

**DESCRIPTION OF THE LARVA AND PUPA OF  
*Aedes (Aedimorphus) nigrostriatus*  
 (DIPTERA: CULICIDAE)**

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**ABSTRACT.** The fourth-instar larva and pupa of *Aedes (Aedimorphus) nigrostriatus* (Barraud) are described and illustrated for the first time.

**INTRODUCTION**

The male and female of *Aedes (Aedimorphus) nigrostriatus* (Barraud, 1927) were originally described from Golaghat, Assam, India, and subsequently redescribed by Barraud (1934) and Reinert (1973), the latter while reviewing the subgenus *Aedimorphus* Theobald in Southeast Asia. However, its larval and pupal stages remained undescribed. We reared the immatures of *Ae. nigrostriatus* in the laboratory by obtaining eggs from wild-caught females captured in Kakati Goan, Dibrugarh, Assam, India. The descriptions of the fourth-instar larva and pupa are presented here with illustrations.

**MATERIALS AND METHODS**

A total of 400 eggs laid by 20 fully fed wild-caught females of *Ae. nigrostriatus* were individually reared. Considerable mortality occurred during rearing and only 24 adult progeny were obtained. Identification of species was confirmed by examining the male genitalia. Nomenclature and chaetotaxy follow Harbach and Knight (1980, 1982). In descriptions of the immatures, the range of setal branching is followed by the mode in parentheses.

**TAXONOMIC TREATMENT**

*Aedes (Aedimorphus) nigrostriatus*  
 (Barraud)

**Larva** (Fig. 1). Chaetotaxy as figured and recorded in Table 1 (n = 50). **Head:** Moderately pigmented; seta 4-C with 5,6 fine branches, anterior to 5,6-C; 5-C barbed, with 5-8(7) branches; 6-C barbed, with 5-7(6) branches; 7-C barbed, with 10-13(10) branches; 5-7-C in a diagonal line; 6-Mx single; dorsomentum with 10,11 teeth on either side of median tooth. **Antenna:** Moderately long, 0.47-0.57 (mean = 0.50) length of head, spiculate, especially basally; seta 1-A barbed, with 5-9(6) branches, inserted about 0.46 length of shaft; 2-6-A single, inserted at or near apex. **Thorax:** Setae 1,10,12-P single; 5-8-P, 5-10,12-M and 7,9,10-T barbed. **Abdomen:** Setae 6,7-I,II barbed; 6-III,IV usually bifid, weakly barbed; 10-III,IV long, about 0.5 length of following segments; 6-V,VI single, weakly barbed; 1-VIII barbed, with 6-9(7) branches; 3-VIII barbed, with 10-13(11) branches; 5-VIII barbed, with 5-7(7) branches; segment VIII with 18-30(21) comb scales arranged in 3 irregular rows, each scale with short, fine, and stout denticles along lateral and apical margins; 1-X short, single, rarely double; 2-X with 5-9(7) subequal branches; 3-X long, single; 4-X composed of 8 long setae on grid and 4 short precratal setae, all with multiple branches. **Saddle:** Moderately pigmented; anal papillae 2 unequal pairs, long, tapered, 2.22-2.80 length of saddle. **Siphon:** Pigmentation uniform, moderate; acus well developed; index

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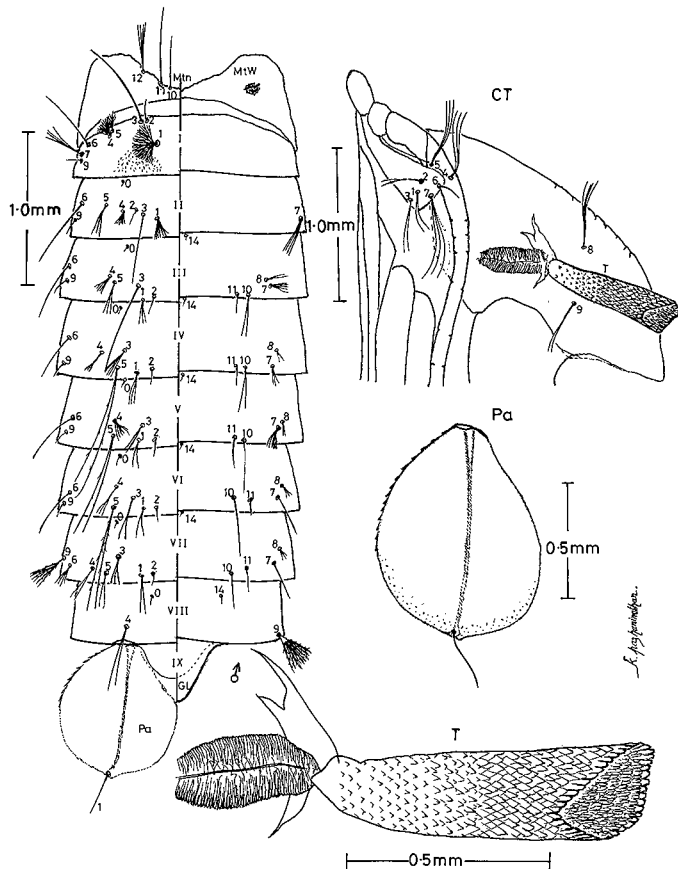


Fig. 2. *Aedes (Aedimorphus) nigrostriatus*, pupa. CT, cephalothorax; GL, genital lobe; Mtn, metanotum; Mtw, metathoracic wing; Pa, paddle; T, trumpet; I-IX, abdominal segments 1-9.

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Fig. 1. *Aedes (Aedimorphus) nigrostriatus*, fourth-instar larva. A, antenna; C, cranium; CS, comb scale; Dm, dorsosomentum; M, mesothorax; P, prothorax; PS, pecten spine; S, siphon; T, metathorax; I-VIII, X, abdominal segments 1-8, 10; 6-Mx, seta 6 of maxilla.

Table 1. Chaetotaxy of the fourth-instar larvae of *Aedes (Aedimorphus) nigrostriatus*.

Seta no.	Head			Thorax			Abdomen							
	C	P	M	T	I	II	III	IV	V	VI	VII	VIII		
0	1	22-31(25)	—	—	—	1-4(2)	1	1	1	1	1	1	1	
1	1	1,2(1)	2-4(3)	1,2(1)	1,2(1)	1,2(1)	4-10(6)	4-7(5)	4-7(5)	4-7(5)	7-10(9)	6-8(6)	6-9(7)	
2	—	1,2(2)	2,3(3)	3-5(4)	—	1	1	1	1	1	1	1,2(1)	1	
3	1	2-4(3)	1,2(2)	15-22(16)	4-8(6)	5-7(6)	3-6(4)	2-5(4)	3-5(4)	3-5(4)	3-4(3)	5-11(7)	10-13(11)	
4	5,6	3,4(4)	4,5(4)	4-8(6)	16-26(20)	15-21(16)	3-5(3)	2-4(3)	6-14(9)	4-8(5)	4-8(5)	3-6(4)	2,3(2)	
5	5-8(7)	1,2(1)	1	—	4-8(6)	2-4(3)	2-5(2)	2,3(2)	1-4(2)	1-3(2)	1-3(2)	2-4(3)	5-7(7)	
6	5-7(6)	1,2(1)	5-7(5)	2,3(2)	3-5(4)	3-5(4)	2	1,2(2)	1,2(1)	1,2(1)	1,2(1)	8-13(12)	—	
7	10-13(10)	3,4(3)	1	8-11(10)	1-3(2)	3-8(5)	8-16(11)	14-19(14)	10-15(12)	3-6(5)	3-6(5)	2-4(3)	—	
8	2-4(3)	1,2(2)	6-10(8)	10-18(15)	1-3(2)	1-3(2)	1,2(1)	1	1	2-5(4)	2-5(4)	7-12(9)	—	
9	3-5(4)	1,2(2)	6-8(7)	4-6(5)	2-4(3)	1,2(1)	1	1	1	1	1	2-5(3)	—	
10	2,3(2)	1	1	1,2(1)	2,3(2)	1,2(1)	1-3(2)	1,2(2)	2,3(2)	1,2(1)	1,2(1)	2,3(2)	—	
11	4-7(5)	4-7(4)	1,2(2)	1,2(1)	1-4(3)	2-4(3)	1-3(1)	1-3(2)	1-3(1)	2-5(3)	2-5(3)	2-4(3)	—	
12	6-10(7)	1	1	1	—	1,2(2)	1-3(2)	1-3(3)	1,2(1)	1-3(2)	1-3(2)	2,3(3)	—	
13	4-7(6)	—	12-16(15)	16-22(18)	1-3(1)	14-22(16)	2-4(3)	2,3(3)	1-4(2)	17-25(20)	6-10(8)	—	—	
14	1	2,3(2)	13-18(18)	—	—	1	1	—	—	—	—	—	1	
15	3-5(4)	—	—	—	—	—	—	—	—	—	—	—	—	

Antenna: 1-A, 5-9(6); 2-6-A, 1. Abdomen: 1-X, 1,2(1); 2-X, 5-9(7); 3-X, 1; 4-X, 8. Siphon: 1-S, 3-5(4); 2-S, 1; 6-9-S, 1.

**Table 2.** Chaetotaxy of the pupae of *Aedes (Aedimorphus) nigrostriatus*.

Seta no.	Cephalo-thorax		Abdomen							
	CT	I	II	III	IV	V	VI	VII	VIII	
0	—	—	1	1	1	1	1	1	1	
1	2	12-18(14) <sup>1</sup>	7-10(7)	2-4(3)	3-5(3)	2,3(2)	2-5(2)	2,3(2)	—	
2	1-3(2)	1	1	1	1	1	1	1	—	
3	1-3(2)	1	1	1	3-6(4)	1-3(2)	1-3(2)	2-4(3)	—	
4	3-5(3)	8-14(12)	5-8(6)	4,5(5)	2,3(3)	5-8(6)	3,4(3)	2,3(2)	2,3(2)	
5	3,4(3)	4-6(4)	3,4(3)	2-5(3)	2,3(2)	1-3(2)	2,3(2)	2-4(2)	—	
6	1,2(1)	1	1	1,2(1)	1	1,2(1)	1	2-5(4)	—	
7	2,3(3)	3-5(4)	2-6(4)	4-8(5)	2-4(3)	5-9(7)	1,2(1)	1,2(1)	—	
8	3-5(4)	—	—	2,3(2)	2-4(2)	1-3(2)	2-4(3)	2-4(3)	—	
9	1,2(2)	1,2(1)	1	1	1	1	1	5-8(6)	6-10(8)	
10	1	—	—	2,3(2)	1-3(2)	1	1	1,2(1)	—	
11	1	—	—	1	1	1	1	1	—	
12	4-6(4)	—	—	—	—	—	—	—	—	
14	—	—	—	1	1	1	1	1	1	

Paddle: 1-P, 1.

<sup>1</sup> Main branches.

2.34-2.78 (mean = 2.54); pecten on basal 0.38-0.45 (mean = 0.39) of siphon, composed of 10-15(14) spines, each spine with 1-3 basal denticles, apical 2 spines longer, widely spaced, smooth, without denticles; 1-S short, with 3-5(4) branches, inserted on basal 0.54-0.79 (mean = 0.63) of siphon.

**Pupa** (Fig. 2). Chaetotaxy as figured and recorded in Table 2 (n = 24). **Cephalothorax:** Seta 5-CT with 3,4(3) branches; 6-CT single, short, about 4.5 length of 7-CT; 7-CT with 2,3(3) branches; 10-CT single (1 specimen bifid at tip). **Trumper:** Moderately pigmented, index 4.07-4.91 (mean = 4.48). **Abdomen:** Seta 1-I dendritic, 12-18(14) main branches; 3-I long, single; 3-III single, long, about 1.0 length of following segment; 5-IV barbed, with 2,3(2) branches, long, reaching to segment VI; 5-V, VI barbed, very long, reaching to segments VII and VIII, respectively; 6-VI single; 6-VII with 2-5(4) branches; 9-VII barbed, with 5-8(6) branches; 11-VII single; 9-VIII barbed, with 6-10(8) branches. **Paddle:** Ovoid, index 1.10-1.33 (mean = 1.22), minute serrations on 0.52-0.63 (mean = 0.57) of basolateral outer margin; 1-P short, single, 0.23-0.28 length of paddle.

**Bionomics.** Immatures of *Ae. nigrostriatus* were collected only once, in small numbers (21), from a fallow field, associated with

*Anopheles (Cellia) kochi* Doenitz, *Culex (Culex) bitaeniorhynchus* Giles, *Culex (Culex) pseudovishuni* Colless, *Culex (Culex) tritaeniorhynchus* Giles, and *Culex (Culex) whitmorei* (Giles). However, adults of *Ae. nigrostriatus* were encountered resting outdoors during routine dusk collections while carrying out studies on Japanese encephalitis. A high density for this species was recorded during the rainy months of July and August.

**Specimen data.** Specimens were reared from eggs laid by wild-caught females from an outdoor resting collection close to a cattle shed at Kakati Goan, Lepaketa, Dibrugarh district, Assam, India; altitude 100 m; date of collection 16, 17 June 1994; 2♂, 2♀, 2Pe, 2Le, 2 4th-instar larvae, deposited in National Museum of Natural History, Washington, DC; 1♀, 1♂, 2Pe, 2Le, 1 4th-instar larva deposited in the Museum of National Institute of Virology, Pune, India; 1♂, 1♀, 19Pe, 19Le, 25 4th-instar larvae deposited in the Museum of Centre for Research in Medical Entomology, Madurai, India; 2♂, 2♀, 5Pe, 5Le, 10 4th-instar larvae retained in the Museum of Regional Medical Research Centre, Dibrugarh, Assam, India.

**Taxonomic discussion.** The larva of *Ae. nigrostriatus* possesses all the important subgeneric characters of *Aedimorphus* Theobald

as defined by Reinert (1973), i.e., (i) antenna long, spiculate, 1-A barbed, with 6 branches; (ii) 4-C small, multiple branched, close to 5-C; (iii) 5-7-C in a diagonal line; (iv) siphon with 2-4 apical pecten spines widely spaced, smooth, acus present; (v) 1-S small, multiple branched, distal to last pecten spine; and (vi) 4-X with 8 setae on grid and 4 precratal setae.

The larva of *Ae. nigrostriatus* is very similar to that of *Aedes alboscuteellatus* (Theobald) but can be differentiated easily by the following combination of characters: 6-C with 5-7(6) branches; dorsomentum with 10,11 teeth on either side of median tooth; 7-T with 8-11(10) branches; siphonal index smaller (range 2.34-2.78, mean = 2.54). In *Ae. alboscuteellatus*, 6-C has 2-5(3) branches; dorsomentum has 32-36(34) teeth; 7-T has 5-7(6) branches; and siphon index ranges from 3.00 to 4.08.

Pupae of species of *Aedimorphus* in Southeast Asia do not possess clear-cut sub-generic characters (Reinert 1973). However, the pupa of *Ae. nigrostriatus* is very similar to other Southeast Asian species described except that 10-CT is always single, which is a diagnostic character to differentiate *Ae. nigrostriatus*. In all other species, 10-CT is reported with 3-33 branches.

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