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Mimicry in the larva of the pine hawkmoth *Hyloicus pinastri* (Lepidoptera : Sphingidae) ?

Alexander Pelzer

Dorfstraße 20, D-3015 Wennigsen-Sorsum, Bundesrepublik Deutschland

Zusammenfassung

Mimikry bei der Raupe des Kiefernschwärmers (*Hyloicus pinastri*) (Lepidoptera : Sphingidae) ? Die erwachsene Raupe des Kiefernschwärmers zeichnet sich durch eine schwarze Intersegmentalhaut zwischen dem Kopf und dem ersten Thorakalsegment aus. Diese schwarze Haut wird bei Störungen dem Angreifer präsentiert. In ganz ähnlicher Weise droht die Raupe des Kiefernspinners (*Dendrolimus pini*) (Lepidoptera : Lasiocampidae) mit ihren schwarzblauen Brennhaaren, die sich in Hautfalten auf dem Meso- und Metathorax befinden. Die etwa gleich großen Raupen beider Arten besetzen den gleichen Lebensraum — wobei *H. pinastri* jedoch deutlich seltener ist — und sind den gleichen potentiellen Freßfeinden ausgesetzt.

Résumé

Mimétisme de la chenille du Sphinx du Pin (*Hyloicus pinastri*) (Lepidoptera : Sphingidae) ? La chenille adulte du Sphinx du Pin se distingue par une peau intersegmentaire noire entre la tête et le premier segment thoracique. Cette peau noire est présentée à l'agresseur qui dérange l'animal. La chenille du Bombyx du pin (*Dendrolimus pini*) (Lepidoptera : Lasiocampidae) «menace» de façon très semblable avec les poils urticants bleu-noir qui se trouvent dans les replis de la peau sur le méso- et le métathorax. Les chenilles à peu près de même taille de ces deux espèces occupent le même biotope — celle de *H. pinastri* étant toutefois nettement plus rare — et sont exposées aux mêmes prédateurs potentiels.

Protective displays in larvae of the lepidopterous family Sphingidae are very well known ; displaying larvae are figured in many textbooks. Perhaps with the exceptions of *Hyles euphorbiae* (Linnaeus, 1758) and *H. nicaea* (Prunner, 1798), European hawkmoth larvae are palatable to vertebrate predators, especially birds.

There are two principal types of protective displays within the family. In the first type, the larva bends its head ventrally under the thorax and tucks it between its thoracic legs, while haemolymph pressure inflates the thorax like a balloon. This is the 'classical' sphinx-like position as adopted by e.g. the larva of the privet hawkmoth, *Sphinx ligustri* LINNAEUS, 1758 (POULTON, 1885). Often, it is not accompanied by specialised thoracic markings.

In the second type, the head is withdrawn into the thorax, thus enlarging the metathoracic and first abdominal segments. These segments are commonly marked with 'eye spot' patterns which become conspicuous during the process. The result is a certain similarity to a small snake, which can be most convincing for a human observer (e.g. in the South American *Leucorampha ornatus*; MOSS, 1920). Additionally, the molested larva will often drop from its foodplant, and it may jerk around with fish-like movements.

In species with strictly tree-dwelling larvae camouflage seems to be more important than pseudo-aggressive display. In these species, protective displays are much reduced. The larvae will not drop from the plant, but may perseveringly try to bite a curious aggressor when actually touched.

The protective display of the full-grown larva of the pine hawkmoth, *Hyloicus pinastri* (LINNAEUS, 1758), does not fit into any of these categories. On disturbance, intrathoracic haemolymph pressure only separates the head from the thorax, stretching the intersegmental membrane between head and first thoracic segment (Fig. 1). This membrane is black, a unique feature among European hawkmoths (*). The larva will not bite, but will always twist around to present its black nape to the intruder. This behaviour is quite different from that of other European sphingids. However, it closely resembles the protective display of Lasiocampidae, which is enforced by urticating hairs.

In common with other members of its family, the larva of the pine lappet, *Dendrolimus pini* (LINNAEUS, 1758) (Lasiocampidae), possesses urticating hairs in membraneous folds on the meso- and metathoracic segments. They are black with a strong bluish sheen. When slightly disturbed, the larva bends its head ventrally under the thorax and tucks it between the thoracic legs (this is quite similar to the first display type of sphingids). Now the black folds on the thoracic segments are

(*) There is some circumstantial evidence that the hitherto unknown larva of *Dolbina elegans* A. BANG-HAAS, 1912 may also feed on coniferous plants (*Juniperus* or *Pinus*; own unpublished observations). In this case, its means of defence may be similar.

very conspicuous. If the degree of arousal increases, the metallic bluish hairs may be everted (Fig. 1). When the larva calms down again, the hairs are quickly retracted, but the black folds will still be exposed for some time. — The urticating hairs are obviously very potent repellents, as only few bird species will feed on lasiocampid larvae.

Though the overall optical similarity is not striking, the protective display behaviour of the larva of the pine hawkmoth is very reminiscent of that of a slightly aroused pine lappet larva. The larvae of both species are of about the same size ; they share the same habitat ; they are exposed to the same (vertebrate) predators ; and the larva of the pine hawkmoth is much rarer than that of the pine lappet. It is, therefore, very probable that the hawkmoth larva gains at least some advantage from its resemblance to the lappet larva : all formal requirements for Batesian mimicry (WICKLER, 1973) are fulfilled !

Fig. 1. Protective displays of last instar larvae of the pine hawkmoth (*Hyloicus pinastri*, Sphingidae ; left) and of the pine lappet (*Dendrolimus pini*, Lasiocampidae ; right). Note black intersegmental membrane behind head in the hawkmoth larva and bands of dark urticating hairs on thorax of the lappet larva.

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