Descriptions of unionicolid larvae from three North American unionid bivalves

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Abstract

Four larval types of unionicolid mite from a lake in New York State are described and figured. Three were found in *Lampsilis siliquoidea* (Barnes), one of these also being found in *Elliptio complanata* (Solander). *Anodonta grandis* (Say) contained the fourth type.

Introduction

A large number of mites of the family Unionicolidae are parasitic in bivalve molluscs. Some of these are resident forms whilst others spend only their transforming stages in mussels and are referred to as transient species. A number of both resident and transient species have a parasitic stage, as larvae, on insects (Jones, 1965, 1978) but it is not yet established that all species show this characteristic (Paterson & MacLeod, 1979). According to Hevers (1980a) larvae will transform to nymphochrysalids only if a mussel is entered, the association being obligatory. Hevers (1975, 1980b) and Jones (1978) described most of the larvae of the European species but apart from *U. gracilipalpis* Viets (Prasad & Cook, 1972) descriptions of the larvae of American species are lacking. Mitchell (1955) states that 'Adults and nymphs may be identified to species but larval identifications are, as yet, impossible except through association'.

Several authors have assumed that if only one species of adult mite is found in a particular habitat, then any eggs and immature stages found there can be automatically referred to that species. The present paper illustrates that this is not necessarily so and that a careful comparison of the larvae or other stages found is essential before any accurate idea of the number of species involved can be gained.

It seems desirable therefore to place on record descriptions of mite larvae found in any hosts examined even when their identity is not known.

Methods

The material was collected from Conesus Lake, Livingstone County, West Central New York, 42°46′ N, 77°43′ W. The common species of bivalve which occur in this lake are *Lampsilis siliquoidea* (Barnes), *Elliptio complanata* (Solander) and *Anodonta grandis* (Say). They were collected off Long Point on the mid-western side of the lake to a depth of eight metres, using a hand net in shallow water, and SCUBA diving to reach deeper water.

Gill and mantle tissues, showing mite eggs developed to the hatching stage in the mantle and nymphochrysalids in the gills, were excised from the mussel hosts. Nymphochrysalids provide information about larval structures since they retain their larval skins. Unhatched larvae were also used to measure coxal and excretory plates.

Samples of larvae and nymphochrysalids were cleared in Vitzthum's solution and mounted in Hoyers or Faures medium for detailed examination, measurements and drawings.

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Results

Samples of gill and mantle tissues from seven *L. siliquoidea*, eleven *E. complanata* and one *A. grandis* were examined for mites. Table 1 indicates the results obtained.

Measurements were made on a total of 208 mites and the results are set out as in a previous paper (Jones, 1978) in Table 2, following the terminology of Prasad & Cook (1972).

In all, five different types of larvae were found designated to A to E. By far the commonest was Type A. It was the only larva found in *E. complanata* and comprised about half the larvae in *L. siliquoidea*. It was not found in *A. grandis*. Type B was found in approximately equal numbers to type A in the gill tissue of *L. siliquoidea*. Type C also occurred in the gill tissue but in only one specimen of *L. siliquoidea*. Type D was found in *A. grandis* which provided four specimens all of which appeared to be slightly engorged. A fifth type, E, was a single specimen from mantle tissue of *L. siliquoidea* but was incomplete and is not described.

The types may be distinguished by the features listed in Table 3, tarsal length being the most consistent of these criteria for distinguishing A from B.

Descriptions

Figures 1 to 3. Figure 1 illustrates the main taxonomic features used.

Type A. Excretory pore plate setae insertions form a rectangle with the leading edge of E2 well behind the front of the pore. All E and V setae reaching well beyond rear margin of body. Point of Cp III often forming an isosceles triangle. The line through LP1, MP1 and MP2 on either side forming two parallel rows.

Material examined 152 specimens from *L. siliquoidea* and *E. complanata* (see Table 1).

Type B. Excretory pore plate bristles form trapezium, E1 being closer together than E2. Leading edge of E2 insertion always forward of excretory pore. All E & V setae reach beyond rear margin of body. Point of Cp III narrower than long. Dorsal plate

Table 1. Numbers of Larval types A–E found in bivalve tissue.

	A	B	C	D	E
Lampsilis siliquoidea gill	28	32	18	–	–
Lampsilis siliquoidea mantle	20	1	–	–	1
Elliptio complanata	104	–	–	–	–
Anodonta grandis	–	–	–	4	–
Totals	152	33	18	4	1

Table 2. Measurements of Larval types A–D. All measurements are in μm. Terminology used for the setae and plates based on Prasad & Cook (1972).

Type	A	B	C	D
Length	330–340	310–330	360–405	400–430
Breadth	180–210	160–190	230–250	310–390
Cp. I	99–105	92–105	111–118	105–110
Cp. II + III	155–164	158–168	185–207	168–195
Abst.	32– 34	28– 33	42– 46	36– 42
Tmas	32	23– 25	42– 42	42– 47
Excretory plate				
Long	32– 38	34– 36	36– 42	32– 42
Wide	25– 30	25– 29	32– 36	27– 34
Front to E1	9– 11	11– 13	11– 15	6– 11
Front to E2	23– 27	22– 25	25– 32	21– 34
Front to pore	21– 21	23– 26	21– 32	21– 30
E1–E1	15– 17	12– 15	19– 21	13– 19
E2–E2	16– 18	17– 18	19– 23	17– 20
Capitulum				
Long	74– 78	74– 75	80– 97	102–105
Wide	55– 69	53– 63	84– 90	63– 65
Claw	27– 32	32– 32	32– 42	39– 40
Legs				
I 4	53– 59	50– 50	61– 66	55– 63
5	63– 71	59– 63	80– 84	66– 74
II 4	65– 68	60– 60	80– 80	84– 88
5	90– 95	84– 90	109–113	99–107
III 4	67– 74	63– 65	80– 85	84– 88
5	95–101	84– 92	116–124	105–111
Dorsal plate				
Long	290–310	280–290	350–355	400
Wide	130–145	130–135	200–200	180
Front to LP1	18– 21	17– 19	16– 19	11
Front to MP1	25– 29	25– 27	25– 27	21
Front to LP2	44– 46	40– 46	42– 42	42
Front to MP2	67– 78	71– 74	67– 71	63
LP1–LP1	47– 53	44– 47	59– 59	51– 55
MP1–MP1	48– 55	46– 49	63– 63	60
LP2–LP2	84– 97	82– 85	105–113	106–110
MP2–MP2	50– 57	46– 50	74– 76	61– 65

Table 3. Characteristics used to distinguish types.

Type A	Type B	Type C	Type D
Dorsal plate 300 ± 10 μm long Line thru' LP1 MP1 & LP2 parallel	Dorsal plate 285 ± 5 μm long Line thru' LP1 MP1 & LP2 parallel	Dorsal plate 352 ± 5 μm long Line thru' LP1 MP1 & LP2 diverging	Dorsal plate more than 395 μm long Line thru' LP1 MP1 & LP2 diverging
E1 E2 insertions form a rectangle	E1 E2 insertions E1 closer together than E2	E1 E2 insertions form rectangle	E1 E2 insertions form rectangle
E2 leading edge well behind front of pore	Leading edge of E2 level with or in front of front of pore	Leading edge of E2 level with or behind front of pore	Leading edge of E2 level with or behind front of pore
Fifth segment of leg III 98 ± 4 μm long	Fifth segment of leg III 88 ± 4 μm long	Fifth segment of leg III 120 ± 4 μm long	Fifth segment of leg III 108 ± 4 μm long

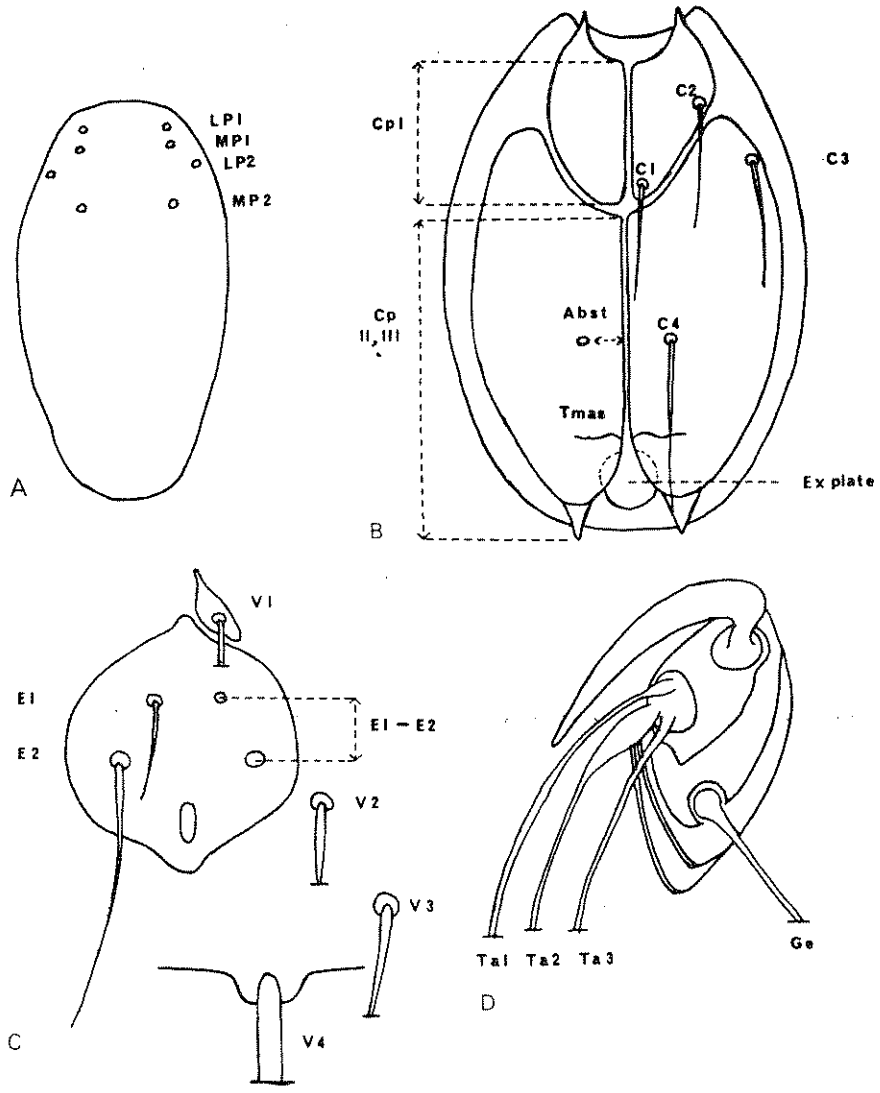

Fig. 1. General features used in the tables and descriptions. A. Dorsal plate; B. Ventral plates; C. Excretory field; D. Left palpus.

bristles LP1, MP1 and MP2 form parallel rows.

Material examined 33 specimens all from *L. siliquoidea.*

Type C. Excretory plate bristles forming an approximate square. Bristles all reaching rear margin of body. The lines LP1, MP1, MP2 diverging very markedly.

Material examined 18 specimens all from one specimen of *L. siliquoidea* gill.

Type D. Excretory plate pointed at rear, and excretory pore touching margin of plate at this point. Excretory setae forming approximate square. Lines LP1, MP1, MP2 diverging.

Material examined 4 specimens of engorged larvae from *A. grandis.*

Discussion

Hevers (1975, 1980b) points out the difficulty of matching the larvae found in mussels to their adult forms. Until adequate larval descriptions are completed this will continue to be a problem. The present paper describes four unionicolid larval types, from three common American unionids.

Although large numbers of eggs, prelarvae and nymphochrysalids occurred in *L. siliquoidea* and *E. complanata,* observations already reported on Conesus Lake unionicolids (Baker, 1982) suggest adult resident mites occur only in *L. siliquoidea* and that all are referable to *U. fossulata* (Koenike). It is reasonable to assume therefore that either larva B or C belongs to this species. Since B occurred in all *L. siliquoidea* examined and C in only one specimen, B appears the more likely candidate.

The larvae found in *L. siliquoidea* appear to belong to four separate types. Mitchell (1955) recorded four species of unionicolids from this host in Michigan, *U. abnormipes, U. serrata, U. aculeata* and *U. fossulata.* None of the mite larvae in this study fit the descriptions of *U. aculeata* given by Hevers (1975, 1980b) or Jones (1978) and the larvae of the other species are yet to be described. Mitchell

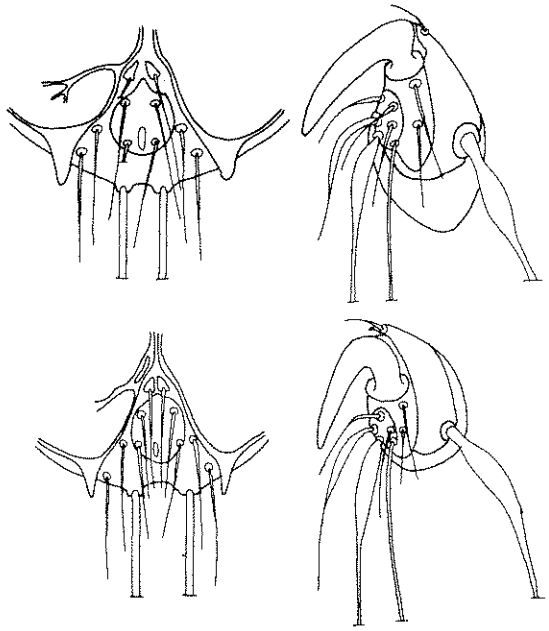

Fig. 2.

	Excretory field	Left palpus
Top	Type A	Type A
Bottom	Type B	Type B

Fig. 3.

	Excretory field	Left palpus
Top	Type C	Type C
Bottom	Type D	Type D

(1955) did not record eggs in the mantle, whereas in *L. siliquoidea* in Conesus Lake, large numbers of eggs occurred in the mantle.

On the evidence available the gills of *L. siliquoidea* harboured types A, B and C and the mantle A, B and E. In Europe according to Hevers (1980a), each species of mussel mite enters a specific region of the mussel and both Mitchell (1955) and Davids (1973) confirm the importance of particular sites within the mussel for the different species of unionicolids present. In the present study however the immature stages of types A and B occur in both the gills and mantle. The suggestion therefore is that some pre and post larval stages of certain mite species may share sites within a mussel and a particular species may occur in more than one region of the bivalve.

Apart from *U. fossulata* which is a resident species, the other larvae presumably belong to species which are not permanently resident in mussels. The identification of types A, C and D should be a simple matter if mussels at this site were to be examined throughout the year, since the adults must enter the mussel at some period in order to lay their eggs.

Further collections and work are needed in order to confirm the identity and permit the description of type E.

It cannot be assumed that the immature stages occurring in mussels in the same habitat all belong to the same species, even if only one species of adult has been found in that habitat. Even a single mussel may contain several species and a morphological examination and comparison is essential if valid conclusions concerning the number of species involved are to be drawn.

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