

Identification of third-instar larvae of flystrike and carrion-associated blowflies in New Zealand (Diptera: Calliphoridae)

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ABSTRACT

A key is provided to identify third-instar larvae of the 9 species of calliphorids causing flystrike and associated with carrion in New Zealand. The species are: *Calliphora hillii* Patton, *C. quadrimaculata* (Swederus), *C. stygia* (Fabricius), *C. vicina* Robineau-Desvoidy, *Chrysomya megacephala* (Fabricius), *Ch. rufifacies* (Macquart), *Lucilia cuprina* (Wiedemann), *L. sericata* (Meigen), and *Xenocalliphora hortona* (Walker). New morphological characters, located on the membrane between the head and thorax, are used to separate third-instar larvae of *L. cuprina* and *L. sericata*.

Keywords: Calliphoridae, blowflies, third-instar larvae, key, morphological characters, *Calliphora*, *Chrysomya*, *Lucilia*, *Xenocalliphora*.

INTRODUCTION

When Dear (1986) revised the New Zealand Calliphoridae, he included *Lucilia cuprina* (Wiedemann) and *Chrysomya megacephala* (Fabricius) in the keys to adults although at that time neither species was known to occur in New Zealand. *Lucilia cuprina*, referred to in the literature as the Australian sheep blowfly, had been intercepted in imported cargo several times up to 1986 but Dear was of the opinion that it was unlikely to establish in New Zealand. *Chrysomya megacephala*, the latrine blowfly of Asia and the Pacific, was included because a female identified by Dear was labelled as having been collected at Springston, Canterbury in April 1973. Dear expressed doubts about the provenance of this specimen.

Within the past 3 years both species have, in fact, become established in New Zealand. Several specimens of *L. cuprina* were reared in May 1988 by Ruud Kleinpaste (MAF, Lynfield) from maggots found in the previous month on flystruck goats at Paparoa, Northland. The subsequent discovery that *L. cuprina* was widely distributed in the North Island suggests that it may have arrived in New Zealand at least 10 years prior to that time (D. M. Bishop, MAF Technology, Wallaceville, pers. comm.). *Lucilia cuprina* has now spread into the northern part of the South Island (Nelson Evening Mail 30 March 1990; Heath *et al.* 1991) and is considered to be the most aggressive flystrike blowfly in New Zealand (Heath, reported in Kelly 1990). Adults of *Ch. megacephala* were first

noticed in January 1990 in the Auckland metropolitan area (Herman 1990), and have since been collected in baited traps at Limestone Downs, south of Port Waikato (J. J. Dymock, pers. comm.). As well as attacking sheep and goats, maggots of *L. cuprina* will develop in carrion (O'Flynn 1983). Maggots of *Ch. megacephala* feed mainly on carrion, faeces and other decomposing organic material, but may also invade lesions in animals (Kitching 1976). They have been found on flystruck sheep in Vanuatu (Herman 1990).

Heath (1986) recorded 7 flystrike calliphorid species in New Zealand—*Calliphora hilli* Patton, *C. quadrimaculata* (Swederus), *C. stygia* (Fabricius), *C. vicina* Robineau-Desvoidy, *Chrysomya rufifacies* (Macquart), *Lucilia sericata* (Meigen), and *Xenocalliphora hortona* (Walker)—and Holloway (1986) provided a key to third-instar larvae of 6 of these. Now that *L. cuprina* is established in New Zealand, research on flystrike has intensified and a more comprehensive identification aid is required. The key to third-instar larvae presented here deals with the 9 species of blowflies that are likely to be found on flystruck animals or carcasses on farms. Hopefully it will eliminate the present need to rear larvae of some species to adulthood in order to obtain identifications. The characters used require no special larval preparation. They can be seen with a dissecting microscope at a magnification of $\times 72$ on preserved specimens submerged in ethanol. The material on which the key is based is in the New Zealand Arthropod Collection at DSIR Plant Protection, Auckland.

In the past, specialists as well as non-specialists have found the identification of third-instar larvae of *L. cuprina* and *L. sericata* to be particularly difficult. The present key incorporates characters not previously used for differentiating the 2 species. They involve the form and arrangement of spines on the mid-dorsal area of the spine band between the head and first thoracic segment. In *L. cuprina* these spines are arranged in widely spaced, curved, subparallel rows (Fig. 1) and have conspicuous black tips. In *L. sericata* they are arranged in close, anastomosing, almost transverse rows (Fig. 2) and are uniformly pale brown in colour. Examination under a compound microscope of temporary preparations of this part of the spine band (slide-mounted in glycerine) reveals fundamental differences between the 2 types of spines and spine rows. The spines of *L. cuprina* are not associated with any other surface structures, and stand alone on the integument (Fig. 3). In *L. sericata* the spines are associated with a granulose, surface reticulum (Fig. 4) which is responsible for the anastomosing appearance of the spine rows. Old or poorly preserved specimens of *L. sericata* may occasionally have darkish spines but can be correctly identified by the close, anastomosing spine rows.

ACKNOWLEDGEMENTS

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Key to third-instar larvae of blowflies associated with flystrike and farm carrion in New Zealand. [Third-instar larvae have 3 slits on the posterior spiracles. Figures with the prefix FNZ8 are on pp. 80-83 of Holloway (1986)]

- 1 1st to 7th abdominal segments each with several pairs of finger-like papillae (FNZ8, fig. 116); "hairy" maggots *Chrysomya rufifacies*
 - 1st to 7th abdominal segments not papillate (FNZ8, fig. 115); "smooth" maggots 2
- 2 Peritreme of posterior spiracle either forming a uniformly dark brown ring around the 3 slits (FNZ8, fig. 137) or paler ventromedially in the vicinity of the stigmatic scar (FNZ8, fig. 129). [*Very occasionally* the peritreme of immature specimens (less than 10 mm long) of *Calliphora stygia* and *C. vicina* is colourless in the vicinity of the stigmatic scar.] 3
 - Peritreme of posterior spiracle either absent (Fig. 8) or virtually colourless (Fig. 6) in the vicinity of the stigmatic scar 8
- 3 Dorsal part of spine band between 1st and 2nd abdominal segments with large, discrete spines that are distributed more or less evenly in somewhat oblique rows (Fig. 7) 4
 - Dorsal part of spine band between 1st and 2nd abdominal segments with minute spines that are grouped unevenly in broken, undulating, transverse rows (Fig. 5) 6
- 4 Dorsomedian part of spine band between 7th and 8th abdominal segments with close-set spines that are uniformly arranged in about 6 oblique rows (FNZ8, fig. 128) *Calliphora hilli*
 - Dorsomedian part of spine band between 7th and 8th abdominal segments either lacking spines or with widely spaced spines that are irregularly arranged in at most 4 oblique rows (FNZ8, fig. 132 and 136) 5
- 5 Oral sclerite short, notched basally, pointed apically (FNZ8, fig. 130); spine band between 1st and 2nd abdominal segments containing very large spines dorsally (FNZ8, fig. 131) *Calliphora quadrimaculata*
 - Oral sclerite long, conspicuously forked basally, truncate apically (FNZ8, fig. 134); spine band between 1st and 2nd abdominal segments containing moderately large spines dorsally (FNZ8, fig. 135) *Calliphora stygia*
- 6 Oral sclerite well developed (FNZ8, fig. 139) *Calliphora vicina*
 - Oral sclerite absent or vestigial (FNZ8, fig. 144) 7
- 7 Mid-dorsal region of spine band between head and 1st thoracic segment with widely spaced, discrete, curved, broken rows of spines, their tips black and conspicuous at $\times 72$ (Fig. 1 and 3) *Lucilia cuprina*
 - Mid-dorsal region of spine band between head and 1st thoracic segment with close, anastomosing, approximately transverse, somewhat continuous rows of spines, their tips pale and inconspicuous at $\times 72$ (Fig. 2 and 4) *Lucilia sericata*
- 8 Dorsal part of spine bands between 1st and 2nd, 2nd and 3rd, and 3rd and 4th abdominal segments with minute spines grouped unevenly in broken, undulating, transverse rows (Fig. 5); posterior spiracle small, its peritreme colourless but clearly discernible on either side of the stigmatic scar (Fig. 6) *Xenocalliphora hortona*
 - Dorsal part of spine bands between 1st and 2nd, 2nd and 3rd, and 3rd and 4th abdominal segments with large, discrete spines more or less evenly distributed in somewhat oblique rows (Fig. 7); posterior spiracle large, its peritreme completely absent on either side of the stigmatic scar (Fig. 8) *Chrysomya megacephala*

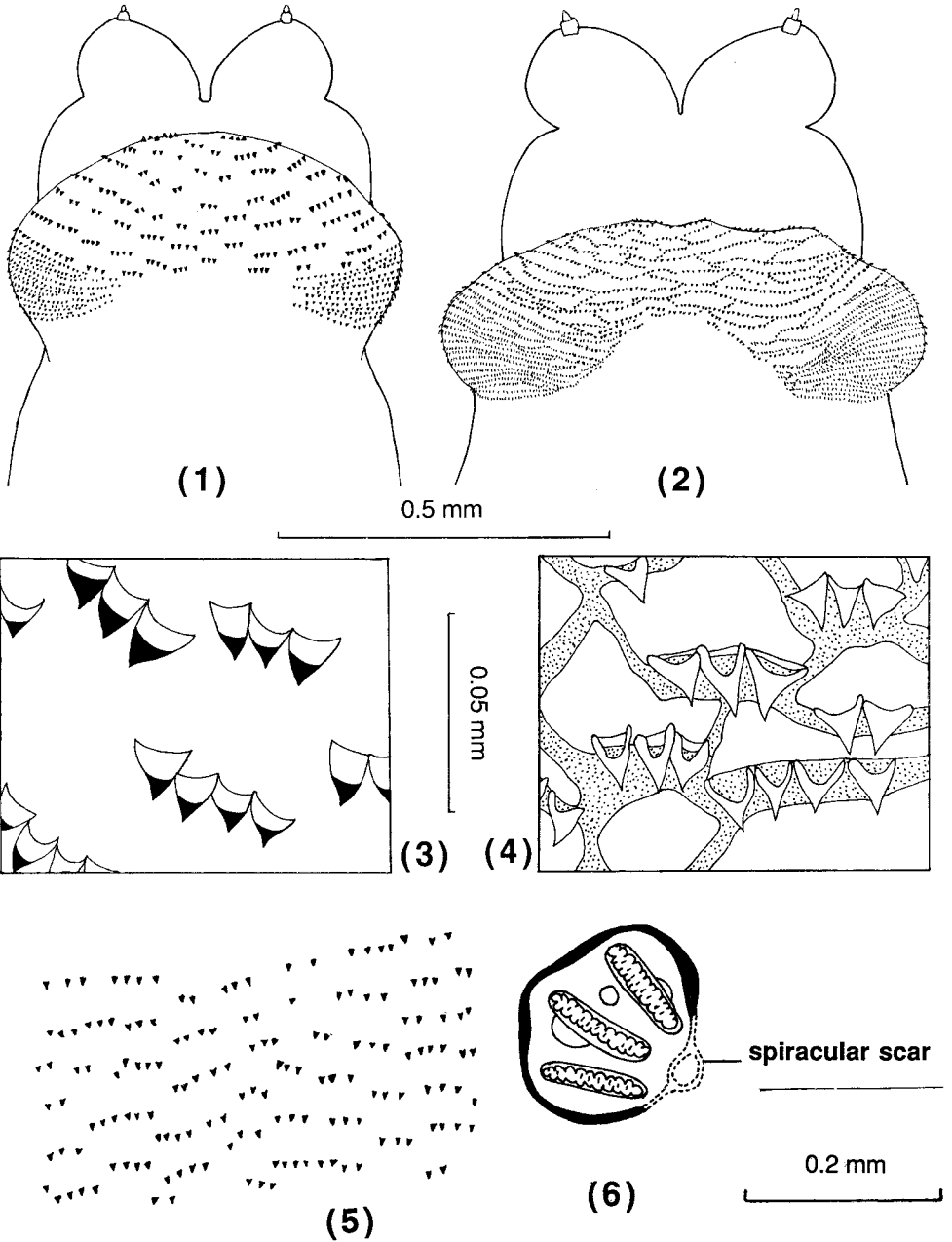


Fig. 1-6: Diagnostic features of third-instar larvae of Calliphoridae.
 1, 2 *Lucilia cuprina*(1) and *L. sericata* (2), dorsal aspect of head and part of prothorax with spine band exposed. Note widely spaced, discrete, curved rows of black-tipped spines in *cuprina* and close, anastomosing, almost transverse rows of paler spines in *sericata*.
 3, 4 *L. cuprina* (3) and *L. sericata* (4), spines near dorsal midline on spine band between head and prothorax. Note black-tipped spines set on pale membrane in *cuprina*, and uniformly pale spines set on granulo-se reticulum (stippled) in *sericata*.
 5, 6 *Xenocalliphora hortona*, dorsomedian area of spine band between 1st and 2nd abdominal segments, and left posterior spiracle.
 Fig.1 and 2, same scale; 3 and 4, same scale; 5 and 6 same scale.

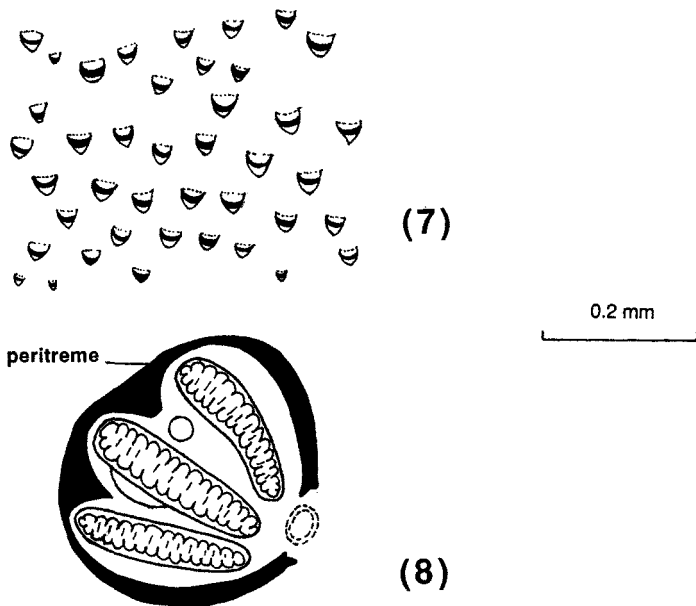


Fig. 7-8: Diagnostic features of third-instar larvae of Calliphoridae.
7, 8 *Chrysomya megacephala*, as for Fig. 5 and 6.
Fig. 7-8, same scale.