Hind-wing folding mechanisms in Staphylinoidea revised on the basis of new observations (Coleoptera Ptiliidae, Silphidae)

Note 03 (Staphylinoidea), released by Luigi De Marzo on July 2012 – An overview of the literature on this matter. l.demarzo@alice.it

SUBJECTS

- A research in progress (De Marzo, Note 01, Note 02) analyzes the hind-wing folding mechanism in Staphylinidae-Staphylininae including both *Creophilus maxillosus* (Linnaeus) and further species;
- it showed hind wings of members of this subfamily to be constantly lacking in specular symmetry.
- Previous knowledge on the folding mechanisms in the Staphylinoidea includes:
- *Nicrophorus vespilloides* Herbst (Silphidae) by Hammond (1979) and
- *Acrotrichis montandoni* (Allibert) (Ptiliidae) by Fedorenko (2009).
- Results of further observations are reported here.

MATERIAL AND METHODS

- Names of veins and other wing structure have been reported by De Marzo (unpublished Note 01).
- Specific names agree with Smetana (2004).
- List of the examined species and number of specimens – Ptiliidae: *Acrotrichis montandoni* (Allibert) (n=2), *Nossidium pilosellum* (Marsham) (n=3); Silphidae: *Necrodes littoralis* Linnaeus (n=1), *Nicrophorus vestigator* Herschel (n=1), *Silpha olivieri* Bedel (n=1), *Thanatophilus rugosus* (Linnaeus) (n=4).
- Hind wings were examined on slides in glycerol.
- Specimens were either obtained from dry collections or freshly killed with ethyl-acetate vapours; in any case, they were dissected after a bath of some hours in a mixture 1:1 of glycerol and ethanol 70%.

RESULTS

----- Silphidae

• The venation of *Nicrophorus vestigator* is obviously similar to that previously described for the staphylinid, *Creophilus maxillosus* (Linnaeus);

• anyhow, it includes an additional vein, which relates with the anal field and is reported “anal vein” in Fig. 1.

• The same mechanism for both wings of a single specimen has been found in *Nicrophorus vestigator* (Fig. 2.A).

• It agrees with the scheme assigned by Hammond (l.c.) to the congeneric, *Nicrophorus vespilloides* (Fig. 2.B-D),

• as it includes: (I) an oblique “anal fold”, (II) one “longitudinal fold”, (III) the “first transversal fold” and (IV) the “second transversal fold”.

• This mechanism has been found also in further two examined silphids, *Necrodes littoralis* and *Thanatophilus rugosus* (Fig. 3).

• A simplified mechanism has been observed in *Silpha olivieri* (Fig. 4), where the second transversal fold is lacking, and a total of three folds is implied.

• The apex of the folded wings shows a different position,

• as it lies at the internal-posterior corner in the folded wings of *Necrodes*, *Nicrophorus* and *Thanatophilus*,

• whereas it is oriented towards the external side in the simplified mechanism of this *Silpha olivieri*.

----- Ptiliidae

• Both *Acrotrichis montandoni* and *Nossidium pilosellum* exhibit the wing folding mechanism already reported by Fedorenko (l.c.) for the former species (Fig. 5.A).

• This mechanism bases only on four transversal folds, as neither an anal fold nor any longitudinal fold do occur.

• Wings in folded position are symmetrical (Fig. 5.C) and follow the scheme assigned by Dybas (1966) to Ptiliidae in general (Fig. 5.D).

• Although this author suggests a different folding mechanism for *Nossidium* spp., I didn’t realize this for the examined member of this genus, *N. pilosellum*.

CONCLUSIVE REMARKS

- Although folding mechanism bases on four folds in both Silphidae and Ptiliidae, the latter exhibit only on transversal folds.
- Because a single folding mechanism does occur for both wings of a single specimen, neither Silphidae nor Ptiliidae exhibit lack of specular symmetry.
- Mechanism of most examined Silphidae includes: an anal fold, one longitudinal fold and two transversal folds;
- it closely corresponds to the mechanism occurring in one of the asymmetric hind wings of the Staphylininae (Fig. 6);
- i.e., either to that of the left wing, when the asymmetric condition is "A", or to the mechanism of the right wing, when the asymmetric condition "B" is occurring.

REFERENCES

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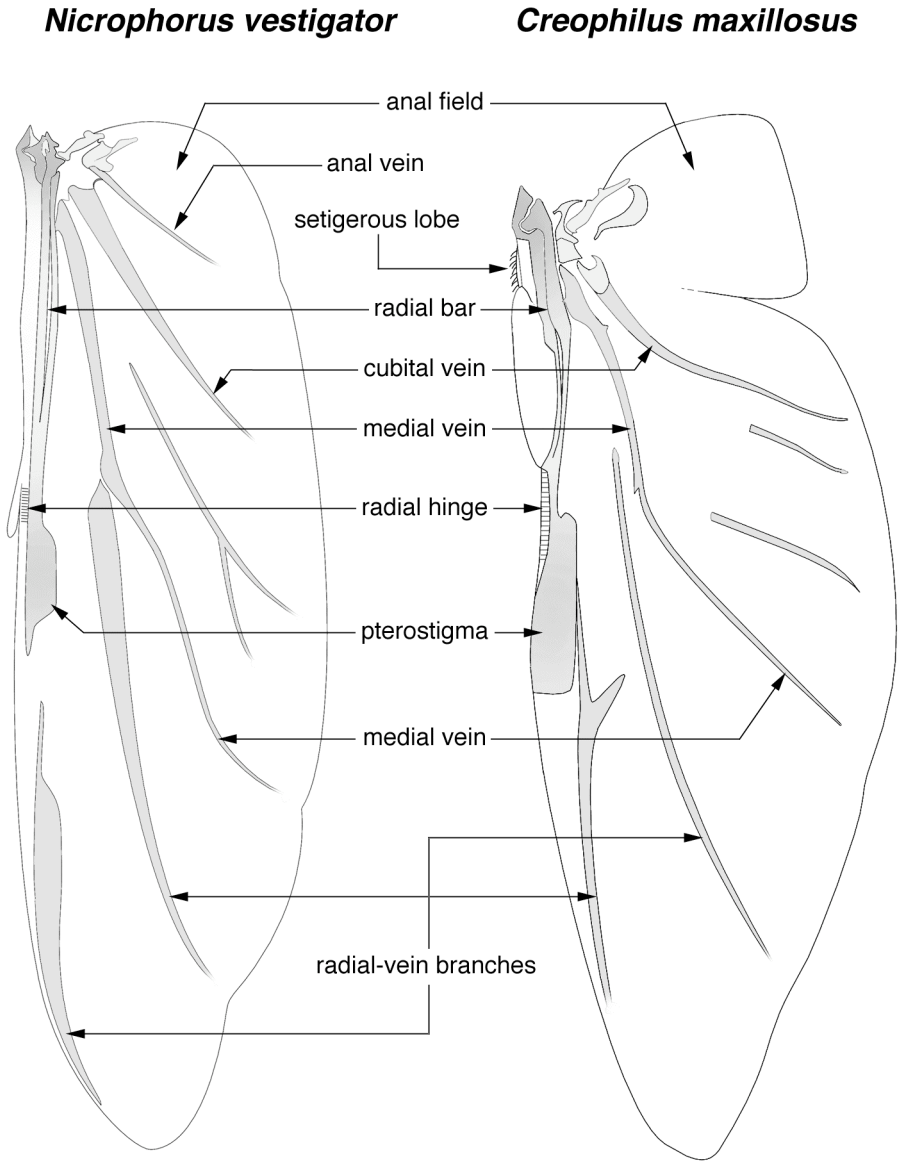

Fig. 1 – Extended hind wings in two common members of the superfamily Staphylinoidea. Terms agree with Kukalová-Peck & Lawrence (1993) and De Marzo (2011).

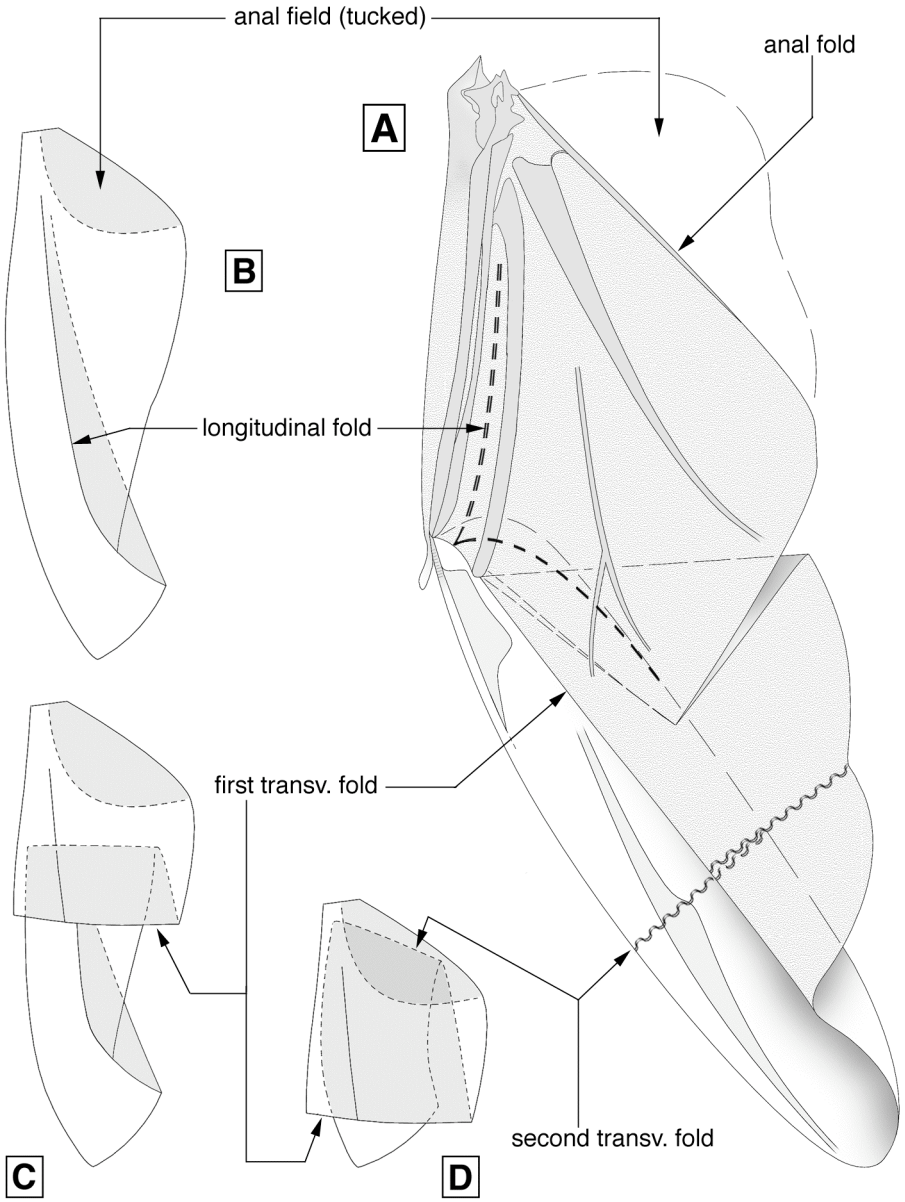

Fig. 2 – Hind-wing folding mechanism (based on four folds) occurring in most Silphidae: A, original drawing referring to *Nicrophorus vestigator* Herschel; (B-D) scheme assigned to *Nicrophorus vespilloides* Herbst by Hammond (1979) on the basis of a Kaufmann's contribution in the 1960s.

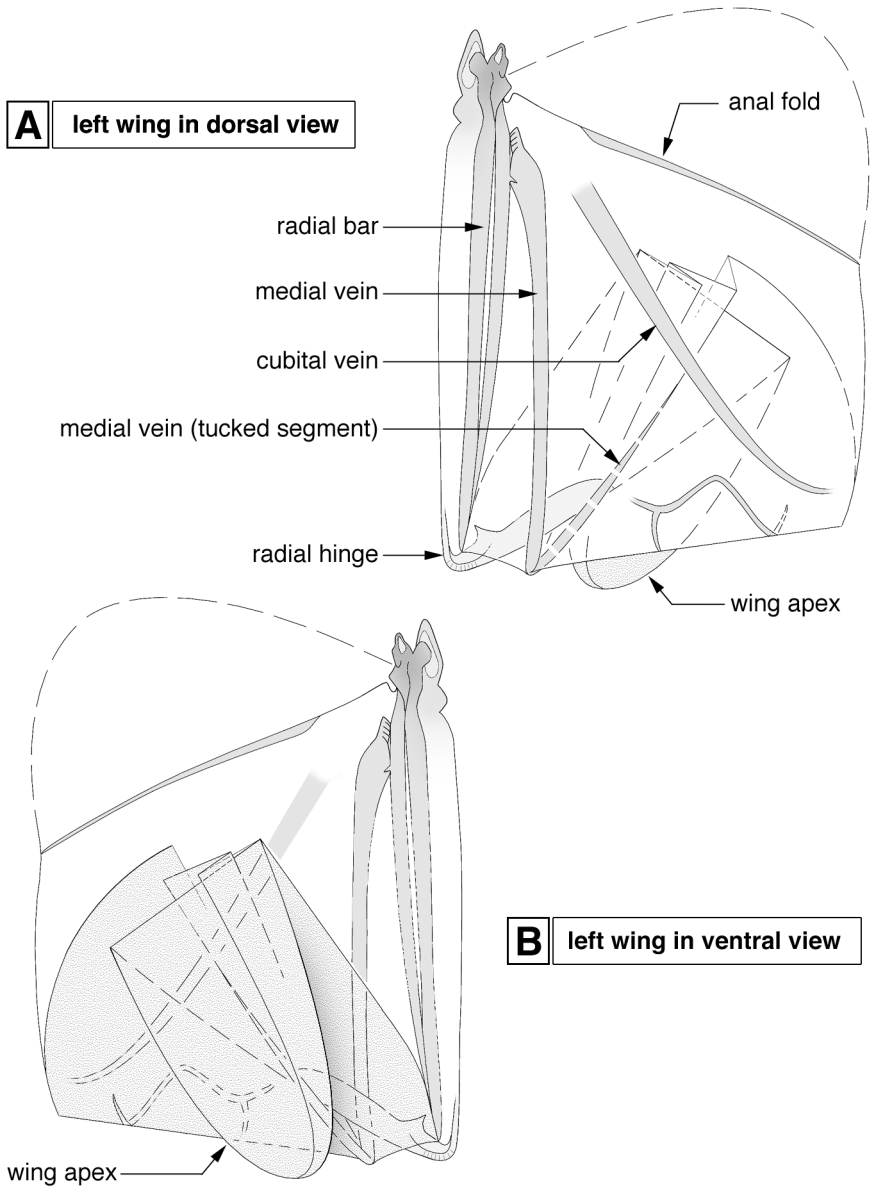

Fig. 3 – Further instance of mechanism based on four folds occurring in another silphid, *Thanatophilus rugosus* (Linnaeus): dorsal and ventral view of a folded wing (left wing).

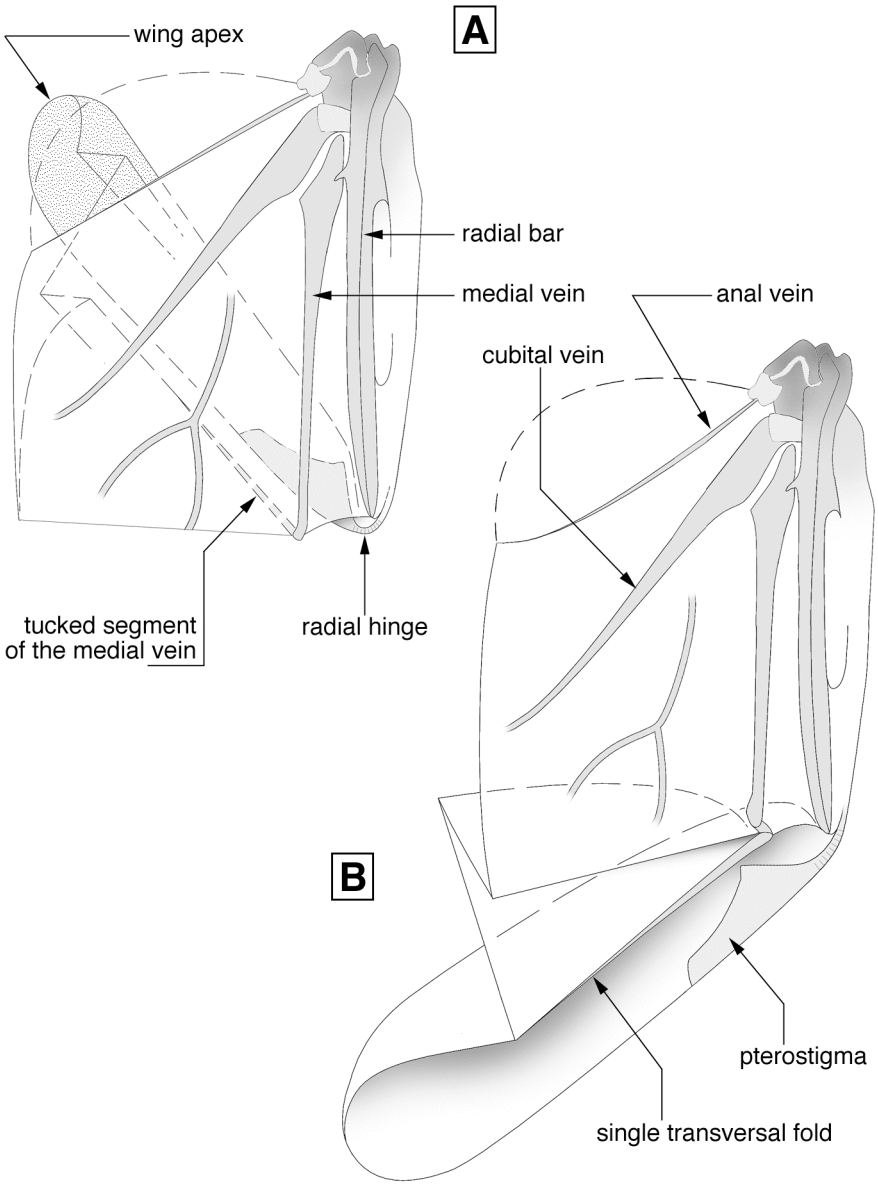

Fig. 4 – Simplified hind-wing folding mechanism (based on three folds) occurring in another silphid, *Silpha olivieri* Bedel: (A) right wing completely folded; (B) right wing partially unfolded.

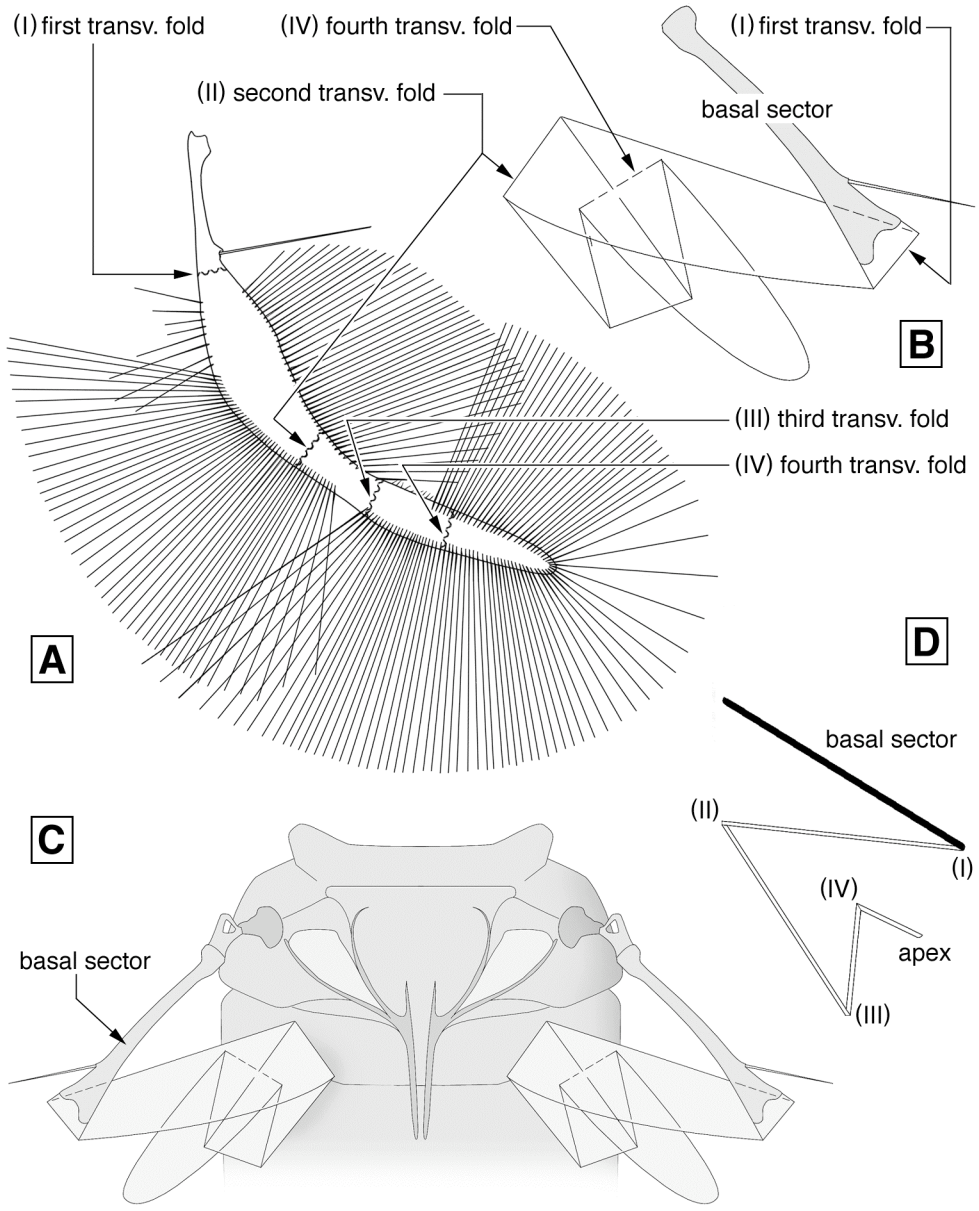

Fig. 5 - Hind-wing folding mechanism of *Acrotrichis montandoni* (Allibert) (Ptiliidae): A, distribution of the folds according to Fedorenko (2009) (redrawn); B-C, original drawings of the folded hind wings; D, folding pattern assigned by Dybas (1966) to Ptiliidae in general (redrawn).

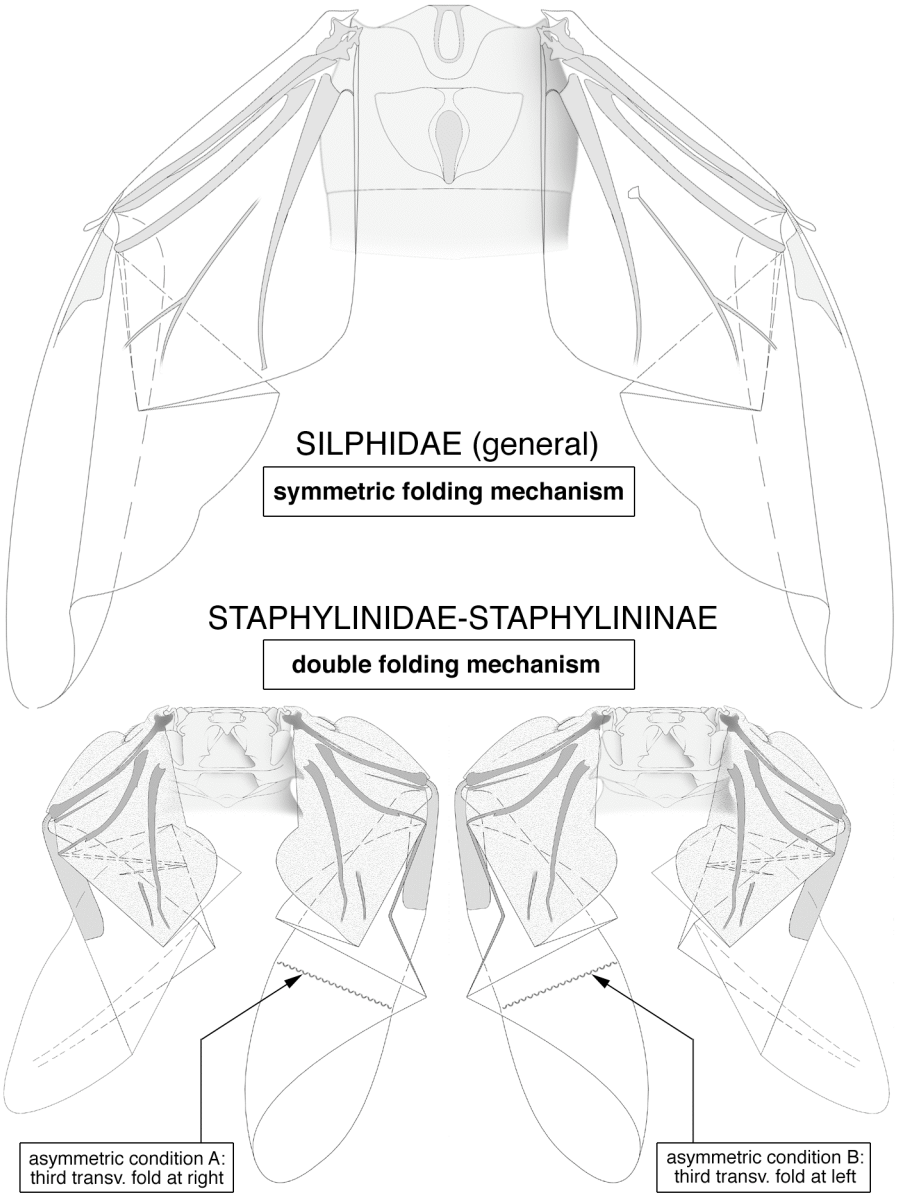

Fig. 6 – Compared instances of symmetrical/asymmetrical hind-wing folding mechanisms known for Staphylinoidea: a silphid, *Nicrophorus vestigator* Herschel, and a staphylinid, *Creophilus maxillosus* (Linnaeus).