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THE ODONATA OF CHILE

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This is a preliminary report on the dragonflies of Chile in both their adult and their immature stages. It is based on collections made by the junior author mainly in the region about the Agricultural School, "El Vergel," near Angol. The immature stages were collected mainly from the Malleco River and from a mill canal that runs through the farm. Some of the adults were obtained from other parts of the country.

This new material, representing all but four of the genera and most of the species known from Chile, enables us to present keys to the genera of both nymphs and adults, and descriptions and figures of nymphs in a number of genera in which none have heretofore been made known. Although the nymphs have not been reared, their adult forms are reasonably certain.

Hitherto there has been published but one extensive paper on the Odonate fauna of Chile, that of Dr. Fr. Ris, published in 1904. His paper listed twenty-six species, and included a description and a figure of the nymph of one of them (*Aeschna diffinis*). It contained also the description of a new genus (*Antiagrion*) and a figure of the wing venation of one of its two species (*A. gayi*). No new species were described from Chile in Ris's paper, and there are none in this one of ours. New material enables us to complete the description of some species of which the original describers had inadequate material, often only single fragmentary specimens, and to establish a new genus.

LIST OF THE DRAGONFLIES AND DAMSELFLIES  
OF CHILE

## ANISOPTERA

## Aeschnidae

<i>Phenes raptor</i> Rambur 1842	<i>Phyllopetalia apollo</i> Selys 1878
<i>Neogomphus molestus</i> Selys 1857	<i>Phyllopetalia apicalis</i> Selys 1857
<i>Neogomphus bidens</i> Selys 1878	<i>Allopetalia reticulosa</i> Selys 1873
<i>Hypopetalia pestilens</i> McLachlan 1870	<i>Aeschna brevifrons</i> Hagen 1861
<i>Petalia punctata</i> Selys 1854	<i>Aeschna diffinis</i> Rambur 1842
<i>Phyllopetalia stictica</i> Selys 1857	<i>Aeschna confusa</i> Rambur 1842
<i>Phyllopetalia decorata</i> Selys 1878	

## Libellulidae

<i>Gomphomacromia paradoxa</i> Brauer 1864	<i>Erythrodiplax connata</i> Burmeister 1839
<i>Anticordulia villosa</i> Rambur 1842	<i>Orthemis ferruginea</i> Fabricius 1775
<i>Erythrodiplax chloropleura</i> Brauer 1866	<i>Tholymis citrina</i> Hagen 1867

## ZYGOPTERA

## Coenagrionidae

<i>Lestes undulatus</i> Say 1839	<i>Ischnura fluviatilis</i> Selys 1876
<i>Antiagrion blanchardi</i> Selys 1876	<i>Ozyagrion rufulum</i> Hagen 1861
<i>Antiagrion gayi</i> Selys 1876	<i>Acanthagrion interruptum</i> Selys 1876

## KEYS TO THE ODONATA OF CHILE

## Adults

- Body stout; wings unequal, the hind wings being broader at base. . . . . Anisoptera, 2  
Body slender; fore and hind wings of equal width. . . . . Zygoptera, 19
- Eyes widely separated on the top of the head. . . . . 3  
Eyes almost meeting or in contact by a point. . . . . 5  
Eyes broadly in contact along their inner margins. . . . . 10
- Face with a heavy black crossbar above the mouth; hind wing 52 mm. . . . . *Phenes raptor*  
Face all pale yellowish; hind wing 26 mm. . . . . *Neogomphus*, 4
- Male with inferior appendage as long as the superior. . . . . *N. molestus*  
Male with inferior appendage half as long as the superior. . . . . *N. bidens*
- Fore wing triangle divided into 2-3 cells; six or seven brown spots along the fore border of the wing; hind wing 48 mm. . . . . *Hypopetalia pestilens*  
Fore wing triangle of two cells; five spots on border. . . . . 6
- Frons very high in front (three times the postclypeus) and divided by a deep longitudinal groove; hind wing 35 mm. . . . . *Petalia punctata*  
Frons moderate, not deeply grooved. . . . . *Phyllopetalia*, 7
- Larger (hind wing 48-49 mm.); one postcostal cell row. . . . . *P. stictica*  
Smaller (hind wing 39-44 mm.); two postcostal cell rows. . . . . 8
- Male with anal triangle 4-celled; frons a little notched above. . . . . *P. decorata*  
Male with anal triangle 3-celled; frons not notched at all. . . . . 9



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9. Leaf-like lateral expansion on abdominal segments 7 and 8; claws black; hind wing 39–41 mm. . . . . *P. apollo*  
Leaf-like lateral expansion on segment 8 only; claws red; hind wing 40–42 mm. . . . . *P. apicalis*
10. Hind wings with four to seven cubito-anal cross veins; stigma with brace vein; triangles similar in fore and hind wing. . . . . Aeschnidae, 11  
Hind wings with one or two cubito-anal cross veins; no brace vein to stigma; triangles of fore and hind wings unlike. . . . . Libellulidae, 14
11. Vein Rs simple; wings streaked at base with brown; hind wing 51–58 mm. . . . . *Allopetalia reticulosa*  
Vein Rs forked; wings hyaline. . . . . *Aeschna*, 12
12. Larger (hind wing 48 mm.) . . . . . *A. brevifrons*  
Smaller (hind wing 36–37 mm.) . . . . . 13
13. Thorax olivaceous in front, clothed with whitish hairs. . . . . *A. diffinis*  
Thorax reddish, with two yellow stripes in front. . . . . *A. confusa*
14. Fore wing with eight antenodal cross veins and no planates. . . . . 15  
Fore wing with ten or more antenodal cross veins and with well-developed planates. . . . . 16
15. Triangle and subtriangle without cross veins. . . . . *Gomphomacromia paradoxa*  
Triangle and subtriangle both divided by cross veins. . . . . *Anticordulia villosa*
16. Anal crossing proximal to base of vein A2. . . . . *Erythrodiplax*, 17  
Anal crossing opposite the base of vein A2. . . . . 18
17. Colored area of base of hind wing golden; hind wing 25 mm. . . . . *E. chloropleura*  
Colored area of base of hind wing brown; hind wing 23 mm. . . . . *E. conmata*
18. Arculus in fore wing at or beyond the second antenodal cross vein; hind wing 40 mm. . . . . *Orthemis ferruginea*  
Arculus in fore wing before the second antenodal cross vein; hind wing 35 mm. . . . . *Tholymis citrina*
19. Middle fork nearer to the arculus than to the nodus; hind wing 21 mm. . . . . *Lestes undulatus*  
Middle fork nearer to the nodus than to the arculus. . . . . 20
20. Front side of quadrangle longer than half the rear side; postnodal cross veins 14 or more. . . . . *Antiagrion*, 21  
Front side of quadrangle less than half the length of the rear side; postnodal cross veins 12 or fewer. . . . . 22
21. Antenodal cross veins 14; hind wing 22 mm. . . . . *A. blanchardi*  
Antenodal cross veins 16–18; hind wing 26 mm. . . . . *A. gayi*
22. Wings not stalked to anal crossing; hind wing 22 mm. . . . . *Ischnura fluviatilis*  
Wings stalked to anal crossing. . . . . 23
23. Coloration reddish; hind wing 19 mm. . . . . *Oxyagrion rufulum*  
Coloration blackish, marked with yellow or blue; hind wing 16 mm. . . . . *Acanthagrion interruptum*

## Nymphs

- |  |   |
|--|---|
| 1. Body stout; gills internal . . . . .  | Anisoptera, 2                               |
| Body slender; gills three, caudal, leaf-like . . . . .   | Zygoptera, 10                               |
| 2. Labium flat or nearly so . . . . .  | 3   |
| Labium spoon-shaped, covering the face up to the eyes . . . . .  | 7   |
| 3. Antennae 4-jointed; tarsi 2-2-3-jointed; burrowers . . . . .  | <i>Neogomphus</i> , 4                       |
| Antennae 7-jointed; tarsi 3-3-3-jointed . . . . .  | 5   |
| 4. Lateral spines on abdominal segments 8 and 9 only . . . . .   | <i>N. molestus</i>                          |
| Lateral spines on segments 6 or 7 to 9 . . . . .   | <i>N. bidens</i>                            |
| 5. Antennae stout, slowly tapered beyond the second segment . . . . .  | 6   |
| Antennae slender, bristle-like beyond the second segment . . . . .   | <i>Aeschna</i>                              |
| Unknown . . . . .  | <i>Allopetalia</i>                          |
| 6. Head parallel-sided for a distance behind the eyes; lateral lobe of the labium broad, concave internally; abdomen with rows of conspicuous hair tufts; end squarely truncated . . . . . | <i>Phenes raptor</i>                        |
| Head strongly narrowed from the eyes backward; lateral labial lobe narrow, taper-pointed . . . . .   | <i>Phyllopetalia</i> <sup>1</sup>           |
| Unknown . . . . .  | <i>Petalia</i> and <i>Hypopetalia</i>       |
| 7. With a pair of nipple-shaped tubercles on top of the head . . . . .   | <i>Anticordulia</i>                         |
| Without such tubercles . . . . .   | 8   |
| Unknown . . . . .  | <i>Gomphomacromia</i>                       |
| 8. Abdomen with huge lateral spines, longer than the segments that bear them . . . . .   | <i>Tholymis citrina</i> <sup>2</sup>        |
| Abdomen with very short and inconspicuous lateral spines . . . . .   | 9   |
| 9. Teeth on the opposed edges of the lateral labial lobes deeply incised and very distinct . . . . .   | <i>Orthemis</i>                             |
| These teeth obsolete . . . . .   | <i>Erythrodiplax</i>                        |
| 10. Labium excessively long and slender, spoon-shaped at tip, its mentum narrowest in the middle . . . . .   | <i>Lestes</i>                               |
| Labium shorter, its mentum narrowest at its basal hinge . . . . .  | 11  |
| 11. Gills widest near the base, and regularly tapering to long and very slender tips . . . . .   | <i>Antiagrion</i>                           |
| Gills widest beyond the middle and abruptly tapered near the tip . . . . .   | 12  |
| 12. Gills cross-jointed at two-thirds their length . . . . .   | <i>Oxyagrion</i>                            |
| Gills not distinctly cross-jointed . . . . .   | <i>Ischnura</i> and (?) <i>Acanthagrion</i> |

<sup>1</sup> These characters are taken from Tillyard's description and figure (Biology of Dragonflies, p. 89) of the nymph of *Austropetalia patricia* from New South Wales, a species so like the Chilean *Phyllopetalia apollo* that the two were long considered identical. Such likeness in the adult indicates that the nymphs will be alike in the characters stated.

<sup>2</sup> *Teste* Fraser, who described and figured (Records Mus. Indian, 16, p. 460, 1919) the nymph of an oriental species, *Tholymis tillarga*.

### **Phenes raptor Rambur**

The newly discovered nymph of this mammoth, archaic species is almost as remarkable as the adult that has so long been known. It has not been reared, but size alone will distinguish it from everything else in the fauna. Also the curious forking of the male caudal appendages (cerci) runs parallel in nymph and adult. The following description is from a single cast skin the exact collecting spot of which is undetermined.

It is a sprawling hair-tufted nymph so completely incrustated with mud in life that some of its characters may only be seen after a long and difficult job of cleaning. The head is wider than long, with eyes set far forward, and the sides behind the eyes are parallel to the broadly rounded hind angles. The antennae are shorter than the head and very stout. Their seven segments range in length from base outward about as 7:4:10:6:7:6:4, and the flagellum is almost as stout as the second segment, with most of the taper on the last segment. A frontal transverse prominence below the base of the antennae is fringed along its margin with stout incurving hairs. The blackish labrum is twice as wide as long, and narrowed to both ends. It bears two transverse rows of similar incurving hairs, one marginal and the other parallel to and near the base.

The labium (fig. 30, No. 2) is nearly flat, only a little depressed between its lateral lobes, not covering the face. It is very short and stout. Its hinge does not reach backward beyond the bases of the fore legs. The mentum is wider than long, parallel-sided in its quadrangular middle portion, strongly contracted to the hinge and expanded at the base of its lateral lobes. The median lobe is produced forward, declined, bare, highly chitinized, thin, and cleft almost to the level of the base of the lateral lobes; the narrow cleft is open. The lateral lobes are short and stout, concave, rather squarely truncate on the ends with rounded corners. The movable hook is remarkably short and stout, straight to near its tip, hardly four times as long as its basal width. Both median and lateral lobes are finely and regularly denticulate on their opposed margins.

There are fringes of short hairs on a low transverse ridge between the bases of the antennae and on the upper margin of each antennal peduncle; also on a shelf-like prominence below the front of each eye. The middle ocellus lies flat on the surface of the head but the lateral ocelli seem to lie in the outer side of a pair of mound-like tubercles on the vertex. Behind the frontal suture there are longitudinal lines of tufted tubercles as follows: a dorsal pair about as

far from each other as from the eyes, dwindling and converging caudad; also two lateral more continuous rows at the sides, more uniformly tufted.

The disk of the prothorax is small, about half as long as wide, and bears a short row of low tubercles on its projecting lateral margins. Below these there are tufted tubercles projecting above the front coxae. Above the base of each middle and hind leg there is a shelf-like, hair-fringed prominence, and farther caudad on the side there is a strong erect tubercle.

The legs are rough and indistinctly scarred, with tarsi 3-3-3-jointed. The hair on the legs appears mostly in tufts on the femora and in lines on the tibiae (see fig. 29). All tibiae terminate in four

FIG. 28. Diagrams illustrating the terminology of Odonate wing venation.

NUMBER

1. Diagram of the principal veins and their connections.
2. The wings of *Cordulegaster sayi*.
3. Diagram of Gomphine wing base.
4. Diagram of a Libelluline wing base.
5. Diagram of an arculus and its sectors ( $M_{1-3}$  and  $M_4$ ).
6. The fore wing of *Cyanocharis valga*.
7. Part of wing base of *Caliphaea consimilis*.
8. The fore wing of *Telebasis salva*.
9. Part of wing base of *Telebasis salva*.
10. Stigma of *Anomalagrion hastatum*. Female with brace vein  $x$ .

ABBREVIATIONS

A.	anal vein	<i>mr.</i>	midrib (bisector of anal loop)
Ac.	anal crossing		
Al. or <i>al.</i>	anal loop	<i>n.</i>	nodus
<i>an.</i>	antenodal cross veins	<i>o.</i>	oblique vein
<i>a. pl.</i>	apical planate	<i>p.</i>	patella
<i>ar.</i>	arculus	<i>q.</i>	quadrangle
<i>b.</i>	basal subcostal cross vein	<i>R.</i>	radius
<i>br.</i>	bridge	<i>Rs.</i>	radial sector
<i>Bs.</i>	mid-basal space; space before the arculus	<i>r. pl.</i>	radial planate
<i>Brs.</i>	basal radial space	<i>s.</i>	subtriangle
<i>C.</i>	costa	<i>Sc.</i>	subcosta
<i>Cu.</i>	cubitus	<i>sct.</i>	sectors of arculus
<i>g.</i>	gaff (fused portion of veins $Cu_2$ and $A_1$ )	<i>sn.</i>	subnodus
<i>h.</i>	hyper triangular space	<i>sq.</i>	subquadrangle
<i>M.</i>	media	<i>st.</i>	stigma
<i>m.</i>	membranule	<i>t.</i>	triangle
<i>Ma.</i>	medio-anal link	<i>tr. pl.</i>	trigonal planate
<i>Mf.</i>	middle fork	<i>u.</i>	point at which petiolation (stalk) of wing base ceases
<i>m. pl.</i>	median planate	<i>x.</i>	brace vein to the stigma

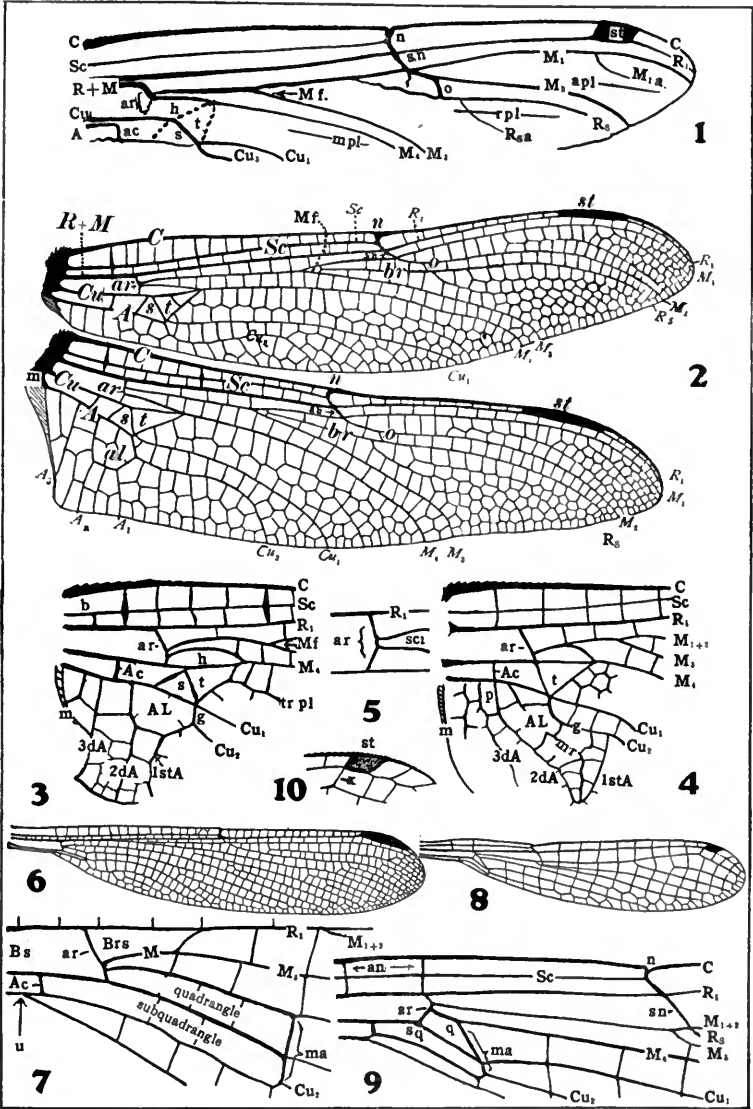


FIG. 28. Diagrams illustrating the terminology of Odonate wing venation. See explanation on opposite page.

stout spines at the base of the tarsi, two on each side. Each of the two basal tarsal segments bears beneath a double row of smaller spines (fig. 30, No. 1) growing larger distally, and the third joint bears a pair of strong smooth claws. The wing cases reach backward to the fifth abdominal segment.

The abdomen is moderately depressed and widest on segment 6. There are no dorsal hooks at all; instead there is a mid-dorsal low streak that lies between two submedian lines of double, large, conspicuous hair tufts, the outermost row on tubercles. There are no lateral spines; instead, the sides of the segments are broadly rounded with a slight notch in the midst of their tufted margins toward the rear. There are two additional lines of hair tufts on each side of the abdomen; one midlateral on the apical carinae, larger; and a minute tuft of a few hairs farther out and toward the antero-lateral angle of each segment. The mid-dorsal length of abdominal segments 6 to 10 is about as 10:9:9:8. The caudal appendages have a remarkable development in this male specimen, corresponding to those of the adult insect. The forked laterals are blunt-tipped and have something of the downy appearance of budding staghorns in the velvet. The superior is already decurved between the laterals and greatly elongated. The inferiors are shorter, invisible when viewed from above, triquetral and sharp-pointed, but densely clothed with tawny hair externally and covered at the base by a yellow hair fringe that springs from the apical margin of segment 10.

Length 48 mm.; abdomen 30; hind femur 10. Width of head 10; of abdomen 13.

### *Hypoptalia pestilens* McLachlan

Of this very beautiful endemic species we have not yet obtained the nymph, but we wish to record a fine male adult from high up in the Andes, only a few miles from the Argentine border. It is rare about Angol, but occurs in one region near Cholchol, where it is common in September. It appears to be an early spring species, not being seen after the end of the year. It has been observed in flight over stagnant ponds.

Seven purplish spots along the costal border of each wing will readily distinguish it from all other Odonata. Dr. Erich Schmidt has recorded (7th Internat. Congress, 3, p. 1501, pl. 163, figs. 1-3) the pattern of its wings as having been used in the design of a cloth for women's dresses, and has published an excellent photograph of a pair of wings and a dress of this design on display.

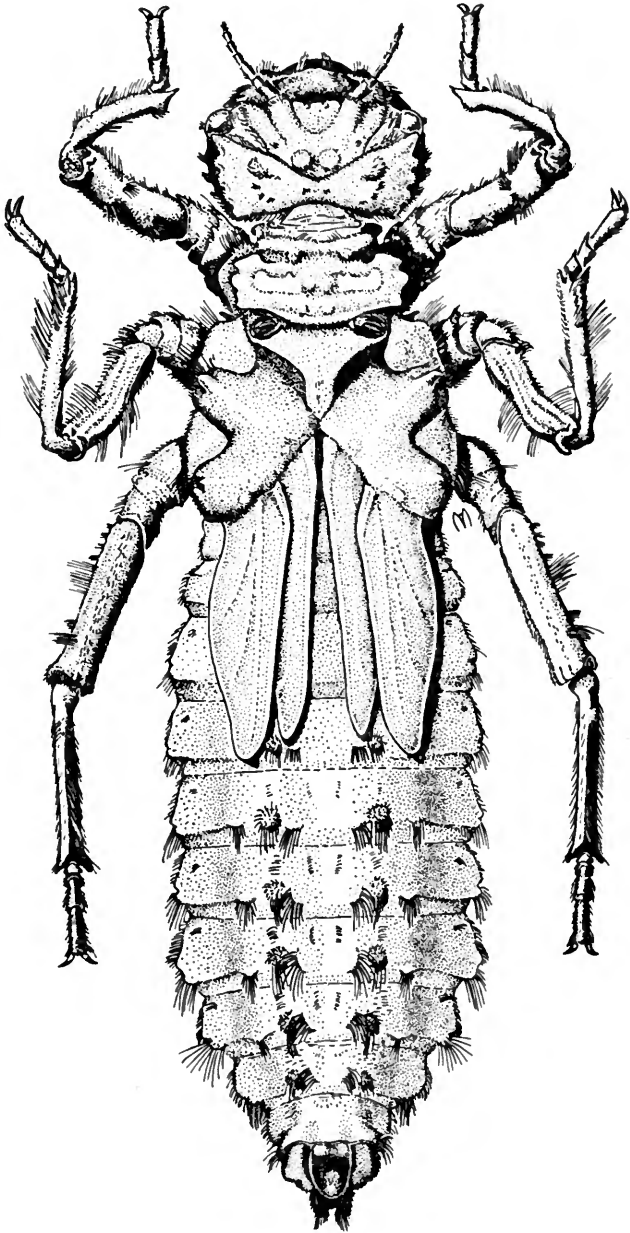


FIG. 29. Nymph of *Phenes raptor*.

**Neogomphus** Leach

The drying up of a mill run on the farm at "El Vergel" made it possible to collect from the exposed stream bed a large number of nymphs of this peculiar endemic genus. They are very similar to the nymphs of *Octogomphus* from California. Two species were present and they correspond to the two species of adults that have been taken in the same locality and may be referred to them by name with hardly any doubt.

**Neogomphus molestus** Selys

This was the commoner of the two species. This is a concolorous nymph, grayish brown and somewhat covered with silt. The head is wedge-shaped, widest at the level of the hind margin of the eye. The third joint of the antennae is about twice as long as the two basal joints taken together, dilated to an oval form and fringed at the edges with long soft hair. The button-like fourth joint is very rudimentary and occupies a notch in the middle of the terminal margin of the third. The mentum of the labium is a third longer than wide and rather regularly narrowed from outer end to basal hinge, with a very slight basal narrowing. The median lobe of the labium (fig. 30, No. 5) is convex and in the middle of its front margin bears three minute brown denticles and a bordering fringe of hairs. The lateral labial lobe is scarcely hooked at the tip where its outer margin beyond the movable hook is regularly incurved to end at a terminal denticle on the inner margin. There are about nine denticles on that margin, each truncated so as to point caudad, and they diminish in size proximally and end at its basal third.

The prothorax is about as wide as the head, with its roundish dorsal disk about a third narrower. The fore and middle tibiae bear strong end hooks. All femora bear the usual longitudinal scars, and all the legs are fringed with hairs.

The fore wings lie parallel upon the back, and the hind wings above them lie with their tips a little convergent.

The abdomen is widest on segment 5, beyond which level it is slowly and regularly tapered to the tip. There are no dorsal hooks at all, but there are some mid-dorsal hair tufts on the basal segments, also some scattered hairs below the wing pads at the sides. There are short triangular lateral spines on segments 8 and 9. The mid-dorsal length of the last three abdominal segments is about as 10:10:6. The bluntly tipped caudal appendages are twice the mid-



dorsal length of the tenth segment, the superior one almost the length of the inferiors, the laterals less than half as long.

Length 24 mm.; abdomen 15; hind femur 4.5. Width of head 5; abdomen 6.

### **Neogomphus bidens** Selys (fig. 30, No. 7)

This species occurred in the bed of the mill run more sparingly than the preceding, perhaps in the proportion of one to ten. It is so similar to *N. molestus* that there is no need to do more than point out the differences by which it may be distinguished.

It is a little larger (length 28 mm.); lateral spines occur regularly on segments 7 to 9 of the abdomen and sometimes also on segment 6; and the inner margin of the lateral lobe of the labium (fig. 30, No. 6) is a little more concave, is armed with fewer and somewhat larger teeth, and the terminal tooth or end hook projects a little more prominently inward beyond the general level of the other teeth.

### **Anticordulia** gen. nov.

#### Type *Cordulia villosa* Rambur

We have nymphs and adults of this species, taken together near "El Vergel" and doubtless belonging together for there is no other regional Corduline to which they may by any possibility be referred. The nymphs show clearly that the species does not belong in the genus *Somatochlora* as has long been supposed. They show much greater resemblance to nymphs of *Neurocordulia* and *Epitheca* but are quite distinct from either of these.

The triangle and subtriangle of the fore wing of the adult are as in *Somatochlora*, two- and three-celled respectively, and in the hind wing the triangle is generally two-celled; in only one (female) specimen have we seen a second cubito-anal cross vein. The space beyond the triangle in the fore wing is scarcely narrowed to the wing margin, veins  $M_1$  and  $Cu_1$  being approximately parallel all the way out. Vein  $M_2$  is slightly undulated in the fore wing. There are but five antenodal cross veins in the hind wing. In the anal area of the hind wing there are three rows of cells paralleling the weakly developed vein  $A_2$ , which is the hind border of the anal loop, and the cells of these rows are not strikingly differentiated in size as in *Somatochlora* (where with but two rows present, the cells of the inner row are three or four times as large as those in the marginal row). The base of vein  $A_3$  is less closely approximated to the anal crossing than

in *Somatochlora*, and the cells within the anal loop are less enlarged toward the ends of it.

It disagrees with *Paracordulia* Martin in type of male genitalia, in lack of convergence of veins  $M_4$  and  $Cu_1$  at the wing margin, in having but five antenodal cross veins in the hind wing, and in having three cell rows in the anal area behind the anal loop; in these characters *Paracordulia* is more like *Somatochlora*.

Martin has figured the caudal appendages of the male for *Anticordulia villosa* (1906, p. 20, fig. 15). The subgenital plate of the female has not been described or illustrated. It is elongate triangular, three-fifths as long as the ninth sternum, against which it lies flat. It is divided for two-thirds of its length by an open parallel-sided narrow slit, and the tips on either side of the slit are rounded.

The nymph (fig. 30, No. 8) is rather smooth, with broadly depressed, oval, almost circular abdomen. Head widest across the laterally prominent eyes, with low hind angles and concave occiput. Antennae with the length of the seven joints as 8:9:10:7:8:10:9. Between the antennae is a low transverse prominence thickly beset with microscopic prickles. The top of the head bears two prominent nipple-shaped tubercles.

Disk of the prothorax much wider than long, bordered on its convex rear margin with a rim that runs out laterally into an obtuse prominence. Legs long, thin and bare except for a few scattering hairs. Labium short and broad, its hinge just reaching the metasternum. Lateral setae seven on each side; mentals ten or eleven, the sixth longest. Lateral lobes broadly triangular, their opposed margins armed with about seven deeply cut and serrately

FIG. 30. Nymphs

1. *Phenes raptor*, hind tarsus and tip of tibia.
2. *Phenes raptor*, labium (*ML*, median lobe; *LL*, lateral lobe; *H*, movable hook).
3. *Oxyagrion rufulum*, tip of lateral labial lobe.
4. *Acanthagrion interruptum*, tip of lateral labial lobe.
5. *Neogomphus molestus*, median and lateral labial lobes.
6. *Neogomphus bidens*, lateral labial lobe (*EH*, end hook; *MH*, movable hook).
7. *Neogomphus bidens*, dorsal view of nymph.
8. *Anticordulia villosa* (*DH*, dorsal hook; *LS*, lateral spine).
9. *Anticordulia villosa*, tip of lateral labial lobe, showing teeth.
10. *Antiagrion* sp., antenna.
11. *Antiagrion* sp., tip of lateral labial lobe (*EH*, end hook; *MH*, movable hook).
12. *Antiagrion* sp., mentum and lateral lobe of labium showing raptorial setae.
13. *Antiagrion* sp., head.
14. *Antiagrion* sp., end of abdomen showing gills and ovipositor.

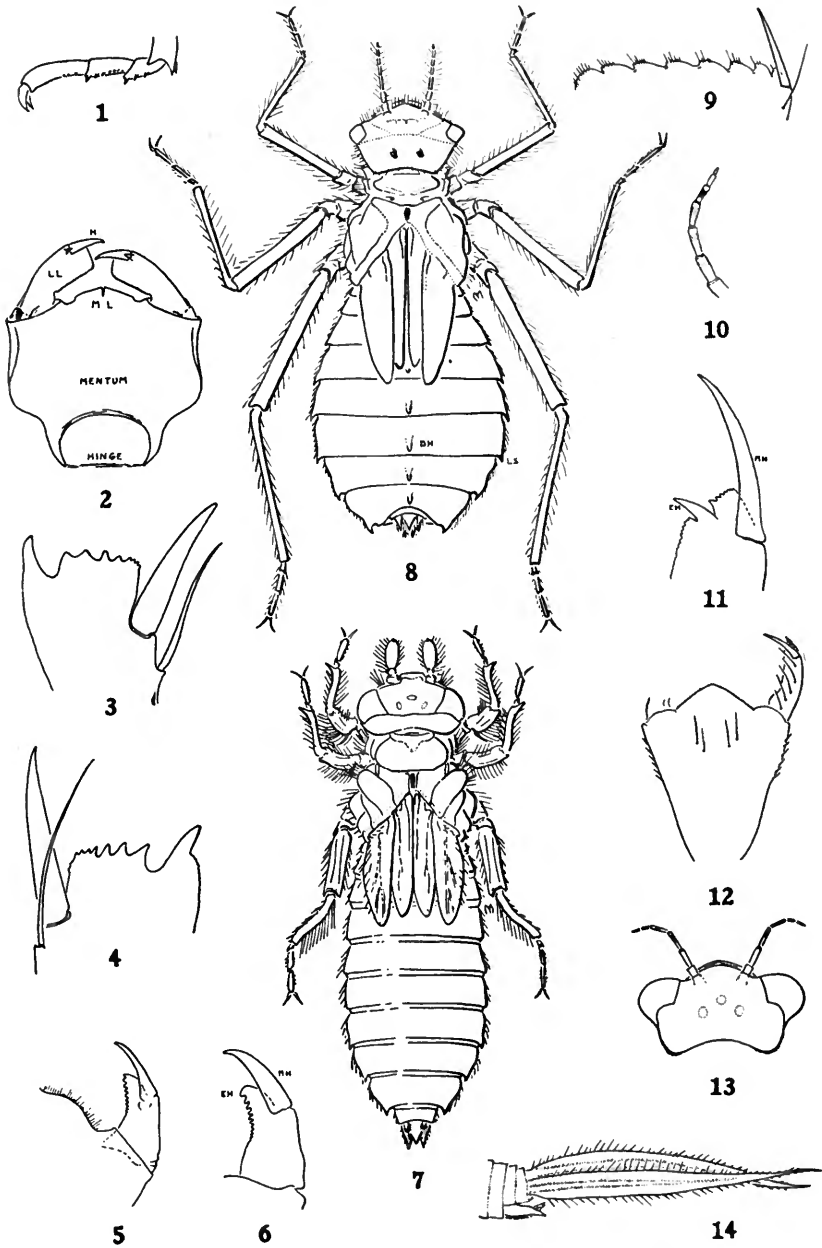


FIG. 30. Nymphs. See explanation on opposite page.

arranged teeth (fig. 30, No. 9), the teeth armed with spinules numbering from one on the foremost tooth to about seven on the hindmost. The movable hook is slender, straight to near the tip, and then slightly incurved.

Abdomen much depressed, broadest on segment 7, narrowing rapidly forward and still more rapidly backward, concolorous except for two longitudinal midlateral rows of round brown spots on a paler ground. Lateral spines on segments 4 to 9 regularly increasing in length and strength caudad, on 9 distinctly incurved. They are arranged about the curving abdominal margin like the teeth of a circular saw. All are sharply pointed and those of 9 are spaced more than their own length apart from the apex of 10. Segment 10 is annular and inserted into the apex of 9. Dorsal hooks on 4 to 9; on 4 a minute rudiment; on 5, larger, blunt-tipped, and erect; and on 6 to 9, higher and laterally flattened but with eroded tips, increasingly declined caudad; on 7 and 8, largest. The mid-dorsal length of the last four segments is as 10:9:8:3, with the appendages on the same scale as 7. Appendages stout, subtriangular, sharp-pointed, superior and inferior of about equal length, the laterals a little shorter. On the under side of the apical margin of 9 there is a thin fringe of long hairs.

Length 25 mm.; abdomen 15; hind femur 9. Width of head 8; of abdomen 12.

### **Antigrion sp.**

The nymph of this peculiar endemic damselfly is rather stout, long-legged, with flat head (fig. 30, No. 13), banded legs, short thick abdomen and very long, slenderly tapering gills. The eyes are large and very prominent. Behind them the head tapers to the bulging hind angles, between which is a deep occipital excavation. Around the hind angles the skin is beset with minute retrorse prickles. The seven-jointed antennae (fig. 30, No. 10) are pale, ringed with brown subapically on the middle segments. The length of the segments is about as 6:8:10:8:7:6:5. The labium (fig. 30, No. 12) is armed with five lateral and two mental setae each side, with six or more stout spinules on the lateral margin of the mentum. The middle lobe is prominent; its margin is beset with regularly spaced microscopic spinules. The terminal border of the lateral lobe (fig. 30, No. 11) between movable and end hooks is inclined toward the latter and armed with a row of microscopic denticles the innermost one of which is of larger size.

The prothorax is flattened above and slopes upward behind to a curving, marginal, elevated rim. The legs are rather long, pale in color, ringed twice with brown toward the outer end of the femora, and twice more, less distinctly, on the tarsi.

The abdomen is brownish above with a pale mid-dorsal line and a wider pale band on each lateral margin. There are neither dorsal hooks nor lateral spines. The ovipositor (fig. 30, No. 14) of a single well-grown female specimen, perhaps contracted somewhat, extends beyond the abdomen for more than the length of segments 9 and 10. The gills are very long and narrow and taper from a thick base regularly outward to excessively slender tips. Their margins are thickly fringed with hairs. The lateral gills are triquetral at base by reason of a stout midlateral keel that also tapers outward almost to infinity.

One well-grown female specimen (perhaps in the penultimate instar), and another much smaller. The wings of the former are not well enough preserved to show the complete venation, but they show two items of it that justify the reference of the nymph to *Antiagrion*. The quadrangles are longer on the front side, and the postnodal cross veins are more numerous (sixteen) than in related local genera.

Length of body 9 mm.; gills 6 additional; abdomen 6; hind femur 3.5. Width of head 3; of abdomen 2.

### ***Oxyagrion rufulum* Hagen**

This is a pale slender nymph with brown-ringed legs and a pair of brownish submedian dorsal stripes along the abdomen. The skin is beset with minute brownish prickles on all the broader surfaces of the body and head. The head is flattened above, with large and very prominent eyes, behind which it is narrowed to very prominent broadly rounded hind angles, where the prickles of the skin are larger. The occipital excavation of the rear of the head is wide. The relative length of the seven antennal segments is as 6:7:10:7:6:5:4. The labium is armed with four or five lateral setae and with three or four (usually three) mentals, and the end of the lateral lobe is as shown (fig. 30, No. 3).

The legs are ringed more or less distinctly with brownish color, two rings on each femur and one on each tarsus. The wing cases extend backward to the middle of the sixth abdominal segment. The gills are cross-jointed at two-thirds their length and widest at

the joint, with the lower margin of the lateral ones spinulose-serrate out to the joint. Their tracheation is very twig-like.

Length of body 15 mm.; gills 8 additional; abdomen 10; hind femur 4. Width of head 4; of abdomen 3.

This species was first described by Hagen (1861) from an incomplete male specimen from northern California; more fully by Selys (1876) with females from Chile added; and still more fully by Calvert (1909), with drawings of the male appendages added. It has not been found again in California. Was Hagen's specimen a stray carried by air currents, or was the locality on the label erroneous?

### *Acanthagrion interruptum* Selys

This nymph is so similar to that of the preceding species that there is no need to do more than point out the differences distinguishing them. Nymphs of the two species came together accompanied by adults of two corresponding species from the same locality. No other nearly related or closely similar Agrionines accompanied these. Neither was reared. The clues to their identity were found in size and in wing venation.

This *Acanthagrion* nymph is smaller, measuring in length of body 13 mm., with the gills 7 mm. additional. The relative length of the seven segments of the antennae (in the single specimen in which they were preserved) is as 5:7:10:7:6:5:4. The raptorial setae on the labium are six laterals and four mentals (in three specimens). The vestigial transverse joint in the gills is about midway of their length. The tracheal twigs are more openly branched.

The developing wings were not in condition to show the critical venational character distinguishing these two species. It is found in the fore wing where the wing base is not stalked out to the anal crossing as it is in *Oxyagrion*. As I was able to see that character in the nymphs here referred to *Oxyagrion*, this nymph would seem to be safely determined by exclusion as belonging to the one other species that was commonly collected.

The adult of this species was fully described by Selys (1876) and again described and illustrated by Ris (1913).

It is not certain that this species properly belongs in *Acanthagrion*. We find no character in its nymph that will distinguish it from the nymph of *Ischnura*. The adult male is also like *Ischnura* in that the mid-dorsal apical margin of the tenth abdominal segment

is prolonged and rather deeply divided into a pair of submedian prominences. We leave it where it is, pending the discovery of the nymph of the typical *Acanthagrion*.

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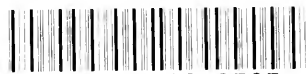






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