ZOOTAXA

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Abstract

Twenty-one species of *Atrichopogon* are described from Costa Rica, based primarily on distinctive males. Of these, females are also described for six species. A key to the males of these species allows for their identification within at least the New World. Three of the species are previously named and described: *A. lacajae* Macfie, *A. didymothecae* Macfie, and *A. longicornis* Ewen. The following are new species: *A. bicuspis, A. colossus, A. spinosus, A. carnatus, A. lobatus, A. magnus, A. granditibialis, A. barbatus, A. yolancae, A. gamboai, A. granditergitus, A. tirzae, A. asuturus, A. quartibrunneus, A. beccus, A. redactus, A. setosilateralis*, and *A. tapantiensis.* A lectotype is designated for *A. didymothecae*.

Resumen

Sobre la base de machos característicos, se describen 21 especies de *Atrichopogon* de Costa Rica, describiéndose también hembras de 6 de ellas. La clave para machos de estas especies permite, al menos, su identificación dentro del Nuevo Mundo. Tres especies fueron previamente nominadas y descritas: *A. lacajae* Macfie, *A. didymothecae* Macfie, and *A. longicornis* Ewen. Las siguientes son especies nuevas: *A. bicuspis, A. colossus, A. spinosus, A. carnatus, A. lobatus, A. magnus, A. granditibialis, A. barbatus, A. yolancae, A. gamboai, A. granditergitus, A. tirzae, A. asuturus, A. quartibrunneus, A. beccus, A. redactus, A. setosilateralis,* and *A. tapantiensis.* Se designa el lectotipo para *A. didymothecae*.

Key words: Diptera, Ceratopogonidae, *Atrichopogon*, new species, Costa Rica

Introduction

Nearly all taxonomists who work on large groups have their pet example of one or more large genera which clearly include many members but which display a depressingly low level of morphological divergence between species. Examination of a given sample reveals several or more morphotypes which differ in small but consistent ways, strongly suggesting the presence of several species; yet compiling all the material from many localities results in an increasing confusion of diagnostic features. A prime example within the Ceratopogonidae is the genus *Atrichopogon* Kieffer. Although 455 species have been described worldwide, most of these cannot be confidently identified. In addition, seven subgenera are currently recognized but appear to apply only on a local level or are recognized as a small group of distinctive species (with the likelihood that a paraphyletic group remains). Not too much has changed since Edwards (1926:399), in his analysis of the British ceratopogonid fauna, pointed out, "The species of *Atrichopogon* are mostly very similar in appearance and difficult to distinguish satisfactorily".

Work by Ewen and Saunders (1958) strongly suggests that there is greater morphological divergence in the larval and pupal stages and therefore that adults need to be reared with associated stages before a good understanding of species characteristics and their

relationships to each other is possible. The larvae and pupae have been described for only 38 species of *Atrichopogon* and there is, therefore, a great need to rear and study the immatures of further species.

Over the past few years we have been examining adult (mostly male) *Atrichopogon* from Costa Rica. It is clear that a large number of species are present in the country but many of these are "typical" *Atrichopogon* and rather similar to one another. However, there are some species with striking features and in this paper we describe these unusual taxa. The remaining species are the subject of continuing study. We will do our best.

Materials and Methods

Specimens were examined, studied, and drawn using a Wild M3 dissecting microscope and a Zeiss Jenaval compound microscope. Measurements were made with an Olympus BX50 compound microscope.

All specimens were mounted on microscope slides, using the technique described by Borkent and Bissett (1990). Terms for structures generally follow those used in the Manual of Nearctic Diptera (McAlpine, et al. 1981). Terms for wing veins follow the system of the Manual of Nearctic Diptera, with modifications proposed by Szadziewski (1996) (summarized by Spinelli and Borkent, 2004) (Fig. 13I). The aedeagus and parameres of most species of *Atrichopogon* are difficult to distinguish and in many taxa appear to form a partially fused complex. We were unable to confidently distinguish these in most of the species described here and in such instances refer to these structures as one unit, called the aedeagal-parameral complex.

Mouthpart length was taken from a horizontal line along the ventral margin of the ommatidia to the apex of the labrum, and gonocoxite width was taken at midlength. Wing and costa length were measured from the arculus. Drawings of the genitalia do not include all setae; only those that are distinctive and the bases of all setae on sternite 9 are shown. Microtrichia on segment 10 of the male abdomen were not drawn, unless distinctive or did not interfere with the interpretation of other features. Gonostyli were drawn in their extended positions, although most were originally in a folded position. Photomicrographs were taken with CoolPix 995 through a Zeiss Jenaval compound microscope.

Material housed at INBC has labels including Lambert numbers and lot numbers (number of a given sample). The first author has a numbering system for samples that is identified with the letters "CD" and these refer to collecting field notes stored in loose-leaf binders, eventually to be archived at the CNCI.

Adults were collected by sweeping with an aerial net, with light and Malaise traps and, for two specimens, with cantharidin bait. Specimens are deposited in the following collections:

BMNH — Department of Entomology, Natural History Museum, London, SW7 5BD, United Kingdom.

CNCI — Canadian National Collection of Insects, Ottawa, Ontario, Canada.
DEIC — Deutsches Entomologisches Institut, Leibniz-Zentrum für Agrarlandschaftsund, Landnutzungsforschung (ZALF) e.V., Eberswalder Straße 84, 15374 Müncheberg, Germany.
INBC — Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica.
USNM — Smithsonian Institution, Museum of Natural History, Washington, D.C., U.S.A.

Acknowledgments

The first author extends his gratitude to his wife Annette Borkent for her generous and continuous support, in the field and throughout the preparation of this article — all priceless gifts! Eight of the species described here were collected by the first author during a delightful family expedition to Costa Rica in 1993/94. The latter trip was partially supported by the first author's brother and sister-in-law Herman and Pieta Borkent, whom we also thank.

We are indebted to Jeffery M. Cumming (CNCI) and Frank Menzel (DEIC) for the loan of type material. We acknowledge the support of the Global Environment Facility of the World Bank through the "Biodiversity Resources Development Project" developed by the National Institute of Biodiversity (INBio), the National System of Conservation Areas (SINAC), Ministry of the Environment and Energy (MINAE) in Costa Rica. Cristian Granados Vindas (INBio) produced the distribution maps for this paper and we thank him for his patient help. We express our appreciation to William L. Grogan and Gustavo R. Spinelli for critical reviews of this paper.

Results

The following key works best with specimens in alcohol or those that are slide-mounted.

Key to Male Atrichopogon from Costa Rica

1. Wing pigmented, with two distinct, darker patches, one over r-m and the other in cell r_3 posterior to apex of R_3 (Fig. 13E) ..... *bicuspis* (pg. 9)
- Wing without any distinct patches of pigmentation (e.g. Fig. 13F); some with gradients of pigmentation but these not discrete (Fig. 14I, J, L) 2
2. Tergite 9 very elongate with long, setose apicolateral processes (Fig. 17B) .... *colossus* (pg. 10)
- Tergite 9 short or only moderately long (Fig. 20C) with, at most, very small apical lobes (Fig. 20A) 3
3. Segment 9 and gonocoxites fused (Fig. 17C); sternite 9 with a patch of strong spines; midtibia with thick apical spine (Fig. 16J) ..... *spinosus* (pg. 12)

- Gonocoxites articulated, with segment 9 and gonocoxites not fused; sternite 9 without a patch of strong spines, although some have thicker setae (not as thick as spines), either scattered or arranged in a wide row; midtibia without a thick apical spine 4

4. Gonocoxite with well-developed, rounded mediobasal lobe; gonostylus apex broadly rounded, with thick basal lobe (Fig. 17D)..... *carnatus* (pg. 13)
- Gonocoxite without well-developed, rounded mediobasal lobe, although some with a slender, posteriorly directed prong; gonostylus apex pointed, slightly rounded at tapered apex, apically bifurcate (Fig. 20D, 21A, C) or with a subbasal tooth (Fig. 18B), without a basal lobe, or if a lobe is present then lobe is slender (Fig. 18A) 5

5. Gonostylus with subbasal, medial, thumb-like lobe (Fig. 18A)..... *lobatus* (pg. 14)
- Gonostylus without subbasal lobe (e.g. Fig. 18B–D) 6

6. Genitalia large, with segment 9 significantly wider than segment 8 (Fig. 15F, G)..... 7
- Genitalia small to medium, with segment 9 not wider than segment 8 (Fig. 15H–L, 16A–I) 8

7. Gonostylus tapering from base but with well-developed subapical tooth; setae scattered along entire length; cercus small, lobe-like (Fig. 18B)..... *magnus* (pg. 16)
- Gonostylus with apical half flattened and apical 1/4 abruptly tapering; setae restricted to basal ½; cercus long, tapering (Fig. 18C) ..... *lacajae* (pg. 17)

8. Hindtibia very swollen for apical half (Fig. 16K)..... *granditibialis* (pg. 20)
- Hindleg tibia expanded only at very apex 9

9. Genitalia highly modified, with gonostylus reduced to small knob and sternite 9 with 3 posterior extensions: two lateral prongs, each bearing a strong apical bristle and a medial lobe (Fig. 19A–D); hindtibial spur large, dark (Fig. 16L) .... *didymothecae* (pg. 21)
- Genitalia not highly modified, with gonostylus well-developed and sternite 9 without lobes (at most, projecting posteromedially as a single lobe (Fig. 19F); hindtibial spur slender and more lightly pigmented or well-developed and large 12

12. Tergite 9 elongate, extending well beyond apex of gonocoxite (Fig. 19F, 20A–C).... 13
- Tergite 9 not extending to (e.g. Fig. 20D) or extending just slightly beyond apex of gonocoxite (Fig. 21A) 16

13. Sternite 9 with posteromedial projection bearing tuft of well-developed setae (Fig. 19F) ..... *barbatus* (pg. 23)
- Sternite 9 not modified (Fig. 20A–C) 14

14. Tergite 9 posteriorly somewhat bilobed (Fig. 20A) ..... *yolancae* (pg. 24)
- Tergite 9 posteriorly broadly rounded (Fig. 20B–C)..... 15

15. Flagellum with well-developed plume; flagellomere 10 elongate, with elongate plume setae (Fig. 3G, 6B); wing length large (1.71–1.73 mm); legs dark brown, equal in pigmentation to thorax ..... *gamboai* (pg. 26)
- Flagellum with weakly-developed plume; flagellomere 10 short, without elongate plume setae (Fig. 3H, 6C); wing length short (0.87–0.92 mm); legs light brown, lighter

than medium to dark brown thorax ..... *granditergitus* (pg. 27)

16. Apex of gonostylus broadly bifid or markedly swollen for basal half (Fig. 20D, 21A–C) 17
- Apex of gonostylus not bifid, at most with one or two subapical small teeth (Fig. 21D, 22A–B) 20
17. Lateral scutal suture absent; all scutal setae in dark pits (Fig. 12D–E); tergites 1–8 each with pigmentation but with tergites 1–4 darker than 5–8 (Fig. 16C–D); antenna female-like (with terminal 5 flagellomeres elongate) (Fig. 6D–E) 18
- Lateral scutal suture present (e.g. Fig. 10A); setae in dark pits or arising directly from uniformly pigmented cuticle; only some abdominal tergites with pigmentation and with tergite 1–3 lacking or with reduced pigmentation (Fig. 16E–F); antenna normally developed (with only terminal 3 flagellomeres elongate) (Fig. 6F–G) 19
18. Aedeagal-parameral complex tapering posteriorly to two rounded lobes (Fig. 20D)..... ..... *tirzae* (pg. 28)
- Aedeagal-parameral complex with long ventral, posteromedially projecting rod (Fig. 21A) ..... *asuturus* (pg. 29)
19. Antenna without plume (Fig. 4C); abdomen mostly pale, with only tergite 4 with brown transverse band and genitalia light brown (Fig. 16E) ... *quartibrunneus* (pg. 30)
- Antenna with well-developed plume (Fig. 4D); abdominal tergites 1–6 pigmented but each with medial area pale, tergites 7–8 pale, genitalia light brown (Fig. 16F) .... *beccus* (pg. 31)
20. Antenna with 8 apparent flagellomeres (5–10 fused into single unit) (Fig. 4E, 6H); aedeagus with medial, slender, prong (Fig. 21D)..... *redactus* (pg. 32)
- Antenna with 13 flagellomeres (Fig. 6I–J); aedeagus broad, without prong (Fig. 22A–B) 21
21. Wing small to long (0.72–1.96 mm); third palpal segment of short or moderate length, not narrow (as in Fig. 7A–J, 8A–I) 22
- Wing long (1.19–1.63 mm); third palpal segment long and narrow (Fig. 8J–K)..... 23
22. Ventral portion of aedeagal-parameral complex broadly triangular, pointed posteromedially, with posteroventral striations; posterolateral margins of aedeagal-parameral complex evenly curved laterally, bent posteriorly near apex and terminating in long slender point ..... *longicornis* (pg. 18)
- Aedeagal-parameral variably shaped but not as above ..... other *Atrichopogon*
23. Flagellomere 10 short, with short setae (Fig. 4F–G, 6I–J) 24
- Flagellomere 10 elongate, with long setae ..... other *Atrichopogon*
24. Flagellomeres 2–9 transversely expanded (Fig. 6I); flagellomere 11–13/ 1–10 = 1.84–2.05; paratergite with one large and 3–5 additional smaller setae .... *setosilateralis* (pg. 33)
- Flagellomeres 2–9 spherical to oval (Fig. 6J); flagellomere 11–13/ 1–10 = 0.94–1.14; paratergite with only one large seta..... *tapantiensis* (pg. 34)

TAXONOMY

Atrichopogon bicuspis Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with the apex of tergite 9 bifid. *Female adult*: not diagnosable.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4–6 ommatidia (Fig. 1A). Antenna light brown; with plume moderately well-developed (Fig. 2D); with 13 flagellomeres, proportions as shown in Fig. 5A; flagellomeres 2–10 fused; flagellomere 9 with plume setae; flagellomere 10 without plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7A) light brown; third segment short, swollen at midlength, with well-developed pit somewhat apical of midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 10A): dark brown, lighter ventrally. Scutum with setae arising from very shallow pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 13E): With patch of pigmentation in area of r-m and posterior to apex of R3; with or without macrotrichiae on membrane in apical portion of r_3. **Halter**: pale. **Legs**: Light brown (including coxae). Hindtibia expanded at apex. Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15A): Medium to dark brown. **Genitalia** (Fig. 17A): Large but segment 9 equal in width or slightly wider than segment 8; tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin bifid. Sternite 9 with posterior margin bilobed, with scattered setae restricted to lobes. Gonocoxite without medial lobe. Gonostylus tapering from base, apical 1/3 curved, apex rounded. Parameres each somewhat sinuous, fused medially with posterior portion blunt. Aedeagus broad, with lateral arms directed more or less laterally, with elongate posteromedial projection with apex somewhat T-shaped. Cercus elongate, positioned anterior to posterior margin of tergite 9.

Female adult. Descriptive statistics: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres as in Fig. 9A. Mandible with about 21 teeth. Maxillary palpus as in Fig. 9G. **Abdomen**: nearly uniformly medium to dark brown, with segment 10, cercus light brown. **Genitalia** (Fig. 22C): Sternite 7 broadly rectangular, with circular, medial patch of light cuticle, surrounded by band of darker cuticle. Sternite 8 without elongate cuticular extensions; with somewhat rectangular, posteriorly bilobed projection. Sternite 9 with broad band medially, anteriorly with ventral expansion; with posterior lobe (possibly a ventral lobe of sternite 10). Spermatheca ovoid, with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon bicuspis* is known only from Arenal National Park, Carara National Park, the Osa Peninsula and Hitoy Cerere Biological Reserve (Fig. 24A), at elevations of 70–745 m. Specimens were collected using light and Malaise traps.

TAXONOMIC DISCUSSION: Males and females were associated by their similar pigmentation pattern, and one male and the two females were collected at the same locality and date.

Five species of Neotropical *Atrichopogon* have distinctively pigmented wings (including *A. bicuspis*). *Atrichopogon pictipennis* Clastrier, known only from a male from French Guiana, has male genitalia somewhat similar to that of *A. bicuspis* in overall shape but differs in numerous details: *A. pictipennis* has tergite 9 with a simple apex, an unmodified sternite 9, the aedeagus is broad and rounded apically and its gonostylus has a basal prong (Clastrier, 1979). The male and female of *A. maculipennis* Clastrier, also known only from French Guiana, have much more broadly pigmented wings (Clastrier, 1968). *Atrichopogon nebulosus* Macfie from the state of Santa Catarina in Brazil (Macfie, 1939), known only from a single female, has a similar wing pattern as *A. bicuspis* but flagellomeres 9–13 are more darkly pigmented than flagellomeres 1–8. The last species, *A. nubeculosus* Macfie, also known only from a single female, from the state of Chiapas, Mexico, is similar to *A. bicuspis* but the spermatheca is "feebly chitinized" (Macfie, 1949). There are probably further differences between the two Macfie species and *A. bicuspis* but the types of the former were not examined.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE *Atrichopogon bicuspis* Borkent and Picado, CR, Limon, Est. Biol. Hitoy Cerere, Send. Toma de Agua, 100 m, 17-IV–8-V-1999. F. Umana, Malaise Trap, LN184600/643400, # 52757, CD5090" (INBC); allotype, female adult on microscope slide, labeled as for holotype (INBC); paratypes: 1 ♀, from type-locality (CNCI); 1 ♀, Sendero Pilón, Arenal National Park, San Carlos, Alajuela, Costa Rica, 600 m, 18-V–26-VI-1999 (INBC); 2 ♂, Sendero Universal, Carara National Park, Puntarenas, Costa Rica, 0–100 m, 19–22-VII-2004 (INBC); 1 ♂, Hitoy Cerere Biological Reserve, Limon, Costa Rica, 100 m, 18–22-IV-1999 (INBC); 1 ♂, Sendero Toma de Agua, Hitoy Cerere Biological Reserve, Limon, Costa Rica, 100–140 m, 17-XI–17-XII-1999 (CNCI); 1 ♂, Sendero Espavel, Hitoy Cerere Biological Reserve, Limon, Costa Rica, 240 m, 17-I–17-II-2000 (INBC); 1 ♂, Estacion Los Planes, Sierpe, Corcovado National Park, Puntarenas, Costa Rica, 180 m, 23–24-VII-2002 (INBC); 1 ♂, Estacion Agujas, Cerro Rincon, Corcovado National Park, Puntarenas, Costa Rica, 745 m, 15-V–15-VI-1999 (INBC); 1 ♂, as for previous locality but 300 m, 10-XII-2000–10-I-2001 (CNCI); 1 ♂, Estacion Los Patos, Corcovado National Park, Puntarenas, Costa Rica, 70 m, 25-XII-2000–13-II-2001 (CNCI).

DERIVATION OF SPECIFIC EPITHET: The name *bicuspis* refers to the two points at the apex of tergite 9 of the male genitalia.

Atrichopogon colossus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a very elongate tergite 9, bearing two long, setose apical lobes. *Female adult*: only

described extant species of *Atrichopogon* in the New World with anterior portion of sternite 8 bilobed (see taxonomic discussion below).

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; nearly abutting medially for length of 2–3 ommatidia (Fig. 1B). Antenna dark brown with flagellomeres 11–13 somewhat light; with plume well-developed (Fig. 2E); with 13 flagellomeres, proportions as shown in Fig. 5B; flagellomeres 2–7 at least partially fused; flagellomeres 9, 10 with plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7B) dark brown; third segment moderately elongate, swollen for basal 3/4, with well-developed pit near midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 10B): Dark brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 13F): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cell r_3. **Halter**: Pale. **Legs**: Nearly uniformly medium brown, with basal portion of femora, coxae lighter. Hindtibia expanded only at apex. Hindtibial spur slightly longer than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15B): Dark brown. **Genitalia** (Fig. 17B): Large but segment 9 equal in width to segment 8; tergite 9 elongate, with elongate, setose apicolateral process extending to about level of apex of gonocoxite; with lateral, anteromedially directed prongs. Sternite 9 with posterior margin broadly concave, with single row of setae. Gonocoxite without medial lobe. Gonostylus tapering on basal half, gently curved, apex rounded, with small subapical flange. Aedeagal-parameral complex with lateral arms directed anterolaterally; with dorsal portion forming medially fused prong; ventral portion broadly-developed, posterior margin broadly blunt; dorsal to posterior margin of ventral portion, another posterior, broadly blunt structure. Cercus elongate, thick. Segment 10 with short medial lobe.

Female adult. Descriptive statistics: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres 1–8 dark brown, 9–13 lighter brown; with flagellomeres as in Fig. 9B. Mandible poorly developed, without teeth. Maxillary palpus as in Fig. 9H. **Abdomen**: dark brown except for pale or lightly marked sternites 1–2. **Genitalia** (Fig.22D): Sternite 7 broad, much wider than anterior sternites. Sternite 8 without elongate cuticular extensions; anterior margin bilobed; posterior margin bilobed. Sternite 9 lightly sclerotized, forming anteriorly pointed to truncate shape. Spermatheca ovoid to spherical, with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon colossus* is known from the Cordilleras de Guanacaste, Tilaran and Talamanca (Fig. 24A) at elevations of 790–1800 m. Specimens were collected by sweeping and using light and Malaise traps.

TAXONOMIC DISCUSSION: Males and females were associated by their similar pigmentation pattern and were collected at the same locality and date at 2 km E. St. Elena, 2 km SW del Cerro Cacao and Estacion Cabro Muco. It appears likely that the females of

some other, undescribed species of Costa Rican *Atrichopogon* also have an anteriorly bilobed sternite 8 but it is uncertain how they differ from those of *A. colossus.* Some pigmentation patterns differ but too little material was available to be confident of species differences. In some alcohol preserved specimens the aedeagal-parameral complex was flipped anteroventrally, so that the basal arch of the aedeagus fit snugly against the concave posterior margin of sternite 9. It seems likely that this is the natural position of the aedeagal-parameral complex during copulation.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon colossus Borkent and Picado, Costa Rica, Prov. Puntarenas, 2 km E Sta. Elena, 1540 m, 26 AGO 1993, Borkent A. LN 257050 447000, #74985 CD1556" (CNCI); allotype, female adult on microscope slide, labeled as for holotype (CNCI); paratypes: 3 ♂ labeled as for holotype (2, CNCI; 1 INBC); 1 ♂ labeled as for holotype but CD1559 (CNCI); 1 ♂ labeled as for holotype but CD1560 (CNCI); 2 ♂, Monteverde, Costa Rica, 1450 m, 15-VIII-1987, H. Howden (CNCI); 2 ♂, Estacion Cacao, Guanacaste National Park, Liberia, Guanacaste, Costa Rica, 1000–1150 m, VII-1996 (INBC); 4 ♂, as for previous locality but 1000–1400 m, VII-1996 (INBC); 3 ♂, as for previous locality but 1050–1150 m, 7–20-II-1996 (INBC); 5 ♂, as for previous locality but VII-1996 (INBC); 3 ♀, as for previous locality but 1000–1400 m, VII-1996 (INBC); 2 ♂, as for previous locality but 1000–1100m, 1–31-VIII-1996 (INBC); 2 ♂, as for previous locality but 1000–1150 m, VIII-1996 (INBC); 6 ♂, 25 km NE Liberia, Sector Santa Maria, Guanacaste, Costa Rica, 790 m, 15-I–15-II-1997 (INBC); 9 ♂, 5 ♀, Estacion Cabro Muco, Macizo Miravalles, Guanacaste, Costa Rica, 1100 m, 18–24-III-2003 (INBC); 1 ♂, 1♀, as for previous locality but 28-VI–6-VIII-2003 (INBC); 3 ♂, 1 ♀, as for previous locality but 18-III-2003 (INBC); 5 ♂, 5 ♀, as for previous locality but 29-IX-2003 (INBC); 3 ♂, as for previous locality but 22-IX–5-X-2003 (INBC); 1 ♂, as for previous locality but 26-IX-2003 (INBC); 3 ♀, as for previous locality but 5-VIII-2003 (INBC); 1 ♂, 2 ♀, as for previous locality but 24-IX–4-X-2003 (INBC); 3 ♂, 3 ♀, as for previous locality but 30-IX–5-X-2003 (INBC); 1 ♂, Sect. La Rep. Torre I.C.E.. entre Rios Porras y Villegas, Tapanti National Park, Paraiso, Cartago, Costa Rica, 1800 m, XI-1996 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *colossus* (immense) refers to the huge male genitalia of this species.

Atrichopogon spinosus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* with segment 9 and the gonocoxites fused together. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; nearly abutting medially for length of 2–3 ommatidia (Fig. 1C). Antenna medium brown; with plume well-developed (Fig. 2F); with 13 flagellomeres, proportions as shown in Fig. 5C; flagellomeres 2–8 at least partially fused;

flagellomeres 9, 10 without plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7C) medium brown; third segment moderately elongate, somewhat swollen for basal 3/4, with shallow pit about 3/4 from base; segments 4, 5 separate. **Thorax** (Fig. 10C): dark brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, slightly bilobed posteriorly. **Wing** (Fig. 12G): Plain, without pattern of pigmented membrane; with a few macrotrichiae near the very apical portion of cell r_3. **Halter**: Pale. **Legs**: Nearly uniformly medium brown, with basal portion of femora, coxae lighter. Midtibia with well-developed apical spine (Fig. 16J). Hindtibia expanded only at apex. Hindtibial spur length longer than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15C): Dark brown. **Genitalia** (Fig. 17C): Large but segment 9 equal in width to segment 8; segment 9 fused with gonocoxites, tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin somewhat truncate. Sternite 9 with posterior margin straight somewhat concave, with medial group of thick spines. Gonocoxite without medial lobe, with ventral group of thick spines. Gonostylus small, tapering from base, gently curved, with subapical tooth, apex sharply pointed. Aedeagal-parameral complex with lateral arms directed anterolaterally; with dorsal portion somewhat convoluted basally, slender for most of length, fused apically; dorsal portion well-developed, posteriorly with ventrally directed, somewhat triangular apex; laterally with numerous cuticular projections. Cercus short, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon spinosus* is known only from two localities in eastern Costa Rica (Fig. 24B), at elevations of 40–200 m (possibly up to 300). Specimens were collected by sweeping and with a light trap. The holotype was collected with a light trap placed near the south end of the foot bridge crossing the Puerto Viejo River.

TAXONOMIC DISCUSSION: Aside from the extremely modified male genitalia, males of *A. spinosus* appear to be the only members of the genus with an elongate midtibial spine.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon spinosus Borkent and Picado, La Selva Biological Station, Costa Rica, 40 m, 1–2-III-2004, A. Borkent, CD5408" (CNCI); 1 ♂ paratype, Sendero principal antes de Rio Dantas, Barbilla National Park, Cartago, Costa Rica, 200–300 m, 16-IX-2000 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *spinosus* (spine) refers to the distinctive midtibial spine.

Atrichopogon carnatus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a large bulbous gonostylus bearing a basal lobe. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 3–4 ommatidia (Fig. 1D). Antenna light brown; with plume well-developed (Fig. 2G); with 13 flagellomeres, proportions as shown in Fig. 5D; flagellomeres 2–8 fused); flagellomere 9,10 without plume setae; flagellomere 13 with apical projection basally constricted. Maxillary palpus (Fig. 7D) light brown; third segment short, ovoid, with well-developed, subapical pit; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 10D): medium brown with pale, lateral stripe anteriorly and posteriorly expanded on scutum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum narrow, sharply bilobed posteriorly. **Wing** (Fig.13H): Plain, without pattern of pigmented membrane; without macrotrichiae on membrane. **Halter**: brown. **Legs**: Medium brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15D): Light brown, with segment 8, genitalia darker. **Genitalia** (Fig. 17D): Large but segment 9 equal in width to segment 8; tergite 9 short, extending to basal or to about level of apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin slightly notched, with 1–3 setae immediately lateral of notch. Gonocoxite with rounded medial lobe. Gonostylus bulbous, with basal, elongate, flat, medial lobe. Aedeagal-parameral complex well-developed, with lateral arms curved posteriorly; elongate, with posterior margin triangular, directed ventrally. Cercus slender, ventral to tergite 9.

Female adult. Unknown

DISTRIBUTION AND BIONOMICS: *Atrichopogon carnatus* is known only from two localities in the Cordillera de Guanacaste and Tilaran (Fig. 24B), at elevations of 1100–1540 m. Specimens were collected using light traps.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon carnatus Borkent and Picado, Costa Rica, Prov. Puntarenas, 2 km E Sta. Elena, 1540 m, 26 AGO 1993, Borkent A. LN 257050 447000, #74985 CD1557" (CNCI); paratypes: 9 ♂ from type-locality, (6, CNCI; 3, INBC); 3 ♂, Estacion Cabro Muco, Macizo Miravalles, Guanacaste, Costa Rica, 1100 m, 24–25-IX-2003 (INBC); 6 ♂, from previous locality but 26-IX-2003 (3 CNCI; 3, INBC); 4 ♂, from previous locality but 27–29-IX-2003 (2 CNCI; 2, INBC).

DERIVATION OF SPECIFIC EPITHET: The name *carnatus* (fleshy, fat) refers to the thick gonostyli of the males of this species.

Atrichopogon lobatus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a gonostylus pointed apically and bearing a basal lobe and with the abdomen pale but with smaller patches of pigmentation on tergites 3–6. *Female adult*: only extant species of *Atrichopogon* in the New World with the abdomen pale but with smaller patches of pigmenta-

tion on tergites 3–6 (broadest on tergite 4, as for male) and a very large, elongate, single spermatheca.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 3–4 ommatidia (Fig. 1E). Antenna with flagellomere 1 medium brown, 2–7 light brown, graduating to medium brown 9–13; with plume not developed (Fig. 2H); with 13 flagellomeres, proportions as shown in Fig. 5E; flagellomeres separate; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7E) light brown; third segment short, ovoid, with shallow, subapical pit; segments 4, 5 separate. **Thorax** (Fig. 10E): Dark brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 13I): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cells r_3, m_1. **Halter**: Pale. **Legs**: Foreleg medium brown, with very apex of forefemur light brown; midleg medium brown with basal 1/4 of midfemur light brown; hindleg (including coxa) light brown. Hindtibia expanded only at apex. Hindtibial spur length longer than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15E): Pale with medium brown patches on tergites 3–6, most extensively on tergite 4. **Genitalia** (Fig. 18A): Large, but segment 9 equal in width to segment 8; tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin nearly straight, with scattered row of setae. Gonocoxite without medial lobe. Gonostylus flattened dorsoventrally, with basal, pointed lobe; apex pointed. Aedeagal-parameral complex with dorsal portion broad, broadly bilobed posteriorly, more ventrally with pair of posterior prongs, ventrally with lateral arms directed laterally. Cercus elongate, extending beyond margin of tergite 9.

Female adult. Descriptive measurements: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres 1–8 light brown, 9–13 slightly darker; with flagellomeres as in Fig. 9C. Mandible poorly developed, without teeth. Maxillary palpus as in Fig. 9I. **Genitalia** (Fig. 2A): Sternite 7 broadly rectangular. Sternite 8 without elongate cuticular extensions; broadly rectangular. Sternite 9 slender medially. Spermatheca elongate (partially collapsed in allotype), with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon lobatus* is known from two localities in the Cordillera de Talamanca (Fig. 25A), at elevations of 1750–1850 m (possibly up to 2000 m). Specimens were collected with Malaise traps.

TAXONOMIC DISCUSSION: Males and the single female were associated by their similar pigmentation pattern and were collected at the same locality and date at Sendero Pittler.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon lobatus Borkent and Picado, CR, Prov. Puntarenas, Send. Pittier, 1 km N de la Estacion. 1800–2000 m, 4-III–4-IV-1997. M. Maraga. 331800 577400, #52198, CD5066"

(INBC); allotype, labeled as for holotype (INBC); paratypes: 1 ♂, labeled as for holotype (CNCI); 3 ♂, Sendero Jueves 13, Est. Santa Elena, San Jose, Costa Rica, 1850 m, 20-III-1997 (2, INBC; 1, CNCI); 1 ♂, Sendero a Cerro Pittier, Puntarenas, Costa Rica, 1750 m, 16-IX-1996 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *lobatus* refers to presence of a lobe on the gonostylus of the male of this species.

Atrichopogon magnus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with tergite 9 wider than segment 8, apex of tergite 9 rounded, and the gonostylus tapering to apex but with a subapical flange. *Female adult*: not diagnosable.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; narrowly abutting medially for length of 2 ommatidia (Fig. 1F). Antenna with flagellomeres 1–10 dark brown, 11–13 somewhat lighter; with plume well-developed (Fig. 2I); with 13 flagellomeres, proportions as shown in Fig. 5F; flagellomeres separate; flagellomere 9 with plume setae; flagellomere 10 without plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7F) dark brown; third segment moderately elongate, swollen for basal 2/3, with well-developed pit near midlength; segments 4, 5 separate. **Thorax** (Fig. 10F): Dark brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 13J): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cells r_3, m_1. **Halter**: Pale. **Legs**: Light brown with bases of femora lighter. Hindtibia expanded only at apex. Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15F): Dark brown. **Genitalia** (Fig. 18B): Large, segment 9 wider than segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with scattered row of setae. Gonocoxite without medial lobe. Gonostylus tapering from base, gently curved, apex pointed, with large subapical flange. Aedeagal-parameral complex broadly dorsally, with posterior lobe; ventrally with lateral arms directed anterolaterally, with posterior, ventrally directed triangular lobe. Cercus short, ventral to tergite 9.

Female adult. Descriptive statistics: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres 1–8 dark brown, 9–13 somewhat lighter; with flagellomeres as in Fig. 9D. Mandible poorly developed, without teeth. Maxillary palpus as in Fig. 9J. **Genitalia** (Fig. 23B): Sternite 7 short, wide. Sternite 8 without elongate cuticular extensions; broadly rectangular, with posteromedial bilobed extension. Sternite 9 well-developed, anteriorly truncate. Spermatheca probably spherical (collapsed in both specimens), with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon magnus* is known only from the southern Cordillera de Talamanca (Fig. 24B), at elevations of 1380–1950 m. Specimens were collected by sweeping and Malaise traps.

TAXONOMIC DISCUSSION: Males and females were associated by their similar pigmentation pattern and were collected at the same locality and date on Cerro Frantzius.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon magnus Borkent and Picado, CR, Puntarenas, Casa Coca, Send. a Cerro Frantzius, 1950 m, 21-VI-1999, A. Picado, Red de Golpe, LS335000/574500, #52789, CD5102" (INBC); allotype, female adult on microscope slide, labeled as for holotype (INBC); paratypes: 1 ♀ from type-locality (CNCI); 1 ♂, 3 km NNE de la Escuela Progreso, Las Tablas Z.P., Coto Brus, Puntarenas, Costa Rica, 1380 m, 20–27-VI-1999 (CNCI); 1 ♂, Sabanas Esparanzas, ACLA PILA, Puntarenas, Costa Rica, 1900 m, 24-IV–6-VI-1999 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *magnus* (large) refers to the big male genitalia of this species.

Atrichopogon lacajae Macfie

Atrichopogon lacajae Macfie, 1953: 100. Type-locality: La Caja, 8 km W. San Jose, Costa Rica. Holotype ♂ (DEIC).

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a gonostylus with apical 0.6 as a flat, nearly bare (only a few small setae at apex) blade. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; nearly abutting medially for length of 1–2 ommatidia (Fig. 1G). Antenna dark brown; with plume well-developed (Fig. 3A); with 13 flagellomeres, proportions as shown in Fig. 5G (flagellomere 13 distorted); flagellomeres separate; flagellomere 9 with plume setae; flagellomere 10 without plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7G) dark brown; third segment moderately elongate, swollen for basal 3/4, with well-developed pit near midlength; segments 4, 5 separate. **Thorax** (Fig. 11A): Dark brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14A): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cell r_3. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length longer than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15G): Dark brown. **Genitalia** (Fig. 18C): Large, segment 9 wider than segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior

margin broadly concave, with scattered row of setae along margin of concavity, few setae on lateral margin. Gonocoxite without medial lobe. Gonostylus with swollen, setose base, apical 0.6 a flat, nearly bare (few small setae at apex) blade, apex pointed. Aedeagal-parameral complex broad dorsally, dorsal portion triangular, with lateral arms directed anterolaterally. Cercus elongate, broad basally, tapering, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon lacajae* is known only from the Central Valley in Costa Rica (Fig. 24B), at elevations of 500–1020 m. The specimen from Atenas was collected with a sweep net near a first order stream. It is unknown how the type series was collected.

TAXONOMIC DISCUSSION: Macfie (1953) described this species on the basis of two males, one of which is in the DEIC and the other in the BMNH. In his introduction to the paper he notes that "All the types of the new species described are in the collection of the Deutsches Entomologisches Institut Berlin." We have taken this to mean that of the two specimens, the specimen in the DEIC should be considered the holotype and that in the BMNH as a paratype. The specimen from the DEIC was labeled merely as "Typus" and "Syntypus" but publication takes priority over labeling. We have added a holotype label to the specimen. We were unable to examine the paratype in the BMNH. The type specimens were collected at "La Caja, 8 km W. of San Jose" (Macfie, 1953), labeled on current maps as Finca La Caja, and is located at 9`57`42``N 84`07`41``W, with an elevation of 1020 m.

The holotype is uncleared and the genitalia rather shriveled. In spite of this, all details are similar between the two specimens examined. The illustration of the aedeagal-parameral complex of *A. lacajae* in Macfie (1953) differs significantly from that drawn here but this is because the holotype is distorted.

MATERIAL EXAMINED: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon lacajae Macfie", "Syntypus", "Atrichopogon lacajae Macfie ♂ Typus ? parasite on metatarsus of middle leg", "La Caja: 8 kil. w. San Jose, C.R. Schmidt 1930" (DEIC). 1 ♂, Atenas, Costa Rica, 500 m, 27-IX-1993 (CNCI).

DERIVATION OF SPECIFIC EPITHET: The name *lacajae* refers to the type-locality at La Caja, Costa Rica.

Atrichopogon longicornis Ewen

Atrichopogon longicornis Ewen, *in* Ewen and Saunders, 1958: 700. Type-locality: Siquirres, Costa Rica. Holotype larva (CNCI).

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with the lateral margin of the aedeagal-parameral complex evenly curved laterally, bent posteriorly and terminating in a long, thin point. *Female adult*: not diagnosable.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4 ommatidia (Fig. 1H). Antenna with flagellomeres 1–9 medium brown, 10–13 darker; with plume well-developed (Fig. 3B); with 13 flagellomeres, proportions as shown in Fig. 5H; flagellomeres 2–6 at least partially fused; flagellomere 9, 10 with plume setae; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 7H) medium brown; third segment moderately elongate, swollen at midlength, with well-developed pit about 0.7 from base; segments 4, 5 separate. **Thorax** (Fig. 11B, C): Medium brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14B): Plain, without pattern of pigmented membrane; without macrotrichiae on membrane. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15H): Light brown. **Genitalia** (Fig. 18D): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin truncate. Sternite 9 with posterior margin broadly concave, with scattered group of setae. Gonocoxite without medial lobe. Gonostylus tapering from base, apical 1/3 curved, apex pointed. Aedeagal-parameral complex dorsally broad, with lateral margins thick, narrowing posteromedially to slender point, dorsal portion broadly triangular, with lateral arms directed anterolaterally. Cercus lobe-like, barely extending beyond margin of tergite 9.

Female adult. Descriptive statistics: see Tables 7–11. As for male, with following differences. **Head**: Antenna likely medium brown (partially stained). Mandible with 17 teeth. **Abdomen**: medium brown. **Genitalia**: Sternite 7 with posterior bilobed cuticular projection, with each lobe with 3–4 slender projections. Sternite 8 not clearly visible. Sternite 9 not visible. Spermatheca ovoid, with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon longicornis* is known from Siquirres (type-locality) and Hitoy Cerere Biological Reserve (Fig. 24B), at elevations of 97–150 m. The type specimens were collected as immatures from rotting wood and two male and two female adults reared. The male from Hitoy Cerere was collected with a light trap.

TAXONOMIC DISCUSSION: We were able to examine the holotype larva and one male and one female paratype adults (all on one slide). Ewen and Saunders (1958) recorded additional male and female paratypes (one of each) but these could not be located (J.M. Cumming, pers. comm.). The adult paratype specimens were not macerated and some details were not visible (especially of the female genitalia).

The specimen from Hitoy Cerere was initially believed to be a distinctive species because it has a pair of protuberances arising from the scutum (Fig. 11 B–C). However, the male is otherwise indistinguishable from that of *A. longicornis*. We believe the specimen is a teratological individual, with the protuberances likely developing inside the elon-

gate thoracic protuberances of the pupa. Because we recognized that these specimens were conspecific toward the end of our study, we do not provide drawings or photos of the female of this species.

MATERIAL EXAMINED: Holotype, larva on microscope slide, labeled "HOLOTYPE Atrichopogon longicornis Ewen larva, CNC No. 6638", "PARATYPE Atrichopogon longicornis Ewen CNC No. 6638", "Diptera Heleidae, Atrichopogon longicornis Ewen, larva, ♀, ♂", "Siquirres, Costa Rica, 18:vi:1956, coll. L.S. Saunders" (CNCI). 1 ♂, Estacion Hitoy Cerere, Costa Rica, 150 m, 18–20-IX-2000 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *longicornis* (long, horn) likely refers to long laterodorsal processes on the larval body, noted by Ewen and Saunders (1958).

Atrichopogon granditibialis Borkent and Picado, new species

DIAGNOSIS: *Male and female adults*: only extant species of *Atrichopogon* in the New World with the apical half of the hindtibia expanded.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 3 ommatidia (Fig. 1I). Antenna dark brown; with plume weakly developed (Fig. 3C); with 13 flagellomeres, proportions as shown in Fig. 5I; flagellomeres separate; flagellomere 9, 10 with plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7I) dark brown; third segment short to moderately elongate, swollen at midlength, with well-developed, subapical pit; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 11D): Dark brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14C): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cells r_3, m_1. **Halter**: Pale. **Legs**: Light brown with bases of femora lighter; apical half of hindtibia dark brown (Fig. 16K). Hindtibia expanded for apical half (Fig. 16K). Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15I): Light brown, with tergites 2–6, genitalia dark brown. **Genitalia** (Fig. 19E): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with 1–2 laterally placed setae. Gonocoxite without medial lobe. Gonostylus tapering from base, gently curved, apex pointed. Aedeagal-parameral complex composed only of ventral portion, nearly rectangular, with low posteromedial lobe, with lateral arms directed anterolaterally. Cercus short, appressed and ventral to tergite 9.

Female adult. Descriptive measurements: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres 2–8 medium brown, 1, 9–13 darker;

with flagellomeres as in Fig. 9E. Mandible poorly developed, without teeth. Maxillary palpus as in Fig. 9K. **Thorax**: Scutum dark brown but with anterolateral corner light brown; nearly all of pleura light brown, with anterior portion of katepisternum dark brown. **Genitalia** (Fig. 23C): Sternite 7 broadly rectangular. Sternite 8 without elongate cuticular extensions; posterior margin concave. Sternite 9 truncated anteromedially. Spermatheca nearly spherical, with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon granditibialis* is known from Braulio Carrillo and Tapanti National Parks (Fig. 24B), at elevations of 500–1400 m (possibly as low as 400 m). Specimens were collected while sweeping along the edge of Rio Grande de Orosi in Tapanti National Park, and using light and Malaise traps.

TAXONOMIC DISCUSSION: Males and females were associated by their similar and distinctively large hindtibiae and were collected at the same locality and date. The thoracic pigmentation of the male and female of this species differed somewhat, with the female significantly more lightly pigmented.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon granditibialis Borkent and Picado, Costa Rica, Prov. Cartago, P.N. Tapanti, 8 km SE Orosi, 22-XII-1993, Borkent, A., LN 192600 560500, #74977, CD1718" (CNCI); allotype, female adult on microscope slide, labeled as for holotype (CNCI); paratypes: 4 ♂, from type-locality (CNCI); 7 ♂, from type-locality but 12-XI-1999 (CNCI); 1 ♂, Est. Queb Segundo, Tapanti National Park — Macizo de la Muerte, Paraiso, Cartago, Costa Rica, 1250 m, 12-VII-2000 (INBC); 2 ♂, as for previous locality but 13-VII-2000 (INBC); 2 ♂, Est. Quebrada Gonzalez, Braulio Carrillo National Park, Pocoici, Limon, Costa Rica, 400–500 m, 15-X-2002 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *granditibialis* refers to the large apex of the hindtibiae of adults of this species.

Atrichopogon didymothecae Macfie

Atrichopogon didymothecae Macfie, 1953: 99. Type-locality: La Caja, 8 km W. San Jose, Costa Rica. Lectotype ♀, here designated (DEIC).

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* with a very small gonostylus. *Female adult*: only extant species of *Atrichopogon* in the New World with an elongate, sac-like, spirally striated spermatheca and with abdominal tergites 1–5 light brown and the remainder of the abdomen pale.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 1–2 ommatidia (Fig. 1J). Antenna medium brown with plume well-developed (Fig.3D); with 13 flagellomeres, proportions as shown in Fig. 5J; flagellomeres separate; flagellomere 9, 10 without plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 7J) with segments 1–2 pale, 3–5 medium brown; third segment short,

slightly ovoid, with well-developed pit just distal to midlength; segments 4, 5 separate. **Thorax** (Fig. 11E): Light brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum somewhat narrow, broadly bilobed posteriorly. **Wing** (Fig. 14D): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cells r_3, m_1. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur thick, length longer than width of hindtibia at midlength (Fig. 16L). Empodia present. **Abdomen** (Fig. 15J): Pale, with tergites 2–5 and part of 1, medium brown. **Genitalia** (Fig. 19A–D): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin broadly bilobed. Sternite 9 with posterior margin divided into three lobes, lateral lobe bearing elongate, thick subapical spine, medial lobe elongate, expanded posteriorly; with single lateral seta. Gonocoxite without medial lobe; swollen basally, tapering to apex. Gonostylus small, hook-shaped lobe. Aedeagal-parameral complex with thick lateral margins, bilobed posteriorly. Cercus thick, lobes extending beyond margin of tergite.

Female adult. Descriptive statistics: see Tables 7–11. As for male, with following differences. **Head**: Antenna with flagellomeres as in Fig. 9F. Mandible poorly developed, without teeth. Maxillary palpus as in Fig. 9L. **Genitalia** (Fig. 23D): Sternite 7 broadly rectangular. Sternite 8 without elongate cuticular extensions; narrow, posterior margin with well-developed concavity. Sternite 9 slender. Spermatheca elongate, sac-like, with fine spiral striations, with well-developed neck.

DISTRIBUTION AND BIONOMICS: *Atrichopogon didymothecae* is broadly distributed in Costa Rica (Fig. 25A), at elevations of 0–1800 m. Specimens were collected by sweeping and Malaise and light traps. One male and one female were collected with cantharidin bait at La Selva Biological Station and 23 km E. Siquirres, respectively. This is somewhat puzzling because females of *A. didymothecae* have reduced mandibles and appear incapable of biting. However, males of other *Atrichopogon* species, also with reduced mouthparts, are known to be attracted to cantharidin bait (Frenzel et al., 1992).

The specimens collected at Atenas were swept from near a small stream with dense vegetation along its margin. Adults were common and were collected at this site from July 29 to Dec.13, 1993. The adult season may have been more extensive because there was no sampling from this site before and after these dates.

TAXONOMIC DISCUSSION: Males and females were associated by their similar pigmentation pattern and were collected at the same locality and date at Atenas. The syntype series was based on three females (Macfie, 1953), two of which are in the DECI and one in the BMNH. The two females in the DEIC are somewhat different from each other, with the lectotype having the characteristic pigmentation pattern described above and the paralectotype appearing to have uniformly, lightly pigmented tergites. However, both specimens are uncleared and somewhat collapsed, making this difference uncertain. We were unable to examine the remaining paralectotype in the BMNH.

The type specimens were collected at “La Caja, 8 km W. of San Jose” (Macfie, 1953), labeled on current maps as Finca La Caja and located at 9`57`42``N 84`07`41``W, with an elevation of 1020 m. Live males have the genitalia curved ventrally under the abdomen.

The male genitalia of *A. didymothecae* is highly modified, so that it was initially difficult to identify its different components (hence the details given in Fig. 19B–D). We have examined a similarly modified but different male from Trinidad (CNCI), representing another undescribed species.

MATERIAL EXAMINED: Lectotype here designated, female adult on microscope slide, labeled "LECTOTYPE Atrichopogon didymothecae Macfie", “Syntypus”, “Atrichopogon didymothecae Macfie ♀ Typus”, “La Caja: 8 kil. w. San Jose, C.R. Schmidt 1930” (DEIC); paralectotype: 1 ♀, labeled as for lectotype (DEIC). 1 ♂, Laguna 200 m S. of Estacion, Palo Verde National Park, Guanacaste, Costa Rica, 0 m, 13–17-VI-1999 (INBC); 2 ♂, Sector Palo Verde, Palo Verde National Park, Bagaces, Guanacaste, Costa Rica, 0–50 m, 6-X–8-XI-1999 (INBC); 1 ♂, from previous locality but 212 m, 13-X–11-XI-1999 (INBC); 1 ♂, Sendero Pilon, Arenal National Park, San Carlos, Alaguela, Costa Rica, 600 m, 26-X–22-XI-1999 (INBC); 1 ♀, Estacion El Pilon, Volcan Tenorio National Park, Alajuela, Costa Rica, 700–800 m, 28-VII-2003 (INBC); 10 ♂, 7 ♀, Atenas, Costa Rica, 500 m, 29-VII-1993 (CNCI); 2 ♂, from previous locality but 11-VIII–1993 (CNCI); 3 ♂, from previous locality but 1-IX-1993 (CNCI); 10 ♂, from previous locality but 27-IX-1993 (CNCI); 1 ♂, from previous locality but 1-IX-1993 (CNCI); 10 ♂, from previous locality but 1-X-1993 (CNCI); 2 ♂, from previous locality but 4-X-1993 (CNCI); 1 ♂, from previous locality but 24-XI-1993 (CNCI); 1 ♂, from previous locality but 3-XII-1993 (CNCI); 5 ♂, 3 ♀, from previous locality but 13-XII-1993 (CNCI); 1 ♂, Send. Tres Rios, Karen Mogensen Private Reserve, Lepanto, Puntarenas, Costa Rica, 315-450 m, 22-IX–7-X-2003 (INBC); 2 ♂, 3 ♀, Sendero Universal, Carara National Park, Puntarenas, Costa Rica, 0 -100 m, 20-VII-2004 (INBC); 1 ♂, La Selva Biological Station, Costa Rica, VIII-1983 (CNCI); 1 ♂, as for previous locality but 1-2-III-2004, (CNCI); 1 ♀, 23 km E. Siquerres, Le Lola Research Station, Costa Rica, 15-III-1983 (CNCI); 2 ♂, Send. Purruja, Estacion Agujas, Rio Agujas, Osa Peninsula, Puntarenas, Costa Rica, 300 m, 10–20-VIII-1996 (INBC); 4 ♂, Estacion Agujas, Golfito, Puntarenas, Costa Rica, 250–350 m, 4–20-VI-1999 (INBC); 1 ♂, Send. Bobocara, Hitoy Cerere Biological Reserve, Limon, Costa Rica, 140 m, 10–18-II-2000 (INBC); 1 ♂, Torre del I.C.E. entre Porras y Villegas, Tapanti National Park, A.C.L.P., Paraiso, Cartago, Costa Rica, 1800 m, VIII-1998 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *didymothecae* (double, container) likely refers to the very large spermatheca of the female of this species.

Atrichopogon barbatus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* with the posterior margin of sternite 9 with a single, sclerotized, medial lobe bearing patch of thick, elongate setae. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4 ommatidia (Fig. 1K). Antenna medium brown; with plume reduced (Fig. 3E); with 13 flagellomeres, proportions as shown in Fig. 5K; flagellomeres separate; flagellomeres 2–3 with few elongate setae, 9 with 1–2 plume setae; flagellomere 10 without plume setae; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8A) medium brown; third segment short, with shallow pit near apex; segments 4, 5 fused. **Thorax** (Fig. 11F): Dark brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum moderately developed, broadly bilobed posteriorly. **Wing** (Fig. 14E): Plain, without pattern of pigmented membrane; with few macrotrichiae in apical portion of cell r_3. **Halter**: Pale. **Legs**: Medium brown, bases of femora lighter, coxae, trochanters pale. Hindtibia expanded only at apex. Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15K): Medium brown. Sternite 2 with lateral patch of thick setae. **Genitalia** (Fig.19F): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 elongate, extending well beyond apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin rounded, with stout median lobe bearing patch of thick, elongate setae. Gonocoxite without medial lobe. Gonostylus with thick base, slender for most of length, gently curved, apex rounded. Aedeagal-parameral complex narrow, with thick posteromedial lobe, with lateral arms short, directed anterolaterally. Cercus short, lobe-like, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon barbatus* is known only from the type-locality in Hitoy Cerere Biological Reserve (Fig. 25B), at an elevation of 100 m. The holotype was collected with a Malaise trap.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon barbatus Borkent and Picado, CR, Limon, Est. Biol. Hitoy Cerere, 100 m, 14–16-IV-1999, G. Chaverri, E. Rojas, B. Hernandez, CD5088, LN184600/643400, #52279" (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *barbatus* (bearded) refers to the tuft of stout setae at the posteromedial lobe of sternite 9.

Atrichopogon yolancae Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with tergite 9 extending well beyond the apices of the gonocoxites and with its posterior margin broadly bilobed. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4–5 ommatidia (Fig. 1L). Antenna with flagellomeres 1–9 light brown, 10–13 medium brown; with plume well-developed (Fig. 3F); with 13 OR 8 flagellomeres, proportions as shown in Fig. 6A; flagellomeres 2–7 fused, 7–8 at least partially fused; flagellomere 9, 10 with plume setae; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8B) light brown; third segment short, ovoid, with well-developed subapical pit; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12A): With pale, lateral stripe anteriorly and posteriorly expanded on scutum; pleura somewhat lighter brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14F): Plain, without pattern of pigmented membrane; without macrotrichiae on membrane. **Halter**: Brown. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 15L): Medium brown. **Genitalia** (Fig. 20A): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 elongate, extending well beyond apex of gonocoxite; posterior margin broadly bilobed with each lobe bearing 3 stout setae. Sternite 9 with posterior margin broadly concave, with scattered row of setae. Gonocoxite without medial lobe. Gonostylus tapering from base, apex narrowly rounded. Aedeagal-parameral complex broad, posteriorly trilobed, with lateral arms directed anterolaterally. Cercus short, lobe-like, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon yolancae* is known from a few localities on the east and west coast of Costa Rica (Fig. 25B), at elevations of 0–100 m. Specimens were collected by sweeping in the swamp forest at Cahuita National Park, by a spring and along a small stream at Chimuri Reserve, along a first order stream at Finca Vargas (just west of Carara National Park), and along several streams in Carara National Park. These collections suggest that this species is associated with standing water and small lotic habitats.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon yolancae Borkent and Picado, 3 km E. Cahuita, C.R., 29-X-1993, A. Borkent, CD1641" (CNCI); paratypes: 4 ♂, from type-locality (2, CNCI; 2, INBC)); 4 ♂, from type-locality but 30-X-1993 (CNCI); 2 ♂, from type-locality but 8-XII-1993 (CNCI, INBC); 2 ♂, Chimuri Reserve, 1 km W. Puerto Viejo, Limon, Costa Rica, 29-XII-1993 (CNCI); 4 ♂, 2 km NE Tarcoles, Carara National Park, Puntarenas, Costa Rica, 100 m, 11-XI-1993 (2, CNCI; 2, INBC); 1 ♂, from previous locality but 1-I-1994 (CNCI); 1 ♂, 2 km NE Tarcoles, Costa Rica, 14-XII-1993 (CNCI); 4 ♂, from previous locality but 17-XII-1993 (CNCI); 9 ♂, 5 km NE Tarcoles, Costa Rica, 17-VIII-1993 (6, CNCI; 3 INBC).

DERIVATION OF SPECIFIC EPITHET: This species is named after the second author's young and precious daughter Yolancy Gamboa Picado.

***Atrichopogon gamboai* Borkent and Picado, new species**

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with tergite 9 extending somewhat beyond the apices of the gonocoxites and rounded posteriorly and with flagellomeres 8 and 9 elongate. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4–5 ommatidia (Fig. 1M). Antenna dark brown; with plume well-developed (Fig. 3G); with 13 flagellomeres, proportions as shown in Fig. 6B; flagellomeres 2–8 fused; flagellomere 9, 10 with plume setae; flagellomere 13 with apical projection basally constricted. Maxillary palpus (Fig. 8C) dark brown; third segment moderately elongate swollen at midlength, with shallow pit just beyond midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12B): Dark brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14G): Plain, without pattern of pigmented membrane; without macrotrichiae on membrane. **Halter**: Brown. **Legs**: Dark brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16A): Dark brown. **Genitalia** (Fig. 20B): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 elongate, extending somewhat beyond apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin concave, with lateral group of setae. Gonocoxite without medial lobe. Gonostylus tapering from base, most rapidly tapering near apex, apical 1/3 curved, apex pointed. Aedeagal-parameral complex broad, with rounded posterolateral margin, well-developed median lobe, with lateral arms directed anterolaterally. Cercus somewhat elongate, extending just beyond margin of tergite 9 or appressed against lateral margin.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon gamboai* is known only from the type-locality at Rio Macho Forest Reserve (Fig. 25B), at an elevation of 3000 m. Specimens were collected using a Malaise trap in this very rainy area.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon gamboai Borkent and Picado, CR, Cartago, Reserva Forestal Rio Macho, Est. Ojo de Agua, Col. alrededor del Monumento ojo de Agua, 3000 m. Trampa Malaise, 22–28-VII-1999, A. Picado, LS 396400/483500, #52878, CD5105" (INBC); paratype: 1 ♂, from type-locality (CNCI).

DERIVATION OF SPECIFIC EPITHET: This species is named after the second author's husband, Billen Gamboa Romero, in recognition of his faith in, and support of the second author.

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with tergite 9 extending well beyond the apices of the gonocoxites and rounded posteriorly and with flagellomeres 8 and 9 spherical. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4–5 ommatidia (Fig. 1N). Antenna with flagellomeres 2–7 medium brown, 1, 8–13 slightly darker; with plume somewhat developed (Fig. 3H); with 13 flagellomeres, proportions as shown in Fig. 6C; flagellomeres 2–10 fused (8–10 partially); flagellomeres 8–10 without plume setae; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8D) medium brown; third segment short, ovoid, swollen at midlength, with well-developed pit beyond midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12C): Dark brown with or without small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14H): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cell r_3. **Halter**: Brown. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16B): Medium brown. **Genitalia** (Fig. 20C): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 elongate, extending well beyond apex of gonocoxite; posterior margin truncated. Sternite 9 with posterior margin slightly concave, with scattered, medial group of setae. Gonocoxite without medial lobe. Gonostylus swollen, tapering on apical 1/3, gently curved, apex pointed. Aedeagal-parameral complex broad, with posterodorsal narrow lobe, posteroventral broad lobe, with lateral arms directed laterally. Cercus short, lobe-like, not extending beyond margin of tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon granditergitus* is known only from Tapanti National Park (Fig. 25B), at elevations of 1200–1400 m. The holotype was swept with an aerial net at the end of Pava Trail, along the Rio Grande de Orosi and the paratype was collected at a Mercury vapor light.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon granditergitus Borkent and Picado, Costa Rica, Prov. Cartago, P.N. Tapanti, 8 km SE Orosi, 1400 m. 12 DEC 1999, Borkent, A., A. Picado. LN 192600 560500, #74970 CD5035" (INBC); paratypes: 1 ♂, from type-locality but 11-XII-1999, 1200 m (CNCI).

DERIVATION OF SPECIFIC EPITHET: The name *granditergitus* refers to the large tergite 9 of the male of this species.

***Atrichopogon tirzae* Borkent and Picado, new species**

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with the scutum lacking a lateral suture or with setae in dark pits, abdominal tergites 1–4 more darkly pigmented than tergites 5–8 and with the aedeagus tapering posteriorly and with two rounded apical lobes. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 6 ommatidia (Fig. 1O). Antenna light brown; with plume not developed (Fig. 4A); with 13 flagellomeres, proportions as shown in Fig. 6D; flagellomeres separate; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8E) light brown; third segment short swollen at midlength, with well-developed pit just beyond midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12D): Dark brown. Scutum with all setae in dark pits; without lateral suture. Paratergite with one seta. Anepisternum narrow, slightly bilobed posteriorly. **Wing** (Fig. 14I): With slight infuscation in area of r-m and posterior to apex of R_3; with macrotrichiae on membrane in apical portion of r_3. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16C): Tergites 1–3 dark brown, 4–6 successively lighter, 7–8 successively darker than 6. **Genitalia** (Fig. 20D): Large, segment 9 equal in width to segment 8; tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with row of setae separated medially. Gonocoxite without medial lobe. Gonostylus tapering from base, anterolaterally flattened, gently curved, apex bifid with each part pointed. Aedeagal-parameral complex elongate, broad, with dorsal portion forming posteriorly directed prong, ventral portion bilobed posteriorly, with lateral arms directed anterolaterally. Cercus slender, elongate, extending beyond margin of tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon tirzae* is known only from the type-locality in the Osa Peninsula (Fig. 26A), at an elevation of 70 m. The holotype was collected with a light trap at the Centro Juvenil Tropical (Fundacion Neotropica).

TAXONOMIC DISCUSSION: The lack of a lateral scutal suture is shared with *A. asuturus* and this condition, apparently unique within at least the Forcipomyiinae, is likely a synapomorphy of these two species. The presence of setae arising from dark pits on the scutum is shared with *A. asuturus* and *A. beccus* and may be a synapomorphy of these three species (we have not seen the condition elsewhere in the genus) but this character state distribution needs further study; the pits were not as well developed in *A. beccus* as in *A. tirzae* and *A. asuturus*.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon tirzae Borkent and Picado, Costa Rica, Prov. Puntarenas, 4 km NW Rincon, 70 m, 11 AGO 2001, Borkent, A., LS 294300 517300, #74989, CD5134" (INBC).

DERIVATION OF SPECIFIC EPITHET: This species is named after the second author's sister, Tirza Maria Picado Calvo, in recognition of her friendship and continuous support.

Atrichopogon asuturus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with the scutum lacking a lateral suture or with setae in dark pits, abdominal tergites 1–4 more darkly pigmented than tergites 5–8 and with the aedeagus with an elongate, slender, posteromedial prong. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 6 ommatidia (Fig. 1P). Antenna light brown; with plume not developed (Fig. 4B); with 13 flagellomeres, proportions as shown in Fig. 6E; flagellomeres separate; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8F) light brown; third segment short swollen at midlength, with well-developed pit just beyond midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12E): Dark brown. Scutum with all setae in dark pits; without lateral suture. Paratergite with one seta. Anepisternum narrow, slightly bilobed posteriorly. **Wing** (Fig. 14J): With slight infuscation in area of r-m and posterior to apex of R3; with macrotrichiae on membrane in apical portion of r_3, m_1. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16D): Tergites 1–3 dark brown, 4–7 successively lighter, 8 medium brown. **Genitalia** (Fig. 21A): Large but segment 9 equal in width to segment 8; tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin strongly concave, with lateral group of scattered setae. Gonocoxite without medial lobe. Gonostylus anteroposteriorly flattened, tapering from base, gently curved, apex bifid with each part pointed. Aedeagal-parameral complex broad anteriorly, tapering posteriorly, posterodorsally somewhat rounded, ventrally with elongate, slender, posteriorly directed prong, with lateral arms directed anterolaterally. Cercus short, lobe-like, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon asuturus* is known only from the type-locality in the Nicoya Peninsula (Fig. 26A), at an elevation of 300–400 m. The holotype was collected with a Malaise trap.

TAXONOMIC DISCUSSION: *Atrichopogon asuturus* is likely the sister species of *A. tirzae* (see taxonomic discussion under that species).

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon asuturus Borkent and Picado, Costa Rica, Punt. R. Priv. Karen Mogensen, Send.

Princ. 300–400 m, 18 Mar–4 ABR 2003, Y. Cardenas, D. Briceno, C. Guzman, Malaise #4. LN 205600 420300 #73795" (INBC); paratypes: 2 ♂, from type-locality (CNCI, INBC).

DERIVATION OF SPECIFIC EPITHET: The name *asuturus* refers to the absence of the lateral scutal suture (also absent in *A. tirzae*).

Atrichopogon quartibrunneus Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with gonostylus with basal 2/3 swollen and apical 1/3 uniformly slender and with the abdomen pale except for some light brown pigmentation on tergite 4. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4 ommatidia (Fig. 1Q). Antenna with flagellomeres 2–8 pale, 1, 9–13 light brown; with plume not developed (Fig. 4C); with 13 flagellomeres, proportions as shown in Fig. 6F; flagellomeres separate; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8G) pale; third segment short, swollen at midlength, with shallow pit near midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 12F): Medium brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14K): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cell r_3, m_1. **Halter**: Pale. **Legs**: Mostly pale, except most of forefemur, foretibia, midfemur light brown. Hindtibia expanded only at apex. Hindtibial spur length longer than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16E): Pale, with tergite 4 partially light brown, genitalia light brown. **Genitalia** (Fig. 21B): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 moderately elongate, extending to about level of apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin slightly concave, with scattered row of setae. Gonocoxite without medial lobe. Gonostylus swollen for basal 2/3, apical 1/3 slender, apex rounded. Aedeagal-parameral complex broad, posterodorsally broadly bilobed, posteroventrally with broad projection, with lateral arms directed laterally. Cercus slender, elongate, at margin of tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon quartibrunneus* is known only from the type-locality in Tapanti National Park (Fig. 26A), at an elevation of 1800 m. The holotype was collected with a sweep net.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon quartibrunneus Borkent and Picado, Costa Rica, Prov. Cartago, Paraiso, Pque. Nac. Tapanti, La Represa, Torre del ICE entre Rio Porras y Villegas. 1800 m, Jun. 1997. R. Delgado. Manual. LN 186150 - 560100, #52224, CD5338." (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *quartibrunneus* refers to the brown fourth abdominal tergite of the male of this species.

***Atrichopogon beccus* Borkent and Picado, new species**

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a strongly bifid gonostylus and with a pale abdomen with tergites 1–6 each partially light brown. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 5 ommatidia (Fig. 1R). Antenna with flagellomeres 1–9, basal portion of 10, pale, apical portion of 10, all of 11–13 light brown; with plume well-developed (Fig. 4D); with 13 flagellomeres, proportions as shown in Fig. 6G; flagellomeres 2–10 at least partially fused; flagellomere 9,10 with plume setae; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 8H) segments 1–2 pale, 3–5 light brown; third segment short, ovoid, with well-developed pit just beyond midlength; segments 4, 5 separate, broadly abutting. **Thorax** (Fig. 13A): with dorsal portion (including anepisternum) dark brown, ventral portion (most of pleura) light brown. Scutum with all setae in shallow, dark pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, deeply bilobed posteriorly. **Wing** (Fig. 14L): With slight infuscation in area of r-m and posterior to apex of R3; without macrotrichiae on membrane. **Halter**: Pale. **Legs**: Light brown. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16F): Pale, with tergites 1–6 each partially medium brown, genitalia light brown. **Genitalia** (Fig. 21C): Small, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with scattered row of setae. Gonocoxite without medial lobe. Gonostylus thick for most of length, expanded distally, apex strongly bifid, with each prong pointed. Aedeagal-parameral complex broad, with wide posteroventral lobe, with lateral arms directed laterally. Cercus elongate, lobe-like, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon beccus* is known only from Hitoy Cerere Biological Reserve (Fig. 26A), at an elevation of 100–140 m. The holotype was collected with a Malaise trap.

TAXONOMIC DISCUSSION: The scutal setae arising from dark pits is shared with *A. tirzae* and *A. asuturus* but the condition is not as well developed in *A. beccus* as in these other two species. See the taxonomic discussion under *A. tirzae* for further commentary.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon beccus Borkent and Picado, Costa Rica, Prov. Limon, Valle de la Estrella, R.B. Hitoy Cerere, Sendero Toma de Agua. 100–140 m. 17 NOV–17 DIC 1999. F. Umaña. Malaise LN 184600 643400 #54940" (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *beccus* (bill, as of a bird) refers to the shape of the apex of the gonostylus, looking somewhat like the open mouth of a bird.

***Atrichopogon redactus* Borkent and Picado, new species**

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* with flagellomeres 5–10 fused into a single unit. *Female adult*: unknown.

DESCRIPTION: *Male adult.* Descriptive measurements: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 3 ommatidia (Fig. 2A). Antenna light brown; with plume poorly developed, flagellomeres 2–4, 11–13 each with a few elongate setae (Fig. 4E); with 8 apparent flagellomeres, proportions as shown in Fig. 6H; most flagellomeres separate, 5–10 fused into single unit; flagellomere 13 with apical projection not basally constricted. Maxillary palpus (Fig. 8I) very light brown; third segment moderately short, ovoid, with well-developed pit near apex; segments 4, 5 separate, broadly abutting, appearing nearly fused. **Thorax** (Fig. 13B): Medium brown with small pale patch on scutum just anterior of lateral margin of scutellum. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14M): Plain, without pattern of pigmented membrane; with macrotrichiae in apical portion of cell r_3. **Halter**: Pale. **Legs**: Very light brown, with area of slightly darker brown on apical 0.6 of forefemur, 0.5 of midfemur, middle 0.25 of dorsal surface of hindfemur. Hindtibia expanded only at apex. Hindtibial spur length less than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16F): Pale, with portion of each of tergites 1–6 light brown; genitalia pale with apical portion of tergite 9, gonostylus light brown. **Genitalia** (Fig. 21D): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin protruding, with scattered row of setae restricted to median protrusion. Gonocoxite without medial lobe. Gonostylus tapering from base, gently curved, apex pointed. Aedeagal-parameral complex broad, moderately elongate, posterodorsally with two prongs, one more lateral and shorter than more medial prong, ventrally with elongate, slender structure protruding posteriorly, with lateral arms curved posterolaterally. Cercus short, lobe-like, ventral to tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon redactus* is known only from the type-locality at Hitoy Cerere Biological Reserve (Fig. 26B), at an elevation of 160 m. The holotype was collected by sweeping.

TAXONOMIC DISCUSSION: The strongly fused antenna of *A. redactus* appears to be unique within the genus. The right antenna had flagellomeres 5–10 completely fused into one unit but small curves on the surface of this unit on the left antenna matched the

number of “missing” flagellomeres (perhaps this was merely a difference in viewing angle). This suggests that the unit is indeed made of a fusion of flagellomeres 5–10.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon redactus Borkent and Picado, Costa Rica, Prov. Limon, R.B. Hitoy Cerere. Send Catarata. 160 m. 20 SET 2000. A. Picado. Red de Golpe. LN 643300 184500. #58319" (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *redactus* (reduced) refers to the partially fused antenna of the male of this species.

Atrichopogon setosilateralis Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with uniformly dark brown antennae, palpus, thorax and legs, the third palpal segment long and narrow, antennal plume poorly developed (flagellomere 10 short and with only short setae), and the paratergite with one large and 3–5 additional smaller setae. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence restricted to anteriormost ommatidia; broadly abutting medially for length of 5 ommatidia (Fig. 2B). Antenna dark brown; with plume poorly developed (Fig. 4F); with 13 flagellomeres, proportions as shown in Fig. 6I; flagellomeres separate; flagellomere 9, 10 without plume setae; flagellomere 13 with apical projection basally constricted. Maxillary palpus (Fig. 8J) dark brown; third segment very elongate, slender, with well-developed pit about 0.6 from base; segments 4, 5 separate. **Thorax** (Fig. 13C): Dark brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with 4–6 seta (x= 4.8). Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14N): Plain, without pattern of pigmented membrane; without macrotrichiae on membrane. **Halter**: Light brown. **Legs**: Dark brown. Hindtibia expanded only at apex. Hindtibial spur length about equal to width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16H): Medium brown. **Genitalia** (Fig. 22A): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with scattered setae. Gonocoxite without medial lobe. Gonostylus tapering from base, apical ½ curved, apex pointed. Aedeagal-parameral complex broad, posterodorsal T-shaped projection, posteroventrally rounded, with lateral arms directed anterolaterally. Cercus short, lobe-like, situated anterior from posterior margin of tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon setosilateralis* is known only from Tapanti and Barbilla National Parks (Fig. 26A), at elevations of 300–1400 m (possibly as low as 200). Specimens were collected by sweeping. The specimens from Tapanti were collected either by sweeping along the margin of the Rio Grande de Orosi (n = 1) or

over some logs lying on gravel on the exposed river bed (n = 2, including holotype). The specimens from Barbilla National Park were also swept from a river margin and these data suggest the species is indeed associated with rivers.

TAXONOMIC DISCUSSION: This species belongs to the subgenus *Lophomyidium* Cordero, the New World members of which were revised by Wirth (1994). The only other previously described member of this subgenus with a reduced antennal plume is *A. deyrupi* Wirth but that species has a number of body parts which are more lightly pigmented (e.g. palpus, scutellum, legs).

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon setosilateralis Borkent and Picado, Costa Rica. Prov. Cartago. P.N. Tapanti. 8 km SE Orosi, 1400 m. 12 DEC 1999. Borkent A., A. Picado. LN 192600 560500, #74970, CD5037" (CNCI); paratypes: 1 ♂, from type-locality (INBC); 1 ♂, from type-locality but 22-XII-1993 (CNCI); 1 ♂, Rio Dantas a 1.5 km s de Estacion, Barbilla National Park, Turrialba, Rio Pacuare Forest Reserve, Cartago, Costa Rica, 200–300 m, 17-VII-2000 (INBC); 1 ♂, Rio Dantas, Camino a Valle Escondido, Barbilla National Park, Cartago, Costa Rica, 400–500 m, 29-VI-2000 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *setosilateralis* refers to setose paratergites of the male of this species.

Atrichopogon tapantiensis Borkent and Picado, new species

DIAGNOSIS: *Male adult*: only extant species of *Atrichopogon* in the New World with a uniformly dark brown antennae, palpus, thorax and legs, the third palpal segment long and narrow, antennal plume poorly developed (flagellomere 10 short and with only short setae), and the paratergite with only one large seta. *Female adult*: unknown.

DESCRIPTION: *Male adult*. Descriptive statistics: see Tables 1–6. **Head**: Ommatidia with interfacet pubescence; broadly abutting medially for length of 4–5 ommatidia (Fig. 2C). Antenna dark brown; with plume poorly developed (Fig. 4G); with 13 flagellomeres, proportions as shown in Fig. 6J; flagellomeres separate; flagellomere 9, 10 without plume setae; flagellomere 13 with apical projection slightly constricted basally. Maxillary palpus (Fig. 8K) dark brown; third segment very elongate, slender, with well-developed pit about 0.75 from base; segments 4, 5 separate. **Thorax** (Fig. 13D): Dark brown. Scutum with setae arising directly from surface, not in pits; with lateral suture. Paratergite with one seta. Anepisternum well-developed, broadly bilobed posteriorly. **Wing** (Fig. 14O): Plain, without pattern of pigmented membrane; with no or a few macrotrichiae in apical portion of cell r_3. **Halter**: Light brown. **Legs**: Dark brown. Hindtibia expanded only at apex. Hindtibial spur length shorter than width of hindtibia at midlength. Empodia present. **Abdomen** (Fig. 16I): Medium brown. **Genitalia** (Fig. 22B): Of moderate size, segment 9 about equal in width to segment 8; tergite 9 short, not extending to

apex of gonocoxite; posterior margin rounded. Sternite 9 with posterior margin broadly concave, with scattered setae. Gonocoxite without medial lobe. Gonostylus tapering from base, apical 1/3 curved, apex pointed. Aedeagal-parameral complex broad, posterodorsal T-shaped projection, posteroventrally slightly bilobed, with lateral arms directed anterolaterally. Cercus short, lobe-like, situated anterior from posterior margin of tergite 9.

Female adult. Unknown.

DISTRIBUTION AND BIONOMICS: *Atrichopogon tapantiensis* is known only from Tapanti and Barbilla National Parks (Fig. 26B), at elevations of 300–1400 m (possibly as low as 200). Specimens were collected by sweeping and with light traps. Four specimens from Tapanti were collected by sweeping along the margin of the Rio Grande de Orosi, and two were taken directly from the small flowers of *Mikana micrantha* (Asteraceae) near the park entrance. Members of the subgenus *Lophomyidium* all have long mouthparts and these are likely an adaptation for imbibing nectar from flowers. The senior author has observed another member of the subgenus, *A. borkenti* (Wirth), taking nectar from flowers of species of *Salix* in Canada.

TAXONOMIC DISCUSSION: This species belongs to the subgenus *Lophomyidium* and, like *A. setosilateralis* above, may be distinguished from the only other previously described member with a short antennal plume, *A. deyrupi*, by differences in pigmentation.

Although this species is described as having a dark brown thorax, it is actually somewhat lighter than the very dark males of *A. setosilateralis*.

TYPES: Holotype, male adult on microscope slide, labeled "HOLOTYPE Atrichopogon tapantiensis Borkent and Picado, Costa Rica, Prov. Cartago, P.N. Tapanti. 8 km SE Orosi. 22 DEC 1993, Borkent, A., LN 192600 560500, #74977" (CNCI); paratypes: 2 ♂, from type-locality but 11-XII-1999, 1200 m (CNCI, INBC); 3 ♂, from type-locality but 12-XII-1999, 1400 m (2, CNCI; 1, INBC); 1 ♂, Estacion Quebrada Segundo, Macizo de la Muerte, Tapanti National Park, Paraiso, Cartago, Costa Rica, 1250 m, 7-VII-2000 (INBC); 2 ♂, as previous locality but 8-VII-2000; 1 ♂, Rio Dantas a 1.5 km s de Estacion, Barbilla National Park, Turrialba, Rio Pacuare Forest Reserve, Cartago, Costa Rica, 200–300 m, 17-VII-2000 (INBC).

DERIVATION OF SPECIFIC EPITHET: The name *tapantiensis* refers to the type-locality.

Conclusions

As noted in the introduction, the genus *Atrichopogon* is diverse but most species cannot be confidently identified and the subgeneric classification is, in our opinion, poorly supported. Subgeneric concepts have been applied with partial success in the Holarctic Region (Szadziewski et al. 1995) and China (Liu et al. 2001), but they generally serve poorly in the Neotropical Region and it is difficult or impossible to designate many species to these subgenera. Adult character states presently distinguishing subgenera are nearly all

homoplastic in other genera of Ceratopogonidae and vary incongruently within the genus (i.e., pigmentation patterns, presence or absence of interfacet pubescence, mouthpart length, position of sensory pit on third palpal segment, number of paratergal setae, presence or absence of wing macrotrichia, number of spermathecae). The only apparently good synapomorphy used to group adult *Atrichopogon* at the subgeneric level is the presence of cuticular extensions arising from female abdominal sternites 8 and 9 in *Psilokempia* Enderlein. We therefore have generally refrained from placing the species described in this paper to subgenus. We have noted that two species described above (*A. setosilateralis, A. tapantiensis*) are members of *Lophomyidium* but we consider this subgenus to be merely a distinctive group of species arising from a paraphyletic remainder. In addition, we have examined Costa Rican species that are intermediate in mouthpart length between "typical" *Lophomyidium* and *Atrichopogon* with shorter mouthparts.

Previous to this paper, 12 species of *Atrichopogon* were known or believed to be in Costa Rica (those with broader distributions), as follows: *A. archboldi* Wirth, *A. costaricae* Macfie, *A. didymothecae, A. glaber* Macfie, *A. fusculus* (Coquillett), *A. gordoni* Macfie, *A. incultus* Ewen, *A. lacajae, A. longicornis*, *A. pachycnemus* Macfie, *A. pallidipes* Kieffer, and *A. utricularis* Macfie. Of these, three are redescribed here and an additional 18 species newly described, so that a total of 30 species are now known from this country. There is a great need to examine nearly all the types of the 94 species of *Atrichopogon* now recorded from south of the United States (current paper; Borkent and Spinelli 2000; Huerta 2001) to determine valid species and to construct a workable key for the Neotropical Region. Unfortunately, a number of these taxa were described on the basis of only females, which we consider to be more difficult to identify than males.

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