

***Psorophora (Grabhamia) varinervis* (Diptera: Culicidae)  
Morphological Description Including Pupa and Fourth-Stage  
Larva Previously Unknown**

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**ABSTRACT** *Psorophora (Grabhamia) varinervis* Edwards (Diptera: Culicidae) is redescribed in the adult stage. Pupa and fourth-stage larva are described and illustrated for the first time. Information about distribution, bionomics, and taxonomy also is included. Adults of *Ps. varinervis* can be separated from the closely related species *Ps. (Gra.) discolor* (Coquillett) on the basis of the wing characters, and the larva by the siphon and antenna characters.

**KEY WORDS** *Psorophora (Grabhamia) varinervis*, adult redescription, pupa and larval description

As noted by Darsie (1985), several *Psorophora (Grabhamia)* larvae are unknown. Larvae of different mosquito species were collected during studies carried out in different provinces of Argentina and in Uruguay. Several larvae belonging to the genus *Psorophora* could not be identified to the species level, according to the published keys (Dyar 1928, Del Ponte et al. 1951, Lane 1953, Darsie 1985). However, these unidentified larvae coming from Buenos Aires, Chaco, and Corrientes provinces (Argentina), and Colonia (Uruguay) were evidently conspecifics. Fortunately, several of these larvae were individually reared in the laboratory and the adults identified as *Psorophora (Grabhamia) varinervis* Edwards. These specimens were used to describe the adults, and the larva and pupa of this species, which were unknown until now. The terminology used for the description is based on Harbach and Knight (1980), and the abbreviations for genus and subgenus are based on Reinert (2001). Voucher specimens were deposited in the Scientific Department of Entomology, La Plata Museum (Buenos Aires Province), Instituto de Medicina Regional (UNNE), Resistencia, Chaco Province, and Centro de Investigaciones Entomológicas de Córdoba, Edificio de Investigaciones Biológicas y Tecnológicas, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba Province (Argentina).

***Psorophora (Grabhamia) varinervis* Edwards, 1922**

**Type Locality.** Paraguay (HNM) Lane 1953: 764 (♀). Martínez et al. 1959: 115 ♂\*. Guedes et al. 1965: 24 (♂\*, ♀\*).

**Female.** *Head:* Covered with small bronze scales with spots bronzy at center and posterior area, forked scales dark. Torus tanned with few small golden scales in the internal side. Clypeus ochre. Palpus brown with shining reflection and few opaque scales, length 0.42–0.78 mm. Proboscis straight, length 2.00–2.80 mm, slightly longer than forefemur, chestnut, darker at base and apex than middle. Antenna with pedicel ochre and few whitish scales on mesal surface. *Thorax:* Integument reddish brown covered by small pale bronzy scales. Scutellar lobes with patches of scales similar to those of scutum, with 5–8 (7) long and one to three small setae in the median lobe, and 4–10 (7) long and one to three small setae in lateral lobes. Pleura with broad scales in anteprepronotum and postspiracular area, larger in meskatepisternum and mesepimeron. Setae as follows: 6–7 (6) prealar, 8–10 antealar, 6–11 upper proepisternal, a row of 4–7 (5) meskatepisternal, 6–9 (7) prespiracular. *Legs:* Brown yellowish, femora and tibia with whitish scales in the internal side, in femora on the basal two thirds. Tarsi resembling the femur-tibia color, with dark scales at base and apex, more evident from Ta-1 to Ta-4, Ta-5 peppered. Unguis single. *Wing:* Covered with tiny whitish scales except by scattered brown scales in the internal side of Costa, Subcosta and spots at base of M, apex of A, M, base of R<sub>3</sub> and a spot in R<sub>4</sub> + <sub>5</sub> with tightened dark scales. *Abdomen:* Integument brown with wide whitish scales covering almost the whole tergum, except the lateral area, being more abundant in the apical side. Sternum with the same arrangement.

**Male.** Similar to female except for the sexual characteristics. *Genitalia* (Fig. 1): Gonocoxite subcylindri-

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**Fig. 1.** Pupa and genitalia of *Ps. (Gra.) varinervis*. (A) Dorsal aspect of cephalothorax. (B) Dorsal side (left) and ventral side (right) of the metanotum and abdomen. P, paddle. (C) Genitalia. (D) Ninth tergite.

cal, slightly longer than triple the basal wide, covered with fine setae in addition to the normal long setal pattern and large scales. Apical lobe of gonocoxite prominent, undivided with 8–13 conspicuous and one to three small setae. Gonostylus with rounded base, narrowed and expanded at middle and narrowed at apex, with reticulated surface at base and middle, with two setae in the internal side. Gonostylus claw straight pointed. *Claspette*: Claspettes divided and diverging at base, the apical lobe with a projection with five to six specialized ribbon-shape bristles, the three external with tiny striation and blunt point, the three internal

bristles with spicules distally. Proctiger narrowed with three to four small teeth at apex. Cercal seta  $\approx 4$ . Ninth tergite sclerotized, lobes without central excavation and 12–14 conspicuous setae. Sternite projecting between sidepieces, its anterior margin with a finger lobe. Aedeagus single, trapezoid with aedeagal sclerites separated. Moderately broad at base and narrowed near to apex.

**Pupa (Fig. 1).** Placement and character of setae as figured; range and modal number of branches in Table 1. *Cephalothorax*: Lightly pigmented, brownish. Trumpet moderately tanned, cylindrical; length 1.55–1.67

Table 1. Number of branches for setae of the pupa of *Ps. (Gra.) varinervis* ( $n = 10$  specimens)<sup>a</sup>

Seta no.	CT <sup>b</sup>	Abdominal segment								Pa <sup>c</sup>
		I	II	III	IV	V	VI	VII	VIII	
0			1	1	1	1	1	1	1	1
1	1	— <sup>d</sup>	4	2-5 (3)	2	2-3 (2)	1-2 (2)	1-2 (1)		1
2	1-2 (2)	1	1	1	1	1	1	1		1
3	1-3 (2)	1	1	2-5 (3)	2	1	1	1		
4	1-2 (2)	2-7 (3)	3-4 (3)	2	1-2 (1)	1	1	1		
5	1-2 (1)	2-5 (3)	1	1-3 (3)	2	2	2-4 (2)	2		
6	1-2 (1)	2	2	1	1	1	1	2-5 (3)		
7	1	3	2-4 (2)	1	1-2 (2)	1	1	1-2 (1)		
8	2-3 (3)		2-3 (2)	2	1	1	1	2-4 (3)		
9	1	1	1	1	1	1	1	1		
10	2-6 (3)		1	1	1	1	1	3		
11	1		1	1	1	1	1	3		
12	1									
13										
14										

<sup>a</sup> Values are range (number counted).

<sup>b</sup> CT, cephalothorax.

<sup>c</sup> Pa, paddle.

<sup>d</sup> For seta 1-I, four to six branches and >60 secondary branches.

mm ( $\bar{x} = 1.62$ ), width 0.42–0.50 mm ( $\bar{x} = 0.47$ ), index 3.31–3.67 ( $\bar{x} = 3.49$ ); pinna 0.62–0.66 length of trumpet. Tracheoid area  $\approx 0.30$  length of trumpet. *Abdomen*: Lightly tanned, similar to cephalothorax, with a darker, median longitudinal strip. Seta 1-III-VI usually single. Genital lobe lightly tanned in female, darker in male. Paddle ovoid, lightly tanned, buttress darker, strong at middle (1.24–1.55 mm). Midrib developed except at apex (2.10–2.33 mm), paddle length 2.13–2.45 mm, width 1.67–1.82 mm, paddle index 1.27–1.34; seta 2-P  $\approx 0.33$  length of 1-P.

**Larva (Fig. 2).** Chaetotaxy as figured: range and modal number of branches in Table 2. *Head*: Wider than long, width 1.25–1.44 mm ( $\bar{x} = 1.34$  mm), length 0.92–1.23 mm ( $\bar{x} = 1.02$  mm). Lightly tanned, dorsomentum triangular, dark with eight to nine (9) teeth on each side of median tooth. Seta 1-C downturned. Seta 2-C absent; seta 3-C 0.25 length of 1-C, seta 4-C very small with four to six branches and posterior to seta 6-C. Seta 5, 6-C aciculate, strongly developed; seta 7-C with two to six (3) branches; 8, 9, and 15-C with one to three branches; 10, 11, 13, and 14-C single. *Antenna*: length 1.07–1.49 mm ( $\bar{x} = 1.12$  mm), S-shaped, spiculose, tanned. Seta 1-A with 6–13 aciculate branches (variably on each side of same larva); seta 2-3-A strong, with a basal tooth. *Thorax*: Integument hyaline, smooth. Seta 0-P usually with four (2–4) branches. Seta 1-5-P single, 6-P single or double, 7-P with two to three branches, both 6, 7-P aciculate, each on a sclerotized tubercle, 8-P with two to four branches, seta 9–12-P simple and inserted on a common tubercle. Seta 1–2-M with one to two branches, small, 3–4-M single, small, 5-M single, strong, 6-M 4–6 (4) and 7-M single, 8-M 4–7 (7), 9-M with three to six branches, 10–12-M single, 9–12-M inserted on a common tubercle. Seta 1-T with one to three branches, 2–3-T single, 4-T with two to seven branches, 5–6-T single, 7-T with six to eight branches, 9–12 T similar to 9–12 M. *Abdomen*: Integument hyaline, smooth, with small spicules on dorsocentral surface of segments

I–VIII, forming a patch of 8–10 rows. Seta 0 on II–VIII single. Seta 1-I with three to five branches, 1-II with two to three branches, seta 1-III-V single, longer than corresponding segment. Seta 6-I quadruple, 6-II usually triple, seta 6-III-V usually double (2–3), seta 7-I with two to three branches, seta 7-II-IV with three to five branches, seta 7-V-VI usually double, aciculate. Segment VII with small setae, only 1-VII strong and long. Comb of segment VIII with six scales forming a curved row, central scales longer than lateral scales, 168–121  $\mu\text{m}$ , each with small spicules. Siphon brownish, length 1.12–1.50 mm ( $\bar{x} = 1.35$  mm), width at base 0.30–0.39 mm ( $\bar{x} = 0.35$  mm), with a ventromedial protuberance at 0.5–0.6 from base, bearing seta 1-S, usually six (5–9). Siphonal index 3.43–4.09 ( $\bar{x} = 3.75$ ); pecten on basal 0.33 of siphon, with 7–13 (11) spines, increasing in size distally, length 123–200  $\mu\text{m}$ . Seta 2-S curved, strong,  $154 \pm 5$   $\mu\text{m}$  in length, similar to apical siphon diameter. *Segment X*: Saddle complete, brownish, with spicules more distinct on posterolateral margin. Grid with only transverse bars as Subtype B1 of Reinert (2002) with six to eight precratal setae in irregular row and four to seven setae in a grid. Anal papillae length 1.23–1.53 mm ( $\bar{x} = 1.30$  mm). Seta 1-X double. Seta 2-X double, 3-X simple.

**Material Examined.** *Ps. varinervis*: 9  $\delta^*$ , 11  $\text{♀}$ , 12 Pe, 22Le, 31L as follows: ARGENTINA: Buenos Aires Province: 1  $\delta^*$ , 1Pe, 4L, Brandsen (35° 10' S, 58° 15' W), Provincial Route N 215 (km 25), 18-IV-1989, García coll., 3L, Brandsen, Provincial Route No. 215 (km 25), 12-IV-1988, Rossi coll., 2  $\delta^*$ , 1  $\text{♀}$ , 3Pe, 3Le, 4L, Brandsen, Provincial Route No. 215 (km 25), 25-IV-1989, García & Rossi coll., 4 L, Brandsen, Provincial Route No. 215 (km 25), 2-II-1991, Rossi coll.; 1L, Villa Elisa, La Plata (34° 54' S, 57° 53' W), 5-III-2001, M. Dellapé coll.; 11L, Zapata Stream, Magdalena, 17-XI-1987, Macia coll.; Corrientes Province: 1L, Monte Caseros (30° 15' S, 57° 37' W), Cno. a Paniagua, 21-XII-1989, Ronderos coll., same locality, 1  $\text{♀}$ , H. Marino coll.; Chaco Province: 2  $\text{♀}$ , 2Pe, 2Le, Monte Alto (27° 26' S, 58° 55' W), 16-X-2001, Stein coll., 2  $\delta^*$ ,

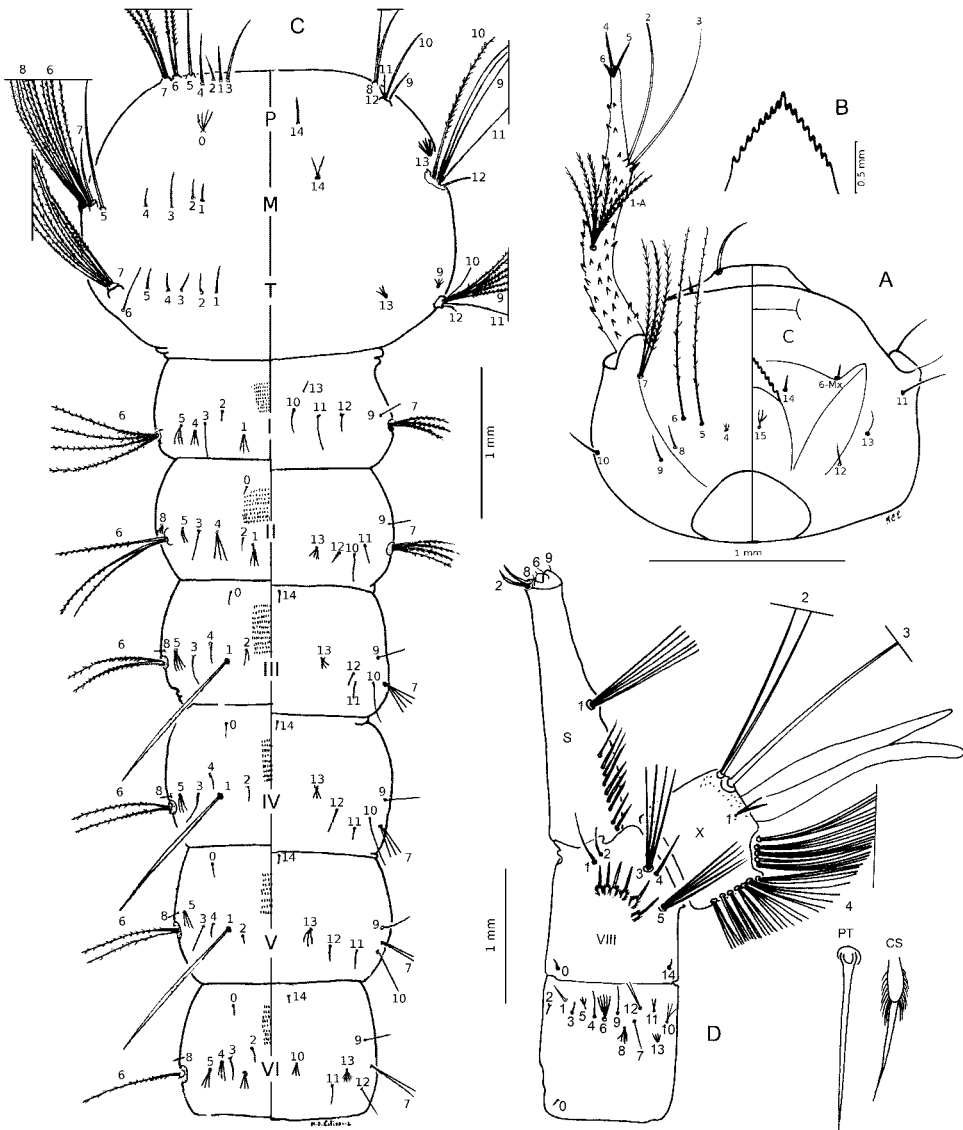


Fig. 2. Fourth-stage larva of *Ps. (Gra.) varinervis*. (A) Head, dorsal and ventral view. (B) Dorsosentum. (C) Thorax and abdominal segments I-VI dorsal and ventral view. P, prothorax; M, mesothorax; T, metathorax. (D) Abdominal segments VII-X. S, siphon; CS, comb scale; and PT, pecten tooth.

2♀, 2Pe, Monte Alto, 22-XI-2001, Stein coll.; 1L, Monte Alto, 21-III-2002, Stein coll., 4♀, 3Pe, 10Le, Monte Alto, 5-XII-2002, Stein coll., 2 ♂\*, 3Le, Monte Alto, 26-XII-2002, Stein coll., 2 ♂\*, 2Le, Monte Alto, 24-IV-2003, Stein coll.; 1♀, 1Pe, 1Le, Km 1031 (27° 10' S, 58° 58' W), Provincial Route No. 11, 3-XII-2002, Stein coll. URUGUAY: 2L, Colonia (34° 27' S, 57° 50' W), 3-V-1993, Rossi coll.

**Distribution.** This species is known from Argentina, Bolivia, Brazil, Paraguay, and Uruguay (Knight and Stone 1977). In Argentina, it is known from the following provinces: Buenos Aires, Chaco, Córdoba, Corrientes, Entre Ríos, Formosa, Misiones, Salta, Santa Fe, Santiago del Estero, and Tucumán (Mitchell and Darsie 1985, Ludueña Almeida et al. 2004).

**Bionomics.** Immature stages were collected by dipping from ground ponds, in wild and urban environments, temporary breeding habitats with clear or turbid water, with grass and aquatic macrophyta, full sunny or at shadow, and not very deep. In Buenos Aires Province, *Ps. varinervis* immature stages were found in association with larvae of *Anopheles albitarsis* Lynch Arribalzaga, and *Uranotaenia nataliae* Lynch Arribalzaga; in Corrientes Province with *Culex pilosus* Dyar & Knab; in Chaco Province *Anopheles neomaculipalpus* Curry, *Culex bidens* Dyar, *Culex eduardoi* Casal and García, *Cx. maxi* Dyar, *Culex pilosus*, *Aedes albifasciatus* (Macquart), *Aedes fulvus* (Wiedemann), *Aedes hastatus* Dyar/*oligopistus* Dyar, *Aedes serratus* (Theobald), *Psorophora albigena* (Peryassu), *Psorophora ciliata* (F.), *Psorophora cingulata*

**Table 2.** Number of branches for setae of the fourth-stage larva of *Ps. (Gra.) varinervis* ( $n = 10$  specimens)<sup>a</sup>

Seta no.	H <sup>b</sup>	Thorax <sup>c</sup>			Abdominal segment												
		P	M	T	I	II	III	IV	V	VI	VII	VIII	X				
0	— <sup>d</sup>	2-4 (4)															
1	1	1	1-2 (1)	1-3	3-5	2-3 (3)											
2	— <sup>d</sup>	1	1-2	1	1	1	1-2 (2)	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1-2	1-2	1-2	1-3 (1)	1	1	1	1	1	1	1
4	4-6	1	1	1-7 (2)	3-6 (3)	3-5	1-2 (1)	1	1-4	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
5	1	1	1	1	3-5	2-5 (2)	2-6 (4)	3-4 (3)	2-4 (3)	2-4	3-6 (4)	2-5	2-5	2-5	2-5	2-5	2-5
6	1	1-2	4-6 (4)	1	4	2-5 (3)	2-3	2	2	1-3 (1)	6-10	1-2	1-2	1-2	1-2	1-2	1-2
7	2-6 (4)b	2-3	1	6-8 (7)	2-3 (3)	3-5 (4)	3-5 (4)	3-5	2-3 (2)	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
8	1-3 (1)	2-4	4-7 (7)	1-4 (4)		3-6 (3)	1	1	1	1-2 (1)	5	1a	5-9 (6)	1a	5-9 (6)	1a	5-9 (6)
9	1-3	1	3-6 (3)	4-5 (5)	1-3	1	1	1	1	1	1-5	1-5	1-5	1-5	1-5	1-5	1-5
10	1	1	1	1	1-4	1	1	1	1	1	1-5	1-5	1-5	1-5	1-5	1-5	1-5
11	1	1	1	1	1	1	1	1	1	1	1-6 (3)	1-2	1-2	1-2	1-2	1-2	1-2
12	1-2 (1)	1	1	1	1	1-2	1	1	1-2	1-11	1-2	1-2	1-2	1-2	1-2	1-2	1-2
13	1		2-3	3-4 (3)	1-2	3-7	3-5	3-5	3	2-3	4-8	4-8	4-8	4-8	4-8	4-8	4-8
14	1	1	2-3				1	1	1	1	1	1	1	1	1	1	1
15	1-3 (1)																

<sup>a</sup> Range (number counted).<sup>b</sup> H, head.<sup>c</sup> P, prothorax; M, mesothorax; and T, metathorax.<sup>d</sup> Not counted.

(F.), *Psorophora confinnis* (Lynch Arribalza), *Psorophora cyanescens* (Coquillett), and *Psorophora ferox* (von Humbolt).

**Taxonomy.** The antennal shape, the position of seta 2 and 3-A, and the siphon shape are characteristic in *Ps. varinervis* larva. This species and the closely related *Psorophora discolor* (Coquillett) show a similar antennae but can be easily separated by the following characters: *Ps. varinervis* with a mean siphon index of 3.75, pecten with 7-13 spines, seta 6-S curved, seta 1-S as long as the siphon diameter, and VIII segment comb with six separated spines; *Ps. discolor* with a shorter siphon (index 2.98), with six pecten spines, seta 6-S hooklike, seta 1-S more than twice the siphon diameter in length, and VIII segment comb in a sclerotized plate. The characteristic wing spot of adults, the pale color of the body, and the leg ring bands easily separate them from other South American closely related species; these characteristics also allow identification of males, because the male genitalia are similar to other *Grabhamia* species.

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