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A new Afrotropical species of *Phytomyza* in the subgenus *Ptochomyza* (Diptera: Agromyzidae)

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ABSTRACT

Phytomyza impunita sp. n. is described in the subgenus *Ptochomyza* Hering. This species is known from a single location in the Republic of South Africa, representing the fifth described species in the subgenus, and the second known *Ptochomyza* to occur outside of the Palaearctic Region, with *P. asparagivora* (Spencer) known from southern Europe, Pakistan, Ethiopia and Kenya. The new species is described and figured, and discussed in relation to congeners.

KEY WORDS: South Africa, *Phytomyza*, *Ptochomyza*, Agromyzidae, Diptera, new species.

INTRODUCTION

Ptochomyza Hering is a small subgenus of Agromyzidae that includes four previously described species and one treated here as new. Throughout most of its history, *Ptochomyza* was treated as close to, but separate from, the much larger *Phytomyza* Fallén. It was included in Spencer's (1990) *Napomyza* group, which was not defined, and included *Chromatomyia* Hardy, *Napomyza* Westwood, *Phytomyza*, *Ptochomyza* and *Pseudonapomza* Hendel. The group's concept was expanded and elaborated upon in Dempewolf's (2001) treatment of the family, which included a quantitative analysis utilising morphological characters. Based on the results of his analysis, Dempewolf included *Aulagromyza* Enderlein and *Gymnophytomyza* Hendel in the group, which he renamed the *Phytomyza* group; *Pseudonapomyza* was not included in the group, not being treated in the analysis. This genus group is best characterised by a costa that extends to vein R_{4+5} and "costalisation" of the wing, whereby the radial veins are clustered anteriorly to meet the costa closer to the wing base.

This classification was developed more recently in studies by Scheffer *et al*. (2007) and Winkler *et al*. (2009), which utilised molecular data sets in quantitative analyses, and are supportive of Dempewolf's *Phytomyza* group. The analyses of Scheffer *et al*. (2007) reconstructed the wider evolutionary history of the Agromyzidae, and Winkler *et al*. (2009) focused on the *Phytomyza* group, attempting to resolve species relationships and further test generic boundaries with a broader sampling of species. Results of the latter study strongly supported a polyphyletic *Chromatomyia,* and found the lineage containing the type species to be deeply nested within *Phytomyza*, providing good support for its synonymy in the same paper. While support for basal branches in the genus group was relatively weak, and additional study is required, results suggested that *Napomyza*, *Ptochomyza* and part of *Aulagromyza* (the bright yellow *A. populicola* group) were actually basal lineages in a broader *Phytomyza*. Since *Napomyza* and *Ptochomyza* were both well defined and supported as monophyletic, they were maintained as valid, but their treatment as subgenera was based on two factors, the first being that they likely rendered the larger *Phytomyza* a non-natural, paraphyletic entity. The second was that a broader *Phytomyza s.l* was more pragmatic and useful, being

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readily identified by easily viewed external and non-genitalic characters: orbital setulae proclinate, costa only extending to vein R_{4+5}, medial vein weak/spectral, and crossvein *dm-cu* absent or situated basally. While much of the classification of this group remains to be resolved (the position of the *A. populicola* group being especially relevant). The system of Winkler *et al*. is very useful, is the best quantitatively supported to date, and aims to structure classification on the criterion of monophyly so as to eliminate artificial entities.

Within *Phytomyza*, *Ptochomyza* is characterised by projecting parafacials and orbital plates, stronger costalisation of the radial veins, absence of vein *dm-cu*, reduced chaetotaxy including a shorter vibrissa and usually only three or four visible dorsocentrals that decrease in height anteriorly, a short bare arista, a simplified phallus (Figs 9, 10) and pale coloration. The scutum is covered with a light greyish pruinosity and has three characteristic brown-to-black stripes that do not reach the posterior margin of the scutum (Figs 1–3), although these may coalesce and sometimes cover the entire scutal surface. The pleuron is usually yellow with at least one dark spot on the katepisternum that does not reach the katepisternal seta. The abdomen is mostly yellow with an ill-defined, dorsomedial grey-brown stripe.

MATERIAL AND METHODS

Pinned material was examined from the National Museum Bloemfontein, Bloemfontein, South Africa (BMSA). Some paratypes were deposited in the Natural History Museum, London, United Kingdom (BMNH), the Canadian National Collection of Insects, Arachnids and Nematodes (CNC) and the United States National Museum of Natural History, Washington, D.C. (USNM). Other collection acronyms used below are: Naturhistorisches Museum Wien, Vienna, Austria (NMW); Museum für Naturkunde, Institut für Systematische Zoologie, Berlin, Germany (ZMHB). Male genitalia were prepared by macerating the abdomen in lactic acid followed by washing in ethanol. Genitalia are stored in glycerin in microvials pinned with the specimen. Terminology follows that of Lonsdale (2011), with relevant structures of the male genitalia labelled in the figures provided.

TAXONOMY

Phytomyza* (*Ptochomyza*) *impunita sp. n.

Figs 1–10

Etymology: The specific epithet is Latin for "free", referring to its collection locality in the Free State province of South Africa.

Description (Figs 1–3):

Wing length 1.8–2.1 mm (♂), 2.1–2.4 mm (♀). Eye height divided by gena height: 2.2–2.3. Scutum covered with light brownish-grey pruinosity. Arista bare, less than twice the length of the antenna, with basal half slightly thickened. First flagellomere small, slightly longer than high, with anterodorsal corner angulate. Orbital plate raised, becoming more prominent anteriorly where it becomes strongly enlarged parafacial, which conceals base of antenna (viewed laterally). Epistoma relatively large, not noticeably delimited from soft face. Mouthparts relatively small, clypeus narrow and recessed.

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Chaetotaxy: Vibrissa short, difficult to distinguish from one or two stronger anterior genal setae. Two ori, two ors; sometimes three ori on one side. Postvertical and ocellar setae approximately as long as ocellar tubercle. One to two irregular rows of proclinate orbital setulae. Two notopleural setae, closely spaced on posterior half of notopleuron and nearly equidistant from lateral margin. Three dorsocentral setae, strongly decreasing in height anteriorly; sometimes fourth postsutural dorsocentral evident anteriorly. Acrostichal setulae in two to four scattered rows on anterior half of scutum (i.e. anterior to base of third dorsocentral); intra-alar setulae sparse, nearly absent posterior to third dorsocentral.

Coloration: Setae black to dark brown. Head yellow in base colour, sometimes light yellow, with face, parafacial, gena and postgena always light yellow to whitish; first flagellomere and mouthparts deeper yellow to orange; clypeus light yellow with lateral arms darker yellowish orange; ocellar tubercle narrowly dark brown with centre paler and posterior region (including base of postvertical) yellow; posterolateral corner of frons with narrow spot extending from eye margin to medial base of inner vertical seta, proceeding posteriorly as thin line to back of head and extending in a straight vertical line to side of foramen; remainder of eye broadly surrounded by yellow; back of head brown with outer margin broadly yellow. Scutum yellow with faint greyish tint and with three dark stripes: anteromedial stripe narrow, widening at anterior margin, posteriorly ending at midpoint of scutum, and often faded in region just anterior to transverse suture; paired intra-alar stripes long, narrow, dark brown, floating, tapering posteriorly; also with very narrow, faded postsutural supra-alar stripe attaining posterior margin of scutum; postpronotum with light-brown anterior spot reaching base of seta. Scutellum yellow with greyish tint. Metanotum yellow with posteroventral corner of katatergite, ventral half of anatergite and mediotergite dark brown. Pleuron mostly yellow with greyish tint; anepisternum with narrow, oblique, brown, ill-defined anteromedial to ventromedial stripe, with region anterior to stripe slightly paler; katepisternum paler with dark-brown ventral spot not reaching base of seta; anepimeron with brown to dark-brown stripes on anterior half; meron dark-brown with dorsum yellow. Legs yellow with base of coxae brownish; femora sometimes with brownish tint (possibly an artifact of preservation). Wing clear. Calypter margin and hairs brown. Halter yellowish white with apical surface of knob light brown. Abdomen mostly yellow; male with brownish, ill-defined dorsomedial stripe from tergite (1) 2–6, sternite 8 entirely yellow, epandrium with very narrow double stripe dorsally; female abdomen similarly yellow with stripe from tergites (1) 2–6, and with oviscape dark brown.

Male genitalia: (Figs 4–10) Epandrium as wide as high, length approximately ⅔ height; dorsomedial region above anus bulging. Cercus small, finger-like. Surstylus small, fully fused to epandrium, not evident. Phallapodeme (not illustrated) long, dark, rod-like. Hypandrium narrow with small triangular apodeme apically; arms broadly arched; two setae on shallow rounded lobe that is distinct from surrounding membranous area. Postgonite broad and subrectangular with long, tapering base, and darker slightly produced apex; one seta and one empty socket on outer-distal surface. Phallus weakly sclerotised, gracile. Phallophorus small, cylindrical, flanked by one pair of relatively dark, rod-like lateral lobes. Basiphallus consisting mostly of long, narrow, dorsal plate split on distal ⅔; fused to dorsal margin of phallophorus; base

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with left lateral arm wrapping around venter of shaft. Paraphallus small, lobate, membranous. Hypophallus absent. Mesophallus not evident. Distiphallus nearly as long as basiphallus, curled dorsally and tapered to apex, weakly sclerotised laterally along length. Ejaculatory apodeme with relatively broad base, short stem and broad subtriangular blade with very weak distal margin; sperm sac with one pair of small, irregular subcircular sclerites.

Holotype ♂: SOUTH AFRICA: *Free State*: Brandfort, Florisbad Res. Stat., 28°46.039'S, 26°04.234'E, 25–29.x.2010, A.H. Kirk-Spriggs, Malaise traps, *Acacia* savanna (BMSA).

Paratypes: Same data as holotype (19♂ 25♀, BMSA; 4♂ 4♀, CNC; 2♂ 2♀ BMNH; 2♂ 2♀ USNM).

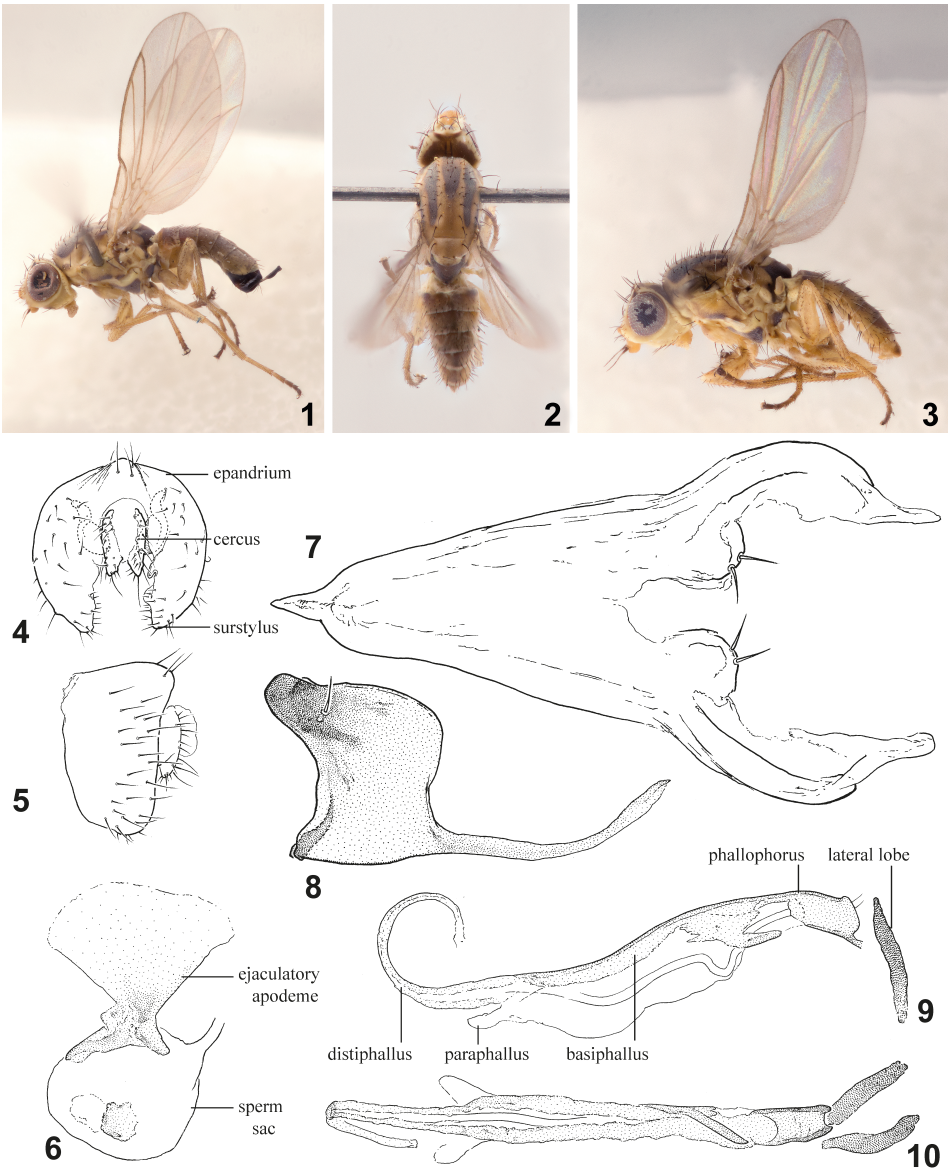
DISCUSSION

Phytomyza impunita is so far known from only a single locality in South Africa. All previously described *Ptochomyza* are European in distribution, at least in part. *Phytomyza czernyi* Strobl is known from Croatia, Italy and Malta (Cerný 2004). Type data are as follows: CROATIA: Volosca (HT ♂, coll. Strobl) (Strobl 1909). Süss (2002) photographed and illustrated the larva and adult. *Phytomyza mayeri* (Spencer) is known from Spain (von Tschirnhaus, pers. comm.), Austria, Croatia and Italy. Type data are as follows: AUSTRIA: Vienna, Eichkogel, ex stem of *Clematis recta*, em. 21.iii.1953, H. Mayer (HT ♀ NMW). It was discussed in Hering (1958) as *Phytomyza czernyi*, Hering (1967) illustrated the mine and larval spiracles, and Süss (1977–1978) illustrated the adult. *Phytomyza asparagi* (Hering, 1942) is known from Spain, Greece (von Tschirnhaus, pers. comm.), Germany, Lithuania and Palaearctic China. Type data are as follows: GERMANY: Zinna near Jüterbog, ex mine on *Asparagus officinalis* L., 29.viii.1941, H. Buhr (ST ♂♀ ZMHB). This species was further discussed in Spencer (1990) and Ostrauskas *et al.* (2005). *Phytomyza asparagivora* (Spencer) is known from southern Europe, Pakistan and Africa, including the Canary Islands (von Tschirnhaus, pers. comm.), but unlike the South African *P. impunita*, this species has only been recovered in the Afrotropics as far south as Ethiopia and Kenya. Type data are: ETHIOPIA: Addis Ababa, Little Akaki River, 2300 m, bred ex leaf-mines in *Asparagus africanus* Lam. [det. J.B. Gillett], 31.x.1959, E.M. Hering (HT ♂ BMNH). This species was discussed in Spencer (1964, 1973, 1985, 1990).

Host preference for the new species cannot be reliably predicted at this point because diets are varied across the subgenus and its sister-group relationships are uncertain. *Phytomyza asparagi* feeds on *Asparagus officinalis* (Asparagaceae), mining in the leaves and sometimes the stem. *Phytomyza asparagivora* similarly feeds on *A. officinalis* (Dempewolf 2004), but is also known from wild, climbing species, including *A. acutifolius* L., *A. africanus* Lam., *A. falcatus* L.and *A. stipularis* Forssk. (Spencer 1990). *Phytomyza mayeri* is known from *Clematis recta* (Ranunculaceae) with the larva feeding in the stem. The host preference of *P. czernyi* was established by Süss (2002), who reared specimens from leaf mines in Italian *Foeniculum* Mill. (Apicaeae).

Morphologically, *Phytomyza impunita* is very similar to other *Ptochomyza* in many external and male genitalic features, but it differs in a number of ways that allow for confident diagnosis. It is larger than other *Ptochomyza* (wing length 1.8–2.4 mm, not 1.7 mm or less) with a much more pronounced parafacial, the halter is brownish apically, the first flagellomere is small and slightly angulate (similar to *P. czernyi* – see Süss (2002: fig. 1)), the anterior genal setae are longer, the distiphallus is relatively

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Figs 1–10. *Phytomyza* (*Ptochomyza*) *impunita* sp. n., photos: (1) female paratype, left lateral; (2) male holotype, dorsal; (3) same, left lateral. Figs 4–10: *P. impunita* paratype, male genitalia: (4) epandrium, posterior; (5) epandrium, left lateral; (6) sperm pump; (7) hypandrium, ventral; (8) left postgonite, left lateral; (9) phallus, left lateral; (10) phallus, ventral.

long and undivided (Figs 9, 10), the postgonite is unique (Fig. 8), the hypandrium is very slender with an apical point (Fig. 7), and the epandrium has a bulge above the anus (Figs 4, 5) and one pair of very narrow dorsal stripes (entirely yellow in other species).

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Among the rest of the subgenus, *Phytomyza asparagi* can be differentiated by usually having only a single notopleural seta medially on the notopleuron, the acrostichal setulae are usually in two rows, the pleuron is yellow with two spots on the katepisternum and meron, and the phallus is a simple membranous tube with a shorter distiphallus than that seen in the new species. *Phytomyza asparagivora* has an arista similar to the new species and the two notopleural setae are positioned posteriorly (although the posterior seta is positioned far above the anterior seta, not equidistant from the lateral margin of the sclerite), but the acrostichal setulae are only in two sparse rows, the distiphallus is bifid with one pair of minute floating sclerites apically in the membrane, and the pleuron is yellow with spots on the katepisternum and meron; this latter character is also seen in *P. asparagi*, which may be conspecific (Dempewolf 2004). *Phytomyza czernyi* (based on Spencer (1966)) has a uniformly grey scutum with the stripes sometimes partially evident, the pleuron is mostly dark, there is a wide brown stripe from the back of the head to the eye margin lateral to the vertical setae, the genal setae are absent and the distiphallus is bifid (see Süss (2002: figs 3–6)). *Phytomyza mayeri* (based on descriptions in Spencer (1966) and Süss (1977–1978)) has a slightly elongate and rounded first flagellomere with a darker outer surface, no acrostichal setulae (one setula possibly present), a fourth presutural dorsocentral, and partial fusion of the three scutal stripes; the phallus is long and undivided, similar to *P. impunita*, but the left section of the basiphallus is broken medially.

The list of diagnostic characters and hosts presented here for previously described species is based largely on published descriptions, as well as limited material of *Phytomyza asparagi* and *P. asparagivora*, and should not be considered exhaustive. Full revision of the subgenus is recommended following more thorough investigation of the Palaearctic fauna.

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