



## Distribution of the alien freshwater snail *Ferrissia fragilis* (Tryon, 1863) (Gastropoda: Planorbidae) in the Czech Republic

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### Abstract

We summarize and analyze all known records of the freshwater snail, *Ferrissia fragilis* (Tryon, 1863) in the Czech Republic. In 1942 this species was found in the Czech Republic for the first time and a total of 155 species records were obtained by the end of 2005. Based on distribution data, we observed the gradual expansion of this gastropod not only in the Elbe Lowland, where its occurrence is concentrated, but also in other regions of the Czech Republic particularly between 2001 and 2005. Information on habitat, altitude and co-occurrence with other molluscs are presented.

Key words: alien species, Czech Republic, distribution, *Ferrissia fragilis*, habitats

### Introduction

Probably only one species of the genus *Ferrissia* (Walker, 1903) occurs in Europe. Different theories exist, about whether it is an indigenous and overlooked taxon or rather a recently introduced species in Europe (Falkner and Proschwitz 1995). This gastropod was most often named as *Ferrissia wautieri* (Mirolli, 1960) and it was considered as native or cryptogenic, requiring further studies (Glöer 2002, Glöer and Zettler 2004). When referred to as *Ferrissia clessiniana* (Jickeli, 1882) it was considered as a non-native mollusc in Europe (Falkner and

Proschwitz 1995). New studies (Walther et al. 2006) confirmed that the North American ancyloid *Ferrissia fragilis* (Tryon, 1863) is a cryptic invader of European and East Asian freshwater ecosystems. The name *F. fragilis* is used for all specimens of the genus *Ferrissia* found in the Czech Republic.

Records of the genus *Ferrissia* exist from all Czech neighbouring countries (Frank et al. 1990, Lisický 1991, Frank 1995, Strzelec and Lewin 1996, Glöer and Meier-Brook 2003) and also from other European countries, e.g. Great Britain (Kerney 1999), Sweden (Falkner and Proschwitz 1995), and France (Falkner et al. 2001).

## Material and Methods

The datasets used are from senior author's database of over 40,000 records of aquatic molluscs, most of which were obtained by field research during the previous 10 years. The remainder come from Czech museum collections and published papers.

The main sampling method for aquatic molluscs was to wash vegetation or sediments using a metal sieve (kitchen strainer, diameter 20 cm, mesh size 0.5-1 mm). This was combined with a search of various substrates present; stone, wood and artificial surfaces (e.g. plastic bags and bottles). This method is only qualitative - time and area under study was different. All molluscs present in samples were identified. Specimens of *Ferrissia fragilis* (Figure 1) and most of the other molluscs were identified based on shell morphology. When this identification method was not possible, some species (i.e. *Stagnicola*, *Gyraulus*) had to be dissected and then identified using their copulatory organs. The classification used follows Beran (2002).



Figure 1. Shell of *Ferrissia fragilis* (record No.123 in Annex 1). Photo by M. Horsák.

Altogether, 155 records of *F. fragilis* were obtained; 109 of these included extra environmental data and were used for an analysis of habitat preferences and co-occurrence with other species. The assemblage of the whole site was

taken into account for the analysis of co-occurrence, not only the species recorded in the site's part where *F. fragilis* occurred because these more detailed data was not at disposal.

## Results and Discussion

### *Distribution in the Czech Republic*

In the Czech Republic this snail was recorded for the first time in 1942 from pools near Sadská and for the second time in 1946 from an oxbow lake of the Elbe River near Mělník (Ložek 1971) (Record No. 85 respectively No. 27 in Annex 1, see also Figure 2, A). It is probable that this species was subsequently overlooked because further records were not made until 1975 (Elbe River oxbow lake, near Ostrá, V. Ložek pers. comm.) and 1978 (Ohře River oxbow lake, near Doksany, Flasar 1998) (Figure 2, B). Between 1991 and 2000 the species was recorded at 45 new sites (Figure 2, C). Data obtained until 2001 are summarised in Beran (2002). A rapid increase in records was observed between 2001 and 2005 when 106 finds were recorded (Figure 2, D). This increase was also visible in Figure 3 where the number of records of *F. fragilis* is weighted by all records of other freshwater molluscs in particular period (data from senior author's database were used). The data represented 0.05 % from 1901-1950, 0.03 % from 1951-1990, 0.34 % from 1991-2000 (Beran 2002), and 0.88 % from 2001-2005. The sites identified for this snail are concentrated in the Elbe Lowland, but between 2001 and 2005 this species was recorded more and more frequently in other regions of the Czech Republic as well (Figure 2). Thus, it is evident that the distribution of this snail is increasing and is spreading despite the possibility that the species was overlooked in the past but at least sampling effort in 1991-2000 was similar to that in 2001-2005. Such a noticeable increase in records is more typical for non-native invasive species e. g. *Potamopyrgus antipodarum* (Gray, 1843), *Menetus dilatatus* (Gould, 1841), *Corbicula fluminea* (O. F. Müller, 1774) or *Dreissena polymorpha* (Pallas, 1771) than for native species (reviewed in Beran 2002 or Meier-Brook 2002).

This species has also been recorded in Czech Republic greenhouses (Horsák et al. 2004) from where it could spread outside, but greenhouse sites are not included in this paper.

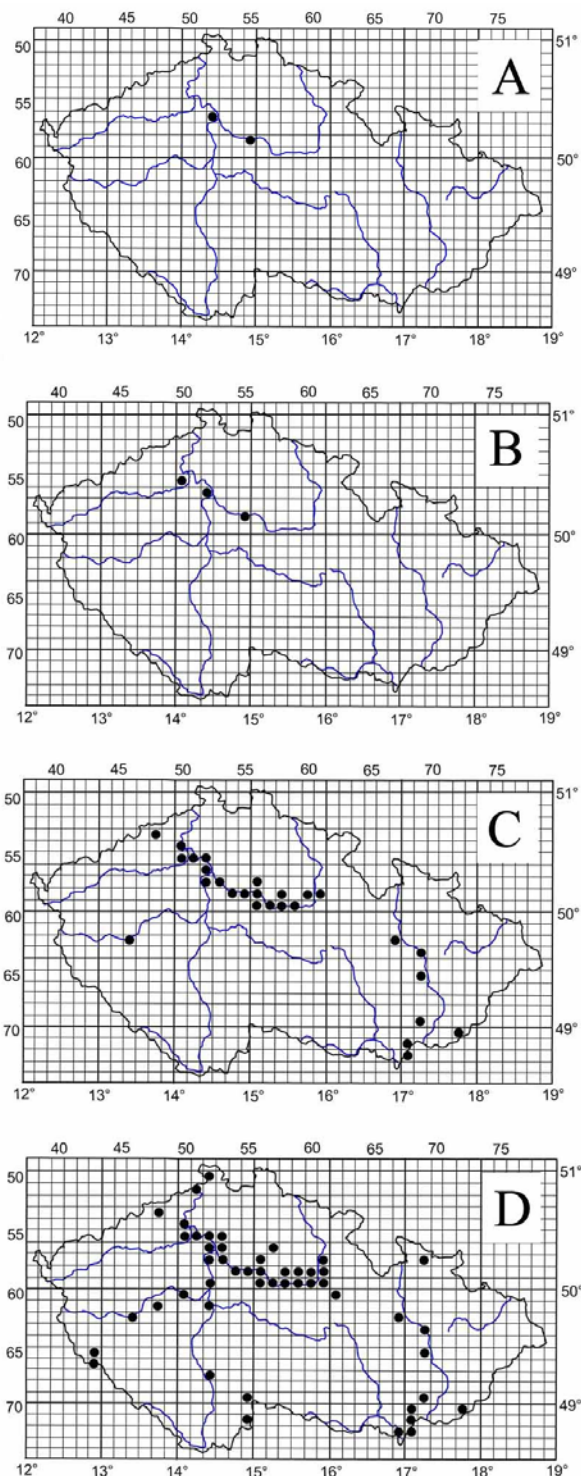


Figure 2. Distribution of *Ferrissia fragilis* in the Czech Republic till 1950 (A), till 1990 (B), till 2000 (C) and till 2005 (D)

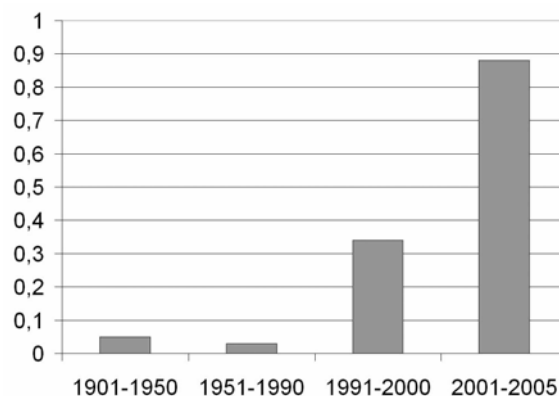


Figure 3. Relative number of records of *Ferrissia fragilis*

### Habitats

In all cases this snail was recorded from permanent water bodies; this was in common with Polish records from Bernard (1994) and Strzelec and Lewin (1996). Stagnant waters were a more frequently recorded habitat of this snail than flowing waters. Records from lotic habitats were mainly concentrated in the Elbe River, especially in the stretches upstream of weirs. In fact these stretches had reduced flow due to channelization during weir construction. The most frequently observed habitats were oxbow lakes, pools mostly in floodplains and also water bodies created during mineral extraction (mainly sandpits). Less frequent habitats included water reservoirs. Only occasionally this snail was recorded in rivers and brooks or canals (Figure 4).

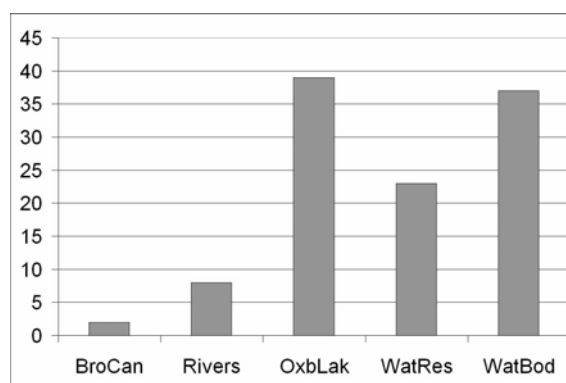


Figure 4. Habitats with occurrence of *Ferrissia fragilis*. BroCan – brooks, canals; Rivers – rivers; OxbLak – oxbow lakes, pools; WatRes – water reservoirs, ponds; WatBod – water bodies created during mineral extraction (mainly sandpits)

In terms of substrates, *Ferrissia fragilis* was usually found on the surface of emergent macrophytes (e.g. reedmace *Typha* spp., reed sweet grass *Glyceria* spp.); macrophytes with large floating leaves (e.g. the water lilies *Nymphaea* spp. and *Nuphar lutea*); different man-made objects (waste, e.g. plastic and glass bottles or jars); wood; dead parts of plants (especially leaves), and also stones.

#### Altitude

Altitude was available for nearly all the datasets on *F. fragilis* and these were analysed. In the Czech Republic this snail unambiguously prefers low altitude ranges between 150–250 m (Figure 5). These results correspond with Beran (2002). Lack of data with lower altitude (below 150 m) corresponds with the geographical character of the Czech Republic where sites with altitude below 150 m are restricted. In comparison to previous results of Beran (2002), more data on occurrence at higher altitudes now exist and 552 m is the highest altitude record for this species.

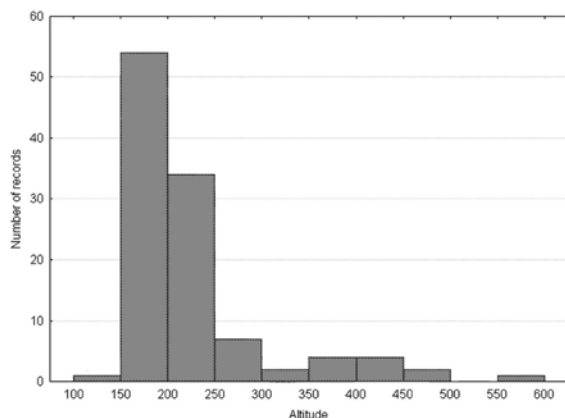


Figure 5. Number of records of *Ferrissia fragilis* in particular altitude ranges

#### Co-occurrence of other molluscs

In the studied water-bodies *F. fragilis* co-occurred with 53 molluscs. The most species-rich site harboured 23 species. In the median site, 10 species were found co-existing with *F. fragilis*. In 50% of the sites researched, *F. fragilis* co-occurred with 7-15 species (Figure 6). The frequencies of co-occurrence of particular species with *Ferrissia fragilis* varied considerably. *Radix auricularia* (Linnaeus, 1758), *Gyraulus albus* (O. F. Müller, 1774), *Bithynia tentaculata* (Linnaeus, 1758), *Hippeutis*

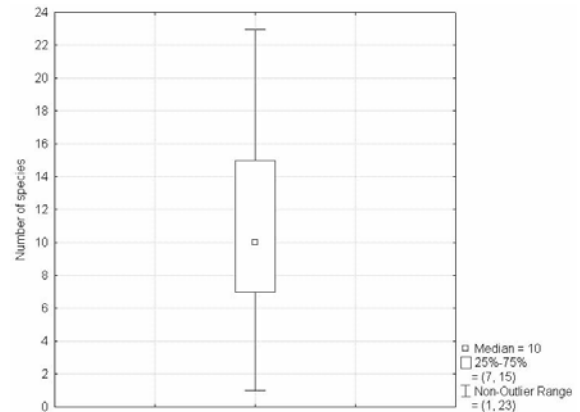


Figure 6. Number of mollusc species at particular sites

*complanatus* (Linnaeus, 1758), *Anodonta anatina* (Linnaeus, 1758) co-occurred with *F. fragilis* in more than half of the 109 studied sites (Annex 2). These mollusc species are common and widespread in the Czech Republic (Beran 2002). On the other hand, co-occurrences with *Viviparus viviparus* (Linnaeus, 1758), *Valvata macrostoma* Mörch, 1864, *Anisus spirorbis* (Linnaeus, 1758) and *Corbicula fluminea* were documented in one case only.

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**Annex 1**Records of *Ferrissia fragilis* in the Czech Republic

Record No.	Record coordinates		Mapping field	Date	Abundance	Collector
	Latitude, °N	Longitude, °E				
1	50°55'14"	14°28'09"	5052	20.08.2005	20	L. Beran
2	50°49'34"	14°16'41"	5151	20.08.2005	35	L. Beran
3	50°36'15"	13°46'46"	5348	11.12.1999	5	L. Beran
4	50°31'28"	14°04'22"	5450	27.08.2000	4	L. Beran
5	50°29'01"	14°14'00"	5551	27.08.2000	45	L. Beran
6	50°27'06"	14°22'01"	5552	23.11.1996	10	L. Beran
7	50°27'06"	14°22'01"	5552	24.08.2003	18	L. Beran
8	50°27'02"	14°09'17"	5550	27.08.2000	15	L. Beran
9	50°27'02"	14°09'17"	5550	8.05.2004	7	L. Beran
10	50°26'51"	14°19'17"	5552	28.10.2005	4	L. Beran
11	50°26'46"	14°22'10"	5552	24.08.2003	17	L. Beran
12	50°26'28"	14°38'05"	5553	26.04.2005	8	L. Beran
13	50°26'26"	14°18'21"	5551	6.10.2002	18	L. Beran
14	50°26'26"	14°18'21"	5551	1.08.2004	3	L. Beran
15	50°26'20"	14°18'20"	5551	1.08.2004	12	L. Beran
16	50°26'19"	14°22'14"	5552	8.09.2001	7	L. Beran
17	no data	no data	5550	1.01.1978- 31.12.1978		I. Flasar <sup>1</sup>
18	50°26'06"	14°09'59"	5550	11.07.2004	10	L. Beran
19	50°25'51"	14°16'00"	5551	27.08.2000	3	L. Beran
20	50°24'53"	14°34'48"	5553	16.10.2003	45	L. Beran
21	50°24'53"	14°34'48"	5553	9.08.2004	28	L. Beran
22	50°24'53"	14°34'48"	5553	1.10.2004	25	L. Beran
23	50°24'53"	14°34'48"	5553	10.05.2005	8	L. Beran
24	50°24'53"	14°34'48"	5553	15.07.2005	150	L. Beran
25	50°24'53"	14°34'48"	5553	14.10.2005	80	L. Beran
26	50°23'33"	14°32'58"	5653	27.08.2004	8	L. Beran
27	50°23'22"	14°27'39"	5652	8.09.1946		V. Ložek <sup>4</sup>
28	50°23'22"	14°27'39"	5652	29.11.1996	10	L. Beran
29	50°23'22"	14°27'39"	5652	23.09.2001	40	L. Beran
30	50°22'48"	14°27'16"	5652	5.08.2001	5	L. Beran
31	50°22'25"	14°27'15"	5652	5.08.2001	8	L. Beran
32	50°21'45"	14°26'49"	5652	11.10.2002	1	L. Beran
33	50°21'06"	14°29'14"	5652	24.06.2001	3	L. Beran
34	50°21'06"	14°29'14"	5652	4.07.2000	70	L. Beran
35	50°21'06"	14°29'14"	5652	26.06.2004	5	L. Beran
36	50°19'52"	14°29'45"	5652	12.04.2003	2	L. Beran
37	50°19'23"	14°27'24"	5652	12.10.2003	40	L. Beran
38	50°17'57"	15°11'26"	5657	4.07.2004	2	L. Beran
39	50°17'51"	14°28'55"	5752	2.09.1999	1	E. Stuchlík, det. LB
40	50°17'51"	14°28'55"	5752	5.09.2005	1	E. Stuchlík, det. LB
41	50°17'42"	14°31'47"	5753	27.07.2002	2	L. Beran
42	50°17'42"	14°31'47"	5753	28.10.2002	6	L. Beran
43	50°17'42"	14°31'47"	5753	26.04.2003	4	L. Beran
44	50°17'15"	14°31'13"	5753	12.04.2003	3	L. Beran

*Annex 1 (continued)*

Record No.	Record coordinates		Mapping field	Date	Abundance	Collector
	Latitude, °N	Longitude, °E				
45	50°17'06"	14°30'33"	5753	16.09.1994	10	L. Beran
46	50°17'06"	14°30'33"	5753	22.09.2001	300	L. Beran
47	50°16'49"	17°15'19"	5769	11.10.2001	2	L. Beran
48	50°15'58"	14°32'40"	5753	25.07.1999	5	L. Beran
49	50°15'58"	14°32'40"	5753	29.09.2001	12	L. Beran
50	50°15'35"	14°32'34"	5753	30.09.2001	5	L. Beran
51	50°14'45"	14°32'47"	5753	3.11.1995	5	L. Beran
52	50°14'43"	14°37'28"	5753	23.04.1995	10	L. Beran
53	50°14'43"	14°37'28"	5753	21.09.2001	9	L. Beran
54	50°14'33"	14°35'44"	5753	8.05.2005	3	L. Beran
55	50°14'28"	15°01'12"	5756	16.12.2000	25	L. Beran
56	50°12'60"	15°56'06"	5861	27.08.2005	25	L. Beran
57	50°12'31"	15°53'17"	5761	19.08.2003	6	L. Beran
58	50°12'21"	14°39'38"	5753	2.07.2003	14	L. Beran
59	50°11'20"	15°01'54"	5856	7.12.2002	2	L. Beran
60	50°11'14"	15°51'12"	5861	19.08.2003	4	L. Beran
61	50°11'09"	15°02'46"	5856	20.09.2002	240	L. Beran
62	50°10'50"	15°03'24"	5856	10.10.2004	20	L. Beran
63	50°10'50"	15°03'24"	5856	8.10.2005	20	L. Beran
64	50°10'47"	15°03'19"	5856	22.01.2005	2	L. Beran
65	50°10'46"	14°49'56"	5854	17.08.2005	20	J. Špaček
66	50°10'41"	14°51'13"	5855	13.10.2002	15	E. Stuchlík, det. LB
67	50°10'41"	14°51'13"	5855	10.10.2003	73	E. Stuchlík, det. LB
68	50°10'41"	14°51'13"	5855	7.09.2001	65	L. Beran
69	50°10'39"	14°54'02"	5855	22.05.1994	10	L. Beran
70	50°10'39"	14°54'02"	5855	13.07.2001	25	L. Beran
71	50°10'26"	14°53'49"	5855	28.08.1975		V. Ložek <sup>4</sup>
72	50°10'26"	14°53'49"	5855	10.08.2001	50	L. Beran
73	50°10'26"	15°00'54"	5856	20.09.2000	15	L. Beran
74	50°10'23"	15°49'48"	5861	19.08.2003	14	L. Beran
75	50°10'16"	14°49'50"	5854	27.09.1998	10	L. Beran
76	50°10'16"	15°50'11"	5861	4.10.2000	65	M. Horsák
77	50°10'16"	15°50'11"	5861	19.08.2003	50	L. Beran
78	50°10'14"	14°43'25"	5854	10.08.2003	3	L. Beran
79	50°10'13"	15°50'43"	5861	19.06.1994		L. Juříčková <sup>2</sup>
80	50°10'07"	14°52'03"	5855	27.04.2003	4	L. Beran
81	50°09'42"	15°33'00"	5859	19.07.2003	3	L. Beran
82	50°09'33"	15°43'28"	5860	24.06.2005	2	L. Beran
83	50°08'22"	15°47'51"	5860	31.07.1999	5	L. Beran
84	50°08'10"	15°47'53"	5860	31.07.1999	5	L. Beran
85	no data	no data	5855	1.01.1942- 31.12.1942		V. Ložek <sup>4</sup>
86	50°07'52"	14°55'49"	5855	21.11.1999	20	L. Beran
87	50°07'50"	15°06'53"	5856	10.09.1994	20	L. Beran
88	50°07'49"	15°48'10"	5860	31.07.1999	5	L. Beran
89	50°07'43"	15°07'22"	5856	15.07.2001	12	L. Beran

*Annex 1 (continued)*

Record No.	Record coordinates		Mapping field	Date	Abundance	Collector
	Latitude, °N	Longitude, °E				
90	50°07'31"	15°11'13"	5856	29.12.2002	6	L. Beran
91	50°07'30"	15°08'36"	5856	27.09.2001	75	L. Beran
92	50°07'20"	15°27'37"	5858	24.09.2000	3	L. Beran
93	50°06'57"	15°09'38"	5856	6.11.2005	50	L. Beran
94	50°06'39"	15°45'20"	5860	30.06.1996	20	L. Beran
95	50°06'17"	15°04'10"	5856	11.12.2004	70	L. Beran
96	50°05'51"	15°46'57"	5860	24.07.2002	8	L. Beran
97	50°05'42"	15°48'27"	5960	11.10.2003	2	E. Stuchlík, det. LB
98	50°05'37"	15°09'05"	5956	30.09.1996	10	L. Beran
99	50°05'37"	15°09'05"	5956	29.09.2001	15	L. Beran
100	50°05'22"	15°57'01"	5961	24.09.2005	20	L. Beran
101	50°04'07"	14°20'13"	5952	30.07.2005	2	L. Beran
102	50°03'24"	15°47'57"	5960	13.07.2004	35	L. Beran
103	50°03'05"	15°33'38"	5959	9.10.2000	26	M. Horsák
104	50°02'54"	15°23'55"	5958	23.05.1999	10	L. Beran
105	50°02'38"	15°34'24"	5959	4.07.2001	4	L. Beran
106	50°02'29"	15°23'35"	5958	12.10.1997	50	L. Beran
107	50°02'25"	15°35'02"	5959	9.10.2000	2	M. Horsák
108	50°02'10"	15°30'35"	5959	17.07.2004	2	L. Beran
109	50°02'08"	15°19'28"	5958	15.09.2001	3	L. Beran
110	50°02'05"	15°19'42"	5958	15.11.2000	16	V. Vrabec <sup>6</sup>
111	50°02'05"	15°19'42"	5958	15.09.2001	35	L. Beran
112	50°02'05"	15°19'42"	5958	20.04.2002	4	L. Beran
113	50°02'05"	15°20'28"	5958	15.09.2001	300	L. Beran
114	50°01'59"	15°37'04"	5959	10.10.2003	32	E. Stuchlík, det. LB
115	50°01'59"	15°37'34"	5959	4.08.1993	3	E. Wohlgemuth <sup>7</sup>
116	50°01'59"	15°37'34"	5959	5.09.2004	30	L. Beran
117	50°01'45"	15°12'24"	5957	31.07.2002	3	L. Beran
118	50°01'39"	15°17'56"	5957	2.09.1999	5	L. Beran
119	49°59'53"	14°04'27"	6062	31.07.2002	200	L. Beran
120	49°57'54"	14°09'47"	6050	14.10.2004	12	L. Beran
121	49°53'22"	13°45'42"	6148	27.06.2003	80	L. Beran
122	49°52'26"	15°26'02"	6158	20.04.2003	6	L. Beran
123	49°48'58"	14°25'12"	6152	13.11.2005	35	L. Beran
124	49°47'56"	14°25'13"	6152	13.11.2005	5	L. Beran
125	no data	no data	6246	18.09.1995		L. Juříčková <sup>3</sup>
126	49°47'04"	16°57'24"	6267	29.09.2000	3	L. Beran
127	49°46'35"	16°57'44"	6267	8.10.2001	4	L. Beran
128	49°39'02"	17°14'13"	6369	17.07.2003	3	L. Beran
129	49°38'56"	17°14'12"	6369	18.07.2003	8	L. Beran
130	49°38'53"	17°14'29"	6369	18.07.2003	10	L. Beran
131	49°37'38"	17°13'44"	6369	28.09.1998	10	L. Beran
132	49°37'38"	17°13'44"	6369	1.07.1992- 31.8.1993	2	M. Maňas <sup>5</sup>
133	49°29'07"	17°13'14"	6569	28.09.2000	45	L. Beran
134	49°29'07"	17°13'14"	6569	10.10.2001	2	L. Beran



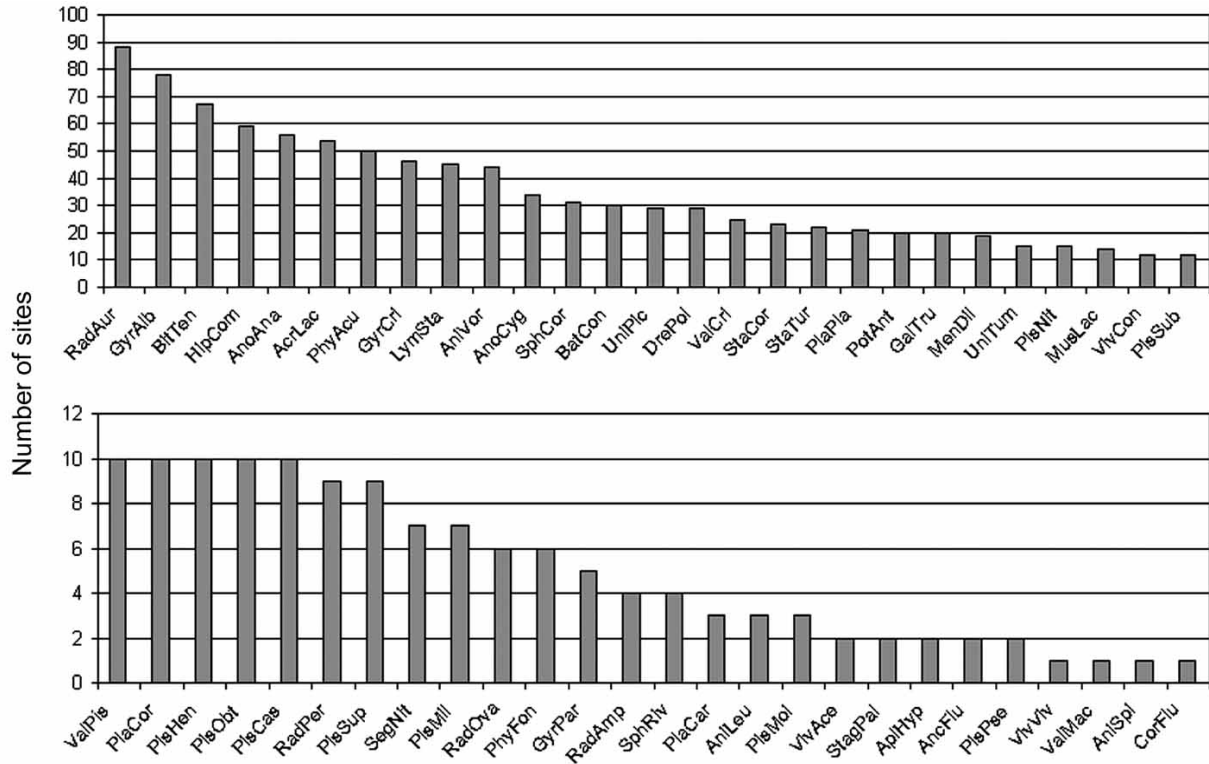
**Annex 1 (continued)**

Record No.	Record coordinates		Mapping field	Date	Abundance	Collector
	Latitude, °N	Longitude, °E				
135	49°24'06"	12°51'47"	6543	31.08.2004	2	L. Beran
136	49°22'02"	12°52'09"	6643	22.05.2003	2	L. Beran
137	49°13'44"	14°23'48"	6752	6.05.2002	2	L. Beran
138	49°01'35"	14°51'57"	6955	22.10.2005	10	L. Beran
139	49°00'59"	17°25'36"	6970	5.09.1996	4	M. Horskák
140	49°00'59"	17°25'36"	6970	20.09.1997		M. Horskák
141	no data	no data	7072	11.11.1993 -1.5.1994		E. Wohlgemuth <sup>7</sup>
142	no data	no data	7072	23.08.1996		V. Ložek
143	48°58'12"	17°44'17"	7072	24.08.2001	350	L. Beran
144	48°57'44"	17°08'58"	7068	6.08.2005	1	L. Beran
145	48°56'44"	17°40'52"	7072	26.07.1998	20	M. Horskák
146	48°56'44"	17°40'52"	7072	5.07.2001	1	M. Horskák
147	48°56'44"	17°40'52"	7072	21.08.2001	40	L. Beran
148	48°54'35"	17°44'22"	7072	21.08.2001	8	L. Beran
149	48°53'47"	14°54'23"	7155	7.10.2005	3	L. Beran
150	48°53'37"	14°56'06"	7155	7.10.2005	40	L. Beran
151	48°48'10"	17°05'40"	7168	1.10.1997	10	L. Beran
152	48°46'08"	17°02'13"	7268	4.10.2001	3	LB+MH
153	48°44'53"	17°01'44"	7268	4.10.2001	4	LB+MH
154	48°44'29"	17°01'31"	7267	4.10.2001	4	LB+MH
155	48°44'20"	16°55'43"	7267	5.10.2001	1	LB+MH

<sup>1</sup>Flasar I (1998) Die Gastropoden Nordwestböhmens und ihre Verarbeitung. Heldia, München, 3, 4: 1-210<sup>2</sup>Juříčková L (1998) Měkkýši Hradce Králové. (Molluscs of Hradec Králové (East Bohemia, Czech Republic)). Acta musei Reginaehradecensis s. A., Hradec Králové, 26: 101-172 (in Czech, English abstract)<sup>3</sup>Juříčková L (1998) Měkkýši Plzně. (Mollusca of city Plzeň (West Bohemia, Czech Republic)). Sborn. Západočes. Muz. Plzeň, Přír., Plzeň, 96: 1-47 (in Czech, English abstract)<sup>4</sup>Ložek V (1971) Přílipkovití plži v našich vodách. Živa, Praha, 19, 3: 101 (in Czech)<sup>5</sup>Maňas M (2004) Měkkýši (Mollusca) chráněné krajinné oblasti Litovelské Pomoraví. Dipl. práce, Ms. depon. in: PFF UP, Olomouc, 80 pp., 66 pp. příloh. (in Czech)<sup>6</sup>Vrabec V (2000) Nález druhu *Ferrissia wautieri* (Mollusca: Gastropoda: Ancyliidae) v tůni Bejkovna u Lžovic na Kolínsku a známé rozšíření tohoto druhu v ČR. (Finding of Species *Ferrissia wautieri* (Mollusca: Gastropoda: Ancyliidae) in a Pool Bejkovna near Lžovice (Kolín district) and its Known Distribution in Czech Republic). Práce muzea v Kolíně, řada přírodovědná 4: 33-44 (in Czech, English summ.)<sup>7</sup>Wohlgemuth E (1995) Další nálezy plže *Ferrissia wautieri* na našem území. Živa, Praha, 43: 2: 75 (in Czech)

**Annex 2**

Co-occurrence of other molluscs. Number of sites (n = 109) where other molluscs co-occurring with *Ferrissia fragilis*



RadAur – *Radix auricularia*, GyrAlb – *Gyraulus albus*, BitTen – *Bithynia tentaculata*, HipCom – *Hippeutis complanatus*, AnoAna – *Anodonta anatina*, AcrLac – *Acroloxus lacustris*, PhyAcu – *Physella acuta*, GyrCri – *Gyraulus crista*, LymSta – *Lymnaea stagnalis*, AniVor – *Anisus vortex*, AnoCyg – *Anodonta cygnea*, SphCor – *Sphaerium corneum*, BatCon – *Bathymphalus contortus*, UniPic – *Unio pictorum*, DrePol – *Dreissena polymorpha*, ValCri – *Valvata cristata*, StaCor – *Stagnicola corvus*, StaTur – *Stagnicola turricula*, PlaPla – *Planorbis planorbis*, PotAnt – *Potamopyrgus antipodarum*, GalTru – *Galba truncatula*, MenDil – *Menetus dilatatus*, UniTum – *Unio tumidus*, PisNit – *Pisidium nitidum*, MusLac – *Musculium lacustre*, VivCon – *Viviparus contectus*, PisSub – *Pisidium subtruncatum*, ValPis – *Valvata piscinalis*, PlaCor – *Planorbis corneus*, PisHen – *Pisidium henslowanum*, PisObt – *Pisidium obtusale*, PisCas – *Pisidium casertanum*, RadPer – *Radix peregra*, PisSup – *Pisidium supinum*, SegNit – *Segmentina nitida*, PisMil – *Pisidium milium*, RadOva – *Radix ovata*, PhyFon – *Physa fontinalis*, GyrPar – *Gyraulus parvus*, RadAmp – *Radix ampla*, SphRiv – *Sphaerium rivicola*, PlaCar – *Planorbis carinatus*, AniLeu – *Anisus leucostoma*, PisMoi – *Pisidium moitessierianum*, VivAce – *Viviparus acerossus*, StagPal – *Stagnicola palustris*, AplHyp – *Aplexa hypnorum*, AncFlu – *Ancylus fluviatilis*, PisPse – *Pisidium pseudosphaerium*, VivViv – *Viviparus viviparus*, ValMac – *Valvata macrostoma*, AniSpi – *Anisus spirorbis*, CorFlu – *Corbicula fluminea*.