

## THE GENUS *COENOMYIA* (DIPTERA: COENOMYIIDAE) IN THE NEARCTIC REGION AND NOTES ON GENERIC PLACEMENT

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*Abstract.*—The genus *Coenomyia* is revised for the Nearctic Region and its phylogenetic relationships with other genera of lower brachycerous Diptera are discussed. The adults, pupa, and larva of the single species, *C. ferruginea* (Scopoli), are described and illustrated.

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This study is based on 542 specimens of *Coenomyia ferruginea* (Scopoli), the only Nearctic species in the genus *Coenomyia*. The adults and immature stages are redescribed with notes on biology and distribution. The relationship between the genus *Coenomyia* and other genera of lower brachycerous Diptera is discussed.

The genus *Coenomyia* was erected by Latreille (1796) although no species name was included. Latreille (1802) repeated the description and included the species *Sicus ferruginea* Fabricius (= *Musca ferruginea* Scopoli, 1763). Three species are currently recognized: *Coenomyia basalis* from Japan (Nagatomi and Saigusa, 1970), *C. bituberculata* from the Himalayas (Enderlein, 1921; Oldroyd 1966); and *C. ferruginea* from the Holarctic Region (James, 1981; Leonard, 1930; Oldroyd, 1966; Séguy, 1955). *Coenomyia pallida* Say (1824) and *C. cinereibarbis* Bigot (1879) were described from the Nearctic Region, but are currently considered synonyms of *C. ferruginea*.

*Coenomyia* has been placed in three different families of Diptera: (1) Rhagionidae, Coenomyiinae (Lindner, 1925); Rhagionidae, Xylophaginae (Leonard, 1930); (2) Xylophagidae (Williston, 1888); Xylophagidae, Xylophaginae (James, 1965; Williston 1896, 1908); Xylophagidae, Coenomyiinae (James, 1981); Coenomyiidae (Bezzi, 1903; Brues and Melander, 1932; Lundbeck, 1907; Malloch, 1917; Nagatomi 1975a, 1975b, 1977; Nagatomi and Saigusa, 1970; Séguy, 1926; Steyskal, 1953); (3) Coenomyiidae, Coenomyiinae (Brues, Melander, and Carpenter, 1954; Cole, 1969). Nagatomi (1975a) defined the family Coenomyiidae and included the genera *Coenomyia*, *Anacanthaspis*, *Arthropeas*, *Odontosubula*, and *Dialysis*.

For the phylogeny of 21 genera, including *Coenomyia*, of lower brachycerous Diptera in the Nearctic Region, Webb (1981) examined 53 morphological characters of adult males and females. Two phylogenetic (cladistic) and three phenetic methods were utilized in developing and interpreting the relationships of these genera.

*Phylogenetic methods.*—Cladograms were developed which (1) reflected the least number of convergences for all character states considered and (2) were



rooted from a hypothetical ancestor possessing the plesiomorphic state for all 53 characters using the Wagner algorithm.

Phenetic methods.—Phenetic similarities were analyzed, using CLUSTER (written by Dr. R. B. Selander, University of Illinois), and phenograms were produced utilizing UPGMA (unweighted pair-group method using arithmetic averages) for Pearson product-moment correlation coefficients, average taxonomic distances, and mean character differences.

The two phylogenetic analyses associated the genera *Arthropeas*, *Coenomyia*, and *Dialysis*. The three phenetic analyses closely associated *Coenomyia* and *Dialysis*, but separated *Arthropeas* from these genera and associated it with *Arthroceras*. This phylogenetic analysis reinforces Nagatomi's association and grouping of *Coenomyia*, *Arthropeas*, and *Dialysis* in Coenomyiidae (Nagatomi, 1975a).

Most recently, James (1981) included the genus *Coenomyia* in the family Xylophagidae, based on the strong similarity in the larvae of *Coenomyia*, *Rachicerus*, and *Xylophagus*. However, because of the divergence of the adults, he grouped *Coenomyia*, *Dialysis*, and *Arthropeas* in the subfamily Coenomyiinae. On the basis of the larva, Krivosheina (1967, 1971) associated *Coenomyia* with *Arthropeas*. The immature stages of *Dialysis fasciventris* were reared in 1982 and showed a close association with the larva of *Coenomyia* and *Arthropeas* on the basis of their general shape and appearance, mandibular-maxillary complex (not illustrated for *Arthropeas*), metacephalic rods, and anal plate. Here again, the characteristics of the larvae of *Coenomyia*, *Dialysis*, and *Arthropeas* reinforce Nagatomi's (1975a) grouping of these genera into the family Coenomyiidae.

The terminology used for the adults is from McAlpine (1981) and Stuckenberg (1973); terminology for the immature stages is from Teskey (1969, 1981).

### *Coenomyia* Latreille

*Coenomyia* Latreille, 1796: 159; Leonard 1930: 6; Lindner 1925: 4; Oldroyd 1966: 953.

### *Coenomyia ferruginea* (Scopoli)

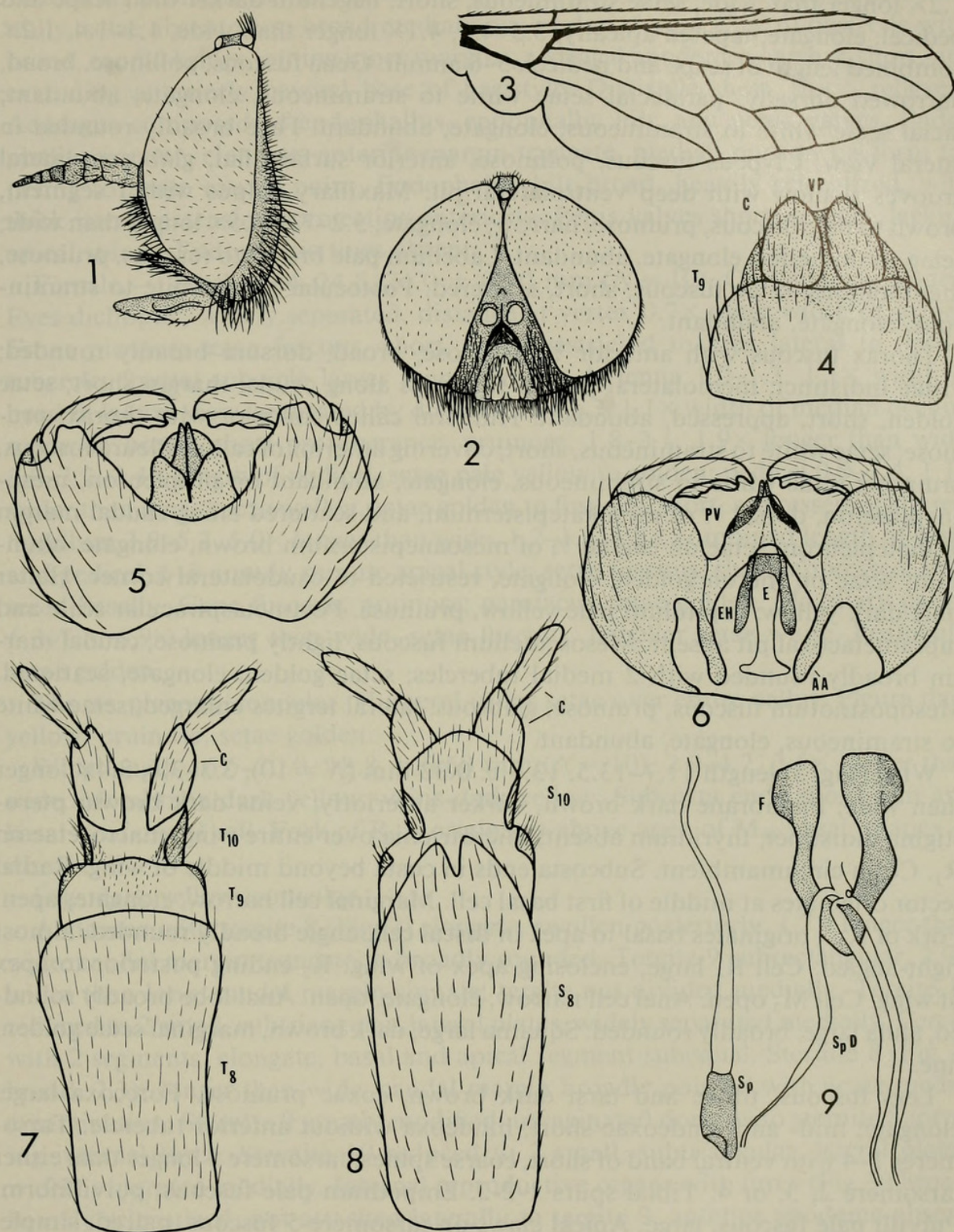
*Musca ferruginea* Scopoli, 1763: 349 (No. 913).

*Coenomyia ferruginea*: Leonard 1930: 7; Lindner 1925: 5; Oldroyd 1966: 957.

Twenty species have been synonymized with *Coenomyia ferruginea* (Leonard, 1930; Lindner, 1925; Oldroyd, 1966).

Male.—Length 13.9–16.2,  $15.3 \pm 0.41$  mm ( $N = 10$ ). Head in lateral view (Fig. 1) hemispherical. Vertex (Fig. 2) broadly rounded, not emarginate lateral to ocellar tubercle. Ocelli fuscous, large; ocellar tubercle fuscous, pruinose, subtriangular, distinctly raised above vertex; setae fuscous, elongate, restricted to caudal margin. Eyes large, holoptic, contiguous for short distance ventral to median ocellus; facets of equal size; setae fuscous, erect, very short, scattered over entire eye; medial margin sinuate, ventral  $\frac{1}{2}$  diverging laterally, no emargination dorsolateral to base of scape; in lateral view eyes hemispherical, covering more than  $\frac{3}{4}$  of head. Frons fuscous, pruinose, glabrous, dorsomedial tubercle short. Antenna fuscous, lightly pruinose, elongate, 0.9–1.0,  $0.96 \times$  width of head in lateral view; scape cylindrical, base almost contiguous, separated by distance 0.2–0.7,  $0.4 \times$  width of ocellar tubercle, 1.9–2.3,  $2.1 \times$  longer than wide, 1.7–2.6,  $2.0 \times$  length of pedicel, setae stramineous, elongate, appressed over entire segment; pedicel globose, 1.0–1.4,





Figs. 1–9. *Coenomyia ferruginea*. 1, Lateral view of male head. 2, Anterior view of male head. 3, Wing. 4, Dorsal view of male terminalia. 5, Ventral view of basistyle. 6, Dorsal view of basistyle. 7, Dorsal view of female terminalia. 8, Ventral view of female terminalia. 9, Internal female reproductive structures. Abbreviations: AA = aedeagal apodeme; C = cercus; E = endophallus; EH = endophallic hilt; F = furca; PV = penis valve; S = sternite; Sp = spermatheca; SpD = spermathecal duct; T = tergite; VP = ventral plate of proctiger.



1.2× longer than wide, setae stramineous, short; flagellum darker than scape and pedicel, elongate, tapered apically, 3.5–4.5, 4.1× longer than wide, 1.1–1.4, 1.2× combined length of scape and pedicel, 5–6 annuli. Gena fuscous, pollinose, broad, narrowed dorsally; parafacial setae white to stramineous, elongate, abundant; facial setae white to stramineous, elongate, abundant. Face broadly rounded in lateral view. Clypeus fuscous, pollinose, anterior surface flat, glabrous, lateral grooves shallow with deep ventrolateral pit. Maxillary palpus with 1 segment, brown to pale fuscous, pruinose, narrow, elongate, 5.2–7.4, 6.5× longer than wide; setae stramineous, elongate, abundant. Labellum pale brown to fuscous, pruinose, membranous; setae fuscous, short, scattered. Postocular setae white to stramineous, elongate, abundant.

Thorax fuscous with anterior  $\frac{1}{4}$  pollinose, broad; dorsum broadly rounded; vittae indistinct; mediolateral pair of tubercles along caudal margin short; setae golden, short, appressed, abundant. Humeral callus concolor with thorax, pruinose; setae white to stramineous, short, covering anterior of callus. Pleura fuscous, pruinose; setae white to stramineous, elongate, abundant on propleuron, mesoanepimeron, dorsal  $\frac{1}{2}$  of mesokatepisternum, and scattered along caudal margin of metepleuron; setae on caudal  $\frac{1}{2}$  of mesoanepisternum brown, elongate, abundant; setae on meron golden, elongate, restricted to caudolateral corner. Halter stalk dark yellow; capitulum pale yellow, pruinose. Postmetaspiracular scale and suprametacoxal pit absent. Mesoscutellum fuscous, lightly pruinose, caudal margin broadly rounded with 2 medial tubercles; setae golden, elongate, scattered. Mesopostnotum fuscous, pruinose, glabrous; lateral tergites enlarged, setae white to stramineous, elongate, abundant.

Wing (Fig. 3) length 11.7–13.5,  $13.0 \pm 0.33$  mm ( $N = 10$ ), 3.3–3.6, 3.4× longer than wide; membrane dark brown, darker anteriorly; veins dark brown; pterostigma indistinct; thyridium absent; microtrichia over entire wing; macrosetae on  $R_1$ . Costa circumambient. Subcosta ends in costa beyond middle of wing. Radial sector originates at middle of first basal cell. Marginal cell narrow, elongate, open. Fork of  $R_{4+5}$  originates basal to apex of discal cell, angle broadly rounded, almost right-angled. Cell  $R_4$  large, enclosing apex of wing.  $R_5$  ending posterior to apex of wing. Cell  $M_3$  open. Anal cell narrow, elongate, open. Anal lobe broadly rounded, alula large, broadly rounded. Squama large, dark brown, marginal setae golden, fine.

Legs fuscous, tibiae and tarsi dark brown, coxae pruinose. Forecoxa large, elongate; mid- and hindcoxae short; hindcoxa without anterior tubercle. Tarsomeres 1–4 with ventral band of short, coarse spines; tarsomere 5 longer than either tarsomere 2, 3, or 4. Tibial spurs 1-2-2. Empodium pale fuscous, pulvilliform. Pulvilli pale fuscous, large. Apical claws on tarsomere 5 fuscous, paired, simple. Hindleg not raptorial.

Abdomen dark yellow to brown, glossy, dorsoventrally flattened; 7 visible segments; setae yellow, fine, elongate, with no distinctive pattern. Tergite 1 broad, subrectangular, anterior margin truncate. Tergite 8 reduced, retracted under tergite 7. Tergite 9 (Fig. 4) subrectangular, brown, medial area pale yellow, glabrous, caudal margin truncate, tergite not divided medially. Tergite 10 absent. Cercus with single short, oblong lobe, rounded caudally. Ventral plate of proctiger subtriangular, large, lying ventral to cerci, caudal margin emarginate. Sternite 9 and



10 absent. Basistyle in ventral view (Fig. 5) broad, rounded laterally, fused ventrally, setae absent from broad medial area; in dorsal view (Fig. 6) basistyle with broad, caudal bridge joining inner margins; aedeagal apodemes narrow, short, not extending anteriorly beyond base of basistyle. Dististyle short, thick, reflexed. Aedeagus composed of endophallus, endophallic hilt, and penis valves. Endophallus narrow, elongate, anterior margin truncate, median portion fusiform tapering to acute caudal point. Endophallic hilt broad, heavily sclerotized, with thick lateral extensions projecting anteriorly. Penis valves short, sinuate, lacking apical spines. Endophallic tines absent.

Female.—Length 19.4–24.5,  $21.0 \pm 0.90$  mm ( $N = 10$ ). Ocellar setae golden. Eyes dichoptic, widely separated, distance at vertex  $0.7\times$  outer width of scapes. Frons piceous; setae fuscous, short, erect, restricted to area lateral to ocellar tubercle; frontal tubercle larger than in male. Antenna 1.0–1.3,  $1.1\times$  width of head in lateral view, separated by distance 1.0–1.3,  $1.1\times$  width of median ocellus; scape on broad, short protuberance, pruinose, 1.8–2.1,  $1.9\times$  longer than wide, 2.0–3.2,  $2.4\times$  length of pedicel, setae pale yellow to golden; pedicel 0.9–1.4,  $1.1\times$  wider than long, apex swollen, setae golden to fuscous, short, appressed, scattered; flagellum 3.9–5.7,  $5.0\times$  longer than wide, 1.2–1.5,  $1.3\times$  combined length of scape and pedicel, 6–8 annuli; minute apical style; setae fuscous, short, appressed, scattered basally. Gena fuscous, pruinose; parafacial setae golden. Maxillary palpus 6.3–7.8,  $6.9\times$  longer than wide, setae fuscous. Labellar setae white. Postocular setae golden.

Thorax piceous, concolor. Humeral callar setae over entire callus. Pleura dark yellow, pruinose, setae golden.

Wing length 16.5–20.0,  $18.8 \pm 0.60$  mm ( $N = 10$ ), 2.9–4.2,  $3.5\times$  longer than wide. Membrane dark yellow; veins dark yellow. Subcosta ends above r-m and basal  $\frac{1}{3}$  of discal cell. Fork of  $R_{4+5}$  originates above apex of  $M_3$ , basal to apex of discal cell.

Legs dark yellow, concolor.

Abdomen with tergite 8 (Fig. 7) elongate, swollen posteriorly,  $1.7\times$  longer than wide; caudal margin truncate to broadly rounded. Tergite 9 subrectangular,  $2.0\times$  wider than long; caudal margin sinuate; tergite not divided medially. Tergite 10 reduced to 2 small, subtriangular, lateral plates, widely separated medially. Cercus with 2 segments, elongate, basal and apical segment subequal. Sternite 8 (Fig. 8) broad,  $2.3\times$  longer than wide; caudal margin broadly pointed with acute medial emargination. Sternite 9 greatly modified, invaginated dorsally to sternite 8 forming internal furca. Sternite 10 reduced to 2 small, subtriangular, lateral plates, widely separated medially. Internal reproductive organs with furca (Fig. 9) broad, heavily sclerotized, not attached laterally to tergite 9, anterior apodeme absent. Common spermathecal duct short, trifurcating to form duct with anterior and caudal  $\frac{1}{3}$  broader than medial  $\frac{1}{3}$ , ending in spermatheca. Spermatheca oblong, fuscous to black, with apical depression.

Pupa (Figs. 10, 11).—Length 26.6–36.9, 32.0 mm ( $N = 3$ ), width 5.7–7.4, 6.6 mm, 4.4–5.5,  $4.9\times$  longer than wide. Aedealous, obdurate, dark brown to fuscous.

Head separated from thorax by cephalothoracic suture anterior to thoracic spiracle, extending ventrally from middle of dorsum to beneath sheath of mouthparts. Antennal sheath (AS) broad, tapered apically, about  $2.0\times$  longer than basal



width. Callus seta (CS) 1, posterior orbital setae (POS) 3, lateral orbital seta (LOS) 1, basalalar seta (BAS) 1. Mesothoracic spiracle (Sp) distinct, lying anterior-lateral. Wing and leg sheaths extend posteriorly over 1st abdominal sternite.

Abdominal segments 1–7 with lateral spiracle and paired lateral spines. Tergites 1–2 with 2 dorsal spines; tergites 3–7 with transverse row of spines on caudal  $\frac{1}{3}$  of segment, increasing in size on posterior tergites; tergites 4–6 with lateral V-shaped pattern of small, dark brown punctations. Sternites 5–7 with transverse row of spines on caudal  $\frac{1}{3}$  of segment, increasing in size on posterior sternites; sternites 2–7 with lateral diagonal row of dark brown punctation. Terminal abdominal segment distended caudally to form 2 obtuse projections (Fig. 10, 11); dorsal surface (Fig. 10) with mediolateral tubercle bearing 4 acute spines; lateral margin with broad tubercle bearing 4–6 coarse spines; ventral surface without spines.

Larva (Fig. 12, 13).—Length of full grown larva 38–48 mm, width 5–8 mm, 6.0–7.6× longer than wide. Body shape fusiform, pale white to ivory, holopneustic.

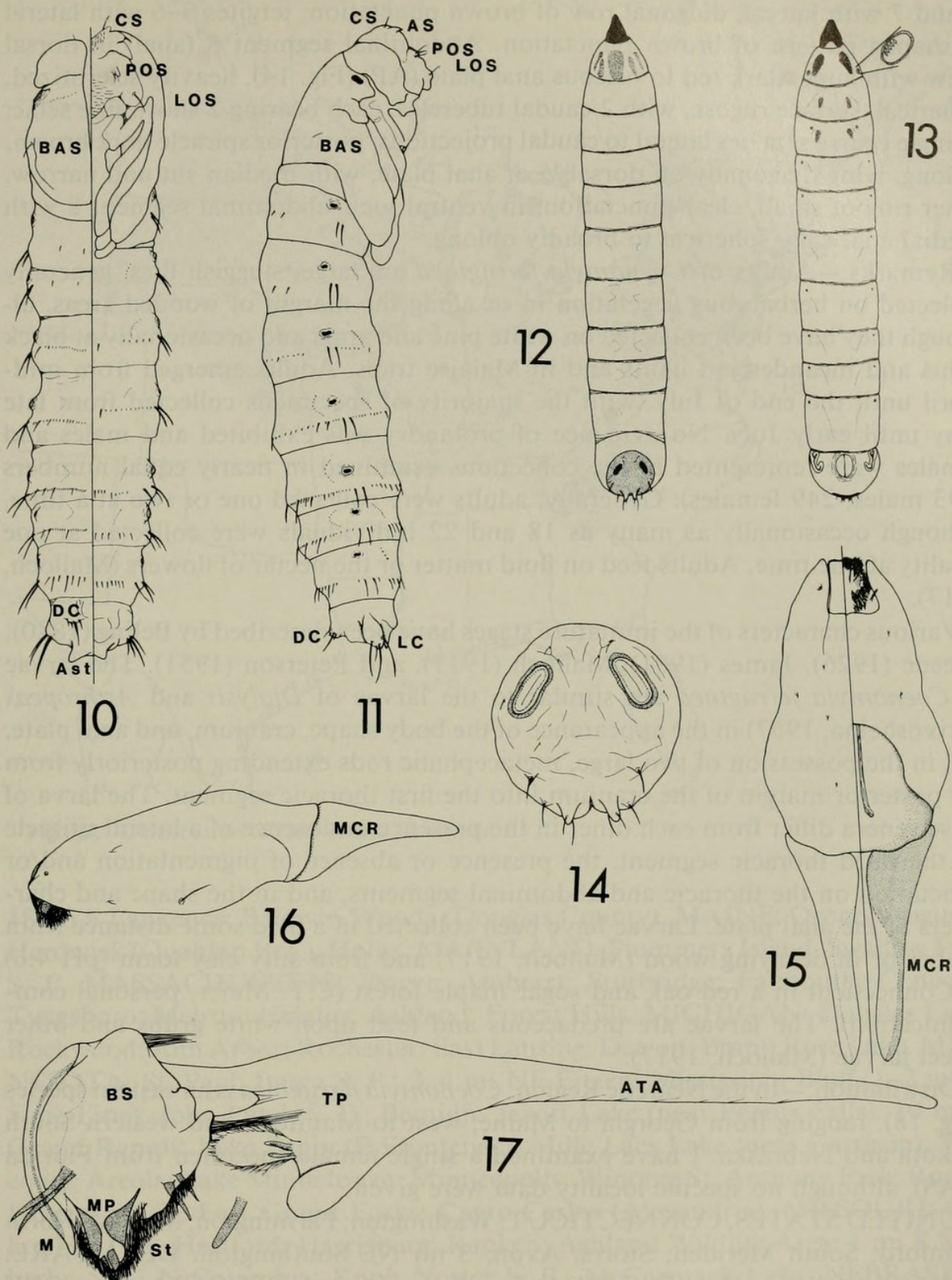
Cranium (Fig. 15, 16) hemicephalic, partially retracted into 1st thoracic segment, dark brown to black, heavily sclerotized, about 1.5× longer than wide, short, tapering anteriorly, with 4 lateral setae. Ocelli absent. Labrum short, wedge-shaped, curved ventrally; epipharynx with dense setal brush. Mandibles hypognathus. Antenna greatly reduced. Metacephalic rods broad, elongate, flattened laterally, heavily sclerotized, extending posteriorly into 1st thoracic segment.

Mouthparts (Fig. 17) or mandibular-maxillary complex with large basal sclerite (BS) bearing mandible, maxillary palpus, stipes, and 2 pairs of flat elongate blades; 1 pair situated dorsal to base of maxillary palpus and directed anteriorly, the 2nd pair situated posterior to base of maxillary palpus and directed ventrally. Mandible (M) large, dark brown, sickle-shaped, heavily sclerotized, tapered ventrally with 3 small serrations on ventral margin, central canal visible. Maxillary palpus with 2 segments, short, thick, about 1.5× longer than wide; apical segment reduced. Stipes and medial surface of basal sclerite with dense brush of membranous projections. Two tendons, 1 dorsal and 1 ventral are attached to posterior margin of basal sclerite. Tentorial phragma attached posteriorly to basal sclerite, anterior tentorial arm narrow, elongate, tapering posteriorly; attached to anterior surface of tentorial phragma are 2 membranous projections surrounded by a membranous fanlike structure bearing numerous branching filaments along its border. Labial palps with 1 elongate segment.

Thorax with 3 distinct segments. Thoracic tergite 1 (Fig. 12) with broad, oblong median area of fuscous pigmentation and 2 narrow lateral, oblong areas of fuscous pigmentation; thoracic sternite 1 (Fig. 13) with large, lateral, oblong area of fuscous pigmentation; lateral prothoracic spiracle oval, strongly sclerotized, level with surface of segment, with 5 small inner slits. Thoracic tergite 2 (Fig. 12) without pigmented areas; thoracic sternite 2 with reduced area of mediolateral, fuscous pigmentation, and a lateral, diagonal row of brown punctation. Thoracic tergite 3 (Fig. 12) without pigmented areas; thoracic sternite 3 (Fig. 13) with reduced mediolateral patch of fuscous pigmentation, a lateral diagonal row of brown punctation, and a small metathoracic spiracle, similar in shape and size to the lateral spiracles on abdominal segments 1–7. Thoracic setae absent.

Abdominal segments 1–7 (Fig. 12) with small, brown, lateral spiracle, a ring of short, coarse spines along anterior margin, and setae absent. Abdominal tergites





Figs. 10–17. *Coenomyia ferruginea*. 10, 11, Pupa. 12–17, Larva. 10, Dorsal/ventral view. 11, Lateral view. 12, Dorsal view. 13, Ventral view. 14, Anal plate, dorsal view. 15, Head, dorsal/ventral view. 16, Head, lateral view. 17, Mandibular-maxillary complex, lateral view. Abbreviations: AS = alar setae; Ast = aster; ATA = anterior tentorial arm; BAS = basal alar setae; BS = basal sclerite; CS = callus setae; DC = dorsal comb; LC = lateral comb; LOS = lateral orbital setae; M = mandible; MP = maxillary palp; MCR = metacephalic rods; POS = posterior orbital setae; St = stipes; TP = tentorial phragma.



2 and 7 with lateral, diagonal row of brown punctation; tergites 3–6 with lateral V-shaped pattern of brown punctation. Abdominal segment 8 (anal) in dorsal view with large, dark red to fuscous anal plate (AP) (Fig. 14), heavily sclerotized, spherical, surface rugose, with 2 caudal tubercles, each bearing 2 short, fine setae; a single coarse seta lies lateral to caudal projections; posterior spiracle dark brown, oblong, lying diagonally on dorsal  $\frac{1}{2}$  of anal plate, with median slit and narrow, outer ring of small, clear punctation; in ventral view abdominal segment 8 with medial anal ring, spherical to broadly oblong.

Remarks.—Adults of *Coenomyia ferruginea* are large, sluggish flies, generally collected on herbaceous vegetation in or along the margin of wooded areas, although they have been collected on white pine and grass and occasionally at black lights and incandescent lights and in Malaise traps. Adults emerged from mid-April until the end of July, with the majority of specimens collected from late May until early July. No evidence of protandry was exhibited and males and females were represented in the collections examined in nearly equal numbers (293 males, 249 females). Generally, adults were collected one or two at a time, although occasionally as many as 18 and 22 individuals were collected at one locality at one time. Adults feed on fluid matter or the nectar of flowers (Malloch, 1917).

Various characters of the immature stages have been described by Beling (1880), Greene (1926), James (1981), Malloch (1917), and Peterson (1951). The larvae of *Coenomyia ferruginea* are similar to the larvae of *Dialysis* and *Arthropeas* (Krivoshchina, 1967) in the appearance of the body shape, cranium, and anal plate, and in the possession of two large, metacephalic rods extending posteriorly from the posterior margin of the cranium into the first thoracic segment. The larva of these genera differ from each other in the presence or absence of a lateral spiracle on the third thoracic segment, the presence or absence of pigmentation and/or punctation on the thoracic and abdominal segments, and in the shape and characters of the anal plate. Larvae have been collected in a field some distance from timber or in decaying wood (Malloch, 1917) and from silty clay loam (pH 4.6) in Connecticut in a red oak and sugar maple forest (C.T. Maier, personal communication). The larvae are predaceous and feed upon white grubs and other insect larvae (Malloch, 1917).

Distribution.—In the Nearctic Region, *Coenomyia ferruginea* is an eastern species (Fig. 18), ranging from Georgia to Maine, west to Manitoba and western South Dakota and Nebraska. I have examined a single female specimen from Florida (CAS), although no specific locality data were given.

UNITED STATES. CONNECTICUT: Washington; Farmington; Milford; North Branford; South Meriden; Storrs; Avon; 3 mi NE Southington. DELAWARE: Wilmington; Water Gap. FLORIDA: Locality unknown. GEORGIA: 15 mi NW Dahlonga; Athens. ILLINOIS: Allerton Park, 4 mi W Monticello; Beverly Hills; Elsau; Pine Hills; Edgebrook; Ottawa; Argonne National Laboratory; Chicago; Palos Park; Downers Grove; Charleston; Riverside; Fourth Lake; Sand Lake; Algonquin; Stratford; Galena; Willow Springs; Glen Ellyn; Oakwood. INDIANA: Harrison County; The Bear Wallow (Brown County). IOWA: Ames; Allamakee County; Union County; Lake Okoboji; 4 mi E Gilbert; Ledges S. P.; Leon; Thayer. KANSAS: University of Kansas Natural History Reserve (Douglas County); Manhattan; Tuttle Creek Reserve (Riley County); Onaga; Baldwin; Lone Star Lake;



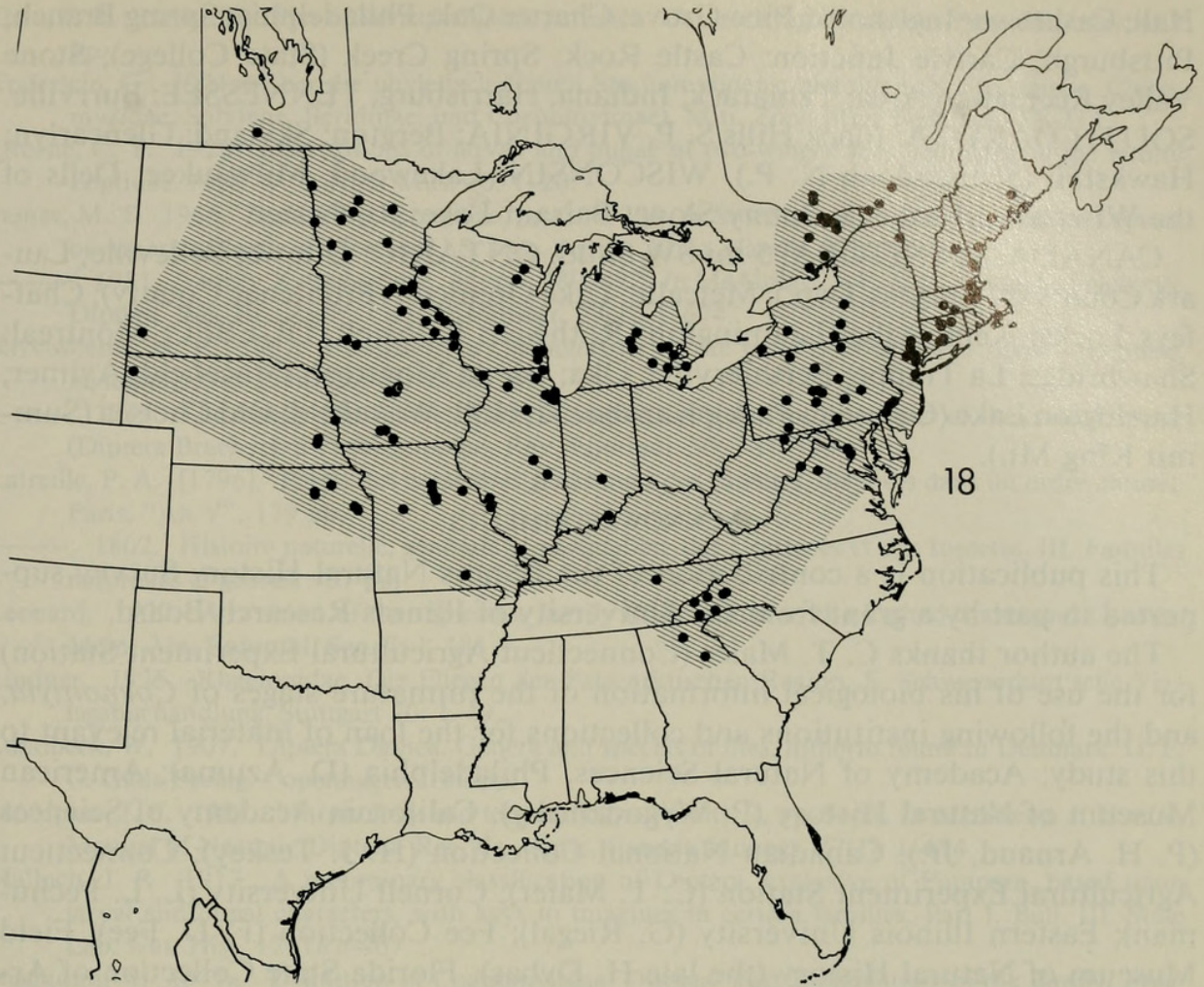


Fig. 18. Distribution of *Coenomyia ferruginea*.

18 mi S Lawrence; Baldwin Woods (Douglas County). MAINE: Orono; Augusta; Hardwick (Quabbin Res.); Hollis. MARYLAND: Plummers Island; Swallow Falls S. P. MASSACHUSETTS: Dover; Amherst; Sturbridge; Falmouth; Concord; Tyngsboro; Melrose Heights; Ashland; Forest Hills. MICHIGAN: Douglas Lake; Rockwood; Ann Arbor; Rochester; East Lansing; Detroit; Brant; Rose Lake. MINNESOTA: St. Paul; Itasca S. P.; 3–4 mi NE Eitzen; Mississippi Bluff (1–2 mi N State Line); John Latch S. P.; Bemidji; Jewitt Lake (near Fergus Falls); 10 mi S Grand Rapids; Lake Pepin (E Frontenac); Mille Lacs Lake (near Garrison); Waconia; Arcola; Lake Minnetonka; Minneapolis; Winona; St. Anthony Park; Round Lake; 9 mi SE East Grand Forks; Camp Carlos (Alexandria). MISSOURI: Columbia; New Hartford; Harrisburg; Ranken; Ashland Wildlife Area; 1 mi E Moberly; 5 mi N Columbia; Knob Noster S. P.; McCormack Lake. NEBRASKA: Sprague; Omaha; Lincoln. NEW HAMPSHIRE: Durham; Moultonboro; Barrington. NEW JERSEY: Alpine; Greenwood Lake; Tenaflly. NEW YORK: Monroe; Elmira; Protection; West Point; Syracuse; Colear Bay (Lake Champlain); Fort Montgomery; Chautauqua; Ithaca; Suffern; Pearl River; Richmond; Tuxedo. NORTH CAROLINA: Retreat; Andrews Bald (Great Smoky Mountains N. P.); mi 403.3 Blueridge Parkway; Black Mts.; Wayah Bald (Macon County); 5 mi N Brevard. NORTH DAKOTA: Fargo. PENNSYLVANIA: Lewisburg; Somerset; Mt. Alton; Dauphin; Wilawana; State College; The Rock; Gap Run; Barrens; Oak



Hall; Cashtown; Inglenook; Pine Grove; Charter Oak; Philadelphia; Spring Branch; Pittsburgh; Carlyle Junction; Castle Rock; Spring Creek (State College); Stone Valley Recreation Area; Tamarack; Indiana; Harrisburg. TENNESSEE: Burrville. SOUTH DAKOTA: Black Hills S. P. VIRGINIA: Bergton; Skyland; Glencarlyn; Hawksbill (Shenandoah N. P.). WISCONSIN: Lakewood; Milwaukee; Dells of the Wisconsin; Keshena; Sunny Slope; Balsam Lake; Rochester.

CANADA. MANITOBA: 5 mi SW Shilo. ONTARIO: Ottawa; Belleville; Lanark County (N Burgess Twp.); Metcalfe; Lake Opinicon (Frontenac County); Chaffeys Locks; Kemptville; Leamington; Rothwell; Bathwell. QUEBEC: Montreal; Shawbridge; La Trappe; Berthierville; Oka; Isle of Montreal; Gracefield; Aylmer; Harrington Lake (Gatineau Park); Kazabazua; Hull; Wakefield; Old Chelsea (Summit King Mt.).

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