

***Branchiobdella* (Annelida: Clitellata) Species Found in Crayfish Collection of London Natural History Museum**

Mitko A. Subchev

Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin str., 1113 Sofia, Bulgaria;
E-mail: subchev@zoology.bas.bg

Abstract: One hundred and seven samples with a total of 331 crayfishes in the crayfish collection of London Natural History Museum were examined for branchiobdellidans (crayfish worms). This included an examination of jar debris and also removing and examination of the gills of crayfishes. As a result 830 crayfish worms were found, separated and identified. The branchiobdellidans found in samples from Europe were: *Branchiobdella astaci* ODIER 1823, *Branchiobdella parasita* (BRAUN 1805), *Branchiobdella pentodonta* WHITMAN 1882 and *Branchiobdella hexodonta* GRUBER 1883. Another species, *Branchiobdella kozarovi* SUBCHEV 1978 was found in samples from six sites in Turkey which is the first proof about recent occurrence of this species, and also of branchiobdellidans, in Asian Turkey. Examination of a rich crayfish material from UK for branchiobdellidans yielded no results.

Key words: *Branchiobdella*, distribution, Europe, Asian Turkey

Introduction

Branchiobdellidans (Annelida: Branchiobdellida) are crayfish dwelling species living either on the body surface or gill chamber of their host. Four of the five European indigenous crayfish species: *Astacus astacus* (Linnaeus 1758), *Astacus leptodactylus* Eschscholtz 1823, *Austropotamobius torrentium* (Schrank 1803) and *Austropotamobius pallipes*, Kessler 1876, are known to be hosts for *Branchiobdella* sp. (SUBCHEV, STANIMIROVA 1998, KLOBUČAR *et al.* 2006). The only European species on which branchiobdellidans have not been reported so far is *Astacus pachipus* Rathke 1837. Among members of Branchiobdellida, *Branchiobdella* is the only indigenous genus known in Europe. However, together with their hosts two North American branchiobdellidan species were introduced into Europe – *Xironogiton victoriensis* Gelder & Hall 1990 and *Cambarincola mesochoreus* Hoffman 1963 (NESEMANN, NEUBERT 1999, GELDER 2006).

One of the ways to study species diversity and distribution of branchiobdellidans and other crayfish epibionts like aeolosomatid *Hystricosoma chappuisi* MICHAELSEN 1926 and copepod *Nitokra divaricata* (= *Nitocrella divaricata*) CHAPPUIS 1923 is an examination of museum crayfish collections. Recently such investigations have been successfully done by the author and results published for Natural History Museums in Berlin (SUBCHEV 2007), Paris (SUBCHEV 2008), Stockholm (SUBCHEV 2009) and Vienna (SUBCHEV, GELDER 2010). Here are reported the results obtained from the examination of the crayfish collection in London Natural History Museum.

Materials and methods

The examination of crayfish body surface, crayfish gills, as well jar debris, has been done by stereomicroscope as described earlier (SUBCHEV 2007). Total

of 107 samples containing 331 crayfishes have been examined. Branchiobdellidans found were identified by body form and size and, when needed, by jaw form and male reproductive system (SUBCHEV 1984, NESEMANN, NEUBERT 1999)

Results

The results of the identification of *Branchiobdella* species found in crayfish collection of London Natural History Museum are presented in Table 1.

A total of 830 *Branchiobdella* specimens were found in 24 of 107 crayfish samples. The crayfish samples containing branchiobdellidans originated from seven European countries: Austria, Czechia (original name of the locations on corresponding samples were 'Bohemia', a historical region occupying the western two-thirds of recent Czechia (Czech Republic)), Denmark, France, Hungary, Italy, FYRMacedonia and Montenegro. In addition, branchiobdellid worms were found in a sample from a general location named 'Medditeranean' and in eight crayfish samples collected in Asian Turkey.

The branchiobdellid species identified were: *Branchiobdella astaci* ODIER, 1823, *Branchiobdella parasita* (Braun 1805), *Branchiobdella pentodonta* Whitman 1882, *Branchiobdella hexodonta* Gruber 1883, *Branchiobdella italica* Canegallo 1928 and *Branchiobdella kozarovi* Subchev 1978. *B. astaci* was found in crayfish samples collected in Austria, Czechia and France, *B. parasita* in samples from Denmark and Hungary, *B. pentodonta* in samples from Czechia (Bohemia) and Hungary, *B. hexodonta* in samples from Czechia (Bohemia), Hungary, Italy, FYROM (Macedonia) and Montenegro and *B. italica* in samples from Italy. All *B. kozarovi* specimens identified were from crayfish samples collected in Turkey. A total of 12 *A. leptodactylus* samples and 27 *A. pallipes* samples originated from UK were examined but no branchiobdellidan or branchiobdellidan cocoons were found neither on crayfish body including gill chamber, nor in sample debris. Similarly no branchiobdellidan cocoons were found in five *A. pallipes* samples from Ireland.

Discussion

This is first report on the presence of *B. astaci* in Czechia and a second report on its occurrence in Austria after SUBCHEV, GELDER (2010). This species

was originally described presumably from France (ODIER 1823) and its recent presence in this country has already been confirmed by SUBCHEV (2008). *B. parasita* was reported for the first time for Denmark by SUBCHEV (2009) and this is the second report of the species for this country. This species together with *B. pentodonta* has already been reported in Hungary (SUBCHEV 1984, 2007; KOVACZ, JUHÁSZ 2007). *B. hexodonta* is one of the most widely distributed branchiobdellidans in Europe and already found in all European countries presented in Table 1 (SUBCHEV 2011). *B. italica* is a species originally described from Italy (CANEGALLO 1928) and later its presence in this country was reported by GHERARDI *et al.* 2002, OBERKOFER *et al.* 2002 and QUAGLIO *et al.* 2006.

The first report of branchiobdellidans in Asian Turkey was that of SUBCHEV (2008) who found a poorly preserved specimen in a sample from an unidentified region in Turkey in crayfish collection in French National Museum of Natural History. Later SUBCHEV, GELDER (2010) gave more precise information about branchiobdellid fauna in this country reporting *B. kozarovi* from two Turkish localities both situated in western part of Asian Turkey: Sabanca lake and a location near Bursa. However in both these cases branchiobdellidans were found in crayfish samples collected at the end of XIX century. Thus the new data reported here are the first proof about recent presence of *B. kozarovi* in Asian Turkey. With numerous branchiobdellid worms in samples of crayfishes from several localities all from Western Turkey, *B. kozarovi* could be stated as a quite common species in this part of the country. It is worth mentioning that another six samples of crayfishes from Asian Turkey examined were free of branchiobdellid worms. Recently FARD, GELDER (2011) reported *B. kozarovi* from Iran. Summarizing the data available so far they concluded that the association of species on *A. leptodactylus* appeared to be endemic to Eastern Euro-Mediterranean sub-region, according to the zoogeographical system of BĂNĂRESCU (1990), with apparent focus in the countries around Black Sea.

LEEKE, PRICE (1963) reported *B. astaci* from Reading on *A. pallipes* crayfishes which is the only report of a branchiobdellidan in the country. This is documented by some worms and crayfish gill bearing cocoons (1964;11:1/17&18/23) deposited in Oligochaeta collection of London National Museum of Natural History. Besides our failure to find bran-

Table 1. Branchiobdella species found in crayfish samples in Crustacean collection of London Natural History Museum.

Locality, as appeared on the label of the crayfishes; catalogue number	Crayfish species, number of the specimens	<i>Branchiobdella</i> sp.: location of founding – number of the specimens	Notes
1	2	3	4
Austria, Tyrol, 1873; 1976:223	<i>A. pallipes italicus</i> , 1	<i>B. astaci</i> : gills – 4 adult	Worms in a very bad condition; cocoons in the gills
Bohemia [Czechia] 98.5.7.636-37	<i>A. astacus</i> , 3	<i>B. astaci</i> : gills – 2 adult, 1 juv.	
Bohemia [Czechia] 1905.V.31.3-6	<i>A. astacus</i> , 4	<i>B. hexodonta</i> : gills -2 adult; <i>B. pentodonta</i> : debris – 2 adult	Worms in a very bad condition; cocoons in the gills
Denmark, Pond in Frederiksborg, Slotspark, Hillerød, N.E. Zealand; 1905.6.10.1-10	<i>A. astacus</i> , 2	<i>B. parasita</i> : debris – 4 adult, 12 juv.	Worms in a very bad condition
France, Mont pellier, 1874; 1976: 224	<i>A. pallipes pallipes</i> , 1	<i>B. sp.</i> : debris – 1 adult; <i>B. astaci</i> : gills – 3 adult.	Worms dried; cocoons in the gills
Hungary, Cserna river near Vajda-Hunyad; 1905.8.20; 1906.3.16.13-22	<i>A. astacus</i> , 12	<i>B. pentodonta</i> : debris – 1 adult	Worms in a very bad condition
Hungary, Meleghegy (Konitat Gömör), 1905.7.13; 1906.3.16.29-34	<i>A. (fluviatilis) astacus</i> , 5	<i>B. parasita</i> : debris – 5 adult <i>B. hexodonta</i> : gills – 2 adult	Cocoons in the gills and on the host abdomen
Italy, Firenzuola, 45 km NNE from Florence, 1976:226	<i>A. pallipes</i> , 2	<i>B. italica</i> : debris – 2 adult	
Italy, 15 km N of Florence, 1970; 1976: 228	<i>A. pallipes pallipes</i> , 2	<i>B. sp.</i> : gills – 1 adult	
Italy, Scarperia, 30 km N from Florence, 19.9.70; 1976:225	<i>A. pallipes italicus</i> , 2	<i>B. sp.</i> : gills – 10 adult	Worms in a very bad condition
Italy, Lake of Viverone, Piedmont, 1905.5.13.20-I	<i>A. pallipes pallipes</i> , 2	<i>B. italica</i> ?: debris – 2	Cocoons in the gills and debris
Italy, Vestena, near Verona, 1905.V.31,12-15	<i>A. pallipes</i> , 4	<i>B. sp.</i> : gills – 2 adult	Worms in a very bad condition; cocoons in the gills
Italy, Ivrea 1905.5.31.24-25	<i>A. pallipes italicus</i> , 2	<i>B. hexodonta</i> : gills – 1 adult 1 juv.	Cocoons in the gills
Macedonia [FYROM], 1918, 1925.6.5.1-2	<i>A. torrentium</i> , 2	<i>B. hexodonta</i> : debris – 1 adult; <i>B. hexodonta</i> : gills – 8 adult	Worms from the debris in a very bad condition; cocoons in the gills

Table 1. Continued

1	2	3	4
Mediterranean, 1873:26	<i>A. leptodactylus salinus</i> , 1	<i>B. astaci</i> : gills – 15 adult	Worms dried; dried cocoons in the gills
Montenegro, River Zetta (Zeat), South of Nikšić, 1906.5.15.1-2	<i>A. pallipes italicus</i> , 2	<i>B. hexodonta</i> : debris – 36 adult, 25 juv.; <i>B. hexodonta</i> : gills –30 adult	
Turkey, lakes, exact condition is not known; 1976	<i>A. astacus</i> , 2	<i>B. kozarovi</i> : gills – 1 adult	Cocoons in the gills
Turkey (Bandirma), Manyas lake, 27.8.75; 1976: 164	<i>A. leptodactylus salinus</i> , 2	<i>B. sp.</i> : gills – 1 adult	Cocoons in the gills
Turkey, Iznik lake, 25.8.1975; 1976:162	<i>A. leptodactylus salinus</i> , 2	<i>B. kozarovi</i> : debris – 108 adult, 45 juv.; gills – 6 adult, 7 juv.	Cocoons in the gills
Turkey, Poyrazlar/ Poytazlar lake, 22.8.1976	<i>A. leptodactylus</i> , 4	<i>B. kozarovi</i> : debris – 87 adult, 67 juv., gills – 6 adult	Cocoons in the gills
Turkey, Calticak lake, 21.8.1976	<i>A. leptodactylus salinus</i> , 4	<i>B. kozarovi</i> : debris – 41 adult, 33 juv., gills – 5 adult, 3 juv.	Cocoons in the gills
Turkey, Terkos lake, 26.8.1976	<i>A. leptodactylus leptodactylus</i> , 4	<i>B. kozarovi</i> : debris – 6 adult, gills – 1 ad.	
Turkey, Sapanca lake, 24.8.1976	<i>A. leptodactylus salinus</i> , 1	<i>B. kozarovi</i> : debris – 153 adult, 97 juv., gills – 11 adult,	
Turkey, Apolyont lake, 16.8.1975; 1976:160	<i>A. leptodactylus</i> prob. <i>salinus</i> , 5	<i>B. kozarovi</i> : debris -12 adult, 6 juv., gills – 2 adult, 8 juv.	Cocoons in the gills

chiobellidans on crayfish collected in the UK reported here, GELDER (1999) also failed to find branchiobdellidans on any of over 200 endemic crayfish collected from the Aire and Ouse river basins in Northeast England. Thus, bearing in mind the note of LEEKE, PRICE (1963) in their paper that the worms found by them ‘may have obtained from imported

crayfish’ we can not exclude that *B. astaci* occurs or had occurred only in Reading.

Acknowledgments: Thanks are due to the members of London Natural History Museum Ms Miranda Lowe, Ms Emma Sherlock and Mr Andrew Cabrinovic for their generous assistance, Prof. Stuart R. Gelder for his helpful suggestions on the text and financial support from the European Commission’s Research Infrastructure Action via the SYNTHESYS (GB-TAF-1168).

References

- BĂNĂRESCU P. 1990. Zoogeography of Fresh Waters. Aula-Verlag Wiesbaden, Germany: 1-1617.
- CANEGALLO M. 1928. Una nuova specie di Branchiobdella – *Branchiobdella italica*. – *Atti. Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano*, **67**: 214-224.
- FARD ALI NEKUIE, STUART R. GELDER. 2011. First report of *Branchiobdella kozarovi* Subchev, 1978 (Annelida: Clitellata) in Iran, and its distribution in the eastern Euro-Mediterranean subregion. – *Acta zoologica bulgarica*, **63** (1): 105-108.
- GELDER S. 2006. Branchiobdellidans. IN: SOUTY-GROSSET, C., D. M. HOLDICH, P. Y. NOËL, J. D. REYNOLDS, P. H. AFFNER (Eds.): Atlas of Crayfish in Europe. Muséum national d'Histoire naturelle, Paris, 187 p. (Patrimoines naturels, 64).
- GELDER S. R. 1999. Zoogeography of branchiobdellidans (Annelida) and temnocephalidans (Platyhelminthes) ectosymbiotic on freshwater crustaceans, and their reactions to one another *in vitro*. – *Hydrobiologia*, **406**: 21-31.
- GHERARDI F., F. CENNI, G. CRUDELE, M. MORI. 2002. Infestation rate of branchiobdellids in *Austrpotamobius pallipes italicus* from a stream of Ventral Italy: preliminary results. – *Bull. Fr. Pêche Piscic.*, **367**: 785-792.
- KLOBUČAR G., I. MAGUIRE, S. GOTTSTEIN-MATOČEC, S. GELDER 2006. Occurrence of Branchiobdellida (Annelida: Clitellata) on freshwater crayfish in Croatia. *Ann. Limn. – Int. J. Limn.*, **42** (4): 251-260.
- KOVÁCS T., P. JUHÁSZ 2007. Data to the distribution of crayfish worms (Branchiobdellidae) in Hungary. – *Folia Hist. Nat. Mus. Matraensis*, **31**: 77-79.
- LEEKE C. J., A. PRICE 1965. *Branchiobdella astaci* Odier (Oligochaeta, Annelida) in Reading. – *Reading Nat.*, **17**: 18-19.
- NESEMANN H., E. NEUBERT 1999. Süßwasserfauna von Mitteleuropa. Bd. 6 Annelida. 2. Clitellata: Branchiobdellida, Acanthobdellea, Hirudinea. Spectrum Akademischer Verlag GmbH, Heidelberg, Berlin, 192.
- OBERKOFER B., F. QUAGLIO, L. FÜREDER, M. L. FIORAVANTI, S. GIANNETTO, C. MOROLLI, G. MINELLI 2002. Species of Branchiobdellidae (Annelida) on freshwater crayfishes in South Tyrol (Northern Italy). – *Bull. Fr. Pêche Piscic.*, **367**: 777-784.
- ODIER A. 1823. Memoire sur le Branchiobdella, nouveau genere d'Annelides de la famille des Hirudinees. – *Mém. Soc. Hist. Nat. Paris*, **1**: 70-78.
- QUAGLIO F., C. MOROLLI, R. GALUPPI, C. BONOLI, F. MARCHER, L. NOBILE, G. DE LUISE, M. P. TAMPIERI 2006. Preliminary investigations of disease-causing organisms in the white-clawed crayfish *Austrpotamobius pallipes* complex from streams of Northern Italy. – *Bull. Fr. Pêche Piscic.*, **380-381**: 1271-1290.
- SUBCHEV M. 1984. On Hungarian Branchiobdellids (Oligochaeta: Branchiobdellidae). *Miscellanea. – Zoologica Hungarica*, **2**: 47-50.
- SUBCHEV M. 2007. Branchiobdellidans (Annelida: Clitellata) found in the crayfish and annelid collections of the Natural History Museum of Humboldt University, Berlin, Germany. *Acta zoologica bulgarica*, **59** (3): 275-282.
- SUBCHEV M. 2008. Branchiobdellida (Annelida: Clitellata) found in the crayfish and annelid collections of Paris National Museum of Natural History and on recently collected crayfishes from France. – *Acta zoologica bulgarica*, **60** (3): 233-237.
- SUBCHEV M. 2009. Branchiobdellida (Annelida: Clitellata) Found in the Crayfish Collection of the Swedish Museum of Natural History with Remarks on the Swedish Branchiobdellid Fauna. – *Acta zoologica bulgarica*, **61**: 287-292.
- SUBCHEV M. 2011. First record of Branchiobdella Odier, 1823 (Annelida: Clitellata) in Albania and an overview of the geographic distribution of Branchiobdella hexodonta Gruber, 1882 in Europe. – *Acta zoologica bulgarica*, **63** (1): 109-112.
- SUBCHEV M., STUART R. GELDER. 2010. Branchiobdellida (Annelida: Clitellata) found in the crayfish collection of the Natural History Museum in Vienna, Austria, with a re-description of *Branchiobdella papillosa* NESEMANN & HUTTER, 2002. – *Acta zoologica bulgarica*, **62** (1): 33-42.
- SUBCHEV M., L. STANIMIROVA. 1998. Distribution of freshwater crayfish (Crustacea: Astacidae) and the epibionts of the genus *Branchiobdella* (Annelida: Branchiobdellidae), *Hystricosoma chappuisi* Michaelsen, 1926 (Annelida: Oligochaeta) and *Nitocrella divaricata* (Crustacea: Copepoda) in Bulgaria. – *Hist. nat. bulg.*, **9**: 5-18. (In Bulgarian).

Received: 20.12.2011
Accepted: 13.04.2012

