

A revision of *Neoardelio* HENDEL (Diptera: Platystomatidae), with description of a new species

[Revision der Gattung *Neoardelio* HENDEL (Diptera: Platystomatidae),
nebst der Beschreibung einer neuen Art]

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Abstract	The distinguishing characters of <i>Neoardelio</i> HENDEL, 1914 are discussed in relation to similar Afrotropical genera of Platystomatidae. A new species is described, based on material from near Klaver in the Western Cape, South Africa. A key and illustrations are provided to distinguish this species from the five known species. Two other species are nomina nuda created by LOEW (1873). <i>Neoardelia</i> (sic) <i>aliena</i> FREY, 1964 is synonymised with <i>Herina burmanica</i> (FREY, 1959). Biological details from the type locality of the new species confirm phytophagous larval development.
Key words	Diptera, Platystomatidae, <i>Neoardelio</i> , <i>Aspalathus</i> , South Africa
Zusammenfassung	Die Differentialmerkmale von <i>Neoardelio</i> HENDEL, 1914 werden im Vergleich zu ähnlichen afrotropischen Gattungen der Platystomatidae diskutiert. Eine neue Art wird anhand von Material aus der Umgebung von Klaver in der westlichen Kapregion Südafrikas beschrieben. Ein Bestimmungsschlüssel und Abbildungen zu den fünf Arten der Gattung werden gegeben. Zwei von LOEW (1873) eingeführte Namen erwiesen sich als nomina dubia . <i>Neoardelia</i> (sic) <i>aliena</i> FREY, 1964 ist synonym mit <i>Herina burmanica</i> (FREY, 1959). Details zur Biologie der neu beschriebenen Spezies bestätigen die phytophage Lebensweise ihrer Larven.
Stichwörter	Diptera, Platystomatidae, <i>Neoardelio</i> , <i>Aspalathus</i> , Südafrika

Introduction

Neoardelio HENDEL, 1914 (HENDEL 1914a) is a small genus of African Platystomatidae, previously containing five species. These are entirely known from south of the Kunene and Zambezi Rivers, with no information available concerning their larval stages or biology. The new species described below is from South Africa, bringing the number of known species to six and introducing the first known biological information about the genus.

STEYSKAL (1960) provided a key to species, a discussion of *Neoardelio* and descriptions of two new species. His paper represents one of the few recent attempts (post FREY 1932) to clearly identify the species of an African platystomatid genus, although it was not a revision of *Neoardelio* in the formal sense. Other examples (all by STEYSKAL) include the keys for *Lule* SPEISER, 1910 (STEYSKAL 1960); for *Neoepidesma* HENDEL, 1914 (STEYSKAL 1964); for part of *Paryphodes* SPEISER, 1911 (STEYSKAL 1965); and keys in STEYSKAL (1990) for subfamilies, the genera of Trapherinae and the species in *Seguyopiara* STEYSKAL, 1990.

The new species frequents plantations of *Aspalathus linearis* (BRUM. f.) DAHLG. (Papilionoidea: Fabaceae, "red bush tea") an important indigenous tea crop in South Africa. The primary aim of this paper is to describe the new species and place it in context within the genus and make the name available for further biological and economic research.

Biological data available for Platystomatidae remains scarce. Further fieldwork is necessary to establish the feeding mode of the larvae and the female oviposition strategy in *Neoardelio*.

Material and methods

This revision deals exclusively with adults, since larvae for the genus are not known (FERRAR 1987). Previously described species were not re-described, but where applicable, genital morphology has been newly described. All descriptions are based on primary type specimens, with information about variable characters from supplementary specimens. Bilaterally symmetrical features are described in the singular. Variable character states and measurement ranges, such as those of body and wing lengths, are listed under a separate heading. Body length was measured from the apex of frons, in a straight line to the apex of the abdominal segment 5. In cases where the abdomen was bent, the constituent parts before and after the deflexion were added together. Where female ovipositors were extended, these were excluded from the body length measurement.

Terminology and abbreviations concerning gross morphology follows WHITE et al. (2000) with reference to (and in many cases replacing) older terminology (MUNRO 1947, D. K. McALPINE 1973, J. F. McALPINE 1981, WHITE 1988, WHITE & ELSON-HARRIS 1992 and WHITTINGTON 2000). New nomenclatural acts that are introduced in this revision are proposed in accordance with the Fourth Edition of the International Code of Zoological Nomenclature (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE 1999).

STEYSKAL, 1960 introduced the character “a short fascia from costa between bands over *ta* and *tp*”, i. e. between stigmal and discal bands of the wing. I have chosen to call this band the interband. In some species the interband is clearly separated from the stigmal band, while in others it narrowly touches the stigmal band on the posterior basal margin, or is completely fused with the discal band. In the latter case there is sometimes a small hyaline spot remaining on the costal margin.

The following institutions are referred to in the text by their codens as established in ARNETT, et al. 1993:

BMNH	-	The Natural History Museum, London, England
MZLU	-	Lund University Zoological Museum, Lund Sweden
NHMV	-	Naturhistorisches Museum, Wien, Austria
NHRS	-	Naturhistoriska Riksmuseet, Stockholm, Sweden
NMBZ	-	Natural History Museum, Bulawayo, Zimbabwe
NMSA	-	Natal Museum, Pietermaritzburg, South Africa
RMSE	-	Royal Museum of Scotland, Edinburgh, Scotland
SANC	-	National Collection of Insects, Pretoria, South Africa
TAUI	-	Tel Aviv University, Tel Aviv, Israel
UZMH	-	Zoological Museum, University of Helsinki, Finland

Taxonomic history

In a comparative discussion of characters found in North American Diptera relative to genera from other regions, LOEW (1873) described *Ardelio*, with two species *A. brevicornis* and *A. longipennis*. He assigned *A. longipennis* as the type species for the genus, but provided no description for these two species, which are thus *nomina nuda* and no type specimens are known for them. *Ardelio* LOEW, 1873 is a junior homonym, preoccupied by *Ardelio* GISTL, 1848, for a genus of Coleoptera (first noted by HENDEL 1914a).

Herina lineatocollis THOMSON, 1869 was recognised by HENDEL (1914a) as a member of *Ardelio* LOEW, 1873, but at the same time, he proposed the replacement name *Neoardelio* for the genus. Since *Ardelio* LOEW, 1873 was not properly described, has a nomen nudum for a

type species and has no type specimens, *Neoardelio* HENDEL, 1914 actually represents a new genus (rather than a replacement name), for which HENDEL (1914a) gave the type species as *H. lineatocollis* THOMSON, 1869. HENDEL neither recognised nor included *A. brevicornis* LOEW, 1873 and *A. longipennis* LOEW, 1873 in his later paper (HENDEL, 1914b). He did, however, include *N. alternatus* (WALKER, 1861) and a new species *N. nigricans* HENDEL, 1914 in both papers.

Neoardelio nigricans was synonymised with the senior subjective synonym *N. alternatus* by STEYSKAL (1960). This same paper described two more species (*N. longiala* STEYSKAL, 1960 and *N. retifrons* STEYSKAL, 1960) bringing the total at that stage to four valid species. HANCOCK (1982) added *N. inyangani* HANCOCK, 1982 from eastern Zimbabwe.

A further species, *N. aliena* FREY, 1964 from Kambaiti, N.E. Burma, is excluded here, because this is a synonym of *Herina burmanica* (FREY, 1959) (Otitidae). FREY (1964) mistook the specimen he described as *Neoardelia* (sic) *aliena* as a member of the Platystomatidae, after having described otitid specimens from the same series in 1959, thereby demonstrating how easily some Otitidae and Platystomatidae can be misidentified. STEYSKAL (1977) clearly indicated the error:

“Inasmuch as all other species in this genus inhabit the Cape area of South Africa, the generic reference of this species should be reviewed.”

He failed, however, to pitch his comment at the family level. The visitor and loan records in the Zoological Museum, University of Helsinki, show that STEYSKAL did not examine the specimens (P. VILKAMAA, pers. comm. March 1998). The holotype (in UZMH) has the following label added by T. SAIGUSA: “Synonym of Otitid, / *Rhadinomyia* / *burmanica* Frey, 1959 / = *Herina* / *burmanica* (FREY) / det. T. SAIGUSA, 1985”. Thus, *Neoardelia* (sic) *aliena* FREY, 1964 (Platystomatidae) = *Herina burmanica* (FREY, 1959) (Otitidae) **syn. nov.**

Genus *Neoardelio* HENDEL, 1914

Neoardelio HENDEL, 1914 – HENDEL 1914a: 16 (key) & 93 (description); HENDEL 1914b: 9 (key) & 185 (description). Type species *H. lineatocollis* THOMSON, 1869; head & wing figured as figure 124 & 125 (HENDEL 1914a).

Neoardelia FREY, 1964 – FREY 1916: 6. Incorrect subsequent spelling of *Neoardelio* HENDEL, 1914; wing figured as Fig. 3.

Herina lineatocollis THOMSON, 1869

Diagnosis: Length of eye greater than height of gena. Antennae close together at base. Flagellomere 1 curved outward at apex, with a small apical tubercle. Arista fine pubescent. Ocellar seta minute. Anterior orbital seta short, posterior orbital seta strongly developed. Lower frons pitted; with evenly spaced, short, black setulae. Medial vertical seta cruciate, slightly stronger than lateral vertical. Postocellar seta parallel, very fine and setula-like. Genal seta weak or absent. Lower facial margin raised upwards away from gena, but not distinctly protruding. Palp parallel sided. Anepisternum with distinct markings comprised of microtrichia. Katepisternal seta absent. Notum marked with distinctive pattern of microtrichia. Femora equally developed in all legs. Wings with bands or spots. Subcosta distinct to junction with costa, not abruptly angled and slightly weakened toward apex. Apical sections of R_{4+5} and M parallel or slightly divergent. M straight, not curved into dm. Abdomen elliptical or oval in shape.

Included species:

N. alternatus (WALKER, 1861) – WALKER 1861: 326, South Africa.

N. aspalathus **spec. nov.**, South Africa.

N. inyangani HANCOCK, 1982 – HANCOCK 1982: 151, Zimbabwe.

N. lineatocollis (THOMSON, 1869) – THOMSON 1869: 576, South Africa.

N. longiala STEYSKAL, 1960 – STEYSKAL 1960: 310, South Africa.

N. retifrons STEYSKAL, 1960 – STEYSKAL 1960: 312, Lesotho.

Discussion: This genus includes species whose adults are 3-4 mm in length, with wings of similar dimension. Specimens may easily be overlooked in the field and in unsorted material in collections, often being confused with other platystomatid genera or even with Tephritidae or Otitidae if not closely examined.

The main feature by which specimens of *Neoardelio* can be distinguished from Tephritidae is the lack of lower orbital seta. All Platystomatidae lack these setae, as do some Otitidae. In the case of many Otitidae, however, the anal cell is extended at the apex into a pointed lobe. In Platystomatidae this lobe does not occur and in *Neoardelio* the vein closing the anal cell (i.e. Cu_2) is slightly rounded outwards toward the wing apex.

Care must nevertheless be taken when separating Otitidae from Platystomatidae. Mis-identifications such as those encountered previously with the species *Herina burmanica* and *Neoardelia* (sic) *aliena* are a healthy lesson. Superficially, *N. aliena* does resemble the Platystomatid genus *Neoardelio*. The main distinction, based on gross morphology, is that in *Herina* (Otitidae) the setulae on vein R_1 begin after the forward curvature of the subcostal vein, while in *Neoardelio* (Platystomatidae) these setulae start at the confluence of R_1 and R_{2+3} . Platystomatidae have setulae along R_{4+5} , while in *Herina* this vein is bare. In addition, members of *Herina* have short orbital setae, but these are not present in *Neoardelio*. These short setae are, however, easily overlooked or often broken.

Neoardelio could be confused with other small Platystomatidae, such as those in Plastotephritinae. All Plastotephritinae have the lower calypter reduced to a linear fringe (Fig. 1a). This feature is often difficult to see, since the wing base and anal lobe obscure the lower calypter. Specimens can be softened in a humidity chamber and the wing moved, or, in long series a specimen can usually be found with the wings positioned such that this character can be seen. *Neoardelio* has a distinct lobe on the lower calypter (Fig. 1b).

Other genera with small body size occur in the Trapherinae and Scholastinae. These sub-families are distinct in having a dorsal katapisternal seta. Occasionally this is absent, in which case the wings are distinctly bent across the abdomen or the second basal cell is distorted or kite-shaped. Being a member of the Platystomatinae, *Neoardelio* lacks the dorsal katapisternal seta and has straight wings.

Among the Platystomatinae this genus is most easily confused with *Rivellia* and *Neoepidesma*, which have approximately the same body size and form. *Neoardelio* can be distinguished from both of these genera in that the medial vein is straight. Furthermore, most species of *Neoardelio* have a distinct pattern of microtrichia on the notum and have a pitted frons. In *Rivellia* and *Neoepidesma* the medial vein bends into dm shortly before R-M and then makes a sharp point at R-M. Some specimens of *Rivellia* resemble *Neoardelio* in that the medial vein has only a poorly defined dip in it and appears straight and flagellomere 1 has a small tubercle at the tip. These specimens can be separated from *Neoardelio* by the presence of two well defined upper orbital setae. All specimens of *Neoardelio* have the anterior seta weakly developed.

A previous key (STEYSKAL 1960) made use of the number of scutellar setae for species diagnosis. In this revision, this character has been found to vary considerably within and between species of *Neoardelio*. For instance, in *N. aspalathus*, a male specimen from Hottentotsfontein

farm has only four scutellar setae, one female has eight and another has seven, while the majority of specimens from that species have six scutellar setae. Indeed, STEYSKAL (1960) indicated that there is variation in the number of scutellar setae between males and females of *N. lineatocollis*. In this species the male holotype has four setae, while the only female he saw had only two scutellar setae. Further analysis indicated a far broader range (Table 1), which would therefore indicate that the number of scutellar setae (like the wing pattern) is not a reliable character.

Distribution: Lesotho, Zimbabwe and the Western and Eastern Cape in South Africa.

Key to the species of *Neoardelio* HENDEL, 1914

- 1 Wings spotted (Fig. 2) *N. aspalathus* spec. nov.
- Wings banded (Fig. 8) 2
- 2 Microtrichia on anepisternum restricted to small areas behind and below anterior spiracle and sometimes at dorsal posterior angle (Fig. 4a, b); interband clearly separated from stigmal band (Fig. 8a) 3
- Microtrichia on anepisternum more widespread across both anterior and posterior parts (Fig. 4c-f); no interband or if distinct, then narrowly touching (figure 125 in HENDEL, 1914a) or broadly joined to stigmal band (Fig. 8b) 4
- 3 Microtrichia on anepisternum restricted to small triangle behind anterior spiracle and small stripe above first coxa (Fig. 4a); notum lacking pattern of microtrichia; frons lacking pits, but having distinct black setulae *N. alternatus* (WALKER, 1861)
- Microtrichia surrounding anterior spiracle and extending a little onto anterior anepisternum and small patch at dorsal posterior angle, but most of anepisternum free from microtrichia (Fig. 4b); notum marked with pattern of microtrichia in narrow lines (similar to Fig. 2); frons with black setulae and poorly developed pits and wrinkles...
..... *N. longiala* STEYSKAL, 1960
- 4 Frons covered with distinct and deeply sculptured pits (figure 1 in HANCOCK, 1982); anterior anepisternum with one irregular stripe of microtrichia behind anterior spiracle and two stripes below it (Fig. 4d, f); posterior anepisternum lightly marked with microtrichia in dorsal half (Fig. 4d, f); scutellum finely sculptured and dusted with microtrichia, giving rough surface texture (similar to Fig. 2); sockets of scutellar setae raised on distinct tubercles (similar to Fig. 2) 5
- Frons with indistinct or small circular pits; entire upper half of anepisternum densely covered with microtrichia and posterior anepisternum with dark spots, from which setulae arise (Fig. 4e); scutellum smooth, lacking microtrichia; sockets of scutellar setae not raised on distinct tubercles, but flush with scutellum margin
..... *N. lineatocollis* (THOMSON, 1869)
- 5 Anterior anepisternum with middle stripe of microtrichia ceasing part way across posterior anepisternum, with some irregular marks of microtrichia beyond this point (Fig. 4d); frons densely marked with large, lens-shaped pits; interband on wing just touching stigmal band (figure 2 in STEYSKAL 1960) *N. retifrons* STEYSKAL, 1960
- Anterior anepisternum with middle stripe of microtrichia continuing across posterior anepisternum, reaching posterior margin of anepisternum, but evanescent along its posterior part (Fig. 4f); lower frons densely marked with large, elongate pits, upper frons marked with rounded pits; interband on wing broadly touching stigmal band (figure 1 in HANCOCK 1982) *N. inyangani* HANCOCK, 1982

Neoardelio alternatus (WALKER, 1861)

(Figs 4a, 8a)

Ortalis alternatus WALKER, 1861 – WALKER 1861: 326. Type locality: Cape (South Africa). Depository of type specimen: ♂ Holotype BMNH.

Neoardelio alternatus (WALKER, 1861); HENDEL 1914a: 94 (transferred to *Neoardelio*); HENDEL 1914b: 186 (repeat of description); STEYSKAL 1960: 309 (discussion) & 312 (key); STEYSKAL 1980: 568 (catalogue); HANCOCK 182: 151 (mention).

Neoardelio nigricans HENDEL, 1914 – HENDEL, 1914a: 94 **nomen nudum**.

Neoardelio nigricans HENDEL, 1914 – HENDEL, 1914b: 186. Type locality: South Africa. Depository of type specimen: ♀ Holotype in NHMV. STEYSKAL 1960: 309 (designation of synonymy); STEYSKAL 1980: 568 (catalogue).

Diagnosis: Frons lacking pits, black setulae distinct. Notum shining black, lacking pattern of microtrichia. Microtrichia on anepisternum restricted to small triangle behind anterior spiracle and small stripe above first coxa (Fig. 4a). Four scutellar setae inserted in alveoli without raised tubercles; scutellum smooth. Wings banded, with interband clearly separated from stigmal band (Fig. 8a); apical band on wing extending across apex of r_{2+3} and r_{4+5} and slightly into m (Fig. 8a); with additional spot in m posterior to M in middle of apical section (Fig. 8a).

Type material: ♀ Holotype (BMNH): SOUTH AFRICA, Western Cape: “Type” [printed circular label with green border]; “Africa / C. of Good Hope / ex coll / W. W. Saunders / 68.4.” [hand written in cursive]; “68 4” [tiny, printed label]; “alternata” [hand written in cursive on the back of part of some other written script, folded up]; “Cape / Camp” [hand written in cursive]; “HOLOTYPE / *Neoardelio* / *alternatus* / (Walker, 1861) ♀ / Det. Whittington” [first and last lines printed, middle three lines hand-written on red card. The specimen has the right hind leg, the left hind tarsus, the right fore tibia and tarsus and the left wing missing.

Literature records: SOUTH AFRICA, Western Cape, Blinkwater [kloof], 33°57'38"S; 18°23'46"E to 33°57'55"S; 18°24'23"E, Table Mountain, Cape Town (STEYSKAL 1960). HENDEL (1914) provides only “Südafrika” and the holotype has only Cape of Good Hope as the locality.

Discussion: This species is only known from a few female specimens. WALKER described one specimen without specifying gender, HENDEL saw 1 ♀ and STEYSKAL examined 2 ♀ ♀. The identification of this species by the absence of frontal pits and the lack lines of microtrichia on the thorax, seems reliable and is not an artefact resulting from greasiness. Thus, this species is unusual in the genus, in that all other species have pits and pattern of microtrichia on the notum.

Disregarding the small brown spot in m posterior to M in the middle of its apical section (Fig. 8a), the wing patterns of *N. retifrons* and *N. alternatus* are identical. The presence or absence of the small spot is clearly an unstable character (see discussion for *N. lineatocollis*). Furthermore, the two species can be separated by the presence of distinct and deeply sculptured pits on the frons in *N. retifrons* and the presence of four scutellar setae and a smooth scutellum in *N. alternatus*, although caution is required with respect to the use of the number of scutellar setae. *Neoardelio alternatus* is the only species with a pale orange-brown vertex, frons, face and gena, all other species are dark brown to red-brown on one or more of these regions. Males are unknown.

Neoardelio alternatus represents the most pleisiomorphic species in the cladistic analysis (Fig. 9). All the characters analysed were represented by the pleisiomorphic state, except for character 12 (interband free from stigmal band), which it shares with *N. aspalathus* and *N. longiala*. No autapomorphies are apparent.

Neoardelio aspalathus spec. nov.

(Figs 2, 3, 4c, 5a, 6b, 7a & b)

Diagnosis: A distinct species recognised by wing with pale coloured spots (Fig. 2). Frons with poorly developed pits (Fig. 2). Notum with distinct pattern of microtrichia (Fig. 2). Microtrichia

covering almost entire anepisternum, although weakly spread on dorsal posterior portion (Fig. 4c). Six scutellar setae inserted in alveoli on raised tubercles; scutellum wrinkled (Fig. 2).

Etymology: Named for *Aspalathus linearis* (Fabaceae), with which this fly is associated.

Description: Holotype ♂; body length 3.1 mm, wing length 3.0 mm.

Colour and Microtrichia: **Head** red-brown below antennal insertion, but paler yellow-brown on face; dark brown above antennal insertion and on postocellar region; ocellar triangle black. Antennal segments 1 & 2 red-brown; flagellomere 1 black on dorsal half and apex of inner surface and all of outer surface, red-brown on basal half of inner surface. Arista dark brown. Palp red-brown, remainder of mouthparts dark brown. **Thorax** black; exposed membrane in anepisternal phragma brown; legs brown, with dark femora, lighter tibiae and yellow-brown basal tarsomeres darkening to dark-brown over distal two tarsomeres. Mid-coxa buff ventrally. Pulvilli pale buff, claws black. **Wings** mostly hyaline, mottled with broken bands of pale-brown and marked between basal bands with orange-brown. Calypter white. Halter brown with a darker knob. Abdomen entirely black. Microtrichia silver to brass coloured, extensive on gena, occipital and medial occipital sclerites, flagellomere 1 and antennal grooves; adjacent to eye margin and on central frons, looping around sides of ocellar triangle (slightly obscured by grease in Holotype). Forming a distinct brass-coloured pattern on notum (Fig. 2). More silvery microtrichia scattered around margin of notum and as round patch in centre of base of scutellum. Dense on propleuron, sparser on anepisternum (Fig. 4c) and postnotum. Covering dorsal surface of tarsomeres 4 and 5. Silvery over most of T_{1+2} , and as proximal lines along margins of T_3 , T_4 and T_5 .

Head (Fig. 3): frons long and flat, vertex extended posteriorly over post occiput, gena bulging strongly behind eye and epistomal margin swollen outwards frontally. Depth of gena (below eye) almost half eye height. Face concave above swollen epistomal margin, with distinct antennal grooves separated by a broad and evenly rounded facial carina and with steep lateral sides. Antennae inserted close together, lunule forming a sharp point between them. Flagellomere 1 subrectangular, slightly curved up at apex with a weak apico-dorsal tubercle (Fig. 3). Parafoveal raised ridge-like adjacent to antennal grooves of frons. Medial occiput slightly concave. Palp elongate oblong, as long as antenna. Setae: weak and minute setula-like ocellars, anterior orbital, and parallel post-ocellars; stronger posterior orbital, strong cruciate medial verticals and divergent lateral verticals; no genal and pedicel setae. Setulae pale, short and sparse, except on gena where setulation is long and distinct.

Thorax (Figs 2 and 4c): wider than head at notopleural callus; as deep (in lateral view) as long (including scutellum). Dorsal setulae short and black, recumbent. Lateral and ventral setulae long and white, restricted to posterior anepisternum, anepimeron and anterior half of katepisternum; sternites and coxae with long white setulae. **Legs** evenly covered with pale setulae on femora and brown setulae on tibiae and tarsomeres; front femur with antero-dorsal row of strong black setulae. Mid-coxal prong weakly curved and short. Ventral pre-apical setulae on apex of each tarsomere. Dorsal setulae at apex of distal tarsomere long and curved over claws. Claws smooth and evenly curved. Empodium setiform; pulvilli slightly oblong, evenly covered in fine setulae. Marginal setulae of calypter white and fine, about as long as half width of upper calypter. Wings with costagial and humeral breaks plus a weakening at subcostal break. Subcosta weakened and evanescent shortly before reaching costa. Cu_1 and A evanescent before wing margin. Basal medial cell (bm) about half length of basal radial cell (br). Apex of posterior cubital cell (bcu) slightly convex. Thoracic setae long and well developed: 1 humeral, 2 notopleural (posterior one on notopleural callus), 1 anepisternal, 1 mesocoxal, 1 supra-alar, 1 post-alar, 1 intrapost-alar (aberrantly paired on right-hand side),

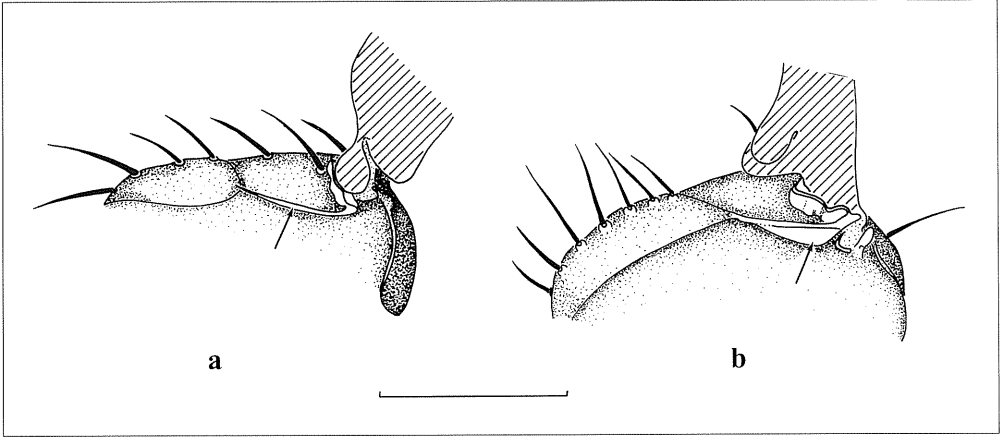


Fig. 1a, b: Comparison between ventral views of the right wing base to indicate extent of lower calypter. – a: *Oeciotypa parallelomma* HENDEL, 1914 (Plastotephritinae); – b: *Neoardelio lineatocollis* (THOMSON, 1869) (Platystomatinae). Scale bar = 1 mm.

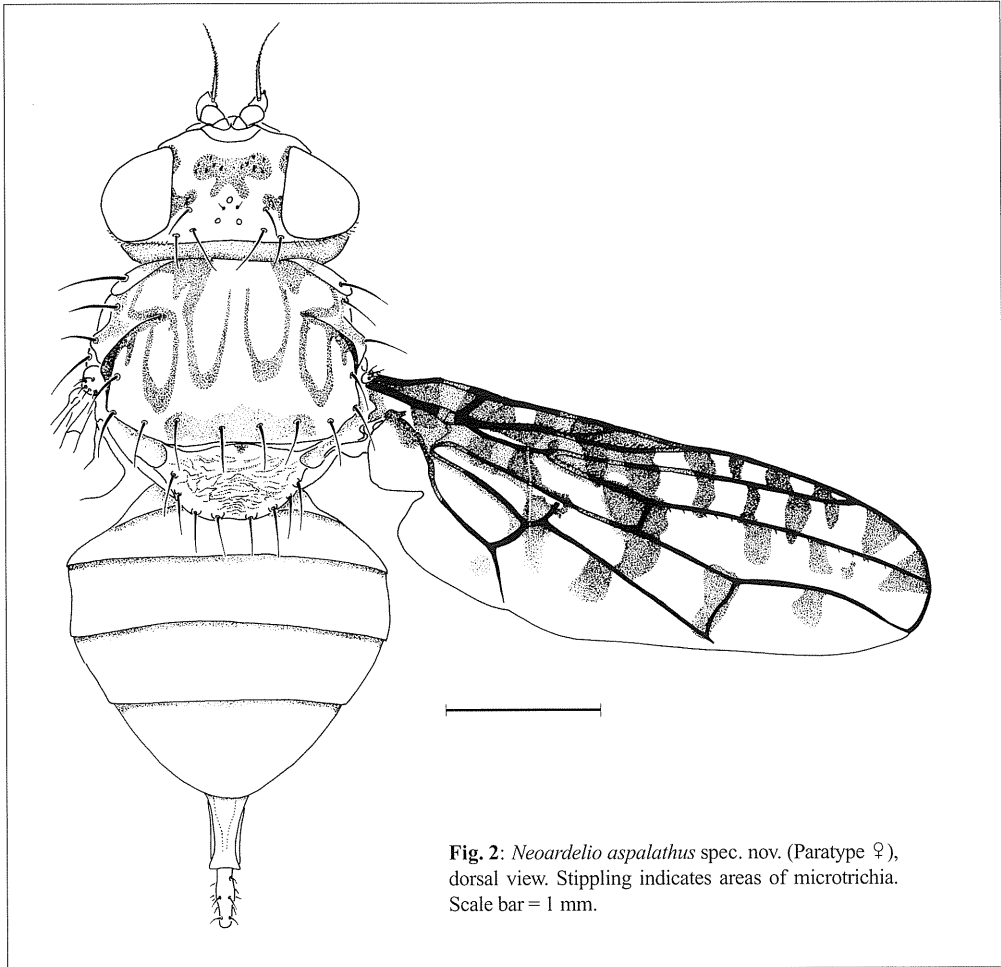
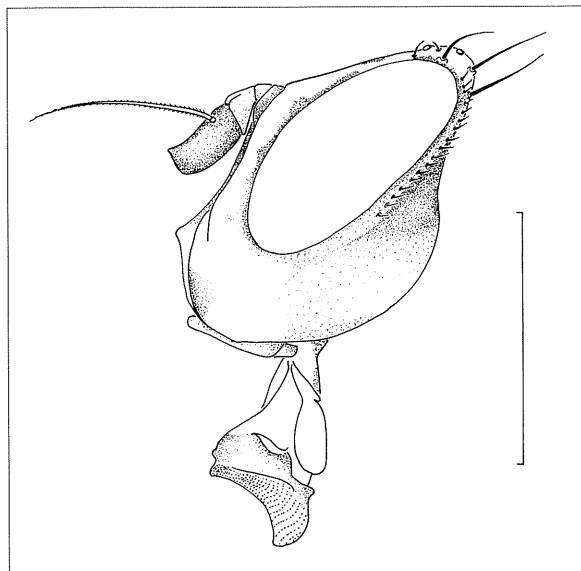


Fig. 2: *Neoardelio aspalathus* spec. nov. (Paratype ♀), dorsal view. Stippling indicates areas of microtrichia. Scale bar = 1 mm.



single posterior acrostichal and dorsocentral. Scutellum with six setae raised on tubercles, posterior pair slightly more pronounced than laterals.

Abdomen (Fig. 2): suture between T_1 and T_2 distinct in medial part of tergites. T_5 two thirds length of T_3 and T_4 together. Setulae long and white to pale brown. Sternites S_{1+2} to S_4 strongly reduced (Fig. 5a), less than one fifth width of abdomen and corresponding pleurites grossly developed and strongly wrinkled.

Fig. 3. Lateral view of head of *Neoardelio aspalathus* spec. nov. (Paratype ♀). Scale bar = 1 mm.

S_5 normally sized; posterior margin poorly sclerotised and weakly delimited. Male genitalia: Epandrium subglobose (Fig. 6b), with weak brown setulae dorsally. Hypoproct about half as long as epandrium, fused to membranous proctiger and fused at apex, with strong brown setulae dorsally and a fringe of finer setulae at apex ventrally. Surstylus an elongate rhombahedron with a row of three minute setulae on inner surface; strongly sclerotised at apex by an apical bar; ventrally and externally covered by membranous sheath, finely marked with setulae. Distiphallus long (extending twice the long dimension of phallapodeme and hypandrium); preglans cylindrical, but same width as stipe; glans cylindrical and broader than distiphallus, ending in a single terminal filament (Fig. 6b) longer than length of phallapodeme and pointed at apex. Ejaculatory apodeme narrow and poorly spatulate, with a bilobed partly sclerotised basal cap. Arms of hypandrium broad and strongly sclerotised. Basal arms of phallapodeme densely sclerotised. Apex of phallapodeme truncated into a straight edge; less sclerotised than hypandrium and basal arms.

Variation: ♂ body length 3.0-3.1 mm, wing length 2.9-3.0 mm; ♀ body length 3.4-3.8 mm, wing length 3.3-3.8 mm. A male paratype from Hottentotsfontein farm is slightly more robust and has the wings slightly more heavily marked than those of the holotype. The density of colour and the number of spots on the costa between the apex of R_1 and the apex of the wing are variable across all specimens examined in this species. In the specimen from Hottentotsfontein farm there are only three bars at the costal margin between the apex of R_1 and the apex of the wing, the first of which has a hyaline central spot adjacent to the costa. In other specimens this hyaline spot is enlarged, dividing the first mark in two. The maximum number of spots along the costa is five seen in two females from Puts farm. One of these females paratypes has eight rather than six scutellar setae (Fig. 2). Another female from Puts farm has seven scutellars, the odd one situated between the apical pair. The condition of more than six scutellar setae is unusual among Platystomatidae and is certainly an aberration.

Furthermore, the male from Hottentotsfontein farm has only four scutellar setae. This character, as well as the slight difference in wing pattern, was initially thought to distinguish this specimen as a separate species. The genitalia is no different from that for *N. aspalathus* and the specimen has been retained in this species.

The meso-coxal setae of many specimens are pale and difficult to distinguish. Greasy deposits readily obscure microtrichia on the frons and flagellomere 1 frequently shrivels during drying. Colour is also variable on the head, with specimens varying between deep red-brown to orange or even yellowish-brown.

Female genitalia (Fig. 7a, b): T_6 vestigial (visible only as a darkened band of poorly sclerotised membrane); T_6 and oviscape tucked under T_5 ; oviscape conical, shorter dorsally than ventrally. S_6 present as a narrow band-like sclerite. Eversible membrane very finely ornamented in distal membranous section; aculeus blunt ended, coarsely ornamented with wrinkles basally, setose on main body and at apex. Two bell-shaped spermathecae.

Type material: ♂ Holotype (SANC): SOUTH AFRICA, Western Cape: "South Africa: WCape / Puts (farm), nr Klawer / 31.47,4S 18.41,5E / 640 m 02.viii.1996 / Oberprieler/Stals/Stiller" [printed on white card]; "Collected from rooibos / tea *Aspalathus linearis* (FABACEAE) in / 1 year old plantation" [printed on white card]; "HOLOTYPE / *Neoardelio* / *aspalathus* / n.sp. ♂ / Det. Whittington" [first and last lines printed, middle three lines hand-written on red card].

Paratypes: SOUTH AFRICA, Western Cape: (all collected by OBERPRIELER, STALS and STILLER, from rooibos tea, *Aspalathus linearis* (FABACEAE) plantations): 10 ♀ ♀ with same data as Holotype (7 ♀ ♀ SANC; 1 ♀ NMSA; 1 ♀ RMSE); 2 ♂ ♂, 4 ♀ ♀ Puts / Pypies (farm) near Klawer, 31°46,9'S 18°43,4'E, 620 m, 02.viii.1996, 4 year old plantation (SANC); 2 ♂ ♂, 3 ♀ ♀ Hottentotsfontein (farm) near Klawer 31°51,1'S 18°44,4'E, 440 m, 02.viii.1996, 3 year old plantation (SANC); 1 ♀ Groenkol (farm) near Graafwater, 32°06,3'S 18°41,4'E, 500 m, 01.viii.1996, 1 year old plantation (SANC); 2 ♂ ♂ Aggenbagskraal (farm) near Clanwilliam, 32°17,9'S 18°53,0'E, 380 m, 02.viii.1996, 4 year old plantation (SANC); 1 ♂, 1 ♀ Remhoogte (farm) near Citrusdal, 32°24,5'S 19°01,0'E, 480 m, 03.viii.1996, 4 year old plantation (SANC).

Discussion: *N. aspalathus* is not paired with another species in the cladistic analysis (Fig. 9), but shares a strong affinity with the *N. retifrons-inyangani* species pair. It shares a mixture of apomorphies with the other species in a variety of combinations as listed in Table 2 and illustrated in Figure 9. The autapomorphy: (11) spotted wings, is expressed in this species.

Neoardelio inyangani HANCOCK, 1982

(Figs 4f, 6d)

Neoardelio inyangani HANCOCK, 1982 – HANCOCK 1982: 151. Type locality: Mt Inyangani, Inyanga District, eastern Zimbabwe. Depository of type specimens: ♂ Holotype and ♂ paratype in NHMZ. Body and wing illustrated: HANCOCK, 1982: 152 (figure 1)

Diagnosis: lower frons densely marked with large, elongate pits, upper frons marked with rounded pits; anterior anepisternum with one irregular stripe of microtrichia behind anterior spiracle and two stripes below it; dorsal part of posterior anepisternum lightly marked with microtrichia; middle stripe of microtrichia on anterior anepisternum continuing on to posterior anepisternum, but evanescent along its posterior part (Fig. 4f); scutellum finely sculptured and dusted with microtrichia, imparting a rough surface texture; sockets of scutellar setae raised on distinct tubercles (figure 1 in HANCOCK 1982); wings banded with interband broadly joined to stigmal band (figure 1 in HANCOCK 1982).

Description of male genitalia: Epandrium elongate (Fig. 6d), with strong black setulae dorsally. Hypoproct half length of epandrium, fused to membranous proctiger and fused at apex, with strong black setulae dorsally and ventrally. Surstylus strongly sclerotised at apex by a rounded apical bar; ventrally and externally covered by membranous sheath, finely marked with setulae. Distiphallus long (extending well beyond supposed apex of phallapodeme and hypandrium); preglans small; glans elongate, cylindrical; terminal filament as long as length of distiphallus and bifurcate at apex. Ejaculatory apodeme, arms of hypandrium and phallapodeme not dissected.

Type material: Holotype not examined. ♂ Paratype (NMBZ): ZIMBABWE: "Mt Inyangani [18°18'S 32°51'E, 2592m] / 17.xii.1979 / D. Taylor"; Paratype / *Neoardelio inyangani* / sp. nov. / det. D. L. Hancock, 1982". In good condition,

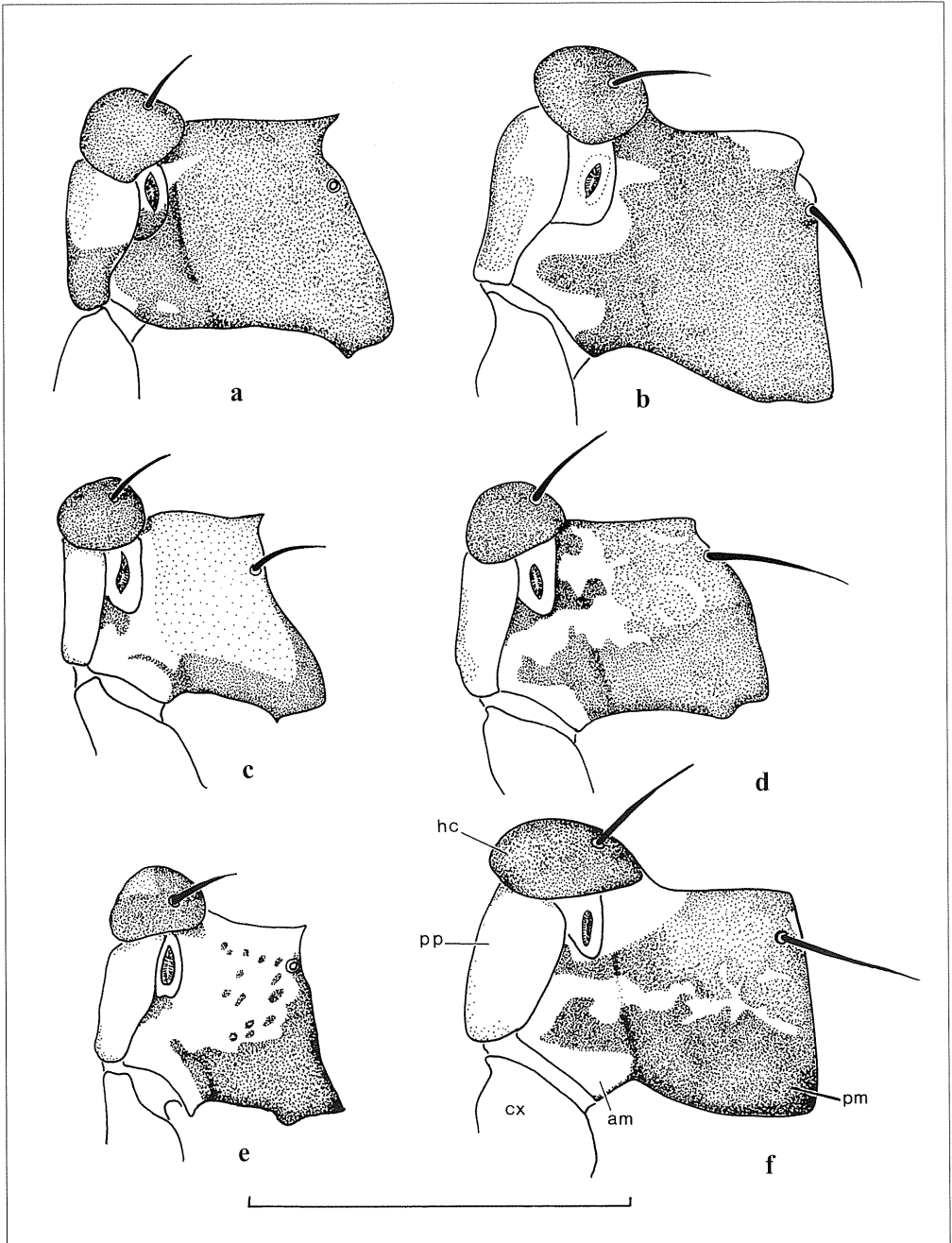


Fig. 4a-f: Patterns of microtrichia on anepisternum, lateral view; – **a:** *Neoardelia alternatus* (WALKER, 1861); – **b:** *N. longiala* STEYSKAL, 1960; – **c:** *N. aspalathus* spec. nov.; – **d:** *N. retifrons* STEYSKAL, 1960; – **e:** *N. lineatocollis* (THOMSON, 1869); – **f:** *N. inyangani* HANCOCK, 1982. Degree of microtrichia indicated by density of stippling: white = dense microtrichia and dark stippling = no microtrichia. Abbreviations: hc = humeral callus; pp = propleuron; cx = coxa; am = anterior anepisternum; pm = posterior anepisternum. Scale bar = 1 mm.

scutellar setae broken and apex of mid tarsi missing; genitalia dissected and stored in micro vial. The male holotype is from the same locality (HANCOCK 1982). The paratype compares well with the holotype (D. HANCOCK pers. comm.).

Discussion: This species was described and clearly illustrated by HANCOCK (1982). The female is unknown. It represents one of the many endemic species known only from a few mountains in eastern Zimbabwe (e.g. Mt. Selinda [20°25'S;32°46'E] near Chipinge, Mt. Binga [19°47'S;33°03'E] near Chimanimani, the Vumba Mountains [19°07'S;32°43'E] near Umtali and Mt Inyangani [18°18'S;32°45'E] near Inyanga). It remains unclear whether this high degree of endemism is a result of inadequate or preferential collecting, or a reflection of the natural situation. In any case the number of species known from these mountains, but not from other equally well collected montane localities is considerable and it is practical, from a conservation viewpoint, to continue to treat these species as rare until proven otherwise.

Neoardelio inyangani is represented together with *N. retifrons* on a branch of the cladogram (Fig. 9), sharing the apomorphies 1.2 (distinct pits on frons), 2 (parafacial bar present). The branch giving rise to *N. aspalathus*, *N. inyangani* and *N. retifrons* is defined by the character states: 8 (scutellum sculptured – also shared with *N. aspalathus*), 9 (alveoli of scutellar setae raised on distinct tubercles) and 10 (six scutellar setae). The number of scutellar setae is found to be variable in *N. aspalathus* and *N. lineatocollis* (Table 1) and should thus be treated with some caution. Character state 6 (microtrichia widespread on posterior portion of anepisternum), is common between these three species and *N. lineatocollis*.

***Neoardelio lineatocollis* (THOMSON, 1869)**

(Figs 1b, 4e, 5b, 6c, 8b)

Herina lineatocollis THOMSON, 1869 – THOMSON, 1869: 576. Type locality: South Africa. Depository of type specimen: ♂ Holotype in NHRS.

Neoardelio lineatocollis (THOMSON, 1869): HENDEL 1914a: 16 (key & designation as type of *Neoardelio*) & 93 (re-description); HENDEL 1914b: 9 (key) & 185 (re-description); STEYSKAL 1960: 310 (discussion) & 312 (key); STEYSKAL 1980: 568 (catalogue); HANCOCK 1982: 151 (mention). Head and wing illustrated: HENDEL 1914a: pl. 6 (figures 124, 125).

Diagnosis: Pits extended indistinctly over entire length of frons. Notum marked with pattern of microtrichia in narrow lines. Entire upper half of anepisternum densely covered with microtrichia; posterior anepisternum with dark spots, from which setulae arise (Fig. 4e). Four (five or sometimes six) scutellar setae; scutellum smooth, without microtrichia; sockets of scutellar setae not

Tab. 1: Numbers of scutellar setae in male and female specimens of *Neoardelio lineatocollis* (THOMSON, 1869) from nine farms in the Western Cape, South Africa

number of scutellar setae	♂♂			♀♀	
	4	5	6	4	6
Location	number of specimens				
Puts farm (Klawer)	11	1	2	2	0
Puts/Pypies (Klawer)	3	0	0	1	0
Hottentotsfontein farm (Klawer)	15	1	3	6	1
Oudam farm (Graafwater)	6	0	2	4	0
Groenkol farm (Graafwater)	32	1	6	16	2
Brandwag (Leipoldville)	1	0	0	0	0
Seekoevlei (Clanwilliam)	0	0	1	0	0
Aggenbagskraal (Clanwilliam)	3	0	0	2	0
Papkuilsvlei farm (Aurora)	1	0	0	1	0
Total number of specimens (124)	72	3	14	32	3

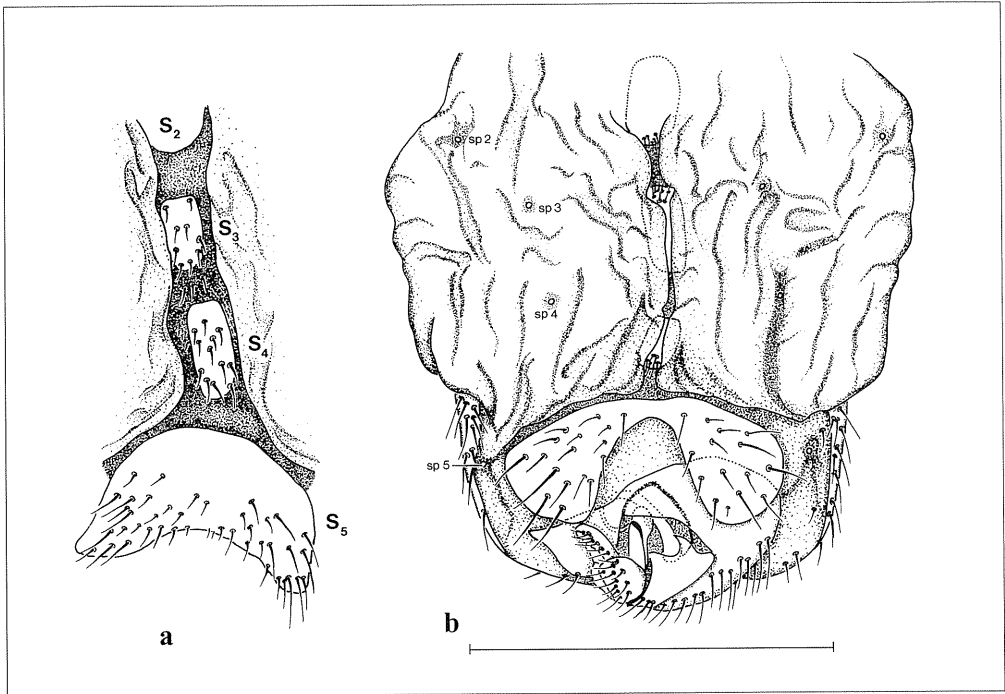


Fig. 5a, b: Male abdomen ventral view. – a: sternites of *Neoardelio aspalathus* spec. nov.; – b: sternites and pleurites of *N. lineatocollis* (THOMSON, 1869). Abbreviations: S = sternite; sp = spiracle. Scale bar = 1 mm.

raised on distinct tubercles, but flush with scutellum margin. Wings banded, but lacking an interband; apical band on wing extending across apex r_{2+3} and a little into r_{4+5} (Fig. 8b).

Description of male abdomen: Sternites S_{1+2} to S_4 strongly reduced, about one tenth width of abdomen and corresponding pleurites grossly developed and strongly wrinkled (Fig. 5b). S_5 normally sized, strongly indented along posterior margin, such that the segment is almost bisected. Male genitalia: Epandrium subglobose (Fig. 6c), with strong black setulae dorsally. Hypoproct equally as long as epandrium, fused to membranous proctiger and fused at apex, with strong black setulae dorsally. Surstylus strongly sclerotised at apex by an apical bar; ventrally and externally covered by membranous sheath, finely marked with setulae. Distiphallus short (extending only a little beyond phallapodeme and hypandrium); preglans small; glans rounded and ending in a single terminal filament longer than length of distiphallus and flared at apex. Base of filament sheathed in raised sides of glans. Ejaculatory apodeme narrow and poorly spatulate, with a bilobed partly sclerotised basal cap. Arms of hypandrium broad and strongly sclerotised. Basal arms of phallapodeme densely sclerotised. Apex of phallapodeme truncated into a straight edge; less sclerotised than hypandrium and basal arms.

Type material: not examined.

Other material examined: SOUTH AFRICA, Western Cape: 3♂♂, 1♀ Puts/Pypies (farm), nr Klawer, 31°46,9'S 18°43,4'E, 620 m, 02.viii.1996, in 4 year old plantation (SANC); 14♂♂, 2♀♀ Puts (farm), nr Klawer, 31°47,4'S 18°41,5'E, 640 m, 02.viii.1996, in 1 year old plantation (SANC); 19♂♂, 7♀♀ Hottentotsfontein (farm) near Klawer 31°51,1'S 18°44,4'E, 440 m, 02.viii.1996, in 3 year old plantation (SANC); 8♂♂, 4♀♀ Oudam (farm) near Graafwater, 32°04,4'S 18°41,8'E, 440 m, 01.viii.1996, in 4 year old plantation (SANC); 39♂♂, 18♀♀ Groenkol (farm) near Graafwater, 32°06,3'S 18°41,4'E, 500 m 01.viii.1996, 1 year old plantation (SANC, 1♂, 1♀ in each of NMSA & RMSE); 1♂ Brandwag (farm) near Leipoldtville, 32°09,2'S 18°24,8'E, 100 m, 04.viii.1996, 3 year old plantation (SANC); 1♂

Seekoevlei (farm) near Clanwilliam, 32°09,3'S 18°45,12'E, 100 m, 04.viii.1996, 5 year old plantation (SANC); 3 ♂♂, 2 ♀♀ Aggenbagskraal (farm) near Clanwilliam, 32°17,9'S 18°53,0'E, 380 m, 02.viii.1996, 4 year old plantation (SANC); 1 ♂, 1 ♀ Papkuilsvlei (farm) near Aurora, 32°39,3'S 18°38,3'E, 100 m 04.viii.1996, in 3 year old plantation (all collected by R. OBERPRIELER, R. STALS and M. STILLER from rooibos tea, *Aspalathus linearis* (FABACEAE) plantations; SANC); 3 ♂♂ 2 ♀♀ Clanwilliam, 32°10'S 18°49'E, 04.viii.1999, J. L. HATTING (SANC).

Literature records: SOUTH AFRICA: ♂ Holotype, South Africa (THOMSON 1869) (NHRS); 2 ♂♂, 1 ♀ Cape Province (HENDEL 1914b) (NHMV); 1 ♀ Blinkwater[kloof] [from 33°57'38"S;18°23'46"E to 33°57'55"S;18°24'23"E], Table Mountain, Cape Town (STEYSKAL 1960) (MZLU).

Discussion: A distinct species known from numerous specimens: one seen by THOMSON; 2 ♂♂ and 1 ♀ seen by HENDEL; 1 ♀ seen by STEYSKAL and 124 specimens seen by myself. In his key, STEYSKAL (1960) stated that this species has pits on the front half of the frons only. The range of specimens before me, indicated that this is a variable character, with some specimens having pits continuous across the entire frons. The pits are indistinct and are obscured in greasy specimens. The form and size of the ejaculatory apodeme (the narrow spatulate plate to the left of the main part of the genitalia in Fig. 6c) are variable. DREW (1969) demonstrated that the spatulate plate changes shape and size with sexual maturity in *Strumeta tryoni* (FROGGATT, 1897) (Tephritidae) and there is no indication that this will not be the case in Platystomatidae.

Neoardelio lineatocollis is alone on a branch of the cladogram (Fig. 9) with no autapomorphies expressed. It shares an affinity with the *N. aspalathus-retifrons-inyangani* species group, expressed by the shared character state: (6) microtrichia widespread on posterior part of anepisternum.

Neoardelio longiala STEYSKAL, 1960

(Figs 4b, 6a, 7c)

Neoardelio longiala STEYSKAL, 1960 – STEYSKAL 1960: 310. Type locality: SOUTH AFRICA, Kirstenbosch [33°57'S; 18°25'E]. Depository of type specimen: ♂ Holotype and 1 ♀ paratype MZLU. Literature: STEYSKAL 1960: 312 (key); STEYSKAL 1980: 568 (catalogue); HANCOCK 1982: 151 (mention). Wing illustrated: STEYSKAL 1960: 311 (Fig. 1).

Diagnosis: Frons with poorly developed pits and wrinkles on anterior part only. Notum marked with pattern of microtrichia in narrow lines. Microtrichia on anepisternum surrounding anterior spiracle and extending slightly onto anterior anepisternum and small patch at dorsal posterior angle, but most of the anepisternum free from microtrichia (Fig. 4b) Scutellum smooth. Wings banded, interband clearly separated from stigmal band; apical band on wing extending across apex r_{2+3} and r_{4+5} and slightly into m (figure 1 in STEYSKAL 1960).

Description of male genitalia: Epandrium subglobose (Fig. 6a), with strong black setulae dorsally. Hypoproct about half as long as epandrium, fused to membranous subsquare proctiger and fused at apex, with strong black setulae dorsally. Surstylus strongly sclerotised at apex terminating in an apical bar, which has two ventral teeth; ventrally and externally covered by a membranous sheath, finely marked with setulae. Distiphallus short (extending only a little beyond phallapodeme and hypandrium); preglans cylindrical and elongate; glans rounded and ending in a single terminal filament longer than length of distiphallus and bilobed at apex. Base of filament partially covered by raised extension of glans. Ejaculatory apodeme narrow and poorly spatulate, with a bilobed partly sclerotised basal cap. Arms of hypandrium broad and strongly sclerotised. Basal arms of phallapodeme densely sclerotised. Apex of phallapodeme truncated into a straight edge; less sclerotised than hypandrium and basal arms.

Description of female genitalia: The aculeus with noticeably long terminal setulae (Fig. 7c).

Type material: ♂ Holotype (MZLU): SOUTH AFRICA, Western Cape: "S. Afr. Cape Prov. / Cape Peninsula, / Kirstenbosch [33°57'S;18°25'E] / 29.X.[19]50 No.18" [printed on white card]; "Swedish South Africa / Expedition / 1950-1951 / Brinck — Rudbeck" [printed on white card]; "HOLOTYPE / NEOARDELIO / LONGIALA / Steyskal" [handwritten on red card]; "Type No. / 13: 1-2 / Zool. Mus. Lund Sweden / Otitidae [sic]" ["Type No." printed down left side,

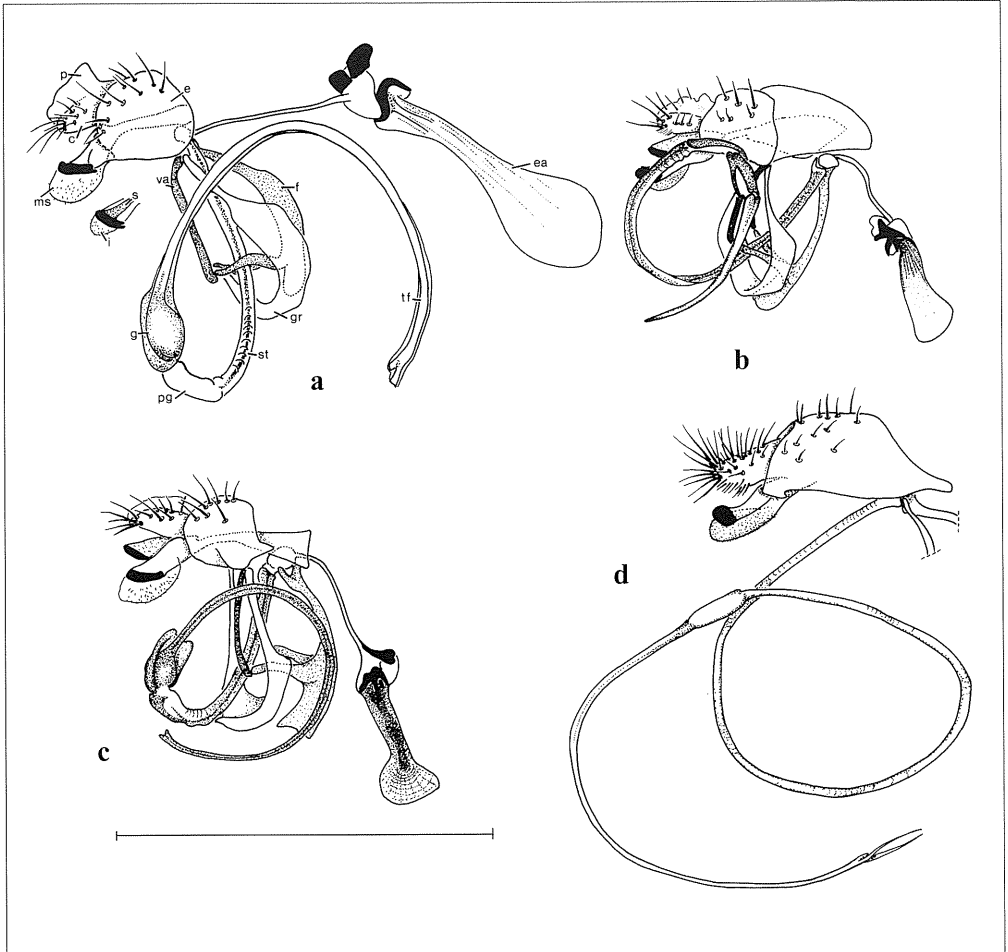


Fig. 6a-d: Male genitalia lateral view. – a: *Neoardelio longiala* STEYSKAL, 1960; – b: *N. aspalathus* spec. nov.; – c: *N. lineatocollis* (THOMSON, 1869); – d: *N. inyangani* HANCOCK, 1982. Abbreviations: e = epandrium; p = proctiger; c = cercus; ms = membranous sheath; s = surstylus; i = interior view of membranous sheath and surstylus; va = ventral arm; f = phallopodeme; gr = hypandrium; st = distiphallus; pg = preglans; g = glans; tf = terminal filament; ea = ejaculatory apodeme. Scale bar = 1 mm.

Zool. Mus. Lund Sweden printed across top, remainder hand-written on white card]. Right wing detached and adhered to a separate piece of card, abdomen a little shrivelled and the genitalia in glycerine in a capsule on the same pin.

Paratype: SOUTH AFRICA: Eastern Cape: 1 ♀ Assegaaibos 30 miles WNW Humansdorp [33°56'S;24°19'E; 2.5 km NE of Kareedouw (or 48 km WNW of Humansdorp as expressed by STEYSKAL 1960)], 1.iii.1951, BRINCK & RUDBECK (MZLU).

Other Material examined: SOUTH AFRICA: Western Cape: 1 ♀ Ceres [33°23'S;19°19'E], iv.1923, R. E. TURNER, Brit. Mus.1925-210 (BMNH); 1 ♂ Kirstenbosch [33°57'S;18°25'E] and 1 ♀ Assegaaibos [Eastern Cape, 33°56'S;24°19'E], as described for the type specimens (MZLU); 1 ♀ Kirtsenbosch Gardens 33°59'S;18°25'E, 7.xii.1993, P. E. REAVELL, Fynbos and *Eragrostis* (the label also bears the code: #38) (NMSA); 2 ♀ Storms River [33°59'S 23°52'E], 11.ix.1983, A. FREIDBERG (TAUI).

Discussion: *Neoardelio longiala* is alone on a branch of the cladogram (Fig. 9) with no autapomorphies expressed. A number of character states are shared with other species as indicated in Table 2 and illustrated in Fig. 9.

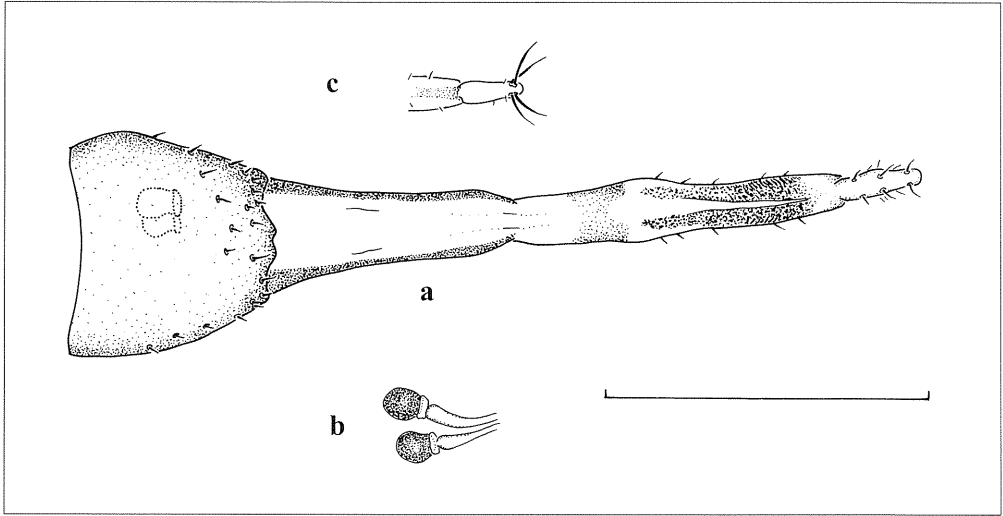


Fig. 7a-c: Female genitalia. – a: *Neoardelio aspalathus* spec. nov., dorsal view; – b: detail of spermathecae; – c: *Neoardelio longiala* STEYSKAL, 1960, apex of aculeus. Scale bar = 1 mm.

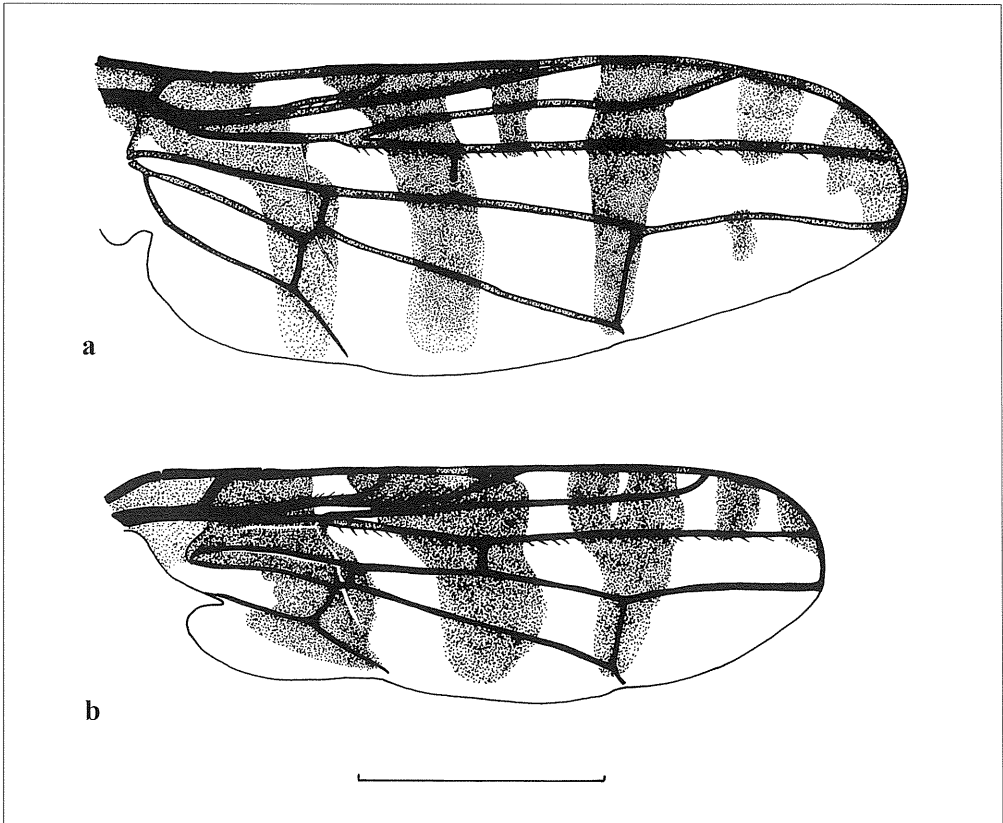


Fig. 8a, b: Right wing, dorsal view. – a: *Neoardelio alternatus* (WALKER, 1861); – b: *N. lineatocollis* (THOMSON, 1869). Scale bar = 1 mm.

Neoardelio retifrons STEYSKAL, 1960

(Fig 4d)

Neoardelio retifrons STEYSKAL, 1960 – STEYSKAL 1960: 312. Type locality: LESOTHO, Mt Morosi [33°57'S;18°25'E], 24 km NE of Quthing. Depository of type specimens: ♂ Holotype and 1 ♀ paratype MZLU. Literature: STEYSKAL 1960: 312 (key); STEYSKAL 1980: 568 (catalogue); HANCOCK 1982: 151 (mention). Wing illustrated: STEYSKAL 1960: 311 (Fig. 2).

Diagnosis: Frons covered with distinct and deeply sculptured pits. Notum marked with pattern of microtrichia in narrow lines. Anterior anepisternum with one irregular stripe of microtrichia behind anterior spiracle and two stripes below it; posterior anepisternum lightly marked with microtrichia (Fig. 4d). Scutellum sculptured and dusted with microtrichia; six scutellar setae, arising from tubercles. Wings banded, with interband narrowly touching stigmal band on posterior basal margin; apical band on wing extending across apex r_{2+3} and a little into r_{4+5} (figure 2 in STEYSKAL 1960).

Description of female genitalia: The aculeus with noticeably long terminal setulae, but indistinguishable from that of *N. longiala*.

Type material: ♀ Holotype (MZLU): LESOTHO: “S. Afr. Basutoland / Mount Morosi [=Moorosi, 30°17'S;27°53'E], 15 miles [24 km] / NE Quthing. [30°25'S;27°43'E] / 18.III.[19]51 No.241” [printed on white card]; “Swedish South Africa / Expedition / 1950-1951 / Brinck — Rudbeck” [printed on white card]; “HOLOTYPE / NEOARDELIO / RETIFRONS / Steyskal” [hand-written on red card]; “Type No. / 14: 1-2 / Zool. Mus. Lund Sweden / Otitidae [sic]” [“Type No.” printed down left side, Zool. Mus. Lund Sweden printed across top, remainder hand-written on white card]. In good condition. Paratype: LESOTHO: 1 ♀ Mokhotlong [29°18'S;29°05'E], 6.iv.1951, BRINCK & RUDBECK (MZLU).

Discussion: A highland species from above 2000 m, known only from the type specimens, clearly described and illustrated by STEYSKAL (1960). In the wing pattern, the extent to which the interband touches the stigmal band varies. The holotype has the right wing with the two bands separated by about two widths of the R_{4+5} vein, while on the left wing the two bands touch. The paratype has the two bands fused on both wings.

Sharing an affinity on the cladogram (Fig. 9) with *N. inyangani* by the branch supported by apomorphies as described in the discussion for that species. No autapomorphies are expressed.

Phylogenetic analysis

The cladogram (Fig. 9) was compiled using the data set (Table 2) and implicit enumeration (*ie-*) option in Hennig86 (FARRIS 1988). Use of the successive weighting (*xsteps w*) setting achieved the values: ‘length 122, consistency index 95, and retention index 95’, with no change to the single tree produced. Use of branch swapping or branch breaking techniques did not improve the resultant tree.

The following characters (extracted from the specimens before me) were included in the data set. Platystomatidae were used as the outgroup and all characters were scored in comparison with it.

1. Pits on frons. The plesiomorphic state of this character is the lack of pits on the frons (0). Presence of indistinct pits (1) was distinguished from strongly developed pits (2) in a linear series resulting in a binary code for this character (Table 2) (Fig. 2 and figure 1 in HANCOCK, 1982).
2. Bar of microtrichia on parafacial area extending onto gena. The plesiomorphic state, absent (0), is usual in Platystomatidae, while presence (1) represented the apomorphic state. This is a horizontal band of silvery microtrichia halfway between the lower margin of the eye and the lower facial margin.

3. Band of microtrichia running the length of the postgena. Pleisiomorphic state, absent (0), is usual in Platystomatidae, while presence (1) represented the apomorphic state.
4. Microtrichia on notum. The pleisiomorphic state of this character is the lack of lines of microtrichia forming a distinct pattern on the notum (0) and is the state for only a single species in this genus (*N. alternatus*). The presence of these lines in circles, square and rectangular patterns (Fig. 2 and figure 1 in HANCOCK 1982) is taken to be the apomorphic condition (1), which is generally consistent throughout the rest of the species in *Neoardelio*.
5. Microtrichia on anterior anepisternum: partly developed (0) or over all of the anterior anepisternum (1). These states together with those in 6 are consistent in the specimens examined and form the most accurate diagnosis between species in this genus (Fig. 4).
6. Microtrichia on posterior anepisternum: absent or partly developed (0) or widespread over all of the posterior anepisternum (1). These states together with those in 5 are consistent in the specimens examined and form the most accurate diagnosis between species in this genus (Fig. 4).
7. Microtrichia on propleuron: absent or partly developed (0) or widespread over the propleuron (1) (Fig. 4).
8. Surface of scutellum. A smooth scutellum is considered pleisiomorphic (0). In some species the surface is distorted by a series of irregular wrinkles or fine sculpturing (1) (Fig. 2), representing the apomorphic state of this character.
9. Insertion of scutellar setae. Scutellar setae inserted in the normal manner, directly into alveoli (sockets) at the same level as the surrounding sclerite, is pleisiomorphic (0), while the condition in which the alveoli are found at the apex of small tubercles (referred to as “warts” by some authors - e.g. STEYSKAL 1960) is apomorphic (1) (Fig. 2 and figure 1 in HANCOCK 1982).

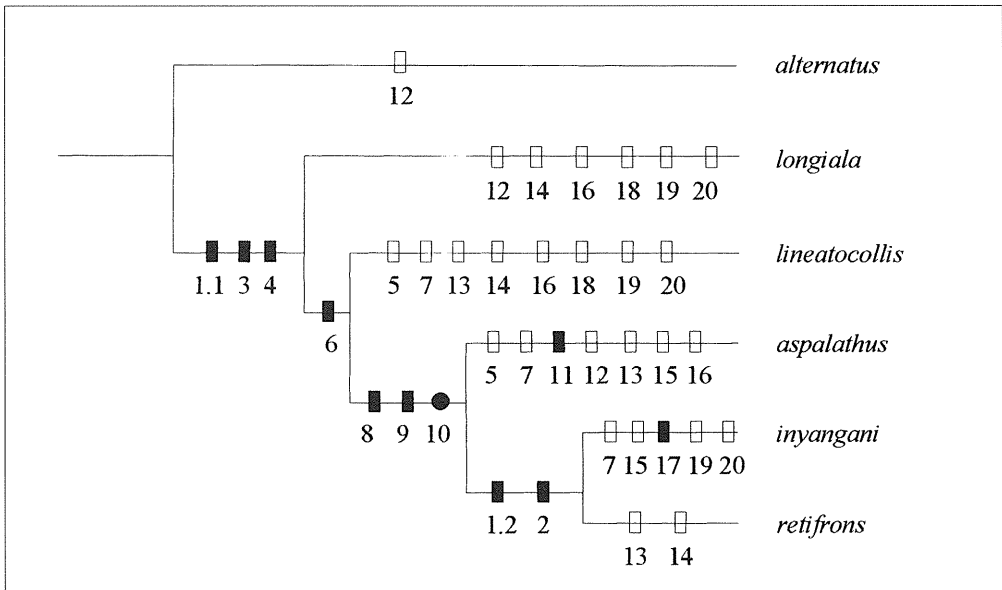


Fig. 9: Cladogram for species of *Neoardelio* derived from the character set (Table 2) and key characters as discussed in the text. Shaded blocks (■) represent autapomorphies; open blocks (□) represent shared apomorphies and a filled dot (●) represents a reversal.

10. Number of scutellar setae. Six scutellar setae (figure 1 in HANCOCK, 1982) or in some specimens of *N. aspalathus*, where seven or eight scutellar setae (Fig. 2) have been observed, is pleisiomorphic among Platystomatidae (0), compared to the condition in which species have four scutellar setae [or 2 in some ♀♀ *N. lineatocollis* (STEYSKAL, 1960)] (1). STEYSKAL (1960) and Table 1 indicate how unstable this character is. For species such as *N. aspalathus* and *N. lineatocollis* in which this character is variable and long series of specimens are available, the most common number of setae has been scored, in both cases resulting in the apomorphic state.
11. Wings banded or spotted. The majority of Platystomatidae have densely marked wing membranes. Thus, the completely darkened wing membrane has been taken here as the pleisiomorphic state [see also VAN BEMMELEN (1917)]. In *Neoardelio* the completely darkened wing membrane is absent, the most pleisiomorphic condition is the banded wing (0) (Fig. 8); and the less dense pattern, i.e. spots (Fig. 2) is apomorphic (1).
12. Condition of the interband on the wing. Interband completely merged with stigmal band (figure 125 in HENDEL 1914a and figure 1 in HANCOCK 1982) and thus not apparent, or present and linked (even narrowly to the stigmal band) (figure 2 in STEYSKAL 1960) is pleisiomorphic (0). Interband completely free from the stigmal band (figure 1 in STEYSKAL 1960) and in the case of spotted wings (Fig. 2), it can also be associated with spots in the same position (1). In the case of *N. retifrons* the interband sometimes only just touches the stigmal band, but in other instances it is clearly fused with it. Thus, the pleisiomorphic state has been scored for this species.
13. Extent of apical band. A long apical band, extending from the apex of cell r_{2+3} , extending over R_{4+5} and M and into cell m is considered pleisiomorphic (0) (figure 1 in STEYSKAL 1960 & figure 1 in HANCOCK 1982). A short band over R_{4+5} , extending into cell r_{4+5} (figure 125 in HENDEL 1914a and figure 2 in STEYSKAL 1960) or a spot over the apex of cell r_{2+3} , is apomorphic (1).
14. Presence of medial spot. In some wings there is a medial spot situated posterior to M in the middle of its apical section. This is considered to be pleisiomorphic (0) (Fig. 2 and figure 1 in HANCOCK 1982), while the absence of this spot is apomorphic (1) (figures 1 and 2 in STEYSKAL 1960). In *N. lineatocollis* this character is variable and thus the most common state (absence of the spot) has been used. The irregularity of occurrence in this character, renders it less useful than previously thought (STEYSKAL 1960, HANCOCK 1982).
15. Setulation of hypoproct. Hypoproct are variably setose on the ventral surface. No setulae or only a few setulae have been accepted as the pleisiomorphic state (0) (Fig 6. a, c), while a dense cluster of setulae or a well defined margin of strong setulae represent the apomorphic state (1) (Fig. 6b, d).
16. Apex of surstyli. In Platystomatidae, the apex of the surstyli is often formed by a rigid, strongly sclerotised bar. This is an apomorphy. In those species of *Neoardelio* for which males are known, all have an apical bar. A short (rounded) bar (Fig. 6d) has been scored as the pleisiomorphic state (0) and an elongate bar (Fig. 6a-c) as the apomorphic state (1).
17. Shape of epandrium. The coding for this character is debatable, since there is no clear indication of which state may be more pleisiomorphic than another. The rounded state (Fig. 6a-c) was scored as pleisiomorphic (0) and elongate (Fig. 6d) as apomorphic (1).
18. Shape of glans. Most Platystomatidae examined have an elongate, cylindrical glans (Fig. 6b, d) and this has been coded as pleisiomorphic (0). The condition found in *N. lineatocollis*

and *N. longiala*, in which the glans is bulbous and the base of the filaments are sheathed in a flange-like extension of the glans (Fig. 6a, c) was scored as apomorphic (1).

19. Length of aedeagal filament. A short filament (Fig. 6b) has been scored as the plesiomorphic state (0), with a long filament (Fig. 6a, c, d) as the apomorphic state (1). The apomorphic state is taken to the extreme in genera such as *Duomyia* WALKER 1849, where some species (for example *D. angustata* MCALPINE, 1973) have the filaments so long that they must be tightly coiled in order to accommodate them in the genital pouch (figure 42 in D. K. MCALPINE 1973).
20. Tip of aedeagal filament. The filaments in males of this genus terminate in a gradual decrease in size (thus a single ending) or are bifurcate. The single ending (Fig. 6b) has been taken to be the plesiomorphic state (0) and the bifurcate ending (Fig. 6a, c, d) as the apomorphic state (1).

In *Neoardelio*, some species (*N. alternatus* and *N. retifrons*) are only known from female specimens and thus cannot be scored for characters 15 to 20. The analysis was re-run without these six characters, using the same settings. The resultant cladogram showed the same affinities as those illustrated in Fig. 9, but had the following values: length 102; ci 94; ri 95; trees 1. These improved figures are clearly the result of no queries in the table and imply that the first cladogram (Fig. 9) would be much improved by inclusion of the missing character states for *N. alternatus* and *N. retifrons*, although the female genitalia are uniform throughout the genus and thus provide few useful interspecific characters.

Tab. 2: *Neoardelio* HENDEL, 1914 character set, based on key characters as discussed in the text

Characters	Ancestor	<i>N. longiala</i> STEYSKAL, 1960	<i>N. retifrons</i> STEYSKAL, 1960	<i>N. lineatocollis</i> (THOMSON, 1869)	<i>N. aspalathus</i> spec. nov.	<i>N. alternatus</i> (WALKER, 1861)	<i>N. inyangani</i> HANCOCK, 1982
1. Pits on Frons	00	00	10	11	10	10	11
2. Bar of microtrichia on parafacial area	0	0	0	1	0	0	1
3. Band of microtrichia on postgena	0	0	1	1	1	1	1
4. Microtrichia on Notum	0	0	1	1	1	1	1
5. Microtrichia on anterior mesonotum	0	0	1	0	1	0	0
6. Microtrichia on posterior mesonotum	0	0	1	1	1	0	1
7. Microtrichia on propleuron	0	0	1	1	1	0	0
8. Surface of scutellum	0	0	1	1	0	0	1
9. Insertion of scutellar setae	0	0	1	1	0	0	1
10. Number of Scutellar setae	0	1	0	0	1	1	0
11. Wings banded or spotted	0	0	1	0	0	0	0
12. Condition of interband on wing	0	1	1	0	0	1	0
13. Extent of apical band	0	0	1	0	1	0	1
14. Presence of medial spot	0	0	0	0	1	1	1
15. Setulation of hypoproct	0	?	1	1	0	0	?
16. Apex of surstuli	0	?	1	0	1	1	?
17. Shape of epandrium	0	?	0	1	0	0	?
18. Shape of glans	0	?	0	0	1	1	?
19. Length of aedeagal filament	0	?	0	1	1	1	?
20. Tip of aedeagal filament	0	?	0	1	1	1	?

Discussion

Considering the small size of these flies, and the scattered distribution of known species, it seems likely that there are more species of *Neoardelio* to be discovered and that the present distributions of species, such as *N. lineatocollis*, are more widespread. It is evident from the present distribution (Fig. 10), that this genus is endemic to Africa South of the Zambezi and Kunene Rivers. The altitudinal range is from 100 m to above 2000 m; with vegetation types ranging from dry semi-arid farmlands on the West coast to high altitude grassland of Lesotho and high altitude semi tropical vegetation in the Eastern Highlands of Zimbabwe. It is interesting to notice, that the two highland species (*N. inyangani* and *N. retifrons* - Fig. 10) are paired on the preliminary cladogram (Fig. 9). The remaining species are known from lower and/or drier habitats.

Information on larval habits and female oviposition of Platystomatidae is rudimentary. The first mention of Platystomatidae larvae, was made by PERRIS (1856), who described finding *Platystoma umbrarum* MEIGEN, 1826 in soil under a log. Following this, the only published work on African Platystomatidae discussing aspects of biology, is that of SEEGER & MALDAGUE (1960). They describe the infestation of leguminous root nodules (including the peanut, *Arachis hypogaea* L.) by the larval stage of an undetermined species of *Rivellia*, in Yangambi,

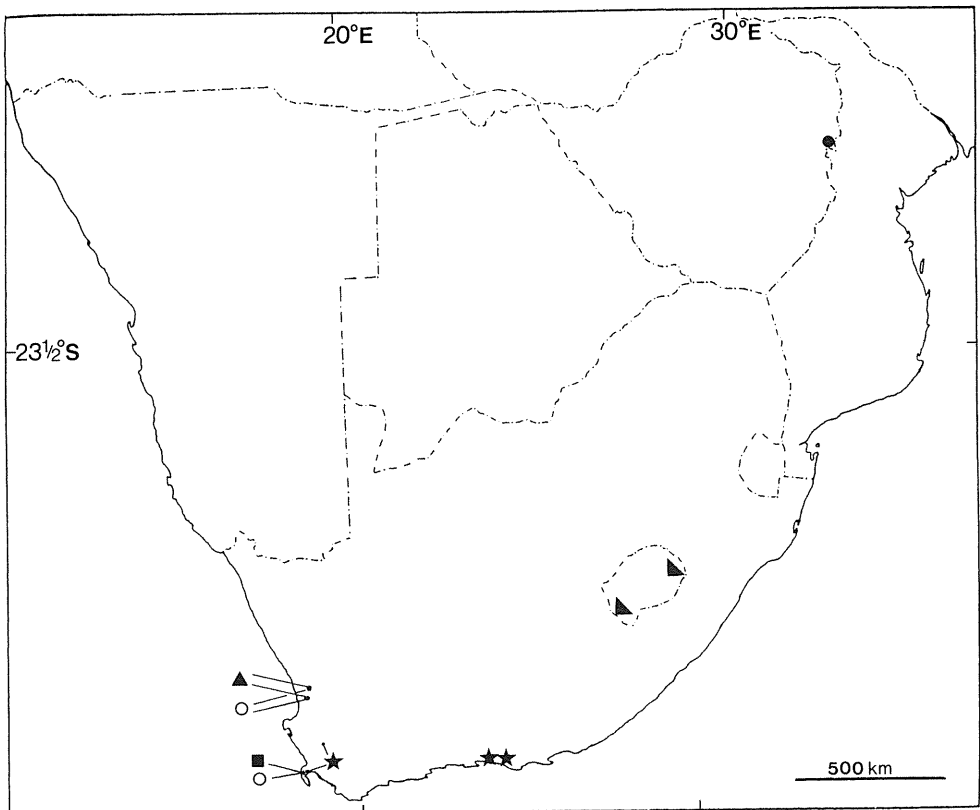


Fig. 10: Distribution map of *Neoardelio* HENDEL, 1914. ■ = *N. alternatus* (WALKER, 1861); ▲ = *N. aspalathus* spec. nov.; ● = *N. inyangani* HANCOCK, 1982; ○ = *N. lineatocollis* (THOMSON, 1869); ★ = *N. longiala* STEYSKAL, 1960; □ = *N. retifrons* STEYSKAL, 1960.

Zaire. Similarly, in Queensland, Australia, DIATLOFF (1965) found up to 70 % of the nodules of *Glycine javanica* L. (a pasture legume) were damaged by an undetermined species of *Rivellia*. Complementary to both these studies is a more detailed analysis compiled by FOOTE (1985) for *Rivellia pallida* LOEW, 1873 on the hog peanut, *Amphicarpa bracteata* (L.) and which includes a list of the leguminose host plants for eight out of the 31 North American species of *Rivellia*. Prior to this, PEIRSOL (1907) described the courtship and mating of *R. boscii* ROBINEAU-DESVOIDY, 1830 and EASTMAN & WUENSCH (1977) noted damage by *Rivellia quadrifasciata* (MACQUART, 1835) to soy bean (*Glycine max* L.) root nodules. Further work on N. American *Rivellia* includes that of KOETHE, et al. (1986) and KOETHE & VAN DUYN (1984 1985 1988 1989) who discussed various aspects of *R. quadrifasciata* on soy bean (*Glycine max* L.) root nodules. BIBRO & FOOTE (1986) described the larva of *R. pallida*. The host list of FOOTE (1985) was expanded to include host records for 11 of the N. American species (FOOTE et al. 1987). The biology of *R. melliginis* (FITCH, 1855) feeding on root nodules of *Robinia pseudoacacia* L. (the "black locust pod") was examined by McMICHAEL et al. (1990). Finally, provision of intrinsic protection of Pigeon pea (*Cajans cajan* L.) against damage by *R. angulata* HENDEL, 1914 was suggested by NAMBAIR et al. (1990). FERRAR (1987) provides a more complete review of the literature covering other genera and biogeographic regions and totalling 29 species.

As in many of the host records mentioned above, *Aspalathus linearis* (used for herbal rooibos tea production) is a member of the Papilionoideae (Fabaceae). The capture of so many specimens of *Neoardelio* (belonging to *N. aspalathus* and *N. lineatocollis*) from rooibos tea plantations in the Western Cape of South Africa, suggests that these species may be breeding in the plantations, possibly affecting root nodules in a fashion similar to the damage caused by *Rivellia*. The aculeus of the female ovipositor of these species is apically rounded [see figure 9 in HARA 1989 for *R. syngenesiae* (FABRICIUS, 1781)] and not of the firm piercing form typical of many Tephritoidea that oviposit into plant tissue. It is possible that the eggs are laid either into the soil, in leaf litter (as observed in the laboratory for *R. melliginis* by McMICHAEL et al. 1990) or into crevices or nodes on the plant surface. Further research is required to establish if this is so and if these species are infecting *A. linearis*.

As it is likely that there are more species of this genus to be discovered, the cladogram (Fig. 9) should be viewed only as a preliminary assessment. It has been carried out in an attempt to place the species in context one with another. More than 50 % of the characters used occur only once on the cladogram and there is a single reversal (viz. character 10: number of scutellar setae). According to the out-group comparison, the plesiomorphic number of scutellar setae is six. This polarity results in a reversal. If the alternative hypothesis is used, namely that four scutellar setae is plesiomorphic, character 10 becomes an autapomorphy on the branch leading to the terminal taxa *N. aspalathus* + [*N. inyangani* + *N. retifrons*]. The tree produced by this 'switched' state is characterised as: 'length 118, ci. 96, ri. 98, tress 1'. Rendering this character inactive resulted in a single tree with values: 'length 118, ci. 96, ri. 97'. The difference between these tree values is minimal and it is clear, then, that this character is not particularly significant at the species level. It may be more useful at a higher level (e.g. generically), but then the polarity clearly needs further evaluation. In the out group (the rest of the Platystomatidae) the number of setae on the scutellum ranges from vestigial to eight, with two, four and six being common character states.

Another short fall of the analysis, is that insufficient specimens were available for scoring some species. Furthermore there is a need to examine characters in the genitalia and in the

larval stages more closely. Both of these issues need extensive fieldwork to be carried out before they can be achieved.

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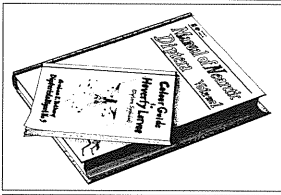
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