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Description of a new species and record of *Bactrocera* **Macquart** (Diptera, Tephritidae) from China

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Abstract

One new species, *Bactrocera (Zeugodacus) anala* Chen et Zhou, sp.nov, and one newly recorded species, *B. (Z.) armillata* (Hering, 1938), from China are described and illustrated. The male of *B. (Z.) armillata* (Hering) was discovered for the first time and as a result the species is moved from subgenus *Bactrocera* to subgenus *Zeugodacus*. In addition, the morphological differences and comparing illustrations of *B. (Z.) adusta* (Wang et Zhao) and *B. (Z.) biguttata* (Bezzi), are provided.

Key words: Tephritidae, Bactrocera, new species, new record, China

Bactrocera Macquart is the largest genus in the family Tephritidae with more than 500 described species arranged in 28 subgenera (Hardy, 1973; Drew, 1989; Liang *et al.*, 1993; Wang, 1996; White and Hancock, 1997, 2004; White and Evenhuis, 1999; Drew and Hancock, 2000; Drew, 2004; Chen *et al.*, 2011, 2012). It is also one of the most economically important groups within the family. Here, we described and illustrated one new species, *Bactrocera* (*Zeugodacus*) anala Chen et Zhou, sp.nov, and one newly recorded species, *B.* (*Z.*) armillata (Hering, 1938), from China. The male of *B.* (*Z.*) armillata (Hering) was discovered for the first time, and the slight concavity of sternite V indicates that it should be placed in subgenus *Zeugodacus* rather than subgenus *Bactrocera*. In addition, *B.* (*Z.*) adusta (Wang et Zhao) is a closely related species to the new species, however, it had been questioned as the synonym of *B.* (*Z.*) biguttata (Bezzi) (White & Hancock, 1997). In order to clarify this doubtful point, the morphological differences and comparing illustrations of *B.* (*Z.*) adusta (Wang et Zhao) and *B.* (*Z.*) biguttata (Bezzi) are provided.

B. (*Z.*) anala, *B.* (*Z.*) armillata, *B.*(*Z.*) adusta, *B.* (*Z.*) biguttata, together with *B.*(*Z.*) assamensis White, 1999 and *B.* (*Z.*)gansuica Chen, Han et Zhou, 2012, share the following morphological characters: scutum mostly black with two narrow lateral postsutural yellow vittae and one narrow median postsutural yellow vitta (only occasionally invisible), scutellum with two lateral yellow marks and a black medial mark extending from base to apex or largely black with two small lateral yellow spots, wing with very narrow costal band and a distinct apical spot, legs usually with extensive black markings. These species appear to be closely related, but the relationships between them need further study before any definite conclusions are deduced.

Morphological terminology generally follows White *et al.* (1999) and McAlpine (1981). Lengths of body and wing were measured in millimeters. The following acronyms are used for specimen depositories: **BMNH** (The Natural History Museum, Cromwell Road, London SW7 5BD, England, UK), **IZCAS** (Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, P. R. China), **NRS** (Naturhistoriska Riksmuseet, Sektionen fur entomologi, Stockholm S-10405, Sweden), **YNCIQ** (Yunnan Entry-Exit Inspections and Quarantine Bureau, Yunnan Kunming 650228, P. R. China), **ZSI** (Zoological Survey of India, National Zoological Collection, India).

Bactrocera Macquart, 1835

Bactrocera Macquart, 1835: 452. Type-species: B. longicornis Macquart, 1835, by monotypy.

Dasyneura Saunders, 1842: 60. Type-species: D. zonata Saunders, 1942, by monotypy.

Strumeta Walker, 1856: 33. Type-species: S. conformis Walker, 1856 [= Dacus umbrosus Fabricius, 1805], by monotypy.

Chaetodacus Bezzi, 1913: 93. Type-species: *Musca ferruginea* Fabricius, 1794 [= *Dacus dorsalis* Hendel, 1912], by original designation.

Marquesadacus Malloch, 1932: 145 (as subgenus of Dacus). Type-species: Chaetodacus perfuscus Aubertin, 1929, by monotypy.

Apodacus Perkins, 1939: 26. Type-species: A. cheesmani Perkins, 1939 [= A. cheesmnae Perkins, 1939], by original designation.

Aglaodacus Munro, 1984: 25, Type-species: A. nesiotes Munro, 1984, by original designation.

Mauritidacus Munro, 1984: 25. Type-species: M. montyanus Munro, 1984, by original designation.

This genus is closely related to *Dacus* Fabricius, but chiefly differs from the latter by the abdominal tergites not being fused. More than 500 species are known from the Oriental, Pacific, Australian and Afrotropical Regions, with *B. oleae* (Rossi, 1790) also occurring in southern Europe. A few of adventives species are found in Hawaii and South America.

Bactrocera (Zeugodacus) anala Chen et Zhou, sp.nov

(Figs 1–7)

Description. Male (Figs 3–4). Body length 6.1mm; Wing length 6.4mm.

Head. Frons (Fig.1) yellow to fulvous, with indistinct middle blackish mark and black spots at bases of setae; frons about 1.8 times as long as wide, narrower than eye in dorsal view. Lunule dark brown. Ocellar triangle and vertex black. Face (Figs 1, 5) yellow to fulvous with two blackish round spots in antennae grooves, the distance between the two spots distinctly shorter than their diameter. Parafacial and gena yellow to fulvous, gena with vague black area under lower margin of eye. Occiput dark brown to black, yellowish along eye margin; occipital row of setae present. Antenna with scape and pedicel fulvous, flagellomere 1 fulvous with apex and anterior part slightly darker and about 4.0 times as long as pedicel; arista bare, black with yellowish base. Head setae black: 3 frontals, 1 orbital, 1 medial vertical, 1 genal.

Thorax. Scutum (Fig.6) black with two narrow lateral postsutural yellow vitta extends well before the level of intra-alar setae, and one long narrow median postsutural yellow vitta that extend well before prescutellar acrostichal setae and is about as long as lateral postsutural vittae. Postpronotal lobes entirely yellow. Pleura predominantly black with following yellow areas: notopleural callus, anepisternal stripe, anatergite, katatergite. Scutellum with two lateral yellow marks, narrow black basal band and a black medial mark extending from base to apex. Mediotergite entirely black. Scutellum with basal as well as apical setae. Other thoracic chaetotaxy: 2 notopleural, 1 postsutural supra-alar, 1 postalar, 1 intra-alar, 1 anepisternal, 2 scapular, 1 prescutellar acrostichal setae present. Wing (Fig. 2) hyaline in ground color; costal dark brown band confluent with vein R_{2+3} , having an isolated apical dark brown spot; anal streak dark brown and broad, extending to posterior margin; cells bc and c colourless. Legs yellow to fuscous; fore femur with apical 3/4 black; mid with apical 1/2 black and hind femora with apical 1/3 black; fore and hind tibiae dark brown to black, mid tibiae fuscous with apical 1/3 darker; tarsi yellow to fuscous (apical 4 segments darker); mid tibia with black apicoventral spur.

Abdomen (Fig. 7). Oval in outline, generally black. Tergite 1 black, with a very narrow vague yellow to fulvous band on posterior margin; tergite 2 black, with a broad, middle concave yellow to fulvous band on posterior margin; tergites 3 and 4 black; tergite 3 with pecten on each side of posterior margin; tergite 5 black, with a very narrow vague yellow to fulvous band on posterior margin and a pair of oval dark shining spots at middle area.

Female. Unknown.

Etymology. The specific epithet refers to the wing anal streak.

Type Data. Holotype ♂ (IZCAS), China: Yunnan: Xishuangbanna, Mengsong, Benggangxinzhai 1750m, N22°09'34" E100°33'47", 11 July 2011, Zhao Zhe.

Distribution. China: Yunnan (Xishuangbanna).

Host. Unknown.

Remarks. This species is somewhat similar to *B*. (*Z*.) adusta (Wang et Zhao) from Sichuan. These two species may be characterized by scutum entirely black except for 3 postsutural yellow vittae, and scutellum with two lateral yellow marks and a black medial mark extending from base to apex. This new species, however, can be easily differentiated by the following characters: 1) scutellum with 2 pairs scutellar setae, 2) wing with anal streak dark brown and broad, and 3) the distance between the two facial spots much shorter, being about 0.5 times their diameter. This species is also similar to *B*. (*Z*.) biguttata (Bezzi), but can be differentiated from the latter by the following characters: 1) scutellum with 2 pairs scutellar setae, 2) wing with anal streak dark brown and broad, and 3) is pair scutellar setae, 2) wing with anal streak dark brown and broad, and 3) wing with a slightly smaller and isolated apical spot.



FIGURES 1–7. *Bactrocera (Zeugodacus) anala* Chen et Zhou, **sp.nov.** 1. Head, front view; 2. Wing; 3.Body, lateral view; 4. Body, dorsal view; 5. Head, lateral view; 6. Scutum, dorsal view; 7.Abdomen, dorsal view

Bactrocera (Zeugodacus) armillata (Hering, 1938) New Record in China

(Figs 8–16)

Description. Male (Fig. 10). Body length 5.0mm; Wing length 5.3mm.

Head. Frons (Fig. 8) yellow to fulvous, with black spots at bases of setae; frons about 1.4 times as long as wide and about as wide as eye in dorsal view. Ocellar triangle black, lunule fulvous and vertex yellow to fulvous; Face yellow to fulvous with two large black spots on sides, the distance between them about 1.0–1.5 times their diameter. Parafacial and gena yellow to fulvous, occiput dark brown to black, yellowish along eye margin; occipital row of setae present. Antenna with segments 1 and 2 yellow to fulvous, segment 3 fuscous with apex and anterior part slightly dark brown and about 3.2 times as long as segment 2; arista bare, black with yellowish base. Head setae black: 3 frontals, 1 orbital, 1 medial vertical, 1 lateral vertical, 1 genal.

Thorax. Scutum (Fig. 12) black with two narrow lateral postsutural yellow vittae extending to or before the level of intra-alar setae, and one short narrow median postsutural yellow vitta (invisible in 2 specimens). Postpronotal lobes entirely yellow. Pleura predominantly black with following yellow areas: anepisternal stripe, anatergite, katatergite. Scutellum largely black, with two very small lateral yellow marks. Mediotergite entirely black. Scutellum with apical setae only. Other thoracic chaetotaxy: 2 notopleural, 1 postsutural supra-alar, 1 postalar, 1 intra-alar, 1 anepisternal, 2 scapular, 1 prescutellar acrostichal setae present. Wing (Fig. 9) hyaline in ground color; with rather narrow costal band and an isolated brown spot at lower apex of cell r_{2+3} and upper apex of cell r_{4+5} ; anal streak extending to posterior margin; cells bc and c colourless. Legs yellow to black; fore femora (Fig. 11) with about basal 1/4 yellow and remainder black, mid femora with basal 1/2 yellow and remainder black, hind femora with basal 1/2 yellow and remainder black; fore tibiae fuscous, mid tibiae with basal 1/2 fuscous and remainder yellow, hind tibiae black; tarsi yellow to fuscous (apical 4 segments darker); mid tibiae each with an apical black spur.

Abdomen (Fig. 13). Oval in shape, completely black except for a narrow, fulvous band on posterior margin of tergite 1, tergite 2 and tergite 5 (sometimes obscure); pecten present on tergite 3. Tergite 5 slightly longer than tergite 4. Sternite 5 with a slight concavity (Fig. 16).

Male terminalia: Epandrium large and broad, rounded in posterior view (Fig. 14); posterior surstylus lobe much longer, lateral surstylus with apex angulated in lateral view (Fig. 15); medial surstylus with 2 black and similar-sized prensisetae. Glans slightly elongate, with slender and membranous subapical lobe.

Female. Only known from the type series originally described by Hering in 1938.

Material examined. Holotype \bigcirc (NRS), Burma: Kachin: Kambaiti, N25°24' E98 ° 9', 9 VI 1934; Paratype \bigcirc (BMNH), (E)#5327647, Burma: Kachin: Kambaiti, 2000m, 9/6.1934 Malaise; 6 \bigcirc (IZCAS), China: Yunnan: Nujiang , Pianma 1695m, N26°11'00", E 98°58'00", 28 July 2010, Wang Shaojun and Zhao Kanglin, attracted to Cue lure.

Distribution. Burma, China (Yunnan).

Attractant. Cue lure.

Host. Unknown..

Remarks. This species distinctly differs from all other related species by the following combination of characters:1) scutellum largely black, only with two small lateral yellow spots, 2) scutum usually with one very short and narrow median postsutural yellow vitta (occasionally invisible), 3) the distance between the two facial spots being about 1.0–1.5 times their diameter.

The male of *B. armillata* (Hering) is recorded here for the first time, and it shows the typical subgenus *Zeugodacus* character of abdominal sternum 5 having a slight concavity, thus the species is transferred from subgenus *Bactrocera* to subgenus *Zeugodacus*.

We examined images of the holotype of *B*. (*Z*.) *armillata* (Hering, 1938) with the help of Dr Yngve Brodin (Naturhistoriska Riksmuseet, Sektionen fur entomologi, Sweden). We also examined images of the paratype of *B*. (*Z*.) *armillata* (Hering, 1938) with the help of Dr Ian White and Mrs Kim Goodger (Department of Entomology, Natural History Museum, Cromwell Road, London, England).



FIGURES 8–16. *Bactrocera (Zeugodacus) armillata* (Hering, 1938). 8. Head, front view; 9. Wing; 10.Body, lateral view; 11. Fore leg; 12. Scutum, dorsal view; 13.Abdomen, dorsal view; 14. Epandrium, circus and surstylus in posterior view; 15. Epandrium, circus and surstylus in lateral view; 16. Sternite 5.

Bactrocera (Zeugodacus) adusta (Wang et Zhao, 1989)

(Figs 17, 19)

Dacus (Zeugodacus) adustus Wang & Zhao, 1989a: 212. Type-locality: Mt. Emei, Sichuan, China. Holotype male in IZCAS. *Bactrocera (Zeugodacus) adusta*: Liang *et al.*, 1993: 139; Wang, 1996; Norrbom *et al.*,2004.

Material examined. Holotype 3 (IZCAS), China: Sichuan: Mt. Emei, 30. IV. 1957, K. R. Huang. 2 3 (YNCIQ), China: Yunnan, Nujiang , Pianma 1695m, E98°58'00", N26 °11'00", May 2012, Wang Shaojun and Zhao Kanglin, attracted to Cue lure

Distribution. China (Sichuan, Yunnan).

Remark. This species is similar to *B*. (*Z*.) *biguttata* (Bezzi), but can be differentiated from the latter by the following characters: 1) scutum with median postsutural yellow vitta distinctly present and situated near the suture, as shown in fig 17 (*biguttata* has the median postsutural yellow vitta absent or situated far from the suture where it might be covered by the pin and is invisible, as shown in fig 18), 2) wing with a slightly smaller and isolated apical spot, as shown in fig 19 (*biguttata* has the wing with a larger apical spot connected continuously with the narrow costal band, as shown in fig 20). We examined images of the type of *B*. (*Z*.) *biguttata* (Bezzi) kept in ZSI with the help of Dr. Dhriti Banerjee (Zoological Survey of India, National Zoological Collection, India), and figs 18 and 20 were taken by her. The type label data of *B*. (*Z*.) *biguttata* (Bezzi) are: India: W. Bengal: Darjeeling, 7000 ft., 25. V.1910.





FIGURES 17–20. Bactrocera spp 17. Bactrocera (Zeugodacus) adusta (Wang et Zhao, 1989), Scutum, dorsal view; 18. Bactrocera (Zeugodacus) biguttata (Bezzi), Scutum, dorsal view, 19. Bactrocera (Zeugodacus) adusta (Wang et Zhao, 1989), Wing; 20. Bactrocera (Zeugodacus) biguttata (Bezzi), Wing.

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