26. STUDIES ON THE BIOLOGICAL CONTROL OF TWO COMMON VECTOR SNAILS OF PUNJAB BY PREDATORY INSECTS

8 species of aquatic insects have been screened for their predatory activity against two species of snails viz. *Limnoea luteola* and *Indoplanorbis exustus*. Larvae of *Hydaticus* sp. are the most efficient predators of *L. luteola* as they consumed 84.3% of the snails exposed to them and the other species in decreasing order ranked as follows, *Laccotrephes ruber* (70%), *Diplonychus rusticum* (43.3%), *Laccotrephes griseus* (40%) and *Lethocerus indicus* (22.2%). *Laccotrephes ruber* is the most efficient predator of *I. exustus* as it consumed 84.3% of the snails and the other species in decreasing order ranked as follows, *Diplonychus rusticum* (60%), *Hydaticus* sp. larvae (52.5%), *Lethocerus indicus* (20%), *Cybister* sp. (18.7%) and *Laccotrephes griseus* (16.6%). *Ranatra elongata* and *Strenolophus* sp. did not feed either on *L. luteola* or on *I. exustus* and *Cybister* sp. did not feed on *L. luteola.*

Introduction

The importance of snails cannot be over emphasised as many of them act as the intermediate hosts of several important diseases of man and livestock namely Schistosomiasis, Fascioliasis and Paramphistomiasis and some are serious crop and garden pests. Their control is, therefore, rather essential. Controlling snails through chemical methods involves large scale dissemination of pesticides or molluscicides which in addition to being expensive may prove hazardous to the health of livestock and man. Studies for the development of alternate methods of snail control are, therefore, quite necessary. The need to develop new methods for the control of medically important snails has also been stressed by the U.S. Parasitic Diseases Panel (Anonymous 1971).

Bequaert (1925, 1926) studied the arthropod enemies of molluscs with particular emphasis on the dipterous parasites of snails. Berg (1953, 1961, 1964a, 1964b, 1973) studied the potential of sciomyzid fly larvae for snail-killing and highlighted their importance for the biological control of snails. The role of sciomyzid fly larvae for the biological control of snails was also stressed by Neff (1964), Neff & Berg (1966), Knutson *et al.* (1967, 1970), Bratt *et al.* (1969), Eckblad (1971), Ferguson *et al.* (1971) and Geckler (1971). The biological control of snails through giant water bug was studied by Somasunderarao (1963), through another belostomatid bug by Voelker (1968) and through *Hydrophilus* beetles by Maillard (1971). Studies on the biological control of snails as such have also been carried out by Chernin *et al.* (1956, 1971) Michelson (1957), Ferguson *et al.* (1956, 1971), Petitjean (1966), Scott (1970), Yasuvaoka (1970) and Muley (1978).

It was, therefore, considered worthwhile to find out the biological control agents from amongst the aquatic insects living in the water bodies inhabited by snails. The present study deals with the assessment of 8 species of aquatic insects for the biological control of two important species of vector snails namely *Indoplanorbis exustus* and *Limnoea luteola.*

Materials and Methods

Eight species of aquatic insects namely *Laccotrephes ruber* Linn., *L. griseus* Guer. and *Ranatra elongata* Fabr. belonging to Nepidae

(Hemiptera); *Diplonychus rusticum* (Fabr.) and *Lethocerus indicus* (Lep. and Serv.) belonging to Belostomatidae (Hemiptera); *Cybister* sp. and *Hydaticus* sp. larvae belonging to Dytiscidae (Coleoptera); and *Sternolophus* sp. belonging to Hydrophilidae (Coleoptera) were used in the experiments and these were collected from the different permanent water bodies of Ludhiana district. Two species of laboratory bred snails i.e. *Indoplanorbis exustus* and *Limnoea luteola* in well established aquaria were exposed to the attack of the above aquatic insects and their rates of snail consumption were recorded. Their interesting behaviour patterns were also photographed. The observations were made over a period of about two weeks.

Results and Discussion

Out of the 8 species of predacious insects used in the present study the larvae of *Hydaticus* sp. ranked first for the control of *Limnoea*

Table 1

Showing the consumption rate of *Limnoea luteola* and *Indoplanorbis exustus* by aquatic insects ..

Sr. No.	Name of insect	Snail species	No. of snails used	No. of snails left unconsumed	Soft mass/ shell consumed	Consumption %
1	2	3	4	5	6	7
1.	*Laccotrephes griseus* Guer.	*Limnoea luteola*	20	12(8)	Only soft mass consumed	40
		Indoplanorbis exustus	18	15(3)		16.6
2.	*L. ruber* Linn.	*L. luteola*	30	9(21)	—do—	70
		I. exustus	32	5(27)		84.3
3.	*Ranatra elongata* Fabr.	*L. luteola*	6	6(0)	—do—	0
		I. exustus	8	5(3)*		
4.	*Diplonychus rusticum* (Fabr.)	*L. luteola*	30	17(13)	—do—	43.3
		I. exustus	30	12(18)		60
5.	*Lethocerus indicus* (Lep. & Serv.)	*L. luteola*	9	7(2)	—do—	22.2
		I. exustus	20	16(4)		20
6.	*Cybister* sp.	*L. luteola*	15	15(0)	—do—	0
		I. exustus	16	12(3)		18.7
7.	*Sternolophus* sp.	*L. luteola*	20	20(0)	—do—	0
		I. exustus	22	20(2)*		0.09
8.	*Hydaticus* sp. larvae	*L. luteola*	70	11(59)	17 shells completely eaten and 50% shells of the rest partly eaten	84.3
		I. exustus	40	19(21)		52.5

N.B. Figures in parenthesis under heading 5 indicate snails consumed.
* Natural death.

luteola as they ate up 84.3% of the snails exposed to their predatory activity. They were found to be voracious feeders of snails as they even ate up the hard shells along with the soft parts. The other species which ranked next in decreasing order were *Laccotrephes ruber, Diplonychus rusticum, Laccotrephes griseus* and *Lethocerus indicus* as they consumed 70%, 43.3%, 40% and 22.2% of the *L. luteola* snails respectively (Table 1). The other 3 species namely *Ranatra elongata, Cybister* sp. and *Sternolophus* sp. did not feed even on a single *L. luteola* snail. *Laccotrephes ruber* has been found to be the most efficient predator of *Indoplanorbis exustus* as it consumed 84.3% of the snails exposed to its predatory activity. The other species namely *Diplonychus rusticum, Hydaticus* sp. larvae, *Lethocerus indicus, Cybister* sp. and *Laccotrephes griseus* consumed 60%, 52.5%, 20%, 18.7% and 16.6% of the *I. exustus* snails respectively. *Ranatra elongata* and *Strenolophus* sp. did not consume any *I. exustus* snail although 3 out of 8 snails & 2 out of 22 snails exposed to them respectively died a natural death. Somasundararao (1963) also studied the predatory activity of *Sphaerodema rusticum* (now called as *Diplonychus rusticum*) and found that 39 bugs destroyed 309 snails in 5 days which worked out to be 45 snails per month for each bug. He further observed that *Limnoea luteola* snails were preferred over *Indoplanorbis corneus* and the latter over *Limnoea accuminata.*

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27. NECROPHAGOUS HABIT IN THE GIANT AFRICAN SNAIL, *ACHATINA FULICA FULICA* BOWDICK

(With a plate)

On the sunny day of 18th August, 1982 at 6.45 A.M. one of us (RMS) saw a house lizard, *Hemidactylus frenatus* Schlegel dying in a cemented open space near the bath room of his house. The lizard was lying upside down. In the vicinity a number of giant African snails, *Achatina fulica fulica* Bowdick were also present. Out of them one snail came towards the lizard, crawled on it from the head end, came upto the lower jaw and started devouring it within a couple of minutes. Initially the lizard moved its limbs but after 15 minutes it became motionless. This feeding was continued upto 8.10 A.M. When the snail retired, skin and flesh of the lower jaw and the neck of the lizard were found to be eaten