PREDATION OF FRESHWATER SNAILS BY A LEECH *GLOSSIPHONIA HETEROCLITA*

GRAHAM RIX AND PAT HILL-COTTINGHAM

Segmentina nitida Shining Ram's-horn, is an RDB1 and National Priority Action Plan Species, found only in a single ditch on the Somerset Levels and Moors. Scientifically based conservation requires a knowledge of limiting factors in the ecology or population dynamics of a species. In the process of a study to determine these, I (PH-C) came across the following relevant and more generally interesting relationship.

PREDATION OF *S. NITIDA*

This predation was first observed by chance in September 2001 whilst sorting molluscs from a ditch on one of the Catcott Reserves (Somerset Wildlife Trust).

I did not see the initial encounter, just the later stages in the feeding process.

The anterior end of the leech was inserted into the body whorl and extended so that the head was more than half way round the body whorl and orientated sideways so that the eyes were visible laterally. The pharynx was everted to reach the contracted body of the snail to enable enzymes to be secreted and the digested tissue of the snail to be sucked into the gut of the leech. (Fig. 1) Because of its small size and the dorso-ventral flattening, even the branches of the empty gut can be seen through the body wall. It was therefore easy to watch the semi-digested food moving along the pharynx by peristalsis at intervals.

At first darkly pigmented (grey-black) tissue from the mantle area was ingested and, as the pharynx reached further round into the second whorl, red blood from the heart region was drawn into the gut (as with other Planorbiidae, *S. nitida* has haemoglobin as a respiratory blood pigment).

As material was ingested, branches and sub-branches of the diverticula in the body of the leech were filled and expanded. Once past the heart region more darkly pigmented tissue was ingested and the body of the leech extended in a series of regular expansions to accommodate the food. Finally the pharynx reached into the region of the hepato-pancreas and more blood was ingested. Periodically the pharynx was withdrawn slightly to 'hoover up' particles of tissue floating around in the body whorl. The whole process was awe-inspiringly leisurely and horribly inevitable.

After 30 minutes the inside of the shell was clean and the leech withdrew its body.

The leech, *G. heteroclita* was approximately 4mm contracted to 8.5mm long extended. The *S. nitida* shell was 2mm at its maximum diameter. Klemm (1975) records *S. nitida* as a prey species for this leech.

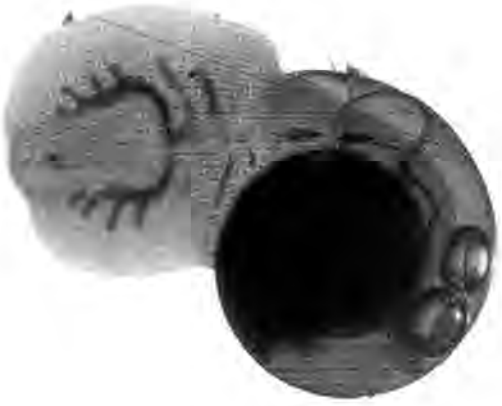

Fig. 1 *Glossiphonia heteroclita* feeding on *Segmentina nitida*; photo Graham Rix

PHOTOGRAPHING THE PREDATION

Following these initial observations, it was decided to set up a camera so that the feeding process could be photographed (GR). Several active *S. nitida* were placed in a glass dish with three specimens of the leech *G. heteroclita* (all with empty guts). A rectangular piece of stiff card roughly twice the area of a microscope stage was perforated to allow illumination from below and attached by elastic to the stage of microscope so that fine adjustment of focus was possible. The camera and lens combination were supported in a vertical position by a tripod, above the card extension of the stage, aligned with the subjects in a small petri dish above the illumination hole. A 40mm standard lens on f22 (manually opened to 2.8 for focusing) was reversed on a 200mm telephoto lens on full aperture (f4). This gives 200/40 = 5x magnification on the film, frame width 7 mm. A long strip of stiff paper was folded into a 45 degree right-angled triangle and the 'hypotenuse' face was placed below the illumination hole facing a horizontally directed bench lamp to provide focusing light. A Pentax 280T flashgun connected to the camera by a dedicated lead permitted 'through the lens' metering off the camera. This was placed near the bench lamp so that it too illuminated the white inclined plane, sending light up through the specimen. Exposure compensation of +1 stop was given to ensure a white background.

It soon became apparent that for the leech to find a snail was a very hit and miss affair. There seemed very little or no chemotaxis and it took about 30 minutes to persuade a leech to attack the snail by guiding them together in the dish. The snail made no effort to escape as the leech crawled over the shell, instead it contracted deep into the body whorl, blowing bubbles as it did so which hampered our ability to see the detail of what was happening. Eventually the leech penetrated the shell aperture and photographs were taken every ten minutes or so to chart the passage of food into the gut of the leech. After two hours, only half the snail had been eaten. By the following morning, however, the shell was empty and the gut of the leech full and darkly pigmented.

SELECTIVE FEEDING BY *G. HETEROCLITA*

It was decided to find out whether *G. heteroclita* feeds preferentially or exclusively on *S. nitida*. Accordingly, on Dec 29, a 10cm patch box was set up containing five specimens each of *Segmentina nitida, Bathyomphalus contortus, Lymnaea palustris, Lymnaea peregra*, and

Table 1 Species predated by *G. heteroclita*

Date	Species eaten	Size (mm)
Dec 29.01	*P. planorbis*	3.8 diam
	P. planorbis	4.1 diam
Dec 31.01	*L. palustris*	2.0 height
Jan 1.02	*S. nitida*	3.9 diam
	S. nitida	3.6 diam
Jan 2.02	*B. contortus*	3.0 diam
	P. planorbis	4.5 diam
Jan 4.02	*B. contortus*	1.9 diam
	P. planorbis	3.7 diam
Jan 6.02	*B. contortus*	3.5 diam
Jan 8.02	*S. nitida*	4.0 diam
	L. palustris	5.0 height
Jan 11.02	*S. nitida*	2.9 diam
	L. peregra	5.0 height
Jan 15.02	*S. nitida*	3.9 diam
Jan 17.02	*L. peregra*	3.5 height
Jan 21.02	*L. palustris*	4.7 height
Jan 22.02	*B. contortus*	3.3 diam
	B. contortus	3.4 diam

Planorbis planorbis. All these species are found in association in the ditch and all are prey to *G. heteroclita*. *Lemna trisulca*, Ivy-leaved Duckweed, was added as food material for all these grazing snails and to act as an oxygen source.

Three specimens of *G. heteroclita* were added. Observations on predation were made daily and the species and size of predated shells recorded. These results are shown in Table 1.

As can be seen from the data, there is no preferential selection by *G. heteroclita* with regard to its prey species, and, because it is found in far fewer numbers than the more common and related *G. complanata* (which has not been recorded as a predator of *S. nitida*) it is a species unlikely to cause any serious effect on the overall population of *S. nitida*, which is present in thousands.

The question remains, therefore, what is the main limiting factor in ditch colonisation by *S. nitida*? Certainly it has been found to require *L. trisulca* to feed on but it also seems to need emergent stems enabling it to climb out of the water. The ditch in which it lives is highly vegetated with emergent *Typha latifolia* and mats of *Agrostis stolonifera* which have to be penetrated by the net to take a sample. In addition, during the summer, the water level falls to a few centimetres. This late-succession state, renders ditches almost useless as a stock barrier. The rarity of this snail, therefore, may well be a consequence of modern ditch management as 'wet hedges'. What is certain, however, is that it pays to keep one's eyes open and seize on opportunities as they arise.

ACKNOWLEDGEMENT

The observations described in this article were made during research for a PhD by Pat Hill-Cottingham under the supervision of Dr Eric Bowers of the Department of Biological Sciences, Open University.

REFERENCE

Klemm, D.J., 1975. 'Studies on the feeding relations of leeches (Annelida Hirudinea) as natural associates of mollusks', *Sterkiana* 58, 1–50, 59, 1–20.