A key to the adults of species of blowflies in southern Australia known or suspected to breed in carrion

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Abstract. The reliable morphological identification of carrion-breeding blowflies is important ecologically, as well as for medical, veterinary and forensic reasons. To date, no comprehensive key has been available to make this possible for workers in southern Australia. An illustrated key is presented to the adults of all species of blowflies (Diptera: Calliphoridae) south of 30° S known or suspected to breed in carrion (species exclusive to Queensland and/or the Northern Territory are excluded).

Key words. Calliphora, Chrysomya, Hemipyrellia, Lucilia, Ptilonesia, identification, Australia.

Introduction

It is important that carrion-breeding blowflies be identified reliably because of their ecological, medical, veterinary and forensic importance (Putman, 1983; Catts & Goff, 1992; Crosskey & Lane, 1993; Hall & Wall, 1995). Australia has a high diversity of these flies, corresponding to the continent’s great biogeographical and climatic variability. Such species have been assigned to five genera and associated subfamilies: Calliphora Robineau-Desvoidy, Ptilonesia Bezzi (Calliphorinae), Chrysomya Robineau-Desvoidy (Chrysomymae), Hemipyrellia Townsend and Lucilia Robineau-Desvoidy (Luciliinae). In southern Australia (defined herein as south of 30° S), Calliphora is the genus by far the richest in species known or suspected to be carrion-breeders (16 species vs. 12 such species of Chrysomya, Hemipyrellia, Lucilia and Ptilonesia combined).

The present paper presents, for the first time, a key which enables the identification of the adults of all species of carrion-breeding blowflies in southern Australia that are known or suspected to breed in carrion. Their recognition was previously difficult for non-specialists, possible only by consulting disparate sources. Diagrams are provided to enable all morphological features referred to herein to be identified with ease.

Although a number of the species in southern Australia are also found further north (some predominantly so), those known exclusively from Queensland and/or the Northern Territory have not been included. The key is therefore largely inapplicable to those areas. Tropical northern Australia as a whole has not been covered because the fauna of that region is still too poorly known.

Although there have been recent advances in the identification of forensically and medically important insects using molecular techniques, this approach has applicability mainly to immature stages (e.g. Sperling et al., 1994; Wallman & Adams, 2001; Wallman & Donnellan, 2001) and to species that are aphanic as adults (e.g. Dujardin et al., 1996). All of the taxa included in this paper are identifiable from adult morphology without the assistance of biochemical analysis, even though this has been applied to a number of species to check for cryptic forms (Wallman & Adams, 1997). However, as immatures, not all species are recognizable morphologically or even known.

The obligate carrion-breeding habit of most of the included species has long been known (e.g. Fuller, 1934). Some, e.g. Lucilia cuprina (Wiedemann), are also facultative agents of myiasis in humans and other animals (Zumpt, 1965). However, four species of Calliphora are yet to be confirmed as carrion-breeders, despite all having been collected at meat-baited traps: Calliphora canimicans bezii Hardy, Calliphora centralis Malloch, Calliphora fulvicoxa Hardy and Calliphora macleayi Malloch. Further evidence for carrion-breeding in these species is as follows:

- Calliphora canimicans bezii: this has probably been reared from liver (K. R. Norris, Division of Entomology, CSIRO, personal communication);
- Calliphora centralis and Calliphora macleayi: females of these species carry relatively large first-instar larvae (K. R. Norris, personal communication), like other known carrion-breeding members of the Calliphora augur species-group;
Calliphora fulvicoxa: Hardy (1937) stated that this fly has been shown to oviposit on carrion in the laboratory, but did not say if it could be successfully reared on this medium. It is important that the above flies be included in the key because workers studying carrion may well encounter them. One or more of these species may yet possibly be shown to be a parasitoid of earthworms, as are other calliphorine blowflies such as Onesia tibialis (Maccart) and Calliphora sternalis Malloch, which visit carrion to feed rather than to reproduce (Norris, 1991; K. R. Norris, personal communication) and thus are not included here. Workers should be aware that the key may misidentify such other species, although not if it is used only to identify specimens reared from carrion. Other Calliphora species, such as Calliphora gilesi Norris, have also been caught at carrion baits, but as there is as yet no evidence that their association with carrion differs from that of flies such as O. tibialis and C. sternalis, they also have not been included in the key. In any case, species that are only feeding at a carcass will generally be far outnumbered by true carrion-breeders.

The as yet undescribed species diagnosed in couplet 26 of the key, Calliphora sp. nov., was referred to under this synonym by Wallman & Adams (1997), who confirmed its species status using allozyme electrophoresis (see above).

There are three other families of calyptrate Diptera in Australia, some of whose members also breed in carrion: Fanniidae, Muscidae and Sarcophagidae. Australian carrion-breeding blowflies can be separated from these families by their possession of all of the following characters: meron with a row of strong setae (Fig. 3); integument often, at least in part, metallic blue or green; outer posthumeral seta distinctly lateral to presutural seta (Fig. 4) (Oosterbroek, 1998).

The key was produced by reference to specimens in the author’s own collection and in the Australian National Insect Collection in Canberra. Keys to various groups of Australian and Oriental Calliphoridae by the following authors were also consulted: Kurahashi (1971), Dear (1985), Spradbery (1991), Norris (1994), Wells & Kurahashi (1996) and Kurahashi et al. (1997).


Key to adults of species of Calliphoridae in southern Australia known or suspected to breed in carrion

Suspected, but not proven, carrion-breeding species are asterisked. Abbreviations for Australian states and territories in which species are found are as follows: ACT – Australian Capital Territory; NSW – New South Wales; NT – Northern Territory; Qld – Queensland; SA – South Australia; Tas – Tasmania; Vic – Victoria; WA – Western Australia.

1 Base of stem-vein (Fig. 5) setulose dorsally (Chrysomya) ......................................................... 2
   – Base of stem-vein bare dorsally ........................................ 7
2 Greater ampulla (Fig. 3) with only short dense pubescence (NSW, Qld) .................. Chrysomya latifrons (Malloch)

Figs 1,2. Calliphora hilli hilli: 1, Anterior view of head of ♂ 2, left lateral view of head of ♂. *Note that the setulae themselves are not shown, only the sockets into which they are inserted.

- Greater ampulla with hairs longer than height of ampulla ................................................................. 3
3 Anterior spiracles of thorax (Fig. 3) dark brown to blackish ................................................................. 4
   – Anterior spiracles of thorax pale yellow, cream or white ................................................................. 5
4 Supravibrissal and subvibrissal setulae (Fig. 2) mostly black; ♀ eyes with ommatidia in upper two-thirds enlarged and sharply demarcated from small ones in lower third (ACT, NSW, NT, Qld, SA, WA) ......................... Chrysomya megacephala (Fabricius)
   – Supravibrissal and subvibrissal setulae mostly orange; ♀ eyes with ommatidia in upper two-thirds enlarged, but not sharply demarcated from small ones in lower third (ACT, NSW, NT, Qld, WA) ....... Chrysomya saffranea (Bigot)
5 Genae (Fig. 2) orange-brown to black (ACT, NSW, SA, NT, Qld, Tas, Vic, WA) ......................................................... Chrysomya rubicunda (Macquart)
   – Genae wholly yellow ............................................................... 6
6 Larger species, body length usually >7 mm; greater ampulla (Fig. 3) with golden hairs; abdomen partly, at least ventrally, yellow-orange (NSW, Qld, Vic) ............ Chrysomya incisuralis (Macquart)
- Small species, body length always < 7 mm; greater ampulla with black hairs; abdomen wholly metallic green; : fore femur with prominent, white hairs dorsally (ACT, NSW, SA, NT, Qld, Vic, WA) .............................

7 Lower calypter (Fig. 3) hairy on upper surface ........................................ 12
- Lower calypter bare on upper surface ................................ 8

8 Katatergite (Fig. 3) with long, erect hairs (Hemipyrellia) (NSW, Qld) ................. Hemipyrellia fergusoni Patton
- Katatergite pubescent (Lucilia) ........................................ 9

9 3 pairs of postsutural acrostichal setae (Fig. 4); basicosta (Fig. 5) yellow........................................... 10
- 2 pairs of postsutural acrostichal setae; basicosta dark brown to black ......................... 11

10 Frontoclypeal membrane (Fig. 1) light brown; metasternal area (Fig. 3) hairy; outer surface of fore femora (Fig. 3) and proximal half of under surface of mid femora (Fig. 3) metallic blue to black (ACT, NSW, NT, Qld, SA, Tas, Vic, WA) ......................... Lucilia sericata (Meigen)

- Frontoclypeal membrane dark brown to blackish; metasternal area bare; outer surface of fore femora and proximal half of undersurface of mid femora metallic green (ACT, NSW, NT, Qld, Vic, WA) ........................................ 11

Antennae (Figs 1 and 2) and facial plate (Fig. 1) dark brown to blackish; anterior pair of postsutural acrostical setae (Fig. 4) inserted on or posterior to line joining second pair of postsutural dorsocentral setae (Fig. 4); tergites 3 and 4 (Fig. 6) with dark marginal bands posteriorly (NSW, Qld) ....................... Lucilia cuprina (Wiedemann)
- Antennae and facial plate orange to orange-brown; anterior pair of postsutural acrostichal setae usually inserted anterior to line joining second pair of postsutural dorsocentral setae; tergites 3 and 4 not darkened posteriorly (NSW, Qld) 11

Lucilia papuensis Macquart
- Antennae and facial plate orange to orange-brown; anterior pair of postsutural acrostichal setae usually inserted anterior to line joining second pair of postsutural dorsocentral setae; tergites 3 and 4 not darkened posteriorly (NSW, Qld) 11

12 Subcostal sclerite (Fig. 3) setulose; whole upper surface of lower calypter (Fig. 3) hairy (Ptilonesia) (NSW, Vic)........................................ Ptilonesia auronotata (Macquart)
- Subcostal sclerite pubescent; upper surface of lower calypter bare apically (Calliphora) ......................... 13

13 3 pairs of presutural acrostical setae (Fig. 4) ........... 14
- 2 pairs of presutural acrostical setae ................. 16

14 Postocular area (Fig. 2) with gold pruinescence; coxae (Fig. 3) yellow-orange (ACT, NSW, Qld, SA, Tas, Vic)........................... Calliphora fulvicosa Hardy*
- Postocular area with silver pruinescence; coxae darkened ........................................... 15

15 Fore femora (Fig. 3) uniformly orange on outer surface; fronto-orbital plates (Figs 1 and 2) and parafacials (Figs 1 and 2)
and 2) with gold pruinosecence; \( \delta \): frons (Fig. 1) minimum width < width of anterior ocellus (Fig. 1); ommatidia on anterior upper two-thirds of eyes considerably enlarged to about \( 2 \times \) width of others (ACT, NSW, Qld, SA, Tas, Vic) ........................................... Calliphora stygia (Fabricius)

- Fore femora brown to blackish on proximal quarter of uppermost half of outer surface; fronto-orbital plates and parafacials with silver pruinosecence; \( \delta \): frons minimum width > width of anterior ocellus; ommatidia on anterior upper two-thirds of eyes only slightly larger than others (SA, WA) ................. Calliphora albifrons Malloch

16 Abdomen yellow-orange with contrasting metallic blue or green area dorsally. .............................................. 17

- Abdomen with generally uniform coloration, lacking contrasting metallic area dorsally. ......................... 20

17 3 pairs of presutural acrostichal setae (Fig. 4); presutural intra-alar setae (Fig. 4) about as well developed as anterior postsutural intra-alar setae (Fig. 4) (NSW, Qld) ............. 18

- 2 pairs of presutural acrostichal setae; presutural intra-alar setae absent or much less well developed than anterior postsutural intra-alar setae. ............................................ 19

18 Humeral calli (Fig. 4) blue-grey, concolorous with rest of mesonotum (Fig. 4); katepisternal setae (Fig. 3) 2 + 1; 3 notopleural setae (Fig. 4); meral setae (Fig. 3) black; dorsal metallic area of abdomen with at least partly greenish-blue or green sheen (NSW, Qld).......................... Calliphora centralis Malloch*

- Humeral calli yellow; katepisternal setae 1 + 1; 2 notopleural setae; meral setae yellow; dorsal metallic area of abdomen with wholly blue to purple sheen (NSW, Qld) ......................... Calliphora nucleaiyi Malloch*

19 Dorsal metallic area of abdomen with greenish-blue sheen; tergite 5 (Fig. 6) with yellowish pruinosecence; \( \delta \): frons (Fig. 1) minimum width < \( 2 \times \) width of anterior ocellus (Fig. 1) (ACT, NSW, Qld, SA, Tas, Vic) ......................... Calliphora augur (Fabricius)

- Dorsal metallic area of abdomen with rich blue or purplish sheen; tergite 5 with vivid white pruinosecence; \( \delta \): frons minimum width \( \geq 2 \times \) width of anterior ocellus (ACT, NSW, NT, Qld, SA, WA) ................................................. Calliphora dubia (Macquart)

20 Abdomen metallic blue with silver pruinosecence (ACT, NSW, SA, Tas, Vic, WA)........................................ Calliphora vicina Robineau-Desvoidy

- Abdomen not metallic blue .................................................................................................................. 21

21 Abdomen uniformly dark orange; eyes with dense erect yellow hairs ..................................................... 22

- Abdomen entirely mottled olive-green or golden; eyes hairless ................................................................ 23

22 Mesonotum (Fig. 4) with yellowish pruinosecence; \( \delta \): frons (Fig. 1) minimum width < width of anterior ocellus (Fig. 1) (ACT, NSW, Qld, Vic) ........................................... Calliphora ochracea Schiner

- Mesonotum with whitish pruinosecence; \( \delta \): frons minimum width much > width of anterior ocellus (ACT, NSW, SA, Tas, Vic) ................................................. Calliphora nigrithorax Hardy

23 Legs blackish (Vic) Calliphora canimicans Bezzi Hardy*

- Legs yellow, orange or brown ............................................................................................................... 24

24 Fore femora (Fig. 3) dark brown to blackish on proximal half of inner surface; abdomen with strong olive-green sheen (NSW, SA, Tas, Vic, WA) ................................................. Calliphora maritima Norris

- Fore femora orange on proximal half of inner surface; abdomen lacking strong olive-green sheen. ........... 25

25 Parafacials (Figs 1 and 2) checkered, with silver pruinosecence (WA) ................. Calliphora varifrons Malloch

- Parafacials not checkered, with gold pruinosecence. ............... 26

26 Postocular area (Fig. 2) with silver pruinosecence; \( \delta \): frons (Fig. 1) minimum width > \( 4 \times \) width of anterior ocellus (Fig. 1) (SA, Vic) ......................... Calliphora sp. nov.

- Postocular area with gold pruinosecence; \( \delta \): frons minimum width < \( 4 \times \) width of anterior ocellus. ................. 27

27 Tergite 3 (Fig. 6) with purplish sheen medially and hairs predominantly black anterolaterally (Fig. 6); tergite 5 (Fig. 6) with hairs predominantly black medially; \( \delta \): frons (Fig. 1) minimum width < \( 2 \times \) width of anterior ocellus (Fig. 1) (ACT, NSW, Qld) ............... Calliphora fagax Hardy

- Tergite 3 with greenish sheen medially and hairs predominantly yellow anterolaterally; tergite 5 with hairs predominantly yellow medially; \( \delta \): frons minimum width > \( 2 \times \) width of anterior ocellus (ACT, NSW, SA, Tas, Vic) ......................... Calliphora hilli hilli Patton

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References


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