

**STUDIES ON THE LIFE HISTORY OF *TRITHEMIS FESTIVA*
(RAMBUR, 1842) (ODONATA: LIBELLULIDAE)**

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Specimens of *Trithemis festiva* were reared from egg to adult in the laboratory. The principal changes in external morphology in different instars and the characters which are helpful in distinguishing various instars are described in detail. In addition, the phenology of the species has also been studied.

INTRODUCTION

The order Odonata has failed to attract the deserved attention of entomologists in India. Efforts made so far have been directed towards the study of the adults only. The author has begun a study of the life history of different species of dragonflies found in the Dehra Dun valley (KUMAR, 1972, in press). The present paper deals with the life history of *Trithemis festiva* (Rambur), a species very common all over the Dun valley almost throughout the year. FRASER (1936) recorded it from the plains of India, Ceylon and Burma. Its distribution extends from Asia Minor to the Philippines and Java.

The adults are common on the wing from March-April to November. Females oviposit in slow running marshy streams and near the Weedy banks of large rivers. Larvae are sluggish and commonly remain attached to the submerged vegetation. They are usually found with the larvae of *Neurobasis chinensis chinensis* (Linnaeus), *Pseudagrion decorum* (Rambur) *P. laidlawi* Fraser and *Ischnura delicata* (Hagen).

It is one of the first dragonflies to emerge at the approach of spring. A large

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number of freshly emerged specimens were caught near a marshy stream at Mathrow Wala, during March-April 1968. The adults spend the summer and monsoon season on the wing, oviposition occurs towards the decline of the monsoon. Copulation takes place a little away from the larval habitats, females are un-accompanied by males during oviposition.

MATERIAL AND TECHNIQUES

This study was started on November 3, 1968, by collecting eggs from an ovipositing female dipping its abdomen in water in a glass vial. In the laboratory the eggs were kept in a petri dish at room temperature up to November 22, 1968 (temperature range 5°C – 25°C), after that they were transferred into a constant temperature bath maintained at 28°C. Hatching commenced on November 25, 1968 and was completed by November 30, 1968. Each larva was kept separately in a constant temperature bath at 28°C. until the final emergence.

In early instars the larvae were fed on *Paramecium* and *Cyclops*, and later on mosquito larvae.

Observations on all instars are based on the laboratory reared material and those of the final instar have been further augmented from the material collected in the field. The larval characters are summarised in Table I.

Table I
Summary of larval characters of *Trithemis festiva* (Rambur)

Character	Instar										
	1	2	3	4	5	6	7	8	9	10	11
Antennal segments		3	4	5	6	6	7	7	7	7	7
Premental setae		-	3+3	4+4	5+5	6+6	7+7	8+8	9+9	10+10	11+11
Palpal setae		1+1	2+2	3+3	4+4	4+4	4+4	6+6	6+6	6+6	6+6
Tarsal segments		1	1	2	2	3	3	3	3	3	3
Abdominal segments covered with wing sheaths		-	-	-	-	1	2	2½	3	4	6
Anal cerci		-	-	-	-	r	i	i	i	i	i
Mid-dorsal abdominal spines		-	-	-	r	i	i	i	i	i	i
Body length (in mm) including the anal appendages		1.18	2.42	2.74	3.15	3.42	3.90	5.50	7.33	11.20	15.40

(-) absent; (r) rudimentary; (i) increasing.

Microscopical slides were prepared for the study of antennae, labium, tibial comb and tarsi. All figures of the labium are from the oral side, and show it flattened as on the slide.

The terminology used in describing the labium is that of CORBET (1953), for tibial comb and setae on tarsi that of MacNEILL (1967), and for anal appendages that of SNODGRASS (1954).

BREEDING RECORD

The study was begun with six larvae in 2nd instar, but only one larva survived after the 3rd instar and entered subsequent instars. It finally emerged on February 20, 1969, after having passed through 11 instars. The breeding record of this larva is presented in Table II.

Table II
Breeding record of a larva of *Trithemis festiva* (Rambur)
(Eggs laid on November 3, 1968 and hatched between November 26 and 30, 1968)

Instar	Date of entry to instar (1968-69)	Duration of instar (in days)
1 (prolarva)	30th November	X
2	30th November	5
3	5th December	5
4	10th December	3
5	13th December	3
6	16th December	3
7	19th December	5
8	24th December	8
9	1st January	9
10	10th January	8
11	18th January	33
Emergence	20th February	—
Total number of days (from oviposition to emergence)		109

The Egg

Eggs (Fig. 1) are a little longer than broad. Length 0.365 to 0.390 mm, width 0.268 to 0.295 mm. Freshly laid eggs are white but change to pale yellow within a few days. The incubation period lasted for 23 days (Table II).

Larval Stages

1st Instar or Prolarva. Length 0.90 mm; yellowish. Hatching through a longitudinal slit on one side of the egg. Its duration is short (a few minutes). Antennae directed posteriorly. Labium stretched towards the posterior side. Legs also directed posteriorly, held on the ventral side. Abdomen tapering.

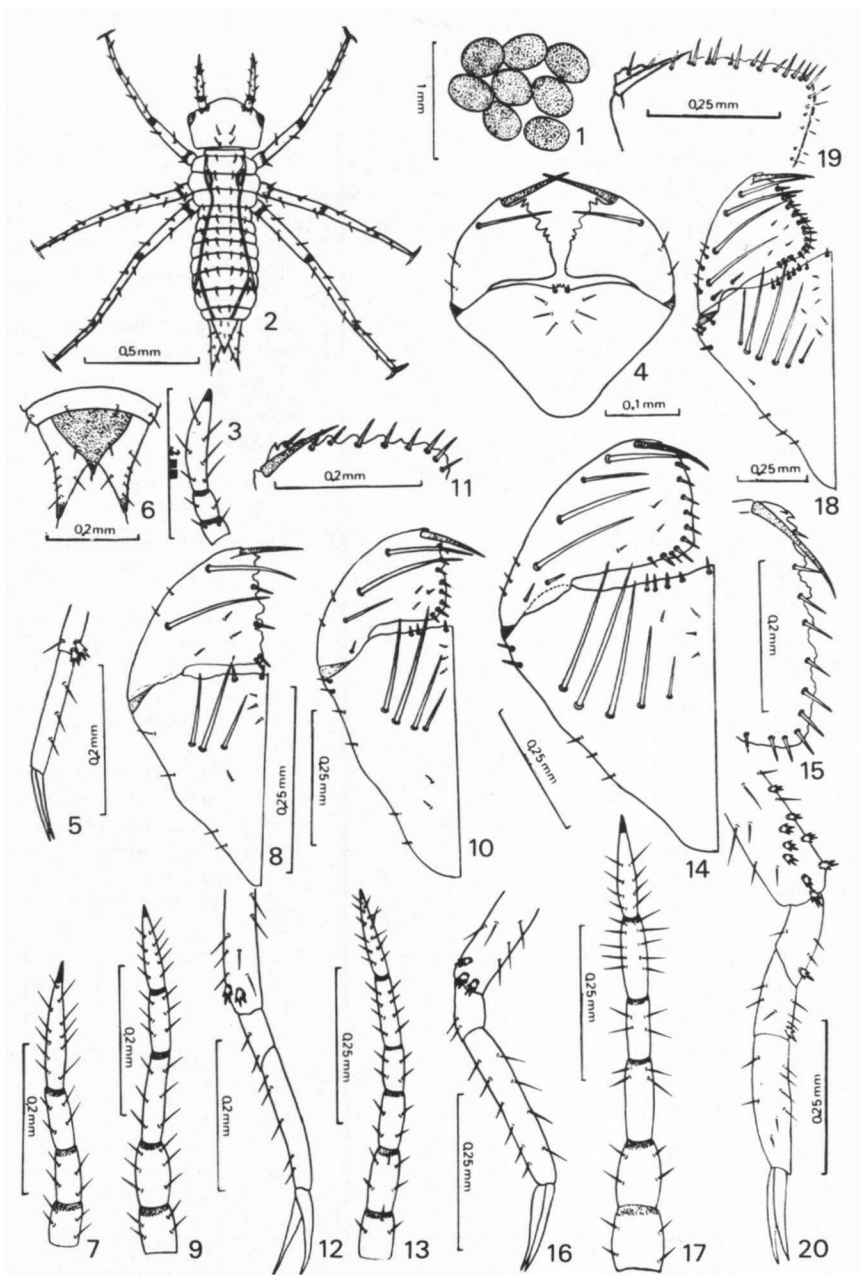
2nd Instar. (Figs. 2-6). Duration 5 days. Length 1.87 mm; brownish. Head roughly triangular. Eyes small, bead like. Antennae (Fig. 3) 3-segmented, comprising scape, pedicel and flagellum. Labium (Fig. 4) flat; premental setae absent, distal margin of prementum somewhat straight with three small processes. Palpal setae 1 + 1, upper distal margin of palpus wavy, lower straight. Tarsi (Fig. 5) single segmented. Tibial comb consists of 2 furcate setae.

3rd Instar. (Figs. 7-8). Duration 5 days. Length 2.42 mm. Antennae (Fig. 7) 4-segmented, flagellum divided into two unequal segments. Labium (Fig. 8): premental setae 3+3; palpal setae 2+2, distal margin of palpus formed into crenations, a few of which bear a single claviform seta each. Tarsi still single segmented.

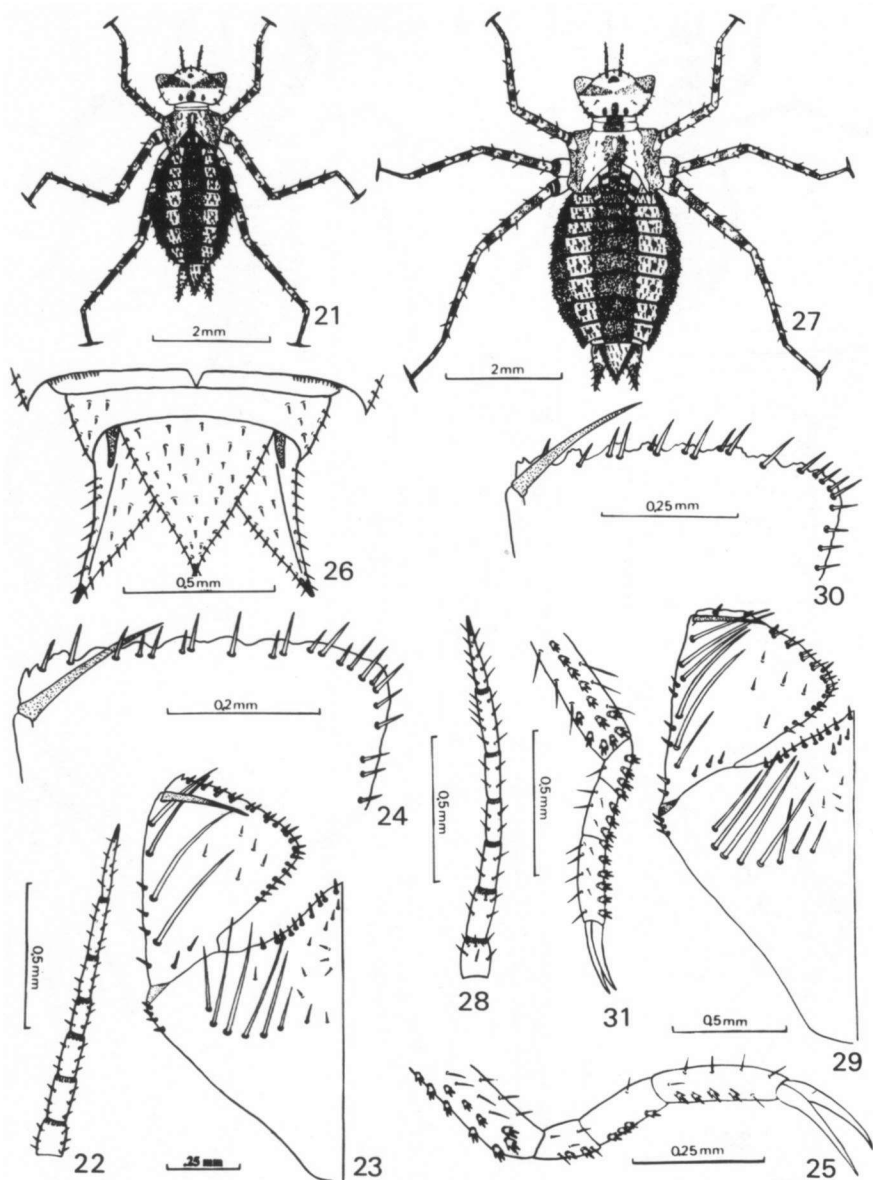
4th Instar. (Figs. 9-12). Duration 3 days. Length 2.74 mm. Antennae (Fig. 9) 5-segmented (flagellum with 3 segments). Labium (Fig. 10): premental setae 4+4, two spiniform setae present at the lateral sides of prementum; palpal setae 3+3, each crenation bears a claviform seta (Fig. 11). A single mesial spiniform seta present at the base of palpus. Tarsi (Fig. 12) 2-segmented, tibial comb still consists of 2 furcate setae.

5th Instar. (Figs. 13-16). Duration 3 days. Length 3.15 mm. Antennae (Fig. 13) 6-segmented, 1st flagellar segment divided into two unequal segments. Labium (Figs. 14-15): premental setae 5+5, 10 claviform setae at distal margin of prementum; palpal setae 4+4, last seta arising in between 1st and 2nd anterior palpal setae, distal margin of palpus with 11 claviform setae (Fig. 15). Tarsi (Fig. 16) still 2-segmented. Middorsal spines on 5th, 6th and 7th abdominal segments distinct.

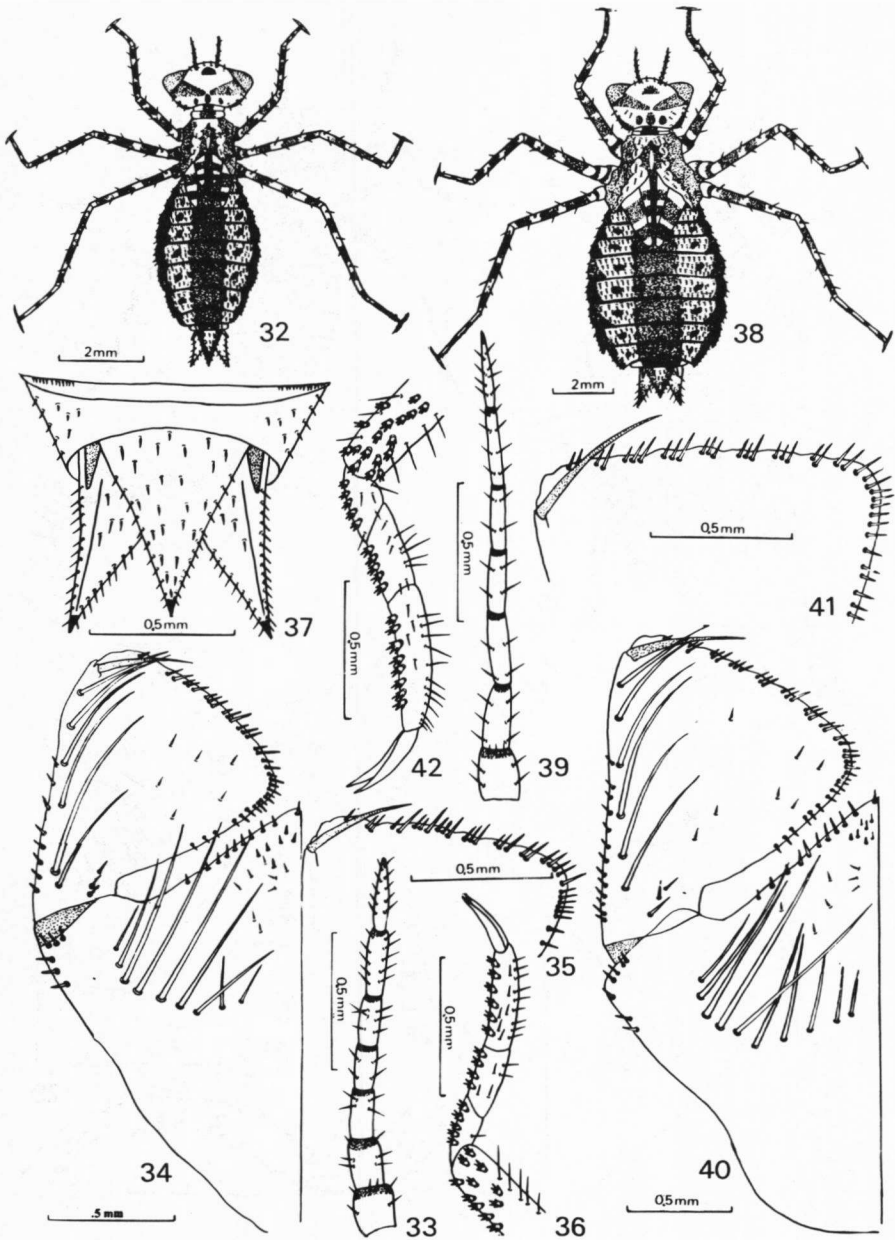
6th Instar. (Figs. 17-20). Duration 3 days. Length 3.42 mm. Dark spots present on head, abdomen and legs. Antennae (Fig. 17) still 6-segmented. Labium (Fig. 18): premental setae 6+6, last seta added laterally; palpal setae 4+4. Three spiniform setae present at the basal end of the outer side of the palpus. Wing sheaths rudimentary.



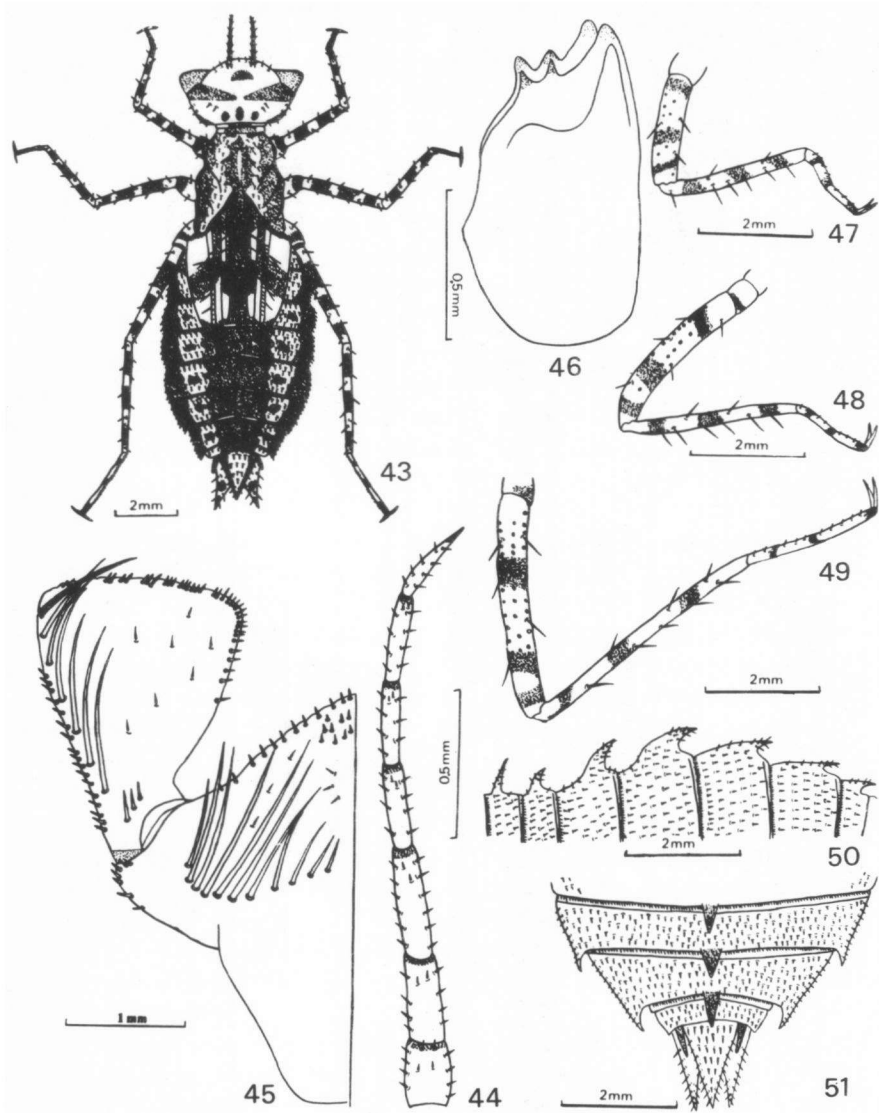
Figs. 1-20. Life history of *Trithemis festiva* (Rambur): (1) The eggs; – (2-6) 2nd instar (2, larva; 3, antenna; 4, labium; 5, tibial comb and tarsi; 6, anal appendages, dorsal view); – (7-8) 3rd instar (7, antenna; 8, labium); – (9-12) 4th instar (9, antenna; 10, labium; 11, distal margin of palpus, enlarged view; 12, tibial comb and tarsi); – (13-16) 5th instar (13, antenna; 14, labium; 15, distal margin of palpus, enlarged view; 16, tibial comb and tarsi); – (17-20) 6th instar (17, antenna; 18, labium; 19, distal margin of palpus, enlarged view; 20, tibial comb and tarsi).



Figs. 21-31. Life history of *Trithemis festiva* (Rambur): (21-26) 7th instar (21, larva; 22, antenna; 23, labium; 24, distal margin of palpus, enlarged view; 25, tibial comb and tarsi; 26, anal appendages); – (27-31) 8th instar (27, larva; 28, antenna; 29, labium; 30, distal margin of palpus, enlarged view; 31, tibial comb and tarsi).



Figs. 32-42. Life history of *Trithemis festiva* (Rambur): (32-37) 9th instar (32, larva; 33, antenna; 34, labium; 35, distal margin of palpus, enlarged view; 36, tibial comb and tarsi; 37, anal appendages, dorsal view); - (38-42) 10th instar (38, larva; 39, antenna; 40, labium; 41, distal margin of palpus, enlarged view; 42, tibial comb and tarsi).



Figs. 43-51. Life history of *Trithemis festiva* (Rambur), 11th (ultimate) instar: (43) larva; - (44) antenna; - (45) labium; - (46) mandible; - (47) fore leg; - (48) middle leg; - (49) hind leg; - (50) mid-dorsal abdominal spines; - (51) anal appendages (dorsal view).

7th Instar. (Figs. 21-26). Duration 5 days. Length 3.90 mm. Head broader than long. Antennae (Fig. 22) 7-segmented, the last flagellar segment divided into two unequal segments. Labium (Fig. 23): premental setae 7+7, last added mesially; a few spiniform setae present near the middle anteriorly and on lateral sides of prementum. Palpal setae 4+4, almost each crenation at distal margin with 2 claviform setae (Fig. 24). Wing sheath extending up to the anterior half of the 2nd abdominal segment. Tarsal segments beset with furcate setae (Fig. 25).

8th Instar. (Figs. 27-31). Duration 8 days. Length 5.50 mm. Antennal segments (Fig. 28) increasing in length (measurements, in mm from scape, being 0.13, 0.17, 0.16, 0.14, 0.15, 0.22 and 0.26; total length 1.23). Labium (Fig. 29): premental setae 8+8, last pair again added mesially; palpal setae 6+6, one added posteriorly and another in interpolation. Wing sheaths extending up to the middle of 2nd abdominal segment. Mid-dorsal abdominal spines distinct on segments 3 to 8. Legs with dark bands on femur, tibia and tarsi. Tibial comb beset with a number of furcate setae; their number increasing on tarsal segments also (Fig. 31).

9th Instar. (Figs. 32-37). Duration 9 days. Length 7.33 mm. Antennal segments (Fig. 33) further increasing in length (measurements, in mm from scape, being 0.15, 0.18, 0.17, 0.15, 0.18, 0.24 and 0.27; total length 1.34). Labium (Figs. 34-35): premental setae 9+9, last pair added laterally; 5-6 spiniform setae present at the lateral sides of prementum just below the base of palpus. Palpal setae 6+6, claviform setae arranged in groups of three and two (Fig. 35). A number of spiniform setae present on the outer sides of palpus. Wing sheaths developing further and extending up to the end of the 3rd abdominal segment.

10th Instar. (Figs. 38-42). Duration 8 days. Length 11.20 mm. Measurements, in mm of the antennal segments, starting from the scape: 0.18, 0.22, 0.25, 0.22, 0.23, 0.28 and 0.28; total length 1.66. Labium (Fig. 40): premental setae 10+10, last pair added mesially; palpal setae 6+6. Wing sheaths extending up to the posterior half of the 4th abdominal segment. Tibial comb with a number of furcate setae; tarsal segments beset with a paired row of furcate setae (Fig. 42).

11th (ultimate) Instar. (Figs. 43-51). Duration 33 days. Average length 15.40 mm. Dark, extensively marked with greyish spots. Antennae (Fig. 44) filiform, beset with setae. Measurements (in mm) of the segments, starting from scape: 0.20, 0.28, 0.37, 0.28, 0.27, 0.29 and 0.30; total length 1.99 mm. Labium (Fig. 45): premental setae 11+11, spiniform setae present at the lateral sides near the base of each palpus; palpal setae 6+6. Mandible as shown in Figure 46. The hind wing sheath extends up to the middle of the 6th abdominal segment. Tibial comb and tarsi beset with a number of furcate setae. Prominent mid-dorsal spines present

on abdominal segments 3 to 9 (Fig. 50). Epiproct and paraprocts beset with setae (Fig. 51).

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