THE IMMATURE INSTARS OF *ALGOPHAGUS PENNSYLVANICUS* FASHING AND WISEMAN (ASTIGMATA: ALGOPHAGIDAE)

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ABSTRACT—The immature instars of *Algophagus pennsylvanicus* are described and illustrated. The addition of the following idiosomal setae accompanies the molt from larva to protonymph: a_2, a_4, l_4, l_5 and d_5. Setae cx_4 and g_1 are added in the protonymph-tritonymph molt, and a_1 is added in the tritonymph-adult molt. The developmental changes in leg chaetotaxy and solenidiotaxy are in agreement with that reported for astigmatid mites by Grandjean (1935) and Hughes (1964).

INTRODUCTION

The family Algophagidae consists of two subfamilies, the Algophaginae and the Hericiinae. Members of the completely aquatic Algophaginae inhabit water-filled treeholes in the northeastern United States (genus *(Algophagus*, Fashing and Wiseman 1980), algal mats in rivers of the western United States (genus *Algophagopsis*, Fain and Johnston 1975), and freshwater or brackish pools in the Subantartic (genera *Algophagus*; Hughes 1955, Fain 1974; and *Neohyadesia*; Hughes and Goodman 1969). The subfamily Hericiinae includes the genera *Hericia* and *Fusohericia* which inhabit sap fluxes and the wet subcortical layers of trees (O'Connor 1982). Little is known concerning the biology of any member of the Algophagidae, and none have had their immature instars described. The present paper describes the immature instars of *Algophagus pennsylvanicus* Fashing and Wiseman, an inhabitant of water-filled treeholes.

Stock cultures of *A. pennsylvanicus* were started from samples of treehole water, leaf litter and associated arthropods collected from water-filled treeholes in Cook Forest State Park, Cook County, Pennsylvania. Male and female pairs were selected from the stock cultures, placed in a small syracuse watch glass containing water, and provided with either a small piece of maple leaf (*Acer* species) or fungal material (*Fusarium oxysporum*, Schlect. emend Snyder and Hansen) as a food source. As offspring were produced, immature instars were removed, cleared in Nesbitt's fluid, and slide mounted using Hoyer's medium. Measurements were taken on ten individuals of each immature instar and are given in micrometers (mean followed by the range in parentheses). The relative position of setae and other structures are as figured.

GENERAL FEATURES — Idiosoma pear-shaped in all immature instars, a feature similar to the adult female. Each instar with an elevated sclerotized band running dorso-ventrally between Legs I and II (axillary organ of Fashing 1984). A pair of small unsclerotized areas representing the vestigial sockets of setae *ve* are located midway on the lateral margins of propodosomal shield. The idiosomal setae are similar in appearance to those of the adult female with the *l* series being thinner and more threadlike then the other dorsal setae. Adult, tritonymph, and protonymph with four lyrifissure cupules (*ia, in, ip* and *ih*) whereas larva with only three (*ia, in,* and *ih*). All immature instars as well as adults with a pair of lateral opisthosomal glands between setae l_2 and l_3. Apodemes of Legs I fused to form a Y-shaped sternum; apodemes of Legs II, III, and IV free.

Gnathosoma possessing general characteristics of typical sarcoptiform mouthparts, although modified for fungal grazing. The long, slender chelicerae are chelate with few teeth, and with distal ends slightly hooked or curved inward and serrated or rake-like.

DESCRIPTION OF TRITONYMPH (Figs. 1A, 1B) — Idiosomal length, 413 (376-436); width at the level of coxae III 250 (202-308). Dorsum bearing 15 pairs of setae: *vi* 59 (49-70), *sce* 134 (116-155), *sci* 18

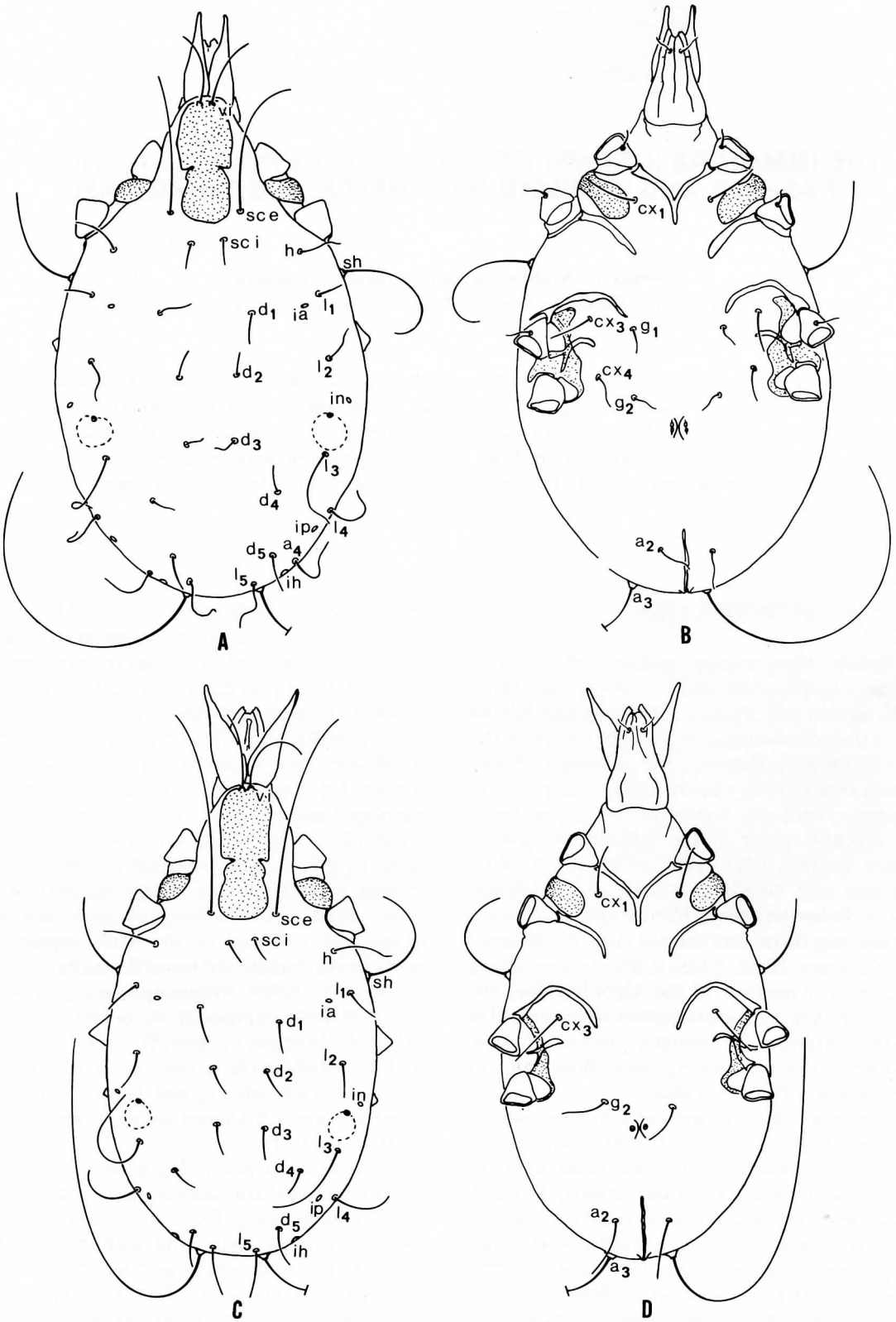

Fig. 1. *Algophagus pennsylvanicus* — A, dorsal view of tritonymph; B, ventral view of tritonymph; C, dorsal view of protonymph; D, ventral view of protonymph.

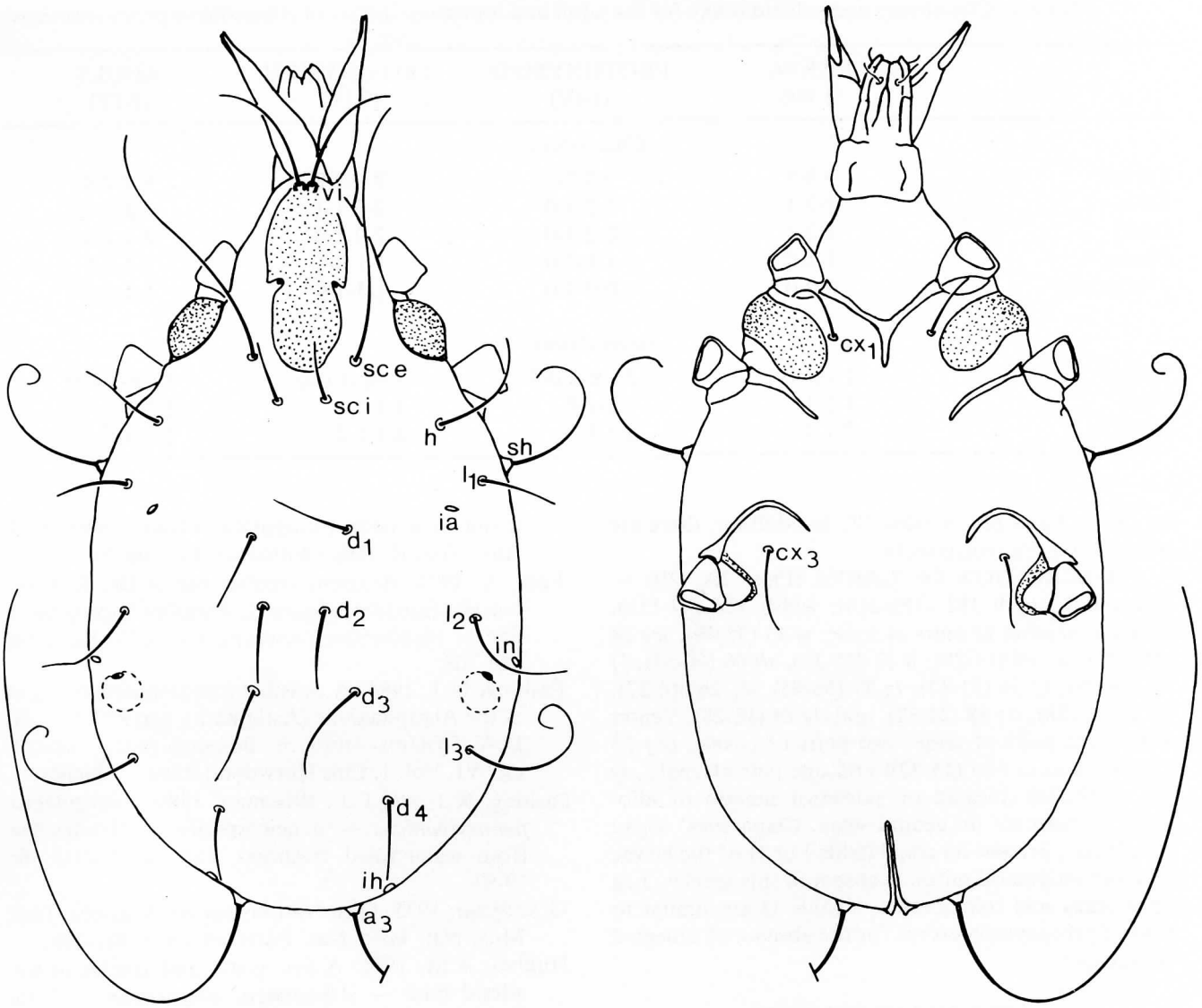

Fig. 2. *Algophagus pennsylvanicus* — Dorsal and ventral view of larva.

(10-25), *h* 44 (34-51), *sh* 87 (77-107), l_1 22 (13-29), l_2 41 (35-49), l_3 86 (63-105), l_4 53 (30-70), l_5 36 (20-50), d_1 19 (12-27), d_2 15 (4-29), d_3 21 (8-27), d_4 14 (8-20), and d_5 23 (7-39). Venter with eight pairs of setae as follows: three pairs of coxals, cx_1 38 (15-43), cx_3 35 (25-42), and cx_4 24 (20-35); two pairs of genitals g_1 17 (14-20) and g_2 26 (8-35); and three pairs of anals, a_2 36 (29-34) (located next to the anus), a_3 269 (211-352) (located on posterior margin of idiosoma), and a_4 61 (46-82) (located between l_4 and a_3 on lateral margin of idiosoma). Leg chaetotaxy and solenidiotaxy similar to adult female (Table 1).

DESCRIPTION OF PROTONYMPH (Figs. 1C, 1D) — Idiosomal length, 274 (240-332); width 166 (93-211). Dorsum bearing 15 pairs of setae: *vi* 54 (44-62), *sce* 125 (92-135), *sci* 15 (19-22), *h* 39 (35-41), *sh* 85 (71-89), l_1 21 (15-28), l_2 36 (25-43), l_3 87 (71-103), l_4 43 (28-61), l_5 29 (20-34), d_1 19 (14-24), d_2 19 (11-26), d_3 24 (18-27), d_4 18 (11-22), and d_5 21 (15-28). Venter bearing six pairs of setae: two pairs of coxals, cx_1 35 (29-41) and cx_3 31 (23-34); one pair of genitals, g_2 22 (13-27); and three pairs of anals, a_2 31 (25-34) (located next to the anus), a_3 251 (200-371) (located on the posterior margin of idiosoma) and a_4 43 (35-50) (located between l_4 and a_3 on lateral margin of idiosoma). Leg chaetotaxy and solenidiotaxy (Table 1) similar to tritonymph except for absence of *f* on tarsus IV, *kT* on tibia IV, *wF* on femor IV, omega-3

Table 1. Chaetotaxy and solenidiotaxy for the adult and immature instars of *Algophagus pennsylvanicus*.

	LARVA (I-III)	PROTONYMPH (I-IV)	TRITONYMPH (I-IV)	ADULT (I-IV)
		Chaetotaxy		
Tarsus	9-9-7	9-9-7-7	9-9-7-8	9-9-7-8
Tibia	2-2-1	2-2-1-0	2-2-1-1	2-2-1-1
Genu	2-2-1	2-2-1-0	2-2-1-0	2-2-1-0
Femor	1-1-0	1-1-0-0	1-1-0-1	1-1-0-1
Trochanter	0-0-0	0-0-0-0	1-1-1-0	1-1-1-0
		Solenidiotaxy		
Tarsus	1+ε-1-0	2+ε-1-0-0	3+ε-1-0-0	3+ε-1-0-0
Tibia	1-1-1	1-1-1-0	1-1-1-1	1-1-1-1
Genu	2-1-1	2-1-1-0	2-1-1-0	2-1-1-0

on tarsus I and phi on tibia IV. In addition, there are no setae on the trochanters.

DESCRIPTION OF LARVA (Figs. 2A, 2B) — Idiosomal length 183 (159-216); width 126 (87-151). Dorsum bearing 12 pairs of setae: *vi* 43 (35-49), *sce* 88 (56-105), *sci* 16 (14-20), *h* 32 (25-37), *sh* 66 (50-85), l_1 22 (18-28), l_2 34 (21-42), l_3 77 (56-95), d_1 24 (14-27), d_2 23 (13-28), d_3 28 (21-37), and d_4 23 (18-28). Venter with three pairs of setae: two pairs of coxals, cx_1 23 (13-28), and cx_3 25 (15-32), and one pair of anals, a_3 216 (199-234) (located on posterior margin of idiosoma). There are no genital setae. Claparedes' organ (urstigma), present on coxal fields I or II of the larvae of most astigmatid mites, is absent in this species. Leg chaetotaxy and solenidiotaxy (Table 1) are similar to that of protonymph except for the absence of omega-2 on tarsus I.

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