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Directeur de la publication, rédacteur, conception graphique et PAO:
Lionel Delaunay

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Classification, natural history, and evolution of the Korynetinae (Coleoptera: Cleridae). Part V. Taxonomy of the African genera *Avena* Opitz, *Dolichopsis* Gorham, *Notostenus* Spinola, and *Pectobullus* Opitz

WESTON OPITZ

Research Associate, Florida State Collection of Arthropods, Division of Plant Industry/Entomology, Florida Department of Agriculture and Consumer Services, 1911 SW 34th Street, Gainesville, FL 32614-7100, USA - opitz@kwu.edu
- ZooBank : http://zoobank.org/D67F4DA0-C173-4ED8-BCD7-94E5A3A1FF87

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Taxonomy ;
new species ;
South Africa ;
Angola ;
Zimbabwe ;
Namibia ;
Botswana ;
Congo.

Abstract. – The checkered beetle genera *Avena*, *Dolichopsis*, *Notostenus*, and *Pectobullus* comprise a monophyletic group. Their species composition involve *Avena coerulea* (Thunberg), *A. cyanella* (Gorham), *A. microplicata* Opitz **n. sp.**, *Dolichopsis haplocnemodes* Gorham, *D. bicoloripes* (Pic), *Notostenus viridis* (Thunberg), and *Pectobullus auronitens* (Gorham). These beetles are diurnal and frequent niches laden with sunlight. It is suggested that the wide tarsal soles in members of *Notostenus* and *Pectobullus* reflect predominant movement on smooth substrate such as broad leaved angiosperms. Moreover, it is speculated that the subrostrate head of *Dolichopsis* beetles relates to an anthophilous lifestyle. Provided is a hypothesis of generic level phylogeny generated by a computer program involving Winclada/Nona. It is postulated that the ancestor of these genera resided in montane forests of southern Africa. This work includes a key to the species, brief discussion of functional morphology and evolution, 14 electron micrographs, 7 figures of aedeagi, 1 computer generated phylogenetic tree, 2 distribution maps, and 7 habitus photographs.

Opitz W., 2019. – Classification, natural history, and evolution of the Korynetinae (Coleoptera: Cleridae). Part V. Taxonomy of the African genera *Avena* Opitz, *Dolichopsis* Gorham, *Notostenus* Spinola, and *Pectobullus* Opitz. *Faunitaxys*, 7(5) : 1 – 13.

ZooBank : http://zoobank.org/E8FC890D-2918-4DC5-B66E-57CB18820345

Introduction

This is the fifth contribution that strictly deals with the taxonomy of the checkered beetles of the subfamily Korynetinae (*sensu stricto*, Opitz 2010: 86). The work involves four African genera, *Avena* Opitz, *Dolichopsis* Gorham, *Notostenus* Spinola, and *Pectobullus* Opitz. Although considerably different in adult external morphology, the members of these genera form a monophyletic group; a hypothesis supported by seven synapotypic characteristics as depicted in Fig. 22. The fauna of African checkered beetles remains vastly understudied. It is hoped that this contribution will serve to stimulate naturalists to further inventory the checkered beetles of a most interesting and ecologically diverse African continent.

Materials and Methods

Adult morphological criteria were used to distinguish species, but I adhere to the biological species concepts as discussed by Standfuss (1896), Dobzhansky (1937), and Mayr (1963). The operational criteria for the delimitation of species involve morphologic structure and any other available criteria that suggest reproductive isolation among members of metapopulation lineages (de Queiroz, 2007). Experience with structural diversity provides comprehensive knowledge with which to hypothesize reproductive isolation. In this study, consideration for species status involves: shape of the head, shape of the pronotum, microsculpture of the pronotal disc, configuration of capitular antennomeres, and structure of the aedeagus. I follow the precepts of Hennig (1966) to investigate supraspecific relationships. Some phylogenetic terminology varies from that of Hennig in that I agree with Tuomikoski (1967) who advocates the use of “apotypic” and “plesiotypic” instead of “apomorphic” and “plesiomorphic” because phylogenetic work may not be restricted to morphological criteria.

Methods involving measurements and morphological terminology follow those described in Opitz (2010). Brown (1956) and Borror (1960) were used to formulate scientific names. Abbreviations used in this treatise are defined as follows:

– **EW/FW** = eye width (frontal view)/frons width (frontal view)

– **PW/PL** = pronotum width (across the middle) /pronotum length (midline from pronotum anterior margin to posterior margin)

– **EL/EW** = elytral length (from humeral angle to apex)/elytral width (greatest dorsal width of one elytron).

Measurements were made at 500X. Microscopic observations were made with a M5 Wild stereoscopic microscope with camera lucida attachment (Leica, Wetzlar, Germany). Habitus photographs were taken with a Leica Z 16 APO microscope equipped with JVC KY-F75U-CCD camera and controlled by Syncroscopy Auto Montage software (Cambridge, United Kingdom). The SEM micrographs were produced with a Scanning Electron Microscope-S-3500N (Hitachi Science Systems, Ltd., Tokyo, Japan). Image stacks, involving the aedeagus, were taken with a Leica® DM2500 compound scope with a 10X objective lens and a Leica® DFC425 camera

(Meyer Instruments, Houston, Texas, United states of America), and combined using Zerene Stacker®. To facilitate the identity of type specimens, I transcribed their locality information in the exact manner as found on labels. Historical literature, published prior to 1950, are not included in this work. They are cited in Corporaal's (1950) Catalogue of World Cleridae; post 1950 publications are included.

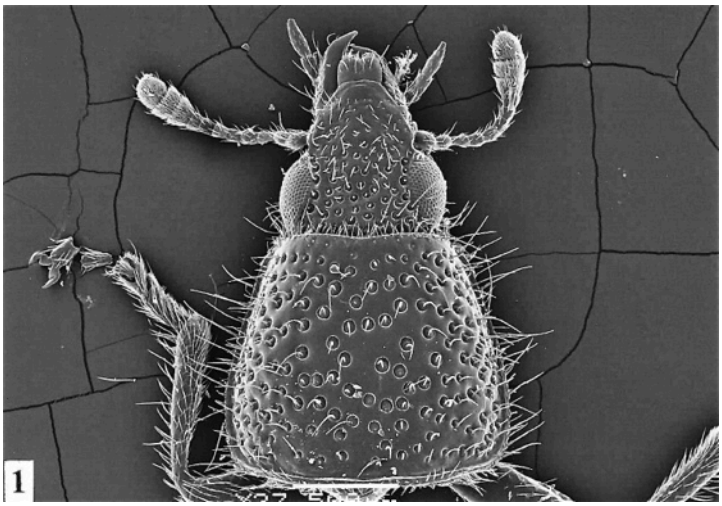
Evolutionary States of Characters

Twenty-two character states were organized into a matrix, which was then analyzed with NONA (Goloboff 2003) in combination with WINCLADA version 100.80 (Nixon 2002), to find the most parsimonious phylogenetic tree. The WINCLADA program produced one tree (Fig. 22) via heuristic analysis [Maximum trees (hold) = 100, number of replications 1 (mult) = 100, and multiple TBR = TBR (mult max) were used] (with indices as follows: L- 22, Ci- 100, Ri-100). The genus *Necrobia* Olivier (outgroup) and my general knowledge of other Clerinae genera were used to assist in predictions of the evolutionary states of characteristics. I relied on the methods of character-state analysis employed by Ekis (now Opitz) (1977), Watrous and Wheeler (1981), and Nixon and Carpenter (1993).

Character **0**	**Capitular antennomeres**	(0) not quadrate	(1) quadrate
Character **1**	**Metathoracic wing wedge cell**	(0) open	(1) closed
Character **2**	**Prointercoxal process**	(0) expanded distally	(1) not expanded distally
Character **3**	**Pronotal projections**	(0) long	(1) short (**Fig. 12**)
Character **4**	**Mandibular lamina**	(0) not present	(1) present (**Fig. 6**)
Character **5**	**Epipharyngeal plate**	(0) does not traverse tormal process	(1) traverses tormal process
Character **6**	**Elytral asetiferous punctures**	(0) striate	(1) not striate (**Fig. 7**)
Character **7**	**Pronotal hind angles**	(0) angular	(1) obtuse (**Fig. 1**)
Character **8**	**Elytral 2° setae**	(0) present	(1) not present (**Fig. 7**)
Character **9**	**Antennal scape**	(0) twice length of pedicel	(1) not twice length of pedicel
Character **10**	**Pronotal shape**	(0) not trapezoidal	(1) trapezoidal (**Fig. 1**)
Character **11**	**Furcal lamina**	(0) present	(1) not present
Character **12**	**Phallobasic rod shape**	(0) not cordate	(1) cordate (**Fig. 19**)
Character **13**	**Head shape**	(0) not subrostrate	(1) subrostrate (**Fig. 1**)
Character **14**	**Pronotal side margins**	(0) not serrate	(1) serrate
Character **15**	**Antennal scape shape**	(0) oblong	(1) global
Character **16**	**Tarsal soles**	(0) oblong	(1) triangular (**Fig. 9**)
Character **17**	**Phallobasic rod**	(0) not bifid	(1) bifid (**Fig. 21**)
Character **18**	**Furcal anterior plate**	(0) not acuminate	(1) acuminate
Character **19**	**Pronotum dorsum**	(0) convex	(1) flat
Character **20**	**Metasternum**	(0) without peg	(1) with peg (**Fig. 14**)
Character **21**	**Elytral epipleural margin**	(0) not serrate	(1) serrate (**Fig. 13**).

TAXA	**CHARACTERS**																					
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Necrobia	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avena	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0
Dolichopsis	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Notostenus	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Pectobullus	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1

Table 1. Character matrix of 22 adult morphological characters of *Necrobia* Olivier (outgroup) and *Avena* Opitz, *Dolichopsis* Gorham, *Notostenus* Spinola, and *Pectobullus* Opitz.



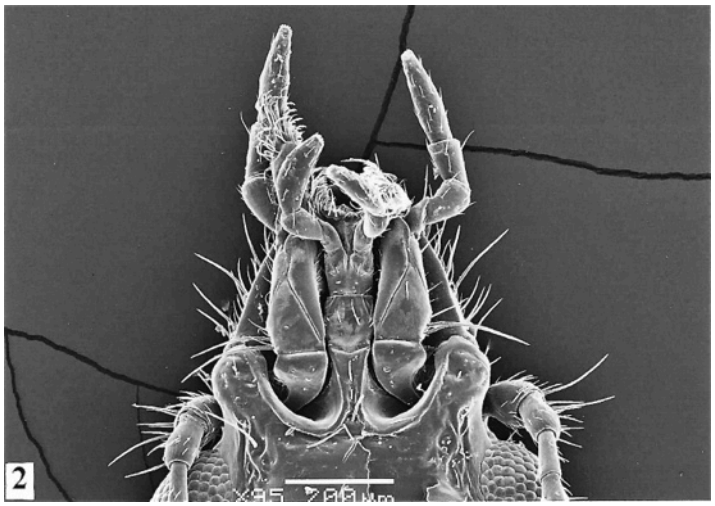
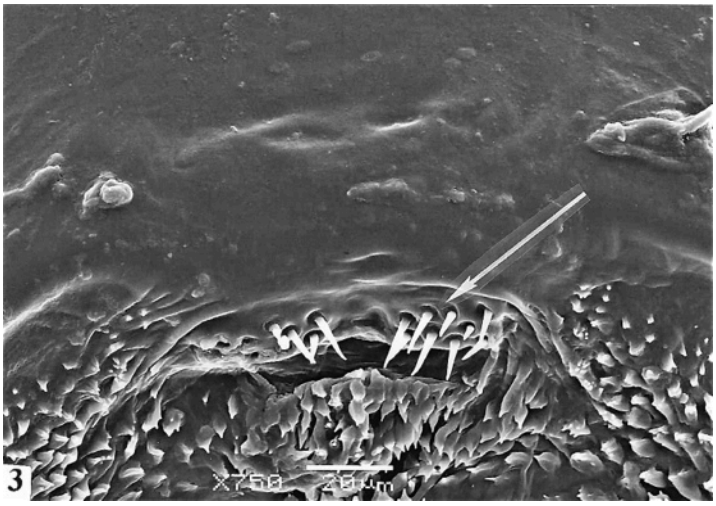


Fig. **1**-**2**. - Structures of *Dolichopsis haplocnemodes*. – **1**: Forebody (dorsal view). – **2**: Mouthparts.



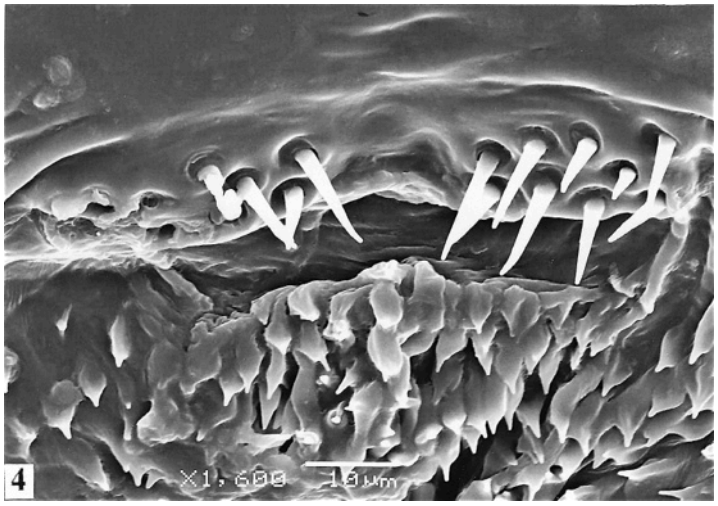
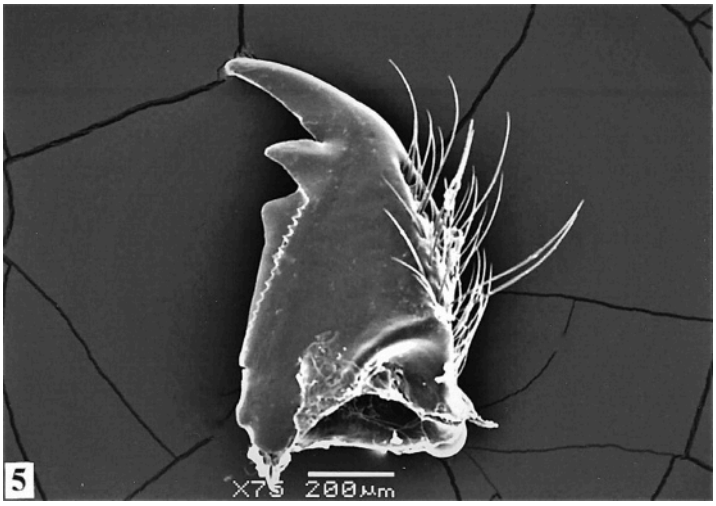


Fig. **3**-**4**. - Structures of *Dolichopsis haplocnemodes*. – **3**-**4**: Post-gular process.



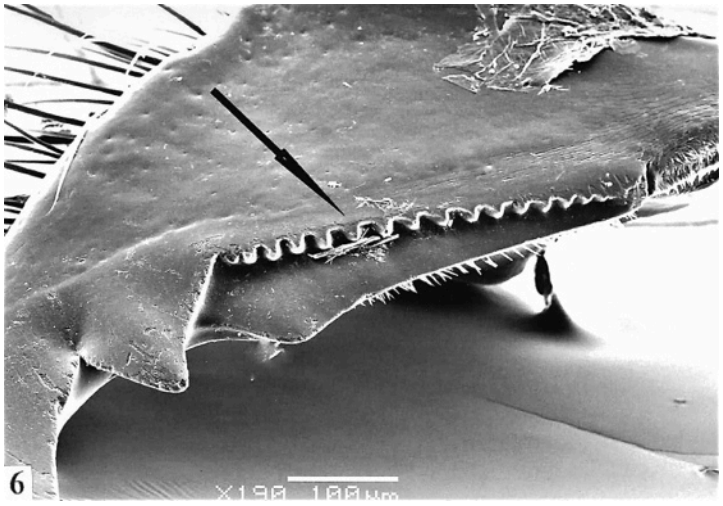


Fig. **5**-**6**. - Mandible of *Pectobullus auronitens*. – **5**: Entire mandible. – **6**: Focus on mandibular lamina.

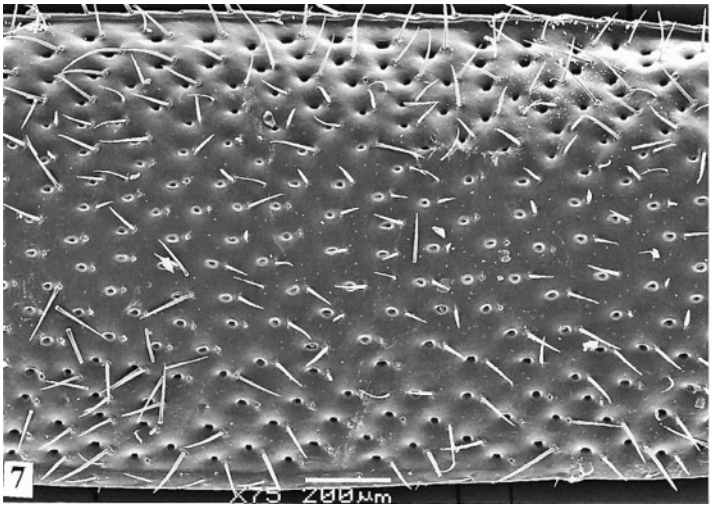


Fig. **7**-**8**. - Structures of *Dolichopsis haplocnemodes*. – **7**: Elytron (dorsal view). – **8**: Metatarsus.

Repository of Specimens

I use codens as noted in Arnett, Jr. et al. (1993) to indicate repositories of specimens, with some modifications to accommodate institutional name changes.

– **AMNH**: American Museum of Natural History, Department of Entomology, Central Park West at 79th Street, New York, New York 10024-5192, United States of America (Lee Herman; herman@amnh.org).

– **BMNH**: British Museum of Natural History, Department of Entomology, SW 5BD, London, United Kingdom (Beulah Garner; b.garner@nhm.ac.uk; Maxwell V. L. Barclay; m.barclay@nhm.ac.uk).

– **CMNC**: Canadian Museum of Nature, Insect Collection, Post Office Box 3443, Station D, Ottawa, Ontario, Canada K1P 6P4, Canada (Robert S. Anderson; randerson@mus-natur-ca. Francois Genier; fgenier@mus-natur.ca).

– **CMNH**: Carnegie Museum of Natural History, Invertebrate Zoology, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213, United States of America (Robert L. Davidson; davidson@clpgh.org; Robert Androw; androwr@carnegiemnh.org).

– **CNCI**: Agriculture-Food Canada, K.W. Neatby Building, 960 Carling Avenue, Ottawa, K1A OC6, Canada (Serge Laplante; serge.laplante@agr.gc.ca).

– **FMNH**: Field Museum of Natural History, Department of Entomology, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605, United States of America (Rebekah Baquiran; rshuman@fieldmuseum.org).

– **FSCA**: Florida State Collection of Arthropods, Division of Plant Industry/ Entomology, Doyle Connor Building, 1911 SW 34th Street, Florida Department of Agriculture, Gainesville, Florida 32608. United States of America (Paul E. Skelley; paul.skelley@freshfromflorida.com).

– **ISNB**: Institute royal des sciences naturelles de Belgique, Département d'Entomologie, Rue Vautier 29, B-1000 Bruxelles, Belgique (Wouter Dekoninck- naturalscience.be).

– **MNHN**: Museum d'Histoire Naturelle, Entomologie, 45 bis, Rue de Buffon, Paris (Ve), France (Antoine Mantilleri; amantill@mnhn.fr).

– **MRAC**: Royal Museum for Central Africa, Department of Entomology, Leuvensesteenweg 13, B-3080, Tervuren, Belgium (Marc De Meyer; marc.de.meyer@africamuseum.be).

– **NHMB**: Naturhistorisches Museum Basel, Augustinergasse 2, Postfach 1048, CH 4001 Basel, Switzerland (Michel Brancucci; Michel.brancucci@bs.ch).

– **OXUM**: Oxford University Museum of Natural History, Hope Entomological Collections, Parks Road, Oxford, OX1 3 P W, Unites Kingdom (Amoret Spooner; amoret.spooner@oum.ox.ac.uk).

– **RGCM**: Roland Gerstmeier Collection, Technische Universität München, Lehrstuhl für Zoologie AG Entomologie, Hans-Carl-von-Carlowitz-Platz 2 85354 Freising, Germany (gerstmei@wzw.tum.de).

– **RMNH**: Naturalis Biodiversity Center, Vondellaan 55, 2332 AA, Leiden, The Netherlands (Hans Huijbregts; hens.huijbregts@naturalis.nl).

– **SAMC**: Izico South African Museum, Terrestrial Invertebrates, PO Box 61, Cape Town, The Republic of South Africa (Margie Cochrane; mcochrane@izico.org.za).

– **TMSA**: Transvaal Museum, 01 Paul Kruger Street, P. O. Box 413, 0001 Pretoria, Republic of South Africa (Ruth Müller; muller@nfi.co.za).

– **UCMS**: University of Connecticut, Department of Ecology and Evolutionary Biology, 75 North Eagleville Road, Storrs, Connecticut 06269-3043 (Jane O'Donnell; janeodonnell@uconn.edu).

– **UGCA**: University of Georgia Athens, Collection of Arthropods, Georgia Museum of Natural History, Natural History Building, Athens, Georgia 30602-7882 (E. Richard Hoebeke; rhoebeke@uga.edu).

– **USNM**: United States Department of Agriculture. Systematic Entomology Laboratory, c/o National Museum of Natural History MRC 168, Washington, D.C. 20560-0165, United States of America (Floyd Shockley; ShockleyF@si.edu).

– **UZIU**: Uppsala University, Museum of Evolution- Zoology, Norbyvägen 16, SE-752 36 Uppsala, Sweeden (Hans Mejlon; Hans.Mejlon@evolmuseum.uu.se).

– **WOPC**: Weston Opitz Collection, Research Associate, Florida State Collection of Arthropods, Division of Plant Industry/Entomology, Florida Department of Agriculture and Consumer services, 1911 SW 34th Street, Gainesville, Florida 32614-7100, United States of America (opitz@kwu.edu).

Taxonomy

Avena Opitz, 2011: 35

ZooBank : http://zoobank.org/3E46FF51-414F-4A49-B040-31E85BAB4EBF

Type species. – *Dolichopsis cyanella* Gorham, 1878: 155.

Diagnosis. – The members of this genus show a globular antennal scape and the pronotal side margins are serrate.

Description. – *Avena* was adequately described and illustrated by Opitz (2011: 35).

Key to Species of *Avena*, *Dolichopsis*, *Notostenus*, and *Pectobullus*

1. Pronotal disc plane (South Africa) ..... ***Notostenus viridis*** (Thunberg) (Fig. 30)
— Pronotum convex **2**

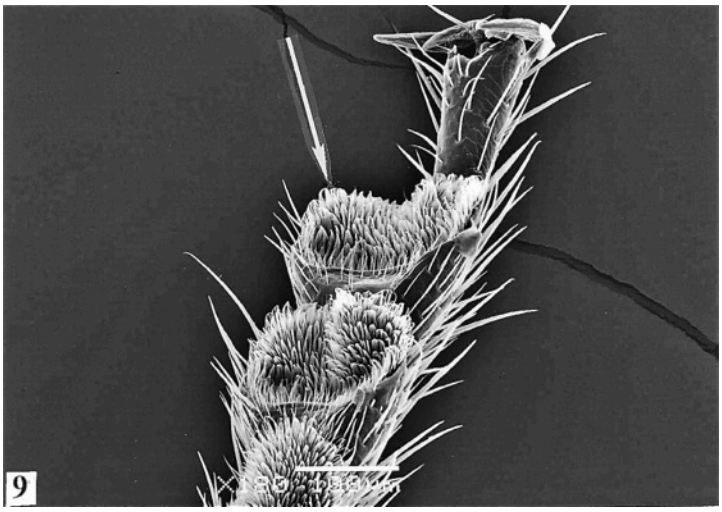
2. Pronotum quadrate; elytra viridescent, legs yellow (South Africa, Zimbabwe, Namibia, Botswana, Democratic Republic of the Congo) ..... ***Pectobullus auronitens*** (Goham) (Fig. 27)
— Pronotum trapezoidal, elytra aeneous, legs black **3**

3. Pronotal disc sculptured with minute folds (Angola) ..... ***Avena microplicata*** Opitz **n. sp.** (Fig. 27)
— Pronotal disc without minute folds **4**

4. Tibiae yellow (Democratic Republic of the Congo, Belgian Congo) ..... ***Dolichopsis bicoloripes*** (Pic) (Fig. 28)
— Tibia black **5**

5. Frons extended, head narrow triangular (South Africa) ..... ***Dolichopsis haplocnemodes*** Gorham (Fig. 29)
— Frons not extended, head broad triangular **6**

6. Interstitial spaces of the pronotum disc narrower than width of the pronotal punctures; antennomeres 6-8 infuscated; serrations on pronotal side margins very prominent (South Africa) ..... ***Avena cyanella*** (Gorham) (Fig. 25)
— Interstitial spaces of the pronotum disc as wide or wider than width of pronotal punctures; antennomeres 6-8 not infuscated; serrations on pronotal side margins not very prominent (South Africa) ..... ***Avena coerulea*** (Thunberg) (Fig. 2)



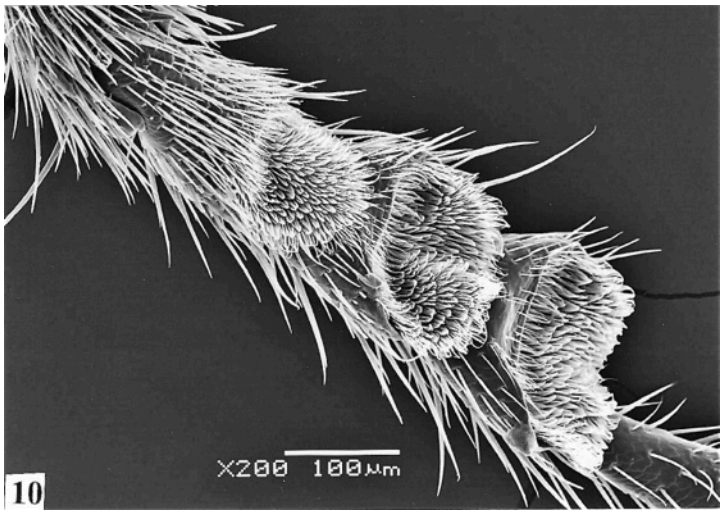
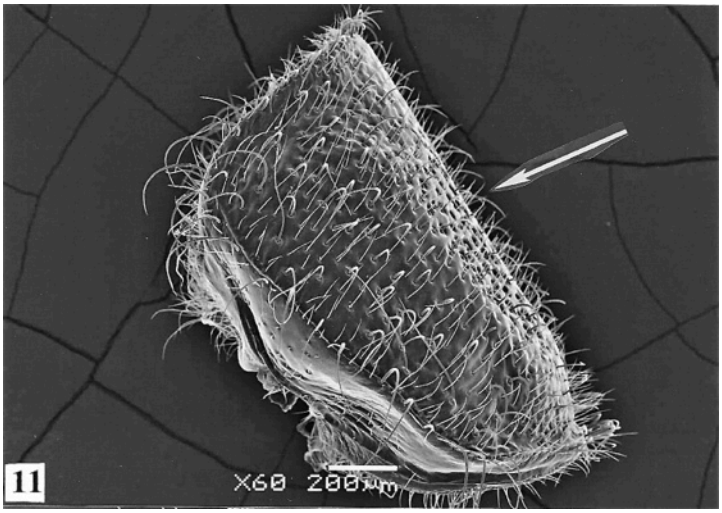


Fig. **9-10**. - Metatarsus of *Pectobullus auronitens*.



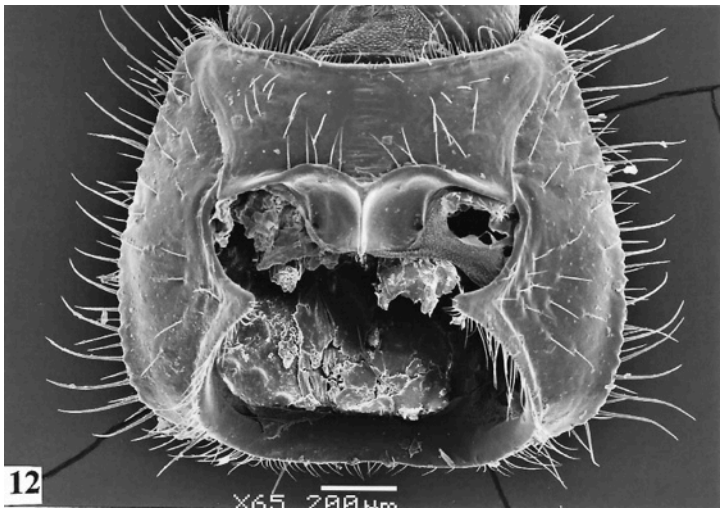
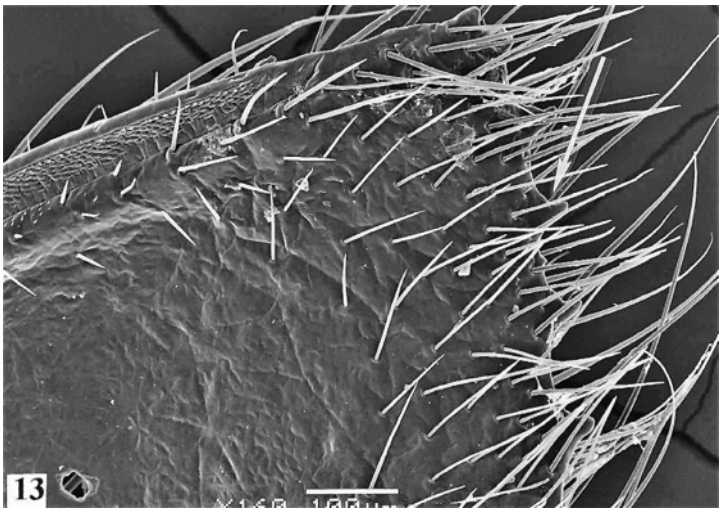


Fig. **11-12**. - Prothorax. – **11**: *Notostenus viridis* (lateral view). – **12**: *Dolichopsis haplocnemodes* (ventral view).



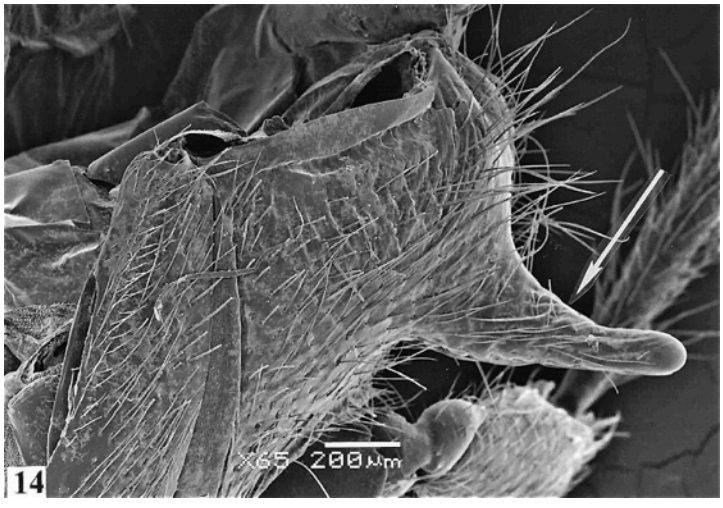


Fig. **13-14**. - Structures of *Pectobullus auronitens*. – **13**: Focus on serrations of elytral apex. – **14**: Focus on metasternal peg.

Avena coerulea (Thunberg, 1781: 10) **New combination**

(Fig. 16, 23, 26)

Lectotype. – Gender not determined. Type locality: South Africa, Cape of Good Hope (UZIU). Corporaal, 1950: 301 (*Notostenus*).

Synonym. – *Corynetes thunbergii* Klug, 1842: 354.

Diagnosis. – The interstitial spaces of the pronotal disc are as wide or wider than the width of the pronotal punctures. This characteristic will distinguish the members of this species from superficially similar members of *A. cyanella* (Gorham).

Description

Size. – Length 6.0 mm. – Width 1.8 mm.

Form (Fig. 26).

Color. – Mostly cyaneous; *mouthparts*, *antennal capitulum* and *legs* black; antennal fundus testaceous.

Head. – *Cranium* coarsely sculptured; antenna capitate, funicular antennomeres filiform, capitulum not compact; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 4 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 15/40).

Thorax. – *Pronotum* transverse (PW/PL 95/70), side margins minutely serrate, disc coarsely punctate, interstitial spaces as wide or wider than width of pronotal punctures, posterior margin slightly wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures (EL/EW 230/55).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 16), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod diamond-shaped; phallic plates wide; phallic apex triangular.

Variations. – Elytral color varies from cyaneous to aeneous.

Natural History. – Specimens were collected from South Africa during January, February, March, August, and October, some at light and some at 1,768 m.

Distribution (Fig. 23). – In addition to the lectotype, I examined 8 specimens from:

South Africa:

– Natal, Giants Castle Park, 6-III-1968, 5,800 feet, T. Schuh, J. A. & S. Slater, M. Sweet.

– Cape Province, Tulbash, ?-?-1902, Lightfoot.

– East Cape Province, Katberg, 19-26-II-1933, R. E. Turner.

– King Williams Town, Cape Province, 3-5-X-1971, at light, E. Greenwood.

– Capetown, ?-I-1951, A. J. Duke.

Specimens are deposited in: BMNH, CNCI, RGCM, UCMS, and WOPC.

Notes. – The lectotype was examined, but the description is based on a homotype specimen.

Avena cyanella (Gorham, 1878: 155)

(Fig. 15, 23, 25)

Lectotype. – ♀. Type locality: South Africa, Cape of Good Hope (BMNH). Corporaal, 1950: 301 (*Dolichopsis*).

Diagnosis. – The interstitial spaces of the pronotal disc are narrower than the width of the pronotal punctures. This characteristic will distinguish the members of this species from superficially similar members of *A. coerulea* (Thunberg). Also, the serrations on the side margins of the pronotum are more pronounced in the members of this species.

Description

Size. – Length 6.0 mm. – Width 1.8 mm.

Form (Fig. 25).

Color. – Mostly cyaneous; *mouthparts*, *antennal capitulum* and *legs* black; antennal fundus testaceous.

Head. – *Cranium* coarsely sculptured; antenna capitate, funicular antennomeres filiform, capitulum not compact; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 5 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 10/35).

Thorax. – *Pronotum* transverse (PW/PL 85/60), side margins serrate, disc coarsely punctured, interstitial spaces narrower than width of punctures, posterior margin much wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures (EL/EW 225/55).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 15), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod digitiform; phallic plates narrow; phallic apex triangular.

Variations. – Except for slight variations in body size, the available specimens are quite homogeneous.

Natural History. – Specimens were collected from South Africa during October, some at light, and some at 1,250 m.

Distribution (Fig. 23). – In addition to the lectotype, I examined 16 specimens from:

South Africa:

– Cape Town, ?-?-1886, F. C. Purull.

– Cape Town Province, King Williams Town, 3-5-X-1971, at light, E. Greenwood.

– Tulbagh, ?-?-1902, Lightfoot; Cape Town, collection date not noted, D. Purcell.

– SW Cape, Mount Hawaquas, 27-X-1978, 1,250 m, Endrödy-Younga.

– Cape Province, Capetown, 21-X-2000, M. S. Blum.

Specimens are deposited in: BMNH, CNCI, ISNB, MNHN, SAMC, TMSA, UGCA, and WOPC.

Avena microplicata Opitz **n**. **sp**.

(Fig. 17, 23, 27)

ZooBank : http://zoobank.org/0C767EE7-CF52-43A9-8BD6-131FACCD5DF7

Holotype. – ♂. Type locality: ANGOLA (A 40), Tundavala, 8-10 mls. NW. Sa da Bandeira, 27-29.III.1972. A second label reads: Southern African Exp. B. M. 1972-1 (BMNH).

Diagnosis. – The minute folds on the pronotum disc will distinguish the members of this species from congeners.

Description

Size. – Length 6.2 mm. – Width 1.7 mm.

Form (Fig. 27).

Color. – Mostly cyaneous; *mouthparts*, *antennal capitulum* and *legs* black; antennal fundus testaceous.

Head. – *Cranium* coarsely sculptured; antenna capitate, funicular antennomeres filiform, capitulum not compact; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 3 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 15/45).

Thorax. – *Pronotum* transverse (PW/PL 100/80), side margins slightly serrate, disc sculptured with minute folds, posterior margin much wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny, width of interstitial spaces variable (EL/EW 260/55).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 17), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod slightly expanded at posterior limit; phallic plates wide; phallic apex large-triangular.

Natural History. – The holotype was collected in March.

Distribution (Fig. 23). – This species is known from Angola.

Etymology. – The specific epithet, *microplicata*, is a compound name that stems from the Greek *micros* (= little) and the Latin *plico* (= fold). I refer to the tiny folds on the pronotal disc.

Dolichopsis Gorham, 1878: 154

Type species. – *Dolichopsis haplocnemodes* Gorham, 1878: 155.

Diagnosis. – The specimens of this genus show a subrostrate head, absence of furcal lamina, and cordate phallobasic rod. These characteristics will distinguish *Dolochopsis* specimens from those of *Avena*, *Notostenus*, and *Pectobullus*.

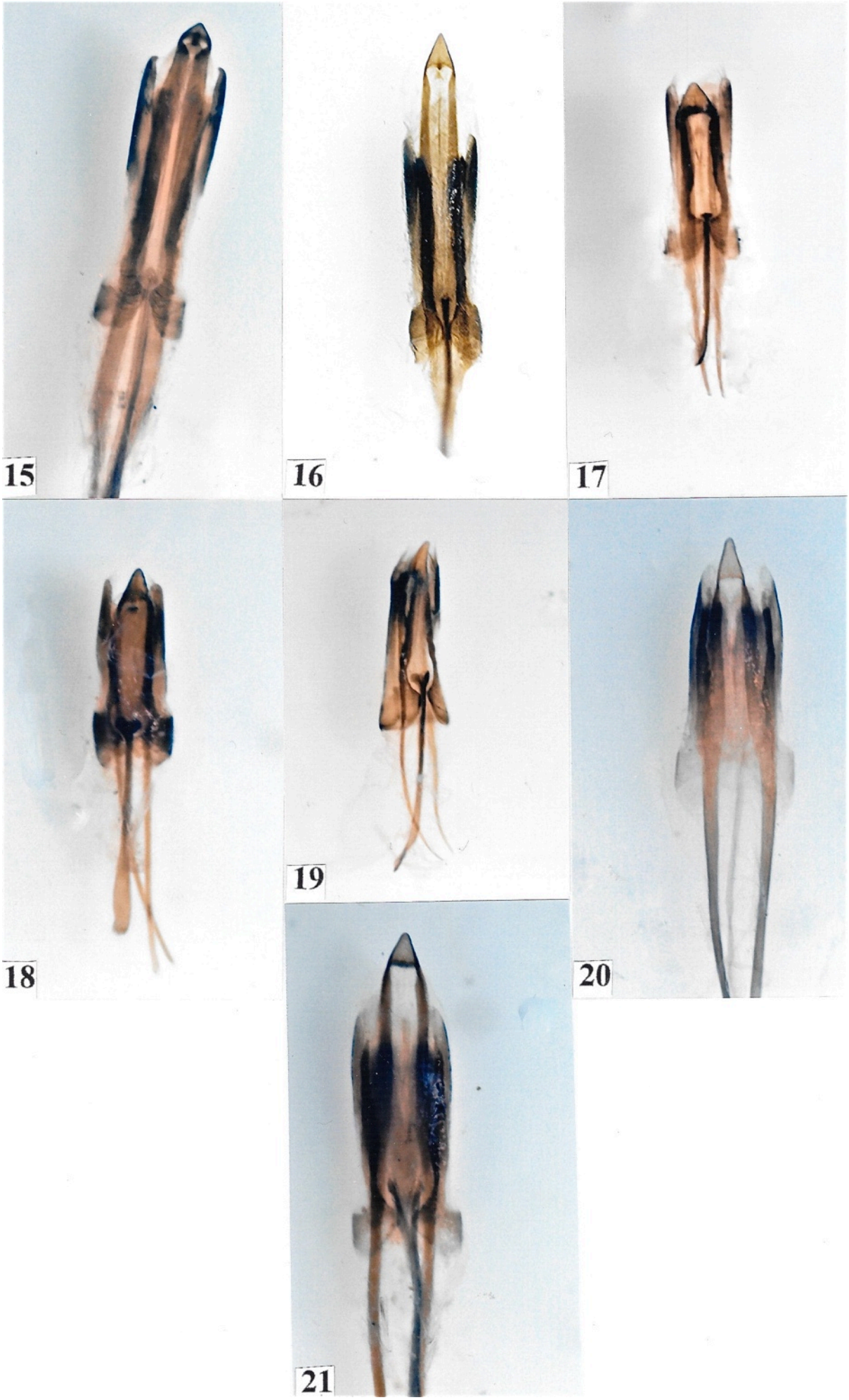


Fig. **15-21**. - Aedegi. – **15**: *Avena cyanella*. – **16**: *A. coerulea*. – **17**: *A. microplicata* **n**. **sp**. – **18**: *Dolichopsis bicoloripes*. – **19**: *Dolichopsis haplocnemodes*. – **20**: *Notostenus viridis*. – **21**: *Pectobullus auronitens*.

Description. – *Dolichopsis* was adequately described and illustrated by Opitz (2011: 38).

Dolichopsis haplocnemodes Gorham, 1878: 155

(Fig. 1-4, 7, 8, 12, 19, 24, 29)

Holotype. – Gender not determined. Type locality: Prom. Bon. Spei (= Cape of Good Hope, South Africa (BMNH). Corporaal, 1950: 301.

Diagnosis. – The triangular forebody is the characteristic that will distinguish the members of this species from those of congeners.

Description

Size. – Length 6.5 mm. – Width 1.7 mm.

Form (Fig. 29).

Color. – Body and legs cyaneous; *mouthparts*, black; *antennal fundus* testaceous, antennal capitulum and tarsi black.

Head. – *Cranium* projected to render head triangular, coarsely sculptured; post-gular process as in Figs. 3 and 4); antenna capitate, funicular antennomeres filiform, capitulum compact; maxillary and labial terminal palpomeres digitiform (Fig. 2), maxillary terminal palpomere about 3 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 10/30).

Thorax. – *Pronotum* trapezoidal (PW/PL 90/60), disc coarsely punctate, side margins not serrate, width of interstitial spaces variable, posterior margin much wider than width of anterior margin; *furcal lamina* absent. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures (EL/EW 280/60); metatarsus as in Fig. 8.

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 19), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod cordate; phallic plates wide; phallic apex long triangular.

Variations. – Except for body size, the available specimens are quite homogeneous.

Natural History. – Specimens were collected from South Africa during November, December, and January; one at 1,342 m.

Distribution (Fig. 24). – In addition to the holotype, I examined 25 specimens from:

South Africa:

– Natal, Krantzkop, collection date and collector not noted.

– Transvaal, 10 km NE Thabezimbi, 24-25-XI-1984, A. & A. Howden.

– Pretoria, ?-XII-1903, 4,400 feet, R. Crawshay.

– Transvaal, Rhenosterpoort, 1-XII-1979, L. Schulze.

– Transvaal, Irene, Smut's Farm, 10-I-1968, J. A. & S. Slatter, M. Sweet.

– Cape Town, ?-?-1886, F. C. Purull.

Specimens are deposited in: CMNC, CMNH, FSCA, ISNB, MRAC, NHMB, TMSA, UCMS, and WOPC.

Notes. – The holotype was examined, but the description is based on a homotype specimen.

Dolichopsis bicoloripes (Pic), 1932: 8

(Fig. 18, 24, 28)

Holotype. – Gender not determined. Type locality: Lomami: Kamina,-1930, R. Massart (MRAC). Corporaal, 1950: 301 (*Notostenus*).

Diagnosis. – The forebody is cupreous, the elytra viridescent, and the tibiae and tarsi are testaceous; these characteristics will distinguish the members of this species from congeners.

Description

Size. – Length 8.5 mm. – Width 2.0 mm.

Form (Fig. 28).

Color. – *Forebody* cupreous; *elytra* viridescent; *legs* bicolorous, tibiae and tarsi testaceous, femora black; antennal capitulum black, antennal fundus testaceous; mouthparts black.

Head. – *Cranium* finely sculptured; antenna capitate, funicular antennomeres filiform, capitulum compact; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 3 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 15/55).

Thorax. – *Pronotum* quadrate (PW/PL 100/100), disc coarsely punctate, side margins not serrate, width of interstitial spaces variable, posterior margin not wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures (EL/EW 340/65).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 18), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod cordate; phallic plates wide; phallic apex long triangular.

Variations. – Except for body size, the available specimens are quite homogeneous.

Natural History. – Specimens were collected from the Democratic Republic of the Congo during March through June, and during November.

Distribution (Fig. 24). – In addition to the holotype, I examined 30 specimens from:

Democratic Republic of the Congo:

– Lomami-Kaniama, ?-III-VI-1932, R. Massart.

– Mayidi, ?-?-1942, P. Van Eyen; Elisabethville, 25-30-XI-1930, R. Massart.

Belgian Congo:

– Katanga Kinda, ?-?-1926, F. G. Overlaet.

– Katanga, Kinda, collection date not noted, Don J. Muller.

Specimens are deposited in: ISNB, MNHN, TMSA, and WOPC.

Notostenus Dejean, 1837: 127

Type species. – *Anobium viride* Thunberg, 1781: 9.

Diagnosis. – The specimens of this genus show a flattened pronotal disc, a characteristic that will distinguish them from members of *Avena*, *Dolichopsis*, and *Pectobullus*.

Description. – *Notostenus* was adequately described and illustrated by Opitz (2011: 52).

Notostenus viridis (Thunberg, 1781: 9)

(Fig. 11, 20, 24, 30)

Lectotype. – ♀. Type locality: South Africa, Cape Colony (UZIU). Corporaal, 1950: 301.

Synonym. – *Clerus rufipes* Weber, 1801: 46.

Diagnosis. – The flattened pronotal disc is the characteristic that will distinguish the members of this species them from members of *Avena*, *Dolichopsis*, and *Pectobullus*.

Description

Size. – Length 9.5 mm. – Width 2.2 mm.

Form (Fig. 30).

Color. – Body cyaneous; *mouthparts*, *antennal fundus* and *legs* testaceous, except antennal capitulum, labrum, mandibles, maxillary and labial palpi, and tarsi black.

Head. – *Cranium* coarsely sculptured; antenna capitate, funicular antennomeres filiform, capitulum not compact; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 3 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 18/63).

Thorax. – *Pronotum* transverse (PW/PL 140/110), disc flat, side margins not serrate, disc coarsely punctured, interstitial spaces narrower than width of punctures, posterior margin slightly wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures (EL/EW 400/80).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 20), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod bifid; phallic plates wide; phallic apex long triangular.

Variations. – Elytral color varies from cyaneous to aeneous.

Natural History. – Specimens were collected from South Africa during January, February, March, August, and October, some at light, and some at 1,768 m.

Distribution (Fig. 24). – In addition to the lectotype, I examined 17 specimens from:

South Africa:

– Capetown, ?-XI-XII-1969, Besnard.

– Cape of Good Hope, Cape Alfred, 1-I-1898, CleDeux.

– Stellenbosch, ?-XI-1887, L. Peringuey.

– Clanwilligam District, ?-VII-1958.

– Garhams't, 15-VI-1912, CleDeux.

– *idem*, 12-V-1898, CleDeux.

– Capland, no other information available.

Specimens are deposited in: MRAC, NMNH, USNM, and WOPC.

Notes. – The lectotype was examined, but the description is based on a homotype specimen.

Pectobullus Opitz, 2011: 55

ZooBank : http://zoobank.org/F29BB96D-D17F-41BA-A6BE-6650BEA3DFBF

Type species. – *Dolichopsis auronitens* Gorham, 1900: 74.

Diagnosis. – The male members of this genus are easily identified by showing a metathoracic ventral peg (Fig. 14). Deep body, metallic green color, and copious white vestiture will identify the females of this genus.

Description. – *Notostenus* was adequately described and illustrated by Opitz (2011: 55).

Pectobullus auronitens (Gorham), 1900: 74

(Fig. 5, 6, 9, 10, 13, 14, 21, 23, 31)

Holotype. – Gender not determined. Type locality: Natal (BMNH). Corporaal, 1950: 301 (*Dolichopsis*).

Diagnosis. – The male members of this species are easily identified by showing a metathoracic ventral peg (Fig. 14). Deep body, metallic green color, brief portion of serration on the distal limits of the epipleural margin (Fig. 13), and copious white vestiture will identify the females of this species.

Description

Size. – Length 8.0 mm. – Width 3.0 mm.

Form (Fig. 31).

Color. – Body metallic viridescent; *mouthparts*, antennae, and *legs* testaceous, except labrum, mandibles, maxillary and labial palpi brown.

Head. – *Cranium* finely punctated; antenna capitate, funicular antennomeres filiform, capitulum not compact; mandible as in Figs. 5 and 6; maxillary and labial terminal palpomeres digitiform, maxillary terminal palpomere about 3 X longer than wide; eyes very small, much narrower than width of frons (EW/FW 20/60).

Thorax. – *Pronotum* quadrate (PW/PL 130/130), disc very convex, coarsely punctate, side margins not serrate, width of interstitial spaces variable, posterior margin slightly wider than width of anterior margin. – *Elytra* with asetiferous punctures profusely distributed throughout disc, interstitial spaces smooth and shiny and narrower than width of punctures; metatarsus as in Figs. 9 and 10; posterior 1/4th of epipleural margin serrate (Fig. 13) (EL/EW 310/80).

Abdomen. – *Pygidium* scutiform, about as wide as long. – *Aedeagus* (Fig. 21), with 2 phallobasic lobes that are not fimbriate, phallobase narrowed in basal 1/3rd; phallobasic rod bifid; phallic plates wide; phallic apex long triangular.

Variations. – The body is more cupreous in one specimen from Mashonaland, Zimbabwe.

Natural History. – Specimens were collected from: Zimbabwe during December, at 1,524 m; from Namibia during December through March; from Botswana during January; and from the Democratic Republic of the Congo during February, at 1,750 m.

Distribution (Fig. 23). – In addition to the lectotype, I examined 27 specimens from:

Zimbabwe:

– Mashonaland, Salisbury, ? XII-1904, 5,000 feet.

– Africa, River Zambezi, ?-?-1878, Bradshaw.

Namibia:

– Khomas Highlands, 30 miles W Windhoek, ?-II-1958, C. Koch. Windhoek Regenstein, 7-III-1975, Endrödy-Younga.

– Damaraland, ?-XII-1951, G. Hobohm; Tsumkwe, Kungveld, ?-I-1958, C. Koch.

Botswana:

– Bechuanaland, Kalahari, 20-I-1935, G. Tenison.

Democratic Republic of the Congo:

– Katanga, Kundelungu, 6-II-1950, 1,750 m, N. Leleup.

Specimens are deposited in: AMNH, BMNH, CMNH, OXUM, MRAC, RMNH, TMSA, USNM, and WOPC.

Notes. – The lectotype was examined, but the description is based on a homotype specimen.

Discussion

This study is based on relatively few specimens. Moreover, those that are available were collected in the southern African environs during times when it was not part of the custom to detail ecological data on specimen labels. Therefore, any discussion of natural history, evolution, and zoogeography must be considered tentative. Such discussions, however tentative, may encourage future availability of ecological information and, in terms of distributional data, they may encourage future collecting efforts that will extend into more northern African regions.

All of the available specimens were collected south of the Sahara. The brilliance of the body dorsum (all species), broad tarsal soles (*Notostenus* and *Pectobullus*), and subrostral head (*Dolichopsis*) suggests a niche existence that involves open sun light, broad leaved vegetation, and an anthophilic lifestyle. The

metallic color, if it has an adaptive advantage, would suggest that these beetles frequent niches in which there is ample sunlight, to amplify the brilliance of the body dorsum. It is no accident that lignicolous checkered beetles that frequent the dark galleries of wood borers are never metallic and are usually quite dull in color. The extra width of the tarsal soles in members of *Notostenu*s and *Pectobullus* suggests an existence on smooth substrate such as broad leaved angiosperms. Fast-moving checkered beetles that frequent rough bark surface show tarsal soles that are slender and reduced in size. Lastly, there is little doubt that a subrostral head structure, found in members of *Dolichopsis*, is related to crevice or nectar feeding. It has been observed that checkered beetles with a subrostrate head, such as the members of *Trichodes* and *Eleale*, are involved in nectar feeding amidst an anthophilous lifestyle (Foster, 1976: 64; Opitz, 2002: 244).

Phylogenetic Interpretations

Current distributional records suggest that the ancestor of the monophyletic group of genera under study existed in montane forests of southern Africa. Among the available specimens, we find collection sites involving montane altitudes of 1,250, 1,342, 1,524, and 1,768 m. I posit that the ancestor in question (ancestor A, Fig. 22) was characterized as follows: mandible with lamina, epipharyngeal plate traverses tormal process, pronotal hind angle obtuse, pronotal projections short, prointercoxal process linear, elytral asetiferous punctures not striate, and wedge cell of metathoracic wing closed. Ancestor A diverged to evolve ancestral species B and C. Ancestor B produced the genus *Notostenus* whose descendant attained a flattened pronotum. Progenitor B also gave rise to the genus *Pectobulus* characterized by a serrate epipleural margin and the sex-dimorphic metasternal peg. Ancestral species C gave rise to the three species of *Avena*, in which the furca lost its lamina and the scape became globular. Finally, ancestor C also produced two species of *Dolichopsis*, which are characterized by having a variable degree of serration on the pronotal outer margins, the head became subrostrate, and the phallobasic rod took on a cordate shape.

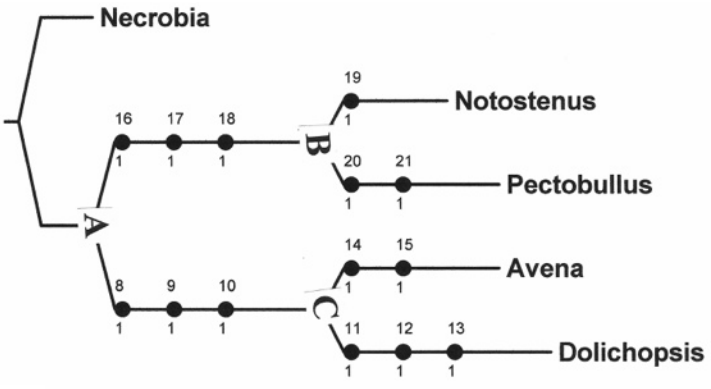


Fig. **22**. - Computer generated phylogenetic tree.

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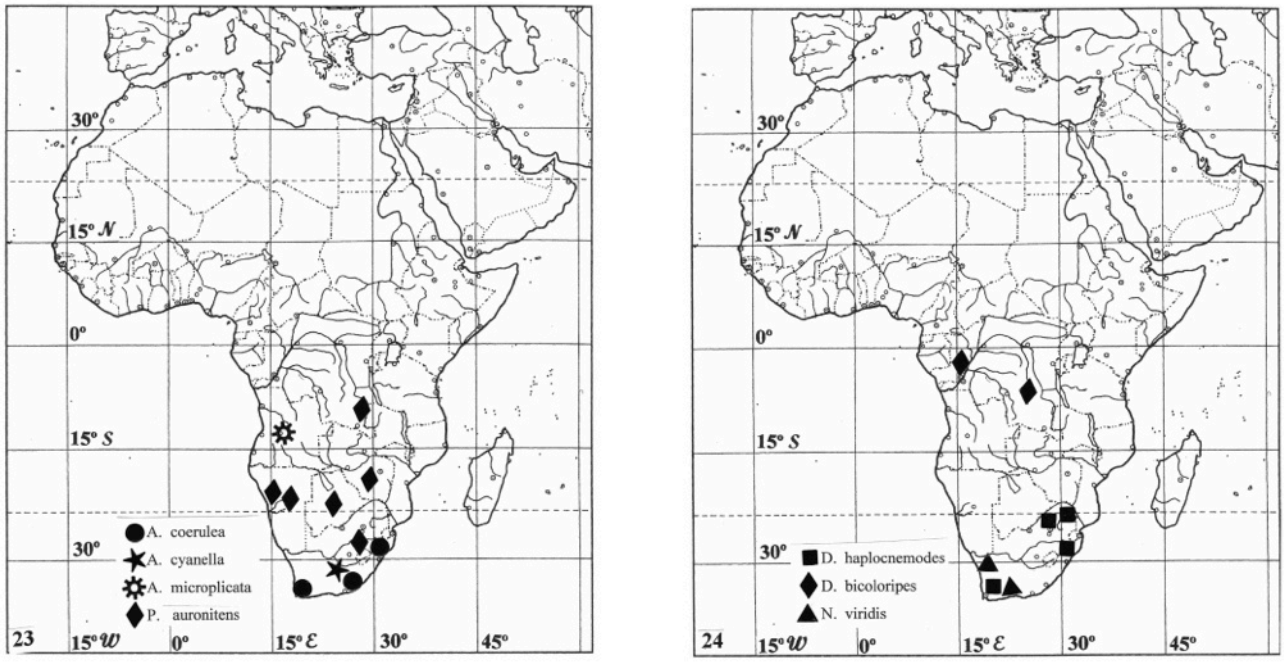

Fig. **23**-**24**. - Approximate distribution of species as noted.

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Résumé

Opitz W., 2019. – Systématique, biologie, et évolution des Korynetinae (Coleoptera: Cleridae). Partie V. Taxonomie des genres africains *Avena* Opitz, *Dolichopsis* Gorham, *Notostenus* Spinola, et *Pectobullus* Opitz. *Faunitaxys*, 7(5) : 1 – 13.

Les Clairons des genres *Avena*, *Dolichopsis*, *Notostenus* et *Pectobullus* constituent un groupe monophylétique. Leur composition en espèces comprend *Avena coerulea* (Thunberg), *A. cyanella* (Gorham), *A. microplicata* Opitz **n**. **sp**., *Dolichopsis haplocnemodes* Gorham, *D. bicoloripes* (Pic), *Notostenus viridis* (Thunberg) et *Pectobullus auronitens* (Gorham). Ces coléoptères diurnes fréquentent les biotopes particulièrement ensoleillés. Il est suggéré que les tarses à larges semelles des *Notostenus* et des *Pectobullus* traduisent des déplacements prédominants sur des surfaces lisses, comme les angiospermes à larges feuilles. De plus, il est supposé que la tête subrostrée des *Dolichopsis* est liée à un mode de vie anthophile. Il est fourni une hypothèse de phylogénie au niveau générique générée par un programme informatique impliquant Winclada / Nona. Il est postulé que l'ancêtre de ces genres résidait dans les forêts des montagnes du sud de l'Afrique. Ce travail comprend une clé des espèces, une brève discussion sur la morphologie fonctionnelle et l'évolution, 14 micrographies électroniques, 7 photos d'édéages, 1 arbre phylogénétique généré par ordinateur, 2 cartes de répartition et 7 photographies d'habitus.

Mots-clés. – Coleoptera, Cleridae, Korynetinae, Clairons, *Avena*, Taxonomie, espèce nouvelle, Afrique du Sud, Angola, Zimbabwe, Namibie, Botswana, Congo.

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Fig. **25-28**. - Habitus. – **25**: *Avena cyanella*. – **26**: *A. coerulea*. – **27**: *A. microplicata* **n**. **sp**. – **28**: *Dolichopsis bicoloripes.*

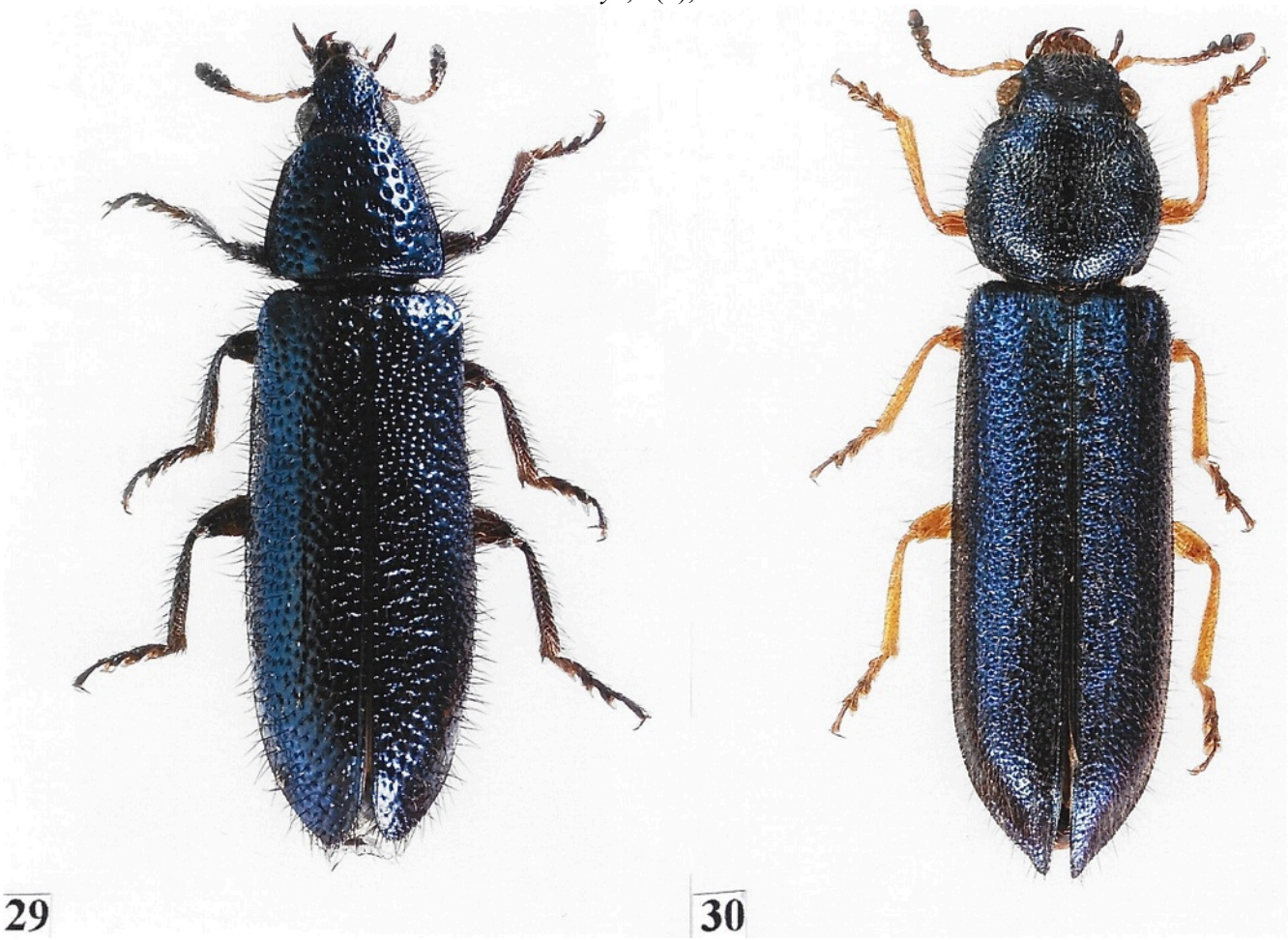

Fig. **29-31**. - Habitus. – **29**: *Dolichopsis haplocnemodes*. – **30**: *Notostenus viridis*. – **31**: *Pectobullus auronitens*.

Faunitaxys

Volume 7, Numéro 5, Avril 2019

SOMMAIRE

CONTENTS

Illustration de la couverture: Termitière champignon, forêt de Pénélan, commune de Bassila, nord du Bénin.

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