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Systematic revision of the genus *Trichonotuloides* Balthasar, 1945 with description of two new Mexican species (Coleoptera: Scarabaeidae: Aphodiinae)

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Abstract. Besides the two species at present known belonging to the genus *Trichonotuloides* Balthasar (*T. glyptus* (Bates) and *T. latecrenatus* (Bates)), two new Mexican species, *T. alfonsinae* and *T. hansferyi,* are herein described (Coleoptera: Scarabaeidae: Aphodiinae). The complete set of figures is supplied for all taxa herein dealt with.

Key words. Systematics, *Trichonotuloides,* new species, *Trichonotuloides alfonsinae*, *Trichonotuloides hansferyi*, Mexico, Aphodiinae.

Introduction

This work is part of a series of papers in preparation for a systematic revision of Mexican Aphodiinae (Coleoptera Scarabaeidae).

Materials and Methods

Terminology used to describe morphological features follows that of Dellacasa et al. (2001). Materials studied are in the following collections:

AARX	Arriaga Collection, Xalapa, Veracruz, Mexico
CNCI	Canadian National Collection, Ottawa, Canada
DCGI	Dellacasa Collection, Genoa, Italy
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, U.S.A.
IEXA	Instituto de Ecologia, Xalapa, Veracruz, Mexico
MNHN	Muséum national d'Histoire naturelle, Paris, France
NHML	Natural History Museum, London
NMPC	National Museum, Department of Entomology, Prague, Czech Republic [Balthasar Collection]
USNM	United States National Museum, Washington, D.C., U.S.A.

Genus *Trichonotuloides* Balthasar, 1945

Aphodius (*Trichonotuloides*) Balthasar, 1945: 43.
Trichonotuloides; Dellacasa et al. 2001: 292 (new status); Skelley et al. 2007: 7.

Type species. *Aphodius fossulatipennis* Balthasar, 1945 (junior synonym of *Aphodius latecrenatus* Bates, 1887) (monotypy).

Diagnosis. Small size species (length 4.0–6.0 mm), oblong-oval, moderately convex, subshiny or almost dull; more or less diffusely pubescent. Blackish, piceous or dark brownish. Head with epistome feebly gibbous at centre, regularly coarsely punctured; clypeus slightly sinuate at middle, round at sides, rather thinly bordered, edge very shortly bristled; genae obtusely round, ciliate, more or less strongly protruding from the eyes; frontal suture not tuberculate. Pronotum transverse, regularly convex or narrowly explanate on sides, simply or dually, rather regularly, very densely and coarsely punctured; larger punctures cariose and sometimes slightly umbilicate; lateral margins feebly arcuate or nearly straight, sometimes subsinuate before hind angles; latter obtusely round or truncate and inwardly sinuate; base slightly bisinuate, distinctly bordered. Scutellum small, elongately triangular with curved sides, coarsely punctured mainly on basal half. Elytra oval-elongate, with shoulder denticulate or not, deeply crenato-striate; interstices convex or flat, coarsely punctured, punctures, at least the lateral, setigerous. Fore tibiae distally tridentate and proximally feebly crenulate at outer margin; upper side smooth or vaguely punctured. Middle and hind tibiae with strong transverse carinae on outer face; apically fimbriate with short and equal spinules. Pygidium with short and recumbent pubescence; mixed few straight and rather elongate setae; apical margin sparsely but very elongately ciliate. Sexual dimorphism shown in males mainly by metasternal plate deeply spoon-shaped, punctured and distally pubescent. Aedeagus with tegmen slender and very elongate; parameres short or moderately elongate, curved and more or less acuminate apically. Epipharynx transverse, slightly sinuate at anterior margin, round at sides; epitorma conical; corypha with elongate apical celtes distinctly protruding from the fore margin; chaetopariae stout and elongate; pedia densely pubescent with several lateral spines subserially intermixed.

Distribution. Mesoamerican region (Mexico and Guatemala).

Discussion. The primary systematic characters of the genus are:
- scutellum small, triangular;
- front tibiae with dorsal surface lacking or vaguely punctured;
- hind tibiae apically fimbriate with short equal spinules;
- clypeal margin more or less deeply sinuate at middle, round or angulate at sides; fontal suture not tuberculate;
- basal margin of pronotum distinctly bordered;
- elytra deeply crenato-striate with interstices coarsely punctured and more or less diffusedly pubescent.

Key to species of *Trichonotuloides*

1. Elytra strongly denticulate at shoulder; striae almost as broad as interstices; latter coarsely, densely, evenly punctured; pronotum dually punctured with hind angles truncate. Dark brownish. Length 4.0–4.5 mm. Guatemala, Mexico (Chiapas) ..... ***T. latecrenatus* (Bates)**
— Elytra not denticulate at shoulder, at most with distinct epipleural carina; striae not so broad; pronotum irregularly punctured with hind angles obtusely round **2**

2(1). Clypeus widely round at sides of median sinuosity; genae round, feebly protruding from the eyes; elytral interstices densely, coarsely evenly punctured; fore tibiae spur almost straight and acuminate in both sexes. Blackish. Length 4.5–6.0 mm. Mexico (Veracruz) .... ***T. hansferyi* new species**

— Clypeus subangulate at sides of median sinuosity; genae obtusely round, strongly protruding from the eyes; elytral interstices with coarse punctation confusedly vermiculose; fore tibiae spur, in males, hooked or strongly inwardly curved apically..... **3**

3(2). Epistome subshiny, coarsely, distinctly almost evenly punctured; clypeus relatively more feebly sinuate at middle; spur of fore tibiae, in males, spatulate and apically hooked. Blackish or piceous black, margins of head and pronotum shadowy reddish. Species relatively larger: length 4.5–5.0 mm. Mexico (Colima, Durango, Hidalgo, México, Oaxaca, Puebla, Veracruz) .....***T. glyptus* (Bates)**

— Epistome dull, confusedly subrugosely punctured; clypeus relatively more deeply sinuate at middle, fore tibiae spur, in males, stout, subcylindrical, acuminate and strongly curved inwardly apically. Blackish. Species relatively smaller: length 3.5–4.0 mm. Mexico (Veracruz) .... ***T. alfonsinae* new species**

***Trichonotuloides alfonsinae* new species**
(Figures 1–5)

Type locality. Pico de Orizaba, Veracruz, Mexico.

Type repository. Dellacasa Collection. Genoa, Italy.

Description. Length 3.5–4.0 mm; oval-elongate, moderately convex, subopaque; head and pronotum glabrous, elytra laterally and subapically shortly pubescent. Blackish. Head with epistome dull, feebly gibbous on disc, subrugosely confusedly punctured, punctation more superficial on disc; clypeus distinctly sinuate at middle, subangulate at sides, thinly bordered, edge glabrous, faintly upturned; genae obtusely round, shortly sparsely ciliate, distinctly protruding from the eyes; frontal suture not tuberculate, feebly raised medially and laterally; front coarsely, not densely punctured. Pronotum transverse, moderately convex, somewhat irregularly coarsely punctured, punctures distinctly umbilicate, denser and almost confluent on sides, more superficial on disc, herein with impunctate longitudinal narrow areola; lateral margins almost parallel, thickly bordered, edge glabrous; hind angles obtusely round; base feebly bisinuate, distinctly entirely bordered. Scutellum superficially alutaceous, sparsely coarsely punctured on basal half. Elytra moderately convex, oval, somewhat widened posteriorly, not denticulate at shoulder, laterally and on preapical declivity with short recumbent setae; epipleural carina very distinct, striae shiny, moderately deep, coarsely not closely punctured, feebly crenulate; interstices flat, rather dull, with coarse, confluent, vermiculous punctation. Hind tibiae upper spur somewhat shorter than first tarsal segment; latter as long as following three segments combined. Male: fore tibiae spur stout, subcylindrical, acuminate and distinctly inwardly curved apically; head and pronotum relatively less convex, wider and less coarsely punctured; aedeagus Fig. 4–5. Female: fore tibiae spur almost straight; head and pronotum more convex, somewhat narrowed anteriorly, more coarsely punctured.

Type material. MEXICO: Puebla: Sierra Negra, 19°00'34.9"N-097°20'36.6"W, m 3334, 15.VI.2012, leg Arriaga A. J., pitfall trap baited with human faeces (2 paratypes, AARX, DCGI); **Veracruz:** Pico de Orizaba, 19°04'18.5"N-097°18'59.3"W, m 3406, 15.VI.2012, leg. Arriaga A. J., pitfall trap baited with human faeces (male, **holotype**, DCGI); *idem*, 19°04'21.1"N-097°18'50.6"W, m 3473, 15.VI.2012, leg. Arriaga A. J., sheep dung (allotype and paratype, AARX, DCGI); *idem*, 19°04'21.2"N-097°18'59.9"W, m 3415, 13.VI.2012, leg. Arriaga A. J., horse dung (2 paratypes, AARX, FSCA); *idem*, 19°03'14.3"N-097°04'23.9"W, m 2788, 22.VII.2012, leg. Arriaga A. J., sheep dung (1 paratype, DCGI).

Distribution. Mexico (Puebla, Veracruz).

Etymology. Named in honor of Alfonsina Arriaga Jiménez, PhD student at Paul-Valéry University (Montpellier, France), collector of all specimens of the type series.

Biology. The specimens of the type series were collected in June-July in horse and sheep dung, or by pitfall traps baited with human faeces.

***Trichonotuloides glyptus* (Bates, 1887)**
(Figures 6–10)

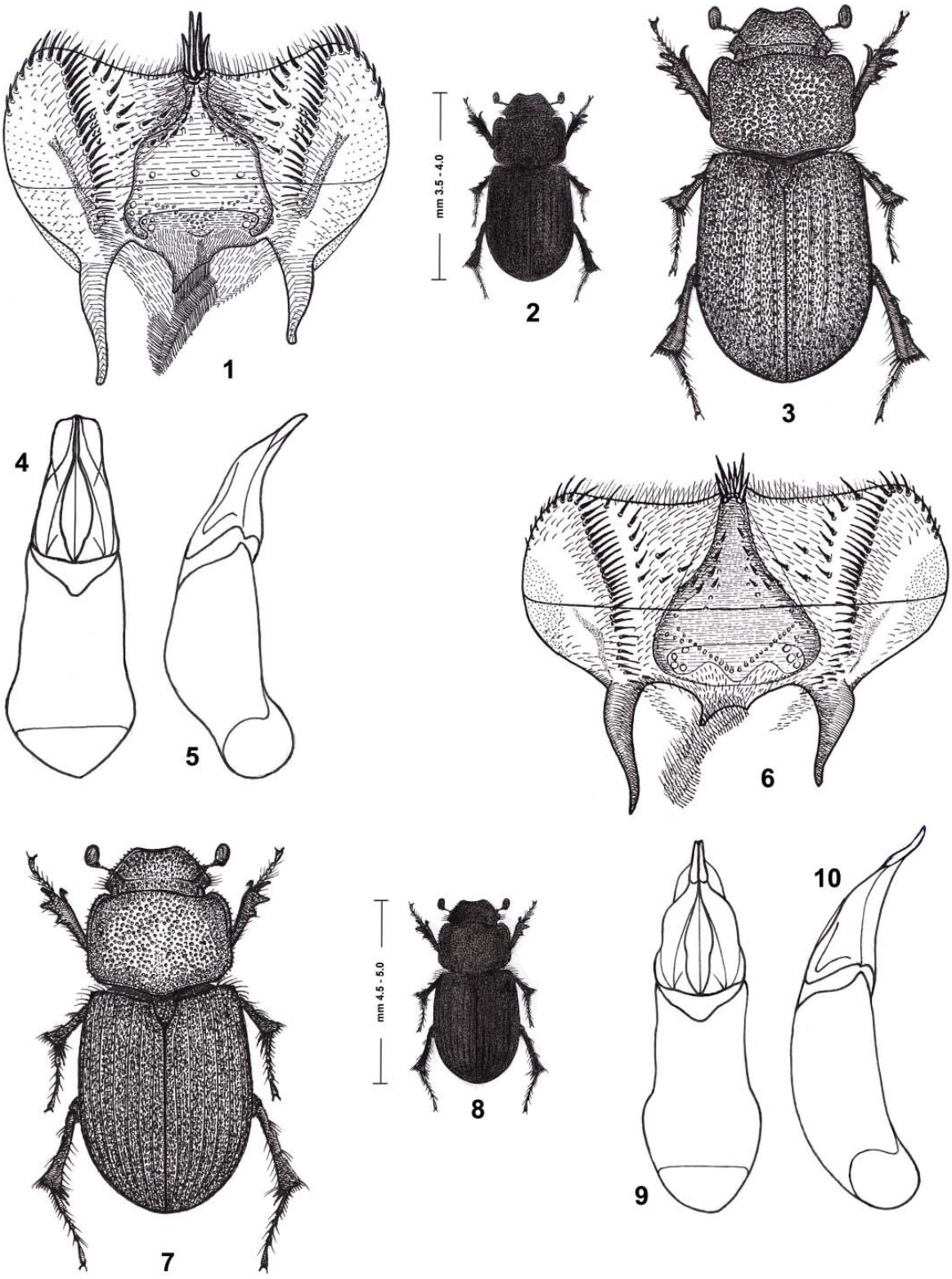
Aphodius glyptus Bates, 1887: 86; Blackwelder 1944: 212.
Aphodius (*Amidorus*) *glyptus*; Schmidt 1913:149; Dellacasa 1988: 135.
Trichonotuloides glyptus; Dellacasa et al. 2002: 178 (lectotype designation and new combination); Skelley et al. 2007: 7.

Type locality. "Ciudad in Durango" [Estado de Durango, Mexico].

Type repository. Natural History Museum. London. (type examined).

Redescription. Length 4.5–5.0 mm; oval-elongate, moderately convex, subopaque; more or less widely shortly and densely silver-grey pubescent. Blackish or piceous black; head, pronotum and elytra with margins dark reddish. Head with epistome convex at centre, coarsely and densely punctured, punctures sparser on disc, denser on sides; clypeus feebly sinuate at middle, obtusely angulate at each side, bordered, edge nearly imperceptibly bristled laterally; genae obtuse, rather shortly ciliate, distinctly protruding from the eyes; frontal suture nearly obsolete at middle, moderately raised laterally; front coarsely and rather densely punctured. Pronotum transverse, moderately convex medially, narrowly flattened on sides, strongly and densely punctured, punctures subconfluent on sides; lateral margins with border cerciniform and minutely bristled, slightly inwardly sinuate before hind angles; latter subtruncate; base slightly bisinuate and distinctly bordered. Scutellum with curved sides, coarsely and confusedly punctured. Elytra elongate-oval, moderately convex, not denticulate at shoulder; epipleural carina very distinct at humeral callus and minutely bristled; striae wide, shiny, superficially punctured and subcrenulate discally, indistinctly punctured and canaliculate toward apex; interstices flat with punctation confusedly vermiculose. Upper spur of hind tibiae shorter than first tarsal segment; latter as long as following three segments combined. Male: pronotum relatively more transverse; fore tibiae spur stout, spatulate, and apically hooked; metasternal plate spoon-shaped, punctured and shortly pubescent distally; aedeagus Fig. 9–10. Female: pronotum relatively narrower frontward; fore tibiae spur slender and regularly acuminate apically; metasternal plate nearly flat, glabrous.

Material examined. MEXICO: Colima: Sierra de Manantlán, El Tepeiztle (Mpio. Minatitlán), m 2300, 13.VII.1989, leg. Rivera L., open pasture (1 ex., DCGI); **Durango:** km 125 carr. El Salto-Mazatlán, El Salto dint. W, 23°45'20.6"N-105°31'17.0"W, m 2400, 20.VII.2004, leg. Dellacasa M. & Martínez I., horse dung (6 exx, DCGI); Ciudad [in Durango], 8100 ft., leg. Forrer (lectotype, NHML; 2 paralectotypes, MNHN); **Hidalgo:** Jacale [Jacala], leg. Sallé (1 ex., MNHN); **México:** Río Frío, 22.VIII.1980, leg. Zunino M. (1 ex., DCGI); 3 km ante Santa Martha, 19°04'58.1"N-099°43'48.2"W, m 2700, 25.VII.2004, leg. Dellacasa M. & Martínez I. (2 exx., DCGI); carr. Temoaya-Jiquipilco, 19°32'09.9"N-099°29'47.3"W, m 3000, 23.VII.2004, leg. Dellacasa M. & Martínez I., cow dung (6 exx., DCGI); Paso de Cortés, 19°05'11.4"N-098°38'47.1"W, m 3300, 24.VII.2004, leg. Dellacasa M. & Martínez I., cow dung (73 exx., DCGI); Raices dint., 19°09'44.9"N-099°48'17.9"W, m 3499, 08.VII.2006, leg. Dellacasa M., Fresi C. & Martínez I., sheep dung (40 exx., DCGI); Salazar, 08.IX.1968, leg. Cabrera M. (1 ex., DCGI); Toluca, 16.VII.1933, leg. Hinton H. & Usinger H. (24 exx., DCGI; USNM); Valle del Silencio, m 3000, Mexico City env., 23.VIII.1980, leg. Zunino M. (1 ex., DCGI); **Oaxaca:** La Venta dint., 16°11'25.0"N-096°29'50.2"W, m 2467, 28.VI.2007, leg. Dellacasa M., Fresi C. & Martínez I., horse dung (1 ex., DCGI); Microwave Sta., 14 km n. Jct. To Tlaxlaco from Pan Am Hwy, 01.VIII.1974, leg. Whitehead (2 exx., USNM); **Puebla:** carr. Puebla-Paso de Cortés, 19°05'20.5"N-098°36'25.1"W, m 3365, 17.VII.2006, leg. Martínez I., Suarez S., Gonzalez O., Cabrero F. & Trotta N. (20 exx., DCGI); San Nicolas de los Ranchos-Paso de Cortés, 19°05'50.5"N-098°36'51.0"W, m 3350, 10.VII.2006, leg. Dellacasa M., Fresi C. & Martínez I., cow dung in shaded pasture (39 exx., DCGI); **Veracruz:** El Conejo dint., 19°31'26.3"N-097°09'22.1"W, m 3375,



Figures 1–10. *Trichonotuloides alfonsinae*, new species (Pico de Orizaba, Veracruz, Mexico). **1)** Epipharynx. **2–3)** Habitus (length ideogram and morphological details). **4–5)** Aedeagus (dorsal and lateral views). *Trichonotuloides glyptus* (Bates, 1887) (Toluca, México, Mexico). **6)** Epipharynx. **7–8)** Habitus (morphological details and length ideogram). **9–10)** Aedeagus (dorsal and lateral views).

10.VII.2007, leg. Dellacasa M. & Fresi C. (1 ex., DCGI); El Triunfo, cam. a Ayahualulco, 03.X.2000, leg. Pensado T., sheep dung (5 exx., DCGI); km 11 cam. a Cofre de Perote, m 3500, 16.VIII.1996, leg. Halftter G. & *alii*, cow and horse dung in open pastures (1 ex., DCGI); San José Aguazuelas, cam. a Los Altos, 23.VIII.1995, leg. Halftter G. & *alii*, sheep dung in open pasture (1 ex., DCGI); San José Aguazuelas, El Plano, 19°24'08"N-097°11'57"W, m 2600 (1 ex., DCGI); San José Aguazuelas, de El Triunfo a Xico, 03.X.2000, leg. Martínez I., sheep dung (7 exx., DCGI); Tembladeras, B. P., 19°30'55"N-097°06'55"W, 01-18.VI.2001, leg. Montes de Oca E. & Santiago Q. (5 exx., IEXA); Cofre de Perote, 19°27'35.3"N-097°11'12.6"W, m 3171, 09.VII.2012, leg . Arriaga A. J., horse dung (1 ex., DCGI).

Distribution. Mexico (Colima, Durango, Hidalgo, México, Oaxaca, Puebla, Veracruz).

Biology. Generalist dung feeder; specimens were collected mainly in summer.

***Trichonotuloides hansferyi* new species**
(Figures 11–15)

Type locality. Los Laureles, Ixhuacán de los Reyes, Veracruz, Mexico.

Type repository. Dellacasa Collection. Genoa, Italy.

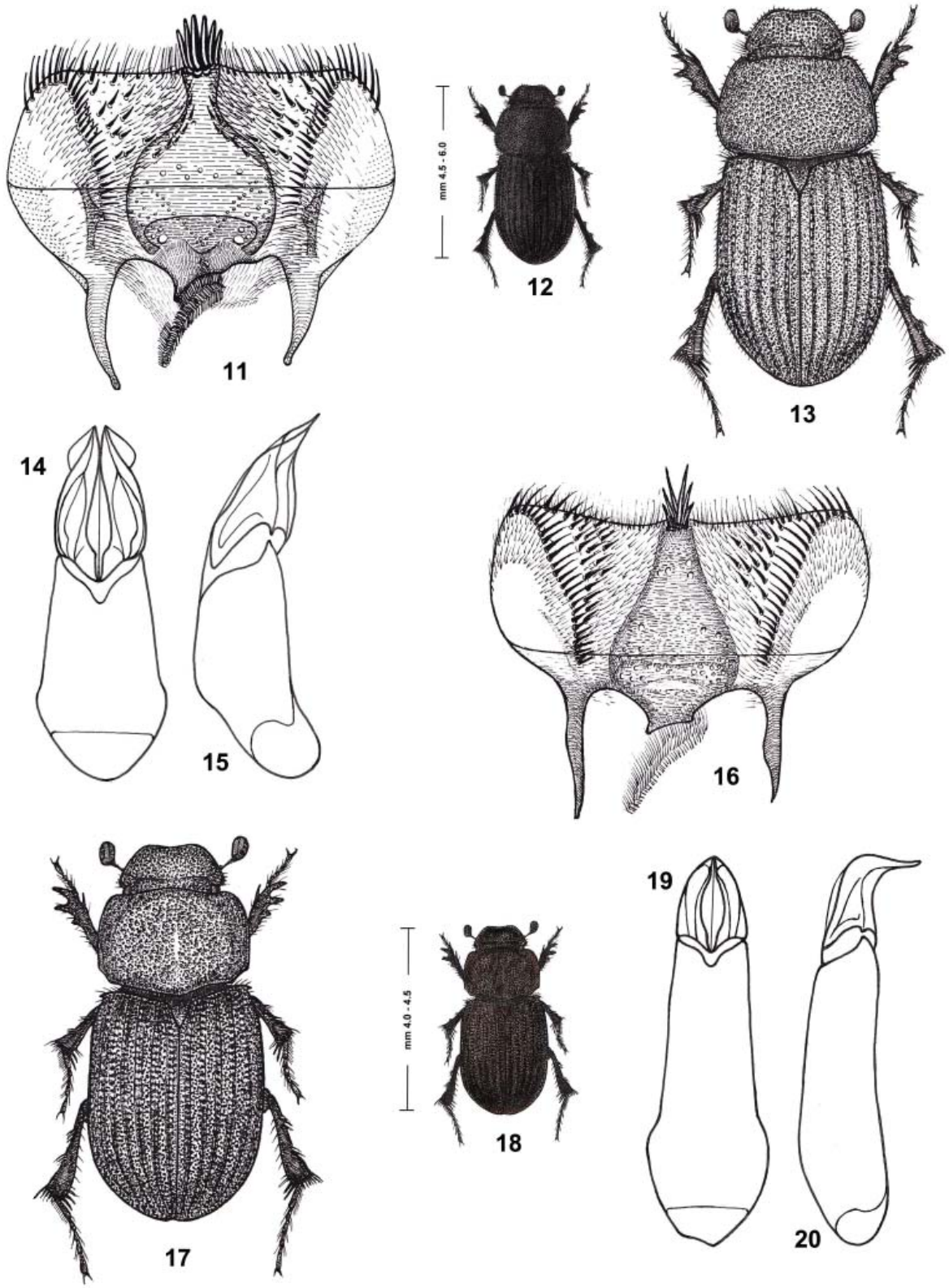
Description. Length 4.5–6.0 mm; oval-elongate, convex, subopaque; head almost glabrous, pronotum and elytra shortly densely pubescent. Blackish, clypeal margin shadowy brownish-red; legs dark brown; antennal club fuscous. Head with epistome slightly gibbous on disc, coarsely, densely, somewhat irregularly punctured; clypeus faintly sinuate at middle, round at sides, rather thickly bordered, edge slightly reflexed, shortly sparsely bristled; genae almost round, sparsely ciliate, feebly protruding from the eyes; frontal suture subcariniform, faintly gibbous medially and at sides; front coarsely, densely, somewhat irregularly punctured. Pronotum transverse, convex, simply, coarsely, very densely punctured; each carious and feebly umbilicate puncture with a short recumbent seta; lateral margins moderately arcuate, thickly bordered, edge very shortly sparsely bristled; hind angles broadly obtusely round; base almost regularly arcuate, rather thinly bordered. Scutellum excavate, coarsely punctured on basal half, punctures with short recumbent setae. Elytra elongate, moderately convex, feebly widened posteriorly, with epipleural carina very distinct at shoulder, shortly and rather sparsely bristled; deeply striate; striae, on disc, feebly crenulate, punctures rather close, slightly umbilicate, canaliculate and almost impunctate toward apex; interstices flat, coarsely, densely, evenly punctured, each puncture with short recumbent seta. Fore tibiae spur slender and acuminate in both sexes. Hind tibiae upper spur as long as first tarsal segment; latter as long as following two segments combined. Male: frontal suture relatively more raised; pronotum less convex and not narrowed anteriorly; metasternal plate concave and marginally pubescent; aedeagus Fig. 14–15. Female: frontal suture almost obsolete; pronotum relatively more convex and somewhat narrower anteriorly; metasternal plate almost flat, glabrous.

Type material. MEXICO: Veracruz: Cofre de Perote, 19°30'07.8"N-097°07'08.1"W, m 3169, 12.VII.2012, leg. Arriaga A. J., horse dung (1 paratype, DCGI); Los Laureles, 19°25'40"N-097°08'30"W, Ixhuacán de los Reyes, 08.XII.1999-10.II.2000, leg. Montes de Oca E. & Santiago Q., pitfall trap baited with cow dung (**holotype** male and 3 paratypes, DCGI, FSCA).

Distribution. Mexico (Veracruz).

Etymology. Named in honor of our friend and colleague Hans Fery, German dytiscidologist, for continuous supplying of literature hardly attainable.

Biology. The specimens of the type series were collected in horse dung or by pitfall traps baited with cow dung.



Figures 11–20. *Trichonotuloides hansferyi*, new species (Los Laureles, Ixhuacán de los Reyes, Veracruz, Mexico). **11)** Epipharynx. **12–13)** Habitus (length ideogram and morphological details). **14–15)** Aedeagus (dorsal and lateral views). *Trichonotuloides latecrenatus* (Bates, 1887) (Totonicapam, Guatemala). **16)** Epipharynx. **17–18)** Habitus (morphological details and length ideogram). **19–20)** Aedeagus (dorsal and lateral views).

***Trichonotuloides latecrenatus* (Bates, 1887)**
(Figures 16–20)

Aphodius latecrenatus Bates, 1887: 86; Blackwelder 1944: 212.
Aphodius (*Amidorus*) *latecrenatus*; Dellacasa, 1988: 150.
Aphodius (*Trichonotuloides*) *fossulatipennis* Balthasar 1945: 44; Dellacasa 1988: 258.
Trichonotuloides fossulatipennis; Dellacasa et al. 2001: 293; Dellacasa et al. 2002: 181 (lectotype designated and new synonymy).
Trichonotuloides latecrenatus; Dellacasa et al. 2002: 181; Skelley et al. 2007: 7.

Type locality. Totonicapam [Guatemala].

Type repository. Natural History Museum. London. (type examined).

Redescription. Length 4.0–4.5 mm, oblong-oval, moderately convex, subshiny; head glabrous, sides of pronotum and elytral interstices shortly pubescent. Dark brownish; clypeal margin, fore angles of pronotum and elytral apex ferrugineous; antennal club piceous; legs brown-reddish; inferior side brownish. Head rather large; epistome slightly gibbous at centre, somewhat depressed toward clypeal margin, distinctly and regularly punctured, punctation sparser on median gibbosity; clypeus feebly sinuate at middle, round at sides; genae obtusely round, shortly ciliate, distinctly protruding from the eyes; frontal suture somewhat raised, mutic; front regularly and coarsely punctured, punctation coarser than on epistome. Pronotum transverse, convex, dually, rather regularly and very densely and coarsely punctured; large punctures, three to four times larger than small, distinctly cariose and mainly on sides shortly piligerous, near base with a belt of larger contiguous and coarser punctures; lateral margins nearly straight, thickly bordered, edge glabrous, subsinuate before hind angles; latter obliquely truncate and inwardly sinuate; base feebly bisinuate, distinctly bordered. Scutellum basally and laterally coarsely punctured, toward apex subcarinate and smooth. Elytra oval-elongate, with distinct humeral denticle, broadly and deeply striate; striae almost as broad as interstices, strongly crenulate on disc, toward apex canaliculate and indistinctly punctured; interstices convex, densely, coarsely and rather irregularly punctured, toward apex punctures more superficial and somewhat confusedly confluent, quite densely and shortly pubescent. Fore tibiae spur slender and acuminate in both sexes. Hind tibiae upper spur distinctly shorter than first tarsal segment; latter as long as following three segments combined. Male: frontal suture relatively more distinct, somewhat raised; pronotum less convex and not narrowed anteriorly; metasternal plate spoon-shaped and shortly pubescent distally; aedeagus Fig. 19–20. Female: frontal suture almost obsolete; pronotum relatively more convex and somewhat narrower anteriorly; metasternal plate almost flat, nearly glabrous.

Material examined. GUATEMALA: Totonicapam, 85 – 10,500 ft., leg. Champion (lectotype and 4 paralectotypes, CNCI, MNHN, NHML). **MEXICO: Chiapas:** San Cristobal de las Casas, El Chivero dint., 16°40'27.1"N-092°30'23.1"W, m 2100, 03.VII.2002, leg. Dellacasa M. & Martínez I. (1 ex., DCGI).

Distribution. Guatemala, Mexico (Chiapas).

Biology. The sole Mexican specimen was collected in sheep dung in summer.

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