

Afroscoparia – a new genus of Scopariine from southern Africa (Insecta: Lepidoptera: Pyraloidea: Crambidae)

MATTHIAS NUSS

Museum für Tierkunde, Königsbrücker Landstr. 159, D-01109 Dresden; e-mail: matthias.nuss@snsd.smwk.sachsen.de

Abstract. A new genus of Scopariinae, *Afroscoparia* gen. n. is established for *Afroscoparia contemptalis* Walker, [1866] (*Scoparia*) comb. n. and to include also *Afroscoparia australis* sp. n. described here. The tentative phylogeny of the scopariine genera is briefly discussed in the context of the contradictory evidence of the phylogenetic relationships of *Afroscoparia*.

Key words. Afrotropic, Pyraloidea, Scopariinae, phylogeny, new genus, new species.

Introduction

The Scopariinae which belong to the Crambidae (Pyraloidea) comprise 530 species occurring predominantly in the temperate zones of the northern and southern hemispheres, on oceanic islands and at montane and alpine elevations of the tropics (NUSS 1999, 2000). Only 17 species have been named so far from the African continent south of the Sahara (cf. MAES 1996; NUSS 1999, 2000), leaving the larger number of montane areas still unexplored for this group. According to a revision of the Scopariinae (NUSS 1999), this subfamily is classified into 21 genera world-wide. Species of three genera occur on the African mainland south of the Sahara: *Eudonia* Billberg, 1820, *Scoparia* Haworth, 1811, and *Dipleurinodes* Leraut, 1989 (NUSS 1999). *Eudonia* and *Scoparia*, each containing more than 200 described species from all continents. However, all known species of *Dipleurinodes* are restricted to the Afrotropical Region including Madagascar and the Comores (LERAUT 1989; NUSS 1999). The sister taxon of *Dipleurinodes* is *Eudipleurina* Leraut, 1989 of which all species are restricted to Madagascar and the Comores (LERAUT 1989; NUSS 1999). Another genus, *Helenoscoparia* Nuss, 1999, with 5 species, is endemic to the Atlantic island of St. Helena. Its ancestor is believed to have invaded the island via ocean surface currents from south-western Africa (NUSS 1999), but the sister-group of *Helenoscoparia* is still unknown.

The examination of specimens from museum collections now revealed a group of species from southern Africa which is presenting its own set of synapomorphies. Externally, these species show the characteristic scopariine wing pattern (cf. NUSS 1999) but no peculiarities in comparison with most Scopariinae. However, both male and female genitalia structures are conspicuously different from species of all other scopariine genera.

Abbreviations

BMNH	The Natural History Museum, London
GU	Genitaluntersuchung (genitalia slide)
TMP	Transvaal Museum, Pretoria
USNM	United States National Museum of Natural History, Washington

Systematic Part

Afroscoparia gen. n.

Type species: *Scoparia contemptalis* Walker, [1866]

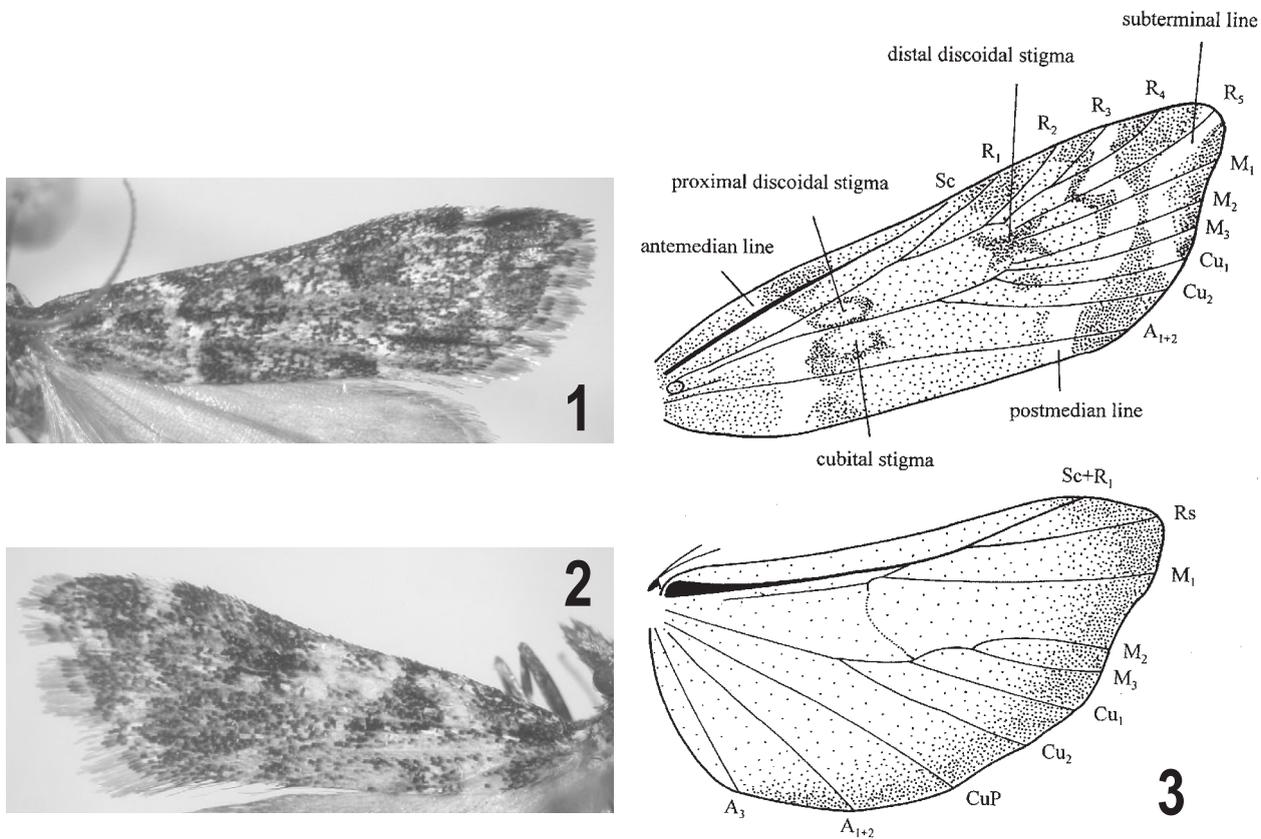
Description. Moth (Figs. 1, 2). Medium sized moths with forewing lengths of 6.5–9 mm. Head area comprising clypeus, frons and vertex evenly rounded, uniformly sclerotized and bare of any projections; ocelli and chaetosemata present; flagellomeres of females cylindrical, of males slightly prismatic; labial palpi porrect, about twice to three times as long as diameter of eyes; maxillary palpi brush like, upright; proboscis basally scaled. Forewings narrow, elongate, with characteristic scopariine wing pattern (cf. NUSS 1999; Fig. 3); hindwings brownish white, pale brown at termen and with a second pale brown line parallel to termen. Wing coupling system with frenulum single in males, double in females and males with hamus in retinaculum. Legs with spurs 0-2-4 as typical for Pyraloidea.

Tympanal organ. Tympanal organ of the crambiform type (NUSS & SPEIDEL in press); bullae tympani kidney-shaped, zona glabra tympani with paired triangular area devoid of scales.

Male genitalia (Figs. 4, 5, 6, 7). Uncus weakly sclerotized, distally more or less round; gnathos strongly sclerotized, slender, with pointed tip and about as long as uncus; tegumen with H-shaped mid-dorsal margins; Vinculum at its anal part with long vertical margin, proximally extended to form two lateral, broadly triangular sclerites; their proximal tips are surrounded by the U-shaped saccus. Valva with dorsal part weakly sclerotized as in all scopariine species, but ventral part with heavily sclerotized sacculus which anteriorly occupies more than a half of height of valva and distally terminating in a long spine-like extension. Aedeagus with one cornutus; bulbus ejaculatorius inserted at the most dorso-proximal part of the aedeagus; bulbus ejaculatorius large, with semicircular lateral surfaces forming an U-shaped vessel. Tergite VIII with T-shaped, sternite VIII with U-shaped sclerotization.

Female genitalia (Figs. 8, 9, 10, 11). Corpus bursae membranous, without appendix bursae. Ductus seminalis opens into the posterior part of ductus bursae. Antrum or lamella postvaginalis heavily sclerotized and partly surrounded by a tremelloid endocuticle. Abdominal segment VII heavily sclerotized, with specific modifications. Membrane VIII–IX short.

Diagnosis. All species of *Afroscoparia* show the characteristic scopariine wing pattern. Among scopariine genera, they are unique by the common presence of the following characters: males with large and heavily sclerotized sacculus terminating in a long distal spine; vinculum large and heavily sclerotized; bulbus ejaculatorius large, with semicircular lateral surfaces and females with corpus bursae membranous, absence of an appendix bursae and sternite VII strongly sclerotized posteriorly.



Figs. 1–3. Wing pattern. **1:** *Afroscoparia contemptalis* from South Africa, Kogelberg, 23.iii.1981, Kroon leg. (TMP). **2:** *Afroscoparia australis* from Lesotho, 28°46'S 28°10'E, 2900 m, Krüger & Dombrowski leg. (TMP). **3:** Scheme of scopariine wing-pattern (after Nuss 1999).

Diversity and Distribution. Two species are known from southern Africa.

Derivatio nomini. The name is a combination derived from 'Africa' and 'Scoparia'.

Remarks. Externally, *Afroscoparia*-moths present no unique characteristics. However, looking at a large series of scopariine specimens from southern Africa, the adults of *Afroscoparia* are slightly more melanistic, their forewings are narrower with a slightly concave costa and slightly pointed apex; the posterior abdomen is slightly thicker in both sexes due to the special sclerotizations of the male genital aramature and the female segment VII.

***Afroscoparia contemptalis* comb. n.** (Figs. 1, 4, 8, 9)

Scoparia contemptalis WALKER, [1866]: 1499–1500. Type locality: 'Cape'.

Redescription Moth (Fig. 1). Head globular, clypeus flat; ocelli and chaetosemata present; labial palpi porrect, 2 ? times as long as eye diameter; maxillary palpi brush-like, upturned. Body dorsally predominantly black, with an admixture of white and ochreous scales, ventrally mainly white scaled and legs chequered with black. Forewing length of males 6.5–8.5 mm, females 7.5–8.0 mm; forewings conspicuously narrow proximally with costa slightly concave, antemedian line 2.5 mm from wing-base, white, M-shaped; proximal discoidal stigma and cubital stigma black, dot-like, both situated 1 mm separate from antemedian line; distal discoidal stigma black, X-shaped, filled ochreous; postmedian line starts at costa close to the apex, indentation towards the distal discoidal stigma on R₅,

a second conspicuous indentation at Cu₂ below distal discoidal stigma; postmedian and subterminal line touching in the middle of wing forming an X; fringe chequered black and white. Hindwings whitish, pale brown towards the margin, with a white line before margin; fringe basally pale brown with white line along the margin, white at their tip. Male genitalia (Fig. 4). Uncus triangular, distally slightly pointed; gnathos slender, slightly longer than uncus; tegumen narrow with H-shaped mid-dorsal margins; vinculum-saccus formation broad V-shaped in caudal aspect; juxta shell-shaped, concave towards the posterior; dorsally, the juxta supports the anellus which is formed by a spinulose membrane; valva narrow proximally, distally forming a broad lobe, ventrally a strongly sclerotized sacculus reaching from the proximal margin until 2/3 of length of valva and distally with a long, spine-like extension extending to the distal end of valva. Aedeagus short and thick, slightly bent, opening for ductus ejaculatorius dorso-proximally; cornutus large, nearly as long as the total length of aedeagus, at the proximal part sharply bent S-like and supported in the ductus ejaculatorius by numerous small spines, distal part of cornutus smoothly bent to form a tipped sabre-like structure. Tergite VIII with T-shaped, sternite VIII with U-shaped sclerotization.

Female genitalia (Figs. 8, 9). Corpus bursae ovoid, ductus bursae long and narrow, without distinct antrum; a large trapezoid lamella postvaginalis with wide lateral lobes surrounds the pocket-like ostium bursae; tergite VII large hexagonal, sternite VII at posterior half heavily trapezoid sclerotized; Segment VIII with apophyses anteriores and posteriores of the same length, intersegmental membrane VIII+IX short, papillae anales distally notched.

Diagnosis. *A. contemptalis* differs from the second species of the genus in male genitalia by its slightly pointed uncus, the narrow lateral walls of the tegumen, the distally fluted valvae, the distal extension of the sacculus reaches the distal edge of the valva, the cornutus is nearly as long as the aedeagus, and in female by the absence of a sclerotized antrum, the presence of a sterigma, and the only posteriorly heavily sclerotized sternite VII.

Distribution. Precisely labelled specimens are only known from the Kogelberg [some 90 km south-east of Cape Town] and the Table Mountain [near Cape Town]. Both localities are situated in the south-western part of the Western Cape province of South Africa.

Material. Holotype ♂ (by monotypy) with labels: printed 'Type' (on white paper, round, bordered green), handwritten 'Co. B. <?> | S.' (on white paper, round), printed 'SCOPARIA CONTEMPTALIS.' (on white paper), printed, with handwritten insertion 'Pyralidae | Brit. Mus. | Slide No. | 3781' (on white paper, print in red), handwritten '1749.' (on white paper), printed 'Holo- | type' (on white paper, round, bordered red), handwritten (Nuss) on printed form 'Holotype | Scoparia | contemptalis W[a]lk[er]. | det. M. Nuss. 1994' (on white paper), BMNH. – 1♂ South Africa, Cape Province, Kogelberg, 23.iii.1981, Kroon leg., TMP (GU Nuss 848). 1♂, 1♀ (overflowed) same data, but Nature Reserve, 6.–13.iii.1983, Kroon & Molekane leg., TMP (GU Nuss 854). 5♂, 1♀ South Africa, Cape Province, Table Mountain, 1035 m, North of Echo Canyon, fynbos, 24.iii.1978, D. & M. Davis, B. Akerbergs leg., USNM; 2♂ same data, but 1050 m, 23.iii.1978, USNM.

***Afroscoptaria australis* sp. n.** (Figs. 2, 5, 6, 7, 10, 11)

Description. Moth (Fig. 2). Head as given in the generic description; labial palpi porrect, 2 times as long as eye diameter. Body dorsally predominantly black, with an admixture of white and ochreous scales, ventrally blackish with legs chequered white. Forewing length of males 8–9 mm; females 6.5–8.5 mm; forewings conspicuously narrow proximally with costa straight to slightly concave; pattern elements of wings as in *A. contemptalis*.

Male genitalia (Figs. 5, 6, 7). Uncus triangular, distally round; gnathos slender, with slightly down-curved hook distally; tegumen broad with H-shaped mid-dorsal margins; vinculum-saccus formation broad U-shaped in caudal aspect; juxta shell-shaped, concave towards the posterior; anellus formed by a spinulose membrane; valva small, dorsal and ventral margin parallel to each other, not widened distally, ventrally with large conspicuously sclerotized sacculus; sacculus distally with spine-like extension, not reaching the distal edge of valva. Aedeagus slender, slightly bent; bulbus ejaculatorius with semicircular lateral surfaces; cornutus 1/3 of length of aedeagus, sickle-shaped, pointed at one end, at the other end surrounded by several tiny spines.

Female genitalia (Figs. 10, 11). Corpus bursae small, ovoid; ductus bursae very short; antrum large funnel shaped, conspicuously sclerotized, spinulose; lamella postvaginalis absent; tergite VII fully sclerotized, sternite VII strongly sclerotized, at its posterior half with a paired conspicuous double keel-like structure laterally; Apophyses anteriores and posteriores of the same length; intersegmental membrane VIII+IX short, papillae anales distally round.

Diagnosis. *A. australis* is externally similar to *A. contemptalis*, but differs by the following characters: in male, the uncus is distally round, the lateral walls of the tegumen are very broad, the valvae are not fluted distally, the distal extension of the sacculus do not reach the distal edge of the valva, the costa of the valva is more strongly sclerotized and the cornutus measures only 1/3 of length of aedeagus; in the female, there is a large, elongate trapezoid antrum but no sterigma.

Distribution. The species is known from montane and alpine elevations in the southern Cape Province, Lesotho and Transvaal.

Derivatio nominis. The name of the species is derived from the Latin adjective 'australis' (south) and refers to the occurrence in different parts of southern Africa.

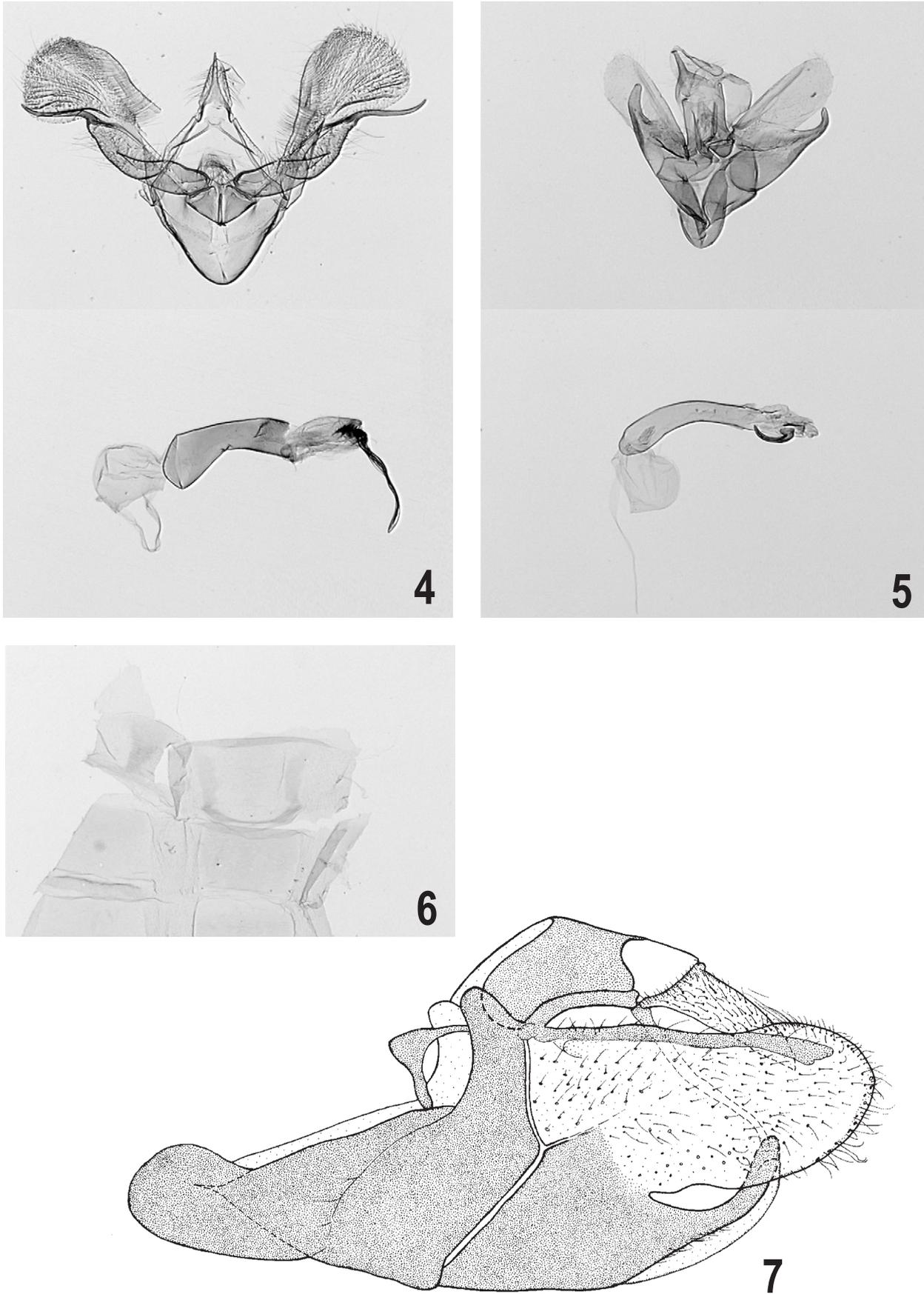
Material. Holotype ♂ Lesotho, New Oxbow Lodge, Tlholohatsi River, Themeda-Festuca alpine veld, 2900 m, 28°46'S 28°10'E, 14.i.1996, at UV-light, Krüger & Dombrowski leg., TMP (GU Nuss 974). – Paratypes: 1♀ same data, TMP; 1♂ Lesotho, Maluti Ski Chalet, Themeda-Festuca alpine veld, 3000 m, 28°47'S 28°12'E, 15.i.1997, at UV-light, Krüger & Dombrowski leg., TMP. 1♀ South Africa, Transvaal, Nelshoogte gallery, for.[est] below st.[ation], 25.51S 30.53E, 4.xii.1986, Endrödy-Younga leg., TMP (GU Nuss 849); 1♀ South Africa, Cape Province, Groebal R, Schoemansport, ca. 18 km N of Oudtshoorn, 700 m, 17.iii.1978, D. & M. Davis, B. Akerbergs leg., USNM.

Discussion

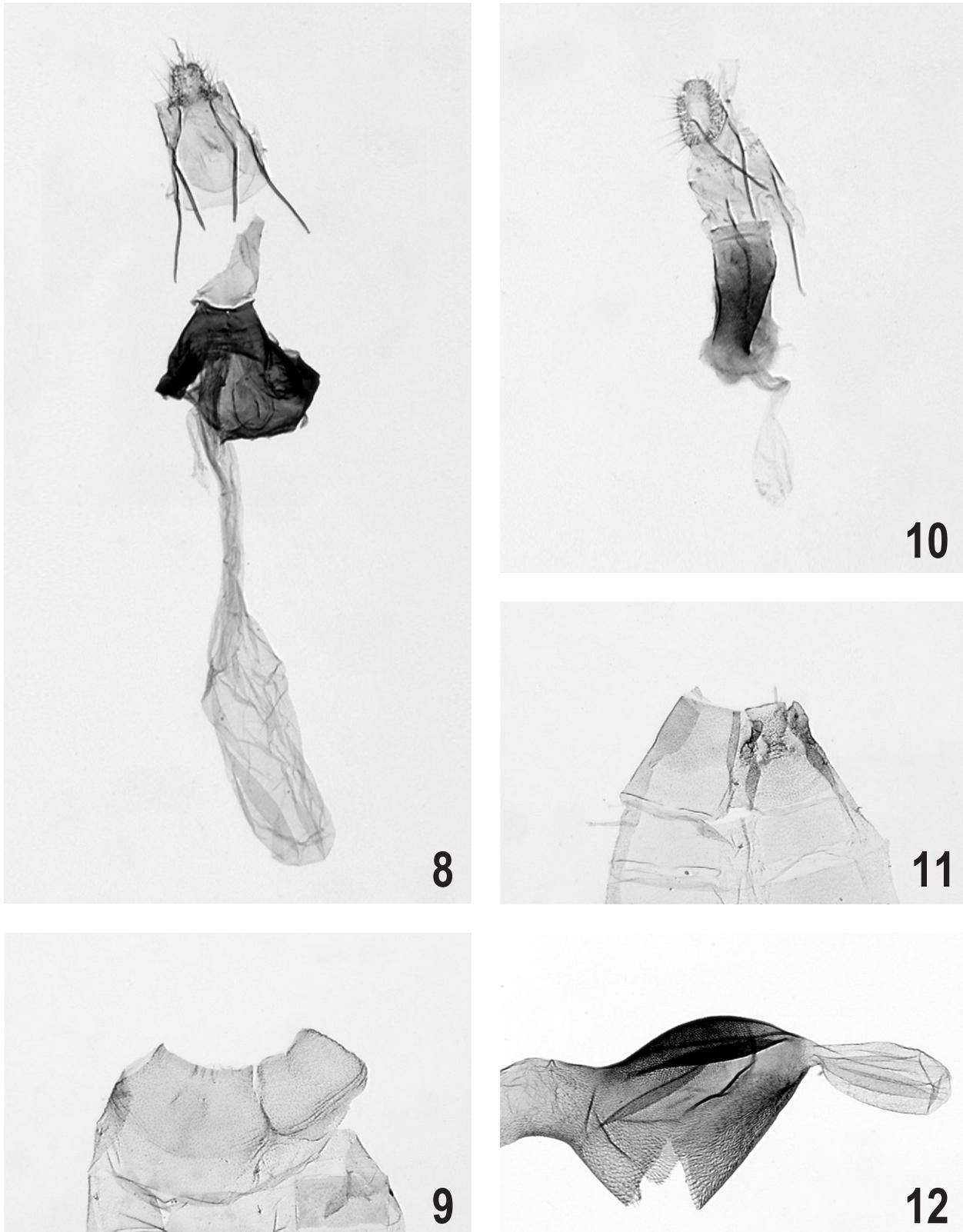
The Scopariinae have been revised on a world-wide scale by Nuss (1999). The phylogenetic information of this revision is summarised in the cladogram given in Fig. 13. Nuss (1999) defined the Scopariinae as a monophyletic group hypothesising that their unique forewing pattern is a synapomorphy. This character, the 'scopariine wing pattern' (character 1), is a composition of the following elements: (a) presence of an antemedian line at one third of wing; (b) presence of two antemedian stigmata distally of the antemedian line – the proximal discoidal stigma and the cubital stigma; (c) presence of a distal discoidal stigma, which is X- or 8-shaped; (d) presence of a postmedian line which always has an indentation towards the distal discoidal stigma at vein R₅; (e) presence of a subterminal line which more or less forms an 'X' together with the postmedian line. This complex character is common for all scopariine species with only very few exceptions. One of these exceptions is *Cholius luteolaris* (Scopoli, 1772) which has uniform ochreous coloured forewings, which is regarded as a derived character state among Scopariinae.

Within the Scopariinae, Nuss (1999) regarded *Dasyscopa* Meyrick, 1894, *Dipleurinodes*, *Eudipleurina*, *Eudonia*, *Scoparia*, *Sineudonia* Leraut, 1986, *Cholius*, *Gibeauxia* Leraut, 1988, *Micraglossa* Warren, 1891, *Toulgoetodes* Leraut, 1988 and *Witlesia* Chapman, 1912 as a monophyletic group with the synapomorphy 'one half of the corpus bursae-wall with sclerotized spines, the other half with scobinate patches' (character 2, Fig. 12). The remaining genera have a membranous corpus bursae (*Helenscoparia*) or the corpus bursae has the entire wall uniformly covered with tiny spines (*Antiscopa* Munroe, 1964, *Iranarpi* Leraut, 1982, *Syrianarpi* Leraut, 1982, *Cosipara* Munroe, 1972, *Anarpi* Chapman, 1912, *Gesneria* Hübner, [1825]), but for three genera, this character state could not be verified because their females are still unknown (*Caradjaina* Leraut, 1986, *Hoenia* Leraut, 1986, *Pagmanella* Leraut, 1985).

Within the monophyletic group based on character 2, 6 genera are regarded as monophyletic based on the synapomorphy 'presence of an appendix bursae' (character 3, Fig. 12). These genera are *Dasyscopa*, *Dipleurinodes*, *Eudipleurina*, *Eudonia*, *Scoparia*, and *Sineudonia*. Within this group, *Dipleurinodes* and *Eudipleurina* are regarded as sister groups by the presence of the synapomorphy 'male sternite VIII with U-shaped sclerotization' (character 4). Nuss' (1999) hypothesis on the phylogeny of the Scopariinae is still weakly supported, because only 7 informative characters were found for 21 scopariine genera. Nevertheless, a comparison of all 21 scopariine genera treated by Nuss (1999) shows, that *Afroscoptaria* can be regarded as a monophyletic group supported by the presence of a heavily



Figs. 4–7. Male genitalia. **4:** *Afroscoparia contemptalis* (GU Nuss 848). **5:** *Afroscoparia australis* (GU Nuss 974). **6:** *Afroscoparia australis*, male sternite VIII (above right) (GU Nuss 974). **7:** *Afroscoparia australis*, male genitalia in lateral view (aedeagus removed) (drawing by G. Wolf).



Figs. 8–11. Female genitalia. **8:** *Afroscoparia contemptalis* (GU Nuss 854). **9:** *Afroscoparia contemptalis*, female tergite (left) and sternite (right) VII (GU Nuss 854). **10:** *Afroscoparia australis* (GU Nuss 849). **11:** *Afroscoparia australis*, female tergite (left) and sternite (right) VII (GU Nuss 849). **Fig. 12.** Corpus bursae of the European *Scoparia subfusca* Haworth, 1811 (GU Nuss 804) showing the characters 'wall of corpus bursae at one half with sclerotized thorns, at the other half with scobinate patches' (character 2) and 'presence of an appendix bursae' (character 3).

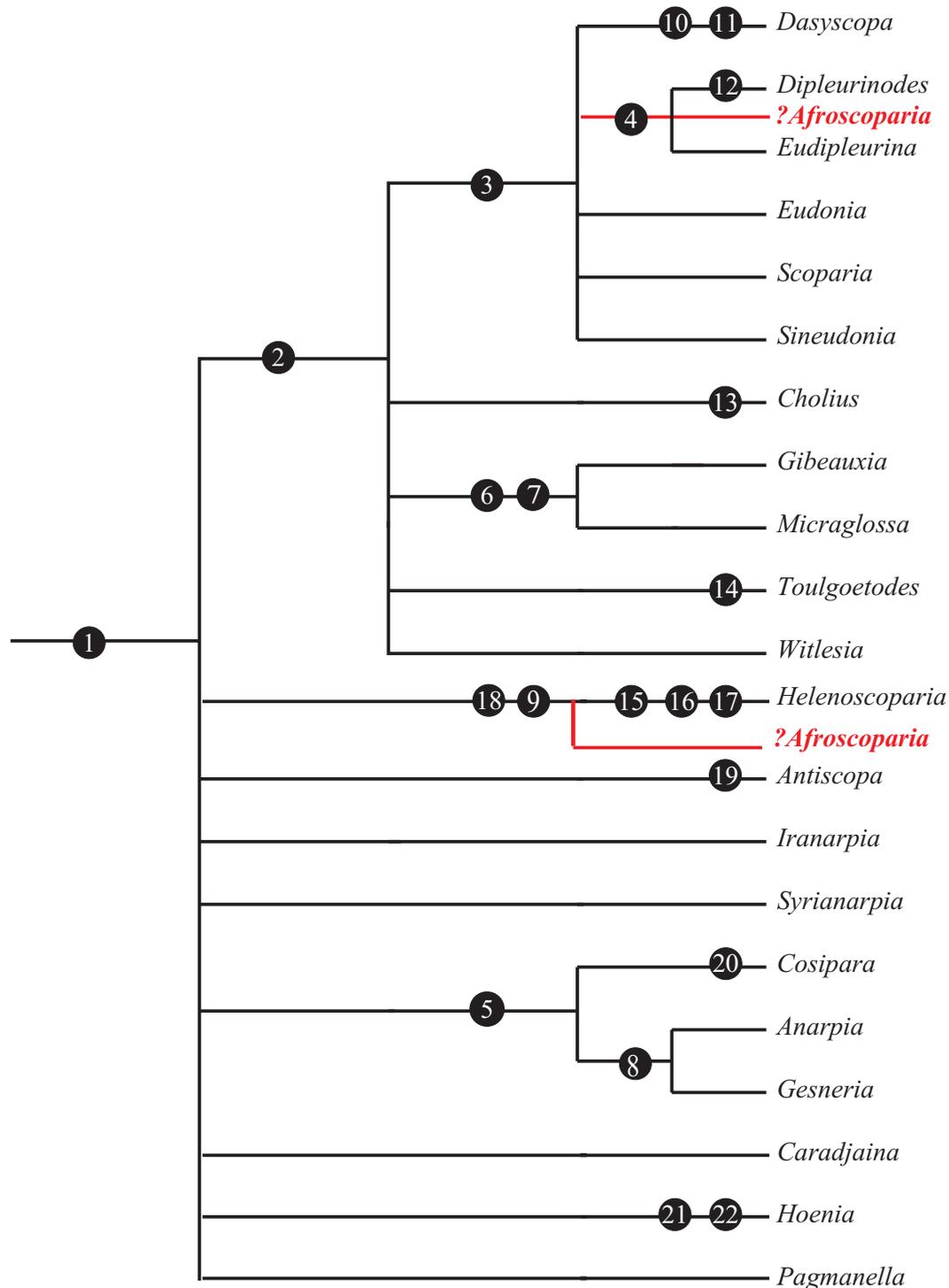


Fig. 13. Cladogram showing the phylogenetic relationships of scopariine genera according to Nuss (1999), showing the two contradictory positions of *Afroscoparia*.

Synapomorphies. Character 1: Forewing with scopariine wing pattern. Character 2: Half of corpus bursae-wall covered with spines, the other half with scobinate patches. Character 3: Corpus bursae cephalad with appendix bursae. Character 4: Male sternite VIII with heavily U-shaped sclerotization. Character 5: Corpus bursae with elongate signum consisting of heavily sclerotized scobinate patches. Character 6: Corpus bursae with streak-like signum. Character 7: Valvae with heavily sclerotized setae. Character 8: Wall of Corpus bursae with hair-like spines.

Apomorphies. Character 9: Corpus bursae membranous. Character 10: Hindwing vein M_2 and the not reduced part of discoidal cross vein with a common stalk. Character 11: Hindwing with complex androconial organ. Character 12: Vesica with diverticulum which is covered with a number of very small cornuti. Character 13: Scopariine forewing pattern completely reduced. Character 14: Female sternite VII not scaled and with heavily sclerotized thorns. Character 15: Male flagellomeres thickened; each flagellomere with several, conspicuous protuberances. Character 16: Gnathos heavily sclerotized, sickle shaped. Character 17: Tympanal organ reduced. Character 18: Bulbus ejaculatorius large, with semicircular lateral surfaces forming an U-shaped vessel. Character 19: Juxta distally with lanceolate prolongation. Character 20: Valvae proximally with long, heavily sclerotized sclerites, directed dorsally. Character 21: Presence of an arch-shaped sclerite dorsally of aedeagus. Character 22: Sacculus proximally with protruding sclerotization, which is covered with spines.

sclerotized vinculum and sacculus. The two characters are regarded as synapomorphies for the two species of *Afroscoparia*. However, the evidence of the phylogenetic relationships of *Afroscoparia* is contradictory. On the one hand, the species of *Afroscoparia* share two apomorphic characters states with all the species of *Helenoscoparia*: the female corpus bursae is membranous (character 9) and the male bulbus ejaculatorius is large, with semicircular lateral surfaces (character 18). On the other hand, male specimens of *Afroscoparia* have an U-shaped heavy sclerotization in the sternite VIII, which is shared with all the species of the afrotropical genera *Dipleurinodes* and *Eudipleurina*. The contradiction is based on the fact that *Dipleurinodes* and *Eudipleurina* is supposed to belong either to a monophyletic group consisting of 6 or to another such group which is more comprehensive consisting of 11 scopariine genera, both excluding *Helenoscoparia*. The first group is supported by autapomorphic character 3 and the second by character 2. All endemic genera of the Afrotropical Region are involved in this conflict. It might be promising to study their morphology in greater detail especially using characters of the endo- and mesoderm in order to increase the potential number of studied characters. Such characters are mostly lost in dried museum specimens which have been available for this study.

Acknowledgements

The work is based exclusively on the study of loan material supported by Martin Krüger (TMP), Michael Shaffer and Kevin Tuck (BMNH). David Agassiz (Gravesend, Kent) kindly supplied afrotropical specimens of Scopariinae, among which no representatives of *Afroscoparia* could be found. Gudrun Wolf (Dresden) did the genitalia drawing and Uwe Kallweit (Dresden) assisted in photography. Wolfgang Speidel (Bonn) and Yuri Nekrutenko (Kiev) gave useful comments to the manuscript.

References

- LERAUT, P. J. A. 1989: Insectes Lépidoptères. Crambidae Scopariinae. – Faune de Madagascar, Paris **72**: 41 pp.
- MAES, K. V. N. 1996. New species of Scopariinae from Cameroon. (Lepidoptera, Pyraloidea, Crambidae). – Lambillionea **96**: 295–304.
- NUSS, M. 1999. Revision der Gattungen der Scopariinae (Lepidoptera: Pyraloidea: Crambidae). – Nova Supplementa Entomologica **13**: 3–151.
- NUSS, M. 2000. Three new species of Afrotropical Scopariinae (Insecta: Lepidoptera: Pyraloidea: Crambidae). – Reichenbachia **33**: 433–438.
- NUSS, M. & W. SPEIDEL (in press). Introduction. in: Goater, B., M. Nuss & W. Speidel, Pyraloidea I (Crambidae: Acen-tropinae, Evergestinae, Heliothelinae, Schoenobiinae, Scopariinae). in: P. Huemer, O. Karsholt & L. Lyneborg (eds.), Microlepidoptera of Europe **4**. Apollo Books, Stenstrup.
- WALKER, F. [1866]. List of the Specimens of Lepidopterous Insects in the Collection of the British Museum **34**, Supplement **4** (1865): 1121–1533. The Trustees of the British Museum, London.