The variability of larval coloration patterns of *Agraylea multipunctata* in a population from Belgium (Trichoptera: Hydroptilidae)

Ph. Stroot

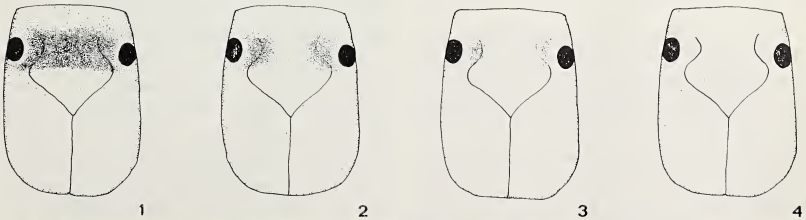
STROOT, PH., 1989. THE VARIABILITY OF LARVAL COLORATION PATTERNS OF *AGRAYLEA MULTIPUNCTATA* IN A POPULATION FROM BELGIUM (TRICHOPTERA: HYDROPTILIDAE) – *ENT. BER., AMST.* 49 (10): 157-160

Abstract: The variability of larval coloration patterns of *Agraylea multipunctata* is described in a population from a Belgian pond. The observed variation in coloration leads to a confusion of the darkest specimens with *A. cognatella* larvae. As the only morphologic distinctive character given by Solem (1972) was contested elsewhere, both species should be regarded as not distinguishable at their larval stages. Moreover, an adult male specimen from Norway, which is intermediate between *A. multipunctata* and *cognatella*, suggests that the status of these species remains questionable, differences between male adults also appearing less clear-cut as first assumed.

Unité d'Ecologie des Eaux Douces (UNECED), Facultés Universitaires de Namur, rue de Bruxelles, 61, B-5000 Namur, Belgium.

Introduction

In recent years, some *Agraylea* larvae closely resembling the description of *A. cognatella* McLachlan, 1880 (Solem, 1972) have been caught in various Belgian localities. However, all the adults recorded from Belgium were identified as either *A. multipunctata* Curtis, 1834 or *sexmaculata* Curtis, 1834 (Stroot, 1987), the two other European species of the genus. *A. cognatella* appears to be a more northern species, particularly well represented in Norway, Sweden and further eastward, in spite of its alleged occurrence in southern Germany (Tobias & Tobias, 1981). Struggling with this problem, I had the opportunity to study a collection of 90 larvae and 106 pupae of *Agraylea* from a single pond, Tweeling, in Eke, Belgium (24.iv-25.vi.1986, D. Roels, coll. Institut royal des Sciences naturelles de Belgique). On account of 28 mature male pupae, of which some specimens were checked by P. Wiberg-Larsen (Ribe Amstrad, Denmark), the material was assigned to *A. multipunctata* despite some differences in the coloration patterns of larval exuviae. This identification is consistent with other features of the larvae examined, namely the presence of a brush of hair-like setae on the edge of the left mandible, thought to be absent in *A. cognatella* (Solem, 1972), and the lack of the typical pairs of dark spots shown by *A. sexmaculata* (Jacquemart, 1958; Barnard, 1971).



Figs. 1-4. *Agraylea multipunctata*, head-capsules of larvae in dorsal view; Tweeling, Belgium, 15.v.1986.

Table 1. Distribution of the 90 larvae and 106 larval exuviae of *A. multipunctata* in the four coloration classes (see text); classes (1) to (4) correspond to figs. 1 to 4.

	Larvae				Larval exuviae			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
April 24	5	8	34	3	0	0	3	0
May 15	1	3	22	5	4	16	70	0
June 6	0	0	1	0	0	1	3	0
June 25	0	2	6	0	1	4	4	0
Total	6	13	63	8	5	21	80	0
Percentage	7	14	70	9	5	20	75	0

The coloration variability of the larvae in the population from Eke, Belgium, is described below; attention has particularly been paid to the head and thoracic nota, largely used in specific identification.

Larval coloration in *A. multipunctata*

Head and thoracic sclerites of larvae and larval exuviae rather uniformly plain straw coloured to slightly deeper yellow with well marked dark areas. Darkest specimens with a large blackish area between eyes (fig. 1) and two smaller ones ventrally near proximal border of head; thoracic nota darker than ground colour of head, with blackish band posteriorly and paler area at anterior third, especially visible on pronotum. Intermediate specimens with two more or less distinct dark spots corresponding to lateral edges of larger blackish area situated between eyes of darkest larvae (figs. 2-3), other dark zones appearing very faint; thoracic nota more uniform with at the most a slightly darker posterior band. The only dark feature of the lightest specimens (fig. 4) is the prominent black border running laterally and posteriorly around pronotum, also visible in all darker larvae.

In order to quantify this variation, the material was arbitrarily divided into four classes according to coloration of the head-capsule:
(1) one continuous dark area between eyes (fig. 1);
(2) two faintly connected dark spots between eyes (fig. 2);
(3) two distinct dark spots between eyes (fig. 3);
(4) no dark spot at all on dorsal surface of head (fig. 4).

The results (table 1) reveal a predominance of the intermediate forms, particularly the one with two distinct spots (at least 70%); light and very dark specimens represent each about 5% of the population.

Discussion

The proportions of individuals in the 4 classes of coloration appear about concordant for larvae and larval exuviae. Besides the very light-coloured larvae, supposed to have just moulted (there are no such light-coloured exuviae), the variability observed in the coloration patterns of *A. multipunctata* is thus largely due to individual differences in the intensity of pigmentation.

More important is the incidence of such a variability in colour pattern on the reliability of specific identifications of *Agraylea* larvae, especially those of *multipunctata* and *cognatella*. According to the coloration pattern, which appears as the main criterion in Solem's key (1972), only about 80% of our larvae would correctly be identified as *A. multipunctata*, the other being either particularly doubtful or even taken for *A. cognatella*. This confusion is due to the overlap in the coloration patterns of the darkest specimens of *A. multipunctata*, also noticed by Nielsen (1948) in a Danish lake, and the *A. cognatella* larva described by Solem (1972). Moreover, our specimens showed a blackish margin around the pronotum, a feature first attributed to *A. cognatella* and *sexmaculata*. Our observations thus point out

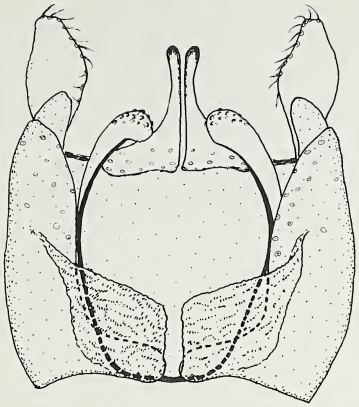


Fig. 5. *Agraylea cognatella*, male genitalia in dorsal view (aedeagus removed); Talvik, Norway, 24.vii.1985.

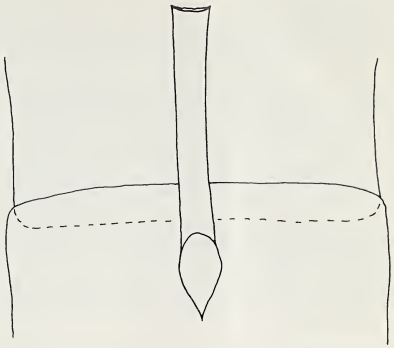


Fig. 6. *Agraylea cognatella*, appendage of male viith sternite in ventral view; Talvik, Norway, 24.vii.1985.

the highly questionable value of coloration features to distinguish *A. multipunctata* and *cognatella*. As the only distinctive character left, the absence of the setae on the left mandible in *A. cognatella* (Solem, 1972), was recently contested by Botosaneanu & Levanidova (1988), we should consider both species as not distinguishable at larval stages.

The close resemblance between the larvae of *A. multipunctata* and *cognatella* is not surprising considering the similar morphology of the adults, of which the genitalia have been described precisely only these last years (Tobias & Tobias, 1981; Andersen & Wiberg-Larsen, 1987; Botosaneanu & Levanidova, 1988). Despite these recent publications, distinction between male adults does not appear as clear as alleged by their authors. Indeed, Malicky (in litt.) found in a population from an Austrian lake that the ventral appendage of the viith segment, one of the three main distinctive criteria (Botosaneanu & Levanidova, 1988) was extremely variable. Moreover, we observed intermediate genital characteristics on a male *Agraylea* caught in Talvik, Norway (24.vii.1985, G. K. Langohr, coll. IRSNB). According to Wiberg-Larsen (in litt.), this specimen definitely belongs to *A. cognatella*, although it differs from all figured specimens by having the dorsal part of segment ix clearly open (fig. 5), an other feature considered as specific to *A. multipunctata* (Tobias & Tobias, 1981; Andersen & Wiberg-Larsen, 1987; Botosaneanu & Levanidova, 1988). Without denying the possibility of anomalies – a clear anomaly was observed on *A. cognatella* by Botosaneanu & Levanidova (1988) – these arguments show that the differences between the adults are not as clear-cut as presented in recent papers and suggest, as thought by Malicky (in litt.), that the status of *A. cognatella* (see Andersen & Wiberg-Larsen, 1987) may be not definitively settled yet. As proposed already by Marshall (1979), a thorough study should be made of all records refered to *A. multipunctata* and *cognatella* in order to specify the limits of individual and geographic variability.

Acknowledgments

I am indebted to Mr. D. Roels (Rijksuniversiteit, Gent, Belgium) and Mr. G. K. Langohr (Simpelveld, The Netherlands) for their gift of material. I am also very grateful to Dr. P. Wiberg-Larsen (Ribe Amstrad, Denmark), who kindly checked my identifications, and to Drs. J. O. Solem (University of Trondheim, Norway), H. Malicky (Biologische Station Lunz, Austria) and L. Botosaneanu (Instituut voor Taxonomische Zoölogie, Amsterdam) for their valuable but conflicting pieces of information and advices.

References

Andersen, T. & P. Wiberg-Larsen, 1987. Revised checklist of NW European Trichoptera. – *Ent. scand.* 18: 165-184.

Barnard, P. C., 1971. The larva of Agraylea sexmaculata Curtis (Trichoptera, Hydroptilidae). – *Entomologist's Gaz.* 22: 253-257.

Botosaneanu, L. & I. M. Levanidova, 1988. Trichoptera Hydroptilidae (Insecta) from Soviet Union far-eastern territories. – *Bull. zoöl. Mus., Amsterdam*, 11: 169-176.

Jacquemart, S., 1958. A propos d'Agraylea pallidula McLachlan (Trichoptera, Hydroptilidae). – *Bull. Inst. r. Sci. nat. Belg.* 34 (14): 1-4.

Marshall, J. E., 1979. A review of the genera of the Hydroptilidae (Trichoptera). – *Bull. br. Mus. nat. Hist. (Ent.)* 39: 135-239.

Nielsen, A., 1948. Postembryonic development and biology of the Hydroptilidae. – *Biol. Skr.* 5: 1-200.

Solem, J. O., 1972. The larva of Agraylea cognatella McLachlan (Trichoptera, Hydroptilidae). – *Norsk ent. Tidsskr.* 19: 77-79.

Stroot, Ph., 1987. Faunistic and zoogeographical notes on Trichoptera from Belgium. – *Arch. Hydrobiol.* 110: 195-216.

Tobias, W. & D. Tobias, 1981. Trichoptera Germanica. Bestimmungstafeln für die deutschen Köcherfliegen. – *Cour. Forschungsinst. Senckenberg* 49: 1-672.

Accepted 2.vi.1989.