

STUDIES ON THE LIFE HISTORY OF INDIAN DRAGONFLIES,  
*ACISOMA PANORPOIDES PANORPOIDES* RAMBUR, 1842  
(LIBELLULIDAE : ODONATA)

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(With 37 Text-figures)

INTRODUCTION

The present communication is in continuation to my earlier studies on the life history of Indian Odonata (KUMAR, 1971, 1972a, 1972b, 1972c, 1973, 1979a, 1980 and in press). These studies have been undertaken to fulfill the long felt need to have a better understanding of morphology and bio-ecology of immature stages of Indian species of these amphibiotic insects. The present paper, ninth in the series, deals with larval stages of *Acisoma panorpoides panorpoides* Rambur.

Genus *Acisoma* Rambur, 1842, comprises small sized dragonflies, which are Oriental in distribution. Within Indian sub-region only one subspecies, i. e., *Acisoma p. panorpoides* has been recorded. It is widely distributed within our limits in western Himalaya, M. P., Assam, West Bengal, Sikkim and outside to Nepal, Sri Lanka, Phillipines, Malay-Archipelago, Indonesia, Celebes, Sumba, Lesser Sunda Islands, China, Japan, Thailand and Singapore (KUMAR & PRASAD 1981).

MATERIAL AND TECHNIQUES

Field observations were made during the year 1976 at a perennial pond in vill. Gorakhpur, Dehra Dun. Study on the life history in laboratory was started on 27.IV.1976 by collecting eggs from a ovipositing female. In laboratory eggs were kept submerged in water in a glass vessel. Hatching started on 3.V.76 and completed on 8.V.76. Study on larval development was begun on 3.V.76 by rearing 4 larvae in 2nd instar, of these 2 larvae emerged into imagos (♂), after passing through 12 instars and taking 67 and 69 days respectively from oviposition to emergence. Breeding record of the larvae reared in the laboratory is tabulated in Table 1. In early instars larvae were fed on paramecium and cyclops and later on mosquito larvae.

TABLE 1. Breeding record (1976) of larvae of *Acisoma panorpoides panorpoides* (Rmb.) Eggs collected on 27.iv.1976 Eggs hatched on 3. v. 1976 to 8. v. 1976.

INSTAR	LARVA I		LARVA II		LARVA III		LARVA IV		Average (maximum temperature during the period)
	Date of entry	Duration (in days)	Date of entry	Duration (in days)	Date of entry	Duration (in days)	Date of entry	Duration (in days)	
2nd	3.v.76	3	3.v.76	3	3.v.76	3	5.v.76	3	24°C-36°C
3rd	6.v.77	2	6.v.76	2	6.v.76	3	8.v.76	2	
4th	8.v.76	2	8.v.76	2	9.v.76	2	10.v.76	2	
5th	10.v.76	7	10.v.76	3	11.v.76	3	12.v.76	6	
6th	17.v.76	4	13.v.76	7	14.v.77	7	18.v.76	4	
7th	21.v.76	5	20.v.76	5	21.v.76	4	22.v.76	3	
8th	26.v.79	3	25.v.76	6	25.v.76	4	25.v.76	4	
9th	29.v.76	4	31.v.76	3	29.v.76	4	29.v.76	3	
10th	2.vi.76	7	3.vi.76	6	2.vi.76	15	1.vi.76	4	
11th	9.vi.76	14	9.vi.76	13	died on	17.vi.76	5.vi.76	11	
12th	23.vi.76		22.vi.76	13			5.vi.76	17	
Emergence	died on 27.vi.76		5.vii.76	—			3.vii.76		
Total number of days (from oviposition to emergence)				69					67

Studies on various instars are based on laboratory reared material. Field studies on seasonal regulations were made by larval and adult sampling from different biotopes.

Terminology used for the labium follows CORBET (1953) ; the tibial comb and tarsi follows MAC NEILL (1967) ; the anal appendages follow SNODGRASS (1954) and MAC NEILL (1960).

#### OVIPOSITION AND EGGS

Oviposition is exophytic and is performed by perched females at the oviposition sites. The egg laying is generally performed in those areas of the ponds which have thick growth of submerged aquatic vegetation, namely of *Nymphaeae*.

The female dips a number of times, posterior end of its abdomen in water amidst the floating vegetation. Unlike the fellow species *Diplacodes trivialis* (KUMAR, in press), the female of *Acisoma p. panorpoides* is guarded by hovering male during oviposition. Similar behaviour of male has also been recorded in the Nigerian form, *Acisoma panorpoides inflatum* Selys (HASSAN, 1978).

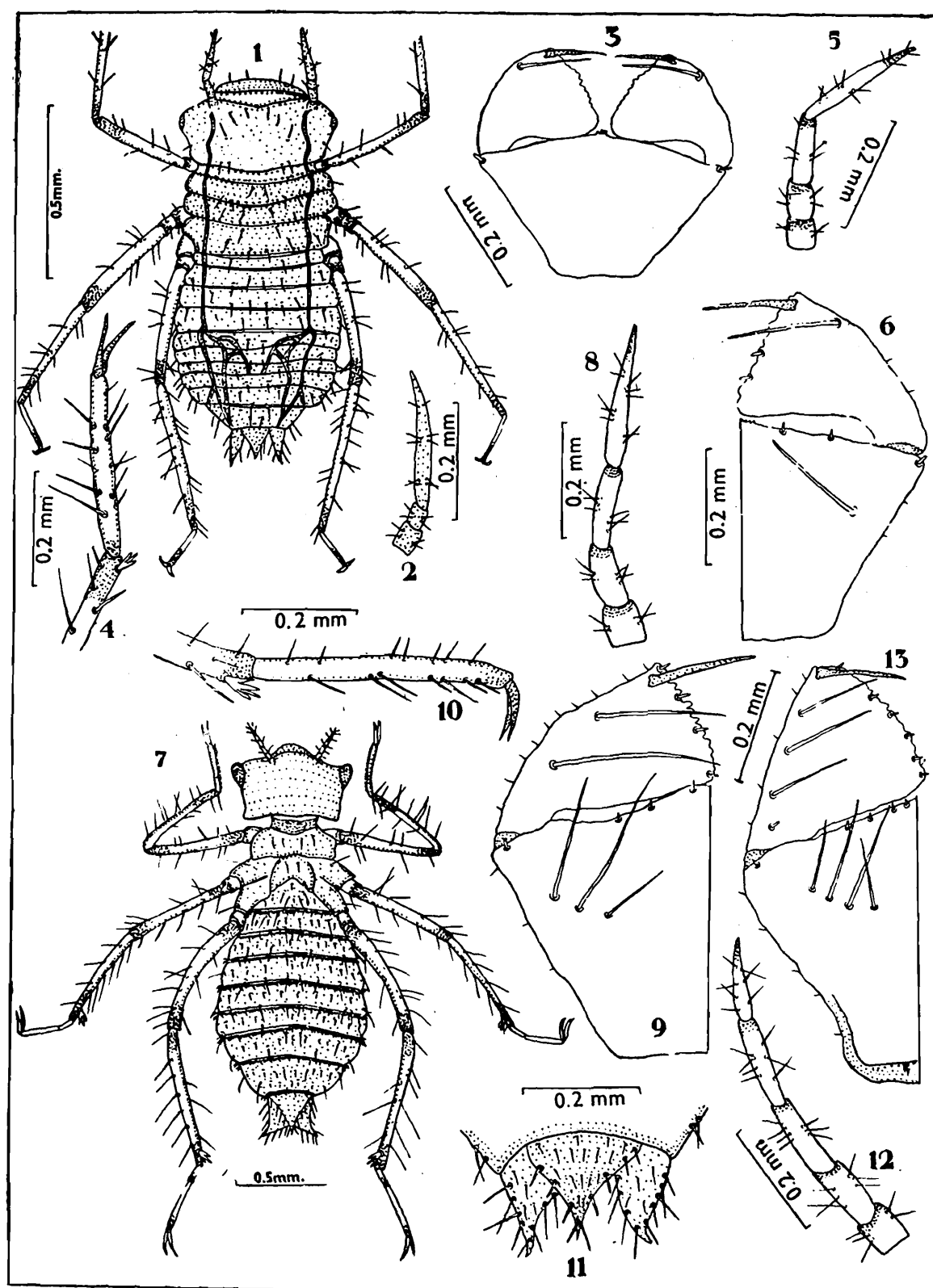
The eggs are oval in shape, a little longer than broader. Length 0.285 to 0.301 mm, width 0.204 to 0.209 mm. Eggs when laid are creamy but change to yellowish-brown within a day or two. Incubation lasted 7 days. Maximum temperature during this period varied from 24°C to 28°C.

#### LARVAL STAGES

*1st instar or Prolarva* : Hatches through ruptured longitudinal slit of the egg ; of very short duration. Head squarish, abdomen elongated with ventrally folded legs ; white-creamish ; antenna 3-segmented, folded downwards with labium ; anal appendages short.

*2nd instar* (Text-figs. 1-4) : Duration 3 days. Length 2.15 mm ; dirty white. Head almost rectangular ; eyes small, bead like. Antennae (Text-fig. 2) 3-segmented, comprising scape, pedicel and flagellum. Labium (Text-fig. 3) flat, squarish ; premental setae absent, a lateral spiniform seta present near the base of palpus ; palpal setae 1 & 1, upper distal margin of palpus wavy, lower straight. Tarsi (Text-fig. 4) single segmented ; tibial comb comprises a single furcate seta. Anal appendages comprising median epiproct and paired lateral paraprocts.

*3rd instar* (Text-figs. 5 & 6) : Duration 2 days. Length 2.90 mm ; become little darker. Head broader than long. Antennae (Text-fig. 5) 4-segmented ; flagellum divided into two unequal segments. Labium



Text-figs. (1-4) 2nd Instar Larva : 1, Larva (D. V.) ; antenna : 3, labium ; 4, tibial comb and tarsi ; (5-6) 3rd Instar larva : 5, antenna, 6, labium ; (7-11) 4th Instar larva : 7, larva (D. V.) ; 8, antenna : 9, labium, 10, tibial comb and tarsi ; 11, anal appendages ; (12-13) 5th Instar larva : 12, antenna ; labium.

(Text-fig. 6) : premental setae 1+1 ; palpal setae 1 & 1 ; distal margin of prementum and palpus bear a few claviform setae. Tarsi still single segmented.

TABLE 2. Summary of larval changes in *Acisoma panorpoides panorpoides* Rambur

INSTAR	2	3	4	5	6	7	8	9	10	11	12
Antennal segments	3	4	4	5	6	6	6	7	7	7	7
Premental setae	—	1+1	3+3	4+4	4+4	5+5	6+6	7+7	8+8	9+9	11+11
					2 2	2 2	1 1	1 1	2 2	1 1	
Palpal setae	1&1	1&1	2&2	3&3	5&5	6&6	6&6	8&8	8&8	8&8	8&8
Tarsal segments	1	1	1	2	2	2	3	3	3	3	3
Abdominal segments covered with wing buds	—	—	—	1/2	1½	2	2½	3½	4½	5½	6½
Anal cerci											
Head width [in mm]	—	—	—	—	+	+	+	+	+	+	+
Body length (in mm) including anal appendages	0.35	0.70	0.95	1.15	1.35	1.55	1.80	2.05	2.35	2.75	3.10
	2.15	2.90	3.71	4.95	5.60	6.50	8.75	10.90	13.25	15.60	17.10

.....PRO-LARVA.....

(-) absent ; (+) present.

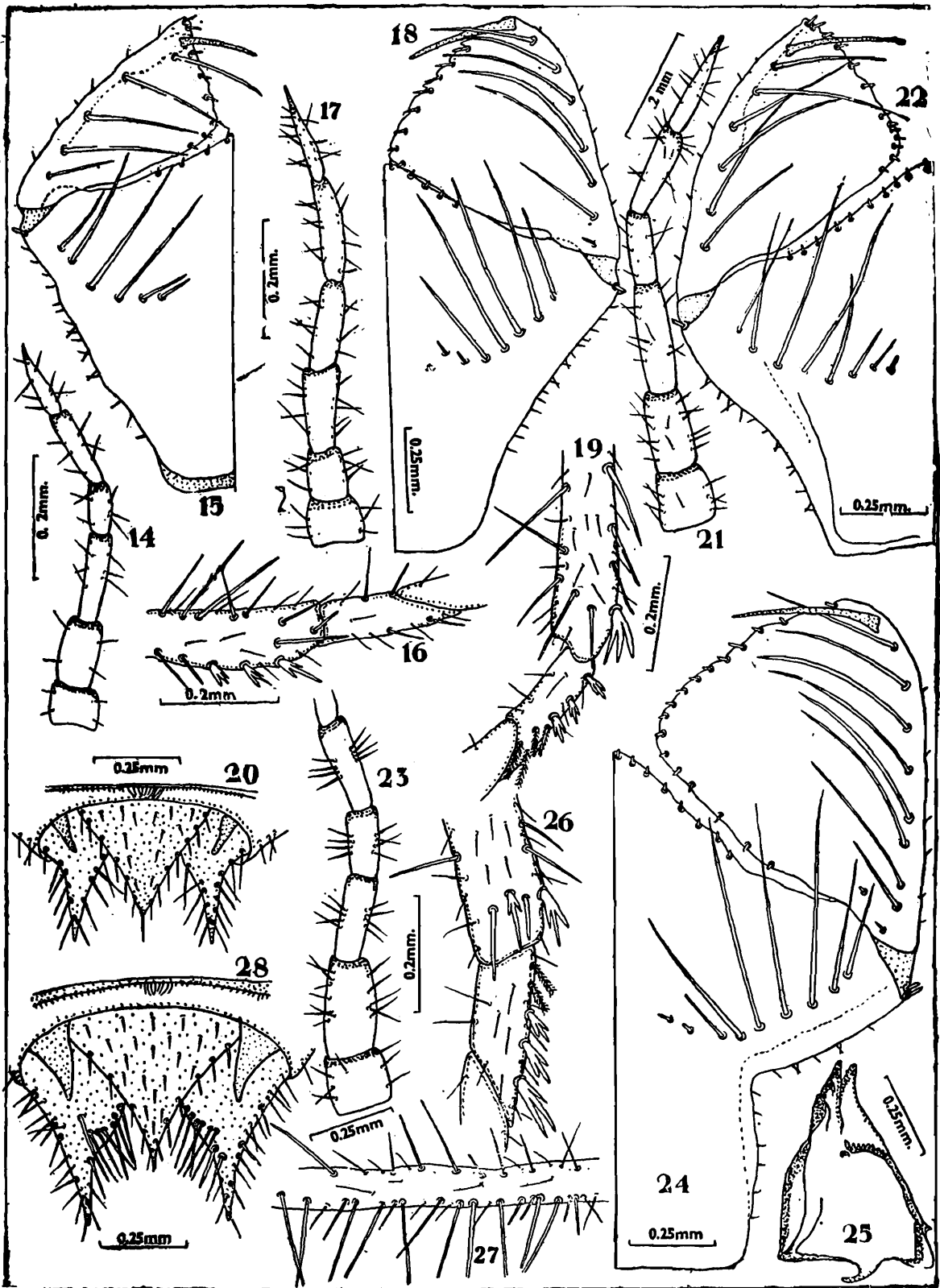
*4th instar* (Text-figs. 7-11) : Duration 2 days. Length 3.71 mm, dirty yellowish. Head rectangular ; eyes distinct protruding antero-dorsally. Antennae (Text-fig. 8) still 4-segmented, beset with sparse setae. Labium (Text-fig. 9) : premental setae 3+3, distal margin of prementum beset with 3 claviform setae ; another seta present near the base of palpus ; palpal setae 2 & 2, distal margin of palpus formed into crenations, a few of them beset with claviform setae. Tarsi (Text-fig. 10) still single segmented. Anal appendages (Text-fig. 11) comprising epiproct and paired paraprocts, beset with spiniform setae.

*5th instar* (Text-figs. 12 & 13) : Duration 6 days. Length 4.95 mm. Antenna (Text-fig. 12) 5-segmented, last flagellar segment divided in two unequal segments. Labium (Text-fig. 13) : premental setae 4+4, last added laterally, each crenation at distal margin beset with a claviform seta ; palpal setae 3 & 3, last seta added interpolated, a setella present near the base. Tarsi divided in two unequal segments. Anal appendages still comprising epiproct and paired paraprocts.

*6th instar* (Text-figs. 14-16) : Duration 4 days. Length 5.60 mm. Larva dark-yellowish and hairy. Antenna (Text-fig. 14) 6 segmented, 2nd flagellar segment having divided in two unequal segments. Labium (Text-fig. 15) : premental setae 4+4, 2 setella being added mesially on either side, a row of simple hair like setae present laterally on prementum, palpal setae 5 & 5, one seta each added at base and towards apex of palpus. Hind wing-buds extend upto the middle of 2nd abdominal segment. Tarsi (Text-fig. 16) 2-segmented, tibial comb comprises a number of furcate setae and scattered spiniform setae. Cerci appear as small appendages.

*7th instar* (Text-figs. 17-20) : Duration 5 days. Length 6.50 mm. Head transverse, vertex convex. Antenna (Text-fig. 17) still 6-segmented, beset with hair like setae. Labium (Text-fig. 18) : premental setae 5+5, last seta added mesially ; row of spiniform setae present on distal margin of prementum ; palpal setae 6 & 6, last seta added interpolated, each crenation at distal margin beset with a seta. Wing buds extending upto end of 2nd abdominal segment. Tarsi (Text-fig. 19) still 2-segmented ; a number of pectinate setae appear on 1st tarsal segment. Anal appendages (Text-fig. 20) with distinct cerci.

*8th instar* (Text-fig. 21 & 22) : Duration 6 days. Length 0.75 mm. Larva becoming more hairy and darker. Antenna (Text-fig. 21) still 6-segmented. Labium (Text-fig. 22) : premental setae 6+6, last seta added mesially ; palpal setae 6 & 6. Tarsal segments divide further and become 3, tibial comb comprises a number of furcate setae.



Text-figs. (4-16) 6th Instar larva : 14, antenna ; 15, labium ; 16, tibial comb and tarsi ; (17-20) 7th Instar larva : 17, antenna, 18, labium ; 19, tibial comb and tarsi ; 20, anal appendages ; (21-22) : 8th Instar larva : 21, antenna ; 22, labium ; (23-28) 9th Instar larva : 23, antenna ; 24, labium ; 25, mandible. 26, tibial comb and and tarsi ; 27, femur (E. V.) ; 28, anal appendages.

*9th instar* (Text-figs. 23-28) : Duration 3 days. Length 10.90 mm. Resembles final instar larva, except size. Antenna (Text-fig. 23) 7-segmented, last flagellar segment having divided into two unequal segments, thickly beset with setae. Labium (Text-fig. 24) premental setae 7+7, last seta added laterally, 2 setella each, present mesially; palpal setae 8 & 8, one added at base and the other interpolarily. Femur (Text-fig. 27) beset with long, spiniform setae; tibial comb (Fig. 26) comprises a number of furcate and spiniform setae, while tarsi beset with paired row of pectinate and furcate setae. Median epiproct and paired lateral paraprocts thickly beset with spiniform setae (Text-fig. 28).

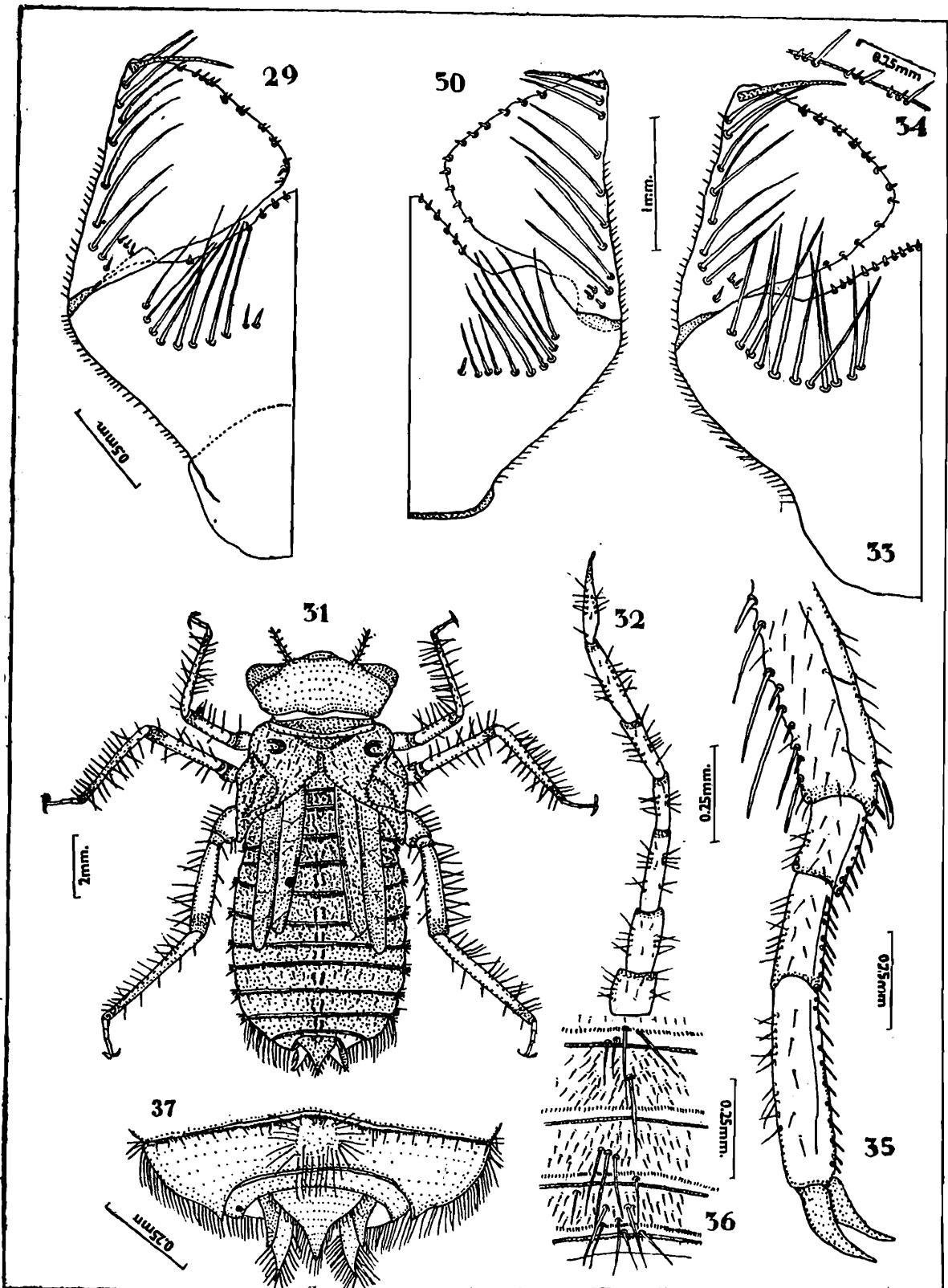
*10th Instar* (Text-fig. 29) : Duration 6 days. Length 13.25 mm. Antennal segments further increasing in length. Labium (Text-fig. 29) : Premental setae 8+8, last seta added laterally; palpal setae 8 & 8, as in preceding instar. Wing buds well developed and extend upto middle of 5th abdominal segment. A number of hairy setae present.

*11th Instar* (Text-fig. 30) : Duration 13 days. Length 15.60 mm. Antennal segments increasing further in length. Larva dark marked with greyish spots. Labium (Text-fig. 30) : premental setae 9+9, last seta added mesially, a pair of mesial setella present; palpal setae 8 & 8, 3 spiniform setae present near the base of palpus; thick row of hair like setae present at lateral margins of prementum and palpus. Wing buds extend upto the middle of 6th abdominal segment. Tibial comb and tarsi comprise a number of furcate setae.

*12th (Ultimate) Instar* (Text-figs. 31-37) : Duration 13 days. Length 17.10 mm. Larva (Text-fig. 31) small, hairy and compact in appearance. Dark dirty grey with darker wing buds. Antenna (Text-fig. 32) filiform, beset with simple setae.

Labium (Text-figs. 33 & 34) : spoon shaped; premental setae 11+11, last two setae added interpolated, distal margin of prementum strongly convex, formed into crenations, each crenation bear a claviform seta; palpal setae 8 & 8, 3 setella present near the base of palpus, distal margin of palpus formed into a number of crenations, some of which bear 3 claviform setae each (Text-fig. 34); laterally beset with row of hair like setae. Hind-wing buds extend upto the middle of 7th abdominal segment. Tibial comb and tarsi (Text-figs. 35) beset with a number of furcate, pectinate and simple setae on the ventral side. Tuft of long mid-dorsal setae present (Text-fig. 31 & 36) on abdominal segments 2-10. Anal appendages (Text-fig. 37) thickly beset with long setae on dorsal and lateral sides.





Text-figs. (29) 10th Instar larva : 29, labium ; (30) 11th Instar larva : 30, labium ; (31-37) 12th Instar larva : 31, larva ; 32, antenna, 33, labium ; 34, distal margin palpus (E. V.) ; 35, tibial comb and tarsi ; 36, three abdominal segments (dorsal E. V.) ; 37, anal appendages.

### BIOLOGY

KUMAR (1979b) has recorded *Acisoma p. panorpoides* as one of the multivoltine species occurring at Dehra Dun. The adults are common

around weedy ponds for a major portion of the year. HASSAN (1978) also reported the occurrence of adults of *A. panorpoides inflatum* Selys round the year at Nigeria.

Adults generally perch on the floating vegetation of Nymphae in medium to large sized ponds. Larvae occur amidst weeds and roots of the aquatic vegetation.

Larval development is rather rapid and it takes about 2 months each for completion of two summer larval broods (i.e. March-April to May-June and June-July to August-September); thus the first batch of adults emerge from preceding larval brood in ponds during March-April, oviposition takes place soon after and the 2nd batch of emergence occurs in June-July. After being on the wing for some time the adults of 2nd batch oviposit in similar perennial ponds. The second larval brood is again completed rapidly like the preceding one and the 3rd batch of adults emerge in September-October. This is the period of the decline of monsoon, soon after, these adults oviposits in perennial ponds existing in fields and forests in the flat and sub-mountaneous areas of the valley. The third larval generation is slowed down and is completed by following March-April, thus taking not less than 5-6 months.

#### SUMMARY

The life history of *Acisoma panorpoides panorpoides* Rambur has been studied in the field and the laboratory. Specimens were reared from egg to the adult. The principal changes external morphology in different larval instars and the characters which are helpful in distinguishing various instars are described in detail. The seasonal distribution of the species has been studied in the field.

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