

Mating balls in stoneflies (Insecta, Plecoptera)

Las bolas de apareamiento en plec6pteros (Insecta, Plecoptera)

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Mating balls occur when some males simultaneously attempt copulation with one female and they pile onto and around her forming a ball. Mating balls have been described in different animal groups, particularly in colubrids and anurans (Madsen & Shine, 1993; Luiselli, 1996; Wells, 1977; Reyer *et al.*, 2003; Pleguezuelos & Feriche, 2006). As pointed out by Shine *et al.* (2000) for snakes, mating balls are most likely to occur in species that (1) do not display male-male combat, (2) have high population densities, and especially (3) have mating periods soon after spring emergence, while the snakes are highly aggregated at overwintering dens. Moreover, in all these animals females are larger than males.

All these criteria are shared by many Plecoptera species in our latitudes: no existence of male-male combat, high population density after the emergence (the emergence is usually very concentrated in a short period of time) and tendency to aggregation (Hanada *et al.*, 1994; Stewart, 1994; Alexander & Stewart, 1996; Ja6mez-Cu6llar & Tierno de Figueroa, 2005).

Up to now, the attempts of one male trying to displace a mating male and mate guarding behaviours have been described for some different stonefly species (Alexander & Stewart, 1996; Tierno de Figueroa *et al.*, 2000; Tierno de Figueroa, 2003), but not forming a real mating ball.

Brinck (1949) pointed that when a female of a setipalpiian species with short-winged males has emerged, she usually becomes surrounded by waiting males; this has been observed in *Diura bicaudata* (Linnaeus,

1758), *Arcynopteryx compacta* (McLachland, 1872) and *Dinocras cephalotes* (Curtis, 1827). Nevertheless, according with his description, the remaining males (not the one copulating) wait around the female sides (no attempts of copulation were observed until the male from the pair retired and left a place).

We have observed in the field the formation of mating balls in two different stonefly species: *Dinocras cephalotes* (observed at Río Peguera, Pyrenees, Lérida province, Spain, June, 24th 2006) (Fig. 1) involving five brachypterous males, and *Hemimelaena flaviventris* (Pictet, 1842) (observed in Río Despeñaperros, Sierra Morena, Jaén province, Spain, April, 27th 2006) (Fig. 2) involving three macropterous males. These data constitute the first evidence of this behaviour in Plecoptera. Probably, and in relation with the little research devoted to mate-finding, copulation and displacement attempts during copulation in stoneflies (Tierno de Figueroa, 2003),



Fig. 1.—Mating ball of *Dinocras cephalotes*. The female can be distinguished by its long wings, while males are all brachypterous.

Fig. 1.—Bola de apareamiento de *Dinocras cephalotes*. La hembra se puede distinguir por sus largas alas, mientras que los machos son braquípteros.



Fig. 2.—Mating ball of *Hemimelaena flaviventris*. The female can be distinguished by its higher size and the presence of the subgenital plate.

Fig. 2.—Bola de apareamiento de *Hemimelaena flaviventris*. La hembra se puede distinguir por su mayor tamaño y por la presencia de la placa subgenital.

the existence of mating balls in Plecoptera is probably more common than currently thought.

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