The genus *Phyllomyza* Fallén from China, with descriptions of three new species (Diptera, Milichiidae)

Yu-Qiang Xi¹, Ding Yang³, Xin-Ming Yin¹²

¹ Department of Entomology, Henan Agricultural University, No. 95 Wenhua Road, Jinsui District, Zhengzhou 450003, Henan Province, China ² Xinyang College of Agriculture and Forestry, 24th Street, Yangshan District, Xinyang 464000, Henan Province, China ³ Department of Entomology, China Agricultural University, No. 2 Yuanmingyuan West Road, Haidian District, Beijing 100193, China

Corresponding author: Xin-Ming Yin (xinmingyin@126.com)

Academic editor: R. Meier | Received 29 November 2017 | Accepted 24 April 2018 | Published 28 May 2018

Citation: Xi Y-Q, Yang D, Yin X-M (2018) The genus *Phyllomyza* Fallén from China, with descriptions of three new species (Diptera, Milichiidae). ZooKeys 760: 143–157. https://doi.org/10.3897/zookeys.760.22595

Abstract
The following three species of the genus *Phyllomyza* Fallén from China are described as new to science: *P. guangxiensis* sp. n., *P. luteigenis* sp. n., and *P. quadratpalpus* sp. n. A key to the known species of *Phyllomyza* from China is presented.

Keywords
China, Milichiidae, Diptera, new species, *Phyllomyza*

Introduction
The genus *Phyllomyza* was established by Fallén in 1810. It belongs to the subfamily Phyllomyzinae of the family Milichiidae and most species are recognized by the following characteristics: three lateroclinate orbital setae; occiput not strongly concave when viewed from above; palpus and first flagellomere in male usually greatly enlarged, longer than broad; lunule usually with a pair of setae (Brake 2000). There are 49 described species distributed widely in the world except the Neotropical region (Malloch 1914a; Hennig 1967; Yang 1998; Brake 2000; Iwasa 2003; Xi and Yang 2013, 2015a, b; Xi et al. 2016).
15 species are known from the Palaearctic region (Hennig 1937; Papp 1976, 1984; Papp and Wheeler 1998; Yang 1998) and 29 species from the Oriental region (Brake 2000; Iwasa 2003; Xi and Yang 2013, 2015a, b; Xi et al. 2016). There are 20 species occurring in China, of which four species are distributed in Taiwan (Hendel 1914; Malloch 1914b; Yang 1998; Xi and Yang 2013, 2015a, b; Xi et al. 2016). In the present paper, three species of the genus from China are described as new to science. A key to the described species of Phyllomyza from China is presented. Larvae of some Phyllomyza are generally saprophagous and live in decaying plants, or rear from nests of ants (Donisthorpe 1927). Adults of some species can be collected in open landscapes, such as steppes or meadow, in wadis, at the edges of forests, inside forests, in the forest canopy, in stables or houses, or even in caves, but they don’t seem to be found in coastal habitats or to other places near water (Brake 2000), this habit is different from Canacidae and Tethinidae, each of which have members with similar physical characters to the genus Phyllomyza.

Materials and methods

Genitalia preparations were made by removing and macerating the apical portion of the abdomen in glacial acetic acid, then rinsed in distilled water before being stored in glycerine filled microvials. After examination, they were transferred to fresh glycerine and stored in a microvial on the pin below the specimen or moved to an ethanol tube together with the wet specimens. Specimens examined were deposited in the Entomological Museum of China Agricultural University (CAU), Beijing; the Entomological Museum of Henan Agricultural University (HAU). The general terminology follows McAlpine (1981) and Brake (2000). The following abbreviations are used:

- asc = apical scutellar seta(e),
- bsc = basal scutellar seta(e),
- dc = dorsocentral seta(e),
- h = humeral seta(e),
- ia = intraalar seta(e),
- kepsts = katepisternal seta(e),
- npl = notopleural seta(e),
- pa = postalar seta(e),
- pos = postsutural seta(e),
- prs = presutural seta(e),
- prsc = prescutellar seta(e),
- sa = supraalar seta(e),
- S = sternite,
- T = tergite.

Taxonomy

Key to species (males) of Phyllomyza from China

1. Palpus almost bare, without setulae ................................................................. 2
   – Palpus with short setulae at tip and on ventral side ........................................ 7
2. Frons with 3 interfrontal setae ........................................... P. fuscusa Xi, Yin & Yang
   – Frons with 4 interfrontal setae ................................................................. 3
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3 Arista 2.5 times as long as first flagellomere; cercus with or lacking ventral appendix

– Arista 3 times as long as first flagellomere; cercus lacking ventral appendix.... 5

4 Gena approximately one-fourth eye height (Fig. 5); cercus lacking ventral appendix (Fig. 7) ................................................................. *P. luteigenis* sp. n.

– Gena approximately one-eighth eye height (Fig. 25); cercus with ventral appendix (Fig. 26) ................................................................. *P. nudipalpis* Malloch

5 Gena very narrow, approximately one-fourteenth eye height (Fig. 1); first flagellomere irregularly oblong; knob of halter brownish........... *P. guangxiensis* sp. n.

– Gena at least one-tenth eye height; first flagellomere irregularly quadrate; knob of halter yellowish.......................................................... 6

6 Gena approximately one-sixth eye height; first flagellomere 2 times wider than long................................................................. *P. leioipalpus* Xi, Yin & Yang

– Gena approximately one-tenth eye height; the length of first flagellomere is the same as width................................................................. *P. aureolusa* Xi, Yin & Yang

7 Palpus very long, at least 6 times as long as wide.................................... 8

– Palpus relatively short, less than 5 times as long as wide .................... 9

8 First flagellomere long, 1.4 times as long as wide; knob of halter yellowish white ................................................................. *P. basilatus* Xi, Yin & Yang

– First flagellomere wide, 1.1 times as long as wide; knob of halter darkish brown ................................................................. *P. sinensis* Xi & Yang

9 Cercus with ventral appendix (Fig. 22); first flagellomere broadly elliptoid ...

................................. *P. epitacta* Hendel

– Cercus lacking ventral appendix; first flagellomere very broadly oblong.... 10

10 Palpus pointed apically; first flagellomere shallowly panduriiform (Figs 15, 16) ................................................................. *P. claviconis* Yang

– Palpus inflated, blunted apically; first flagellomere broadly elliptoid or shallowly oblong................................................................. 11

11 First flagellomere shallowly oblong, 1.3 times as long as wide ............

................................................................. *P. quadratpalpus* sp. n.

– First flagellomere broadly elliptoid, almost the same length and width..... 12

12 M₁ between r-m and dm-cu as long as dm-cu..................................... 13

– M₁ between r-m and dm-cu longer than dm-cu..................................... 14

13 Gena narrow, approximately one-eleventh eye height; palpus 5 times as long as wide (Figs 13, 14) ................................................................. *P. angustigenis* Xi & Yang

– Gena relatively broad, approximately one-seventh eye height; palpus 7 times as long as wide (Figs 23, 24) ................................................................. *P. euthyipalpis* Xi & Yang

14 M₁ between r-m and dm-cu at least 1.5 times longer than dm-cu .......... 15

– M₁ between r-m and dm-cu less than 1.2 times longer than dm-cu ..... 19

15 Vibrissa located at level of lower margin of eye .................................. 16

– Vibrissa located below level of lower margin of eye .......................... 17

16 Palpus yellow; hind tibia yellowish................................................. *P. luteipalpis* Malloch

– Palpus dark brown; hind tibia yellow to brown.................................. *P. clavellata* Xi & Yang
Halter white; palpus curved ........................................... *P. drepanipalpis* Xi & Yang

– Halter dark brown or yellowish; palpus straight ........................................... 18

Gena approximately one-seventh eye height; knob of halter yellowish ...........

........................................................................... *P. emeishanensis* Xi & Yang

– Gena approximately one-fifth eye height; knob of halter with upper half white and lower half dark brown ........................................... *P. latustigenis* Xi & Yang

Gena broad, approximately one-sixth eye height (Figs 19, 20) ......................

........................................................................... *P. dicrana* Xi & Yang

– Gena narrow, less than one-sixth eye height .............................................. 20

Vibrissal angle relatively acute, the tip less than 60° angle (Figs 17, 18) .......

........................................................................... *P. cuspigera* Xi & Yang

– Vibrissal angle blunt, the tip almost 90° angle .......................................... 21

Cercus with thin ventral appendix (Fig. 21); hind tibia brownish .................

........................................................................... *P. dilatata* Malloch

– Cercus lacking short ventral appendix; hind tibia dark brown ................... 22

Arista approximately 4.5 times as long as first flagellomere; knob of halter with upper half brownish and lower half dark brown (Figs 27, 28) ....

........................................................................... *P. planipalpis* Xi & Yang

– Arista approximately 3.5 times as long as first flagellomere; knob of halter with upper half yellow and lower half yellowish (Figs 29, 30) .....................

........................................................................... *P. tibetensis* Xi & Yang

Phyllomyza guangxiensis sp. n.

http://zoobank.org/FCE8BDB1-7760-434F-BCC8-168358778852

Figs 1–4

**Diagnosis.** Gena approximately one-fourteenth of eye height. Upper blade of bifurcated tip of surstylus swollen and apical margin rounded, lower blade thin and longer than upper one; cercus arched with short sparse setae.

**Description.** Male. Body length 1.6–1.7 mm; wing length 1.6–1.7 mm.

Head (Fig. 1) black with greyish microtomentum; orbital plate satiny blackish brown, with microtomentum, ocellar triangle blackish brown without microtomentum; lunule very depressed falciform, darkish brown with black margin. Posterior eye margin ventrally diverging from head margin; eye 1.4 times as high as long, gena approximately one-fourteenth of eye height. Setae and setulae on head black; ocellar triangle with two ocellar setae and three short setae; frons with three orbital and two frontal setae on blackish brown orbital stripe, orbital setae lateroclinate and frontal setae medioclinate, four interfrontal setae; postocellar setae cruciate. Lunule with two setae. Vibrissal angle flat, the tip a little more than a 90° angle; vibrissa strong, located below level of lower margin of eye. Antenna darkish brown pedicel with short black setulae at middle and margin, setulae at margin longer than others, longest one approximately five times longer than others; first flagellomere with pubescence, irregularly oblong; arista three times as long as
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First flagellomere, black, distinctly pubescent. Proboscis short and folded, darkish brown, with sparse black setulae. Palpus wide, 0.5 mm, with blunt apex in lateral view; darkish brown with short dense black pubescence, margin without sparse setulae.

Thorax brown with grey microomentum, except scutum shiny brownish with sparse black microomentum; scutellum brownish with gray microomentum. Setae and setulae on thorax black; one h, two dc, one prsc, two npl, one prs, one pos, one sa, one pa, one kepsts (setulae at forward position); scutellum 1.5 times wider than long, with pair of asc and bsc, asc three times longer than bsc. Legs slender, coxae and femora darkish brown, tibiae yellow except hind tibia brown with yellow apex, tarsi yellowish. Setae and setulae on legs black, mid tibia with single black preapical dorsal seta. Wing (Fig. 2) hyaline, unspotted; veins brown; Sc strong; M₁ between r-m and dm-cu longer than dm-cu. Calypter yellowish, with dense brownish microtrichae, margin with thin and long setulae. Knob of halter brownish, stalk yellow.

Abdomen blackish brown with grey microomentum. Setae and setulae on abdomen black; TII-TV with setae, marginal setae longer than others; sternites with sparse
black setulae at posterior 3/4. Posteromedial triangular projection of TI into TII pre-
sent; SII generally luniform, the apex blunt and round, SIII irregularly oblong, SIV
generally quadrate, SV depressed panduriform, apical margin arched. Male genitalia
(Figs 3–4): epandrium with eight strong black setae; upper blade of bifurcated tip of
surstylus swollen and apical margin rounded, lower blade thin and longer than upper
one; cercus arched with short sparse setae.

Female. Unknown.

Material examined. Holotype, ♀, China, Guangxi, Fangchenggang, Shangsi
County (21°53’47.61”N, 107°49’20.32”E; 450 m), 18. V. 2012, Guo-Quan Wang
(CAU). Paratypes, 2 ♂♂, same data as holotype.

Distribution. China (Guangxi).

Etymology. The specific name guangxiensis is derived from the type locality.

Remarks. This species is similar to P. nudipalpis Malloch, but can be separated
by the gena being approximately one-fourteenth of the eye height and the knob of
the halter brownish; in P. nudipalpis, the gena is approximately one-eighth of the eye
height and the knob of the halter is yellowish white (Malloch 1914b).

Phyllomyza luteigenis sp. n.
http://zoobank.org/A5CA19E7-9E6F-4EB3-8CB2-E8E0D57B559F
Figs 5–8

Diagnosis. Gena approximately one-quarter of eye height. Surstylus with upper blade
of bifurcated tip extremely swollen, lower blade short and thinner than upper blade.

Description. Male. Body length 1.7–1.9 mm; wing length 1.6–1.8 mm.

Head (Fig. 5) darkish yellow with greyish microtomentum; orbital plate satiny yel-
low, with microtomentum; ocellar triangle brownish without microtomentum; lunule
very depressed luniform, brownish with black margin. Posterior eye margin ventrally
diverging from head margin; eye 1.1 times as high as long, gena approximately one-
fourth of eye height. Setae and setulae on head black; ocellar triangle with two ocellar
setae and three short setae; frons with three orbital and two frontal setae, orbital setae
lateroclinate and frontal setae medioclinate; four interfrontal setae; postocellar setae
cruciate. Lunule with two short setae. Vibrissal angle blunt, the tip almost a 90°angle;
vibrissa strong, located at the level of lower margin of eye. Antenna blackish yellow;
pedicel with black setulae at middle and margin, setulae at margin longer than others,
longest one approximately 3 times longer than others; first flagellomere with pubes-
cence, irregularly quadrate and margin blunt; arista 2.5 times as long as first flagel-
lomere. Proboscis short and folded, brownish, with short sparse black setulae. Palpus
slightly flat, 0.4 mm, apex blunt in lateral view, 3 times longer than wide; darkish
yellow with short dense brownish pubescence, margin without short sparse setulae.

Thorax yellow with grey microtomentum, except scutum shiny darkish yellow with
sparse brownish microtomentum; scutellum brownish yellow with gray microtomen-
tum. Setae and setulae on thorax black; one h, two dc, one prsc, two npl, one prs, one
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Figures 5–8. *Phyllomyza luteigenis* sp. n. (male). 5 Head, lateral view 6 wing 7 epandrium, cerci, and surstyli, posterior view 8 epandrium, cerci, and surstyli, lateral view. Scale bars: 0.1 mm.

pos, one sa, one ia, two pa, one kepsts (a row of setulae at forward position); scutellum 1.3 times wider than long, with pair of asc and bsc, asc two times longer than bsc. Legs slender, coxae and femora brownish, tibiae brownish except fore tibia darkish yellow, tarsi yellowish. Setae and setulae on legs black. Mid tibia with a single black preapical dorsal seta. Wing (Fig. 6) hyaline, unspotted; veins brown; Sc strong; M₁ between r-m and dm-cu a little longer than dm-cu. Calypters yellowish, with yellowish microtrichae, margin with brownish setae. Knob of halter white, stalk yellowish.

Abdomen brownish with gray microtomentum. Setae and setulae on abdomen black; TIII-TV with setae at posterior 3/4, marginal setae longer than others; sternites with sparse setulae. Posteromedial triangular projection of TI into TII present; SII irregularly luniform, apical margin blunt, SIII irregularly oblong, SIV very broadly panduriform, basal margin a little wider than apical margin, SV very shallowly falciform. Male genitalia (Figs 7–8): epandrium with nine strong black setae; surstylus with upper blade of bifurcated tip extremely swollen, lower one short and slightly thin; cercus arched with short sparse setae.

**Female.** Unknown.
Material examined. Holotype, ♂, China, Gansu, Tianshui City, Maiji Mountain (34°23'30.31"N, 106°06'35.61"E; 150 m), 15. VII. 2012, Li-Hua Wang (CAU). Paratypes, 3 ♂♂, China, Gansu, Tianshui City, Maiji Mountain (34°23’30.31"N, 106°06’35.61"E; 150 m), 15. VII. 2012, Ze-Hui Kang (CAU).

Distribution. China (Gansu).

Etymology. The specific name refers to the yellow gena.

Remarks. This new species is distinctly different from other species of the genus: the gena is approximately one-fourth of the eye height, eye 1.1 times as high as long, and SV is generally very shallowly falciform.

Phyllomyza quadratpalpus sp. n.
http://zoobank.org/75DB8CAA-1489-4E94-875A-6B8349603DA7
Figs 9–12

Diagnosis. Gena narrowed, approximately one-twelfth of eye height. Surstylus with upper blade of bifurcated tip extremely swollen, lower one slightly swollen and shorter than upper one.

Description. Male. Body length 1.6–1.8 mm; wing length 1.6–1.8 mm.

Head (Fig. 9) black with grayish microtomentum; orbital plate satiny black, with microtomentum, ocellar triangle brownish without microtomentum; lunule transverse luniform, darkish brown with black margin. Posterior eye margin ventrally diverging from head margin; eye 1.4 times as high as long, gena approximately one-twelfth of eye height. Setae and setulae on head black; ocellar triangle with two ocellar setae and three short setae; frons with three orbital and two frontal setae on brownish orbital stripe, orbital setae lateroclinate and frontal setae medioclinate, four interfrontal setae; postocellar setae converging. Lunule with two short setae. Vibrissal angle flat, the tip almost a 90° angle; vibrissa strong, located at level of lower margin of eye. Antenna brownish brown; pedicel with black setulae at middle and margin, setulae at margin longer than others, longest one 4.5 times longer than others; first flagellomere with pubescence, shallowly oblong and margin blunt; arista 2.5 times as long as first flagellomere, black, distinctly pubescent. Proboscis thick and geniculate, 0.4 mm, brownish, with short sparse black setulae. Palpus flat, irregularly quadrate in lateral view, 2.5 times longer than wide; darkish brown with short dense black pubescence, margin with short sparse setulae.

Thorax darkish brown with grey microtomentum, except scutum shiny blackish brown with sparse black microtomentum; scutellum dark brown with grey microtomentum. Setae and setulae on thorax black; one h, two dc, one prsc, two npl, one prs, one pos, one sa, one ia, one pa, one kepsts (a row of setulae at forward position); scutellum 1.3 times wider than long, with pair of asc and bsc, asc three times longer than bsc. Legs slender, coxae and femora dark brown, tibiae brownish yellow except hind tibia darkish brown, tarsi yelllowish. Setae and setulae on legs black. Mid tibia with a black preapical dorsal seta. Wing (Fig. 10) hyaline, unspotted; veins brown;
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Figures 9–12. *Phyllomyza quadratopalpus* sp. n. (male). 9 Head, lateral view 10 wing 11 epandrium, cerci, and surstyli, posterior view 12 epandrium, cerci, and surstyli, lateral view. Scale bars: 0.1 mm.

Sc strong; M₁ between r-m and dm-cu a little longer than dm-cu. Calypter yellowish, with brownish microtrichae, margin with brownish setulae. Knob of halter yellowish white, stalk yellowish white.

Abdomen brown with grey microtomentum. Setae and setulae on abdomen black; TII-TV with setae at posterior 3/4, marginal setae longer than others; sternites with sparse setulae. Posteromedial triangular projection of TI into TII present; SII generally luniform, SIII oblong, apical margin blunt and round, SIV very broadly obpanduriform, SV shallowly oblong. Male genitalia (Figs 11–12): epandrium with five strong black setae; surstylus with upper blade of bifurcated tip extremely swollen, lower one slightly swollen and shorter than upper one; cercus irregularly arched with short sparse setae.

*Female.* Body length 1.8–2.0 mm; wing length 1.8–2.0 mm.

Similar to male, but palpus shorter, approximately four-fifths of males’. Female terminalia: TVIII brown, shallowly oblong, margin with setulae. Supra-anal plate broadly trullate; SVIII very shallowly luniform, subanal plate wide, brownish, very depressed trullate. Cercus with long setulae.

**Material examined.** Holotype, ♂, China, Guizhou, Libo County, Maolan National Nature Reserve (25°15’36.67”N, 108°03’21.65”E; 620m), 13. X. 2013, Ding Yang (CAU). Paratypes, 5 ♂♂, same data as holotype; 2 ♀♀, China, Guizhou, Libo County,
Figures 13–18. 13 *Phyllomyza angustigenis* Xi et Yang (male); head, lateral view 14 *Phyllomyza angustigenis* Xi et Yang (male); epandrium, cerci, and surstyli, posterior view 15 *Phyllomyza claviconis* Yang (male); head, lateral view 16 *Phyllomyza claviconis* Yang (male); epandrium, cerci, and surstyli, posterior view 17 *Phyllomyza cuspigera* Xi et Yang (male); head, lateral view 18 *Phyllomyza cuspigera* Xi et Yang (male); epandrium, cerci, and surstyli, posterior view. Scale bars: 0.1 mm.
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Figures 19–24. 19 Phyllomyza dicrana Xi et Yang (male); head, lateral view 20 Phyllomyza dicrana Xi et Yang (male); epandrium, cerci, and surstyli, posterior view 21 Phyllomyza dilatata Malloch (male); epandrium, cerci, and surstyli, posterior view 22 Phyllomyza epitacta Hendel (male); epandrium, cerci, and surstyli, posterior view 23 Phyllomyza euthypalpis Xi et Yang (male); head, lateral view 24 Phyllomyza euthypalpis Xi et Yang (male); epandrium, cerci, and surstyli, posterior view. Scale bars: 0.1 mm.
Figures 25–30. 25 Phyllomyza nudipalpis Malloch (male); head, lateral view 26 Phyllomyza nudipalpis Malloch (male); epandrium, cerci, and surstyli, posterior view 27 Phyllomyza planipalpis Xi et Yang (male); head, lateral view 28 Phyllomyza planipalpis Xi et Yang (male); epandrium, cerci, and surstyli, posterior view 29 Phyllomyza tibetensis Xi et Yang (male); head, lateral view 30 Phyllomyza tibetensis Xi et Yang (male); epandrium, cerci, and surstyli, posterior view. Scale bars: 0.1 mm.
Maolan National Nature Reserve (25°12'32.50"N, 108°21'20.08"E; 830m), 18. VIII. 2017, Xiaohui Hou (HAU).

**Distribution.** China (Guizhou).

**Etymology.** The specific name refers to the shaped of palpus.

**Remarks.** This new species is somewhat similar to *P. planipalpis* Xi & Yang, but differs in the palpus irregularly quadrate in lateral view, surstylus with upper blade of bifurcated tip extremely swollen and apical margin smooth; in *P. planipalpis*, the palpus depressed semiluniform in lateral view, surstylus with upper blade of bifurcated tip swollen and apical margin blunt (Xi and Yang 2015a).

**Discussion**

*Phyllomyza guangxiensis* sp. n. and *P. quadratpalpus* sp. n. are separately distributed in Guangxi and Guizhou Provience, this is the first reported species of *Phyllomyza* species in the two places. The palpus of *P. guangxiensis* sp. n. is wide and the basally curved, the shaped of the palpus is different with other species and cercus almost as wide as epandrium in lateral view. *P. quadratpalpus* sp. n. has a distinctive palpus, as the shaped of pal-
pus is very shallowly rhombiod in lateral view. In Milichiidae, as far as we know, there is no similar species to *P. luteigenis* sp. n., when you consider the body colour, and palpus and eye shapes. There are 49 species of *Phyllomyza* distributed in the world, until now, 23 species are known to occur in China. Only three species are distributed in the Palaearctic Region, *P. clavicornis*, *P. latustigenis*, and *P. luteigenis* sp. n., which have one similar character, which is the wide gena: *P. luteigenis* sp. n. is wider than others, and the species of Oriental Region do not have this obvious character. Twenty species are distributed in the Oriental Region, of which nine are distributed in Yunnan Province (*P. angustigenis*, *P. aureolusa*, *P. basilatusa*, *P. clavellata*, *P. cuspiegera*, *P. dicrana*, *P. euthypalpis*, *P. fuscusa*, *P. leioipalpus*) and four species in Taiwan Province (*P. dilatata*, *P. epitacta*, *P. luteipalpis*, *P. nudipalpis*) (Hendel 1914; Malloch 1914b; Xi and Yang 2013, 2015a; Xi et al. 2016) (Fig. 31). The Chinese fauna of Milichiidae is extraordinarily rich, with the continued discovery and description of further species providing great potential.

Acknowledgements

We are grateful to Dr. Guo-Quan Wang (Nanning), Dr. Li-Hua Wang (Beijing), and Dr. Ze-Hui Kang (Qingdao) for their kind help in collecting the specimens. Grateful thanks to Prof. Xiaohui Hou (Zunyi Medical University) for providing the females specimens of *Phyllomyza quadratpalpus* sp. n. This work was supported by the National Natural Science Foundation of China (No.31672333), the Agricultural Science and Technology Innovation Project of Henan (No. 30600309) and the Agricultural Technology System of Henan (No. S2014-11-G03).

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