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NEW AMERICAN CYNIPID WASPS FROM GALLS

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TWENTY-FOUR new species of cynipids and their galls and two inquilines are described herein, together with some notes on biology and synonymy. One new generic name is proposed for three described gall-making species from the Pacific coast.

Types of the new species are in the United States National Museum (U.S.N.M.). Paratypes are deposited in institutions that are indicated by the following abbreviations: the American Museum of Natural History (A.M.N.H.), the Chicago Museum of Natural History (C.M.N.H.), the Academy of Natural Sciences of Philadelphia (A.N.S.P.), the California Academy of Sciences (C.A.S.), the Museum of Comparative Zoology (M.C.Z), Cornell University (C.U.), the Illinois Natural History Survey (I.N.H.S.), and the University of Utah Museum (U.U.M.).

Genus SAPHONECRUS Dalla Torre and Kieffer

SAPHONECRUS BREVICORNIS (Ashmead), new combination

Synergus brevicornis ASHMEAD, Trans. Amer. Ent. Soc., vol. 23, p. 189, 1896.

The types have the radial cell open; hence the species belongs in *Saphonecrus*.

Genus SYNOPHRUS Hartig

SYNOPHRUS MEXICANUS (Gillette)

Synergus mexicana GILLETTE, Trans. Amer. Ent. Soc., vol. 23, pp. 90, 96, 1896.

The type, in the U. S. National Museum, has the petiole smooth and

the radial cell open; hence the species belongs in *Synophrus* and was transferred in "Hymenoptera of America North of Mexico," p. 613, 1951.

Genus *SYNOPHROMORPHA* Ashmead

Synophromorpha ASHMEAD, Psyche, vol. 10, p. 45, 1903.

Ashmead, in his key to genera, designated *Synophromorpha salicis* as the type of this genus, but no further description of it was ever published, and no specimen so labeled was found in the Ashmead collection. It was supposed to have been reared from a dipterous gall on willow and considered to be a guest fly. He characterized the genus as having an open radial cell, the petiole not longitudinally striate, and separable from *Synophrus* Hartig by having a coriaceous instead of transversely sculptured mesoscutum with more or less distinct parapsidal grooves, smaller foveae, incomplete areolet, and the third segment of the antenna longer than the fourth in the male.

SYNOPHROMORPHA SYLVESTRIS (Osten Sacken), new combination

Synophrus (?) *sylvestris* OSTEN SACKEN, Ent. Zeit. Stettin, vol. 22, p. 415, 1861.

This species agrees with the diagnosis of *Synophromorpha* and is here transferred to that genus, and as the original spelling is permissible Latin it is retained. It was reared from the gall of *Diastrophus nebulosus* Osten Sacken on blackberry in the Washington, D. C., area. Adults agreeing with paratypes of this species have often been reared from this gall in this, the type, area and in many other localities. Range in length of females 2.1–3.25 mm. Average of 31 specimens 2.86 mm. Males 1.8–2.65 mm. Average 2.25 mm. Similar adults have been reared from galls of *Diplolepis ignota* (Osten Sacken) in the Washington area.

Two new species are described in the present paper. Like *sylvestris* they have the face striate, antennae and legs straw yellow, antennae 12-segmented in the female, mesoscutum broader than long, parapsidal grooves percurrent and broadened posteriorly, foveae smooth, carinae on propodeum straight, diverging above, abdomen with a hairy ring at base and a faint indication of a suture between tergites II and III as in *Ceroptres*.

SYNOPHROMORPHA TERRICOLA, new species

Differs from *sylvestris* in having the mesopleuron smooth instead of finely aciculate and a fainter coriaceous sculpture on mesoscutum. The parapsidal grooves closely approach each other at scutellum where they are separated only by a distinct median groove. Length of females 2.2–2.9 mm. Average of 32 specimens 2.57 mm. Males have 14-

segmented antennae. Length 1.8–2.7 mm. Average of 20 specimens 2.42 mm.

Types.—U.S.N.M. No. 60105: Type female, allotype, and six paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.¹

Habitat.—Emerged early in May from galls of *Diastrophus radicum* Bassett at East Falls Church, Va. Part of the paratypes are from galls of *D. bassettii* Beutenmueller, from Washington, D. C.

SYNOPHROMORPHA RUBI, new species

Differs from *S. terricola* in having the parapsidal grooves widely separated behind with a median groove wanting or a mere notch. Females measure 2.2–2.9 mm. Average of 15 specimens 2.46 mm. Males 1.6–2.2 mm. Average of six specimens 1.77 mm.

Types.—U.S.N.M. No. 60106: Type female, allotype, and four paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Habitat.—The types emerged in July from galls of *Diastrophus cuscutaeformis* Osten Sacken collected at Winnetka, Ill.

Genus CEROPTRES Hartig

CEROPTRES OBTUSILOBENSIS Weld

Diptolepis q. obtusilobae KARSCH, Zeitschr. für Ges. Naturw., vol. 53, pp. 292, 293, pl. 6, figs. 3, 3a, 3b, 1880.

Cynips obtusilobae DALLA TORRE, Catalogus hymenopterorum, vol. 2, p. 47, 1893 (cites Karsch).

The Karsch gall in Berlin is an abrupt terminal stem swelling on *Quercus stellata*, from Texas, labeled *Cynips quercus obtusilobae*. The three type adults reared from it, which Karsch considered to be the makers of the gall and related to *Neroterus*, are all guest flies of the genus *Ceroptres*. Dalla Torre was the first to apply a binomial designation to the species. As *obtusilobae* was preoccupied in *Ceroptres* in 1885 by Ashmead (Trans. Amer. Ent. Soc., vol. 12, p. 300) the name *obtusilobensis* was proposed in the "Hymenoptera of America North of Mexico," p. 614, 1951, for the Karsch species.

Genus LIPOSTHENES Foerster

LIPOSTHENES GLECHOMAE (Linnaeus)

Cynips glechomae LINNAEUS, Systema naturae, ed. 10, p. 553, 1758.

Aulax latreillei KIEFFER, Ent. Zeit. Wien., vol. 17, p. 257, 1898.

Linnaeus did not describe his species, but he cited seven references; six of these refer to galls only. However, in one, Reaumur (Memoirs,

¹ See p. 315 for explanation of abbreviations used throughout this paper.

vol. 3, pp. 460-462, figs. 1-5, 1737) says he reared a brown fly with four wings, similar to those he had reared from oak but with slight and sufficient differences to indicate it is a distinct species. This brief characterization of the maker of the gall validates the name that Linnaeus gave to the species in 1758. He himself evidently had not seen the maker, for in *Fauna Suecica*, p. 386, No. 1520, 1761, he says of the gall "insectum tamen non dum vidi" (however, I have not yet seen the insect).

Kieffer makes two misstatements when he writes (loc. cit.): "Linné hat zuerst aus den Galläpfeln von *Glechoma hederacea* den Erzeuger erhalten, und denselben *Cynips glechomae* genannt; die Beschreibung lautet: '*fusca thorace villosa*.' *Fauna Suecica* 1761, pag. 386, Nr. 1520." Reaumur, in France, was the first to rear the maker. The phrase "*fusca thorace villosa*" does not occur in the reference that Kieffer cites. There is in Geoffroy (*Histoire abrégée des insectes qui se trouvent aux environs de Paris . . .*, vol. 2, p. 203, No. 20, 1762), the statement, "*Cynips totus fuscus, thorace subvillosus. Sa couleur est brun et noirâtre; son corcelet est un peu velu.*" Then, in 1787, Fabricius (*Mantissa insectorum . . .*, vol. 1, p. 252), in what is merely a key to species in each genus, shortens this to "*fusca thorace villosa*," to distinguish *glechomae* from the preceding species in his key.

The sides of the pronotum are pubescent and the mesoscutum is bare. In 1841 Hartig described adults he had from Foerster as having a shining mesonotum and makes the comment that "*Cynips glechomae* Lin. (*fusca thorace villosa*) muss notwandig ein andere Insect gewesen sein, da die Brust nichtsweniger als behaart ist." He does not name it, however. He takes the three Latin words to be a condensed *description* instead of a mere phrase to separate it from another species. This Hartig-Foerster material is what Foerster in 1869 made the type of his genus *Liposthenes*.

Latreille also (*Histoire naturelle générale et particulière, des crustacés et des insectes . . .*, vol. 13, p. 207, 1803) reared the maker and described it as very black, smooth, shining—the same insect that Hartig and Foerster examined. In 1898 Kieffer gave a new name to this species, calling it *Aulax latreillei*, and in 1910 (*Das Tierreich*, Lief. 24, p. 668) it appeared as a species distinct from *glechomae* Linnaeus from Sweden (sic), its gall not distinguishable from that of *glechomae*. *Aulax latreillei* is listed as from Britain, Germany, France, Austria, Italy, and North America.

If the above reasoning about the Latin phrase is correct, then Kieffer was not justified in giving a new name to the Hartig-Foerster-Latreille material, and the name *latreillei* should go into synonymy. There is only one species making the characteristic gall on *Nepeta* in

Europe and this species was introduced, together with its host plant, into the eastern United States. It should be known by the specific name that Linnaeus gave to it. Taylor (Amer. Journ. Botany, vol. 36, pp. 222-230, February 1949) published an excellent study of the early stages of this gall.

Genus *DIPLOLEPIS* Geoffroy

Rhodites Hartig, 1840, was founded on three species and Foerster in 1869 designated *Cynips rosae* Linnaeus as the type. The name is transliterated from a Greek word meaning "pertaining to a rose." Thus the name when applied to an insect implies an association with rose. In both the American and European literature up to 1917 the maker of a rose gall has been placed consistently in *Rhodites*.

Neither Hartig nor Foerster seems to have consulted the old literature. Geoffroy in 1762 (*Histoire abrégée des insectes*, vol. 2, p. 308) proposed the genus *Diplolepis* for six species of gall makers, which he designated simply by number. Under No. 1 he cites Rösel, ins. vol. 3, suppl., plates 35, 36, and 53, figs. 10, 11, where he describes and figures an insect and gall on the leaf of oak without name. (Fourcroy in 1785 gave the name *Diplolepis quercus* to Geoffroy's No. 1.) In the bibliography of his No. 2 he cites among others *Systema Naturae*, ed. 10, p. 553, No. 1, 1758, which is *Cynips rosae* Linnaeus. The other numbered species lack a bibliography and have no standing. Thus by a reference the genus is established on one named species, and the definite designation of *Cynips rosae* as the type by Rohwer and Fagan in 1917 (*Proc. U. S. Nat. Mus.*, vol. 53, p. 365) was unnecessary. They seem to feel that there is some slight doubt about the supposed designation of *C. rosae* as type by Geoffroy. The genus is monobasic. It is next-to-the-oldest name in the Cynipidae and was plainly intended to apply to a gall maker. And yet it does not appear in the key to genera in Foerster (1869), Mayr (1881), or Ashmead (1903), either as a valid name or a synonym. It was used erroneously in 1910 by Dalla Torre and Kieffer in *Das Tierreich*, Lief. 24, Cynipidae.

As *Rhodites* and *Diplolepis* are isogenotypic, *Rhodites* disappears in synonymy, although there is sentiment for having it placed on the conservanda list. Kinsey and Ayres (*Indiana University Studies*, vol. 9, Study 53, 1922) were the first to adopt *Diplolepis* in place of *Rhodites*, and Felt in 1940 (*Plant galls and gall makers*) followed their example. The name is coming into increased use among American authors. Europeans still use *Rhodites*. It is a case of an appropriate name made familiar by a century of usage against the plain intent of an older author. The establishment of a name by a reference is not an unusual or doubtful procedure. Lin-

naeus thus established his *Cynips glechomae*. Whether plenary power should be exercised in a case where the obvious intent of an author is so evident and his procedure so little open to question is a matter for discussion.

DIPLOLEPIS LENS, new species

Female.—Head and thorax black, abdomen and legs red. Vertex coriaceous. Antennae 14-segmented. Mesoscutum almost shining but not smooth, slightly rugose behind; parapsidal grooves percurrent with a median groove posteriorly. Scutellum rugose, longer than broad. Mesopleuron with a smooth and shining spot above and a larger one below. Wing pubescent and ciliate, clouded on radial and part of cubital cells as in *rosae*. Abdomen not so long as head plus thorax. Length 1.9–2.6 mm. Average of 23 specimens 2.24 mm. Smaller than *D. bicolor* (Harris), whose mesoscutum is more coarsely rugose behind, without a median groove.

Types.—U.S.N.M. No. 60107: Type and 4 paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Rosa nutkana*.

Gall.—A lentil-shaped thickening, up to 3.2 mm. in diameter by 1.7 mm. thick, in the parenchyma of the leaf in the fall. Single or several on a leaf. Similar to the gall of *D. rosaeifolii* Cockerell in the eastern United States.

Habitat.—The types are from galls collected at Corvallis, Oreg., on October 16, 1939, along a road northwest of the university campus. Adults emerged June 7–14, 1940. Similar galls were seen at Holland, Siskiyou, and Klamath Falls, Oreg.; Chelan and Waitsburg, Wash., and Walnut Creek, Calif.

DIPLOLEPIS TERRIGENA, new species

Female.—Head and thorax variegated, red and black, abdomen and legs red. Antennae 14-segmented, three basal segments slightly reddish. Mesoscutum shining, smooth, with scattered punctures; parapsidal grooves broad, rugose, percurrent, ending in a rugose area at pronotum, median groove represented posteriorly by confluent punctures and continued forward by a dark median line. Scutellum rugose, less coarsely so in center. Wing not clouded, areolet reaching one-fifth way to basal. Propodeum with a smooth median groove. Abdomen nearly as long as head plus thorax, exposed parts of tergites back of II finely coriaceous, tergites IV–VII knife-edged dorsally. Using width of the head as a base the length of mesonotum ratio is 1.27; antenna 2.4; wing 3.0; ovipositor 3.3. Length 3.45–5.0 mm. Average of 65 specimens 3.99 mm.

Male.—Head and thorax black, abdomen red under black, legs beyond coxae red. Antennae 15-segmented, third bent. Abdomen

shorter than thorax, twice as long as high. Length 2.25–3.25 mm. Average of 43 specimens 2.92 mm.

Differs from *D. fulgens* (Gillette), the median groove of which is as distinct as a parapsidal in posterior third and whose propodeum is rugose medially.

Types.—U.S.N.M. No. 60108: Type female, allotype, and 20 paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., M.C.Z., and C.U.

Host—*Rosa* sp.

Gall (pl. 17, fig. 17).—A large abrupt "root" gall at the crown, up to 50 mm. in diameter, surface somewhat botryoidal.

Habitat.—The types are from galls collected at Ojai, Calif., on April 6, 1922. They contained pupae at that time. Adults emerged April 26 to May 20. Galls were seen also at St. Helena and Los Gatos, Calif.

DIPLOLEPIS POLITA (Ashmead)

Rhodites polita ASHMEAD, Colorado Biol. Assoc. Bull. 1, pp. 14, 38, 1890.

Rhodites occidentalis BEUTENMUELLER, Brooklyn Ent. Soc., vol. 17, p. 45, 1922 (new synonymy).

Ashmead described *polita* from a gall similar to the eastern *Diplolepis bicolor* (Harris), found on *Rosa californica*, but adds the statement that he has seen galls from Dakota and Colorado also. As the types in the U. S. National Museum are from Marin County, Calif., and bear Koebele's label with No. 70 in red ink, the type locality is California, and the Dakota and Colorado material was misdetermined. There are males of this species in collections from Los Angeles but not marked as types.

Fullaway reared adults, which he determined to be *Rhodites bicolor* (Harris), from Cupertino (Stevens Creek), Calif., and described them in 1911 (Ann. Ent. Soc. Amer., vol. 4, p. 377). In 1922 Beutenmueller gave this *bicolor* Fullaway the name of *Rhodites occidentalis*. The U. S. National Museum has a female specimen from Cupertino (Stevens Creek) which must be a type of the Fullaway description. It agrees with types of *R. polita* Ashmead. It measures 3.1 mm. The 5 mm. measurement in the description must be a misprint for 3 mm.

Genus NEUROTERUS Hartig

NEUROTERUS TANTULUS, new species

Female.—Black. Head from above about twice as wide as long, broader than thorax, cheeks slightly broadened behind eyes; from in front broader than high, malar space one-third eye with a faint groove, interocular space broader than high. Antennae 12-segmented, lengths as (scape) 25(12) : 18(14) : 25(6) : 17 : 16 : 16 : 16 : 16 : 15 : 14 : 12 : 22

(9). Mesoscutum without trace of parapsidal grooves. Wing pubescent and ciliate, second cross-vein at angle of 55 degrees with basal, areolet reaching one-fourth way to basal. Claw with a weak tooth. Abdomen higher than long, ovipositor often extruded. Using width of the head as a base the length of mesonotum ratio is 1.17; antenna 1.8; wing 4.3; ovipositor 3.3. Range in length of 100 measured specimens 1.75–2.05 mm. Average 1.91 mm.

Types.—U.S.N.M. No. 60109: Type and 20 paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., M.C.Z., I.N.H.S., and C.U. A gall is on each pin.

Host.—*Quercus alba*.

Gall (pl. 16, fig. 1).—Small saucer-shaped galls occurring in large numbers attached by a broad base on under side of leaf in early summer. Individual galls measure .9–1.6 mm. in diameter by .6–.7 mm. high, with an elevation in center of the concave free surface, brown, almost bare, dropping off when mature and leaving a scar .7 mm. in diameter on the gall and a brown spot on the leaf.

Habitat.—Type locality, College Park, Md. On May 24, 1948, W. H. Anderson swept up a tablespoonful of the galls, which had fallen on a table under a heavily infested white oak tree. These were placed in a breeding cage on the ground outdoors and when examined on April 1, 1949, scores of adults had emerged and many had already died.

Genus TRICHOTERAS Ashmead

TRICHOTERAS PERFULVUM, new species

Female.—Piceous; mandibles, parts of scutellum and legs, brown. Head coriaceous, pubescent; from above transverse, as broad as thorax, cheeks not broadened behind eyes; from in front almost circular, malar space one-third eye, without groove, antennae filiform, 12-segmented, lengths as (scape) 16:11:20:19:17:17:15:11:10:9:8:18. Pronotum and mesonotum somewhat shining with uniformly distributed appressed hairs from prominent punctures. Mesoscutum broader than long, parapsidal grooves percurrent. Scutellum rugose posteriorly, with two widely separated smooth pits at base. Wing pubescent and ciliate, veins brown, third abscissa of subcosta almost parallel with second abscissa of radius, radial cell five times as long as broad, areolet present. Mesopleuron largely bare, smooth, polished. Tarsal claws with a strong tooth. Carinae on propodeum slightly bent, area on either side pubescent. Abdomen bare except for usual pubescent patches at base of tergite II, tergite II foliiform. Ventral spine slender, about five times as long as broad in side view, shorter than hind metatarsus. Using width of the head as a base the length

of mesonotum ratio is 1.3; antenna 2.6; wing 4.7. Length 1.75–2.15 mm. Average of five specimens 1.99 mm. Differs from *T. coquilletti* Ashmead in having fully developed wings, from amber-colored *T. vacciniifoliae* (Ashmead) in having cheeks not broadened behind the eyes.

Types.—U.S.N.M. No. 60110: Type and paratype. Paratypes also in A.M.N.H. and C.A.S.

Host.—*Quercus chrysolepis*.

Gall (pl. 17, fig. 20).—Tan colored, circular, 6–8 mm. in diameter by 1 mm. high, single or in two's or three's, attached to midrib on upper or lower side of leaf in the fall. Sparingly hairy, thin walled, with an eccentric ellipsoidal cell inside held in place by radiating fibers.

Habitat.—The types are from galls collected at Idyllwild, Calif., November 9, 1948. Both living and dead adults were found in the galls when they were cut open, February 9, 1949. Galls have been seen in the San Bernardino, San Gabriel, and Santa Lucia Mountains, in Giant Forest, Big Basin, on Mount St. Helena, and at Ukiah, Calif. Fresh galls are fully grown by mid-June.

TRICHOTERAS ROTUNDULA, new species

Female.—Particolored, black and brown. Head coriaceous; from above transverse, cheeks not broadened behind eyes; from in front malar space one-half eye, without groove, faintly striate; antennae 12-segmented, first four segments as 10:8:15:13—last 11. Mesoscutum broader than long, not quite smooth, with uniformly distributed pubescence, parapsidal grooves percurrent, a median groove present posteriorly. Scutellum punctate, foveae smooth. Mesopleuron bare and smooth above, pubescent below. Wing pubescent and ciliate, veins slender, brown, first abscissa of radius arcuate, radial cell elongated, areolet small. Claws toothed. Carinae on propodeum diverging below. Abdomen as long as head plus thorax, lengths of tergites on dorsal margin as 65:13:4, tergite II foliiform. Ventral spine slender, as long as hind metatarsus. Using width of head as a base the length of mesonotum ratio is 1.3; antenna 2.4; wing 4.6. Length 2.0–2.05 mm. Described from three specimens. Differs from *T. perfulvum* in having a longer striate malar space and a longer ventral spine.

Types.—U.S.N.M. No. 60111: Type. Paratype in C.A.S.

Host.—*Quercus chrysolepis*.

Gall (pl. 16, fig. 2).—A midrib cluster of a few globular galls, usually on the under side of a leaf in the fall. Covered with short straight hairs when young and green, later bare, smooth, tan, up to 2.7 mm. in diameter with a central cell 1.5 by 1.2 mm. supported by stout radiating fibers.

Habitat.—The type emerged in November from a gall collected at Camp Baldy, Calif., on November 7, 1939. One paratype was cut out September 5, 1918, from a gall collected at Los Gatos. Another was cut out November 10, 1949, from a gall collected at Idyllwild on November 6, 1948. One (not in the type series and all amber) was cut out dead in 1946 from a gall collected on Mount St. Helena in August 1922.

PARACRASPIS, new genus

Genotype.—*Callirhytis guadaloupensis* Fullaway.

Agamic female.—Head massive, broader than thorax, cheeks broadened behind eyes, malar space without groove, antennae 14-segmented, filiform, third longer than fourth, longer than first two. Thorax normally arched; pronotum narrowed to one-ninth in middle. Mesoscutum broader than long, parapsidal grooves complete or incomplete, median wanting. Scutellum rounded behind, with a transverse groove at base, lateral impressions prominent. Mesonotum covered with uniformly distributed appressed hairs which almost hide the sculpture. Mesopleuron pubescent. Tarsal claws with a tooth. Wings reduced but with evident and nearly normal venation, reaching about to the tip of abdomen. Abdomen longer than head plus thorax, second tergite longest but not reaching half the length of the abdomen, remaining five more or less subequal, sides of III–VI not pubescent. Ventral spine broad, rounded at end, bristly as in *Acraspis* Mayr. Ovipositor almost straight at end, rather short and stout.

Differs from *Acraspis* Mayr in having less reduced wings, a more robust thorax with a normally rounded scutellum. Genus erected to include three agamic species, all from leaf galls not of the "hedgehog" type on *Quercus chrysolepis* in California. Sexual generation unknown.

Included species.—The following species are included in the new genus:

PARACRASPIS GUADALOUPENSIS (Fullaway)

Callirhytis guadaloupensis FULLAWAY, Ann. Ent. Soc. Amer., vol. 4, p. 363, 1911.

PARACRASPIS INSOLENS (Weld)

Acraspis insolens WELD, Proc. U. S. Nat. Mus., vol. 68, art. 10, p. 59, 1926.

PARACRASPIS PATELLOIDES (Weld)

Acraspis patelloides WELD, Proc. U. S. Nat. Mus., vol. 68, art. 10, p. 60, 1926.

Genus LIODORA Foerster

LIODORA COMATA, new species

Female.—Black; mandibles, palpi, base of antennae and legs yellowish white. Head from above transverse, as broad as thorax, cheeks not broadened behind eyes; from in front wider than high, malar space .3 eye, without groove, antennae 14-segmented, lengths of first five as 9:6:11:10:9. Sides of pronotum, mesoscutum, and mesopleuron smooth, bare, polished. Parapsidal grooves narrow, percurrent. A distinct suture between mesoscutum and scutellum. Two smooth, shallow pits at base of scutellum, disk smooth, punctate and pubescent behind and overhanging propodeum. Carinae on propodeum slightly bent. Wing pubescent and ciliate, radial cell five times as long as broad, veins brown, areolet small, first abscissa of radius arcuate. Claws with a strong tooth. Abdomen as high as long, tergites smooth, all visible on dorsal margin. Ventral spine stout, twice as long as broad, not bristly. Ovipositor curved at tip. Length 1.45–2.15 mm. Average of 30 specimens 1.7 mm.

Male.—Head broader than thorax. Antennae 15-segmented, lengths of first five as 9:6:16:11:10, third bent and lighter in color. Abdomen with a short pedicel. Length 1.45–1.8 mm. Average of six 1.64 mm.

Types.—U.S.N.M. No. 60112: Type female, allotype, and six paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus alba*.

Gall (pl. 16, fig. 11).—Conical, 3.0 by 1.4 mm., tan, thin walled, covered with crinkly white matted hairs. Produced singly at edge of leaf in early spring when leaves are only an inch or so long.

Habitat.—Type locality East Falls Church, Va. Adults emerged April 26 and May 4–15.

Genus AMPHIBOLIPS Reinhard

AMPHIBOLIPS GLOBUS, new species

SEXUAL GENERATION

Female.—Head, thorax, antennae, legs except fore and middle tibiae and tarsi, black; abdomen red to almost black. Head rugose, from above narrower than thorax, cheeks not broadened behind eyes; from in front broader than high, malar space .4 eye, with radiating ridges, antennae filiform, 13-segmented. Sides of pronotum coarsely reticulate. Mesoscutum coarsely rugose, the percurrent parapsidal and median grooves also rugose. Scutellum more coarsely rugose behind, pits shallow, a median depression on disk hardly apparent. Meso-

pleuron rugose, more coarsely so anteriorly. Wing pubescent and ciliate, the blotch at base of radial cell covering the areolet also. Tarsal claws toothed. Carinae on propodeum strongly bent, enclosed area rugose with a short median. Abdomen about as long as thorax, lengths of tergites on dorsal margin as 38:8, tergite II smooth on hind margin, III punctate. Ventral spine pubescent, as long as hind metatarsus. Using width of head as a base the length of mesonotum ratio is 1.5; antenna 2.1; wing 3.2; ovipositor 2.0. Length 4.15–4.8 mm. Average of 10 specimens 4.58 mm.

Male.—Similar but abdomen black. Antennae 15-segmented, the third stoutest, the flagellum tapering to tip. Abdomen shorter than thorax, all tergites visible on dorsal curvature. Antenna ratio 3.3. Length 3.5–4.0 mm. Average of 11 specimens, 3.74 mm.

Differs from *A. spongifera* (Osten Sacken), whose tergite II is punctate posteriorly.

Types.—U.S.N.M. No. 60113: Type female, allotype, and three paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus palustris*.

Gall (pl. 16, fig. 4, a).—A bud gall in June produced from weak lateral buds on previous year's growth of saplings 1 to 3 feet high, on sprouts from stumps and on lower limbs of small trees, occasionally from dormant buds on main trunk of trees. In good light, deep green with white spots at attachment of radiating fibers inside; in deep shade, more or less etiolated. Globular, firm, fleshy, bare, up to 18 mm. in diameter, not deciduous. Wall 1 mm. thick. Central cell relatively large, supported by many coarse, branching, radiating fibers. Larval cell 6 mm. by 3.2 mm. and its wall 1.5 mm. thick with big cells at base of the radiating fibers. Exit hole 2.2 mm. in diameter made while gall is still green. After the emergence of the maker the gall turns brown and becomes wrinkled. Many undersized galls are parasitized. Out of more than 200 galls collected only 20 makers emerged.

Habitat.—The type series of galls was collected at East Falls Church, Va. June 26, 1948. Adults emerged June 28, 30, July 2, 4, 1948. None of these galls was seen at this place in 1949, in 1950, or in 1951. Galls had been seen at Rosslyn and Lucketts, Va., Washington, D. C., and Lanham, Md.

AGAMIC GENERATION ?

In early September 1948 approximately 65 bud galls were collected on the ground under a large pin oak tree only a few feet from where galls of *A. globus* herein described were taken the previous June. Similar galls had not been seen here before—circumstantial evidence that it is the alternating form. It occurs in August and September at

the end of the season's growth. It is smooth, bare, green with small purple spots marking the attachment of numerous radiating fibers within, up to 14 mm. in diameter, rounded at distal end, slightly tapering at attached base, the wall relatively thin (.8 mm.) (pl. 16, fig. 4, *b*). Larval cell ellipsoidal, 6 by 4 mm. Galls drop in late August or early September and soon turn brown and become slightly wrinkled. At this time the nutritive layer is all used up and full-grown larvae and pupae are found inside. Some may emerge in the fall but the adults described below were cut out of the galls on October 18 and November 5, 1949. As they are thought to be the alternating agamic generation of *globus* they are not given a different specific name.

Agamic female.—Head and thorax black, abdomen red, tibiae and tarsi brown. Cheeks broadened behind eyes. Antennae 13-segmented. Mesoscutum rugose with parallel longitudinal ridges back of anterior lines and short transverse ridges on either side of them; parapsidal grooves shallow, rugose, percurrent, a median streak percurrent in the sculpture. Scutellum rugose, without distinct median depression or posterior emargination, foveae with oblique ridges in bottom. Large spot on base of radial cell covers areolet also. A short median carina on propodeum. Abdomen as long as thorax, all tergites normally showing on dorsal curvature, hind margin of II smooth, rest punctate, VII pubescent. Ventral spine longer than hind metatarsus. Mesonotum ratio 1.5; antenna 2.0; wing 4.0. Length 3.9–4.55 mm. Average of three 4.3 mm.

Genus ANDRICUS Hartig

ANDRICUS BRUNNEUS Fullaway

Andricus brunneus FULLAWAY, Ann. Ent. Soc. Amer., vol. 4, p. 353, 1911.

This species was described from a "thin-walled subglobular gall, pointed at both ends and about the size of a pea" on the leaves of *Quercus douglasii*. It seems to have been associated with the wrong gall. The type gall in the Stanford collection, agreeing with the above description but with a central cell supported by radiating fibers, seems to be a gall of what was described under the name of *Andricus atrimentus* Kinsey. I have reared adults agreeing with the types from a midrib cluster on this host at Stanford University, the type locality, and also from similar galls on *Quercus lobata*, *Q. dumosa*, and *Q. garryana*. These galls are from 3–5 mm. in diameter, in a cluster of 4 to 6 on the under side of the leaf (pl. 17, fig. 16), tan, slightly mottled, slightly pubescent, thick walled without any radiating fibers or free central cell, dropping in September. From galls collected on *Quercus douglasii* at Stanford University on October 27, 1948, adults emerged October 18 to November 5, 1949.

ANDRICUS ALBICOMUS, new species

Female.—Red, often with some black on occiput, foveae, propodeum, and parts of abdomen. Head coriaceous; from above vertex bare, cheeks slightly broadened behind eyes, occiput not concave; from in front malar space 0.4 eye, without groove, antennae filiform, 13-segmented. Mesoscutum microcoriaceous, shining, longer than broad, with scattered hairs, parapsidal grooves percurrent. Scutellum rugose, pubescent, margined on sides, foveae smooth. Mesopleuron bare, smooth. Wing hyaline, pubescent and ciliate, veins pale and slender, radial cell four times as long as broad, areolet and cubitus almost obsolete. Claws toothed. Abdomen longer than head plus thorax, almost as high as long, lengths of tergites as 45:18:8:4:4, slightly gibbous below petiole, the curved tip of ovipositor projecting beyond sheaths. Ventral spine longer than hind metatarsus. With width of head as a base, the length of mesonotum ratio is 1.4; antenna 2.9; wing 4.9; ovipositor 5.8. Range in length 1.5–2.4 mm. Average of 53 specimens 2.0 mm.

Close to *Andricus kingi* Bassett, whose disk is smooth back of septum and antennae are 14-segmented.

Types.—U.S.N.M. No. 60114: Type and 10 paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

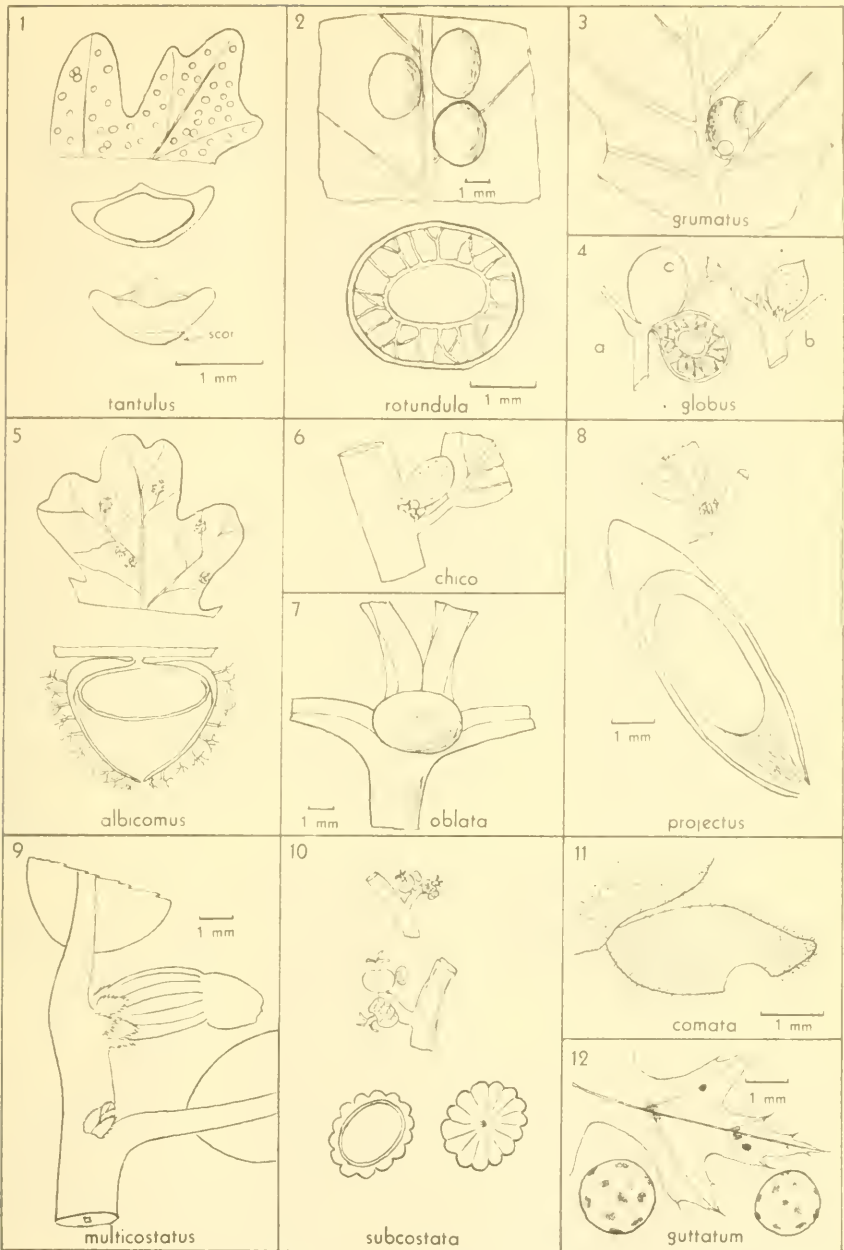
Host.—*Quercus garryana*.

Gall (pl. 16, fig. 5).—A thin-walled conical gall about 5 mm. in diameter on the under side of a leaf in the fall, densely covered with pedicelled, stellate grayish-white hairs. Inside is a transverse basal larval cell with a distal cavity opening at apex.

Habitat.—The types were cut out October 18, 1949, from galls collected at Cave Junction, Oreg., on October 14, 1948. Others emerged in outdoor breeding cage on April 1, 1950. Galls were seen also at Corvallis and at Siskiyou summit, Oregon, on United States Highway 99.

ANDRICUS CHICO, new species

Female.—Light brown; eyes, ocelli and sheaths black. Head coriaceous; from above transverse, cheeks broadened behind eyes, occiput concave; from in front interocular area wider than high, malar space one-third eye, without groove, fan-striae about mouth, antennae filiform, 13-segmented. Mesoscutum coriaceous with short uniformly distributed pubescence from distinct punctures, parapsidal grooves percurrent. Septum between the foveae broad, disk rugose. Mesopleuron smooth under hind wing, striate below, almost bare. Wing pubescent and ciliate, veins beyond second cross-vein pale, areolet distinct. Claws toothed. Carinae on propodeum straight and parallel.



1, *Neuroterus tantulus* on *Quercus alba*; 2, *Trichoteras rotundula* on *Q. chrysolepis*; 3, *Dryocosmus grumatus* on *Q. wislizeni*; 4, *Amphibolips globus* on *Q. palustris*; 5, *Andricus albicomus* on *Q. garryana*; 6, *Andricus chico* on *Q. lobata*; 7, *Callirhytis oblata* on *Q. falcata*; 8, *Andricus projectus* on *Q. chrysolepis*; 9, *Andricus multicostatus* on *Q. subturbinella*; 10, *Callirhytis subcostata* on *Q. stellata*; 11, *Liodora comata* on *Q. alba*; 12, *Zopheroteras guttatum* on *Q. palustris*.



13, *Dryocosmus minusculus* on *Quercus agrifolia*; 14, *Callirhytis hopkinsi* on *Q. imbricaria*; 15, *Andricus prescottii* on *Q. suburbinella*; 16, *Andricus brunneus* on *Q. dumosa*; 17, *Diplolepis terrigena* on *Rosa* sp.; 18, *Andricus crenatus* on *Q. dumosa* and *Q. douglasii*; 19, *Antron pileus* on *Q. suburbinella*; 20, *Trichoterus perfulum* on *Q. chrysolepis*; 21, *Callirhytis furva* on *Q. palustris*; 22, *Callirhytis cistella* on *Q. emoryi*.

Abdomen as long as head plus thorax, as high as long, all tergites showing on dorsal margin. Ventral spine slender, longer than hind metatarsus. Using width of the head as a base the length of mesonotum ratio is 1.3; antenna 2.3; wing 3.8. Length 2.3–2.6 mm. Average of three specimens 2.48 mm.

Differs from *A. foliatus* (Ashmead) in the shorter and more sparse pubescence on thorax and in having a distinct areolet.

Type.—U.S.N.M. No. 60115: Type. Paratype in C.A.S.

Host.—*Quercus lobata*.

Gall (pl. 16, fig. 6).—A smooth, bare, ovoid bud gall found in fall in the axils of leaves, greenish and mottled with purple, projecting beyond the bud scales, 2–3 mm. in diameter.

Habitat.—The types were cut out November 10, 1949, from galls collected at Chico, Calif., on October 18, 1948. Galls have been seen at Stanford University, Los Gatos, Santa Margarita, Lakeport, Ukiah, and Willits, Calif.

ANDRICUS PROJECTUS, new species

Female.—Body reddish brown, infuscated dorsally; antennae and legs lighter. Head coriaceous; from above transverse, occiput not concave, cheeks broadened behind eyes; from in front broader than high, interocular space broader than high, malar space one-half eye, a few striae from corners of clypeus, antennae filiform, 13-segmented. Mesoscutum pebbled, almost bare, parapsidal grooves percurrent, no median. Disk of scutellum pubescent, rugose except back of septum, foveae smooth, shallow. Mesopleuron and sides of propleura bare, finely striate. Wing hyaline, hairs on surface short, not ciliate, veins almost clear, areolet small, radial cell five times as long as broad. Claws with a strong tooth. Carinae on propodeum straight, parallel. Abdomen longer than head plus thorax, lengths of tergites along dorsal curvature as 44:11:2:2:9; hind margin of II smooth, exposed parts of rest punctate. Ventral spine slender, seven or eight times as long as broad. Using width of head as a base, the length of mesonotum ratio is 1.3; antenna 2.5; wing, 4.5; ovipositor 3.4. Range in length 1.15–3.0 mm. Average of nine specimens 2.12 mm. Differs from *A. niger* Tavares in having tergite III punctate.

Types U.S.N.M. No. 60116: Type and one paratype. Paratypes also in C.A.S. and A.N.S.P.

Host.—*Quercus chrysolepis*.

Gall (pl. 16, fig. 8).—Bursting out far beyond the bud scales in the fall, cylindrical, bare, smooth, greenish with a light tan apex. When detached the base is darker, with a depressed scar at the truncated end, 7.0 mm. long by 2.1 mm. in diameter. Monothalamous. Usually occurs at tip of strong sprouts from stumps.

Habitat.—The type emerged April 16, 1943, from galls collected at Canyonville, Oreg., October 18, 1939. One was cut out February 17, 1941. Two paratypes were cut out October 18, 1949, from galls collected at Canyonville on October 12, 1948. Three emerged April 15, 1941 and April 20, 1942, from galls collected on the Mt. Wilson trail above Sierra Madre, Calif., on November 4, 1939. One is from Colfax, Calif. Galls were seen also at the California-Oregon State line on United States Highway 199 and at San Rafael and Idyllwild, Calif.

ANDRICUS CRENATUS, new species

Female.—Red or amber, slightly infuscated. Head coriaceous; from above transverse, vertex bare, occiput not concave, cheeks broadened behind eyes; from in front as high as wide, malar space one-third eye, without groove, antenna 14-segmented, infuscated distally. Sides of pronotum faintly striate. Mesoscutum microcoriaceous, shining, longer than wide, high arched in profile, with scattered hairs, parapsidal grooves percurrent. Scutellum longer than wide, sides margined, finely rugose, pubescent, the two deep smooth foveae at base often infuscated. Mesopleuron largely bare, smooth. Wing pubescent and ciliate, veins slender, radial cell 4.7 times as long as broad, areolet almost obsolete. Claws toothed. Carinae on propodeum bent, enclosed area smooth, narrowed above. Abdomen longer than head plus thorax, longer than high, all tergites usually showing on dorsal margin, ventral spine slender, longer than hind metatarsus. Using width of the head as a base the length of mesonotum ratio is 1.4; antenna 2.7; wing 5.1. Length 1.5–2.45 mm. Average of 24 specimens 1.9 mm.

Differs from *Andricus pattersonae* Fullaway in its smaller size.

Types.—U.S.N.M. No. 60117: Type and three paratypes. Paratypes also in the C.M.N.H., A.N.S.P., C.A.S., and the M.C.Z.

Hosts.—*Quercus dumosa* and *Q. douglasii*.

Gall (pl. 17, fig. 18).—A spangle about 4 mm. in diameter, usually on the upper side of the leaf, saucer shaped, with a thin crenate margin when young in August and with a prominent hump in center. When mature in fall there is a lens-shaped larval cavity inside, on the floor of which is a thin, white, circular disk from which prominent lines radiate. Galls on *Quercus douglasii* are less crenate.

Habitat.—The type is from a series of dead adults cut out of galls collected on *Quercus dumosa* at Los Gatos, Calif., on December 13, 1935. Others, all from California, are from the San Bernardino Mountains, San Jacinto Mountains, and Banning; other paratypes emerged November 19, 1935, from galls collected at Colfax, on *Quercus douglasii* a few days previously; others are from Stanford University

and Angels Camp. Similar galls have been seen on *Quercus engelmanni* at Santa Anita, Calif. Adults not included in the type series have been reared from galls on *Quercus garryana* at Siskiyou summit north of Holbrook, Calif.

ANDRICUS MULTICOSTATUS, new species

Female.—Straw yellow, head and thorax slightly darker, only ventral valves and tips of mandibles infuscated. Head from above transverse, as broad as thorax, cheeks short, not broadened behind eyes, occiput not concave; from in front broader than high with a median ridge above clypeus, malar space striate, half length of eye, antennae 13-segmented, filiform. Mesoscutum coriaceous, with scattered hairs, without evident punctures, parapsidal grooves percurrent, no median. Scutellum rugose with two deep, smooth, shining pits, septum narrow. Carinae on propodeum straight and parallel. Mesopleuron finely striate. Wing hyaline, pubescent and ciliate, first abscissa of radius arcuate, second pale, only distal vein of areolet evident. Tarsal claws toothed. Abdomen longer than head plus thorax, higher than long, only tergites II and III showing on dorsal margin, both smooth; ventral spine slender, almost as long as hind metatarsus. With the width of the head used as a base the length of mesonotum ratio is 1.3; antenna 2.2; wing 4.0. Length 2.2 mm.

Type.—U.S.N.M. No. 60118: Holotype.

Host.—*Quercus subturbinella*.

Gall (pl. 16, fig. 9).—An axillary or terminal bud gall in fall. Cylindrical with 10 to 20 distinct longitudinal ribs, up to 5 mm. long, protruding far beyond the bud scales. Greenish with white spots when fresh, the bulbous distal third smooth and reddish.

Habitat.—The type was cut out alive on October 14, 1944, from a gall collected at Prescott, Ariz., September 13, 1943, by Mrs. N. W. Capron. She collected galls at Cherry and Prescott, Ariz., on October 4, 1935, and September 11, 1947, respectively.

ANDRICUS PRESCOTTI, new species

Female.—Black: antennae, palpi, legs distally and abdomen ventrally brown. Head from above transverse, as broad as thorax, vertex bare, ocellar area punctate, cheeks broadened behind eyes, occiput slightly concave: from in front broader than high, malar space over half eye, without groove, front finely coriaceous. Antennae filiform, 13-segmented. Pronotum pubescent except medially. Mesoscutum finely coriaceous with scattered hairs from punctures, parapsidal grooves percurrent, a median notch or short groove behind, lateral and

anterior lines depressed. Scutellum finely rugose, pubescent, basal pits smooth, shallow. Carinae on propodeum short, straight, parallel. Wings hyaline, cilia and pubescence short, veins brown, first abscissa of radius angled, areolet reaching one-fourth way to basal. Mesopleuron largely bare, smooth, polished. Claws toothed. Abdomen almost globose, tergite II with usual pubescent patches at base, its hind margin and exposed parts of rest punctate. Ventral spine bare, five times as long as broad in side view, shorter than hind metatarsus. Using width of head as a base the length of mesonotum ratio is 1.4; antenna 1.3; wing 3.7; ovipositor 2.4. Length 2.5–3.15 mm. Average of 30 specimens 2.79 mm.

Types.—U.S.N.M. No. 60119: Type and six paratypes. Paratypes also in the A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus subturbinella*.

Gall (p. 17, fig. 15).—A bare, smooth, ellipsoidal gall, 5.0 mm. long by 2.9 mm. in diameter with a nipple at the apex, protruding from a shallow depression in the side of the acorn cup and dropping to the ground when mature in late summer, and then showing a girdle of hairs at the base. From one to eight on an acorn. Monothalms.

Habitat.—The type locality is Prescott, Ariz. From galls collected in October 1935 by Mrs. N. W. Capron, adults were cut out on October 10, 1936, and one emerged April 23, 1937. In July and August 1947 she tied bits of cloth over a lot of affected acorns, so that the galls would not drop to the ground and be lost. Adults were cut out of these galls on March 20, 1948 and January 7, 1949. More were bagged in the summer of 1948, when the galls began to drop by the middle of August, a month earlier than usual, perhaps owing to a dry season. Many of these were blanks. Adults emerged April 15, 23, 26, 30, 1949.

ANDRICUS PILULA Bassett

This species was described from two females cut from galls from southern Utah. The types have the claws toothed, not simple as described. Similar galls were collected by Dr. A. W. Grundmann on *Quercus gambelii* in the mountains near Salt Lake City, Utah, and both females (agreeing with the types) and males were reared June 1–5, 1949. A description of the male is given below.

Male.—Black, flagellum and legs in part yellowish. Antenna nearly three times as long as width of the head, 15-segmented, third longer than fourth and bent, flagellum tapering to tip. Mesoscutum coriaceous, median groove shorter than in female. Disk of scutellum finely rugose, foveae smooth. Mesopleuron bare, smooth except for a few striae in middle. Wing pubescent and ciliate, veins brown, areolet wanting, cubitus traceable from margin nearly to basal. Claws toothed. Carinae on propodeum slightly bent. Abdomen shorter

than thorax, lengths of tergites as 15:4. Length 1.7–2.15 mm. Average of 15 specimens 1.83 mm.

Types.—Specimens of the above description of male are in the U.S.N.M., A.N.S.P., C.A.F., and the U.U.M.

ANDRICUS PILULARIS, new species

Female.—Related to *Andricus pilula* Bassett but entirely different in color, being uniform amber. Antennae 13- instead of 14-segmented. Mesoscutum microcoriaceous instead of pebbled, anterior lines scarcely evident, median groove shorter but a dark median line is percurrent, with uniformly distributed, short, appressed pubescence instead of almost bare. Disk of scutellum more finely rugose, foveae smooth instead of with parallel longitudinal ridges. Mesopleuron smooth, without striae in center. Wing with a small but distinct areolet. Hind femur stouter. Carinae on propodeum slightly bent and enclosed area smooth instead of rugose. Abdomen with all the tergites visible on dorsal curvature, only the tip of sheaths projecting. Ventral spine longer. Length 2.05–2.85 mm. Average of 12 specimens 2.45 mm.

Male.—Differs from male of *pilula* in having greatly bulging eyes, the interocular space higher than broad and cheeks narrowed behind eyes. Length 1.9–2.75 mm. Average of 8 specimens 2.28 mm.

Type.—U.S.N.M. No. 60120: Type female, allotype, and two paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus subturbinella*.

Gall.—Similar to galls of *Andricus utriculus* Ashmead and *A. pilula* Bassett. Globular, about 4 mm. in diameter, projecting more on upper side of leaf.

Habitat.—The types are from galls collected at Wolf Creek, near Prescott, Ariz., by Mrs. N. W. Capron, in June and July 1935. Living adults were cut out of the galls on July 20 and August 15. Others were sent August 1, 1947, and adults cut out August 7. One paratype is from a gall on *Quercus oblongifolia*, from Nogales. Galls have been noted on *Q. toumeyii*, *Q. submollis*, *Q. gambelii*, and *Q. diversicolor*.

Genus ANTRON Kinsey

ANTRON PILEUS, new species

Female.—Amber. Head coriaceous; from above transverse, narrower than thorax, occiput not concave, cheeks not broadened behind eyes; from in front broader than high, malar space .28 eye, without groove, antennae filiform, 15-segmented. Sides of pronotum pubescent. Mesoscutum shining, smooth and almost bare, parapsidal

grooves deep, percurrent. Scutellum longer than broad, an arcuate groove and two shallow pits at base, disk finely rugose, pubescent, overhanging propodeum behind. Mesopleuron smooth, shining. Wing pubescent and ciliate, without clouds, veins distinct, brown, abscissa II of radius enlarged at wing margin, areolet reaching one-fifth way to basal. Claws toothed. Carinae on propodeum strongly bent, enclosed area smooth, much broader than long medially. Abdomen as high as long, only 2 or 3 tergites on dorsal margin. Ventral spine stout, bristly, tapering to tip in side and ventral view. Using width of the head as a base the length of mesonotum ratio is 1.3; antenna 2.3; wing 3.8; ovipositor 2.5. Length 1.5–2.35 mm. Average of 24 specimens 2.02 mm.

Male.—Differs from female in having head and abdomen black and 16-segmented antennae. Length 1.5–1.9 mm. Average of 13 specimens 1.58 mm.

Differs from some other species of *Antron* in having the wing clear.

Types.—U.S.N.M. No. 60121, type female, allotype, and six paratypes. Paratypes also in the A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and the M.C.Z.

Host.—*Quercus subturbinella*.

Gall (pl. 17, fig. 19).—A broadly conical bud gall, usually solitary, at end of new growth in summer. Straw yellow above with a purple margin, 4–7 mm. in diameter, broader than high, strongly concave below like the pileus of the fungus *Coprinus*. Larval cavity at very apex and exit hole just below the short nipple.

Habitat.—The type material was sent by Mrs. N. W. Capron, from Prescott, Ariz., July 12, 1947, and one adult (the type female) emerged en route. More galls were sent August 1, 1947, and dead adults were cut out of the galls. More were sent in early July 1949, and adults emerged July 10–19. In previous years she had sent galls from Camp Creek, Cherry, Pine, and Young, and I had collected them at Ash Fork and Williams, Ariz.

Genus ZOPHEROTERAS Ashmead

ZOPHEROTERAS GUTTATUM, new species

Female.—Living specimens black; head and thorax fading to brown. Head coriaceous; from above transverse, occiput concave, cheeks not broadened behind the eyes; from in front broader than high, interocular area 1.4 times as broad as high, malar space .5 eye, with a groove, antennae 14-segmented, filiform, lengths of first four and last segments as 15 : 5 : 16 : 13 and 10. Mesoscutum coriaceous, bare, longer than broad, not humped in profile, parapsidal grooves distinct, percurrent, widely separated in front, almost meeting behind. Knob on scutellum coriaceous, almost as wide as deep groove at base, in

which are two indistinct smooth pits. Carinae on propodeum almost straight, widely diverging below. Mesopleuron striate below, coriaceous above. Hind tibia longer than tarsus. Claws simple. Abdomen as long as head plus thorax, gibbous below petiole, all tergites visible on dorsal margin, ventral spine 6.5 times as long as broad in side view, ovipositor straight at tip. Using width of head as a base the length of mesonotum ratio is .67, antenna 2.7, ovipositor 5.9. Length 1.5–2.65 mm. Average of 42 specimens 2.2 mm.

Differs from *Z. sphaerula* Weld in its smaller size, in having mesoscutum uniformly convex in profile, the mesopleuron striate in part and ovipositor straight at tip.

Types.—U.S.N.M. No. 60122: Type and nine paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and the M.C.Z.

Host.—*Quercus palustris*.

Gall (pl. 16, fig. 12).—Almost spherical, smooth, bare, with purple spots on a cream background, attached singly on under side of leaf on a secondary vein, dropping in early October. From 1.4 to 2.5 mm. in diameter. Pure white inside with the minute larval cavity central.

Habitat.—Type locality East Falls Church, Va. Galls were collected in October in eight different years; adults emerged the second spring in each case on the following dates: March 6, 20, 25, 29, April 1, 3, 7. Buds on pin oak at that time show no signs of swelling. Oviposition not observed. Alternating generation unknown.

Genus EUMAYRIA Ashmead

EUMAYRIA INVISA, new species

Female.—Light brown to amber. Head massive, coriaceous, dull: from above broader than thorax, occiput not concave; from in front broader than high, malar space one-third eye without groove, antennae 14-segmented, first four as 13:8:20:14. Pronotum coriaceous, dull. Mesoscutum lighter in color, somewhat shining, not quite smooth, rather flat, parapsidal grooves percurrent, straight and converging behind but well separated at scutellum. Disk of scutellum margined at sides, narrowed in front, rugose behind. Wing reduced, not reaching tip of abdomen, pubescent and ciliate, venation almost normal, areolet wanting. Mesopleuron with a smooth and polished spot under hind wing. Claws simple, hind femur short and stout. Carinae on propodeum almost straight, slightly converging above. Abdomen longer than head plus thorax, tergite II with usual patches of pubescence at base, rest subequal. Ventral spine longer than hind metatarsus, eight times as long as broad in side view. Using width of head as a base the length of mesonotum ratio is 1.0; antenna 2.3; wing 2.0. Length 2.3–3.2 mm. Average of 12 specimens 2.56 mm. No other species known with reduced wings.

Types.—U.S.N.M. 60123: Type and six paratypes. Paratypes in A.M.N.H. and C.M.N.H.

Host.—*Quercus myrtifolia*.

Gall.—Cells under the bark producing, where numerous, a more or less hypertrophied twig. Similar to gall of *Callirhytis crypta* (Ashmead).

Habitat.—Type locality Carrabelle, Fla. Living adults were cut out of the galls on November 17, 1929. Galls collected 2 weeks previously.

Genus BASSETTIA Ashmead

BASSETTIA FLORIDANA Ashmead

Bassettia floridana ASHMEAD, TRANS. AMER. ENT. SOC., vol. 14, p. 147, 1887.

Dryophanta corrugis BASSETT, TRANS. AMER. ENT. SOC., vol. 17, p. 71, 1890 (new synonymy).

The types of *Dryophanta corrugis* in the Bassett collection in the Academy of Natural Sciences of Philadelphia agree with Ashmead's *floridana*.

Genus DRYOCOSMUS Giraud

DRYOCOSMUS GRUMATUS, new species

Female.—Red, often with black on occiput, anterior and lateral lines, mesopleura, and dorsal abdomen. Head granulate; from above transverse, cheeks slightly broadened behind eyes, antennae filiform, 14-segmented. Mesoscutum smooth and polished, parapsidal grooves deep, smooth, percurrent, median wanting. Scutellum longer than broad, coriaceous behind the shallow pits, rugose peripherally. Mesopleuron almost bare, faintly striate in center. Wing pubescent and ciliate, veins brown, areolet small, cubitus reaching basal, radial cell four times as long as broad. Tarsal claws simple. Abdomen in side view as high as long, not gibbous below petiole, all tergites showing on dorsal margin. Ventral spine nine times as long as broad, longer than hind metatarsus. Length 2.15–2.75 mm. Average 2.3 mm. Described from eight specimens, all imperfect.

Types.—U.S.N.M. No. 60124: Type and two paratypes. Another paratype is in C.A.S.

Host.—*Quercus wislizeni*.

Gall (pl. 16, fig. 3).—A smooth, bare, ellipsoidal gall about 3 mm. in diameter attached to midrib on under side of the leaf in the fall and bearing a little fleshy knob on its summit exactly like the gall of *rileyi* (Ashmead) in the eastern United States.

Habitat.—Rex Hunt collected a lot of galls in the fall of 1949 at Felton, Calif., and placed them in a wire breeding cage outdoors on

the ground for the winter. When examined on March 15, 1950, many adults had emerged and died while other galls still contained larvae. These galls occur also on *Quercus agrifolia* and *Q. kelloggii*.

DRYOCOSMUS MINUSCULUS, new species

Female.—Black; mandibles, antennae and legs mostly brownish. Head coriaceous; from above transverse, cheeks slightly broadened behind eyes, occiput concave; from in front broader than high, malar space .4 eye, without groove, antennae 14-segmented, last 8 with rhinaria. Sides of pronotum striate in part. Mesoscutum bare, polished, parapsidal grooves percurrent. Scutellum with two smooth circular pits at base; disk coriaceous behind septum, rugose behind. Mesopleuron bare, smooth. Wing pubescent, ciliate, veins pale, areolet small, radial cell four times as long as broad. Claws simple. Carinae on propodeum slightly bent, enclosed area broader than high. Abdomen plump, in side view gibbous below petiole, tergites along dorsal curvature as 43: 10: 10: 10: 13: 1, III–VI sparsely punctate, VII coriaceous, tip of ovipositor projecting beyond sheath curved. Ventral spine eight times as long as broad, slightly longer than hind metatarsus. Using width of the head as a base the length of mesonotum ratio is 1.3; antenna 2.4; wing 5.0. Length 1.75–2.05 mm. Average of five specimens 1.91 mm.

Differs from *Dryocosmus bicornis* (McCracken and Egbert), which is straw yellow and has the ovipositor straight at the tip. *D. bicornis* forms galls on the same hosts as does *D. minusculus*.

Types.—U.S.N.M. No. 60125: Type and one paratype. Paratypes also in C.A.S., and A.M.N.H.

Host.—*Quercus agrifolia*.

Gall (pl. 17, fig. 13).—Small brown galls up to 2.7 mm. in diameter, shaped like a depressed sphere with a minute pit in the center above. Produced on upper side of leaves of *Quercus agrifolia*, *Q. wislizeni*, and rarely on *Q. kelloggii* in the fall and dropping when mature. Said to be so numerous sometimes as to defoliate the tree. Some years these galls are not common.

Habitat.—The types were reared from galls collected October 22, 1939, on *Quercus agrifolia* on Mount Diablo, Calif. Adults emerged April 17, 1941. Galls have been noted on this host at some 40 localities between Alpine and Ukiah and Red Bluff, Calif. They are also common on *Quercus wislizeni* and have been seen on *Quercus kelloggii* a few times. The guest fly, *Synergus agrifoliae* Ashmead, often reared from it, varies much in color pattern and has been redescribed as *Synergus maculatus* Fullaway (1911) new synonymy, and as *Synergus obscurus* McCracken and Egbert (1922), new synonymy.

Genus *CALLIRHYTIS* Foerster*CALLIRHYTIS CORRUGIS* (Bassett)

When I previously reported (Proc. Ent. Soc. Washington, vol. 33, p. 225, 1931) that this species had been taken in numbers ovipositing in buds of *Quercus maxima*, *Q. velutina*, and *Q. palustris* at various dates in April at East Falls Church, Va., the gall from which they had emerged was not known. It can now be reported that the species has now been reared from "stone" galls in acorns of all the above oaks—galls not distinguishable from those of *Callirhytis fructuosa* Weld. Acorns of red oak were collected in Loudoun County, Va., on September 22, 1940, and from them *fructuosa* emerged April 19, 1942, and *corrugis* May 4, 1943, and April 20, 1947. Acorns of pin oak were collected at East Falls Church, Va., on October 20, 1940. *C. corrugis* (Bassett) emerged April 12, 18, 26, 1942; April 18, 1944; April 14, 1945, and April 6, 1946. Two species thus sometimes make similar galls in acorns of the same host oak. The alternating gall produced by these adults which oviposit in buds has not yet been discovered.

CALLIRHYTIS MODESTA (Osten Sacken)

In the box of Bassett cynipid types in the American Entomological Society the type of *Cynips papula* Bassett, a synonym of *modesta*, is a female of *Ceroptres* sp., a guest fly. A pinned specimen in another case marked "cotype" is the maker of the gall and has now been made the type. This is in spite of the fact that the original description of *papula* was drawn from specimens of two genera and combined the head and thorax of the guest with the abdomen and wing of the maker.

CALLIRHYTIS CISTELLA, new species

Female.—Head and thorax amber, dull; abdomen red, shining; propodeum and tips of antennae infuscated. Head from above transverse, narrower than thorax, cheeks not distinctly broadened behind eyes; from in front broader than high, malar space .4 eye, slightly striate; antennae filiform, 13-segmented. Mesoscutum finely and uniformly rugose, appressed pubescence short, parapsidal grooves obsolete anteriorly, median short. Disk of scutellum slightly coarser posteriorly, not humped back of the narrow septum between two smooth shining pits. Mesopleuron striate on lower half. Wing hyaline, surface dotted, nonciliate, veins brown, not clouded, abscissa I of radius arcuate, areolet wanting. Claws simple. Abdomen as high as long, gibbous below petiole, only two tergites on dorsal margin; ventral spine 7 times as long as broad, longer than hind meta-

tarsus. Using width of the head as a base, the length of mesonotum ratio is 1.4; antenna 2.2; wing 3.7. Length 2.2 mm.

Type.—U.S.N.M. No. 60126: Type.

Host.—*Quercus emoryi*.

Gall (pl. 17, fig. 22).—A stalked, fusiform, pip gall beside young acorns July to October. Spindle shaped, brown, 3 by 5 mm. tapering at both ends, cavity large, wall thin.

Habitat.—The type was reared from a gall collected October 4, 1935, at Cherry, Ariz., by Mrs. N. W. Capron. A paratype emerged April 14, 1951, from a gall she collected at Prescott, Ariz., on September 20, 1950. Galls have been seen at Oracle, Ariz., and in Burro Mountains in New Mexico; seen also on *Quercus hypoleuca* at Patagonia, Bisbee, and in Huachuca and Chiricahua Mountains in Arizona.

CALLIRHYTIS HOPKINSI, new species

Agamic female.—Amber; foveae, propodeum, middle and hind tibiae and tarsi infuscated. Head granulate, dull; from above as broad as thorax, cheeks broadened behind eyes, occiput concave; from in front broader than high, malar space .6 eye with a groove, antennae 14-segmented, first four as 23(9) : 9(7) : 28(6) : 21; last 17(6). Mesoscutum granulate, covered uniformly with very short hairs, parapsidal grooves percurrent, a median evident posteriorly. Sculpture of disk coarser and somewhat transverse, in profile strongly humped back of septum. Mesopleuron dull, granulate, short-pubescent. Wing hyaline, dotted, nonciliate, veins beyond second cross-vein clear, first abscissa of radius angulate, heavy, areolet small. Hind femur broadest back of middle. Claws simple. Carinae on propodeum but slightly bent, enclosed area twice as broad as high. Abdomen length to height to width as 37 : 31 : 31; lengths of tergites along dorsal curvature as 95 : 26 : 24 : 10 : 12 : 13. Ventral spine 8 times as long as broad, shorter than hind metatarsus. Using width of the head as a base the length of the mesonotum ratio is 1.3; antenna 2.5; wing 3.5; ovipositor 2.4. Length 3.1–4.2 mm. Average of 154 specimens 3.89 mm.

Differs from agamic *Callirhytis operator* (Osten Sacken) in having a shorter ventral spine, 14-segmented antennae and in its lighter color.

Types.—U.S.N.M. No. 60127: Type and 40 paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus imbricaria*.

Gall (pl. 17, fig. 14).—A "pip" gall found in fall on young acorns of current season, green when fresh and secreting honey dew, becoming brown later and dropping to the ground. Short-cylindrical, 4–7 mm. broad by 2–4 mm. high, the larval cell central, the wall thick. Differs in shape and structure from all other known "pip" galls.

Habitat.—The type material was collected at Mineral Wells, W. Va., by Dr. A. D. Hopkins on September 4 and October 8, 1943. By September 12 most of the specimens had fallen to the ground, and he estimated that there were over a bushel of the galls (from 50 to 100 to a square foot) under this one large tree. Adults emerged from an outdoor breeding cage at Falls Church, Va., on March 28 and April 1, 6, 14, 1945, March 29 and April 5, 1946, and April 12, 18, 1947. Galls on this host have been seen at Washington, D. C., and Rosslyn, Va. Alternating generation unknown.

CALIRHYTIS OBLATA, new species

Female.—Bicolored; red with black on anterior and parallel lines, on foveae, sternum, middle and hind tibiae and all last tarsal segments. Head from above transverse, as broad as thorax, occiput concave; from in front broader than high, cheeks broadened behind eyes, malar space half eye without groove. Antennae 13- or 14-segmented, first six as 16:10:19:18:15:13. Mesoscutum coriaceous with scattered punctures and short appressed pubescence. Parapsidal grooves deep, narrow, smooth, not percurrent, median almost as long as parapsidal. Scutellum rugose, the two pits at base separated by a septum. Mesopleuron largely aciculate and bare. Wing hyaline, pubescence short, nonciliate, veins beyond second cross-vein scarcely evident. Claws simple. Carinae on propodeum straight, parallel, enclosed area broader than high. Abdomen with an interrupted ring of white hairs at base. Lengths of tergites along dorsal curvature as 87:24:14:11:11. Hind margin of tergite II and exposed parts of rest punctate. Ventral spine slender, longer than hind tibia. Using width of the head as a base the length of mesonotum ratio is 1.2; antenna 2.1; wing 4.2; ovipositor 4.8. Range in length 2.85–3.8 mm. Average of 18 specimens 3.29 mm. It seems to be related to those species of the genus that are reared from root galls. Has a much longer ventral spine than *C. fulva* Weld.

Types.—U.S.N.M. No. 60128: Type and four paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Hosts.—*Quercus coccinea* and *Quercus falcata*, Spanish oak.

Gall (pl. 16, fig. 7).—A green, smooth, bare bud gall at apex of new growth in May, dropping to ground when mature. An oblate sphaeroid, 4–5 mm. in diameter by 2.5 mm. high, red in center above but without a nipple, not at all hidden by bud scales; when detached without a girdle of hairs at base.

Habitat.—The type is selected from a series that emerged March 21, 1946, from galls collected on Spanish oak at Dyke, 3 miles south of Alexandria, Va., on April 19, 1945. Paratypes are from galls on scarlet oak collected near Vienna, Va., and at East Falls Church, Va.

CALLIRHYTIS FURVA, new species

Female.—Reddish brown with clypeus, antennae, occiput, anterior and lateral line areas, propodeum, tibiae, tarsi, and abdomen in part infuscated; foveae and mesopleuron black. Head from above transverse, cheeks broadened behind eyes; from in front broader than high, malar space one-third eye, not striate, antennae filiform, 14-segmented. Mesoscutum coriaceous, with scattered hairs, parapsidal grooves percurrent. Scutellum disk coriaceous anteriorly, rugose behind, the two basal foveae sharply outlined. Mesopleuron bare and smooth under hind wing, striate anteriorly, pubescent below. Wing pubescent and ciliate, veins brown, areolet small. Claws simple. Carinae on propodeum parallel above, bowed out below, enclosed area broader than high. Abdomen compressed, longer than head plus thorax, gibbous below petiole in side view, knifelike back of tergite II, lengths of tergites along dorsal curvature as 73:20:17:15:10:4; tergite II smooth, exposed parts of rest punctate. Ventral spine shorter than hind metatarsus, tip of ovipositor hooked. Using width of the head as a base, the length of mesonotum ratio is 1.3; antennae 2.3; wing 2.9; ovipositor 4.8. Length 2.15–3.65 mm. Average of 46 specimens 2.91 mm.

Differs from *Callirhytis infuscata* (Ashmead) in being particolored, larger, in having setigerous punctures between parapsidal grooves and a longer ovipositor.

Types.—U.S.N.M. No. 60129: Type and seven paratypes. Paratypes also in A.M.N.H., C.M.N.H., A.N.S.P., C.A.S., and M.C.Z.

Host.—*Quercus palustris*.

Gall (pl. 17, fig. 21).—Small, somewhat globular galls, 3–4 mm. in diameter covered with short, straight, stiff brown hairs, scattered along midrib or main veins on upper side of leaf in the fall and dropping off singly when mature. The hairs do not weather away during winter. Similar to galls of *C. infuscata* (Ashmead) on *Quercus laevis* in Florida.

Habitat.—The types were reared from galls collected on ground at East Falls Church, Va., on October 12, 1943. Adults emerged March 20, 24, 1945, and one was cut out alive on January 2, 1946. Others emerged March 20, 29, 1948, from galls collected September 15, 1946. One was cut out December 1, 1919, from a gall collected at Ironton, Mo., on October 15, 1917. Similar galls have been noted on nine other species of red oaks.

CALLIRHYTIS SUBCOSTATA, new species

Female.—Black; sides of pronotum and legs in part amber. Head coriaceous; from above transverse, cheeks broadened behind eyes,

occiput concave; from in front broader than high, malar space one-third eye, striate, antennae filiform, 14-segmented. Mesoscutum broader than long, coriaceous, almost bare, parapsidal grooves smooth, percurrent, median short, anterior lines sunken. Scutellum pubescent, coriaceous back of the smooth narrow pits, rugose peripherally. Mesopleuron bare and polished. Wing pubescent and ciliate, veins brown, areolet reaching one-fifth way to basal, second abscissa of radius arcuate, radial cell 4 times as long as broad. Tarsal claws simple. Abdomen in side view as high as long, lengths of tergites as 50:15:6:5:4:3, tergites smooth. Ventral spine slender, 8 times as long as broad, shorter than hind metatarsus. Using width of the head as a base, the length of mesonotum ratio is 1.3; antenna 2.1; wing 4.0. Length of four specimens 2.45, 2.25, 2.1 and 2.0 mm.

Types.—U.S.N.M. No. 60130: Type and one paratype. Paratype also in A.M.N.H.

Host.—*Quercus stellata*.

Gall (pl. 16, fig. 10).—Produced on the side of the acorn cup when the latter is about 4 mm. in diameter and dropping off when mature in late May. Green, 2.5–3.0 mm. in diameter, ribbed like a melon with about 16 grooves, pinkish in the grooves.

Habitat.—The types emerged April 1, 1950, from galls collected at East Falls Church, Va., on May 29, 1949. The nutritive layer was then about used up and the galls about ready to drop. This isolated tree had been visited almost every spring for many years but these galls had never been seen there before.