

Annotated list of rotifers of Lake Võrtsjärv

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Abstract. The present review makes an inventory of published information on the taxonomic composition of rotifers in L. Võrtsjärv, Estonia, since 1920, and provides a revised list of rotifers recorded from the lake, with up-to-date taxonomy. The list of synonyms used in earlier literature is also given. A total of 173 rotifer taxa (138 species) belonging to 22 families and 46 genera have so far been recorded from L. Võrtsjärv. The most taxon-rich family is Brachionidae with 41 taxa listed, followed by Synchaetidae with 19 and Trichocercidae with 18 taxa. The most diverse genera are *Trichocerca* (17 taxa) and *Lecane* (14). Most (75%) of the rotifer taxa found have cosmopolitan or wide distribution, approximately 11% have Holarctic and 2% Palearctic occurrence. The rotifer fauna of L. Võrtsjärv includes four rare species: *Cephalodella compacta*, *Eosphora thoides*, *Monommata grandis*, and *Resticula gelida*.

Key words: Rotifera, taxonomic composition, shallow eutrophic lake.

INTRODUCTION

Rotifers constitute an important part of the zooplankton in strongly eutrophic L. Võrtsjärv. Their abundance fluctuates between 163 000 and 2 130 000 ind m⁻³ during the year, the average is 656 000 ind m⁻³. The share of rotifers in the zooplankton abundance is great all the year round (82%), being especially high in winter (99%) and spring (90%). In summer and autumn, owing to abundant occurrence of cladocerans and copepods, the share of rotifers diminishes, remaining still on a rather high level (68%). The biomass of rotifers is low ranging 0.112–0.858 g m⁻³, with an average 0.278 g m⁻³. They form quite a considerable part (28%) of the zooplankton biomass during the vegetation period. In the winter zooplankton, rotifers are the main component (91%) in the zooplankton biomass (Haberman & Virro, 2003).

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The first data on the rotifers of L. Võrtsjärv were published in the monograph by Mühlen & Schneider (1920). In this study, based on the samples collected during 1911–1913, 26 rotifer taxa were listed. In 1952–1954, after an interval of almost 40 years, the zooplankton of the lake was investigated again by Schönberg (1958). Only the dominating four rotifer species were mentioned among 63 zooplankters. Since 1964, the zooplankton of L. Võrtsjärv has been monitored monthly. Together with this, more data began to accumulate on rotifers. Haberman & Mäemets (1973) summarized earlier literature data and the investigations made during 1954–1966, providing a list of zooplankton taxa with 51 rotifer taxa (45 species). The pelagic rotifer community was studied in detail by Haberman (1976, 1978). She reported 34 taxa (31 species) of rotifers from the material collected in 1965–1966. In the 1970s, the studies were carried on dealing mostly with the seasonal dynamics and quantitative aspects of rotifers as a group and of dominant species. In 1980–1982, the pelagial and littoral habitats of L. Võrtsjärv were investigated by Kutikova & Haberman (1986), recording 148 rotifer taxa (129 species). The same taxa are mentioned in further rotifer or general zooplankton works based on the analysis of monthly monitoring data from the years 1989–1997 (e.g. Haberman, 1995, 1998; Haberman & Põllumäe, 1998). More recently, the previous information has been summarized and supplemented with new data from different sets of samples dating up to 2002. Further 18 taxa (6 species) have been added to the list of rotifers previously known from L. Võrtsjärv (Haberman & Virro, 2003; Virro & Haberman, submitted).

The aim of the present review is to make an inventory of all available information published on the taxonomic composition of rotifers in L. Võrtsjärv since 1920 and to provide a revised list of rotifers recorded from the lake, with up-to-date taxonomy. Summarized and improved information on the taxonomic composition is essential for the monitoring of the compositional changes in the rotifer fauna of L. Võrtsjärv, for the assessment of its ecological status, and conservation of biodiversity, as well as for facilitating future checkings of the earlier lists.

DESCRIPTION OF THE LAKE

Lake Võrtsjärv is situated in central Estonia. It is the second largest lake in the Baltic region. Data on several morphometric and physico-chemical characteristics are presented in Table 1. Based on the long-term nutrient data from the years 1968–2001, L. Võrtsjärv can be qualified as strongly eutrophic, its southern part even hypertrophic. The shallowness of the lake and the wave-induced resuspension of bottom sediments contribute to the formation of high seston (detritus) concentration and high turbidity during summer. Algal blooms are common in the lake. Filamentous algae are dominating all the year round: species of *Aulacoseira* in spring, *Limnothrix planktonica* (Wolosz.) Meffert, *L. redekei* (van Goor) Meffert, *Planktolyngbya limnetica* (Lemm.) Kom.-Legn., and *Aphanizomenon skujae* Kom.-Leng. et Cronb. in summer and autumn

Table 1. Morphometric and physico-chemical characteristics (mean values) of L. Vörtsjärv

Characteristic	Value
Length, km	35
Maximum width, km	15
Mean surface area, km ²	270
Mean depth, m	2.8
Maximum depth, m	6.0
Mean volume, km ³	0.75
Mean annual range of water level fluctuations, m	1.4
Mean residence time, year	1
Transparency, m	1.07
pH	8.1
Total P, mg P m ⁻³	52
Total N, mg N m ⁻³	1540
Chl <i>a</i> , mg m ⁻³	22
Duration of ice cover, day	135 (November–April)
Maximum water temperature, °C	23 (July)

(Nöges et al., 2003). Zooplankton is dominated by small cladocerans (*Chydorus sphaericus* (Müller), *Bosmina longirostris* (Müller)) and rotifers typical of eutrophic waterbodies (Haberman & Virro, 2003). The total number of bacteria fluctuated from 0.28×10^6 to 11×10^6 cells mL⁻¹ during the period of 1963–2001, being as an average 3.7×10^6 cells mL⁻¹ (Tammert & Kisand, 2003).

MATERIAL AND METHODS

The present review is based on all previous taxonomical or ecological publications dealing with rotifers of L. Vörtsjärv to a greater or lesser extent. The general classification scheme followed in the present list is that used by Melone et al. (1998). The arrangement of families is based on Kutikova (1970) with modifications after the updated keys published in the series *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* (see the citations in the text). The genera and species within each family are arranged in alphabetical order. Intrasubspecific forms (ecotypes or morphotypes) are included. Although they have no systematic status, they can be significant from the ecological aspect, the more so because in many cases the status of these infrasubspecific units is not yet clear. The nomenclature of Lecanidae, Notommatidae, Scaridiidae, Proalidae, Dicranophoridae, Asplanchnidae, Gastropodidae, Lindiidae, Synchaetidae, and Trochosphaeridae follows the *Guides* ... (Segers, 1995; Nogrady et al., 1995; De Smet, 1996; De Smet & Pourriot, 1997; De Paggi et al., 2002). In the other cases various sources have been consulted, including Donner (1965), Kutikova (1970), Koste (1978), Koste & Shiel (1987, 1989a, 1989b), and Shiel & Koste (1992).

RESULTS AND DISCUSSION

A total of 173 rotifer taxa (138 species) belonging to 22 families and 46 genera have so far been recorded from L. Vörtsjärv (Table 2). The list of synonyms used in earlier literature is given in Table 3. The most taxon-rich family is Brachionidae with 41 taxa (21 species) listed, followed by Synchaetidae with 19 (18) and Trichocercidae with 18 (16) taxa. The most diverse genera are *Trichocerca* (17 taxa, 15 species) and *Lecane* (14 taxa, 14 species). Most (75%) of the rotifer taxa found have cosmopolitan or wide distribution, approximately 11% have Holarctic and 2% Palearctic occurrence. Five taxa (3%) are presently known only from Europe: *Collotheca balatonica*, *Dicranophorus robustus* f. *europaeus*, *Encentrum eurycephalum*, *Polyarthra dissimulans*, and *Trichotria pocillum bergi*.

Table 2. Systematic list of Rotifera recorded from Lake Vörtsjärv, with remarks on occurrence. Key to reference sources: 1 = Mühlen & Schneider, 1920; 2 = Haberman & Mäemets, 1973; 3 = Haberman, 1978; 4 = Kutikova & Haberman, 1986; 5 = Haberman, 1998; 6 = Haberman & Virro, 2003; 7 = Virro & Haberman, submitted. Pe = pelagial plankton; Li = littoral plankton; Ps = psammon; ? = probable presence

Taxon	Source	Month	Habitat
Phylum Rotifera			
Superclass Eurotatoria			
Class Bdelloidea			
Order Philodinida			
Family Philodinidae			
<i>Dissotrocha aculeata</i> (Ehrenberg, 1832)	4, 5, 6	7	Li
<i>Philodina citrina</i> Ehrenberg, 1832	4, 5, 6	6	Ps
<i>Rotaria neptunia</i> (Ehrenberg, 1832)	4, 5, 6	6	Pe, Li
<i>R. rotatoria</i> (Pallas, 1766)	4, 5, 6	6	Li
<i>R. tardigrada</i> (Ehrenberg, 1832)	4, 5, 6	6	Ps
Bdelloidea gen. et spp. <i>indet.</i>	4, 5, 6, 7	1, 4–6, 8–12	Pe, Li
Class Monogononta			
Order Ploimida			
Family Notommatidae			
<i>Cephalodella compacta</i> Wiszniewski, 1934	4, 5, 6	8	Ps
<i>C. gibba</i> (Ehrenberg, 1832)	4, 5, 6	6–11	Li, Ps
<i>C. gibba</i> (Ehrenberg, 1832) f. <i>microdactyla</i> Koch-Althaus, 1963	6	4	Pe
<i>C. megalcephala</i> (Glasscott, 1893)	4, 5, 6	6	Ps
<i>C. sterea</i> (Gosse, 1887) f. <i>minor</i> Donner, 1950	4, 5, 6	6	Ps
<i>C. ventripes</i> (Dixon-Nuttall, 1901)	4, 5, 6	7	Li
<i>Eosphora thoides</i> Wulfert, 1935	4, 5, 6	4	Li
<i>Monommata grandis</i> Tessin, 1890	4, 5, 6	9	Li
<i>Notommata cyrtopus</i> Gosse, 1886	4, 5, 6	6	Ps
<i>N. diasema</i> Myers, 1936	4, 5, 6	8	Ps
<i>Resticula gelida</i> (Harring et Myers, 1922)	4, 5, 6, 7	3	Li

Table 2. Continued

Taxon	Source	Month	Habitat
Family Scaridiidae			
<i>Scaridium longicaudum</i> (Müller, 1786)	4, 5, 6	7	Li
Family Trichocercidae			
<i>Elosa spinifera</i> Wiszniewski, 1932	4, 5, 6	8	Li
<i>Trichocerca brachyura</i> (Gosse, 1851)	6, 7	1, 7	Pe
<i>T. capucina</i> (Wierzejski et Zacharias, 1893)	1, 2, 3, 4, 5, 6	5–10	Pe, Li
<i>T. dixon-nuttalli</i> (Jennings, 1903)	6	7	Pe
<i>T. elongata</i> (Gosse, 1886)	4, 5, 6, 7	12	Li
<i>T. jenningsi</i> Voigt, 1956	4, 5, 6	6	Li
<i>T. longiseta</i> (Schrank, 1802)	2, 4, 5, 6	7	Li
<i>T. porcellus</i> (Gosse, 1886)	4, 5, 6	6, 9	Li
<i>T. porcellus</i> (Gosse, 1886) f. <i>major</i> (Hauer, 1935)	6	7	Pe
<i>T. pusilla</i> (Lauterborn, 1898)	4, 5, 6	6–9	Pe, Li
<i>T. rattus</i> (Müller, 1776)	4, 5, 6	9	Li
<i>T. rattus</i> (Müller, 1776) f. <i>carinata</i> (Ehrenberg, 1830)	4, 5, 6	6–8	Li
<i>T. rousseleti</i> (Voigt, 1902)	4, 5, 6	6–9	Pe, Li
<i>T. rutneri</i> Donner, 1953	4, 5, 6	6, 7	Li
<i>T. similis</i> (Wierzejski, 1893)	4, 5, 6	8	Pe
<i>T. stylata</i> (Gosse, 1851)	4, 5, 6	7	Pe
<i>T. taurocephala</i> (Hauer, 1931)	4, 5, 6	8	Ps
<i>T. tenuior</i> (Gosse, 1886)	4, 5, 6	6, 7	Pe, Ps
Family Gastropodidae			
<i>Ascomorpha ecaudis</i> Perty, 1850	4, 5, 6	6	Li
<i>A. saltans</i> Bartsch, 1870	6	6	Pe
<i>Gastropus stylifer</i> Imhof, 1891	2, 3, 4, 5, 6	5–10	Pe, Li
Family Synchaetidae			
<i>Ploesoma hudsoni</i> (Imhof, 1891)	1, 2, 3, 4, 5, 6	4–10	Pe, Li
<i>Polyarthra dissimulans</i> Nipkow, 1952	2, 3, 6		Pe
<i>P. dolichoptera</i> Idelson, 1925	1?, 2, 3, 4, 5, 6, 7	1–7, 10–12	Pe, Li
<i>P. cf. dolichoptera</i> Idelson, 1925	6	4–7	Pe, Li
<i>P. euryptera</i> Wierzejski, 1891	1, 4, 5, 6	6–8	Pe, Li
<i>P. longiremis</i> Carlin, 1943	4, 5, 6	6, 8	Li
<i>P. luminosa</i> Kutikova, 1962	2, 3, 4, 5, 6	5–10	Pe, Li
<i>P. major</i> Burckhardt, 1900	1?, 4, 5, 6	7–10	Pe, Li
<i>P. minor</i> Voigt, 1904	1?, 2, 3, 4, 5, 6	6, 7	Pe, Li
<i>P. remata</i> Skorikov, 1896	1?, 2, 3, 4, 5, 6, 7	3, 5–7, 9	Pe, Li
<i>P. vulgaris</i> Carlin, 1943	1?, 2, 3, 4, 5, 6	5, 7	Pe, Li
<i>Synchaeta grandis</i> Zacharias, 1893	4, 5, 6	5–10	Pe, Li
<i>S. kitina</i> Rousselet, 1902	4, 5, 6	4–8, 10	Pe, Li
<i>S. lakowitziana</i> Lucks, 1930	7	1	Pe
<i>S. longipes</i> Gosse, 1887	4, 5, 6	4, 6	Li
<i>S. oblonga</i> Ehrenberg, 1831	4, 5, 6	4–9	Pe, Li
<i>S. pectinata</i> Ehrenberg, 1832	4, 5, 6	4–7, 9–11	Pe, Li
<i>S. stylata</i> Wierzejski, 1893	4, 5, 6	5–9	Pe, Li
<i>S. verrucosa</i> Nipkow, 1961	4, 5, 6, 7	1–5, 10–12	Pe, Li

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Table 2. Continued

Taxon	Source	Month	Habitat
Family Lindiidae			
<i>Lindia truncata</i> (Jennings, 1894)	4, 5, 6	8	Li
Family Dicranophoridae			
<i>Albertia naidis</i> Bousfield, 1886	1, 2, 6		Parasitic
<i>Aspelta</i> sp.	4, 5, 6	8	Ps
<i>Dicranophorus hercules</i> Wiszniewski, 1932	4, 5, 6	8	Ps
<i>D. hercules</i> Wiszniewski, 1932 f. <i>adenta</i> Wulfert, 1961	4, 5, 6	8	Ps
<i>D. luetkeni</i> (Bergendal, 1892)	4, 5, 6	6	Ps
<i>D. robustus</i> Harring et Myers, 1928 f. <i>europaeus</i> Wulfert, 1936	4, 5, 6	7	Ps
<i>Dicranophorus</i> sp.	6	5	Pe
<i>Encentrum eurycephalum</i> Wulfert, 1936	4, 5, 6	6	Ps
<i>E. marinum</i> (Dujardin, 1841)	4, 5, 6	8	Ps
<i>Wierzejskiella sabulosa</i> (Wiszniewski, 1932)	4, 5, 6	6	Ps
<i>W. velox</i> (Wiszniewski, 1932)	4, 5, 6	6	Ps
Family Asplanchnidae			
<i>Asplanchna girodi</i> de Guerne, 1888	4, 5, 6, 7	1–4, 9, 12	Pe, Li
<i>A. herrickii</i> de Guerne, 1888	1, 2, 3, 4, 5, 6	6–9	Pe, Li
<i>A. priodonta</i> Gosse, 1850	1, 2, 3, 4, 5, 6, 7	1–12	Pe, Li
<i>A. priodonta</i> Gosse, 1850 f. <i>helvetica</i> Imhof, 1884	4, 5, 6	5–8, 10, 11	Pe, Li
Family Lecanidae			
<i>Lecane bulla</i> (Gosse, 1851)	4, 5, 6	4–8	Pe, Li
<i>L. clara</i> (Bryce, 1892)	4, 5, 6	10	Pe
<i>L. closterocerca</i> (Schmarda, 1859)	2, 3, 4, 5, 6	6, 8	Pe, Li, Ps
<i>L. cornuta</i> (Müller, 1786)	1, 2, 6	7	
<i>L. curvicornis</i> (Murray, 1913)	4, 5, 6	6	Pe
<i>L. elsa</i> Hauer, 1931	4, 5, 6	4–6	Li
<i>L. flexilis</i> (Gosse, 1886)	4, 5, 6	8	Li
<i>L. furcata</i> (Murray, 1913)	4, 5, 6	6	Ps
<i>L. ludwigii</i> (Eckstein, 1883)	4, 5, 6	7, 8	Li
<i>L. luna</i> (Müller, 1776)	1, 2, 3, 4, 5, 6, 7	1, 5–9, 12	Pe, Li
<i>L. lunaris</i> (Ehrenberg, 1832)	4, 5, 6	4–7, 10	Li
<i>L. psammophila</i> (Wiszniewski, 1932)	4, 5, 6	8	Li
<i>L. punctata</i> (Murray, 1913)	4, 5, 6	8	Ps
<i>L. stenroosi</i> (Meissner, 1908)	4, 5, 6	7, 8	Pe, Li
Family Proalidae			
<i>Bryceella stylata</i> (Milne, 1886)	4, 5, 6	8	Ps
Family Epiphanidae			
<i>Proalides tentaculatus</i> Beauchamp, 1907 f. <i>wulferti</i> Sudzuki, 1959	4, 5, 6	8	Pe

Table 2. Continued

Taxon	Source	Month	Habitat
Family Trichotriidae			
<i>Trichotria pocillum</i> (Müller, 1776)	1, 2, 4, 5, 6	6–11	Pe, Li
<i>T. pocillum bergi</i> (Meissner, 1906)	4, 5, 6	5, 6, 9, 10	Pe, Li
<i>T. tetractis</i> (Ehrenberg, 1830)	1, 2, 3, 4, 5, 6	4, 5, 7, 9	Pe, Li
<i>T. tetractis</i> (Ehrenberg, 1830) f. <i>caudata</i> (Lucks, 1912)	4, 5, 6	8	Li
<i>T. tetractis</i> (Ehrenberg, 1830) f. <i>similis</i> (Stenroos, 1898)	4, 5, 6	9, 10	Pe, Li
<i>T. truncata</i> (Whitelegge, 1889)	4, 5, 6	8–10	Pe, Li
Family Mytilinidae			
<i>Lophocharis naias</i> Wulfert, 1942	4, 5, 6	4, 6, 8, 9	Li
<i>L. oxysternon</i> (Gosse, 1851)	4, 5, 6	8	Li
<i>Lophocharis</i> sp.	2, 3	9	Pe
<i>Mytilina mucronata</i> (Müller, 1773)	2, 3, 4, 5, 6	4–6, 8–10	Pe, Li
<i>M. ventralis</i> (Ehrenberg, 1832)	2, 4, 5, 6	7, 8	Li
<i>M. ventralis</i> (Ehrenberg, 1832) f. <i>brevispina</i> (Ehrenberg, 1832)	4, 5, 6	6	Li
Family Colurellidae			
<i>Colurella adriatica</i> Ehrenberg, 1831	4, 5, 6	5–7	Li
<i>C. colurus</i> (Ehrenberg, 1830)	4, 5, 6	8	Pe, Li, Ps
<i>C. uncinata</i> (Müller, 1773)	4, 5, 6	7	Li
<i>Lepadella acuminata</i> (Ehrenberg, 1834)	4, 5, 6	7	Li
<i>L. ovalis</i> (Müller, 1786)	4, 5, 6, 7	4, 7, 10, 12	Li
<i>L. patella</i> (Müller, 1773)	4, 5, 6	6–8	Li
<i>L. patella</i> (Müller, 1773) f. <i>biloba</i> Hauer, 1958	4, 5, 6	6	Li
<i>L. patella</i> (Müller, 1773) f. <i>oblonga</i> (Ehrenberg, 1834)	4, 5, 6	7	Li
Family Euchlanidae			
<i>Dipleuchlanis propatula</i> (Gosse, 1886)	4, 5, 6	4, 5	Li
<i>Euchlanis deflexa</i> Gosse, 1851	2, 4, 5, 6	5, 7–9	Li
<i>E. dilatata</i> Ehrenberg, 1832	1, 2, 4, 5, 6	6–9	Pe, Li
<i>E. dilatata</i> Ehrenberg, 1832 f. <i>lucksiana</i> Hauer, 1930	2, 3, 4, 5, 6	6–10	Pe, Li
<i>E. dilatata</i> Ehrenberg, 1832 f. <i>unisetata</i> Leydig, 1854	4, 5, 6	5, 6, 8, 9	Pe, Li
<i>E. incisa</i> Carlin, 1939	4, 5, 6	6	Li
<i>E. lyra</i> Hudson, 1886	4, 5, 6	4–11	Pe, Li
<i>E. lyra myersi</i> Kutikova, 1959	4, 5, 6	7	Li
<i>E. oropha</i> Gosse, 1887	4, 5, 6, 7	2, 3, 12	Pe, Li
<i>E. parva</i> Rousselet, 1892	2		Li
<i>E. proxima</i> Myers, 1930	2, 3, 6	5	Pe, Li
<i>E. pyriformis</i> Gosse, 1851	4, 5, 6	7	Pe, Li
<i>E. triquetra</i> Ehrenberg, 1838	2, 4, 5, 6	5, 8	Li
Family Brachionidae			
<i>Anuraeopsis fissa</i> (Gosse, 1851)	4, 5, 6	5–9	Pe, Li
<i>Brachionus angularis</i> Gosse, 1851	2, 3, 4, 5, 6, 7	1, 3–7, 10, 12	Pe, Li
<i>B. angularis</i> Gosse, 1851 f. <i>bidens</i> Plate, 1886	6	4–6	Pe
<i>B. bennini</i> Leissling, 1924	4, 5, 6, 7	5, 6	Li

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Table 2. Continued

Taxon	Source	Month	Habitat
<i>B. calyciflorus</i> Pallas, 1766	4, 5, 6, 7	1, 4–8, 10–12	Pe, Li
<i>B. calyciflorus</i> Pallas, 1766 f. <i>amphiceros</i> (Ehrenberg, 1838)	4, 5, 6	4–6	Pe, Li
<i>B. calyciflorus</i> Pallas, 1766 f. <i>anuraeiformis</i> Brehm, 1909	4, 5, 6, 7	4–6, 11, 12	Pe, Li
<i>B. plicatilis</i> Müller, 1786 f. <i>longicornis</i> Fadeev, 1925	6	4	Pe
<i>B. quadridentatus</i> Hermann, 1783	1, 2, 4, 5, 6	5–8	Pe, Li
<i>B. quadridentatus</i> Hermann, 1783 f. <i>brevispinus</i> Ehrenberg, 1832	6	7	Pe
<i>B. sericus</i> Rousselet, 1907	4, 5, 6	5	Pe, Li
<i>B. urceus</i> (Linnaeus, 1758)	4, 5, 6	4–6	Pe, Li
<i>Kellicottia longispina</i> (Kellicott, 1879)	1, 2, 3, 4, 5, 6, 7	1–12	Pe, Li
<i>Keratella cochlearis</i> (Gosse, 1851)	1, 2, 3, 4, 5, 6, 7	1–12	Pe, Li
<i>K. cochlearis</i> (Gosse, 1851) f. <i>macracantha</i> (Lauterborn, 1898)	4, 5, 6, 7	1–6, 10	Pe, Li
<i>K. cochlearis</i> (Gosse, 1851) f. <i>micracantha</i> (Lauterborn, 1900)	6	6, 7	Pe
<i>K. cochlearis</i> (Gosse, 1851) f. <i>pustulata</i> (Lauterborn, 1900)	6	5–7	Pe
<i>K. cochlearis hispida</i> (Lauterborn, 1898)	1, 4, 5, 6	6–8	Pe, Li
<i>K. cochlearis hispida</i> (Lauterborn, 1898) f. <i>ecauda</i> Amman, 1921	4, 5, 6	7	Pe
<i>K. cochlearis hispida</i> (Lauterborn, 1898) f. <i>micracantha</i> Slonimski, 1932	6	6	Pe
<i>K. cochlearis robusta</i> (Lauterborn, 1900)	6	4, 5	Pe
<i>K. cochlearis tecta</i> (Gosse, 1851)	1, 4, 5, 6	5–10	Pe, Li
<i>K. hiemalis</i> Carlin, 1943	2, 3, 4, 5, 6, 7	1–6, 11, 12	Pe, Li
<i>K. irregularis</i> (Lauterborn, 1898)	4, 5, 6	5–7	Pe, Li
<i>K. irregularis</i> (Lauterborn, 1898) f. <i>angulifera</i> (Lauterborn, 1900)	4, 5, 6	5, 6	Pe
<i>K. irregularis</i> (Lauterborn, 1898) f. <i>connectens</i> (Lauterborn, 1900)	6	6, 7	Pe
<i>K. irregularis</i> (Lauterborn, 1898) f. <i>wartmanni</i> (Asper et Heuscher, 1889)	4, 5, 6	6, 7, 10	Pe, Li
<i>K. quadrata</i> (Müller, 1786)	1, 2, 3, 6	4–8	Pe
<i>K. quadrata</i> (Müller, 1786) f. <i>frenzei</i> (Eckstein, 1895)	4, 5, 6, 7	1–12	Pe, Li
<i>K. quadrata</i> (Müller, 1786) f. <i>reticulata</i> Carlin, 1943	6, 7	1, 6	Pe
<i>K. testudo</i> (Ehrenberg, 1832)	4, 5, 6	10	Pe
<i>Notholca acuminata</i> (Ehrenberg, 1832)	1, 2, 3, 4, 5, 6	5, 6, 9, 10	Pe, Li
<i>N. caudata</i> Carlin, 1943	2, 3, 6	9–11	Pe
<i>N. foliacea</i> (Ehrenberg, 1838)	2, 3, 4, 5, 6	5, 6	Pe, Li
<i>N. labis</i> Gosse, 1887	4, 5, 6, 7	1, 5–7, 9–11	Pe, Li
<i>N. labis</i> Gosse, 1887 f. <i>limnetica</i> Levander, 1901	2, 6, 7	9–12	Pe
<i>N. squamula</i> (Müller, 1786)	2, 3, 4, 5, 6, 7	2–5, 12	Pe, Li
<i>N. squamula</i> (Müller, 1786) f. <i>evensi</i> Gillard, 1948	6		Pe
<i>N. squamula</i> (Müller, 1786) f. <i>muelleri</i> Focke, 1961	6		Pe
<i>N. striata</i> (Müller, 1786)	1, 2, 3, 6, 7	2–5, 10–12	Pe
<i>Platyias quadricornis</i> (Ehrenberg, 1832)	2, 4, 5, 6	4, 8	Li

Table 2. Continued

Taxon	Source	Month	Habitat
Order Flosculariacea			
Family Flosculariidae			
<i>Floscularia</i> sp.	1, 2, 6	6, 7, 10	
Family Conochilidae			
<i>Conochilus unicornis</i> Rousselet, 1892	1, 2, 3, 4, 5, 6, 7	2–9, 11	Pe, Li
Family Testudinellidae			
<i>Pompholyx sulcata</i> Hudson, 1885	1, 2, 4, 5, 6, 7	3, 6	Pe, Li
<i>Testudinella patina</i> (Hermann, 1783)	1, 2, 4, 5, 6	5, 7, 10	Pe, Li
Family Trochosphaeridae			
<i>Filinia longiseta</i> (Ehrenberg, 1834)	1, 2, 3, 4, 5, 6, 7	1, 3–10, 12	Pe, Li
<i>F. limnetica</i> (Zacharias, 1893)	2, 3, 6	5–11	Pe
<i>F. terminalis</i> (Plate, 1886)	2, 3, 4, 5, 6, 7	1–5, 7, 10, 11	Pe, Li
Order Collotheceacea			
Family Collotheceidae			
<i>Collotheca balatonica</i> Varga, 1936	4, 5, 6	6–11	Pe, Li
<i>C. mutabilis</i> (Hudson, 1885)	4, 5, 6	6–11	Pe, Li
<i>C. ornata</i> (Ehrenberg, 1832)	4, 5, 6	4	Pe
<i>Stephanoceros fimbriatus</i> (Goldfuss, 1820)	4, 5, 6	8	Li

The present rotifer community of L. Vörtsjärv is dominated by *Anuraeopsis fissa*, *Keratella cochlearis*, *K. cochlearis tecta*, *K. quadrata*, *Polyarthra dolichoptera*, *P. luminosa*, *Synchaeta verrucosa*, and *Trichocerca rousseleti* (Haberman, 1995, 1998; Haberman & Virro, 2003). The composition of the dominating complex as well as of the whole community is very characteristic of eutrophic lakes in the northern temperate zone (Kutikova, 1970, 1998; Bērziņš, 1978). Typically of the waterbodies of these latitudes, with a quite variable thermal regime, more or less eurythermic taxa constitute the major fraction of the rotifer fauna of the lake. The fully developed winter season (ice cover lasts from November to April) provides a suitable habitat for widely documented (e.g. Carlin, 1943; Berner-Fankhauser, 1983; May, 1983; Bērziņš & Pejler, 1989b) cold stenotherms such as *Filinia terminalis*, *Keratella hiemalis*, *Synchaeta lakowitziana*, *S. verrucosa*, and thermophobes with somewhat wider thermal tolerance like *Notholca squamula* and *Polyarthra dolichoptera*. The winter rotifer assemblage of L. Vörtsjärv is dominated by *P. dolichoptera*, *Keratella cochlearis*, *K. quadrata*, and *S. verrucosa* (Virro & Haberman, submitted). On the other hand, summer water temperature reaching up to 23°C as an average (Järvet, 2003), enables besides eurytherms the development of warm stenothermic component including

Table 3. List of synonyms used in earlier literature for different rotifer taxa encountered in Lake Vörtsjärv

Synonyms used	Valid name
<i>Albertia intrusor</i> Gosse	<i>Albertia naidis</i> Bousfield, 1886
<i>Anuraea aculeata</i> Ehrenberg	<i>Keratella quadrata</i> (Müller, 1786)
<i>Anuraea cochlearis</i> Gosse	<i>Keratella cochlearis</i> (Gosse, 1851)
<i>Anuraea cochlearis</i> f. <i>hispida</i> Lauterborn	<i>Keratella cochlearis hispida</i> (Lauterborn, 1898)
<i>Anuraea cochlearis</i> var. <i>tecta</i> Lauterborn	<i>Keratella cochlearis tecta</i> (Gosse, 1851)
<i>Argonotholca foliacea</i> (Ehrenberg)	<i>Notholca foliacea</i> (Ehrenberg, 1838)
<i>Bipalpus hudsoni</i> (Imhof)	<i>Ploesoma hudsoni</i> (Imhof, 1891)
<i>Brachionus bakeri</i> Müller	<i>Brachionus quadridentatus</i> Hermann, 1783
<i>Cathypna luna</i> Ehrenberg	<i>Lecane luna</i> (Müller, 1776)
<i>Dinocharis pocillum</i> (Müller)	<i>Trichotria pocillum</i> (Müller, 1776)
<i>Dinocharis tetractis</i> Ehrenberg	<i>Trichotria tetractis</i> (Ehrenberg, 1830)
<i>Euchlanis lucksiana</i> Hauer	<i>Euchlanis dilatata</i> Ehrenberg, 1832 f. <i>lucksiana</i> Hauer, 1930
<i>Euchlanis myersi</i> Kutikova	<i>Euchlanis lyra myersi</i> Kutikova, 1959
<i>Filinia longiseta</i> f. <i>limnetica</i> (Zacharias)	<i>Filinia limnetica</i> (Zacharias, 1893)
<i>Keratella hispida</i> (Lauterborn)	<i>Keratella cochlearis hispida</i> (Lauterborn, 1898)
<i>Keratella hispida</i> f. <i>ecauda</i> Amman	<i>Keratella cochlearis hispida</i> (Lauterborn, 1898) f. <i>ecauda</i> Amman, 1921
<i>Keratella hispida</i> f. <i>micracantha</i> Slonimski	<i>Keratella cochlearis hispida</i> (Lauterborn, 1898) f. <i>micracantha</i> Slonimski, 1932
<i>Keratella tecta</i> (Gosse)	<i>Keratella cochlearis tecta</i> (Gosse, 1851)
<i>Lecane</i> (L.) <i>acronycha</i> Harring et Myers	<i>Lecane curvicornis</i> (Murray, 1913)
<i>Lecane</i> (L.) <i>presumpta</i> Ahlstrom	<i>Lecane elsa</i> Hauer, 1931
<i>Lecane luna</i> <i>presumpta</i> Ahlstrom	<i>Lecane elsa</i> Hauer, 1931
<i>Lecane</i> (M.) <i>constricta</i> Murray	<i>Lecane lunaris</i> (Ehrenberg, 1832)
<i>Lecane</i> (M.) <i>crenata</i> Harring	<i>Lecane lunaris</i> (Ehrenberg, 1832)
<i>Lecane</i> (M.) <i>latvica</i> (Bērziņš)	<i>Lecane closterocerca</i> (Schmarda, 1859)
<i>Lecane</i> (M.) <i>tethis</i> (Harring et Myers)	<i>Lecane furcata</i> (Murray, 1913)
<i>Monostyla cornuta</i> Müller	<i>Lecane cornuta</i> (Müller, 1786)
<i>Notholca limnetica</i> (Levander)	<i>Notholca labis</i> Gosse, 1887 f. <i>limnetica</i> Levander, 1901
<i>Notholca longispina</i> Kellicott	<i>Kellicottia longispina</i> (Kellicott, 1879)
<i>Polyarthra platyptera</i> Ehrenberg	<i>Polyarthra dolichoptera</i> Idelson, 1925
<i>Polyarthra platyptera</i> Ehrenberg	<i>Polyarthra major</i> Burckhardt, 1900
<i>Polyarthra platyptera</i> Ehrenberg	<i>Polyarthra minor</i> Voigt, 1904
<i>Polyarthra platyptera</i> Ehrenberg	<i>Polyarthra remata</i> Skorikov, 1896
<i>Polyarthra platyptera</i> Ehrenberg	<i>Polyarthra vulgaris</i> Carlin, 1943
<i>Polyarthra platyptera</i> f. <i>euryptera</i> Wierzejski	<i>Polyarthra euryptera</i> Wierzejski, 1891
<i>Proalides wulferti</i> Sudzuki	<i>Proalides tentaculatus</i> Beauchamp, 1907 f. <i>wulferti</i> Sudzuki, 1959
<i>Pterodina patina</i> Müller	<i>Testudinella patina</i> (Hermann, 1783)
<i>Rattulus capucinus</i> (Wierzejski et Zacharias)	<i>Trichocerca capucina</i> (Wierzejski et Zacharias, 1893)
<i>Triarthra longiseta</i> Ehrenberg	<i>Filinia longiseta</i> (Ehrenberg, 1834)
<i>Trichotria similis</i> (Stenroos)	<i>Trichotria tetractis</i> (Ehrenberg, 1830) f. <i>similis</i> (Stenroos, 1898)

Anuraeopsis fissa, *Brachionus quadridentatus*, *Lecane ludwigii*, *L. punctata*, *Polyarthra euryptera*, *P. longiremis*, and *Synchaeta stylata* (e.g. after May, 1983; Bērziņš & Pejler, 1989b; De Paggi et al., 2002; Segers, 1995) in the summer assemblage.

The composition of the rotifer community of L. Vörtsjärv reflects expressively its present strongly eutrophic state. *Anuraeopsis fissa*, *Keratella cochlearis tecta*, and *Trichocerca rousseleti* of the dominating complex are generally acknowledged as good indicators of eutrophy (Hakkari, 1972; Pejler, 1983; Bērziņš & Pejler, 1989a; Ejsmont-Karabin & Hillbricht-Ilkowska, 1994; Duggan et al., 2001). In the 1960s, *K. cochlearis tecta* was occasionally encountered in L. Vörtsjärv as single individuals, whereas *A. fissa* and *T. rousseleti* did not become dominant before the 1980s and 1990s (Haberman & Mäemets, 1973; Haberman, 1998; Haberman & Virro, 2003). During the last 40 years, the species characteristic of oligo-mesotrophic conditions (Hakkari, 1972; Pejler, 1983; Bērziņš & Pejler, 1989a; Duggan et al., 2001) have either totally (*Asplanchna herrickii*) or nearly disappeared (*Conochilus unicornis*, *Kellicottia longispina*, *Ploesoma hudsoni*) following the accelerated eutrophication process in L. Vörtsjärv. The decrease in the abundance of several other species known to prefer lower trophy (*Asplanchna girodi*, *Filinia longiseta*, *Gastropus stylifer*, *Keratella hiemalis*) has been also observed.

Due to the shallowness of the lake, a strong influence of the wind causing constant resuspension of sediments, and extensive macrophyte zones, the presence of non-planktonic (benthic, littoral, or periphytic) forms (e.g. representatives of the genera *Dicranophorus*, *Cephalodella*, *Colurella*, *Lecane*, *Rotaria*, *Trichotria*) in the pelagial is an expected feature of L. Vörtsjärv.

Comments on selected species

The rotifer fauna of L. Vörtsjärv includes four rare species:

Cephalodella compacta was originally described from psammon samples from Poland. The subsequent records were from Hungary and North America (Kutikova, 1970; Nogrady et al., 1995). In L. Vörtsjärv, this rare species has been found in densely vegetated psammolittoral in August (Kutikova & Haberman, 1986).

Eosphora thoides, a benthic or periphytic species, is known from Europe, Australia, and New Zealand (Kutikova, 1970; Nogrady et al., 1995). It has been encountered in the littoral of L. Vörtsjärv in April (Kutikova & Haberman, 1986).

Monommata grandis is considered a cosmopolitan but rare species with usually single finds in littoral of lentic waters in Europe, Asia, North America, Australia, and Tasmania (Kutikova, 1970; Nogrady et al., 1995). This species is also known as an indicator of oligosaprobic conditions occurring at the pH range 3.5–9.2 (optimum 5.5) and temperatures 7.3–27.0 °C (maximum abundance at 17.5 °C) (Bērziņš & Pejler, 1987, 1989b; Nogrady et al., 1995). *M. grandis* has been reported from the littoral of L. Vörtsjärv in September (Kutikova & Haberman, 1986).

Resticula gelida has been found in the littoral of L. Võrtsjärv in March (Kutikova & Haberman, 1986). This raptorial benthic rotifer has a cosmopolitan (Europe, Asia, North America, Australia) but rather isolated occurrence in benthos and periphyton of still and slowly flowing waterbodies (Kutikova, 1970; Koste & Shiel, 1991; Nogrady et al., 1995). *R. gelida* is usually found in cold water, but is also documented at 17°C (Nogrady et al., 1995).

CONCLUDING REMARKS

In comparison with other waterbodies in Estonia, L. Võrtsjärv is undoubtedly the most thoroughly investigated regarding Rotifera. The remarkably long period of observations, dating back to the 1910s, with satisfactory monitoring intervals has resulted in a considerable taxonomic list of rotifers. Nevertheless, to date the studies have been mostly restricted to the pelagial region of the lake, which leaves the benthos and littoral zone (incl. periphyton and psammon) poorly investigated. Further studies focussed on these habitats will likely increase the number of taxa. It should be also noted that higher taxonomic resolution is required dealing with illoricate rotifers, especially Bdelloidea.

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Võrtsjärve keriloomade annoteeritud nimestik

Taavi Virro ja Juta Haberman

Tänapäevasele nomenklatuurile kohandatult on seni avaldatud (alates 1920. aastast) kirjanduse põhjal antud kokkuvõtlik ülevaade Võrtsjärvest leitud keriloomade (hõimkond Rotifera) taksonilisest koosseisust. Lisatud on ka varasemates allikates kasutatud sünonüümide nimekiri. Praeguse seisuga on Võrtsjärvest registreeritud 173 taksonit (138 liiki) keriloomi. Esindatud on 22 sugukonda 46 perekonnaga. Kõige taksonirikkamaks sugukonnaks on Brachionidae 41 taksoniga, järgnevad Synchaetidae 19 ja Trichocercidae 18 taksoniga. Kõige mitmekesisemad perekonnad on *Trichocerca* ja *Lecane*: vastavalt 17 ja 14 taksoniga. Enamik (75%) leitud keriloomadest on kosmopoliitse levikuga või asustavad mitut kontinenti, ligikaudu 11% taksonitest on levinud Holarktises ja 2% Palearktises. Viis taksonit (3%) – *Collotheca balatonica*, *Dicranophorus robustus* f. *europaeus*, *Ecentrum eurycephalum*, *Polyarthra dissimulans* ja *Trichotria pocillum bergi* – esinevad teadaolevalt ainult Euroopas. Võrtsjärve keriloomade faunasse kuulub ka neli haruldast liiki: *Cephalodella compacta*, *Eosphora thoides*, *Monommata grandis* ja *Resticula gelida*. Teiste Eesti veekogudega võrreldes on Võrtsjärve keriloomade osas kahtlemata üks põhjalikumalt uuritud veekogusid. Pikka aega (alates 1910. aastatest) – ning selle perioodi kohta rahuldava intervalliga – toimunud vaatluste tulemuseks on küllaltki arvestatav keriloomade nimestik. Sellele vaatamata on suurem osa seniseid uurimusi käsitletud peaaesjalikult pelagiaali, mistõttu bentose ja litoraaliööndi (sh perifüüton ja psammon) keriloomastik on jäänud väheuurituks. Edasiste uuringutega nendest biotoopidest peaks Võrtsjärve keriloomade nimestik tõhusalt täienema.