Diopsis (Diopsidae, Diptera) with unusual wing spots: two new species from Malawi with a longer eye span in females than in males

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Key words: Diopsidae, Diptera, *Diopsis*, new species, redescriptions, Africa, sexual dimorphism.
Diopsis malawiensis spec. nov. and *D. vanbruggeni* spec. nov. are described from Malawi. Subgeneric grouping of *Diopsis* Linnaeus, 1775, is briefly discussed, but the genus awaits revision. A redescription is given of *Diopsis micronotata* Brunetti, 1926, from the D.R. of Congo, as this species might be confused with *D. vanbruggeni*. The two new species and *D. micronotata* are closely related and are tentatively placed in the *absens* Brunetti group. *Diopsis surcoufi* Séguy, 1955, from Mozambique and Tanzania, is redescribed because of its superficial resemblance to *D. malawiensis*. All four species are characterised by tiny, but distinct, apical or subapical wing spots. In *D. malawiensis*, *D. micronotata* and *D. vanbruggeni*, eye span is, in absolute and relative terms, slightly longer in females than in males. Sexual dimorphism in Diopsidae, as related to eye span, is briefly discussed.

Introduction

From 1971 to 1975 the authors made a large collection of approximately 65,000 Diopsidae in Malawi. Around 51 species were collected, divided over six genera: 30 species of *Diopsis* Linnaeus, 1775, 2 *Sphyracephala* Say, 1828, 15 *Diasemopsis* Rondani, 1875, 1 *Centrioncus* Speiser, 1910, 2 *Diopsina* Curran, 1928, and 1 *Chaetodiopsis* Séguy, 1955. *Chaetodiopsis* is considered a junior synonym of *Diasemopsis* by Baker et al. (2001), Meier & Baker (2002) and Carr et al. (2006). However, we prefer to maintain *Chaetodiopsis* while awaiting a badly needed revision of the *Diasemopsis* group. The Malawian *Centrioncus jacobae* Feijen, 1983, was placed in the Centrioncidae by Feijen (1983). However, later authors (Meier & Hilger, 2000, Kotrba & Balke 2006, Meyer, 2004) placed the Centrioncinae again in the Diopsidae

Most of the species collected in Malawi are not yet described. This paper deals with two peculiar *Diopsis* species: *D. malawiensis* spec. nov. and *D. vanbruggeni* spec. nov. These two 'forest' *Diopsis* are characterised by small, unusual apical wing spots. A brief redescription is given of *D. micronotata* Brunetti, 1926 from the D. R. of Congo, as this species might be confused with *D. vanbruggeni*. The two new species and *D. micronotata* are closely related species. *Diopsis surcoufi* Séguy, 1955 from Mozambique and Tanzania is redescribed because of its superficial resemblance to *D. malawiensis*, though it is not a close relative. A preliminary subdivision of *Diopsis* is presented.

The three species *D. malawiensis*, *D. micronotata* and *D. vanbruggeni* are peculiar, as their eye span is, in absolute terms, slightly longer in females than in males. Relatively (as compared to body length), female eye spans are also longer, as body length is longer in males. Because of this unusual phenomenon, sexual dimorphism in Diopsidae, as

related to eye span, is briefly discussed. Sexual dimorphism in eye span has been well documented for a number of diopsid species, while sexual homomorphism for the same character has been found in other diopsid species. So far 'reversed' sexual dimorphism, in which females have the longer eye span, has not been documented, though Feijen (1989) briefly indicated its existence.

Abbreviations used

AMNH	American Museum of Natural History, New York
BMNH	British Museum (Natural History), London
MNHNP	Muséum National d'Histoire Naturelle, Paris
MRAC	Musée Royal de l'Afrique Centrale, Tervuren
NMSA	Natal Museum, Pietermaritzburg
RMNH	National Museum of Natural History, Leiden
IVB	Inner Vertical Bristle
OVB	Outer Vertical Bristle

Species groups within *Diopsis* Linnaeus, 1775

Diopsis remained the sole diopsid genus till Say (1828) erected *Sphyracephala*. Until Rondani (1875) described two more genera, all newly described diopsids were placed in *Diopsis*, except for two more *Sphyracephala*. As a result, many species were subsequently referred to later described genera. To some extent, *Diopsis* remained a default genus and a thorough revision of the genus is overdue. After Linnaeus' description "Capite bicorni, oculis terminalibus," the genus has never been redescribed. So far, only some partial keys were produced. Séguy (1955) produced two keys, one for *Diopsis* with a black or brown abdomen and the other for *Diopsis* with an abdomen that is largely or completely red. Lindner (1962) gave a key for *Diopsis* with a red abdomen. Feijen (1978) gave keys for *Diopsis* with a large apical wing spot and for dark *Diopsis* with banded wings. Feijen (1984b) briefly reviewed black *Diopsis* with irregularly infuscated wings. Below, a provisional subdivision of *Diopsis* is given. This subdivision is intended as a first guide only into the genus. Subsequent subdivisions need to be based on descriptions of male and female genitalia and DNA analyses. For future species descriptions, the importance of pollinosity patterns on the dorsal thorax has to be stressed. The greater number of *Diopsis* species remains to be described, while many of the existing species need to be redescribed.

1. **The *circularis* Macquart group**: dark *Diopsis* with banded wings. This is the easiest group to recognise with a mainly dark grey to black colour, though some parts can be reddish brown. The wing has dominant dark bands; the most central one of these dark bands is almost round. Feijen (1978) gave a key for this group and proposed a number of synonymies. However, Feijen (1984a) reconsidered some of these synonymies. In any case, the group comprises *circularis* Macquart, 1835, *ornata* Westwood, 1837, *pollinosa* Adams, 1903 and *munroi* Curran, 1929. Proposed junior synonymies of the first three species will have to be reviewed. This concerns *macquartii* Guérin-Méneville, 1837-1844, *curva* Bertoloni, 1861, *aries* Hendel, 1923, *conspicua* Eggers, 1925 and *globosa* Curran, 1931.

2. **The *carbonaria* Hendel and *gnu* Hendel groups**: Blackish *Diopsis* with irregularly infuscated wings. Feijen (1984b) divided the eleven black species into two groups. The first group was referred to as the *carbonaria*-group and is characterised by tiny IVB and OVB and strongly incrassate front femora. It includes *carbonaria* Hendel, 1923, *melania* Eggers, 1925, *aterrima* Brunetti, 1926, *diversipes* Curran, 1928, *baigumensis* Séguy, 1955, *nitela* Séguy, 1955 and, probably, *nigrasplendens* Feijen, 1984. The second group was referred to as the *gnu*-group and is characterised by the presence of inner and outer spines on the stalks (replacing IVB and OVB) and hardly incrassate front femora. It includes *gnu* Hendel, 1923, *acanthophthalma* Eggers, 1925, *angustifemur* Brunetti, 1926, *anthracina* Brunetti, 1928 and *orizae* Séguy, 1955.
3. **The *apicalis* Dalman group**: *Diopsis* with brown head, thorax without cross-like pattern of pollinosity and almost always a large apical wing spot, living in open habitat (savannah, swamps). This is, no doubt, the largest group of *Diopsis* with many undescribed species (Feijen, 1987). It includes *apicalis* Dalman, 1817 (= *tenuipes* Westwood, 1837) and *lindneri* Feijen, 1978, but also the well-known rice diopsid *longicornis* Macquart, 1835 (= *thoracica* Westwood, 1837 and *phlogodes* Hendel, 1923), which has only some apical infuscation on the wing. The *apicalis* group is more closely related to the *cruciata* and *fumipennis* groups than to the other groups.
4. **The *cruciata* Curran group**: *Diopsis* with brown head, thorax with cross-like pollinosity pattern and a large apical wing spot. The species in this group are (rain) forest dwellers. This group is superficially very similar to the *apicalis* group and its species are often found under '*apicalis*' labels in museum collections. So far, it only includes *cruciata* Curran, 1934, though another 15 species await description. This group might also include *eisentrauti* Lindner, 1962, but its thoracic cross is not complete and it has wrinkled, sausage-shaped spermathecae instead of the usual round spermathecae.
5. **The *fumipennis* Westwood group**: *Diopsis* with black head and a large apical wing spot. Pollinosity pattern on the thorax is variable; usually no cross-like pattern, but *fumipennis* itself has a cross. Species can occur in savannah habitat or forest habitat. The group includes *fumipennis* Westwood, 1837, *punctiger* Westwood, 1837, (= *trentepohlii* Westwood, 1837), *atricapillus* Guérin-Méneville, 1837-1844, *fascifera* Eggers, 1925 and many undescribed species.
6. **The *indica* Westwood group**: Asian *Diopsis* with an apical wing spot, abdomen with black base or tip and sometimes completely black. The relation between the Asian *Diopsis* and the African *Diopsis* requires study. For the moment, the systematics of this group is complicated given summary original descriptions and questionable origins. As this group is considerably larger than earlier anticipated, it appears better to disregard, for the moment, earlier proposed synonymies. Next to *indica* Westwood, 1837, the group then includes *graminicola* Doleschall, 1857 and *westwoodii* Westwood, 1848. It is not unlikely that *abdominalis* Westwood, 1837, and *assimilis* Westwood, 1837 are of Asian origin and would also belong to this group. A recent addition was *chinica* Yang & Chen, 1996.
7. **The *ichneumonea* Linnaeus group**: *Diopsis* with a distinctive preapical wing spot. This group might have to be split into two groups: slender forest *Diopsis* and more broadly built savannah *Diopsis*. This group is large and contains already quite some described species: *ichneumonea* Linnaeus, 1775, *arabica* Westwood, 1837, *basalis* Brunetti, 1926, *collaris* Westwood, 1837, *dimidiata* Curran, 1929, *erythrocephala* West-

wood, 1837, *hoplophora* Hendel, 1923, *macromacula* Brunetti, 1926, *nigriceps* Eggers, 1925, *pallida* Westwood, 1837, *planidorsum* Hendel, 1923, *praeapicalis* Speiser, 1910, *rubriceps* Eggers, 1925 and *somaliensis* Johnson, 1898 (= *lunaris* Hendel, 1923).

8. **The *servillei* Macquart group**: clear winged *Diopsis*. This is a not so well-defined group of rather dissimilar species. The colour varies from the common brown head, black thorax, brown abdomen to almost completely black. It includes *servillei* Macquart, 1843, *affinis* Adams, 1903, *diversipes* Curran, 1928, *flavoscutellata* Brunetti, 1928, *sulcifrons* Bezzi, 1908 (= *maculithorax* Brunetti, 1928) and a few undescribed species. Most species are savannah-dwelling.
9. **The *absens* Brunetti group**: slender forest diopsids with no or minor wing markings, brown head, black thorax and brown abdomen with often black base. It includes *absens* Brunetti, 1926, *finitima* Eggers, 1916, *micronotata*, *malawiensis* spec. nov. and *vanbruggeni* spec. nov.

Descriptive part

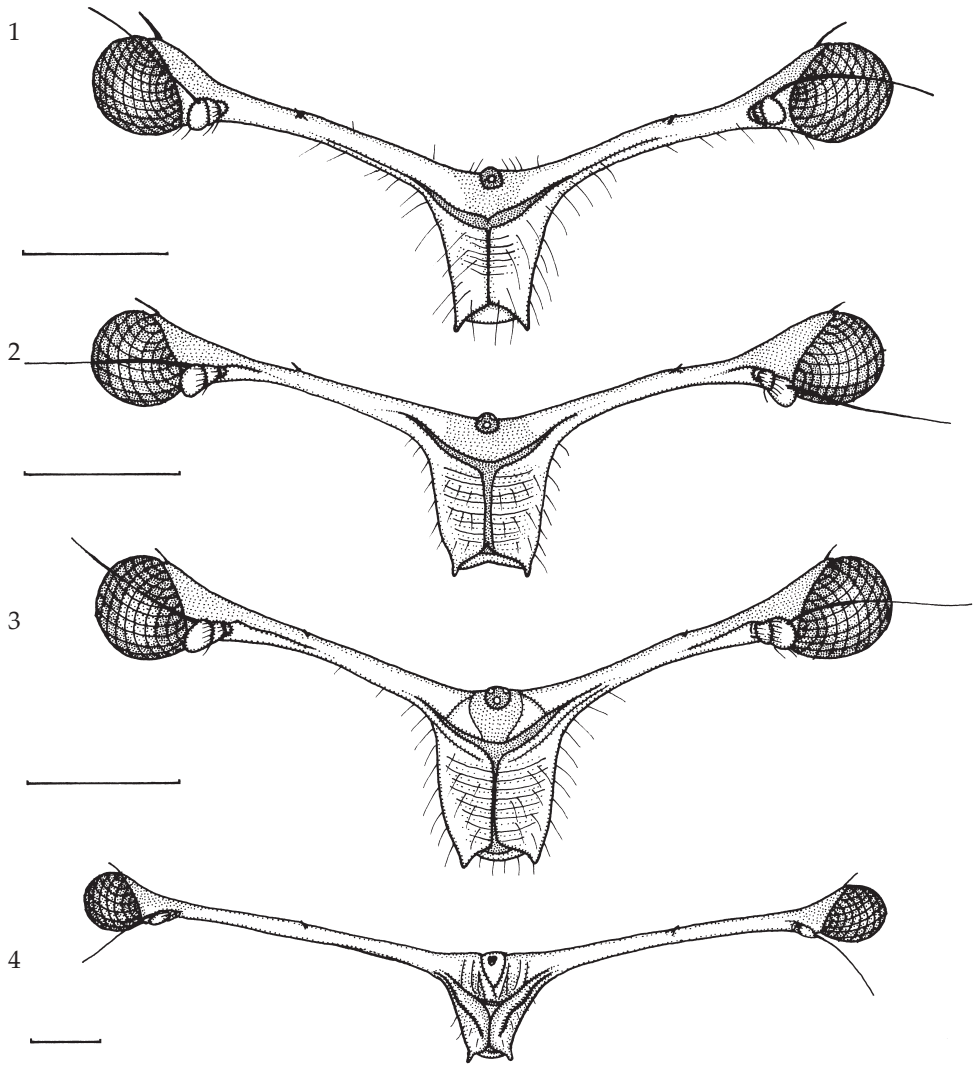
Diopsis malawiensis spec. nov.
(figs 1, 5, 9, 13, 17-21, 30)

Material.— Holotype, ♂ (RMNH), **Malawi**, Zomba, tributary stream of Mlunguzi, 960 m, 24.vii.1974. Paratypes: 1 ♂, 28.vii.1974; 1 ♀, 31.viii.1975; 1 ♂, 4.v.1975; 2 ♂, 10.v.1975; 1 ♀, 18.v.1975; 1 ♂, 22.v.1975; 1 ♂, 31.v.1975 (all topotypic); 1 ♀, Zomba plateau, Mlunguzi river, near bridge, 17.x.1974, 1,700 m; 1 ♀, Blantyre, Ndirande rainforest, 10.vii.1975, 1,350 m; 2 ♀, 1 ♂, Mlunguzi rainforest, 20.vii.1975, 990 m (upstream from main collection site). All paratypes in RMNH. In total 6 ♀ and 8 ♂ were collected.

Diagnosis.— *D. malawiensis* can be recognised by the smooth frons, small facial teeth, minute IVB, tiny wing spot in apex of cell r2+3, apically slightly broadening cell r4+5, incrassate front femora, blackish brown terga 1 and 2, dark brown mesal band on tergum 3, curved ♀ sternum 7, ♀ tergum 7 and sternum 8 each consisting of two sclerites, articulated surstyli in lateral view bone-shaped and in posterior view spatula-shaped, broad male cerci, and reversed sexual dimorphism - eye span relatively and absolutely shorter in males, ♂ body longer than ♀ body.

Measurements.— Body length ♀ 7.3 mm ± SE 0.1 (range 7.0-7.4, n = 6), ♂ 7.7 mm ± 0.1 (range 7.1-8.3, n = 8); eye span ♀ 5.3 mm ± 0.1 (range 5.1-5.7, n = 6), ♂ 5.1 mm ± 0.1 (range 4.5-5.3, n = 8); wing length ♀ 5.8 mm ± 0.1 (range 5.5-6.1, n = 6), ♂ 6.0 mm ± 0.1 (range 5.3-6.4, n = 8); length of scutellar spine ♀ 1.04 mm ± 0.04 (range 0.90-1.14, n = 6), ♂ 1.07 mm ± 0.02 (range 0.93-1.12, n = 7). The body length is significantly longer in males (t-Test, t = 2.99, d.f. = 12, $P < 0.01$), while the eye span is not significantly longer in females (t = 1.64, d.f. = 12, $P < 0.10$). The sexual differences in wing length and length of scutellar spine are not significant.

Head.— Dorsocentral part glossy brown; ocellar tubercle blackish; frons (fig. 1) mainly smooth, centrally with a fine granular structure, around this granular area some very fine ridges; arcuate groove dark brown; face glossy brown, slightly paler than frons, with hardly discernable fine horizontal lines, mesocentrally bulging outwards, covered with fine whitish hairs, facial teeth small but distinct; eye span ♀ very short (26% shorter than body length), ♂ very short (34% shorter than body length); stalks



Figs 1-4, frontal view of head. 1, *Diopsis malawiensis* spec. nov., holotype ♂; 2, *Diopsis micronotata* Brunetti, 1926, ♂, Kimilolo; 3, *Diopsis vanbruggeni* spec. nov. paratype ♀, Ntchisi; 4, *Diopsis surcoufi* Séguy, 1955, ♂, Amatonga forest. Scales 1 mm.

glossy brown, anteriorly with a darker brown stripe towards antennae, broad apical parts blackish, pollinose; IVB minuscule, 1/8 × diameter of eye stalk, base of IVB also minute; OVB medium-sized, 1½ x diameter of eye stalk.

Thorax.— Collar glossy black, posterior margins pollinose dorsally, narrow pollinose stripe on the meson, lateroventrally pollinose; scutum, pleura and sterna uniformly black pollinose, scutellum brown pollinose, dorsolaterally more blackish, scutellar spines glossy brown, twice the length of scutellum, almost straight, almost in line with the dorsal scutellum, diverging under an angle of 55° (figs 5, 9); metapleural spines

short, blunt, posterolaterally directed; some fine white hairs on thorax, scutellar spines with about ten hairs, no basal warts.

Wing.— Almost hyaline; apically in cell r2+3 a tiny blackish spot (figs 9, 13), reaching vein R4+5 but staying clear of vein R2+3; some hardly discernable infuscation at apical tip of cell m, some minute infuscation in cell r4+5; vein R4+5 just curving upwards apically, while vein M just curving downwards apically, leading to a cell r4+5 which is distinctly broader apically than subapically; 'former' base of vein A1+CuA2 and place of former crossvein Bm-Cu just indicated; covered with microtrichia except for glabrous basal areas; glabrous basal areas include cell c (except for anterior apical half), basal tip of cell r1, basal two-thirds of cell br, basal half of cell bm and basal half of cell cu.

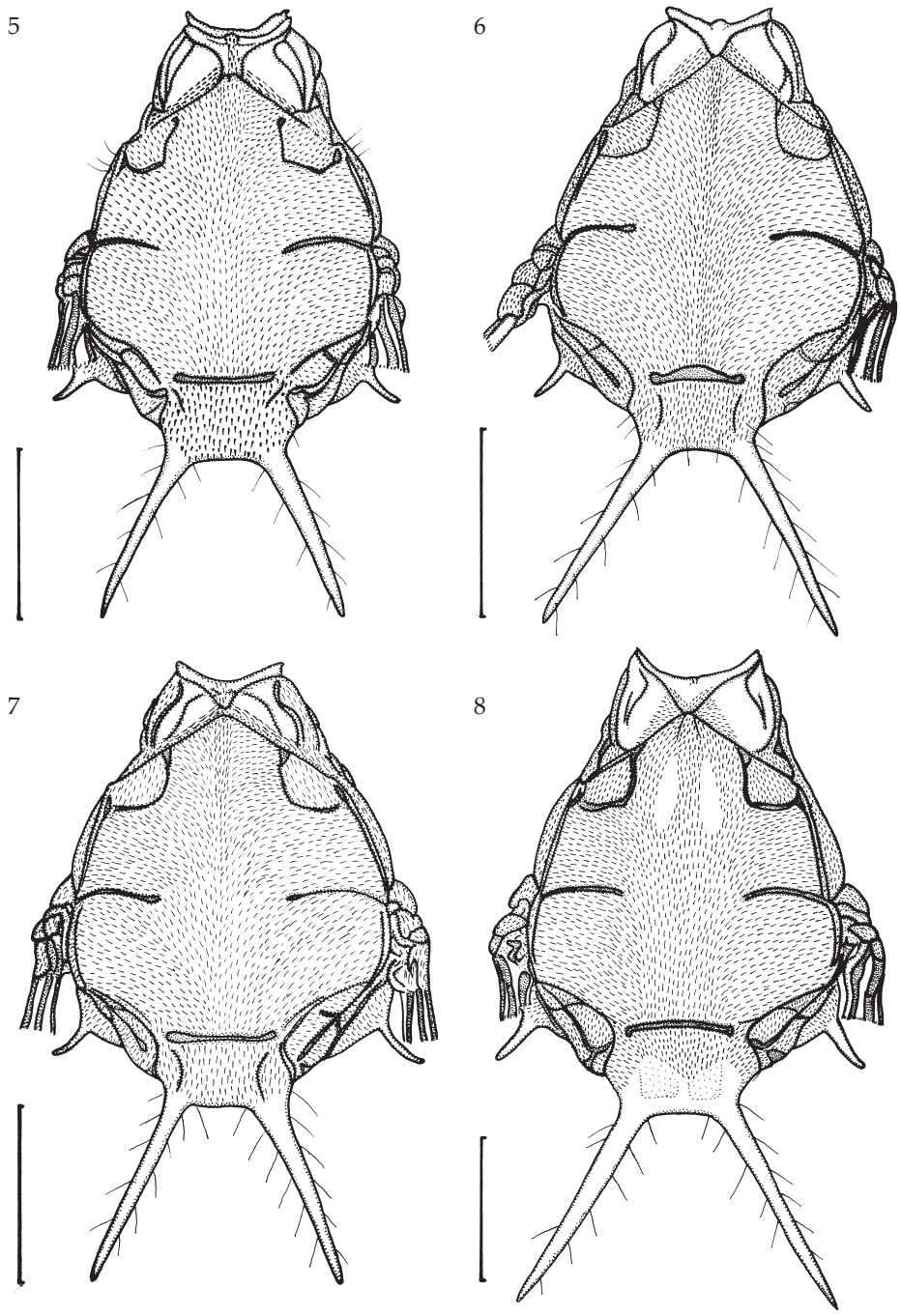
Legs.— Front leg yellowish brown with darker tibia and tarsi, tibia with blackish stripe on both sides; mid leg yellowish brown with slightly darker tibia and tarsi, femur 2 with small dark spots distally; hind leg yellowish brown with darker tibia and tarsi, femur 3 with small dark spots distally, tibia 3 with darker basal and distal third; femur 1 incrassate in both ♀ and ♂, ratio of length/width in ♀ 3.5 ± 0.0 (range 3.5-3.6, n = 5) and in ♂ 3.5 ± 0.0 (range 3.4-3.7, n = 7), two rows of tubercles on distal two-thirds, outer tubercles distinctly larger than inner tubercles, inner row in ♀ with 19.1 ± 0.7 tubercles (range 17-23, n = 9) and in ♂ with 18.4 ± 0.5 tubercles (range 16-22, n = 13), outer row in ♀ with 15.2 ± 0.5 tubercles (range 13-18, n = 10) and in ♂ with 15.8 ± 0.3 tubercles (range 13-17, n = 13); femora 2 and 3 slightly swollen and with small apical spur.

Preabdomen.— Tergum 1 blackish, tergum 2 blackish brown but brown posterolaterally, tergum 3 brown with dark brown mesal band (fig. 9), remaining terga yellowish brown, no pollinosity on terga; syntergum consisting of terga 1, 2 and 3, sutures not visible; sternum 1 glossy dark brown, not fused to syntergum, sternum 2 brown, slightly pollinose, other sterna yellowish brown, slightly pollinose; interscleriite 1-2 very narrow; spiracle 1 in membrane.

Female postabdomen.— Straight, not deflexed; tergum 6 a rectangular sclerite, tergum 7 consisting of two rectangular sclerites, narrowly separated on the meson; tergum 8 a narrow rectangular sclerite; tergum 10 with 3 pair of hairs, cerci broad (fig. 20), ratio of length/width 1.3, covered with microtrichia and hairs; sterna 5 and 6 single rectangular sclerites; sternum 7 a single, somewhat curved rectangular sclerite with posteriorly a row of small black spines on the meson; sternum 8 represented by two rectangular sclerites; spiracle 7 in membrane; subanal plate short, broad and with rounded corners (fig. 20), posteriorly with 4 pairs of hairs; spermathecae (fig. 21) smooth and round.

Male postabdomen.— Straight, sometimes slightly deflexed; epandrium (fig. 17) rounded, with about 22 pairs of hairs, covered with microtrichia; surstyli articulated, basal half straight and slender, apically strongly broadening, apically slightly constricted in the middle, in lateral view somewhat bone-shaped, in posterior view more spatula-shaped, on apical half, especially at the tip with short hairs, no microtrichiae; surstyli interconnected via thin, hardly visible processus longi; cerci simple, somewhat triangular, broad, ratio length/width 1.8, covered with microtrichia and hairs; phallapodeme rather slender (fig. 18), anterior arm with rounded apical corners and about equal in length to posterior arm; ejaculatory apodeme gradually broadening anteriorly with blunt corners (fig. 19).

Habitat.— *D. malawiensis* was mainly collected at the type locality from grasses among rocks in an area of just 2 m^2 in a shady stream. The species was only collected at



Figs 5-8, dorsal view of thoraces. 5, *Diopsis malawiensis* spec. nov., holotype ♂; 6, *Diopsis micronotata* Brunetti, 1926, ♀, Kimilolo; 7, *Diopsis vanbruggeni* spec. nov., paratype ♀, Ntchisi; 8, *Diopsis surcoufi* Séguy, 1955, ♂, Amatonga forest. Scales 1 mm.

Zomba, except for one fly from the rainforest at Ndirande Mountain. Flies were only collected in the dry season.

Remarks.— *D. malawiensis* is morphologically quite similar to *micronotata* and *vanbruggeni* spec. nov. It probably belongs to the *absens* group (see the discussion on species groups within *Diopsis* above), although *absens* does not have the characteristic apical broadening of cell r4+5 of the three species.

Diopsis micronotata Brunetti, 1926
(figs 2, 6, 10, 14)

Type material.— ♀ syntype ("type" on label), **Democratic Republic of Congo**, (Belgian Congo), Grand Kimbembe, Haut Luapula, 20.viii.(19)19, Lt. Ghesquiére (MRAC, no. 1198b, det. E. Brunetti 192, 5). "Cotypes": 2 ♂ (MRAC, no. 1198c, det. E. Brunetti 192, 5), 1 ? (BMNH). The syntypes were only cursorily inspected by us some years ago. Brunetti remarked "Described from 4 specimens, of which one is apparently a ♂, the genitalia being concealed in the other two." The three specimens in MRAC and the specimen in BMNH are assumed to form the original type series.
Material studied.— 1 ♀, 1 ♂, **Democratic Republic of Congo**, Elizabethville, rivière Kimilolo, 29.vii.1930, Dr N. Bequaert.

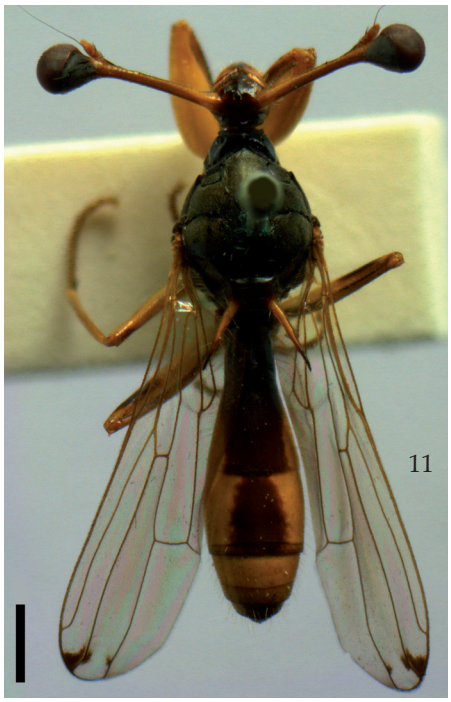
Diagnosis.— *D. micronotata* can be recognised by the smooth frons, distinct facial teeth, small IVB, tiny subapical wing spot attached to flexure in vein R2+3, small subapical wing spot around vein R4+5, cell r4+5 twice as broad apically as subapically, narrow cell r2+3, incrassate front femora, blackish brown terga 1 and 2, and *assumed* reversed sexual dimorphism - eye span relatively and absolutely shorter in males, ♂ body longer than ♀ body.

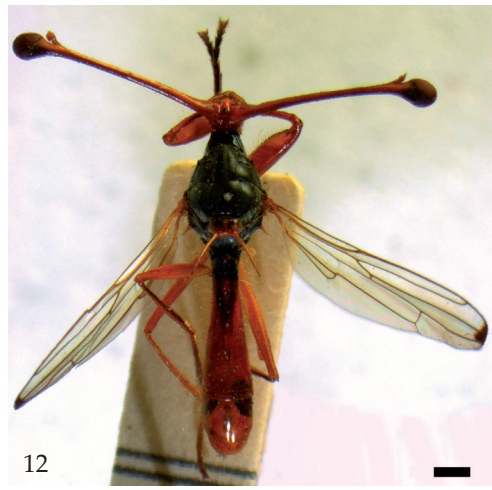
Measurements.— Body length ♀ 6.8 mm, ♂ 7.3 mm; eye span ♀ 5.1 mm, ♂ 4.7 mm; wing length ♀ 5.5 mm, ♂ 5.9 mm; length of scutellar spine ♀ 1.09 mm, ♂ 1.04 mm.

Head.— Dorsocentral part glossy brown to blackish; ocellar tubercle blackish; frons (fig. 2) mainly smooth, two small shallow dimples on both sides of the meson, centrally with a fine granular structure; arcuate groove brown to blackish; face glossy brown to dark brown, with a large number of hardly discernable fine horizontal lines, mesocentrally bulging outwards, covered with fine whitish hairs, facial teeth distinct; eye span ♀ very short (25% shorter than body length), ♂ very short (36% shorter than body length); stalks glossy yellowish brown, ventrally darker, broad apical parts blackish, pollinose; IVB small, 1/4 × diameter of eye stalk, base of IVB very small; OVB medium-sized, 1½ × diameter of eye stalk.

Thorax.— Collar glossy black, posterior margins pollinose dorsally, lateroventrally pollinose, surface of dorsal collar finely structured laterally; scutum, pleura and sterna uniformly black pollinose, scutellum brown pollinose (figs 6, 10); scutellar spines glossy brown, 2½ × length of scutellum, almost straight, nearly in one plane with dorsal scutellum, diverging under an angle of 60°; metapleural spines short, blunt, posterolaterally directed; some fine white hairs on thorax, scutellar spines with about ten hairs, no basal warts.

Wing.— Almost hyaline; veins brown but apical parts of veins R2+3, R4+5 and M distinctly darker; a tiny subapical spot in cell r2+3 attached to flexure of vein R2+3; subapically around vein R4+5 a small irregular spot (figs 10, 14); subapically around vein M a very narrow spot 'thickening' the vein; some weak infuscation around tip of cell cu; flexure near end of vein R2+3 quite sharp, vein R4+5 distinctly curving upwards apically,





Figs 9-12, habitus in dorsal view. 9, *Diopsis malawiensis* spec. nov., holotype ♂; 10, *Diopsis micronotata* Brunetti, 1926, ♂, Kimilolo; 11, *Diopsis vanbruggeni* spec. nov., paratype ♀, Ntchisi; 12, *Diopsis surcoufi* Séguy, 1955, ♂, Kilossa. Scales 1 mm.

vein M distinctly curving downwards apically, leading to a cell r4+5 which is twice as broad apically as at its subapical constriction; cell r2+3 remarkably narrow for most of its length; covered with microtrichia except for glabrous basal areas; glabrous basal areas include cell (except for anterior apical half), basal tip of cell r1, basal two-thirds of cell br, basal half of cell bm and basal half of cell cu.

Legs.— Front leg yellowish brown with darker tibia and tarsi, tibia with blackish stripe on both sides; mid leg yellowish brown with slightly darker tibia and tarsi, femur 2 with dark spots on distal third; hind leg yellowish brown with darker tibia and tarsi, femur 3 with dark spot on distal third, tibia 3 with darker basal and distal third; femur 1 incrassate in both ♀ and ♂, ratio of length/width in single ♀ 3.6 and in single ♂ 3.4, two rows of tubercles on distal two-thirds, outer tubercles distinctly larger than inner tubercles, inner row in ♀ with 13.5 tubercles (range 13-14) and in ♂ with 14.5 tubercles (range 13-16), outer row in ♀ with 13 tubercles and in ♂ with 14 tubercles; femora 2 and 3 slightly swollen and with small apical spur.

Preabdomen.— Tergum 1 dark brown, tergum 2 dark brown but yellowish brown posterolaterally (fig. 10), remaining terga yellowish brown, no pollinosity on terga; syntergum consisting of terga 1, 2 and 3, sutures not visible; sternum 1 glossy dark brown, sternum 2 brown, slightly pollinose, other sterna yellowish brown, slightly pollinose.

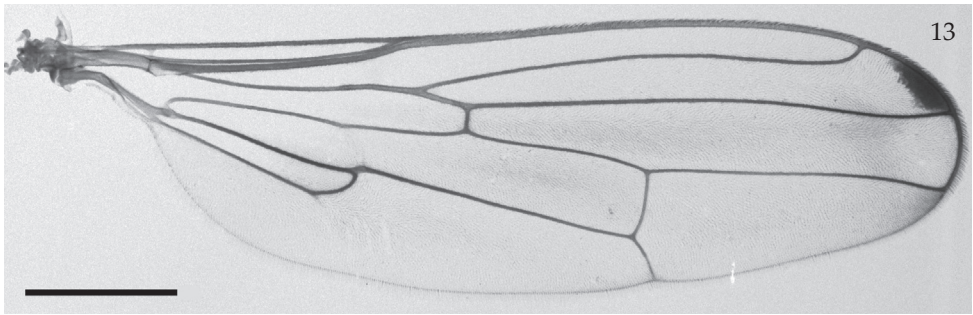
Female and male postabdomen.— Not enough material was available for dissection.

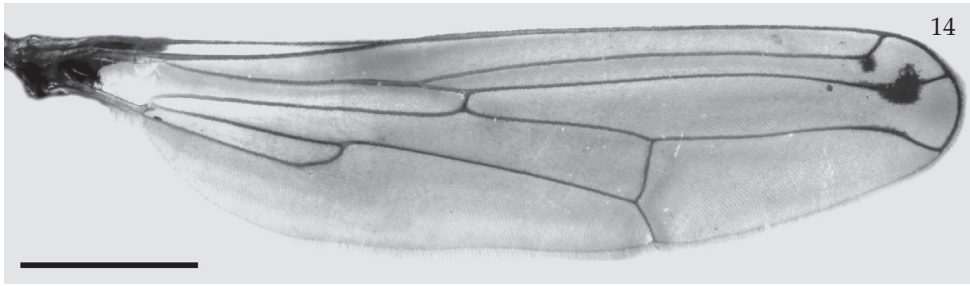
Remarks.— *D. micronotata* is morphologically similar to *malawiensis* spec. nov. and *vanbruggeni* spec. nov. It probably belongs to the *absens* group, although *absens* does not have the characteristic apical broadening of cell r4+5. Dr Marc De Meyer (pers. comm.) supplied information on additional material labelled as "cotypes" and "paratypes" in MRAC: 1 ♀, 1 ♂ cotypes (no. 1200f); 6 ♀, 7 ♂ paratypes (no. 1200f); 1 ♀ paratype, (no. 1388e). All this material is topotypic but not type material. De Meyer assumes that Brunetti first studied a short series (no. 1198). Later on he received a second series which were labelled as cotypes and paratypes (no.'s 1200 and 1388), but which were not referred to in the publication. Both series bear identification labels by Brunetti, but are dated differently (1198 series as 1925; 1200 & 1388 series as 1926). However, formally these "types" do not belong to the type series.

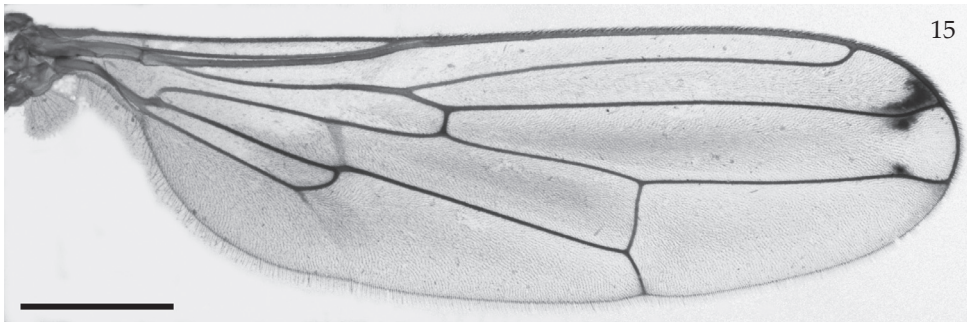
Diopsis vanbruggeni spec. nov.
(figs 3, 7, 11, 15, 22-26, 31)

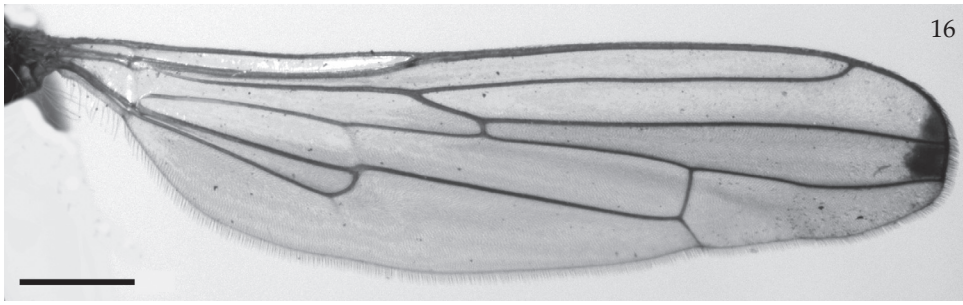
Type material.— Holotype, ♂ (RMNH), **Malawi**, Ntchisi rainforest, small tributary stream of Mahatope river, just below resthouse, 1,390 m, 21.viii.1974. Paratypes: 4 ♀, 20.viii.1974; 4 ♀, 3 ♂, 21.viii.1974; 1 ♀, 1 ♂, 22.viii.1974; 13 ♀, 7 ♂, 25.ix.1974 (all topotypic); 1 ♀, Ntchisi rainforest, along main path, 1,480 m, 20.viii.1974; 1 ♂, Ntchisi rainforest, along main path, 1,480 m, 22.viii.1974; 8 ♀, 2 ♂, Ntchisi, tributary of Dwanzi stream, 1,340 m, 25.ix.1974. All paratypes in RMNH. In total 31 ♀ and 16 ♂ were collected.

Diagnosis.— *D. vanbruggeni* can be recognised by the smooth frons, small facial teeth, minute IVB, small apical wing spot around apex of vein R4+5, tiny subapical spot in cell attached to vein M, apically slightly broadening cell r4+5, incrassate front femora, blackish brown tergum 1, terga 2 and 3 with broad, dark brown mesal band, ♀ sternum 7 a single rectangular sclerite, ♀ tergum 7 and sternum 8 each consisting of two sclerites, articulated surstyli strongly broadening apically and pointed in the middle, broad male cerci, and reversed sexual dimorphism - eye span relatively and absolutely shorter in males, ♂ body longer than ♀ body.









Figs 13-16, dorsal view of wing. 13, *Diopsis malawiensis* spec. nov., paratype ♂, Zomba; 14, *Diopsis micronotata* Brunetti, 1926, ♂, Kimilolo; 15, *Diopsis vanbruggeni* spec. nov., paratype ♀, Ntchisi; 16, *Diopsis surcoufi* Séguy, 1955, ♂, Kilossa. Scales 1 mm.

Measurements.— Body length ♀ 7.0 mm ± SE 0.1 (range 5.9-7.4, n = 30), ♂ 7.2 mm ± 0.1 (range 6.6-7.5, n = 16); eye span ♀ 5.0 mm ± 0.1 (range 4.0-5.4, n = 30), ♂ 4.8 mm ± 0.1 (range 4.1-5.1, n = 16); wing length ♀ 5.9 mm ± 0.0 (range 5.2-6.2, n = 30), ♂ 6.0 mm ± 0.1 (range 5.3-6.5, n = 16); length of scutellar spine ♀ 1.04 mm ± 0.02 (range 0.86-1.21, n = 28), ♂ 1.05 mm ± 0.02 (range 0.83-1.19, n = 16). The body length is significantly longer in males (t-Test, t = 2.16, d.f. = 44, $P < 0.05$), while the eye span is significantly longer in females (t = 2.26, d.f. = 44, $P < 0.05$). The differences in wing length and length of scutellar spine are not significant.

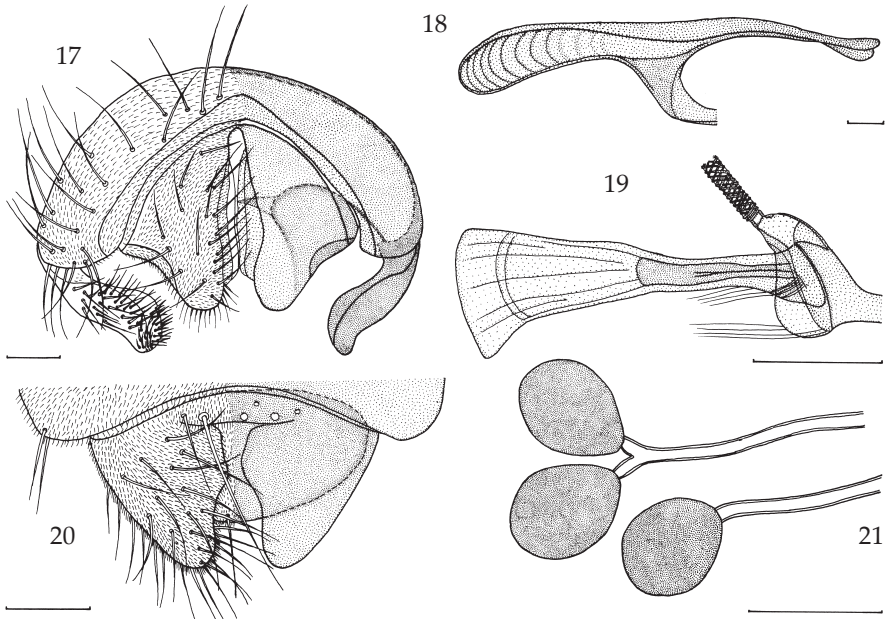
Head.— Dorsocentral part glossy brown; ocellar tubercle blackish; frons (fig. 3) mainly smooth, two small shallow dimples on both sides of the meson, centrally with a very fine granular structure, around the frons small radiating grooves towards the arcuate groove; arcuate groove dark brown; face glossy yellowish brown, with a large number of hardly discernable fine horizontal lines, mesocentrally bulging outwards, covered with fine whitish hairs, facial teeth small but distinct; eye span ♀ very short (29% shorter than body length), ♂ very short (34% shorter than body length); stalks glossy yellowish brown, anteriorly with a darker brown stripe towards antennae, broad apical parts blackish, pollinose; IVB minuscule, 1/6 × diameter of eye stalk, base of IVB also minute; OVB medium-sized, 1½ × diameter of eye stalk.

Thorax.— Collar glossy black, posterior margins pollinose dorsally, lateroventrally pollinose, surface of dorsal collar finely structured laterally; scutum, pleura and sterna uniformly black pollinose, scutellum brown pollinose, scutellar spines glossy yellowish brown, more than twice the length of scutellum, almost straight, nearly in line with the dorsal scutellum, diverging under an angle of 55° (figs 7, 11), metapleural spines short, blunt, posterolaterally directed; some fine white hairs on thorax, scutellar spines with about ten hairs, no basal warts.

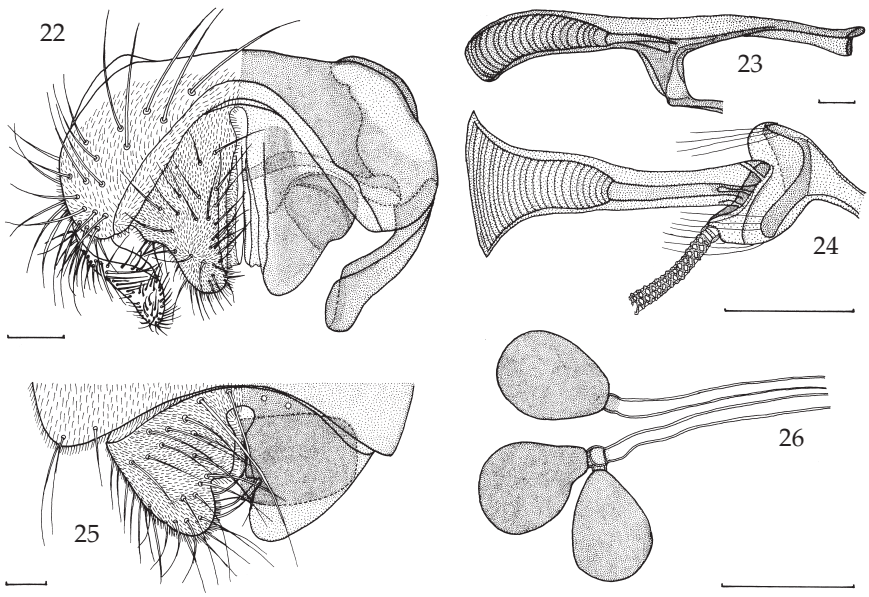
Wing.— Almost hyaline; apically around the end of vein R2+3 a very small dark irregular spot (mostly in ventral tip of cell r2+3, slightly extending subapically into cell r4+5), a tiny dark spot subapically in cell r4+5, attached to vein M (figs 11, 15); some hardly discernable infuscation at apical tip of cell m; some almost unnoticeable infuscation in basal half of cell r4+5 and in cell dm; vein R4+5 curving upwards apically and vein M somewhat curving downwards apically from the tiny spot, leading to a cell r4+5 which is distinctly broader apically than subapically; 'former' base of vein A1+CuA2 and place of former crossvein Bm-Cu distinctly indicated; covered with microtrichia except for glabrous basal areas; glabrous basal areas include cell c (except for anterior apical half), basal tip of cell r1, basal two-thirds of cell br, basal two-thirds of cell bm and basal half of cell cu.

Legs.— Front leg yellowish brown with darker tibia and tarsi, tibia with blackish stripe on both sides; mid and hind legs yellowish brown, femora 2 and 3 with distinct dark smudges on distal third, tibiae 2 and 3 with dark stripes interrupted in the middle; femur 1 incrassate in both ♀ and ♂, ratio of length/width in ♀ 3.6 ± 0.0 (range 3.3-4.0, n = 20) and in ♂ 3.7 ± 0.0 (range 3.3-4.0, n = 16), two rows of tubercles on distal two-thirds, outer tubercles distinctly larger than inner tubercles, inner row in ♀ with 17.2 ± 0.3 tubercles (range 14-20, n = 32) and in ♂ with 16.6 ± 0.2 tubercles (range 14-19, n = 32), outer row in ♀ with 15.1 ± 0.2 tubercles (range 13-18, n = 35) and in ♂ with 14.7 ± 0.2 tubercles (range 13-17, n = 29); femora 2 and 3 slightly swollen and with small apical spur.

Preabdomen.— Tergum 1 blackish, tergum 2 dark brown or with a very broad dark brown mesal band (fig. 11), tergum 3 yellowish brown with dark brown mesal band



Figs 17-21, *Diopsis malawiensis* spec. nov., paratypes, Zomba. 17, posterior view of epandrium with surstyli and cerci; 18, lateral view of phallapodeme; 19, ejaculatory apodeme and sac; 20, dorsal view of ♀ tergum 10 and cerci; 21, spermathecae. Scales 0.1 mm.



Figs 22-26, *Diopsis vanbruggeni* spec. nov., paratypes, Ntchisi. 22, posterior view of epandrium with surstyli and cerci; 23, lateral view of phallapodeme; 24, ejaculatory apodeme and sac; 25, dorsal view of tergum 10 and cerci; 26, spermathecae. Scales 0.1 mm.

narrowing basally or interrupted basally (this colour pattern of the syntergum is also common in the *fumipennis* group), remaining terga yellowish brown, sometimes also with a brown mesal band, no pollinosity on terga; syntergum consisting of terga 1, 2 and 3, sutures not visible; sternum 1 glossy dark brown, not fused to syntergum, sternum 2 brown, pollinose, other sterna yellowish brown, pollinose; intersclerite 1-2 very narrow; spiracle 1 in membrane.

Female postabdomen.— Straight, not deflexed, tergum 6 a rectangular sclerite, tergum 7 consisting of two rectangular sclerites, narrowly separated on the meson; tergum 8 a narrow rectangular sclerite; tergum 10 with two pairs of hairs, cerci broad, ratio of length/width 1.1 (fig. 25), covered with microtrichia and a number of large hairs; sterna 5 and 6 single rectangular sclerites; sternum 7 a single rectangular sclerite with posteriorly a row of small black spines on the meson; sternum 8 consisting of two rectangular sclerites; spiracle 7 in membrane; subanal plate rectangular, with rounded corners (fig. 25), posteriorly four pairs of hairs; spermathecae (fig. 26) smooth and rounded.

Male postabdomen.— Straight, sometimes slightly deflexed; epandrium (fig. 22) rectangular with anterolateral corners less sclerotised, anterolateral corners bulging outwards in anterior direction, with about 25 pairs of hairs, covered with microtrichia; surstyli articulated, basally narrow strongly broadening apically in lateral view, in posterior view somewhat spatula-shaped, apically somewhat pointed in the middle (not slightly concave in the middle like in *malawiensis*), basally somewhat longer hairs and on apical half shorter hairs, no microtrichia; surstyli interconnected via slender processus longi; cerci simple, somewhat triangular, broad, ratio length/width 1.8, covered with microtrichia and hairs; phallapodeme rather slender (fig. 23), anterior arm with somewhat angular corners, anterior arm about equal in length to posterior arm; ejaculatory apodeme strongly broadening apically giving an axe-shape (fig. 24).

Habitat.— *D. vanbruggeni* was only collected in Ntchisi forest, although extensive collections were made in Malawi. It is, therefore, not unlikely that its distribution is limited to Ntchisi forest, though it might also occur in Chipata forest, 35 km north-west of Ntchisi, as no collections were made in that forest. Ntchisi forest lies between 13°15′ and 13°23′S, and 33°59′ and 34°06′E at an altitude of 1,300 to 1,645 m. Its size is less than 3 km^2, while Chipata forest is less than 1 km^2. Extensive information on the forest can be found in Chapman & White (1970).

Remark.— *D. vanbruggeni* is morphologically similar to *malawiensis* spec. nov. and *micronotata*. It probably belongs to the *absens* group, although *absens* does not have the characteristic apical broadening of cell r4+5.

Etymology.— This species is named in honour of Dr A.C. van Bruggen. His paper "A partial revision of the Diopsidae or stalk-eyed flies of Southern Africa" (van Bruggen, 1961) represented a first comprehensive approach towards Diopsidae systematics and biology, including well-illustrated descriptions of genitalia. His remark "The study of these unusual flies is fascinating and highly rewarding" (van Bruggen, 1962) was well-proven by the many papers on Diopsidae biology which appeared in the past 25 years.

Diopsis surcoufi Séguy, 1955
(figs 4, 8, 12, 16, 27-29)

Type material.— ♀ syntype ("type" on label), 1 ♀ syntype ("type" on label), **Mozambique**, Env. de Vila Pery (now Chimoio), forêt d'Amatongas, xi.1929, J. Surcouf (MNHNP). The type was only cursorily inspected.

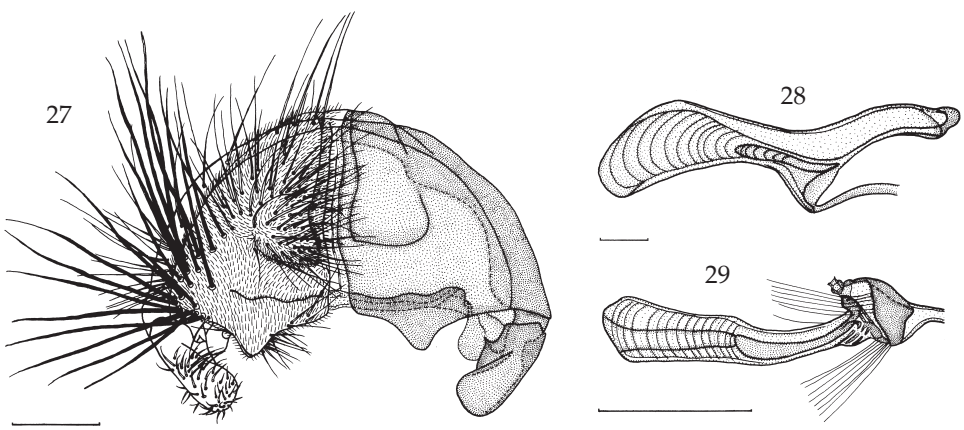
Further material.— 1 ♂, **Mozambique**, Amatonga forest, 15.ii.1964, D. Cookson (NMSA); 1 ♂, **Tanzania** (as Tanganyika), Kilossa forest, 26.vii.1935, S. Werner (AMNH).

Diagnosis.— *D. surcoufi* is characterised by the sharp ridge below frontal suture, short facial teeth, short IVB, small apical wing spot mainly in cell r4+5, pollinose dorsal thorax, moderately incrassate front femora, black base of syntergum distally running out into mesal point, articulated, rectangular surstyli broadening apically, broad ♂ cerci with lateral groups of long black hairs, and moderate sexual dimorphism in eye span (eye span relatively and absolutely longer in males).

Measurements.— Body length ♀ syntype 9.2 mm, ♂ 10.1 ± 0.3 (range 9.8-10.3, n = 2); eye span ♀ 8.6 mm, ♂ 11.7 mm ± 0.4 (range 11.3-12.1, n = 2); wing length ♀ 7.5 mm, ♂ 7.8 mm ± 0.3 (range 7.5-8.1, n = 2); length of scutellar spine ♀ 1.67 mm, ♂ 1.59 mm (n = 1). Séguy gave as measurements for ♀ syntype: "Long. corps: 10 mm, pédoncules oculaires (d'un oeil à l'autre: 9 mm)."

Head.— Central part brown, ocellar tubercle dark brown, frons slightly elevated on the meson, surrounded laterally by a pattern of strong vertical ridges, frons with fine granulated structure (fig. 4); frontal suture narrow, black; face yellowish brown, a dark strongly elevated ridge runs from dorsolateral corners of face towards central part of sulcus, ridge and suture combine to give the anterior section of the head the shape of a cat-like mask, whole face including area between ridge and suture with fine, hardly discernable, horizontal lines, face mesocentrally bulging outwards, covered with fine whitish hairs; facial teeth short and blunt; eye span ♀ relatively medium-sized (7% shorter than body length, 8% shorter if Séguy's measurement of the type is included), ♂ long (16% longer than body length); stalks long, glossy brown, broad apical section darker and pollinose; IVB short, just smaller than diameter of stalk, base of IVB minute; OVB small, just longer than IVB; antennae, brown pollinose; eyes dark reddish brown, stalks and face covered with rather long white hairs.

Thorax.— Collar glossy black, posterior margin especially mesally pollinose, ventral margin pollinose; scutum black pollinose with two narrow glossy spots (figs 8, 12) in between humeral calli (spots almost lacking in cotype), pleurae pollinose except for



Figs 27-29, *Diopsis surcoufi* Séguy, 1955, ♂, Amatonga forest. 27, posterior view of epandrium with surstyli and cerci; 28, lateral view of phallapodeme; 29, ejaculatory apodeme and sac. Scales 0.2 mm.

glossy mesal area behind basal first legs; scutellum brown pollinose, lateroposterior corners glossy leaving just some pollinosity on the meson, dorsal scutellum with fine granular structure, scutellar spines glossy yellowish; scutellar spines almost straight, diverging under an angle of 60°, medium sized, 2.7 × scutellum; metapleural spines straight, metapleural calli yellowish; thorax with some white hairs, especially on scutellar spines and below wing base.

Wing.— Almost hyaline; small apical spot mainly in cell r4+5, somewhat extending into cell r2+3, not extending into cell m (figs 12, 16); some very vague infuscation in and around cell cu, along veins R4+5 and M, and in tip of cell m; glabrous basal sections of wing include basal half of cell c, small basal section of cell r1, slightly more than basal half of cell br and basal half of cell bm; rest of wing, including whole cell cu, covered with microtrichia; cell r4+5 narrowing apically.

Legs.— Front leg pale brown with darker tibia and tarsi, second and third leg pale brown, tibia 3 darker; femur 1 moderately incrassate in ♀ and ♂, ratio of length/width in ♀ 5.0 and in ♂ 4.7 ± 0.3 (range 4.4-5.0, n = 2) with on distal two-thirds of ventral side two rows of black tubercles, tubercles of inner and outer row equal in size, inner row in ♀ with 20 tubercles (range 20, n = 2) and in ♂ with 17.3 ± 0.8 tubercles (range 15-18, n = 4), outer row in ♀ with 15 tubercles (range 15, n = 2) and in ♂ with 15.3 ± 0.5 tubercles (range 14-16, n = 4); femur 2 and 3 slightly swollen and with very small apical spurs.

Preabdomen.— Rather elongate, somewhat clavate, dorsally glossy brown, base of syntergum blackish, running out into a mesal point distally (fig. 12); lateral margins of syntergum blackish (not in Tanzanian specimen); sternum 1 glossy dark brown; remainder of ventral side pale brown pollinose; especially along margins a number of whitish hairs.

Female postabdomen.— Syntypes not dissected; cerci appear broad and short; distal edge of sternum 7 with a row of tiny black spines mesally.

Male postabdomen.— Sternum 5 distally with a peculiar large mesal gap and remarkable sclerotised internal structures laterally of the gap (sternum unfortunately damaged during dissection); epandrium (fig. 27) rounded, with about 22 pairs of hairs, only mesally with some microtrichia; surstyli articulated, rather rectangular in lateral view, somewhat broadening distally, inner sides sharply flattened, no microtrichia, but with about 50 hairs on distal half; surstyli about halfway linked to processus longi, processus longi fused and rather flattened; cerci peculiarly shaped, large and broad, ratio length/width 1.3, largest width subapically, apex sharply pointed, at one-third from the apex sharply folded inward and connected to processus longi, covered with microtrichia and hairs, lateral corners with remarkable bunches of about 20 long black hairs; phallapodeme (fig. 28) solidly built with rounded corners, anterior arm mussel-shaped, anterior arm longer than posterior arm; ejaculatory apodeme (fig. 29) rather slender, only slightly broadening anteriorly.

Habitat.— From the labels it is clear that this striking species is a forest diopsid. Three flies were collected in the Amatonga forest near Chimoio (19°10'S 33°44'E), while the fourth specimen comes from the forest near Kilosa.

Remark.— *D. surcoufi* can, for the moment, not be linked to any other *Diopsis*. Very superficially it might be mistaken for *D. longicornis*, but its pollinose dorsal thorax, typical wing spot, and shape of face and frons distinguish it. Because of the tiny apical wing spot, it might be confused with *D. malawiensis,* but the species are otherwise very different.

Sexual dimorphism in Diopsidae

Sexual dimorphism, as far as eye stalks are concerned, is a well-known phenomenon in Diopsidae (Eggers 1916, Frey 1928, Descamps 1957, Shillito 1971, Burkhardt & Motte 1983, 1985, 1987, Feijen 1984a, 1989, 1998). Sexual dimorphism was shown for front femora by Shillito (1971) and Feijen (1998). In the past two decades, Diopsidae have been the subject of studies in the fields of genetics, ecology, morphology, ethology, physiology, evolution and molecular biology. The functions of the (sexually dimorphic) eye stalks and sexual selection are a central axis in these studies. For an introduction to these studies see Baker & Wilkinson (2001, 2003), Carr (2008), Christianson et al. (2005), Cotton et al. (2006), David et al. (2000), Lande & Wilkinson (1999), Swallow et al. (2005), Warren & Smith (2007), Wilkinson & Dodson (1997) and Wilkinson et al. (1998, 2003 and 2005).

Considerable variation in size of eye span and extent of sexual dimorphism has been recorded among the Diopsidae. Sexual dimorphism in eye span can vary from weak to strong, but also homomorphism is found (Burkhardt & Motte 1985, Wilkinson & Dodson 1997, Feijen 1998). The possibility of 'reversed' sexual dimorphism was indicated by Feijen (1989) for *D. servillei*. Wilkinson & Dodson (1997) and Feijen (1989) indicated that apparent reversed sexual dimorphism for eye span in *Sphyracephala brevicornis* (Say), 1817 is due to females having longer eye spans and longer bodies. However, neither the slopes nor the elevation of the eye span on body length regressions differed between the sexes.

In *D. malawiensis* spec. nov., *D. micronotata* and *D. vanbruggeni* spec. nov., the situation with regards to the allometric aspects of eye span appears distinct from that of homomorphic species. For all three species, the eye span is shorter in males than in females, while body length is longer in males. In Table 1, measurements are presented for these three *Diopsis.* For comparison, data are also given for moderately dimorphic *D. longicornis*, highly dimorphic *Teleopsis belzebuth* (Bigot), 1874 and homomorphic *Teleopsis bigotii* Hendel, 1914. Numbers of specimens measured for *malawiensis*, *micronotata* and *vanbruggeni* (respectively, 14, 2 and 46) are low, but differences between females and males, in eye span and body length, are consistent and significant for the larger samples. Table 1 also gives the allometric slope for females and males and the rate of dimorphism (cf. Baker & Wilkinson, 2001). The allometric slope is the least-squares regression slope of eye span on body length, while the rate of dimorphism is the difference between male allometry and female allometry. The rate of dimorphism is high for *T. belzebuth* and moderate for *D. longicornis*. For *T. bigotii* this rate comes close to zero. Although in *D. vanbruggeni* eye span is significantly longer in females and body length is significantly longer in males, the indicator of dimorphism still gives a positive value close to zero. This would place *D. vanbruggeni* in the category of homomorphic species. In *D. malawiensis*, where eye span is non-significantly longer in females and body length is significantly longer in males, the dimorphism value is negative. However, in *malawiensis* the number of specimens measured is low. Baker & Wilkinson (2001) found only for *D. gnu* a negative dimorphism value (-0.37), but also for a small and inconclusive sample. In figs 30-31, plots are presented of eye span against body length for *D. malawiensis* and *D. vanbruggeni*. For *D. vanbruggeni*, the slopes of the regressions are almost similar for males and females, though the difference in intercept is distinct. For *D. malawiensis*, the slopes and intercepts are dissimilar for females and males and the plot echoes in a reversed way what is seen

in dimorphic diopsids in which males have the longer eye span. For comparison, plots (figs 32-33) are presented for the homomorphic *Teleopsis bigotii* and the highly dimorphic *T. belzebuth*. The evidence presented for *D. malawiensis* and *D. vanbruggeni* is not sufficient to decide whether in this group just a special form of sexual homomorphism occurs or a form of 'reversed' sexual dimorphism. Obtaining bigger samples might answer the question, but that will be difficult for *D. malawiensis*, which is a rare species.

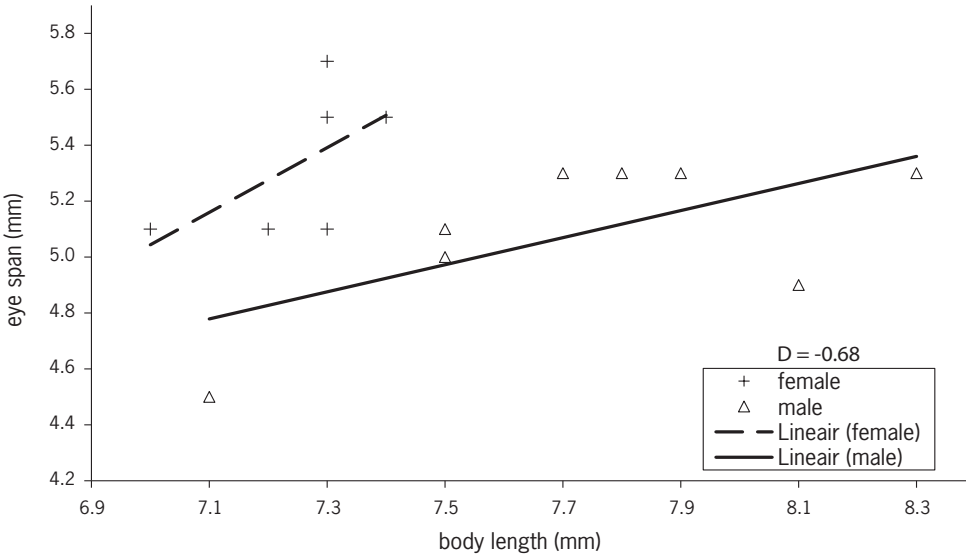


Fig. 30. *Diopsis malawiensis* spec. nov.: eye span plotted against body length. Regression lines are given for heuristic purposes. D, see Table 1.

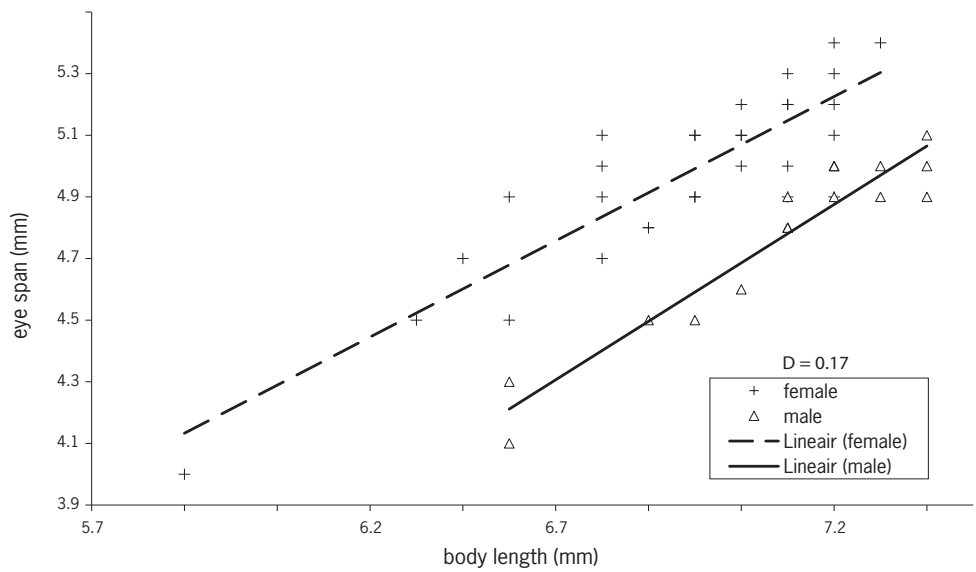


Fig. 31. *Diopsis vanbruggeni* spec. nov.: eye span plotted against body length. D, see Table 1.

While many studies on sexual dimorphism concentrated on Asian *Cyrtodiopsis* Frey, 1928, and *Teleopsis* Rondani, 1875, studies on univoltine African *Diopsis* might also be rewarding. In various *Diopsis*, ecological selection pressure on span size might play a large role next to sexual selection. This can be illustrated with *D. longicornis* in which the mean ratio eye span / body length is 1.29 in females against 1.49 for males. In *Teleopsis*, this ratio never comes above 1.0 for females (Feijen, 1998). Field studies on

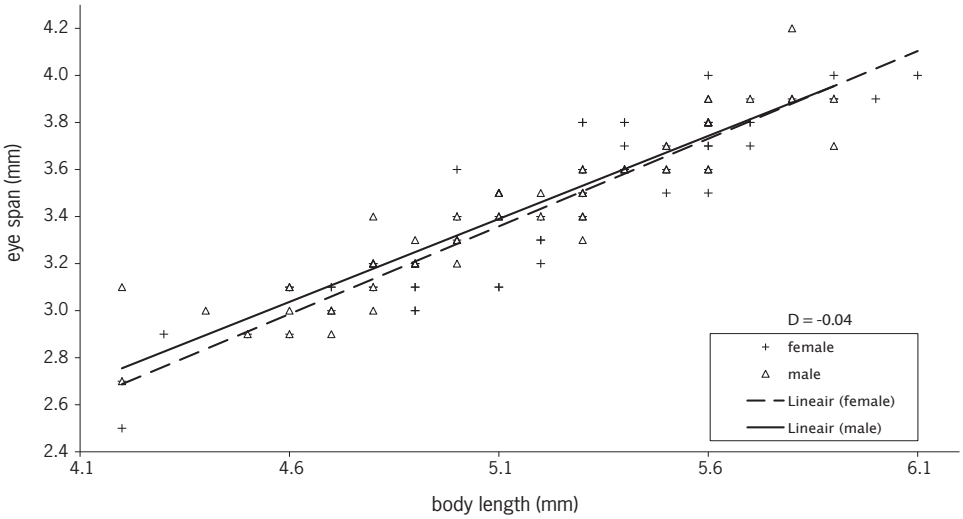


Fig. 32. *Teleopsis bigotii* Hendel, 1914: eye span plotted against body length. Sexual homomorphism. D, see Table 1.

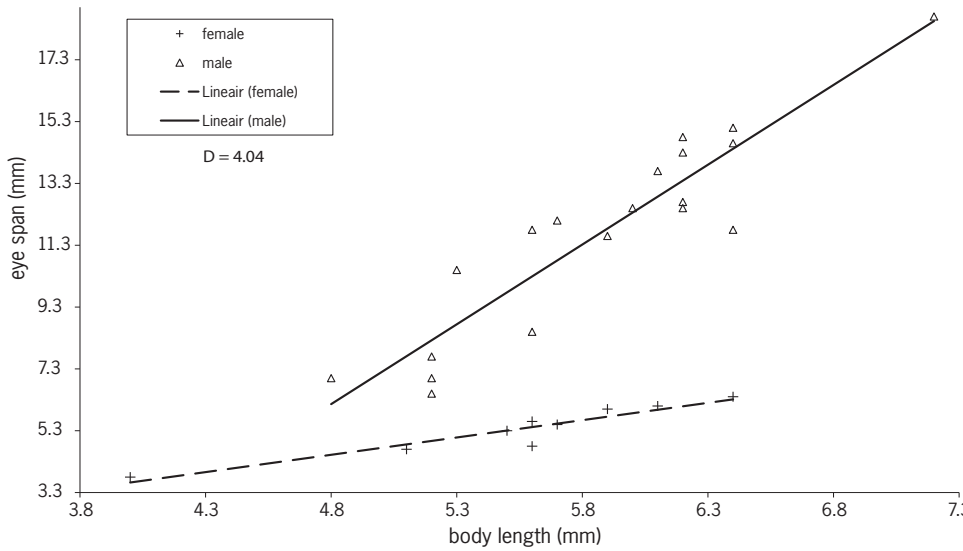


Fig. 33. *Teleopsis belzebuth* (Bigot), 1874: eye span plotted against body length. Sexual dimorphism. D, see Table 1.

Table 1. Mean trait size for eye span, body length, wing and scutellar spine in mm (± SE). Allometric slope (± SE) is the least-squares regression slope of eye span on body length. The dimorphism gives the difference between male allometry and female allometry. Data concern the three *Diopsis* of the *absens* group dealt with in this paper, while for comparison, data are presented for moderately dimorphic *Diopsis longicornis* Macquart, 1835, highly dimorphic *Teleopsis belzebuth* (Bigot), 1874 and homomorphic *Teleopsis bigotii* Hendel, 1914.

Species	**Females**					
	N	Eye span	Body length	Wing	Scutellar spine	Allometric slope
D. malawiensis	6	5.3 ± 0.1	7.3 ± 0.1	5.8 ± 0.1	1.04 ± 0.04	1.16 ± 0.77
D. micronotata	1	5.1	6.8	5.5	1.09	-
D. vanbruggeni	30	5.0 ± 0.1	7.0 ± 0.1	5.9 ± 0.0	1.04 ± 0.02	0.78 ± 0.08
D. longicornis	3133	11.4 ± 0.0	8.9 ± 0.0	-	2.07 ±0.00	1.06 ± 0.03
T. belzebuth	9	5.4 ± 0.3	5.5 ± 0.2	3.7 ± 0.2	1.31 ± 0.10	1.12 ± 0.14
T. bigotii	68	3.4 ± 0.0	5.2 ± 0.1	3.9 ± 0.1	0.83 ± 0.02	0.75 ± 0.04
	Males					
D. malawiensis	8	5.1 ± 0.1	7.7 ± 0.1	6.0 ± 0.1	1.07 ± 0.02	0.48 ± 0.24
D. micronotata	1	4.7	7.3	5.9	1.04	-
D. vanbruggeni	16	4.8 ± 0.1	7.2 ± 0.1	6.0 ± 0.1	1.05 ± 0.02	0.95 ± 0.08
D. longicornis	3874	12.8 ± 0.0	8.6 ± 0.0	-	1.97 ± 0.00	1.76 ± 0.03
T. belzebuth	19	11.8 ± 0.1	5.9 ± 0.1	4.2 ± 0.1	1.28 ± 0.04	5.16 ± 0.52
T. bigotii	66	3.4 ± 0.0	5.1 ± 0.1	3.9 ± 0.1	0.81 ± 0.02	0.71 ± 0.03

fluctuations of mean eye span against time might indicate selective advantages and disadvantages of eye stalks. For these studies large samples are required. The relevance of this can be shown in *D. longicornis* for which the sample of over 7,000 flies (table 1) gives as allometric slope 1.06 ± 0.03 for females and 1.76 ± 0.03 for males. However, the relation between eye span and body length in this species reaches a maximum around a body length of 9.2 mm. Allometric slopes for body lengths below 9.3 mm are 1.53 ± 0.04 for females and 1.95 ± 0.03 for males, while above 9.2 mm they are 0.01 ± 0.14 and -0.47 ± 0.47, respectively. The question is to what extent this 'capping' of the relation between eye span and body length is found in recently emerged *longicornis* and to what extent it is the effect of subsequent selection. Possible other functions of eye stalks were discussed by Burkhardt & Motte (1996) and Feijen (1989).

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