# THE LIFE-HISTORY AND EARLY STAGES OF CORYTHUCHA PARSHLEYI GIBSON.

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This species was described by E. H. Gibson in the Trans. Amer. Ent. Soc. XLIV, 69-104, April 4, 1918, from specimens collected by us on walnut at Hammonton, N.J. In the above publication, Gibson states that the food plants are walnut and juneberry (*Amelanchier intermedia*). When we first collected this species on walnut, specimens were submitted to Mr. Parshley together with specimens of *C. cydoniæ* from juneberry. When Mr. Parshley sent the specimens to Mr. Gibson for description, it is quite possible that the host labels might have been accidentally changed. However, repeated visits to the type locality, Hammonton, N.J., and numerous examinations of both walnut and juneberry have resulted in finding the species only on the former plant.

In New Jersey we have found *parshleyi* at Hammonton on butternut (*Juglans cincerea*), walnut (*Juglans nigra*) and Japanese walnut (*Juglans sibboldiana*), and at Cedarville and Bridgeton on walnut. An additional locality in New Jersey is Ramsey, by Dr. F. E. Lutz. Records of its occurrence outside of New Jersey are: Lake Waccamaw, N.C., April 20, (on pecan) (R. W. Leiby) and Great Falls, Va., Sept. 5, (on walnut) (Coll. of H. G. Barber). It undoubtedly occurs in many other localities and is possibly wrongly labeled in collections as *Corythucha juglandis* Fitch.

The following observations relative to *C. parshleyi* were made at Hammonton, which is in the southern part of New Jersey. Overwintering adults appeared about the middle of May, and during the third and fourth weeks of this month egg laying was well under way. From one to four eggs were laid in the angles formed by the mid-rib and the side ribs on the under leaf surfaces. Some eggs were found upright in the leaf close to the mid-rib and removed from the vein angles, while others were inserted in the base of the mid-rib, projecting parallel to the leaf surface. Most of them, however, were found in the vein angles in groups of two or three, each egg being more or less perpendicular to the leaf surfaces. Here they were partly hidden by pubescence, only the

black, conical tops being visible. Most of the eggs were found in the basal half of the leaf, and none at the tips where the veins were finer. The basal ends were inserted only slightly in the tissue, and each egg could be easily removed.

By the third week in June, a few second stage nymphs, many third and fourth, and a few fifth, were found. By the end of the first week in July, quite a few adults of the first brood were present together with many fifth stage nymphs. Eggs were deposited soon afterward in uninfested leaves, and during the last week in July first stage nymphs of a second brood were observed. During the last part of August and first part of September adults of a second brood appeared and later went into hibernation. Thus it is seen that there are two generations, each requiring about six weeks. On account of the extended oviposition period, it is possible at times to find all nymphal stages and adults and more or less overlapping of the broods takes place.

After hatching, the nymphs feed in colonies on the under leaf surface, causing a discoloration of the upper surface. In severe infestations, the leaves become yellow and dry, and many fall to the ground. The dorsal surfaces of all nymphs are covered with minute spines in addition to the larger tubercles and spines. As the nymphal stages advance, the insects tend to become broader and flatter; the lateral margins become flatter and more conspicuous, and the spines and hairs more pronounced.

*Egg.*—Length 0.51 mm. Greatest width 0.14 mm. Elongate oval, slightly curved when viewed laterally. Basal end rounded, gradually narrowing to distal end, which is covered with a conical cap, below which is a constriction. Widest at basal third. Basal one-half to one-third translucent, remainder dark brown to black.

*First Nymphal Stage.*—Length 0.5 mm. Greatest width exclusive of spines 0.2 mm. Broadly elliptical. General colour brown, lightest at posterior end of thorax and anterior end of abdomen. Fine median dorsal line beginning on head and extending through the second abdominal segment. A single broad, dorsal light band extending from head to posterior end of abdomen. Entire dorsal surface covered with minute spines. Eyes not

prominent consisting of a group of five ommatidia. Antennæ one-fourth to one-third the length of the body, translucent, bearing several hairs. Head with two minute tubercles on front each bearing a hair, a divided tubercle on vertex bearing two fine hairs and a pair of tubercles on dorsum each bearing a hair on tip and another one posterior. A pair of median tubercles on mesothorax each bearing a hair. A pair of median tubercles on second abdominal segment each bearing a hair. A pair of more prominent median tubercles on the 5th, 6th, 8th and 9th abdominal segments each bearing a single spine-like hair on the tip. Tubercles on the 5th, 6th and 8th abdominal segments also bear two longer spine-like hairs anterior to spine-like hair at tip. A single lateral spine-like hair arising from tuberculate base on pro- and mesothorax, and all abdominal segments beginning with the second. Ventral surface light; rostrum translucent, one-half the length of the body; legs translucent tinged with brown, tarsi tipped with pair of claws.

*Second Nymphal Stage.*—Length 0.75 mm. Greatest width exclusive of spines 0.4 mm. Narrowly oval to broadly elliptical, posterior end obtusely round, sides margined. Colour brown, light median dorsal line beginning on head and extending through the pro- and mesothorax broadening into a central dorsal light spot on the metathorax and the first and second abdominal segments. Dorsal armature similar to that of the first stage but more pronounced, lateral spine-like hairs becoming spines. Each lateral spine on the pro- and mesothorax has a minute spine posterior to it. Antennæ and eyes similar to those of first stage. Median portion of ventral surface light; beak translucent, one-half the length of the body. Legs similar to those of first stage.

*Third Nymphal Stage.*—Length 1.0 mm. Greatest width exclusive of spines 0.52 mm. Broadly oval, obtusely rounded at posterior end. Colour similar to that of preceding stage but somewhat darker. Lateral margins of 1st and 2nd abdominal segments light. Dorsal armature somewhat similar to that of proceding stage but more prominent. Lateral tubercles of pro- and mesothorax each bearing a prominent spine and four minute spines surrounding it. Lateral tubercles of abdomen more pronounced,

each bearing a hair on inner side. Legs, antennæ and rostrum white tinged with brown, otherwise similar to those of preceding stage.

*Fourth Nymphal Stage.*—Length 1.31 mm. Greatest width exclusive of spines 0.71 mm. Shape oval. Colour dark brown, fine V-shaped light line on median dorsal surface of head, connected with fine median dorsal line extending through the prothorax and broadening to a light spot extending to posterior margin of 2nd abdominal segment. Lateral posterior margin of prothorax and lateral margins of first three abdominal segments light. A small, light, dorsal median spot on 8th abdominal segment. Lateral tubercles and all spines light. Antennæ, legs, rostrum and median portion of ventral surface light. Lateral margins of pro- and mesothorax lobed. Lobes of mesothorax extending beyond posterior margin of first abdominal segment. Head with pair of spines on front, tubercle on vertex bearing a pair of spines with a smaller one anteriorly and posteriorly, pair of tubercles on dorsal surface bearing one prominent and five smaller spines. Prothorax bearing a pair of dorsal median spines and a smaller pair posterior to them. Mesothorax bearing pair dorsal tubercles each bearing a spine and posterior to the spine two hairs and a smaller spine. Other tubercles and spines of dorsal surface similar to but more pronounced than those of preceding stage. Prothorax with two minute and one larger spine on anterior lateral margin and one large and three smaller spines on outer angle of lobe. Tubercle on lateral margin of mesothorax bearing three spines and two hairs and anterior to tubercle are two spines on the lateral margin. Lateral margins of abdominal segments beginning with the second, each bearing a spine on tuberculate base and an inner side of each spine, a hair. Beginning with the fourth abdominal segment, there is an additional spine below each lateral spine. Antennæ one-third to one-half the length of the body. Rostrum extending to abdomen.

*Fifth Nymphal Stage.*—Length 1.9 mm. Greatest width exclusive of spines 1.2 mm. Broadly oval, sides flattened. Colour dark brown except following portions which are light; legs, antennæ, rostrum, majority of spines and tubercles, fine V-shaped

line on dorsal portion of head connecting with fine median line extending to posterior portion of prothorax where it connects with a subquadrate spot, lateral posterior margins of prothorax, central portion of metathorax between tubercles, posterior half of mesothoracic lobes, lateral margins of 6th, 7th and 8th abdominal segments, dorsal median spots on 6th, 7th, 8th and 9th abdominal segments, 1st, 2nd and most of 3rd abdominal segments. Ventral surface dark brown except light median band extending from front of head to 8th abdominal segment and the 1st, 2nd and outer portion of the 3rd abdominal segments which are also light. Lobes of mesothorax extending to 5th abdominal segments, sides of lobes somewhat angulated. Head with a pair of elongate spines on front, a tubercle on vertex bearing a pair of elongate spines and a short one anterior and posterior to this pair, a pair of elongate tubercles on dorsum of head, each bearing six elongate spines of varying lengths. Prothorax with sides broadly lobed, four spines in centre arising from a tuberculate base and a pair of smaller spines arising from a posterior light area, anterior margins of prothoracic lobes bearing three short spines, posterior to these arises a long one, posterior to this long one, there is another of similar length, on lateral posterior angle of lobe is a tubercle bearing five spines of varying length and a short hair interiorly. Mesothorax with a pair of dorsal tubercles on either side of light area each bearing three spines, lateral margin bearing two spines on outer angle of lobe and two minute ones posterior to these; posterior to the two minute ones there is a tubercle bearing three or four spines. Second abdominal segment bears a pair of median dorsal spines. Fifth, 6th, 8th and 9th abdominal segments each bear a pair of median, dorsal tubercles from each of which arises a single spine with two hairs anterior to it. Lateral margins of abdominal segments four to eight bear a single tuberculate spine from base of which arises two smaller spines and a hair. Eyes prominent, consisting of a number of ommatidia. Antennæ four-jointed, sides parallel, apical joint slightly clavate, second joint two-thirds the length of the first, third joint three times the combined lengths of the first and second, fourth joint slightly longer than the first and second combined. Two apical joints bearing several long

hairs. Legs somewhat hairy, tarsi bearing two strongly curved claws. Rostrum extending to metathoracic segment.

*Adult.*—Length 4 mm., width 2.3 mm. This was described by Gibson as mentioned in the first part of this account. Gibson states in discussing *C. juglandis*, which is also found on walnut, that both *juglandis* and *parshleyi* occur in the type series of *juglandis* in the Fitch collection, and that this probably accounts for the more or less vague conception of *juglandis* Fitch. He states that *juglandis* is somewhat smaller than *parshleyi* and has the apical band straight across the elytra, while in *parshleyi*, the apical band runs obliquely from the costal margin toward the inner margin of elytra and is narrower. Gibson also states that *juglandis* Fitch occurs throughout New England and south and west to Kansas and Texas, its food plants including walnut, butternut and linden. This means that it undoubtedly occurs in New Jersey, but up to the present we have not been successful in locating any species other than *parshleyi* on walnut.

## THE VARIETIES OF THE DRAGONFLY, *AGRION ÆQUABILE* (SAY).

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This living jewel with its metallic green body and crystal wings tipped with jet, flutters before the collector through the shadows of wooded streams from Maine to California, while its awkward nymph may be found crawling through the dense mats of willow and alder roots that hang in the woodland pools. Because of this timid and weak flight of *æquabile* as well as the rather special environment preferred by the nymphs, this species is seldom continuously spread in any region but is met on those occasional streams, which furnish its special requirements in patchy light, and root masses hanging in fairly clear water. As a result of this low ability to spread and the distance between broods because of the special environment required, this species has developed several marked varieties.*

By reference to the plate the reader can see at once the dif-

*This same tendency to the development of varieties in the weak-flying Agrionine dragonflies is discussed by MacLachlan, "Notes on Odonata collected by Buckley in Ecuador," Trans. Ent. Soc. Lond., 1881, p. 25