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Notes on Snail Feeding Behavior of Anaxjunius (Drury): (Odonata)

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Synopsis: A naiad of *Anax junius* (Drury), in final instar, preyed upon 47 mature snails, *Helisoma trivolvis* (Say), during a period of 63 days. The feeding behavior has potential significance: (1) with respect to biological control of trematode vectoring gastropods; (2) as a mechanism for vectoring trematodes between snails and birds; and (3) in interpreting structural adaptations and perception in immature odonates.

In rearing the final instar of *Anax junius* in the laboratory, predation upon 47 mature snails, *Helisoma trivolvis,* was observed over a period of 63 days. Although *Anax* has been previously reported (Needham and Hart, 1901) feeding on gastropods, this is the first instance of this snail genus being involved in the predator-prey relationship. Although the mean feeding rate was approximately one snail every 36 hours, feeding was irregular. Occasionally the naiad consumed three snails in a 24-hour period. Personal communication with several authorities (Bick, Corbet, Macklin, Montgomery) together with the paucity of published information argued for recording this behavior.

The biological control of trematode-vectoring snails makes information on predators of vector snails significant (Sohn and Komicker, 1972). Records of predator-prey encounters between snails and dragonflies are very rare (Table 1 & 2). Past investigators have usually identified the predator, and/or the prey, only to genus.

TABLE 1. Gastropod Genera Preyed Upon by Anisoptera

Genus	*Source*
Amnicola	(Needham and Hart, 1901)
Helisoma[a]	(new record)
Lymnea (?)[a]	(Williams, 1936)
Melania[a]	(Williams, 1936)
Physa[a]	(Needham and Hart, 1901)

[a]Known to host *Schistosoma sp.*

TABLE 2. Anisoptera Genera Reported to Prey Upon Gastropods

Genus	*Source*
Anax	(Needham and Hart, 1901)
Aeshna[a]	(Pfau, 1967)
Epicordulia	(Needham and Hart, 1901)

[a]Preyed only on the eggs of snails.

The potential importance of predator-prey relationships in regulating trematode parasites can be illustrated by comparing the trematodes found in gastropods known to serve as food for anisopterans with trematodes found in anisopterans (Table 3 & 4). Such comparisons indicate that nearly all trematode records taken from dragonflies come from pond-dwelling families and genera. The trematode *Prosthogonimus macrorchis* can be vectored to birds by a snail and/or a naiad or mature dragonfly (Biester and Schwarte, 1948; Becklund, 1964). The primary hosts of the trematode *Collyriclum faba* are unknown, but a gastropod-odonate vector is suspected (Riley, 1931). In the last two instances dragonflies serve as intermediate host vectors of snail parasites and thus predation might be ineffective in controlling certain trematodes with an obligatory or facultative mollusk-arthropod relationship. On the other hand, the majority of the genera of snails serving as prey for dragonflies also serve as hosts for trematodes such as *Schistosoma*. *Schistosoma* has not been taken from any known dragonfly hosts (Doss and Farr, 1969). Predation in this instance might be helpful in regulating trematode populations of this type.

TABLE 3. Trematodes Common to Dragonflies, Snails and Birds[a]

Host	*Species of Trematode*			
Snail	*Apatemon gracilis*	*Halipegus occidualis*	*Prosthogonimus macrorchis*	*Collyriclum faba*
Amnicola	–	–	X	?
Helisoma[b]	X	X	–	?
Physa	X	X	–	?
Dragonfly				
Aeshna	X	–	–	?
Epicordulia	–	–	X	?
Erythemis	–	–	X	?
Gomphus	–	–	X	?
Leucorrhinia	–	–	X	?
Libellula	–	X	?	?
Mesothemis	–	–	X	?
Tetragoneuria	–	–	X	?
Bird				
Agelaius phoenicus	–	–	X (Ellis, 1963)	X
Corvus cornix	–	–	–	X
Gallus gallus	–	–	X	X
Ixoreus naevis	–	–	–	X

[a]Compiled from *Index-Catalogue of Medical and Veterinary Zoology, Parts 11, 12 and Supplement 17.* 1969.
[b]*Helisoma trivolvis.*
X Indicates host-parasite relationship
– Indicates no reported host-parasite relationship
? Indicates a possible host-parasite relationship

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TABLE 4. ANISOPTERAN GENERA KNOWN TO HOST TREMATODES[a]

Family	*Genus*
Gomphidae	*Dromogomphus*
	Gomphus
	Ophiogomphus
Aeshnidae	*Aeshna*
	Anax
Libellulidae	*Celithemis*
	Cordulia
	Epicordulia
	Erythemis
	Leucorrhinia
	Libellula
	Mesothemis
	Pachydiplax
	Perithemis
	Plathemis
	Somatochlora
	Sympetrum
	Tetragoneuria

[a]Compiled from *Index-Catalogue of Medical and Veterinary Zoology*, Parts 11 and 12. 1969.

Williams (1936) reported that *Anax strenuus* broke up shells of large gastropods during predation while smaller gastropods were swallowed whole. In such instances fragments of gastropod shells were found within the alimentary canal of the naiads involved. This appears not to be the case in *Anax junius*. The latter "peels" the snail from its shell, using the labium and mandibles in a manner not clearly understood, but leaving the shell intact.

In analyzing the predation upon snails by naiads, senses other than sight perception may be involved (Corbet, 1962). This complicates the visual model often used in explaining predation in immature odonates.

If dragonfly naiads feed on snails, they must play some role in controlling snail density. The exact role they play in regulating snail populations has yet to be studied. One can only speculate as to the possible usefulness dragonflies may serve as agents of trematode control. An additional complexity is that the naiad or adult may also act as an intermediate host between snail and bird (or other prey). Of possible additional significance is the use of snails in behavioral experimentation, particularly in resolving problems of prey location by naiads. Such explorations may also prove useful in indicating some functional significance to the variations observed in the labia of various species of anisopterans.

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LITERATURE CITED

BECKLUND, W. W. 1964. Revised checklist of internal and external parasites of domestic animals in the United States and Possessions and in Canada. *Amer. J. Vet. Res.* 25:1380-1416.

BIESTER, H. E., and L. H. SCHWARTE. 1948. Trematodes of poultry, p. 839-861. *In* H. E. Biester and L. H. Schwarte, *Diseases of poultry*. Ia. St. Coll. Press, Ames.

CORBET, P. S. 1962. The larval stage: general, p. 47-89. *In* P. S. Corbet, *A biology of dragonflies*. Witherby, London.

DOSS, M. A., and M. M. FARR. 1969. *Index-catalogue of medical and veterinary zoology:* Part 11 and 12. U.S. Gov't. Print. Office.

ELLIS, C. J. 1963. Trematodes of passerine birds from Chickasaw County, Iowa. *Proc. Iowa Acad. Sci.*, 70:486-492.

NEEDHAM, J. G., and C. A. HART. 1901. The dragonflies (Odonata) of Illinois: Part 1. Petaluridae, Aeshnidae and Gomphidae. *Ill. St. Lab. Natur. Hist.* 6:1-95.

PFAU, H-K. 1967. A larva of *Aeshna cyanea* eats gastropod eggs. *Tombo*. 10:25.

RILEY, W. A. 1931. *Collyriclum faba* as a parasite of poultry. *Poultry Sci.* 10:204.

SOHN, I. G., and L. S. KORNICKER. 1972. Predation of schistosomiasis vector snails by Ostracoda (Crustacae). *Science* 175:1258-1259.

WILLIAMS, F. X. 1936. Biological studies in Hawaiian water-loving insects: Part II. Odonata or dragonflies. *Hawaiian Ent. Soc., Proc.* 9:273-349.