Studies on the flies occurring from the excrement of pasturing cattle and other herbivorous animals

1. On the 3rd stage larvae of the genus *Orthellia* R.-D. of Japan (Diptera, Muscidae, Muscinae)

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Abstract: The 3rd stage larvae of 6 species belonging to the genus *Orthellia* R.-D., namely *O. caesarion* (Meigen), *O. pacifica* Zimin, *O. coerulea* (Wiedemann), *O. indica* (Robineau-Desvoidy), *O. coeruleifrons* (Macquart), and *O. lauta* (Wiedemann), are described and figured. Among the species, *O. caesarion* was described by Zimin (1948) from U. S. S. R. and *O. coerulea* was described previously by Ishijima (1967). The other species are newly described in this paper.

INTRODUCTION

Flies belonging to the genus *Orthellia* are known to occur from cow or waterbuffalo dung in Japan. As previously described by Kano and Shinonaga (1967) and Shinonaga and Kano (1971), the adults have a tinge of metallic green, blue or purple and they crowd on fresh dung. Hitherto 6 species of adults were recorded from Japan. Of these, *O. caesarion* was recently added as a new record (Shinonaga *et al.*, 1972). On the larvae of *O. caesarion*, Zimin (1948) described in detail with Russian material. *O. coerulea* is widely distributed in Oriental and a part of Palaearctic regions (Japan, China and U. S. S. R.), and the larvae were described by Ishijima (1967). The larvae of the other 4 species, *O. pacifica*, *O. indica*, *O. coeruleifrons*, and *O. lauta*, have so far been unknown. In the present paper, the authors describe the larvae of 6 the species which were obtained by rearing the adults.

METHOD OF COLLECTING LARVAE

Gravid female flies were collected by sweeping net in field and identified into species. The identified flies were cut wings, then kept in plastic beakers, 10×10 cm. As a food and ovipositing medium, some fresh cow dung and a small ball of absorbent cotton, soaked in 5% sugar solution, were placed on the bottom of the vessel, and then covered with gauze. Cotton ball and dung were renewed every second day. The oviposited eggs were transferred in other rearing vessel with fresh cow dung, then reared to mature larvae. About half of the mature larvae were killed by boiling water and preserved in 70% ethanol. Another half were reared continuously to obtain adults and reconfirm the species. Body length was measured in the extended state. Cephalopharyngeal sclerite and anterior and posterior spiracles were mounted in Canadian balsum and were photographed or illustrated.

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GENERAL CHARACTERS OF THE LARVAE OF *ORTHELLIA* IN JAPAN

Fully matured larvae of the genus are cylindrical, tapering anteriorly and with 12 segments (Figs. 1-6). First segment is head, 2nd to 4th are thorax, and 5th to 12th are abdomen. The color in prepupal stage is creamy white in *coerulea*, purplish-blue in

caesarion, *pacifica*, *indica* and *lauta*, and dark blue in *coeruleifrons*. Anterior spiracle is situated on 2nd segment and branched 5 to 8 (Figs. 26-31). Anterior margins of 6th to 12th segments have ventral papillae except *coerulea* which has spines instead of papillae (Figs. 1-6). Last segment is characteristic one having posterior spiracles, anal plate, and anal, postanal, extra-anal papillae, etc.

Figs. 1-6 Lateral view of 3rd stage larva

1. *caesarion*; 2. *pacifica*; 3. *coerulea*; 4. *indica*; 5. *lauta*; 6. *coeruleifrons*.

Figs. 7-12 Posterior view of 12th segment

7. *caesarion*; 8. *pacifica*; 9. *coerulea*; 10. *indica*; 11. *coeruleifrons*; 12. *lauta*.

Fig. 13 Ventral view of 12th segment

(Figs. 7-12). These are characteristic in each species, therefore it is able to identify species by combination of the shape and arrangement of these papillae. Cephalopharyngeal sclerite is not so much different in each species (Figs. 14-19). Mouth hooks of both

sides are symmetric, accessory sclerite is usually present except *coerulea*. Pharyngeal sclerite is not heavily pigmented, dorsal cornua is usually shorter than ventral cornua, and no windows are present on both cornuae. Ventral cornua has triangular projection on the middle part. Posterior spiracles are usually black in mature larvae, but brownish in young individuals (Figs. 20-25).

KEY TO THE SPECIES OF THIRD STAGE LARVAE OF *ORTHELLIA*

1. Second to 6th segments with spine-bands around anterior margins; anterior margins of 7th to 12th segments with ventral spines *O. coerulea* (Wiedemann)
- Second to 5th segments without papillae or spines, rarely a few papillae present on ventral surface of 5th segment; 6th to 12th segments with ventral papillae (2)
2. Extra-anal papillae absent (3)

Figs. 14-19 Lateral view of cephalopharyngeal sclerite
 14. *caesarion*; 15. *pacifica*; 16. *coerulea*; 17. *indica*; 18. *coeruleifrons*; 19. *lauta*.

Figs. 20-25 Posterior view of posterior spiracles

20. *caesarion*; 21. *pacifica*; 22. *coerulea*; 23. *indica*; 24. *coeruleifrons*; 25. *lauta*

Figs. 26-31 Lateral view of anterior spiracle

26. *caesarion*; 27. *pacifica*; 28. *coerulea*; 29. *indica*; 30. *coeruleifrons*; 31. *lauta*.

- Extra-anal papillae present.....(4)
3. Dorsal surface of 12th segment with 3 stripes.....*O. caesarion* (Meigen)
Dorsal surface of 12th segment without stripes.....*O. pacifica* Zimin
4. Anal papillae reduced; large species, body length about 15–19 mm.....
.....*O. coeruleifrons* (Macquart)
Anal papillae developed; medium species, body length about 11–14 mm.....(5)
5. A row of small papillae on posterior margin of anal plate not reaching to extra-anal papillae.....
.....*O. indica* (Robineau-Desvoidy)
A row of small papillae on posterior margin of anal plate reaching to extra-anal papillae; 2nd anal papillae present
.....*O. lauta* (Wiedemann)

DESCRIPTION OF THE LARVAE OF EACH SPECIES

Orthellia caesarion (Meigen, 1826) (Figs. 1, 7, 14, 20, 26)

Fully matured 3rd stage larvae are about 10–11 mm in length. Body with numerous small dots as figured; anterior spiracles with 6 to 8 branches; apical part of anal plate bending anteriorly; inner ventral tubercles inconspicuous; anal papillae large, protruding ventrally and with small papillae on anterolateral part; postanal papilla and subanal papillae conical, subanal papillae larger than postanal papillae; extra-anal papillae absent; numerous small papillae present on posterior part of anal plate; 12th segment with 3 stripes on the dorsal surface.

Orthellia pacifica Zimin, 1951 (Figs. 2, 8, 15, 21, 27)

Body length 12–15 mm. Body with a row of small papillae laterally; anterior spiracles with 6 to 8 branches; anal papillae not strongly protruding, with small protuberances laterally; postanal and subanal papillae conical; extra-anal papillae absent; a row of small papillae present on the posterior part of anal plate; posterior spiracles kidney-shaped, inner margins parallel.

Orthellia coerulea (Wiedemann, 1819) (Figs. 3, 9, 16, 22, 28)

Body length 10–12 mm. Second to 6th segments with microscopic spine-bands around

anterior margins; 7th to 12th segments with broad ventral spine-bands on the lateral to ventral surfaces; 1st anal papillae large, protruding ventrally, with 2 protuberances (2nd and 3rd anal papillae) on the anal plate; subanal papillae conical, smaller than anal papillae; extra-anal papillae present; postanal papillae absent; posterior spiracles kidney-shaped, inner margins slightly rounded; posterior surface of last segment with 2 pairs of small dorsal tubercles and numerous spines on the upper part of subanal papillae.

Orthellia indica (Robineau-Desvoidy, 1830) (Figs. 4, 10, 16, 23, 29)

Body length 11–14 mm. Anterior spiracle with 5 to 6 branches; anal papillae not strongly protruding; no protuberance on anal plate; postanal papillae small; extra-anal papillae present; inner margins of posterior spiracles straight.

Orthellia coeruleifrons (Macquart, 1851) (Figs. 6, 11, 17, 24, 30)

Body length 15–19 mm. Anterior spiracle with 5 to 6 branches; numerous lines of small dots present on the body surface; anal papillae not protruding; subanal and postanal papillae small; extra-anal papillae present; a row of small papillae extending to extra-anal papillae; posterior margin of anal plate wave-like; dorsal surface of 12th segment with 3 rows of dotted line; inner margins of posterior spiracles straight. Description and illustration of this species were made by the material from Taiwan.

Orthellia lauta (Wiedemann, 1830) (Figs. 5, 12, 18, 25, 31)

General characters of this species are similar to those of *O. indica*, but it differs from the latter in having a row of small papillae between extra-anal papillae and subanal papillae, which is situated only between both subanal papillae in *indica*, and 2nd anal papillae present in this species, on the contrary no 2nd anal papillae in *indica*.

ABBREVIATIONS USED IN FIGURES

acs.....accessory sclerite
an.....anus
anp.....anal papilla
anp 1.....1st anal papilla
anp 2.....2nd anal papilla

anp 3.....3rd anal papilla
 ap.....anal plate
 as.....anterior spiracle
 b.....button
 dc.....dorsal cornua
 ds.....dental sclerite
 dt.....dorsal tubercle
 eap.....: extra-anal papilla
 hs.....hypostomal sclerite
 ivt.....inner ventral tubercle
 mh.....mouth hook
 pap.....postanal papilla
 pss.....parastomal sclerite
 ps.....posterior spiracle
 sap.....subanal papilla
 s.....slit
 vc.....ventral cornua
 vp.....ventral papillae
 (ventral spines)
 vs.....ventral spines
 (ventral papillae)
 1-12.....1st to 12th segments

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摘 要

牛およびその他の草食獣糞から発生する蠅類に関する研究. I. 日本産ミドリハナバエ属の終令幼虫について

日本産ミドリハナバエ属については、加納・篠永 (1967)、篠永・加納 (1971) が成虫 5 種を記載しているほか、篠永ら (1972) がキタミドリハナバエ *O. caesarion* を北海道から日本新記録種として報告している。わが国では、本属の幼虫はすべて牛その他の大形草食獣糞より発生するが、とくに放牧場の牛糞からの発生が多い。しかし、沖縄の石垣、西表島などでは、水牛糞がおもな発生源である。

本属の幼虫の形態については、日本では石島 (1967) がミドリハナバエ *O. coerulea* の 3 令幼虫を記録しているのみである。著者らは、野外で採集した雌成虫を新鮮な牛糞と砂糖水を与えて飼育し、産卵させて 3 令幼虫をえた。図と記載のごとく、ミドリハナバエ属の幼虫は腹部第 12 節に特徴があり、そのうちでも anal plate と anal, subanal, postanal, extra-anal papillae などの有無、形態とその組合せなどは種の特徴として重要でありこれらによって種の同定も可能である。