**Monolepta** Chevrolat, 1837, the most speciose galerucine taxon: redescription of the type species *Monolepta bioculata* (Fabricius, 1781) and key to related genera from (Chrysomelidae, Coleoptera)*

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Abstract

*Monolepta* Chevrolat, 1837 is the most speciose galerucine genus, with about 600 described nominal species mainly from tropical and subtropical regions, including 180 species from continental Africa. In the past, the generic delimitation of other taxa based on typological concepts was very inconsistent, and needs to be redefined. To ensure the correct generic placement of species, based on phylogenetic principles, a comprehensive knowledge of the morphology of the type species, *Monolepta bioculata* (Fabricius, 1781) is necessary, which is presented herein. External and genital characters are figured, and data on distribution and ecology are provided. A phylogenetic analysis of some crucial taxa, and an identification key to all genera of afrotropical galerucines with elongated basi-metatarsus are provided. *Chimporia* Laboissière, 1931a (=syn. nov.) is synonymized with *Monolepta*.

Keywords: Galerucinae, taxonomy, phylogeny, redescription, synonymy, lectotype, identification key, Africa, Afrotropical region

Introduction

*Monolepta: mega diversity in Galerucinae*

The Galerucinae are one of the most diverse group of the Chrysomelidae (leaf beetles). About 6300 nominal species are currently described, most of them from tropical regions (Wagner 1999a). The genus *Monolepta* was described in 1837 by Chevrolat. Until now about 600 nominal species have been described, which is more than in any other galerucine genus. Most species have been described from tropical Africa, Asia and Australia, and few also from the southeastern Palaearctic region, and from the Neotropics (Wilcox 1973). All these species have one peculiar, easily recognizable character in common: the strongly
elongated first tarsomere of the hind-leg. But the question arises if this character is
apomorphic or has evolved convergently in several subgroups? When a taxonomic and
phylogenetic revision of Afrotropical Monolepta, and some additional taxa traditionally
affiliated to this genus, was started (Wagner 1999b) it became clear that Monolepta as
traditionally delimitated is a non-monophyletic group (Wagner 2004). In more recent
studies of Afrotropical Monolepta, phylogenetic relationships have been taken into account
(Wagner 2000, 2001a, 2002, 2003b, 2005). Some of the Oriental, Australian and
Neotropical species described in Monolepta have also been studied recently: few of them are
congeneric with Monolepta, but most are not (Wagner, unpublished data). Thus, a
comprehensive redescription of the type species of this most speciose galerucine genus is
essential. This will allow an assignment of both previously and subsequently described
species from all zoogeographic regions to Monolepta as a monophyletic taxon.

Historical aspects

One of the oldest compilations of insects was written by Fabricius (1781) where he
described some hundreds of insects in his Species Insectorum. At that time, most larger
Chrysomelidae were assigned to only two genera: Chrysomela for broad-bodied, and
Crioceris for slender-bodied species. In Fabricius’s work, material in the collection of Joseph
Banks was included. Although is better known as a botanist, Banks was also an enthusiastic
collector of insects, beetles in particular. His collection contains two beetle specimens from
the Cape of Good Hope, which are remarkable due to their large eye-like elytral spots.
Since there were two spots on each elytron Fabricius named it Crioceris bioculata. Twenty-
four years later, the same conspicuous beetle was described again as Chrysomela
quadrimaculata in the doctoral thesis of Georg August Goldfuß (1805) also from a small
collection from the Cape of Good Hope. While the two type specimens of Fabricius are
available in the Banks collection at the Natural History Museum, London, Goldfuß’s
material, which was presumably deposited in an ancient collection at the University of
Erlangen, Germany, is most likely destroyed. However, there is no doubt about the species
identity, since a coloured figure of Chrysomela quadrimaculata was provided in the original
publication. In 1837 Chevrolat re-examined the extensive beetle material in the collection
of the Compte de Dejean, and introduced many new generic names. One of these was
Monolepta, to which he assigned Galerucinae with strongly elongated basi-metatarsi. The
generic name refers to this character, since it is derived from the greek “mono”=one, and
“leptos”=thin, slender. Chevrolat (1837) assigned 21 species from Africa and 18 species
from tropical Asia and New Guinea to this new genus. In 1849 he designated Crioceris
bioculata Fabricius, 1781, as the type species of Monolepta. Erichson (1843) was the first
author who adopted the name for a new species, Galeruca (Monolepta) pauperata.

Chapuis (1875) introduced “Monoleptites” as a supra-generic name and transferred to
this group additional Galerucinae with an elongated basi-metatarsus, which had been
described meanwhile, e.g. Luperodes Motschulsky, 1858. He later established Candezea
Chapuis, 1879 for Monoleptites with long antennae and tarsi, elongate epipleura and the
third antennomere much longer than the second. Monolepta occipitalis Reiche, 1847, a
species described from Ethiopia, was designated as the type species of Candeza, and a
further 38 species from tropical Africa were subsequently described in this genus. Another
genus traditionally placed in Monoleptites is Barombia Jacoby, 1903, with Barombia
metallica Jacoby, 1903 from Cameroon as type species. The name is a junior homonym and
was substituted by Barombiella Laboissière, 1931a. Seeno and Wilcox (1982) placed
Barombiella as a junior synonym of Bonesioides Laboissière, 1925, the type species of which is Ootheca coerulesca Allard, 1889. Recent studies of Allard’s type material have shown that these species are not congeneric (Freund & Wagner 2003; Wagner & Freund 2003). Species of Barombiella were defined as Monoleptites with an anteriorly strongly narrowed (trapezoidal) prothorax and an extremely narrow and carinate prosternum (Laboissière 1925). A further genus introduced by Laboissière is Chimporia with Chimporia monardi Laboissière, 1931a as type species, which was established for Monoleptites with an exceptionally wide pronotum. Apart from the type species, only one further species, Monolepta ciliata Weise, 1909 was transferred to this genus (Laboissière 1931a).

The structure of the procoxal cavities has been used as an important character for the delimitation of galerucine genera in the past. For Monolepta, the procoxal cavities have been described as closed (Chapuis 1875, Weise 1923), while Weise (1892) previously described Monolepta as having open coxal cavities. The type species of Barombiella has closed procoxal cavities, but Laboissière (1919) described many of the 42 species described until now in this genus as having “incompletely closed cavities”. There remain therefore, many inconsistencies in the supraspecific taxonomy of these beetles, and the question arises again: what is Monolepta?

Taxonomic phylogenetic revision of afrotropical Monolepta and related taxa

Galerucinae without significant pronotal depressions, the pronotum being nearly rectangual, and the second and third antennomere of the same length, have traditionally been assigned to Monolepta. Most Afrotropical species were described between 1890 and 1950, while between 1965 and 2000 no data on the African species have been published.

Wilcox (1973) was especially aware of the many inconsistent allocations of species to Monolepta. In his Coleopterorum Catalogus on the Galerucinae he commented about the list of “group not determined” Monolepta species: “This group needs revision. Many of these species should be transferred to other genera. Probably some species belong to Candezea. However, most of the species previously placed in Candezea do not”. He was completely correct in this observation, and the taxonomic revision of several taxa has led to many changes (Hasenkamp & Wagner 2000; Middelhauve & Wagner 2001; Wagner 2000, 2001a, 2002, 2003b, 2005; Freund & Wagner 2003, Schmitz & Wagner 2001; Stapel & Wagner 2000, 2001; Wagner & Scherz 2002; Bolz & Wagner 2004; Steiner & Wagner 2005; Wagner & Kirtscheid 2005). In particular, on the basis of studying the genital structures for the first time, it became necessary to exclude many species originally described in Monolepta from a monophyletic “core group” of species including Monolepta bioculata.

In Wilcox’s (1973) catalogue, 180 African species are listed, which were originally described in Monolepta. Some of these were earlier transferred to Candezea and Barombiella by preceding authors (Weise 1924; Wilcox 1973), but the delimitation of these genera was inconsistent. In their earlier works, Weise and Bryant used Candezea only as a subgenus of Monolepta (Weise 1924; Bryant 1938), and Bryant (1953) did not accept the previous “generic concept” of Barombiella. During the recent revision of Afrotropical Monolepta, about 90 species had to be transferred to other genera and about 40 names were found to be synonyms. In addition to the 50 remaining valid species, about 50 species have been newly described (Wagner 2000, 2001a, 2001b, 2002, 2003b, 2005) or await description.

Methods

Morphometric measurements were made for external characters. Absolute measurements are: total length from the clypeus to apex of the elytron, length of elytron, maximal width of...
both elytra (usually in the middle or posterior third of the elytra), and width of pronotum. Relative measurements are: length to width of pronotum, maximal width of both elytra to length of elytron, length of the second to third antennomeres, and length of third to fourth antennomere. Fifteen specimens were measured: minimum, maximum values and means are given. Figures include illustrations of the colour pattern (dorsal view), with right antenna. Genital structures are given in detail, including an overview of male and female genitalia and details. The redescription of *Monolepta bioculata* is based on 369 specimens from the following collections. Acronyms used, responsible persons and number of specimens in brackets: Bishop Museum, Honolulu (BPBM; A. Samuellson; n=4); Natural History Museum, London (BMNH; S. Shute, M. Brendell, M. Cox; n=64); Deutsches Entomologisches Institut, Müncheberg (DEI; L. Behne, L. Zerche; n=43); Hungarian Natural History Museum, Budapest (HNNM; O. Merkl; n=1); Institute Royal des Sciences Naturelles de Belgique, Brussels (IRSN; M. Cludts, D. Drugmand; n=18); The Manchester Museum (MMUE; C. Johnson; n=9); Musée National d’Histoire Naturelle, Paris (MNHN; N. Berti; n=21); Museum für Naturkunde der Humboldt Universität, Berlin (MNHU; J. Frisch, H. Wendt; n=39); Musée Royal d’Afrique Centrale, Tervuren (MRAC; M. de Meyer; n=11); Hope Collection of Insects, Oxford (OUMNH; G. McGavin; n=6); Naturhistorisches Museum Basel (NHMB; M. Brancucci, E. Sprecher; n=8); Naturhistorisches Museum, Wien (NHMW; H. Schönmann; n=8); Naturhistoriska Riksmuseet, Stockholm (NHRS; B. Viklund; n=16); Nationaal Natuurhistorisch Museum, Leiden (RMNH; n=29); South African Museum, Cape Town (SAMC; M. Cochrane; n=9); National Collection of Insects, Pretoria (SANC; B. Grobbelaar; n=83); Transvaal Museum of Natural History, Pretoria (TMSA; S. Endrödy-Younga, S. Gussmann; n=8); Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK; K. Ulmen, M. Schmitt; n=2); Zoological Institute St. Petersburg (ZISP; A. Kirejtshuk; n=3); Zoological Museum, University of Copenhagen (ZMUC; M. Hansen; n=12).

**Results**

*Monolepta* Chevrolat, 1837, p. 407

=*Chimporia* Laboissière, 1931a, p. 413, syn. nov.

**Redescription of Monolepta bioculata (Fabricius, 1781)**

*Crioceris bioculata* Fabricius, 1781, p. 154.

*Chrysoloba quadrimaculata* Goldfuß, 1805, p. 42; Gemminger & Harold (1876, p. 3593); Wilcox (1973, p. 533).

*Monolepta bioculata* (Fabricius, 1781): Chevrolat (1837, p. 407).

*Monolepta tricolor* Fairmaire, 1888, p. 222; Weise (1902, p. 404), Wilcox (1973, p. 533).

**Total length.** 4.8–6.2 mm (0: 5.50 mm; n=16).

**Head.** Red to reddish-yellow, palpi brown to black, maxillary palpi slender, labial palpi very short (Figure 1a). Distance of antennal grooves to each other much larger than distance to eye (Figure 1b). Second and third antennomere short, approximately of same length, in males short (Figure 2a) in females more elongated (Figure 2b), antennomeres 4–11 about 2.5 times longer than broad at apex (Figure 3). Length of second to third
antennomere 0.83–1.00 (0: 0.93), length of third to fourth antennomere 0.36–0.46 (0: 0.42). Antennomeres 1–3 yellowish-red to red (Figure 8a), sometimes also proximal half of fourth antennomere red (Figure 8b), other antennomeres dark brown to black (Figure 8).

**Thorax.** Yellowish-red to red, pronotum broad, posteriorly slightly enlarged (Figure 4a). Pronotal width 1.80–2.10 mm (0: 1.94 mm), pronotal length to width 0.51–0.55 (0: 0.53). Prosternal processus posteriorly widened, prothoracic coxal cavities open (Figure 4b). Mesosternum slender, metasternum very broad (Figure 5). Scutellum yellow to brownish-red (Figures 8 and 9). Basi-metatarsomere about two times longer than second and third tarsomere of metatarsus together (Figure 6c). Legs yellowish-red, in about 30% of material

Figures 1–3. External morphology of *Monolepta bioculata* (Fabricius, 1781). (1) Head; a: ventral, showing mouthparts (ga: galea, lp: labial palpus, mdb: mandible, mp: maxillary palpus); b: dorsal (atg: antennal grooves, lbr: labrum). Scale bar: 1 mm (same for all following figures). (2) Basal antennal articles; a: two different males; b: two different females. (3) Antenna (left, female) showing hairs and bristles.
Figures 4–5. External morphology of *Monolepta bioculata* (Fabricius, 1781). (4) Prothorax; a: dorsal; b: ventral (hm: hypomeron, pst: prosternum; pstpr: prosternal processus). (5) Meso- and metathorax, ventral view (msem: mesepimeron, msep: mesepisternum, msst: mesosternum, mtcx: metacoxa, mtem: metepimeron, mtep: metepisternum, mtst: metasternum).
examined, tibia black. Hindwings fully developed, venation like Figure 7. Elytra ovate, broad (Figure 8); elytral length 4.10–4.70 mm (0: 4.43 mm), maximal width of both elytra 2.90–3.30 mm (0: 3.09 mm), maximal width of elytra to length of elytron 0.67–0.72 (mean: 0.70), greatest elytral width in the middle. Elytra yellow to brownish-red, each with two large yellow spots which usually have (in 70% of material examined) broad black margins which are incomplete at the basal spot (Figure 8a); in some specimens the black margins are very narrow (Figure 8b) but at least at the humerus with a significant black spot (Figures 8 and 9).

Figures 6–7. External morphology of Monolepta bioculata (Fabricius, 1781). (6) Legs; a: prothoracic, b: mesothoracic, c: metathoracic. (7) Hindwing, left, dorsal view (A: analis, Cu: cubitus, M: media, R: radius, Sc: subcosta, rt: radial triangle, rm: cross vein).
Abdomen. Reddish-brown, rarely dark brown to black.

Female genitalia (overview Figure 10). Spermathecal cornu slender, slightly curved, middle part short, nodulus spherical, large (Figure 11). Ventral part of bursa sclerites slender, finely undulate at outer margins (Figure 12a), dorsal pair triangular, hooked at base.

Figures 8–9. External morphology of Monolepta bioculata (Fabricius, 1781). (8) Dorsal colour patterns (white: yellow, dot-shaded: red, black: black). (9) Habitus.
Male genitalia (overview Figure 16). Seventh sternite with two deep incisions at apex (Figure 17). Median lobe straight, slightly conical, rounded at apex (Figure 18a), dorso-ventrally compressed (Figure 18b). Tectum broad, short, not reaching the apex of the median lobe (Figure 18a). Endophallus with three distinct types of spiculae: ventral endophallic spiculae small, comb-like; median spiculae long, slender, straight; lateral spiculae slender, with claw-like small spine medially. During copulation the endophallic sac is extruded outside the median lobe and spiculae turned inside out (Figure 19).

**Diagnosis**

*Monolepta bioculata* can be easily distinguished from all other *Monolepta* species by its peculiar colour pattern of two ovate eye-like, yellow, black margined spots on each elytron.
It could be confused with two other species: *M. zambesiana* Jacoby, 1906 occurring sympatrically with *M. bioculata* in northern South Africa. This species also has yellow, black margined elytral spots, but those are elongated or stripe-like. Furthermore, this species has

Figures 13–15. Genital morphology of *Monolepta bioculata* (Fabricius, 1781), female. (13) Abdominal tip in lateral view (abbreviations see Figure 10). (14) Opivositor, view from inner side. (15) Eighth sternite, view from inner side.

Figures 16–17. Genital morphology of *Monolepta bioculata* (Fabricius, 1781), male. (16) Overview from dorsal, tergites 1–7 removed (ed: ductus ejaculatorius, hg: hind gut, ml: median lobe, spg: Spiculum gastrale, tc: tectum, te: tegmen, te8: 8th tergite). (17) Seventh sternite.
no black apical antennomeres, a more elongated third antennomere (length of second to third antennomere: 0.75–0.81; *M. bioculata*: 0.83–1.00), and a much narrower pronotum (pronotal length to width: 0.58–0.63; *M. bioculata*: 0.51–0.55). *Monolepta laboissierei* Wagner, 2001b is also similar, but allopatrically distributed in relation to *M. bioculata*, being known from northern Democratic Republic of Congo to Zambia. It also has two ovate, black margined spots on each elytron, but those spots are smaller and the margins broader than in *M. bioculata*, and it can be also distinguished by its very slender median lobe and the shape of the bursa sclerites. All the other approximately 100 known valid species of afrotropical *Monolepta* have very differently coloured elytra. They can be uniformly yellow, red or black, sometimes with the apex of a different colour, or the elytra can bear black or red transverse bands or a black suture, margins and a median transverse band forming a cross-like pattern.

**Distribution**

Only known from some parts of the Republic of South Africa, particularly abundant in the Cape Provinces (Figure 20).
Ecology

Some specimens were collected when feeding on, sometimes “damaging”, lemon leaves (*Citrus* spec., Rutaceae), in one case feeding on buds and flowers of *Rumex angiocarpus* (Polygonaceae), bud and flowers of *Cyclopia maculata* (Fabaceae), and flowers of *Sporobolus pyramidalis* (Poaceae) was recorded, a few others were collected on flowers without detailed plant identification.

Type material

*Crioceris bioculata* Fabricius, 1781
Lectotype: ♀ “*Crioceris 2-oculata*, Fabr. Sp. Ins. n. 27”, Banks coll. (BMNH); examined; herein designated. Paralectotype: a second female specimen without any original label from the Banks collection.

*Chrysomela quadrimaculata* Goldfuß, 1805
A type specimen is not available, but a colour illustration is provided in the original description which clearly indicates the species’ identity.

*Monolepta tricolor* Fairmaire, 1888
Holotype: ♀ “Ovarmo, Schirn/Ex Museao L. Fairmaire 1883” (MNHN); examined.

Further material examined: South Africa: 2 ex., coll. Chevrolat (BMNH); 7, Süd-Afrika, Penther (NHMW); 17 ex., coll. Chapuis (IRSN); 29 ex., Cap, coll. Kraatz (DEI); 9 ex., Cap (MMUE); 5 ex., Cap bon. Sp. [Cap Bona Spei=Cape of Good Hope] (MNHN); 8 ex., Pr. B. Sp. [dto.] (MNHU); 3 ex., C. Bon. Spei, Baly coll. (BMNH); 4 ex., Cape (BMNH); 1 ex., C.G.H. (BMNH); 2 ex., Cap, Frisch, ex coll. J. Weise (MNHU); 8 ex., Pr. b. Sp., Lichtenst. (MNHU); 7 ex., C. Bon. Spei., Mus. Murray, Fry coll. (BMNH); 2 ex., Mus. Westermann, Cap. B. Sp. (ZMUC); 10 ex., Cap. B. sp., Severtsen (ZMUC); 1 ex., Prom. B. sp. (ZISP); 1 ex., Cap. B. Sp. (ZISP); 9 ex., Cap. B. Spei, Victorin (NHRS);
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5 ex., Cap. B. Spei, Wahlberg (NHRS); 4 ex., Kapstadt, 33.56S/18.28E (MNHN); 1 ex., Kapstadt (NHMW); 7 ex., Kapstadt, Dr. Martin (3 ex. MNHN, 2 ex. SAMC, 2 ex. ZFMK); 1 ex., Kapstadt, Raffray (MNHN); 1 ex., Cape Town, Dr. Purchell (SAMC); 1 ex., Cape Town, H. Roberts coll. (BMNH); 1 ex., Cap., “Luperodes bioculatus F.” (ZISP); 2 ex., Dicken (NHRS); 10 ex., Cap., v. Hosttolk (?) (RMNH); 1 ex., Capland, coll. Geitner (HNHM); 1 ex., Bredasdorp, Transvaal, coll. Veth (RMNH); 1 ex., H. R. Transvaal, coll. Veth (RMNH); 1 ex., Transvaal (MNHU); 1 ex., Natal (BMNH); 1 ex., Majuba, 32.48S/27.23E, Wattens & Donkaster (MNHU); 12 ex., Zoutpansburg, 28.10S/32.15E, Distant coll. (BMNH); 11 ex., East London, 33.00S/27.54E, ex coll. Breuning (MRAC); 2 ex., Hopefield, 33.05S/18.20E, 1885, F. Barkmann (MNHU); 1 ex., Bloemfontein, 29.07S/26.14E, VI.1896, Pöhl (IRSN); 2 ex., Karoo, X.1896, C. G. H. (SANC); 7 ex., Wynberg, 28.31S/27.01E, 1896, IX.1898, J. P. Ciegare (?) (MNHN); 2 ex., Talbagh (?), Lightfort, 1902 (SANC); 1 ex., Kapstadt, Fischhoek, VII.1903, Vanhoffen (MNHU); 9 ex., Wynberg, XI.1904, Gokin (BMNH); 1 ex., Table Mts., VIII.1905, G. A. K. Marshall (BMNH); 3 ex., Table Mt., 1906–167, W. Bevins (BMNH); 6 ex., Stellenbosch, 33.56S/18.51E, 1908, L. C. Blundell (OUUMNH); 2 ex., Wynberg, IV.1915, R. Smit (SANC); 14 ex., Noordhoek, 29.50S/26.14E, X.1914, Andreae (DEI); 1 ex., Witzenberg Vall., 33.19S/19.14E, 1000 m, I.1921, R. E. Turner (BMNH); 2 ex., Ceres, 33.23S/19.19E, 500 m, I.–II.1921, R. E. Turner (BMNH); 2 ex., Stellenbosch, VIII.1921, Ch. K. Brain (BMNH); 1 ex., George, 33.57S/28E, XI.1921, R. E. Turner (BMNH); 4 ex., George, XI.1931, J. Ogilvie (BMNH); 1 ex., Kirstenbosch, 33.59S/18.26E, XI.1931, Miss A. Mackie (BMNH); 1 ex., Ceres, II.1932 (BMNH); 3 ex., Huguenot, 31.05S/26.36E, II.1932, L. Ogilvie (BMNH); 3, Omgv. Kaapstad, IX.1939, Dr. L. D. Brongersma (RMNH); 2 ex., Cape Town, XI.1938, A. H. Newton pres. (BMNH); 2 ex., Cape, IX.1940, C. J. Joulbert, S. E. Coll. Agric. (SANC); 14 ex., Cape Prov., Zeekoevlei Cape Flats, 34.40S/20.03E, XI.1949, R. A. Maas Geesteranus (RMNH); 1 ex., Wolseley, 33.24S/19.12E, III.1961, A. Boomzaaier (SANC); 1 ex., 5–10 miles NW of Seven weeks Poort, V.1964, SA Museum exp. (SANC); 3 ex., Storms River Mouth, 33.59S/23.52E, X.1964, A. L. Capener (SANC); 1 ex., Bettytsboa, IX.1969, D. J. Rust (SANC); 1 ex., Hout Bay, 34.03S/18.21E, V.1970, M. J. Russell (BMNH); 2 ex., Elim, 34.36S/19.45E, I.1971, M. W. Strydom (SANC); 2 ex., Stormsvlei, 34.05S/20.05E, II.1971, M. W. Strydom (SANC); 1 ex., Worcester, IX.1973, 33.39S/19.25E, “singed on flowers”, L. Schulze (TMSA); 1 ex., Nuweberg, XI.1973, 34.00S/19.06E, “water plankton”, S. Endrödy-Younga (TMSA); 2 ex., George, 33.58S/22.28E, I.1979, S. J. v. Tonder (SANC); 1 ex., Plettenbergbay, C.P., 34.03S/23.23E, I.1979, S. J. v. Tonder (SANC); 3 ex., Knysna, 34.02S/23.03E, I.1979, S. J. v. Tonder (SANC); 2 ex., Uniondale, 33.39S/23.07E, I.1979, C. Kok, S. J. v. Tonder (SANC); 1 ex., Kommetjie, VIII.1979, A. J. Prins (SANC); 6 ex., Clarens, 28.32S/28.28E, II.1980, W. A. Harrop, C. Kok, S. J. v. Tonder (SANC); 4 ex., Natal, Nottingham Road, 29.22S/29.59E, I.1981, S. J. v. Tonder & C. Kok (SANC); 1 ex., Underberg, 29.47S/29.30E, XI.1981, S. J. v. Tonder & C. Kok (SANC); 1 ex., Knysna, 34.02S/23.03E, XI.1983, G. L. Prinsloo & N. C. Grobbelaar (SANC); 5 ex., Abrahamskraal, 33.14S/18.09E, XI.1983, gras netting, S. Endrödy-Younga (TMSA); 11 ex., Cape Town, 33.56S/18.28E, VI.1984, G. Tribe, “feeding on lemon leaves” (SANC); 2 ex., Sederberg, XI.1984, G. L. Prinsloo (SANC); 4 ex., Saasveld nr. George, 33.57S/22.35E, II.1985, W. Brytenbach (SANC); 9 ex., Vyeboom nr. Grabouw, 34.04S/19.07E, IX.1985, S. Neser, feeding on buds and flowers of *Rumex angiocarpus* (SANC); 1 ex., Nieuwoudtville, 31.23S/19.06E, IX.1985, “flow. vegetation”, S. Endrödy-Younga (TMSA); 10 ex., Stellenbosch, C. P., 30.56S/18.52E, II.1986, A. Schwartz, “damaging grape leaves” (SANC); 2 ex.,
Phylogenetic considerations

Following the completion of the taxonomic revision of several groups of afrotropical galerucines, first studies on their phylogenetic relationships have been carried out based on morphological characters (Wagner 2004). Forty-four species analysed with 14 genitalic characters and 20 characters based on external morphology are included in the analysis, using maximum parsimony (for details of character coding and matrix see Wagner 2004). About 10% of the valid afrotropical species of *Monolepta* and *Bonesioides* and about 50% of *Candezea*, *Afrocrania*, and *Afromaculepta* species have been included with species of other genera originally placed in “*Monoleptites*”. Furthermore, some short-legged Galerucinae, *Exosoma lusitanicum* (Linnaeus), *Exosoma politum* (Jacoby) and *Oides humeralis* Gahan, the latter as the outgroup, have been included. Results are presented as a strict consensus tree (Figure 21).

The traditional delimitation of *Monolepta*, *Candezea* and *Barombiella* has resulted in polyphyletic groups. Also “*Monoleptites*” is polyphyletic, since an elongated metatarsus has evolved more than once in the Galerucinae. Genitalic characters, in particular, reveal a much better generic delimitation. The monophyly of *Monolepta* s. str. is based on two synapomorphies, two pairs of strongly sclerotized bursa sclerites, and the presence of three distinct types of endophallic spiculae. Other important diagnostic genitalic characters are the large and spherical spermathecal nodulus, the short tectum of the median lobe, and the second and third antennomeres of approximately the same length. At least one external character, the relative length of the second and third antennomere, might be apomorphic for *Monolepta*, but until the revision is completed, this statement is preliminary. However, this character has a high diagnostic value. All taxa with significantly elongated third antennomeres (length of second to third antennomere: 0.45–0.80) need to be transferred to other genera, in particular all taxa with partly or entirely metallic dorsal colour (see identification key below).

The genus *Chimpora* was established for those “*Monoleptites*” having an exceptionally wide pronotum. However, despite this conspicuous character, the genitalic structures clearly reveal affiliation to *Monolepta*.

The number of Afrotropical species of *Candezea* was reduced from 39 to only eight valid species (Wagner & Kurtscheid 2005). In the cladogram the four species involved in the analysis cluster as a paraphyletic group together with *Afrocandeza* and *Afrocrania* as a
Figure 21. Strict consensus tree with Bremer support indices (>1); tree length: 274, CI: 0.33, RI: 0.70. Taxa which original generic allocations are not concordant with the phylogenetic relationships indicated by exclamation marks.

Redescription of Monolepta bioculata

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terminal taxon (Figure 21). These taxa are in particular characterized by an apically incised tectum of the median lobe, and the form of the endophallic armature. However, the phylogenetic position of Candeeza cannot be fully resolved with the available data. The analyses of these groups need to be pursued with an extended set of characters when the taxonomic revision of all Afrocrania and Afrocandeza species is completed.

“Clade 1” comprises a well-supported group of species originally described in Monolepta and Candeeza, which are phylogenetically very remote from the type species of those genera. This clade is characterised by several autapomorphies (see Wagner 2004) and the species will be redefined under a new genus name in the near future (Wagner in prep.). The character pattern is most similar to Dyolania antennalis, the type of Dyolania Laboissière 1931b, a genus which was synonymized with Luperodes Motschulsky, 1858 by Wilcox (1973), but is not congeneric and need to be re-established. A revision on this group is in preparation.

As well as recently described species, Afrocandeeza includes additional taxa originally described in Monolepta. The introduction of this new genus (Hasenkamp & Wagner 2000) as a monophyletic group is well justified by several apomorphies, indicated by a high Bremer support index. Some of the apomorphic characters also have a high diagnostic value, such as the yellow and black elytra having small, symmetrically arranged spots, and the peculiar type of endophallic spiculae which bear rows of spines.

Bonesioides is not closely related to any other taxon named above. Species of this genus have a very different external appearance, metallic blue or metallic green head and thorax, and most species with metallic dorsum originally placed in Monolepta have been recently transferred to this genus (Freund & Wagner 2003). Species of this group show a wide variation in the form of the basi-metatarsus.

A further group, which is not yet named (“clade 2”), includes taxa with short- and long-legged Galerucinae. This clade comprises typical species of Galerudolphia, which has been revised recently (Bolz & Wagner 2005). One important external character of “clade 2” is the trapezoidal pronotum, which is typical for Barombiella. After revision, this genus turned out as monotypic, and since Barombiella violacea with its overall metallic colouration is closely related to Bonesioides, the non-metallic coloured species of Barombiella and several species formerly described in Monolepta which are also characterised by a strongly trapezoidal pronotum need to be excluded from these taxa.

### Identification key for Afrotropical Galerucinae with elongated basi-metatarsus

The following key can be used for all recently revised or newly described genera of afrotropical Galerucinae with an elongate basi-metatarsus, including some species of Bonesioides and Galerudolphia, which have short basi-metatarsi. Since the revision of all species is not yet completed this key is provisional. Checking of genital characters of both sexes is usually necessary. Specimens having genitalia which do not fit to the structures mentioned below should be excluded.

| Key | Description | Species |
|-----|-------------|---------|
| 1.   | At least parts of head, pronotum or elytra metallic blue or green; in most species dorsum entirely metallic blue or green; median lobe broad, less than 3.5x longer than broad at orifice |  
- Without any metallic colour; median lobe slender, more than 4x times longer than broad at orifice |

2. |

3. |
2. Legs yellow to brownish-yellow, antennomeres very slender, pronotum very broad, strongly trapezoidal (pronotal length to width 0.39–0.49); endophallus without spiculae.  
   - Legs brown or black, antennomeres shorter, pronotum narrower (pronotal length to width 0.54–0.58), posterior pronotal angles less protruding; endophallus with two or three asymmetric endophallic spiculae.  
   
   **Barombiella** (1 species)

3. Second and third antennomeres subequal in length (length of second to third antennomere 0.75–1.20); endophallus with three distinct types of spiculae (cf. Figures 18 and 19) or with two pairs of spiculae carrying rows of spines or two distinct types of spiculae in three separated portions.  
   - Third antennomere much longer than second (length of second to third antennomere 0.45–0.80); endophallus without or with spiculae, if spiculae present they are of one type only, or if two distinct types, but than spiculae are not arranged in three separated portions.  
   
   **Bonesioides** (21 species)

4. Elytra with symmetrically arranged small black spots.  
   - Elytra without such symmetrically arranged spots.  
   
   **Afromaculepta** (6 species)

5. Endophallus with three distinct types of spiculae, median spiculae slender, second and third antennomeres subequal in length (length of second to third antennomere 0.80–1.20).  
   - Endophallus with large claw-like median spiculae and two separate groups of bristle-like spiculae in the apical half, third antennomere slightly longer than second (length of second to third antennomere 0.75–0.95).  
   
   **Monolepta** (ca. 100 species)

   **Afronaumannia** (5 species)

6. Very large, 8.8–9.9 mm.  
   - Total length less than 8.5 mm.  
   
   **Afromegalepta** (1 species)

7. Small, 2.4–4.9 mm, pronotum broad at base, trapezoidal, elytra usually slender (width of both elytra together to length of elytron 0.39–0.75), uniformly yellow, with or without black suture and margins, never with transverse black bands, legs short (length of basi-metatarsus to metatibia 0.34–0.50); median lobe without endophallic spiculae, deeply incised at apex.  
   - Total length 4.2–8.1 mm, pronotum rectangular or significantly narrowed in the basal third (heart-like), elytra usually broader (width of both elytra to length of elytron: 0.57–0.75), legs usually much longer (length of basi-metatarsus to metatibia more than 0.50); median lobe with endophallic spiculae, apex of median lobe not incised.  
   
   **Galerudolphia** (15 species)

8. Elytra very narrow (width of both elytra to length of elytron 0.57–0.62); males often with complex sexual dimorphic structures on frons, basal antennal articles or elytra; median lobe ventrally with one pair of spurs in the middle.  
   - Elytra broader (width of both elytra to length of elytron 0.62–0.86); males without those complex sexual dimorphic structures at frons, antenna or elytra; median lobe ventrally without spurs.  
   
   **Afrocrania** (16 species)

9. Tibiae and tarsi black, femora contrasting yellow; median lobe very slender, sigmoid in lateral view, endophallus with many small, short spiculae.  
   
   **Afrotizea** (1 species)
Femora, tibiae and tarsi concolorous, if occasionally contrasting, femora black and tibiae yellow; endophallus with one to three pairs of strong spiculae 10

10. Larger, 5.7–8.1 mm; elytra comparatively slender (width of both elytra to length of elytron: 0.62–0.70) ............................. Candezea (8 species)

– Smaller, 4.2–6.7 mm, if total length more than 5.5 mm elytra much broader 11

11. Males with deep cavity on vertex; median lobe arrow-like at apex; with one pair of curved endophallic spiculae, without spiculae protruding outside the median lobe ............................. Monoleptocrania (1 species)

– Males without cavity on vertex; median lobe parallel-sided at apex; two or three pairs of endophallic spiculae, and one pair of fixed spiculae protruding outside the median lobe ............................. Afrocanandeza (15 species)

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