Records of the parasitic worm *Aspidogaster conchicola* (Baer 1827) in the Chinese pond mussel *Sinanodonta woodiana* (Lea 1834) in Poland and Ukraine

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Abstract

This paper presents a short review of published data and the authors’ own observations related to the occurrence of the parasitic worm *Aspidogaster conchicola* (Baer 1827) in the Chinese pond mussel *Sinanodonta woodiana* (Lea 1834). Infections were found in some fresh-water bodies in Poland (Konin Lakes System) and Ukraine (Danube Basin). The prevalence of infection ranged from 5 to 30%, intensity of infection – 1-2 specimens/mollusk. Free-living species of ciliates, nematodes and chironomides were also discovered during the investigation of *S. woodiana* in the Konin Lakes System (Poland).

Key words: *Sinanodonta woodiana*, *Aspidogaster conchicola*, symbiotic ciliates, host specificity

The Chinese pond mussel *Sinanodonta woodiana* (Lea 1834) (Figure 1) is an invasive species of fresh-water bivalve that has been introduced into surface water bodies in Europe (Petro 1984; Sarkany-Kiss 1986; Girardi and Ledoux 1989; Kraszewski and Zdanowski 2001; Yurishinents and Korniushin 2001; Manganelli et al. 1998), Central America and Indonesia (Watters 1997). The natural habitats of mollusks of the genus *Sinanodonta* are the water-bodies of the large Eastern Asian rivers basins, particularly those of the Amur and Yangtze Rivers (Bogatov and Zatrawkin 1988). Most authors correlate the invasion of this bivalve species in the recipient ecosystems with the introduction of some Far Eastern fishes (Silver Carp – *Hypophthalmichthys molitrix* Valenciennes, Bighead Carp – *Hypophthalmichthys nobilis* Richardson, and Grass Carp – *Ctenopharyngodon idella* Valenciennes and some other species) into natural and artificial water bodies with the aim of increasing their productivity (Welcomme 1981). It is likely that some specimens of the transferred carp were infected with the species’ parasitic larvae (glochidia) that invaded the new water bodies after metamorphosis.

Figure 1. The Chinese pond mussel *Sinanodonta woodiana*, scale – 1 cm (Danube-Sasyk Channel, Ukraine). Photograph by Volodymyr Yuryshynets

The transfer of *S. woodiana* larvae into the recipient ecosystems resulted in the expected absence of native symbiotic organisms that are normally found in adult clams in their natural habitats. Data on the structure of the symbiotic community of *S. woodiana* in the donor ecosys-
tems are rare (Zhao and Tang 2007). The main goal of the present study was to investigate the symbiotic community of *S. woodiana* in various recipient water ecosystems and make some suggestions and hypothesis concerning its formation.

The parasitological investigations of *S. woodiana* in the recipient ecosystems were carried out in some water-bodies in Ukraine (the Danube Basin) and Poland (the Konin Lakes System). The list of the surveyed water bodies, some data on the biotopes and samples is presented in Table 1.

Parasitic aspidogastrean worms *Aspidogaster conchicola* (Baer 1827) (Figure 2) (Platyhelminthes, Aspidogastridae) were observed in the pericardial cavity of *S. woodiana* in some locations (Table 1, Figure 3). The infection indexes were as follows: prevalence ranged from 5 to 27.3%, while the number of specimens found per mollusk (intensity of infection) was either 1 or 2 (Yuryshynets 2004; Pavlyuchenko 2005). This aspidogastrean species is a common element of symbiotic communities of native European unionid species. Moreover, *A. conchicola* has a circumpolar Holarctic area of distribution and has been described as a parasite of European and North American bivalve species with a wide range of host specificity – at least on the level of superfamily Unionoidea (Skryabin 1952; Dvodryadkin 1967; Fuller 1974). This platyhelminthes species has also been found in snails of the family Viviparidae (Skryabin 1952; Dvodryadkin 1967) and in the intestines of some Far Eastern molluskivorous fishes (Dvodryadkin 1967; Gao et al. 2003). *A. conchicola* represents an archaic group of Platyhelmintes, which need only a single host to complete their life cycle as eggs carrying larvae infect mollusks, develop as larvae and grow into adult worms (Bakker and Davids 1973; Rohde 1994, 2001). *A. conchicola* specimens are typically found in the pericardial or renal cavities of bivalve mollusks where they feed on blood cells and hemolymph (Bakker and Davids 1973).

Finding *A. conchicola* in *S. woodiana* suggests that this alien species has become a host to symbiotic species in their new habitats, normally

### Table 1. Data on surveyed water bodies, number of dissected clams and parameters of infection by *Aspidogaster conchicola*

<table>
<thead>
<tr>
<th>Record number (map ref.)</th>
<th>Location name and coordinates</th>
<th>Some biotope characteristics</th>
<th>Record date</th>
<th>Number of dissected mollusks</th>
<th>Prevalence of infection, %</th>
<th>Intensity of infection, sp./mollusk</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kugurluy Lake (Danube Basin, Ukraine) 45°20'27&quot;N, 28°40'24&quot;E</td>
<td>Depth – 1.8 m; population density – 2 specimens/m²</td>
<td>Summer 2004</td>
<td>29*</td>
<td>27.3*</td>
<td>1.5*</td>
<td>Pavlyuchenko (2005)</td>
</tr>
<tr>
<td>2</td>
<td>Rapida River (Danube Basin, Ukraine) 45°20'15&quot;N, 28°45'44&quot;E</td>
<td>Depth – 1.8 m; population density – 2 specimens/m²</td>
<td>Summer 2004</td>
<td>27</td>
<td>25</td>
<td>1.5</td>
<td>Pavlyuchenko (2005)</td>
</tr>
<tr>
<td>3</td>
<td>Channel Danube-Sasyk reservoir (Danube Basin, Ukraine) 45°33'04&quot;N, 29°35'45&quot;E</td>
<td>Depth – 1 m; current velocity – 0.0-0.5 m/s; population density – 2 specimens/m²</td>
<td>Autumn 2003</td>
<td>15</td>
<td>13.3</td>
<td>1</td>
<td>Yuryshynets (2004), present study</td>
</tr>
<tr>
<td>4</td>
<td>Goslawske Lake (Konin Lakes, Poland) 52°18'10&quot;N, 18°15'33&quot;E</td>
<td>Depth – 0.5-1 m, t - 24°C, population density – 10 specimens/m²</td>
<td>July 2007</td>
<td>39</td>
<td>5.13</td>
<td>1</td>
<td>Present study</td>
</tr>
<tr>
<td>5</td>
<td>Patnowskie Lake (Poland) 52°18'22&quot;N, 18°15'46&quot;E</td>
<td>Depth – 0.1 m, t -28°C, population density – 2 specimens/m²</td>
<td>July 2007</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>Present study</td>
</tr>
<tr>
<td>6</td>
<td>Hot water discharge channel (Patnow Power Plant, Poland) 52°17'40&quot;N, 18°16'03&quot;E</td>
<td>Depth – 0.5 m, t - 34°C, population density – 85 specimens/m², current velocity – 0.3 m/s</td>
<td>July 2007</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>Present study</td>
</tr>
</tbody>
</table>

* - average data for 1st and 2nd map refs
characteristic to native unionid species. But our observations show that the process of integration of a native symbiotic species in the invasive community of \textit{S. woodiana} has some peculiarities. Oligochaetes \textit{Chaetogaster limnaei} (Baer 1827) have also been identified in the mantle cavities of \textit{S. woodiana} collected from the studied localities. This species is a common symbiont of fresh water bivalves and snails (Kurandina and Ovcharenko 1993; Piechocki and Dyduch-Falniowska 1993) and has been reported both in Europe and North America (Molloy et al. 1997). Being invasive in North American water bodies, \textit{Dreissena polymorpha} (Pallas 1771) is also a host of \textit{Ch. limnaei}. In addition, free-living species of ciliates, nematodes and chironomids were revealed during the investigation of \textit{S. woodiana} in the Konin Lakes system (Poland).

However, commensal ciliates of the Conchophthiridae family, which are characteristic of aboriginal unionid species, have never been discovered in \textit{S. woodiana} mollusks. At the same time, these ciliate species (\textit{Conchophthirus curtus} Eng. 1862, \textit{Conchophthirus unionis} Raabe 1932, \textit{Conchophthirus anodontae} Echrbg. 1861) have demonstrated high infection rates in native unionid species (\textit{Anodonta anatina} O.F. Müller 1774, \textit{Unio pictorum} Linnaeus 1758) where they were found in the mantle cavities, when in joint biotopes with \textit{S. woodiana} (Krasutska 2008).

Our preliminary laboratory investigations show that mucus on the surface of the mantle cavity of \textit{S. woodiana} has a deleterious effect of on ciliates of the Conchophthirus genus as indicated by decreased motility and a shortened life span when compared to those commensal in aboriginal unionid clams.

Thus, the symbiotic community of the invasive species \textit{S. woodiana} in the studied recipient ecosystems included some elements of native symbiotic fauna of the fresh-water mollusks.
The absence of obligate commensal ciliates in the mantle cavity of *S. woodiana* should be verified in further investigations, but preliminary findings could hypothetically be explained by the difference in the chemical content of the mantle cavity mucous.

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