

Article III.—NEW PACIFIC COAST CYNIPIDÆ (HYMENOPTERA)¹

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PLATE XXIV

During 1919 and 1920, while a Sheldon Travelling Fellow of Harvard University, I had an opportunity to make a considerable collection of Pacific Coast gall-wasps. The new species and varieties of this paper constitute only a small part of the undescribed material in the collection. It is safe to say that not fifty per cent of the Pacific Coast gall-making Cynipidæ have yet been reported. This will not appear strange when it is realized that the region constitutes a very distinct faunal area and that, with the exception of Miss Rose Patterson's rather small collection made mostly about Stanford University (and studied by Fullaway), there are no published accounts of systematic collecting of Cynipidæ from the region.

Generic names in this paper follow the scheme I have used before: "*Andricus*" is a meaningless name and does not necessarily express natural relationships of the species thus labelled; other generic names used appear to designate truly phylogenetic groups.

Acknowledgment of aid in my work with Pacific Coast Cynipidæ is due the Harvard University authorities and especially Dr. William Morton Wheeler, of the Bussey Institution of Harvard University, to whom I am indebted for the Fellowship which made the collecting trip possible; to Mr. S. B. Parish, then of San Bernardino, California, for material help in learning to distinguish California plants, particularly oaks; and to Mr. W. H. Vance who has assisted in the tedious but all-important work of mounting my material for study.

The holotypes of all these species are in The American Museum of Natural History; paratypes are in that museum and elsewhere as indicated for each species. All specimens of these species labelled cotypes should be considered paratypes.

***Andricus atrimentus*, new species**

Plate XXIV, Figures 15 and 16

Black; thorax largely smooth; median, anterior parallel, and lateral lines absent; arcuate groove at base of scutellum; female abdomen produced dorsally, male abdomen small, pedicellate; areolet moderately small.

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FEMALE.—**HEAD:** Not quite as wide as thorax, hardly widened behind the bulging eyes; black, mouth-parts bright piceous; coriaceous, finely rugose and scatteringly hairy on the face. Antennæ brown, yellowish basally; densely hairy except on the first two segments; 14 (?)-jointed; third segment not much longer than fourth. **THORAX:** Piceous black to black; smooth and shining, only microscopically coriaceous anteriorly and laterally; parapsidal grooves deep, continuous to the pronotum, gradually diverging anteriorly, gradually converging toward the scutellum; median groove lacking; anterior parallel lines and lateral lines practically lacking; scutellum black, elongate, rugose, hairy, an arcuate depression at the base, deep, smooth, not forming foveæ; pronotum piceous black, rugose, rugoso-aciculate laterally; mesopleuræ black, rugose, very sparsely hairy, aciculate, the central area smoother, shining. **ABDOMEN:** Piceous black; smooth and shining, microscopically punctate, sparingly hairy at the base laterally; produced dorsally, the second segment covering about half the area, segments two to four with the edges at an angle of 45°; ventral spine short, lighter in color, sparsely hairy; ventral valves hairy, at a 45° angle. **LEGS:** Yellow-brown, the coxæ piceous, the tips of tarsi brown; tarsal claws simple. **WINGS:** Clear, minutely hairy, ciliate on margin; veins brown, subcosta, radius, and basalis heavy; areolet moderately small; cubitus hardly reaching basalis; radial cell long and narrow, open, the second abscissa of the radius straight, the first abscissa slightly angulate, without a projection, slightly infuscated. **LENGTH:** 2.0–2.5 mm.

MALE.—Differs from the female as follows: antennæ entirely brown, 15-jointed; thorax more elongate; abdomen very small, narrow, rather long-pedicellate; legs darker brown.

GALLS (Pl. XXIV, Figs. 15, 16).—Small, inflated capsules in the leaf-blade. Monothalamous. Spherical, 3.–5. mm. in diameter, about smooth, leaf-green when fresh, soon paling, finally drying yellow-brown. Walls thin, a thin-walled larval cell, about 1.5 mm. in diameter, is connected with the outside wall by a tangle of dense, but not definitely branched fibers. In the leaf-tissue, projecting about equally on either side, usually near the edge of very young leaves of *Quercus Douglasii*.

RANGE.—California: Three Rivers, Redding.

TYPES.—Five females, six males, thirty-eight galls, labelled Three Rivers, California; March 23, 1920; Kinsey collector. The adults are all imperfect. Holotype female and paratype adults and galls in the collections of The American Museum of Natural History; paratype adults in the collection of the author; galls at Leland Stanford University and the U. S. National Museum.

These galls develop early on the unfolding leaves, looking like small air-bubbles blown in the tissue. The galls were always very new and fresh when gathered, but were also practically mature. The development of this generation of the species must be a matter of only a month or two; the other generation is unknown. The adults were maturing, had not emerged, but did emerge at some date later than the dates of collecting the galls: March 23 at Three Rivers, and April 2 at Redding. Of 23 adults, 13 were females. This species resembles *Andricus palustris* form *palustris* (Osten Sacken) of the black oaks of the eastern part of the United States, and it might prove desirable to consider the two as varieties of one species. Morphologically the two are very similar, even

in many minute details of venation, thoracic sculpture, abdominal and antennal characters; in *atrimentus* the parapsides are more convergent at the scutellum, the scutellum is less elongate, less rugose, with the foveal groove smoother and less distinctly bifoveate than in *palustris*. In the male of *atrimentus* the abdomen is not as small as in *palustris*. *Atrimentus* occurs on a white oak in one distinct faunal area; *palustris* on black oaks in a very different faunal area. It is exceedingly significant that the galls of the two species show similarity of structure, for as has been repeatedly shown the gall is an expression of the physiological nature of the insect. Physiologically then the two species are related, just as they are morphologically, but physiologically they differ even more markedly than morphologically. For though the galls are similar hollow bladders in the leaf, the Pacific Coast species does not have the thick and succulent walls of *palustris*; while the attached larval cell of *atrimentus* is distinctly unlike the remarkable, loose cell of *palustris*. Both forms are bisexual generations, developing very quickly in early spring on the unfolding leaves. The other generation of *palustris*, namely *Andricus palustris* form *compressus* (Gillette), is a wingless, agamic species forming a small, hollow, egg-shaped, separable gall on the leaves in late summer, the gall dropping to the ground in autumn, the insect emerging very early in the spring. It is not unlikely that *atrimentus* has a similar history, but it will be important that some one determine exactly what differences exist in the life-histories of the two insects.

***Andricus attractans*, new species**

Plate XXIV, Figure 2

MALE.—Black; parapsides and lateral grooves the only well-developed thoracic grooves; foveæ irregular, not distinctly separated; legs rufous yellow; areolet moderate in size; length averaging 2.0 mm. HEAD: At least as wide as the thorax, the eyes large, bulging beyond the sides of the head; piceous black, toward the mouth and on the mouth-parts more piceo-rufous; very finely rugose, very finely and sparsely hairy. Antennæ light yellow-brown, golden yellow basally, pubescent, 15-jointed, the last segment not shorter than the preceding, the third segment approaching twice the length of and more slender than any other. THORAX: Elongate; piceous black to black; posteriorly about smooth, mostly finely coriaceous antero-laterally; parapsidal grooves distinct, less so anteriorly, gradually and then widely divergent anteriorly, gradually convergent posteriorly, but still fairly well separated; median groove absent; anterior parallel lines hardly indicated; lateral lines not very well defined; scutellum narrow, longer than wide, slightly hairy, rugose, depressed and smoother anteriorly but with the two irregular and slightly rugose foveæ not distinctly separated by the rugose intermediate area; pronotum rugose, more rugoso-aciculate posteriorly; mesopleuræ in part smooth and shining, irregularly aciculate

or punctate in places. ABDOMEN: Small, long-pedicellate, irregularly triangular, piceous to black, lightest at the posterior tip, apparently smooth and naked. LEGS: Rufous yellow, light piceous on the coxæ, tips of tarsi darker; tarsal claws simple. WINGS: Large, extending more than half beyond the abdomen; finely set with hairs, margins ciliate; veins light brown, cross-veins and subcosta darker; areolet moderate in size; cubitus faint, reaching the basalis at the mid-point, but hardly evident there; radial cell open; second abscissa of the radius almost straight, the first abscissa slightly arcuate without a projection. LENGTH: 1.7–2.2 mm.

GALLS (Pl. XXIV, Fig. 2).—Sticky cells protruding from buds. Each cell is monothalamous, about 2×3 mm., oval, but with rather flattened ends; only microscopically roughened, marbled red to dark green when fresh, drying brown; thin-walled, hollow. Under the bud scales, but often largely protruding; covered with a sticky secretion when fresh; often several in a bud; on *Quercus Wislizeni*.

RANGE.—California: Redding.

TYPES.—Thirteen males and nine infested buds. Holotype male and paratype males and galls in the collections of The American Museum of Natural History; paratype males and galls in the collections of Leland Stanford University, the U. S. National Museum, and of the author. Labelled Redding, California; April 2, 1920; Kinsey collector. Most of the insects are partly imperfect.

These galls are distinct in appearance from other Pacific Coast bud galls, but probably reach maturity in such a short time that they will need to be discovered at just the opportune season. The very sticky secretion on the surface proves attractive to ants, and likely attracts wasps and bees. I am surprised to find all of the thirteen adults bred are males, and am at a loss to explain the situation. The insect shows relations to some species of *Neuroterus*, but does not belong to the typical group of that genus.

***Andricus gigas*, new species**

Plate XXIV, Figure 14

Entirely piceous black; mesothorax almost smooth; parapsidal grooves the only thoracic lines; a distinctly smooth, shining area on the hairy scutellum; areolet small or closed, cubitus discontinuous.

FEMALE.—HEAD: About as wide as thorax, hardly broadened behind the eyes; black, mandibles rufous brown; finely coriaceous, face smooth but sparingly and minutely punctate, sparsely and finely hairy on the sides of the head and on the face. Antennæ finely hairy, brown, the basal three or four segments yellowish brown, 14(?)-jointed, third segment longest, but hardly longer than the fourth. THORAX: Piceous to black, mesothorax mainly smooth and shining, coriaceous anteriorly; parapsidal grooves fine but evident only posteriorly, less evident, discontinuous or absent anteriorly where the area is finely coriaceous; median groove, anterior parallel and lateral lines lacking; scutellum finely rugose, hairy, with a small, elevated, smooth and naked area at the apex; foveal depression arcuate, shallow and smooth; pronotum smooth and naked, sparingly hairy on the dorsal edge, slightly furrowed posteriorly; mesopleuræ mostly smooth and naked, limitedly furrowed centrally. ABDOMEN: Piceous black, ventral spine yellow-piceous; smooth and shining, naked

of hairs except for a few hairs on the ventral spine and tips of valves, and scattering hairs at the base of the second segment; abdomen produced dorsally, segments two to four with their ventral edges considerably rounded, segment two occupying about half the area; valves at about a 45° angle. LEGS: Yellow-brown, femora especially of the hind legs darker, coxæ piceous brown, tips of tarsi dark; finely and not densely hairy; tarsal claws simple. WINGS: Clear, set with fine, brown hairs, edges ciliate; veins brown; areolet moderately small to closed; cubitus very fine, not reaching basalis; radial cell long and open, but the second abscissa of radius somewhat curved; first abscissa with only a suggestion of an angle, without a projection. LENGTH: 1.5-2.0 mm.

MALE.—Differs from the female as follows: antennæ entirely brown, 15 (?)-jointed; abdomen very small, moderately long-pedicellate; areolet averaging smaller; length uniformly near 1.5 mm.

GALLS (Pl. XXIV, Fig. 14).—Small, brown, egg-shaped cells scattered in the aments. Each cell monothalamous, naked, only microscopically granulate, well pointed at the apex, thin-walled and hollow. Apparently tremendously enlarged anthers, about 1 mm. in diameter by 2 mm. long. Scattering in aments of *Quercus Douglasii*.

RANGE.—California: Merced Falls.

TYPES.—Thirteen females, seven males and over 150 galls. Holotype female and paratype females, males, and galls in The American Museum of Natural History; paratype adults and galls in Leland Stanford University, the U. S. National Museum, and the author's collection. Labelled Merced Falls, California; March 28, 1920; Kinsey collector. All of the adults are imperfect.

The galls were just maturing on March 28. Because of the location and structure of the galls, this form of the insect must complete its history in a month or two; there is undoubtedly an alternate generation, probably agamic.

***Andricus humicola*, new species**

Plate XXIV, Figure 13

FEMALE.—Bright rufous brown; thorax hairy, lateral lines in a smooth area, parapsidal grooves rugose anteriorly, foveæ very rugose, areolet large, claws simple. HEAD: Bright rufous brown, the moderately narrow median elevation and the mouth-parts darker; about as wide as the thorax, considerably widened behind the eyes; rugoso-punctate, the cheeks more distinctly coriaceous and punctate, whole head moderately hairy. Antennæ darker rufous brown; the second joint almost globular, the third joint longest, as long as one and two combined, fourth two-thirds the length of three. THORAX: Generally bright reddish brown; coriaceous and scattering punctate and hairy, especially anteriorly, on the sides, and on the pronotum; parapsidal grooves extending to the pronotum, fairly broad, deep, and smooth for two-thirds the distance, anteriorly finer, rugose, and widely divergent, gradually convergent and not widely separated posteriorly; median groove very fine posteriorly, merely indicated by a more rugoso-punctate depression anteriorly; anterior parallel lines extending about half-way toward the scutellum, somewhat raised and smooth; lateral lines extending more than half the length of the mesonotum, in an area somewhat darker in color, elevated, smooth and shining; scutellum rufous to black, longer than wide, rugose, hairy, with two large sunken areas basally indicating very rugose

foveæ; mesopleuræ bright rufous, darker toward the tegulæ and ventrally, shining, partly smooth, mostly puncto-aciculate, hairy. ABDOMEN: Rufous to bright piceous; smooth, only microscopically punctate, sparingly hairy on the sides basally, and on the ventral spine and valves; as broad or broader than long, the second segment covering only somewhat more than half the area, extending only somewhat farther dorsally, the ventral edges of the segments moderately curved; ventral spine fairly long and slender, ventral valves at an angle of 60°. LEGS: Rufous, darker to black on the trochanters and hind tibiæ and tarsi; punctate and hairy, most densely so on the tibiæ and tarsi; tarsal claws simple. WINGS: Clear, set with fine hairs, margin ciliate; veins brown, distinct; areolet moderately large; cubitus fading out before reaching the basal vein; radial cell open, tip of radius showing some remnant of the subcosta, the first abscissa of the radius angulate, the projection into the radial cell blunt and not prominent, the vein somewhat infuscated. LENGTH: 4.2 mm.

GALL (Pl. XXIV, Fig. 13).—Large, irregular, tuber-like, woody swellings of the bark and new wood of roots. Agglomerate. The swellings are very irregular, smooth and rounded when fresh, roughening with age; the fresh bark covering is more reddish brown than on the normal roots; length up to 10.5 cm., the diameter 7.5 cm. on large galls. Affecting both wood and bark, including wood below the normal line of the bark; larval cells lying toward the bark, oval, 3.5 by 4.5 mm., with a thin, distinctive tissue lining the cells, but not separable from the wood. On the sides of large roots, well below the surface of the ground, on *Quercus Kelloggii*.

RANGE.—Oregon: Ashland.

TYPES.—Holotype female and seven paratype galls; female and galls at The American Museum of Natural History; galls at Leland Stanford University, the U. S. National Museum, and in the author's collection. Labelled Ashland, Oregon; April 6, 1920; Kinsey collector.

A cave-in of a railroad embankment had exposed these galls. The single female was found running over the surface of the galls, and was identified as the producer of these by recovering an immature adult which had not emerged from the galls. Almost all of the insects had emerged, but at least one was still alive on April 6. Very likely the species is agamic, at least in this generation.

***Andricus pedicellatus*, new species**

Plate XXIV, Figure 10

Mostly black, except the brownish-yellow legs; entire thorax except scutellum smooth, shining, and naked; parapsides the only apparent grooves; veins brown, areolet small.

FEMALE.—HEAD: Not quite as broad as the thorax, only slightly widened behind the eyes; black, mouth-parts brownish rufous; rugoso-granulose, most rugose on the front, very sparingly hairy, rather densely hairy on the lower part of the face; antennæ brownish rufous at base. THORAX: Entirely black; mesothorax elongate; smooth and shining, slightly coriaceous anteriorly, naked; parapsidal grooves distinct, continuous to the pronotum, curved apart anteriorly, gradually and rather closely convergent at the scutellum; median groove lacking; anterior parallel and lateral lines only very slightly indicated; scutellum elongate, rounded at the pos-

terior edge, moderately rugose, smoother basally, set with long hairs, a large, broad, sunken, smooth and arcuate furrow at base not divided into foveæ; pronotum almost smooth and shining; mesopleuræ smooth and shining, slightly aciculate in places. ABDOMEN: Piceous black; entirely smooth and shining except for a very few hairs at the base laterally; somewhat higher than long, highest posteriorly, second segment not covering half the area, segments two to four curved ventrally, only moderately produced dorsally; ventral valves at an angle of more than 60°. LEGS: Brownish yellow, coxæ piceous; hairy; tarsal claws simple. WINGS: Long, clear, set with fine hairs, margins ciliate, veins brown, subcosta, radius and basalis heaviest; areolet moderately small, cubitus continuous to the basalis but rather faint there; radial cell open, long, and narrow; second abscissa of the radius only slightly curved, the first abscissa slightly angulate, without a projection. LENGTH: About 2.0 mm. (?)

MALE.—Similar to the female, differing as follows: eyes large, protruding beyond sides of head; antennæ wholly dark brown; parapsidal grooves less evident, especially anteriorly; abdomen very small, long-pedunculate; legs darker brownish yellow, the femora brownish piceous; areolet very small, the cubitus continuous to the basalis but very faint there. LENGTH: 2.2 mm. One male, apparently not wholly mature, has the thorax and abdomen lighter piceous, the length 1.5 mm.

GALLS (Pl. XXIV, Fig. 10).—Small, elongate capsules attached by a slender thread near the edge of the leaf. Monothalamous. The capsule is elongate, 5–7 mm. long by 1.0–1.5 mm. wide; sharp-tipped but broadest near the tip, basally slender tapered, continuing into a slender, thread-like stem 5–12 mm. long, evidently a continuation of a vein of the leaf. The capsules are thin-walled and entirely hollow. Attached either near the edge or farther from the edge to very young leaves of *Quercus Douglasii*.

RANGE.—California: Three Rivers, Oroville.

TYPES.—Four females, two males, and many galls; holotype female, paratype female, male, and galls in the collection of The American Museum of Natural History; paratype adults and galls in the collection of the author; galls at Leland Stanford University and the U. S. National Museum. Labeled Three Rivers, California, March 23, 1920, and Oroville, California, April 1, 1920; Kinsey collector. The adults are all imperfect, and consequently it seemed desirable to utilize material from two localities in making the description.

This species appears very early in the spring, as soon as small leaves come out of the opening buds. At Three Rivers the galls were just maturing. It is likely that this is the short-lived bisexual generation of a species having an agamic alternate generation which takes all but one or two months of the year to develop. The species is in many respects related to species like *Neuroterus irregularis* (Osten Sacken), *N. majalis* (Osten Sacken), and *N. vesiculus* (Bassett), but those species do not represent typical *Neuroterus* Hartig.

Andricus perdens, new species

Plate XXIV, Figures 5 to 7

FEMALE.—Generally dark rufous, mesothorax shining, obscurely reticulated, hairy; scutellum squared off posteriorly, areolet moderately large, radial area broad. **HEAD:** Not as broad as the thorax, considerably broadened behind the eyes; deep rufous, piceous black at the mouth and on the mouth-parts; rugoso-coriaceous, a rugose area between the ocelli, face more rugose, (hairy?). Antennæ hairy, joints one and two piceous black, three and four black, second segment almost globular, very much the smallest, three as long as one and two together and almost twice as long as four. **THORAX:** Mesothorax deep rufous; appearing smooth and shining, finely reticulated, moderately punctate and hairy, more densely punctate and hairy anteriorly; parapsidal grooves continuous to pronotum, narrow, distinct, divergent anteriorly, curved and convergent at the scutellum where they are only narrowly separated; median groove only evident, but is evident for the length of the mesonotum; anterior parallel lines hardly evident for less than half the length of the mesonotum; lateral lines indicated by a smooth area; scutellum rufous-piceous, piceous black at base, somewhat longer than wide, widest near the posterior end, abruptly squared off posteriorly, rugose, dense with long hairs, two basal foveæ broad, deep, shining, smooth, set at a 90° angle; pronotum rufous-piceous, about black at the edges, rugose, dense with long hairs; mesopleuræ rugoso-aciculate and hairy at top and bottom, a large smooth, shining and (apparently) naked area centrally. **ABDOMEN:** Rufous, rufous-piceous dorsally and basally, smooth and shining, hairy at the base laterally, (posterior segments hairy?); higher than long, more extended dorsally, edges of basal segments curved ventrally but segments not “tongue-shaped”; second segment occupying about half the area; ventral spine darker rufous, hairy, extended into quite a long, slender, fine-tipped spine; ventral valves piceous black, at a 60° angle. **LEGS:** Brown-black, the coxæ and at least the front tibiæ in part rufous; densely punctate and hairy; tarsal claws well developed, not toothed. **WINGS:** Clear, set with fine hairs, ciliate on edge; veins rufous brown, subcosta, radius and basalis heaviest; areolet moderately large; cubitus just continuous to the basalis but faint there; radial cell open, broad, subcosta stopping quite a little short of the margin; second abscissa of the radius somewhat curved; the first abscissa somewhat angulate but without a projection. **LENGTH:** 3.0 mm.

GALLS (Pl. XXIV, Figs. 5-7).—Stem swellings, raggedly split open, containing flattened seed-like cells. The swellings are 6.-13. mm. in diameter by 1.5-20. cm. long. Within are large cavities, 4 or 5 arranged more or less radially about the axis of the stem, and a great many in series along the stem, each cavity sector shape, extending to the bark, 10. mm. wide or less at the edge. Inserted on the wall of each cavity is a larval cell; each cell is monothalamous, flattened, a somewhat squared oval in outline, 4. mm. high by 3. mm. wide, broadest at the top; concave at the base with a projecting tongue by means of which the cell is inserted in the twig; cells smooth, shining, buff-yellowish, finely streaked, more or less, with purplish brown. The cell walls are shell-like, moderately thick, entirely hollow within. At maturity the bark splits raggedly over each cavity, the larval cell drops to the ground, and the affected twigs die. On terminal twigs of *Quercus Kelloggii*.

RANGE.—Oregon: Ashland and Grants Pass. California: Gilroy (Redwood School), Placerville and Ukiah.

TYPES.—Two females (imperfect and not completely mature), 12 larval cells and 26 infested twigs. Holotype female and galls in the collections of The American Museum of Natural History; paratype female and galls with the author; galls at Leland Stanford University and the U. S. National Museum. Labelled Ashland, Oregon; April 6, 1920; *Q. Kelloggii*; Kinsey collector.

This is a very common cynipid throughout the Pacific Coast region, its presence being made noticeable because the leading shoots and ultimately the whole tree may be killed. I have seen small stands of young black oaks, possibly fifteen years old, almost completely killed out in this way. It has, however, been difficult to obtain the wasp, apparently because the larval cells fall out of the twigs before maturity; possibly the insect completes development and emerges only after it has been on the ground for some time. From galls collected from January through April no adults were obtained, and only two individuals which had failed to quite complete development were cut out of the few larval cells remaining in the twigs. A very similar if not specifically identical gall is found on *Quercus Wislizeni*.

***Andricus perfoveatus*, new species**

Plate XXIV, Figure 8

FEMALE.—Antennæ wholly deep brown, 15-jointed; median groove distinct, scutellum roughly sculptured; mesopleuræ with a large aciculate area; cubitus continuous to basalis; tarsal claws simple. HEAD: About as wide as the thorax; hardly widened behind eyes; black, mandibles rufous brown; roughly coriaceous-rugose, rugose and somewhat hairy on the face. Antennæ densely hairy; the third joint not much longer than the fourth, the fifteenth not much shorter than the fourteenth. THORAX: Entirely black; mesonotum roughly coriaceous, almost naked of hairs; parapsidal grooves distinct, wider posteriorly, continuous to the pronotum where they diverge sharply, moderately convergent at the scutellum where they are much broader; median groove wide at the scutellum, distinct for less than half the length of the mesothorax, but indicated by a slightly rugose depression anteriorly; anterior parallel lines scarcely indicated; lateral lines indicated only by a smoother area; scutellum much longer than wide, roughly but not deeply sculptured, with the two large, deep, shining foveæ at the base somewhat sculptured, and separated by rougher sculpturing; metanotum hairy only at the sides; pronotum roughly aciculate or sculptured laterally, sparsely hairy only on the edge; mesopleuræ almost smooth and shining, very sparsely hairy, with a large, central, aciculate area. ABDOMEN: Piceous to black, lightest ventrally, entirely smooth and shining, very scatteringly hairy latero-basally, on the posterior edge, and on the ventral spine and valves; about as wide as long, produced dorsally, the ventral edges of segments two to four well rounded, the hypopygium somewhat produced, the valves at about a 60° angle, second segment occupying about half the abdominal area. LEGS: Somewhat hairy, yellow-brown, the coxæ, trochanters, and tips of tarsi dark brown; tarsal claws simple. WINGS: Clear, finely hairy, ciliate, veins deep brown; areolet moderately small; cubitus reaching the basalis; radial cell open; second abscissa of radius not quite straight,

extending slightly along the margin; first abscissa distinctly angulate but without a projection, and slightly infusate where it joins the subcosta. LENGTH: 1.5–2.2 mm., averaging nearer 2.2 mm.

GALLS (Pl. XXIV, Fig. 8).—Small, fleshy-walled capsules imbedded in the leaf-blade. Monothalamous. Spherical or more elongate, about 6. mm. in diameter (perhaps larger when fresh), leaf-green, drying brown, projecting about symmetrically from either surface of the leaf. The walls are thick, succulent, the cavity (in shriveled galls) about oval, 2. × 3. mm., with a distinct larval cell lining, but the cell inseparable (at least in the shriveled gall). On the very young leaves of *Quercus Kelloggii*.

RANGE.—California: Santa Rosa and Redding.

TYPES.—Six females and twenty galls; holotype female, paratype females, and galls in The American Museum of Natural History; paratype females and galls in the author's collection, and galls at Leland Stanford University and the U. S. National Museum. Labelled Santa Rosa, California; March 16, 1920; Kinsey collector. Some of the adults were cut from old galls and are imperfect.

At the time the galls were collected they were very fresh and succulent, on the very young, unfolding leaves of the black oaks, but inasmuch as adults emerged from some of these galls, in spite of their immediate shriveling on collecting, it would appear that the insects complete their development in a very short period in the early spring. Such species of cynipids are usually bisexual, so the male may yet be discovered for this species.

***Andricus serricornis*, new species**

Plate XXIV, Figure 3

FEMALE.—Thorax almost smooth, rufo-piceous; abdomen piceous; antennæ yellow to brown, rather serrate; parapsidal grooves distinct, other thoracic grooves lacking; areolet small. HEAD: Not quite as wide as the thorax, broadened slightly behind the eyes, a prominent median elevation; piceous or black, mouth-parts brown; finely shagreened or coriaceous, the face sparingly hairy. Antennæ short, brown, darker distally, yellow on four or five basal joints; slightly hairy, the second segment short, almost globose, the third longest and most slender, the last almost twice as long as the preceding; 14-jointed, the last ten joints giving a rather serrate appearance to the antennæ. THORAX: Mesothorax rufo-piceous; almost smooth, very finely coriaceous with a very few scattering hairs especially on the edges; parapsidal grooves distinct, deep, continuous to the pronotum, slightly divergent and finally curved apart anteriorly, slightly convergent posteriorly; median groove lacking or incompletely indicated; anterior parallel lines lacking or barely indicated; lateral lines lacking; scutellum hardly longer than wide, finely rugose, rufo-black, the two basal foveæ broad, shining, not quite smooth, separated by only a fine ridge; pronotum darker rufo-piceous, irregularly aciculate laterally, sparingly hairy; mesopleuræ rufo-piceous, almost smooth and shining, partly irregularly aciculate. ABDOMEN: Piceous black; smooth and shining, very sparingly hairy on the second segment basally; the abdomen produced dorsally, the second segment hardly covering half the area, edges of most of the segments well rounded ventrally; ventral spine lighter in color, slightly hairy; the hypopygium produced slightly; ventral valves at about a

45° angle, hairy. LEGS: Yellow-brown except the darker tips of the tarsi; somewhat hairy; tarsal claws simple. WINGS: Large, projecting half beyond abdomen, clear, set with fine hairs, edges finely ciliate; veins clear brown, not very heavy; areolet of moderately small or smaller size; cubitus extending hardly two-thirds the distance to the basalis; radial cell open; the first abscissa of the radius almost arcuate with only a suggestion of an angulate form. LENGTH: 1.5–2.2 mm., averaging nearer 2.0 mm.

MALE.—Differs from the female as follows: antennæ dark brown only distally, more or less distinctly 15-jointed, more distinctly serrate; thorax wholly yellow-rufous, the scutellum only slightly darker; foveæ divergent, smooth at base; abdomen very small, triangulate, piceous; legs yellow-brown with distal tarsal segments darker; wings with areolet moderately small, small, or closed; length, 1.7 mm.

GALLS (Pl. XXIV, Fig. 3).—Dense clusters of grain-like cells, yellow or yellow-brown. Bithalamous, though often several cells will fuse; the whole cluster rounded or elongate-oval, containing 20 to 40 or more cells. The cells are thin-walled, almost wholly hollow except for the partition separating the larval chambers. Apparently modified anthers of aborted, compacted aments, the clusters sessile on the young twigs of *Quercus Wislizeni* and *Q. agrifolia*.

RANGE.—California: Alpine, Three Rivers.

TYPES.—Ninety-nine females, 49 males, 12 clusters of galls, labelled Three Rivers, California; March 23, 1920; *Q. Wislizeni*; Kinsey collector. Holotype females, paratype females, males, and galls in the collections of The American Museum of Natural History; paratype adults and galls at Leland Stanford University, the U. S. National Museum, and in the collection of the author.

Galls collected February 24 at Alpine showed the adults to have emerged at an earlier date, but galls collected at Three Rivers on the following March 23 did not give adults until some (unrecorded) later date. It is likely that the emergence dates of spring galls for more northerly latitudes or higher elevations are regularly later. Although I do not have adults from the galls on *Q. agrifolia* the galls appear so identical as to make the identification at least specifically certain. I secured 99 females and 49 males, which is not the usual ratio for a bisexual form in this group of Cynipidæ. Because of the early appearance of the gall on an evanescent part of the plant it is probable that this species has an alternate, agamic generation. The galls of this species resemble those of *Neuroterus pallidus* Bassett of the eastern United States, but in that species the clusters are borne at the ends of the aments instead of sessile on the young twig, distorting the whole ament.

***Andricus spectabilis*, new species**

Plate XXIV, Figures 11 and 12

FEMALE.—Head and thorax black; densely hairy; abdomen rufous; areolet very large, cubitus not continuous; average length 4.5 mm. HEAD: Dark piceous to black, mandibles rufous; about as broad as thorax, broadened behind eyes; very finely coriaceous, punctate, and hairy, dense with long hairs on the face, naked just

lateral to the eyes. Antennæ rufous brown to piceous, first segment darker, and darker apically; hairy; 14-jointed (or incompletely 15-jointed). THORAX: Black, piceous to black on the sides; very finely coriaceous, closely punctate and densely hairy with long hairs; parapsidal grooves distinct, punctate, slightly convergent at the scutellum, slightly divergent at the pronotum; median groove distinct and smooth for a short distance from the scutellum, obsolete forward; anterior parallel lines raised, smooth, extending about half-way to the scutellum; lateral lines somewhat smooth, extending from the scutellum about half the mesonotal length; scutellum black, longer than wide, deeply rugose, slightly depressed on the median line, with two large, shining, smooth or slightly rugose, laterally-spreading foveæ at the base separated by a fine ridge; mesopleuræ piceous or black, finely coriaceous and smooth, almost naked of hairs. ABDOMEN: Rufous to piceous, brightest at the very base and apically especially ventrally; practically smooth, the posterior segments, the ventral spine and valves with long hairs; only a few, scattering, long hairs at the base of the second segment laterally; abdomen longer than wide, the second segment covering about two-thirds the total area, and rounded ventrally, the hypopygium projecting slightly posteriorly. LEGS: Yellow-brown to rufous, the coxæ and sometimes trochanters black; hairy, hairs densest and longest on the tarsi and on the hind tibiæ; claws prominently toothed. WINGS: Hyaline, tinged with yellowish, covered with fine, brown hairs, edges ciliate; veins brown, heavy, cross-veins heaviest; longer than whole length of body, extending half beyond abdomen; areolet large, sometimes spectacularly so, extending sometimes one-third the way to the cubitus; cubitus not reaching basalis, the tip curved distinctly downward toward a point well below the mid-point of the basalis; radial cell apparently closed, but whether by the extension of the subcosta or by another thickening of the margin is not entirely evident; first abscissa of the radius arcuate-angulate, heavily but limitedly infuscated, without much of a projecting point. LENGTH: 3.7-4.7 mm.

GALLS (Pl. XXIV, Figs. 11, 12).—Elongate stem swellings. Polythalamous. Large, elongate, oval to spindle-shaped, averaging 2.5 cm. wide by 5.0 cm. long; large specimens of scarcely greater diameter will reach 11.0 cm. in length; covered with bark of natural color. Internally hard and woody, only the peripheral tissue being less compact than the normal stem wood; larval cells toward the center of the gall, oval, 3. by 5. mm., tissue almost not at all distinct from rest of wood; exit holes upon aging show a distinct, smoother area on the bark. On smaller stems of *Quercus chrysolepis*.

RANGE.—California: San Jacinto Mountains, San Bernardino, Upland, Pasadena, Placerville, Auburn.

TYPES.—Seventy-six females and 19 galls, labelled Pasadena, California; February 7, 1920; Kinsey collector. Holotype female, paratype females, and galls in The American Museum of Natural History; paratype females and galls at Leland Stanford University, the U. S. National Museum, and in the author's collection.

The galls of this species have been mistaken for those of *Andricus suttoni* (Bassett) which occurs on *Quercus agrifolia*; and it is likely that all the records of *suttoni* occurring on *Quercus chrysolepis* apply actually to *spectabilis*. Though the galls of the two cynipids closely resemble each other, the insects are not similar, exhibiting what will be interpreted as generic differences when *Andricus* is subdivided. In several respects, such as the median depression of the scutellum, this species shows rel

tions to *Andricus pomiformis* (Bassett). Adults emerged from galls at Placerville, California on March 30; but it is likely that there is an earlier emergence date for more southern material. The gall is prominent and very abundant wherever I have seen *Quercus chrysolepis*.

***Bassettia ligni*, new species**

Plate XXIV, Figure 1

FEMALE.—Almost wholly black; the thorax transversely rugulose, lateral lines distinct; edges of wings not ciliate; length, 1.7 mm. HEAD: Slightly wider than thorax, bulging behind eyes; black, rufous brown at mouth; coriaceous to shagreened. Antennæ almost black, rufous brown basally. THORAX: Elongate; entirely black; prominently but shallowly puncto-rugose, or transversely rugulose, naked of hairs; parapsidal grooves fine but distinct to the pronotum where they are gradually curved apart, gradually curving together at the scutellum; median groove very fine and short, a fine, median, shallowly rugose depression extending anteriorly; anterior parallel grooves fine, extending posteriorly not much more than a third the length of the mesothorax; lateral lines smoother areas or shallow grooves, distinct, short, not reaching the posterior edge of the mesonotum; scutellum longer than wide, the surface the same as that of the remainder of the thorax, the two, oval, small, shallow foveæ slightly rugose, distinctly separated by a rather fine ridge; mesopleuræ smooth and shining, in places shagreened or coriaceous, especially centrally and anteriorly. ABDOMEN: Almost black, piceous ventro-posteriorly; entirely smooth, naked except for a few hairs at the base, laterally, and the hairs on the ventral spine and valves; not quite as broad as long, not produced dorsally, the second segment covering about half the total area, only slightly produced dorsally, but with the ventral margin curved; edges of other segments more vertical; ventral valves at about a 60° angle. LEGS: Brown-piceous, darkest on the coxæ, lightest at the joints and on the tarsi; finely pubescent; tarsal claws simple. WINGS: Clear, finely set with hairs, margins *not* ciliate; veins light brown, rather fine, cross-veins and subcosta heavier; areolet moderate in size; cubitus reaching basalis; radial cell open; second abscissa of radius somewhat curved, first abscissa arcuate, hardly suggesting an angle. LENGTH: 1.7 mm.

GALLS (Pl. XXIV, Fig. 1).—Cells within the wood of small twigs, usually not distorting the stem, or producing hardly noticeable swellings. Each cell is elongate-oval, about 1.0 by 2.5 mm., with a shell-like lining, distinct from but hardly separable from the wood; the cells lie wholly within the wood, which is not particularly modified; often a hundred or more are closely crowded in dense clusters. Exit holes, cleanly circular, about 0.5 mm. in diameter, disclose the infestation. On twigs of *Quercus Douglasii*.

RANGE.—California: Galt.

TYPES.—Five females (all imperfect) and 12 pieces of infested twigs. Holotype female, paratype female, and galls in the collections of The American Museum of Natural History; paratype females and galls with the author; galls at Leland Stanford University and the U. S. National Museum. Labeled Galt, California; March 29, 1920; Kinsey collector.

This very distinct genus regularly produces galls of about this simple type, and search for exit holes in otherwise undeformed twigs will probably produce, as I have already experienced, more species of the group. Species have been obtained heretofore only from Georgia, Florida, Missouri, Colorado, Arizona, and New Mexico, but not from the Pacific Coast. Insects were still emerging at Galt on March 29, but apparently most of them had emerged previously. The galls were mostly in the two-year-old wood, only rarely in the wood of the previous summer; but whether it takes the species more than one year to develop I cannot say because it was not carefully determined at the time which galls were producing the emerging insects.

***Neuroterus decipiens*, new species**

Plate XXIV, Figure 9

FEMALE.—Piceous black, pale yellow toward the mouth; antennæ brown, yellowish basally; areolet small; abdomen produced dorsally; length averaging 1.7 mm. **HEAD:** As wide or slightly wider than the thorax, not widened behind the eyes; piceous black, darkest on the front, lighter on the face, pale yellowish-white toward the mouth, on the mouth-parts, and under the head for the most part; surface almost smooth, microscopically rougher in places, naked, very sparsely hairy on the lower part of the face. Antennæ brownish, first two, three, or four segments pale yellow; hairy, least so basally; 13-jointed, second joint globose, third longest and most slender, last almost twice the length of the preceding. **THORAX:** Piceous black, lightest on the sides; mesothorax entirely smooth and shining, naked, entirely without the usual grooves and lines; scutellum entirely smooth, shining, naked, an arcuate furrow at the base; pronotum and mesopleuræ almost smooth, shining, and naked, only very microscopically coriaceous. **ABDOMEN:** Piceous black, lightest on the hypopygium, smooth, shining, naked; irregularly triangulate, distinctly produced dorsally. **LEGS:** Mostly light yellowish, yellow to piceous on the coxæ; smooth, hairy; tarsal claws simple. **WINGS:** Clear, minutely hairy; hind margin long-ciliate, front margin hardly ciliate; veins rather rich-brown, cubitus the lightest; areolet moderately small; cubitus reaches the basalis; radial cell long, narrow, open, the second abscissa of the radius about straight; first abscissa somewhat angulate without a projection. **LENGTH:** 1.5–1.8 mm.

MALE.—Differs from the female as follows: almost wholly golden yellow, eyes about black, abdomen brownish yellow; antennæ brownish apically, 14-jointed, third segment curved and incised; abdomen long, narrow-triangulate, long-pedicellate; areolet varying from somewhat larger to closed; radial area open but more nearly closed than in the female; length, 1.7–2.0 mm.

GALLS (Pl. XXIV, Fig. 9).—Clusters of egg-like cells in the leaf-blade. Each cell monothalamous, oval, about 1.7 mm. long by 1.0 mm. wide, thin-walled, entirely hollow, equally protruding from either surface of the leaf; leaf-green, drying brownish yellow. In dense, compacted clusters containing many scores of cells; on young leaves of *Quercus Douglasii*.

RANGE.—California: Stanford University (I. C. McCracken, Coll.), Three Rivers, and Redding.

TYPES.—Thirty-nine females, 11 males, 40 clusters of galls. Holotype female, paratype females, males, and galls in The American Museum of Natural History; paratype adults and galls in Leland Stanford University, the U. S. National Museum, and the author's collection. Labelled Redding, California; April 2, 1920; Kinsey collector.

This species is very abundant early in the spring; the galls are very succulent and the insects mature quickly after the unfolding of the leaves. There must be, therefore, another generation in the year, probably agamic. Insects were emerging at Three Rivers on March 22, but some hundred miles farther north, at Redding, adults did not emerge until some time after collection of the galls on April 2. Of 93 adults of my collection, only 14 are males, not the usual ratio for bisexual generations of this genus. Material of this species is in several collections labelled *Neuroterus pacificus* Beutenmüller, but this is obviously not that species.

Neuroterus engelmanni, new species

Plate XXIV, Figure 4

FEMALE.—Entirely piceous black; antennæ brown, straw-yellow basally; wing-veins light brown but cubitus and discoideus almost colorless; length averaging under 1.0 mm. HEAD: Somewhat wider than thorax, broadened behind eyes; piceous black, mandibles rufous brown; microscopically reticulate, the front smooth and naked, hairy about the mouth. Antennæ brown, straw-yellow basally, the third segment very much the longest and most slender. THORAX: Piceous black, microscopically reticulate, devoid of thoracic grooves, naked of hairs, not shrivelling as much as in many species of this genus; scutellum elongate cushion-shaped, an arcuate, smoother furrow at the base. ABDOMEN: Entirely piceous black, naked of hairs; finely but not long pedicellate; angulate-oval in shape, not as triangulate and shrivelled as in many species of the genus. LEGS: Piceous yellow, darkest basally, brown to straw-brown toward the tips of tarsi, but the tips dark; finely pubescent. WINGS: Clear, long-ciliate on margins; veins brown, cubitus and discoideus fine and light in color; areolet of moderate size; radial cell moderately long, narrow, open; cubitus reaching the basalis (though hardly discernible there) nearly at the point of union of the basalis with the discoideus; first abscissa of the radius about arcuate. LENGTH: 0.7–1.2 mm.

GALLS (Pl. XXIV, Fig. 4).—Pustulate swellings embedded in the leaf-tissue; monothalamous, but often several galls confluent; about circular, averaging 1.2 mm. in diameter. The surface of the leaf not modified, the under surface somewhat distended, the upper surface less so but very evidently swollen; thin-walled, hollow. On leaves of *Quercus Engelmannii*.

RANGE.—California: Alpine, Fallbrook.

TYPES.—Eleven females, and a great many galls. Holotype female, paratype females, and galls in the collections of The American Museum of Natural History; paratype females and galls at Leland Stanford University, and with the author;

galls in the U. S. National Museum. All the adults are imperfect. Labelled Fallbrook, California; February 26, 1920; Kinsey collector.

The galls were very abundant on the few trees on which they were found. On February 24 and 26 they contained only larvæ. Of the two or three thousand insects bred from one of the lots of galls, only eleven gall-makers were recovered, the other insects being parasites. The galls closely resemble *Neuroterus niger* Gillette which occurs on *Quercus macrocarpæ*, *N. perminimus* Bassett on *Q. alba*, *N. papillosus* Beutenmüller on *Q. bicolor*, and several other species which I shall describe from other species of oaks. The insects of these species show evident relationships morphologically, and it is of considerable significance to find the galls (an expression of the physiology of the insect!) similarly related. These species are certainly distinct, but it may be desirable at some time to label them varieties. Such "host varieties" are biologically important because of the material they may offer for experimental work on the possible effect of environment (the host) on the insect.

***Neuroterus varians*, new species**

Plate XXIV, Figures 17 and 18

FEMALE.—Entirely black, including the legs and the antennæ for the most part; abdomen extending ventrally as far as or farther than dorsally; areolet of a moderate size to closed; length varies, 1.0–1.8 mm. **HEAD:** As wide or wider than the thorax, protruding slightly back of the eyes; black, light rufous brown around the mouth and on the mouth-parts; only microscopically coriaceous; practically naked of hairs. Antennæ piceous black, the second and third segments in part lighter piceous; hardly hairy; with 13 segments, third most slender and longest but not considerably longer than fourth, last segment not much longer than the preceding. **THORAX:** Entirely black; mesothorax smooth, shining, naked of hairs, entirely without the usual grooves and lines; scutellum smooth, shining, naked, with a smooth, arcuate furrow at the base; pronotum smooth, very finely punctate and hairy at the sides, not very evidently so; mesopleuræ practically smooth, shining and naked. **ABDOMEN:** Black, piceous ventro-apically; smooth, naked; usually protruding as far or farther ventrally than dorsally, as high or higher than long. **LEGS:** Black (piceous in small individuals), light piceous yellow at the joints and on the tarsi, tips of tarsi dark; shining, smooth except for minute punctures, minutely hairy; tarsal claws simple. **WINGS:** Long, clear, set with very fine hairs, long-ciliate on the hind margins, hardly ciliate on the anterior margins; veins light brown; areolet of moderate size (small or closed in small individuals); cubitus continuous to the basalis; radial cell open, not as long and narrow as usual in this genus; first abscissa of the radius sharply angulate, very slightly infusate where it leaves the subcosta. **LENGTH:** 1.5–1.8 mm. (individuals vary, down to 1.0 mm.).

GALLS (Pl. XXIV, Figs. 17, 18).—Short, blunt, irregular stem swellings. Polythalamous. Distorted lateral stems, 5–12 mm. in diameter, 6–35 mm. long, very rough, covered with bark of natural color; very irregular in shape, involving distorted buds, petioles, or leaves. Internally the larval cells are closely compacted, located mostly

toward the periphery; cells oval, averaging 1.5 by 0.8 mm., but varying in size; cells with a distinct, shell-like lining which is not, however, separable. On *Quercus lobata*.

RANGE.—California: Byron.

TYPES.—Over 200 females and 49 clusters of galls. Holotype female, paratype females, and galls in the collections of The American Museum of Natural History; paratype females and galls in Leland Stanford University, the U. S. National Museum, and the author's collection. Labelled Byron, California; March 19, 1920; Kinsey collector.

This species shows a considerable variation in the size of the adults, the color of the legs, and the size of the areolet. All of the material, which gave almost eight hundred adults, was collected from a single tree; the smaller individuals appear structurally and almost entirely in regard to color indetical with the largest individuals, and what differences do exist show all the intermediate stages in still other individuals. So I have no doubt that these variations are all within a single species, but to avoid any chance of confusion I have sorted out a series of the largest individuals as paratypes.

Adults emerged March 21, a couple of days after collecting the galls.

PLATE XXIV

- Fig. 1. *Bassettia ligni*, new species; natural size.
Fig. 2. *Andricus attractans*, new species.
Fig. 3. *Andricus serricornis*, new species.
Fig. 4. *Neuroterus engelmanni*, new species; natural size.
Figs. 5 and 7. *Andricus perdens*, new species; reduced.
Fig. 6. *Andricus perdens*, new species; larval cell.
Fig. 8. *Andricus perfoveatus*, new species.
Fig. 9. *Neuroterus decipiens*, new species; natural size.
Fig. 10. *Andricus pedicellatus*, new species.
Figs. 11 and 12. *Andricus spectabilis*, new species; reduced.
Fig. 13. *Andricus humicola*, new species; reduced.
Fig. 14. *Andricus gigas*, new species.
Figs. 15 and 16. *Andricus atrimentus*, new species.
Figs. 17 and 18. *Neuroterus varians*, new species.

All figures enlarged except as noted.



