Hind-wing folding mechanism analyzed in Histeridae (Coleoptera)

Note 07 (Hydrophiloidea), released by Luigi De Marzo on September 2012 – A further study on beetles provided with abbreviated elytra. l.demarzo@alice.it www.luigidemarzo.eu

SUBJECTS

• . . . "*In beetles with abbreviated elytra, particularly in Staphylinidae but also in Nitidulidae, Histeridae etc., the wings become very long in relation to the elytra, and an extra degree of folding becomes necessary, which in turn leads to further reduction and modification of the wing-venation.*" (Crowson, 1981, on page 48).

• This Crowson's sentence is analyzed by looking at the hind wings of some histerids.

• The different folding mechanism occurring in Histerinae and Saprininae is described.

MATERIAL AND METHODS

• Examined species (in agreement with Vienna, 1980, and Audisio *et al.*, 1995) – **Histerinae**: *Atholus bimaculatus* (Linnaeus) (n=10), *Hister quadrinotatus* Scriba (n=4), *Margarinotus ignobilis* (Marseul) (n=3), *Pachylister inaequalis* (G.A.Olivier) (n=2). **Saprininae**: *Hypocacculus metallescens* (Erichson) (n=9), *Hypocaccus rugifrons* (Paykull) (n=11), *Saprinus semipunctatus* (Fabricius) (n=20).

• Wings were examined on slides in glycerol; they were separated from dry-preserved specimens after these had been bathed for some hours in formaldehyde 2%.

RESULTS

----- Hind-wing folding in Histerinae

• Looking at the hind wings of a member of the nominal genus, *Hister quadrinotatus*, we can find the features previously described for the congeneric species, *Hister unicolor* Linnaeus (Vienna, 1980),

• as each wing bears (Fig. 1): (a) four long veins, R1, M1, R5, M4+Cu, (b) two short veins, 3A1, 3A2, (c) a series of spine-like setae along the basal tract of the vein M4+Cu, and (d) a marginal indentation which delimits the anal field.

• In rested position, wings of *Hister quadrinotatus* show specular symmetry, and each of them entirely sets under the corresponding elytron (Fig. 2.A).
• Symmetry does depend upon the occurrence of the occurrence of the same folding mechanism at both left and right wing.
• This mechanism occurs in every examined species of the subfamily Histerinae;
• it includes an oblique "anal-field fold", which virtually cuts this field,
• together with three hinges (Fig. 2.B), which do correspond to three transversal folds (Fig. 3).
• This mechanism based on three folds causes apex of each wing to be oriented towards the medial plane of the insect body.

----- Hind-wing folding in Saprininae
• All examined species of the subfamily Saprininae share a folding mechanism based on three folds only.
• When observed in extended position, the hind wings of a common member of this subfamily, *Saprinus subnitescens*, agree with the scheme reported in the literature for the congeneric species, *Saprinus maculatus* (Rossi) (Vienna, l.c.) (Fig. 4),
• as, when compared with *Hister*, they include further two veins, R3 and R4.
• The particular folding mechanism of Saprininae lacks the third transversal fold;
• it causes each wing to be extended under the opposite elytron (Fig. 5.A), so that apex of one wing sets just under the anal field of the opposite wing (Fig. 5.B);
• Every examined species, *Saprinus subnitescens*, *Hypocacculus metallescens* and *Hypocaccus rugifrons* (Fig. 6.A), share: (I) the "anal-field fold", (II) the "first transversal fold" and (III) the "second transversal fold".
• This type of mechanism does mask the specular symmetry, as wings of each specimen overlap to each other by the two asymmetric conditions A and B referring to dualism of wing position (see Table A).

Tab. A – Hind-wing overlapping outlines recorded in the examined Saprininae: number of specimens showing either the condition A or the reverse condition B.

	A = left wing above	B = left wing below
Hypocacculus metallescens (n=9)	6	3
Hypocaccus rugifrons (n=11)	7	4
Saprinus semipunctatus (n=20)	16	4

• “Condition A” (Fig. 6.B) implies left wing to stay in upper position with its apex set just under the anal field of the right wing,
• whereas the “condition B” (Fig. 6.C) is reversed.
• The evaluation listed in the Table A shows the condition A to be predominating in every species: especially in *Saprinus semipunctatus*, where the proportion A:B=4:1 has been recorded.

CONCLUDING REMARKS

• A previous evaluation of the morphological diversity of the hind wings in histerids has been reported by Vienna (l.c.),
• who referred to the venation, which usually composes of somewhat broad veins, except for both some small size species (*Plegaderus*, *Halacritus*, etc.) and the large-sized *Trypanaeus*.
• The new diversity parameter arising from the present study refers to the folding mechanism, which clearly differs between Histerinae and Saprininae.
• A particular adaptation of the hind wings within beetles provided with abbreviated elytra has been found elsewhere in Staphylinidae-Staphylininae,
• which exhibit a double folding mechanism in any single individual (De Marzo, unpublished Note 01).
• Histerids don’t follow this type of adaptation; anyhow, they show a trend to a suitable use of the space under the elytra as well.
• Their type of adaptation deals with the asymmetric overlapping of their hind wings.

REFERENCES

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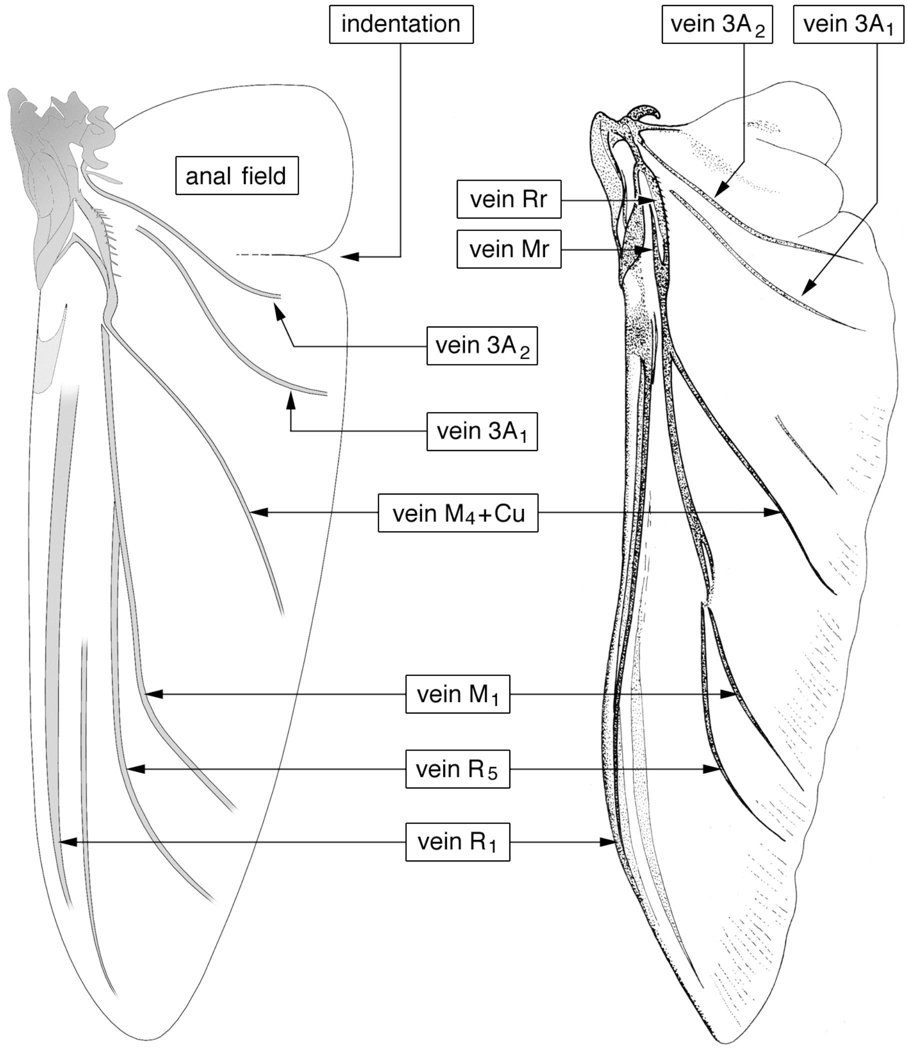

Fig. 1 - Histeridae-Histerinae, hind wings: equipment of veins in *Hister quadrimaculatus* Linnaeus (original drawing) and *Hister unicolor* Linnaeus (redrawn from Vienna, 1980).

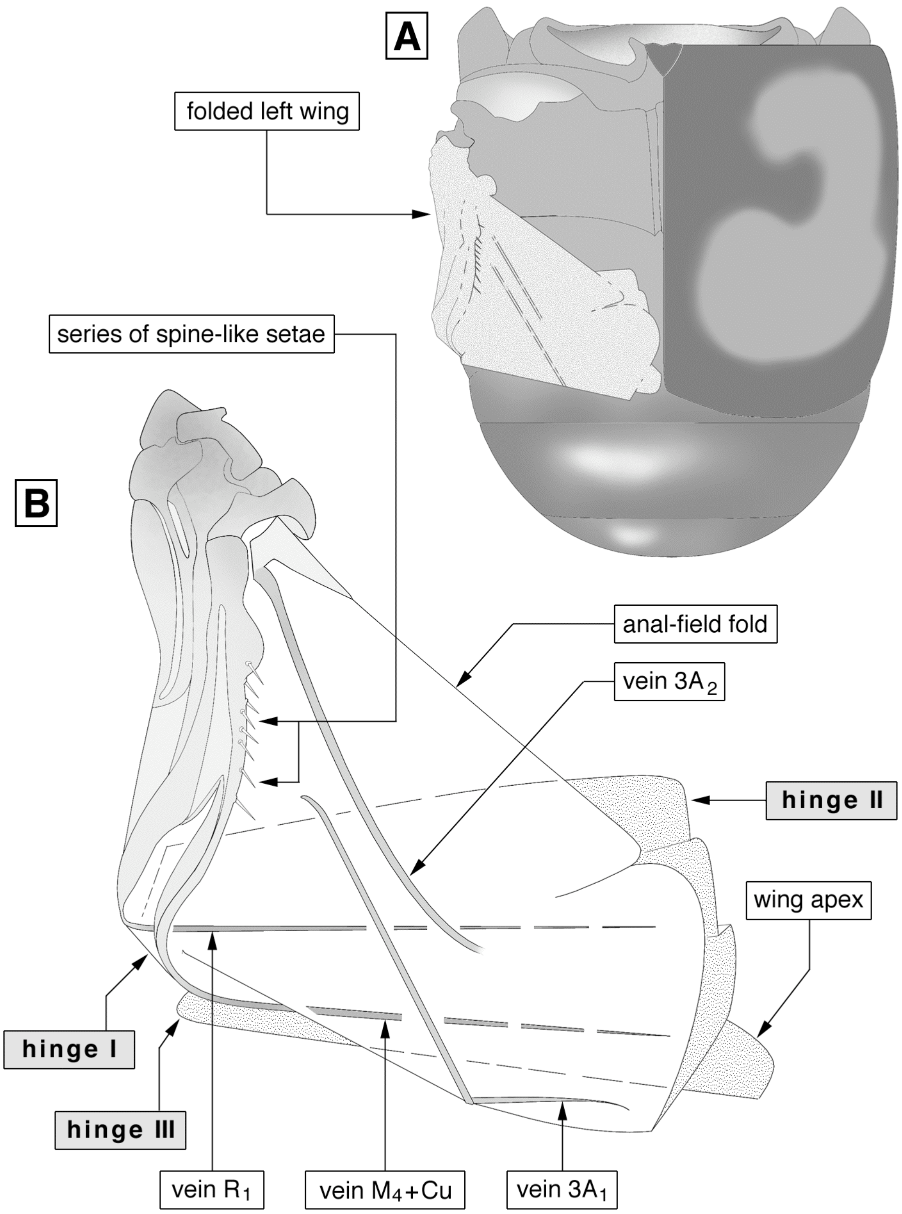

Fig. 2 – Histeridae-Histerinae, *Hister quadrinotatus* Scriba: position and features of one folded hind wing.

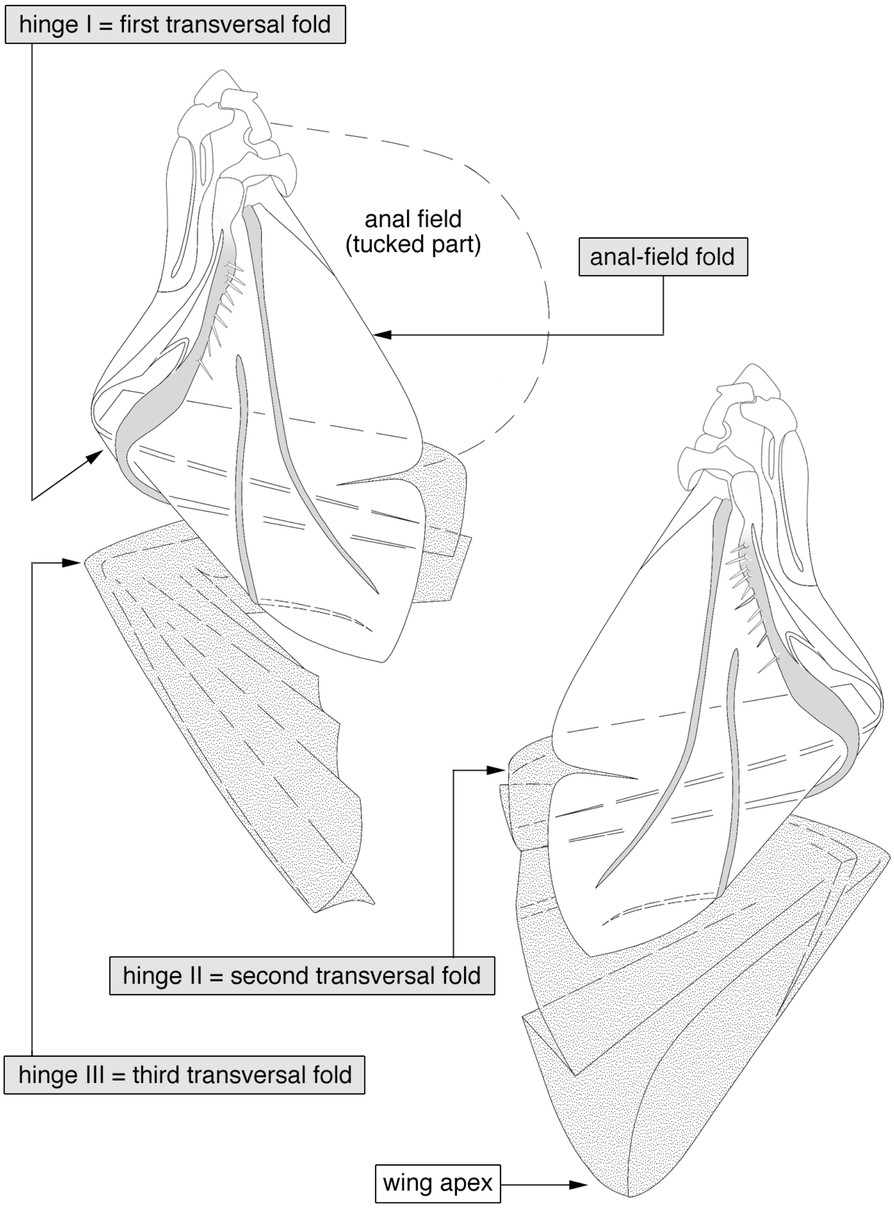

Fig. 3 – Histeridae-Histerinae, *Hister quadrinotatus* Scriba: features of the folding mechanism observed in moderately extended hind wings of a single individual.

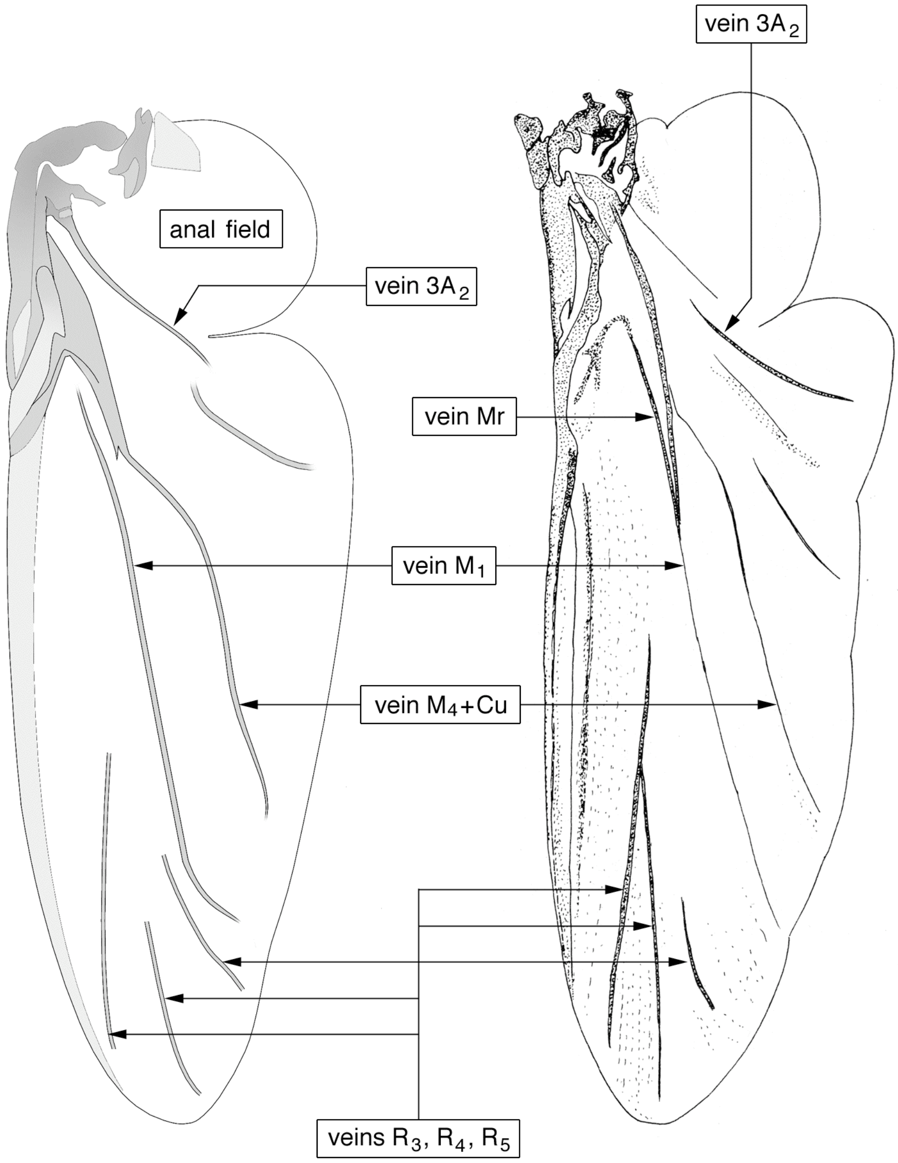

Fig. 4 - Histeridae-Saprininae, hind wings: equipment of veins of *Saprinus semipunctatus* (Fabricius) (original drawing) and *Saprinus maculatus* (Rossi) (redrawn from Vienna, 1980).

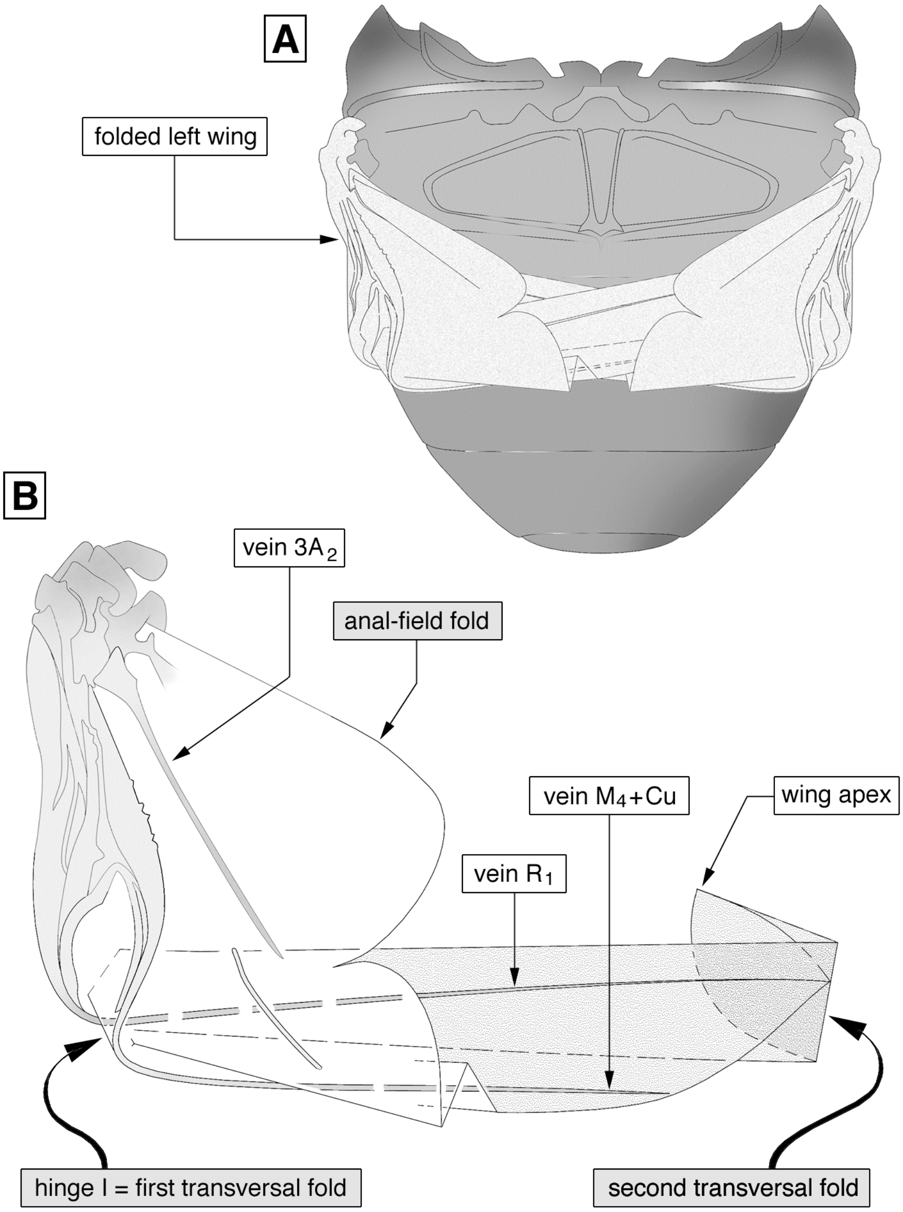

Fig. 5 - Histeridae-Saprininae: position and features of one folded hind wing in *Saprinus semipunctatus* (Fabricius).

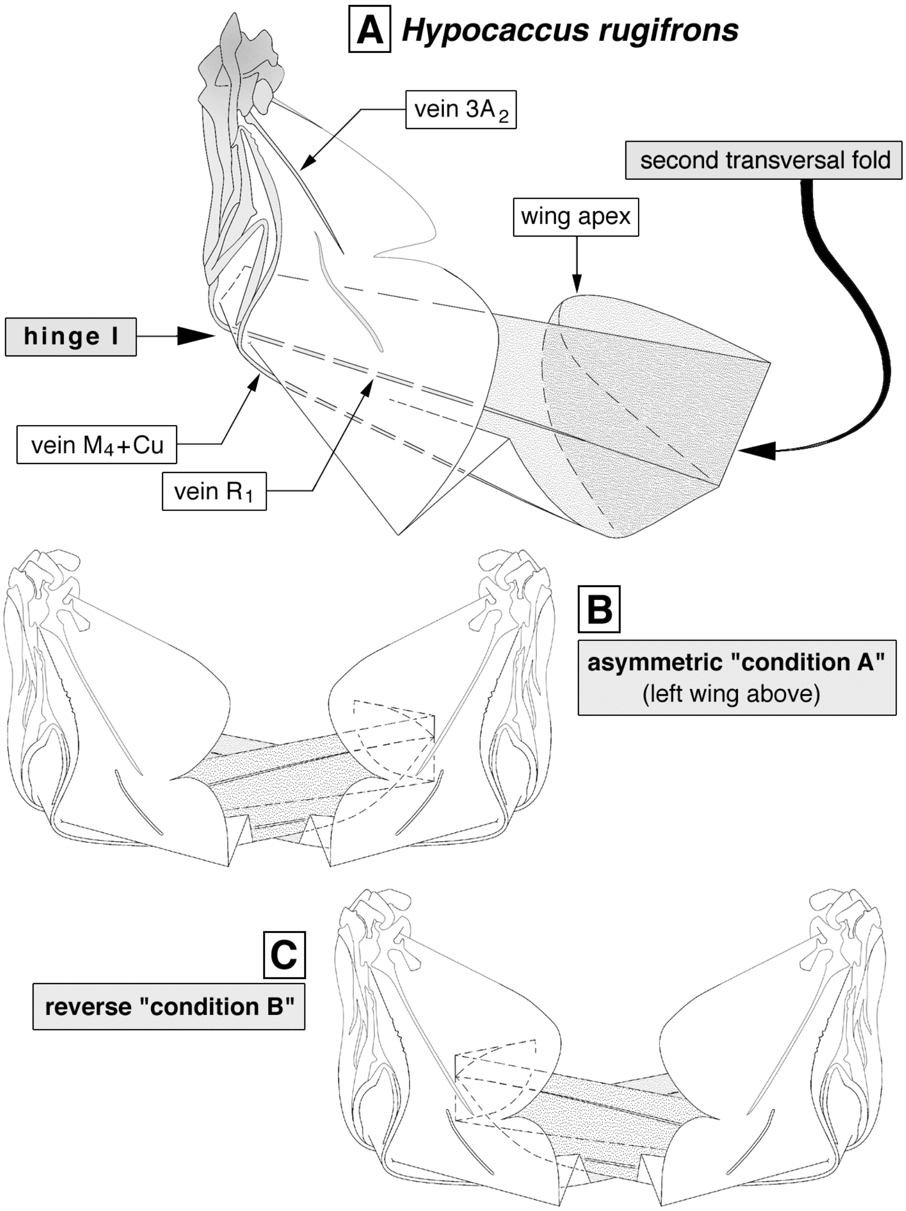

Fig. 6 - Histeridae-Saprininae: one folded wing in another member of this subfamily and scheme of the opposite folding modes occurring in every examined species.