

Redescription of *Heizmannia (Heizmannia) greenii* Theobald
from Sri Lanka (Diptera: Culicidae)

by

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ABSTRACT. *Heizmannia (Heizmannia) greenii* (Theobald, 1905) is one of the earliest recognized members of the genus, but it has never been adequately defined in its major life stages. This paper presents redescriptions of the male, female and larva, and a first description of the pupa of this species. The distribution of *greenii* and its bionomics, including man-biting behavior in Sri Lanka, are discussed.

INTRODUCTION

Heizmannia (Heizmannia) greenii is one of the earliest discovered species of the genus *Heizmannia*, being first described by Theobald (under the name "*Wyeomyia greenii*") in the same year that the type species, *H. scintillans*, was described by Ludlow (1905). Theobald's (1905) original paper included brief descriptions of the male and female, and an illustration of the male antenna, from material collected at Peradeniya, Sri Lanka. Subsequent descriptions of specimens attributed to *greenii* have been even briefer than Theobald's original description. These include Edwards (1922) and Barraud (1929, 1934) based on adults from India, Borel (1930) on adults from Vietnam, Carter and Wijesundara (1948) on larvae from Sri Lanka and Thurman (1959) on adults from Thailand.

Only brief mention is made of *greenii* in Mattingly's (1957, 1970) revisions of the genus in Indomalaya and Southeast Asia. However, he clarified some of the distinguishing characteristics of adult *greenii* and defined a "Greenii Group" consisting of *greenii* (Sri Lanka and southern India), *lii* Wu (China and Korea), *taiwanensis* Lein (Taiwan) and *kanhsienensis* Tung (China). While the other members of the group have been adequately characterized, *greenii* has remained poorly defined. Most descriptions following Theobald (1905) are of doubtful validity: they are not based on the original material collected by Theobald and are also inconsistent in the characters described. There is a definite impression that several different forms have been described by these various authors as *greenii*. Remarkably, the genitalia of the syntype male and female collected in 1902 and deposited at the British Museum (Natural History) (BMNH) had not been examined - they were removed and dissected in 1986 by this author.

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The present paper, therefore, provides the first definitive descriptions and illustrations of the major life stages of this species, based on the original material in the BMNH and recent collections from Sri Lanka.

The terminology and abbreviations used herein follow Harbach and Knight (1980, 1981) and Reinert (1975). Male and female symbols have been replaced by "m" and "f" respectively, while "l" and "p" refer to the 4th instar larval and pupal exuviae respectively. An asterisk (*) after these letters indicates that at least some part of the life stage is illustrated.

Heizmannia (Heizmannia) greenii Theobald.

Wyeomyia greenii Theobald, 1905. J. Bombay Nat. Hist. Soc. XVI: 247 (m*,f).

Heizmannia greenii (Theobald) Edwards, 1922. Indian J. Med. Res. 10: 449 (m*); Carter and Wijesundara, 1948, Ceylon J. Sci. (B) 23: 142 (1*).

FEMALE. (Figs. 1,4) **Head.** Eyes well separated; clypeus bare; vertex with broad, flat dark scales and triangular patch of broad flat white scales extending anteriorly into interocular space; broad flat white scales extending down side of head to postgena; prominent setae along ocular and interocular lines; postgenal setae present; proboscis dark, with ventral white spot and 3-4 setae at base; length forefemur/proboscis 0.91-1.02, mean 0.95 (sample of 10 females); palpus dark, length palpus/proboscis 0.08-0.15, mean 0.13; antennal pedicel scaled along inner surface, flagellomere 1 with pale scales along inner surface. **Thorax.** Scutum with dense covering of broad dark scales with metallic bronze to purple-green reflections; acrostichal, dorsocentral and prescutellar setae absent, scutal fossal setae present along anterior margin: scutellum dark, with broad pale scales on midlobe and usually at apices of lateral lobes (pale scales on lateral lobes absent in some females); 2-3 stout setae present on lateral scutellar lobes; anteprenotum with 4-6 mesal and 4 anterolateral setae, anterior and upper surfaces broadly white-scaled, inner (mesal) tips and posterior border dark-scaled; postpronotum with patch of broad white scales on upper posterior region and 4 setae along upper posterior margin; proepimeron bare; proepisternum and postprocoxal membrane white-scaled; postspiracular area, upper 0.5 of subspiracular area, paratergite, posterior 0.5 and upper anterior region of mesokatepisternum, and mesanepimeron with broad white scales; prealar knob with few broad white scales; antealar margin with line of broad white scales; proepisternum with 3-4 setae; mesanepimeron with single very long seta; prealar knob with 6-7 seta (1 dark, rest pale); mesokatepimeron, mesomeron, metepisternum and metapostnotum bare; mesopostnotum with patch of small pale setae. **Wing.** Upper calypter with 6-8 setae; alula with patch of small dark scales; plume scales extremely narrow; length cell R_2 vein $R_{2+3} = 2.0-3.0$, mean 2.57; length cell M_1 /vein $M_{1+2} = 1.5-1.8$, mean 1.64. **Halter.** Capitellum dark-scaled. **Legs.** pro-, meso- and metacoxae pale-scaled; forefemur pale-scaled on basal 0.33 of anterior and 0.5 of posterior surface, midfemur dark on both surfaces, and hindfemur pale-scaled along 0.8 of both surfaces, apex dark; all tibiae and tarsi dark; fore-, mid- and hindlegs with both ungues simple. **Abdomen.** Tergum I dark, with few broad white scales on lateral borders; II-VII with basal lateral triangular white markings extending towards dorsum, often forming narrow basal

white band across dorsum of VI-VII; some specimens with scattered white basal scales on dorsum of II-VI, sometimes forming narrow basal bands; tergum VIII dark, partially retracted; sternum II entirely pale-scaled, III-VII with broad basal white bands. **Genitalia.** Cerci broad; postgenital lobe convex, with 3 pairs of long setae and 4-5 pairs of shorter, curved setae along convex region; tergum IX in 2 separate plates, each with 2-3 apical setae; spiculose tuberculus present.

MALE. (Figs. 1,2,3) Habitus similar to female except antenna subplumose with 2 distal flagellomeres greatly elongated; length forefemur/proboscis 0.87-0.94, mean 0.91; length palpus/proboscis 0.09-0.13, mean 0.10; no pale scales at tip of lateral scutellar lobes; some specimens with few to no white scales along antealar margin; length cell R_2 vein R_{2+3} = 2.2-2.8, mean 2.50; length cell M_1 vein M_{1+2} = 1.7-1.8, mean 1.74; one foreunguis simple, other toothed; mid and hindungues simple. **Genitalia.** Gonocoxite with 2 parallel rows of flattened unbarbed apical setae, upper row with short and lower row with long setae; subapical lobe with 2 subequal spines; proximal claspette with 2 short tufts of unbarbed setae and tuft of long unbarbed setae ending in distinct tassel; distal claspette with setose arm and transparent, irregularly shaped apical lobe; gonostylus broad, with prominent rounded crest; paraprocts relatively short, sclerotized, toothed; IX-S rounded, with incompletely defined median lobe.

PUPA. (Fig. 4, Table 1) Unicolorous, brown. **Cephalothorax.** Trumpet simple, index 2.80-3.50 (mean 3.22); setae 1,4-CT with 2,3 branches; 2-CT single (occasionally bifid); 3,7-CT double (rarely with 1,3 branches); 6,9,11-CT single; 5,12-CT with 1-3 branches; 8-CT with 1-4 branches; 6,7-CT long, subequal. **Abdomen.** Seta 0 on terga II-VIII always single; seta 1-I well developed, with 10-19 branches; 1-II-VII generally small, 1-II with 7-18 branches, 1-III with 2-5 branches, 1-IV with 2-4 branches, 1-V with 1-3 branches and 1-VI-VII with 1,2 branches; 3-I-III well developed, 3-III 0.60-0.78 length of tergum IV (mean 0.70); 3-IV-VII weak; 5-IV-VI strongly developed, single, occasionally bifid at tip; 5-IV 1.00-1.22 length of tergum V (mean 1.08); 5-V 1.00-1.33 length of tergum VI (mean 1.15); 5-VI 0.71-0.96 length of tergum VII (mean 0.85); 5-VII short, 0.33-0.49 length of tergum VIII (mean 0.38); 9-I-VI small, single; 9-VII well developed, with 1,2 branches; 9-VIII well developed, with 1-3 barbed branches. **Paddle.** Index 1.55-2.00 (mean 1.81); seta 1-P single, occasionally bifid.

LARVA. (Fig. 5, Table 2) Unicolorous, brown. **Head.** Seta 1-C single, moderately stout and incurved; 4,7,11-C with many plumose branches; 5-C with simple branches; 6-C double (very rarely single) with one branch 0.5 length of the other; mental plate with 8-10 teeth (mode 9) on either side of central tooth; lateral palatal brush (mouth brush) filaments dimorphic, pectinate in some larvae but not in others of same sibling series. Antenna non-spiculate to lightly spiculate on basal 0.5; apical 0.5 more darkly pigmented than base; antennal length/head length 0.33-0.42 (mean 0.38); seta 1-A with 2-5 branches (mode 2,3), situated midway along shaft; 2-6-A at apex of shaft. **Thorax.** Seta 0-P with 3-6 branches; 3-P with 2-4 barbed branches, approximately twice length of 1,2-P; 4-P small, double (very rarely triple); 9,10,12-P small, unbarbed; 3-M single (very rarely double); 4-M double (rarely single); setae 9,10,12-M and 9,10,12-T long,

stout, barbed; 4-T small, double (rarely triple). **Abdomen.** setae 1-I, II small, 1-III-VI well developed, 1-VII long, stout, barbed; 1-VIII, X, barbed; 2-IV-VI single (very rarely double); 3-I-VII small to moderate, 3-VIII well developed, with barbed branches; 4-IV with 1,2 branches (3 very rare); 4-VI single (very rarely double); 5-I-VII small to moderate, 5-VIII well developed, with barbed branches; 7-I single (very rarely double), long, stout, barbed; 9-I,II,VI single (rarely double); 9-III,IV,V,VII always single; 10-I,IV,VI,VII small to moderately well developed; 10-II,III,V long, stout; 12-I absent; 13-I,II,VI,VII small; 13-III-V stout, as long or longer than 10-III-V; comb with 10-20 scales (modes 11,14), some uniformly fringed and others fringed but with hypertrophied median denticle; ventral brush (seta 4-X) composed of 4 pairs of double setae on grid; saddle incomplete, with apex finely spiculate; length anal papillae/saddle length 2.25-3.00 (mean 2.67); siphon index 1.95-2.32 (mean 2.05); seta 1-S barbed, inserted 0.35-0.44 (mean 0.39) from base of siphon; pecten with 3-7 spines (mode 7), each with one or more secondary denticles.

TYPE DATA. The syntype male of *greenii* deposited in the BMNH under Accession Number 884 bears the following data: "Peradeniya, Ceylon, 1. 1902" (top label); "Wyeomyia greenii, ♂ type. F. Theobald." (middle label); "Wyeomyia greenii Theobald; Holotype; P. F. Mattingly, 15-XI-56" (bottom label). This specimen has a rubbed scutum and scutellum, 1 wing and foreleg missing, abdomen broken at segment 2 and the broken piece mounted on cardboard with the rest of the specimen.

The syntype female, also deposited under the same Accession Number (884) as the male, bears the following data: "Peradeniya, Ceylon, 2. 1902." (top label); "Wyeomyia greenii. ♀ (type) F. Theobald." (middle label); "Wyeomyia greenii Theobald. Allotype. P. F. Mattingly 15-XII-56." (bottom label). This specimen has the scutum rubbed, fore-, mid- and hindlegs of one side missing, 1 wing missing, abdomen broken at segment 2 and the broken piece mounted on cardboard with the rest of the specimen.

The genitalia of both syntypes were mounted on slides by the present author on April 1986.

The above lectotype selections by Mattingly 15-XI-56 were never published and are therefore invalid. By present selection the male and female are designated lectotype and paralectotype, respectively.

DISTRIBUTION. In addition to the type male and female (see data above), the following specimens of *greenii* were examined at the BMNH: SRI LANKA. Peradeniya. Ref. No. 307 (1m, "Peradeniya, Ceylon, J.C.F. Fryer, V.12.1913" - this specimen lacks abdomen and genitalia); Ref. No. 307 (1m, same data as above - genitalia mounted on slide); Ref. No. 307 (1m, same data as above, genitalia mounted on acetate sheet, with specimen); Ref. No. B.M. 1924-100 (?sex, "Suduganga, Ceylon. 15.IV.1923. R. Senior White" - this specimen lacks antennae and abdomen); Udawattakele Forest, F. P. Amerasinghe & T.S.B. Alagonda, Ref. No. L29/1b/2, L49c/6 (1m, 1f, 21 November 1980, reared from bamboo stump), 11B/5 (1f, 04 July 1980, human bait catch), 30B/4 (1f, 08 November 1980, human bait catch).

INDIA. No reference number (1m, "India, Chittoor, Masalimadagur Forest, R. Reuben, 24.VIII.1964." - genitalia and midtarsus on slide); Two other females identified as *greenii*, labelled "Malabar Coast, 1915, Khazan Chand," are definitely not *greenii* and most probably belong to the Indian species *chandi* Edwards.

Data for a total of 143 specimens and exuviae of *greenii* (19m, 57f, 33l, 34p) examined in collections at the Department of Zoology, University of Peradeniya, Sri Lanka are as follows: **SRI LANKA.** Kandy District, Udawattakele Forest; Bamboo stump; F. P. Amerasinghe & T.S.B. Alagoda: Ref. No. L6a/1 (1f, 1p, 10 May 1980); Ref. No. L29/1b/1, L29/1b/3 (2f, 21 November 1980). Kandy District; Udawattakele Forest; Human bait catch; N. B. Munasingha & F. P. Amerasinghe: Ref. No. 2B/6 (1f, 09 February 1980); Ref. No. 29B/8, 30B/11, 34B/2 (3f, 26 April 1980); Ref. No. 41B/6 (1f, 10 May 1980); Ref. No. 34B/3 (1f, 25 October 1980); Ref. No. 23B/3, 24B/5, 25B/4, 25B/5, 26B/4, 28B/1 (6f, 08 November 1980); Ref. No. 44B/1, 44B/2 (2f, 22 December 1980); Ref. No. UK-10 (1f, 20 March 1986). Ampara District, Hungamala-Oya; Human bait catch in secondary forest; N. B. Munasingha & F. P. Amerasinghe: Ref. No. A-26, A-242, A-250, A-258, A-262, A-264, B-161, B-165, B-167, B-222 (10f, 06-07 April 1984). Ampara District, Hungamala-Oya; Adults reared from eggs laid by blooded females; F. P. Amerasinghe: Ref. No. DKD-37/1, 37/3, 37/4, 37/5, 37/6, 37/7, 37/8, 37/9, 37/10, 37/12, 37/13, 37/14, 37/15, 37/17, 37/18, 37/19, 37/20, 37/21, 37/22, 37/23, 27/24, 37/25, 37/26, 37/27, 37/28, 37/29, 37/30, 37/31, 37/40, 44/1, 44/2, 44/3, 44/4 (19m, 14f, 33l, 33p, 26 December 1984). Ampara District, Mahawanwela; Human Bait catch in secondary forest; N. B. Munasingha & F. P. Amerasinghe: Ref. No. A-27, A-30, A-57, A-62, B-5, B174, C82, C112, C125 (9f, 10-12 May 1984). Ampara District, Bakmeedeniya; Human bait catch in secondary forest; N. B. Munasingha & F. P. Amerasinghe: Ref. No. A-41, A-206, A-238, A-246, BKY-01 (5f, 10 May 1984). Ampara District, Dehiattakandiya; Human bait catch in secondary forest; N. B. Munasingha & F. P. Amerasinghe: Ref. No. DKD-002 (1f, 09 May 1984).

There are 2 literature references to *greenii* from Sri Lanka: Wijesundara (1942) records adults reared from larvae collected at Yattewatte, Matale District in January 1941. The subsequent descriptions of these larvae by Carter and Wijesundara (1948) are in general agreement with the present data. There are several literature citations of *greenii* from areas outside of Sri Lanka, but in most cases, specimens do not exist. Barraud (1929) reported the species from the Malabar Coast, India, but Mattingly (1957) states that this is a misidentification. The 2 remaining specimens of this series examined by me at the BMNH were definitely not *greenii* (see under material examined at BMNH, above). Borel (1930) reported the species from Vietnam, but his description of the male genitalia (cited in Thurman, 1959) is closer to *scintillans* Ludlow than to *greenii*. Indeed, Mattingly (1970) considers Borel's record to refer to *scintillans*. Chow (1949) reported *greenii* from Yunnan but this has never been confirmed, and is a likely misidentification, possibly of *lii* or *kansienensis*. Thurman's (1959) record of *greenii* from Thailand is definitely not this species, as the postpronotum is described as dark-scaled (pale-scaled in true *greenii*). Thus, in accordance with Mattingly (1970), the evidence points to *greenii* being restricted to Sri Lanka and southern India.

DISCUSSION. During this study, *greenii* was compared with specimens of other known species of *Heizmannia* housed in the BMNH and the National Museum of Natural History, Smithsonian Institution, U.S.A. Adults of *greenii* possess the following combination of characters that help to distinguish them from the other species in the genus: anteprenotum broadly pale-scaled anterodorsally and narrowly dark posteriorly, postpronotum with pale scales only, plume scales on the wing narrow and linear, particularly on veins R₂ and R₃, and male genitalia with the distinctively-shaped gonostylus, 2 subapical spines on the gonocoxite, and 3 groups of setae on the proximal claspette (PC1), one of which is much longer than the others (Fig. 2A, 3-A,D).

Mattingly (1957) proposed that *greenii* and *lii* should be grouped together on the basis of similarities in the male genitalia. He later (Mattingly 1970) expanded the "Greenii Group" to include *taiwanensis* and *kanhsienensis* (referred to as "kanhsiensis" by Mattingly). During the present study, specimens of *lii* (3m, 3f paratypes) and *taiwanensis* (1m, 1f paratypes) were examined at the BMNH but *kanhsienensis* was not available for study. Characters common to the 3 examined species (and *kanhsienensis*, following Tung 1955 and Mattingly 1970) are: the presence of anterodorsal pale and posterolateral dark scales on the anteprenotum, pale scales on the postpronotum, narrow linear plume scales on the wing, and male genitalia with 2 spines on the subapical lobe and 3 tufts of PC1 setae, one of which is much longer than the others. *Heizmannia greenii* can be separated from *lii* and *taiwanensis* by the prominent rounded crest on the gonostylus, 2 rows of unbarbed apical setae on the gonocoxite, unbarbed setae on the 2 short PC1 tufts, and the tuft of long PC1 setae ending in a distinct tassel (Fig. 2A, 3-A, D). In the latter 2 species the gonostylus is roughly triangular in shape and lacks a prominent rounded crest, the 2 short PC1 tufts have barbed setae, and the long PC1 setal tuft does not end in a tassel. The apical setae of the gonocoxite are barbed in *taiwanensis*, while *lii* possesses a mixture of flattened leaflike setae and barbed setae in this position (Fig. 3-B, C, E,F).

Going by Tung's (1955) description and illustration, the male genitalia of *kanhsienensis* are extremely similar to that of *taiwanensis* and thus easily separable from *greenii*. The proboscis of *greenii* and *taiwanensis* has a pale basal spot, which is absent in *lii*. The ratio of wing cell R₂ stem R₂₊₃ shows a certain degree of overlap, but is small in *greenii* (2.0-3.0) intermediate in *lii* (2.6-3.5) and large in *taiwanensis* (3.0-3.5).

The pupa of *greenii* resembles that of *taiwanensis* in possessing setae 6-CT as long as 7-CT, 5-IV and 5-V as long as tergum V and tergum VI, respectively, 5-VI shorter than tergum VII, and 9-II-VI inconspicuous. It differs from *taiwanensis* in having setae 9,11-CT and 3-I unbarbed (these setae barbed in the latter species). The pupa of *lii*, and pupa and larva of *kanhsienensis*, are yet undescribed. The 4th stage larva of *greenii* resembles that of *taiwanensis* and *lii* (as defined by Mattingly 1970 and Tanaka et al. 1979) in possessing seta 6-C with 2 unequal branches and pecten spines with secondary denticles. It differs from both in having mixed comb scales, some uniformly fringed and others with a hypertrophied median denticle. Both *taiwanensis* and *lii* reportedly possess only uniformly fringed comb scales. Seta 5-C in *greenii* has non-plumose

branches and seta 1-VIII is usually single, unlike *taiwanensis* where the branches of 5-C are plumose and 1-VIII is multibranched (there is no mention of these features in Lee's (1971) description of *lii* quoted in Tanaka et al. 1979). However, as is the case with most members of this genus, the descriptions of the immatures of *taiwanensis* and *lii* are based on very few specimens and the range of variation is very poorly defined. Species separations based on these stages are thus rather tenuous.

BIONOMICS. *Heizmannia greenii* is the only member of the genus recorded in Sri Lanka. It is a common diurnal human biting species in both hill country wet zone (elevation 500m) and low country dry zone (elevation 0-150m) secondary forests (Amerasinghe, 1982; Amerasinghe and Munasingha, 1988). In the former habitat, it has been collected at a biting rate of 0.64 females/man-hr., most intense biting (77.6% of specimens) being between 1100-1600 hr. - the hottest part of the day (Amerasinghe, unpublished data). In dry zone forest, it has been collected at an overall rate of 0.45 females/man-hr., occurring in significantly higher densities during the monsoonal (October-January) and post-monsoonal (February-May) periods than during the dry season (June-September) (Amerasinghe and Munasingha, 1988). The species does not show evidence of nocturnal human biting activity (Amerasinghe and Munasingha, 1985, 1988). Immatures have been collected breeding in the stump of a "kitul" palm, *Caryota urens* L. (Carter and Wijesundara, 1948), as well as in stumps of the giant bamboo, *Dendrocalamus giganteus* Munro, (water pH = 5.0-6.5) in wet zone secondary forest (Amerasinghe, 1982). In bamboo stumps, it occurred in association with *Aedes albopictus* (Skuse), *Ae. krombeini* Huang, *Ae. mediopunctatus* Theobald, *Toxorhynchites splendens* (Wiedemann), *Tripteroides aranoioides* (Theobald) (= *ceylonensis* Mattingly), *Tp. affinis* (Edwards) and *Culex uniformis* Theobald (Amerasinghe, 1982). A single collection from a tree hole (water pH = 8.0) in dry zone secondary forest, was in association with an unidentified *Tripteroides* sp. (Amerasinghe, unpublished data).

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Table 1. Setal Branching of Pupa of *Heizmannia greenii* (19 specimens).

Seta No.	Cephalo-thorax CT.	Abdominal Segments									Paddle P
		I	II	III	IV	V	VI	VII	VIII	IX	
0	-	-	1	1	1	1	1	1	1	-	-
1	2,3(2) ^a	10-19(13)	7-18(12)	2-5(2)	2-4(2)	1-3(2)	1,2(1)	1,2(1)	-	-	1,2(1)
2	1	1	1	1	1	1	1	1	-	-	-
3	1-3(2)	1	1	1	3-6(4)	1,2(2)	1	1-3(2)	-	-	-
4	2,3(2)	2-6(4,5) ^b	1-5(3)	2-5(3)	1-4(2)	2-5(4)	1-3(3)	1-3(2)	1,2(1)	-	-
5	1-3(2)	2-3(2)	1-3(1)	1,2(1)	1	1	1	1,2(1)	-	-	-
6	1	1,2(1)	1	1	1	1	1	2-5(3)	-	-	-
7	1-3(2)	1-3(1,2)	1-3(2)	2-5(2)	2-4(2)	2-8(3)	1	1	-	-	-
8	1-4(1)	-	-	2-5(3)	2-4(3)	2-4(3)	2-5(3)	2-4(3)	-	-	-
9	1	1	1	1	1	1	1	1,2(1)	1-3(2)	-	-
10	2-6(3)	-	-	1-3(2)	1,2(1)	1,2(1)	1,2(1)	1,2(2)	-	-	-
11	1	-	-	1	1	1	1	1	-	-	-
12	1-3(2)	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	1	1	1	1	1	1	-	-

a - Range (mode)

b - Two modal numbers

Table 2. Setai Branching of Fourth Instar Larva of *Heizmannia greenii* (23 specimens).

Seta No.	Head		Thorax					Abdominal Segments									
	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X				
0	-	3-6(4) ^a	-	-	-	1	1	1	1	1	1	1	1	-			
1	1	2	2,3(2)	3-5(3,4)	2-5(4)	1-4(3)	1-3(2)	1,2(2)	1,2(1)	1,2(1)	1,2(2)	1-3(1)	1,2(1)	1,2(1)			
2	-	1	1,2(1)	1	1,2(1)	1,2(2)	1	1,2(1)	1,2(1)	1,2(1)	1	1	1	2,3(2)			
3	1	2-4(3)	1,2(1)	2-5(3)	1,2(2)	1	1	1	1	1	1	2-4(2,3)	3-6(4)	1			
4	14-22(17,18) ^b	2	1,2(2)	2,3(2)	2-6(3,4)	2-4(3)	1-3(2)	1-3(2)	2-6(3)	1,2(1)	1	1	1	4			
5	8-16(10)	2-3(2)	1	1,2(2)	2,3(2)	1-4(2)	1,2(2)	1,2(1)	1,2(1)	1	1,2(1)	2-4(3)	-	-			
6	1,2(2)	1	3-5(4)	1	3,4(3,4)	2-5(3)	2,3(2)	2	2	2	3-6(4)	-	-	-			
7	10-18(12,13)	2-4(3)	1	5-8(5,6)	1,2(1)	1-3(2)	2,3(3)	1-5(3)	2-4(3)	1-3(1)	1,2(1)	1	1,2(1)	1			
8	1,2(1)	2-5(3)	4-7(6)	2-5(3)	-	1-3(2)	1,2(1)	1,2(1)	1,2(1)	1-3(2)	4-7(6)	-	-	-			
9	1-3(2)	1-4(2)	4-6(4)	2-5(4)	1,2(1)	1,2(1)	1	1	1	1,2(1)	1	1	1	1			
10	1-4(2)	1	1	1	1	1	1	1	1	1	1,2(1)	-	-	-			
11	13-20(16,18)	1-4(2)	1	1	2-5(3)	1	1	1	1	1	1	1	1	1			
12	1-5(3)	1	1	1	-	1-3(2)	1,2(2)	1,2(1)	1,2(1)	1,2(1)	1	1	1	1			
13	2-4(2,3)	-	4-8(5)	4-7(5)	1-3(2)	2-6(3)	1-3(2)	1,2(2)	1-3(2)	3-6(5,6)	2-4(3)	-	-	-			
14	2	2-4(3)	3-8(5,6)	-	-	-	1	1	1	1	1	1	1	-			
15	2-4(2)	-	-	-	-	-	-	-	-	-	-	-	-	-			

1-S = 2-3(2)
2-S = 1
6-S = 1
7-S = 1
8-S = 1-3(2)
9-S = 1

a - Range (mode)

b - Two modal numbers

LEGENDS FOR FIGURES

Figure 1. *Heizmannia greenii*. Adult.

- A. Lateral view of head and thorax of female
- B. Lateral view of antenna of male
- C. Dorsal view of mesonotum of female
- D. Lateral view of abdomen of female
- E. Dorsal view of wing of female
- F. Anterior view of fore-, mid- and hindlegs of female

Figure 2. *Heizmannia greenii*. Male genitalia.

- A. Dorsal aspect (prerotation sense) of gonocoxite and associated structures
- B. Dorsal aspect (prerotation sense) of proctiger and paraprocts
- C. Aedeagus
- D. Sternum IX

AS = Apical Setae	BP = Basal Piece
DC1 = Distal Claspette	GC = Gonostylar Claw
Gc = Gonocoxite	GS = Gonostylus
PC1 = Proximal Claspette	Ppr = Paraproct
SSp = Subapical Spine	

Figure 3. Apical region of gonocoxite and gonostylar claw of

- A. *Heizmannia greenii*
- B. *Heizmannia taiwanensis*
- C. *Heizmannia lii*

Proximal claspette of

- D. *Heizmannia greenii*
- E. *Heizmannia taiwanensis*
- F. *Heizmannia lii*

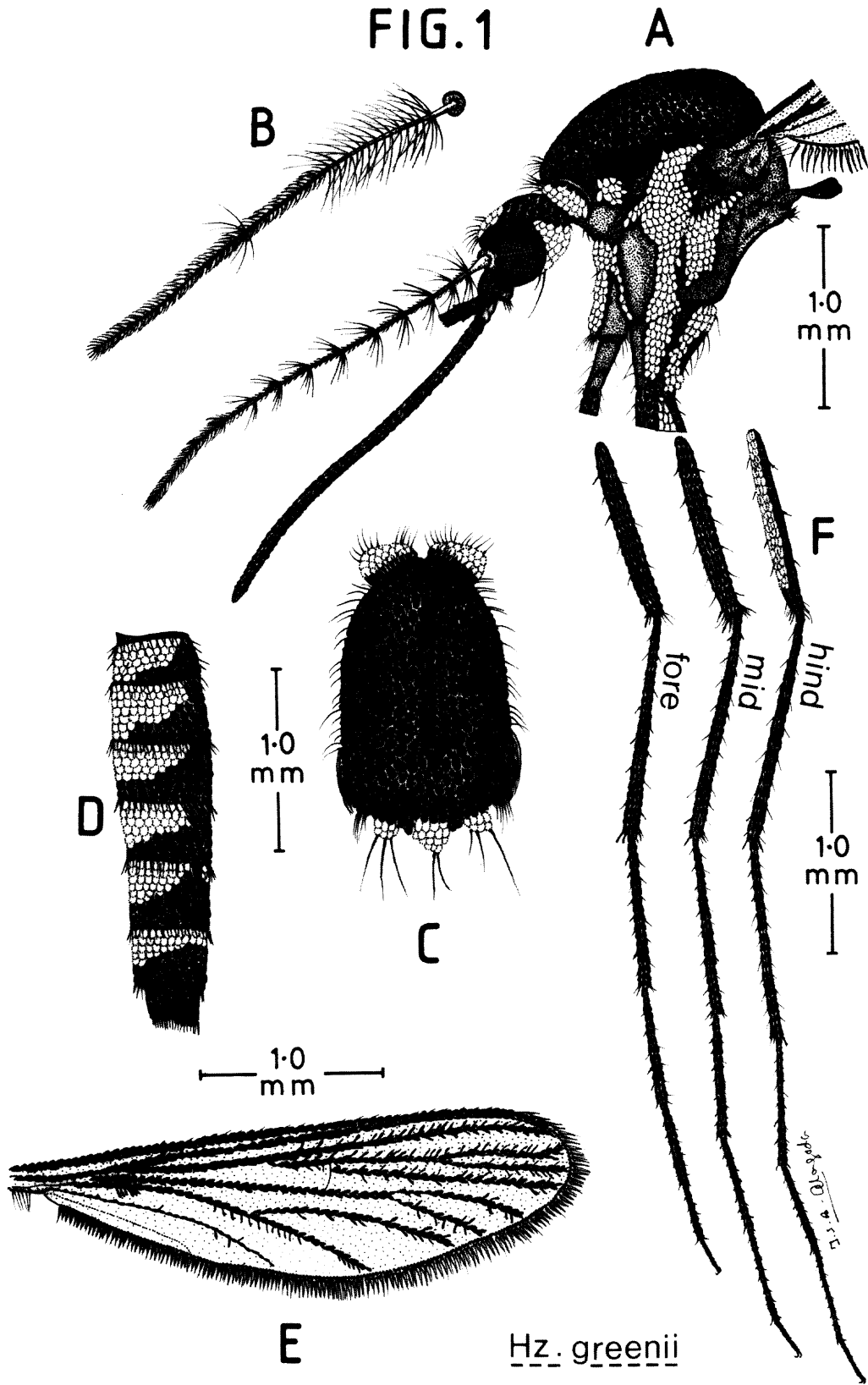
Figure 4. *Heizmannia greenii*. Pupa (A,B); Ventral aspect of female genitalia (C).

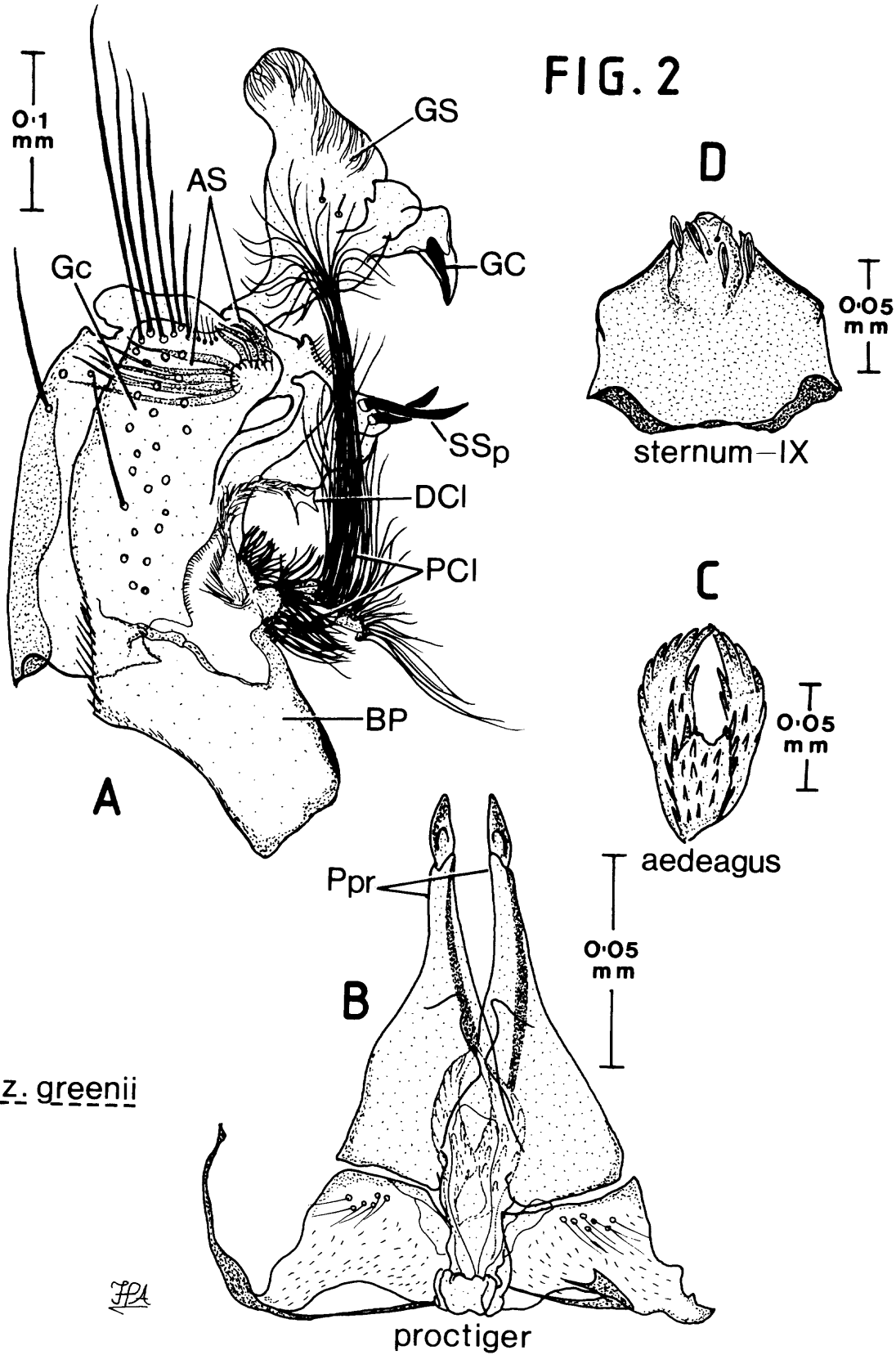
AD = Accessory Gland Duct	Ce = Cercus
CT = Cephalothorax	GL = Genital Lobe
PG = Postgenital Lobe	SCa = Spermathecal Capsule
Tu = Tuberculus	UVL = Upper Vaginal Lip
UVS = Upper Vaginal Sclerite	I-IX = Abdominal Segments

Figure 5. *Heizmannia greenii*. 4th instar Larva (A, B, C).

C = Cranium	CS = Comb Scale
DM = Dorsomentum	M = Mesothorax
P = Prothorax	PS = Pecten Spine
S = Siphon	T = Metathorax
I-X = Abdominal Segments	

FIG. 1





Hz. greenii

FPA

FIG. 3

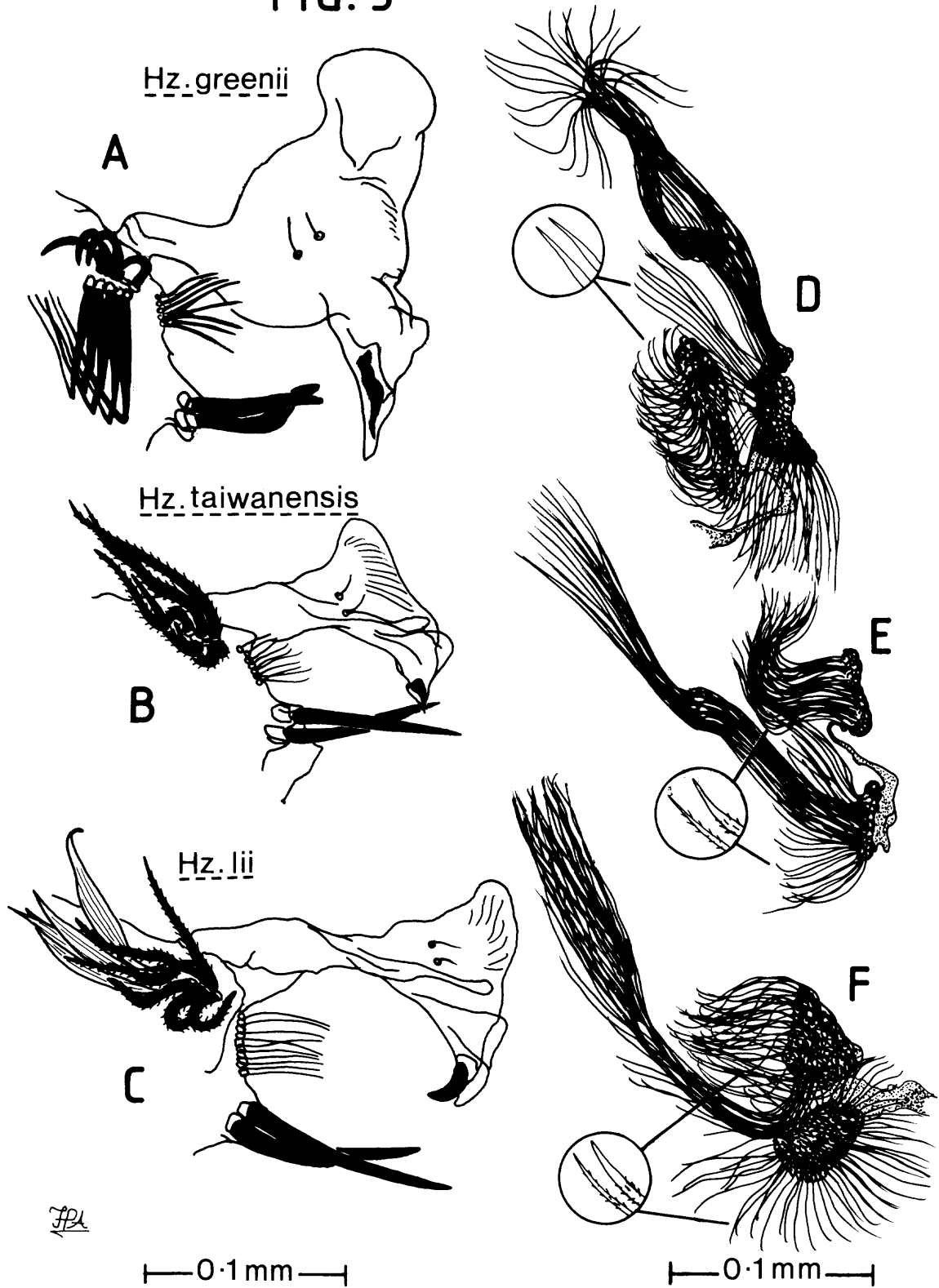


FIG. 4
Hz. greenii

