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STUDIES ON THE LIFE HISTORY OF INDIAN DRAGONFLIES : *ORTHETRUM SABINA SABINA* (DRURY) (ODONATA : LIBELLULIDAE)

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INTRODUCTION

In my endeavour to study the larval stages and the life history of Indian dragonflies, present is fourteenth paper in the series. In this paper findings are presented of the study on the larval development of *Orthetrum sabina sabina* (Drury). The last-instar larva has been described earlier (KUMAR, 1973).

The genus *Orthetrum* Newman is very widely distributed in the Old World and contains a large number of species : from the Indian sub-region alone more than a dozen species have been recorded (FRASER, 1936, KUMAR & PRASAD, 1981). *O. sabina sabina* has a very wide distribution, being recorded from most of India, Mesopotamia, Iraq, Iran, Thailand, Java, Samoa, Somaliland, Sumba, Timor, New Guinea, Australia, Egypt, Angola and other countries in the African continent.

O. sabina sabina is fairly common around temporary and perennial ponds during the summer and monsoon seasons and around slow running marshy streams during the rest of the year. Larvae are found in ponds and amongst vegetation in marshy streams.

MATERIAL AND METHODS

Eggs were collected on 26.iii.1976 from a copulating female near a perennial pond at Gorakhpur vill., Dehra Dun Valley, India (77°45′ & 78°20′ EL and 29°57′ & 31°2′ NL :

alt. ca. 650m). Hatching started on 5.iv. and continued till 12.iv. at a water temperature (max.) of 28°C. Study of larval development was begun on 5.iv. with rearing of larvae in II instar. Larvae Nos. 1, 2, 3 and 6 died in intermediate instars, but larvae Nos. 4 and 5 emerged as imagines on 3.vii. and 27.vi., having taken 99 and 91 days respectively from oviposition to emergence. The breeding record of these two larvae is tabulated in Table I.

The morphological data regarding larval development is derived from larvae 4 and 5. Larval length was measured from the anterior border of head (excluding the antennae) to the tip of the anal appendages. The terminology for the larval labium follows CORBET (1953).

Development

Oviposition and egg : Oviposition occurs in temporary perennial ponds at the onset of S. W. monsoons. Many copulating pairs perch on the vegetation surrounding these water bodies. Egg laying was also observed in slow running marshy streams during autumn and summer. The unaccompanied female lays the eggs near the margins.

Eggs when released are dirty white but become yellow within 24 hours. They form a gelatinous substance as soon as they come in contact with water. Oval, length varies 0.272 to 0.315 mm.

Larval development : The prolarva (instar I) has a very short duration. The morphological changes from instar II to XIII are described below. The principal larval changes are : summarised in Table II.

Head : During the larval development of *O. sabina sabina* the shape of the head changes gradually from instar II to VII, when it attains the characteristic shape of the genus. In instar II the head is broadly triangular with anterodorsally placed bead-like eyes. As development proceeds it becomes squarish with a number of setae developing on the surface. In each instar the size of the head increases by 10 to 20 percent.

Table—I

Duration of development in *ORTHETRUM SABINA SABINA*

Eggs collected on 26.3.1976

Duration of egg stage 10 days

Eggs hatched on 05.4.1976

Instar	Larva 4 (duration in days)	Larva 5 (duration in days)
II	3	4
III	3	3
IV	6	5
V	9	7
VI	5	6
VII	6	6
VIII	10	7
IX	7	7
X	7	5
XI	7	5
XII	9	8
XIII	17	17
Emergence	3.7.1976 (♂)	27.6.1976 (♂)
Total number of days (from oviposition to emergenee)	99	91

Antennae : The antenna becomes four-segmented in instar IV due to the division of first flagellar segment (Fig. 8), it again gains one more flagellar segment in instar V and become six-segmented in instar VI due to further division of the basal flagellar segment (Fig. 13). The final complement of seven segments is attained by instar VII (Fig. 17) ; thereafter it increases in length and setae are added on segments upto instar XIII.

Labium : From instar II to XIII the general shape of the labium does not change much and remains characteristically libellulid in type. Major changes occur only in the increase of number of premental and palpal setae and the number of of crenations and setae at the distal margin of prementum and palpus.

Premental setae : Their number rises to 4+4 in IV instar (Fig. 9) with the addition of setae mesially and laterally (Fig. 14), and it rises to 8+8 in instar VI (Fig. 18), with the

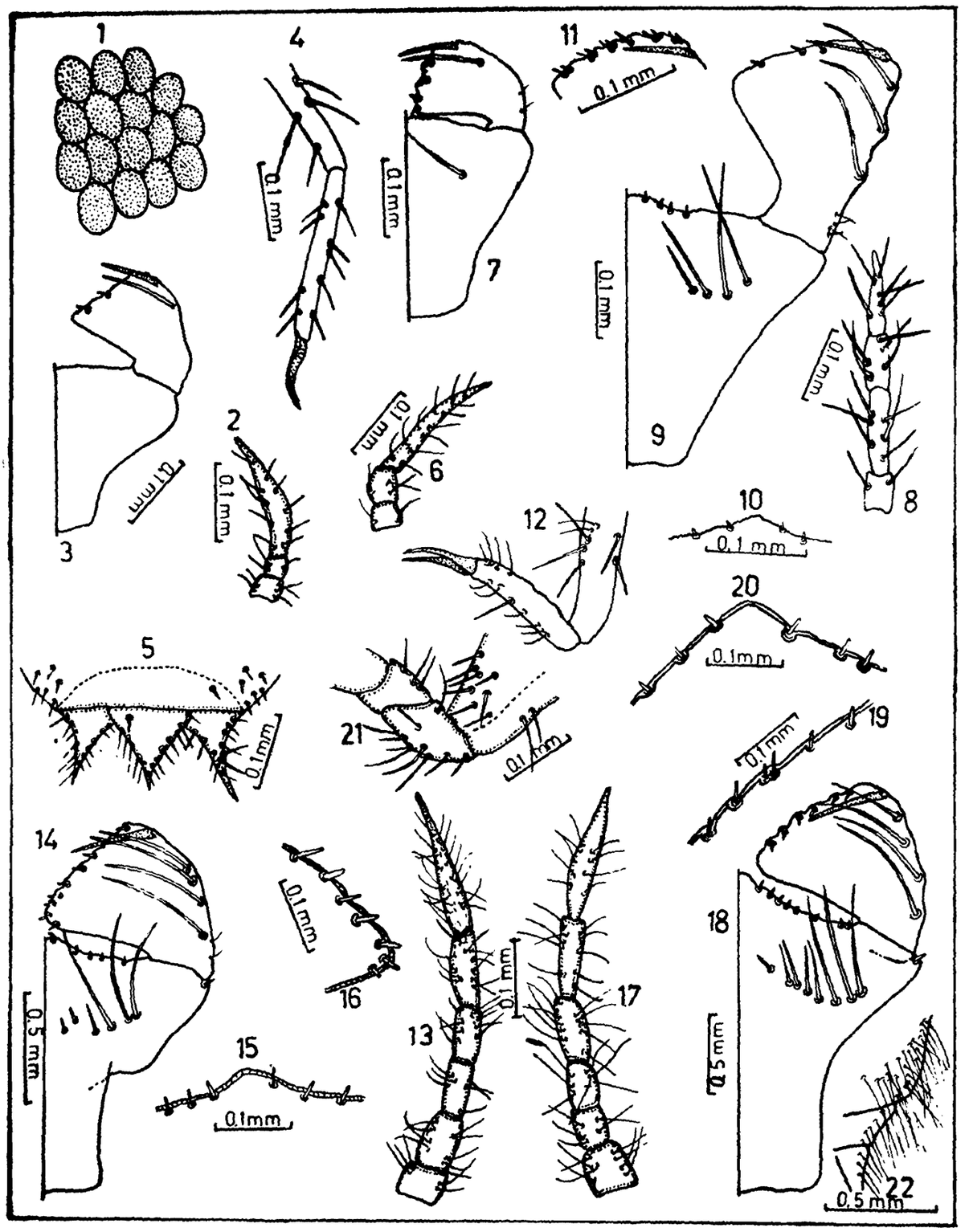
Table—II

Summary of morphological development of *Orthetrum sabina sabina*

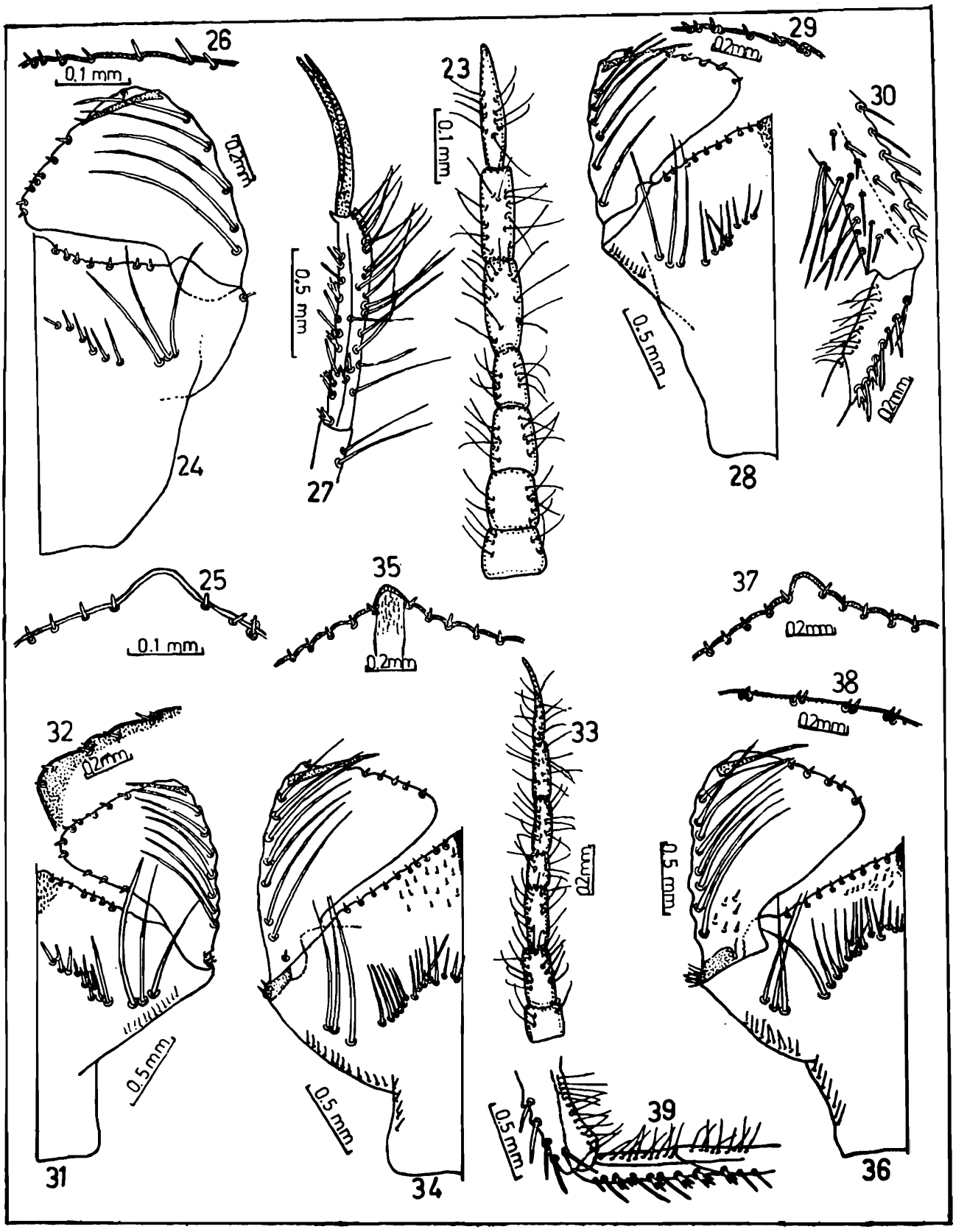
Instar	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Antennal segments	PROLARVA	3	3	4	5	7	7	7	7	7	7	7	7
*Premental setae		(—)	1+1	4+4 (4+3)	6+5	8+8 (7+8)	9+9	11+10	12+12 (11+11)	13+13	16+16 (16+15)	18+18	19+19
*Palpal setae		1&1	1&1	3&3	4&4 (3&3)	4&4	5&5	6&6 (5&5)	7&7	7&7 (7&6)	7&7	8&8	8&8
Tarsal segments		1	1	1	2	3	3	3	3	3	3	3	3
Abdominal segments covered with wing-sheaths		(—)	(—)	(—)	(—)	½	1	1½	2½	3½	4½	5½	6½
Anal cerci		(—)	(—)	(—)	(—)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Body length (in mm) including anal-appendages		1.12	2.02	2.72	3.24	4.75	5.20	6.47	9.24	11.50	14.20	16.34	19.80

*Variations in number of setae in two larvae have been given within brackets

(+) present ; (—) absent



Figs. 1—22. (1) The eggs ; (2-5) 2nd instar larva ; (2) antenna ; (3) labium ; (4) tibial comb and tarsi ; (5) anal appendages ; (6-7) 3rd instar larva ; (6) antenna ; (7) labium ; (8-12) 4th instar larva ; (8) antenna ; (9) labium ; (10) enlarged view prementum ; (11) enlarged view palpus ; (12) tibial comb and tarsi ; (13-16) 5th instar larva ; (13) antenna ; (14) labium ; (15) enlarged view prementum ; (16) enlarged view palpus ; (17-22) 6th instar larva ; (17) antenna ; (18) labium ; (19) enlarged view prementum ; (20) enlarged view palpus ; (21) tibial comb and tarsi ; (22) enlarged view 9th and 10th abdominal segments.



Figs. 23—39. (23-27) 7th instar larva ; (23) antenna ; (24) labium ; (25) enlarged view prementum ; (26) enlarged view palpus ; (27) tibial comb and tarsi ; (28-30) 8th instar larva ; (28) labium ; (29) enlarged view distal margin palpus ; (30) enlarged view tibial comb and tarsi ; (31 & 32) 10th instar larva ; (31) labium ; (32) enlarged view distal margin palpus ; (33-35) 11th instar larva ; (33) antenna ; (34) labium ; (35) enlarged view distal margin prementum ; (36-39) 12th instar larva ; (36) labium ; (37) enlarged view distal margin prementum ; (38) enlarged view distsl margin palpus ; (39) tibial comb and tarsi.

addition of 2 inretcalated setae. In instar VII, number rises to 9+9 (Fig. 24), due to addition of a small seta mesially on either side ; setae become 11+11 in eighth instar (Fig.28), one more seta is added laterally in ninth instar, while 3 setae are added mesially in eleventh instar. From instar VII (Fig. 24) onwards the 3 lateral setae are larger than, and separate, from the rest.

Palpal setae : The number increases to 3 & 3 in instar IV by addition of 2 setae basally (Fig. 9). In instar V, another seta is added basally. One more basal seta is added in instar VII (Fig. 24). In instar VIII, one seta is further added, on either side, in inter-polar position. The final complement of 8 & 8 is attained in instar XII (Fig. 36).

Median lobe ; It is almost straight and lacks crenations and piliform setae in instar II, but subsequently becomes curved and faint crenations are formed at the distal margin. From instar II onwards piliform setae arise from the distal margin. Later these setae increase rapidly (Figs. 10, 15, 20, 25 & 35) and by instar X they become numerous.

Palpus : In instar II the distal margin is formed into very faint crenations with 2 spiniform setae ; as the development proceeds the crenations become more distinct each provided a single or paired spiniform setae (Figs. 11, 16, 19, 26, 29 & 38).

Abdominal spines : Mid-dorsal abdominal spines on segments 4 to 8, become distinct after instar IX. Lateral abdominal spines are present on segments eight and nine in all instars.

Anal appendages : Median epiproct and paired lateral paraprocts are almost of the same length. Anal cerci increase in size from instar VI.

Coloration : When hatched larvae are pale yellowish. From instar II to VII they become brownish ; as the development proceeds they become darker, the anterior abdominal segments being pale yellowish while the posterior ones are sepia coloured both on dorsal and ventral sides.

Biology : *O. sabina sabina* is common around ponds, lakes and small streams in fields and thick jungles. Adults are on the wing almost throughout the year. They are commonly observed making short but fast flights from one bush to another.

Larvae of *O. sabina sabina* occur both in static as well as lentic aquatic biotopes, viz., temporary monsoon and perennial ponds, and slow running streams. The biology of *O. sabina sabina* has been discussed by me in earlier publications (KUMAR, 1979, 1981 & 1985). From studies in the laboratory and field, the observations indicate that it is multivoltine at Dehra Dun, being able to complete 3 larval generations in a year. Larval cohorts overlap slightly but there are 3 periods of emergence and oviposition occurring generally in the warmer months of the year. The larval duration in each summer generation (March to June and June to September) is approximately 90 days, whereas that of the winter generation (October to May) is prolonged to about 200 days (KUMAR, *l.c.*)

Summary

Orthetrum sabina sabina has been reared from egg to adult. The principal changes in external morphology during larval development and characters which are helpful in distinguishing various instars have been described. Seasonal development has been studied in the field.

Key words : Larval development dragonfly/Seasonal development of *Orthetrum sabina* (Drury).

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