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# DESCRIPTION AND NATURAL HISTORY OF THE COSTA RICAN ODONATA LARVAE. 5. *MEGALOPREPUS CAERULATUS* (DRURY, 1782) (ZYGOPTERA, PSEUDOSTIGMATIDAE)

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The larva is described and illustrated, and a comparison is made with the other described spp. in the family. The most useful characteristic for the separation of the different spp. is the shape of the pale spot on the tip of each caudal gill. A discussion of the morphological similarities of the phytotelmata dwellers is presented and it is noted that spp. of Zygoptera are more similar to one another and share more specialized characteristics than the Anisoptera spp. Also, the larvae of the Pseudostigmatidae are very similar to those of Coenagrionidae that breed in phytotelmata, the main differences being body size and number and shape of labial palpi teeth.

## INTRODUCTION

The family Pseudostigmatidae has been a subject of research since early odonatologists found adults flying in the forest far from any typical or obvious larval habitat. While reseachers were able to collect and study the adults, the larval habitat remained unknown for many years. Dr D.C. Geijskes was one of the first to try to find the microhabitat of the larvae, particularly that of *Megaloprepus caerulatus*. The most likely habitat at that time was thought to be tank bromeliads (CALVERT, 1923), and it was not until the 1985 S.I.O. Symposium in Paris, that Geijskes learned from O.M. Fincke that the larvae are tree hole dwellers. It was his wish to describe the larvae but his untimely death made this impossible. I, therefore, dedicate this modest paper to the memory of Dr D.C. G e ij s k e s, though it cannot be compared with what he would have done.

Several interesting papers have been published on the ecology and taxonomy of the family Pseudostigmatidae (CALVERT, 1911, 1923; FINCKE, 1984, 1992). However, the larval taxonomy developed slowly, mainly because the specific

microhabitat makes the collection of specimens difficult.

The family has six species in Central America, split among three genera (PAULSON, 1982). There are four known species: *Mecistogaster modesta* (Sel.) (CALVERT, 1911), *M. ornata* Ramb. (RAMÍREZ, 1995), *Pseudostigma aberrans* Sel. (NOVELO-GUTIÉRREZ, 1993) and *Megaloprepus caerulatus* (Dru.). NOVELO-GUTIÉRREZ (1993) stated that the larvae of at least two more species have been reared for ecological studies, but formal description are still to be completed.

Previous to the present study, *Megaloprepus caerulatus* larvae were separated from other species using characters provided by earlier ecological studies (FINCKE, 1984, 1992; DE LA ROSA & RAMÍREZ, 1995). For example, FINCKE (1992) briefly described how to separate several species of the family, among them *M. caerulatus*.

The larvae used for the present study were found living in small water bodies in tree holes. Almost all of the tree holes had a capacity of nearly one liter and were situated at different heights above the forest floor.

Also found with the larvae were larvae of *M. ornata*, (Pseudostigmatidae), *Orthemis ferruginea* (Fab.) (Libellulidae) as well as chironomids and other dipterans.

## *MEGALOPREPUS CAERULATUS* (DRURY, 1782)

Figures 1-6

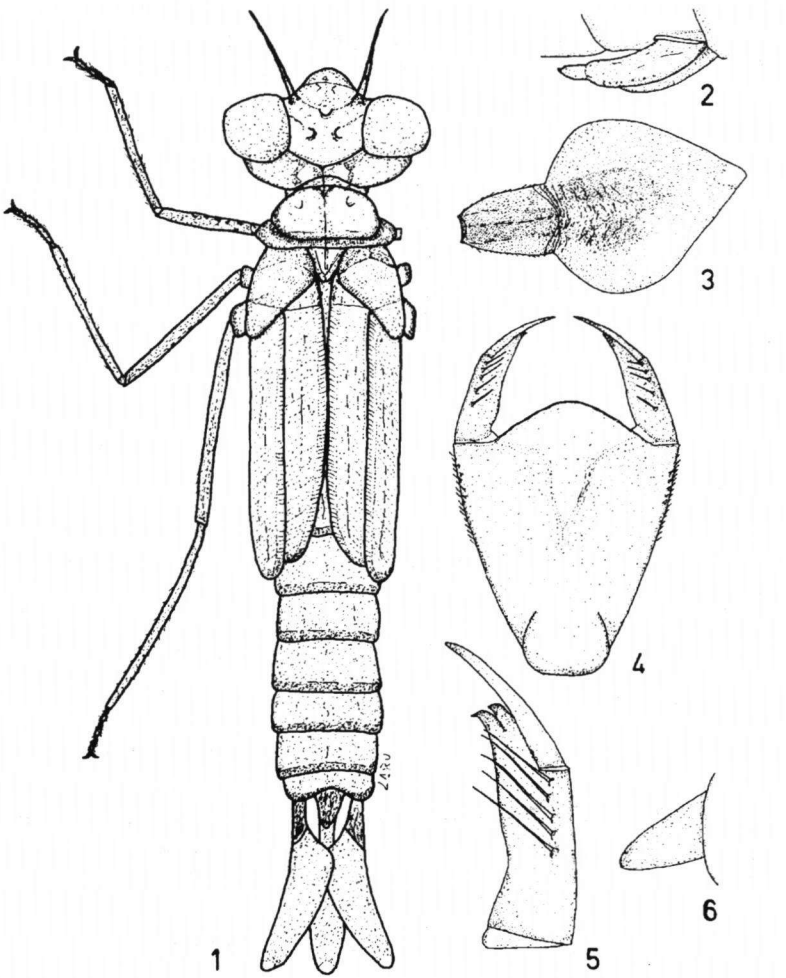
M a t e r i a l. – 2 exuviae (♂, ♀) of specimens emerged in laboratory, 2 larvae (♂, ♀), last instar, 2 intermediate instars, Maritza Biological Station, Guanacaste Conservation Area, Guanacaste province, 24-I-1994, A. Ramírez, N. Barbee & C. de la Rosa, leg.; – 2 larvae (♂, ♀), last instar, collected in 1986; – 3 exuviae (♂, ♀), last instar, 27-XI-1982 & 2-XII-1982. 6 larvae, (♂, ♀), intermediate instars, II-1986. Barro Colorado Biological Station, Panamá, O.M. Fincke leg.

DESCRIPTION. – Larvae and exuviae light brown or brown; body slender and long, almost entirely glabrous, with several distinctive pale areas, as follows: three white spots on the mid-dorsal face of the thorax, two behind the spiracles and one in the middle, between the spiracles (Fig. 1). One conspicuous white spot at the tip of each caudal gill.

H e a d. – Wider than long, occiput small and concave, cephalic lobes pronounced and rounded, with groups of spiniform setae; labrum with two pale lines at each side of the midline, slightly converging in the middle, in dorsal view; clypeus brown with a triangular middorsal pale area, just in front of the lines on labrum. Antennae 7-jointed, as long as the head, glabrous or with few scattered setae just proximad the articulations; uniformly colored; proportion of antennomeres, from base to tip: 0.37, 0.51, 1.0, 0.67, 0.45, 0.30, 0.15. Mandibles biramous, external branch with four teeth, the ventral one with a small tooth at its base, internal branch with two teeth. Galeolaciniae with four, robust and slightly curved teeth, similar in length and arranged in a row, with scattered setae throughout; maxillary palpi covered

with numerous long setae. Labium light brown, prementum-postmentum articulation reaching the proximal margin of the mesocoxae; prementum glabrous, but with a row of small spines on the apical 0.25 (Fig. 4); ligula prominent with the margin serrated. Palpal setae 6-7, basal 0.7 of external margin with small setae, internal margin smooth; two palpal teeth of similar shape (Fig. 5).

T h o r a x. – Pronotum glabrous, posterolateral angles rounded, frontal margin bilobed, lateral margins with long setae; posterior margin with three distinctive pale areas, one behind each spiracle and another in the midline. Synthorax with




Figs 1-6. Larval morphology of *Megaloprepus caerulatus*: (1) female, last instar, general dorsal aspect; – (2) female gonapophyses, lateral view; – (3) caudal gill, lateral view; – (4) prementum, dorsal view; – (5) labial palpi, dorsal view; – (6) female cercus, lateral view.

some medium size setae on the lateral margins, a pale area along the anterior middorsal line. Hind pair of wing sheaths reaching the posterior margin of abdominal segment 5, the front pair reaching the 0.5 of the same segment. Legs light brown, femora with 2 rows of dorsal, 2 of ventral and one lateral small spines; tibiae with 2 ventral rows of small spines and some scattered dorsal setae, distal 0.2 with a dense group of small spines, near the articulation with the tarsus; tarsus 3--jointed with two rows of ventral spines and long setae on the dorsal side. Pulviliform empodium present on tarsus.

A b d o m e n. – Uniformly light brown, darker next to the posterior margins of each segment, completely glabrous, but posterior margin of segment 10 with a row of small setae; without either dorsal protuberances, or lateral spines. Female gonapophyses reaching the basal 0.6 of segment 10, external lobes ending in a rounded tip with a small spine, the inner ones shorter than the externals (Fig. 2). Male gonapophyses cone shaped, ending acutely and not reaching the posterior margin of segment 9. Male and female cerci small and conical (Fig. 6). Caudal gills flattened (Fig. 3), slightly longer than wide, dark brown and harder in texture in the basal 0.25, the rest gray colored with violet and a softer texture near the borders; with a distinctive pale area at the tip of each one.

M e a s u r e m e n t s (in mm). – Total length (excluding gills) 22, abdomen 15, lateral gills 4, medial gill 4, metafemur 5; – head: width 5, length 3; – prementum: width 3, length 5.

VARIATION. – Some specimens had a modified tarsus on the front or middle legs; they were 2-jointed and one of the claws was larger than the other.

## DISCUSSION

All Pseudostigmatidae larvae are characterized by being adapted to live in very similar and sometimes identical microhabitats. For example, four of the six species of the family in Central America have been found living in tree holes and it is known that three or more species are able to live together in the same tree hole at the same time (FINCKE, 1992; DE LA ROSA & RAMÍREZ, 1995). This suggests that different genera were subject to similar selection pressures, probably resulting in the morphological similarity observed among larvae of the Pseudostigmatidae.

The shape and structure of the caudal gills are the most useful character to separate the genera; they are basically leaf-like, but vary in size and shape. The fact that two genera, *Pseudostigma* and *Megaloprepus*, have pale areas at the tip more evident in the latter, makes genus identification easier. All known species of Pseudostigmatidae larvae can be separated using the key in RAMÍREZ (1995).

## THE PHYTOTELMATA DWELLERS

Among Odonata it is not uncommon to find species with larvae that live in tree holes, bromeliads or similar habitats, generally known as phytotelmata (CORBET,

1983). Some of these species are opportunistic as is the case in several Anisóptera species such as *Orthemis ferruginea* and *Libellula herculea* (pers. observ.). Others, however, seem to specialize in this kind of habitat, for example all species in the family Pseudostigmatidae and the coenagrionid genus *Leptagrion*.

From a literature review it is evident that anisopteran larvae living in phytotelmata do not show special morphological adaptations and that larvae are morphologically identical to those that live in other types of habitats (e.g. pools). Several species of Aeshnidae, such as *Indaeschna grubaueri* (Förster) (ORR, 1994), and *Gynacantha membranalis* Karsch (SANTOS et al., 1987; FINCKE, 1984), have been found living in phytotelmata and in pools on the ground, without any morphological characteristics that could indicate an adaptation to any of these habitats, besides different color patterns, which are known to vary with the color of the microhabitat (CORBET, 1960; RAMÍREZ, 1994).

The case of Zygoptera larvae is completely different. Larvae of different families and genera that dwell in phytotelmata tend to be more similar among themselves, sharing many morphological characteristics. These include modified leaf-like gills (Fig. 3) usually colored black and purple, glabrous bodies, dark color pattern, short labium with triangular prementum, short legs, and labial palpus with 4-5 setae. Phytotelmata dwellers tend to be larger than related species that do not use this habitat (ORR, 1994). Larvae of the family Pseudostigmatidae and Coenagrionidae are in general very different, but when larvae of the former are compared with the species of the latter that breed in phytotelmata, the differences are less evident. DE MARMELS (1985) described the larvae of *Leptagrion fernandezianum* Rácenis which live in bromeliads. From his descriptions and comments the resemblance of the species to *Mecistogaster* is clear. ORR (1994) described the larvae of *Pericnemis triangularis* Laidlaw (Coenagrionidae). This species also shows all the morphological characteristics of the phytotelmata dwellers (see above). Finally, another bromeliad dweller is *Diceratobasis macrogaster* (Sel.) (Coenagrionidae) (WESTFALL, 1976). In this case the larva is similar to the other species described above only differing in the shape of the caudal gills, which are more typical of Coenagrionidae. Morphologically, *D. macrogaster* represents an intermediate step between the normal Coenagrionidae and the phytotelmata dwellers.

In conclusion, phytotelmata-dwelling species of Coenagrionidae and all species of Pseudostigmatidae are morphologically similar. The differences are mainly the size and shape of the labial palpi, the disposition of the premental setae, and in a few cases, shape of the caudal gills. Pseudostigmatidae lack the premental setae and the labial palpi have two end teeth (Fig. 5). However, these characteristics are variable among the phytotelmata-dwelling Coenagrionidae. For example, *P. triangularis* lacks the premental setae but its labial palpi are modified, with one end hook and a serrated area. The labial palpi of *L. fernandezianum* is similar to those of Pseudostigmatidae but it has premental setae. The length of the final instar in Pseudostigmatidae is not less than 18 mm, while in Coenagrionidae it is usually

not more than 18 mm.

SANTOS (1966) and DE MARMELS (1985) concluded that the Pseudostigmatidae evolved from the Coenagrionidae. This conclusion is supported by the present study. In order to improve our understanding of this relationship more Coenagrionidae larvae need to be reared and described.

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