

THE PUPARIA AND LARVAE OF SARCOPHAGID FLIES

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INTRODUCTION

The family Sarcophagidae has always been considered a very difficult group of flies and especially difficult in the immature stages. The adults are determined very easily by the male genitalia. These flies are very important from the fact that some species are parasitic on insects of great economic importance, while other species are parasitic on turtles and the higher animals, including man. Some species are parasitic and others simply scavengers in dead insects, mollusks, and decomposing animal matter, while certain species are either a parasite or a scavenger as the opportunity offers. The larvae of the genus *Wohlfahrtia* are found under the skin of young infants. There are also records of these larvae working under the skin of some of the lower vertebrates, such as the cat, dog, and rabbit. The larvae of *Sarcophaga* are often found in the nasal passages of man and also in open wounds of various animals. The larva of *Sarcophaga haemorrhoidalis* has been found in the intestinal tract of man on several occasions. The full-grown larva always leaves the wound and pupates elsewhere. The puparium is formed from the molted larval skin. So far as known none of the species of Sarcophagidae deposit eggs. All the species deposit first-stage larvae or maggots which start to work in immediately, and they develop very rapidly under favorable conditions.

Up to this time there has been no attempt to classify the larvae or pupae. In the larval and pupal stage the main character used for separating this family from the other muscoid flies is the absence of the button on the spiracular plate. This button is also absent in some species in the family Oestridae, but there can be no confusion because the larva and the puparium of this family are of an entirely

different form from that of the Sarcophagidae and are almost completely covered with very large chitinous spines. This button is located on the inner edge of the spiracular plate either near the middle or on the lower half. All of the pupae have a pit or cavity at the posterior end which I call the "posterior cavity." There are several species in the family Tachinidae which also have this posterior cavity but all of these Tachinids have a definite button on the spiracular plate. Within this cavity are located the spiracular plates and they are always located on the upper half of the cavity. It is very difficult to see these plates and it is also impossible to determine a species accurately without first cutting into this cavity. With a sharp knife and using a little care you can make a transverse cut which will divide the cavity into an upper and a lower half. After this operation the spiracular plates will be seen to be very distinct in each species. In the pupal stage the tubercles on the edge of the posterior cavity are quite variable in the various species and may be present or absent and this is due, I think, to the shrinkage in transforming and drying. However, the constancy of these tubercles in their presence or absence seems to be reliable within the species.

In the larval stage the tubercles around the edge of the posterior cavity are always present. The spiracular plate of the larva differs slightly from that of the puparium. In the larva this plate is generally a pale yellowish white in the central area with an amber color towards the upper or outer ends of the slits and with a very deep amber or dark brown ring around the edge. The ends of this outer ring appear to be separated at the lower end of the plate. In transforming to the pupal stage the appearance of the spiracular plate is changed by the entire plate changing to a deep red or black color, and in shrinking, the ends of this outer ring are contracted, causing the plate to be a little more pointed. The slits are of an amber color and darken a little in the pupal stage. The anterior spiracles are often of considerable value, but there is a possibility of variation in the number of lobes of each spiracle.

For details of the terms used in this paper see plate 1, figures 1 and 2. The dotted line shows the contour of the posterior cavity and just above the horizontal axis is shown the location of the spiracular plates.

I think the term *spiracular plate* is more appropriate and should be used in place of the term *stigmatal plate* used in my former paper.¹ The right spiracular plate is drawn for each species.

¹ An illustrated Synopsis of the Puparia of 100 Muscoid Flies (Diptera), by C. T. Greene, Proceedings of the U. S. National Museum, 1921, vol. 60, article 10, pp. 1-39, pls. 1-20, No. 2405.

The number given to each species is the same in the table of species, description, and the figure on the plate.

The specimens used in this paper are labeled with the number herein given to the species and a reference to the number of this article.

Unless otherwise stated, the material is located in the national collection.

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TABLE OF SPECIES—PUPARIA

1. Puparium definitely wrinkled along the segmental lines.....	2
Puparium not wrinkled as above.....	3
2. Segmental wrinkles distinct on at least half of the puparium; posterior cavity shallow, located centrally on the horizontal axis; posterior spiracular plates smooth without definite lobes.	
No. 1, <i>Sarcophaga cistudinis</i> Aldrich.	
Segmental wrinkles distinct on the anterior segments 1-4; posterior cavity deep, located on the horizontal axis but mostly above; spiracular plates with three distinct lobes, the inner one short.	
No. 2, <i>Sarcophaga communis</i> , var. <i>ochracea</i> Aldrich.	
3. Posterior end of puparium with three black chitinized points on each side and above the posterior cavity; posterior cavity medium sized, elliptical, located on but mostly below the horizontal axis; posterior spiracular plates with three distinct lobes with all slits slightly arcuate.	
No. 3, <i>Sarcophaga communis</i> Parker.	
Posterior end of puparium without chitinized points.....	4
4. Puparium with a keel or ridge below the posterior cavity.....	5
Puparium without a keel or ridge at posterior end.....	8
5. A narrow definite keel reaching from the posterior cavity to the anal opening.....	
No. 4, <i>Sarcophaga securifera</i> Villeneuve.	
Without a definite keel but having a definite rounded ridge below the posterior cavity.....	6
6. A broad, rounded, definite ridge connecting with the two tubercles at the anal opening; posterior spiracular plates with three lobes, slits narrow, sinuous; a narrow extension of chitin on the lower and outer edge of the plate.....	
No. 5, <i>Sarcophaga cooleyi</i> Parker.	
With a ridge not well developed like the above.....	7
7. A broad, flattened, slightly raised surface below the posterior cavity, with a large rounded tubercle each side of the anal opening; posterior cavity very large; spiracular plate with three definite lobes, pointed at the base; slits nearly straight.....	
No. 6, <i>Agria affinis</i> Fallén.	
Puparium not as above.....	8

8. Puparium with posterior cavity located above or below the horizontal axis----- 9
 Puparium with posterior cavity located on the horizontal axis----- 10
9. Posterior cavity distinctly below the horizontal axis; spiracular plate rounded with a definite extension on the outer edge.
 No. 7, *Sarcophaga eleodis* Aldrich.
 Posterior cavity distinctly above the horizontal axis; spiracular plate without an extension; slits short and nearly straight.
 No. 8, *Sarcophaga opifera* Coquillett.
10. Posterior cavity quite round with the edge flattened.
 No. 9, *Sarcophaga subaenescens* Aldrich.
 Posterior cavity not as above----- 11
11. Posterior cavity extremely small----- 12
 Posterior cavity very large----- 13
12. Posterior end of puparium slightly tuberculate; spiracular plates with three distinct lobes; slits short, broad, pointed apically.
 No. 10, *Sarcophaga hunteri* Hough.
 Posterior end of puparium more broadly tuberculate, with three segments a little indefinite; lobes smaller, slits short and narrow.
 No. 11, *Sarcophaga atlanis* Aldrich.
13. Posterior cavity extremely large----- 14
 Posterior cavity medium sized to large----- 15
14. Posterior cavity located centrally on horizontal axis; last two segments visible; spiracular plate rounded; slits narrow; two inner ones very long, outer slit noticeably shorter----- No. 12, *Sarcophaga fuscicauda* Böttcher.
 Posterior cavity slightly quadrate (especially at base); spiracular plate with three broad slits; the plate has a broad extension on the upper and outer edges----- No. 13, *Sarcophaga sternodontis* Townsend.
15. Posterior cavity large----- 16
 Posterior cavity medium sized----- 17
16. Posterior cavity slightly semicircular, with yellowish pointed tubercles on the edge; spiracular plates with three narrow, nearly straight slits.
 No. 14, *Sarcophaga australis* Aldrich.
 Posterior cavity irregularly rounded, with greater portion below the horizontal axis; spiracular plate large, with three large lobes, each lobe with a long, broad slit----- No. 15, *Sarcophaga sarracenioides* Aldrich.
17. Posterior spiracular plate without definite lobes----- 18
 Posterior spiracular plate with definite lobes----- 19
18. Posterior cavity elliptical; located centrally on horizontal axis, edge of cavity with indications of tubercles; below the cavity is a definite outlined rounded area containing two rounded tubercles; spiracular plate about as broad as long; slits broad, pointed at the base.
 No. 16, *Wohlfahrtia vigil* Walker.
 Posterior cavity elliptical, with only the lower edge of the cavity touching the horizontal axis; spiracular plate with three very broad slits pointed at the base----- No. 17, *Sarcophaga aculeata* Aldrich.
19. Spiracular plate with a tuberculate projection on the inner edge; plate rounded with three curved slits--- No. 18, *Sarcophaga singularis* Aldrich.
 Spiracular plates not as above----- 20
20. Spiracular plates with a small narrow ridge in addition to the main lobes----- 21
 Spiracular plates without the above ridge----- 22

21. Spiracular plates with a narrow ridge on the lower inner edge; slits long, narrow; the inner slit with a bend just above the middle.
 No. 19, *Sarcophaga haemorrhoidalis* Fallén.
 Spiracular plate with a narrow ridge between the two inner slits; slits of nearly equal length, broad. No. 20, *Chaetoravinia quadrisetosa* Coquillett.
22. Anal opening located on a definite tubercle; spiracular slits short, slightly curved; plate with an extended edge along the upper and outer edges.
 No. 21, *Sarcophaga rudis* Aldrich.
 Anal opening not as above..... 23
23. Spiracular plates rounded, lobes flattened with three straight slits of equal length..... No. 22, *Sarcophaga pachyprocta* Parker.
 Spiracular plates not flattened..... 24
24. Spiracular plate with the first slit bent sharply downward to the right. 25
 Spiracular plate not as above..... 26
25. Spiracular plate with the middle slit quite long; posterior cavity large.
 No. 23, *Sarcophaga barbata* Thomson.
 Spiracular plate with the middle slit short, posterior cavity small.
 No. 24, *Sarcophaga bisetosa* Parker.
26. Posterior cavity round or nearly so..... 27
 Posterior cavity elliptical..... 28
27. Spiracular plate with an oblique point on the first lobe.
 No. 25, *Sarcophaga plinthopyga* Wiedemann.
 Spiracular plate without the above point; spiracular plate more quadrate; lobes broad..... No. 26, *Helicobia helicis* Townsend.
28. Spiracular plate with the first slit much longer than the second or third.
 No. 27, *Sarcophaga uliginosa* Kramer.
 Spiracular plate not as above..... 29
29. Lobes of plate broad; slits short and broad; posterior cavity on but below the horizontal axis; lower edge of cavity with short rugosities.
 No. 28, *Sarcophaga davidsoni* Coquillett.
 Lobes not as above..... 30
30. Spiracular slits short..... 31
 Spiracular slits long..... 32
31. Spiracular plate rounded; slits slightly bent; posterior cavity not elliptical; no indication of segmentation on the posterior end of pupa.
 No. 29, *Sarcophaga prohibita* Aldrich.
 Spiracular plate more rectangular; first slit slightly curved, with the other two slits parallel; posterior cavity elliptical; one segmental line prominent on the posterior end of the puparium.
 No. 30, *Sarcophaga morosa* Aldrich.
32. First two slits longer than the third..... 33
 All slits of about equal length..... 34
33. All three slits slightly arcuate; a conical tubercle on each side of anal opening..... No. 31, *Sarcophaga latisterna* Parker.
 First two slits slightly arcuate; third slit quite short and straight.
 No. 32, *Sarcophaga marginata* Aldrich.
34. Puparium with indications of segmentation on the posterior end; first slit slightly sinuous; a tubercle on each side of the anal opening.
 No. 33, *Sarcophaga bullata* Parker.
 Puparium smooth..... 35

35. Puparium with a depression, containing a central ridge above the posterior cavity; posterior cavity small, rounded; a weak tubercle each side of the anal opening; first slit bent toward the second, other slits nearly straight, of equal length..... No. 34, *Sarcophaga utilis* Aldrich.
Puparium not as above..... 36
36. Posterior cavity located on but mostly below the horizontal axis..... 37
Posterior cavity located more centrally on the horizontal axis..... 38
37. Spiracular plate somewhat rounded: three long, narrow, arcuated slits of equal length; a small tubercle each side of anal opening; these tubercles close together..... No. 35, *Sarcophaga tryoni* Johnston and Teig.
Spiracular plate not so rounded; third slit shorter than first two; larger tubercle each side of anal opening; these tubercles widely separated.
No. 36, *Sarcophaga dux* Thomson.
38. With large rounded tubercles each side of anal opening; slits in spiracular plate narrow, slightly arcuate and of nearly equal length.
No. 37, *Sarcophaga aldrichi* Parker.
Tubercles at anal opening very small or absent..... 39
39. Tubercle small..... 40
Tubercles absent; spiracular plate with an extension of chitin except on the inner edge; first two slits parallel; third slit slightly arcuate and extending below the other slits..... No. 38, *Sarcophaga kellyi* Aldrich.
40. Middle slit long, straight..... 41
All three slits slightly arcuate; posterior cavity elongated transversely; ridges on spiracular plate broad, with a deep notch between them.
No. 39, *Ravinia peniculata* Parker.
41. Spiracular plate rounded; tubercles and anal opening near lower edge of posterior cavity..... No. 40, *Sarcophaga placida* Aldrich.
Spiracular plate more rectangular; tubercles more widely separated; more distant from posterior cavity and with a slightly raised area between them..... No. 41, *Sarcophaga froggatti* Taylor.

TABLE OF SPECIES—LARVAE

1. Anterior end pointed; posterior end truncate; chitinous spines small... 2
Anterior and posterior ends tapering slightly; chitinous spines very robust.
No. 42, *Sarcophaga cistudinis* Aldrich.
2. Larva quite robust; posterior cavity small; a large rounded tubercle each side of the anal opening; spines along segmental lines small and sparse.
No. 43, *Wohlfahrtia vigil* Walker.
Larva more slender; posterior cavity larger..... 3
3. Posterior cavity with a very large tubercle each side; anal tubercles very widely separated; spiracular plates small; chitinous edge of plate broad and the slits short..... No. 44, *Sarcophaga placida* Aldrich.
Posterior cavity and characters not as above..... 4
4. Anal tubercles slender; tubercles below posterior cavity nearly in a line; spiracular plates large with long slits.
No. 45, *Sarcophaga bullata* Parker.
Anal tubercles more robust; tubercles below posterior cavity, with a pair of small ones below the usual line; spiracular plates smaller.
No. 46, *Sarcophaga securifera* Villeneuve.

DESCRIPTIONS OF THE PUPARIA

1. *SARCOPHAGA CISTUDINIS* Aldrich

Medium sized, dull, deep reddish black, very rugose with the segmentation distinct. Posterior cavity distinct but not deep; it is elliptical and located centrally on the horizontal axis; no tubercles on the edge of the posterior cavity. Each spiracular plate is smooth, shining, reddish-black with three dark, dull yellow slits; there are no indications of ridges around the slits; the slits are straight and converge slightly at their bases; each spiracular plate is on a slight elevation which is rugose. Anal opening is a distinct depression in the middle of a large wrinkle just below the posterior cavity. Anterior spiracles are missing in this material.

Length, 10 mm.; diameter, 3.5 mm.

Long Branch, N. J., no date. In collection of J. Bequaert and National Collection. Reared from box turtle *Cistudo carolina*.

2. *SARCOPHAGA COMMUNIS*, var. *OCHRACEA* Aldrich

Large sized, dull, reddish black, decided transversely wrinkled. Posterior cavity deep, broadly elliptical; located on but mostly above the horizontal axis; a depression above (seen from lateral view) and deeply notched laterally; numerous broad, flattened, yellowish tubercles around the entire edge of the cavity. Each spiracular plate is subshining, deep reddish with three long, reddish yellow slits; first slit bent outward; middle slits decidedly converging toward the apex; spiracular plates separated by a space equal to one-half the width of one plate. Anal opening small and not very conspicuous and located not far below the cavity. Anterior end of puparium decidedly wrinkled; first three segments very well marked and a broad lateral ridge. Anterior spiracles located at the apex of the puparium; spiracles are about two and one-half to three times as long as high, with 22 small, deep yellow lobes; basal portion of the spiracle is deep reddish.

Length, 8-9.5 mm.; diameter, 3.5-4 mm.

Dallas, Texas, August 28, 1907, to September 10, 1907; F. C. Pratt, collector. Reared from cow dung.

3. *SARCOPHAGA COMMUNIS* Parker

Medium sized, dull, dark red. Posterior cavity medium sized, not very deep, elliptical, located on but mostly below the horizontal axis; on each side of the vertical center line, above the cavity, are three blackish pointed tubercles; below the cavity, on each side, is a small roughened area. Each spiracular plate is dull, dark red

with the three lobes well defined apically; three yellow slits, shining; middle slits nearly parallel, or at most converging slightly toward the apex; spiracular plates separated by a space equal to half the width of one plate. Anal opening small, slightly depressed, located a short distance below the edge of the cavity; no anal tubercles. Anterior spiracles much wider than high, located a short distance below the apex of the puparium; each spiracle has 18 small yellow lobes; lower portion of spiracle is deep, dull red.

Length, 7.5 mm.; diameter, 2.75-3 mm.

Dallas Texas, August 13, 1907; F. C. Pratt collector. Scavenger. Also found in human excrement.

3. *SARCOPHAGA SECURIFERA* Villeneuve

Large, dull, dark red. Posterior cavity deep, large, elliptical, located mostly above the horizontal axis; tubercles around the edge of the cavity distinct; deeply incised in lateral view. Each spiracular plate is shining black with three long, narrow, yellow slits; the middle slits are parallel; at the lower inside edge of each spiracular plate is a raised, roughened area; spiracular plates separated by a space equal to about half the width of one plate. From the lower edge of the cavity is a narrow, sinuous, keel-like ridge extending to the anal opening; a row of very short setae the entire length of this ridge; each side of the anal opening is a conical tubercle and the two are connected by a roughened raised area. Anterior spiracles arcuate, about twice as wide as high and having 10 small yellow lobes; reddish brown near the base.

Length, 9-11 mm.; diameter, 3-4 mm.

Washington, D. C., June 8, 1923; H. E. Ewing, collector. Reared from decomposed liver.

5. *SARCOPHAGA COOLEYI* Parker

Large, dull, dark red. Posterior cavity medium sized, elliptical, deep, and located on horizontal axis; two tubercles on each side of cavity flattened; from the lower edge of the cavity and connected with the anal tubercles is a broad rounded ridge which forks and connects the two anal tubercles. Each spiracular plate is black, subshining; each plate has three yellow slits, the middle ones parallel. Spiracular plates separated by a space about half the width of one plate. Anal opening located between the two anal tubercles. Anterior spiracles slightly more than twice as broad as high and having 16 yellow lobes; spiracle reddish brown near base. Spiracles located at the end of the puparium.

Length, 10 mm.; diameter, 4 mm.

Laurel, Montana, 1914. Reared from decayed fish.

6. *AGRIA AFFINIS* Fallén

Medium to large sized. Dull, yellowish red to a deep red, nearly black; from a lateral view there is a small depression above the posterior cavity. Posterior cavity large, deep, rounded, located centrally on the horizontal axis; tubercles on edge of cavity indistinct. Each spiracular plate is small, shining, from dark red to black; each plate has three reddish slits of nearly equal length converging very slightly toward their basal ends; spiracular plates separated by a space nearly equal to the width of one plate. Anal opening distinct, with a rounded tubercle on each side; this tubercle varies somewhat in size. There are indications of an indistinct ridge from the anal opening to the lower edge of the cavity. Anterior spiracles are missing in this material.

Length, 6–9 mm.; diameter, 2.5–3.75 mm.

Melrose Highlands, Massachusetts (Gypsy Moth Laboratory). In national collection and one specimen in collection of R. R. Parker. Reared from larva of *Vanessa antiopa*.

7. *SARCOPHAGA ELEODIS* Aldrich

Medium sized, dull, dark, yellowish red. Posterior cavity small, nearly round, located entirely below the longitudinal axis; this location is a little variable; tubercles indistinct or absent. Each spiracular plate is very dark, shining red, with three narrow, yellow slits; first slit slightly bent below the middle; middle slits parallel; on the outside of each plate is a narrow extended area of a dark reddish-black color; spiracular plates separated by a space nearly equal to the width of one plate. Anal opening not very distinct and located near the edge of the cavity; no anal tubercles. Anterior spiracles slightly below the apex of the puparium; each spiracle has seven yellow lobes; area on the side reddish brown down to the base.

Length, 8 mm.; diameter, 3 mm.

Maxwell, New Mexico; D. J. Caffrey, collector. Koehler, New Mexico; V. L. Wildermuth, collector. Reared from *Eleodes extricata*, *E. fusiformis*, *E. hispilabris*, *E. obsoleta*, *E. tricostata*, and *Asida obvata*.

8. *SARCOPHAGA OPIFERA* Coquillett

Small, dull, yellowish to red. Posterior cavity small, elliptical, located above the horizontal axis; no tubercles visible around the edge. Each spiracular plate is shining, deep reddish with three yellow slits; middle slits nearly parallel; spiracular plates separated by a space less than the width of one plate. Anal opening small, depressed, located close, under the posterior cavity; no anal tubercles.

Anterior spiracles located near the apex of the puparium; each spiracle has six yellow lobes well separated; basal portion of the spiracle is dull, dark red.

Length, 5-6 mm.; diameter, 1.5-2 mm.

Natrona, California, July 18, 1885. Reared from *Melanoplus devastator*, *marginates*, *differentialis*, *plumbeus*, and *bivittatus*.

9. SARCOPHAGA SUBAENESCENS Aldrich

Small, dull, yellowish red. Posterior cavity small, round, located centrally on the horizontal axis; the edge of the cavity flattened and there are no indications of tubercles. Each spiracular plate is shining, deep red with three yellow slits, each on a broad lobe, the middle slit is straight and the other two slits converge toward it at the lower end; spiracular plates separated by a space about three-fourths the width of one plate. Anal opening small, fairly distinct, and located just below the posterior cavity. Anterior spiracles are missing.

Length, 4.5 mm.; diameter, 2 mm.

Somerville, New Jersey, June 23, 1922; R. T. Webber, collector. From spider web.

10. SARCOPHAGA HUNTERI Hough

Small, dull yellowish red. Posterior cavity is quite small, elliptical, and located on the horizontal axis; no tubercles visible on the edge of the cavity. Each spiracular plate is sub-shining, dark red with three distinct lobes; three yellow slits each slightly broader at the base and pointed at the apex; middle slits almost parallel; spiracular plates almost touching. Anal opening quite small, depressed, and located just below the edge of the cavity; no anal tubercle. Anterior spiracles nearly as high as broad; each spiracle has nine small yellow lobes; basal part of spiracle is deep reddish.

Length, 5.25 mm.; diameter, 2 mm.

Charleston, Missouri, September 28, 1914; G. W. Barber, collector; Platte, South Dakota, C. N. Ainslie, collector. Reared from *Melanoplus differentialis*, *M. atlansis*, and from codling moth.

11. SARCOPHAGA ATLANIS Aldrich

Small sized, dull, yellowish red. Posterior cavity quite small, shallow, located on the horizontal axis; no tubercles around the edge of the cavity; last two segments of puparium rather distinct. Each spiracular plate is sub-shining, red with three yellow slits; the middle slits parallel, spiracular plates separated by a space about three-fourths the width of one plate; on the inside, near the lower edge of each spiracular plate is a small, wrinkled area. Anal opening small,

inconspicuous, dark; on each side of the opening is a small, rounded depression; no anal tubercles. Anterior spiracles small, located close to the apex of the puparium; each spiracle has seven yellow lobes; spiracle dull, dark red at base.

Length, 6 mm.; diameter, 2 mm.

Aberdeen, South Dakota, July 12. Reared from *C. atlantis* and grasshoppers.

12. SARCOPHAGA FUSCICAUDA Böttcher

Large, dull, dark red. Posterior cavity deep, diameter large, located centrally on the longitudinal axis; tubercles on outer edge of cavity indistinct. Each spiracular plate is reddish black with three yellow, narrow slits, the third slit much shorter than the other two; first slit deeply curved on lower half toward the lower end of the middle slit; middle slits about parallel; spiracular plates separated by a space slightly less than the width of one plate. Anal opening some distance from the edge of the cavity; each side of the anal opening is a conical tubercle, these tubercles are widely separated. Posterior end of puparium shows two segments slightly more pronounced than the others. Anterior spiracles close to anterior end of puparium; each spiracle has .27 small, yellow lobes, five of these are below the edge and on the outside surface of the spiracle; basal part of the spiracle reddish-brown.

Length, 9 mm.; diameter, 3.5 mm.

Honolulu, J. F. Illingworth, collector; two specimens in national collection. Honolulu, February 5, 1917; Timberlake, collector; in collection of R. R. Parker. Reared from dead grubs.

13. SARCOPHAGA STERNODONTUS Townsend

Medium sized, sub-shining, dark red; more shining around the posterior cavity. Posterior cavity deep, large, rounded, more pointed at lower middle; at the lower edge of the posterior cavity is a short, sharply defined carina or ridge. Each spiracular plate is very deep red, subshining with three reddish yellow slits; middle slits about parallel; on the upper and outside edge of each spiracular plate is a broad extension, slightly broader toward the apex; spiracular plates separated by a space equal to about two-thirds the width of one plate. Anal opening depressed, some distance from the edge of the cavity; each side of the anal opening is a small conical tubercle; these tubercles separated by a space equal to about twice the height of one tubercle. Anterior spiracles about as high as broad, not far from anterior end of puparium; each spiracle has 14 small yellow lobes, otherwise the spiracle is a dull, very dark red.

Length, 7 mm.; diameter, 2.5 mm.

Canal Zone, September 1, 1918; H. F. Dietz, collector, Mayaguez, Porto Rico, November 17, 1915; R. H. Van Zwalenburg, collector. Reared from pupa of *Erinnyis allo* Linnaeus.

14. SARCOPHAGA AUSTRALIS Aldrich

Medium sized, dull, yellowish red. Posterior cavity large, deep, slightly wider than high; located about centrally on the horizontal axis; upper edge of cavity has three tubercles on each side, the middle one smaller; on lower edge are four tubercles, the middle pair being larger. Each spiracular plate is black, subshining with three yellow slits, the middle slits are parallel; spiracular plates are separated by a space slightly less than the width of one plate. Anal opening small, some distance from the edge of the cavity; each side of the anal opening is a distinct, conical tubercle; these tubercles are separated by a space equal to the height of one tubercle. Anterior spiracles are missing in the specimen.

Length, 7 mm.; diameter, 2 mm.

Baton Rouge, Louisiana, December 8, 1923; T. H. Jones, collector.

15. SARCOPHAGA SARRACENIOIDES Aldrich

Medium to large sized, dull, dark red. Posterior cavity on but mostly below the horizontal axis; numerous distinct wrinkles on the edge of the cavity. Each spiracular plate is shining reddish black with yellow slits; middle slits slightly converging toward the apex; spiracular plates separated by a space equal to about half the width of one plate. Anal opening located some distance below the edge of the cavity; each side is a definite, rugose, conical tubercle; these tubercles are separated by a space equal to about one and one-half times the height of one tubercle. Anterior spiracles located a short distance from the apex of the puparium; each spiracle has 18 yellow lobes; area in center of this spiracle is reddish and rugose.

Length, 7-10 mm.; diameter, 3-3.75 mm.

Gainesville, Texas; W. E. Pennington, collector, Webster, No. 12745. Gila River Valley, Arizona, August 21, 1915; R. N. Wilson, collector. Baton Rouge, Louisiana, April 5; T. H. Jones, collector. Dallas, Texas, July 15, 1905; W. D. Pierce, collector. Okanogan Valley, British Columbia (from *Anabrus*); emerged April, 1896; J. Fletcher. Graysville, Tennessee, from *Dynastes tityus*.

16. WOHLFAHRTIA VIGIL Walker

Large, dull, very dark red. Posterior cavity small, elliptical, located centrally on the horizontal axis; edge of cavity broadly rounded; tubercles on edge rather weak. Each spiracular plate is subshining, blackish with three yellow slits, first two slits bent near

their base toward the third slit, which is straight; middle slits parallel; spiracular plates are separated by a space about half the width of one plate. Below the posterior cavity is a rounded area in the middle of which is the anal opening; each side of the anal opening is a distinct rounded tubercle, the space between these tubercles is about the width of one tubercle at its base. Anterior spiracles near the apex of the puparium; each spiracle has nine lobes in a slightly curved line.

Length, 9 mm.; diameter, 3.5 mm.

Ithaca, New York; emerged July 15, 1922; R. C. Shannon. Reared from rabbit caught by R. Harwood.

17. SARCOPHAGA ACULEATA Aldrich

Large sized, dull, yellowish red to dark red. Posterior cavity not very deep, small, elliptical, located just above the horizontal axis; tubercles on the edge of the cavity indistinct; on the dorsum above the cavity is a faint depression (seen from lateral view). Each spiracular plate is shining, deep red with three large, yellow slits pointed at the posterior end; middle slits are almost parallel; spiracular plates are separated by a space equal to about one-third the width of one plate. Anal opening small, darkened, and faintly depressed; no anal tubercles; between the anus and the cavity is a large depression, sometimes this depression appears more like two depressions with a faint elevation between them; below the anus is a depression or fold reaching up on each side nearly to the horizontal axis. Anterior spiracles located near to the apex of the puparium; each spiracle has five yellow lobes; basal portion of spiracle is dull reddish.

Length 8–8.5 mm.; diameter, 2.75–3 mm.

Reared from an Acridid species at Alpine, California; C. M. Packard, collector. Pasadena No. 16163, July 21, 1916. Ashland, Nebraska, August 14, 1914, from grasshopper; W. E. Pennington, collector; exp., No. A 787. Ellis, Kansas, no date; from *E. opaca*; J. S. Wade, collector; Webster, No. 14258.

18. SPIROBOLOMYIA SINGULARIS Aldrich

Medium to large sized; dull yellowish to red. Posterior cavity deep, broadly elliptical, located about centrally on the horizontal axis; tubercles around the edge of the cavity indistinct; on the dorsal part of the puparium, close to the cavity is a faint depression. Each spiracular plate dull, reddish to black, with three narrow yellow slits, the two middle slits very slightly converging toward the apex; on the inner edge of the spiracular plate, near the base, is a slight projection; spiracular plates separated by a space about equal to

half the width of one plate. Anal opening small, dark, depressed, located some distance below the edge of the posterior cavity; each side of the anal opening is a small tubercle; these tubercles are separated by a space about equal to twice the height of one tubercle. Anterior spiracles are missing in these specimens.

Length, 6.5–8 mm.; diameter, 2.5–3 mm.

Enola, Virginia, May 1, 1915; Sara Reynolds, collector.

19. SARCOPHAGA HAEMORRHOIDALIS Fallén

Large, dull, brownish red. Posterior cavity deep, nearly round, the greatest width being on the horizontal; located centrally on the horizontal axis; there are two pairs of rounded tubercles above the center line and one pair below. Each spiracular plate is dark red subshining, with three narrow, yellowish slits, the first or inner slit is bent slightly just above the middle; on the inner edge of each plate, near the base, is a small ridge; spiracular plates separated by a space about half the width of one plate. Anal opening distinct, located a short distance below the cavity. Anterior spiracles close to the apex, much wider than high, with 14 small yellow lobes: the basal portion of the spiracle deep red.

Length, 9–10 mm.; diameter, 2.5–4 mm.

No date or locality given; specimens in collection of R. R. Parker; two specimens in national collection.

20. CHAETORAVINIA QUADRISSETOSA Coquillett

Small, dull, yellowish red. Posterior cavity is of medium size, elliptical, and located centrally on the horizontal axis; tubercles around the edge of the cavity fairly distinct. Each spiracular plate is subshining, deep red, with three yellow slits; middle slits are about parallel and longer than either of the other two; between the first and second slits is a faint, narrow, elongated ridge; spiracular plates separated by a space equal to about one-third the width of one plate. Anal opening depressed, located some distance below the edge of the cavity, slightly darkened near the outer edges; no anal tubercles. Anterior spiracles at apex, wider than high; each spiracle has 13 yellow lobes, lower portion of spiracle is deep reddish.

Length, 5.5 mm.; diameter, 2 mm.

Victoria, Texas, June 15, 1907; J. D. Mitchell, collector; bred from manure; Hunter, No. 1611–39. Dallas, Tex., August 10, 1907, bred from manure; F. C. Pratt, collector; Hunter, No. 1611–11.

21. SARCOPHAGA RUDIS Aldrich

Small sized, dull, dark red. Posterior cavity fairly deep, elliptical, located on but entirely above the horizontal axis; immediately

above the cavity is a slight depression (seen laterally). Each spiracular plate with three distinct lobes, shining, very dark, red, with three yellow slits; middle slits about parallel; spiracular plates separated by a space at least as wide as the width of one plate; each spiracular plate has an extension along the upper and outer edges. Anal opening conspicuous, depressed, with an elevated ridge encircling it, located close to under edge of the cavity; no anal tubercles. Anterior spiracles missing in this material.

Length, 6 mm.; diameter, 2 mm.

Charleston, Missouri, June 22, 1915; E. H. Gibson, collector. Reared from *L. gibbosus*. Webster No. 13668.

22. METOPOSARCOPHAGA PACHYPROCTA Parker

Medium sized, dull to subshining, yellowish red to dark red. Posterior cavity deep, somewhat quadrate, medium sized, located on the horizontal axis; tubercles around the edge of the cavity indistinct; laterally the posterior end is deep notched. Each spiracular plate is dull, deep red with three narrow, yellow slits, the first and middle one parallel; middle slits nearly parallel; at the lower, inner edge of the spiracular plate is a small wrinkle. Anal opening and a wrinkle on each side well defined and darkened; no anal tubercles. Anterior spiracles at the apex of the puparium, a little wider than high; each spiracle has 11 yellow lobes; basal portion of spiracle dark reddish.

Length, 7 mm.; diameter, 2.5 mm.

Beaufort, North Carolina, from terrapin eggs; issued September 27, 1915; W. P. Hay, collector.

23. SARCOPHAGA BARBATA Thomson

Large, dull, dark red, dorsal surface definitely arched. Posterior end reduced in diameter with an elliptical, deep, transverse cavity located nearly centrally; tubercles very faintly showing; each side of and below the cavity is a good sized, faint depression. Each spiracular plate has three narrow slits of unequal length; the first slit is sharply bent near its lowest third and directed toward the lower end of the middle slit; spiracular plates separated by a space equal to about half the width of one plate; middle slits very slightly oblique, converging toward their apex. Anal opening depressed, some distance below the cavity; each side of anal opening is a very small, conical tubercle; these tubercles are separated by a space equal to one and one-half times the height of one tubercle. Anterior spiracles are located close to the apex of the puparium; each spiracle has 12 small, yellow lobes; lower area of the spiracle dark reddish brown.

Length, 9.5 mm.; diameter, 4 mm.

Honolulu, Hawaii, March 27, 1917; P. H. Timberlake, collector. Reared from dead grubs; Timberlake, No. 7629.

24. *SARCOPHAGA BISETOSA* Parker

Small sized, dull, dark red. Posterior cavity small, deep, somewhat elliptical, with the lower edge notched in the middle; located centrally on the horizontal axis; tubercles on the edge of the cavity indistinct. Each spiracular plate is subshining, black with three yellowish slits, each on a well-defined ridge; the first slit is slightly bent, near its base, toward the second; the plate is slightly extended beyond the ridges along the upper and outer edge; spiracular plates are separated by a very narrow space. Anal opening small, located just below the posterior cavity; there is a small tubercle each side of the anal opening. Anterior spiracles close to the apex; each spiracle has 29 small, yellow lobes; the lower part of the spiracle is deep red.

Length, 7 mm.; diameter, 2 mm.

Rockville, Pennsylvania, April 17, 1922; A. B. Champlain, collector.

25. *SARCOPHAGA PLINTHOPYGA* Wiedemann

Large sized, dull, dark red with a faint depression above the posterior cavity. Posterior cavity medium to large sized, rounded and located centrally on the horizontal axis; tubercles on edge of cavity fairly well marked. Each spiracular plate is shining reddish black with three yellow slits; middle slit long and straight; first slit is slightly sinuous and the first ridge has a point on the side near the apex; spiracular plates separated by a space equal to about one-third of the width of one plate. Anal opening depressed and some distance below the edge of the cavity; a rounded tubercle on each side of the anal opening. Anterior spiracles are missing in this material.

In one specimen the spiracular plates are nearly touching.

Length, 7-9 mm.; diameter, 2.5-3.75 mm.

Victoria, Texas, November 1, 1916; J. D. Mitchell, collector; Bishopp, No. 7092.

26. *HELICOBIA HELICIS* Townsend

Small sized, dull, dark red. Posterior cavity large, deep, rounded, located centrally on the horizontal axis; tubercles around the edge indistinct; above the posterior cavity is a depression (seen from lateral view). Each spiracular plate is small, shining, reddish black with three narrow yellow slits; middle slits about parallel; spiracular plates separated by a space slightly greater than the width of one plate. Anal opening large, not far below the cavity; no anal

tubercles. Anterior spiracles located close to the apex of the puparium; each spiracle is wider than high and with 12 yellow lobes; basal portion is dark reddish.

Length, 5–6 mm.; diameter, 1.5–2 mm.

Chain Bridge, District of Columbia. Reared August 17, 1912, from *Allorrhina nitida*; C. T. Greene, collector.

27. SARCOPHAGA ULIGINOSA Kramer

Medium sized, dull, dark red. Posterior cavity medium sized, elliptical, located centrally on the horizontal axis; three indistinct tubercles on each side of the cavity above the center line. Each spiracular plate is shining dark red with three yellow, narrow slits; middle slit straight; the first or inner slit parallel with the second for the first half of its length and then the first slit bends diagonally toward the second and reaches a little beyond it; outer slit almost as long as the middle one; spiracular plates separated by a space equal to about one-third the width of one plate. Anal opening located in a transverse depression a short distance below the cavity. Anterior spiracles close to the apex; each spiracle has 30 small, yellow lobes, with the central portion of the spiracle deep reddish.

Length, 8 mm.; diameter, 3 mm.

Gypsy Moth Laboratory, 548B; May 14, 1907. In collection of R. R. Parker.

28. SARCOPHAGA DAVIDSONI Coquillett

Medium sized, dull, yellowish red. Posterior cavity nearly round below, but touching the horizontal axis; tubercles on edge not visible; there are a few, short, visible wrinkles on the lower edge of the cavity. Each spiracular plate shining, dark red, with three yellow slits and the lobes distinct; middle slits nearly parallel; spiracular plates separated by a space slightly greater than the width of one plate. Anal opening small, depressed, with a darkened area around the edge, located some distance below posterior cavity; no anal tubercles. Anterior spiracle located below the anterior end of the puparium; each spiracle has six small, yellow lobes; basal portion of spiracle is deep reddish.

Length, 6 mm.; diameter, 2.5 mm.

Los Angeles, California. Reared from eggs of *Epeira argentata*, September, 1893; Anstruther Davidson, collector.

29. SARCOPHAGA PROHIBITA Aldrich

Medium sized, dull, reddish brown. Posterior cavity small, deep, somewhat hexagonal, located on but mostly below the horizontal axis; tubercles on the edge indistinct. Each spiracular plate shining, deep red with three yellow slits; middle slits about parallel;

spiracular plates separated by a space equal to the width of one plate. Anal opening small, inconspicuous, and with a depressed area on each side. No anal tubercles. Anterior spiracles missing in this material.

Length, 7 mm.; diameter, 2.5 mm.

Manhattan, Kansas, June 5, 1917; McColloch and Hays, collectors; Lafayette cage 611a.

30. SARCOPHAGA MOROSA Aldrich

Large sized, dull, very dark red. Posterior cavity deep. Medium sized, elliptical, located centrally on the horizontal axis; tubercles on edge of cavity not very distinct. Each spiracular plate is subshining, black with three yellow slits; the middle and third slit about parallel; the first slit is slightly curved downward and toward the middle slit; spiracular plates separated by a space equal to about half the width of one plate. Anal opening small, distinct, located just a short distance below the edge of the cavity; each side of the anal opening is a well-defined tubercle with a large reddish spot on the inner side. Anterior spiracles are missing.

Length, 9.5 mm.; diameter, 4 mm.

Near Ottawa, Canada; F. Johansen, collector. Reared July 11, 1918, by C. T. Greene.

31. SARCOPHAGA LATISTERNA Parker

Large sized, dull, reddish black. Posterior cavity deep, elliptical, located centrally on the horizontal axis; two tubercles on the upper edge of the cavity faintly visible, the others indistinct; laterally the posterior end of the puparium is slightly notched. Each spiracular plate is dull, black, with three narrow yellow slits, the two outer ones closer together, middle slits about parallel; spiracular plates separated by a space equal to half the width of one plate. Anal opening small, distinct, depressed, with a low, rounded tubercle on each side; tubercles separated by a space equal to about one and one-half times the diameter of one tubercle. Anterior spiracles are missing in this material.

Length, 9.5 mm.; diameter, 4 mm.

Andover, New Hampshire, Gipsy Moth Laboratory, 100416-7, August 2, 1922.

32. SARCOPHAGA MARGINATA Aldrich

Medium sized, subshining, yellowish red, and slightly arched along the dorsum. Posterior cavity medium sized, elliptical, located centrally on the horizontal axis; no distinct tubercles on the edge of the cavity; a distinct depression on the dorsum just above the

cavity. Each spiracular plate is shining red, with three yellow slits; inner and middle slit slightly convex to each other and of about equal length; outer slit straight and about two-thirds as long as the middle one; spiracular plates separated by a space about as wide as one plate. Anal opening small, indistinct, located just below the cavity. Anterior spiracles are missing in the specimens at hand.

Length, 7-7.5 mm.; diameter, 3 mm.

One specimen without labels; other specimen labeled "Sarcophaga No. 25." Both specimens in collection of R. R. Parker.

33. SARCOPHAGA BULLATA Parker

Large, dull, dark red. Posterior cavity large, elliptical; located centrally on the horizontal axis; tubercles around the edge very small; two posterior segments slightly visible; on each side and below the posterior cavity is an area faintly depressed. Each spiracular plate is shining black with three narrow yellow slits; the first slit is slightly sinuous; middle slits about parallel; spiracular plates separated by a space about half the width of one plate. Anal opening some distance from the edge of the cavity; each side of the anal opening is a conical tubercle; these tubercles are separated by a space about twice the height of one tubercle. Anterior spiracles arcuate, about twice as wide as high; located at the apex each spiracle has 20 small, yellow, lobes; spiracle reddish brown at the base.

Length, 8 mm.; diameter, 3 mm.

Bethesda, Maryland, June 26, 1915; reared from meat by Max Kisiuk; Hunter, No. 3281.

34. SARCOPHAGA UTILIS Aldrich

Large subshining, dark red; surface around the posterior cavity shining with the edge of the cavity yellow. On the dorsum at the posterior end is a depression with a broad ridge in the middle. Posterior cavity nearly round, located centrally on the horizontal axis. Each spiracular plate is shining, deep reddish black, with three yellow slits of nearly equal length; two inner slits parallel with the outer or first slit bent slightly to the right near the base; spiracular plates separated by a space equal to about two-thirds the width of one plate. Anal opening small, fairly distinct, with a rather weak tubercle on each side of the opening. Anterior spiracles about as high as wide; each spiracle has 26 small yellow lobes with the lower part of the spiracle deep red.

Length, 9 mm.; diameter, 4 mm.

Natrona, Pennsylvania, May 30, 1896. In collection of R. R. Parker.

35. *SARCOPHAGA TRYONI* Johnston and Teig

Small sized, dull, from light yellowish-red to dark red. Posterior cavity medium sized, elliptical, located entirely below with just the upper edge touching the horizontal axis; tubercles on the edge of the cavity distinct, somewhat flattened laterally; there are three pairs on the upper half of the cavity and two pairs on the lower half. Below the cavity is a narrow ridge reaching from the lower edge of the cavity to the anal opening. Each spiracular plate is shining, deep reddish black, and with three narrow yellow slits slightly curved, the first two slits convex to one another; spiracular plates are just barely separated at the upper, inner edge. Anal opening small, depressed, with a small, conical tubercle on each side. Anterior spiracles each have 23 small, yellow lobes with the basal portion of the spiracle deep red.

Length, 6.5 mm.; diameter, 2.5 mm.

One specimen labeled "1501," one specimen without labels. Both in collection of R. R. Parker.

36. *SARCOPHAGA DUX* Thomson

Large sized, dull, dark red. Posterior cavity large, deep, elliptical; located on but mostly below the horizontal axis; tubercles on the edge of the cavity indistinct; laterally the cavity is deeply notched. Each spiracular plate is subshining, reddish black, with three well-defined lobes and three yellow slits, first two slits much longer than the third; first two slits converge toward the base and almost touch; spiracular plates separated by a space equal to about half the width of one plate. At the lower edge of the cavity, in the center, is a very short, narrow carina. Anal opening some distance below the cavity, short, depressed; each side is a tubercle slightly longer than its diameter; these tubercles are separated by a space equal to about three and one-half times the length of one tubercle. Anterior spiracles missing in this material.

Length, 9 mm.; diameter, 3.25 mm.

Honolulu, February 5, 1917. Reared from dead grubs; P. H. Timberlake, collector.

37. *SARCOPHAGA ALDRICHI* Parker

Large, dull, red to black. Posterior cavity deep, medium-sized, located centrally on the horizontal axis; edges of cavity slightly wrinkled. Each spiracular plate is blackish, subshining and with three narrow yellow slits; between the first and second slit is a short yellow line which resembles a short slit; spiracular plates separated by a space equal to about one half the width of one plate. Anal opening distinct, located a short distance below the cavity; each

side of the anal opening is a large, rounded tubercle. Anterior spiracles close to the apex; each spiracle has about 80 small, yellow lobes; base of spiracle is deep reddish.

Length, 8–9.5 mm.; diameter, 3–4 mm.

Lunenburg, Mass., 6114; R. T. Webber, collector. In collection of R. R. Parker. One specimen from Melrose Highlands, Massachusetts, May 25, 1916; R. T. Webber, collector. In National Collection.

38. SARCOPHAGA KELLYI Aldrich

Medium size, dull, dark red. Posterior cavity nearly round, large, located centrally on the horizontal axis; tubercles on the outside edge indistinct. Each spiracular plate is deep reddish black with three yellow, narrow slits; middle slits about parallel; each plate has an extension nearly all the way around it and a wrinkled area on the lower, inner edge; spiracular plates separated by a space about equal to the width of one plate. Anal opening small, depressed and located a short distance below the posterior cavity; no anal tubercles; on each side of the anal opening and between that opening and the posterior cavity is a depressed area. Anterior spiracles close to the anterior end of the puparium; each spiracle has six small, yellow lobes; basal portion of the spiracle is reddish brown.

Length, 8 mm.; diameter, 2.5 mm.

Gila River Valley, Arizona, August 21, 1913; R. N. Wilson, collector; Webster, No. 10535. Specimen from Minot, North Dakota, August 1919; C. N. Ainslie, collector; Sioux City, No. 19145. Elida, New Mexico; H. E. Smith, collector; Webster, No. 10244; cage 2926.

39. RAVINIA PENICULATA Parker

Small, dull, reddish-yellow. Posterior cavity, medium sized, elliptical, located centrally on the horizontal axis; tubercles on the edge of the cavity not very distinct; three pairs above and one pair below the center line; those close to the horizontal axis more distinct. Each spiracular plate reddish yellow, subshining with three yellow slits; of nearly equal length; each slit on a broad, well defined lobe; spiracular plates separated by a space from half to two-thirds of the width of one plate. Anal opening distinct, located some distance below the cavity; on each side of the anal opening is a well defined tubercle. Anterior spiracles located at the apex of the puparium; each spiracle has 10 pale yellow lobes; the lower part of spiracle is reddish.

Length, 4–5 mm.; diameter, 1.5–2 mm.

No data. Six puparia in collection of R. R. Parker; two puparia in national collection.

40. *SARCOPHAGA PLACIDA* Aldrich

Medium sized, dull, very dark red. Posterior cavity medium sized, slightly elliptical, located centrally on the horizontal axis; one tubercle on each side of the cavity slightly above the horizontal axis. Each spiracular plate is subshining black with three narrow yellow slits; middle slit straight, all three slits converging very slightly toward their bases; spiracular plates separated by a space nearly equal to the width of one plate. Anal opening small, depressed with a large rounded tubercle each side. Anterior spiracles at anterior end of puparium; each spiracle has 16 small, yellow lobes; basal portion dull, reddish black.

Length, 8 mm.; diameter, 3.25 mm.

Ancon, Canal Zone, September 12, 1923. Reared from *Murex*; J. Zetek, collector; "Z. No. 2305."

41. *SARCOPHAGA FROGGATTI* Taylor

Large, dull, very dark red. Posterior cavity small, elliptical, deep, located centrally on the horizontal axis; tubercles distinct; two pairs above the central line and one pair below: from the posterior cavity to the anal opening is a broadly rounded ridge with a tubercle on each side of the anal opening which is distinctly depressed. Each spiracular plate is shining, reddish black, with three yellow slits; the lower end of the outer slit is bent in toward the middle slit; spiracular plates separated by a space equal to about two-thirds the width of one plate. Anterior spiracles with 15 small, rounded, yellow lobes; the basal portion of the spiracle is deep red.

Length, 9-10 mm.; diameter, 3.5 mm.

Townsville, North Queensland; G. F. Hill, collector; 1506. In national collection and one specimen in collection of R. R. Parker.

DESCRIPTIONS OF THE LARVAE

42. *SARCOPHAGA CISTUDINIS* Aldrich

Larva pale ocher yellow, tapering slightly toward each end. There are 10 segments in addition to the head. First three segments narrow and of equal width; other segments wider and of equal width. Numerous very thick, short, pointed reddish-brown spines not confined to the segmental line but also in various other areas. Posterior cavity shallow, transversely elliptical; the edges around this cavity have very delicate, chitinous, sharp-pointed spines arranged in very short rows like the teeth of a comb; these little rows of teeth are shorter above and below the central area of the cavity. The tubercles around the posterior cavity are round, flat and appear to be made up of rounded plates located one on top of the other; these

tubercles always appear to be worn off. Each spiracular plate is located on a rounded, raised area; these areas touch each other in the center of the cavity; each plate is shining, reddish-yellow with a broad, reddish-black, wide ring around the edge very narrowly connected at the base; each plate has three broad slits nearly parallel; the first or inner slit bent slightly, in the middle, toward the second slit. Looking from the posterior end there is a large rounded, flattened tubercle like those described above. There are two mouth hooklets; two small papillae on each side of head segment near the apex; these papillae are hardly as long as their diameter. Anterior spiracles deeper reddish brown with 19 small lobes to each.

Length, 12–13 mm.; diameter, 3–4 mm.

Long Branch, New Jersey, March 29, 1910; William T. Davis, collector.

43. WOHLFAHRTIA VIGIL Walker

Larva pale yellowish white, very robust; posterior end slightly rounded, tapering to a point at the anterior end. There are 10 segments in addition to the head. First three segments slightly narrower than the others. Chitinous spines minute confined to the segmental lines, much more numerous on the anterior portion, where the spines are arranged in very short, slightly arcuated lines or groups. Anterior segments 2, 3, and 4 with large, rounded tubercles arranged transversely; posterior cavity small, deep, with six small, conical tubercles on the upper edge and with two on the lower edge. Spiracular plates small, shining, deep reddish black, with three yellow slits; the two inner slits nearly parallel. Each side of the anal opening is a large globular tubercle with the space between them about equal to the diameter of one tubercle. Between these two large tubercles is a very small tubercle. There are two mouth hooklets; two small papillae on each side of the head, brownish, the upper one is larger and darker; their length is less than their diameter. Anterior spiracles brownish, and each spiracle with nine lobes.

Length, 13 mm.; diameter, 3.5 mm.

Dunkirk, Montana, September 8, 1922; W. Roy Walker, collector. In back of Airedale puppy 6 days old.

44. SARCOPHAGA PLACIDA Aldrich

Larva yellowish white, slender, tapering to a point at the anterior end, somewhat truncate at the posterior end. There are 10 segments in addition to the head; anterior segments 2, 3, and 4 slightly narrower than the following segments, which are of about the same width. Segments 1 to 9 each have a transverse row of small conical tubercles; those of the first three segments a little more

rounded. Spines minute, pale yellow, and confined to the segmental lines. Posterior cavity deep, large, elliptical. On the edge of the upper half of the cavity is one very large conical tubercle on each side; above, between these, are two pairs of much smaller tubercles; on the lower half of the cavity are two pairs of small tubercles, with a smaller pair located centrally between them. Spiracular plate small, with three broad short slits; the chitinous edge is dark brown, very broad, extending down in a pointed fashion between the slits; the lower end of the inner edge of the plate has a deep notch, and the chitin here is more blackish. Each side of the anal opening is a large conical tubercle; these tubercles are widely separated. There are two mouth hooklets; two small papillae on each side of the head, very pale, of about equal size, their length less than their diameter. Anterior spiracles brownish yellow; each spiracle has 16 small lobes.

Length, 11 mm.; diameter, 2.5 mm.

Ancon, Canal Zone, September 12, 1923; in *Murex*. J. Zetek, collector; "Z No. 2305."

45. SARCOPHAGA BULLATA Parker

Larva pale yellowish-white tapering to a point at the anterior end. There are 10 segments in addition to the head. All segments are nearly equal in length; chitinous spines are very minute, light colored and confined to the segmental lines. Posterior cavity large, deep, elliptical. On the upper edge of the posterior cavity are three pairs of conical tubercles; the outer tubercle is slightly larger than the inner ones; the lower edge has three pairs of tubercles with the middle pair slightly smaller and located slightly below the line of the other tubercles. Spiracular plates large, faintly brownish yellow toward the apex; spiracular plates separated by a space about half as wide as the width of one plate. Each plate has three fairly wide, long yellow slits; darkened edge of the plate very narrow, widened on the lower inner edge. Below the posterior cavity the anal tubercles are nearly transverse. Anterior spiracles are brownish yellow; each spiracle has 20 small lobes.

Length, 12-13 mm.; diameter, 2.5 mm.

Washington, District of Columbia, May 31, 1923; H. E. Ewing, collector. Reared from beef liver.

46. SARCOPHAGA SECURIFERA Villeneuve

Larva is pale yellowish white, tapering gradually to a point at the anterior end. There are 10 segments of about equal width in addition to the head. The very minute chitinous points are principally along the segmental lines, but there are small similar areas between these lines; the posterior end is pretty well covered with

these small points. The three anterior segments each have a transverse row of rounded tubercles; on segments 3 to 9 there is a small granular tubercle on the lower lateral portion. Posterior cavity large, deep, elliptical, with three pairs of conical tubercles of equal size on the edge of the upper half; on the edge of the lower half are three pairs of tubercles with the middle pair smaller. Spiracular plates large, dark yellowish brown, with the edge much darker; on the lower portion of the inner edge the chitin is wider and there is also a notch on the side. Each plate has three broad slits converging at the base. Anal tubercles robust, conical, and widely separated; edge of anal opening yellowish brown. There are two mouth hooklets: two small, brownish papillae on each side of the head just barely elevated.

Length, 14–15 mm.; diameter, 3 mm.

Washington, District of Columbia, June 8, 1923; H. E. Ewing, collector. Reared from beef liver.

EXPLANATION OF PLATES

(Drawings by C. T. Greene)

PLATE 1

- FIG. 1. *Sarcophaga cistudinis* Aldrich.
 2. *Sarcophaga communis*, var. *ochracea* Aldrich.
 3. *Sarcophaga communis* Parker.
 4. *Sarcophaga securifera* Villeneuve.
 5. *Sarcophaga cooleyi* Parker.

PLATE 2

- FIG. 6. *Agria affinis* Fallén.
 7. *Sarcophaga eleodes* Aldrich.
 8. *Sarcophaga opifera* Coquillett.
 9. *Sarcophaga subaenescens* Aldrich.
 10. *Sarcophaga hunteri* Hough.

PLATE 3

- FIG. 11. *Sarcophaga atlantis* Aldrich.
 12. *Sarcophaga fuscicauda* Böttcher.
 13. *Sarcophaga sternodontis* Townsend.
 14. *Sarcophaga australis* Aldrich.
 15. *Sarcophaga sarracenioides* Aldrich.

PLATE 4

- FIG. 16. *Wohlfahrtia vigil* Walker.
 17. *Sarcophaga aculeata* Aldrich.
 18. *Spirobolomyia singularis* Aldrich.
 19. *Sarcophaga haemorrhoidalis* Fallén.
 20. *Chaetoraxinia quadrisetosa* Coquillett.

PLATE 5

- FIG. 21. *Sarcophaga rudis* Aldrich.
22. *Metaposarcophaga pachyprocta* Parker.
23. *Sarcophaga barbata* Thomson.
24. *Sarcophaga bisetosa* Parker.
25. *Sarcophaga plinthopyga* Wiedemann.

PLATE 6

- FIG. 26. *Helicobia helicis* Townsend.
27. *Sarcophaga uliginosa* Kramer.
28. *Sarcophaga davidsoni* Coquillett.
29. *Sarcophaga prohibita* Aldrich.
30. *Sarcophaga morosa* Aldrich.
31. *Sarcophaga latisterna* Parker.

PLATE 7

- FIG. 32. *Sarcophaga marginata* Aldrich.
33. *Sarcophaga bullata* Parker.
34. *Sarcophaga utilis* Aldrich.
35. *Sarcophaga tryoni* Johnston and Teig.
36. *Sarcophaga duæ* Thomson.

PLATE 8

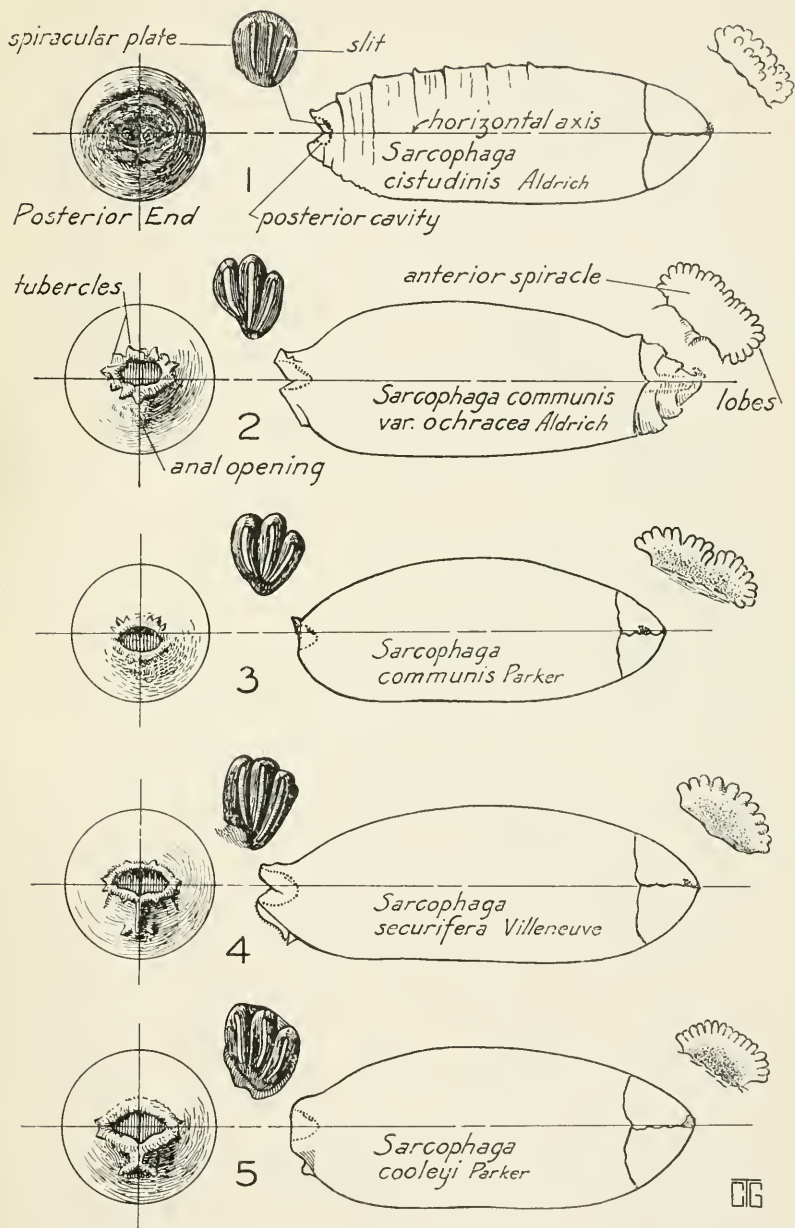
- FIG. 37. *Sarcophaga aldrichi* Parker.
38. *Sarcophaga kelleyi* Aldrich.
39. *Ravinia peniculata* Parker.
40. *Sarcophaga placida* Aldrich.
41. *Sarcophaga froggatti* Taylor.

PLATE 9

LARVAE

- FIG. 42. *Sarcophaga cistudinis* Aldrich.
43. *Wohlfahrtia vigil* Walker.
44. *Sarcophaga placida* Aldrich.
45. *Sarcophaga bullata* Parker.
46. *Sarcophaga securifera* Villeneuve

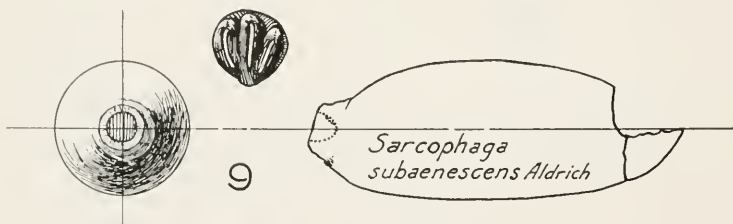
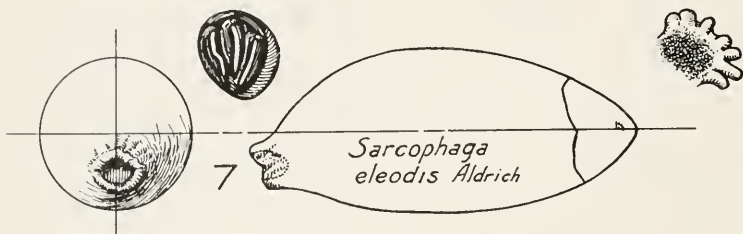
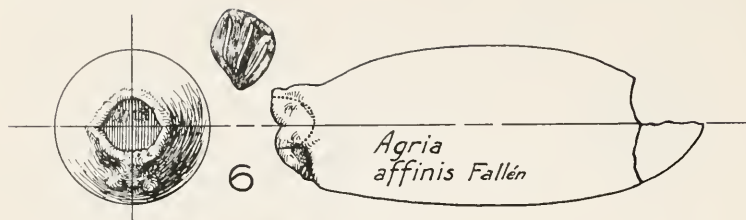




THE PUPARIA OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 25

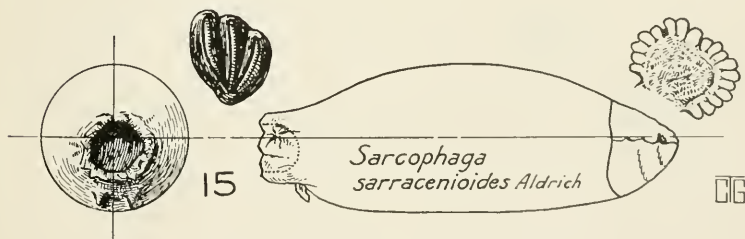
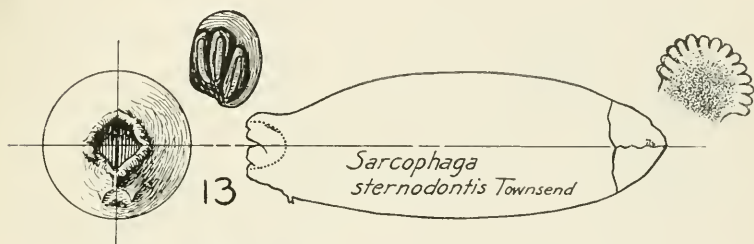
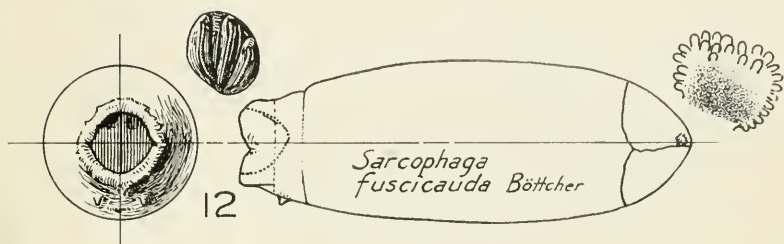
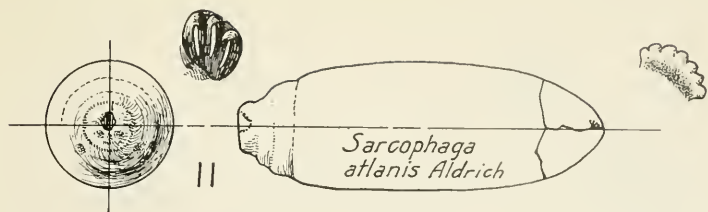
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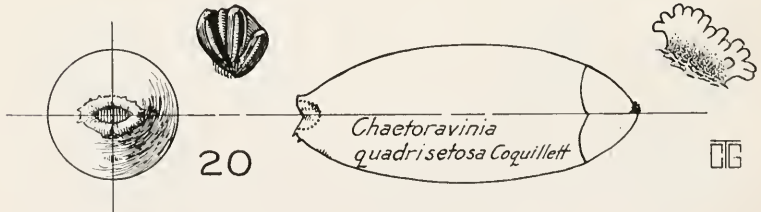
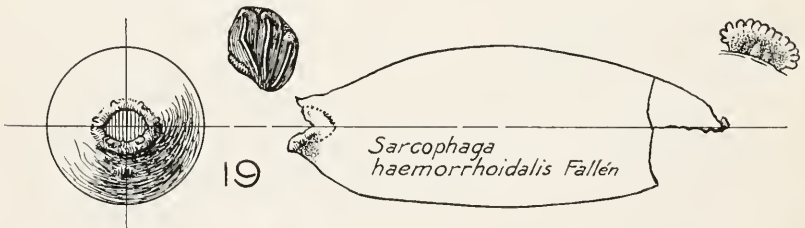
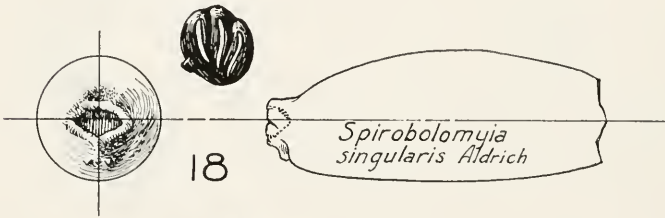
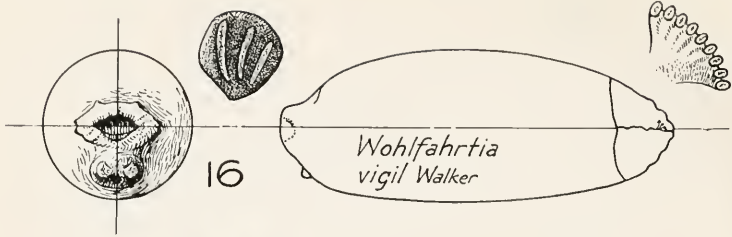
THE PUPARIA OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 25



THE PUPARIA OF SARCOPHAGID FLIES

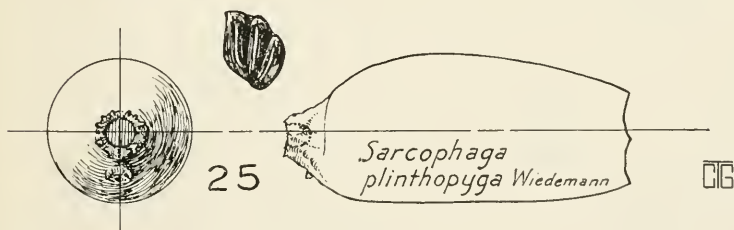
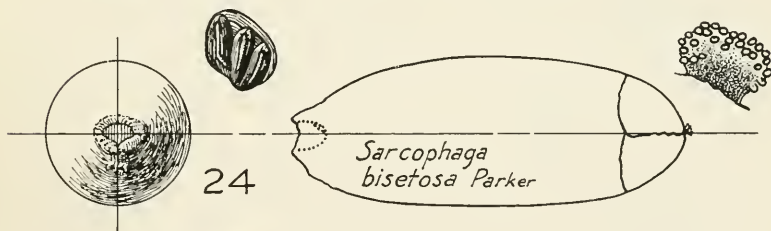
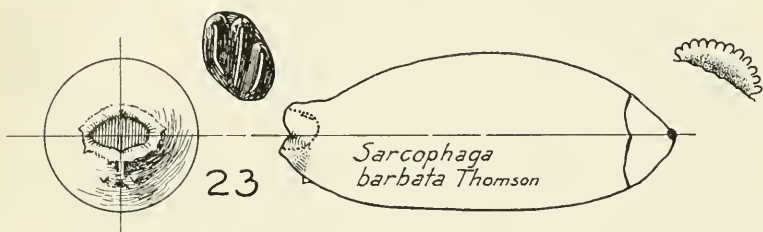
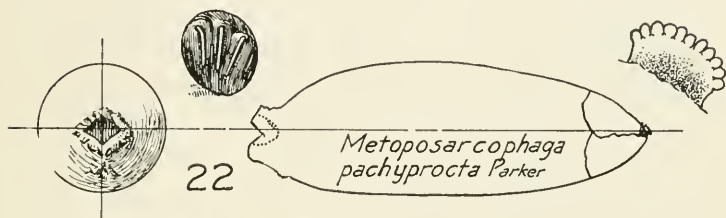
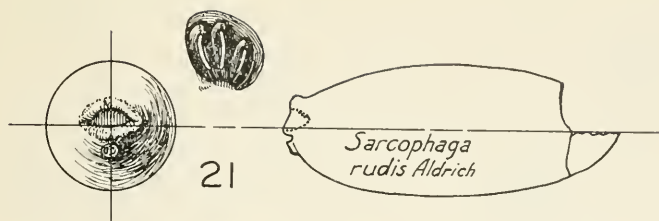
FOR EXPLANATION OF PLATE SEE PAGE 25



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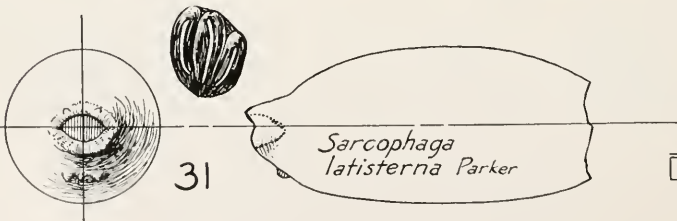
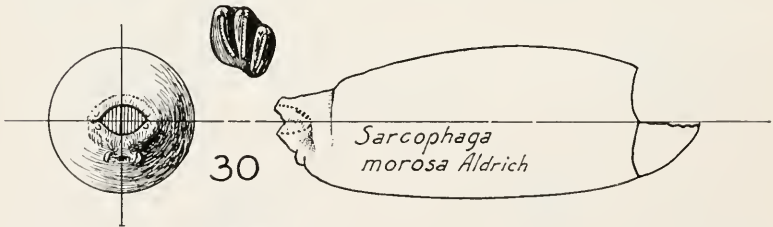
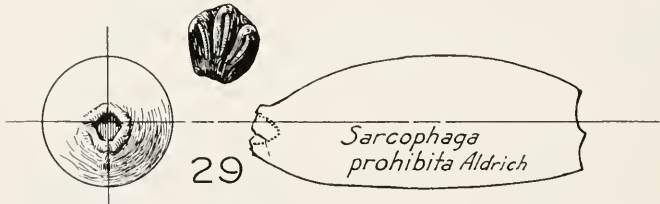
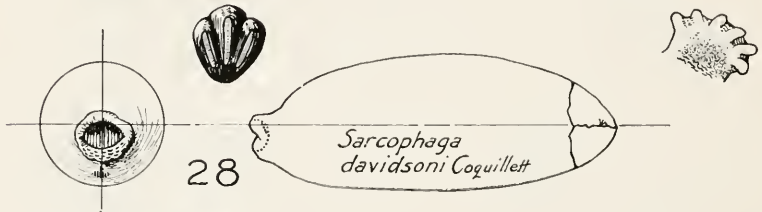
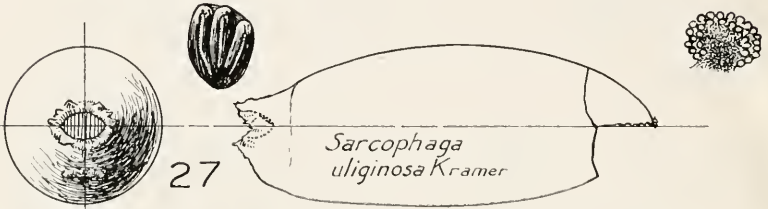
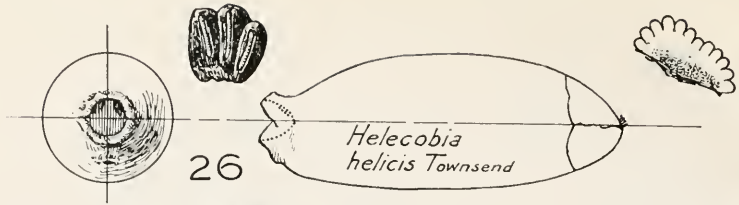
THE PUPAR'A OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 25



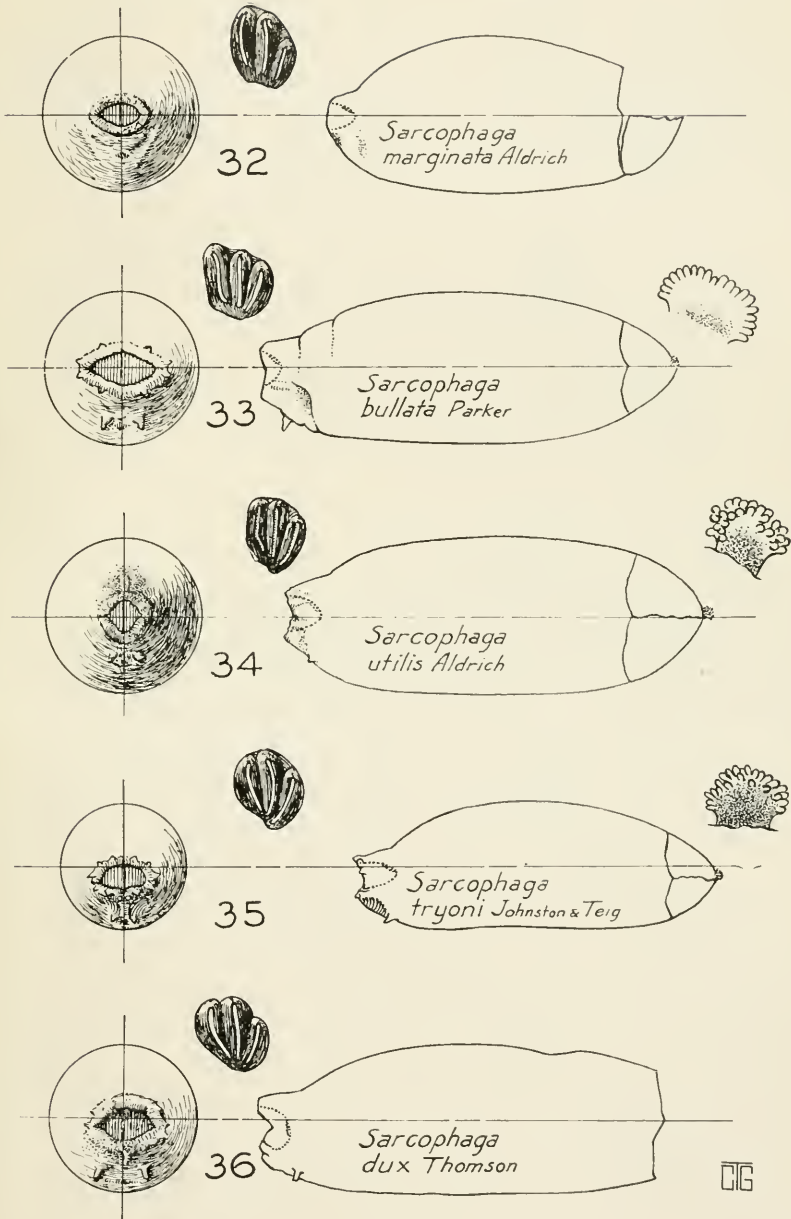
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FOR EXPLANATION OF PLATE SEE PAGE 26



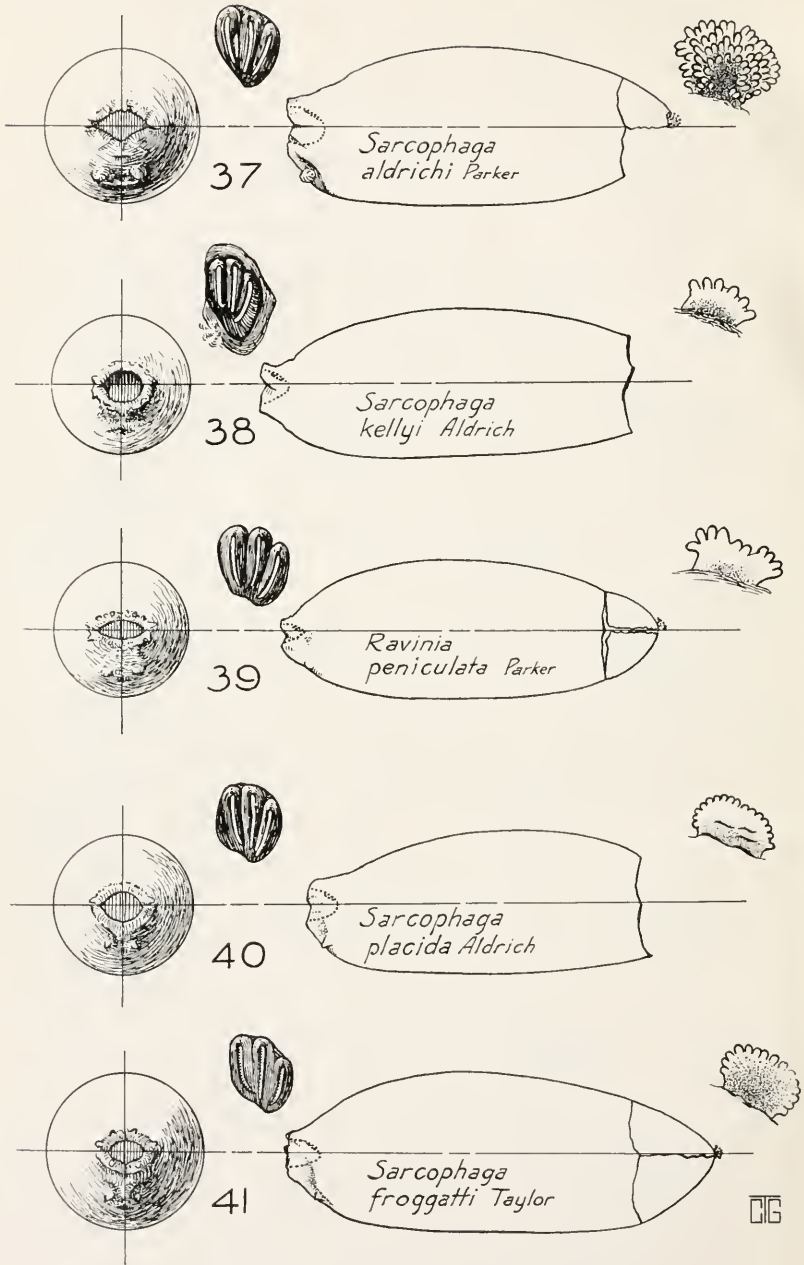
THE PUPARIA OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 26



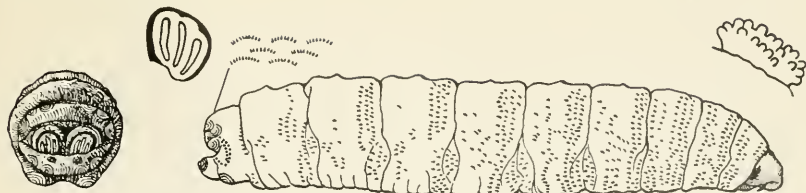
THE PUPARIA OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 26

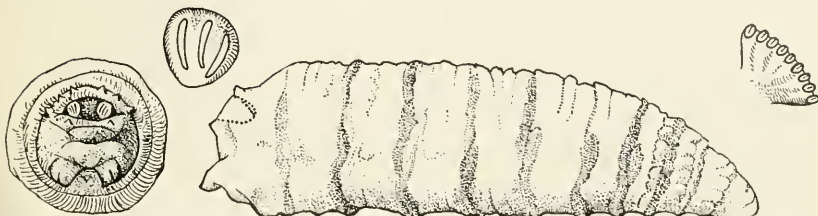


THE PUPARIA OF SARCOPHAGID FLIES

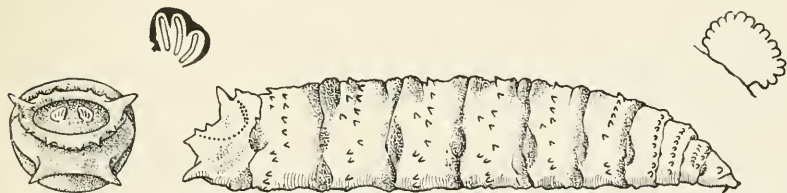
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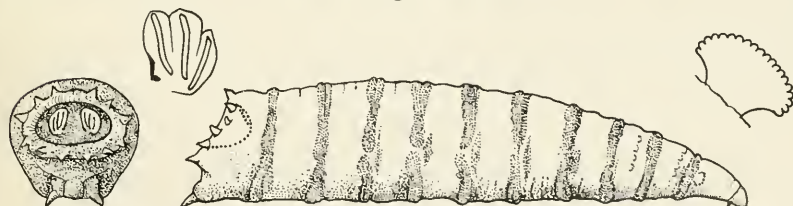
42 *Sarcophaga cistudinis* Aldrich



43 *Wohlfahrtia vigil* Walker



44 *Sarcophaga placida* Aldrich



45 *Sarcophaga bullata* Parker



46 *Sarcophaga securifera* Villeneuve



THE LARVAE OF SARCOPHAGID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 26