Remarkable double androconial systems in some West Indian Trichoptera

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Abstract: Pairs of functionally coadapted androconial organs developed on different parts of the body are known from various male butterflies or moths, but no attention was paid to such systems in Trichoptera. Three examples are described from the author's experience with West Indian caddisflies. In ♂ *Oecetis maspeluda* Botosaneanu, 1977, androconial organs are found on the fore- and hindwing, as well as on the femur of the foreleg. In ♂ *Amphoropsyche janstockiana* Botosaneanu, 1990, they are in two parts of the genitalia: superior appendage and gonopod. In ♂ *Helicopsyche altercoma* Botosaneanu & Flint, 1991, they were found on the forewing and on the gonopod. Some aspects of the significance of such "binate" or "dual" organs in caddisflies are discussed.

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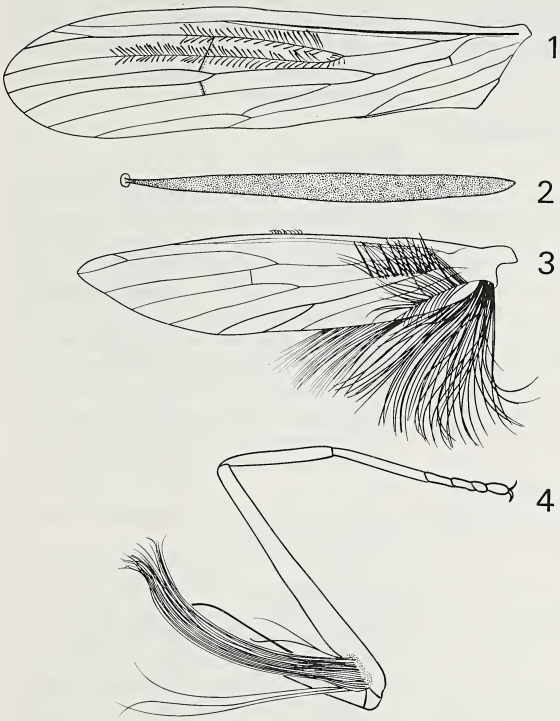
Introduction

In Lepidoptera, butterflies as well as moths, a vast amount of facts is known concerning presence of androconial organs (or "scent organs") in the males (Boppré, 1984; Birch, Poppy & Baker, 1990). These are more or less modified setae, or scales with expanded surfaces, situated on the wings (either scattered, or arranged as patches, tufts, fringes, folds, pockets – often eversible), but sometimes complex eversible abdominal structures (intra-abdominal hair-pencils, coremata), whereas other androconial systems may be present on thorax or legs. The androconial organs are very often (if not always) in contact with glands producing volatile chemicals, probably mainly pheromones, and they are involved in storage and distribution, or in the protection of the underlying glandular areas. Such organs are highly species-specific, widely but irregularly distributed in butterflies and moths, being considered as analogous structures evolved convergently many times.

In caddisflies, the sistergroup of Lepidoptera, relatively numerous species with androconial organs are known in various families (see Moretti & Bicchierai, 1980, for a comparison between androconial organs in the two orders). These organs include androconial setae or scales, mainly on the wings (but also on other organs, like the antennae), complex, partly eversible, cephalic organs, and many types of intra-abdominal organs.

One of the interesting facts about androconial organs is the existence, in some Lepidoptera, of so-called "binate organs" (Boppré, 1984): *pairs* of androconial organs developed on different parts of the body in the males of one species. Boppré & Vane-Wright (1989: 123) even distinguish between two different kinds of "binate organs": „. . .pairs of androconial organs, developed on different parts of the body and requiring special behavioural activity to make functionally necessary mechanical contacts, are termed *binate organs* . . . In contrast, pairs of organs which unavoidably make contact by virtue of their respective anatomical position, we call *dual organs*". Particularly numerous are such pairs of organs in Lepidoptera: Danainae. In the most typical cases, those of most Danaini, the two elements of such a system are a) zones of modified scales and glandular cells on the hindwings, and b) extrusible hairpencils within the tip of the abdomen. Mechanical contacts are established between these two elements; the function of the alar organs is production and storage of "pheromone-transfer-particles", that of the hair-



Figs. 1-4. *Oecetis maspeluda* Botosaneanu, male. 1, forewing; 2, androconium from forewing; 3, hindwing; 4, foreleg.

pencils being dissemination of these last.

Virtually no attention was paid until present to "double" androconial systems in Trichoptera. The following notes from the author's own experience will show that such remarkable systems are present in several West Indian caddisflies.

Oecetis maspeluda Botosaneanu, 1977
(Figs. 1-4)

This species belonging to one of the larger genera with wide distribution of the family Leptoceridae, was described by Botosaneanu (1977) from Isla de Pinos (an island belonging to the Cuban archipelago) as well as from the westernmost province of Cuba: Pinar del Rio. The original description is incomplete in several respects. In the ♂, the upper side of the forewing is characterized by regular rows of strong but not foliaceous androconia inserted on the upper and lower limits of the discoidal cell and reaching along both R2+3 and R4+5 beyond the transverse vein closing this cell; the androconia are not located in a pouch. In the hindwing, several unusual groups of black setae are present: two relatively short rows of medium-sized setae on the basal part of M and along A2, and an extremely conspicuous pencil of long setae inserted in the anal angle (N.B.: in the ♀ there is here a much reduced setal tuft). Besides this, a remarkable tuft of setae, as long as the femur itself, is inserted near the base of the anterior femur; these setae are silky, apparently not of various types; they may be found adpressed to the femur, but can be unfolded to

a wide fan. It is beyond doubt that the femoral penicillus can reach the alar androconial zones if the required movements are performed.

Amphoropsyche janstockiana Botosaneanu, 1990

(Figs. 5-6)

This species, too, belongs to a leptocerid genus, but to a relatively small one, with a Neotropical and West Indian distribution. It was described (Botosaneanu, 1990) from Saint Vincent (West Indies). Two characters of the ♂ genitalia are extremely characteristic for all the species of this genus (see discussion). Inside each superior appendage there is a comparatively enormous gland (the "amphora") whose pore is well distinct on its ventral side; and, laterally on the inflated apical part of the gonopod there is, inserted on a rounded field, a tuft of medium-sized, apparently stiff androconial setae clearly reaching the pore of the gland.

Helicopsyche altercoma Botosaneanu & Flint, 1991

(Figs. 7-9)

The large genus *Helicopsyche* belongs to the family Helicopsychidae. The species here treated was described (Botosaneanu & Flint, 1991) from several provinces of the Dominican Republic. In the ♂, the forewing has, in the central part of its underside, a very large patch (between R2 and M4) covered with black androconia; these are foliaceous but relatively narrow, elongate, with longitudinal ribs and a relatively strong but short petiole; the black androconial patches, not located in pockets or pouches, are easily seen with the naked eye. Moreover, the central, sinuous part of R1, supports a long row of very fine, long, relatively stiff setae, with tips often curled, which are directed towards the androconial field. On the other hand, on most of the lateral face of the lateral branch of the gonopod are inserted extremely long and strong brushes of silky (coppery-reddish) setae, which are about three times longer than the gonopod itself; it was not possible to distinguish different types of setae in these brushes which, if adequate movements are performed, can certainly reach the alar androconial patches.

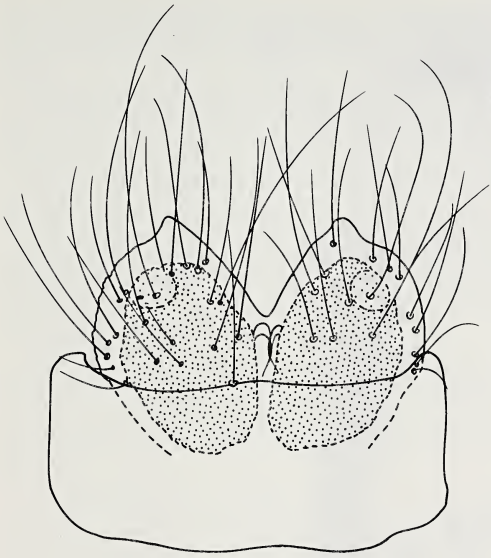
Discussion

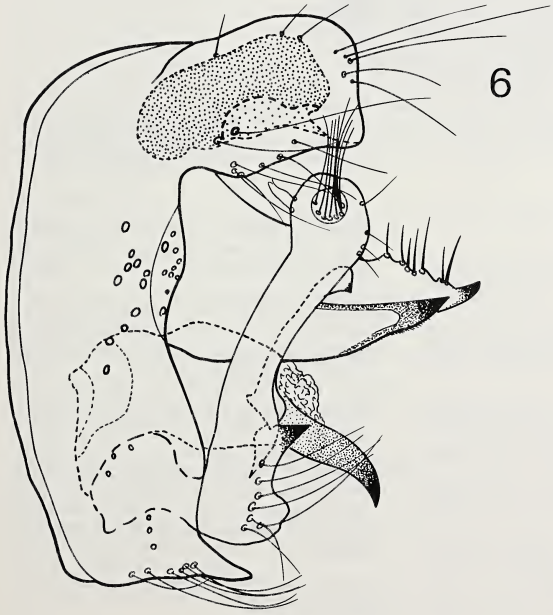
Amphoropsyche janstockiana has a "dual" androconial system, whereas *Oecetis maspeluda* and *Helicopsyche altercoma* have "binate" androconial systems (see introduction). In all these species we have original and sometimes strange androconial organs and combinations of androconial organs, some of them possibly never found in Lepidoptera. Without doubt, SEM microscopy of these species would allow observation of important additional details; it should be added that nothing is known about the *exact* functional significance of these systems.

Interesting subjects of reflection are offered by two of our species.

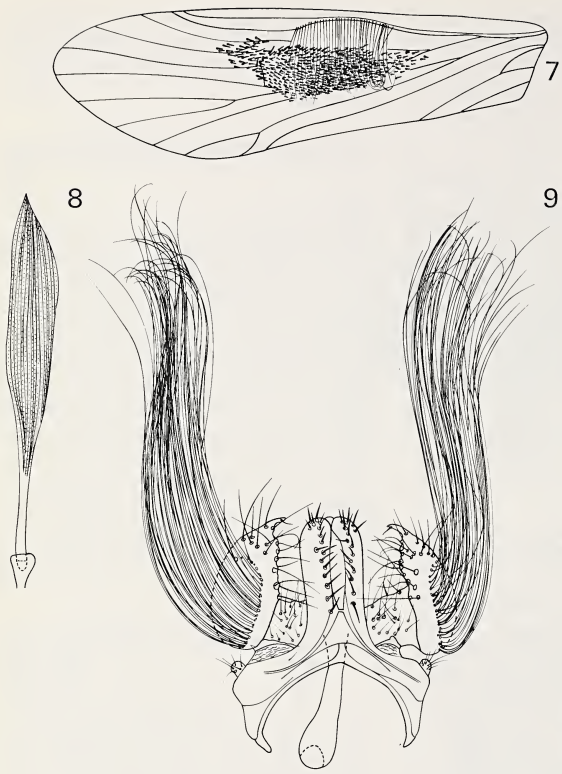
Amphoropsyche Holzenthal presently comprises 12 species, two West Indian, the others northern South American. All species have androconial systems morphologically (and certainly also functionally) similar to that of *A. janstockiana* (Holzenthal, 1985). But surprisingly – an androconial "dual" system fundamentally similar to that of *Amphoropsyche* is found in the genus *Axiocerina* Ross, with only two known species on Réunion and Mauritius (Morse, 1984) and belonging to a different tribe of the family Leptoceridae: a remarkable case of complex systems independently arisen.

The sister-species of the Hispaniolan *Helicopsyche altercoma* is *H. comosa* Kingsolver, from the westernmost province of Cuba: Pinar del Rio. The male genitalia of these two species are practically impossible to distinguish, and are both characterized by the huge tufts of androconial setae on the gonopods. The only character clearly distinguishing these species is the total lack of an androconial area on the forewings of *comosa*. The exciting question which may be asked is: was in the process of speciation the forewing androconial area *lost* in *comosa* or *gained* in *altercoma*?





Figs. 5-6. *Amphoropsyche jan-stockiana* Botosaneanu, male. 5, genitalia, dorsal; 6, genitalia, lateral. Glands dotted.



Figs. 7-9. *Helicopsyche altercoma* Botosaneanu & Flint, male. 7, forewing; 8, androconial scale from forewing; 9, genitalia, dorsal.

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