

A REVISION OF THE AUSTRALIAN DIPTERA BELONGING TO THE GENUS *SARCOPHAGA*.

By Professor T. HARVEY JOHNSTON, M.A., D.Sc., The University, Adelaide; and
G. H. HARDY, Walter and Eliza Hall Fellow in Economic Biology, The
University, Brisbane.

(Twenty-eight Text-figures.)

[Read 30th May, 1923.]

Australian species of Sarcophagid flies were first described in 1830 by Robineau Desvoidy; others were added by Macquart in 1846 and 1850, Walker in 1849, and Thomson in 1868. In more recent times, Skuse described a species in 1891, and Taylor another in 1917.

During 1921-22, papers on Sarcophagid flies were published by Johnston and Tiegs, the specific differentiation being based upon genitalic characters and an attempt was made to attach to the more common species most of the thirteen names given by earlier authors. Parker, in 1922, described two species as new but, as indicated below, both these had already been described by Johnston and Tiegs.

In preparing this revision it was our intention to establish a system whereby identifications could be made from female specimens and our study of the chaetotaxy was undertaken mainly for this purpose, but it was soon found that a critical study of the genital parts had to be undertaken first so as to eliminate errors due to imperfections of previously studied material and to the misunderstanding of the limits of variation in the male. We are convinced that the chaetotaxy of the female conforms to that of the male in regard to certain features which may be used in specific determination, and in several cases, where this rule has not been applicable, it is possible that an error has been made by attaching wrong identification labels to material previously studied.

This revision completes the first step towards establishing a satisfactory taxonomic treatment of Australian Sarcophagid flies in so far as it revises the treatment of male genital parts, giving descriptions as well as drawings of outstanding features and adding a comparative study of the chaetotaxy, that portion relating to the abdomen and femora not having been attempted before.

The new names added to the Australian list include those of one new species, one previously wrongly identified, for which a new name is proposed below, and also for one that previously was only recorded from Europe and North America, namely *S. securifera* Villen. Eight names are placed as synonyms for the first time.

The term "Australian," as used in this paper, does not include localities such as Lord Howe Island, New Guinea and islands in its vicinity.

The first key for the determination of males is based entirely upon genital characters. The second key is based mainly on a selection from the chaetotaxy and other characters that we consider sufficiently constant to warrant their use in this way. The third key for the determination of the females is the first published attempt to isolate females, mainly on the chaetotaxy, and can include, of course, only species of which the females are known. Until more material is bred and the females determined in this manner, it is uncertain whether our key will ultimately be found reliable, though we believe it will prove to be so in most cases.

Acknowledgments.—We are indebted to Dr. C. Anderson and Mr. H. A. Longman, the Directors of the Australian and Queensland Museums respectively, and to Mr. G. F. Hill, Entomologist of the Institute of Tropical Medicine, Townsville, for the loan of those types of Sarcophagid flies that are respectively under their charge; to Dr. E. W. Ferguson, Mr. G. H. Dutton and others for the loan of specimens in their collections.

From Mr. R. R. Parker we received a letter in which he informed us that his two species, described as new, were forestalled by Johnston and Tiegs, and suggested certain further synonymy to which we have given due consideration.

Chaetotaxy.

(A). The bristles of the head (Text-fig. 1) are classified as follows:—

Vertical: Two pairs, inner and outer, situated in a line behind the ocelli; the inner pair always long and convergent, the outer pair always divergent, shorter and situated near the corner of the eyes and, in the male only, may be reduced in size or even obsolete.

Frontal: On each side of the frontal stripe, a row of bristles descends from below the ocelli to the base of the antennae, whence the rows usually diverge for a short distance.

Fronto-orbital: Below the outer vertical and above the frontal, near the eye-margin, there is a reclinate bristle. On the female only there are, besides this, two further bristles placed lower; these form a line of three bristles parallel to the eye-margin.

Vibrissa: A pair of long, stout bristles situated near the oral margin and excessively long in comparison with the other bristles around them.

Facial: A series of bristles, small and often hair-like, extending upwards from each vibrissa. A second, or part of a second, row is present but only the number of bristles in the longer row is quoted herein.

Oral: A series of bristles passing from each vibrissa along the oral margin and often contrasting with the hairs around them but sometimes not so easily detected. We have followed the policy of counting these bristles only when they are black.

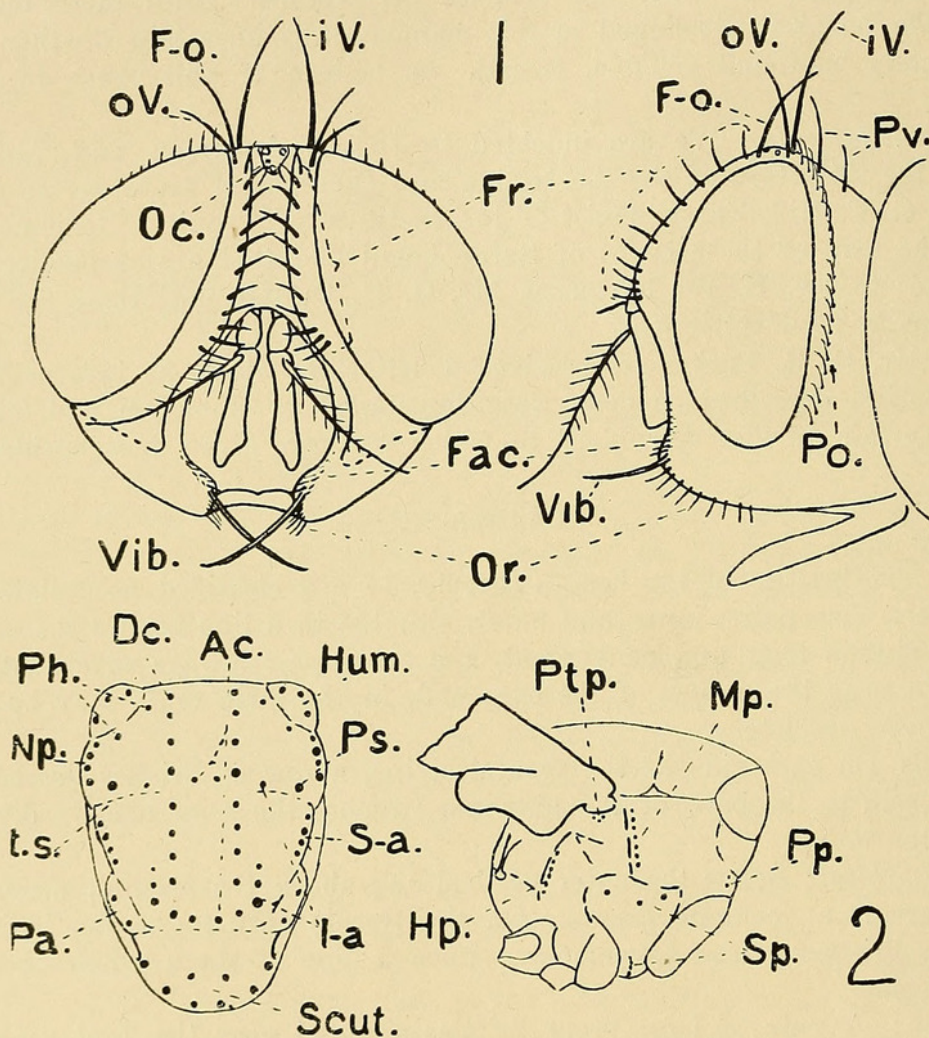
Post-ocular: Immediately behind, and parallel to, the eyes there is a row of black bristles often referred to as *post-orbital*. Sometimes the hairs behind this series form one or two parallel rows of black bristles, these extra rows being apparently constant when they occur on a species and forming one of the leading clues to the identity of females.

Post-vertical: Two pairs of bristles situated behind the verticals.

(B.). The terms used for the bristles on the thorax are as follows:—

Humeral: Three bristles inserted on the humeral callus. The unique *S. bancrofti* contains a fourth, but this character is paralleled by a bristle-like hair occasionally seen in isolated cases on other species and, therefore, we do not consider *S. bancrofti* to be normal in this respect.

Post-humeral: Two bristles situated on the area immediately adjacent to the humeral callus.



Text-fig. 1. Diagram of the head.

Fac. facial; *F-o.* frontal orbital; *Fr.* frontal; *iV.* inner vertical; *Oc.* ocellus on which the ocellar bristles occur; *Or.* oral; *oV.* outer vertical; *Po.* postocular; *Pv.* postvertical; *Vib.* vibrissa.

Text-fig. 2. Diagram of the thorax.

Ac. acrostichal; *Dc.* dorsocentral; *Hp.* hypopleural; *Hum.* humeral; *I-a.* intra-alar; *Mp.* mesopleural; *Np.* notopleural; *Pa.* post-alar; *Ph.* post-humeral; *Pp.* propleural; *Ps.* presutural; *Ptp.* pteropleural; *S-a.* supra-alar; *Scut.* scutellar; *Sp.* sternopleural; *t.s.* transverse suture.

Notopleural: Four bristles alternately short and long, situated immediately above the dorsopleural suture, between the humeral callus and the base of the wing.

Presutural: A rather strong bristle situated immediately before the trans-

verse suture and above the notopleural bristles. A little beyond this may be another smaller bristle, in a line with the intra-alars, but we prefer to consider this second bristle as one of the intra-alars rather than a second presutural.

Supra-alar: Immediately above the base of the wing are four bristles, the fourth sometimes small or even minute, but invariably indicated.

Intra-alar: Two or more bristles parallel to the supra-alars, but further from the base of the wing, appear to be of some specific value. A third bristle is often present, and even a fourth may occur, but situated anteriorly to the transverse suture (see presutural).

Post-alar: Two bristles situated on the post-alar callus.

Dorsocentral: Reaching from just behind the head to the scutellum there is a complete row of bristles, of which four at least are situated between the transverse suture and the scutellum in the genus *Sarcophaga*, and only three in the genus *Helicobia*.

Acrostichal: Between the two dorsocentral rows, vestiges of two further rows may be traced. These bristles, when present, just anterior to the transverse suture, are termed *presutural*, and those just anterior to the scutellum are *pre-scutellar*. The presence or absence of bristles in these particular positions is of considerable specific importance.

Scutellar: On the scutellum there are four pairs of bristles in the male and three in the female.

Propleural: Two bristles situated immediately above the anterior coxa.

Mesopleural: A row of five bristles along the mesopleural suture.

Sternopleural: Three bristles arranged in a row (1.1.1.) on the sclerite anterior and adjacent to the intermediate coxa. Also between the anterior and intermediate legs a row similar in appearance to those on the anterior and intermediate coxa.

Pteropleural: A group of about three bristles just below the wing.

Hypopleural: A vertical row of slender bristles just above the hind coxa.

(C). The bristles on the abdomen are as follows:—

On the first segment there are *discal* bristles situated on each side, varying in number from one to about eight or more and not particularly constant on any one species, but a more or less useful character is to be found in the manner in which they are arranged. They form one or two distinct rows, each composed of one or several bristles. When they are considerably reduced in number, one row may be eliminated on a species that normally has two rows; this reduction is seldom found on both sides of the insect, so that when a second row is not detected on one side it may be indicated on the other. Besides these discal bristles there are from one to three *submarginal* bristles placed near them.

The second segment is generally provided with from one to three *lateral submarginals*. In *S. howensis* (from Lord Howe Island) alone, of all species of *Sarcophaga* known to us, there is also a median pair of submarginal bristles strongly developed and equivalent to those occurring on the third segment of this and all other species of the genus. The lateral submarginals may be small or even obsolete on the female.

The third segment has a median pair of submarginal bristles, and from one to three laterals on each side. These median and lateral submarginals may be joined by intermediate bristles, making up to six pairs of submarginals similar to those on the fourth segment.

The fourth segment has five, or more usually six, pairs of submarginals on the dorsal side. Except between the median pair, these alternate with *marginal bristles* that may be small and hair-like or may be strongly developed, although not so stout as the submarginals. These marginals continue ventrally, where they are densely massed and often excessively long and slender.

(D). The bristles on the legs are referred to as follows:—

The femur is more or less oval in cross-section and that flattened surface that faces the head when the legs are at right angles to the body is called the *anterior side*. The other three sides are respectively *dorsal*, *posterior* and *ventral*.

The anterior femur is without bristles on the anterior side and has a row on each of the other three.

The intermediate femur normally has one anterior row, one posterior row which is restricted to one, two or three subapical bristles, and two ventral rows between which, when reflexed, the tibia lies.

The posterior femur has bristles similar to those on the intermediate femur with the addition of a dorsal row.

The bristles on the female femora are generally fewer in number within each row than those on the male; otherwise the variations from the normal that occur in the male will usually be found occurring in the female. It should be noted that where a row on the male is represented by only one or two bristles, in the female it may be obsolete.

The relative lengths of pubescence, short hair and long hair are illustrated in Text-fig. 4.

Method of pinning specimens and setting the male genitalia.

The method we have adopted in setting Sarcophagid flies is to use a small fine pin passed through the thorax behind the transverse suture and well in front of the scutellum. In this manner the acrostichal bristles remain undamaged and are readily perceptible if present. The insect, if a female, is then "staged."

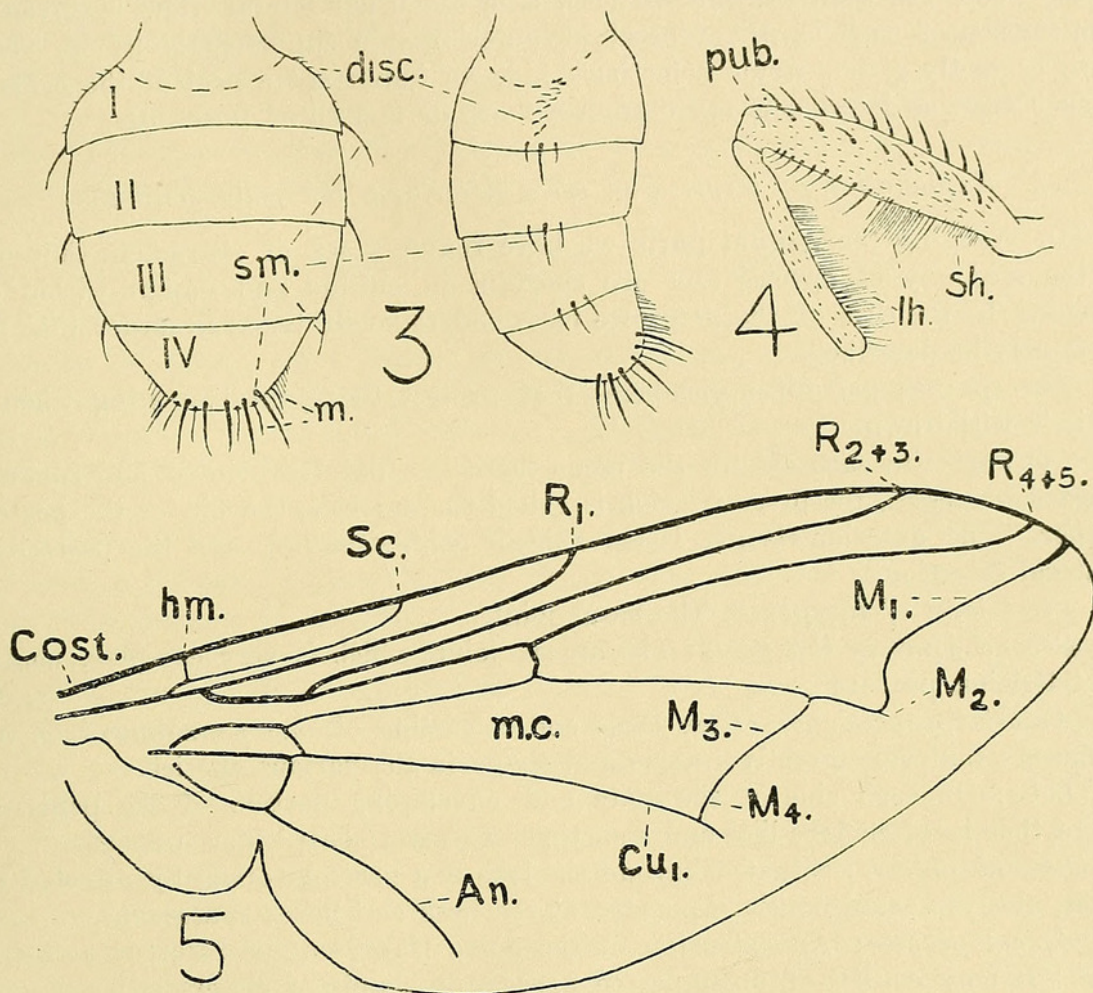
The small pin referred to plays an important part when extracting the male genitalia. It allows the insect to be placed sideways with the genital segments lying close to the cork to which the insect is pinned. A second pin is placed in the cork just above the tip of the abdomen so as to give rigidity and then the genital organs are exposed by inserting the point of another pin against the forceps and drawing them outwards. With fresh material the penis will readily fall into position but with some relaxed specimens a further pin will be necessary to keep the organ in place.

To bring about relaxation we dip the tip of the abdomen into distilled water heated just below boiling point. We find that although the wings may be slightly damaged, especially near the tip, the insect retains its colour and form far more satisfactorily than is usually the case with those relaxed slowly by the more general methods. The time taken to relax by our method is usually half a minute but depends upon the age of the specimen, some very old ones taking quite a minute.

Method of examining and drawing the genital parts.

In examining the type specimens and drawing the genital parts, we have utilised a Leitz-Greenough Stereoscopic Binocular Microscope with eye-pieces O-V, and objectives 25 and 48 mm. The parts of the penis are so very small that it

is necessary to have a stereoscopic effect in order to understand them. We have found it advantageous to examine the organ under higher powers in the direct sunlight, at the same time reflecting the rays with a concave mirror on to the object thus illuminating the inside as well as the outside of the genital complex.



Text-fig. 3. Diagram of the abdomen.

I.-IV. 1st to 4th segments; *disc.* discal; *sm.* submarginal; *m.* marginal.

The median pair of submarginal bristles on the third segment have been accidentally omitted in the drawing.

Text-fig. 4. Diagram of the posterior femur and tibia.

lh. long hair; *pub.* pubescence; *sh.* short hair.

Text-fig. 5. Diagram of the wing.

The veins are named in rotation as follows.—*Cost.* the costa which, bordering the wing, reaches to near the apex; *hm.* humeral, a small cross vein; *Sc.* subcosta; *R*₁. first radial; *R*₂₊₃. second and third radials united; *R*₄₊₅. fourth and fifth radials united; *M*₁. first median; *M*₂. second median; *M*₃ and *M*₄. third and fourth median veins respectively; the basal portion is obsolete thus leaving these two remnants acting as a cross vein between the first median and the cubital vein; *Cu*₁ first cubital which unites with *M*₄ at its apex; *An.* anal; *m.c.* median cell.

By this method we have been able to trace the actual outline of each part of the penis to its source and in a few cases we have augmented our studies by

microslides made from specimens other than the types. The genital parts were drawn in outline by the aid of a camera lucida and the lines not visible by this method were drawn in freehand.

In order to show the relative shape of the various parts more than one view of the penis has been drawn. In each case the usual lateral view is given and another aspect such as the ventral or anterior side supplements it. A ventral view, correctly given, would sometimes hide an important aspect of the organ, so in such cases a drawing is made from a more or less tilted position.

Explanation of terms used when describing the male genitalia.

In studying the genital parts we have found a set of characters that occur in the majority of species and are constant in outline and design within each species. In the case of the penis we have had to select terms in order that these parts may be described.

Forceps: A pair of appendages that protect the genital opening when the penis is withdrawn.

Claspers: On each side of the penis there is a pair of pointed and forwardly directed processes, the first of which is called the *anterior*, the hinder the *posterior* clasper. The anterior clasper is movable in a longitudinal, and the posterior in a lateral direction.

First joint of the penis: The basal joint.

Second joint of the penis: The apical joint, which is very complex, contains the following parts:—

Anterior appendage: Often large and consisting of one, sometimes two, pairs of flanges that vary greatly in size and shape in the various species.

Lobe: On each side of the main and enveloping portion of the penis is a flange that is often lobe-like and sometimes forms a conspicuous process.

Lateral process: Situated beyond the lobe is a pair of forwardly directed processes, always conspicuously separated at the base and never contiguous.

Apical process: An extension of the apex, if present, is referred to by this term. It may consist of an unpaired process or a pair of closely adjacent parts. Extra processes may also be present, but are not usual.

Interior process: A term given to a process arising internally from just posterior to each lobe; so far this process has only been detected in *S. peregrina* Desv. and *S. kappa* J. and T.

Filaments: Between the anterior appendage and the main enveloping portion of the penis there may exist a further pair of appendages referred to by this name. They can be seen arising from the base of the joint and are generally filamentous, although in one species, *S. securifera* Villen., they appear to be highly modified at the apex. Filaments are not always observable and as far as we have determined do not exist in species where they are not apparent.

Variation in the size of species.

One of the commonest species of Sarcophagid flies around Brisbane is *S. tryoni* and of this we have bred over one hundred and fifty specimens, from at least ten females, during four months. One captured female, a very large specimen, produced a batch of flies, all of which were of a large size, about 12 mm. in length. Another, a small female, the identity of which was not known at the time of capture, produced a batch of flies ranging from 6 mm. to about 9 mm.

These two batches, as far as we could tell, were bred under similar conditions and were bred out within a week of each other, consequently it seems possible that size may be an hereditary character quite apart from food. We have other species, varying in size, but not quite reaching the extremes found in *S. tryoni*; nevertheless there is sufficient to show that dimensions are too unstable a character for specific determination. *S. omega* and *S. eta* range from 7 to 12 mm. in the various collections examined.

It is significant to note that the chaetotaxy varied remarkably little in the smaller and larger batches of *S. tryoni* that were bred, and it agrees closely with that of captured specimens.

Genus *SARCOPHAGA* Meigen.

Definition.—The arista is strongly plumose on the basal half and bare thence to the apex. Eyes bare. Thorax with three distinct black stripes. The second humeral bristle situated in a line with or above the presutural. At least four post-sutural dorsocentral bristles. Abdomen tessellated with silvery and black tomentum. Wings without bristles on the vein R_1 , and with a few at the base of R_{4-5} . The vein M_1 , at half its length, bends sharply upwards whence, for a short distance, it proceeds at right angles to the basal part, thence, diverging, reaches the costa before the apex of the wing and near the apex of the vein R_{4-5} . The venation is illustrated and explained in Text-fig. 5.

Observations.—The above definition will be sufficient to distinguish species of the genus *Sarcophaga*, as recognised by us, from other genera of Sarcophagid flies known to us and also from the numerous flies which, although belonging to distinct groups, have a very striking resemblance to these. Further characters have been given under the discussion on the chaetotaxy.

Under the above definition will come also many of the species that have been made the types of other genera, thirty-nine of which were diagnosed in key form by Townsend in 1917. We have attempted to place our Australian species into groups in accordance with Townsend's key, but have found that, in such an attempt, species that, according to genitalia, must be considered closely allied, were widely separated.

In more recent literature several genera have been proposed to contain groups of species that have closely allied genital characters and it is on this principle that ultimate success in re-grouping the Sarcophagid flies will probably be attained.

Sarcophaga alpha, *S. zeta*, *S. beta* and *S. howensis*, to which also may be added (at least for the time being) *S. tryoni*, *S. impatiens* and even perhaps *S. epsilon*, form one group. All these have a well developed flange on the anterior elasper which in the case of the first four becomes bifid. All except the last-named have also a very strongly developed pair of forceps.

S. misera, *S. kohla* and perhaps *aurifrons*, *omega* and *eta* will form a second group. Each has a pair of well developed lateral processes which are bifid in the first two species.

S. bancrofti and *S. fergusoni* will form yet another group, whilst the remaining species have their genitalia too diverse in structure to permit of their being readily grouped in this manner.

A study of the nearest allies within these groups shows that an attempt to use chaetotaxy as a guide to affinities would be misleading.

Key to the species of Australian flies of the genus Sarcophaga based upon the male genital characters.

1. Genital segments red. *securifera* Villen.
Genital segments black. 2.
2. Anterior clasper bifid or with a very wide flange. 3.
Anterior clasper simple, or if a flange be present then it does
not exceed the width of the clasper. 9.
3. Anterior clasper bifid and with a knob anterior to it. 4.
Anterior clasper not bifid and without a knob anterior to it. 6.
4. Filaments present. 5.
Filaments absent. *zeta* J. & T.
5. Anterior clasper bifid nearly to its base. *alpha* J. & T.
Anterior clasper bifid for only half its length. *beta* J. & T.
6. Filaments present. 7.
Filaments absent. *tryoni* J. & T.
7. Forceps large; seen laterally curved and with a conspicuous angle at two-thirds its length. Apex of the anterior appendage with a conspicuous forwardly directed "hook." *impatiens* Walk.
Forceps of moderate length and not angulated. Anterior appendage without a hook. 8.
8. Anterior appendage and lobe very small. Lateral and apical processes together forming a complex tapering and forwardly directed termination to the penis. *epsilon* J. & T.
Anterior appendage large and expanding. Lobe produced to a pointed apex. Lateral process small and curved under a wide, lateral flange on the apical process. *hardyi* J. & T.
9. Lateral process present. 10.
Lateral process absent. 18.
10. A pair of knobs situated behind the lateral processes which are very complex. *omikron* J. & T.
Without such knobs. 11.
11. Lateral process bifid towards the tip. 12.
Lateral process simple. 13.
12. Anterior appendage composed of one pair of broad flanges. *misera* Walk.
Anterior appendage composed of two pairs of narrow flanges. *kohla*, n.sp.
13. With an apical process. 14.
Without an apical process. 16.
14. Apex of the anterior appendage produced into an extremely long process directed downwards. *eta* J. & T.
Anterior appendage without such a process. 15.
15. Anterior appendage broad and much of its area consisting of a mass of minute spines. *peregrina* R.D.
Anterior appendage slender and scarcely discernible when the penis is seen laterally. *depressa* R.D.
16. Filaments present. *aurifrons* Macq.
Filaments absent. 17.
17. Lateral process long, lobe long and pointed; anterior clasper conspicuously longer than the posterior. *omega* J. & T.
Lateral process short, lobe inconspicuous; claspers of about equal length. *froggatti* Taylor.
18. Filaments present. 19.
Filaments absent. 20.
19. Apex of the forceps minutely bifid. Anterior clasper with a small flange at the extreme apex. The pair of anterior appendages slender and bowed, almost meeting at the apex. *synia*, n.sp.

- Apex of the forceps simple. Anterior clasper much longer than the posterior and without a flange at the apex. Anterior appendage widely expanding and broad. *gamma* J. & T.
20. Apical process paired (i.e. consisting of two contiguous processes). 21.
- Apical process not paired. *fergusoni* J. & T.
21. Anterior appendage doubled back, so that the apex is directed towards the base. *bancrofti* J. & T.
- Anterior appendage directed downwards in the usual manner. . . 22.
22. Claspers of about equal length. A pair of interior appendages protrude slightly beyond the apical appendages. *kappa* J. & T.
- Anterior clasper longer than the posterior. Without interior appendages. *littoralis* J. & T.

Alternative key to the male flies of the genus Sarcophaga.

1. Genital segments red. *securifera* Villen.
Genital segments black. 2.
2. With one row of bristles behind the eyes. 3.
With two rows of bristles behind the eyes. 16.
With three rows of bristles behind the eyes. 19.
3. With long hair on the posterior tibiae. 4.
Without long hair on the posterior tibiae. 13.
4. With prescutellar acrostichal bristles. 5.
Without prescutellar acrostichal bristles; with presutural acrostichals. *tryoni* J. & T.
5. With two rows of ventral bristles on posterior femur. 6.
With one row of ventral bristles on posterior femur. 10.
6. Long hair on posterior tibia abundant. 7.
Long hair on posterior tibia scanty. *zeta* J. & T.
7. With one row of disco-lateral bristles on first abdominal segment. 8.
With two rows of disco-lateral bristles on first abdominal segment. *impatiens* Walk.
8. Species with golden yellow tomentum on head and thorax. 9.
Species with silvery-grey tomentum on head and thorax *hardyi* J. & T.
9. Third joint of the antennae about three times the length of the second. *alpha* J. & T.
Third joint of the antennae about twice the length of the second. *beta* J. & T.
10. The marginal bristles on the fourth abdominal segment strongly developed, almost as long as the submarginals. 11.
The marginal bristles on the fourth abdominal segment weak or obsolete. *kappa* J. & T.
11. Third antennal joint about three times the length of the second. *omikron* J. & T.
Third antennal joint about twice the length of the second. . . 12.
12. Outer vertical bristles absent, or at most as long as the post-oculars. *omega* J. & T.
Outer vertical bristles twice the length of the post-oculars. . . *gamma* J. & T.
13. With prescutellar acrostichals. 14.
Without prescutellar acrostichals. *froggatti* Taylor
14. With presutural acrostichals. 15.
Without presutural acrostichals. *misera* Walk.
15. With two extremely long bristles at about half the length of second ventral row on intermediate femur. Ventral hairs on abdomen unusually long. *depressa* R.D.

- Bristles of second ventral row on intermediate femur of about equal length. *littoralis* J. & T.
16. With long hair on the posterior tibiae. 17.
Without long hair on the posterior tibiae. *bancrofti* J. & T.
17. With two rows of ventral bristles on intermediate and posterior femora. 18.
With one row of ventral bristles on intermediate and posterior femora. *eta* J. & T.
18. Ventral hair of abdomen short and scanty. *kohla*, n.sp.
Ventral hair of abdomen rather long and dense. *fergusoni* J. & T.
19. With prescutellar acrostichals; without long hairs on posterior tibiae. 20.
Without prescutellar acrostichals; with long hairs on posterior tibiae. *epsilon* J. & T.
20. With one row of ventral bristles on intermediate and posterior femora. 21.
With two rows of ventral bristles on intermediate and posterior femora. *aurifrons* Macq.
21. With presutural acrostichals. *synia*, n.sp.
Without presutural acrostichals. *peregrina* R.D.

Key to the female flies of the genus Sarcophaga.

1. Genital segments red. *securifera*
Genital segments black or brown. 2.
2. With one row of postocular bristles. 3.
With two (or more) rows of postoculars. 8.
3. With presutural acrostichal bristles. 4.
Without presutural acrostichals; with golden yellow tomentum behind the eyes. *misera*.
4. With prescutellar acrostichals. 5.
Without prescutellar acrostichals. 7.
5. With one row of disco-lateral bristles on the first abdominal segment. 6.
With two rows of disco-laterals on first abdominal segment; with golden yellow tomentum behind the eyes. *impatiens*, *kappa*, *omega*.
6. With golden yellow tomentum behind the eyes. *beta*, *depressa*, *omikron*.
With silver grey tomentum behind the eyes. *hardyi*, *littoralis*.
7. With three postsutural intra-alar bristles. *tryoni*.*
With two postsutural intra-alars. *froggatti*.
8. With presutural acrostichals; with silver grey tomentum behind the eyes. *peregrina*.
Without presutural acrostichals. 9.
9. With golden yellow tomentum behind the eyes. *aurifrons*.
With silver-grey tomentum behind the eyes. *eta*.

In choosing a set of characters whereby any female specimen can be relegated to its correct species, we have been confronted with several difficulties. The females of many species are not certainly known to us, and in only a few cases have we a sufficiently large number that have been correctly referred to their respective males either by breeding or by having been taken *in copula*. Moreover, there appear to be several cases where the identification label has been transferred on specimens previously studied, thus causing confusion in regard to the limits of variation within the species.

*Since this key was prepared further specimens of *S. tryoni* have been bred and many of them are without the third intra-alar bristle.

Of the twenty-two species recorded from Australia, the females of seven are unknown; seven are isolated in the above key, and eight are further grouped into three groups not containing more than three species each. We believe a little modification of the scheme here outlined, when amplified by other characters that may be discovered by a critical survey of females, will ultimately lead to the compilation of a key that will permit the ready determination of the species from the female sex.

SARCOPHAGA ALPHA Johnston and Tiegs. (Text-fig. 6.)

Sarcophaga alpha, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 57, fig. 21; Rec. Austr. Mus., xiii., 1922, p. 177.

Synonymy.—The illustration given by Bottecher, when describing his *S. antiope* (a species from Formosa and New Guinea), has much in common with *S. alpha* and we consider it possible that the two may ultimately be found to belong to one species. The penis in Bottecher's figure does not quite conform to our illustration although the essential characters are there.

Description.—♂. *Head*. Outer vertical bristles about twice the length of the post-oculars; twelve frontals; two or three facials; nine orals; one row of post-oculars.

Thorax. Two intra-alar; one small pair of presutural, and two large pairs of prescutellar acrostichals.

Abdomen. On the first segment one row of two discal lateral bristles and one submarginal; an extra submarginal is developed on one side in the holotype. On the second, one lateral submarginal and an extra one on one side in the holotype. On the third, one median pair and three lateral submarginals. On the fourth segment six pairs of submarginals alternating with marginals.

Genitalia. Forceps long and strongly curved. The anterior clasper bifid almost to the base, and anterior to this there is a small knob; the posterior clasper is broader than the anterior but about the same length. Anterior appendage rather broad and simple; apical process tapering, but moderately broad and rounded at the apex; filaments very long.

Legs. The chaetotaxy conforms to the general type; long hair is abundant on all the femora and on posterior tibiae.

Hab.—Queensland.

Observations.—The above description is taken from the holotype specimen in the Queensland Museum. By slightly altering the position of the parts and allowing for the more forwardly placed filaments, an outline of the genitalia very similar to that given by Bottecher from his *S. antiope* can be seen on the holotype of *S. alpha*.

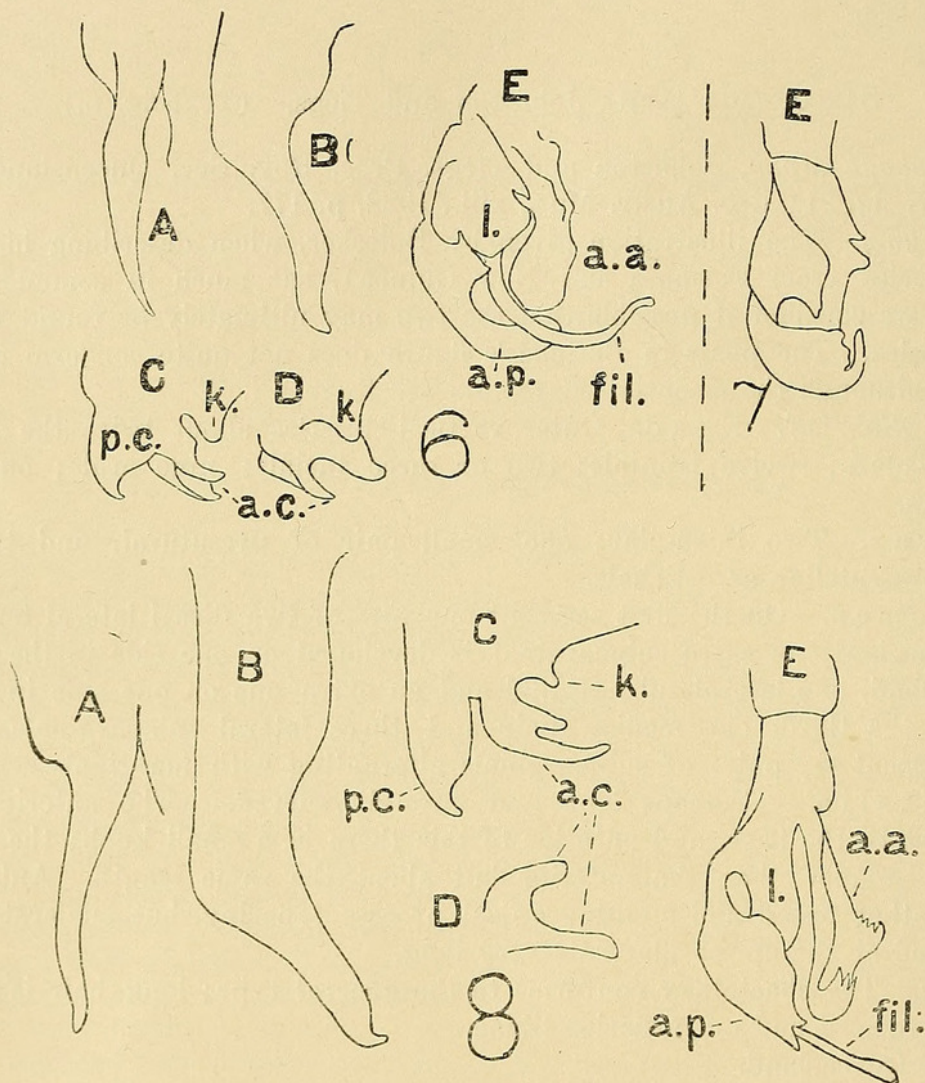
SARCOPHAGA ZETA Johnston and Tiegs. (Text-fig. 7.)

Sarcophaga zeta, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 76, fig. 20; Also xxxiv., 1922, p. 183; Rec. Austr. Mus., xiii., 1922, p. 180.

Description.—♂. *Head*. Outer vertical bristles inconspicuous, as long as the post-oculars; thirteen frontals; eight or more facials; about five orals; one row of post-oculars

Thorax. Two intra-alar bristles; presutural and prescutellar acrostichals present.

Abdomen. On the first segment a row of two discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment the bristles conform to those on *S. alpha*, but this cannot be detected on the holotype as the segment is broken.



Text-fig. 6. *Sarcophaga alpha* J. & T.

Text-fig. 7. *Sarcophaga zeta* J. & T.

Text-fig. 8. *Sarcophaga beta* J. & T.

The following letters occurring in the above and all subsequent illustrations indicate the names of the various parts:—

A. Forceps or the apical part of them seen posteriorly; **B.** The same, lateral view; **C.** Claspers; **D.** Another aspect of one or both the claspers; **E.** Second joint of the penis seen laterally; **F.** The same, ventral view; **G.** The same, or its apex seen posteriorly; **H.** The same, seen anteriorly; **I.** Second joint of the penis, or part of it drawn from another specimen belonging to the same species.

Claspers. *a.c.* anterior clasper; *p.c.* posterior clasper; *k.* knob.

Penis. *a.a.* anterior appendage; *a.p.* apical process; *fil.* filaments, *i.p.* interior process; *k.* knob; *l.* lobe; *l.p.* lateral process.

Genitalia. Forceps and claspers identical with those of *S. alpha*. Anterior appendage enfolded by the remainder of the second joint of the penis which has a pair of slender apical processes; filaments absent.

Legs. The chaetotaxy conforms to the general type but the second ventral row on the posterior femur is weak. The femora are scantily clothed with long hair, the majority being found on the anterior femur; hairs on the posterior tibiae are also scanty.

Hab.—Queensland.

Observations.—The above description is based upon the holotype specimen in the Queensland Museum. In order to test the structure of the penis we relaxed a paratype specimen and could find no sign of the filaments. At the same time we found that, when relaxed, the posterior clasper was movable in a lateral direction and the anterior clasper was hinged to move backwards, so that the three apices of the claspers were brought into one line, in which position they were allowed to dry on one side. The position was secured again on a fresh specimen and with remarkable ease, the two claspers falling into place as readily as they had done in the relaxed specimen.

SARCOPHAGA BETA Johnston and Tiegs. (Text-fig. 8.)

Sarcophaga beta, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 58, fig. 6; Rec. Austr. Mus., xiii., 1922, p. 177.—*S. delta*, Johnston and Tiegs, *ibidem*, xxxiii., 1921, p. 62, fig. 13.

Synonymy.—*Sarcophaga delta* was described from a single male and the penis is doubled back, somewhat distorting the parts, but we have given this a more critical examination, as the other parts of the genitalia were found to be identical with those of *S. beta*. As the parts of the penis are essentially the same in the holotypes of these two species we consider that they cannot be maintained as separate species.

Description.—♂. **Head.** Outer verticals about as long as the post-oculars; on the holotype of *S. beta* there are nine frontals on one side and twelve on the other; and on *S. delta* ten on each side; facials seven or eight; orals seven, and on *S. delta* this row is doubled, that is, there are two rows of about seven each; one row of post-oculars.

Thorax. Intra-alar bristles two (*S. beta*) or three (*S. delta*). Owing to damage, on the thorax only prescutellar acrostichals are discernible on the holotypes, but presutural acrostichals are also present on other specimens.

Abdomen. On the first segment one row of four (*S. beta*) or five (*S. delta*) discal laterals, and one submarginal. On the second, two lateral submarginals. On the third, one median pair and two lateral submarginals. On the fourth segment five pairs of submarginals.

Genitalia. The forceps, claspers and the knob are not very different from those on *S. alpha*, but the anterior clasper is bifid for only half its length. The anterior appendage contains a very delicate fringe that is not easily detected, owing to the lack of chitinisation on the fringed parts; apical process rather broad; filaments very long. These genital parts are very similar to those of *S. howensis* Johnston and Hardy, from which they differ only in the apex of the second joint of the penis.

Legs. The chaetotaxy conforms to the general type, but with the addition of two subapical bristles representing a second dorsal row on the posterior femur. Long hair occurs on all femora and on posterior tibiae.

♀. The chaetotaxy of the female corresponds remarkably well after allowance is made for sexual differences. There are twelve frontal bristles on each side.

Hab.—Queensland.

Observations.—The above description is taken from the holotype specimens of *S. beta* and *S. delta*, and the allotype of *S. beta*, all of which are in the Queensland Museum. A further series of specimens has been examined by us including eight males; the variations in chaetotaxy cover those of the two holotypes, but we have not been able to detect within the series corresponding differences in the male genitalia.

The species *alpha*, *zeta*, *howensis* and *beta* have many genital characters in common; the bifid anterior clasper with the curious knob anterior to it, the long forceps conspicuously bent at two-thirds their length, the small lobe, and the absence of the lateral process do not exhaust the points of similarity. The forceps are raised upon a tubercle that is very prominent in comparison with the corresponding structure on other species. This combination of characters appears to point to very close affinities and it is significant to note that one species, *S. howensis*, has the abnormal character of a pair of median submarginal bristles on the second abdominal segment, which indicates that outstanding characters in chaetotaxy cannot be used advantageously to form natural groups within the genus *Sarcophaga*.

SARCOPHAGA TRYONI Johnston and Tiegs. (Text-fig. 9.)

Sarcophaga tryoni, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 54, figs. 9-10; Rec. Austr. Mus., xiii., 1922, p. 176.—*S. queenslandae*, Parker, Canadian Entom., liv., 1922, p. 6, figs. 1-2.

Synonymy.—Mr. R. R. Parker informs us that his species *S. queenslandae* is the same as *S. tryoni*.

Description.—♂. Head. Outer verticals slightly longer than post-oculars; twelve frontals on one side, thirteen on the other; one strong and several small facials; about seven orals; one row of post-oculars.

Thorax. Two intra-alars on one side, three on the other, and a further one placed anteriorly to the suture is also present. Only the presutural acrostichals present.

Abdomen. On the first segment one row of four or more discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment six pairs of submarginals.

Genitalia. Forceps long. Anterior clasper with a very broad flange. Anterior appendage formed of two parts, the lower of which contains a small but distinct process on the ventral edge; lobe pointed; lateral process barely indicated by a small pointed projection just above the lobe; a pair of apical processes, each containing three pointed projections.

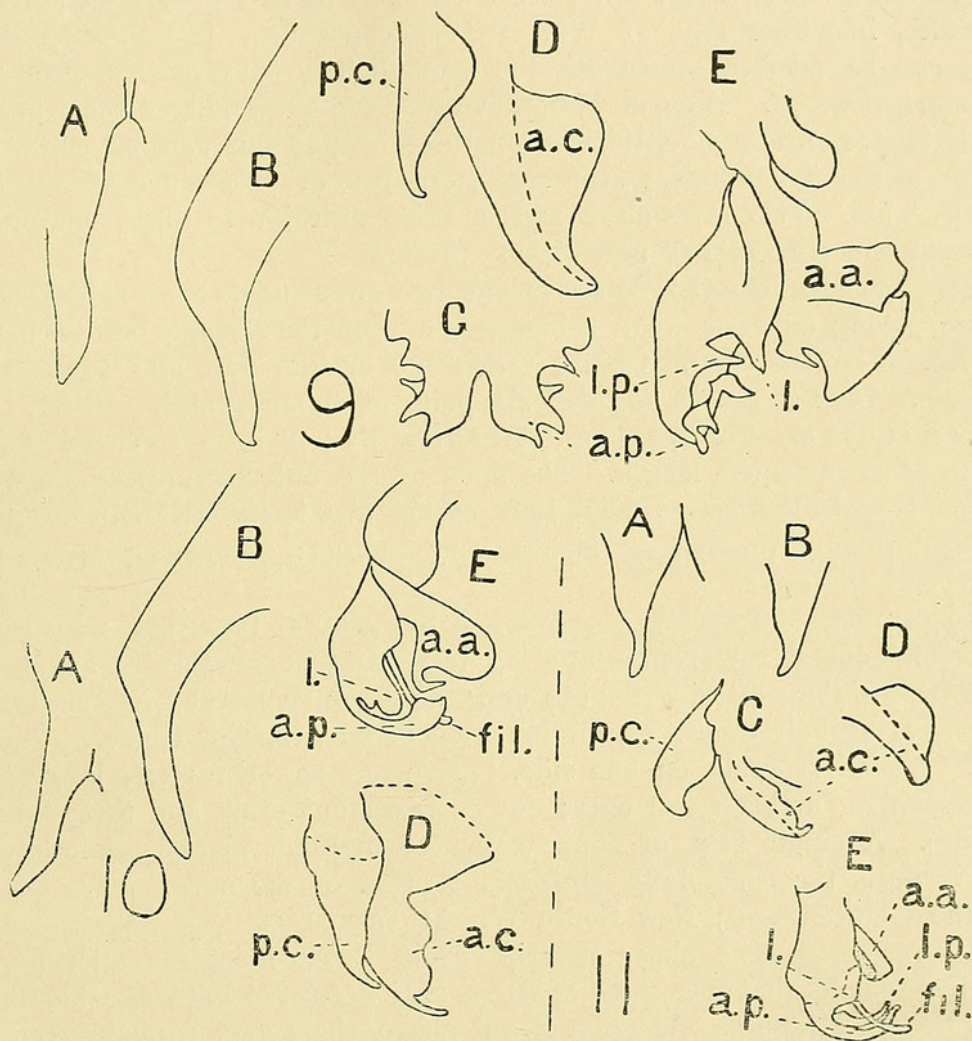
Legs. The chaetotaxy conforms to the general type, but the second ventral row on the posterior femur is represented by three or four subapical bristles only. Long hair occurs scantily on the anterior and posterior femora and abundantly on the posterior tibiae.

♀. The chaetotaxy of the female corresponds well with that of the male, after allowance is made for sexual differences; the submarginal lateral bristle on

the first abdominal segment is missing and the second ventral row on the posterior femur is well indicated.

Hab.—Queensland.

Observations.—On re-examining the material in the Queensland Museum we discovered that the holotype label had been attached to a female specimen, so we have transferred this to the specimen from which the "figure 9" of the original drawings was made. The above description is taken from this newly selected holotype and the allotype, both of which are in the Queensland Museum. Over two hundred specimens have been examined by us, and it appears that the



Text-fig. 9. *Sarcophaga tryoni* J. & T.

Text-fig. 10. *Sarcophaga impatiens* Walker.

Text-fig. 11. *Sarcophaga epsilon* J. & T.

absence of prescutellar bristles, together with one row of post-oculars and three post-sutural intra-alar bristles are characters ample for the determination of this species from either sex.

SARCOPHAGA IMPATIENS Walker. (Text-fig. 10.)

Sarcophaga impatiens, Walker, List Dipt. Brit. Mus., iv., 1849, p. 828; Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 52, figs. 18-19; Also xxxiv., 1922, p. 182; Rec. Austr. Mus., xiii., 1922, p. 176.

Status.—A female specimen was compared by Major E. E. Austen with the holotype female in the British Museum. Bred specimens were determined as belonging to the same species as that compared with the type and the male was described for the first time by Johnston and Tiegs in 1922.

It is significant to note that where, in the compared female, there is only one row of disco-lateral bristles on the first abdominal segment, in that of the described male and in both sexes of other bred specimens there are two rows. These bristles are very well developed, so it excludes the possibility of the second row being reduced on the compared specimen. It seems possible that the compared female belongs to the species known to us as *S. alpha*, but a further study of females, including that of Walker's type specimen, is necessary before any finality can be reached concerning the true identity of Walker's species.

Description.—♂. Head. Outer verticals slightly longer than post-oculars; frontals twelve on one side, thirteen on the other; facials two, beyond which there is a line of about ten hairs; four orals; one row of post-oculars.

Thorax. Two intra-alars and a third anterior to the transverse suture; presutural and prescutellar acrostichals present.

Abdomen. On the first segment two rows of five or six discal laterals, and one strong and one weak submarginal. On the second, one strong and one weak lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment six pairs of submarginals.

Genitalia. Forceps long. Anterior clasper with a broad flange, both claspers of about equal length. The apex of the anterior appendage with a conspicuous, forwardly directed, hook-like process that is characteristic of the species; the apical process paired; the lobe is very distinct; filaments present, projecting just beyond the apex.

Legs. The chaetotaxy conforms to the general type, but with the addition of a second dorsal row represented by two adjacent bristles at about two-thirds the length on the posterior femur; and the second ventral row consists of weak bristles. Long hair occurs on all femora and on posterior tibiae.

♀. Eleven frontals on one side, twelve on the other; one long stout facial and about five further small ones; one or two stout orals and three or four hair-like ones. A single row of four or five strongly developed disco-laterals. In other respects the chaetotaxy conforms to that of the male.

Hab.—Queensland; New South Wales; Tasmania.

Observations.—The above description is taken from the allotype male and from the female that was compared by Major Austen with the holotype female in the British Museum. As pointed out above, these very probably represent two species, and it is impossible at present to determine which, if either, belongs to the true *S. impatiens* of Walker.

The female of *S. impatiens* that was described by Johnston and Tiegs has characters corresponding to the allotype male and in our key to females we have ignored the characters of Major Austen's compared female; we leave the true identity of the species for further consideration. If the characters of the compared specimen were taken into account, then the female would come into the *beta-omikron* group of the key.

SARCOPHAGA EPSILON Johnston and Tiegs. (Text-fig. 11.)

Sarcophaga epsilon, Johnston and Tiegs, Rec. Austr. Mus., xiii., 1922, p. 180, fig. 1.

Description.—♂. *Head*. Outer vertical bristles slightly longer than the post-oculars; twelve frontals; two strong and four short facials; eleven orals, beyond which there is a line of bristle-like hairs; three rows of post-oculars.

Thorax. Two intra-alar bristles; acrostichals absent (the thorax is badly denuded on the holotype but two other specimens examined show that the acrostichals are absent, or, if present, not discernible from the hair, which is rather long and plentiful on this species).

Abdomen. On the first segment one row of five discal lateral bristles and three submarginals. On the second, two lateral submarginals. On the third, one median pair and three lateral submarginals. On the fourth segment six pairs of submarginals.

Genitalia. Forceps slightly curved. Anterior clasper with a well developed flange; the two claspers of about the same length. Anterior appendage very small and simple; lobe inferiorly defined; lateral process probably represented by a pair of appendages that lie close to the equally long apical process; filaments long.

Legs. The chaetotaxy differs from the general type by the absence of the second ventral row on the posterior femur. Long hairs occur scantily on the anterior femur and posterior tibiae.

Hab.—Queensland. New South Wales: 2 ♂♂, Collaroy, Sept., 1921.

Observations.—The description is taken from the holotype male in the Australian Museum.

SARCOPHAGA HARDYI Johnston and Tiegs. (Text-fig. 12.)

Sarcophaga hardyi, Johnston and Tiegs, Rec. Austr. Mus., xiii., 1922, p. 180, Pl. xxxv., fig. 5.

Description.—♂. *Head*. Outer verticals about the length of the post-oculars; frontals eleven on one side, twelve on the other; two rows of about seven facials; five orals; one row of post-oculars.

Thorax. Three intra-alar bristles and a fourth placed presuturally; presutural and prescutellar acrostichals strong.

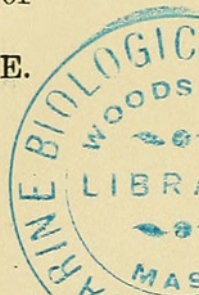
Abdomen. On the first segment one row of three discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and one lateral submarginal. On the fourth segment, five pairs of submarginals alternating with marginals.

Genitalia. Forceps rather short. Anterior clasper longer than posterior and with a short but broad flange near the base. Second joint of the penis composed mostly of thin, uniformly chitinated plates; anterior appendage broad and large, containing an anterior transparent process that is difficult to detect and terminating in a row of spines; lobe produced into a rather long triangular process; lateral process curved under a broad flange situated on the apical process; apical process, besides containing a pair of these flanges, is bifid at the tip; filaments present.

Legs. The chaetotaxy conforms to the general type but the second ventral row on the posterior femur is weak. Long hair occurs on all femora and on posterior tibiae.

♀. The chaetotaxy of the female corresponds remarkably well with that of the male; there are ten frontal bristles.

Hab.—Tasmania. New South Wales: Kosciusko, two males taken by Dr. E. W. Ferguson, December, 1921.

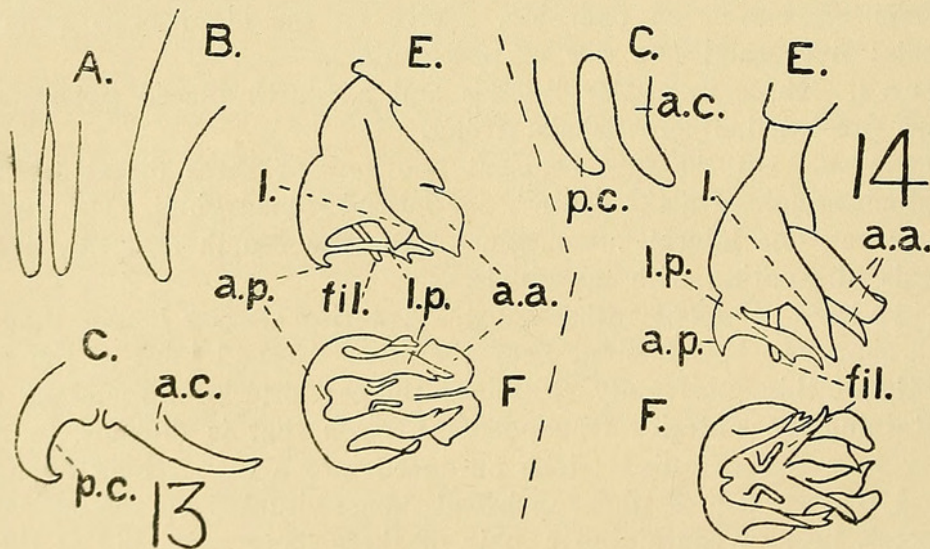
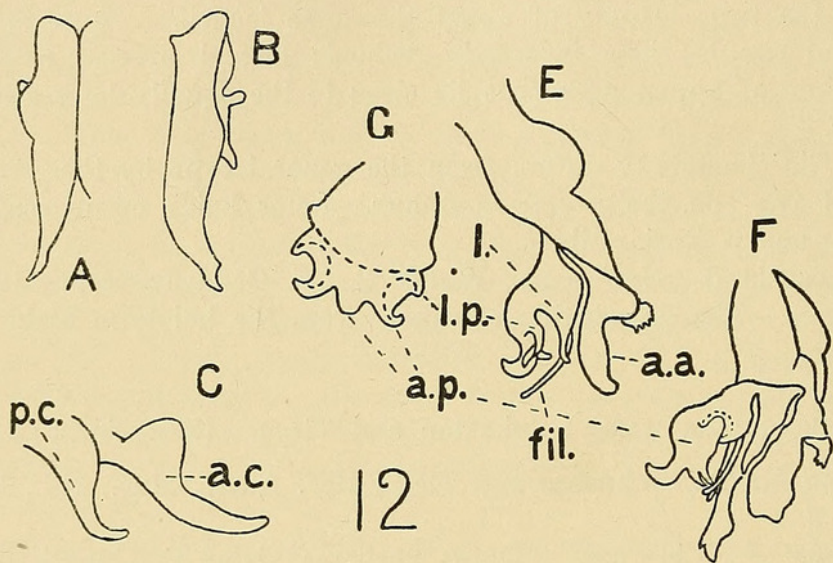


Observations.—The description is taken from the holotype and the allotype in the Australian Museum.

SARCOPHAGA MISERA Walker. (Text-fig. 13.)

Sarcophaga misera, Walker, List Dipt. Brit. Mus., iv., 1849, p. 849; Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 67, fig. 22; Rec. Austr. Mus., xiii., 1922, p. 178.

Status.—Walker's type is a female in the British Museum. Major Austen determined by comparison with the type, two female specimens which are undoubtedly identical with those determined later and described by Johnston and Tiegs under Walker's name.



Text-fig. 12. *Sarcophaga hardyi* J. & T.
Text-fig. 13. *Sarcophaga misera* Walker.
Text-fig. 14. *Sarcophaga kohla*, n.sp.

Description.—♂. Head. Outer vertical bristles scarcely as long as the post-oculars; eleven frontals; four facials; about fourteen orals; one row of post-oculars.

Thorax. Three intra-alar bristles and a fourth placed presuturally; only precutellar acrostichals present.

Abdomen. On the first segment, two discal lateral bristles on one side and two rows of three each on the other; one submarginal lateral. On the second, one lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment, six pairs of submarginals.

Genitalia. Forceps short, simple and slightly curved. The claspers of equal length. Anterior appendage large, broad; lobe pointed at apex; the lateral process long and bifid towards the tip; apical process very small and unpaired; filaments present.

Legs. The chaetotaxy differs from the general type by the absence of the second ventral row on the posterior femur. Long hair on intermediate and posterior femur only.

♀. The chaetotaxy corresponds rather well with that of the male; there are nine frontal bristles.

Hab.—Queensland; New South Wales; Victoria; South Australia and Lord Howe Island.

Observations.—The above description is taken from the allotype male and the larger of the female specimens that were compared with the holotype female in the British Museum by Austen. We have examined about eighty specimens, the majority of which have been recently bred by us.

SARCOPHAGA KOHLA, n.sp. (Text-fig. 14.)

Sarcophaga misera var. *dux*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 70, fig. 23; Rec. Austr. Mus., xiii., 1922, p. 178.

Synonymy.—In a note to Dr. E. W. Ferguson, Mr. R. R. Parker referred to his *S. subtuberosa* as being synonymous with *S. dux* Thomson and consequently Johnston and Tiegs published this information.

S. misera var. *dux*, however, cannot be accepted as identical with *S. subtuberosa* Parker or *S. dux* Thomson, as there are too many genital and other differences between them and, on this account, we describe the species under a new name.

Description.—♂. **Head.** Outer verticals scarcely longer than the post-oculars; frontals ten on one side, eleven on the other; about four facials; twelve orals; two rows of post-oculars.

Thorax. Three intra-alar bristles and a fourth placed presuturally; pre-cutellar acrostichals only present.

Abdomen. On the first segment, two rows of strong discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, six pairs of submarginals.

Genitalia. Forceps and claspers similar to those on *S. misera*. The anterior appendage divided into two pairs of more or less equally long and narrow parts; lobe conspicuously more prominent than in *S. misera*; and the bifid lateral process is more slender than the corresponding part on that species; also the apical process is longer and more pointed.

Legs. The chaetotaxy conforms to the general type. Long hair occurs abundantly on all femora and on posterior tibiae.

Hab.—Queensland; New South Wales.

Observations.—Described from one of the original specimens referred to by Johnston and Tiegs as *S. misera* var. *dux*, and now deposited as holotype in the Australian Museum, Sydney.

We have examined the female specimen from Honolulu, together with a male from the same locality that is evidently conspecific with it; these agree far better with *S. misera*, although showing characters in chaetotaxy which, if constant, would easily separate the Australian *S. misera* from the Honolulu specimens of *S. dux*. This pair from Honolulu has the second row of black post-ocular bristles small and considerably thinned out, every alternate one or two bristles being obsolete. Also the penis shows a form approaching *S. misera* in the shorter apical process and the structure of the anterior appendage, the latter approximating that drawn by Parker to illustrate his *S. subtuberosa*.

We have examined five specimens of *S. kohla*, one of which is in the Queensland Museum and two are in Dr. Ferguson's collection.

SARCOPHAGA SECURIFERA Villeneuve. (Text-fig. 15.)

Sarcophaga securifera, Villeneuve, Mitt. Zool. Mus. Berlin, iv., p. 123, fig.; Bottcher, Deut. Ent. Zeitsch., 1913, pp. 15, 370, fig. 41; Aldrich, *Sarcophaga* and allies, 1916, p. 202, fig. 95.

Description.—♂. Head. Outer verticals strong, at least twice the length of the post-oculars; frontals from seven to twelve; facials about seven; orals about twelve; one row of post-oculars.

Thorax. Two intra-alars; acrostichals absent (in male only).

Abdomen. On the first segment, one row of discal laterals and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, five or six pairs of submarginals.

Genitalia. Genital segments red. Forceps rather broad. Claspers simple, slender, the anterior longer than the posterior. Anterior appendage small, simple; lobe rather sinuous and pointed; lateral process long and terminating in a small flat semicircular disc; filaments rather complex at the apex, their true nature not having been detected.

Legs. The chaetotaxy appears to conform to the general type. Long hair occurs on the anterior femur and on the posterior femur and tibia.

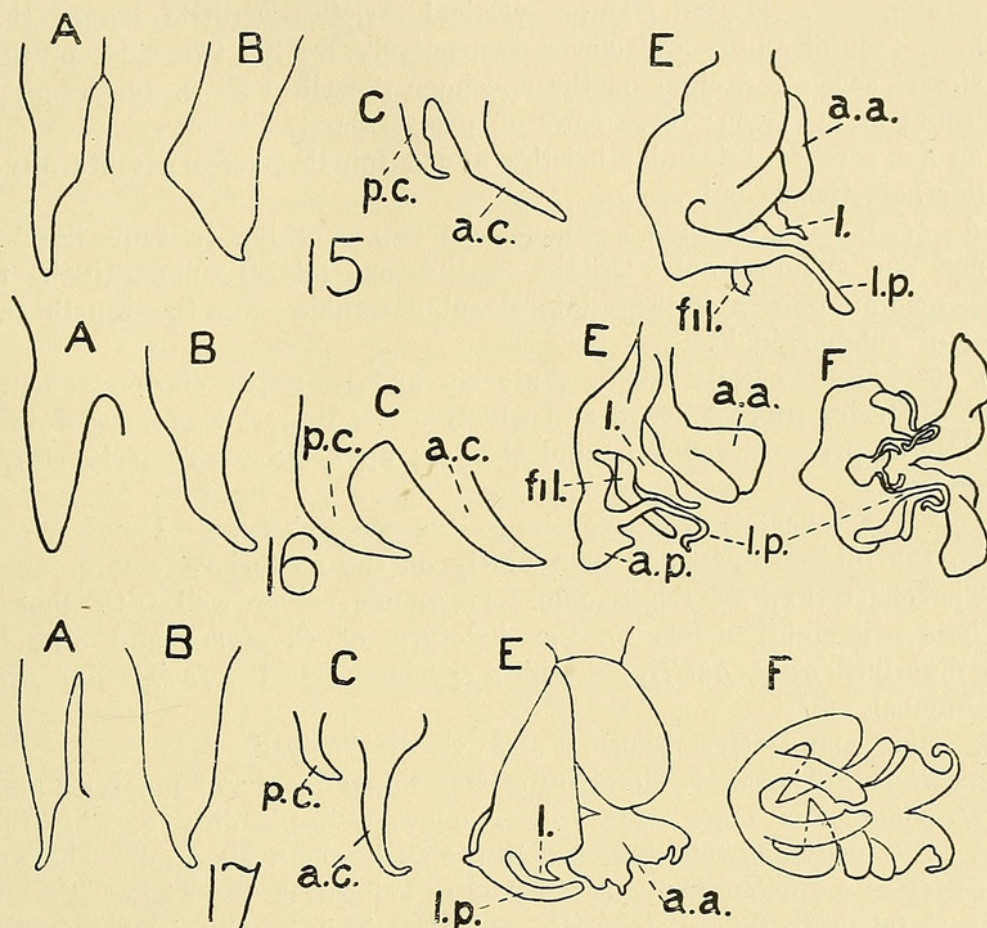
♀. Contrary to the usual rule, this species has several characters on the female that disagree with those on the male. The prescutellar acrostichals are strong and there are two strongly developed rows of discal lateral bristles on the first abdominal segment. The genital segments of the female are red like those of the male, a character that will readily separate the species from all others described in this paper.

Hab.—Originally described from the Canary Islands, this species has a wide range covering Europe, North America and now the new record from Australia. Twelve specimens before us were bred by Dr. E. W. Ferguson from a female captured in Sydney during April, 1922, the flies emerging during September and October of the same year.

Observations.—The dates supplied by Dr. Ferguson show that the species winters in the pupal stage between twenty-two and twenty-six weeks, whereas all other species so far bred by us have remained only twelve or thirteen weeks.

maximum as a pupa, the one exception being an isolated female that persisted in the pupal condition for a little under twenty weeks.

This long wintering period, the fact that the locality Sydney is a port in direct shipping communication with the United States of America, the abundance with which the fly occurs in North America in association with markets and such-like places, as well as the fact that it is the only species yet recorded from



Text-fig. 15. *Sarcophaga securifera* Villeneuve.

Text-fig. 16. *Sarcophaga aurifrons* Macquart.

Text-fig. 17. *Sarcophaga omega* J. & T.

Australia with red genital segments, all point to this species as having been introduced into Australia.

SARCOPHAGA AURIFRONS Macquart. (Text-fig. 16.)

Sarcophaga aurifrons, Macquart, Dipt. Exot. suppl. 1, 1846, p. 191.—*S. aurifera*, Brauer and Bergenstamm, Denkschr. Akad. Wiss. Wien, lviii., 1891 (*nomen nudum*).—*S. aurifrons*, Brauer, Denk. Akad. Wiss. Wien, Math. Nat. Cl., cvii., 1898, p. 21; Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 71, fig. 4; Also xxxiv., 1922, p. 183; Rec. Austr. Mus., xiii., 1922, p. 178.—*S. sigma*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 84; Rec. Austr. Mus., xiii., 1922, p. 180.

Synonymy.—The name *Sarcophaga aurifrons* has been applied to quite a number of distinct species by various Australian economic entomologists. In 1921, Johnston and Tiegs determined the identity of a female specimen identified

as Macquart's species by Coquillett. A critical re-examination of the genitalia of *S. sigma* has convinced us that this species belongs to *S. aurifrons* as identified by Johnston and Tiegs and therefore this second name is placed as a synonym. The genital character referred to under *S. sigma* as "laterally there is a curious tube-like structure of a pale brown colour" is a misinterpretation due to chitination giving the appearance of a tube.

Description.—♂. *Head*. Outer vertical bristles a little longer than the post-oculars; frontals, nine and eleven respectively on the two sides of the holotype *S. sigma*, seven and eight on the specimen described as *S. aurifrons*; facials three or four; orals eleven; three rows of post-oculars.

Thorax. Three intra-alar bristles and a fourth placed presuturally; weak prescutellar acrostichals only.

Abdomen. On the first segment, one row of three or four discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment, five pairs of submarginals.

Genitalia. Forceps short. Anterior and posterior claspers about equal in length. Anterior process broad and widely expanding; lobe formed into a long process; lateral process very long and slender; apex not, or scarcely, forming a definite process.

Legs. The chaetotaxy conforms to the general type. Long hair occurs scantily on the intermediate, and abundantly on the posterior, femora.

♀. The chaetotaxy of the female corresponds rather well with that of the male. There are eight facials on the holotype of *S. sigma* and nine on the specimen described as *S. aurifrons*, which specimen has the facials and orals reduced in number.

Hab.—Queensland; New South Wales; South Australia.

Observations.—The above description was taken from the holotype and allotype of *S. sigma*, and from male and female specimens described by Johnston and Tiegs as *S. aurifrons*; all these are in the Queensland Museum. The genitalia were drawn from a further specimen marked as being that from which the original drawing was taken to figure *S. aurifrons* and which is also in the Queensland Museum.

SARCOPHAGA OMEGA Johnston and Tiegs. (Text-fig. 17.)

Sarcophaga froggatti, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 73, fig. 12; Also xxxiv., 1922, p. 183; Rec. Austr. Mus., xiii., 1922, p. 179; (*nec.* Taylor).—*S. (Parasarcophaga) omega*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 86, figs. 25, 26.

Synonymy.—As pointed out below under *Sarcophaga froggatti* Taylor, that species conforms to *S. theta* Johnston and Tiegs. *S. froggatti* Johnston and Tiegs was based upon a specimen that had been compared by Mr. G. Hill with the type material in the Tropical Institute, Townsville, but without comparing the male genitalia.

S. froggatti Johnston and Tiegs has its genitalia identical with those of *S. omega*, the excrescences on the head of which are due to a persistence of the pilinum that is unusually even on each side in this case, but paralleled by similar cases amongst other Muscoidean flies captured by us.

Aldrich determined a specimen of this fly as *S. knabi* Parker, but Parker's drawing of the genitalia of that species differs from the one we give here in

several respects and therefore it seems advisable to await further particulars before accepting Aldrich's determination which, if correct, would necessitate reverting to Parker's name.

Description.—♂. *Head*. Outer verticals apparently absent; nine frontals on one side, ten on the other; three or four minute facials; about twelve orals; one row of post-oculars.

Thorax. Two intra-alars; presutural and prescutellar acrostichals present.

Abdomen. On the first segment, two rows of four discal lateral bristles and three submarginals. On the second, two lateral submarginals. On the third, six (or seven) pairs of submarginals; on the fourth segment, six pairs of submarginals alternating with marginals.

Genitalia. Forceps short. Claspers simple, anterior much longer than the posterior. Anterior appendix complex; lobe long, directed inwards; lateral process long; apical process and filaments absent.

Legs. The chaetotaxy differs from the general type by having the second ventral row on the posterior femur reduced to hairs. Long hair occurs on all the femora and on posterior tibiae.

Hab.—Queensland.

Observations.—The description is taken from the holotype of *S. omega* in the Queensland Museum. All the specimens grouped under the name *S. froggatti* in the collections examined were captured and not bred, so on this account there are none amongst those revised that can indisputably be placed as the female of this species.

SARCOPHAGA ETA Johnston and Tiegs. (Text-fig. 18.)

Sarcophaga eta, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 65, fig. 14; Also xxxiv., 1922, p. 183; Rec. Austr. Mus., xiii., 1922, p. 178.

Description.—♂. *Head*. Outer verticals about as long or slightly longer than the post-oculars; eight frontals on one side, nine on the other; two stout facials and a line of further hair-like ones; about twelve orals; two rows of post-oculars.

Thorax. Three intra-alars; only prescutellar acrostichals present.

Abdomen. On the first segment, two rows of two discal lateral bristles and three submarginal. On the second, two lateral submarginals. On the third, one median pair and three lateral submarginals. On the fourth segment, four pairs of submarginals.

Genitalia. Forceps rather long and slender, seen from the rear they curve outwards. Anterior clasper slightly longer than the posterior. Anterior appendage produced downward into a long process; lobe long and pointed; lateral process long and rather thin; apical process small, unpaired; filaments long.

Legs. The chaetotaxy differs from the general type by having the second ventral row on the intermediate and posterior femora reduced to hairs. Long hairs occur on all femora and on posterior tibiae.

♀. Four or five orals and only one row of post-oculars. Three intra-alars on one side, two on the other, but on each side there is a further one placed presuturally. The second ventral rows on the intermediate and posterior femora are represented by a few bristles.

Hab.—Queensland.

Observations.—Our description is taken from the holotype and allotype specimens in the Queensland Museum and it will be noted that the female disagrees with the male in several respects.

In the original description this species is stated to be described from specimens bred from fish, but the allotype bears a label containing "fr. bad meat; Brisb. 10/20."

Other females examined by us, including some recently bred, have the second row of post-oculars present, and even a third row, indicated on most males, is sometimes definitely indicated on the female; nevertheless, the two rows of discolaterals on the first abdominal segment appear to be a constant feature on the female, whilst the male invariably has but one. In the key we have taken account of our bred specimens in preference to the characters of the allotype, which specimen we consider has been erroneously labelled.

SARCOPHAGA FROGGATTI Taylor. (Text-fig. 19.)

Sarcophaga froggatti, Taylor, Bull. Ent. Res., vii., 1917, p. 265; Parker, Canadian Ent., liv., 1922, p. 8, fig. 4. (*Nec* Johnston and Tiegs, 1921-2, which = *omega*).—*S. theta*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1922, p. 73, fig. 5; Rec. Austr. Mus., xiii., 1922, p. 179.

Synonymy.—Since the publication of the description of *S. froggatti* by Johnston and Tiegs, Parker gave another species this name, basing his identification on a single paratype female supplied by Taylor. As it became necessary to ascertain to which species Taylor's name belonged, Mr. G. F. Hill, of the Institute of Tropical Medicine, Townsville, kindly submitted the holotype to us for study and to have the genitalia extracted. We find that the paratype examined by Parker has probably been correctly associated with the male, but the details with respect to the anterior appendage, the accessory plate and the three minute spines towards the apex of the forceps are not in accordance with the type. We have drawn the genitalia of Taylor's holotype and this will readily be recognised as being the same as *S. theta* Johnston and Tiegs.

Description.—♂. *Head.* Outer verticals a little or scarcely longer than the post-oculars. Nine frontals on one side, eight and ten respectively on the other side of the holotypes of *S. froggatti* and *S. theta*; four very small facials; six orals; one row of post-oculars.

Thorax. Two intra-alar bristles; only presutural acrostichals present.

Abdomen. On the first segment, one row of discal lateral bristles, one strong and one weak submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, six pairs of submarginals alternating with slender marginal bristles.

Genitalia. Seen from the rear the forceps are curved inwards. Claspers of about equal length. Anterior appendage with two paired parts, the inner pair being the longer; lobe and lateral process small.

Legs. The chaetotaxy differs from the general type by the absence of the second ventral row on the posterior femur. Long hair on the anterior and posterior femora only.

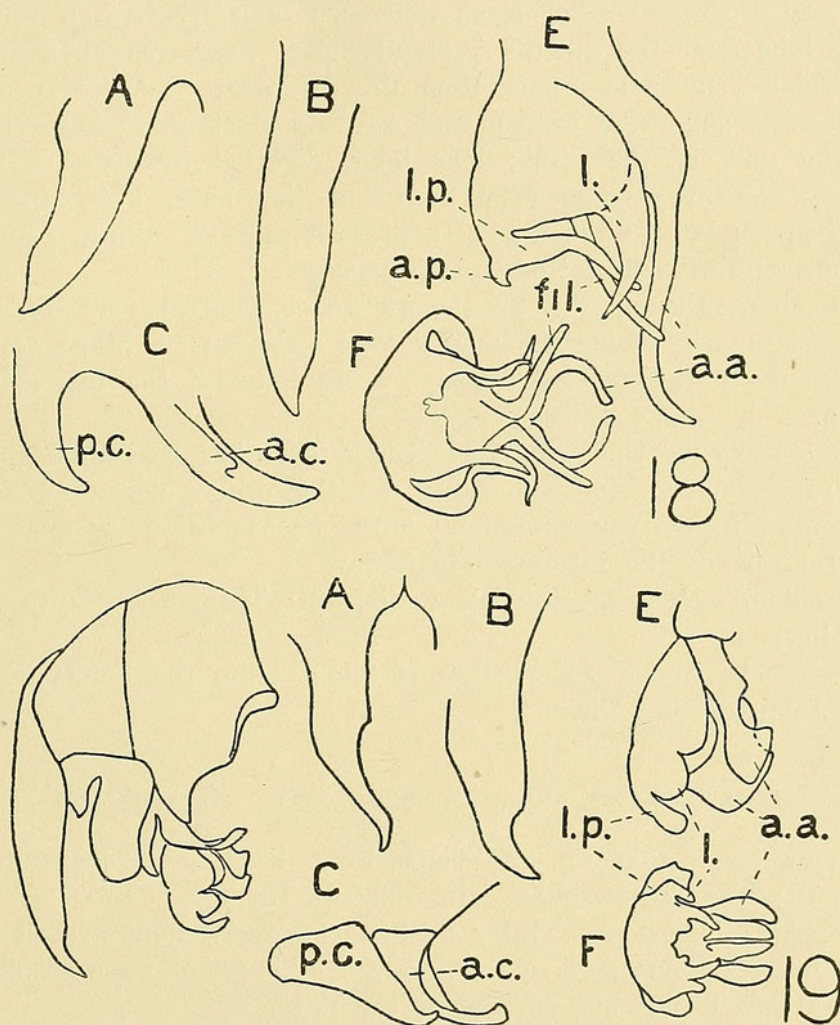
♀. The chaetotaxy of the female corresponds rather well with that of the male; there are eight frontals on the allotype of *S. theta*.

Hab.—Queensland.

Observations.—The above description was taken from the holotype of *S. froggatti* Taylor in the Institute of Tropical Medicine, Townsville, and from the holotype and allotype of *S. theta* Johnston and Tiegs, in the Queensland Museum. The original illustration of *S. theta* was taken from a paratype specimen.

SARCOPHAGA DEPRESSA (Robineau Desvoidy). (Text-fig. 20.)

Myophora depressa, Robineau Desvoidy, Essai Myod., 1830, p. 353.—*Sarcophaga depressa*, Johnston and Tiegs, Rec. Austr. Mus., xiii., 1922, p. 197, Pl. xxv., fig. 4; Proc. Roy. Soc. Queensland, xxxiv., 1922, p. 183.—*Myophora musca*,



Text-fig. 18. *Sarcophaga eta* J. & T.

Text-fig. 19. *Sarcophaga froggatti* Taylor.

- i. A drawing of the genitalia taken from the holotype in the Institute of Tropical Medicine, Townsville.
- ii. Portions of the genitalia taken from the holotype of *S. theta* J. & T. in the Queensland Museum, and to which the letters are attached.

Robineau Desvoidy, *ibidem*, 1830, p. 360.—*Sarcophaga flavifemorata*, Macquart, Dipt. Exot. suppl. 4, 1850, p. 233.—*S. iota*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 79, fig. 11.

Synonymy.—The above synonymy is that given by Johnston and Tiegs in 1922.

Description.—♂. *Head*. Outer verticals shorter than the post-oculars; eight frontals terminating parallel with the base of the antennae; five facials; about ten orals; one row of post-oculars.

Thorax. Three intra-alars and a fourth placed presuturally on one side only; presutural and prescutellar acrostichals present.

Abdomen. On the first segment, one row of about four discal laterals and one submarginal. On the second, one lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment, five pairs of submarginals alternating with smaller marginals. The whole ventral area of the abdomen is exceptionally hairy.

Genitalia. Forceps rather long, and seen laterally with a very characteristic heel-like lobe near the apex. A small flange near the apex of the anterior clasper which is a little longer than the posterior. Anterior appendage slender, seen laterally somewhat hidden and scarcely protruding beyond the apex of the enveloping part of the joint; lobe long, directed inwards and therefore mostly concealed; lateral process very broad at the base, but tapering to a slender serrated apex; behind the lateral process a pair of minute processes and behind these again a minute unpaired apical process.

Legs. At about the middle of the posterior ventral row on the intermediate femur, there are two exceptionally long bristles; in other respects the chaetotaxy conforms to the general type. Long hair on the intermediate and posterior femora.

♀. The chaetotaxy of the female corresponds rather well with that of the male; eight frontals on one side and seven on the other, extending beyond the base of the antennae in the usual manner; only one exceptionally long bristle in the second ventral row of the intermediate femur.

Hab.—Queensland; New South Wales; Victoria; Tasmania; South Australia; Western Australia.

Observations.—The above description is taken from the holotype and allotype of *S. iota* Johnston and Tiegs.

SARCOPHAGA OMIKRON Johnston and Tiegs. (Text-fig. 21.)

Sarcophaga omikron, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 82, fig. 16; Rec. Austr. Mus., xiii., 1922, p. 180.

Description.—♂. *Head*. Outer verticals scarcely longer than the post-oculars; ten frontals on one side, eleven on the other; two rows of about four facials each; about six orals; one row of post-oculars.

Thorax. Two intra-alars; prescutellar and presutural acrostichals present, the latter, however, owing to a fracture, are not to be detected on the holotype.

Abdomen. On the first segment, one row of four discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, five submarginals alternating with marginals.

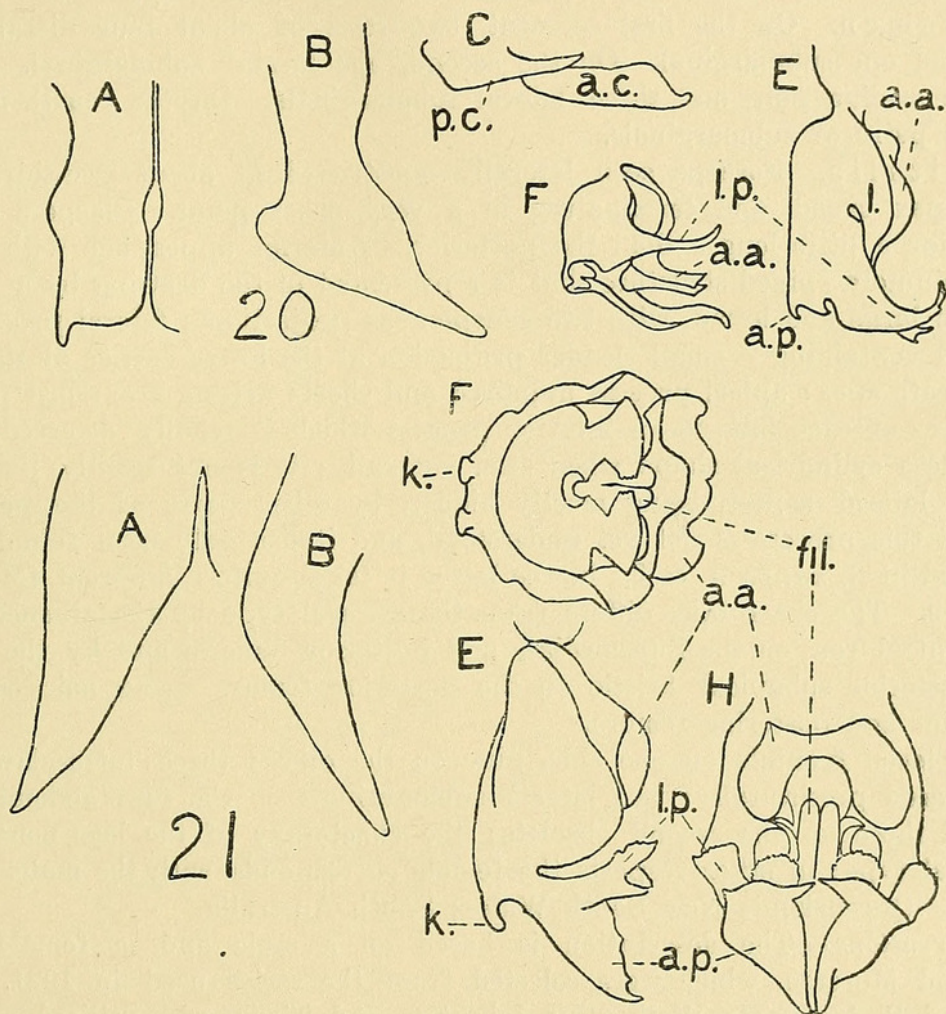
Genitalia. Forceps rather simple, curved and diverging towards the apex. Claspers long and strongly curved forward, the anterior one shorter than the posterior. Anterior appendage small; the lobe not at all conspicuous; a pair of knobs is situated at what may be the true apex, but the lateral processes are

complex and joined at the base by a hood that forms a further process, unpaired; filaments presents.

Legs. The chaetotaxy differs from the general type by the absence of the second ventral row on the posterior femur. Long hair occurs on the posterior tibiae.

♀. The chaetotaxy of the female corresponds rather well with that of the male. Nine frontals; five submarginals on the third abdominal segment.

Hab.—Queensland; South Australia; Western Australia.



Text-fig. 20. *Sarcophaga depressa* Desvoidy.

Text-fig. 21. *Sarcophaga omikron* J. & T.

Observations.—The description is taken from the holotype and allotype in the Queensland Museum.

SARCOPHAGA PEREGRINA (Robineau Desvoidy). (Text-fig. 22.)

Myophora peregrina, Robineau Desvoidy, Essai Myod., 1830, p. 356.—*Sarcophaga peregrina*, Johnston and Tiegs, Rec. Austr. Mus., xiii., 1922, p. 177; Proc. Roy. Soc. Queensland, xxxiv., 1922, p. 182.—*Myophora subrotunda*, Robineau Desvoidy, *ibidem*, p. 357.—*M. rapida*, Robineau Desvoidy, *ibidem*, p. 360.—*Sarcophaga irrequieta*, Walker, List Dipt. Brit. Mus., iv., 1849, p. 830; Johnston

and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 63, figs. 1-3.—*S. ochripalpis*, Thomson, Eugenes Resa, Dipt., 1868, p. 537.

Synonymy.—The above synonymy relating to species described from Australia, is selected from a longer list of synonymy for this species that was published by Johnston and Tiegs, in 1922.

Description.—♂. Head. Outer verticals slightly longer than the post-oculars; eleven frontals on one side, ten on the other; facials, two rows of about five each; about ten orals; three rows of post-oculars.

Thorax. Two intra-alars; prescutellar acrostichals only.

Abdomen. On the first segment, two rows of about four discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment, about five pairs of submarginals.

Genitalia. Forceps seen laterally constricted at about two-thirds their length, apex broad and terminating in a very short point. Claspers slender, the anterior a little longer than the posterior. Anterior appendage with a large area of minutely spined structure that is represented in the drawing by a serrated edge; lobe large and broad, with two conspicuous projections; lateral process very broad and containing a small slender projection at the lower corner of the otherwise truncate apex; apical process unpaired and short; arising from just posterior to the base of each lobe is an interior process which is readily detected by the more or less cylindrical shape when seen ventrally; it is not readily perceptible from the lateral aspect, being mostly hidden by other parts of the penis; the nature of this process is not yet understood, and it has only been found in this species and in *S. kappa* J. & T.; in the latter it takes quite a different form.

Legs. The chaetotaxy differs from the general type by the absence of the second ventral row on the intermediate and posterior femora, and by the absence of the posterior subapical bristle on the posterior femur. Long hair occurs on the anterior and posterior femora.

♀. Eleven frontals on one side, nine on the other; three intra-alars and a fourth placed presuturally; two lateral submarginals on the first abdominal segment and those on the second obsolete; the chaetotaxy of the legs conforms to the general type; in other respects the female corresponds with the male.

Hab.—Queensland; New South Wales; South Australia.

Observations.—The description is based on a male and a female in the Queensland Museum, which were selected from the series used in 1921, for the account of *S. irrequieta* Walker by Johnston and Tiegs, who utilised a general set of characters that occurred in the majority of the specimens and, consequently, their description does not fit any particular pair of specimens in the series. The characters of the chaetotaxy are very variable within this species.

SARCOPHAGA BANCROFTI Johnston and Tiegs. (Text-fig. 23.)

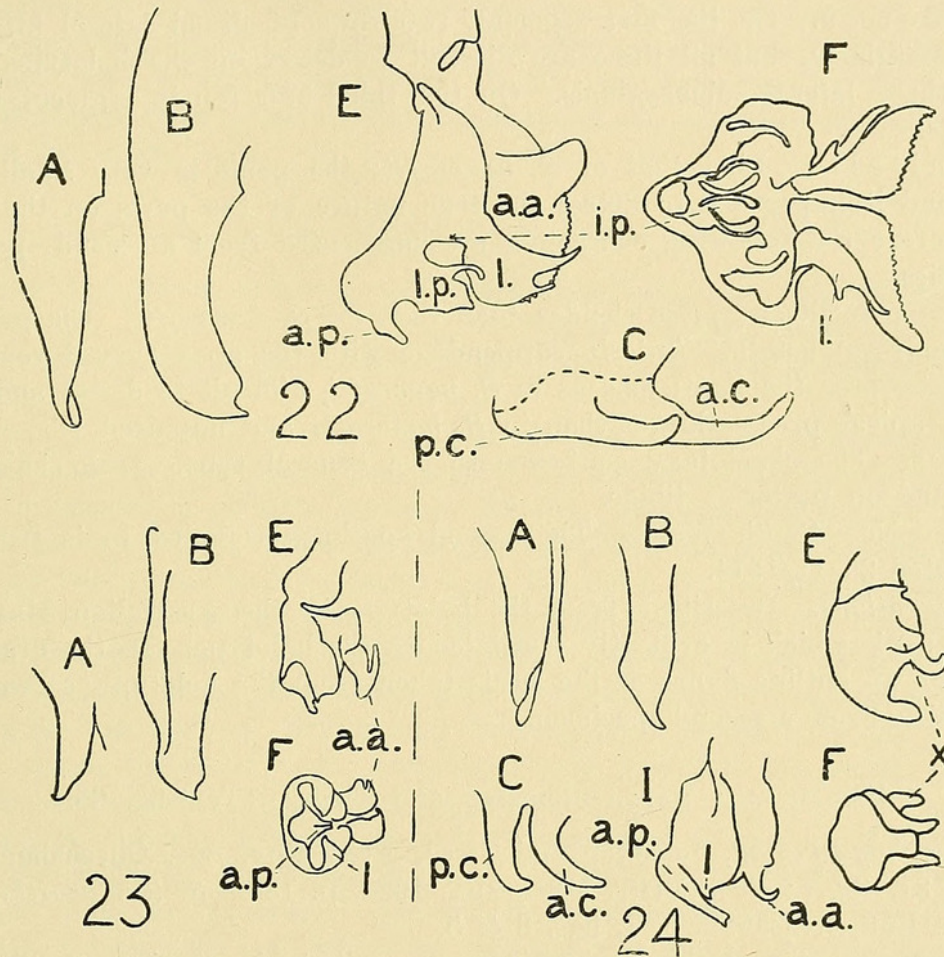
Sarcophaga bancrofti, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 85, fig. 8.

Description.—♂. Head. Outer verticals obsolete on one side and represented by a very short bristle on the other; nine frontals; one long and three other facials; nine or ten orals; two rows of post-oculars.

Thorax. Three intra-alars, and a fourth placed presuturally; prescutellar acrostichals present, the presutural acrostichals, if present, are not to be distinguished from the bristly vestiture around them.

Abdomen. On the first segment, one row of discal lateral bristles and one submarginal. On the second, two lateral submarginals. On the third, five pairs of submarginals. On the fourth segment, six pairs of submarginals.

Genitalia. Forceps very short and rather broad. Claspers not sufficiently perceptible to be drawn, but they are simple and of about equal length. Second joint of the penis exceptionally small; anterior appendage folded so that the apex is directed towards the base; lobe present and directed inwards; apical process small and paired.



Text-fig. 22. *Sarcophaga peregrina* Desvoidy.

The second joint of the penis (E) has the interior process omitted in the lateral view; this process is mostly hidden and arises where indicated by the dotted line from "i.p."

Text-fig. 23. *Sarcophaga bancrofti* J. & T.

Text-fig. 24. *Sarcophaga fergusonii* J. & T.

The second lateral view (I) of the penis is taken from a specimen that is considered to be *S. fergusonii*, and it shows the true shape of the joint which is evidently damaged on the holotype. *x* indicates an outgrowth occurring on one side only of the holotype and apparently accidental.

Legs. The chaetotaxy conforms to the general type. At most long hair is scantily represented on the posterior femur.

Hab.—Queensland.

Observations.—The description is taken from the unique holotype in the Queensland Museum.

SARCOPHAGA FERGUSONI Johnston and Tiegs. (Text-fig. 24.)

Sarcophaga fergusoni, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiv., 1922, p. 186, fig. 2.

Description.—♂. *Head*. Outer vertical bristles about the length of the post-oculars; ten frontals; about seven facials; ten orals; two rows of post-oculars, the second of which consists of very weak bristles.

Thorax. Three intra-alars and a fourth placed presuturally; prescutellar acrostichals only.

Abdomen. On the first segment, two rows of discal lateral bristles and two submarginals, but all these are difficult to detect on the holotype. On the second, three lateral submarginals. On the third and fourth segments, six submarginals.

Genitalia. Like that of *S. bancrofti*; the penis is very small and we have found it impossible to detect the true nature of the parts on the holotype and therefore the following characters are augmented from a second specimen of this species.

Forceps small and more slender than those of *S. bancrofti*. Claspers simple and of uniform length. Anterior appendage with the apex curved round so as to point towards the base; lobe as in *S. bancrofti*, difficult to detect and directed inwards; apical process larger than in *S. bancrofti* and unpaired.

Legs. The chaetotaxy conforms to the general type. Long hairs on all femora and on posterior tibiae.

Hab.—New South Wales. The second specimen referred to is from Uralla and is dated 25/11/1914.

Observations.—Described from the holotype in the Australian Museum, except the penis which is evidently mutilated on the holotype. In the drawings we have given an outline figure of the penis taken from the holotype, as well as the details taken from a second specimen.

SARCOPHAGA KAPPA Johnston and Tiegs. (Text-fig. 25.)

Sarcophaga kappa, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 81, fig. 7; Rec. Austr. Mus., xiii., 1922, p. 180.—*S. illingworthi*, Parker, Canadian Ent., liv., 1922, p. 7, figs. 3 & 5.

Synonymy.—Mr. R. R. Parker informs us that his species, *S. illingworthi*, is the same as *S. kappa*.

Description.—♂. *Head*. Outer verticals about the length of the post-oculars; nine frontals; four or five small facials; six orals; one row of post-oculars.

Thorax. Three intra-alars on one side, two on the other; presutural and prescutellar acrostichals present.

Abdomen. On the first segment, one discal lateral and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, five or six pairs of submarginals.

Genitalia. Forceps rather long and slightly curved. Anterior and posterior claspers short and of about equal length. Anterior appendage small, containing a pair of widely separated and well defined short processes; lobe moderately long; apical process consisting of a pair of broad flanges; two closely adjacent interior processes extend a little beyond the apical processes; they are referred to under the description of *S. peregrina*.

Legs. The chaetotaxy differs from the general type by having only one ventral row on the posterior femur. Long hair on all femora and on posterior tibiae.

♀. Nine frontals on one side, ten on the other; two rows of two discal laterals on the first abdominal segment; the chaetotaxy of the femora conforms to the general type; in other respects the female conforms to the male.

Hab.—Queensland; New South Wales.

Observations.—The description is taken from the holotype and allotype in the Queensland Museum. The one isolated discal bristle on the first abdominal segment is probably due to a reduction of bristles occurring on both sides, where normally the male as well as the female should have two rows of these bristles; similar cases have been found on individual specimens of other species that normally have two rows.

SARCOPHAGA GAMMA Johnston and Tiegs. (Text-fig. 26.)

Sarcophaga gamma, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiii., 1921, p. 60, fig. 15; Also xxxiv., 1922, p. 182; Rec. Austr. Mus., xiii., 1922, p. 180.—*S. brunneopalpis*, Johnston and Tiegs, Proc. Roy. Soc. Queensland, xxxiv., 1922, p. 184, fig. 1.

Synonymy.—We have recently secured a series of about forty specimens of this species and have concluded that despite the difference in chaetotaxy, and the supposed difference in genitalia between the two forms, *S. gamma* and *S. brunneopalpis*, the two really represent one species. The difference in the genitalia between the two forms will be found near the apex of the second joint of the penis, where the process-like lobe and the filaments are clearly discernible in one, but hidden and apparently absent in the other. We have observed several specimens that exposed these parts when first the genitalia were extracted, but the penis became distorted on drying and thus came to conform to the "gamma" type. Moreover, there are both forms of genitalia within the series, with and without the corresponding presutural acrostichal bristles.

Mr. R. R. Parker informs us that he considers *S. gamma* Johnston and Tiegs, is identical with *S. ochidea* Bottecher, but Bottecher's drawing of the genitalia differs from ours in several respects, the most noticeable of which will be found in the relative size and shape of the claspers. Bottecher's localities include New Guinea, nevertheless we consider it advisable to await further information before accepting this possible synonymy.

Description.—♂. **Head.** The outer verticals about twice the length of the post-oculars; eight frontals, ten on one side in *S. brunneopalpis*; one or two stout facials; about twelve orals; one row of post-oculars.

Thorax. Two intra-alar bristles in *S. gamma*, three in *S. brunneopalpis*; presutural and prescutellar acrostichals, the former, however, missing in the holotype of *S. gamma* and in many other specimens of our long series.

Abdomen. On the first segment, two rows of eight discal lateral bristles, five in *brunneopalpis*, and three submarginals. On the second, three lateral submarginals, two in *brunneopalpis*. On the third, one median and three lateral submarginals on *S. brunneopalpis*, but supplemented to form six pairs on *S. gamma*. On the fourth segment, five or six pairs of submarginals that alternate with slenderer marginals.

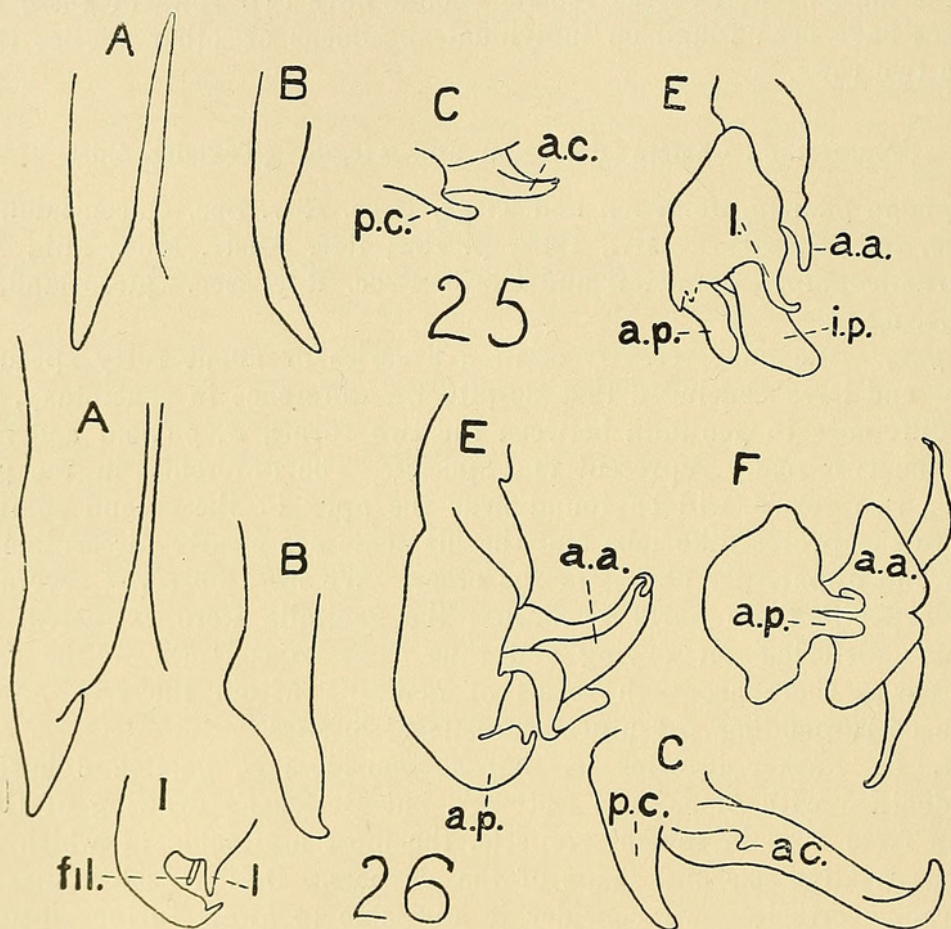
Genitalia. Forceps long. Anterior clasper much longer than the posterior. Anterior appendage widely expanding; lobe forming a small process;

apical process paired; filaments present; the apex of the penis has contracted on the holotype of *S. gamma*, so that the lobe and filaments are not apparent on this specimen.

Legs. The chaetotaxy differs from the general type by having the second ventral row on the posterior femur reduced to hairs. Long hair abundant on the intermediate and posterior femora and on the posterior tibiae.

Hab.—Queensland; New South Wales.

Observations.—The description is taken from the holotypes of *S. gamma* and *S. brunneopalpis* in the Queensland Museum and we have examined about forty further specimens mostly taken around dead birds on Mt. Coot-tha, Bris-



Text-fig. 25. *Sarcophaga kappa* J. & T.

Text-fig. 26. *Sarcophaga gamma* J. & T.

The apex of the penis from the holotype of *S. brunneopalpis* J. and T. (I) shows the true form of the lobe and filaments which characters are concealed in the holotype of *S. gamma*.

bane, during September, 1922. Although males were very abundant in this locality, we were not able to associate with the species any female specimens also taken during this month.

SARCOPHAGA LITTORALIS Johnston and Tiegs. (Text-fig. 27.)

Sarcophaga littoralis, Johnston and Tiegs, Rec. Austr. Mus., xiii., 1922, p. 183, Pl. xxv., fig. 2; Proc. Roy. Soc. Queensland, xxxiv., 1922, p. 184.

Description.—♂. **Head.** Outer verticals not traceable, frontals weak,

twelve or thirteen, scarcely extending beyond the base of the antennae; about four stout facials; four orals, also stout; one row of post-oculars.

Thorax. Badly denuded; probably there are three intra-alars and both presutural and prescutellar acrostichals present.

Abdomen. On the first segment, one row of about three discal laterals and one submarginal. On the second, one lateral submarginal. On the third, one median pair and two lateral submarginals. On the fourth segment, seven pairs of submarginals alternating with marginals.

Genitalia. Forceps broad, terminating in a pointed apex. Claspers simple and small, the anterior longer than the posterior. Anterior appendage small; lobe plainly discernible; the apex consists of a pair of broad flanges, the lower edge of each containing a small fold; the flanges are arranged hood-like, so that the interior of the penis cannot be seen from the ventral aspect.

Legs. The chaetotaxy differs from the general type by the absence of the subapical bristles on the posterior femur. Long hair occurs scantily on all femora.

♀. Frontals eleven or twelve. As in the male, the thorax is damaged, but there are probably three intra-alars, and a fourth placed presuturally; both presutural and prescutellar bristles may be present. The intermediate legs are missing; the posterior femur contains one anterior row of bristles, one subapical dorsal bristle and at least one ventral row.

Hab.—Queensland.

Observations.—The above description is taken from the holotype and allotype in the Australian Museum; both specimens are in a very dilapidated condition.

SARCOPHAGA SYNIA, n.sp. (Text-fig. 28.)

Description.—♂. **Head.** The outer vertical bristles scarcely longer than the post-oculars; ten frontals on one side, eleven on the other; two strong and four or five weak facials; ten orals; three rows of post-oculars, but the two posterior ones are formed of rather slender bristles. Third joint of antennae slightly longer than twice the length of the second. Frontal stripe as wide as parafrontals.

Thorax. Three intra-alars and a fourth placed presuturally; presutural and prescutellar acrostichals present.

Abdomen. On the first segment, a row of four discal lateral bristles and one submarginal. On the second, one lateral submarginal. On the third, one median pair and three lateral submarginals. On the fourth segment, five pairs of submarginals.

Genitalia. Forceps rather simple but terminating in a double point. Anterior claspers with a small flange near the apex, the posterior smaller and simple. The second joint of the penis recalls that of *S. carnaria* Meigen; the anterior appendage consists of a pair of bowed processes that almost meet at the apex; the lobe is very well differentiated; the apex curves forward like that of *S. carnaria* and is unpaired; filaments present.

Legs. The chaetotaxy differs from the general type by the number of bristles in the ventral rows on the intermediate femur being reduced, and by the anterior and the second ventral row on the posterior femur being obsolete.

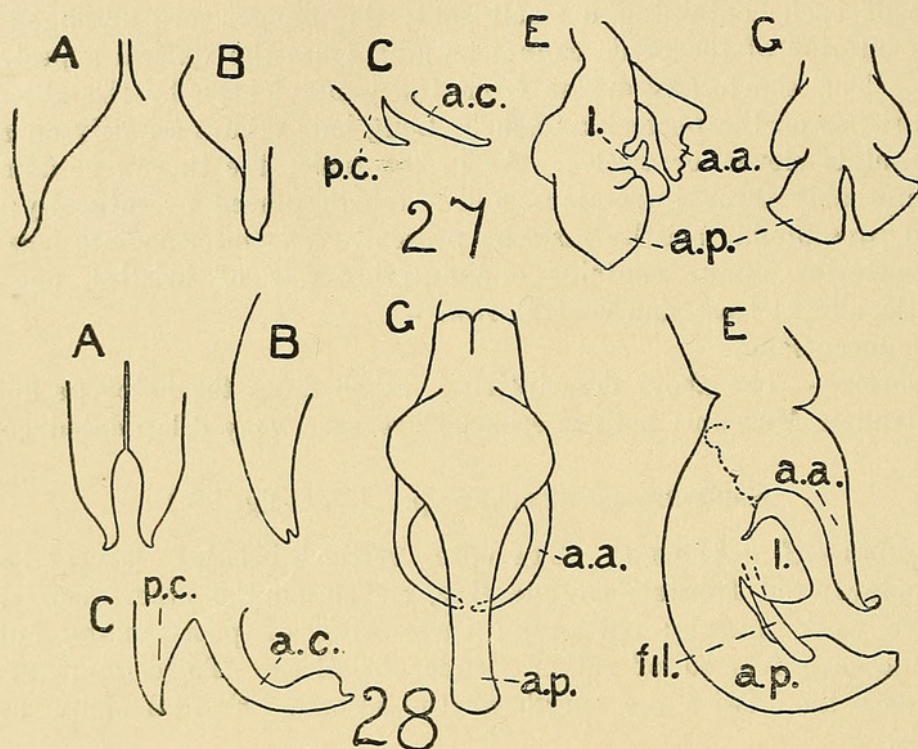
Colour.—Silvery grey, with slight indications of yellowish in places.

Length.—12 mm.

Hab.—Queensland: Mt. Coot-tha, Brisbane, September, 1922; one male, unique.

Observations.—This species bears a remarkable resemblance to *S. carnaria* Meigen in regard to the characters of the male genitalia; in both species the forceps and claspers are of about the same length and of the same general form; the penis also agrees in having characters in common. Possibly this species is the original one upon which the record of *S. carnaria* in Australia was based.

The specimens of *S. carnaria* Meigen examined by us consists of two males and a female from Europe; a male determined by C. J. Wainwright in 1915, and a pair determined by Bottecher and kindly supplied by Dr. M. Bezzi.



Text-fig. 27. *Sarcophaga littoralis* J. & T.

Text-fig. 28. *Sarcophaga synia*, n.sp.

UNRECOGNISED SPECIES.

Sarcophaga praedatrix Walker. (List Dipt. Brit. Mus., iv., 1849, p. 826).

Status.—This species was described by Walker as having the third antennal joint three times the length of the second; and the length of the body five lines. The remainder of the account would fit almost any species of the genus. It was evidently described from a moderately large specimen, not particularly "golden," in which the third antennal joint is longer than usual and such characters would conform to the female of *S. kappa* Johnston and Tiegs.

Locality.—Port Essington, Northern Territory.

Sarcophaga pallichrus Thomson. (Eugenies Resa, 1869, p. 539).

Status.—This species has been placed provisionally by Van de Wulp under *Sarcophagula*. Its small size suggests *Helicobia australis*, but the original description seems to indicate that it is not a Sarcophagid fly.

List of works referred to.

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