

**ATOPOPHLEBIA FORTUNENSIS FLOWERS (EPHEMEROPTERA: LEPTOPHLEBIIDAE) AND CAENIS CHAMIE, ALBA-TERCEDOR AND MOSQUERA (EPHEMEROPTERA: CAENIDAE). NOTES ON THEIR BIOLOGY AND ECOLOGY**

S. Mosquera<sup>1</sup>, M. del C. Zúñiga<sup>1</sup>, and J. Alba-Tercedor<sup>2</sup>

<sup>1</sup> Universidad del Valle  
Departamentos de Biología y Procesos Químicos y Biológicos  
Apartado Aéreo 25360, Cali, Colombia

<sup>2</sup> Universidad de Granada  
Departamento de Ecología Animal  
18071, Granada, España

**ABSTRACT**

*Caenis chamie* and *Atopophlebia fortunensis* were collected in a water supply channel of the Pavas aqueduct (Departamento del Valle del Cauca- Cordillera Occidental, Colombia), that comes from natural sources with a run along a stretch with abundant riparian vegetation. *A. fortunensis* is the first record of a species co-occurring in Central and South America.

The activity of each species was clearly related with timing and intensity of rain periods. Emergence and molting occurs during the day at different hours. Most winged individuals of *A. fortunensis* were observed at the end of rain periods. Observations in the laboratory have shown that subimagos molted to imagos within 24 hours after they had emerged. Time elapsed between emergence and ovoposition of *C. chamie* was very short (5-6 minutes), and the highest emergence peaks took place during cloudy and rainy days. Observations in the laboratory have shown that males emerged first. Females did not undergo an imaginal molt and remained with the submaginal skin.

**INTRODUCTION**

*Atopophlebia fortunensis* was described from nymphs and adults collected in western Panama and Costa Rica by Flowers (1987). Zúñiga et al. (1997) reported this species in Colombia, but its biology and ecology there were unknown. *Atopophlebia* is a strictly Neotropical genus with a close morphological relation to the *Thraulodes* complex (Flowers, 1987). Nymphs of *Atopophlebia* have been collected from good quality waters (Mosquera, 1996). According to the Pan-American Ephemeroptera fauna evaluated by McCafferty (1998), with

respect to the interchange of species between the Americas, *A. fortunensis* is the first record of a species co-occurring in Central and South America.

*Caenis chamie* was recently described by Alba-Tercedor and Mosquera (1999). This genus belongs to the family *Caenidae* and was first reported in Colombia in water supply channels to Pavas aqueduct (Zúñiga et al. 1997). The family is widespread, but not well-known in South America. *Caenis* is a cosmopolitan genus of considerable antiquity, possibly of Pangaean origin, and no species are known to be common to Central and South America (McCafferty, 1998).

This paper contains some notes about the biology and ecology of *A. fortunensis* and *C. chamie* found in the southwestern Colombia.

## METHODOLOGY

### Area of Study

Samples of individuals were taken from September 1994 to March 1995 in water supply channels to Pavas aqueduct, which consisted of a lake and two streams: one with a sandy bed, and the other one with a muddy bed and abundant vegetable detritus. These correspond to high quality water bodies that come from natural sources protected by a small forest. This study was conducted in an area located in the Department of Valle del Cauca, Cordillera Occidental (3° 40' 48" northern latitude, 76° 33' western longitude) at 1,275 meters above sea level, in a life zone classified Subtropical Humid Forest (SHF), according to Holdridge (Espinal, 1968), with an annual rainfall range of 1,000 – 2,000 mm and an average temperature of 22° C (Figure 1).

### Collection Methods and Field and Laboratory Observations

Manual search and aquatic nets were used for collecting live mature nymphs. Animals were then taken to the laboratory and placed under simulated temperature and oxygenation conditions, in two emergence chambers. Malaise and light traps, aerial nets, and searches of surrounding vegetation, were the methods used for collecting subimagos and imagos in the field. Breeding in the laboratory is an unambiguous way of associating nymphs with adults.

## RESULTS

### *Caenis chamie*, Alba-Tercedor and Mosquera

This species, recently described from Colombia, has been just collected in all water supply channels to Pavas aqueduct. Nymphs were most frequently found in the muddy bottom stream with abundant vegetable detritus. The average values for some parameters of water quality in this stream were: Temperature 19,50°C; pH 7,52 units and 64 % oxygen saturation.

Field observations: The time that elapsed from emergence to ovoposition was very short. Individuals were seen to emerge sporadically in the field at the beginning of dawn, for approximately one hour, between 6:00 and 7:00 hours. Individuals flew in a slow and irregular pattern. The highest emergence peaks occurred during rainy periods, in cloudy, rainy and shadowed areas. It is believed that this species makes no real swarms. Males do not fly together, but as they emerge, both males and females rapidly complete their growth and mate. Males die shortly after they mate, and females do so shortly after laying their eggs.

In the laboratory, males were the first to emerge, molting to the imago phase within 5 or 6 minutes. Females did not undergo a final molt from subimagos to imagos. This was confirmed by evaluating their emergence in the laboratory, where it was found that only males left a subimaginal skin. Their emergence occurred between 6:30 and 7:30 hours. Edmunds

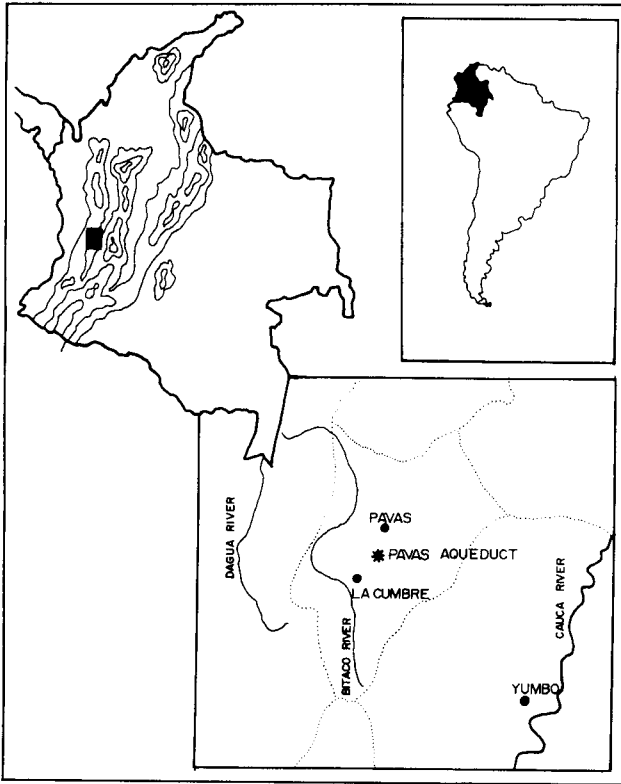


Fig. 1. Geographic area. Pavas aqueduct. La Cumbre. Valle del Cauca. Colombia.

and McCafferty (1988) state that females of some specialized species do not molt from subimagos to adults, and that maturation of their eggs is completed in the final nymphal phase.

### *Atopophlebia fortunensis*, Flowers

This species in Colombia has only been recorded in the sandy-bed stream of Pavas aqueduct, in shadowed places with abundant fallen leaves. The average values for some parameters of water quality to this stream were: Temperature 19,40 ° C; pH 7,70 units and 85 % of oxygen saturation.

While nymphs in younger stages are a grayish brown color, which turns into a brownish orange color as they approach emergence, adults are a lighter orange color. Males differ from females because they have divided compound eyes. This characteristic is visible in the late nymphal stage, and can be useful for both collecting individuals to be raised in the laboratory, and identifying them at a later stage.

Male and female subimagos emerged from 20:00 to 21:00 hours in the laboratory, males emerged first followed by the females; they both molted to imagos 24 hours later. In the field, however, only one subimago was observed as it emerged at 20:15 hours on a clear night. The largest number of subimagos and imagos was observed at the end of a rain period in clear and sunny days, lying under leaves or tree trunks at a height between 1.50 m. and 2.30 m. No swarms or oviposition was observed for this species.

## ACKNOWLEDGMENTS

We thank Dr. R. W. Flowers of Florida Agricultural and Mechanical University for the identification of *A. fortunensis*; Martha Rojas of Universidad del Valle for her valuable suggestions and advise. This work is based upon Bioindicators Water Quality Program of the Universidad del Valle and was supported in part by its Research Committee.

## REFERENCES

- Alba-Tercedor, J. and S. Mosquera. 1999. *Caenis chamie*, a new species from Colombia (Ephemeroptera: Caenidae). Pan-Pac. Ent. 75 (2): 61-67.
- Edmunds, G. F. (Jr.) and W. P. McCafferty. 1988. The mayfly subimago. Ann. Rev. Ent. 33: 509-529.
- Espinal, L. S. 1968. Visión Ecológica del Departamento del Valle del Cauca. Imprenta Universidad del Valle. Cali. 103 p.
- Flowers, R. W. 1987. New Species and Life Stages of *Atopophlebia* (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). Aquat. Insects. 9 (4): 203-209.
- McCafferty, W. P. 1998. Ephemeroptera and the great American interchange. J. N. Amer. Benthol. Soc. 17 (1): 1-20.
- Mosquera, S. 1996. Emergencia, formación de enjambres y distribución de algunas especies de Ephemeroptera del suroccidente colombiano. Trabajo de grado. Universidad del Valle. Departamento de Biología. Cali, Colombia.
- Zúñiga de C., M. del C., A. M. Rojas de H. and S. Mosquera de A. 1997. Biological aspects of Ephemeroptera in rivers of southwestern Colombia (South America), pp. 261-268. In: P.Landolt and M. Sartorius (eds). Ephemeroptera and Plecoptera: Biology- Ecology-Systematics. Fribourg, Switzerland.