

# ***Vermilynx*, a new genus for the wormlion fly *Lampromyia vansonii* Stuckenberg of the Richtersveld, southern Africa (Diptera: Vermileonidae)**

B.R. Stuckenberg

Natal Museum, Private Bag 9070, Pietermaritzburg, 3200 South Africa

A review is given of recent developments in the classification of Vermileonidae among the Lower Brachycera. A new genus, *Vermilynx*, is described for the species *Lampromyia (Vermipardus) vansonii* Stuckenberg, characterized by a primitive form of antenna and highly apomorphic features in the hypopygium.

Key words: Diptera, Vermileonidae, southern Africa, *Vermilynx*, new genus, antennal structure.

## **INTRODUCTION**

For many years the wormlion flies comprised the subfamily Vermileoninae of the Rhagionidae. All previous taxonomic work on the South African taxa followed that classification (Bezzi 1926; Engel 1929; Stuckenberg 1960, 1961, 1965). Inclusion in the Rhagionidae was largely due to a lack of clarity in the definition of that family, for which reliance had been traditionally placed on the plesiomorphic wing venation, the tibial spur formula which is subject to homoplastic change, and the form of the third antennal segment which shows a spectrum of stages in the development of an arista. Various authors had expressed doubt that vermilionines and other rhagionids are closely related, and eventually Nagatomi (1977) gave the vermilionines family rank, though he was uncertain about their relationships.

In the following years, several comprehensive studies of the higher classification of Diptera brought Vermileonidae under the spotlight. Teskey (1981) summarized the characters of the family and stated that there were grounds for relating vermilionids to the Asilomorpha; this notion was reflected in the placement of the family between Scenopinidae and Mydidae in the *Manual of Nearctic Diptera* (Vol. 1). Teskey also considered that there was a close similarity in larval mouthparts between Vermileonidae and some of the Empidoidea, but this was refuted by Sinclair (1992). Woodley (1989) presented a reclassification of the Orthorrhaphous Brachycera in which he placed Vermileonidae in Tabanomorpha, but as *incertae sedis* in view of the absence of a larval mandibular brush and the lack of a bulbous face in some of the genera. Nagatomi *et al.* (1991) and Nagatomi (1992) proposed a fundamental new arrangement

in ranking Vermileonidae as the sister group of Apsilocephalidae + Empidoidea + Cyclorrhapha, on postulated similarities in larval head structure and antennal form; this interpretation was rejected by Sinclair *et al.* (1993) and by Griffiths (1994).

Hennig (1954, 1967) noted that the Upper Jurassic fossil *Archirhagio obscurus* Rohdendorf of Kazakhstan may be a vermilionid, and the possibility of an ancient origin for the family was further supported by Kovalev (1987) who assigned the German fossil *Protobrachyceron liasinium* Handlirsch of the Lower Jurassic to Vermileonidae. Kovalev ranked vermilionids as the sister group of all other Brachycera, and he considered the family to have been abundant during the Jurassic.

Sinclair *et al.* (1993) placed Vermileonidae as a cladistically basal group to the remainder of the Tabanomorpha. This was done on the grounds of a single character, namely the first segment of the female cercus expanded ventrolaterally; they considered this to be an apomorphy supporting monophyly of the Tabanomorpha, though secondarily lost in many taxa. This character was introduced originally by Woodley (1989, character 2.2) who postulated it as an autapomorphy of Pelecophychidae; he considered that a similar condition in some rhagionids was convergent. The character is so poorly investigated and documented, and is subject to so many exceptions, that its validity as a synapomorphy for all Tabanomorpha is contestable. Sinclair *et al.* (1993) included Vermileonidae on scanty and incomplete data; my unpublished studies of *Lampromyia* Macquart show female cerci with a large first segment lacking a ventrolateral expansion. No unequivocal

evidence of a phylogenetic relationship between Vermileonidae and the Tabanomorphs, or indeed any other grouping of families, has been adduced so far.

Most recently, Griffiths (1994) reviewed the higher classification of Brachycera, and he considered that, as there were no morphological grounds for including Vermileonidae in any other major subgroup of Brachycera, the erection of a new infraorder Vermileonomorpha was justified. This includes the fossil families Protobranchycerontidae and Eremochaetidae. Griffiths emphasized the relatively primitive form of the aedeagus in *Lampromyia* as evidence of the early separation of Vermileonomorpha.

This progression from a rhagionid subfamily to an infraorder of the Diptera occurred against the background of an old taxonomy for the various regional vermilionid faunas, as well as sparse information on the morphology of the adult flies. Vermilionid classification requires revision, and the adult morphology needs to be examined in greater depth. Also, the world's vermilionid fauna is incompletely explored; for example, it was only in 1979 that the existence of vermilionids in China was made known by Yang Chi-kun (1979), and two genera and seven species are already recorded from there. The present paper is one of a series intended to improve knowledge of the Afrotropical and Palaearctic wormlion flies.

## MATERIAL AND METHODS

The specimens are pinned flies in the collections of the Natal Museum, Pietermaritzburg (NMSA), the South African Museum, Cape Town (SAMC), and the South African National Collection of Insects, Pretoria (SANC). The male genitalia were macerated in hot potassium hydroxide, and were drawn with the aid of a camera lucida while mounted in glycerine jelly; they are preserved in glycerine in a microvial on the pin below the specimen. For calculating the proboscis to forefemur ratio, the femur was measured on its dorsal surface and the proboscis on its anterior surface; proboscis length was divided by femur length to get the ratio. Conventional morphological terminology is used.

## TAXONOMY

The South African Vermilionidae were last monographed by Stuckenberg (1960). Previously,

the known species had been placed in *Lampromyia* by Bezzi (1926). Stuckenberg (1960) divided the species between two subgenera, namely *Lampromyia* s. str. and *Vermipardus* Stuckenberg. The latter subgenus is exclusively South African and at that time contained five species; two further species, *L. (V.) promontorii* Stuckenberg, 1961, and *L. (V.) vansonii* Stuckenberg, 1965, were subsequently described.

The remarkable species *L. (V.) vansonii* (Fig. 1) was described on a single female specimen from the Richtersveld, a biologically distinctive area from which no other vermilionid has been known. At the time, some of its special features were noted: relative to other *Vermipardus* species, it has a more elongate proboscis; the antennal flagellum is large with eight clearly demarcated segments; the pulvilli are minute and the empodium is vestigial; and the dark chocolate-brown body colouring and uniformly smoky-brown wings are unique. Since then, collecting in the Richtersveld has produced two males and another female, and two males from the extreme south of Namibia have been found in the collection of the South African Museum. Study of this new material shows that the species is generically distinct.

It is notable that this new genus shares with *Vermipardus* the archaic feature of an eight-segmented antennal flagellum, but in an uncompacted form. The antiquity of this character is demonstrated by one of the oldest known fossil Diptera, *Alinka cara* Krzeminski of the Upper Triassic of Virginia, North America, which represents the extinct family Alinkidae assigned by Krzeminski (1992) to the superfamily Tabanoidea. Kovalev (1981) has shown that primitive fossil Brachycera from the Lower and Middle Jurassic of Siberia also had antennae with eight unmodified flagellar segments, and he assigned them to the extant family Rhagionidae. In the second half of the Jurassic, more apomorphic rhagionids had already appeared, which had evolved compaction of the flagellum and early stages in the formation of an arista (Kovalev 1982).

### Genus *Vermilynx* gen. n.

Type species: *Lampromyia (Vermipardus) vansonii* Stuckenberg, 1965.

### Description

*Antennae* large, third segment followed by seven clearly separated and loosely articulated segments

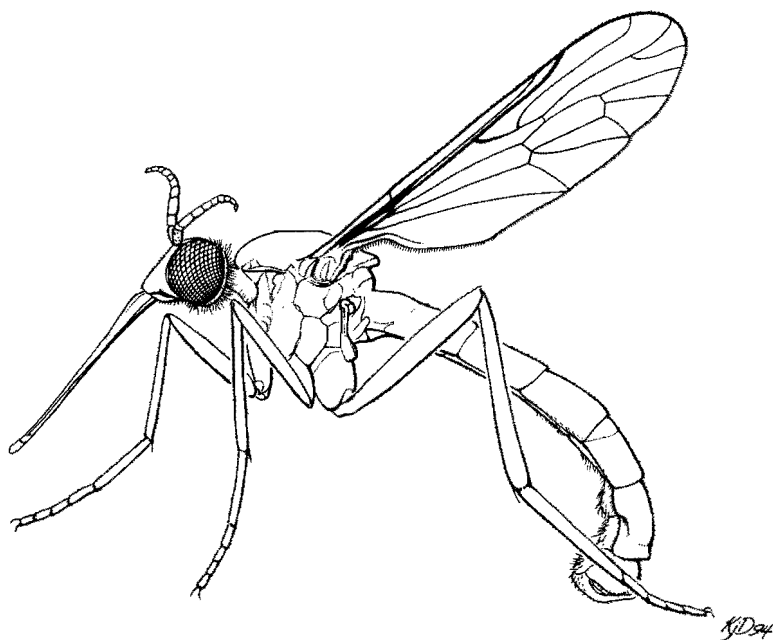


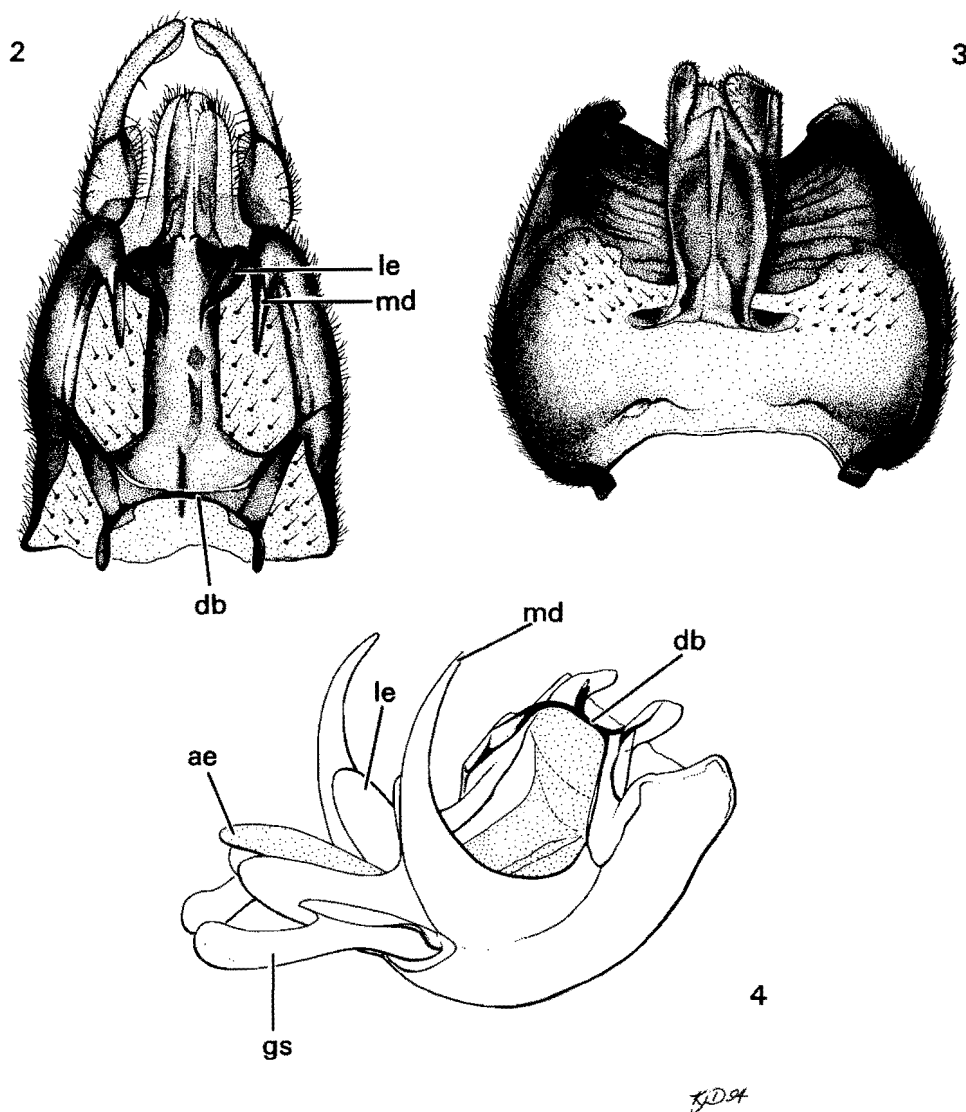
Fig. 1. *Vermilynx vansoni*, male.

forming a tapering style. *Proboscis* elongate, in both sexes about 1.5–1.7 times length of forefemur; *labella* elongate, dorsoventrally compressed, subcylindrical in dorsal profile, without setae. *Legs* relatively short, stout; *pulvilli* minute, *empodium* represented only vestigially as the microscopic, setose apex of the ovate unguitractor plate (Stuckenberg 1965, Fig. 2). *Abdomen* relatively short in both sexes, weakly petiolate in male, most tergites broader than long in female; *hypopygium* complex, prominently subglobose; *epandrium* (Fig. 3) deeply arched, with a large incurved section apically, this transversely wrinkled and lying dorsal to proctiger; *proctiger* elongate, *cerci* short; *hyandrium* completely fused with *gonocoxites* which are fused medially to their apex, each with a ventromedial posterior extension below apical part of aedeagus, reaching beyond site of articulation of gonostylus; *gonostyli* (Fig. 4, gs) large, directed posteriorly, finger-like, slightly incurved, with a basal flange on inner side; aedeagus with small, median, ventral keel at base; aedeagal tube bearing on each side prominent lateral outgrowths (Fig. 2, le) which are adjacent to massive, erect, recurved, dorsally-directed projections (Fig. 2, md) on dorsomedian surface of gonocoxites immediately basad of the gonostyli;

ejaculatory apodeme a small, weakly sinuous rod within basal part of aedeagus; dorsal basal edge of aedeagus attached to a narrow dorsal bridge (Fig. 2, db) joining dorsobasal margins of gonocoxites.

*Etymology.* *Vermis* (L.) a worm + *lynx* (L.) a wild-cat; masculine; in the tradition set by *Vermileo* and *Vermitigris*.

*Remarks.* In the upcurved aedeagal tube with its large lateral extensions, and in the form of the labella, *Vermilynx* is clearly related to *Lampromyia* s. str.; in the non-aristate antenna, with eight graded flagellar segments, *Vermilynx* resembles *Vermipardus*. The length of the proboscis, as expressed by the proboscis to forefemur ratio, places *Vermilynx* (1.5–1.7) between *Vermipardus* (0.6–1.4, mostly 0.6–1.2) and *Lampromyia* s. str. (2.4–3.4). *Vermipardus* differs from *Vermilynx* in having a more compact and smoothly tapered antennal flagellum, usually with a slender apical flagellar segment; in having subtriangular, dorsoventrally aligned, laterally compressed, obviously setose labella; and in lacking lateral expansions of the aedeagal tube. This new evaluation has the effect of making *Lampromyia* s. str. + *Vermipardus* paraphyletic, so generic status for all three taxa is required.



**Figs 2–4.** *Vermilynx vansoni*, male genitalia: 2, hypopygium in dorsal view, epandrium removed; 3, epandrium and proctiger, ventral view; 4, hypopygium in posterolateral view. Abbreviations: ae = aedeagus, db = dorsal bridge, gs = gonostylus, le = lateral expansion of aedeagus, md = mediodorsal projection.

***Vermilynx vansoni* (Stuckenberg) comb. n., Figs 1–4**

*Lampromyia* (*Vermipardus*) *vansoni* Stuckenberg, 1965: 107.

**Male.** *Body colouring* almost entirely dark-chocolate-brown; wings almost uniformly smoky-brown; fore- and middle legs yellowish-brown except dark-brown tarsi; hind femora dull

yellowish-brown over basal three-quarters, apical quarter dark-brown, hind tibia and tarsus black.

**Head.** Frons almost parallel-sided, width anteriorly about 18–22 % of greatest head width; ocelli in equilateral triangle, ocellar tubercle only moderately raised, densely brownish-grey pruinose. **Face** strongly protuberant, greyish-aureous pruinose; proboscis length about 2.5–3.0 times greatest eye height; labella as in female, elongate,

dorsoventrally flattened, rounded apically, completely asetose. *Antenna* with scape and pedicel short, flagellum distinctly elongate (Fig. 1), appearing large in comparison with *Vermipardus* species, in dried specimens somewhat flattened laterally; apical segment conspicuously smaller, constricted basally and sharply terminated.

*Mesonotum* with pattern of greyish-aureous pruinescence; scutellum slightly concave dorsally, with finely rugose surface.

*Abdomen* relatively short, only slightly petiolate posteriorly on second segment, with short but distinctly bulbous hypopygium; in lateral profile tergite 2 moderately swollen over posterior half; entire abdomen blackish-brown, with black, recumbent hairs on posterior half of sternites, sternite 8 entirely haired; gonostyli strongly protruding, apex of aedeagus protruding between cerci. Hypopygium (Figs 2–4) with numerous autapomorphies, notably form of aedeagal lateral expansions (la), prominent, recurved projections from mediodorsal surfaces of gonocoxites (md), and form of gonostyli (gs). Dorsal bridge supporting aedeagus narrow (db).

*Legs* with tibial spurs 1.2.2; tarsal claws slender apically, base dull-yellowish, apex blackish-brown.

*Wing* membrane shiny smoky-brown; a small, elongate clear area over apex of M immediately basal of discal cell; wing shape relatively broad, greatest width about one-third of length, strongly petiolate but petiole relatively short, about one-

fifth of wing length; apex of  $R_{2+3}$  strongly curved forwards, fork of  $R_4$  and  $R_5$  almost symmetrical about wingtip; fourth posterior cell closed.

Wing length of male specimens 8.3, 6.8 and 6.5 mm.

*Material examined.* SOUTH AFRICA: *Northern Cape Province*, 1♂, Richtersveld, Numees Mine, 28.18S 16.58E, 16–20.ii.1979, Malaise Trap, Lamoral, Bampton & Barnely (NMSA); 1♀, Richtersveld, 2816BD, 40 kms south of Ochtha Mine, Londt & Stuckenberg, 2.ix.1983, mixed karoo vegetation with few flowers (NMSA); 1♂, Richtersveld, Numees Mine, 14.iv.1990, S. Naser, larva in pit in cave in old mine, with crocines, adult out 30.xi.1990 (SANC). NAMIBIA: 2♂, Rosh Pinah, 27.58S 16.46E, 13.xi.1975, V.B. Whitehead (SAMC).

The Richtersveld is a semiarid mountainous terrain in the extreme northwestern corner of the Northern Cape Province, bounded to the north by a large bend in the Orange River. The region is renowned for its wealth of endemic plant taxa. The Rosh Pinah locality is in a topographic and biological extension of the Richtersveld in Namibia north of the Orange River.

## ACKNOWLEDGEMENTS

Thanks are due to H. Robertson (SAMC) and M.W. Mansell (SANC) for the loan of specimens, to my colleagues J. Londt and D. Barraclough for comments on the manuscript, and to K. Duxbury for her excellent artwork.

## REFERENCES

- BEZZI, M. 1926. South African Rhagionidae (Diptera) in the South African Museum. *Annals of the South African Museum* 23: 297–324.
- ENGEL, E.O. 1929. A new species of *Lampromyia* (Dipt.) from South Africa. *Annals of the Transvaal Museum* 13: 172–174.
- GRIFFITHS, G.C.D. 1994. Relationships among the major subgroups of Brachycera (Diptera): a critical review. *Canadian Entomologist* 126: 861–880.
- HENNIG, W. 1954. Flügelgeäder und System der Dipteren unter Berücksichtigung der aus dem Mesozoikum beschriebenen Fossilien. *Beiträge zur Entomologie* 4: 245–388.
- HENNIG, W. 1967. Die sogenannten "niederen Brachycera" im Baltischen Bernstein (Diptera: Fam. Xylophagidae, Xylomyidae, Rhagionidae, Tabanidae). *Stuttgarter Beiträge zur Naturkunde* 174: 1–51.
- KOVALEV, V.G. 1981. The oldest representatives of the Diptera with short antennae from the Jurassic in Siberia. *Palaeontological Journal* 15: 84–100.
- KOVALEV, V.G. 1982. Some Jurassic Diptera – rhagionids (Muscida, Rhagionidae). *Palaeontological Journal* 16: 87–99.
- KOVALEV, V.G. 1987. Classification of the Diptera in the Light of Palaeontological Data. In: Narchuk, E.P. (Ed.) *Two-winged Insects: Systematics, Morphology and Ecology*. 40–48. Zoological Institute of USSR Academy of Sciences, Leningrad.
- KRZEMINSKI, W. 1992. Triassic and Lower Jurassic stage of Diptera Evolution. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 65: 39–59.
- NAGATOMI, A. 1977. Classification of Lower Brachycera (Diptera). *Journal of Natural History* 11: 321–335.
- NAGATOMI, A. 1992. Notes on the phylogeny of various taxa of the orthorrhaphous Brachycera (Insecta: Diptera). *Zoological Science* 9: 843–885.
- NAGATOMI, A., SAIGUSA, T., NAGATOMI, H. & LYNEBORG, L. 1991. The systematic position of the Apsilocephalidae, Rhagionempididae, Protempididae, Hilarimorphidae, Vermileonidae and some

- genera of Bombyliidae (Insecta, Diptera). *Zoological Science* 8: 593–607.
- SINCLAIR, B.J. 1992. A phylogenetic interpretation of the Brachycera, based on the larval mandible and associated mouthpart structures. *Systematic Entomology* 17: 233–252.
- SINCLAIR, B.J., CUMMING, J.M. & WOOD, D.M., 1993. Homology and phylogenetic implications of male genitalia in Diptera – Lower Brachycera. *Entomologica Scandinavica* 24: 407–432.
- STUCKENBERG, B.R. 1960. Diptera (Brachycera) Rhagionidae. In: Hanström, B., Brinck, P. & Rudebeck, G. (Eds) *South African Animal Life* 7: 216–308. Swedish Natural Science Research Council, Stockholm.
- STUCKENBERG, B.R. 1961. Records and descriptions of Blepharoceridae, Erinnidae and Rhagionidae from South Africa (Diptera). *Annals of the Natal Museum* 15: 109–124.
- STUCKENBERG, B.R. 1965. A new species of *Lampromyia* Macquart (Diptera: Rhagionidae) from the Richtersveld. *Journal of the Entomological Society of Southern Africa* 28: 107–109.
- TESKEY, H.J. 1981. Vermileonidae [Chapter] 39. In: McAlpine, J.F. et. al. (Eds) *Manual of Nearctic Diptera*, Vol. 1. 529–532. Agriculture Canada Monograph 27.
- WOODLEY, N.E. 1989. Phylogeny and classification of the "Orthorrhaphous" Brachycera [Chapter] 15. In: McAlpine, J.F. et. al. (Eds) *Manual of Nearctic Diptera*, Vol. 3. 1371–1395. Agriculture Canada Monograph 32.
- YANG, C. 1979. A new genus and species of wormlion from China (Diptera Rhagionidae). *Entomotaxonomia* 1: 83–89.

Accepted 10 January 1995