

Survey of Terrestrial and Aquatic Malacophagous Insects in Certain Governorates in Egypt

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ABSTRACT

A survey of aquatic and terrestrial malacophagous insects was carried out during 2001-2004 seasons in certain Governorates in Egypt where the molluscs are commonly distributed. This survey revealed the existence of 17 species of aquatic malacophagous insects and 16 species of terrestrial ones; the last group included one species attacking slugs. All these species are considered bio-control agents of harmful snails and thus are recommended to be utilized in this respect.

Key Words: Survey, Land, Aquatic, Malacophagous insects, Egypt.

INTRODUCTION

Molluscs are very prevalent animals in the world. There are about 128000 species of molluscs including approximately 12000 species of pulmonates from both Basommatophora and Stylommatophora (Boss, 1971). Pulmonates and also prosobranchiates cause very severe damage to many agricultural plants (Godan, 1983).

In Egypt, molluscs infest medical and ornamental plants, vegetables, orchard and field crops; causing damages to all plant parts from roots to fruits (EL-Okda, 1979, 80 and 84, Azzam, 1995). Azzam, 1987 and 1995 recorded about 37 species of pulmonates and prosobranchiates in Egypt. Some of these species serve as intermediate hosts for some parasitic diseases which infect humans and farm animals such as *Bulinus truncatus* Audouin, *Biomphalaria alexandrina* (Eherenberg), *Lymnaea caillaudi* Bourguigant and *Lanistes carinatus* Olivier which serve as intermediate hosts for *Schistosoma haematobium* Billarz, *Schistosoma mansoni* Sambon, *Fasciola hepatica* Linnaeus and *Angiostrongylus cantonensis* (Chen), respectively. Kassab and Daoud (1964) surveyed the helicid and subulinid snails and found that *Eobania vermiculata* and *Monacha obstructa* were the most abundant species. Azzam, (2005) recorded two slugs and 17 terrestrial snail species infested 64 plant species including cotton, wheat, sugar beet, citrus, mango, and potato. Azzam and Belal (2005) recorded 20 species of aquatic molluscs; some of them serve as intermediate hosts of very important parasitic diseases which infect human and animals. All terrestrial snails cause damage to their host plants by feeding on leaves, blooms, flowers, fruits, trunks, limbs and even on barks (Kassab and Daoud, 1964). Godan, (1983), emphasized the necessity of controlling such harmful snails. This is predominately achieved by the application of molluscicides which lead to more environmental pollution; thus confirming the great value of looking for other means of control such as biological methods.

Therefore, the present study deals with a survey of the insect natural enemies of both terrestrial and aquatic molluscs as bio-control agents of these harmful pests.

MATERIALS AND METHODS

Terrestrial snails and slugs were collected from the infested plants by hand from Alexandria, Cairo, Giza,

Ismailia and Fayoum Governorates. After identification of molluscs, every species was confined in a terrarium with size suitable to the number of snails. Attacked and moribund snails and slugs were kept individually in glass beakers 50-250 ml according to their sizes, then covered with pieces of perlon gauze secured with rubber bands. Some of these snails were dissected for checking the presence of parasites.

Insect larvae emerged from the molluscs were introduced to healthy lab-bred molluscs to investigate whether they are saprophagous or malacophagous species.

Aquatic snails and their natural enemies were collected from rice fields, irrigation system and the River Nile by using a metallic strainer (22cm in diameter), with aluminum handle could extend from 70 to 200cm. In laboratory, the samples were thoroughly washed by suitable stream of tap water. Each snail species, after being identified was confined into an aquarium. Predators were also kept individually into plastic pots, with some snails for predation test.

Identification of malacophagous insects was made at Department of Entomology, Faculty of Science, Ain Shams University.

RESULTS AND DISCUSSION

Terrestrial and aquatic malacophagous insects collected in this investigation belonged to four orders and presented in Table (1).

A- Aquatic malacophagous insects

Seventeen species of aquatic malacophagous insects were recorded associated with different snail species. *Cybister tripunctatus* v. *africanus* Cast. can predate different species of snails, preferring the ovate shell-shaped ones especially *Bulinus truncatus* and *Physa acuta*. It was also noticed that this beetle devoured egg masses of *B. truncatus* and *Biomphalaria alexandrina*. The other dytiscid species, *Rhantus puleveroses* Steph. and *R. elevatus* Shp., seem to be inactive predators; feeding only on moribund snails. Azzam (1987) recorded the same observation.

Larvae of *Hydrous piceus* L. were found attacking both discoid and ovate shell shaped snails and showed a shell cracker behavior towards the discoid shaped snails. Azzam (1995) reported this behavior for the same larvae on *B. alexandrina* snail

Larvae of the two chironomid species reported in this

Table (1): Aquatic and terrestrial malacophagous insects and their associated snails distributed in different Governorates in Egypt in 2001-2004 (ranked in alphabetic order).

Malacophagous species	Snail species	Governorates	Habitat
Aquatic malacophagous			
Order: Coleoptera			
Fam :Dytiscidae			
<i>Cybister tripunctatus</i> v.	<i>Bellamyia unicolor</i> (Olivier)	Fayoum	Rice fields
<i>afrricanus</i> Cast + <i>Rhantus</i>	<i>Biomphalaria alexandrina</i> (Ehernberg)	Giza	Irrigation system
<i>puleverosus</i> Steph.	<i>Biomphalaria glabrata</i> Say	Giza	Irrigation system
<i>Rhantuss elevatus</i> Shp.	<i>Bulinus forskalii</i> Ehernberg	Fayoum - Giza	Rice fields -Irrigation system
	<i>Bulinus truncatus</i> (Audouin)	Fayoum - Giza	Rice fields - Irrigation system
	<i>Cleopatra bulimoides</i> (Olivier)	Fayoum - Giza	Rice fields - Irrigation system
	<i>Gabbiella senaariensis</i> (Küster)	Fayoum	Rice fields
	<i>Gyraulus ehrenbergi</i> (Beck)	Fayoum	Rice fields
	<i>Lanistes carinatus</i> (Olivier)	Fayoum - Giza	Irrigation system
	<i>Lymnaea collumella</i> Say	Giza	Irrigation system
	<i>Melanoides tuberculata</i> Müller	Fayoum - Giza	Rice fields - Irrigation system
	<i>Physa acuta</i> Draparnaud	Fayoum - Giza	Rice fields - Irrigation system
	<i>Pila ovata</i> (Olivier)	Fayoum	Rice fields
	<i>Valvata nilotica</i> (Jickeli)	Fayoum	Rice fields
Fam : Hydrophilidae			
<i>Hydrous piceus</i> L.	<i>Bellamyia unicolor</i> (Olivier)	Fayoum	Rice fields
	<i>Bulinus forskalii</i> Ehernberg	Fayoum	Rice fields & Irrigation system
	<i>Bulinus truncatus</i> (Audouin)	Fayoum	Rice fields & Irrigation system
	<i>Cleopatra bulimoides</i> (Olivier)	Fayoum	Rice fields & Irrigation system
	<i>Gabbiella senaariensis</i> (Küster)	Fayoum	Rice fields
	<i>Gyraulus ehrenbergi</i> (Beck)	Fayoum	Rice fields
	<i>Lanistes carinatus</i> (Olivier)	Fayoum	Irrigation system
	<i>Melanoides tuberculata</i> Müller	Fayoum	Rice fields & Irrigation system
	<i>Physa acuta</i> Draparnaud	Fayoum	Rice fields & Irrigation system
	<i>Pila ovata</i> (Olivier)	Fayoum	Rice fields
Order : Diptera			
Fam: Chironomidae			
<i>Chironomus</i> spp.	<i>Biomphalaria alexandrina</i> (Ehernberg)	Giza	Irrigation system
	<i>Biomphalaria glabrata</i> Say	Giza	Irrigation system
	<i>Bulinus forskalii</i> Ehernberg	Fayoum - Giza	Rice field - Irrigation system
	<i>Bulinus truncatus</i> (Audouin)	Fayoum - Giza	Rice field - Irrigation system
	<i>Lymnaea cailliuadi</i> Bourguigant	Cairo- Giza	Nile- Irrigation system
	<i>Physa acuta</i> Draparnaud		
Fam ; Stratiomyidae			
<i>Stratiomyia</i> sp.	<i>Biomphalaria alexandrina</i> (Ehernberg)	Giza	Irrigation system
	<i>Biomphalaria glabrata</i> Say	Giza	Irrigation system
	<i>Bulinus forskalii</i> Ehernberg	Fayoum -Giza	Rice field - Irrigation system
	<i>Bulinus truncatus</i> (Audouin)	Fayoum - Giza	Rice field - Irrigation system
	<i>Lymnaea cailliuadi</i> Bourguigant	Cairo - Giza	Nile -Irrigation system
	<i>Physa acuta</i> Draparnaud	Fayoum - Giza	Rice field - Irrigation system
Fam : Tabanidae			
<i>Atylotus agrestis</i> Wied	<i>Biomphalaria alexandrina</i> (Ehernberg)	Giza	Irrigation system
Order : Odonata			
Fam : Aeschnidae			
<i>Anax imperator</i> Leach	<i>Bulinus forskalii</i> Ehernberg	Fayoum -Giza	Rice fields -Irrigation system
<i>Hemianax ephippiger</i> Selys	<i>Bulinus truncatus</i> (Audouin)	Fayoum -Giza	Rice fields -Irrigation system
<i>Pantala flavescens</i> Hagen	<i>Cleopatra bulimoides</i> (Olivier)	Fayoum -Giza	Rice fields -Irrigation system
Fam : Coenagrionidae			
<i>Ischnura sensgalensis</i> Ramb.	<i>Gabbiella senaariensis</i> (Küster)	Fayoum	Rice fields
<i>Pseudagrion torridum</i> Sleys	<i>Gyraulus ehrenbergi</i> (Beck)	Fayoum	Rice fields
Fam : Libellulidae			
<i>Brachythemis leucosticta</i> Burm	<i>Lanistes carinatus</i> (Olivier)	Fayoum	Rice fields
<i>Crccothemis erythraea</i> Brulle	<i>Lymnaea collumella</i> Say	Fayoum -Giza	Rice fields -Irrigation system
	<i>Melanoides tuberculata</i> Müller	Fayoum -Giza	Rice fields -Irrigation system
	<i>Physa acuta</i> Draparnaud	Cairo -Fayoum-Giza	Nile -Rice fields - Irrigation system
	<i>Pila ovata</i> (Olivier)	Fayoum	Rice fields

Table (1): Continued

Malacophagous species	Snail species	Governorates	Habitat
Terrestrial malacophagous			
Order : Coleoptera			
Fam :Cicindelidae <i>Cicindela aulica</i> Dej.	<i>Monacha obstructa</i> (Ferussac) <i>Pirnella conica</i> (Blainville)	Ismaeiliya Ismaeiliya	Ornamental plants -Orchard Shore plants
Order : Diptera			
Fam :Drosophilidae <i>Drosophila</i> spp.	<i>Eobania vermiculata</i> (Müller) <i>M. obstructa</i>	Cairo -Giza Giza	Ornamental plants-Orchard-Vegetables Ornamental plants-Orchard-Vegetables
Fam :Phoridae <i>Megaselia rufipes</i> Meg.	<i>E.vermiculata</i> <i>Monacha cartusiana</i> Müller	Alexandria-Cairo- Giza Fayoum - Giza	Ornamental plants - Orchard-Vegetables
<i>Megaselia scataris</i> (Loew) + <i>Megaselia</i> spp.	<i>E.vermiculata</i> <i>Eremina</i> sp. <i>Helicella caperata</i> (Montago). <i>Helicella</i> sp. <i>Helicella vestalis</i> (Pfeiffer) <i>Helix aspersa</i> Müller <i>Helix pomatia</i> L. <i>M. obstructa</i> <i>M.cartusiana</i> <i>Theba pisana</i> (Müller) <i>Theba</i> spp.	Alexandria -Giza Giza Alexandria Alexandria -Cairo Alexandria Alexandria Giza Alexandria -Cairo- Fayoum- Giza Fayoum -Giza Alexandria Alexandria -Cairo	Field crops - Ornamental plants – Orchard - Vegetables Orchard -Desert grass Ornamental plants -Orchard-Vegetables Ornamental plants -Orchard-Vegetables Ornamental plants Ornamental plants Desert grass Field crops-Ornamental plants -Orchard- Vegetables Field crops –Vegetables Field crops-Ornamental plants -Orchard- Vegetables Ornamental -Orchard
Fam: Piophilidae <i>Piophila</i> sp.	<i>M.obstructa</i> <i>M. cartusiana</i>	Giza Giza	Field crops –Vegetables Field crops –Vegetables
Fam: Sarcophagidae <i>Parasarcophaga</i> <i>pharaonis</i> (Rohdeendorf)	<i>E.vermiculata</i> <i>Eremina desertorum</i> Forskall <i>Eremina</i> sp. <i>H. aspersa</i> <i>M.obstructa</i> <i>M.cartusiana</i> <i>T.pisana</i> <i>Theba</i> spp.	Alexandria -Cairo –Giza Giza Giza Alexandria Alexandria - Cairo –Fayoum- Giza Fayoum - Giza Alexandria Alexandria-Cairo	Field crops-Ornamental plants -Orchard- Vegetables Desert grass –Orchard Desert grass –Orchard Ornamental plants Field crops-Ornamental plants -Orchard- Vegetables Field crops –Vegetables Field crops-Ornamental plants -Orchard- Vegetables Ornamental -Orchard
<i>Parasarcophaga dux</i> Thomson	<i>E. vermiculata</i> <i>M.obstructa</i>	Alexandria -Cairo –Giza	Field crops - Ornamental plants – Orchard -Vegetables
<i>Ravinia striata</i> (Fabricius)	<i>E.vermiculata</i> <i>Helicella</i> sp. <i>M.obstructa</i> <i>M.cartusiana</i> <i>Theba</i> spp.	Alexandria -Cairo –Giza Alexandria -Cairo Alexandria-Cairo-Fayoum- Giza -Ismaealiya Fayoum -Giza Alexandria -Cairo	Field crops-Ornamental plants -Orchard- Vegetables Ornamental plants -Orchard-Vegetables Ornamental plants –Field crops- Orchard-Vegetables Field crops -Vegetables Ornamental -Orchard
<i>Wohlfartia</i> sp.	<i>Limax flavus</i> Linneaus	Giza	Ornamental plants
Fam: Sphaeroceridae Sphaerocerid larvae	<i>Helicella</i> sp. <i>M.obstructa</i> <i>T.pisana</i> <i>Theba</i> spp.	Alexandria –Cairo Alexandria-Cairo –Fayoum Alexandria Alexandria -Cairo	Ornamental plants -Orchard-Vegetables Ornamental plants -Orchard-Vegetables Field crops-Ornamental plants -Orchard- Vegetables Ornamental plants -Orchard-Vegetables

study (*Chironomus* spp.) were found harboring snails. The stratiomysid *Stratiomysa* sp. and the tabanid *Atylotus agrestis* Wied. attacked *B. alexandrina*; causing bleeding. Seven species of dragon and damselflies were reported where their nymphs predate upon snails; preferring the ovate shell snails. Nymph of dragon and damselflies were reported as snails predators for the first time by Azzam (1987).

The two belostomatids, *Limnogeton fieberi* and *Sphaerodema urinator* predate upon snails during their nymphal and adult stages. The first species is more efficient than the second one where it can predate both operculated and non operculated snails, discoid and ovate shell-shaped, while the second one prefers the ovate-shaped and can predate only the very small size of the discoid shaped. Tawfik *et al.* (1991 and 2001), reported that the feeding capacity of the aforementioned belostomatid nymphs increased progressively in the successive instars.

B- Terrestrial malacophagous insects

Four sarcophagid species were recorded, one of them (*Wohlfartia* sp.) was reported only on slugs. The most efficient predator from the recorded sarcophagids was *Parasarcophaga pharaonis* which could consume during its larval stage from 24-34 individuals of the snail *M. obstructa*; the most distributed in Egypt (Tawfik *et al.*, 1999a). Azzam and Tawfik (2002), studied the prey preference of this predator on eight terrestrial snail species. Ramachandran (1968) reported the sarcophagid *Theria muscaria* (Meigen) on *Helicigona arbustorum* (L.) and *Sarcophaga helices* Townsend on *Cepaea hortensis* (Muller), while Berner (1973), recorded sarcophagid larvae on helioid snails.

Five species from Phoridae were reported also. The most active and common species was *Megaselia scalaris* (Loew) which was studied biologically by Tawfik *et al.* (1999b).

Two drosophilid species and also two sphaerocerid ones were reported during this investigation. The piophilid species *Piophila* sp. showed a parasitic behavior on the snail *M. obstructa*. It is rarely found in nature and needs more investigation.

The survey revealed also the existence of the tiger beetle *Cicindela aulica* which attacks *M. obstructa* and the brackish water snail *Pirenella conica* hidden in the sand of the shore.

From all the above mentioned results, it could be stated that the Egyptian environment contain many species of malacophagous insects that could play an important role in reducing the molluscs pests, either in water or on land and could be taken into consideration when planning programs for controlling these pests.

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