

# A new species of *Anagyrus* (Hymenoptera: Encyrtidae) from China, parasitoid of *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae) on *Lycoris radiata* (L'Her.) Herb.

Guo-Hao Zu · Yuan-hong Wang · Yan-Zhou Zhang · Cheng-De Li · Xu Zhang

Received: 3 January 2018 / Accepted: 31 January 2018 / Published online: 9 February 2018  
© Springer Science+Business Media B.V., part of Springer Nature 2018

**Abstract** A new species of *Anagyrus* Howard (Hymenoptera: Encyrtidae), *A. pseudofuscus* Zu **sp. nov.**, is described from China as a parasitoid of the mealybug, *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae).

**Keywords** Chalcidoidea · Tetracneminae · Anagyrini · New species · Hainan · Yunnan

## Introduction

*Anagyrus* is a large genus of Encyrtidae, contains 282 world species and 44 species from China (Noyes 2017; Zu and Li 2015). Noyes and Hayat (1994) reviewed 74 species from Oriental, 15 species were reported from Hainan Province, China (Noyes 2017): *A. galinae* (Myartseva 1982); *A. ranchiensis* Shamim and Shafee (1984); *A. diversicornis* (Howard 1894); *A. lineatipes*

(Girault 1919); *A. comptoni* Noyes and Hayat (1994); *A. tricolor* (Girault 1913); *A. luci* Noyes and Hayat (1994); *A. hainanensis* Noyes and Hayat (1994); *A. mazaces* Noyes and Hayat (1994); *A. kamali* Moursi (1948); *A. rugas* Noyes and Hayat (1994); *A. jenniferae* Noyes and Hayat (1994); *A. sawadai* Ishii (1928); *A. dactylopii* (Howard 1898); *A. agraensis* Saraswat (1975).

In the present paper a new species, *A. pseudofuscus* Zu, **sp. nov.**, reared from *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae) on *Lycoris radiata* (L'Her.) Herb, is described, and *L. radiata* is also the new host record for *Ph. solani*.

## Material and methods

All the specimens in the present study were collected from Hainan and Yunnan Provinces by sweeping or rearing, 8 specimens were dissected and mounted in Canada balsam on slides following the method described by Noyes (1982). Morphological terminology and abbreviations follow those of Noyes and Hayat (1994) and Noyes (2000) with some modifications. Photographs were taken with a digital CCD camera attached to an Olympus BX51 compound microscope, except Fig. 1, which was taken by using a Leica M205A stereomicroscope.

The following abbreviation are used in the text:

F1–6      funicle segments 1–6  
AOL      minimum distance between a posterior ocellus and anterior ocellus

G.-H. Zu · Y.-h. Wang  
College of Horticulture and Landscape, Tianjin Agricultural University, Tianjin 300384, China

G.-H. Zu  
e-mail: zuguohao@tjau.edu.cn

Y.-Z. Zhang · X. Zhang  
Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China

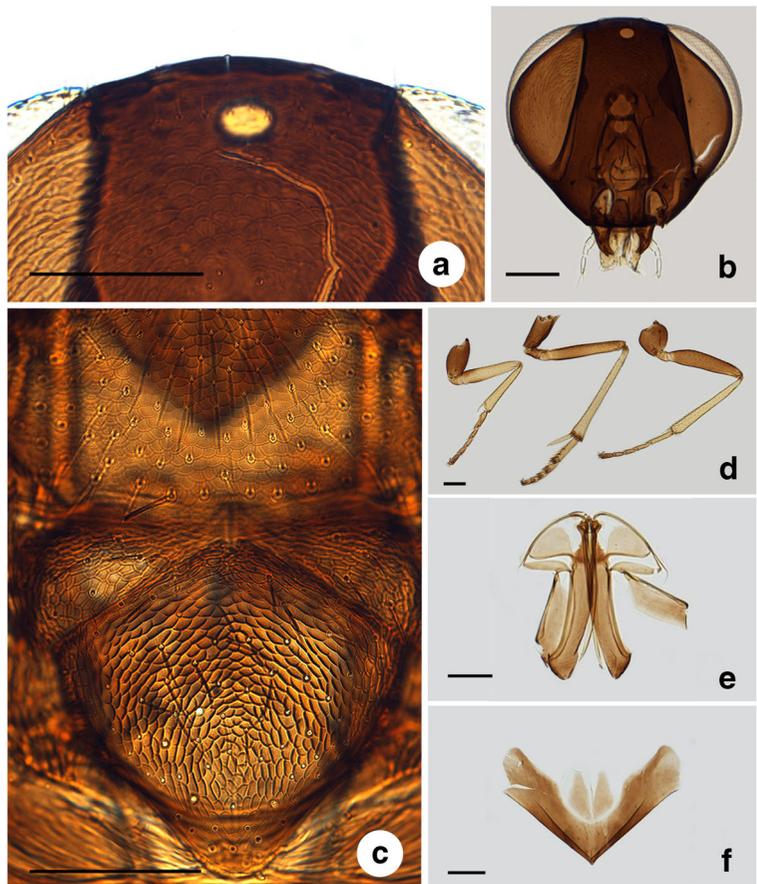
C.-D. Li (✉)  
School of Forestry, Northeast Forestry University, Harbin 150040, China  
e-mail: lichengde0608@sina.com



**Fig. 1** *A. pseudofuscus* sp. nov., female, paratype: body in profile view

- OCL minimum distance between a posterior ocellus and occipital margin  
 OD longest diameter of an ocellus  
 OOL minimum distance between a posterior ocellus and eye margin  
 POL minimum distance between posterior ocelli  
 LTL last tergite length

**Fig. 2** *A. pseudofuscus* sp. nov., holotype female: **a**, sculpture on frontovertex; **b**, head; **c**, sculpture on mesoscutum, scutellum and axillae; **d**, legs; **e**, ovipositor; **f**, hypopygium. Scale bars = 100  $\mu$ m



- LTW last tergite width  
 OL length of ovipositor  
 IZCAS Institute of Zoology, Chinese Academy of Sciences, Beijing, China

***Anagyrus pseudofuscus* Zu, sp. nov.**

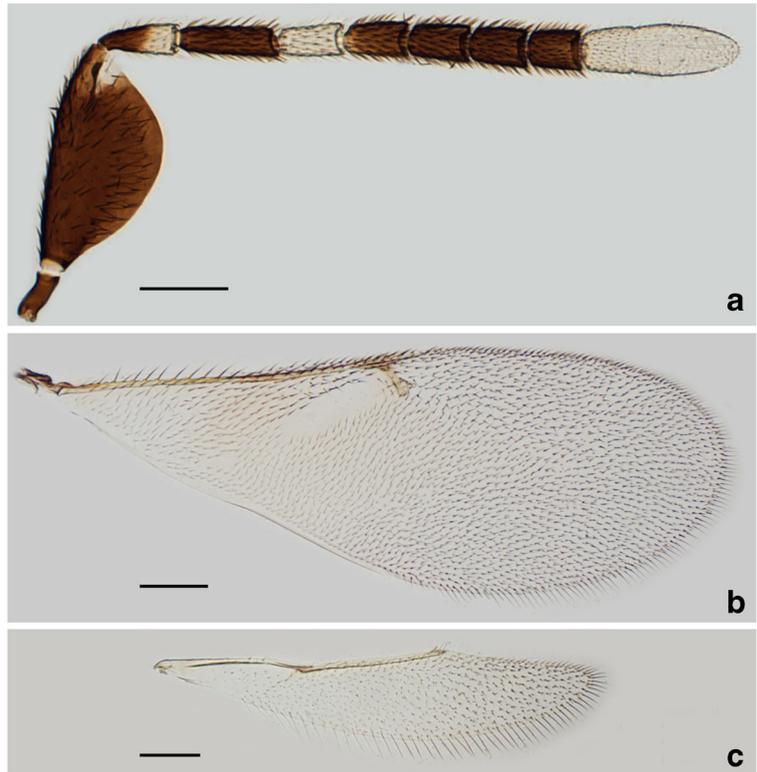
(Figs. 1, 2 and 3)

Holotype. ♀ [on slide], China, Hainan Province, Mt. Jianfengling (18°44'57"N, 108°51'50"E, 785 m), 30. V. 2016, Guo-Hao Zu, sweeping.

Paratypes. 1♀, the same data as holotype. 6♀ [6♀], China, Hainan Province, Sansha City, 12. XI. 2015, Qing-Tao Wu (IZCAS), rearing from *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae). 1♀ [1♀], China, Yunnan Province, Jinghong City, 25. IV. 2014, Xiu-Wei Liu, Qing-Tao Wu (IZCAS), rearing from *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae).

**Diagnosis Female.** Length, 1.47–1.51 mm. Body stout (Fig. 1), not elongate and not dorsoventrally flattened; head, mesosoma and metasoma blackish with a slight

**Fig. 3** *A. pseudofuscus* sp. nov., holotype female: **a**, antenna; **b**, fore wing; **c**, hind wing. Scale bars = 100  $\mu$ m



shreen; scape mainly blackish, but with a small subapical white spot; pedicel and flagellum dark brown with apical third of pedicel, F2 and clava white; all coxae blackish; fore femur yellow, marked with brown basally, mid and hind femora almost completely brown, legs otherwise yellow; wings completely hyaline; frontovortex  $0.35\times$  head width; clypeal margin more or less straight; antennal scape strongly broadened, about twice as long as broad; F1 distinctly longer than other funicle segments; fore wing completely hyaline,  $2.75\times$  as long as broad; costal cell very narrow; ovipositor about  $0.8\times$  as long as mid tibia.

**Description Female.** Holotype. Length, 1.47 mm. Body stout, generally dark brown. Scape dark brown, with a small white subapical spot; pedicel with apical third white; F2 and clava white. Wings hyaline. Legs generally yellow, except all coxae blackish, fore femur marked with brown basally, mid and hind femora almost completely brown.

**Head.** Frontovortex  $0.35\times$  head width, with shallow coriaceous sculpture (Fig. 2a); ocelli forming an angle of about  $80^\circ$ ; posterior ocellus slightly closer to eye margin than to occipital margin; eye reaching occipital margin, with inconspicuous setae; head, in frontal view

(Fig. 2b), slightly ( $1.10\times$ ) wider than high; antennal torulus with its dorsal margin slightly below lower margin of eyes; clypeal margin more or less straight. Antennal scape (Fig. 3a) strongly broadened and flattened,  $2.05\times$  as long as broad; pedicel  $2.61\times$  as long as broad,  $0.82\times$  as long as F1; all funicle segments longer than wide, F1 distinctly longer than others; clava  $2.98\times$  as long as broad, shorter than preceding three funicle segments combined; funicle with linear sensillae on all funicular segments. Measurements ( $\mu$ m): head length in facial view, 400; head width, 440; frontovortex width, 155; OD, 26; POL, 62; OOL, 26; OCL, 28; AOL, 38; eye length, 302; malar space, 100; length and (width)—radicle, 62 (24); scape, 266 (130); pedicel, 94 (36); F1, 115 (34); F2, 72 (36); F3, 72 (41); F4, 70 (43); F5, 65 (43); F6, 60 (46); clava, 185 (62).

**Mesosoma.** Mesoscutum with fine, scale-like sculpture; the sculpture on scutellum and axillae deeper than mesoscutum (Fig. 2c); scutellum  $1.02\times$  as wide as long, and almost as long as mesoscutum. Fore wing (Fig. 3b) about  $2.75\times$  as long as width; linea calva interrupted by 5 rows of setae and closed posteriorly by 3 rows of setae; costal cell very narrow, about as wide as submarginal vein; stigmal vein shorter than marginal vein; hind wing (Fig.

3c) 5.14× as long as broad. Length of mid tibial spur (Fig. 2d) 0.26× of mid tibia and shorter than corresponding basitarsus. Measurements (μm): fore wing length, 990; fore wing width, 360; submarginal vein, 420; marginal vein, 63; postmarginal vein, 74; stigmal vein, 50; hind wing length, 720; hind wing width, 140; mid tibia, 480; mid tibial spur, 125; mid basitarsus, 154.

Metasoma 1.43× as long as mesosoma; ovipositor (Fig. 2e) 0.80× as long as mid tibia, slightly exerted; hypopygium as in Fig. 2f. Measurements (μm): OL, 385; LTL, 490; LTW, 310. [mid tibia, 480].

**Variation** Length of female, excluding ovipositor, varies from 1.47–1.51 mm, otherwise very little in material available.

**Host** *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae).

**Etymology** Latin: pseudo- = false; refers to the fact that this species is easily confused with *Anagyrus fuscus* Shi et al. (1994).

**Comments** This species is very similar to *Anagyrus californicus* (Compere 1947), *Anagyrus fuscus* Shi et al. (1994) and *A. trinidadensis* (Kerrich 1953). However, it can be separated from them as follows: scape with a small white subapical spot (with a subapical white band in *californicus* and *trinidadensis*, cf. Noyes (2000), fig. 114–115, 119; basal one tenth and apical three tenth pale yellow in *fuscus*), scape 2.05× as long as broad (2.8× in *californicus*; usually less than 1.7×, rarely nearly 2× in *trinidadensis*; about 1.5× in *fuscus*), funicle only with F2 white (F2–F3 in *californicus*; F2 and often F3 in *trinidadensis*; apical half of F1 and F2 in *fuscus*), marginal vein 0.85× as long as postmarginal vein (about 2× in *californicus*; about 1.5× in *fuscus*).

Furthermore, it differs from *A. californicus* by its completely white clava (apical two segments yellow in *californicus*); from *A. trinidadensis* by the relatively wider frontovertex (0.33× in smaller specimens to 0.25× in larger ones in *trinidadensis*), fore coxa blackish (whitish in *trinidadensis*), marginal vein 1.26× as long as stigmal vein (about 1.5× in *trinidadensis*); from *A. fuscus* by ocelli forming an angle of about 80° (obtuse in *fuscus*), legs with all coxae blackish, fore femur marked with brown basally, mid and hind femora almost completely brown (only hind coxa dark brown in *fuscus*).

**Acknowledgements** This project was supported by the Scientific Project of Tianjin Municipal Education Commission (No. 2017KJ185), the National Natural Science Foundation of China (Grant No. 31470652), the Foundation of Tianjin Academic Innovation Team and Tianjin 131 Biocide creation team.

#### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

#### References

- Compere, H. (1947). A report on a collection of Encyrtidae with descriptions of new genera and species. *University of California Publications in Entomology*, 8, 18.
- Girault, A. A. (1913). Some chalcidoid Hymenoptera from north Queensland. *Archiv für Naturgeschichte (A)*, 79, 83–84.
- Girault, A. A. (1919). Javanese chalcid flies. *Treubia*, 1, 57.
- Howard, L. O. (1898). On some new parasitic insects of the subfamily Encyrtinae. *Proceedings of the United States National Museum*, 21, 242.
- Ishii, T. (1928). The Encyrtinae of Japan. I. *Bulletin of the Imperial Agricultural Experiment Station of Japan*, 3, 88.
- Kerrich, G. J. (1953). Report on Encyrtidae associated with mealybugs on cacao in Trinidad, and on some other species related thereto. *Bulletin of Entomological Research*, 44, 792.
- Moursi, A. A. (1948). Contributions to the knowledge of the natural enemies of mealybugs. 1. Description of two new species of *Anagyrus* (Hymenoptera: Encyrtidae). *Bulletin de la Société Fouad Ier d'Entomologie, Le Caire*, 32, 1.
- Myartseva, S. N. (1982). New species of the parasitic Hymenoptera, Encyrtidae from the Amu Darya Tugai. *Izvestiya Akademii Nauk Turkmenskoy SSR (Seriya Biologicheskikh Nauk)*, 1982, 44–47.
- Noyes, J. S. (1982). Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). *Journal of Natural History*, 16, 315–334.
- Noyes, J. S. (2000). Encyrtidae of Costa Rica (Hymenoptera: Chalcidoidea), 1. *Memoirs of the American Entomological Institute*, 62, 1–355.
- Noyes, J.S. (2017). Universal Chalcidoidea Database. World Wide Web electronic publication. <http://www.nhm.ac.uk/chalcidoidea>. Accessed Sept 2017.
- Noyes, J. S., & Hayat, M. (1994). *Oriental mealybug parasitoids of the Anagyrini (Hymenoptera: Encyrtidae)*. Wallingford: CAB International.
- Saraswat, G. G. (1975). Records of some known and descriptions of new species of chalcids (Hymenoptera) from India. *Memoirs of the School of Entomology, St. John's College, Agra No*, 4, 41–44.

- Shamim, S. M., & Shafee, S. A. (1984). Four new species of Encyrtidae (Hymenoptera) from Bihar, India. *Indian Journal of Systematic Entomology*, 1, 25.
- Shi, Z. Y., Si, S. G., & Wang, H. Z. (1994). Two new species of the genus *Anagyrus* Howard, 1896 (Hymenoptera: Encyrtidae) from China. *The Fauna and Taxonomy of Insects in Henan*, 1(46–47), 48.
- Zu, G. H., & Li, C. D. (2015). Description of three new species and new distributional data for four species of *Anagyrus* (Hymenoptera: Encyrtidae) from China. *Zootaxa*, 4028, 257–273.