

An electron microscope look at wing scales in “greasy” Lepidoptera

THOMAS J. SIMONSEN

Zoological Museum, University of Copenhagen, DK-2100 Copenhagen. E-mail:
tjsimonsen@zmuc.ku.dk

Summary. The ultrastructural consequences of “wing grease” in dried Lepidoptera specimens are examined and described for two cases (Agathiphagidae: *Agathiphaga vitiensis* Dumbleton, 1952 and Hepialidae: *Hepialus humuli*). The ultrastructure of the wing scales and of the wing surface are heavily obscured.

Zusammenfassung: Die Auswirkungen “verölter” Flügel auf die Feinstruktur von Schmetterlingsflügeln werden an zwei Beispielen beschrieben und illustriert (Agathiphagidae: *Agathiphaga vitiensis* Dumbleton, 1952 und Hepialidae: *Hepialus humuli*). Die Ultrastruktur der Flügelschuppen wird durch Verölung weitgehend verdeckt.

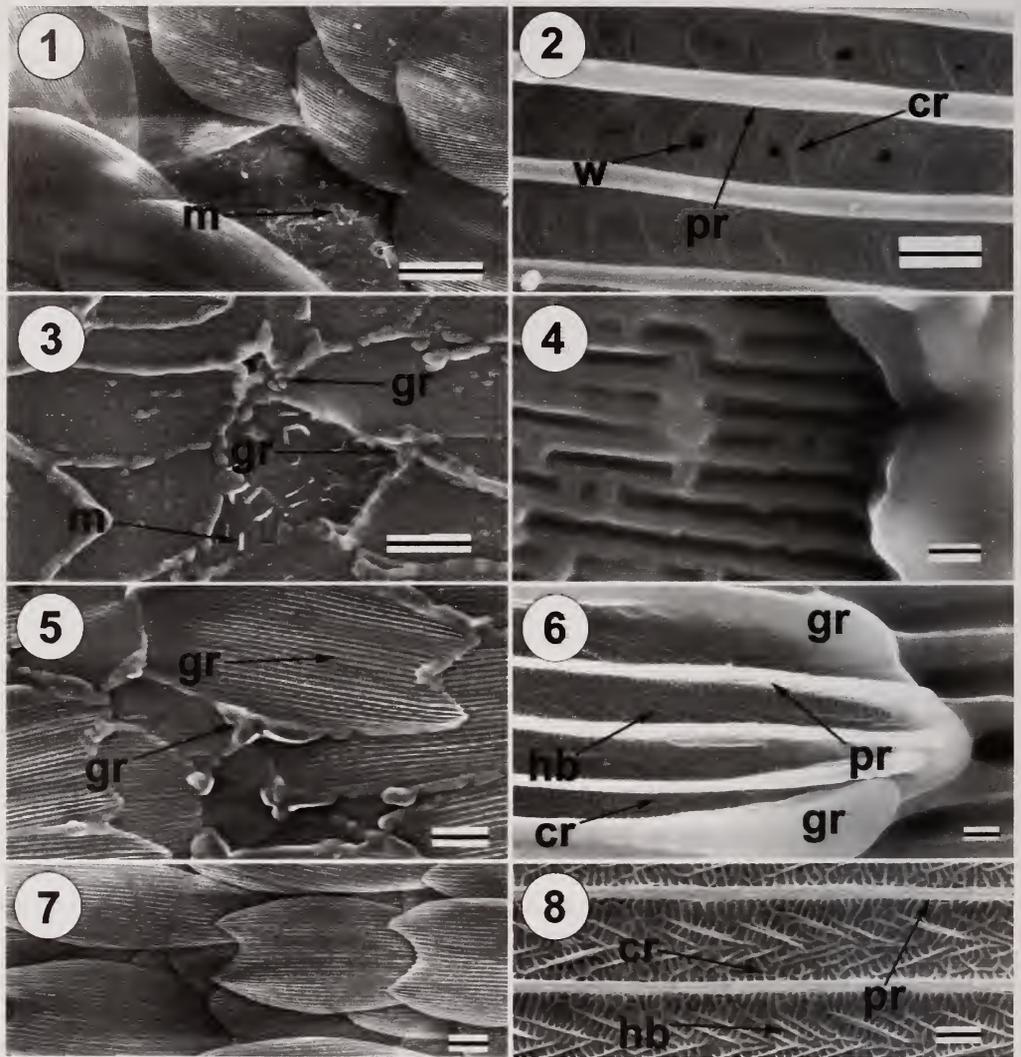
Résumé. Les conséquences ultrastructurelles du „graissage des ailes“ de spécimens de lépidoptères déshydratés sont examinées et décrites pour deux cas (Agathiphagidae: *Agathiphaga vitiensis* Dumbleton, 1952 et Hepialidae: *Hepialus humuli* (Linné, 1758)). L’ultrastructure des écailles alaires et de la surface alaire sont fortement obscurcis.

Key words: Lepidoptera, wing scales, specimens, collections.

Greasiness in dried Lepidoptera is well known among lepidopterists as a very irritating phenomenon which can literally ruin collection specimens. It is due to fats exuding from the animals fat body, and it is most common in taxa with boring larvae (Wolff 1934). Not only does the phenomenon alter the overall appearance of the wing colours and patterns, hence making the specimen useless for macroscopical pattern/colour diversity studies; the phenomenon also obscures the fine details of the wing surface and of the wing scales. However, little attention has been given to the ultrastructural consequences of the grease. This note unveils some of these consequences as seen with the scanning electron microscope, and reports on the effects of cleaning the wings with organic solvents.

Dorsal forewing sectors from one greasy and one clean specimen of male *Hepialus humuli* (Linnaeus, 1758) and one greasy specimen of *Agathiphaga vitiensis* Dumbleton, 1952 were examined in a JEOL JSM-840 scanning electron microscope (SEM). Another forewing sector of the same *A. vitiensis* specimen was first cleaned in absolute ethanol (18 hours), subsequently in benzol (12 hours) and finally freeze dried before it was examined with SEM. The cleaned *A. vitiensis* wing sector was freeze dried to make sure that all benzol was removed from it before coating it with gold in a sputter coater (standard SEM preparation procedure). This may not be necessary when using some newer sputter coaters, but since especially some older models require totally dry material, I choose this extra step in the procedure.

The results demonstrate a remarkable difference between the greasy and the cleaned *H. humuli*. In the clean specimen (Figs. 1-2) sculptures such as longitudinal ridges, windows



Figs. 1–8. 1–4: *Hepialus humuli*. 1 – Clean wing scales and wing surface with microtrichia (m); 2 – Detail of 1 with windows (w), primary ridges (pr) and cross ribs (cr); 3 – Greasy (gr) wing scales and wing surface; 4 – Detail of 3. 5–8: *Agathiphaga vitiensis*. 5 – Greasy wing scales, note that some pr, cr and herring bone crests (hb) are visible; 6 – Detail of 5. 7 Cleaned wing scales; 8 – Detail of 7. (Reference bars: 1, 3, 5, 7 = 20 μm . 2, 6, 8 = 1 μm . 4 = 2 μm).

and cross ribs on the scales and microtrichia (Downy & Allyn 1975, Ghiradella 1998) on the wing surface are clearly visible. In the greasy specimen (Figs. 3–4), however, almost no scale ultrastructure is visible and even the microtrichia are largely obscured. The *A. vitiensis* specimen illustrated in Figs. 5–6 is not as heavily greased as the *H. humuli* specimen; on parts of the wing scale surface sculptures such as longitudinal ridges and herring bone crests (Kristensen 1970; Common 1973; Simonsen & Kristensen *in prep.*) are visible. After cleaning as described all the wing scale sculptures are visible again (Figs. 7–8).

In both examples the most conspicuous greasing effect is a deposition of fat along the scale margins. Such fat deposits are likely to occur at a rather early stage of greasiness development in preserved specimens, and their presence indicate that cleaning (e.g. as described) is mandatory before reliable ultrastructural observations can be made. It must be emphasised that moderate greasiness is *not* always obvious from low-magnification observation of Lepidoptera specimens.

References

- Common, I. F. B. 1973. A new family of Daconypha (Lepidoptera) based on three new species from Southern Australia, with notes on *Agathiphaga*. – J. Aust. ent. Soc. 12: 11–23.
- Downy, J. C. & A. C. Allyn 1975. Wing-scale morphology and nomenclature. – Bull. Allyn Mus. 31: 1–32.
- Ghiradella, H. 1998. Hairs, bristles, and scales. - *In*: Harrison, [init.] & Locke, M. (eds.). Microscopic Anatomy of Invertebrates, Vol. 11A: 257–287. Wiley-Liss, Inc.
- Kristensen, N. P. 1970. Morphological observations on the wing scales in some primitive Lepidoptera (Insecta). – J. Ultrastruct. Res. 30: 402–410.
- Wolff, N. L. 1934. Rensning af fedtede sommerfugle. – Ent. Meddr 14(3): 140–142 (in Danish)