

THE NORTH AMERICAN ICHNEUMON-FLIES OF THE TRIBE EPHIALTINI.

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INTRODUCTION.

This paper is a further contribution to a revision of the subfamily (Pimplinae) Ichneumoninae undertaken by Mr. S. A. Rohwer and the writer. It treats of the tribe Ephialtini as defined by Cushman and Rohwer in the first paper of the series.¹

The drawing of *Ephialtes (Itopectis) conquisitor* (Say) is by Miss Mary Carmody and the photographs by Mr. J. H. Paine, both formerly of the Bureau of Entomology, United States Department of Agriculture.

Tribe EPHIALTINI, Cushman and Rohwer.

In the Nearctic fauna, and indeed in that of the Holarctic region, this tribe includes only two genera, *Ephialtes* Schrank,² with its subgenus *Itopectis* Foerster, and *Apechthis* Foerster. In other regions, notably the oriental region, there are other genera referable to this tribe. All of these genera have heretofore been referred to the tribe (Pimplini) Ichneumonini.

So far as their host relations are known the members of this tribe are internally parasitic in lepidopterous pupae.

Description.—Head thin antero-posteriorly, the temples strongly sloping toward the occipital carina, the latter complete; frons concave; eyes sinuate to sharply emarginate opposite antennae; mandibles bidentate, the teeth equal in length; antennae from long filiform to subclavate; pronotum very short dorsally, the head set very close to the prescutum; thorax stout, ovate; mesoscutum with or without notauli, but the prescutum short, not extending far before the lateral lobes, notauli when complete converging posteriorly, deep and pitlike anteriorly, where they are bounded by a sharp carina that runs backward along the lateral margin of the lateral lobe; lateral

¹ Cushman and Rohwer, Proc. U. S. Nat. Mus., vol. 57, 1920, pp. 379-396.

² (= *Pimplidea* Viereck) not *Ephialtes* Gravenhorst. The reasons for this change are fully set forth by Cushman and Rohwer, Proc. Ent. Soc. Wash., vol. 20, No. 9, 1918 (1919), pp. 186-188.

carinae of mesoscutum strong posteriorly and extending more or less on to scutellum, the latter broad and weakly convex; mesoplural furrow curved or straight, not angulate opposite the punctiform fovea; propodeum in profile declivous from near base, with or without closed areas (in Holarctic genera without); legs usually stout, apical tarsal joint long, curved, claws simple, in female sometimes with basal tooth on some or all legs; wings with areolet always present, oblique quadrangular, nervellus reclivous and broken far above middle or the submediella is interstitial with its upper extremity; abdomen sessile, broadly fusiform, depressed; first tergite broad and with strong dorsal carinae, the anterior basin deeply concave; middle tergites transverse to quadrate, lateral elevations weak or absent; ovipositor short, stout, cylindrical, awl-like, usually straight, though sometimes sharply decurved at extreme apex, the lance dorsally without subapical notch or angulation, either flattened at apex or with its dorsal margin decurved, the ventral margin of lancets curving upward toward apex, the extreme apex rather obtuse.

The robust form, with the rather small, almost lenticular head; the short pronotum, which places the head close against the prescutum; the stout, ovate thorax; the mesoscutum, which, even when the notauli are strong, can hardly be said to have its anterior margin trilobed; the sloping propodeum; stout legs; broad, depressed abdomen; and short, thick, cylindrical ovipositor combined produce a habitus that once learned is very easy to recognize.

The insects of this tribe are most likely to be confused with the Ichneumonini, though it is doubtful if the two tribes are very closely related. Certain of the exotic genera, notably *Xanthopimpla* Saussure, approach the Theroniini in some of their characters, especially in the areolation of the propodeum, and this tribe is probably the closest relative of the Ephialtini.

The two genera found in the restricted region embraced in this paper are very readily distinguished by the characters used in the following key:

KEY TO NORTH AMERICAN GENERA.

- Radius originating from behind middle of stigma; face usually strongly, densely punctate and usually wider than long, without orbital maculation, in male not different from female; scutellum and postscutellum usually immaculate apically; ovipositor straight at tip; claws in female (except sometimes the front ones) without basal tooth; first tergite longer than second *Ephialtes* Schrank.
- Radius originating at or before middle of stigma, face polished, weakly, sparsely punctate and usually longer than wide, with yellow orbital maculation, the latter in male frequently embracing the entire face; scutellum and usually postscutellum maculate apically; ovipositor abruptly decurved at tip; claws in female (at least front and middle ones) with basal tooth or lobe; first and second tergites subsequen in length..... *Apechthis* (Foerster).

Genus EPHIALTES Schrank.

From *Apechthis*, *Ephialtes* is amply distinct by the strongly punctate, immaculate face; the longer first tergite; the straight ovipositor; and the lack of the basal tooth on the claws in the female except sometimes on the front tarsi.

All of the characters employed in the following key for the separation of the two subgenera are subject to great variation, so much so that no one character can be used to place a species in its subgenus. The combinations of long malar space with nonemarginate eyes for *Ephialtes* and short malar space with deeply emarginate eyes for *Itopectis* form perhaps the best characters for the separation of the two subgenera, but can not be depended on unsupported by other characters. The inner margin of the eye varies from nearly straight to deeply emarginate, the malar space from a fourth as long as the basal width of the mandible to slightly longer, the clypeus from truncate or even slightly rounded to deeply emarginate at apex, the propodeal spiracle from round to very long oval, the position of the antennal foramina from distinctly above to distinctly below the middle of the eye, the front tarsal claws in the female from strongly lobed to simple, and so on through the whole list of possible characters, but the characters are not grouped in the same manner in all species belonging to a given subgenus, and the variation in each character is so gradual from species to species that it is difficult, if not impossible, to draw a line of demarkation at any point in the variation.

The male is more slender than the female; the antennae are stouter; the malar space shorter; the clypeus less deeply emarginate in those species having it at all emarginate in the female; and not even the front tarsal claws toothed basally.

KEY TO SUBGENERA.

- Malar space at least half as long as basal width of mandible, shorter in male than in female; inner margin of eye usually broadly curved, not deeply emarginate; clypeus subtruncate to deeply emarginate at apex; lower margin of antennal foramina at or below middle of eye; frons deeply concave; antennae long, filiform, frequently attenuate at apex; notauli usually feebly indicated anteriorly; propodeum long, with lateral ridges strong, spiracle usually elongate; intercubitella usually less than half as long as basal abscissa of radiella; hind tibiae usually not annulated, the tarsi never annulated; apical spines of tarsal joints very long, those of the fourth joint of front tarsus reaching to or beyond middle of fifth joint, not especially long in male; claws of front tarsi in female without basal lobe.....*Ephialtes* Schrank.
- Malar space rarely half as long as basal width of mandible, usually much shorter; inner margin of eye deeply emarginate; clypeus truncate to broadly rounded at apex; lower margin of antennal foramina above middle of eye; frons usually not deeply concave; antennae usually not long, usually more or less thickened toward apex and attenuate at base; notauli usually not at all indicated; propodeum usually short,

declivous from base, lateral ridges usually weak, spiracles usually round or short oval; intercubittella usually more than half as long as basal abscissa of radiella; hind tibiae and tarsi usually annulated; apical spines of tarsal joints short, those of the fourth joint of front tarsus not reaching middle of fifth joint; claws of front tarsi in female with more or less distinct basal lobe. *Itopectis* (Foerster).

Subgenus EPHIALTES Schrank.

- Ephialtes* SCHRANK, Fauna Boica, vol. 2, pt. 3, 1802, p. 316, (not Gravenhorst. 1829). Type, *Ichneumon compunctor* Linnaeus (= *Pimpla instigator* Fabricius).
Pimpla Authors, part.
Pimplidea VIERECK, Bull. 83, U. S. Nat. Mus., 1914, p. 117. (New name for *Pimpla* Authors, not Fabricius). Type, *Pimpla pedalis* Cresson.

KEY TO NORTH AMERICAN SPECIES.

1. All legs, except yellowish mark on prothoracic, black to piceous (hind legs sometimes red, especially in male) 2.
 Legs mostly reddish 3.
2. Abdomen black; scutellum with yellow spot; wings blackish; malar space barely half as long as basal width of mandible *maura* (Cresson).
 Abdomen red; scutellum black; wings hyaline; malar space distinctly more than half as long as basal width of mandible *ellopia* (Harrington).
3. Coxae black 4.
 Coxae red 5.
4. Apical half of hind tibiae and their tarsi fuscous *sodalis* (Ruthe).
 Hind tibiae and tarsi entirely red *longigenalis* Cushman.
5. Front tibiae in female increasing gradually in size from base to apex; first tergite with a more or less prominent elevation each side of middle; hind tibiae black without a trace of annulation *pedalis* (Cresson).
 Front tibiae in female swollen in middle 6.
6. Hind tibiae red or blackish, not or but obscurely annulated, with reddish or whitish 7.
 Hind tibiae black with a distinct white annulus 10.
7. Hind tibiae in female in lateral view increasing gradually in size from base to apex 8.
 Hind tibiae in female in lateral view with a distinct though slight swelling between middle and base 9.
8. Legs slender; hind tibiae blackish with a fairly distinct reddish annulus, their spurs white; both maxillary and labial palpi white (male only known) *yakutatensis* (Ashmead).
 Legs stout; hind tibiae usually entirely red, sometimes infuscated and rarely with a very obscure annulus, the spurs reddish or fuscous; at least the labial palpi blackish or piceous *sanguineipes* (Cresson).
9. Hind tibiae entirely red; palpi and tegulae white *punicipes* (Cresson).
 Hind tibiae fuscous, with an obscure reddish annulus near base; palpi and tegulae piceous *exareolata* (Ashmead).
10. Abdomen finely punctate, the tergites without definite polished apices; scutellum in male white marked (female unknown) *aquilonia* (Cresson).
 Abdomen rather coarsely punctured, the tergites with apices polished, scutellum in male not white marked 11.
11. Front tibiae in female not at all excavated beyond middle; only the hind tibiae annulated; tegulae black; front coxae black to piceous, darker in male *tenuicornis* (Cresson).
 Front tibiae in female more or less deeply excavated below middle; both hind and middle tibiae usually annulated; tegulae usually white; front coxae testaceous *aequalis* (Provancher).

EPHIALTES (EPHIALTES) MAURA (Cresson).

Pimpla maura CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 143, female.

Type.—Acad. Nat. Sci. Phila., No. 1413.

In the United States National Museum is a female of this species from the Belfrage Texas collection. This specimen has been compared by the writer with the type, from which it differs practically only in being somewhat smaller and in having the propodeum with the carinae, transverse regosity, and lateral angulations less strongly developed. The very dark-colored legs with the pale markings of the front femora and tibiae are characteristic of a small group of species which includes also the next following species and two from Japan (*Pimpla pluto* Ashmead and *Pimpla parnarae* Viereck). Another rather conspicuous character that all have in common is the dorsally prominent eyes, the top of the eyes being elevated above the level of the vertex. The present species is very distinct from all other North American species in its almost entirely black color.

Other characteristics are clypeus broadly subtruncate and with a narrow, reflexed, crenulate flange at apex; malar space barely half as long as basal width of mandible; eyes very large, the head in front view being much wider than long, inner margins of eyes deeply sinuate; lower margins of antennal foramina below middle of eye; face and vertex equal in width, the latter slightly below level of top of eyes; front rather shallowly concave, ruguloso-punctate; diameter of lateral ocellus equal to length of ocell-ocular line, and much shorter than postocellar line; notauli briefly, broadly impressed; propodeum transversely rugulose above, reticulate punctate apically, polished behind, spiracles broadly oval; dorsal carinae of first tergite subobsolete; nervulus distinctly postfural.

All specimens known to the writer are from Texas.

EPHIALTES (EPHIALTES) ELLOPIAE (Harrington).

Pimpla ellopiae HARRINGTON, Can. Ent., vol. 24, 1892, p. 99, female, male.

Type.—Coll. W. H. Harrington, Ottawa, Canada.

Five specimens, four females and one male, of this species in the United States National Museum agree in practically every particular with descriptive notes on the type by S. A. Rohwer. The females vary from 10 mm. to 13 mm. in length, while the type is but 9.5 mm.

In the type the abdomen is 6 mm. long and the exerted portion of the ovipositor 3 mm.; in the largest of the National Museum specimens the abdomen is 8 mm. and the ovipositor 3.5 mm. In the latter specimen the hind femora are piceous, becoming almost red within and at the base. The smallest of the National Museum specimens has the abdomen and ovipositor as in the type and the femora red except where they are piceous. A specimen in the

Academy of Natural Sciences of Philadelphia has been examined by the writer. It is also larger than the type and differs also in having the abdomen becoming nearly black at the apex, wings yellowish hyaline, hairs of face longer and more yellowish, ovipositor slightly less than half as long as abdomen. According to Mr. Rohwer's notes, the type male differs from the female but little beyond the more reddish legs and the more hairy head and thorax. The only male in the National Museum differs from the female in the same way and also has the tegulae whitish basally.

Other characters of the female worthy of mention are: Clypeus broadly, rather deeply emarginate; malar space about three-quarters as long as basal width of mandible; eyes broadly arcuate within; face broader than vertex, the latter below level of top of eyes; diameter of lateral ocellus nearly twice as great as ocellular line and nearly as long as postocellar line; lower margin of antennal foramina below middle of eye; front deeply concave and transversely rugulose; antennae nearly as long as body, very slender, not attenuate at apex; notauli briefly, rather deeply impressed; propodeum strongly transversely rugose above, ruguloso-punctate laterally, polished behind, spiracle long oval; dorsal carinae of first tergite obsolete, their positions occupied by broad polished areas. The types are from British Columbia, where they were reared from *Ellopiia somniaria* and the National Museum specimens are from California, one female collected by H. S. Barber in Humboldt County and the rest collected by W. M. Mauer at Pacific Grove.

EPHIALTES (EPHIALTES) SODALIS (Ruthe).

Pimpla sodalis RUTHE, Stettin. Ent. Zeit., vol. 20, 1859, p. 371, female, male.

Pimpla nordenskioldi HOLMGREN, Oefvers. Svensk., Vet.-Akad. Forh., vol. 29, pt. 6, 1872, p. 97, female.

Pimpla longiceps THOMSON, Opusc. Ent., pt. 8, 1877, p. 746, 1877, female, male.

This species, with which Roman¹ synonymizes *nordenskioldi* Holmgren, has been recorded under the latter name from Greenland by Holmgren in his original description and by Aurivillius². It differs from all the other North American species of Pimplidea in having the coxae black and the legs otherwise mostly red, being allied in this respect to *instigator* Fabricius of Europe. No specimens of the species are available for examination.

Distribution.—Northern Europe, Iceland, Greenland.

EPHIALTES (EPHIALTES) LONGIGENALIS, new species.

Apparently very closely related to *sodalis* (Ruthe), differing from descriptions of that species only in having the hind tibiae and tarsi entirely red. Because of this difference it runs in Schmiedeknecht's

¹ Naturh. Untersuch. des Sarekgebirges, vol. 4, 1909, p. 268.

² Bih. Svensk. Vet.-Akad. Handl., vol. 15, pt. 4, No. 1, 1890, p. 29.

key¹ to 17, where it agrees with neither *instigator* (Fabricius) nor *aegyptiaca* (Schmiedeknecht).

Female.—Length, 8 mm.; antennae, 7 mm.; ovipositor, 2.6 mm.

Head rather broad behind eyes, the temples straight and not sharply converging, sparsely, weakly punctate; frons weakly, transversely striate; face with a median longitudinal ridge; clypeus truncate at apex; malar space slightly longer than basal width of mandible. Thorax shining; pronotum, mesopleura posteriorly and metapleura striate; mesopleura otherwise, mesoscutum and scutellum obscurely punctate; propodeum dorsally rugoso-punctate, posteriorly transversely rugose, median carinae divergent; first tergite shallowly concave at base; basal five tergites densely punctate with broad, polished, subcallose apices; apical tergites subpolished; ovipositor about half as long as abdomen.

Brilliant black; this color embracing coxae, trochanters, antennae, tegulae and base of costa; legs otherwise bright rufotestaceous; wings fuscous, venation dark brown.

Type locality.—Tuolumne Meadows, California, 8,600 feet.

Type.—Cat. No. 22871, U. S. N. M.

Described from two females collected by G. R. Pilate, the type on August 15, 1916, and the paratype on August 8, 1916.

The paratype is practically identical with the type, being very slightly larger and having the ovipositor relatively slightly longer.

EPHIALTES (EPHIALTES) PEDALIS (Cresson).

Pimpla pedalis CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 268, male.

Pimpla pedalis WALSH, Trans. St. Louis Acad. Sci., vol. 3, pt. 1, 1873, p. 132, female, male.

Pimplidea pedalis (Cresson) VIERECK, Bull. 83, U. S. Nat. Mus., 1914, p. 117.

Scambus (Pimplidea) pedalis VIERECK, Hym. Conn., 1917, p. 320.

Type.—Acad. Nat. Sci. Philadelphia, No. 1411.

This species is among the most common of the Eastern *Ephialtes*. Its usually large size, brilliant black color, and black hind tibiae and tarsi without any trace of annulation will serve to distinguish it from any other species. Its nearest relative appears to be the Alaskan *yakutatensis* (Ashmead), this species resembling it in the slender legs and the structure of the first tergite, but being distinct from it in the obscurely annulated hind tibiae. *Yakutatensis* is known only in the male, and it is impossible, therefore, to compare the females of the two species. In the female it differs from all the other species of the subgenus in the formation of the front tibiae, these being not at all swollen in the middle but slender and increasing gradually in size from base to apex.

Other characters of value are: Clypeus broadly, very shallowly emarginate; malar space in female equal in length to basal width of

mandible; face and vertex subequal in width; eyes sinuate within; lower margin of antennal foramina below middle of eye; antennae very long and slender, slightly attenuate toward apex; frons deeply concave, transversely rugose medially; diameter of lateral ocellus equal to ocellular line and slightly more than half as long as postocellar line; notauli very broadly, shallowly indicated in front; propodeum transversely rugulose above, reticulate punctate laterally, polished posteriorly, spiracle long oval to broad oval, depending on size and sex; scutellum weakly convex, subtruncate at apex; nervulus postfureal.

In the male the clypeus is truncate rather than emarginate; malar space about two-thirds as long as basal width of mandibles; face slightly narrower than vertex; and the sculpture and impressions of the abdomen stronger than in female.

In the 14 females at hand there is comparatively little variation in size or structure. The largest is 16 mm. long, with abdomen 9.5 mm., exerted portion of ovipositor 4 mm. The smallest has the corresponding measurements, 12 mm., 7 mm., and 3.5 mm. Among the 25 males the variation in size is much greater, the largest being 14.5 mm. and the smallest 7.5 mm. long. In the smaller specimens the propodeal spiracle is relatively much broader than in the larger specimens.

Distribution.—Specimens in National Museum from Nova Scotia, New Hampshire, Massachusetts, New York, Pennsylvania, Michigan, Wisconsin, Minnesota, Vancouver, Washington, California, New Mexico, Virginia, Colorado.

Hosts.—The reared specimens in the United States National Museum are from the following hosts: *Leucania unipuncta*, *Orgyia badia*, *Malacosoma disstria*, and *Olene pinicola*. Other host records gleaned from literature are as follows: Galls of *Saperda concolor*,¹ *Heterocampa guttivitta*,² gypsy moth (*Porthetria dispar*),³ *Pyrrharctia isabella*,⁴ *Tortrix fumiferana*.⁵ In the case of the last record Fernald states that the parasites must oviposit in the host larva, for the material from which they came was received as larvae. Bruner⁶ noted the same phenomenon, the host in this case being *Malacosoma disstria*.

EPHIALTES (EPHIALTES) YAKUTATENSIS (Ashmead).

Pimpla yakutatensis ASHMEAD, Proc. Wash. Acad. Sci., vol. 4, 1902, p. 200, male.
Type, Cat. No. 5621, U.S.N.M.

Besides the unique type there are in the United States National Museum four other males of this species, all from Alaska, but no females. It is probably more closely allied to *pedalis* (Cresson)

¹ Davis, Ins. Life, vol. 4, p. 66.

² Patch, Miss E. M., Me. Expt. Sta. Bull. 162, p. 365.

³ Ins. Life, vol. 5, p. 339.

⁴ Fiske, Tech. Bull. 6, N. H. Expt. Sta., p. 201.

⁵ Fernald, Rept. on Gypsy Moth, p. 377.

⁶ Neb. Expt. Sta. Bull. 14, p. 29-32.

than to any other North American species. It can, however, be easily distinguished from that species by its annulated hind tibiae, white tibial spurs, and white palpi. The apparently best characters for separating it from *sanguineipes* (Cresson) have been made use of in the key, though the variation in both species with reference to all but the first character, which is comparative, makes the separation difficult.

Other characters of the male are: Clypeus broadly, shallowly emarginate at apex; malar space half as long as basal width of mandible; inner margin of eye weakly sinuate; lower margin of antennal foramen slightly below middle of eye; front rather weakly concave; antennae long, slightly attenuate at apex; notauli feeble; propodeum without lateral ridges, rugulose punctate above, punctate laterally, polished behind, spiracle very broadly oval.

EPHIALTES (EPHIALTES) SANGUINEIPES (Cresson).

Pimpla sanguineipes CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 165, female. Type, Cat. No. 12277, U.S.N.M.

Pimpla (Pimpla) erythropus VIERECK, Ent. News, vol. 20, 1909, p. 291, female, male. Type, Cat. No. 12275, U.S.N.M.

Of the two characters mentioned by Viereck in his description of *erythropus*, as distinguishing it from *sanguineipes* (the smooth, polished posterior face of the propodeum with its surrounding carina and the color of the wings), the latter is obviously of no value, since the wings of the type of *sanguineipes* are distinctly brown-stained. As for the propodeal character, I know of no species in the genus in which this is not subject to marked variation. The "carina" surrounding the posterior polished area is formed by the strengthening and completion medially of one of the numerous transverse rugae. In the type of *sanguineipes* the rugae cover most of the posterior face of the propodeum and none is especially strong. In the type of *erythropus* the reverse is true. But other specimens show intermediate structure, and one of Viereck's paratype females has the posterior face strongly rugose, while the "carina" is unusually strong.

The most striking characteristic of this species is its sharply contrasting, intensely black body and almost entirely bright red legs. Other characters of value are: Clypeus broadly emarginate at apex; malar space in female equal in length to base of mandible, slightly shorter in male; face in female slightly wider than, in male equal to, vertex; diameter of lateral ocellus much shorter than ocell-ocular line, the latter nearly as long as postocellar line; frons deeply concave up to anterior ocellus, usually more or less transversely rugulose, in male concavity less deep and not extending up to ocellus; eyes only slightly sinuate within; notauli barely indicated anteriorly; scutellum weakly convex, subtruncate at apex,

propodeum strongly ridged laterally in female, not at all in male, rugulose dorsally, reticulate punctate laterally, polished behind, spiracle long oval to broadly oval; nervulus interstitial or slightly postfurcal.

In the rather large series in the United States National Museum is exhibited a wide range of variation in size, structure, and sculpture, and some in color. Females vary in size from 14 mm. to 5 mm. and males from 12 mm. to 7 mm. The smaller specimens have the head thicker from front to back, the thorax shorter, sculpture weaker, and wings paler (sometimes nearly hyaline) than in the larger specimens. In some specimens the middle tergites have their apices and posterior corners reddish. A few of the smaller specimens have the hind tibiae strongly infuscated, some displaying a very obscure and poorly defined annulation. The shortening of the thorax is especially noticeable in the mesoscutum, this being distinctly longer than wide in large specimens and distinctly wider than long in very small specimens.

In addition to the type from Texas and the type series of *erythropus* from various localities in California, specimens of this species from the following States and Provinces are in the National Museum: British Columbia, Washington, Oregon, California, New Mexico, Texas, Colorado.

Hosts.—*Spilosoma virginica* (Colorado), *Hemileuca maia* (New Mexico, Webster No. 5054), *Malacosoma fragilis* (New Mexico), *Laspeyresia pomonella* (California, Bur. Ent. No. 235), *Sabulodes anfractata* (California, Bur. Ent. No. 850), *Notolophus oslari* (California, Hopkins U. S. Nos. 4449e, e³, e⁵, and e⁶, types of *erythropus* Viereck).

EPHIALTES (EPHIALTES) PUNICIPES (Cresson).

Pimpla punicipes CRESSON, Proc. Acad. Nat. Sci. Phila., 1873, p. 398, female.
Type in Acad. Nat. Sci. Phila., No. 604. Cotype in U. S. Nat. Mus.

This species, described from Mexico, is included in the present paper on the strength of a determination of a Texas specimen by Cresson. This specimen is in the Academy of Natural Science of Philadelphia. The species, as represented by the National Museum cotype, is very closely related to *sanguineipes* (Cresson) and *exareolata* (Ashmead), being distinguished from the very small specimens of the former species and from the unique type of the latter principally by the characters used in the key. The form of the hind tibia in this and in *exareolata*, though not conspicuous, is apparently very characteristic. Other characters of value are: Clypeus truncately emarginate at apex, malar space as long as basal width of mandible; inner margin of eye slightly sinuate; face as broad as vertex; lower margin of antennal foramen far below middle of eye; front rather shallowly concave, polished, weakly rugulose medially; ocell-ocular line slightly

longer than diameter of lateral ocellus; antennae nearly as long as body, not attenuate at apex; notauli not at all impressed; propodeum very weakly ridged laterally, densely punctate dorsally and laterally, polished behind, spiracle practically round; first tergite with posterior depression occupying much more than half the length of the tergite, not roundly prominent on each side of middle at summit; ovipositor sheath about one-third as long as abdomen.

EPHIALTES (EPHIALTES) EXAREOLATA (Ashmead).

Itoplectis exareolata ASHMEAD, Psyche, vol. 9, 1901, p. 147, female. Type, Cat. No. 5326, U.S.N.M.

This species is represented only by the unique type female. In addition to the characters given in the key it differs from its nearest relative, *puncipes* (Cresson), in having the clypeus distinctly emarginate; first tergite with anterior declivity occupying but little more than half of the length of the tergite, and roundly elevated on each side of the middle at the summit; ovipositor sheath about half as long as abdomen.

EPHIALTES (EPHIALTES) AQUILONIA (Cresson).

Pimpla aquilonia CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 145, male. Type, Acad. Nat. Sci. Phila., No. 1421.

This species, described only in the male, is evidently most closely allied to *aequalis* (Provancher) of the North American species, but differs from that species by the white spotted scutellum and more finely sculptured abdomen. The latter character is, however, very variable in *aequalis*. These two characters ally it much more closely to *turionellae* (Linnaeus) of Europe.

The unique type is apparently the only specimen known. It is from Maine. The record published by Davidson¹ of the rearing of this species from spider egg cocoons is of doubtful accuracy. He undoubtedly had a species of *Tromatobia*.

EPHIALTES (EPHIALTES) TURIONELLAE (Linnaeus).

Ichneumon turionellae LINNAEUS, Syst. Nat., ed. 10, vol. 1, 1758, p. 564, male.

Pimpla turionellae GRAVENHORST, Nov. Act. Acad. Nat. Curios., vol. 9, 1818, p. 291.

Roman² records this species from New Jersey, Wisconsin, Illinois, South Carolina, and Texas. The only closely allied North American species that has any such distribution is *aequalis* (Provancher), and it seems most likely that this is what Roman had, especially since his observations on the structure of his specimens apply fairly well to this species.

¹ Ent. News, vol. 7, p. 319.

² Ent. Tijdskr., vol. 31, 1910, p. 187.

EPHIALTES (EPHIALTES) TENUICORNIS (Cresson).

- Pimpla tenuicornis* CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 267, female. Type, Acad. Nat. Sci. Phila., No. 1414.
- Meniscus marginatus* PROVANCHER, Nat. Can., vol. 14, 1883, p. 15, female. Type, Dernière Provancher coll., Public Mus. Quebec.
- Meniscus ashmeadii* PROVANCHER, Addit. Faun. Can. Hym., 1888, p. 430, female. Type, Dernière Provancher coll., Public Mus. Quebec.
- Scambus (Itoplectis) tenuicornis* VIERECK, Hym. Conn., 1917, p. 322.
- Pimplidae tenuicornis* CUSHMAN, Proc. Ent. Soc. Wash., vol. 20, 1918, p. 9-10.

The synonymy of this species has been discussed in a recent paper by the writer (see reference above), and in that place as well as under the following discussion of *aequalis* (Provancher) its very close relationship to the latter species has been outlined. For the characters separating these two species see the synoptic table and discussion under *aequalis*.

Distribution.—Canada from Nova Scotia to Vancouver, northern tier of States, and extending south to Colorado and New Jersey. The following States and Provinces represented in National Museum; New Brunswick, Nova Scotia, Vancouver, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Michigan, Illinois, Colorado.

Hosts.—Gypsy moth (*Porthetria dispar*)¹; *Sesia caudata*.²

EPHIALTES (EPHIALTES) AEQUALIS (Provancher).

- Pimpla annulipes* AUTHORS, not Brullé.
- Pimpla aequalis* PROVANCHER, Nat. Can., vol. 12, 1880, p. 36, female. Type, Dernière Provancher coll., Public Mus. Quebec.
- Pimpla conquisitor*, var. *rufuscula* DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 368, female. Type, Acad. Nat. Sci. Phila.
- Scambus (Itoplectis) marginatus* VIERECK, Hym. Conn., 1917, p. 322.
- Pimplidae aequalis* CUSHMAN, Proc. Ent. Soc. Wash., vol. 20, 1918, pp. 9-10.

In a recent paper (see reference above) the writer has discussed the synonymy and immediate relationship of this species and recapitulation here is unnecessary. This discussion and the following description is based on the types of both Provancher and Davis, specimens compared with both types, and a very large series of both sexes in the United States National Museum.

Malar space equal to basal width of mandible in female, slightly shorter in male; face slightly wider than vertex; antennae nearly as long as body, very slender and slightly attenuate toward apex, the lower margins of their foramina far below middle of eye; frons rather deeply concave, especially in large specimens, polished with few weak rugae in large specimens; ocelli subequal in diameter to length of ocell-ocular line, which is considerably shorter than postocellar line; propodeum with lateral ridges weak, strongly punctate later-

¹ Ins. Life, vol. 5, p. 339.

² Ins. N. J., 1903, p. 626.

ally, polished medially and posteriorly, with more or less transverse rugosity separating posterior from dorsal surface; the spiracles round to broad oval; first tergite with dorsal carinae obsolescent, the anterior face nearly flat; not elevated on each side of middle at summit.

Very closely allied to *tenuicornis* (Cresson) and possibly synonymous with that species. Practically all of the characters separating the two have been listed in the key, and *aequalis* varies in all of these toward *tenuicornis*. The front tibiae in the female vary from deeply excavated to nearly straight below; the middle tibiae vary from distinctly white annulate to entirely red; the tegulae are frequently brownish at apices; and the front coxae are sometimes piceous at base. In size the females in the United States National Museum vary from 4.5 mm. to 13 mm. and the male from 3.5 mm. to 10 mm. Normally the abdomen is black with the apices of the tergites narrowly piceous, but some specimens have the piceous bands broadening out at each side to include a broad lateral space, and in some of the reared specimens the abdomen is entirely brownish with the apices of the tergites slightly paler.

There is some variation in the length of the malar space, relative width of face and vertex, concavity of frons, and diameter of ocelli with respect to length of ocell-ocular line. In some specimens the transverse rugosity of the propodeum amounts almost to a carina and there are two well-defined longitudinal carinae, these elevations setting off a dorsal and a posterior polished area.

Distribution.—New Brunswick to Wisconsin, south to New Mexico and Florida, the National Museum containing specimens from the following States: New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, Georgia, Florida, Alabama, Louisiana, Arkansas, Texas, New Mexico, Kansas, Nebraska, Missouri, Colorado, Wisconsin, Michigan, Illinois, and Indiana, in addition to one from New Brunswick and many labeled simply Canada.

Hosts.—*Synanthedon pictipes*; *Alabama argillacea*; *Mineola juglandis*; *Laspeyresia pomonella*; *Proteropteryx bolliana*; *Recurvaria nanella*; *Euzophera semifuneralis*. The above host records are found in the National Museum series. Dalla Torre lists the following under *Pimpla annulipes*: *Acrobasis (Mineola) juglandis*, *Carpocapsa pomonella (Phycita nebulo)*, *Mineola indigenella*, *Papilio ajax*, *Datana ministra*, *Tortrix quercifoliana*, *Teras (Acleris) oxycoccana* *Heterocampa marthesia*, *Gelechia (Gnorimoschema) gallaeasterella*, all on the authority of Riley; *Chlorippe chyton?* and *Iphiclides ajax*, on authority of Howard; and *Crambus exsiccatu*s, quoting Weed.

Subgenus *ITOPLECTIS* (Foerster) Woldstedt.

Pimpla AUTHORS, in part.

Itoplectis (Foerster) WOLDSTEDT, Vehr. naturh. Ver. preuss. Rheinland, vol. 25, 1868, p. 111; Bull. Acad. Imp. Sci. St. Petersburg, vol. 10, 1877, p. 16, separate. Type, *Pimpla maculator* (Fabricius).

The original description of *Itoplectis* consists of the characters used by Foerster in his key to the genera. He did not include any species, nor were there any included until 1877, when Woldstedt placed two species in the genus. One of these, *maculator* Fabricius, was designated by Viereck¹ as the genotype.

Most of the species have been described under other generic names, the earlier ones under *Ichneumon* and *Pimpla*, the latter name having been most commonly employed.

KEY TO NORTH AMERICA SPECIES.

1. All coxæ black, at least basally (in some males only the hind coxæ are black, the others yellow)..... 2
Front coxæ only black and usually only at base..... 5
2. Hind and middle tibiae and tarsi not annulated; trochanters black; scutellum strongly margined to apex; front coxæ concave behind... *atrocoxalis* (Cresson).
Hind and usually the middle tibiae and tarsi annulated with white; scutellum not strongly margined to apex; front coxæ normal..... 3.
3. Head behind the eyes broad and strongly rounded; front claws in female without basal tooth; all coxæ in male entirely black..... *evetriei* (Viereck).
Head behind the eyes narrowed and only moderately convex; front claws in female with basal tooth; front and middle coxæ in male whitish or testaceous at least at apex..... 4.
4. Abdomen more or less red laterally and with tergites yellow tipped; front and middle coxæ in male black nearly to apex *behrensii* (Cresson).
Abdomen entirely black; coxæ in female red, in male front and middle coxæ mostly pale, hind coxæ black..... *obesus* Cushman (male).
5. Mesepisternum with a distinct, sharp, oblique furrow across the upper end of the prepectal suture; venter black..... *temnopleuris*, new species.
Mesepisternum without such a furrow; venter black and white..... 6.
6. Apices of tergites distinctly yellowish or whitish; abdomen shining.
conquisitor (Say).
Apices of tergites at most narrowly piceous; abdomen opaque or subopaque.... 7.
7. Propodeum polished impunctate throughout, nervulus slightly postfurcal.
quadricingulatus (Provancher).
Propodeum polished only behind and medially; nervulus practically interstitial. . 8.
8. Abdomen in female very broad fusiform, third tergite at least twice as wide at apex as long in middle, first tergite with anterior basin occupying about two-thirds of dorsal length; postocellar line and diameter of lateral ocellus equal and twice as long as ocell-ocular line..... 9.
Abdomen in female narrower, third tergite usually less than twice as wide at apex as long in middle, first tergite with anterior basin occupying but little more than half of dorsal length; post cellular line twice as long as ocell-ocular line..... 10.

¹Bull. 83, U. S. Nat. Mus., 1914, p. 79.

9. Face in female slightly longer than broad at clypeus; malar space only about one-third as long as basal width of mandible; temples seen from above very sharply sloping, their cephalo-caudad length barely half that of eye; hind coxae of male black.....*obesus* (Cushman).
 Face in female slightly wider than long, malar space nearly half as long as basal width of mandible; temples seen from above less sharply sloping, their cephalo-caudad length about two-thirds that of eye; male unknown...*latus*, new species.
10. Malar space about a third as long as basal width of mandible; tegulae entirely yellow; apical joint of hind tarsus with complete basal white annulus.....11.
 Malar space distinctly more than a third as long as basal width of mandible; tegulae brown at apex; apical joint of hind tarsus with incomplete annulus.
montana, new species.
11. Tergites entirely black; apex of hind femur blackish; humeral angle of pronotum without a white spot*leavitti*, new species.
 Tergites narrowly piceous apically; hind femur not black at apex; humeral angle of pronotum with a more or less distinct whitish spot.....*pacificus*, new species.

EPHIALTES (ITOPLECTIS) ATROCOXALIS (Cresson).

Pimpla atrocoxalis CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 145, female.
 Type, Acad. Nat. Sci. Phila., No. 1423.

Discussion based on homotype female (Viereck), 12 other females, and 6 males.

This species and the European *ovalis* Thomson differ from all other species of the genus *Ephialtes* by the form of the front coxae, a character common to both sexes. In general appearance it resembles *Ephialtes* more closely than *Itoplectis*, but the short malar space, deeply emarginate eyes, location of antennal foramina, short tarsal spines, and the basally lobate front claws in the female ally it with *Itoplectis*. It is very distinct from all other North American species of the latter subgenus in the unannulated tibiae and tarsi, black trochanters, and strongly margined scutellum.

From *ovalis*, represented in the United States National Museum by a single female, it differs only slightly as follows: Antennae generally darker; temples more strongly rounded; tegulae pale only at extreme base; carinae weaker and slightly more convergent posteriorly.

Malar space distinctly less than half as long as basal width of mandible; clypeus truncate at apex; inner eye margin deeply emarginate; face slightly narrower than vertex; antennae about two-thirds as long as body, rather stout but not attenuate either at base or at apex, the lower margin of their foramina at about middle of eye; front rather deeply concave, strongly punctate; diameter of lateral ocellus greater than length of ocell-ocular line, which is but little more than half as long as postocellar line; temples narrow, nearly flat; notauli very weakly impressed but indicated well back on the mesoscutum; propodeum rather strongly ridged laterally, polished medially and posteriorly, otherwise confluent punctate,

spiracle long oval to broad oval depending on size and sex; basal lobe of front claw rather small.

In size this species varies from 8.5 mm. to 15 mm. in females and 5mm. to 14 mm. in males.

Distribution.—Cresson's type came from Hudson Bay Territory. In the National Museum are specimens from Nevada, Utah, California, Colorado, and New Mexico. Its distribution is apparently northern extending south along the high altitudes of mountain ridges.

Hosts.—*Malacosoma fragilis* (New Mexico); *Autographa californica* (Colorado).

EPHIALTES (ITOPLECTIS) EVETRIAE (Viereck).

Itopectis evetriae VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913 (April), p. 565, male. Type, Cat. No. 15294, U.S.N.M.

Itopectis plesia ROHWER, Proc. Ent. Soc. Wash., vol. 15, 1913 (January 22, 1914), p. 182, female. Type, Cat. No. 17063, U.S.N.M.

Discussion based on type and paratypes of *evetriae*, type of *plesia*, and five others of each sex.

Rohwer's species is simply the female of Viereck's reared from a larger host and differing from females reared from the type host, *Evetria taxifoliella*, only in size and the variant characters, such as longer propodeal spiracle, which accompany larger size throughout the genus.

This species differs from all other species of the subgenus, and resembles *Ephialtes* in lacking the lobes on the front claws in the female. In all other respects, however, it agrees with *Itopectis*. From all other species of *Itopectis* it differs in the form of the head with its very broad and strongly rounded temples.

Clypeus truncate at apex; malar space less than half as long as basal width of mandible; eyes rather broadly emarginate; face broader than vertex in both sexes; antennae slender, slightly attenuate at base; the lower margins of their foramina slightly above middle of eye; front rather shallowly concave, polished with some punctures medially; notauli obsolete; propodeum very short and declivous but strongly ridged laterally, nearly the whole dorsal surface polished, lateral surface weakly punctate, spiracle round to broadly oval.

All of the specimens are from hosts in two genera, those from the smaller host being about 6 mm. long and those from the larger host about 10 mm. long.

This is a western species, the types of *evetriae* being from California and that of *plesia* from Montana, while other specimens are from Oregon and Montana.

The hosts of this species as shown by the rearings are *Evetria*, sp. (probably *taxifoliella*), in cones of *Pseudotsuga taxifolia* at Yreka, California (types of *evetriae*, Hopkins No. 11415*b*); *Evetria taxifoliella* Busck in cones of *Pseudotsuga taxifolia* (Ashland, Oregon, Hopkins Nos. 10874*bc*, 13209*bb*^{1,5,7}; Colestin, Oregon, Hopkins No. 12535*t*; Missoula, Montana, Hopkins No. 10896*d*); *Evetria siskiyouana* Busck in cones of *Pseudotsuga taxifolia* (Ashland, Oregon, Hopkins No. 12510*b*); *Evetria siskiyouana* Busck in cones of *Abies concolor* (Ashland, Oregon, Hopkins No. 12529*e*²); *Pinipestis zimmermanni* Grote in twigs of *Pinus ponderosa* at Camas, Montana, Hopkins No. 11528 (type of *plesia*); and *Pinipestis cambiicola* Dyar on same host tree on the Flathead Reservation, Montana, Hopkins No. 12565*a*.

EPHIALTES (ITOPLECTIS) BEHRENSII (Cresson).

Pimpla behrensii CRESSON, Proc. Acad. Nat. Sci. Phila., 1878, p. 377, female, male. Type, Acad. Nat. Sci. Phila., No. 1424, female.

Discussion based on homotype (Viereck), 14 other females, and 8 males.

This species is the American prototype of the genotype, *maculator* (Fabricius), differing from that species principally in having the basal joint of the trochanters red instead of black, the legs somewhat less ornately colored, the antennae darker, the pubescence of the thorax silvery rather than cinereous, and the ovipositor shorter. It is very distinct from all other American species by the color of the abdomen, which is black medially and red laterally, with the tergites narrowly yellowish at apex.

Clypeus broadly rounded at apex; malar space half as long as basal width of mandible; eyes deeply emarginate within; face and vertex equal in width; antennae about two-thirds as long as body, very slightly attenuate at base, the lower margins of their foramina at middle of eye; front shallow, ruguloso-punctate medially; diameter of lateral ocellus much longer than ocell-ocular line; notauli barely impressed; propodeum polished medially and posteriorly, otherwise densely punctate; spiracle nearly round; first tergite with dorsal carinae strong; ovipositor barely a fourth as long as abdomen; all coxae black, reddish at apex; all tibiae with at least a trace of annulation; all joints of hind tarsi except fourth white at base; antennae slightly paler beneath, especially toward apex.

The specimens vary very little in size, females ranging from 9 mm. to 10.5 mm. and males from 7.5 mm. to 9 mm. in length.

The type series and all the National Museum specimens are from California, where many of them were reared from pupae of *Phryganidia californica*, which is apparently the only known host.

EPHIALTES (ITOPLECTIS) QUADRICINGULATUS (Provancher).

Pimpla 4-cingulatus PROVANCHER, Nat. Can., vol. 12, 1881, p. 38, female.

Known to me only from the description and from notes on the type by S. A. Rohwer, this species is apparently closely related to the several species that follow it in the key to species. It agrees with *leavitti* and *pacificus* in having the apical joint of the hind tarsus with a complete basal annulus and the tegulae entirely pale, and with the former in the entirely black abdomen; but, according to notes by Mr. Rohwer, it differs from both in having the propodeum entirely polished impunctate and the nervulus slightly postfurcal. *Leavitti* is from the same region as Provancher's type and will very likely prove to be synonymous.

EPHIALTES (ITOPLECTIS) OBESUS Cushman.

Itoplectis obesus CUSHMAN, Proc. U. S. Nat. Mus., vol. 53, 1917, p. 467, female, male. Type, Cat. No. 20779, U.S.N.M.

Discussion based on type, allotype, paratype, one other female, and two other males, all in the National Museum.

Very closely allied to *Itoplectis alternans* Gravenhorst of Europe, but distinguishable by the darker antennae, wing veins and stigma, the brown tipped tegulae, and the fact that only the first two or three hind tarsal joints are white at base.

This and the following four new species are very closely allied, being separable only by characters which are in themselves more or less variable. With larger series of specimens it is entirely likely that some or all of them will be found to be synonyms. On the characters used, however, they fall into groups of similar geographical range and size and it seems inadvisable to synonymize any of them at present. All except *obesus* are based entirely on the female, it being impossible to associate the males with their proper females. Some of the males have the coxae red, while others have them black.

In the male *obesus* differs from *behrensi* in having the front and middle coxae mostly pale.

Malar space much less than half as long as basal width of mandible; clypeus broadly rounded at apex; eyes deeply emarginate within; antennae distinctly stouter toward apex; front shallow, punctate medially; diameter of lateral ocellus much longer than ocell-ocular line; notauli barely indicated; thorax nearly as high as long; propodeum very short, polished medially and posteriorly, otherwise densely punctate; spiracle round to very broad oval; ovipositor about a third as long as abdomen.

The type, paratype, and one other female are from Wenatchee, Washington, where they were reared from pupae of the fruit-tree leaf-roller (*Archips argyrospila*); the allotype from Clark County,

Washington, reared from the bud moth (*Tmetocere ocellana*); another male from Duncan, British Columbia, reared from *Tortrix fumiferana*; and a male from Summit, Placer County, California, collected by W. M. Giffard.

EPHIALTES (ITOPLECTIS) LATUS, new species.

Female.—Length, 10 mm.; antennae, 7 mm.; ovipositor, 2 mm.

Differs from *obesus* Cushman by the characters used in the key and also as follows: Mesoscutum scarcely as wide as long, sparsely finely punctate; propodeum slightly convex in profile; tergites very narrowly pale at apex; antennae brownish below, the sutures black.

Host.—*Chalia fragmentella* Henry Edwards.

Type locality.—Albee, Oregon.

Other localities.—Pullman, Washington, and Beulah, New Mexico.

Type.—Cat. No. 22872, U.S.N.M.

Discussion from three females, the type reared under Hopkins U. S. No. 9063aa on August 15, 1913, by Carl Heinrich, paratype *a* taken June 7, 1908, at Pullman, Washington, and paratype *b* on August 13 at Beulah, New Mexico, by T. D. A. Cockerell.

EPHIALTES (ITOPLECTIS) LEAVITTI, new species.

Female.—Length, 8 mm.; antennae, 6 mm.; ovipositor, 1.5 mm.

Differs from description of *obesus* as follows: Postocellar line longer than diameter of lateral ocellus, which is much less than twice as long as ocell-ocular line; mesoscutum sparsely, weakly punctured, the pubescence dark and inconspicuous; propodeum convex in profile, dorsal carinae extending about halfway to apex; spiracles rather small, nearly round; abdomen not especially broad, third tergite more than half as long as wide; first tergite with dorsal carinae strong to beyond middle, anterior basin occupying little more than half of dorsal length; tegulae yellow throughout; wings brownish hyaline, stigma brown and only slightly paler at base and apex; humeral angle of pronotum without a pale spot; abdomen black with only first and second tergites obscurely piceous at apex; apical joint of hind tarsus with complete basal annulus.

Type locality.—St. Johns, New Brunswick.

Type.—Cat. No. 22873, U.S.N.M.

Described from two females collected October 3 by A. G. Leavitt, for whom the species is named.

The paratype has the piceous margins of tergites more distinct.

EPHIALTES (ITOPLECTIS) PACIFICUS, new species.

Female.—Length, 7.5 mm.; antennae, 5.5 mm.; ovipositor, 1.4 mm.

Differs from description of *obesus* as follows: face with well separated punctures, and sparsely pubescent; malar space nearly half as long as basal width of mandible; postocellar line longer than diam-

ter of lateral ocellus, which is much less than twice as long as ocellular line; mesoscutum sparsely, weakly punctured; mesopleura and mesosternum very sparsely, weakly punctured; propodeum convex in profile, carinae subparallel and reaching to about middle; spiracles rather small and nearly round; abdomen rather slender, third tergite nearly two-thirds as long as wide; first tergite with dorsal carinae reaching beyond middle, anterior basin occupying little more than half dorsal length; tegulae entirely yellow; color pattern not repeated on front tibiae; antennae brown beneath; wings brownish hyaline, stigma brown with apex and base but slightly paler; apical joint of hind tarsus with complete basal annulus.

Hosts.—*Eucratia castella* Walsingham, *Laspeyresia pomonella* (Linnaeus).

Type locality.—Menlo Park, California.

Other localities.—Vancouver, British Columbia; Alameda County, California.

Type.—Cat. No. 22874, U.S.N.M.

Described from four females, the type collected January, 1905, by F. Hornung; paratype *a* from Vancouver by C. F. Baker; paratype *b* and *c* reared by A. Koebele in Alameda County, California, *b* in June from *Eucratia castella* (Bur. Ent. No. 217°) and *c* in August from *Laspeyresia pomonella* (Bur. Ent. No. 235°).

Paratype *a* is somewhat smaller and *c* considerably larger than the type.

EPHIALTES (ITOPLECTIS) MONTANA, new species.

Female.—Length, 8 mm.; antennae, 6 mm.; ovipositor, 1.5 mm.

Differs from description of *obesus* as follows: face with well separated punctures; malar space nearly half as long as basal width of mandible; postocellar line longer than diameter of lateral ocellus, which is less than twice as long as ocell-ocular line; mesoscutum sparsely, weakly punctate, mesopleura and mesosternum even more weakly so; propodeum convex in profile, dorsal carinae strong only at base but extending obsoletely nearly to middle, spiracles rather small, nearly round; abdomen narrow, third tergite nearly two-thirds as long as wide, first tergite with dorsal carinae extending beyond middle, anterior basin but little more than half total length of tergite; all palpi pale; antennae brown; wings brownish stained.

Type locality.—Colorado.

Other localities.—White Mountains, New Mexico; Fort Wrangel, Alaska.

Type.—Cat. No. 22875, U.S.N.M.

Described from six females, the type and paratypes *a*, *b*, and *c* from the C. F. Baker collection from Colorado; paratype *d* collected

at 8,500 feet in the White Mountains of New Mexico by C. H. T. Townsend, and paratype *e* collected at Fort Wrangel, Alaska, by H. F. Wickham. Paratype *b* is the largest, being 9.5 mm. in length.

EPHIALTES (ITOPLECTIS) CONQUISITOR (Say).

Plate 21, fig. 1.

Cryptus conquisitor SAY, Bost. Journ. Nat. Hist., vol. 1, pt. 3, 1836, p. 232, female.

Type, Lost. Neotype in U. S. National Museum.

Cryptus pleurivinctus SAY, Bost. Journ. Nat. Hist., vol. 1, pt. 3, 1837, p. 235, female, male. Type, Lost. Neotype in U. S. National Museum.

Pimpla conquisitor RILEY, 4th Ann. Rept. Ins. Mo., 1872, p. 72.

Pimpla walshii DALLA TORRE, Cat. Hym., vol. 3, p. 454. (= *pictipes* Walsh, Trans. Acad. Sci. St. Louis, vol. 3, 1873, p. 135, female) not Gravenhorst. Type, Destroyed. Neotype in U. S. National Museum.

Apechthis conquisitor MORLEY, Rev. Ichn., pt. 3, 1914, p. 32.

Scambus (Itoplectis) conquisitor VIERECK, Hym. Conn., 1917, p. 321.

Discussion based on neotypes determined from each of the three descriptions and a great many other specimens of both sexes. The neotypes are labeled as follows: *conquisitor*, "Collection Belfrage"; *pleurivinctus*, "35⁰¹ *Pimpla conquisitor* on *Th. ephemeraeformis*, Iss. Sept. 23, '82"; *walshii*, "301, vii. 10, East River, Conn., July, C. R. Ely"; and each is further indicated by a neotype label. They agree in practically every particular with the original descriptions.

All three of the types being lost or destroyed, the only way of determining their nature is from the descriptions. The *conquisitor* type is rather uncommonly small, representing nearly the minimum size for the species while *pleurivinctus* represents nearly the other extreme. The latter, from description and biological notes, is undoubtedly the form of *conquisitor* commonly reared from the larger lepidopterous pupae. The host mentioned by Say is "the common folliculate Linnaean *Bombyx* with transparent wings", undoubtedly *Thyridopteryx ephemeraeformis*, commonly a host of this species. It is quite evident that Walsh's specimen was a small specimen of *conquisitor* with a rather unusual amount of black on the legs and with the apices of the tergites slightly darker than in the more typical specimens. Many specimens of *conquisitor* have a trace of the blackish color on the front and middle tibiae and middle tarsi and the apices of the tergites distinctly reddish rather than white. The neotype of *walshii* differs from the description only in minor details, the black of the legs being less distinct.

Within its range this is probably the most common species of the tribe and one of the most variable. It is always readily distinguishable from any other species by the very definite pale borders of the otherwise black tergites.

The very large series of this species available forms a good basis for a study of the possible range of specific variation in the genus.

Most of the structural variations and to some extent those of color accompany variation in size. The following description is drawn from a female and a male of average size, while the observations on variation are based on the entire series of two hundred or more specimens with special reference to the largest and smallest specimens of each sex available, the character of the smallest being stated first in each case:

Female.—Clypeus very broadly rounded at apex; malar space about one-third as long as basal width of mandible; vertex slightly

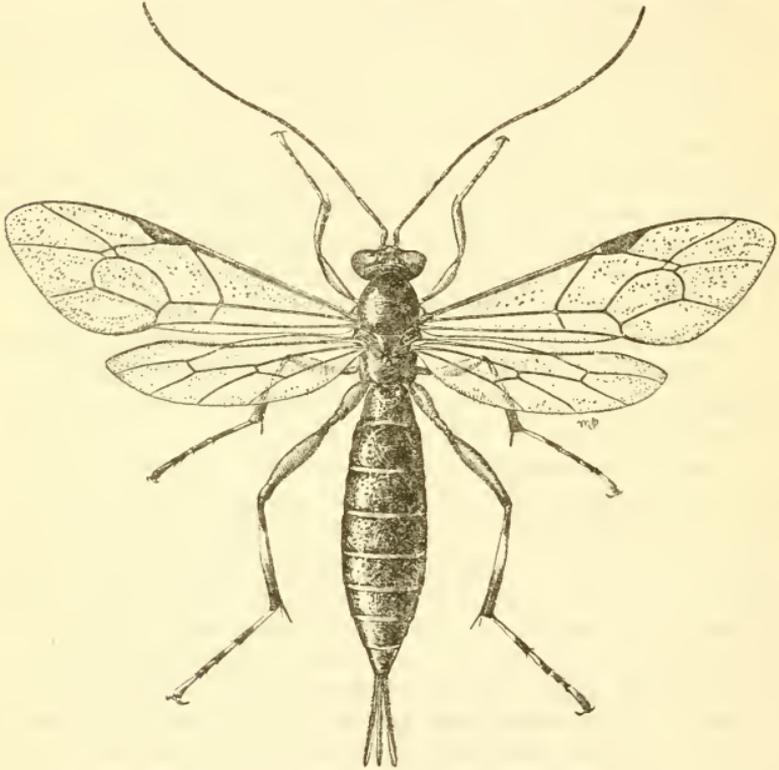


FIG. 1.—EPHIALTES (ITOPLECTIS) CONQUISTATOR (SAY).

wider than face; eyes deeply emarginate; antennae about two-thirds as long as body, barely attenuate toward base, lower margins of their foramina distinctly above middle of eye; front shallow, weakly ruguloso-punctate medially; diameter of lateral ocellus distinctly longer than ocell-ocular line, the latter barely more than half as long as post-ocellar line; notauli barely indicated; propodeum polished medially and apically, otherwise punctured, the punctures fading out gradually and becoming obsolete in front of the spiracle, the latter broad oval; first tergite very slightly longer than second; ovipositor little more than one-third as long as abdomen.

Male.—Differs from female in above characters as follows: Malar space hardly a third as long as basal width of mandible; antennae somewhat shorter and more strongly attenuate basally, lower margins of foramina at middle of eye; front more shallow and more strongly punctured; temples more strongly rounded, less sharply sloping.

Variation.—*Female*.—5.5–15 mm. Head from above slightly more to slightly less than half as long as wide, temples from strongly rounded to nearly flat; front barely concave to rather strongly concave, the concavity extending up to the vertex and down at each side below the antennae; face from sparsely punctate and polished to densely rugosely punctate and subopaque; antennal foramina from middle to distinctly above middle of eye; mesoscutum from slightly longer than wide with no indication of notauli to much longer than wide with notauli weakly indicated to near middle; propodeum from strongly rounded to rather flattened above, the spiracle round to broad oval; first tergite from distinctly longer than wide with spiracles prominent to as wide as long with spiracles not prominent; legs pale to bright testaceous; tegulae, humeral spot, wing base, and annuli of hind legs pure white to yellowish white; wings hyaline to yellowish.

Male.—About as given for female except that sculpture of face varies but little. Perhaps the most remarkable variation is in the form of the abdomen in this sex. In the small specimens it is but little more than twice as long as the thorax, elongate fusiform, and densely, rather opaquely punctured, while in the large ones it is fully three times as long as the thorax, linear, sparsely punctate, and highly polished. In the small form the wings reach nearly to the apex of the abdomen and in the large form barely two-thirds of the way.

The above characters vary with considerable constancy with size. Other variations not so closely correlated with size are: Ovipositor much less than one-third to distinctly more than one-third as long as the abdomen; front and middle tibiae entirely without or with considerable black externally; apices of tergites from nearly pure white to pale reddish yellow; hind tarsal joints from mostly white to less than half white; scape beneath in male from entirely white to entirely black.

Distribution.—From the States and Provinces represented in the National Museum collection the range of this species is practically the entire area east of the Rocky Mountains and from Quebec south to Georgia and Texas, and there is also a series of a dozen specimens from Bermuda.

Hosts.—The host range is as wide as the geographic, including both macrolepidoptera and microlepidoptera, with an occasional case of secondary parasitism and of parasitism on an insect of some other order. The following hosts are represented in the United States

National Museum collection: *Malacosoma americana*, *Hyphantria cunea*, *Hemerocampa leucostigma*, Tussock moth (Nebraska), *Hemileuca lucina*, *Alabama argillacea*, *Autographa brassicae*, *Bleptina* species, *Anomis erosa*, *Diaphania hyalinitalis*, *Diaphania quadristigmalis*, *Ennomos subsignaria*, *Thyridopteryx ephemeraeformis*, *Archips argyropila*, *Tortrix quercifoliana*, *Tortrix fervidana*, *Tortrix fumiferana*, tortricid on oak, tortricid on cedar, leaf-tier on oak, *Acrobasis rubrifasciella*, *Acrobasis betulella*, *Acrobasis kearfottella*, *Acrobasis caryalbella*, *Acrobasis caryaevorella*, *Acrobasis* species, *Eulia pinitubana*, *Peronea hastiana*, *Peronea minuta*, *Peronea* species on hornbeam, *Tmetocera ocellana*, *Cenopsis pettitana*, *Polychrosis viteana*, *Evetria frustrana*, *Epermenia cicutaella*, *Oxyptilus periscelidactylus*, secondary on lepidopterous larva through *Rogas terminalis*, and the coleopteran *Oncideres cingulata*. The parasitism on *Rogas terminalis* was proved by the writer by the finding in the *Rogas* cocoon of the larval exuvium of the *Itopectis*; but examination of the pupa of the coleopteran, which was considerably shattered, failed to disclose any trace of the parasite exuvium.

The following additional hosts have been recorded: *Mineola indigenella*,¹ *Cacoecia cerasivorana*,² *Cingilia catenaria*.³ The recording of *Phryganidea californica* in Insect Life (vol. 3, p. 462) is probably due to a mistake in the determination of the parasite; specimens of *Itopectis behrensii* (Cresson) in the United States National Museum bear the data given in the above record and are undoubtedly the specimens referred to. Fiske reared *conquisitor* as a secondary parasite of *Malacosoma americana* through several species of primary parasites (*Limneria*) *Hyposoter fugitivus* (Say), *Amelotonus clisiocampae* (Weed), *Rogas intermedius* Cresson, *Spilocryptus extrematis* (Cresson), and *Iseropus coelebs* (Walsh) (listed as *Pimpla inquisitor* Say), being the immediate hosts.

Fiske stated that this species oviposits in the pupa of the host.

EPHIALTES (ITOPLECTIS) TEMNOPLEURIS, new species.

Female.—Length, 14 mm.; antennae (broken); ovipositor, 4 mm.

Very closely allied to *conquisitor* (Say), differing from the largest specimens of that species practically only as follows: mesopleurum with a sharply incised, oblique furrow across the top of the prepectal suture; propodeum more strongly, densely punctate; abdominal venter entirely black; apices of tergites narrowly piceous.

Host.—*Iphiclides ajax*.

Type locality.—United States.

Type.—Cat. No. 20909, U.S.N.M.

Described from two females unlabeled except that the type bears the host label. The paratype is very like the type.

¹ Ins. Life, vol. 3, p. 462.

² Dimmock, Proc. Ent. Soc. Wash., vol. 4, p. 154.

³ Fiske, Tech. Bull. 6, N. H. Expt. Sta., p. 190.

SPECIES WRONGLY INCLUDED IN ITOPLECTIS.

Itoplectis orgyiae ASHMEAD, Trans. Amer. Ent. Soc., vol. 23, 1896, p. 213, is an *Iseropus*.

Genus APECHTHIS (Foerster) Woldstedt.

Apechthis (Foerster) WOLDSTEDT, Verh. Naturh. Ver. preuss. Rheinl., vol. 25, 1868, p. 164; Bull. Acad. Imp. Sci. St. Petersburg, vol. 10, 1877, p. 15, separate. Type, *Ichneumon rufatus* Gmelin.

The original description of *Apechthis* consists of the characters employed by Foerster in his generic key to distinguish it from the other genera of the Pimplidae. No species were referred to the genus until Woldstedt (see reference above) included two species, *Pimpla rufata* (Gmelin) and *Pimpla varicornis* Fabricius. The former was designated as the genotype by Viereck.¹

From *Ephialtes* this genus is easily distinguished by the polished, maculate face; the long second tergite; the downcurved ovipositor; and the possession by all the claws in the female, except sometimes those of the hind legs, of the basal lobe or tooth.

The character used by Morley (Rev. Ichn., pt. 3, 1914, p. 4) to separate this genus from *Itoplectis* and *Pimpla* (i. e., the possession by the female of basally lobate claws), will not hold as stated, for most species of *Itoplectis* have the claws of the front tarsi lobate or toothed, and some species of *Apechthis* lack the lobate claws on the hind tarsi. On this character Morley referred *Itoplectis conquisitor* (Say) to *Apechthis*. This species has the front claws lobed, but in this respect it does not differ from *Itoplectis maculator* (Fabricius), the genotype, nor from *alternans* (Gravenhorst) and *ovalis* (Thomson), all three of which Morley placed properly in *Itoplectis*.

Judging from the rather small series of specimens available the species of this genus vary in structure in much the same manner as do those of *Ephialtes*. This variation is especially conspicuous in the degree of convexity and convergence of the temples, comparative length and breadth of the mesoscutum, the position and strength of the propodeal carinae, and the sculpture of the tergites. Variation in color is even more marked than in *Ephialtes* on account of the cephalic and thoracic maculation, especially of the males. In some of the North American species the color of the hind legs varies from black and white to brownish and yellowish; in the tarsi of some specimens the light color predominates, the dark being confined to a narrow apical annulus on each joint; while in others the dark color occupies all but the basal and ventral portion of the first joint. The tegulae may vary within a species from white to nearly black. The face in the male varies from entirely yellow to more or less brown or black marked. The mesoscutal markings vary from entirely absent to broad and conspicuous.

¹ Bull. 83, U. S. Nat. Mus., 1914, p. 13.

KEY TO NORTH AMERICAN SPECIES.

1. First tergite prominently elevated in middle; hind tarsal claws in female with basal tooth.....2.
First tergite not prominently elevated in middle; hind tarsal claws in female without basal tooth.....*ontario* (Cresson).
2. Front coxae in female black basally, whitish at apex, in male reddish; face in male entirely yellow.....3.
Front coxae tricolored (black, white, and red); face in male more or less black.....*pacificus*, new species.
3. Mesoscutum without lateral yellow markings.....*picticornis* (Cresson).
Mesoscutum with yellow markings laterally before tegulae... *componotus* (Davis).

APECHTHIS PICTICORNIS (Cresson).

Plate 21, fig. 2.

Pimpla picticornis CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 146, male.
Type, Acad. Nat. Sci. Phila., No. 1416.

Pimpla annulicornis CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 147, female,
male. Type, Acad. Nat. Sci. Phila., No. 1638.

Scambus (*Pimplidea*?) *annulicornis* VIERECK, Hym. Conn., 1917, p. 321.

Scambus (*Tromatobia*?) *picticornis* VIERECK, Hym. Conn., 1917, p. 322.

Synonymy and discussion based on examination of types, other specimens in the Academy of Natural Science of Philadelphia, and seven females and two males in United States National Museum.

The types of the two descriptions are merely color variations.

In addition to the characters given in the key to species differs from *ontario* (Cresson) as follows: Antennae yellow beneath; front coxae mostly black, whitish at apex, sometimes all yellow in male; propodeum with upper hind angles prominent, the lateral face of the propodeum having its upper margin parallel to the pleural carina; punctuation of tergites very dense and sometimes confluent; averages somewhat larger.

Length.—Female, 11–15 mm.; male, 8–13 mm.

Distribution.—The type of *picticornis* is from New Jersey, that of *annulicornis* from Illinois and the allotype female from Pennsylvania. The series in the National Museum contains specimens from New Brunswick, Ontario, Michigan, Pennsylvania, New Jersey, and Texas.

Nothing is known of the hosts of this species.

APECHTHIS COMPONOTUS (Davis).

Pimpla componotus DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1898, p. 367, male.
Type, Acad. Nat. Sci. Phila.

The type and only known specimen of this species is very highly ornamented. Structurally it is very much like *picticornis*, and it is possibly an extreme variant of that species. One of the National Museum specimens of *picticornis* has the positions of the notauli marked with yellow but lacks the lateral markings of mesoscutum

and those of mesopleura and mesosternum. The type of *componotus* is also from a locality far west of the most western known range of *picticornis*, being from Idaho.

APECHTHIS PACIFICUS, new species.

Easily distinguished in both sexes from any of the above-mentioned species by its tricolored front coxae, by the fact that the middle, as well as the hind tibiae are black with a white annulus, and from all but *componotus* by the yellow margined mesoscutum. The female differs from *ontario* in having a small tooth at the base of the hind claw and from *annulicornis* in this tooth being much smaller than in that species. The male differs from all described North American males in not having the face entirely yellow.

Female.—Length, 12 mm.; antennae, 10 mm.; ovipositor, 2 mm.

Head shining; face sparsely, weakly punctate; temples weakly, evenly convex, very sharply sloping; malar space a third as long as basal width of mandible. Thorax shining, dorsal angle of pronotum, mesoscutum, scutellum, mesopleura (except posteriorly), mesosternum, and metapleura sparsely, weakly punctate; propodeum laterally and at sides dorsally distinctly, rather densely punctate, medially and posteriorly polished; notauli rather sharply but very briefly impressed; propodeum in profile strongly rounded dorsally, rather precipitate posteriorly, not at all angulate at the sides, and with the upper hind angles barely indicated, carinae weakly divergent, strong dorsally but not extending onto the posterior face; basal teeth of all tarsal claws small, those of hind tarsi extremely so. Abdomen very densely, finely punctate, the punctures longitudinally elongate, tubercles strong, transverse; first tergite strongly angulate above, laterally rugosely coriaceous; second tergite nearly as long medially as wide at apex.

Black; mandibles, first two joints of maxillary palpi; inner orbits, a semicircular spot at top of eye, tegulae, humeral angle of pronotum, sides of mesoscutum from tegulae to notauli, a small spot at each side of middle of mesoscutum just in front of scutellum, and apices of scutellum and postscutellum white or whitish; apical three joints of maxillary palpi and entire labial palpi fuscous; antennae black, brownish beneath; pedicel and basal joint of flagellum white marked beneath; front coxae black with a white spot in front and a red stripe outwardly; other coxae and middle and hind trochanters and femora testaceous; the hind femora apically infuscate; front femora and trochanters pale testaceous, whitish in front; hind tibia and tarsus black, the tibia with a broad white annulus, and the tarsal joints all more or less white basally; this pattern repeated, but less contrastingly, on the middle and front legs, the dark color not extending entirely around the tibiae and the tarsi being white with the

joints apically reddish; wings hyaline, veins and stigma, except metacarpus, costa, and base of stigma, black. Abdomen black with the apical margins of all segments very narrowly castaneous; sternites and pleurites black separated by broad bands of white.

Male.—Length, 9 mm.; antennae, 8 mm. Unusually similar to the female, differing practically only in the color of the middle tarsi, palpi, antennae, and face and in the lack of the two white marks on the posterior edge of mesoscutum; palpi except apical joint of labial palpi, which is fuscous, white; clypeus and face white, with clypeal suture, median stripe on face, and a triangular mark below each antenna black; antennae black, with scape as well as pedicel and basal joint of flagellum white beneath; middle tarsi fuscous instead of reddish as in female.

Host.—*Notolophus antiqua* (Linnaeus).

Type locality.—Portland, Oregon.

Type.—Cat. No. 22876, U.S.N.M.

Described from three females and four males reared by E. J. Newcomer, of the Bureau of Entomology, under Quaintance No. 14083.

The two female paratypes differ from the type practically only in size, paratype *b* being only 8 mm. long. The three male paratypes differ but little from the allotype, paratype *d* being 10 mm. long and *e* lacking the white markings on scape and lateral margins of mesoscutum.

APECHTHIS ONTARIO (Cresson).

Pimpla ontario CRESSON, Trans. Amer. Ent. Soc., vol. 3, 1876, p. 146, male.

Type, Acad. Nat. Sci. Phila., No. 1415.

Discussion based on type, specimens compared with type by Viereck and the writer, other specimens in the Academy of Natural Sciences of Philadelphia and ten other specimens in the National Museum.

Easily distinguished from *picticornis* (Cresson) by the characters used in the key, and also differing as follows: Antennae pale brownish beneath; front coxae in female mostly reddish, not whitish at apex, mostly whitish in male; propodeum with upper hind angles not especially prominent, the lateral face of propodeum with upper margin and pleural carina converging posteriorly; punctures of tergites well separated, never confluent; averages somewhat smaller.

Length.—Female, 7–12 mm., male 8–10 mm.

Distribution.—The type is from Canada. The National Museum series includes specimens from Quebec, Ontario, Michigan, Vancouver, Washington, Idaho, and California.

Hosts.—A pair from Quebec were reared from the pupa of the spruce bud worm (*Tortrix fumiferana*), a female reared under Hopkins No. 11100 at Pittsburg, New Hampshire, from the same host, and a female from Sonoma County, California, was taken "In the act of ovipositing on *Tortrix* on wild pea."

SPECIES WRONGLY REFERRED TO APECHTHIS.

Apechthis rugulosa MORLEY, Rev. Ichn., vol. 3, 1914, p. 34.

This species, described from a female from Inverness, British Columbia, is apparently not an *Apechthis*. The uneven tergites, low position of fracture of nervellus, and structure of propodeum would seem to indicate *Tromatobia*.

HOST LIST.

In this list the subgeneric names *Ephialtes* and *Itopectis* are treated as generic.

COLEOPTERA.

ONCIDERES CINGULATA.

Itopectis conquisitor (Say).

SAPERDA CONCOLOR, galls of.

Ephialtes pedalis (Cresson).

HYMENOPTERA.

AMELOCTONUS CLISIOCAMPÆ.

Itopectis conquisitor (Say).

HYPOSOTER FUGITIVUS.

Itopectis conquisitor (Say).

ISEROPUS COELEBS.

Itopectis conquisitor (Say).

ROGAS TERMINALIS.

Itopectis conquisitor (Say).

SPILOCRYPTUS EXTREMATIS.

Itopectis conquisitor (Say).

LEPIDOPTERA.

ACLERIS OXYCOCCANA.

Ephialtes aequalis (Provancher).

ACROBASIS BETULELLA.

Itopectis conquisitor (Say).

ACROBASIS CARYAEVORELLA

Itopectis conquisitor (Say).

ACROBASIS CARYALBELLA.

Itopectis conquisitor (Say).

ACROBASIS KEARFOTTELLA.

Itopectis conquisitor (Say).

ACROBASIS RUBRIFASCIELLA.

Itopectis conquisitor (Say).

ACROBASIS, species.

Itopectis conquisitor (Say).

ALABAMA ARGILLACEA.

Ephialtes aequalis (Provancher).

Itopectis conquisitor (Say).

- Itopectis conquisitor* (Say). ANOMIS EROSA.
Itopectis conquisitor (Say). ARCHIPS ARGYROSPILA.
Itopectis obesus Cushman. AUTOGRAPHA BRASSICAE.
Itopectis conquisitor (Say). AUTOGEAPHA CALIFORNICA.
Itopectis atrocoxalis (Cresson). BLEPTINA, species.
Itopectis conquisitor (Say). CACOECIA CERASIVORANA.
Itopectis conquisitor (Say). CENOPIIS PETTITANA.
Itopectis conquisitor (Say). CHALIA FRAGMENTELLA.
Itopectis latus Cushman. CHLORIPPE CLYTON.
Ephialtes aequalis (Provancher). CINGILIA CATENARIA.
Itopectis conquisitor (Say). CRAMBUS EXSICCATUS.
Ephialtes aequalis (Provancher). DATANA MINISTRA.
Ephialtes aequalis (Provancher). DIAPHANIA HYALINITALIS.
Itopectis conquisitor (Say). DIAPHANIA QUADRISTIGMALIS.
Itopectis conquisitor (Say). ELLOPIA SOMNIARIA.
Ephialtes ellopie (Harrington). ENNOMOS SUBSIGNARIA.
Itopectis conquisitor (Say). EPERMENIA CICUTAELLA.
Itopectis conquisitor (Say). EUCERATIA CASTELLA.
Itopectis pacificus Cushman.
Itopectis quadricingulatus (Provancher). EULIA PINITUBANA.
Itopectis conquisitor (Say). EUZOPHERA SEMIFUNERALIS.
Ephialtes aequalis (Provancher). EVETRIA FRUSTRANA.
Itopectis conquisitor (Say). EVETRIA SISKIYOUANA
Itopectis evetrie Viereck. EVETRIA TAXIFOLIELLA
Ito lectis evetrie Viereck.

GNORIMOSCHEMA GALLAEASTERELLA.

Ephialtes aequalis (Provancher).

HEMERICAMPA LEUCOSTIGMA.

Itopectis conquisitor (Say).

HEMILEUCA LUCINA.

Itopectis conquisitor (Say).

HEMILEUCA MAIA.

Ephialtes sanguineipes (Cresson).

HETEROCAMPA GUTTIVITTA.

Ephialtes pedalis (Cresson).

HETEROCAMPA MARTHESIA.

Ephialtes aequalis (Provancher).

HYPHANTRIA CUNEA.

Itopectis conquisitor (Say).

IPHICLIDES AJAX.

Ephialtes aequalis (Provancher).

Itopectis temnoplewis Cushman.

LASPEYRESIA POMONELLA.

Ephialtes aequalis (Provancher).

Ephialtes sanguineipes (Cresson).

Itopectis pacificus Cushman.

LEAF-TIER ON OAK.

Itopectis conquisitor (Say).

LEUCANIA UNIPUNCTA.

Ephialtes pedalis (Cresson).

MALACOSOMA AMERICANA.

Itopectis conquisitor (Say).

MALACOSOMA DISSTIA.

Ephialtes pedalis (Cresson).

MALACOSOMA FRAGILIS.

Ephialtes sanguineipes (Cresson).

Itopectis atrocoxalis (Cresson).

MINEOLA INDIGENELLA.

Ephialtes aequalis (Provancher).

Itopectis conquisitor (Say).

MINEOLA JUGLANDIS.

Ephialtes aequalis (Provancher).

NOTOLOPHUS ANTICUA.

Apechthis pacificus Cushman.

NOTOLOPHUS OSLARI.

Ephialtes sanguineipes (Cresson).

Ephialtes pedalis (Cresson).

OLENE PINICOLA.

Ephialtes pedalis (Cresson).

ORGYIA BADIA.

OXYPTILUS PERISCELIDACTYLUS.

Itopectis conquisitor (Say).

PERONEA HASTIANA.

Itopectis conquisitor (Say).

PERONEA MINUTA.

Itopectis conquisitor (Say).

PERONEA, species on hornbeam.

Itopectis conquisitor (Say).

PHRYGANIDEA CALIFORNICA.

Itopectis behrensii (Cresson).

PINIPESTIS CAMBICOLA.

Itopectis evetrieae Viereck.

PINIPESTIS ZIMMERMANNI.

Itopectis evetrieae Viereck.

POLYCHROSIS VITEANA.

Itopectis conquisitor (Say).

PORTHETRIA DISPAR.

Ephialtes pedalis (Cresson).

Ephialtes tenuicornis (Cresson).

PROTEROPTERYX BOLLIANA.

Ephialtes aequalis (Provancher).

PYRRHARCTIA ISABELLA.

Ephialtes pedalis (Cresson).

RECURVARIA NANELLA.

Ephialtes aequalis (Provancher).

SABULODES ANFRACTATA.

Ephialtes sanguineipes (Cresson).

SEZIA CAUDATA

Ephialtes tenuicornis (Cresson).

SPILOSOMA VIRGINICA.

Ephialtes sanguineipes (Cresson).

SYNANTHEDON PICTIPES.

Ephialtes aequalis (Provancher).

THYRIDOPTERYX EPHEMERAIFORMIS.

Itopectis conquisitor (Say).

TMETOCERA OCELLANA.

Itopectis conquisitor (Say).

Itopectis obesus Cushman.

TORTRICID on CEDAR.

Itopectis conquisitor (Say).

Itopectis conquisitor (Say).

TORTRICID on OAK.

Itopectis conquisitor (Say).

TORTRIX FERVIDANA.

Apechthis ontario (Cresson).

TORTRIX FUMIFERANA.

Ephialtes pedalis (Cresson).

Itopectis conquisitor (Say).

Itopectis obesus Cushman.

TORTRIX QUERCIFOLIANA.

Ephialtes aequalis (Provancher).

Itopectis conquisitor (Say).

TORTRIX, species on wild pea.

Apechthis ontario (Cresson).

TUSSOCK MOTH (Nebraska)

Itopectis conquisitor (Say).

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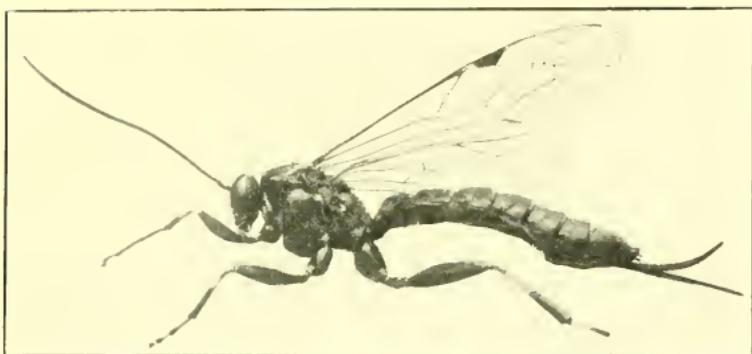
This index includes all of the species referred to in this paper. Accepted genera and subgenera are in the bold-face type; accepted species in Roman; synonyms in italics; and species erroneously included in a genus in parentheses.

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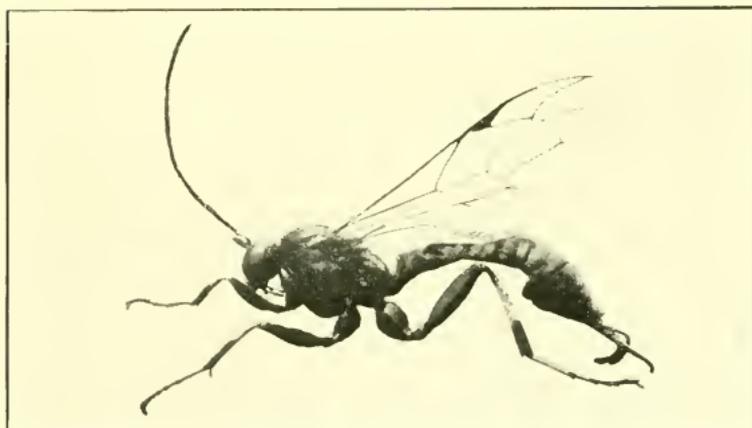
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EXPLANATION OF PLATE 21.

- FIG. 1.—*Ephialtes* (*Itoplectis*) *conquisitor* (Say),
 2.—*Apechthis picticornis* (Cresson).



1. *EPHIALTES (ITOPLECTIS) CONQUISTATOR* (SAY).



2. *APECHTHIS PICTICORNIS* (CRESSON).

FOR EXPLANATION OF PLATE SEE PAGE 362

