Naididae (Annelida, Oligochaeta) associated with *Pomacea bridgesii* (Reeve) (Gastropoda, Ampullaridae)

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ABSTRACT. The family Amplullaridae belongs to this class Gastropoda and is made up of freshwater organisms with a wide geographical distribution in tropical regions. Oligochaeta worms can be found in association with snails of this family, inhabiting the umbilicus of their shells. Due to the lack of information on the ecology of these worms, this work focused on investigating which kind of Oligochaeta species associate with the mollusk *Pomacea bridgesii* (Reeve, 1856). Samples were collected during winter and spring 2003 and summer 2004. From a total of 209 snails collected, the presence of Oligochaeta worms was observed in only 58 of them (27.75%). In these infected snails, 89 Oligochaeta worms were found, all belonging to the family Naididae. The species *Haemonais waldvogeli* Bretscher, 1900, *Dero (Dero) nivea* Aiyer, 1929 and *Dero (Dero) sawayai* Marcus, 1943 were the most abundant (43.68%, 12.32% and 10.08%, respectively). *Haemonais waldvogeli* was found in all of the seasons studied, what demonstrates its affinity for this kind of substrate. The results indicate that several Naididae species find in the umbilicus of these snails's shells (which contains fine detritus) a favorable habitat for establishing themselves.
KEY WORDS. Associated fauna; mollusks; oligochaete worms; seasonal periods.

RESUMO. **Naididae (Annelida: Oligochaeta) associados a *Pomacea bridgesii* (Reeve) (Gastropoda, Ampullaridae).** A família Ampullaridae, pertencente à classe Gastropoda, é caracterizada por organismos de água doce com ampla distribuição na região tropical. Vermes Oligochaeta associados a esses caracóis podem ser encontrados habitando o umbílico de suas conchas. Devido à carência de informação sobre a ecologia desses vermes, o presente trabalho centrou-se em um levantamento de espécies de Oligochaeta associadas ao molusco *Pomacea bridgesii* (Reeve, 1856). Em amostragens realizadas no inverno e na primavera de 2003 e no verão de 2004, foram observados 209 caracóis, sendo que somente em 58 deles foi detectada a presença de vermes Oligochaeta, correspondendo a uma incidência de 27,75%. Foram encontrados, no total, 89 oligoquetos, todos da família Naididae. As espécies *Haemonais waldvogeli* Bretscher, 1900, *Dero (Dero) nivea* Aiyer, 1929 e *Dero (Dero) sawayai* Marcus, 1943 apresentaram a maior abundância relativa (43,68%, 12,32% e 10,08%, respectivamente). Espécimes de *Haemonais waldvogeli* foram encontrados em todos os períodos sazonais, o que demonstra sua afinidade com este tipo de substrato. Os resultados indicam que várias espécies de Naididae encontram no umbílico da concha (que contém detrito fino) um habitat favorável para seu estabelecimento.
PALAVRAS-CHAVE. Fauna associada; moluscos; períodos sazonais; vermes oligoquetos.

Snails of the family Ampullaridae, class Gastropoda, have a medium to large shell, and are found throughout the tropics, living in freshwater. In Brazil, species of the genus *Pomacea* are popularly called "aruá" or "uruá" and some of these are considered pests in ornamental fish breeding ponds.

Naididae worms can live on a considerable range of substrates, including mollusks (Conn *et al.* 1996), aquatic macrophytes (Glowacka et *al.* 1976, Mastrantuono 1986), sponges (Righi 1984, Melão & Rocha 1996), mosses, liverworts (Vlcková et *al.* 2002), and filamentous algae (Armendáriz-Laura 2000).

The scarcity of information about oligochaetes associated with gastropod mollusks, particularly with species of the genus *Pomacea*, stimulated the undertaking of this study. Furthermore, we believe that information on the different substrates colonized by Oligochaeta species is an important step in broadening the knowledge about these worms' ecology.

MATERIAL AND METHODS

Sample specimens were collected from ornamental fish breeding ponds in the municipality of Araraquara (21º43'49.5"S,

48°10'38.6"W, altitude 676 m), in the state of São Paulo, Brazil.

A total of 209 gastropod mollusks of the species *Pomacea bridgesii* (Reeve, 1856) were collected; 72 of them in July 2003, another 72 in November 2003, and 65 in February 2004. This was done for the purpose of assessing which kind of Oligochaeta species associate with these invertebrates at different seasons of the year (Brazilian winter, spring and summer, respectively).

Snails were collected from the ponds with a hand net and were then placed in a polyethylene tray containing a small amount of water. A scalpel was used to remove the fine detritus deposited inside the umbilicus of the shell, and the organisms found were immediately placed in glass flasks containing 4% formalin solution.

The Graphpad Instat software was used for linear regression analysis in order to detect the correlation between the size of the shell and the number of Naididae associated with the snail.

The worms were identified according to Brinkhurst & Jamieson (1971), Righi (1984) and Brinkhurst & Marchese (1989), and then conserved in labeled glass flasks containing 70% alcohol solution.

The mollusk species was identified by Dr. Wagner Eustáquio Paiva Avelar (University of São Paulo, Ribeirão Preto).

RESULTS AND DISCUSSION

Of the 209 snails analyzed, only 58 had associated oligochaete worms (27.75%). A total of 89 worms, all belonging to the Naididae family, were found. The number of individuals per umbilicus varied from 1 to 4.

In July 2003 (winter) 36 worms were found associated with the gastropods, totaling 11 taxa. *Dero (D.) nivea* Aiyer, 1929 was the most abundant species (eight individuals), followed by *Haemonais waldvogeli* Bretscher, 1900 (five individuals). Seven worms were lacking hind parts, so their specific identification was impossible (Tab. I).

In November 2003 (spring), only three species were collected. *Haemonais waldvogeli* was the most abundant species (n = 16), followed by *Dero (D.) sawayai* Marcus, 1943 (n = 10). However, four individuals could not be identified (Tab. I).

In February 2004 (summer), seven species we found, totaling 23 individuals. *Haemonais waldvogeli* was the most abundant species (n = 18). Considering the total fauna of the three samples (seasons), *H. waldvogeli* was the most commonly encountered species (43.68% of the total), followed by the *D. (D.) sawayai* (12.32%) and the *D. (D.) nivea* (10.08%) (Tab. I).

Differences in both diversity and abundance of the species were found according to the date the samples were collected (seasons). *Haemonais waldvogeli* was most abundant in winter and summer. Britton & Wetzel (1999) also found *H. waldvogeli* associated with *Pomacea canaliculata* (Lamarck, 1819) (Gastropoda, Ampullariidae).

Dero (D.) sawayai was most common in spring and winter. Various species of the genus *Dero (Dero)* have also been found associated with mollusks (as occasional fauna) in the Rio de la Plata (Paraná River), in Argentina (Darrigran *et al.* 1998).

In this study, the occurrence of various Naididae species

Table I. Numerical and relative abundance of Naididae associated with *Pomacea bridgesii*.

Taxa/species	Fish breeding ponds (Araraquara, São Paulo)			Total	(%)
	July 2003 (Winter)	November 2003 (Spring)	February 2004 (Summer)		
Allonais inaequalis (Stephenson, 1911)	2		1	3	3.36
Chaetogaster diaphanus (Gruithuisen, 1828)	3			3	3.36
Dero (Aulophorus) furcatus (Müller, 1773)	1			1	1.12
Dero (Aulophorus) sp.			1	1	1.12
Dero (Dero) digitata (Müller, 1773)	1			1	1.12
Dero (Dero) nivea Aiyer, 1929	8		1	9	10.08
Dero (Dero) obtusa d'Udekem, 1885	2			2	2.24
Dero (Dero) raviensis (Stephenson, 1914)			1	1	1.12
Dero (Dero) sawayai Marcus, 1943		10	1	11	12.32
Haemonais waldvogeli Bretscher, 1900	5	16	18	39	43.68
Naididae (missing tail segment)	7	4		11	12.32
Nais communis Piguet, 1906	2			2	2.24
Nais elinguis Müller, 1773	1			1	1.12
Nais pardalis Piguet, 1906	3			3	3.36
Pristina leidyi Smith, 1896	1			1	1.12
Total of organisms	36	30	23	89	

associated with *Pomacea* specimens can be related to the fine detritus accumulated inside the umbilicus of their shells, since these worms are also found in limnic sediments (Alves & Strixino 2000, Montanholi & Takeda 2001). The umbilicus of the shells appears to be a favorable habitat for these worms, providing food and protection against predators. Among the Naididae collected, there were also species of the genus *Chaetogaster*, which are considered mutualists (Wagin 1941, Khalil 1961, Ruppert & Barnes 1996) or, acording to Conn *et al*. (1996), parasites of mollusks.

Assuming that in *Pomacea* specimens the size of the umbilicus is proportional to the size of the shell and, consequently, that a larger umbilicus retains a larger amount of debris, it was expected that a larger number of naidids would be found in bigger mollusks. However the low correlation coefficient (r = 0.336) did not confirm the expectations, showing that the fauna associated with the umbilicus does not depend on the size of the shell.

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