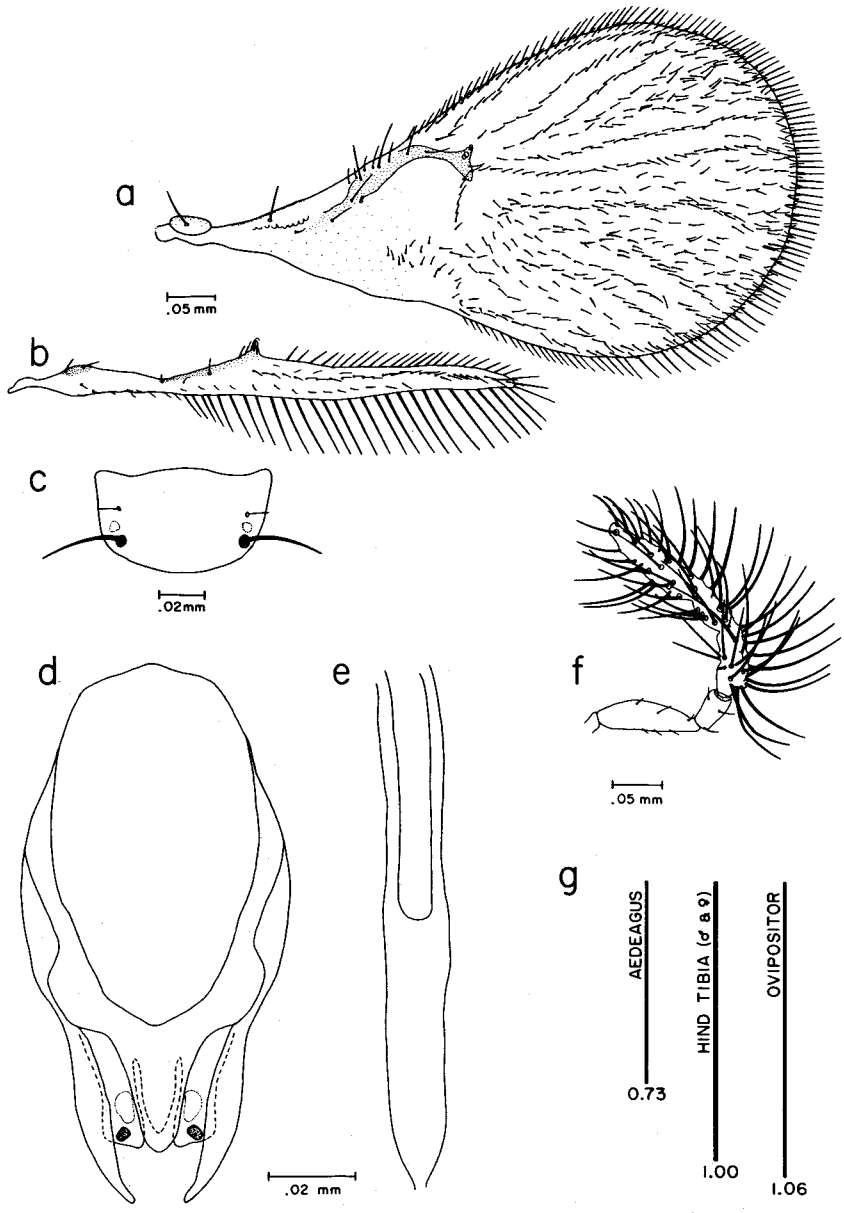


FIG. 10. *Trichogramma chilonus:* **a,** forewing; **b,** hindwing; **c,** mesoscutellum; **d,** ♂ genital capsule; **e,** aedeagus; **f,** ♂ antenna; **g,** ratio of aedeagus and ovipositor to hind tibia.

The length of the flagellum and flagellar setae provide another means of separating males of *T. sembeli* from *T. japonicum* males. In *T. sembeli,* the flagellum is only ca. $^{9}/_{10}$ as long as the hind tibia and the length of the longest flagellar seta is distinctly less than 2× the maximum width of the flagellum. In *T. japonicum,* the flagellum is dis-

tinctly longer than the hind tibia and the longest seta is ca. 3½× the maximum width of the flagellum.

Length of the mesoscutellar setae may be helpful in separating females. In *T. sembeli,* the anterior pair of setae is at least 4/5 the length of the posterior pair, whereas, in *T. japonicum,* they are ca. ½ the length of the posterior pair.

Except for the 2 males described above, only females of *T. sembeli* have been reared from host eggs.

**Trichogramma chilonis** Ishii Fig. 10a–g

*Trichogramma chilonis* Ishii, 1941: 173–75.—Nagarkatti & Nagaraja, 1979: 115–18.
*Trichogramma australicum:* Nagarkatti & Nagaraja, 1968: 81–96; 1971: 15–16; 1977: 157–76.—Nagaraja, 1973: 281.—Pang & Chen, 1974: 444.—Sugonjaev & Sorokina, 1976: 777–79. Misidentifications.
*Trichogramma confusum* Viggiani, 1976: 182–83.

This species was redescribed (as *T. australicum*) by Nagarkatti & Nagaraja (1971). Nagarkatti & Nagaraja (1979) designated a lectotype and also reviewed the history of confusion of this species with *T. australicum.*

The prominent lateral lobes of the DEG (Fig. 10d) distinguish this species from all other *Trichogramma* known from Hawaii. However, it is close to several other species, namely *T. bactriana* Sugonjaev & Sorokina, 1976; *T. poliae* Nagaraja, 1973; *T. dendrolimi* Matsumura, 1925 (see Nagarkatti & Nagaraja 1971 for a comparison with *T. chilonis*); and *T. nubilale* Ertle & Davis, 1975.

Uniparental populations of *Trichogramma* from the islands of Hawaii, Kauai, Maui, Molokai, and Oahu are tentatively treated as *T. chilonis* due to their phenetic similarity to biparental females of this species. Their status needs further clarification, however.

Females of *T. chilonis* (including uniparentals) can be distinguished from females of all other Hawaiian species by the following combination of characters: color light yellow-brown, mesoscutellum with anterior pair of setae only 1/5 to ¼ as long as posterior pair; hindwing with poorly developed anterior and posterior vein tracts (Fig. 10b), and ovipositor 1.06 (1.0–1.1) as long as hind tibia. Females of *T. pretiosum, T. papilionis,* and *T. ostriniae* are most likely to be confused with those of *T. chilonis.* However, the abdomen in these 3 species is dark brown. Also, in *T. ostriniae* the anterior vein tract of the hindwing is either absent or composed of a single seta only. In *T. chilonis* it is composed of more than one seta (usually 4).

*Hawaiian records.* Hundreds of individuals ($P_1$ & $F_1$) representing all major islands (Table 1). All collected by E.R. Oatman.

*Geographical distribution.* Known to occur in India, Japan, China, Hawaii, and Guam.

## SPECIMENS UNASSIGNED TO SPECIES

Thirteen females of 2 different species cannot be assigned to species at this time. Three of these from the collections of the Bishop Museum are close to *T. semifumatum*

TABLE 1. Distribution of *Trichogramma chilonis* in Hawaii as determined by collections from the major islands. July 1977 through January 1978.*

| ISLAND | HOST EGG AND PLANT | COLLECTION LOCALITY |
|---|---|---|
| Oahu | *Agraulis vanillae* L.—passion fruit vine<br>*Agrius cingulata* (Fab.)—sweet potato<br>*Danaus plexippus* (L.)—crown flower<br>*Deilephila nerii* (L.)—crape jasmine, oleander<br>*Heliothis zea* (Boddie)—field corn, sweet corn<br>*Macroglossum pyrrhostictum* (Butler)—*Paederia foetida* L.<br>*Papilio xuthus* L.—citrus<br>*Spodoptera mauritia* (Boisduval)—papaya<br>noctuid—sweet potato | Ewa, Ewa Beach, Hawaii Kai, Honolulu, Honouliuli, Kaaawa, upper Kalihi Vall, Kahuku, Kaneohe, Kawailoa, Laie, Manoa (Univ. of Hawaii), Nanakuli, Nuuanu Pali, Pearl City, Schofield Barracks, Sunset Beach, Wahiawa, Waialua, Waianae, Waikane, Wailua, Waimanalo, Waimano, Waimea, Wilson Tunnel |
| Maui | *Achaea janata* (L.)—castor bean<br>*Danaus plexippus*—crown flower<br>*Deilephila nerii*—oleander<br>sphingid—castor bean | Hana, Kahului, Kihei, Lahaina, Napili Bay, Pukalani, Pulehu, Puuenene, Waihee, Wailea, Wailua |
| Hawaii | *Danaus plexippus*—crown flower<br>*Deilephila nerii*—oleander<br>*Macroglossum pyrrhostictum*—*Paederia foetida*<br>lycaenid—*Crotalaria* sp. | Kailua Kona, Kalapana, Kawaihae, Kawi, Hilo, Naalehu, Napoopoo, Pahala |
| Kauai | *Deilephila nerii*—oleander | Wailua |
| Molokai | *Achaea janata*—castor bean<br>*Danaus plexippus*—crown flower<br>lycaenid—*Crotalaria* sp. | Kaunakakai |

* Biparental populations only.

but are separable by the shorter and narrower anterior mesoscutellar setae. In *T. semifumatum,* these setae are almost as broad and at least ½ as long as the posterior pair (see Pinto et al. 1978). In the 3 unplaced females, the anterior pair of setae is no more than ⅓ as long and only about ½ as broad as the posterior pair. These females were collected from the following 3 locales: KAUAI I: Alakai Swamp, 14–16.IX.1965, C.M. Yoshimoto; HAWAII I: Kilauea, 4000 ft [1220 m], 27.VII.1920; MAUI I: Haleakala, 2134 m, 14.VII.1963, reared from noctuid eggs on *Sophora,* J.W. Beardsley.

The 10 females of a 2nd species are in the collection of the Hawaii State Department of Agriculture. They were collected from MOLOKAI I, Kainalu, 1500 ft [458 m], 24.VII.1927, "ex *Scotorythra* under bark of *Tetraplasandra* (O.H.S.)." These females are quite distinctive. They are black or dark brown. The ovipositor is very short, averaging only 0.70 the length of the hind tibia. The funicular segments of the antenna are broader than long rather than quadrate as in most *Trichogramma.* The hind wing has 3 relatively well-developed vein tracts, and the anterior mesoscutellar setae are minute. The ovipositor is shorter than that of any described *Trichogramma.* The broad funicular segments are rare in *Trichogramma* but are also known in females of *T. retorridum* Girault from North America (see Pinto et al. 1978).

Although both series of females are distinct from other Hawaiian *Trichogramma,* we hesitate to describe them without males. Also, they may represent species already described, but based on males only.

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