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Manual of Neotropical Diptera. Simuliidae

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Introduction

The Neotropical Simuliidae have been most recently monographed by Coscarón & Coscarón Arias (2007), with the exception of the small genus *Pedrowygomyia* Coscarón & Miranda Esquivel, 1998 (revised by Coscarón & Miranda Esquivel, 1998) and the large genus *Gigantodax* Enderlein, 1915 (revised by Wygodzinsky & Coscarón, 1989). Basic information about black flies' bionomics (pp. 15-16), behavior (pp.16-17), morphology (pp. 22-330, collection and preparation of material (pp. 34-35), methods of study (pp. 36-37) and bibliography (pp. 648-670) may be found in Coscarón & Coscarón Arias (2007). Some additional references are added in the ensuing paragraphs.

Some females are vicious biters and their saliva contains certain anticoagulant substances (Abebe, Cupp, Ramberg & Cupp, 1994; Abebe, Ribeiro, Cupp & Cupp, 1996). Due to their hematophagy and anthropophilic habits, simuliids have a great importance in public health and socioeconomy (Coscarón & Coscarón Arias, 2007: 17-18; see also Briceño Iragorry & Ortiz, 1957; Campos Gaona & Andrade, 1999; Coscarón, 1971; Lacey, 1981; Lacey & Charlwood, 1980; León & Wygodzinsky, 1953a, 1953b; Medeiros & Py-Daniel, 1999, 2002; Py-Daniel, Andreazze & Medeiros, 2002; Py-Daniel, Passos, Medeiros & Andreazze, 1999; Ramírez Pérez, Rassi, Conviti & Ramírez, 1976; Shelley, 1988a; Shelley, Dias, Maia-Herzog, Camargo, Costa, Garritano & Lowry, 2001; Shelley, Maia-Herzog, Dias, Camargo, Costa, Garritano & Lowry, 2001; Shelley, Maia-Herzog, Dias, Camargo & Garritano, 2001; Souza, 1984; Takaoka, 1982; Takaoka, Tada, Baba, Shimada, Lazos, Rumbea, Farias, Guderian & Amunarriz, 1988; Travis, Vargas V. & Swartzwelder, 1974; Vargas, 1941; Vieira, Brackenboro,

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Porter, Basáñez & Collins, 2002; Vieira, Brackenboro, Porter, Basáñez & Collins, 2005).

They are responsible for the transmission of several grave diaseases to man and domestic animals, such as equine encephalitis (Sanmartín, Mackenzie, Trapido, Barreto, Mullenax, Gutiérrez & Lesmes, 1973), rabbit mixomatosis (Coscarón, 1963), vesicular stomatitis virus (Cupp, Mare, Cupp & Ramberg, 1992; Howerth, Mead & Staalknecht, 2002; Mead, Gray, Noblet, Murphy, Howerth & Stalknecht, 2004), keratitis (Garrido & Campos, 2000), pemphigus foliaceus (fogo selvagem) (Aoki, Rivitti, Ito, Hans Filho & Diaz, 2005; Diaz, Sampaio, Rivitti, Marins, Cunha, Lombardi, Almeida, Castro, Macca, Lavrado, Hans-Filho, Borges, Chaul, Minelli, Empinotti, Friedman, Campbell, Labib & Anhalt, 1989), but especially of filarioses (Andrade, Medeiros, Pessoa & Py-Daniel, 2004) such as mansonellosis (Cerqueira, 1959; Kozek & Raccurt, 1983; Medeiros & Py-Daniel, 2002, 2003, 2004; Moraes, Shelley & Dias, 1985; Morales-Hojas, Post, Shelley, Maia-Herzog & Coscarón, 2001; Nathan, Tikasingh & Munroe, 1982; Shelley, 1975; Shelley, Dias & Moraes, 1980; Shelley, Maia-Herzog, Dias & Coscarón, 2002; Shelley & Shelley, 1976; Tidwell, Peterson, Ramírez Pérez & Lacey, 1980; Tidwell & Tidwell, 1982; Tidwell, Tidwell & Muñoz de Hoyos, 1980; Tidwell, Tidwell, Muñoz de Hoyos, Corredor & Barreto, 1980; Yarzábal, Basáñez, Ramírez Pérez, Ramírez, Botto & Yarzábal, 1985) and onchocerciasis (Andreazze & Py-Daniel, 2001; Andreazze, Py-Daniel & Medeiros, 2002; Anonymous, 1997; Arzube & Shelley, 1990; Barreto, Trapido & Lee, 1970; Basáñez & Boussinesq, 1999; Basáñez, Boussinesq, Proud'hon, Frontado, Villamizar, Medley & Anderson, 1994; Basáñez, Collins, Porter, Little & Brandling-Bennett, 2002; Basáñez, Remme, Alley, Bain, Shelley, Medley & Anderson, 1995; Basáñez, Rodríguez Pérez, Reyes Villanueva, Collins & Rodríguez, 1998; Basáñez, Townson, Williams, Frontado, Villamizar & Anderson, 1996; Basáñez, Yarzábal, Frontado & Villamizar, 2000; Basáñez, Yarzábal, Takaoka, Suzuki, Noda & Tada, 1988; Bequaert, 1934; Botto, 1990; Botto, Escalona, Vivas Martínez, Behm, Delgado & Coronel, 2005; Botto, Gillespie, Vivas Martínez, Martínez, Planchart, Basáñez & Bradley, 1999; Branding-Bennett & Darsic, 1983; Calvão-Brito, Mokrabe, Maia-Herzog, Mello & Silva Jr., 1998; Campbell, Collins, Huong & Marroquin, 1980; Carabin, Escalona, Marshall, Vivas Martínez, Botto, Joseph & Basáñez, 2003; Charalambous, Lowell, Arzube & Lowry, 2005; Charalambous, Lowry, Lowell, Shelley & Arzube, 1997; Charalambous, Ready, Shelley, Arzube & Lowry, 1993; Charalambous, Shelley & Arzube, 1993; Charalambous, Shelley & Arzube, 1997; Charalambous, Shelley, Maia-Herzog & Dias, 1993; Charalambous, Shelley, Maia-Herzog & Dias, 1996a, 1996b; Collins, 1979a, 1979b; Collins, Campbell, Wilton & Newton, 1977; Collins, Lehmann, Vieira Garcia & Guderian, 1995; Collins, Ochoa, Cupp, González-Peralta & Porter, 1992; Corredor, Santiago Nicholls, Duque, Muñoz de Hoyos, Alvarez, Guderian, Lopez & Palma, 1998; Cupp, Chen & Cupp, 1997; Cupp, Cupp, Ochoa & Moulton, 1995; Dalmat, 1955; Davies, Oskam, Luján, Schoone, Kroon, López-Martínez & Paniagua-Álvarez, 1998; De León & Duke, 1966; Duke, 1970; Garms, 1975; Garms & Ochoa, 1979; Gómez-Priego, Mendoza & Rosa, 2005; Gowtage Sequeira, Higazi, Unnasch & Basáñez, 2002; Grillet, Basáñez, Vivas-Martínez, Villamizar, Frontado, Cortez, Coronel & Botto, 2001; Grillet, Botto, Basáñez & Barrera, 1994; Grillet, Villamizar, Cortez, Furtado, Escalona, Vivas-Martínez & Basáñez, 2005; Grillet, Vivas-Martínez, Villamizar, Frontado, Cortez, Coronel & Basáñez, 2002; Guderian, 1988; Guderian, Anselmi, Espinel, Mancero, Rivadaneira, Proano, Calvopina, Vieira & Cooper, 1997; Guderian, Anselmi, Espinel, Sandoval, Cooper, Rivadaneira & Guderian, 1997; Guderian, Beck, Stone, Isabel & Mackenzie, 1988; Guderian, Lovato, Anselmi, Mancero & Cooper, 1997; Guderian & Shelley, 1992; Guevara, Vieira, Lilley, López, Vieira, Rumbea, Collin, Katholi & Unnasch, 2003; Hashiguchi, Kawabata, Ito & Recinos, 1981; Hernandez, Shelley & Penn, 2002; Hoffmann, 1930, 1931; Lehmann, Cupp & Cupp, 1994a, 1994b, 1995a, 1995b; Lewis, 1963; Lewis & Ibáñez Aldecoa, 1962; Luz, Shelley & Maia-Herzog, 1996; Maia-Herzog, Shelley, Bradley, Dias, Calvão, Lowry, Camargon, Rubio, Post & Coelho, 1999; Marchon-Silva, Caër, Post, Maia-Herzog & Fernandes, 2004; Moraes, Shelley & Dias, 1986; Morales-Hojas, Post, Shelley, Maia-Herzog & Coscarón, 2001; Nettel, 1952; Ochoa, Castro, Barrios, Juárez & Tada, 1997; Omar & Garms, 1975, 1977; Porter & Collins, 1984, 1985, 1988a, 1988b; Porter, Collins & Brandling-Bennett, 1988; Post, Adams, Shelley, Maia-Herzog, Dias & Coscarón, 2003; Procunier, Shelley & Arzube, 1985; Py-Daniel, 1989, 1994a, 1994b; Py-Daniel, Andreazze & Medeiros, 2000, 2002; Py-Daniel, Passos, Medeiros & Andreazze, 1999; Py-Daniel & Py-Daniel, 1998; RamírezPérez, 1983, 1984, 1985; Ramírez-Ramírez, Sánchez-Tejeda, Méndez-Galván, Unnasch & Monroy-Ostria, 2006; Rassi, Lacerda & Guimarães, 1976; Rassi, Lacerda, Guimarães, Vulcano, Ramírez Pérez & Ramírez, 1975; Rodríguez Pérez, Danis-Lozano, Rodríguez & Bradley, 1999; Rodríguez Pérez, Danis-Lozano, Rodríguez, Unnasch & Bradley, 1999; Rodríguez Pérez, Katholi, Hassan & Unnasch, 2006; Rodríguez Pérez, Lilley, Domínguez-Vásquez, Segura-Arenas, Lizarazo-Ortega, Mondoza-Herrera, Reyes-Villanueva & Unnasch, 2004; Rodríguez Pérez, Núñez González, Lizarazo Ortega, Sánchez Varela, Wootren & Unnasch, 2006; Rodríguez Pérez & Reyes Villanueva, 1994; Rodríguez Pérez & Rivas Algalia, 1991; Rodríguez Pérez, Rodríguez, Margeli-Pérez & Rivas-Alcalá, 1995; Rodríguez Pérez, Valdivieso López & McCall, 2003; Rowe & Durand, 1998; Schiller, Petersen, Shirazian & Figueroa Marroquin, 1984; Shelley, 1988b, 1988c, 1991, 2000, 2001, 2002; Shelley & Arzube, 1985; Shelley, Arzube & Couch, 1989; Shelley, Charalambous & Arzube, 1990; Shelley, Dias, Maia-Herzog, Camargo, Costa, Garritano & Lowry, 2001; Shelley, Dias, Maia-Herzog, Procunier & Moraes, 1987; Shelley, Dias, Moraes & Procunier, 1987; Shelley, Dias, Moraes, Procunier & Couch, 1988; Shelley, Hernández, Maia-Herzog & Dias, 2002; Shelley, Lowry, Maia-Herzog, Dias & Moraes, 1997; Shelley, Maia-Herzog, Dias, Camargo, Costa, Garritano & Lowry, 2001; Shelley, Maia-Herzog, Dias & Coscarón, 2002; Shelley, Maia-Herzog, Lowry, Dias, Garritano, Camargo & Carter, 2000; Shelley, Maia-Herzog, Lowry, Dias, Garritano, Shelley, Camargo & Carter, 2000; Shelley, Mello & Rees, 1976; Shelley, Pinger, Moraes, Charlwood & Hayes, 1979; Shelley, Pinger, Moraes & Hayes, 1979; Shelley, Procunier & Arzube, 1986; Atallings, Cupp & Cupp, 2002; Tada, 1987; Takaoka, 1980, 19811982; Takaoka, Ochoa, Juárez & Hansen, 1982; Takaoka, Suzuki, Noda, Ochoa & Tada, 1984; Takaoka, Suzuki, Noda, Tada, Basáñez & Yarzábal, 1984; Takaoka, Tada, Baba, Shimada, Lazos, Rumbea, Farias D., Guderian & Amunarriz,

1988; Takaoka, Tada, Hasiguchi, Baba, Korenaga, Ochoa & Convit, 1986; Tanaka, Hashiguchi, Okazawa, Ochoa & Tada, 1980; Tidwell, Muñoz de Hoyos & Corredor, 1980; Tidwell, Peterson, Ramírez Pérez & Lacey, 1980; Tidwell, Tidwell, Muñoz de Hoyos & Corredor, 1980; Tidwell, Tidwell, Muñoz de Hoyos, Corredor & Barreto, 1980; Vargas, 1942, 1948a, 1948c, 1952; Vargas & Díaz Nájera, 1980; Vieira, Brackenboro, Porter, Basáñez & Collins, 2005; Vivas-Martínez, Basáñez, Botto, Rojas, García, Pacheco & Curtis, 2000; Vivas-Martínez, Basáñez, Botto, Villegas, García & Curtis, 2000; Wada, 1982; Yamagata, Suzuki & García-Manzo, 1986).

Studies about the biology and ecology of the larvae and their predation by some fishes have been published by Alencar, Ludwig, Soares & Hamada, 2001; Andrade & Py-Daniel, 2000; Andrade, Trivinho-Strixino, Py-Daniel & Medeiros, 2004; Crosskey, 1990; Kim & Merritt, 1988; Marino, 2003; Procunier, Shelley & Arzube, 1986; Py-Daniel & Py-Daniel, 1984; Py-Daniel & Jegu, 1998; Rodríguez Pérez, Reyes Villanueva & Rodríguez, 1995; Rodríguez Pérez, Valdivieso López & McCall, 2003; Sato, 1987; Strieder, 1986; Travis, Vargas V. & Fallas B., 1979; Travis, Vargas V. & Swartzwelder, 1974; Vargas, 1947, 1952; World Health Organization, 1982.

Larvae may be parasitized by a virus-like particle (Charpentier, Back, Garzon & Strykowski, 1986), Microsporidea (Ambrós Ginarte, Andrade & Gaona, 2003; Araújo-Coutinho, Nascimento, Figueiró & Becnel, 2004; Castello Branco Jr., 1999; Castello Branco Jr. & Andrade, 1993; Cordeiro & Castello-Branco Jr., 1988; García, 1990a, 1990b, 1990c, 1992; García, Hazard & Fukuda, 1989; Ginarte, Andrade & Gaona, 2003; Hamada, Costa & Darwich, 1997; Lutz & Splendore, 1908; Marino, Coscarón, Maurand, Loubés & Cabeza Meckert, 1980; Shelley (A. J.), 1983; Torres Fernández, Muñoz de Hoyos & Romero de Pérez, 1991; Shelley, 1983), Fungi (Torres Fernández, Muñoz de Hoyos & Romero de Pérez, 1991), especially Chytridiomycetes (López Lastra & García, 1990) and Trichomycetes: Lichtwardt, 1997; Lichtwardt, Ferrington Jr. & López Lastra, 1999; Lichtwardt, López-Lastra & Mazzuchelli, 2000; López Lastra, Scorsetti, Marti & Coscarón, 2005; McCreadie & Beard, 2003; Ríos-Velásquez & Hamada, 2002; Vojvodiæ, Nelder & McCreadie, 2006) and Nematoda (Mermithidae) (Ambrós Ginarte, Andrade & Gaona, 2003; Camino, 1985, 1986, 1988, 1990, 1991a, 1991b, 1992, 1993a, 1993b, 1994; Camino & Poinar Jr., 1988; Camino & Villalobos, 1997; Ginarte, Andrade & Gaona, 2003; Torres Fernández, Muñoz de Hoyos & Romero de Pérez, 1991; Villalobos & Camino, 1997).

Adults may be easily bred from pupae; mass rearings techniques, for various purposes, have been devised by Bernardo & Cupp, 1986, Edmon & Simmnons, 1985, Figueiró, Nascimento & Coutinho, 2002, Figueiró, Docile & Aranda, 2006, Hamada, Costa & Darwich, 1997 and Muirhead-Thomson, 1969.

Several control measures have been proposed (Coscarón & Coscarón Arias, 2007: 18-21; see also Andrade & Campos, 1995; Araújo Coutinho, Figueiró, Viviani, Nascimento & Cavados, 2005; Campos Gaona & Andrade, 2001; Castello Branco Jr. & Andrade, 1992; Cavados, Fonseca, Chaves, Araújo-Coutinho & Rabinovitch, 2005; Cavados, Majerovich, Chaves, Araújo-Coutinho & Rabinovitch, 2004; Cupp, Duke, Mackenzie, Guzmán, Vieira, Méndez-Galván, Castro, Richards, Sauerbrey, Domínguez, Eversole & Cupp, 2004; Cupp, Ochoa, Collins, Cupp, González-Peralta, Castro & Zea-Flores, 1992; Cupp, Ochoa, Collins, Ramberg & Zea, 1989; Elliot & Potter, 1978; Figueroa, Collins & Kozek, 1977; Gay, Adler & Noblet, 1997; Gray, Adler, Coscarón Arias & Noblet, 1999; Guderian, Anselmi, Espinel, Mancero, Rivadaneira, Proano, Calvopina, Vieira & Cooper, 1997; Jamnback, 1973; Kim & Merritt, 1988; Lacey & Undeen, 1988; Mardini, 2006; Mardini, Souza, Rabinovitch, Alves & Silva, 1999; Marino, 1993, 2003; Nettel, 1952; Ochoa, Castro, Barrios, Juárez & Tada, 1997; Overmyer, Armbrust & Noblet, 2003; Py-Daniel & Darwich, 1997; Rodríguez Pérez & Reyes Villanueva, 1994; Rodríguez Pérez, Reyes Villanueva, Barrera Saldaña, Domínguez Vásquez & Lizarazo Ortega, 2007; RodríguezPérez, Rodríguez, Margeli-Pérez & Rivas-Alcalá, 1995; Romaña & Ábalos, 1948; Ruas Neto, 1984a, 1984b; Ruas Neto & Silveira, 1989; Ruas Neto, Souza, Severino, Melo, Silveira & Fontes, 1985; Smith, 1973; Vargas, 1948b; Vieira, Brackenboro, Porter, Basáñez & Collins, 2002; Vivas-Martínez, Basáñez, Botto, Villegas, García & Curtis, 2000; Vivas-Martínez, Basáñez, Grillet, Weiss, Botto, García, Villamizar & Chavasse, 1998; Yamagata, Ochoa, Molina, Sato, Uemoto & Suzuki, 1987.

Illustration of the present publication have been extracted and modified from the original plates of papers published by the first author.

1. Key to the genera of Neotropical Simuliidae

1.1. Adults

1. Pedisulcus well developed (Figs. 8A-B: pe); basal cell invariably absent; length of basal section of R (as measured from humeral cross-vein) less than 1/3 distance from base of Rs to wing tip .... *Simulium* Latreille, 1802 [For subgenera and species-groups, see below]

   Pedisulcus absent (Figs. 8C-F); basal cell absent or present (Fig. 3A); length of basal section of R about 1/3 distance mentioned or more (Figs. 3A-B) 2

2. (1) Cu_2 and A_1 straight, basal cell absent (Fig. 3C). Arms of female genital fork with long cephalad directed apodemes

(Fig. 11K) 3
Cu_2 and A_1 curved, basal cell absent or present (Fig. 3A). Arms of female genital fork without apodemes (Figs. 11J, L-M) (except in *Cnesia*) 4

3. (2) First flagellomere shorter than wide; setae of basal flagellomeres and palpomeres shorter than segment (as in Fig. 2A); clypeus longer than wide (Fig. 1A); female mouthparts normal, functional; calcipala present (Figs. 8D-F); sub-basal tooth on claw well developed (Figs. 11D-E) ..... *Gigantodax* Enderlein, 1925 [For species-groups, see below]
First flagellomere as long as wide; setae of basal flagellomeres and palpomeres longer than segment (Fig. 2B); clypeus as long as wide; female mouthparts reduced, non functional; calcipala absent (Fig. 8C), sub-basal tooth on claw obsolescent (Fig. 11C) ..... *Pedrowygomyia* Coscarón & Miranda Esquivel, 1998

4 (2) Upper portion of pleural membrane hairy (Fig. 2G); apical segment of maxillary palp more than twice as long as penultimate segment (as in Fig. 2C) ..... *Tlalocomyia* Wygodzinsky & Díaz Nájera, 1970
Pleural membrane entirely bare; apical segment of maxillary palp generally less than twice as long as penultimate segment (Figs. 2D-F) 5

5 (4) Antenna with 10 segments; arms of furcasternum with conspicuous projections (Fig. 8H); male terminalia with geniculate median sclerite, composed of a slender, basal, Y-shaped portion and 2 sub-parallel elongate apical arms (Fig. 17H); apical portion of endoparameres with numerous elongate denticles; genital fork of female almost entirely unpigmented, its stem very stout, not longer than arms (Fig. 11L) .... *Paraustrosimulium* Wygodzinsky & Coscarón, 1964
Antenna with 11 segments (as in Fig. 2A); arms of furcasternum lacking conspicuous projections (Fig. 8G) (except *Lutzsimulium*; Fig. 8S); median sclerite of male not as above, or apical portion of endoparameres obsolescent, lacking denticles (Figs. 16B, 17A); genital fork distinctly pigmented, with stem not as above (Figs. 11J, M) 6

6 (5) R_1 only with hair-like setae, spiniform setae not developed (as in Fig. 3E); basal tooth of female claws large (Fig. 11F) ..... *Cnesiamima* Wygodzinsky & Coscarón, 1973
R_1 with hair-like and spiniform setae (Fig. 3D); if spiniform setae not very distinct, then basal tooth of female claw small (Figs. 11A-B) 7

7 (6) Basal cell absent; mandible of female toothed only on internal margin (similar to Fig. 10M); female claws with small sub-basal tooth; male terminalia with teeth of endoparameral organ not perceptible (Fig. 16B) 8
Basal cell present (Fig. 3A); mandible of female as above or with well-developed teeth on internal and external margins (Fig. 10L); claws of female with larger basal tooth (Figs. 11A-B); male terminalia with teeth of endoparameral organ distinct (Fig. 17C) 9

8 (7) Frons longer than wide, with median sulcus relatively short and without basal bifurcated branches (Fig. 1D); Sc with about 50 setae; furcasternal branches with large projections (Fig. 8J). Male gonocoxite about twice as long as gonostylus (Fig. 20A) ..... *Lutzsimulium* d'Andretta Jr. & d'Andretta, 1947
Frons about as long as wide, with median sulcus elongated and bifurcated, with long basal branches (Fig. 1E); Sc without setae; furcasternal branches with very small projections (Fig. 8I). Male gonocoxite 3 times as long as gonostylus (Fig. 20B) ..... *Kempfsimulium* Py-Daniel & Mello, 1982

9 (7) Wings with a slight curvature in Cu_2; A_1 almost attaining wing margin (Fig. 3B); male terminalia with basal portion of endoparameres obsolescent, denticles of distal portion well developed but few in number, forming a tight group of characteristic arrangement; female with arms of genital fork bearing 2 forwardly directed apodemes (as in Fig. 11K) ..... *Cnesia* Enderlein, 1934
Wings with pronounced curvature of Cu_2; A_1 ending well before wing margin (Fig. 3A); endoparameres of male not as above; genital fork of female without apodemes (Figs. 11J) 10

10 (9) Males 11
Females 13

11(10). Median sclerite with basal transverse satellite plate continuous distally with deep cleft and bifurcated apically (Fig. 17B); endoparameres lacking teeth (similar to Fig. 17A) ... *Mayacnephia* Wygodzinsky & Coscarón, 1973
Median sclerite of complex geniculate, with distal half divided into 2 wide but short and divergent arms (Figs. 17C-D); endoparameres with numerous teeth 12

12 (11) Ventral plate of terminalia sub-triangular, and basal arms narrow, straight (Figs. 18A); arms of median sclerite parallel (Fig. 17D); endoparameres with basal portion large and denticles of apical portion well developed .... *Araucnephia* Wygodzinsky & Coscarón, 1973

Ventral plate of terminalia sub-rectangular and basal arms stout, rounded at apex and curved (Fig. 18B); arms of median sclerite sharply diverging apically (Fig. 17E); endoparameres with basal portion small and denticles of apical portion obsolescent ..... *Araucnephioides* Wygodzinsky & Coscarón, 1973

13 (10) Basal tooth of claws narrow, hook like (Fig. 11B) ..... *Araucnephioides* Wygodzinsky & Coscarón, 1973

Basal tooth of claws larger, sub-triangular or spatulate (as in Figs. 11A, F) 14

14 (13) Frons very narrow (Fig. 1B), frontal angle approximately 50°; inner surface of spermatheca without spiculae. Paraproct about half as long as its own width (Mesoamerica) .... *Mayacnephia* Wygodzinsky & Coscarón, 1973

Frons wider (Fig. 1C), frontal angle approximately 85°; inner surface of spermatheca with scattered spiculae. Paraproct about as long as wide (Fig. 13A) (Southern South America) .... *Araucnephia* Wygodzinsky & Coscarón, 1973

1.2. Pupae (Figs. 24-30)

1. Abdominal sterna VI and VII divided longitudinally along middle by a membranous, striate area (Fig. 30C); tergal hooks VI-VIII invariably simple; abdominal segments VIII and IX in many cases with strongly curved, twisted, looped, or grapnel-like strong setae (Figs. 30G-H) 2

Abdominal sterna VI and VII entire; in many cases some hooks on terga VI-VIII, bifid or trifid; abdominal terga VIII and IX without the above-mentioned setae ..... *Simulium* Latreille, 1802

2 (1) Terminal processes of abdomen short and pointed (Fig. 30G), or absent (Fig. 30D) 3

Terminal processes of abdomen elongate (Fig. 30H) 4

3 (2) Cocoon reduced to a small pad, on which the terminal abdominal segments are inserted (Fig. 24A); gills in the shape of a thick stem, with a few thread-like filaments (Fig. 27A); abdomen strongly sclerotized, terga and sterna with a large number of supernumerary spines or hooks; apex of abdomen blunt; terminal processes absent (Fig. 30D) ..... *Tlalocomyia* Wygodzinsky & Díaz Nájera, 1970

Cocoon well developed, of definite shape, covering whole body of pupa except gills, each one of the latter in the shape of a twisted, pseudo-segmented lamella (Fig. 24D); abdomen less sclerotized than thorax; abdomen without supernumerary hooks, and with short terminal processes (Fig. 30G) .... *Cnesiamima* Wygodzinsky & Coscarón, 1973 and *Paraustrosimulium* Wygodzinsky & Coscarón, 1964

4 (2) Abdominal terga with combs of spines; tergum VIII without large hooks 5

Abdominal terga without combs of spines; tergum VIII with 4 large hooks ..... *Cnesia* Enderlein, 1934

5 (4) Facial trichomes (Fig. 26D), thoracic trichomes (Figs. 29B-C) and setae of eighth and ninth abdominal segments tightly looped apically (Fig. 30H) 6

At least facial and thoracic trichomes not looped apically 7

6 (5) Gill with 12-22 branches; frontoclypeus and thorax with tubercles ..... *Lutzsimulium* d'Andretta Jr. & d'Andretta, 1947

Gill with 12 branches; frontoclypeus and thorax without tubercles (Fig. 26D) .... *Kempfsimulium* Py-Daniel & Mello, 1982

7 (5) Head sclerite with frontal, facial, epicranial, lateral, and genal hair trichome-like (Figs. 26A) .... *Araucnephia* Wygodzinsky & Coscarón, 1973

Head sclerite without all the trichomes mentioned above; facial trichomes hair-like or spine-like 8

8 (7) Thorax with tubercles arranged in circles; basal portion of gills with minute plate-like cuticular structures; thoracic trichomes hair-like ..... *Araucnephioides* Wygodzinsky & Coscarón, 1973

Thorax with tubercles not arranged in circles; basal portion of gills without the aforementioned cuticular structures; thoracic trichomes hair- or spine-like 9

9 (8) Cephalic sclerite with 2+2 or 3+3 frontal trichomes; branches of gills more or less tubular ..... *Mayacnephia* Wygodzinsky & Coscarón, 1973
Cephalic sclerite with 1+1 or without frontal trichomes; gill branches varied in shape 10

10 (9) Frontal and frontoclypeal trichomes absent (Fig. 26C); clypeus comparatively narrow .... *Gigantodax* Enderlein, 1925
Frontal and frontoclypeal trichomes present (Fig. 26B); clypeus comparatively wide ..... *Pedrowygomyia* Coscarón & Miranda Esquivel, 1998

1.3. Larvae (Figs. 31-36)

1. Anal sclerite with accessory sclerite forming a complete ring around posterior end of body (Fig. 36A); each mandibles with 3 outer teeth (Fig. 34B) 2
Ring-shaped accessory sclerite not developed (Fig. 36B); each mandible with 2 or 4 outer teeth 3

2 (1) Hypostomium with first intermediate tooth generally projecting beyond level of lateral tooth (Fig. 35C); cephalic larval apotome with basal spots ..... *Pedrowygomyia* Coscarón & Miranda Esquivel, 1998
Hypostomium with lateral tooth, projecting beyond level of first intermediate tooth (Figs. 35D-E); cephalic apotome without basal spots ..... *Gigantodax* Enderlein, 1925

3 (1) Teeth of hypostomium arranged into 3 conspicuous groups (as in Fig. 35A); mandible with numerous (over 5) marginal serrations 4
Teeth of hypostomium more evenly distributed, not arranged into conspicuous groups (Fig. 35B); mandible with marginal serrations less numerous, not more than 5, generally only 2 (as in Fig. 34H) 7

4 (3) Antennae approximately as long as stem of cephalic fan; hypostomium with either 13 or 17 teeth 5
Antennae much shorter than stem of cephalic fan; hypostomium with 15 teeth ..... *Araucnephia* Wygodzinsky & Coscarón, 1973

5 (4). Cervical sclerites very small, sub-ovoidal; mandibles with accessory teeth at level of inner teeth, with second preapical tooth minute and with short, slender, basal setae, only faintly dentate; hypostomium with 17 teeth .... *Araucnephioides* Wygodzinsky & Coscarón, 1973
Cervical sclerites wide or transverse, sub-rectangular, or transverse and fused to the upper ends of the postocciput; mandibles without accessory serrations at level of inner teeth, with second preapical tooth as long as first or only slightly shorter and with short basal setae bearing conspicuous elongated denticles; hypostomium with 13 teeth 6

6 (5). Proximal antennal segment more than half as long as medial segment ..... *Mayacnephia* Wygodzinsky & Coscarón, 1973
Proximal antennal segment at most half as long as medial segment ..... *Tlalocomyia* Wygodzinsky & Díaz Nájera, 1970

7 (3). Antenna much longer than stem of cephalic fan; distal antennal segment distinctly longer than proximal and medial segments combined; backwardly directed struts underlying main body of anal sclerite ..... *Cnesiamima* Wygodzinsky & Coscarón, 1973 and *Paraustrosimulium* Wygodzinsky & Coscarón, 1964
Antenna not longer than stem of cephalic fan (Fig. 32A); distal segment not or only slightly longer than proximal and medial segments combined (Figs. 33F-L); anal sclerite without struts 8

8 (7). Postgenal cleft very shallow (Fig. 31C); hypostomium with 17 teeth, the 4+4 intermediate ones similar to the remaining teeth (Fig. 35B); mandibles with 4 outer teeth ..... *Cnesia* Enderlein, 1934
Postgenal cleft generally well developed (Figs. 31D-F); hypostomium with at most 13 teeth, the 1+1 lateral ones, when perceptible, somewhat similar to lateral serrations; mandible with 2 outer teeth 9

9 (8). Preapical teeth of mandible sub-equal in size (Figs. 34F-H) or decreasing in size from first to third (Fig. 34D-E, G) ..... *Simulium* Latreille, 1802
Preapical teeth of mandible with the second tooth smaller than either first or third 10

10 (9). Body integument with or without setae; without cylindrical projections; rays of cephalic fan with longer setae alternately disposed among smaller setae; antenna with basal segments not overly wide; antenna slightly shorter than or as long as stem of cephalic fan; ninth abdominal segment with 1+1 ventral tubercles; anal ring with about 75 rows and 13 hooks each ..... *Lutzsimulium* d'Andretta Jr. & d'Andretta, 1947

Body integument without setae; cylindrical projections present; rays of cephalic fan with setae arranged homogeneously, without larger setae (Fig. 33N); antenna with basal segments very wide; antenna shorter than stem of cephalic fan; ninth abdominal segment without ventral tubercles; anal ring with 110-130 rows and about 22 hooks each ..... *Kempfsimulium* Py-Daniel & Mello, 1982

2. Key to species groups of *Gigantodax*

2.1. Adults

1. Sub-basal tooth of claw hook-shaped in females (as in Fig. 11B); aedeagal membrane with spinules (Figs. 17F-H), ventral plates, distally, with a concavity in males (Figs. 17F, 18C) 2

Sub-basal tooth of claw sub-triangular or sub-rhomboidal (Fig. 11D); aedeagal membrane without spinules, and ventral plate without a distal concavity in males 3

2 (1). Gonapophyses with distal border elongated (Fig. 12E), spermatheca of normal size, mandible with teeth only on inner side (as in Fig. 10M); spinules of aedeagus well developed, some of them sclerotized basally and fused like a shield (Figs. 17F-G) ..... *igniculus*-group

Gonapophyses with distal border not elongate, only lobulate (Fig. 12B-C); spermatheca large, distinctly developed (Fig. 12B); mandible with teeth on both sides (as in Fig. 10L); spinules of aedeagus poorly developed (Fig. 17I) .... *minor*-group

3 (1). Sensorial vesicle of maxillary palp poorly developed (Fig. 2E); gonapophyses with distal border lobulate; calcipala nearly as long as second tarsomere (Fig. 8F); sub-basal tooth of claw sub-triangular (Fig. 11E) ... *multifilis*-group

Sensorial vesicle well developed (Fig. 2F); gonapophyses with distal border straight (Fig. 12D); calcipala about half as long as second tarsomere (Fig. 8E); sub-basal tooth of claw sub-rhomboidal or sub-triangular .... *brophyi, cilicinus, cormonsi* and *wrighti*-groups

2.2. Pupae

1. Gill branches arborescent, with over 100 terminal filaments (Figs. 24B, 27B) 2

Gill branches with not more than 18 terminal filaments, or branches with tubular or globular shape 3

2 (1). Terminal spines thin and pointed; abdominal tergite 1 with 3 + 3 (4 + 4) or 4 + 4 (5 + 5) hairy trichomes (as in Fig. 30B) ... . *multifilis*-group

Terminal hooks stout; abdominal tergite 1 with 5 + 5 or 7 + 7 trichomes (Figs. 30A) ..... *igniculus*-group

3 (1). Gill filamentous branches not thicker basad and without tegumentary process (Figs. 27C-D) 4

Gills with tubular or sub-globose branches, with cuticular processes; if filamentous, they are thickened basally and generally the 12th and 16th ones more elongated (Figs. 27F-J) 5

4 (3). 11-13 relatively flexuous gill branches (Fig. 27C); terminal hook thin and elongated, pointed distally, trichomes of frontoclypeus and thorax hooked distally (Fig. 29A) ..... *minor*-group

18 relatively resistant (not flexuous) gill branches (Figs. 24C, 27D); terminal spines stout (Fig. 30F); trichomes of frontoclypeus and thorax not hooked ..... *brophyi*-group

5 (3). Gill branches with 17-18 tubular branches, generally with tegumentary processes (Figs. 27E, H-J) 6

Gill branches reduced in number, globose, with cuticular processes, or membranous (Figs. 27K-L) ..... *wrighti*-group

6 (5). Branches independent (Fig. 27E) ..... *cilicinus*-group

Branches often fused, making a shield-like formation (Figs. 27I-J) ..... *cormonsi*-group

2.3. Larvae

1. Basal segment of antenna at most half as long as second (Fig. 33A); second antennal segment as long as third; median tooth of hypostomium longer than corner teeth, an imaginary line going from the medium tooth to the fourth lateral tooth does not intersect the other teeth (Fig. 35E); numerous mandibular serrations (Fig. 34A) .... *igniculus*-group

Second antennal segment not longer than first or third; median tooth of hypostomium not longer than corner teeth; an imaginary line passing over the cuspid of the medium tooth to the fourth lateral tooth intersecting the other teeth (Fig. 35D); generally with a few mandibular serrations present 2

2 (1). Third antennal segment longer than first and second together; second segment very short, less than one-third length of basal segment (Fig. 33B); anal scales reduced, not completing a ring ..... *minor*-group

Third antennal segment shorter than first and second together; basal segment about twice (or more) size of second segment (Figs. 35C-E); anal scales well developed, forming a ring (Fig. 36A) 3

3 (2). Anal gills with numerous lobules (more than three, Fig. 36E); mandible with reduced marginal serrations ... . *multifilis*-group

Anal gill with only three lobules; mandible with abundant marginal serrations (Fig. 34C) .... *brophyi, cilicinus, cormonsi* and *wrighti*-groups

3. Keys to *Simulium* subgenera and species-groups

3.1. Females

1. General coloration black or blackish-brown 2

General coloration brown (reddish-brown to yellowish) 22

2 (1). Body without special ornamentation; scutum hairs homogeneously distributed; claws with basal tooth large, sub-ovoid, elongated; basal portion of cibarium smooth, without reinforcement at sides .... *Eusimulium* Roubaud, 1906 and *Nevermannia* Enderlein, 1921

Body ornamented with light vittae or spots; scutal hairs distributed homogeneously or in groups; claws with or without sub-basal tooth, but if present, it is proportionally smaller and sub-triangular (except *Byssodon* with basal tooth) 3

3 (2). With setae on basal sector of R 4

Without setae on basal sector of R (Fig. 3F) 9

4 (3). Grayish pollinose coloration; scutum with light area limited to 1 median and 1+1 sub-lateral stripes (Fig. 4A); abdomen blackish or grayish with 1+1 silver transverse bands, or with bands on posterior border of tergites III-IV (Figs. 7A-C) ..... *Pternaspatha* Enderlein, 1930 (part)

Blackish coloration; scutum with or without light sub-median stripes or anterior spots; abdomen blackish without silvery transverse bands on tergites III-IV 5

5 (4). Paraproct sub-triangular, about twice as long as wide at base (Fig. 13E); basal portion of cibarium smooth (Fig. 9A) ... . *Chirostilbia* Enderlein, 1921

Paraproct not sub-triangular, curved distally, slightly shorter than wide at base (Fig. 13F); cibarium smooth or with teeth 6

6 (5). Basal portion of cibarium with teeth arranged in elevated median sub-conical group (Fig. 9B) .... *Inaequalium* Coscarón & Wygodzinsky, 1984

Cibarium generally smooth or with small teeth: if teeth present, these arranged in median elevated group, scutum with 1+1 light anterior spots or 3 black longitudinal stripes separated by nacreous stripes that change tone with different light positions 7

7 (6). Cibarium with very small teeth or without teeth (Figs. 9A, 10E-F); paraprocts relatively short, not lobulate, scarcely acuminate apically and directed downwards (Figs. 14B-C) ..... *Aspathia* Wygodzinsky & Coscarón, 1973 (part)

Cibarium with 1 row of teeth (Figs. 10I-J) or without teeth but with reinforced border (Fig. 10K); paraproct relatively long, lobulate and scarcely sclerotized, not acuminate (Figs. 14I-L) 8

8 (7). Scutum with setae grouped, simulating scales, without anterior grayish sub-quadrate spots; cibarium smooth (Fig. 10K, or as in Fig. 10G) ..... *Thyrsopelma* Enderlein, 1934 (part)
Scutum with setae homogeneously distributed; with anterior grayish sub-quadrate light spots (Fig. 6H); cibarium with teeth arranged in 1 row (Figs. 10I-J) ..... *Trichodagmia* Enderlein, 1934 (part)

9 (3). Cibarium without teeth 10
Cibarium with teeth 16

10 (9). Scutum with hairs grouped like scales (Fig. 2H); claw without sub-basal tooth or much reduced (Figs. 11G-H); fronto-ocular triangle absent (as in Fig. 1I); paraprocts generally very thin distally (Figs. 13C-D) ..... *Notolepria* Enderlein, 1930
Scutum with hairs homogeneously distributed; claw with or without sub-basal tooth, fronto-ocular triangle generally well developed; paraprocts generally not thinner distally 11

11 (10). Grayish pollinose species; abdomen grayish, with tergites III-V blackish or velvety brown, generally with an anteromedian or 1+1 silvery lateral spots; calcipala frequently reduced or absent 12
Blackish species; abdomen blackish, without silver spots on tergites III-V; calcipala well developed 13

12 (11). Claws with sub-basal tooth; scutum with blackish areas delimited by grayish median and sub-lateral stripes; abdominal tergites III-V blackish, with 1+1 sub-lateral posterior whitish spots (Fig. 7C); paraprocts sub-rectangular, a little shorter than wide (Fig. 13B) ..... *Pternaspatha* Enderlein, 1930
Claws without sub-basal tooth (Fig. 11I); scutum uniformly grayish, except for 1+1 light median anterior spots; tergites III-V blackish or velvety brown, with or without spots anteromedially (Figs. 7H-I); paraprocts sub-triangular (Fig. 14A), as long as wide ..... *Psilopelmia* Enderlein, 1934 (*blancasi* species group)

13 (11). Paraproct sub-triangular, with distal border arched (Figs. 14G); scutum with 1+1 anterior light submedian spots continued posteriorly with a thin stripe joining the grayish posterior area ..... *Hemicnetha* Enderlein, 1934 *(oviedoi* species group)
Paraproct not sub-triangular, with distal border truncate or acuminate posteriorly; scutum ornamentation variable 14

14 (13). Paraprocts with distal edge truncate and slightly acute posteriorly (Figs. 14B-C); scutum with median and 1+1 sub-median black stripes delimited by nacreous vittae that change color according to incidence of light (Figs. 6A-B) or with only 1 + 1 anterior, submedian, nacreous spots (Fig. 6C) ..... *Aspathia* Enderlein, 1935
Paraprocts with distal edge truncate or rounded, but not acuminate posteriorly; scutum without contrasting silvery vittae (Figs. 6D-G) 15

15 (14). Paraproct as long as wide at base, with external surface mostly nude and shiny, with depressions and distal border truncated (Fig. 14H); gonapophysis as long as wide (Fig. 12G) ..... *Hearlea* Vargas, Martínez Palacios & Díaz Nájera, 1946
Paraproct longer than wide at base, external surface mostly covered by microtrichia, without depressions and distal border curved (Figs. 14E-F), gonapophysis longer than wide (Fig. 12F) ..... *Hemicnetha* Enderlein, 1934 (part, *brachycladum* species group)

16 (9). Scutum with abundant gray pollinosity, showing, according to incidence of light, 3-5 longitudinal, light stripes; cibarium with a weak concavity covered by small, similar, acute teeth; paraprocts sub-triangular, about as long as wide; claws without teeth ..... *Psilozia* Enderlein, 1936
Scutum with sparse pollinosity, with or without 1+1 silvery longitudinal stripes; cibarium with or without teeth, generally with median depression; paraprocts not sub-triangular, with curved distal edge, generally longer than wide and sometimes thinner distally; claws with or without teeth 17

17 (16). Claws with large, sub-ovoid, basal tooth; posterior edge of tergites III-V frequently with 1+1 transverse silvery bands ..... *Byssodon* Enderlein, 1925
Claws with a small, sub-triangular, sub-basal tooth or without tooth; tergites III-V without silvery transverse bands 18

18 (17). Cibarium generally without teeth, but if teeth present, not in the median depression and at sides (Figs. 10E-F); scutum with 1+1 sub-median, longitudinal, silvery stripes generally reaching the posterior grayish area (Figs. 6A-B) or darker, according to incidence of light, or yet reduced to 1 + 1 anterior, sublateral, nacreous spots (Fig. 6C); fronto-ocular triangle well developed ..... *Aspathia* Enderlein, 1935
Cibarium with median depression sclerotized or not and with small teeth at sides (Figs. 9C-G, K, 10C-D); scutum with or without silvery longitudinal stripes that can reach to posterior silvery area; fronto-ocular triangle generally absent or reduced 19

19 (18). Cibarium with central area well sclerotized and with small, rounded teeth (Figs. 9E-G); infra-frontal sutures well developed (Fig. 1F) ..... *Coscaroniellum* Py-Daniel, 1983 (*quadrifidum* species group)
Cibarium with central area not sclerotized, teeth acute (Figs. 9C-D); infra-frontal sutures not developed 20

20 (19). Scutum black, with or without silvery sub-median stripe mostly frequent on anterior area and wedge shaped (Figs. 4B-D); when reaching posterior silvery area, without gray shadow spots on silvery stripe .... *Psaroniocompsa* Enderlein, 1934
Scutum grayish to black with silvery stripe reaching posterior grayish area, generally with gray shadow spots on silvery stripes (Figs. 4F-I, 5A-B) 21

21. (20). Cibarium with small teeth of about the same size and absent on the median depression (Fig. 9D); fronto-ocular triangle very short (Fig. 1I); abdomen without silvery posterior transverse spots on tergites III-V or very short (Fig. 7D) ..... *Cerqueirellum* Py-Daniel, 1983
Cibarium with sub-median teeth larger than other teeth and with small teeth on the median area (Fig. 9H); fronto-ocular triangle relatively deep; abdomen with silvery posterior transverse spots on tergites III-V about 1/3 of the tergite's height (Fig. 7E); scutum with sub-median, silvery vittae narrow (Fig. 5C) .... *Coscaroniellum* Py-Daniel, 1983 (*quadrivittatum* species group)

22 (1). Yellowish-reddish to greenish-gray species; if scutum black, margins yellowish (Figs. 5D-F); paraprocts sub-triangular (Figs. 13F-K), longer than wide at base and distally relatively thin (Fig. 14L) 23
Reddish-brown to dark grayish species; scutum generally with lyre-shaped pattern (Fig. 6H); paraprocts sub-rectangular and distally not acuminate (Figs. 14I-J) 28

23 (22). Scutum gray-greenish to brown-yellowish; cibarium smooth, margin not strongly sclerotized (Fig. 9A) .... *Chirostilbia* Enderlein, 1921 (*subpallidum* species group)
Scutum orange to reddish or black, bordered by yellow, frequently with sub-median silvery stripes; cibarium with sclerotized margin or with small teeth 24

24 (23). Scutum with 1+1 or more nacreous or silvery longitudinal stripes (Figs. 5H-I); abdomen generally with 3 longitudinal rows of sub-quadrate blackish spots (Figs. 7F-G); cibarium with median depression well sclerotized, bordered with weak lobules and with teeth on weakly elevated areas at sides (Figs. 10A-D); paraprocts thinner distally (Figs. 13J-K, 14L) ..... *Psilopelmia* Enderlein, 1934 (*escomeli* species group)
Scutum generally without 1+1 or more nacreous or silvery longitudinal stripes (Figs. 5D-G); abdomen without sub-quadrate blackish spots; cibarium without teeth or with teeth generally larger and with different disposition from above (Figs. 9I-O); paraprocts scarcely thin distally (Figs. 13G-I) (*Ectemnaspis* Enderlein, 1914) 25

25 (24). Scutum yellow or black, in the latter case, totally with yellow margins (Figs. 5D-E); cibarium without or with teeth, in the latter case, with plates or small lobules at median area (Figs. 9I-L) 26
Scutum yellow or reddish, cibarium with teeth but median area without plates 27

26 (25). Cibarium without teeth, but with well sclerotized edge (Figs. 9I-J) ... *Ectemnaspis* Enderlein, 1914 (*bicoloratum* species group)
Cibarium with teeth and median area with plates or lobules (Figs. 9K-L) .... *Ectemnaspis* Enderlein, 1914 (*romanai* species group)

27 (25). Cibarium with well-developed teeth grouped on 1+1 weak elevations (Figs. 9M-N) .... *Ectemnaspis* Enderlein, 1914 (*perflavum* species group)
Cibarium with very small teeth and with 1+1 sub-median processes generally with teeth on apex (Fig. 9O) .... *Ectemnaspis* Enderlein, 1914 (*dinellii* species group)

28 (22). Gonapophysis sub-ovoid, shorter than wide (Fig. 12I); paraproct slightly acuminate distally (Fig. 14L); scutum with hairs grouped and arranged into longitudinal rows ..... *Thyrsopelma* Enderlein, 1934 (part)
Gonapophysis sub-triangular (Fig. 12F) or sub-ovoid (Figs. 12H-I), longer than wide or about as long as wide; paraprocts not acuminate distally (Figs. 14D, E-F, I-J); scutum with hairs homogenously distributed or in groups, but not arranged in longitudinal rows 29

29 (28). Cibarium scarcely sclerotized on median area and without teeth or spiculae (Fig. 10G); paraprocts slightly longer than wide, sub-rectangular and with abundant microtrichia (Fig. 14D) ..... *Hemicnetha* Enderlein, 1934 (*paynei* species group)
Cibarium well sclerotized on median area, with thin, acuminate teeth and scarcely sclerotized (Figs. 10H-J); paraprocts about twice as long as wide and with sparse microtrichia (Figs. 14E-F, I-J) 30

30 (29). Gonapophysis more than twice as long as wide, acute apically (Fig. 12F); cibarium with small, disordered teeth (Fig. 10H) ..... *Hemicnetha* Enderlein, 1934 (*brachycladum* species group)
Gonapophysis less than twice as long as wide, and blunt apically (Figs. 12H-I); cibarium with conspicuous teeth arranged along border to base of cornuae (Figs. 10I-J) ..... *Trichodagmia* Enderlein, 1934

3.2. Males

1. General coloration black, sometimes abdomen with greenish tones; with or without setae on basal sector of R 2
General coloration variable, form dark brown to yellowish, generally with setae on basal sector of R 23

2 (1). With setae on basal sector of R 3
Without setae on basal sector of R 11

3 (2). Gonostylus longer than gonocoxite (Figs. 22D-E); ventral plate relatively short and with or without median process and carina (Figs. 19F-H) 4
Gonostylus shorter than gonocoxite; ventral plate of variable shape 5

4 (3). Scutum with setae homogeneously arranged and without silvery spots; ventral plate distally with small and median, but not lateral, processes (Fig. 19E) ..... *Trichodagmia* Enderlein, 1934
Scutum with setae disposed in groups, like scales, and with 1+1 silvery anterolateral spots sometimes continued sub-medially, reaching the posterior grayish area (Figs. 15H-I); ventral plate distally with large median and lateral processes (Figs. 19F-G) ..... *Thyrsopelma* Enderlein, 1934

5 (3). Distal spur of gonostylus much reduced or absent (Figs. 20C-F) (*Chirostilbia* Enderlein, 1921) 6
Gonostylus with distal spur 7

6 (5). Gonostylus without lateral crest (Figs. 20C-D) ..... *Chirostilbia* Enderlein, 1921 (*pertinax* species group)
Gonostylus with lateral crest (Figs. 20E-F) ..... *Chirostilbia* Enderlein, 1921 (*subpallidum* species group, part)

7 (5). Scutum without ornamentation; gonostylus flattened and curved, with sub-triangular internal lobe .... *Eusimulium* Roubaud, 1906 and *Nevermannia* Enderlein, 1921
Scutum, when illuminated anteriorly, generally ornamented with spots; gonostylus variously shaped 8

8 (7). Gonostylus (microscope slide mounted) sub-quadrate, with distal concavity and sub-apical spur (Figs. 23A-D) (*Pternaspatha* Enderlein, 1930) 9
Gonostylus (microscope slide mounted) sub-triangular to sub-trapezoidal or sub-cylindrical and with apical spur 10

9 (8). Gonostylus with tubercles (Figs. 23A-B) ..... *Pternaspatha* Enderlein, 1930 (*nigristrigatum* species group)
Gonostylus without tubercles (Figs. 23C-D) ..... *Pternaspatha* Enderlein, 1930 (*nemorale* species group)

10 (8). Gonostylus sub-triangular or sub-trapezoidal, with 1 apical spur (Figs. 23G-H); ventral plate without lateral constriction (Figs. 18D-F) ..... *Inaequalium* Coscarón & Wygodzinsky, 1984
Gonostylus sub-cylindrical, with weak distal curvature and 1 apical spur (Figs. 20I-K) (except *wolffhuegeli*, in which it is relatively short and has several apical spurs) (Fig. 20L); ventral plate with weak lateral constriction .... *Ectemnaspis* (*bicoloratum* species group; *romanai* species group)

11 (2). Gonostylus much shorter than gonocoxite 12
Gonostylus as long as or longer than gonocoxite 19

12 (11). Gonostylus without apical spur 13
Gonostylus with apical spur 14

13 (12). Scutum without ornamentation; gonostylus sub-ovoid, with reinforced edge (Figs. 23E-F) ... *Notolepria* Enderlein, 1930
Scutum with 1+1 sub-median, anterior, silvery spots (Fig. 15A); gonostylus sub-trapezoidal, with sub-lateral crest (Figs. 20E-F) ..... *Chirostilbia* Enderlein, 1921 *(subpallidum* species group)

14 (12). Scutum with 1+1 sub-median silvery vittae, reaching or not the grayish posterior area (Figs. 15B-C); gonostylus sub-triangular or sub-trapezoidal 15
Scutum without 1+1 sub-median silvery vittae, but with anterior sub-quadrate or sub-triangular silvery spots (Figs. 15D-G); gonostylus sub-rectanglular or sub-cylindrical 17

15 (14). Gonostylus about twice as long as wide at base; apical spur spatuliform (Figs. 23K-L) ..... *Coscaroniellum* Py-Daniel, 1983
Gonostylus only slightly longer than wide at base; terminal spur sub-conical 16

16 (15). Gonostylus sub-triangular with apical or sub-apical spur (Figs. 23J, M) ..... *Byssodon* Enderlein, 1925*, Cerqueirellum* Py-Daniel, 1983, *Coscaroniellum* Py-Daniel, 1983 *(quadrivittatum* species group) and *Psaroniocompsa* Enderlein, 1934 (*siolii* species group)
Gonostylus sub-quadrate or sub-trapezoidal, with sub-median spur (Figs. 23I) ..... *Psaroniocompsa* Enderlein, 1934 (*incrustatum* species group)

17 (14). Gonostylus sub-cylindrical, generally with weak dorsal curvature and 1 apical spur (Figs. 16C, 20I-K, 21A-F, 22A) ..... *Ectemnaspis* Enderlein, 1914 (*bicoloratum* species group, *romanai* species group), *Psilopelmia* Enderlein, 1934 and *Hemicnetha* Enderlein, 1934 (*oviedoi* species group)
Gonostylus sub-trapezoidal, with 2-15 marginal spurs 18

18 (17). Ventral plate over twice as wide as long; gonostylus with 7-15 marginal spurs (Fig. 20L) ..... *Ectemnaspis* Enderlein, 1915 (*romanai* species group)
Ventral plate as wide as long; gonostylus with 2-4 sub-apical spurs ..... *Psilozia* Enderlein, 1936

19 (11). Gonostylus sub-cylindrical, generally less than half width of gonocoxite, distal edge wide and generally with basal process 20
Gonostylus wider than half width of gonocoxite, distal edge wide and without basal process 21

20 (19). Ventral plate generally becoming narrower apicomedially (Figs. 18J-K); gonostylus with basal process present (Figs. 21H-J) ..... *Aspathia* Enderlein, 1935
Ventral plate not becoming narrower apicomedially (Fig. 19B-C); gonostylus without basal process, but with small sub-basal carina (Fig. 22B) ..... *Hearlea* Vargas, Martínez Palacios & Díaz Nájera, 1946

21 (19). Gonostylus flattened and sinuous, scarcely narrowed distally (Figs. 21K-L); endoparameres with large teeth and well sclerotized base (Fig. 17J) (*Hemicnetha* Enderlein, 1934) 22
Gonostylus sub-triangular, narrowed and well curved apically (Figs. 22D-E); endoparameres without teeth and base not well sclerotized ..... *Thyrsopelma* Enderlein, 1934

22 (21). Ventral plate wider than long, with a large median process (Figs. 18B, 19A) ..... *Hemicnetha* Enderlein, 1934 (*paynei* species group, *brachycladum* species group)
Ventral plate about as long as wide, without median process but with a median carina (Figs. 19B) ..... *Hemicnetha* Enderlein, 1934 (*mexicanum* species group)

23 (1). Gonostylus shorter or slightly longer than gonocoxite..... 24
Gonostylus almost twice as long as gonocoxite 28

24 (23). Gonostylus with 3 to 6 or more spurs (Fig. 22C); endoparameres without teeth (Fig. 17K) .....

.....*Trichodagmia* Enderlein, 1934 (part)
Gonostylus with 1 or no spurs; endoparameres generally with large teeth (Fig. 16C) 25

25 (24). Basal sector of R without setae; scutum dull grayish; gonostylus with internal border straight (Fig. 21G) .....
..... *Psilopemia* Enderlein, 1934 (*blancasi* species group)
Basal sector of R with hair (Fig. 3F); scutum not grayish; gonostylus with internal border curved 26

26 (25). Gonostylus without apical spur, with sub-lateral crest and not curved distally (Figs. 20E-F) .....
..... *Chirostilbia* Enderlein, 1921 (*subpallidum* species group)
Gonostylus with apical spur, without sub-lateral crest and slightly curved distally 27

27 (26). Ventral plate generally longer than wide at base; gonostylus without distal curvature (Figs. 21A-B) .....
..... *Ectemnaspis* Enderlein, 1914 (*perflavum* species group)
Ventral plate generally shorter than wide at base (Figs. 18G-F); gonostylus generally with distal curvature (Figs. 21C-F) ... . *Psilopelmia* Enderlein, 1934 and *Ectemnaspis* Enderlein, 1914 (*dinellii* species group)

28 (23). Scutum dark brown, with setae grouped like scales; gonostylus relatively thick distally (Figs. 22D-E) .....
..... *Thyrsopelma* Enderlein, 1934
Scutum reddish-brown, with setae not grouped like scales; gonostylus relatively thin distally (Fig. 22C) .....
..... *Trichodagmia* Enderlein, 1934

3.3. Pupae

1. Gill arborescent, with relatively thick branches, apices acute, well sclerotized and spine-shaped, with 12-50 branches (Figs. 28H-I); cocoon compact and with ventral side projected anteriorly .....
..... *Thyrsopelma* Enderlein, 1934 (part)
Gills with variable shape, but without acute, well-sclerotized, spine-shaped apices; cocoon of variable shape ... 2

2 (1). Gills thick, asymmetrical, generally with curvature (Figs. 24G-H, 25G, 28E-F) 3
Gills generally filiform, symmetrical, without lateral curvature 6

3 (2). Frontoclypeus and exposed portion of thorax with simple trichomes (Fig. 26K); gills with striations (Figs. 28E-F); cocoon without dorsal projection (Fig. 25G) ..... *Hearlea* Vargas, Martínez Palacios & Díaz Nájera, 1946
Frontoclypeus and exposed portion of thorax with multibranched trichomes with 2-8 branches (Figs. 26F-G); gill without striations; cocoon generally with dorsal projection 4

4 (3). Cocoon generally without dorsal projection, anterior edge straight (Figs. 24G-H) .....
..... *Inaequalium* Coscarón & Wygodzinsky, 1984
Cocoon projected dorsally (Figs. 24I, 25A) 5

5 (4). Frontoclypeus and thorax with bifid trichomes (Figs. 26F) ..... *Psaroniocompsa* Enderlein, 1934
Frontoclypeus and thorax with 3-8 branched trichomes (Fig. 26G) .....
..... *Ectemnaspis* Enderlein, 1914 and *Aspathia* Enderlein, 1935

6 (2). Cocoon with compact weave and anterior portion elevated, generally protecting gill base (Fig. 25D); gill filaments relatively thick 7
Cocoon without compact weave and generally with anterior portion not elevated or protecting gill; gill filaments relatively thin 13

7 (6). Anterior opening of cocoon with festoons protecting gill base (Figs. 25D, H) 8
Anterior opening of cocoon without festoons protecting gill base 9

8 (7). Gill with 8 branches, apices blunt and resistant (Figs. 28D); frontoclypeus generally reinforced at base and enlarged at facial area, with female and male having similar facial area (Figs. 26H-I) .....
..... *Hemicnetha* Enderlein, 1934 (*paynei* species group)
Gill with 10 branches, frequently with blunt membranous apices, not resistant (Fig. 28A); frontoclypeus not

reinforced at base and not enlarged at facial area, male frons basally narrower than in female (Fig. 26E) .... *Chirostilbia* Enderlein, 1921 (part)

9 (7). Gill with 6 filaments 10
Gill with more than 6 filaments 11

10 (9). Frontoclypeus and thorax with numerous tubercles, some of them acute and like short spines (Figs. 26J); cocoon scarcely elevated anteriorly (Fig. 25F) ..... *Hemicnetha* Enderlein, 1934 (*oviedoi* species group)
Frontoclypeus and thorax without tubercles (Fig. 26I); cocoon frequently very elevated anteriorly (Fig. 25E) .... *Hemicnetha* Enderlein, 1934 (*brachycladum* species group)

11 (9). Gill with 18-20 branches arranged in a bunch (Fig. 28G) ..... *Trichodagmia* Enderlein, 1934 (part)
Gill with 8-16 branches 12

12 (11). Gill with 12 branches .... *Hemicnetha* Enderlein, 1934 (*mexicanum* species group) and *Trichodagmia* Enderlein, 1934 (part)
Gill with 10 branches (Fig. 25E) ..... *Hemicnetha* Enderlein, 1934 (*brachycladum* species group, part)

13 (6). Gill with 4 filamentous branches 14
Gill with more than 4 filamentous branches 17

14 (13). Frontoclypeus and thorax with acuminate tubercles (Fig. 29I) ..... *Coscaroniellum* Py-Daniel, 1983 (part)
Frontoclypeus and thorax with tubercles not acuminate 15

15 (14). Cocoon reduced ventrally (Fig. 25C); cephalic and thoracic trichomes simple (Fig. 29J) .... *Psilopelmia* Enderlein, 1934 (*blancasi* species group)
Cocoon not reduced ventrally; cephalic and thoracic trichomes with 1-8 branches 16

16 (15). Cephalic and thoracic trichomes generally bifid (Fig. 26F) .... *Psaroniocompsa* Enderlein, 1934 and *Cerqueirellum* Py-Daniel, 1983
Cephalic and thoracic trichomes with 1-8 branches ..... *Eusimulium* Roubaud, 1906, *Byssodon* Enderlein, 1925, *Nevermannia* Enderlein, 1921 and *Psilopelmia* Enderlein, 1934

17 (13). Gill with 6 filamentous branches 18
Gill with more than 6 filamentous branches 20

18 (17). Over 10 thoracic trichomes on each side, frequently very modified (Figs. 29D-H) .... *Pternaspatha* Enderlein, 1930 and *Aspathia* Enderlein, 1935 (part)
About 5 thoracic trichomes on each side 19

19 (18). Cephalic and thoracic trichomes bifid (rarely single or trifid) .... *Psaroniocompsa* Enderlein, 1934, *Cerqueirellum* Py-Daniel, 1983 and *Aspathia* Enderlein, 1935 (part)
Cephalic and thoracic trichomes generally with more than 3 branches, not bifid .... *Byssodon* Enderlein, 1925, *Inaequalium* Coscarón & Wygodzinsky, 1984, *Notolepria* Enderlein, 1930, *Ectemnaspis* Enderlein, 1914 (*bicoloratum and romanai* species groups) and *Psilopelmia* Enderlein, 1934

20 (17). Gill with 8-10 branches 21
Gill with more than 10 branches ..... *Psilozia* Enderlein, 1936, *Chirostilbia* Enderlein, 1921, *Aspathia* Enderlein, 1935 and *Ectemnaspis* Endxerlein, 1914 (*perflavum* species group)

21 (20). Over 10 thoracic trichomes, frequently much modified (Fig. 29D); gill with 8 branches .... *Pternaspatha* Enderlein, 1930
5 thoracic trichomes on each side; gill with 8-10 branches 22

22 (21). Cocoon weave spongy, with elevated anterior margin and dorsal carina (Fig. 25B) .... *Ectemnaspis* Enderlein, 1914 (*bicoloratum* and *romanai* species groups, part)
Cocoon weave compact, without elevated anterior margin or dorsal carina (Figs. 24E, J) .... *Chirostilbia* Enderlein, 1921 (*subpallidum* species group), *Notolepria* Enderlein, 1930, *Cerqueirellum* Py-Daniel,

1983, *Coscaroniellum* Py-Daniel, 1983, *Psilozia* Enderlein, 1934, *Byssodon* Enderlein, 1925, *Aspathia* Enderlein, 1935, *Ectemnaspis* Enderlein, 1914 (*perflavum* and *dinellii* species groups) and *Psilopelmia* Enderlein, 1934

3.4. Larvae

1. Anal ring with more than 150 rows of hooks 2
Anal ring with less than 120 rows of hooks 6

2 (2). Body cuticle with lanceolate trichomes (Fig. 34I); hypostomium with median tooth and intermediate teeth not well differentiated (Figs. 35H-I); abdomen not dorsally flattened on distal portion (Fig. 31B); cervical sclerites enlarged, each more than twice as wide as long (Fig. 34J) ..... *Thyrsopelma* Enderlein, 1934
Body cuticle without lanceolate trichomes; hypostomium with median tooth and generally well differentiated intermediate teeth (Fig. 35F); abdomen dorsally flattened distally (Figs. 31A); cervical sclerites not enlarged, each less than twice wider than long (Figs. 32C, L) 3

3 (2). Anal sclerite frequently with sclerotized reinforcement, in some cases with ventral branches enlarged and completing a ring (Figs. 36A); anterior margin of hypostomium generally arc-shaped, with lateral and intermediate teeth reduced (Fig. 35F) ..... *Hearlea* Vargas, Martínez Palacios & Días Nájera, 1946
Anal sclerite without sclerotized reinforcement nor with ventral branches completing a ring (Fig. 36B); anterior margin of hypostomium of variable shape 4

4 (3). Cephalic apotome darkened on distal half in form of triangle (Fig. 32F) ..... *Chirostilbia* Enderlein, 1921
Cephalic apotome with different ornamentation 5

5 (4). Hypostomium with lateral edges descending abruptly from lateral teeth, originating a plateau-like appearance (Fig. 35G); mandible with pre-apical tooth shorter than apical tooth (Fig. 34H) .... *Hemicnetha* Enderlein, 1934 (*brachycladum* species group) and *Trichodagmia* Enderlein, 1934
Hypostomium with lateral borders gradually descending from the lateral teeth in a curved manner; mandible with pre-apical tooth as long as or longer than apical tooth (Fig. 34F) .... *Hemicnetha* Enderlein, 1934 (*paynei* and *mexicanum* species groups)

6 (1). Anal ring with 100-120 rows of hooks; cephalic fan rays with setae of similar size (Fig. 33N); mandible with a pair of large marginal teeth (Fig. 34G) ..... *Hemicnetha* Enderlein, 1934 (*oviedoi* species group)
Anal ring with less than 100 rows of hooks; cephalic fan rays alternating between groups of small setae and some larger ones; mandible with only 1 marginal tooth, if 2, the second very small (Figs. 34D-E) 7

7 (6). Cephalic apotome without ornamentation or with a small spot on the median basal area (Fig. 32E); with small, numerous and short setae on cephalic capsule; generally with dark band around first abdominal segment; antenna thin and surpassing apex of cephalic fan stem (Fig. 34E) 8
Cephalic apotome with evident ornamentation; without or with very scarce setae on cephalic capsule; antenna generally thick and surpassing or not apex of cephalic fan stem 9

8 (7). Mandibles with a row of inferior supramarginal setae (Fig. 34D); medial antennal segment as long as or longer than proximal segment (Figs. 33J) ..... *Cerqueirellum* Py-Daniel, 1983
Mandible without a row of inferior supramarginal setae; medial antennal segment about 1/2 to 1/4 length of proximal segment (Fig. 33K) ..... *Coscaroniellum* Py-Daniel, 1983

9 (7). Postgenal cleft scarcely developed, with postgenal bridge longer than hypostomium length (Fig. 31D); rectal papillae without diverticula on lobes (Fig. 36G) 10
Postgenal cleft well developed, with postgenal bridge as long as or shorter than hypostomium length (Fig. 31E); rectal papillae generally with diverticula on lobes (Fig. 36F) 13

10 (9). Antennae with thin transverse striations and surpassing apex of cephalic fan stem; medial antennal segment longer than proximal segment (Fig. 33M) ..... *Aspathia* Enderlein, 1935
Antennae without striations and not surpassing apex of cephalic fan; medial antennal segment shorter than proximal segment 11

11 (10). Ninth sternite without 1+1 tubercles ..... *Psilopelmia* Enderlein, 1934 (*blancasi* species group)
Ninth sternite with 1+1 conspicuous tubercles 12

12 (11). Antennae surpassing apex of cephalic fan stem ..... *Eusimulium* Roubaud, 1906 and *Nevermannia* Enderlein, 1921
Antennae not surpassing apex of cephalic fan stem ..... *Psilozia* Enderlein, 1936

13 (9). Rectal papillae without diverticula on lobes (Fig. 36G) ..... *Psilopemia* Enderlein, 1934 (*blancasi* species group)
Rectal papillae with diverticula on lobes (Fig. 36F) 14

14 (13). Cephalic apotome with isolated spots: anteromedian, posteromedian, anterolateral and posterolateral spots generally present (Figs. 32C-D) 15
Cephalic apotome with variable ornamentation, different from above 19

15 (14). Anal sclerite without scales (Fig. 36B) 16
Anal sclerite with scales 17

16 (15). Antenna surpassing apex of cephalic fan stem (Figs. 32C); medial antennal segment generally shorter than distal segment (Fig. 33I) ..... *Psaroniocompsa* Enderlein, 1934
Antenna not surpassing apex of cephalic fan stem; medial antennal segment generally longer than distal segment (Fig. 33L) ..... *Ectemnaspis* Enderlein, 1914 (*bicoloratum* and *perflavum* species groups)

17 (15). Body length less than 4.5 mm ..... *Notolepria* Enderlein, 1930
Body length over 5.0 mm 18

18 (17). Medial antennal segment shorter than apical segment (Fig. 33G) .....
..... *Chirostilbia* Enderlein, 1921 (*subpallidum* species group)
Medial antennal segment longer than apical segment (Fig. 33F) .....
..... *Byssodon* Enderlein, 1925 and *Pternaspatha* Enderlein, 1930 (part)

19 (14). Cephalic apotome darkened on basal half, leaving a light window on the median sub-basal portion (Figs. 32G-J); anal sclerite without scales .....
... *Ectemnaspis* Enderlein, 1914 (*bicoloratum, romanai* and *dinellii* species groups) and *Psilopelmia* Enderlein, 1934
Cephalic apotome with variable ornamentation, different from above; anal sclerite with or without scales 20

20 (19). Anal sclerite with scales; medial antennal segment longer than distal segment (Figs. 33F) ... *Pternaspatha* Enderlein, 1930
Anal sclerite without scales (Fig. 36B); medial antennal segment shorter than distal segment (Figs. 33G-H) 21

21 (20). Cephalic apotome with a dark, median, basal, diffuse spot, that becomes thinner anteriorly, delimiting two light elongated areas (Fig. 32B) ..... *Inaequalium* Coscarón & Wygodzinsky, 1984
Cephalic apotome with strong, basal, triangle-shaped pigmentation (Fig. 32F) .....
..... *Chirostilbia* Enderlein, 1921 (*pertinax* species group)

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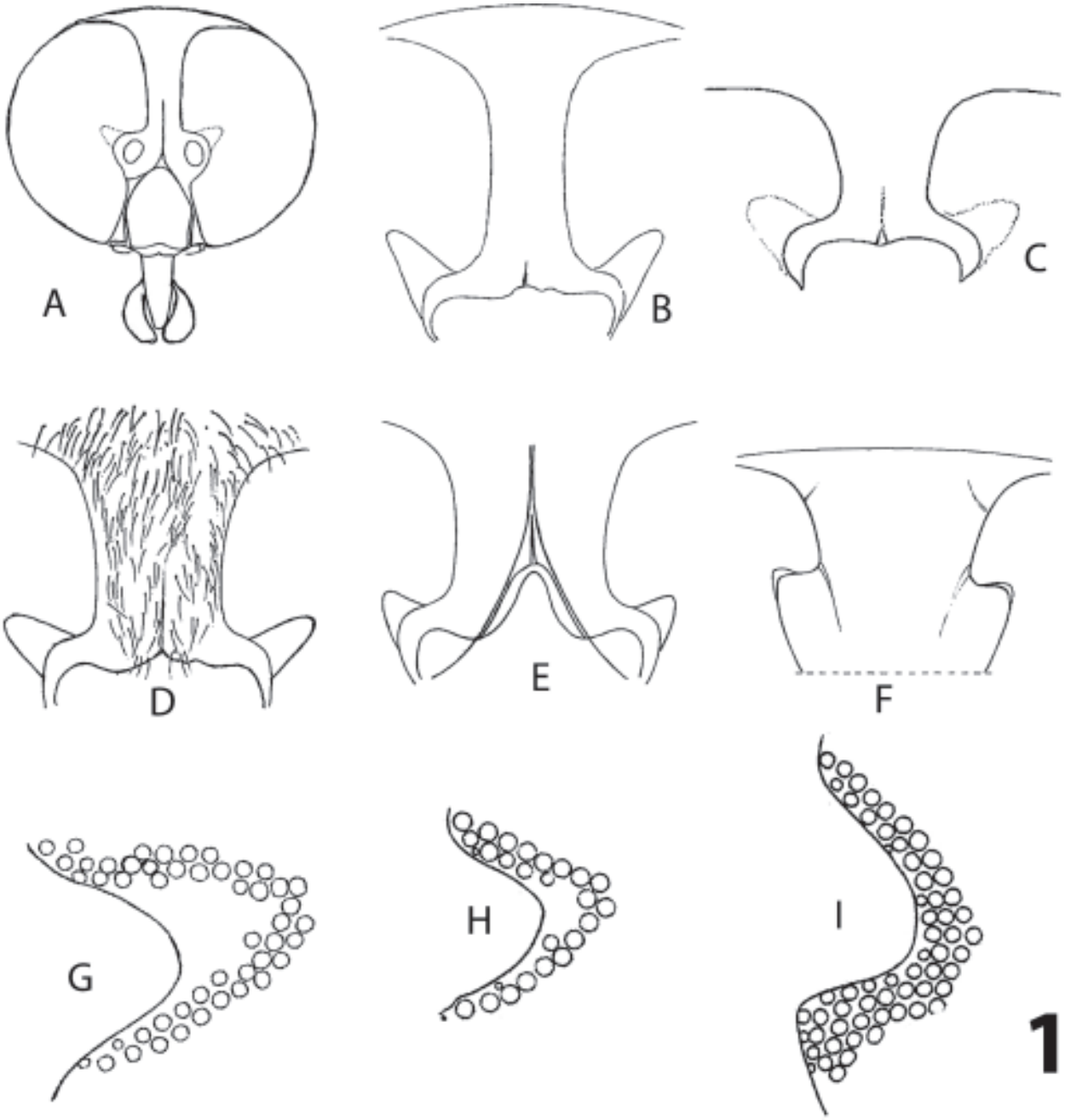


Figure 1. A. *Gigantodax brophyi* (Edwards, 1931). Head. B-F. Frons. G-I. Fronto-ocular triangle. B. *Mayacnephia aguirrei* (Dalmat, 1949). C. *Araucnephia montana* (Philippi, 1865). D. *Lutzsimulium hirticosta* (Lutz, 1909). E. *Kempfsimulium simplicicolor* (Lutz, 1910). F. *Simulium* (*Coscaroniellum*) *quadrifidum* Lutz, 1917. G. *Simulium* (*Pternaspatha*) *philippii* Coscarón, 1976. H. *Simulium* (*Cerqueirellum*) *delponteianum* Wygodzinsky, 1961. I. *Simulium* (*Cerqueirellum*) *chaquense* Coscarón, 1971.

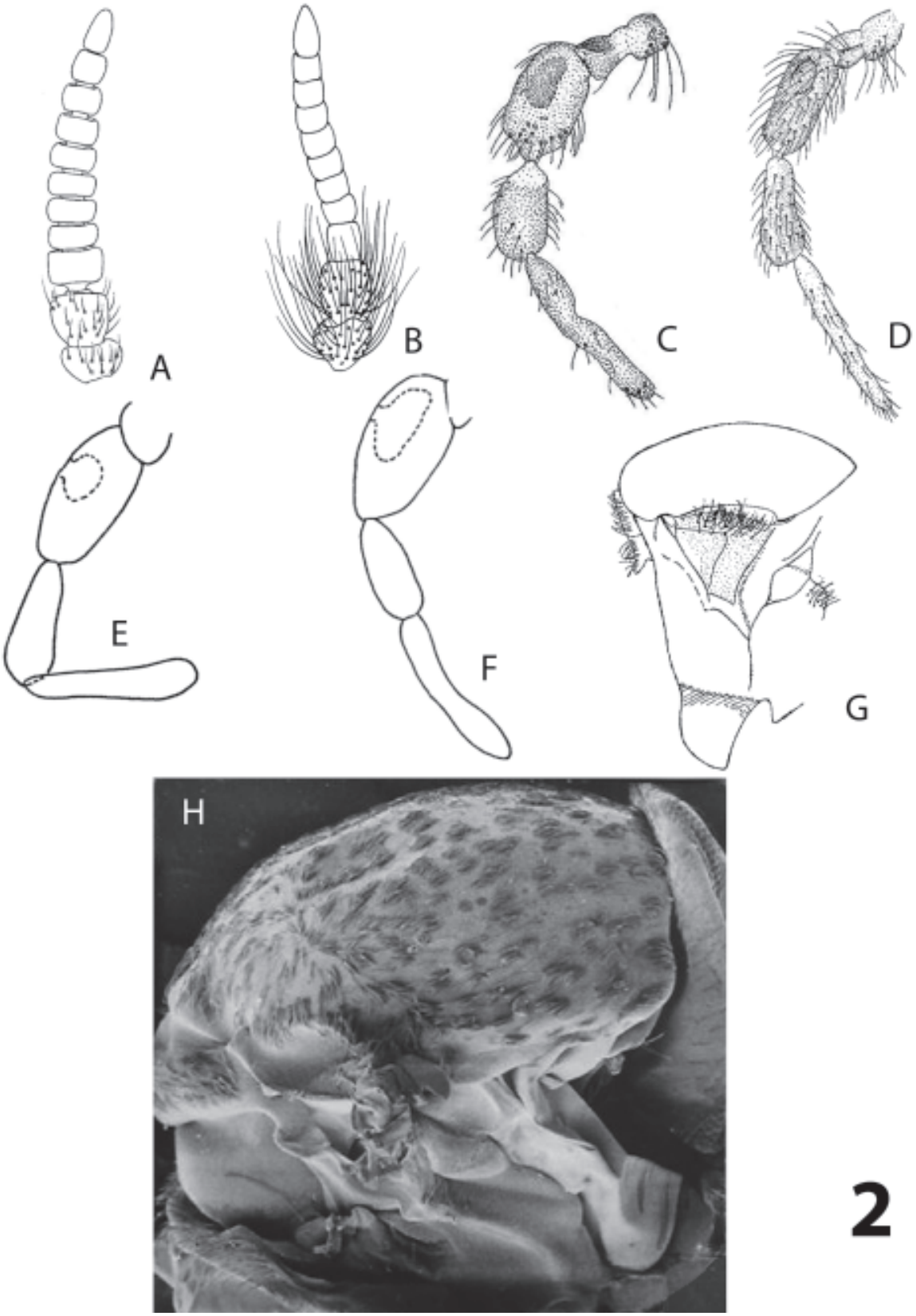
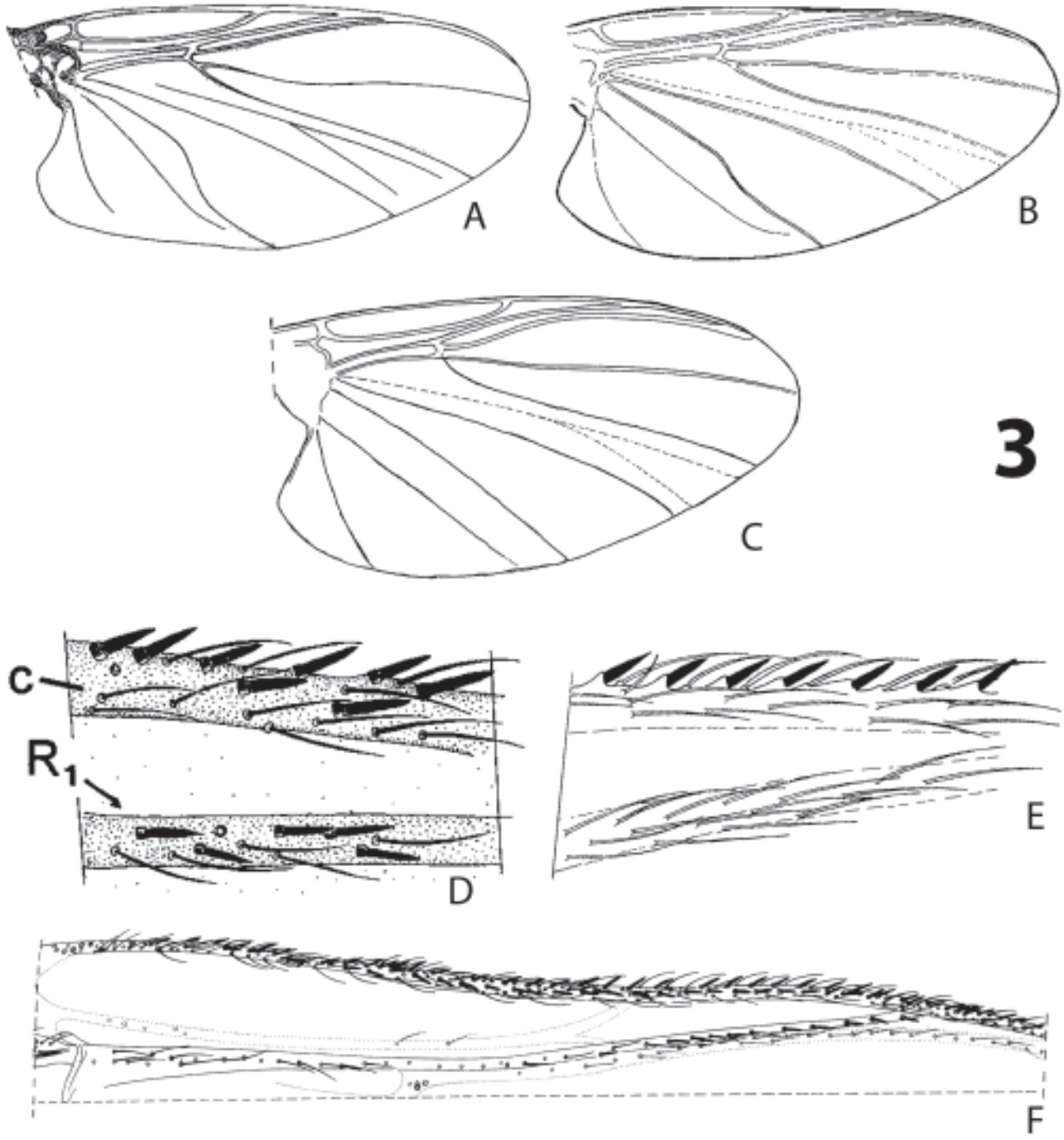


Figure 2. A-B. Antennae. C-F. Maxillary palpi. A. *Araucnephioides schlingeri* Wygodzinsky & Coscarón, 1973. B. *Pedrowygomyia cortesi* (Wygodzinsky & Coscarón, 1989). C. *Mayacnephia aguirrei* (Dalmat, 1949). D. *Araucnephia montana* (Philippi, 1865). E. *Gigantodax multifilis* Wygodzinsky & Coscarón, 1989. F. *Gigantodax antarcticus* (Bigot, 1888). G. *Tlalocomyia revelata* Wygodzinsky & Díaz Nájera, 1970: thorax, lateral view. H. *Simulium* (*Notolepria*) *exiguum* Roubaud, 1906: groups of hairs of scutum.



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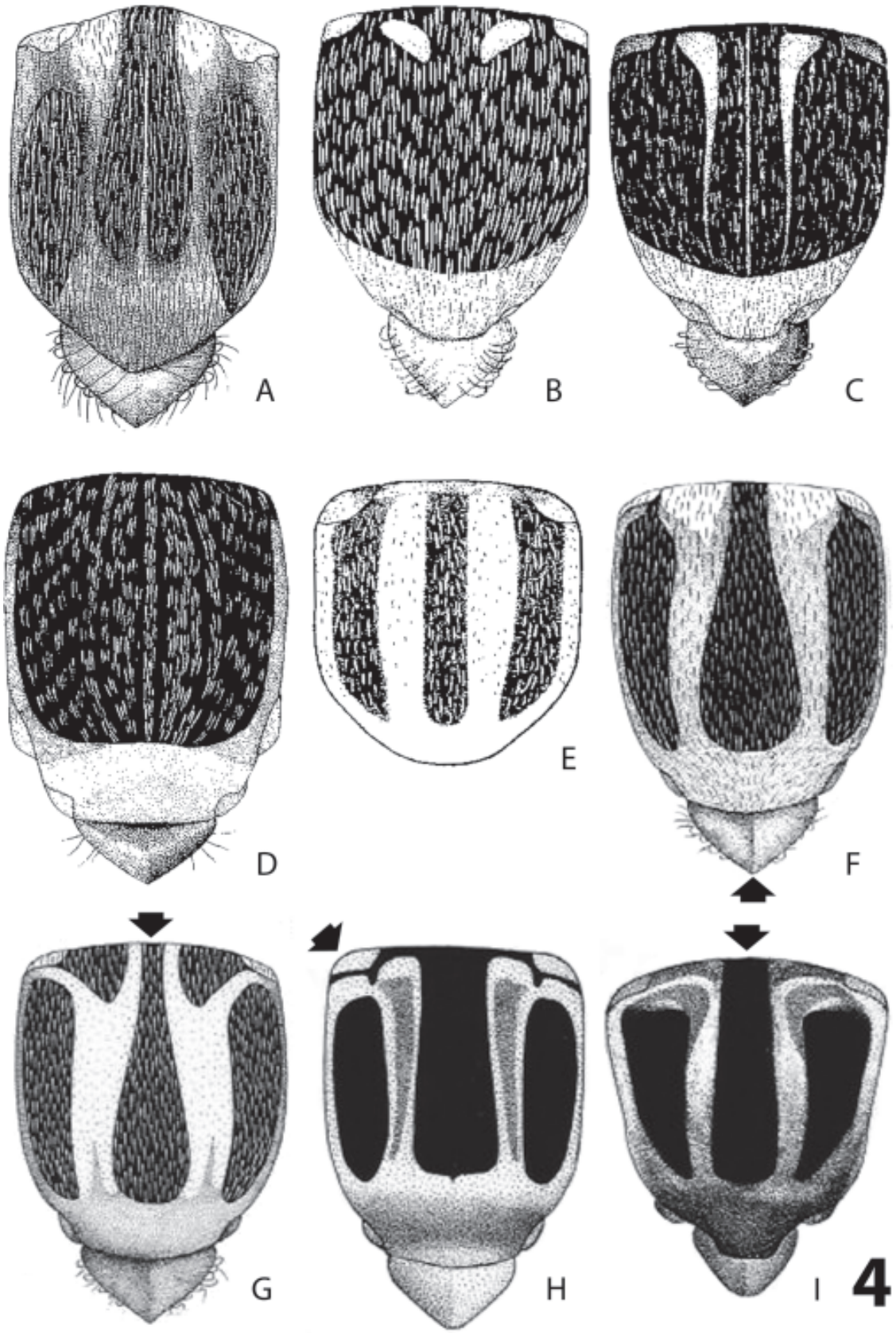

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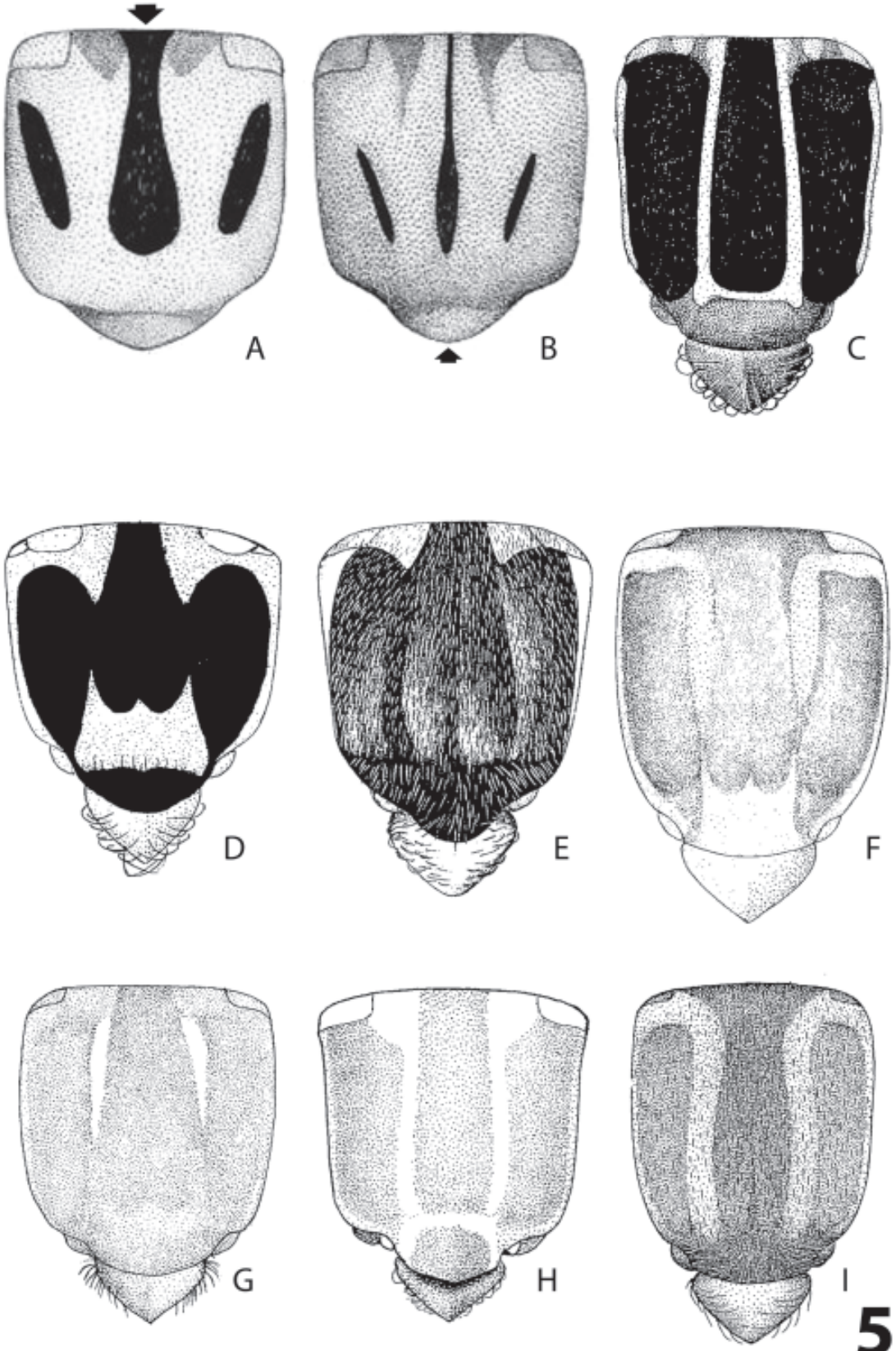

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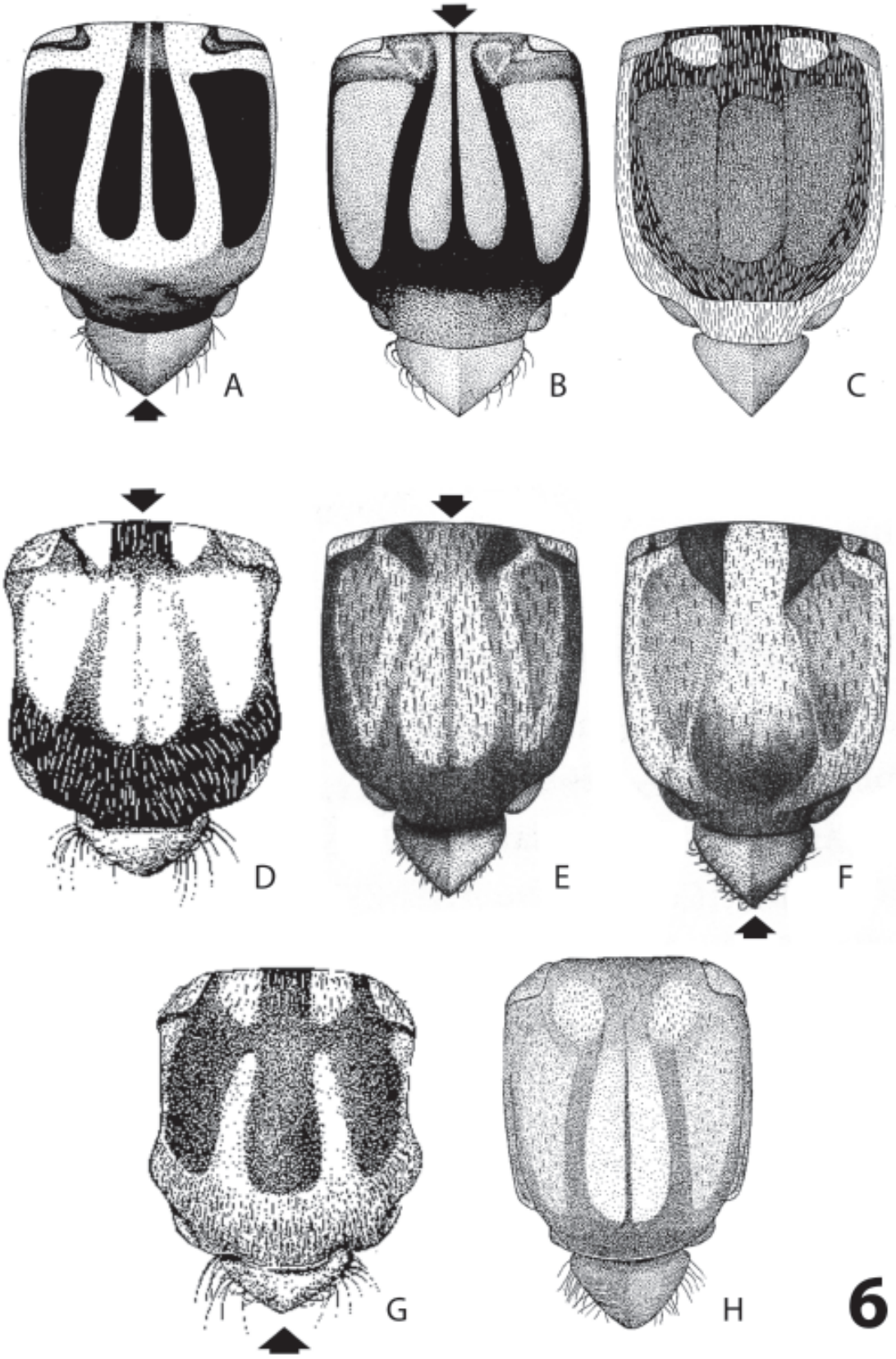

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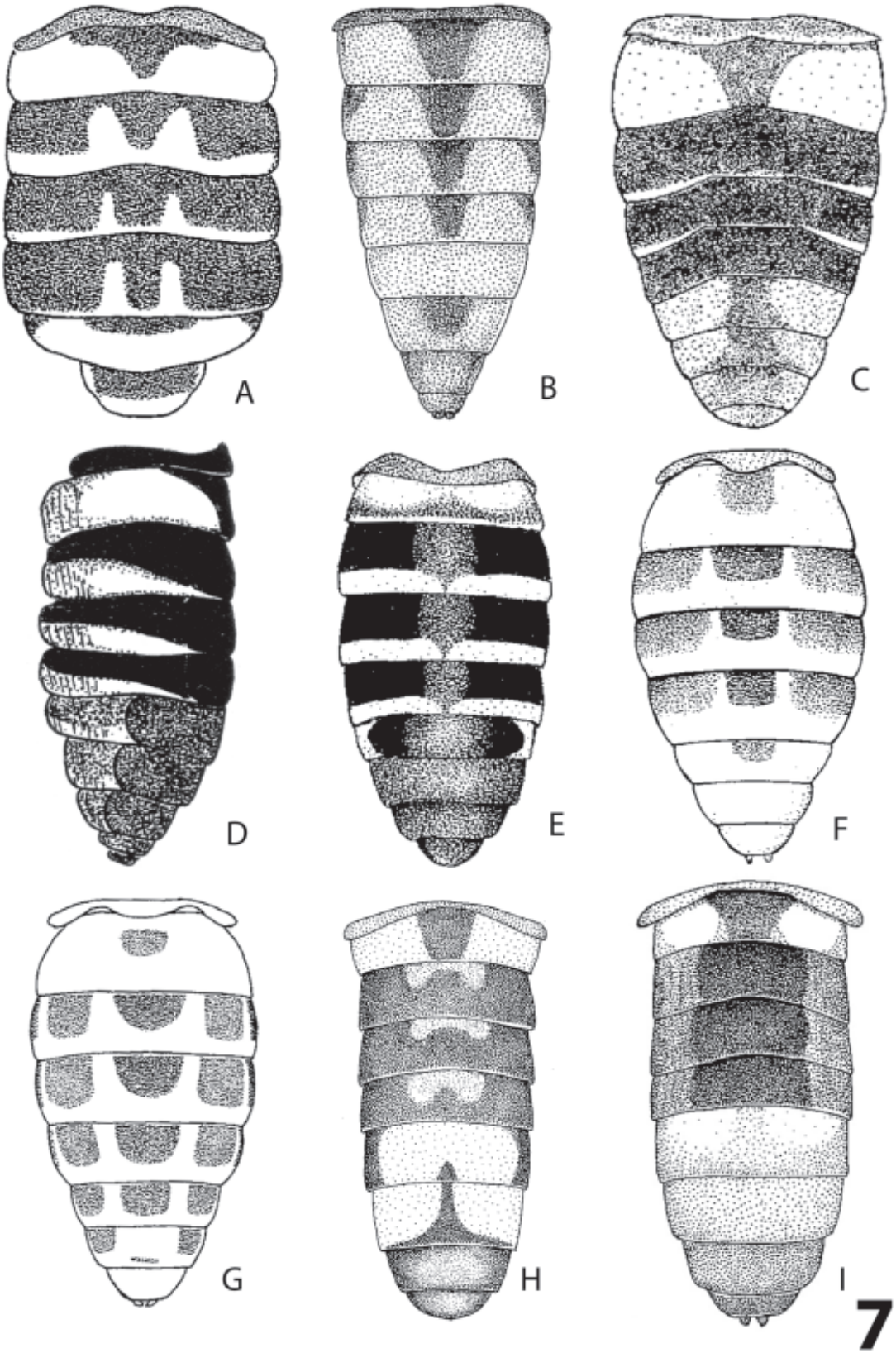

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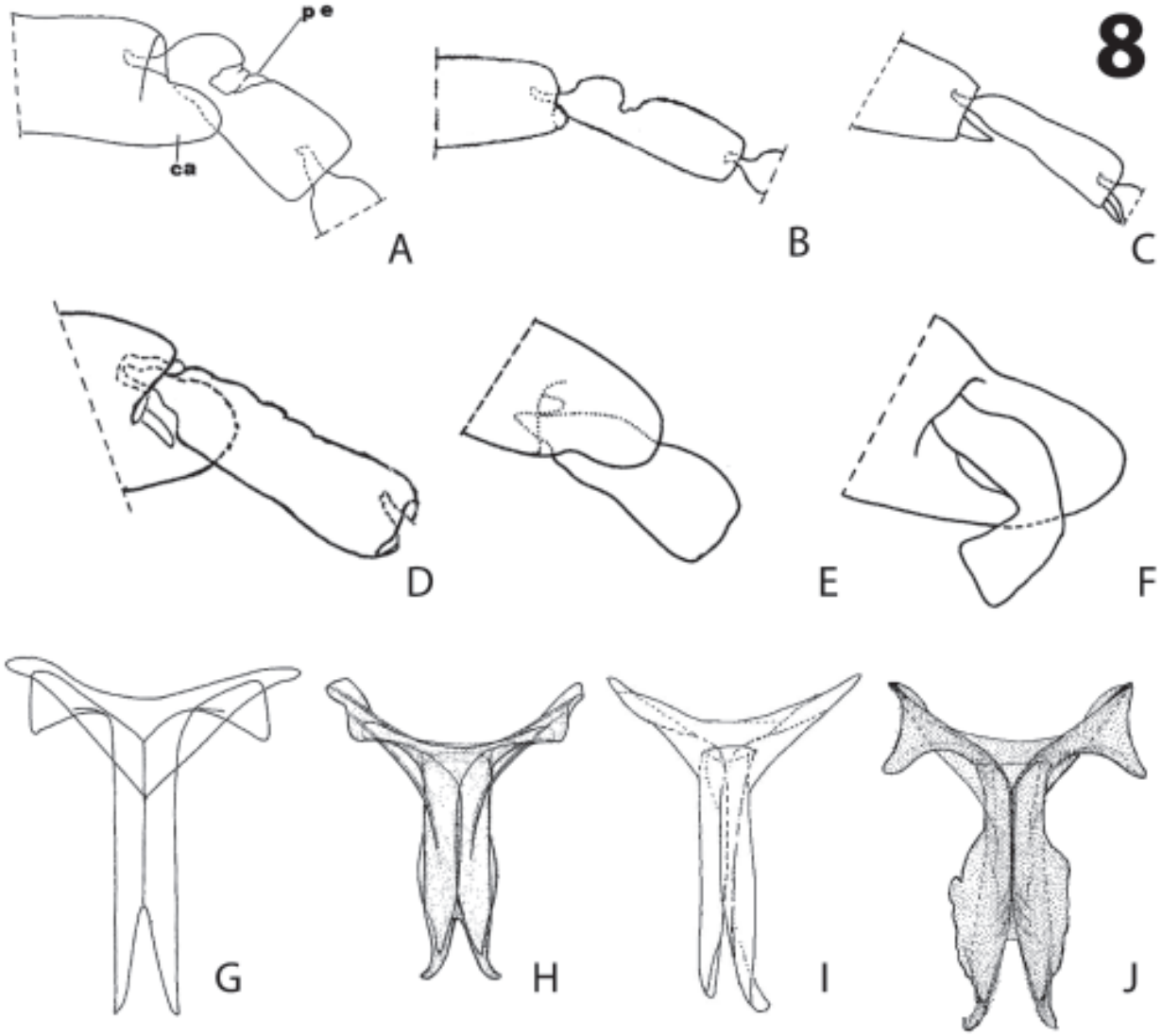

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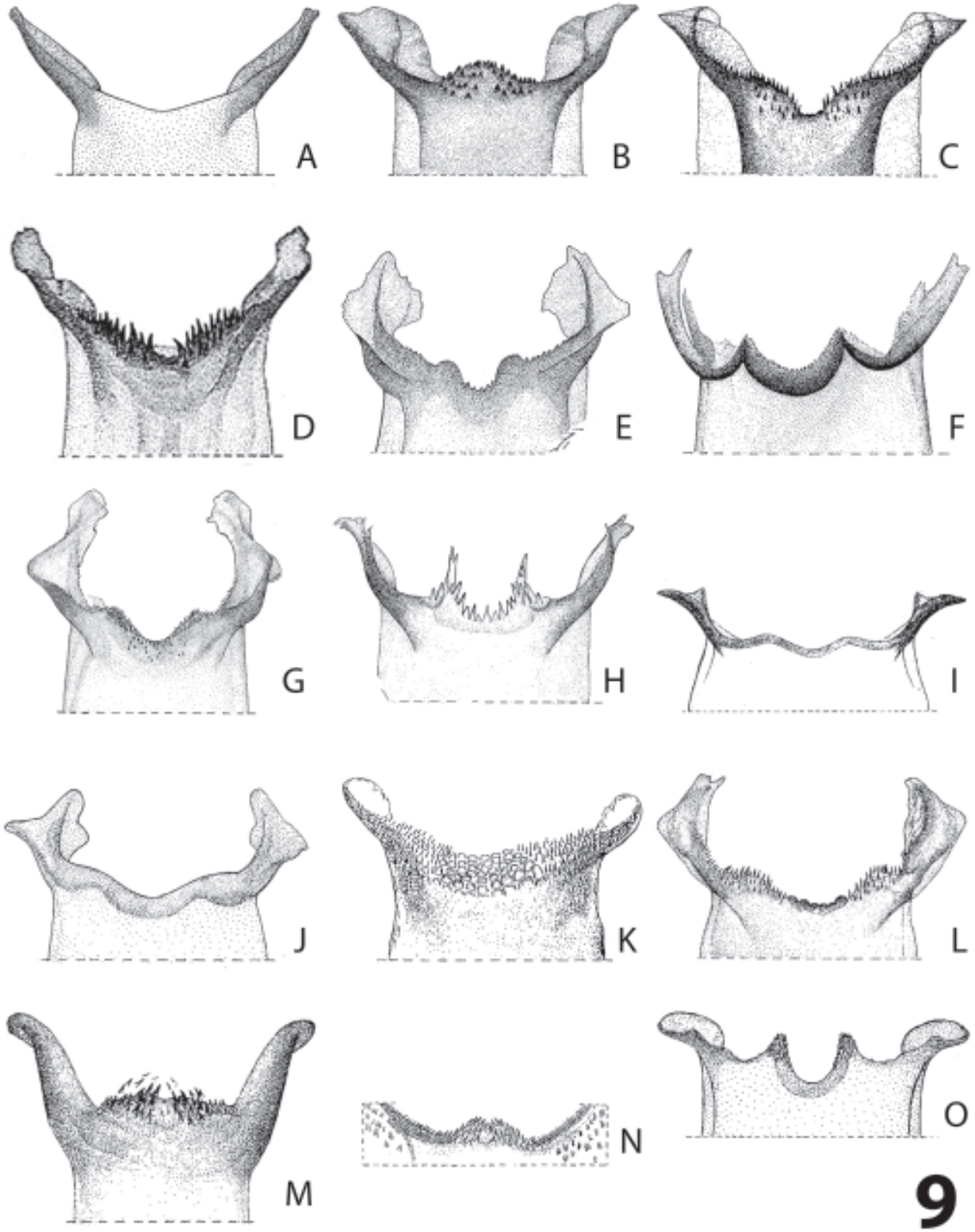

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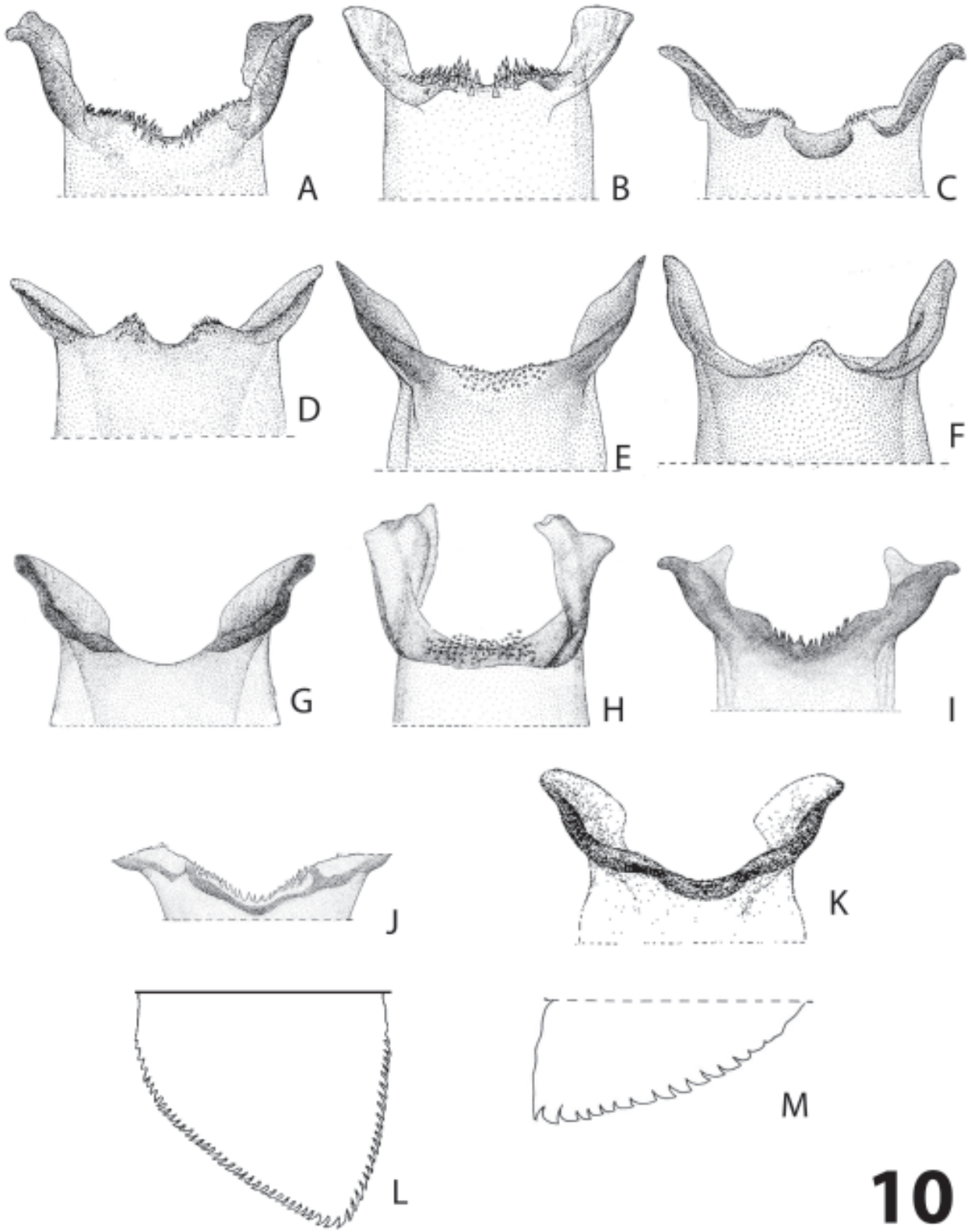

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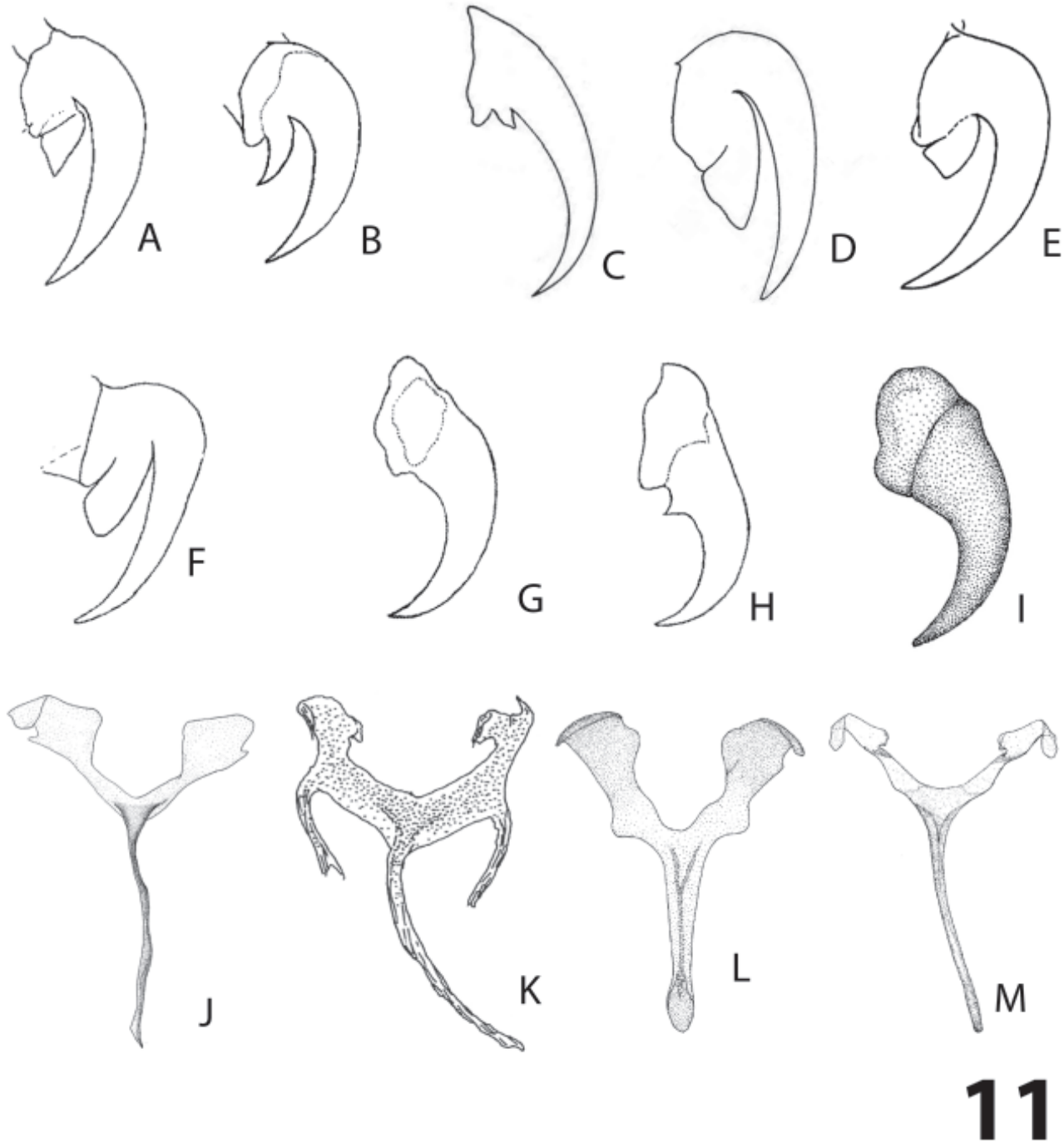

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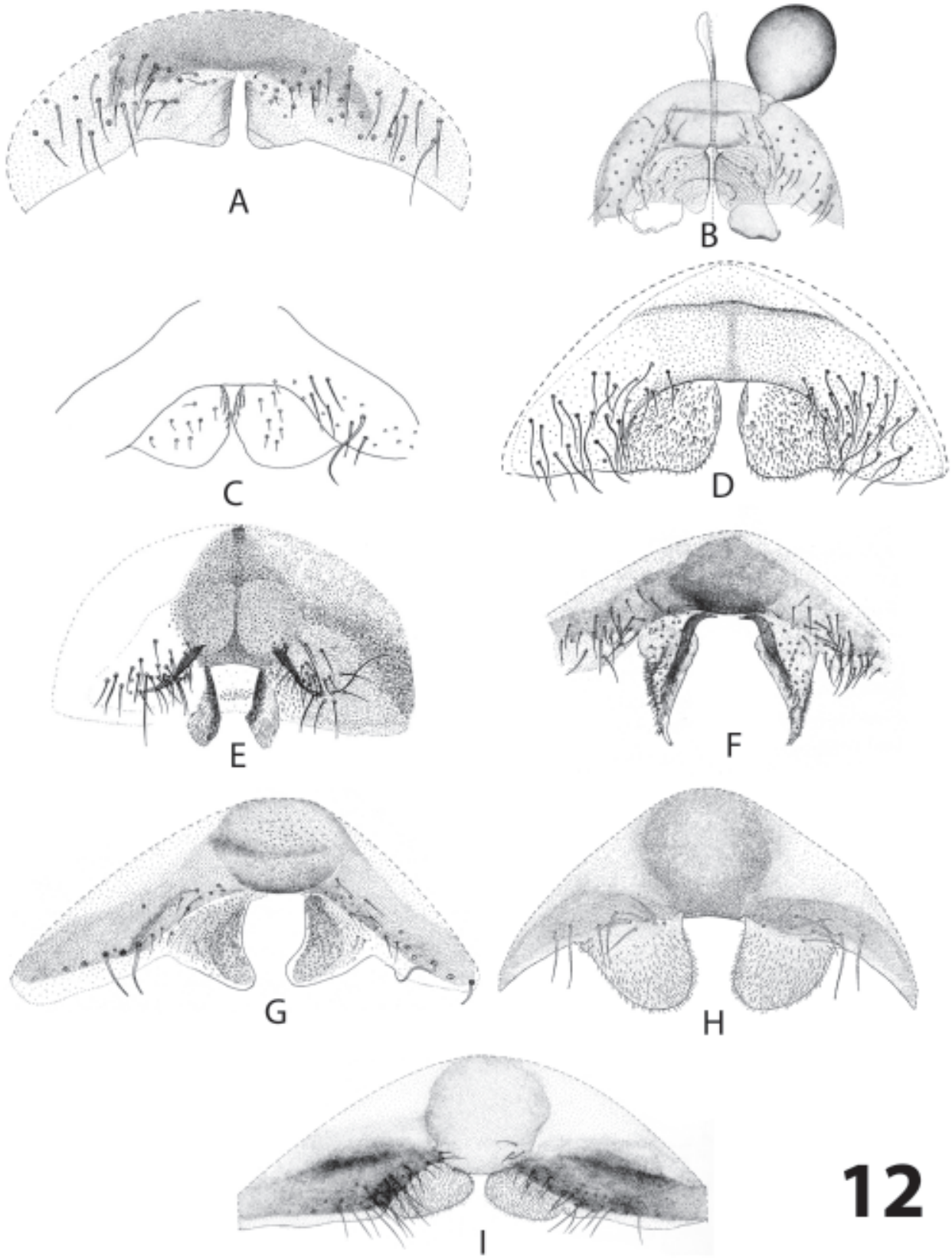

Figure 12. Sternite 8 and gonapophyses. A. *Araucnephia iberaensis* Coscarón & Coscarón Arias, 2002. B-C. *Gigantodax araucanius* (Edwards, 1931). D. *Gigantodax antarcticus* (Bigot, 1888). E. *Gigantodax igniculus* Wygodzinsky & Coscarón, 1962. F. *Simulium* (*Hemicnetha*) *brachycladum* Lutz & Pinto, 1931. G. *Simulium* (*Hearlea*) *capricorne* De Leon, 1945. H. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. I. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

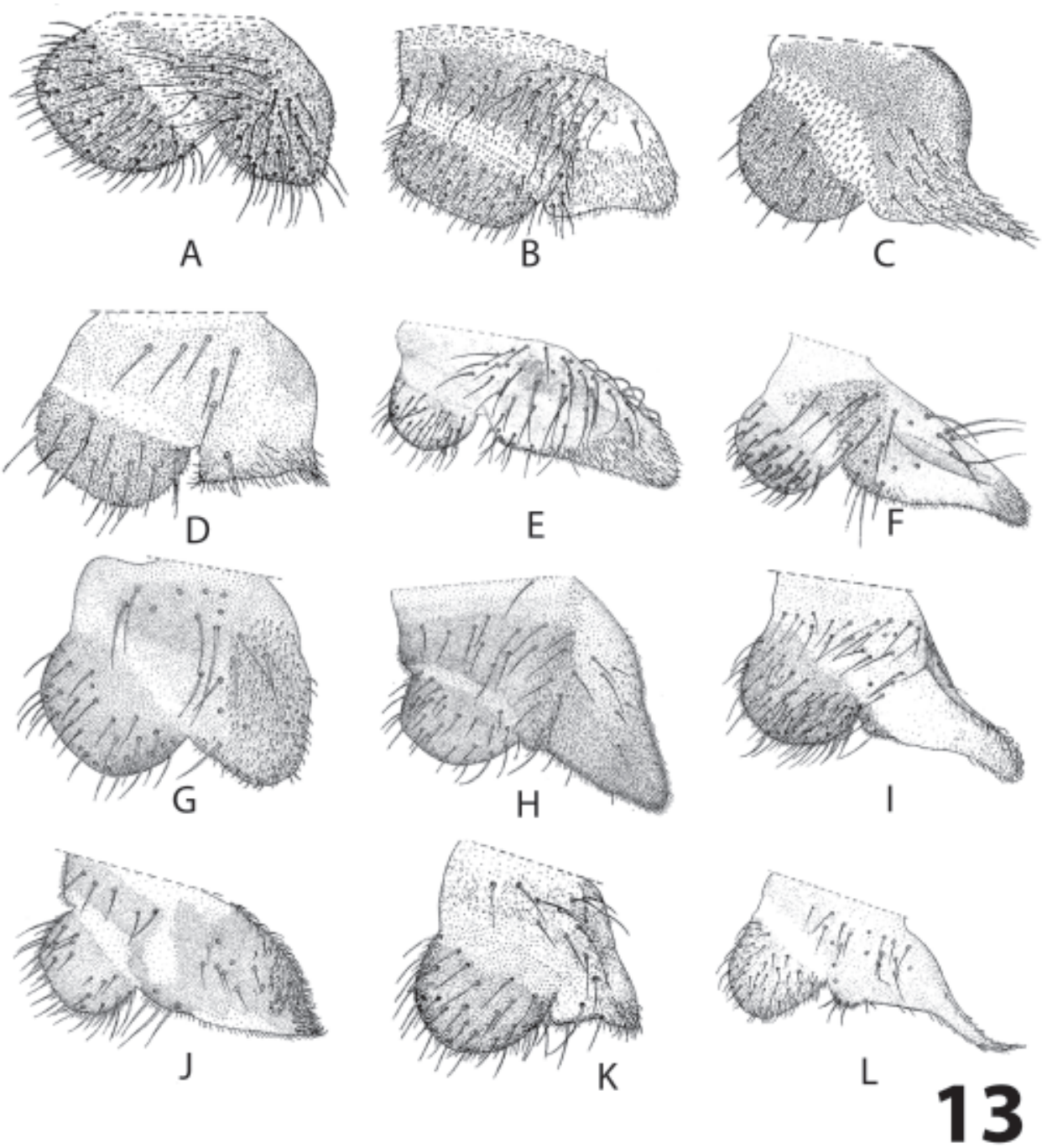

Figure 13. A-L. Cerci and paraprocts. A. *Araucnephia montana* (Philippi, 1865). B. *Simulium* (*Pternaspatha*) *annulatum* Philippi, 1865. C. *Simulium* (*Notolepria*) *exiguum* Roubaud, 1906. D. *Simulium* (*Notolepria*) *gonzalezi* Vargas & Díaz Nájera, 1953. E. *Simulium* (*Chirostilbia*) *pertinax* Kollar, 1832. F. *Simulium* (*Chirostilbia*) *serranum* Coscarón, 1981. G. *Simulium* (*Inaequalium*) *travassosi* d´Andretta & d´Andretta Jr., 1947. H. *Simulium* (*Ectemnaspis*) *furcillatum* Wygodzinsky & Coscarón, 1982. I. *Simulium* (*Ectemnaspis*) *perflavum* (Roubaud, 1906). J. *Simulium* (*Ectemnaspis*) *rorotaense* Floch & Abonnenc, 1946. K. *Simulium* (*Psilopelmia*) *dugesi* Vargas, Martínez Palacios & Díaz Nájera, 1946. L. *Simulium* (*Psilopelmia*) *trivittatum* Malloch, 1914.

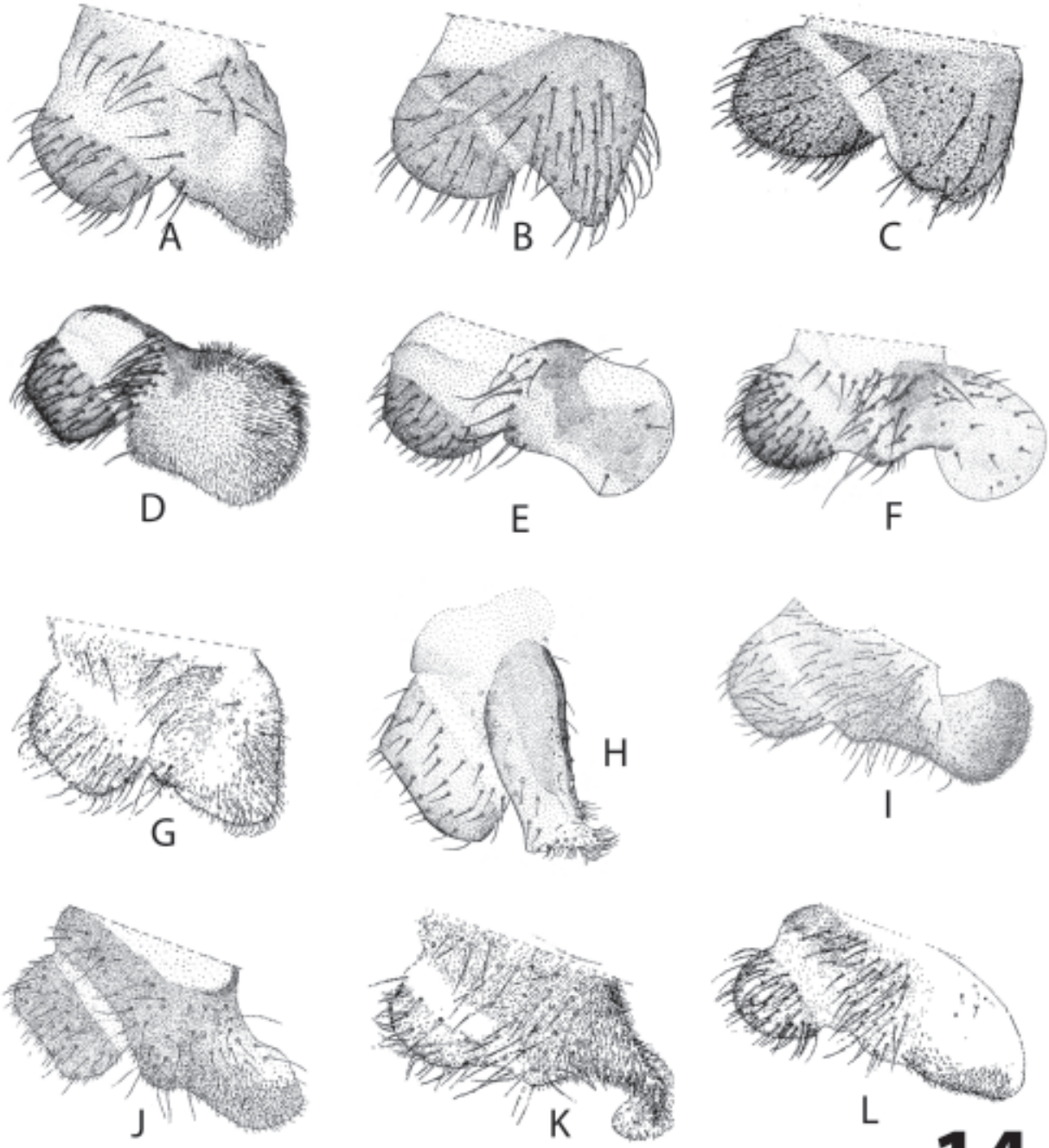

Figure 14. A-L. Cerci and paraprocts. A. *Simulium* (*Psilopelmia*) *tenuipes* Knab, 1914. B. *Simulium* (*Aspathia*) *metallicum* Bellardi, 1859. C. *Simulium* (*Aspathia*) *matteabranchia* Anduze, 1947. D. *Simulium* (*Hemicnetha*) *rubrithorax* Lutz, 1909. E. *Simulium* (*Hemicnetha*) *pulverulentum* Knab, 1914. F. *Simulium* (*Hemicnetha*) *brachycladum* Lutz & Pinto, 1931. G. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971. H. *Simulium* (*Hearlea*) *capricornis* De León, 1945. I. *Simulium* (*Trichodagmia*) *lahillei* (Paterson & Shannon, 1927). J. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. K. *Simulium* (*Thyrsopelma*) *hirtipupa* Lutz, 1910. L. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

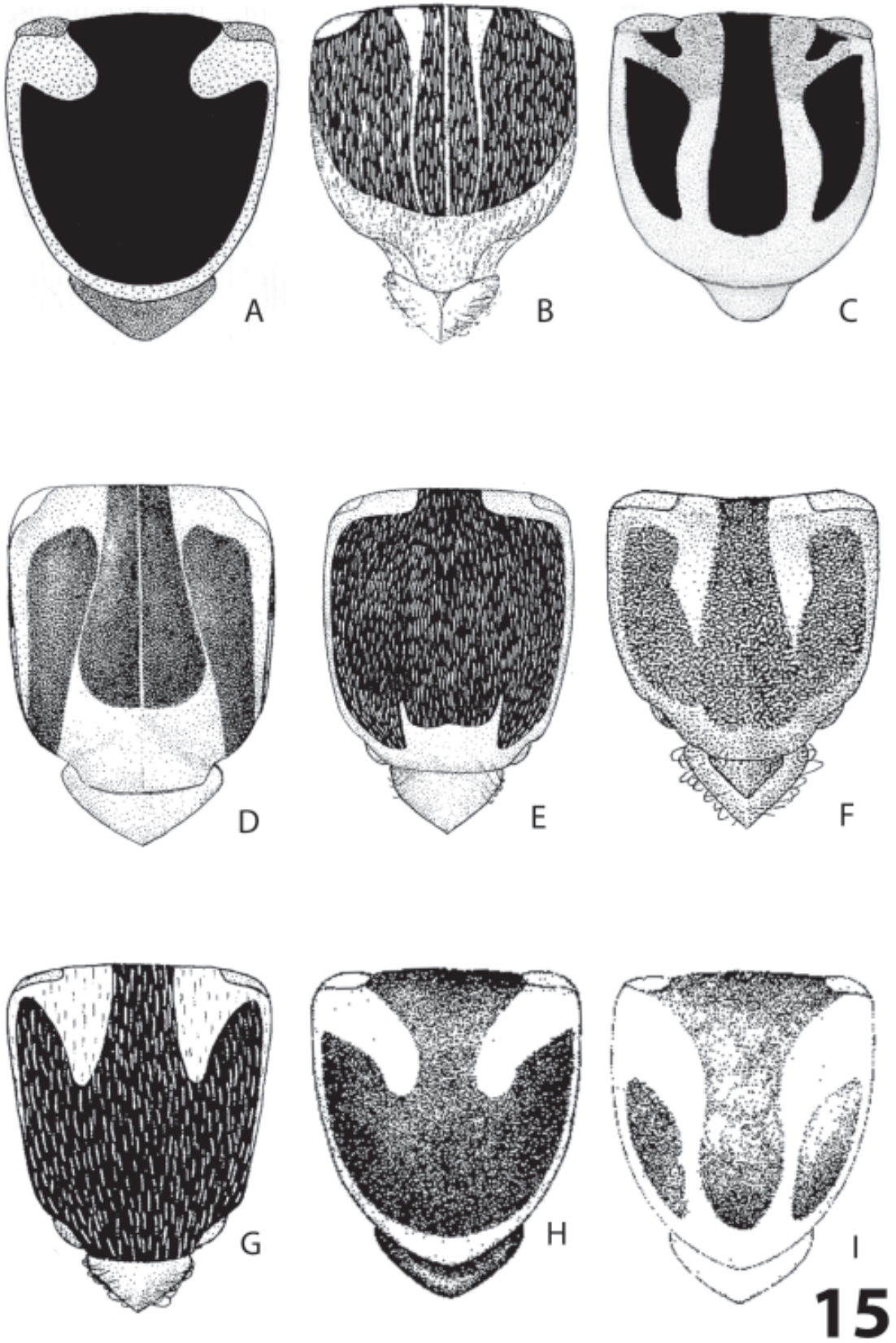

Figure 15. A-I. Scutum and scutellum. A. *Simulium* (*Chirostilbia*) *acarayense* Coscarón & Wygodzinsky, 1972. B. *Simulium* (*Psaroniocompsa*) *limbatum* Knab, 1915. C. *Simulium* (*Cerqueirellum*) *chaquense* Coscarón, 1971. E. *Simulium* (*Ectemnaspis*) *romanai* Wygodzinsky, 1951. F. *Simulium* (*Psilopelmia*) *dugesi* Vargas, Martínez Palacios & Díaz Nájera, 1946. G. *Simulium* (*Psilopelmia*) *escomeli* Roubaud, 1909. H. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910. I. *Simulium* (*Thyrsopelma*) *guianense* Wise, 1911.

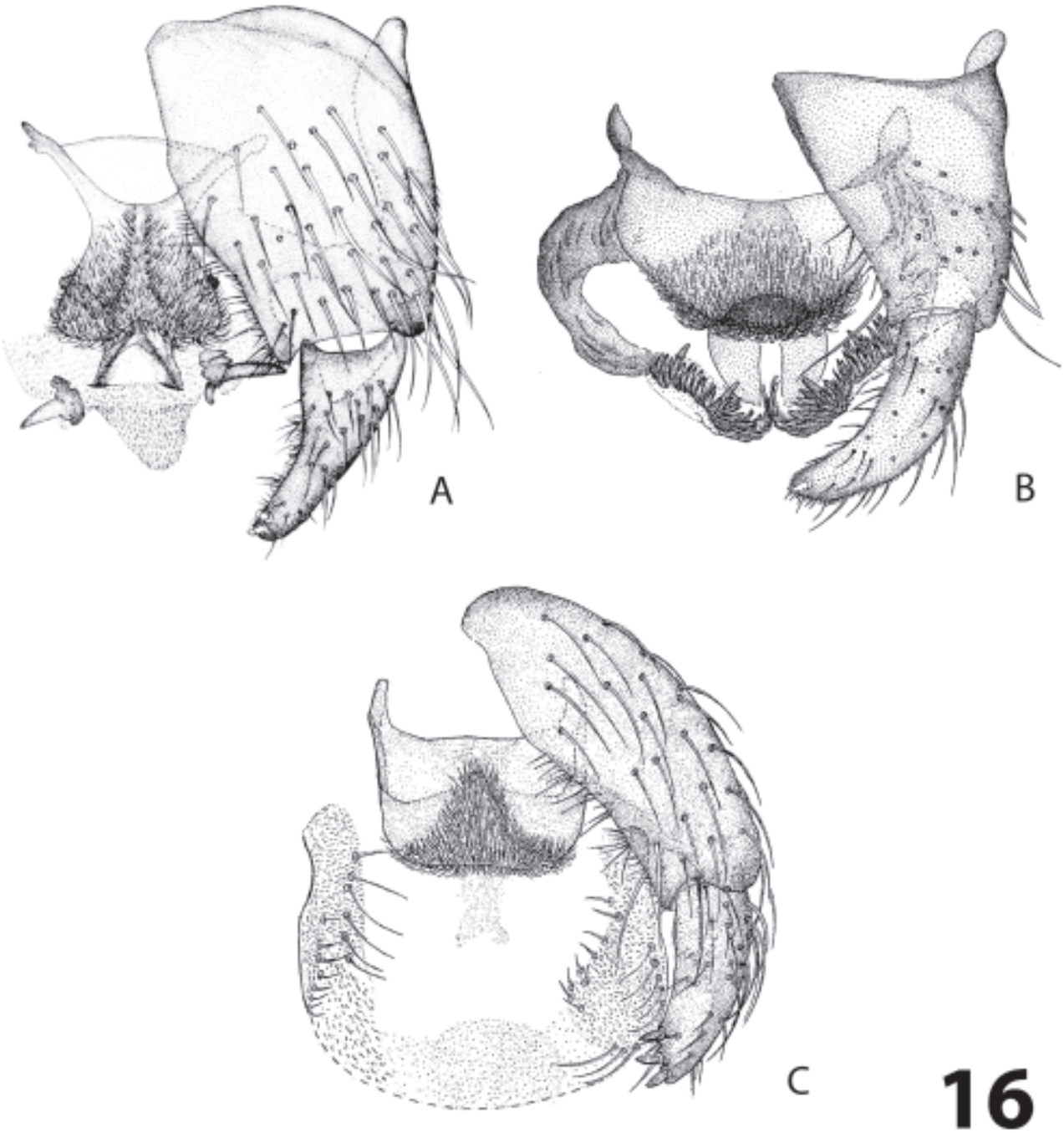

Figure 16. A-C. Terminalia, showing gonocoxite, gonostylus, ventral plate, median sclerite and endoparameres (ventral view). A. *Gigantodax araucanius* (Edwards, 1931). B. *Simulium* (*Psilopelmia*) *tenuipes* Knab, 1914. C. *Lutzsimulium hirticosta* (Lutz, 1909).

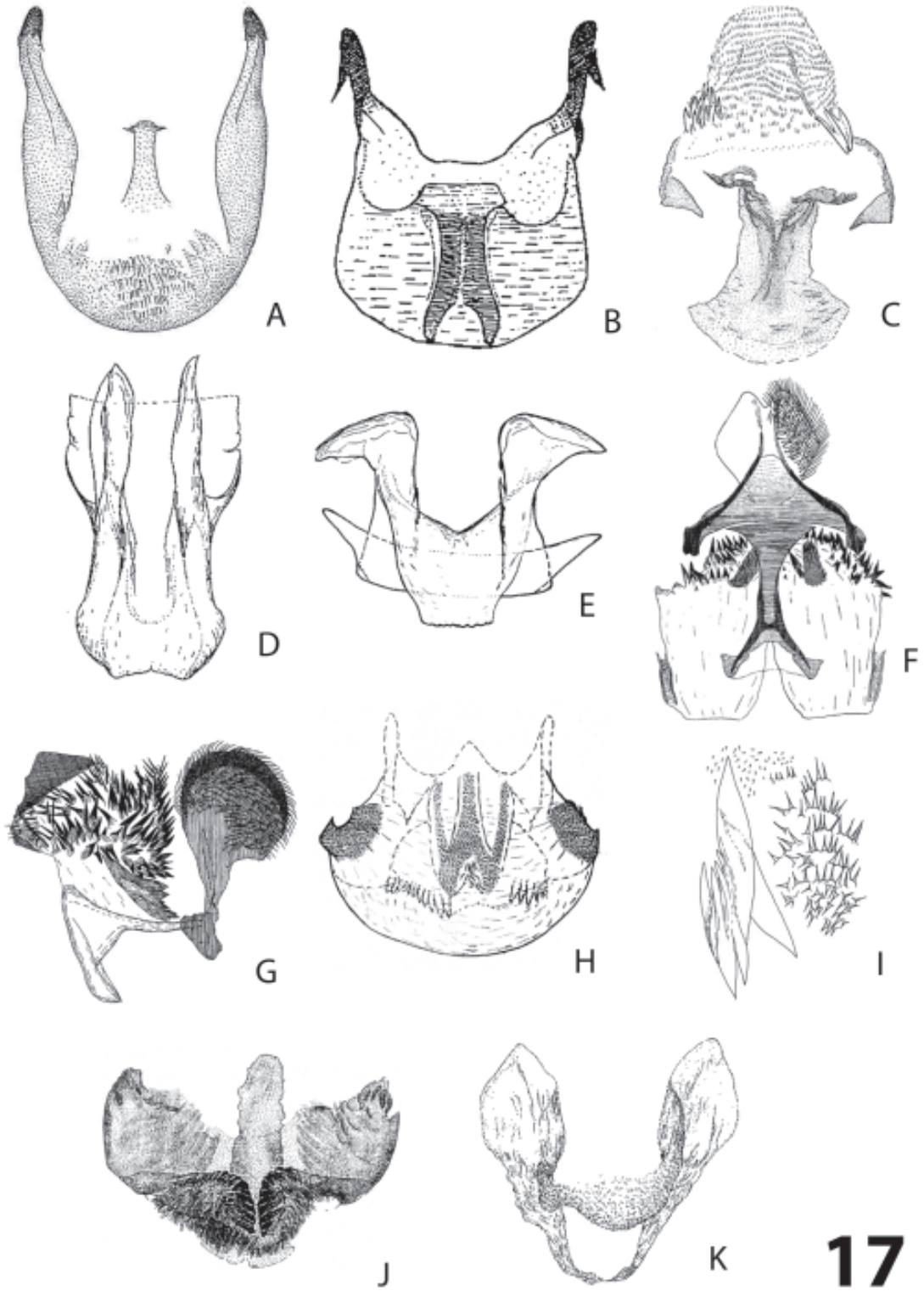

Figure 17. A. *Mayacnephia aguirrei* (Dalmat, 1949), endoparameres with portion of median sclerite and aedeagal membrane. B. *Mayacnephia roblesi* (De León, 1943), median sclerite positioned on ventral plate. C. *Araucnephia iberaensis* Coscarón & Coscarón Arias, 2002, median sclerite, emdoparameres with hooks and aedeagal membrane. D. *Araucnephia montana* (Philippi, 1865), median sclerite. E. *Araucnephioides schlingeri* Wygodzinsky & Coscarón, 1973, median sclerite. F-G. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962, aedeagus with spinules, ventral plate and median sclerite (F) and same in ventral view (G). H. *Paraustrosimulium anthracinum* (Bigot, 1888), aedeagus with median sclerite, endoparameres and ventral plate, visible through it. I. *Gigantodax araucanius* (Edwards, 1931), endoparameres with small spines on aedeagus. J. *Simulium* (*Hemicnetha*) *seriatum* Knab, 1914, endoparameres and median sclerite. K. *Simulium* (*Trichodagmia*) *lahillei* (Paterson & Shannon, 1927), endoparameres and aedeagus.

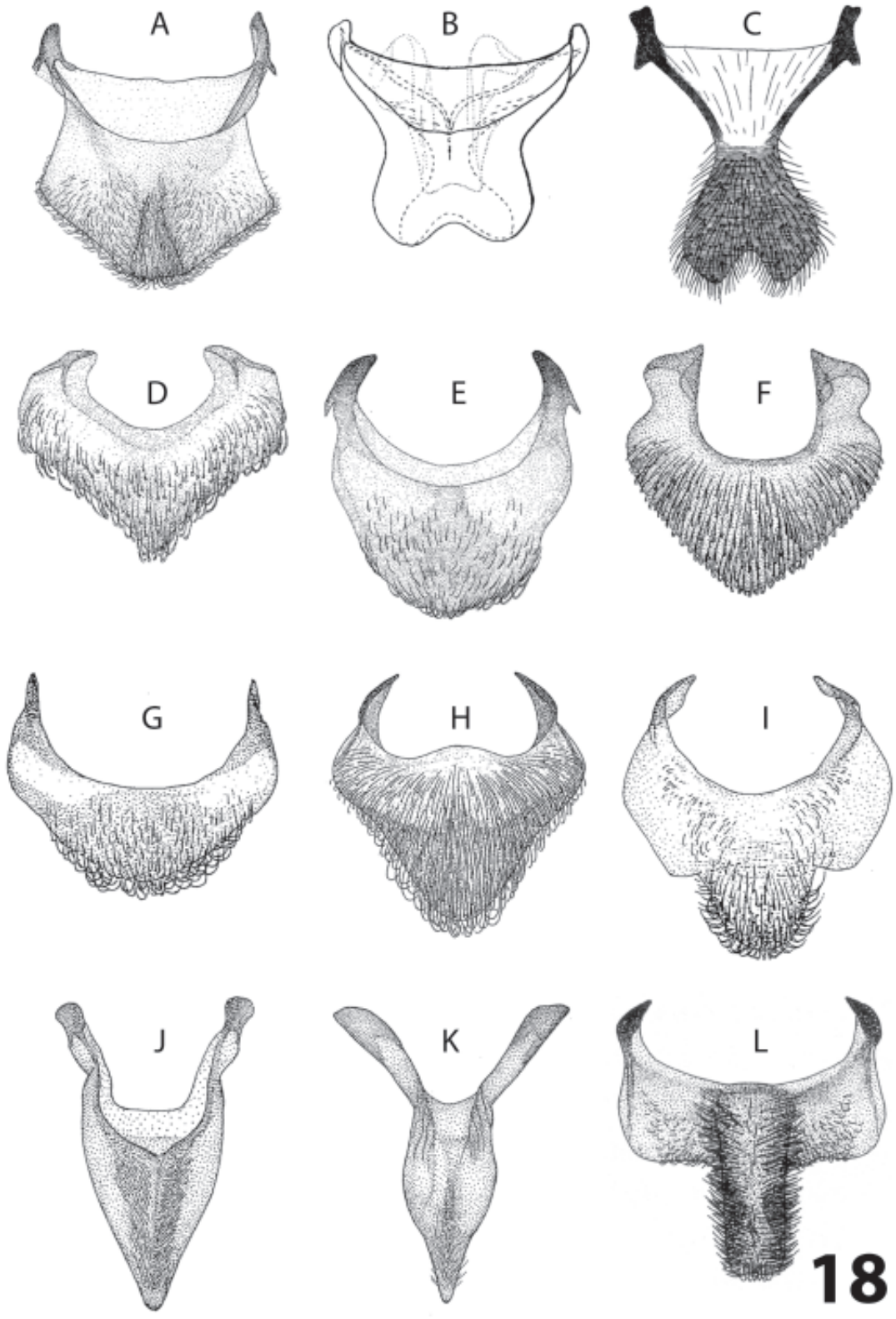

Figure 18. A-L. Male terminalia ventral plate. A. *Araucnephia iberaensis* Coscarón & Coscarón Arias, 2002. B. *Araucnephioides schlingeri* Wygodzinsky & Coscarón, 1973. C. *Gigantodax igniculus* Cocarón & Wygodzinsky, 1962. D. *Simulium* (*Inaequalium*) *subnigrum* Lutz, 1910. E. *Simulium* (*Inaequalium*) *subclavibranchium* Lutz, 1910. F. *Simulium* (*Inaequalium*) *travassosi* d´Andretta & d´Andretta Jr., 1947. G. *Simulium* (*Psilopelmia*) *dugesi* Vargas, Martínez Palacios & Díaz Nájera, 1946. H. *Simulium* (*Psilopelmia*) *escomeli* Roubaud, 1909. I. *Simulium* (*Psilopelmia*) *veracruzanum* Vargas, Martínez Palacios & Díaz Nájera, 1946. J. *Simulium* (*Aspathia*) *hunteri* Malloch, 1914. K. *Simulium* (*Aspathia*) *matteabranchia* Anduze, 1947. L. *Simulium* (*Hemicnetha*) *rubrithorax* Lutz, 1909.

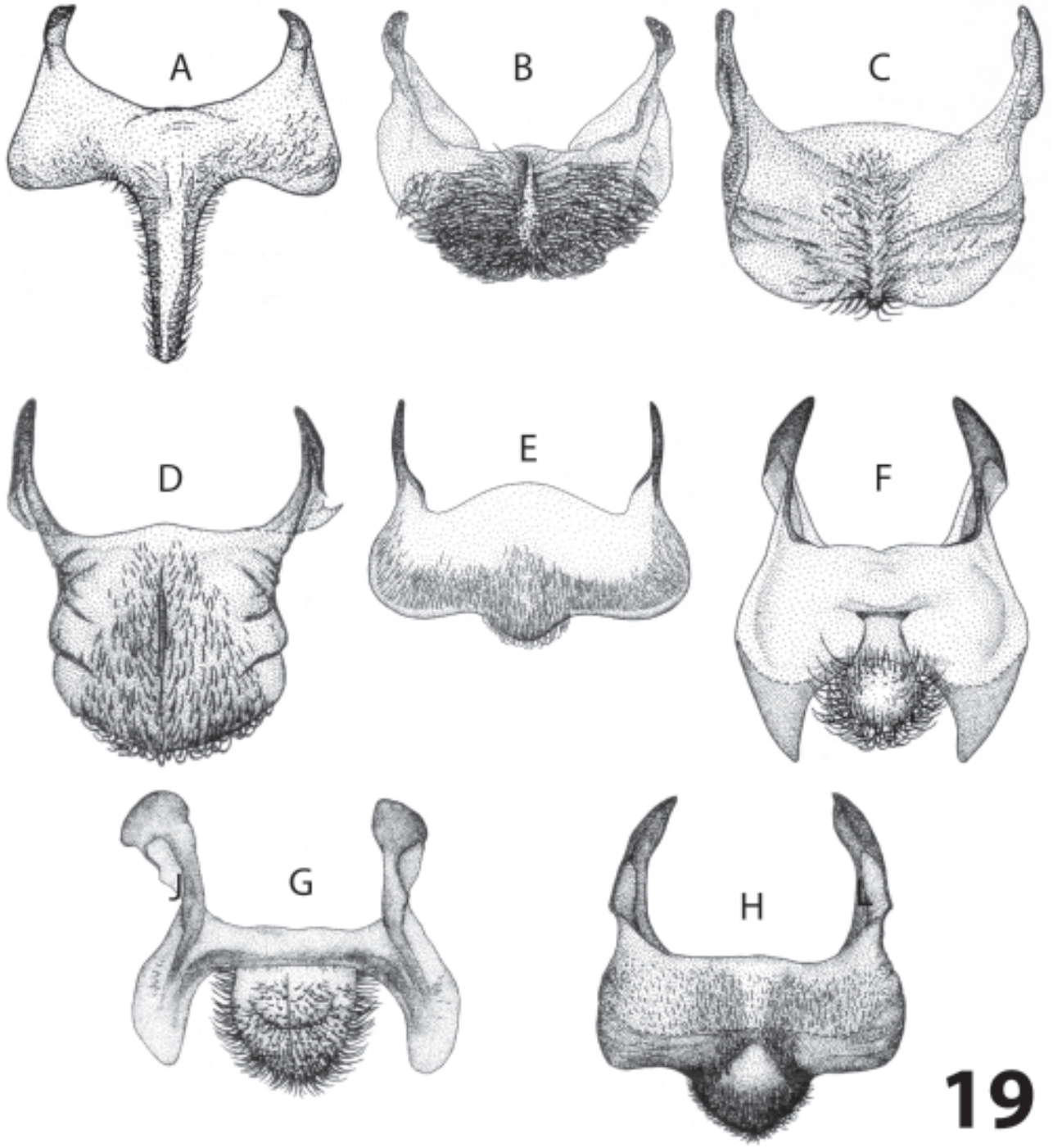

Figure 19. Male terminalia ventral. A. *Simulium* (*Hemicnetha*) *virgatum* Coquillett, 1902. B. *Simulium* (*Hemicnetha*) *seriatum* Knab, 1914. C. *Simulium* (*Hearlea*) *delatorrei* Dalmat, 1950. D. *Simulium* (*Hearlea*) *larvispinosum* De León, 1948. E. *Simulium* (*Trichodagmia*) *huairayacu* Wygodzinsky, 1953. F. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910. G. *Simulium* (*Thyrsopelma*) *guianense* Wise, 1911. H. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

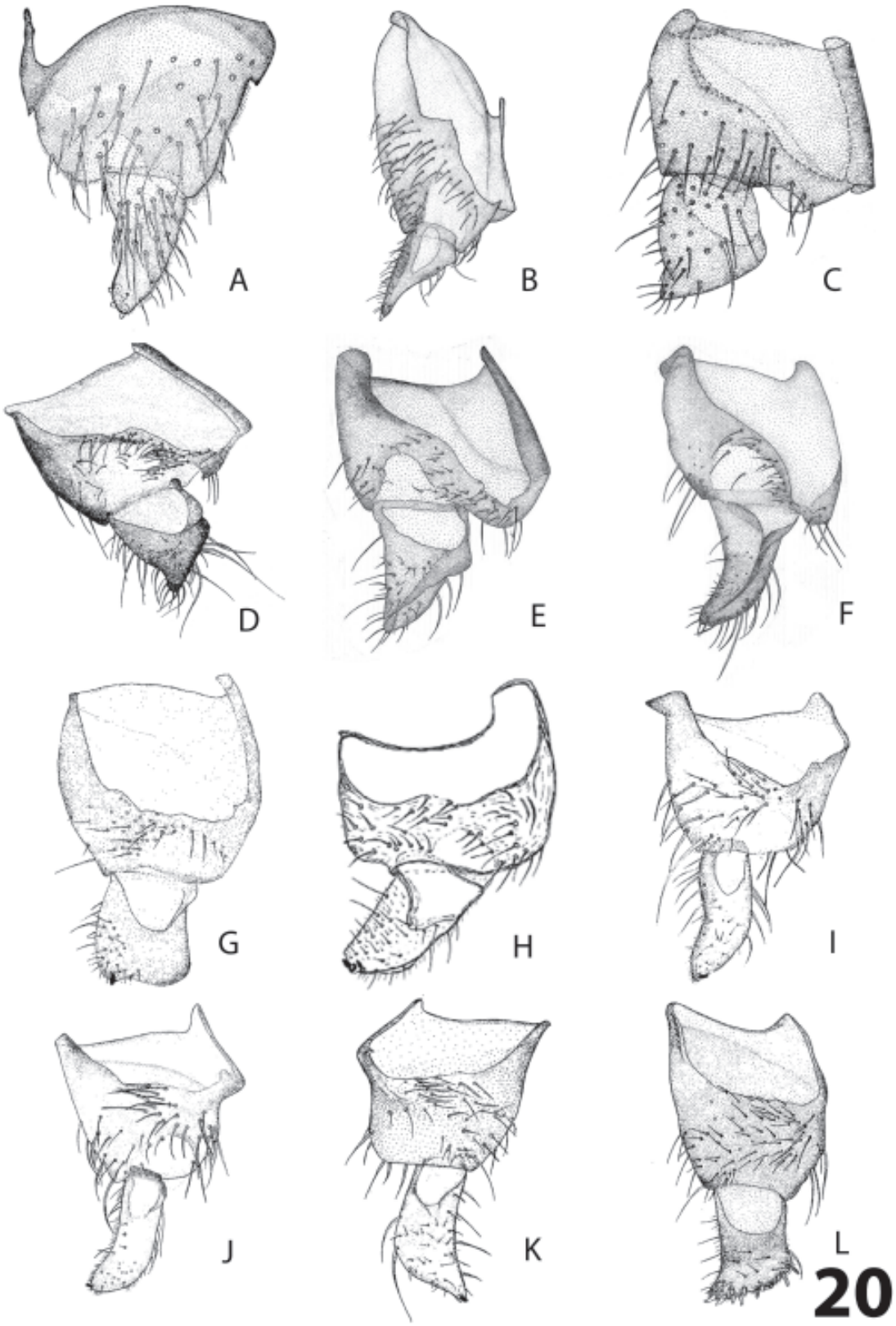

Figure 20. Male gonocoxite and gonostylus. A. *Lutzsimulium hirticosta* (Lutz, 1909). B. *Kempfsimulium simplicicolor* (Lutz, 1909). C. *Simulium* (*Chirostilbia*) *pertinax* Kollar, 1832. D. *Simulium* (*Chrirostilbia*) *serranum* Coscarón, 1981. E. *Simulium* (*Chirostilbia*) *acarayense* Coscarón & Wygodzinsky, 1972. F. *Simulium* (*Chirostilbia*) *subpallidum* Lutz, 1910. G. *Simulium* (*Psaroniocompsa*) *auristriatum* Lutz, 1910. H. *Simulium* (*Ectemnaspis*) *chaquense* Coscarón, 1971. I. *Simulium* (*Ectemaspis*) *arcabucense* Coscarón, 1990. J. *Simulium* (*Ectemnaspis*) *tunja* Coscarón, 1990. K. *Simulium* (*Ectemnaspis*) *romanai* Wygodzinsky, 1951. L. *Simulium* (*Ectemaspis*) *wolffhuegeli* (Enderlein, 1922).

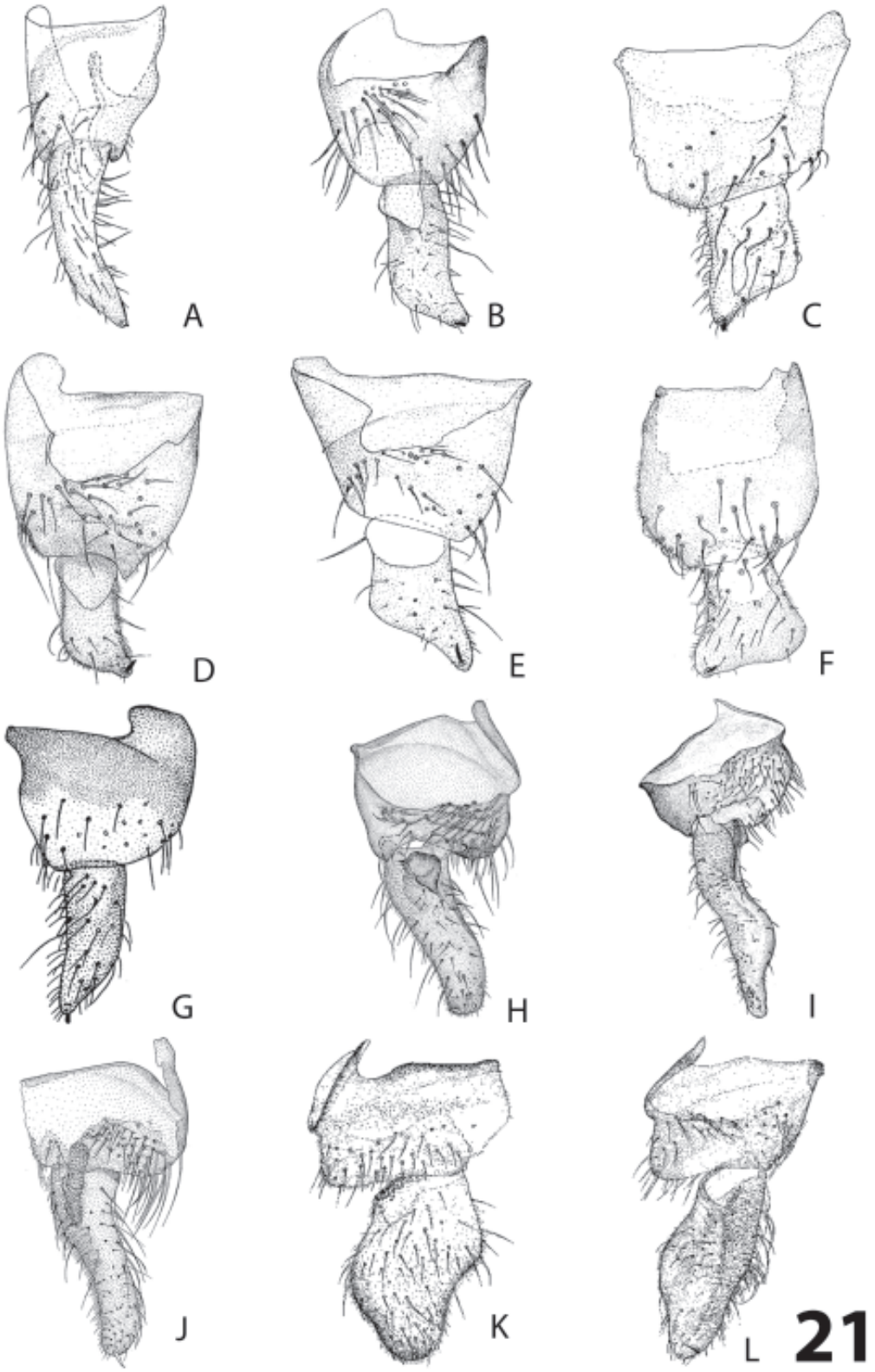

Figure 21. A-L. Male gonocoxite and gonostylus. A. *Simulium* (*Ectemnaspis*) *perflavum* (Roubaud, 1906). B. *Simulium* (*Ectemnaspis*) *rorotaense* Floch & Abonnenc, 1946. C. *Simulium* (*Psilopelmia*) *dugesi* Vargas, Martínez Palacios & Díaz Nájera, 1946. D. *Simulium* (*Psilopelmia*) *iracouboense* Floch & Abonnenc, 1946. E. *Simulium* (*Psilopelmia*) *haematopotum* Malloch, 1914. F. *Simulium* (*Psilopelmia*) *dandrettai* Vargas, Martinez Palacios & Díaz Nájera, 1946. G. *Simulium* (*Psilopelmia*) *blancasi* Wygodzinsky & Coscarón, 1970. H. *Simulium* (*Aspathia*) *metallicum* Bellardi, 1859. I. *Simulium* (*Aspathia*) *putre* Coscarón & Matta, 1982. J. *Simulium* (*Aspathia*) *wygoi* Coscarón, Ibáñez Bernal & Coscarón Arias, 1999. K. *Simulium* (*Hemicnetha*) *brachycladum* Lutz & Pinto, 1931. L. *Simulium* (*Hemicnetha*) *seriatum* Knab, 1914.

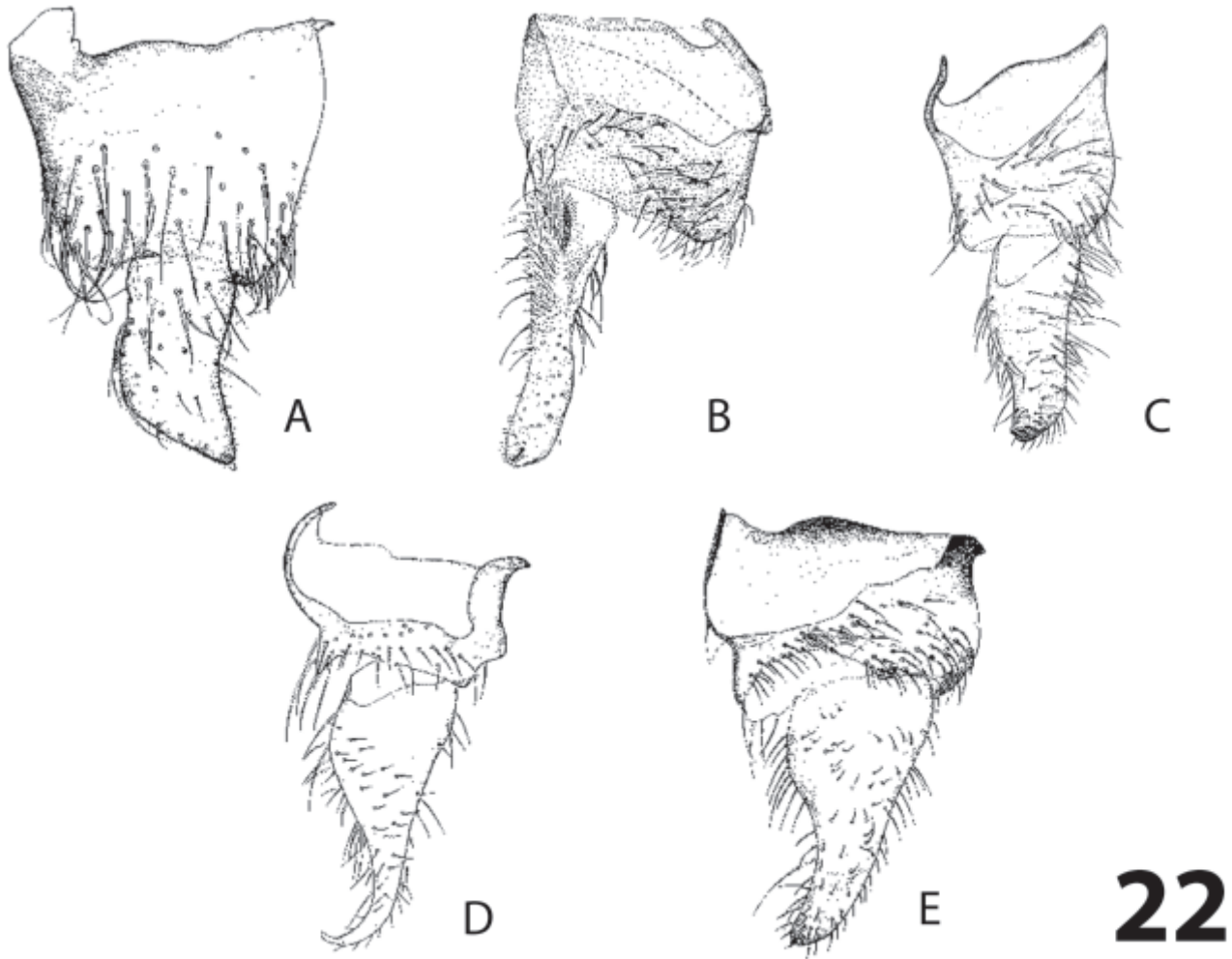

Figure 22. A-E. Male gonocoxite and gonostylus. A. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971. B. *Simulium* (*Hearlea*) *delatorrei* Dalmat, 1950. C. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. D. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910. E. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

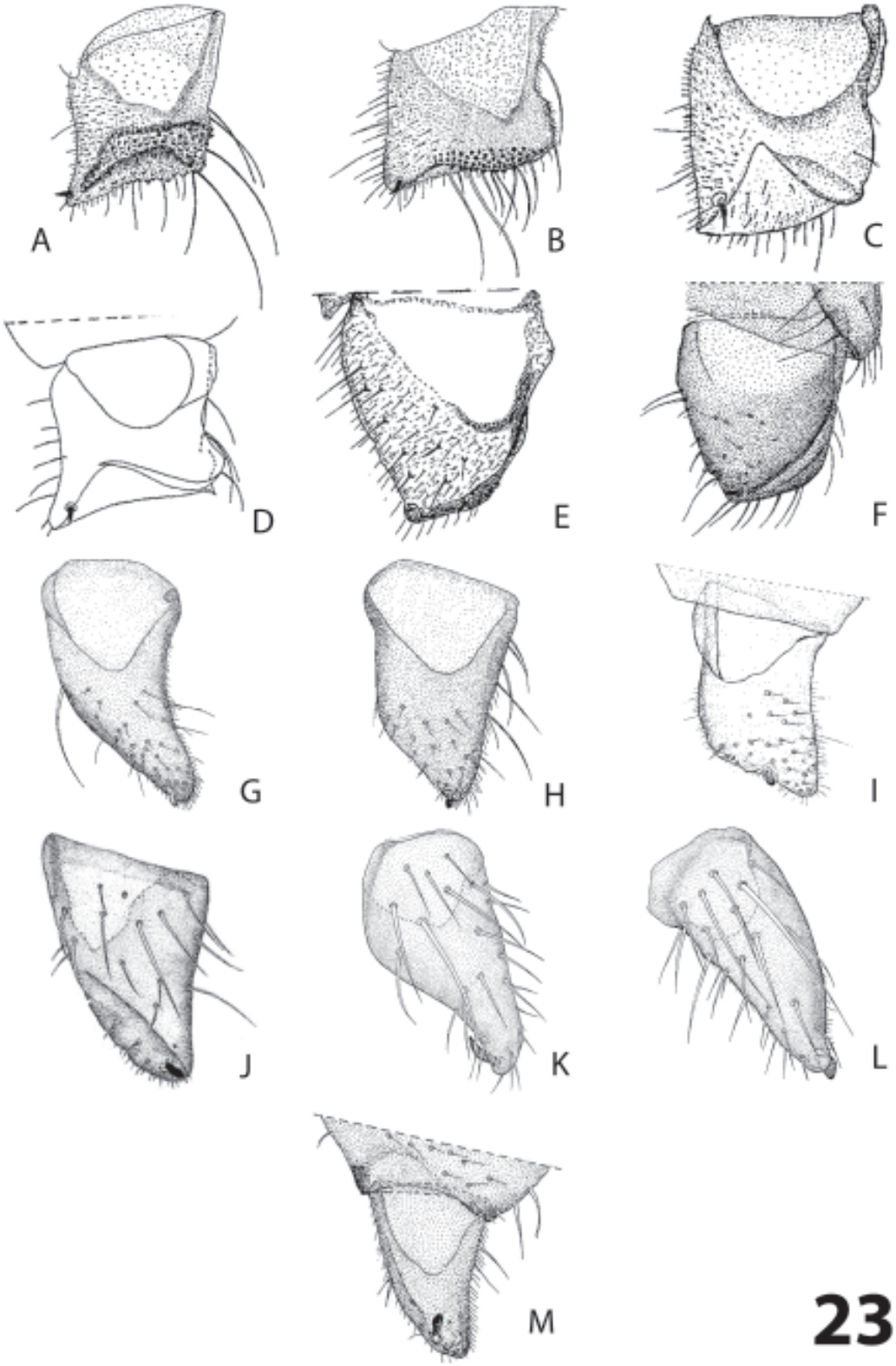

Figure 23. A-M. Male gonostylus. A. *Simulium* (*Pternaspatha*) *pichi* Wygodzinsky & Coscarón, 1967. B. *Simulium* (*Pternaspatha*) *dureti* Wygodzinsky & Coscarón, 1967. C. *Simulium* (*Pternaspatha*) *philippii* Coscarón, 1976. D. *Simulium* (*Pternaspatha*) *caprii* Wygodzinsky & Coscarón, 1967. E. *Simulium* (*Notolepria*) *exiguum* Roubaud, 1906. F. *Simulium* (*Notolepria*) *paraguayense* Schrottky, 1909. G. *Simulium* (*Inaequalium*) *inaequale* (Paterson & Shannon, 1927). H. *Simulium* (*Inaequalium*) *subnigrum* Lutz, 1910. I. *Simulium* (*Psaroniocompsa*) *limbatum* Knab, 1915. J. *Simulium* (*Cerqueirellum*) *cuneatum* (Enderlein, 1936). K. *Simulium* (*Coscaroniellum*) *quadrifidum* Lutz, 1917. L. *Simulium* (*Coscaroniellum*) *cerradense* Coscarón, Cerqueira, Sato & La Salvia, 1992. M. *Simulium* (*Coscaroniellum*) *quadrivittatum* Loew, 1862.

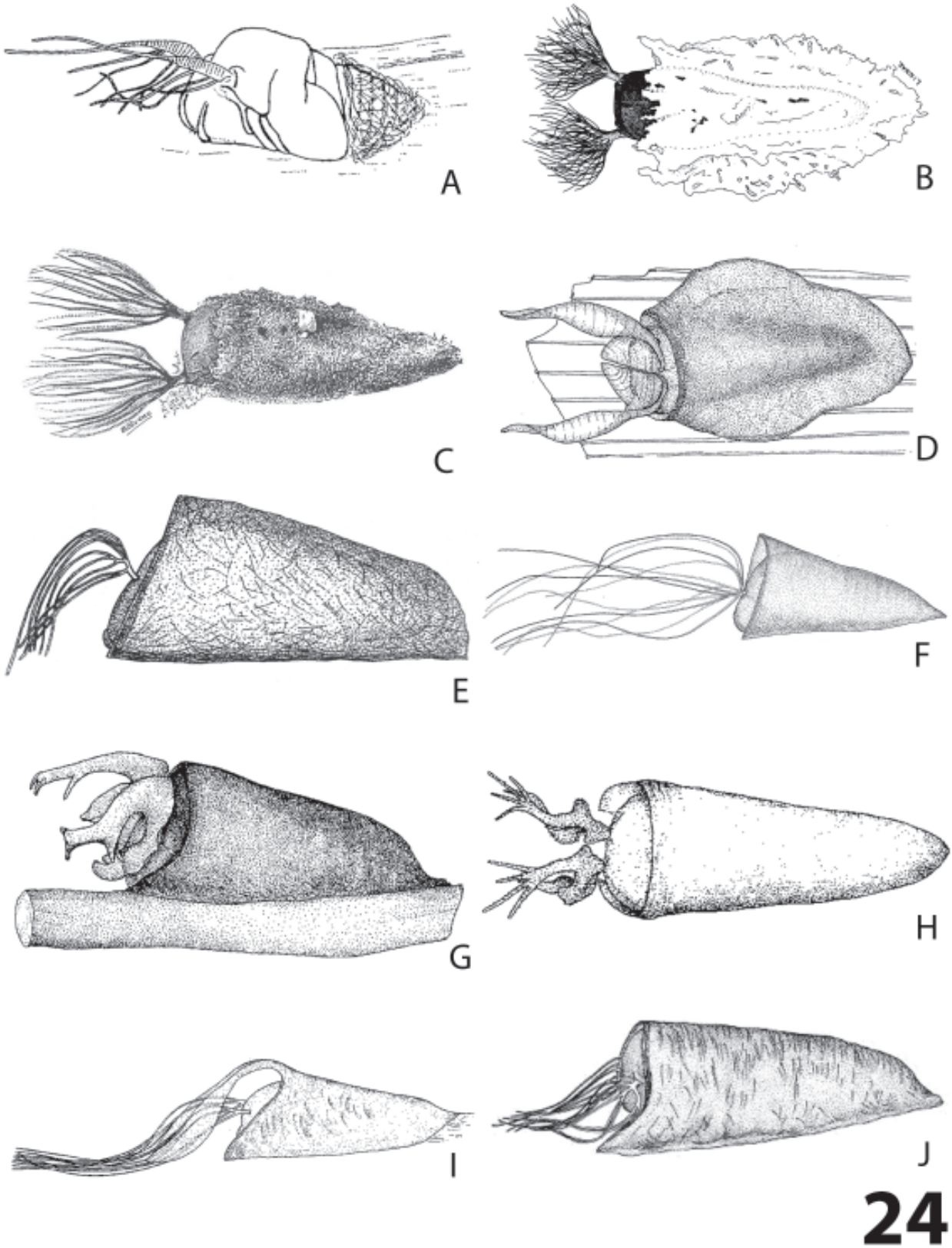

Figure 24. Pupae. A. *Tlalocomyia revelata* Wygodzinsky & Díaz Nájera, 1970. B. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. C. *Gigantodax brophyi* Wygodzinsky & Coscarón, 1989. D. *Paraustrosimulium anthracinum* (Bigot, 1888). E. *Simulium* (*Chirostilbia*) *papaveroi* Coscarón, 1982. F. *Simulium* (*Inaequalium*) *inaequale* (Paterson & Shannon, 1927). G. *Simulium* (*Inaequalium*) *botulibranchium* Lutz, 1910. H. *Simulium* (*Inaequalium*) *petropoliense* Coscarón, 1980. I. *Simulium* (*Psaroniocompsa*) *anamariae* Vulcano, 1962. J. *Simulium* (*Cerqueirellum*) *chaquense* Coscarón, 1971.

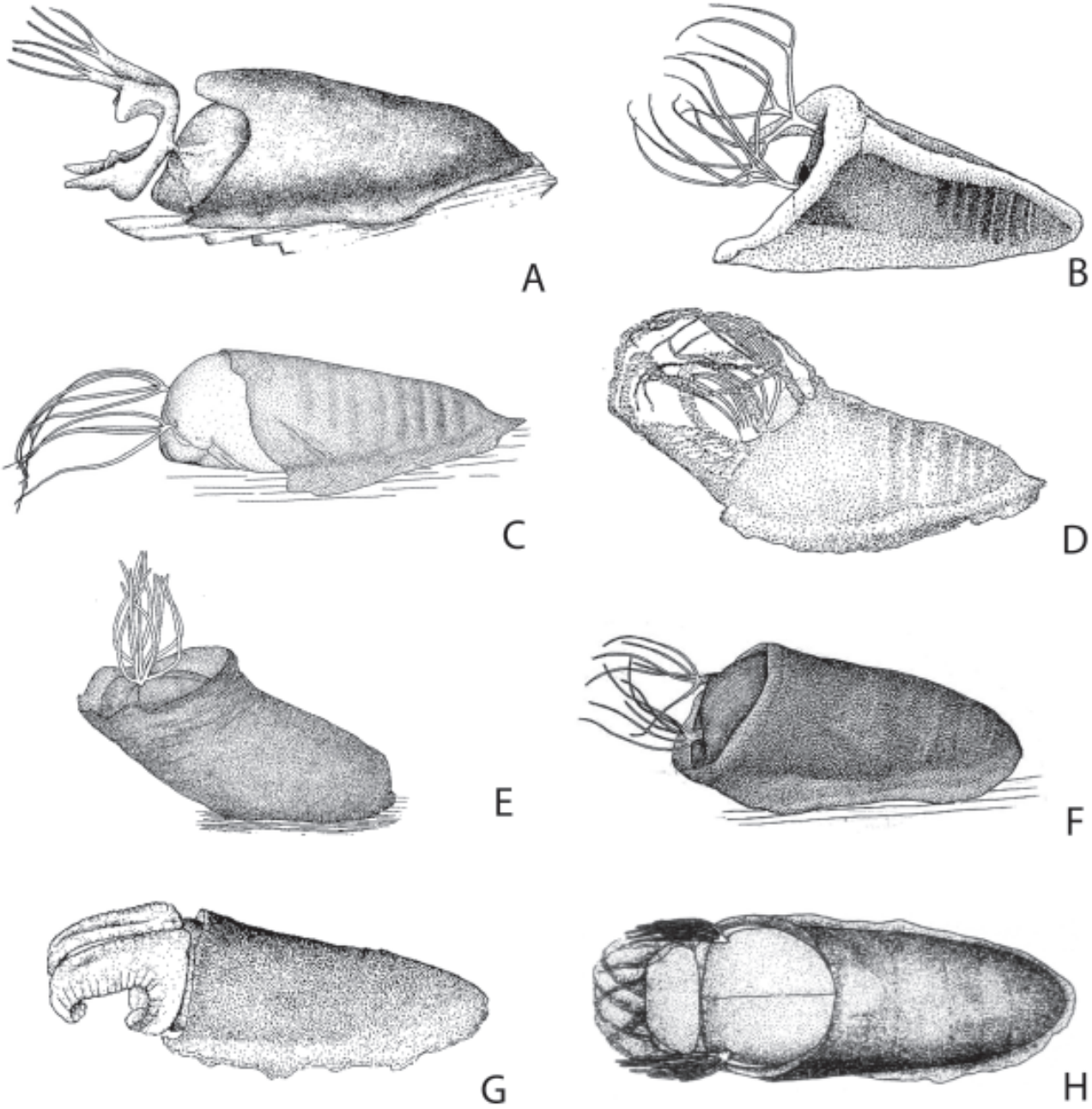

Figure 25. Pupae. A. *Simulium* (*Ectemnaspis*) *furcillatum* Wygodzinsky & Coscarón, 1982. B. *Simulium* (*Ectemnaspis*) *anaimense* Coscarón & Muñoz de Hoyos, 1995. C. *Simulium* (*Psilopelmia*) *tenuipes* Knab, 1914. D. *Simulium* (*Hemicnetha*) *rubrithorax* Lutz, 1909. E. *Simulium* (*Hemicnetha*) *brachycladum* Lutz & Pinto, 1931. F. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971. G. *Smulium* (*Hearlea*) *ethelae* Dalmat, 1950. H. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838.

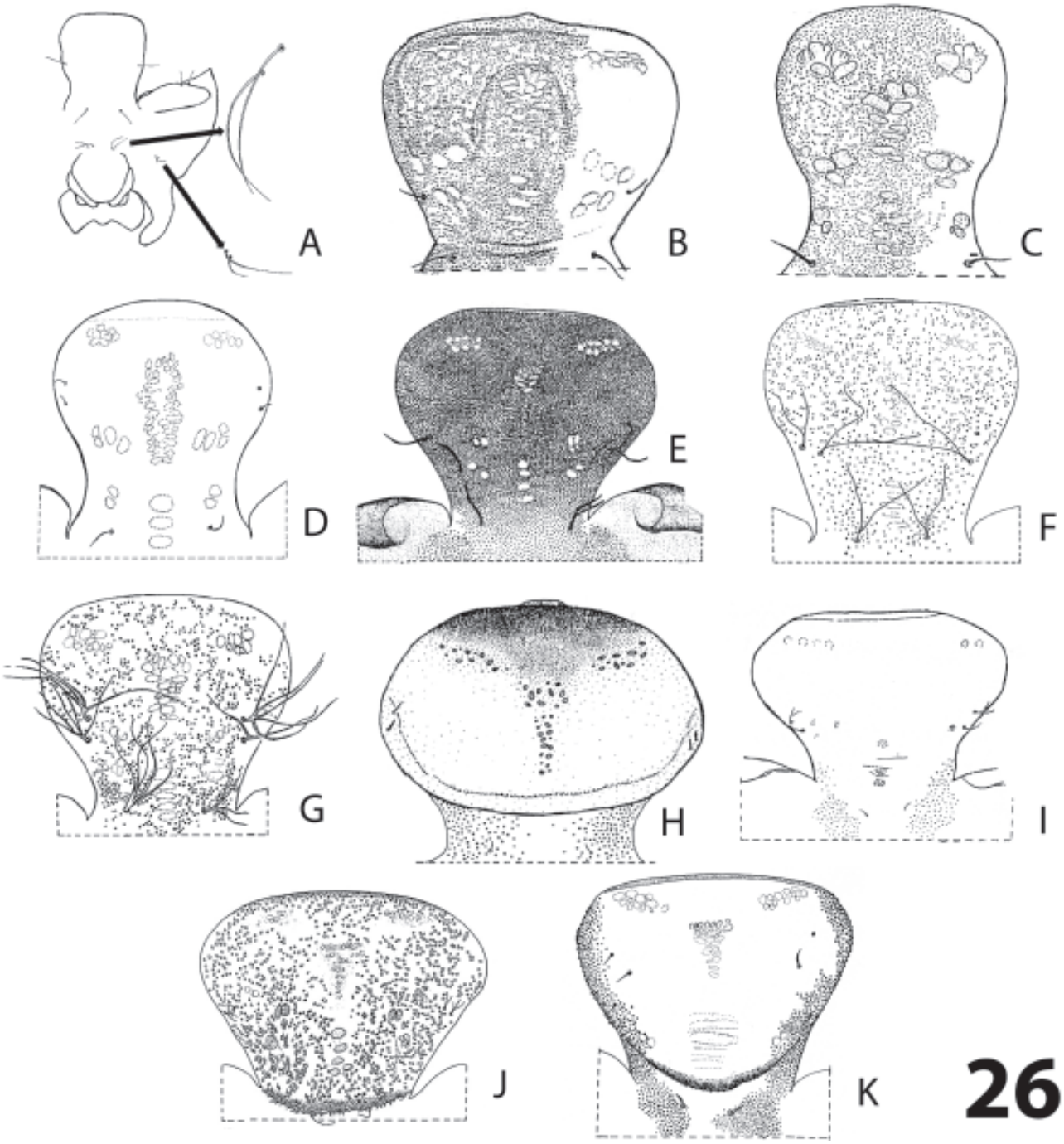

Figure 26. Frontoclypeus. A. *Araucnephia montana* (Philippi, 1865). B. *Pedrowygomyia jatunchuspi* (Wygodzinsky & Coscarón, 1989). C. *Gigantodax marginalis* (Edwards, 1931). D. *Kempfsimulium simplicicolor* (Lutz, 1910). E. *Simulium* (*Chirostilbia*) *pertinax* Kollar, 1832. F. *Simulium* (*Psaroniocompsa*) *incrustatum* Lutz, 1910. G. *Simulium* (*Ectemnaspis*) *dinellii* Joan, 1912. H. *Simulium* (*Hemicnetha*) *rubrithorax* Lutz, 1909. I. *Simulium* (*Hemicnetha*) *brachycladum* Lutz & Pinto, 1931. J. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971. K. *Simulium* (*Hearlea*) *delatorrei* Dalmat, 1950.

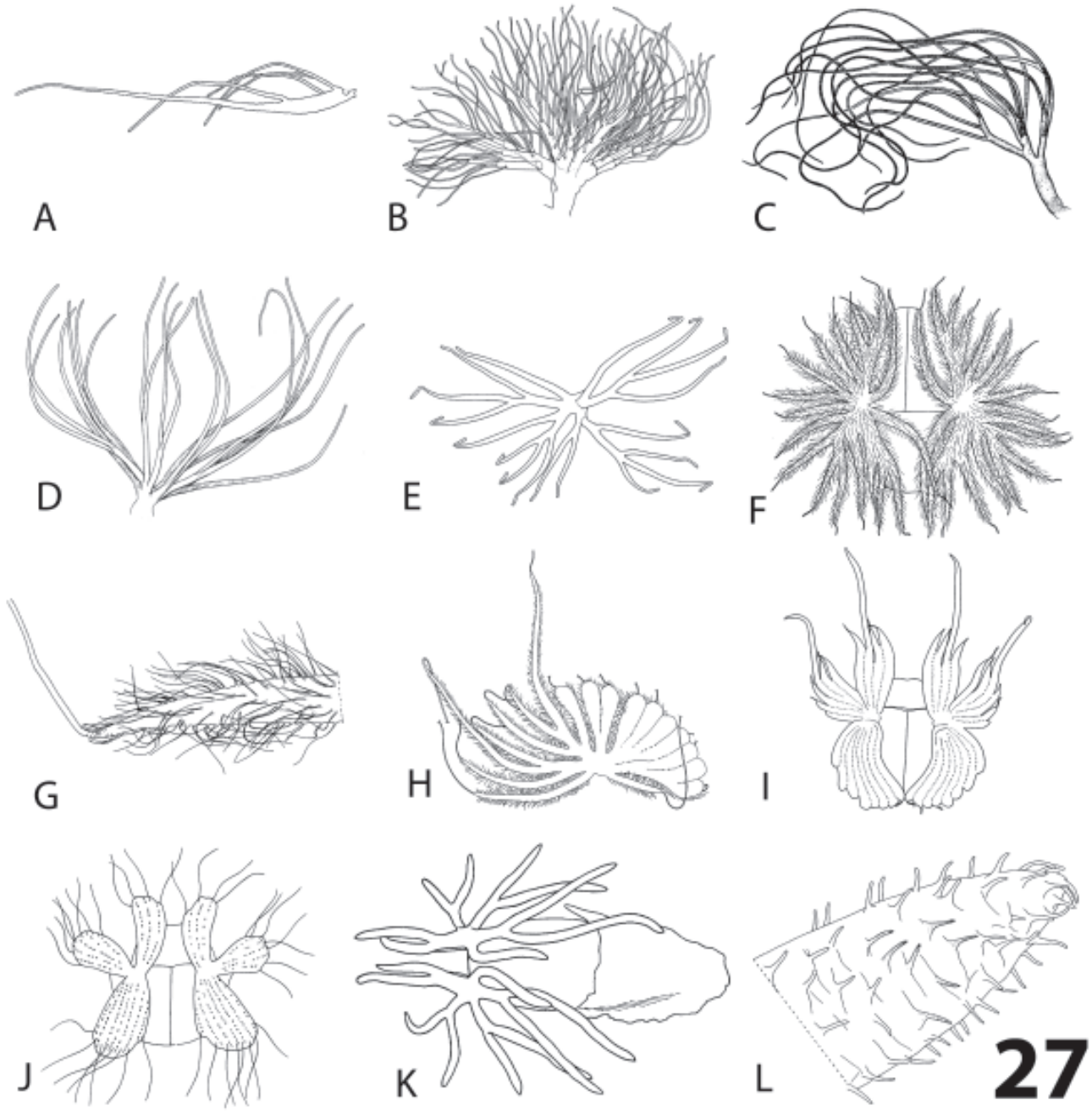

Figure 27. Gills. A. *Tlalocomyia revelata* Wygodzinsky & Díaz Nájera, 1970. B. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. C. *Gigantodax eremicus* Wygodzinsky & Coscarón, 1989. D. *Gigantodax brophyi* (Edwards, 1931). E. *Gigantodax pennipunctus* Enderlein, 1933. F-G. *Gigantodax arrarteorum* Wygodzinsky & Coscarón, 1989 (G: apex gill branch). H. *Gigantodax brevis* Wygodzinsky & Coscarón, 1989. I. *Gigantodax cormonsi* Wygodzinsky & Coscarón, 1989. J. *Gigantodax siberianus* Wygodzinsky & Coscarón, 1989. K-L. *Gigantodax bettyae* Wygodzinsky, 1974 (L: apex of gill branch).

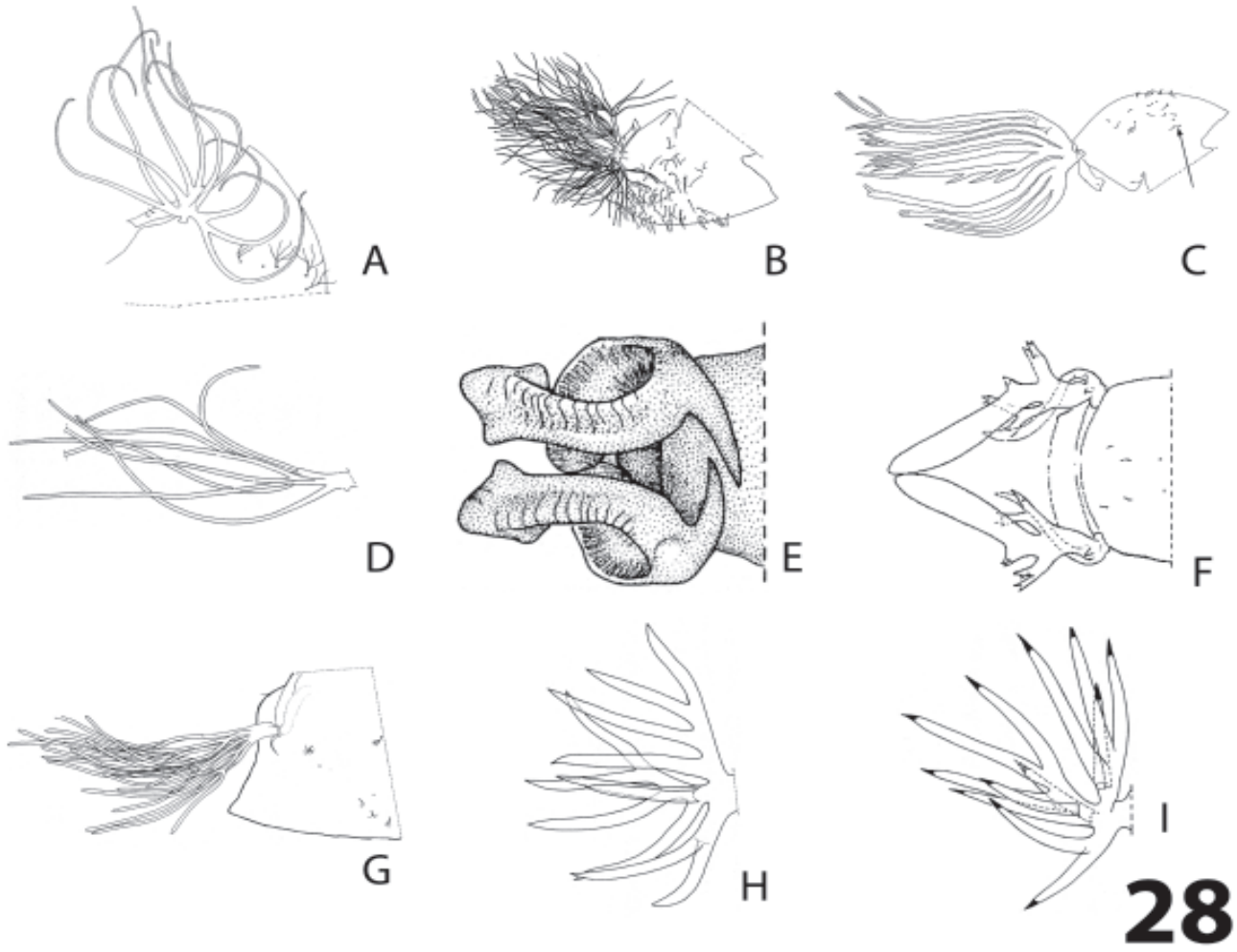

Figure 28. Gills. A. *Simulium* (*Chirostilbia*) *distinctum* Lutz, 1910. B. *Simulium* (*Chirostilbia*) *obesum* Vulcano, 1959. C. *Simulium* (*Aspathia*) *sandyi* Coscarón, Ibáñez Bernal & Coscarón Arias, 1999. D. *Simulium* (*Hemicnetha*) *rubrithorax* Lutz, 1909. E. *Simulium* (*Hearlea*) *dalmati* Vargas & Díaz Nájera, 1948. F. *Simulium* (*Hearlea*) *johnsoni* Vargas & Díaz Nájera, 1957. G. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. H. *Simulium* (*Thyrsopelma*) *guianense* Wise, 1911. I. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

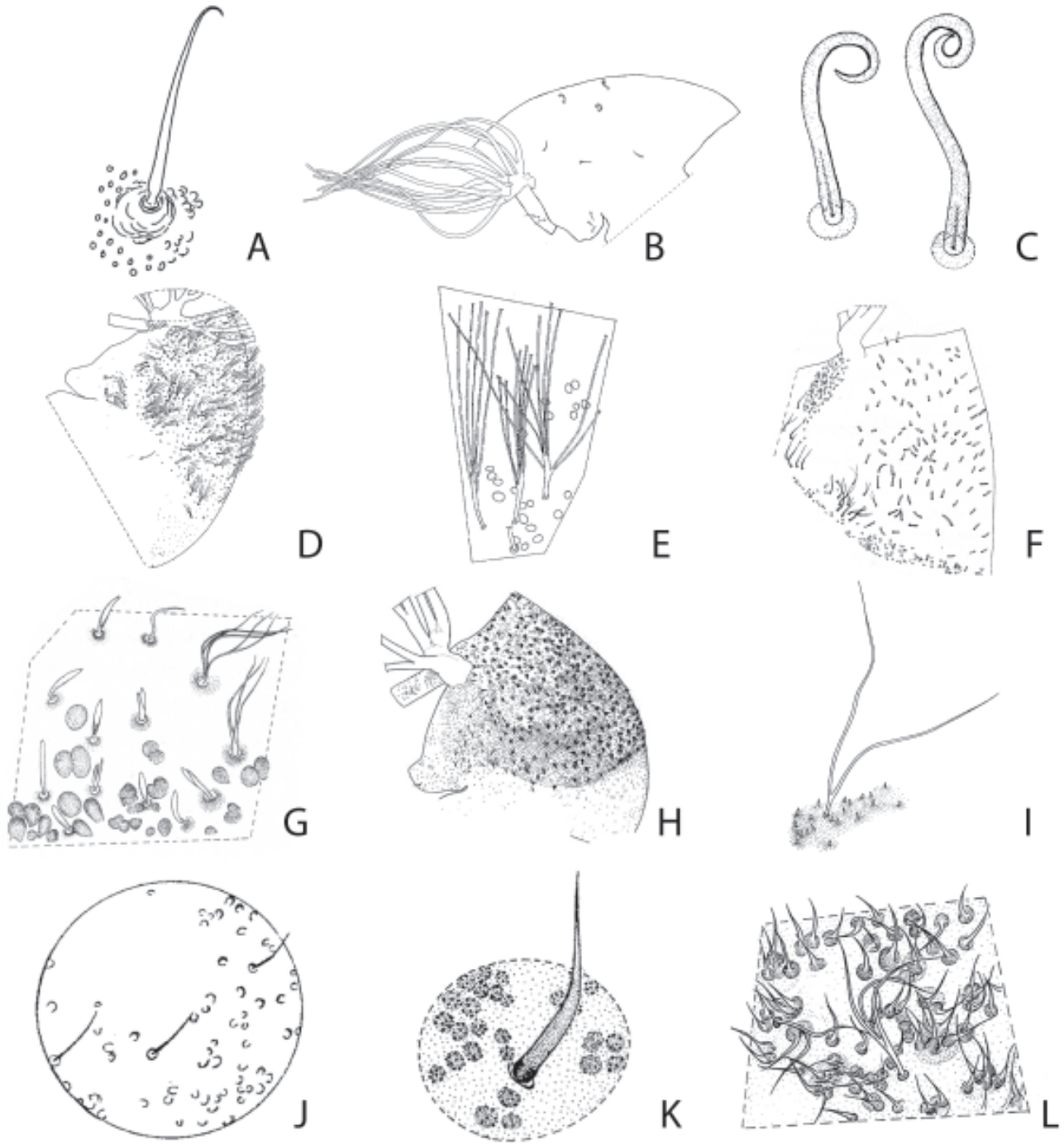

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Figure 29. Dorsal portion of thorax and trichomes of pupa. A, C, E, G, I-K, trichomes enlarged. A. *Gigantodax minor* Wygodzinsky &Coscarón, 1989. B-C. *Kempfsimulium simplicicolor* (Lutz, 1910). D-E. *Simulium* (*Pternaspatha*) *dureti* Wygodzinsky & Coscarón, 1967. F-G. *Simulium* (*Pternaspatha*) *barbatipes* (Enderlein, 1934). H. *Simulium* (*Pternaspatha*) *stelliferum* Coscarón & Wygodzinsky, 1972. I. *Simulium* (*Coscaroniellum*) *quadrifidum* Lutz, 1917. J. *Simulium* (*Psilopelmia*) *blancasi* Wygodzinsky & Coscarón, 1970. K. *Simulium* (*Aspathia*) *sandyi* Coscarón, Ibáñez Bernal & Coscarón Arias, 1999. L. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971 (acuminated tubercles and trichomes).

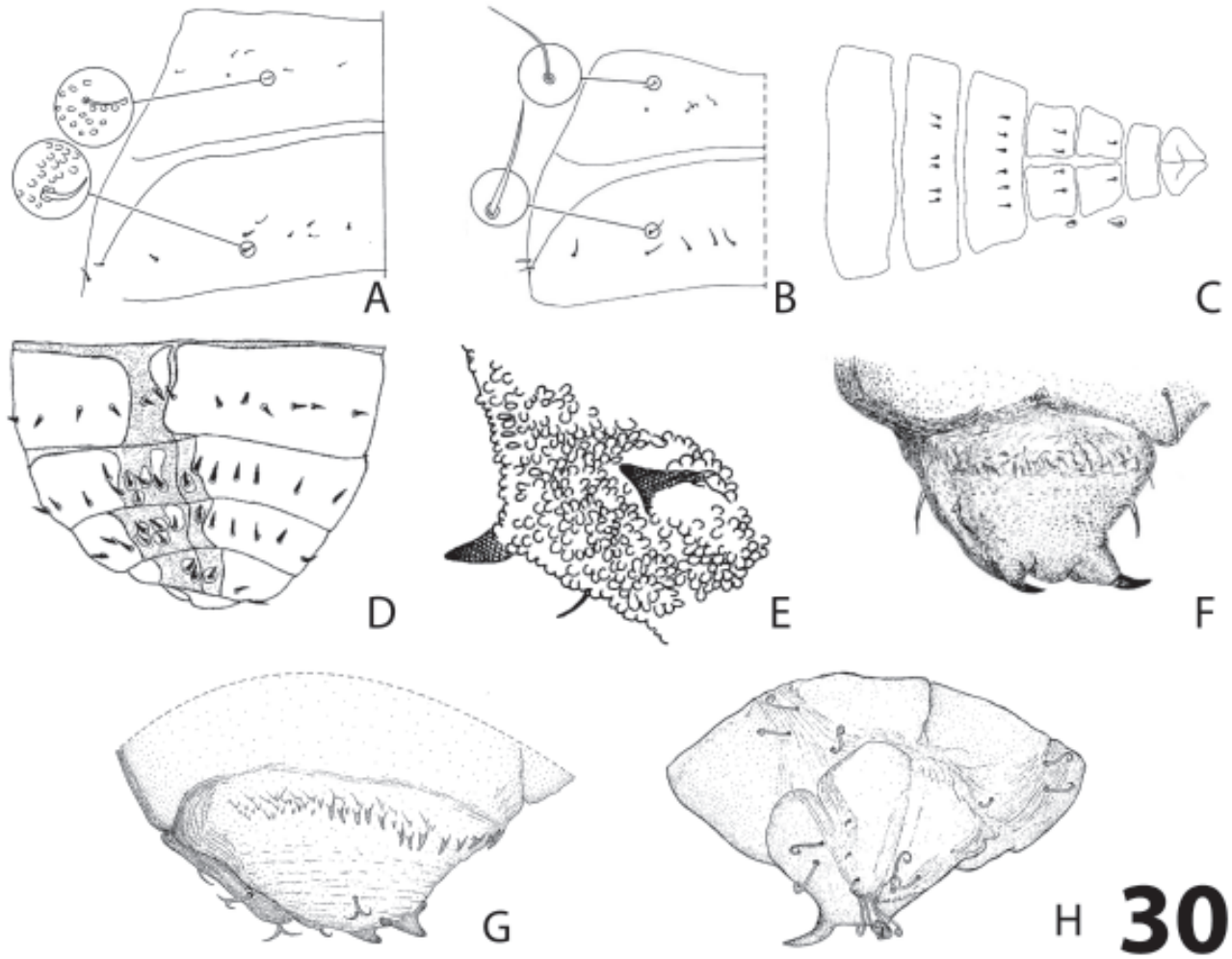

Figure 30. Chaetotaxy of abdomen of pupa. A-B. Tergites II and III. A. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. B. *Gigantodax rufidulus* Wygodzinsky & Coscarón, 1989. C. *Cnesia dissimilis* (Edwards, 1931) (distal portion of abdomen, ventral view). D. *Tlalocomyia revelata* Wygodzinsky & Coscarón, 1970, distal portion of abdomen, lateral view. E-H. Apex of abdomen. E. *Gigantodax carmenae* Wygodzinsky & Coscarón, 1989. F. *Gigantodax brophyi* (Edwards, 1931). G. *Paraustrosimulium anthracinum* (Bigot, 1888). H. *Lutzsimulium hirticosta* (Lutz, 1909).

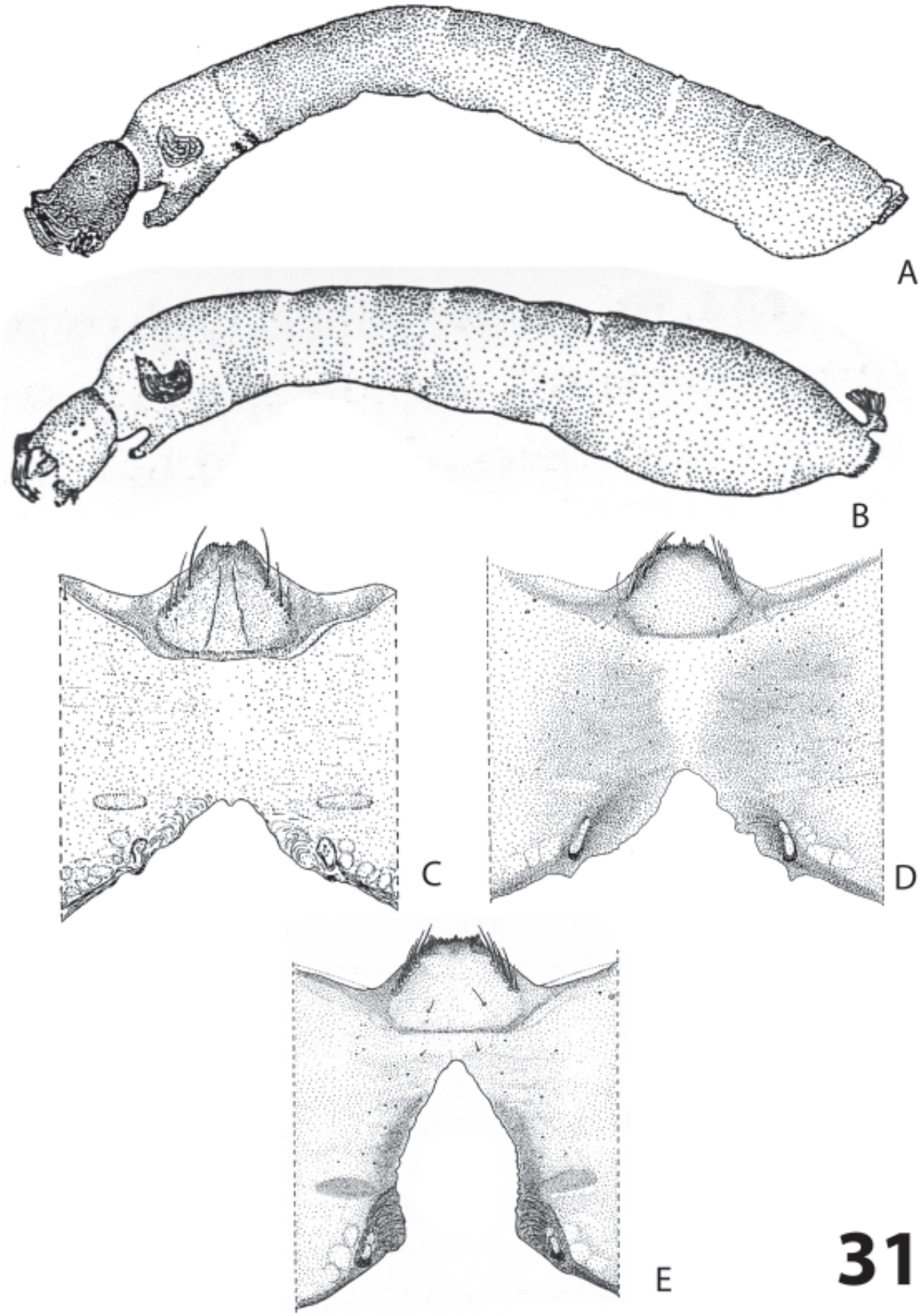

Figure 31. A-B. Larvae, lateral view. A. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. B. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910. C-E. Larval hypostomium, postgenal bridge and gular cleft. C. *Cnesia ornata* Wygodzinsky & Coscarón, 1973. D. *Simulium* (*Aspathia*) *wygoi* Coscarón, Ibáñez Bernal & Coscarón Arias, 1999. E. *Simulium* (*Ectemnaspis*) *rorotaense* Floch & Abonnenc, 1946.

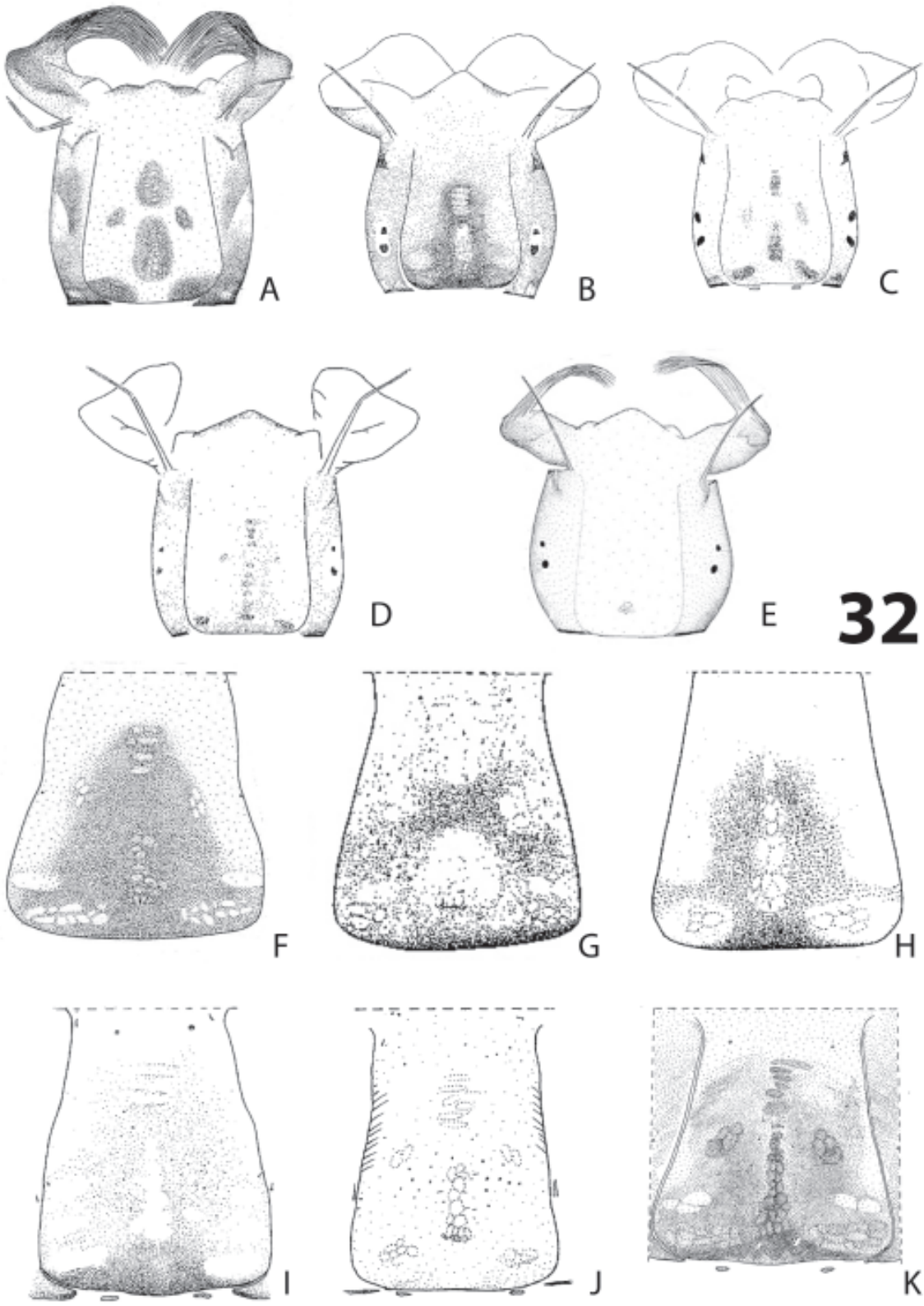

Figure 32. A-E. Larval head, dorsal view. A. *Simulium* (*Chirostilbia*) *subpallidum* Lutz, 1910. B. *Simulium* (*Inaequalium*) *subnigrum* Lutz, 1910. C. *Simulium* (*Psaroniocompsa*) *bonaerense* Coscarón & Wygodzinsky, 1984. D. *Simulium* (*Psaroniocompsa*) *auristriatum* Lutz, 1910. E. *Simulium* (*Cerqueirellum*) *cuneatum* (Enderlein, 1936). F-K. Cephalic apotome. F. *Simulium* (*Chirostilbia*) *pertinax* Kollar, 1832. G. *Simulium* (*Ectemnaspis*) *romanai* Wygodzinsky, 1951. H. *Simulium* (*Psilopelmia*) *escomeli* Roubaud, 1909. I. *Simulium* (*Psilopelmia*) *downsi* Vargas, Martínez Palacios & Díaz Nájera, 1946. J. *Simulium* (*Psilopelmia*) *zempoalense* Vargas, Martínez Palacios & Díaz Nájera, 1946. K. *Simulium* (*Trichodagmia*) *lahillei* (Paterson & Shannon, 1927).

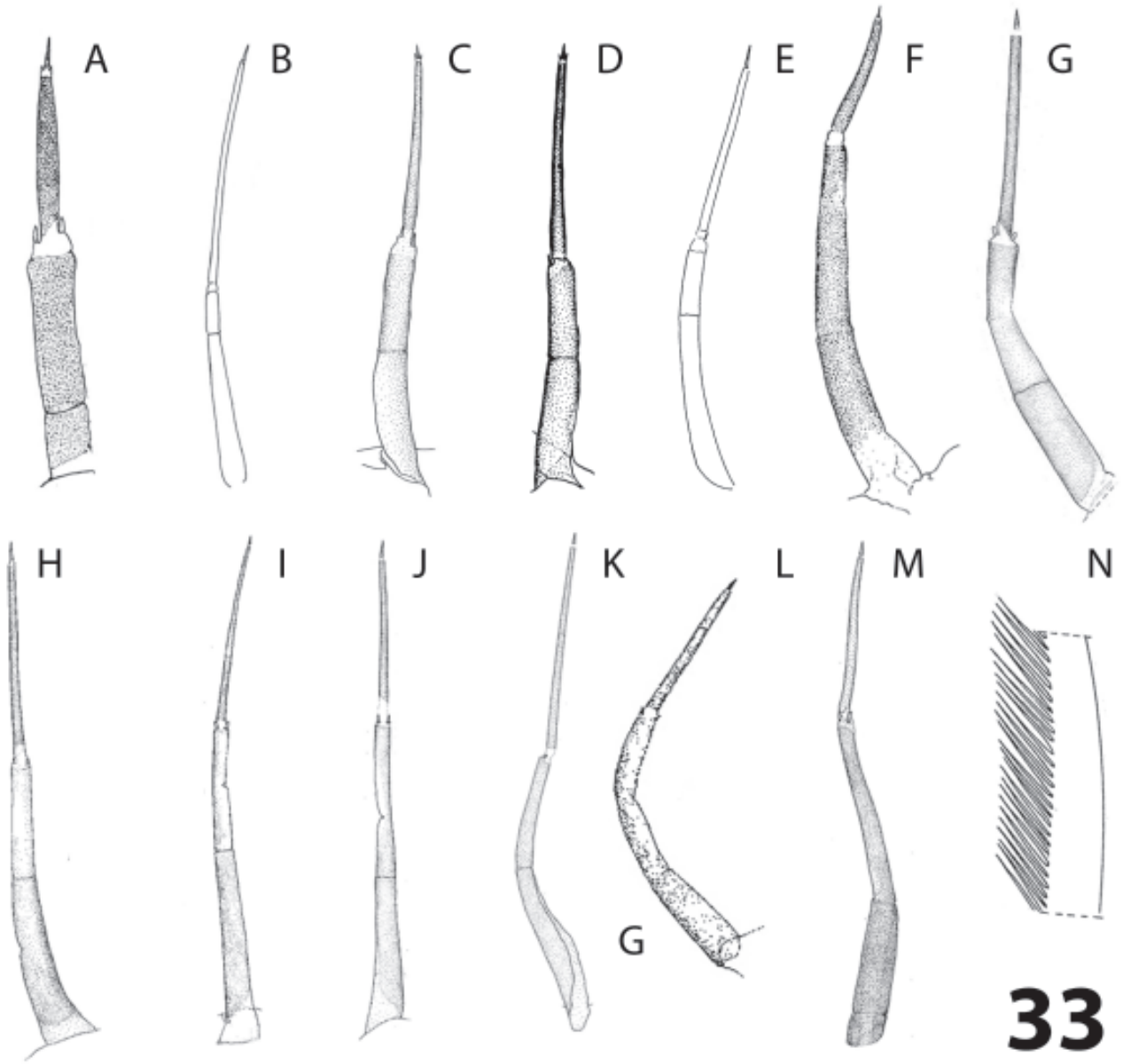

Figure 33. Larval antennae. A. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. B. *Gigantodax minor* Wygodzinsky & Coscarón, 1989. C. *Gigantodax rufidulus* Wygodzinsky & Coscarón, 1989. D. *Gigantodax antarcticus* (Bigot, 1888). E. *Gigantodax pennipunctus* Enderlein, 1933. F. *Simulium* (*Pternaspatha*) *limay* Wygodzinsky, 1958. G. *Simulium* (*Chirostilbia*) *subpallidum* Lutz, 1910. H. *Simulium* (*Inaequalium*) *rappae* Py-Daniel & Coscarón, 1982. I. *Simulium* (*Psaroniocompsa*) *auristriatrum* Lutz, 1910. J. *Simulium* (*Cerqueirellum*) *cuneatum* (Enderlein, 1936). K. *Simulium* (*Psilopelmia*) *quadrifidum* Lutz, 1917. L. *Simulium* (*Ectemnaspis*) *perflavum* (Roubaud, 1906). M. *Simulium* (*Aspathia*) *metallicum* Bellardi, 1859. N. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971, comb of cephalic fan.

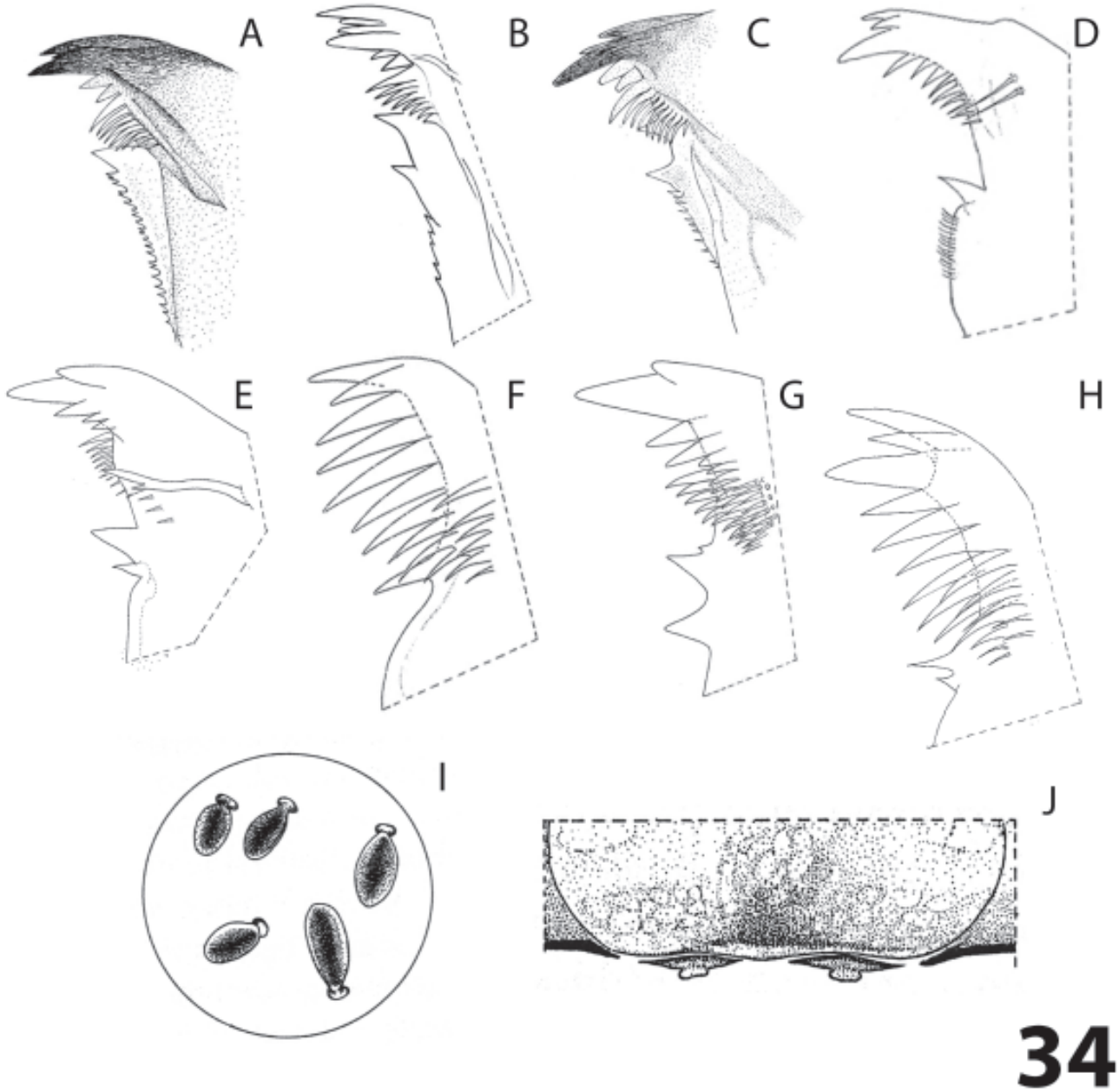

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Figure 34. A-H. Larval mandibles. A. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. B. *Gigantodax minor* Wygodzinsky & Coscarón, 1989. C. *Gigantodax brophyi* (Edwards, 1931). D. *Simulium* (*Cerqueirellum*) *oyapockense* Floch & Abonnenc, 1946. E. *Simulium* (*Coscaroniellum*) *cerradense* Coscarón, Cerqueira, Sato & La Salvia, 1992. F. *Simulium* (*Hemicnetha*) *seriatum* Knab, 1914. G. *Simulium* (*Hemicnetha*) *oviedoi* Ramírez Pérez, 1971. H. *Simulium* (*Trichodagmia*) *nigrimanum* Macquart, 1838. I. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910, trichomes of body, integument. J. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909, posterodosal view of head and cervical sclerites.

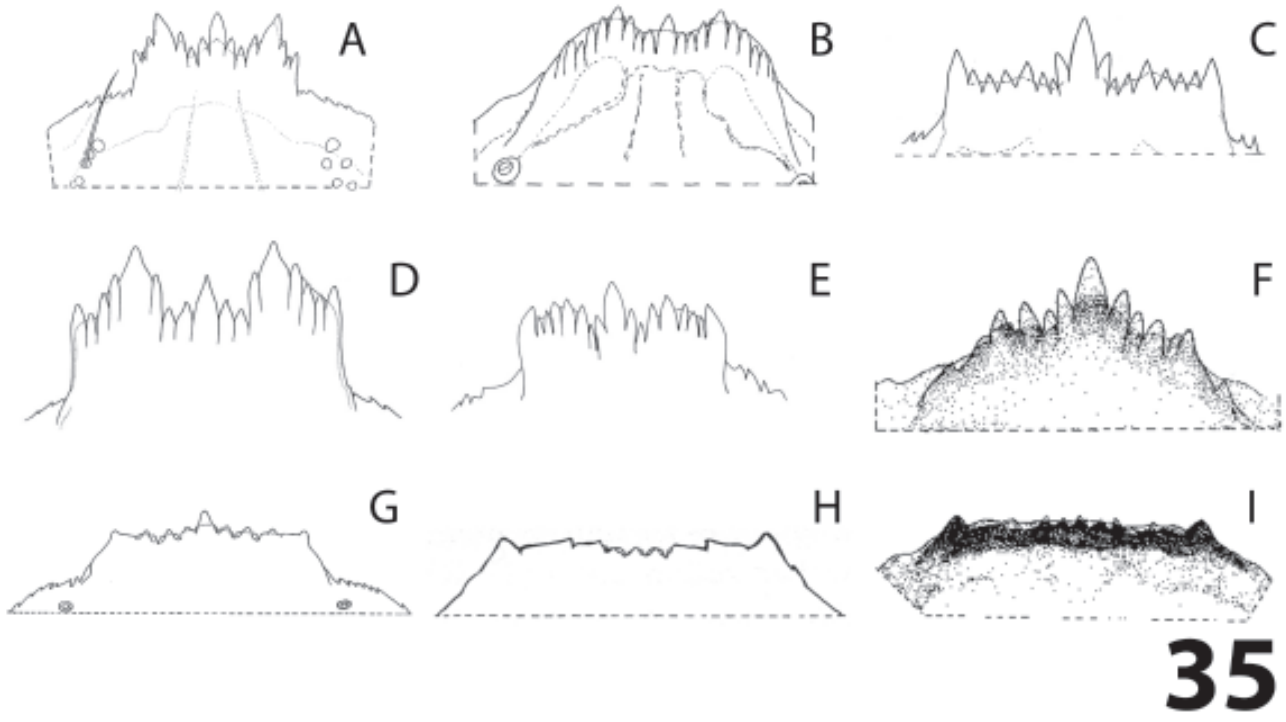

Figure 35. Larval hypostomial teeth. A. *Araucnephia montana* (Philippi, 1865). B. *Cnesia ornata* Wygodzinsky & Coscarón, 1973. C. *Pedrowygomyia cortesi* Wygodzinsky & Coscarón, 1989. D. *Gigantodax minor* Wygodzinsky & Coscarón, 1989. E. *Gigantodax igniculus* Coscarón & Wygodzinsky, 1962. F. *Simulium* (*Hearlea*) *paracarolinae* Coscarón, Miranda Esquivel, Moulton, Coscarón Arias & Ibáñez Bernal, 2004. G. *Simulium* (*Trichodagmia*) *lahillei* (Paterson & Shannon, 1927). H. *Simulium* (*Thyrsopelma*) *orbitale* Lutz, 1910. I. *Simulium* (*Thyrsopelma*) *scutistriatum* Lutz, 1909.

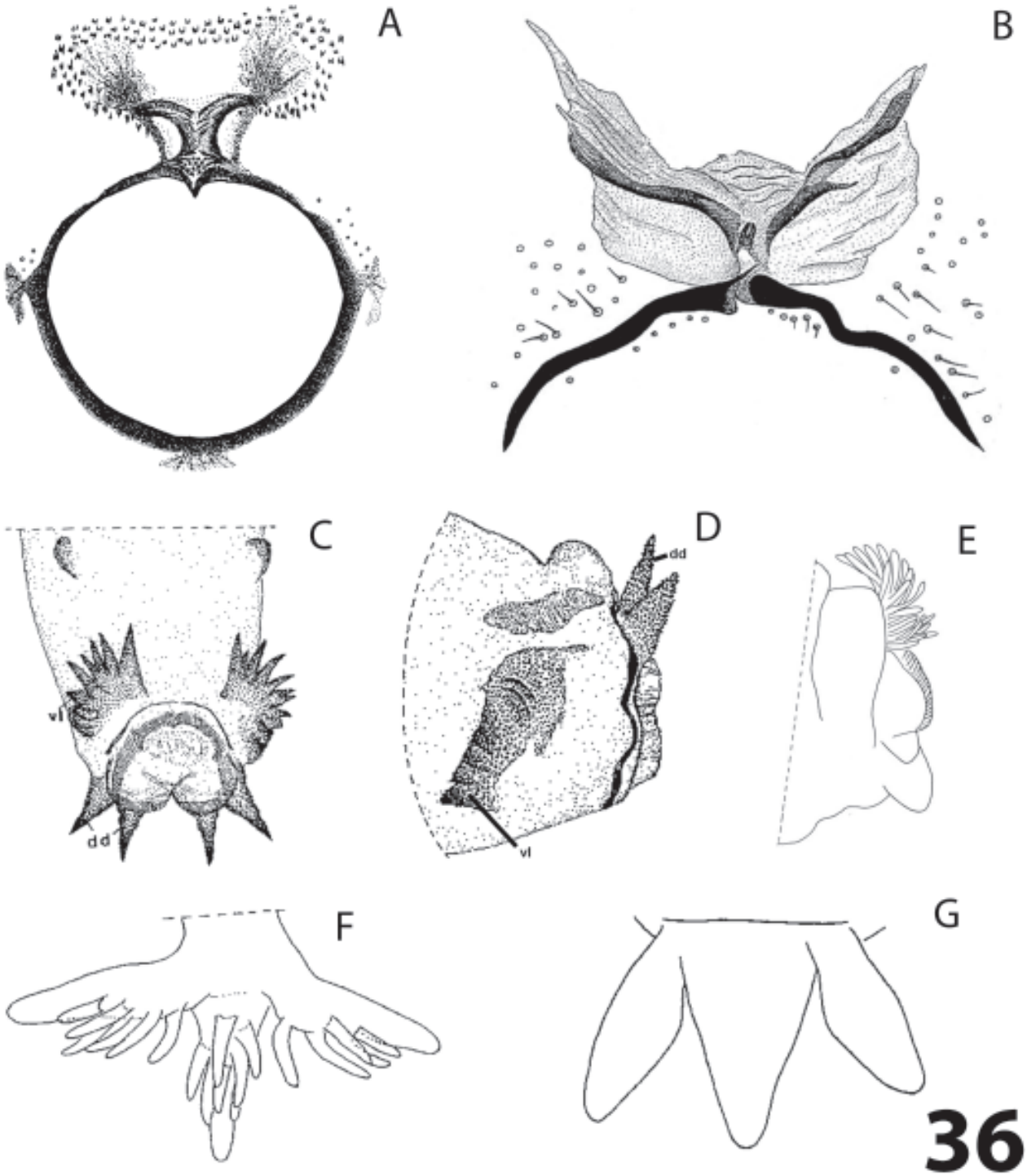

Figure 36. A-B. Larval anal sclerite. A. *Gigantodax cilicinus* Wygodzinsky & Coscarón, 1989. B. *Simulium* (*Chirostilbia*) *serranum* Coscarón, 1981. C-D. Distal portion of larval abdomen, showing anal sclerite and accessory plates (dd: dorsolateral conical accessory plate; vl: ventrolateral accessory plate). C. *Simulium* (*Hearlea*) *gorirossiae* Vargas & Díaz Nájera, 1957. D. *Simulium* (*Hearlea*) *temascalense* Díaz Nájera & Vulcano, 1962. E-G. Larval rectal papillae. E. *Gigantodax multifilis* Wygodzinsky & Coscarón, 1989 (terminal portion of abdomen, lateral view, showing rectal papillae with abundant diverticles and anal ring of crochets). F. *Simulium* (*Pternaspatha*) *diamantinum* Coscarón & Coscarón Arias, 1996 (with several diverticles on rectal lobes). G. *Simulium* (*Psilopelmia*) *blancasi* Wygodzinsky & Coscarón, 1970 (rectal papillae with single lobes).