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SOME SARCOPHAGID FLIES FROM LORD HOWE ISLAND.

By

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(Figures 1-3.)

Mr. A. Musgrave, Entomologist, Australian Museum, collected insects during December, 1921, on Lord Howe Island, an isolated spot consisting of a seven-mile stretch of land, over three, seven, and eight hundred miles from Australia, New Caledonia, and New Zealand respectively. Amongst them are some species of Diptera that are of interest owing to the similarity they bear to those of Australia.

Of the Sarcophagid flies described herein, two cannot be separated specifically from Australian forms, whilst the third is so similar to a continental species that the difference may possibly be considered to be of subspecific value only. It is possible that two of these species may have reached Lord Howe Island by natural means, such as by wind, or may have been transported by shipping, but we have reason to suppose that such an explanation is open to serious doubt.

Amongst the Diptera Brachycera collected, are two species of the genus *Anthrax* (used in the sense given by Hardy, 1921, *nec* Bezzi) that are apparently identical with two common forms known to us from Sydney. These species are selected for comment because in each case the larvæ are subterranean and predaceous, the fly occurring only where the native flora exists and not breeding in gardens; the imagos are apparently capable of only short flights, about fifty yards at the most, and do not fly during windy weather. Under these circumstances it seems impossible for these Bombyliids to have reached the island by natural agencies, and it is very unlikely that they should have been introduced. Moreover, the majority of the collection consists of Australian species or related flies. These facts suggest that Lord Howe Island may have obtained its dipterous fauna during a time when it was not so isolated as it is to-day.

A. S. Olliff, in his account of the insect fauna of the island,[1] makes no mention of any Diptera, but his study of the Coleoptera led him to state that the more conspicuous genera were peculiarly Australian, though the island possessed a number of highly modified endemic forms. He recorded the presence of quite a number of widely distributed beetles which had evidently been introduced.

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[1] Olliff—Austr. Mus. Mem. ii, 1889, p. 77.

It must not be forgotten, however, that the breeding habits of Sarcophagids would favour their transportation to other localities by ships, within certain limits, as it has been shown that a period of twelve to eighteen days in summer, increasing to as much as twelve weeks in winter, may be passed in the combined larval and pupal stages in the case of common Australian species under observation in Brisbane.[2]

In this contribution to the knowledge of the insect fauna of Lord Howe Island, the three species are described rather fully.

Terminology.

A paper revising the Australian Sarcophagids is in course of preparation. It has been found advisable not only to modify the terminology used in papers previously issued from this laboratory, but also to take into account characters that have not received adequate treatment in the past. This contribution is written on similar lines to those of the proposed revision.

Chaetotaxy.—The terminology employed is that utilised by Williston in his "Manual of North American Diptera," 3rd edit. The terms describing the bristles of the legs are those recently used by the junior author in describing *Asilidae*.[3]

Genitalia.—Some structures of the male genitalia have been studied in detail. A pair of forceps protects the genital opening when the penis is withdrawn. On each side of the latter there is an anterior (a.c.) and a posterior (p.c.) clasper. The penis consists of two joints, the second of which is usually complex. Anterior to the main mass of the latter joint there is an anterior appendage (a.a.), which varies greatly in shape and size in different species. The main portion of the second joint contains processes that vary in size, form, and position, while between it and its appendage a pair of filaments (fil.) may be present or apparently absent.

Genus Sarcophaga *Meigen.*

The Australian species placed under the genus *Sarcophaga* may not belong to it, if used in its very restricted sense, and they certainly do not agree in regard to the characters given by Townsend in his keys.[4] This author has already proposed a new generic name for a species which was subsequently considered to be a synonym of an Australian form, but neglected to give the characters whereby his proposed genus may be recognised, and we are not in a position to validate his genus by defining it. Until definite information with regard to its generic position is obtained, *Sarcophaga* is utilised by us in its wider sense.

[2] Johnston and Tiegs—Proc. Roy. Soc. Queensland, xxxiv, 1922, pp. 77-104.
[3] Hardy—Proc. Linn. Soc. N.S. Wales xlv, 1920, p. 187.
[4] Townsend—Proc. Biol. Soc. Washington xxx, 1917, p. 189-198.

The following characters are based on species from Australia and Lord Howe Island.

Chaetotaxy.

Head.—Two pairs of vertical bristles, the outer often reduced in size but rarely quite obsolete. One pair of frontal orbitals, reclinate; also, in the female only, two pairs of proclinate bristles. At least two pairs of postverticals. The series of frontal bristles, composed of a row on either side parallel to the frontal stripe, extends below the base of the antennæ. The arrangement of the following bristles has been found to be of specific value:—The facials (a single, rarely a double row above each vibrissa); those along the oral margin (one row below the vibrissa, rarely a double row); and the postocular (invariably one row, but supplemented by the vestiture behind this row becoming at times bristly and black, so as to form one or two additional rows).

Thorax.—On each side of the median line are the following:—Three humeral bristles; two posthumeral; four notopleural, alternately short and long; one presutural; four supra-alar, the fourth often small or minute; two postalar; normally eight dorsocentral, four of which are postsutural.

The intra-alar and acrostichals are of specific value; the former are usually regarded as consisting of two or three bristles, but sometimes the row can be detected extending to include three further bristles, one of which is anterior, the other two posterior to the suture. The acrostichals utilised in our descriptions consist of one presutural and one prescutellar, though others may occur, but are difficult to detect with accuracy, as when present they are invariably surrounded by rather long vestiture.

Two propleural bristles; a row of five mesopleural along the mesopleural suture; three sternopleural arranged 1:1:1; a group of about three pteropleural just below the wings; a row of hypopleural; and between the anterior and intermediate coxae, on the sternopleura, a row of bristles similar in nature and parallel to those of the intermediate coxae.

Scutellum.—Four pairs of bristles on the male, and three on the female.

Abdomen.—On each side of the first segment there are one or two submarginal bristles and anterior to these are some discal bristles arranged in one or two rows. The second segment has one or two lateral submarginals, very seldom three; very rarely a median pair of submarginals. The third segment usually has one median pair of submarginals and one or two laterals, but sometimes other bristles occur, making as many as six submarginals. The fourth segment has a complete system of submarginals, often alternating with slender bristles placed marginally, the series continuing ventrally.

Legs.—The bristles of the femora are arranged in rows of few or many; when a row is reduced so that only the apical one, two or three bristles remain, these are referred to as subapical bristles. The tibiæ, when reflexed, lie between the two ventral rows, the anterior of which is invariably missing on the anterior pair of legs. The coxæ and tibiæ also contain bristles, but these do not seem to be of particular value.

The hairy vestiture of the femora and tibiæ occurs in three forms: pubescence which is very short and uniform in size and distribution, some short hair and long hair. An examination of any species that has one or more of its femora conspicuously hairy will enable anyone to distinguish between these forms. Only long hair is taken into account for the purpose of descriptions.

Wings.—There do not appear to be any characters of specific value to be found in the wings; the first vein, R_1, invariably contains a row of bristly hairs at the base, the other veins being bare.

Colour.

The Australian Sarcophagids known to us are all of a uniform type in colour and colour markings. The tomentum ranges in colour from grey and silver-grey to golden yellow, and it may vary considerably in this respect even within a species. The legs and forceps are black, or at most the latter are dark brown, never red (as is the case with so many North American species).

Sarcophaga howensis *n. sp.*

(Fig. 1.)

Resembles *Sarcophaga beta* Johnston and Tiegs, to which it is closely allied and possibly is only subspecifically different.

♂.—*Head.* Frontal stripe wider than parafrontals, third antennal joint over twice the length of the second (proportion 7 : 3). Outer verticals scarcely longer than postorbitals; twelve frontals; facials numerous, about two rows of nine or ten each; the bristles along the oral margin are also placed in a double row and are of similar numbers; one postorbital row.

Thorax. Three definite intra-alar bristles and along the same row are two postsutural and one presutural weak bristles; prescutellar and presutural acrostichals present.

Abdomen. A line of three discal and one submarginal lateral bristles on the first segment; the second and third have each one median and two lateral pairs of submarginal bristles; the fourth segment has six pairs of submarginal bristles, alternating with slenderer marginal ones which constitute a series that continues ventrally.

Genitalia. The forceps are long and sinuous, and conform in every detail to those of *S. beta*; the claspers are also identical with those of *S. beta* and consist of bifid anterior and very broad posterior claspers; anterior to these there is a minute knob. The penis conforms in general shape and structure to *S. beta*, but differs at the apex in having a pair of lateral spur-like processes and shorter filaments, this difference being illustrated in the accompanying diagrams (fig. 1, E, F).

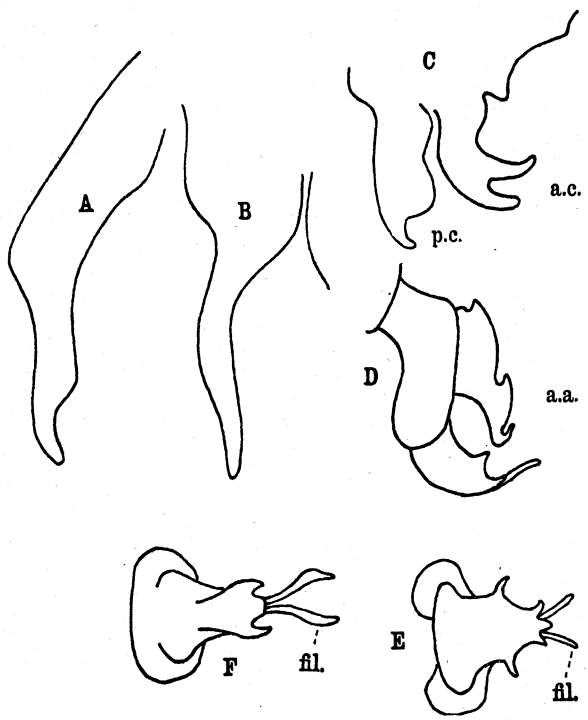

Fig. 1.

Sarcophaga howensis n.sp.

A. one of the forceps seen laterally.

B. posterior view of same.

C. claspers viewed laterally.

D. penis (second joint) seen laterally.

E. the same, ventral view.

Sarcophaga beta Johnston and Tiegs.

F. the penis seen from the same aspect as that of E.

a.c., anterior clasper. p.c., posterior clasper.

a.a., anterior appendage. fil., filaments.

Legs. On the anterior femora one dorsal and one ventral row of bristles; on the intermediate femora one anterior row, two subapical bristles on the posterior side and two ventral rows; on the posterior femora, one anterior and one dorsal row, one posterior subapical bristle and two ventral rows considerably reduced in regard to the number of bristles present. Long hair abundant on all femora and on intermediate and posterior tibiae.

♀.—Unknown.

Length.—Male, 10-15 mm.

Hab.—Lord Howe Island; holotype and three paratypes; December, 1921.

SARCOPHAGA MISERA *Walker.*

(Fig. 2.)

♂.—*Head.* Frontal stripe slightly wider than parafrontals. Third antennal joint twice the length of the second. Outer vertical bristles minute; ten frontals; about five facials; about twelve orals; one row of bristles behind the eyes.

Thorax. Two intra-alar bristles and one pair of strong prescutellar acrostichals.

Abdomen. On the first segment, three discal and one submarginal lateral bristles; on the second, one submarginal lateral; on the third, one median and two lateral submarginals; on the fourth, six submarginal bristles alternating with more slender ones which constitute a series continued ventrally.

Genitalia. The forceps are small and taper uniformly to the tip. The anterior and posterior claspers are simple. The penis contains one anterior appendage and two pairs of lateral processes, one of which is elongate and bifid at the tip. A pair of filaments scarcely protrudes beyond the apex of the second joint.

Legs. On the anterior femora one dorsal, one lateral, and one ventral row of bristles; on the intermediate femora, one anterior row, three subapical posterior bristles, and two ventral rows; on the posterior femora, one anterior row, one subapical dorsal bristle, one subapical posterior bristle and one ventral row. Long hair occurs on the intermediate and posterior femora, and also scantily on the posterior tibiæ.

♀.—In addition to the modifications in chætotaxy, which occur in Australian female Sarcophagids, and are referred to in the generic characterisation already given, it differs in having larger outer vertical bristles, three intra-alar bristles, three lateral marginals on the third abdominal segment, and long hair only on the posterior femora.

Length.—Male and female about 11 mm., but as the male has been attenuated in extracting the genitalia, and the female has conspicuously shrunken, the measurements can only be given approximately.

Hab.—Lord Howe Island; December, 1921; one of each sex. Previously recorded as widely distributed over Australia.

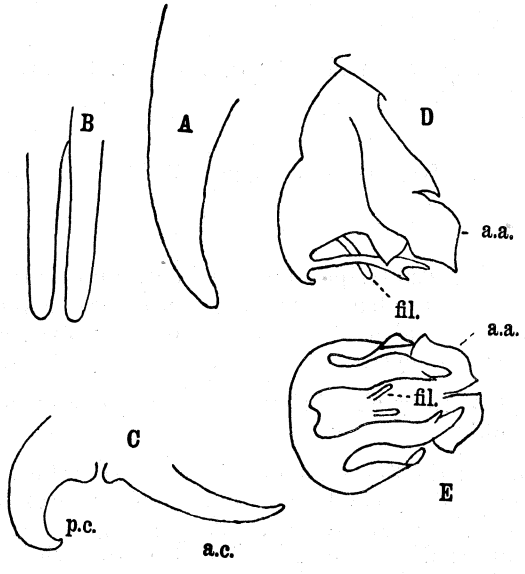

Fig. 2.

Fig. 2, *Sarcophaga misera* Walker.

A. one of the forceps seen laterally.
B. posterior view of same.
C. claspers viewed laterally.
D. penis (second joint) seen laterally.
E. the same, ventral view.

a.c., anterior clasper. p.c., posterior clasper.
a.a., anterior appendage. fil., filaments.

Note.—This species is closely related to *Sarcophaga dux* Johnston and Tiegs, *nec.* Thomson, but there are certain differences in regard to the structure of the genitalia. Besides, the presence of a second postocular row of bristles in *S. dux* will readily distinguish that species.

Genus HELICOBIA *Coquillett.*

This genus was founded upon the character of the third vein of the wing (R_{4+5}, Comstock and Needham's terminology), which has a row of bristles. According to Townsend's key both sexes described below belong to the genus, so there can be little doubt that the species has been rightly included in *Helicobia* as now understood.

Chaetotaxy.—Similar to that given under the genus *Sarcophaga,* but differing in the postsutural dorsocentrals, which are only three in number.

Genitalia.—Very distinctive in appearance from those of the genus *Sarcophaga.* A drawing, taken direct from the holotype of *H. australis,* is given here, and it will be noted that the apices of the parts of the second joint of the penis terminate together in a long complex process. This joint, taken from another specimen, has been mounted on a micro-slide and it shows definitely that the filaments are also contained in this complex process. The genitalia of the specimen described agrees in every respect with those of the holotype.

HELICOBIA AUSTRALIS *Johnston and Tiegs.*

(Fig. 3.)

♂.—*Head.* Frontal stripe wider than parafrontals. The second antennal joint a little larger than in the holotype (proportion, in relation to third joint, 5 : 9 in the holotype, and 7 : 8 in the specimen described). Outer vertical bristles slightly longer than those of the postorbital row; ocellar bristles very strong; eight frontals (in the holotype seven on one side and six on the other); three facials, and at least four bristles along the oral margin; three rows of black bristles behind the eyes.

Thorax. The fourth supra-alar, if present, no longer than the bristly vestiture of the thorax; three intra-alar; five well developed dorsocentrals, others are present but conspicuously weaker; one pair of prescutellar acrostichals (others, if present, cannot be detected from the bristly vestiture around them).

Abdomen. On the first segment four discal (arranged 2 : 2) and one submarginal lateral bristles (all of which are somewhat obscured in the holotype); on the second, one lateral submarginal; on the third, one pair of median and two lateral submarginals; on the fourth segment, seven pairs of submarginals.

Genitalia. Forceps short. Anterior clasper remarkably flattened, almost spoon-shaped, showing anterior and posterior surfaces only; posterior clasper simple. Second joint of penis compact; with the anterior appendage diverted back, provided with a short lateral process and apically attenuated. This anterior appendage, together with the apex of the main portion of the second joint and a pair of filaments, forms a complex apical process to the joint (Fig. 3 D, E).

Legs. On the anterior femora one dorsal row, two closely adjacent rows of bristly vestiture and one ventral row of bristles. On the intermediate femora one anterior row, two subapical bristles on the posterior side and two ventral rows of small bristles. On the posterior femora one anterior row, two dorsal subapical bristles and two ventral rows. No long hairs on the legs, the vestiture, like that on the other portions of the insect, being bristly in nature, making the true bristles sometimes difficult to detect.

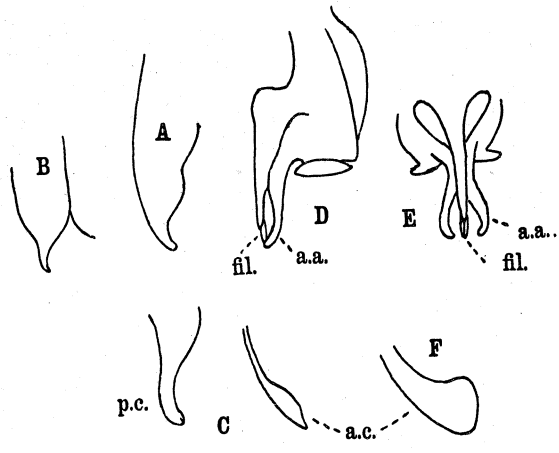

Fig. 3.

Fig. 3, *Helicobia australis* Johnston and Tiegs.

A. one of the forceps seen laterally.
B. posterior view of same.
C. claspers viewed laterally.
D. penis (second joint) seen laterally.
E. posterior view of penis.
F. posterior aspect of anterior clasper.

a.c., anterior clasper. p.c., posterior clasper.
a.a., anterior appendage. fil., filaments.

♀.—In addition to the modifications in chætotaxy, which also occur in the Australian species of *Sarcophaga* and are referred to under the characters of that genus, it differs from the male in having strongly developed outer verticals; third joint of the antenna twice as long as the second; six pairs of submarginal bristles on the third and fourth abdominal segments; and the two rows of bristly vestiture on the posterior side of the anterior legs wider apart.

Length.—Male, 6 mm.; female, 5-7 mm.

Hab.—Lord Howe Island; December, 1921. Three males, allotype female and five paratype females. Previously recorded from Queensland, and represented in the Australian Museum by one male from Dorrigo, N.S. Wales.

Note.—Except where stated the above description of the male agrees in every respect with the holotype.

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