A review of the rotifer fauna of the Sudan

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Abstract

A collection of rotifers contained in samples from the Blue, White and joint Niles in the Sudan, the Red Sea Hills, and Jebel Marra mountains is studied, and the previous literature on the rotifera of Sudan is reviewed. A total of 145 rotifer taxa are now known from this country. Ecological and distributional notes on selected species are added. Besides cosmopolitan, pantropical, and tropical species, a small but significant fraction of the fauna is of northern origin, possibly reflecting climatic conditions of the late-Pleistocene.

Introduction

The present contribution is based upon plankton samples, collected in the Blue Nile and the White Nile systems, in the Nile at Khartoum and in the Jebel Marra Mountains, by A.I. el Moghrabi (University of Khartoum), between 1966 and 1979. Moreover, a number of littoral and plankton samples were collected by H. J. Dumont (State University, Ghent) in the Red Sea Hills, N.E. Sudan, during December 1981, and on the joint Nile between the Egyptian border and Khartoum, during March 1982.

Rotifers of Sudan were studied previously by Daday (1910a), Berzins (in Rzóska, 1956), Abu Gideiri (1969 and in collaboration with M. T. Ali, 1975). Monakov (1969), Moghrabi (1972, 1977), Green *et al.* (1979) and Green (Report, s.d.). The total number of taxa, described by the various authors mentioned above, amounts to 81. Adding the results of the present paper, we arrive at the following list of Sudanese rotifers (the taxonomical arrangement follows De Ridder, 1981), totaling 145 species.

PHYLUM ROTIFERA
Class Digononta Plate, 1889
Order Bdelloidea Hudson & Gosse, 1886
Fam. Philodinidae
Rotaria neptunia (Ehrb., 1832)
R. neptunoida Harring, 1913
R. spec.
Bdelloidea div. spec.
Class Monogononta Plate, 1889
Sub-Class Pseudotrocha de Beauchamp, 1965
Order Ploima Hudson & Gosse, 1886
Fam. Brachionidae
Platyias quadricornis (Ehrb., 1832)
P. leloupi Gillard, 1957
P. patulus (O.F.M., 1786)
Brachionus quadridentatus (Hermann, 1783)
B. quadridentatus melheni (Barrois & Daday, 1894)
B. bidentatus Anderson, 1889
B. urceolaris (O.F.M., 1773)
B. bennini Leiszling, 1924
B. plicatilis (O.F.M., 1786)
B. rubens (Ehrb., 1838)
B. falcatus Zacharias, 1898
B. calyciflorus Pallas, 1766

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Fam. Brachionidae (continued)
B. dimidiatus Bryce, 1931
B. budapestinensis Daday, 1885
B. angularis Gosse, 1851
B. caudatus Barrois & Daday, 1894
Keratella qu. quadrata (O.F.M., 1786)
K. tropica (Apstein, 1907)
K. procurva (Thorpe, 1891)
K. serrulata (Ehrb., 1838)
K. lenzi Hauer, 1953
K. cochlearis (Gosse, 1851)
Notholca acuminata (Ehrb., 1832)
Anuraeopsis fissa (Gosse, 1851)
A. navicula Rousselet, 1910
A. cristata Berzins, 1962
A. coelata (de Beauchamp, 1932)
Fam. Euchlanidae
Manfredium eudactylotum (Gosse, 1886)
Euchlanis meneta Myers, 1930
E. oropha Gosse, 1887
E. dilatata Ehrb., 1832
E. deflexa (Gosse, 1851)
E. incisa Carlin, 1939
E. triquetra Ehrb., 1838
Tripleuchlanis plicata (Levander, 1894)
Dipleuchlanis propatula (Gosse, 1886)
Dipleuchlanis spec.
Fam. Mytilinidae
Mytilina ventralis (Ehrb., 1832) and 'f. macracantha' (Gosse, 1886)
Lophocharis salpina (Ehrb., 1834)
L. oxysternon (Gosse, 1851)
Fam. Trichotridae
Wolga spinifera (Western, 1894)
Macrochaetus collinsi (Gosse, 1867)
Fam. Colurellidae
Colurella obtusa (Gosse, 1886)
C. uncinata (O.F.M., 1773)
Colurella spec.
Lepadella ovalis (O.F.M., 1786)
L. patella (O.F.M., 1786) and 'f. oblonga' (Ehrb., 1834)
L. latusinus (Hilgendorf, 1899)
L. dactyliseta (Stenroos, 1898)
L. acuminata (Ehrb., 1834)
L. amphitropis Harring, 1916
L. quinquecostata (Lucks, 1912)
L. rhomboides (Gosse, 1886)
L. heterodactyla Fadeev, 1925
Heterolepadella ehrenbergi (Perty, 1850)

Fam. Lecanidae
Lecane nana (Murray, 1913)
L. signifera (Jennings, 1896) and 'f. ploenensis' (Voigt, 1902)
L. ludwigi (Eckstein, 1893)
L. appendiculata (Levander, 1894)
L. inermis (Bryce, 1892)
L. luna (O.F.M., 1776)
L. grandis (Murray, 1913)
L. curvicornis (Murray, 1913)
L. ungulata (Gosse, 1887)
L. papuana (Murray, 1913)
L. aculeata (Jakubski, 1912)
L. leontina (Turner, 1892)
L. sympoda Hauer, 1929
L. furcata (Murray, 1913)
L. obtusa (Murray, 1913)
L. harringi (Ahlstrom, 1934)
L. unguitata africana (Wulfert, 1966)
L. stenroosi (Meiszner, 1908)
L. lunaris (Ehrb., 1832) and 'f. perplexa' (Ahlstrom, 1938)
L. bulla (Gosse, 1886)
L. quadridentata (Ehrb., 1832)
L. pyriformis (Daday, 1905)
L. closterocerca (Schmarda, 1859)
L. arcuata (Bryce, 1891)
L. hamata (Stokes, 1896)
Fam. Notommatidae
Notommata pachyura 'f. triangulata' (Kirkman, 1906)
Cephalodella gibba (Ehrb., 1838)
C. catellina (O.F.M., 1786)
Cephalodella spec.
Fam. Trichocercidae
Trichocerca brachyura (Gosse, 1851)
T. cavia (Gosse, 1886)
T. ruttneri (Donner, 1953)
T. dixon-nuttalli (Jennings, 1903)
T. porcellus (Gosse, 1886)
T. similis (Wierzejski, 1893)
T. birostris (Minkiewicz, 1900)
T. elongata (Gosse, 1886)
T. lophoessa (Gosse, 1886)
T. rattus (O.F.M., 1776) and 'f. carinata' (Ehrb., 1830)
T. flagellata Hauer, 1937
T. pusilla (Lauterborn, 1898)
T. stylata (Gosse, 1851)
T. iernis (Gosse, 1887)

T. chattoni (de Beauchamp, 1907)
T. longiseta (Schrank, 1802)
T. capucina Wierzejski & Zacharias, 1893
Fam. Synchaetidae
Synchaeta stylata Wierzejski, 1893
Synchaeta spec.
Polyarthra vulgaris Carlin, 1943
P. dolichoptera Idelson, 1925
P. remata Skorikov, 1896
Polyarthra spec. and 'f. aptera'
Ploesoma truncatum (Levander, 1894)
Fam. Asplanchnidae
Asplanchnopus hyalinus Harring, 1913
Asplanchna priodonta Gosse, 1861
Asplanchna spec.
Asplanchnella brightwelli (Gosse, 1850)
Fam. Dicranophoridae
Dicranophorus forcipatus (O.F.M., 1786)
Dicranophorus spec.
Sub-Class Gnesiotrocha de Beauchamp, 1965
Super-Order Monimotrochida Kutikova, 1970
Order Monimotrocha de Beauchamp, 1965
Fam. Testudinellidae
Testudinella patina (Hermann) and 'f. trilobata' Anderson & Shephard, 1892
T. emarginula (Stenroos, 1893)
Pompholyx complanata Gosse, 1851
Fam. Testudinellidae (continued)
P. sulcata (Hudson, 1885)
Fam. Flosculariidae
Limnias melicerta Weisze, 1848
Floscularia ringens (L., 1758)
Sinantherina socialis (L., 1758)
Sinantherina spec.
Fam. Conochilidae
Conochilus unicornis Rousselet, 1892
C. hippocrepis (Schrank, 1830)
C. dossuarius (Hudson, 1875)
Fam. Hexarthridae
Hexarthra i. intermedia Wiszniewski, 1929
H. mira (Hudson, 1871)
Hexarthra jenkinae (de Beauchamp, 1932)
H. fennica (Levander, 1892)
H. oxyuris (Sernov, 1903)
Hexarthra spec.
Fam. Filiniidae
Filinia longiseta (Ehrb., 1834)
F. pejleri Hutchinson, 1964
Filinia spec.
Tetramastix opoliensis Zacharias, 1898
Fam. Trochosphaeridae
Horaella brehmi Donner, 1949

1. The Blue Nile System

In this series, as in that from the White Nile System, no samples were collected during the flood season.

1.1 Sennar Reservoir (13°45' N, 33°40' E)

	1	2	3		1	2	3
Bdelloidea	–	–	+	*Lepadella dactyliseta*	–	–	RRR
Brachionus falcatus	CCC	–	CC	*Lecane harringi*	–	–	R
B. calyciflorus	–	RR	–	*Trichocerca ruttneri*	RRR	–	–
B. budapestinensis	–	–	RRR	*T. similis*	CCC	–	–
B. angularis	–	–	C	*Polyarthra vulgaris*	RR	–	RRR
B. caudatus	C	–	–	*P. dolichoptera*	–	–	RR
Keratella tropica	CCC	–	C	*Filinia pejleri*	–	–	RR
Anuraeopsis fissa	–	–	RR	*Tetramastix opoliensis*	–	–	RR
A. coelata	–	–	RRR				

1: Feb. 1970; 2: Feb. 1972; 3: Jan. 1975.

Sennar reservoir has (judging from the samples examined) a true plankton community of rotifers, with two exceptions: *Lepadella dactyliseta* is a littoral-periphytic species and *Lecane harringi* a periphytic one. Differences in dominant species are connected with vertical migration and with the very short life cycle of these animals. Moghrabi (1972), who also included Crustaceans in his investigations, concludes to 'a dense and pure association of plankton' for Sennar reservoir.

1.2 Roseires Reservoir (11°37′ N, 34°30′ E)

	1	2	3	4	5	6
Brachionus rubens	–	–	–	–	–	RR
B. falcatus	–	–	CC	–	RR	CCC
B. calyciflorus	–	–	RRR	–	RRR	–
B. angularis	–	–	–	–	RRR	–
B. caudatus	–	–	–	–	R	–
Keratella tropica	RR	RRR	–	–	CCC	CC
Lophocharis salpina	–	–	–	–	–	RRR
Trichocerca chattoni	–	–	RR	–	–	RRR
Asplanchna priodonta	–	–	–	–	RRR	RRR
Asplanchnella brightwelli	–	–	–	RR	–	–
Pompholyx complanata	–	–	–	–	RR	–
Sinantherina socialis	RR	–	–	RR	–	–
Conochilus dossuarius	–	–	–	–	C	–
dossuarius	–	–	–	–	C	–
dossuarius	–	–	–	–	C	–
Filinia longiseta	–	–	–	–	CC	RRR
longiseta	–	–	–	–	CC	RRR
longiseta	–	–	–	–	CC	RRR

1: Dec. 1967; 2: April 1969; 3: Dec. 1969; 4: March 1975; 5 and 6: s.d.

Although Roseires Reservoir (1966) is more recent than Sennar Reservoir (1925), the composition of the plankton communities is almost the same in both water bodies. Rzóska's (1976: 253) conclusions about Crustaceans are also valid concerning the rotifers. The occurrence of *Brachionus rubens* is connected with high population densities of the Cladocera.

In the phytoplankton, *Pediastrum* spec. is largely dominant.

1.3 Blue Nile, several localities, south of Khartoum, and tributary Khor Buy

	1	2	3	4
Bdelloidea	–	–	RRR	RRR
Brachionus calyciflorus	–	–	R	–
Keratella tropica	–	–	RRR	–
Colurella obtusa	–	–	–	RRR
C. colurus	–	–	RRR	RRR
Lepadella ovalis	–	–	–	RR
L. latusinus	–	–	–	CC
L. rhomboides	–	–	–	RR
Lecane nana	–	–	–	RR
L. bulla	–	–	–	RR
L. pyriformis	–	–	–	RR
L. closterocerca	–	–	–	RRR
L. hamata	–	–	–	R
Trichocerca ruttneri	–	–	RR	–
T. similis	–	–	RR	–
Conochilus unicornis	R	RR	RR	–
Hexarthra spec.	–	–	RRR	–
Filinia pejleri	–	–	RR	–
Tetramastix opoliensis	–	–	RR	–

1: Shammar, 11°30′N, 34°25′E, Dec. 1969; 2: Wadi El Naiel, 12°30′N, 34°15′E, 1970; 3. Wadi Medani, 14°27′N, 33°33′E, Nov. 1969; 4: Khor Buy near Bau, 11°21′ N. 34°05′ E, April 1977.

Generally speaking, and judging from the samples examined, the Blue Nile south of Khartoum is very poor in rotifers, though the number of species increases downstreams. In Khor Buy, we found numerous periphytic, littoral and benthic species, mostly represented by a small number of specimens. The sample also contained a lot of *Spirogyra* fragments and a few *Scenedesmus* spec.

In the Blue Nile water system, we found 37 rotifer taxa.

2. The White Nile System

2.1 Jebel Aulyia Reservoir (15°30′ N, 32°35′ E)

	1	2	3	4	5	6	7	8	9	10
Bdelloidea	–	–	RR	–	–		–	–	–	–
Rotaria spec.	–	–	–	–	–	RR	–	–	–	–
Platyias quadricornis	–	–	–	–	–	–	RR	–	–	–
Brachionus falcatus	RRR	RR	–	–	–	RR	–	–	–	–
B. calyciflorus	–	CCC	CCC	RR	CCC	CCC	–	–	RR	–
B. angularis	RRR	–	–	–	–	–	RRR	–	–	–
B. caudatus	–	–	–	–	–	RRR	–	RRR	–	RRR
Keratella tropica	RRR	RR	RR	RRR	–	CC	CCC	C	–	CC
Euchlanis dilatata	–	–	RRR	–	–	CC	–	–	–	–
Trichocerca ruttneri	RR	–	–	–	–	RRR	–	–	–	–
T. similis	–	–	R	RRR	–	RR	–	RRR	–	–
T. chattoni	–	–	RR	–	–	–	–	–	–	–
Synchaeta spec.	–	–	RR	–	–	–	–	–	–	–
Asplanchna priodonta	–	–	–	–	–	–	RRR	–	–	–
Hexarthra intermedia	–	–	–	–	–	–	RR	–	–	–
Filinia longiseta	RRR	R	–	RRR	–	C	RR	RR	–	CC
F. pejleri	–	–	–	–	–	R	–	–	–	–

1: Jan. 1975; 2: Dec. 1976; 3: May 1977; 4: July 1977; 5 to 10: s.d.

Although of different recency (Sennar: 1925; Jebel Aulyia: 1937; Roseires: 1966), all these reservoirs show a rather uniform rotifer fauna: an almost pure planktonic community, with the Brachionidae as dominant group.

Up to now, no specific study of the rotifers of Jebel Aulyia Reservoir had been undertaken: Brook and Rzóska (1954) and Rzóska (1968) only refer to them as a group only.

2.2 Lakes of the White Nile basin

	1	2	3		1	2	3
Bdelloidea	–	R	–	L. curvicornis	RRR	–	–
Platyias patulus	C	–	–	L. ungulata	–	RRR	–
Brachionus falcatus	RR	–	–	L. sympoda	–	–	RRR
Keratella tropica	RRR	–	–	L. lunaris	–	RR	–
Euchlanis dilatata	–	C	–	L. lunaris 'f. perplexa'	–	RRR	–
Lepadella patella	–	RR	–	L. bulla	RR	CC	–
L. latusinus	–	–	RRR	L. closterocerca	–	RR	–
L. acuminata	–	R	–	L. hamata	–	RRR	–
Heterolepadella ehrenbergi	–	RRR	–	Cephalodella spec.	–	RRR	–
Lecane ludwigi	–	RRR	–	*Testudinella patina*	RR	–	–
L. inermis	–	RR	–	*T. emarginula*	–	RRR	–
L. luna	–	RRR	–	*Filinia pejleri*	RRR	–	–

1: Lake Shambe (7°08′ N, 30°48′ E): June 1979; 2: Lake Jur (±8°45′ N, 29°15′ E): s.d.; 3: Lake No (9°30′ N, 30°27′ E): May 1979.

The extreme poverty of rotifers in Lake No is striking. There is an obvious contrast between our results and those of Green (Report on the Zooplankton of the Sudd region, in relation to future monitoring, s.d.). In Lake Shambe the plankton is only slightly more abundant, while Green (*loc. cit.*) found (December 1976) 17 rotifer taxa here.

2.3 Tributaries of the White Nile

	1	2	3	4	5	6
Bdelloidea	R	–	CC	–	–	–
Platyias patulus	–	–	RR	–	RR	–
Brachionus quadridentatus melheni	RRR	–	–	–	–	RR
B. bidentatus 'f. inermis'	–	–	–	–	–	RR
B. rubens	RR	–	–	–	–	–
B. falcatus	RR	–	–	–	–	CC
B. calyciflorus	R	–	RRR	CC	–	C
B. angularis	–	–	–	–	–	C
B. caudatus	–	–	–	–	RRR	C
Keratella tropica	RRR	RR	–	RR	R	CCC
K. lenzi	–	–	–	–	RRR	–
Anuraeopsis fissa	–	–	–	RR	–	–
Euchlanis dilatata	R	–	R	–	RR	–
Dipleuchlanis propatula	–	–	RRR	–	–	–
Macrochaetus collinsi	–	–	RRR	–	–	–
Lepadella ovalis	RRR	–	–	RRR	RRR	–
L. patella	–	–	–	–	RRR	–
L. latusinus	RRR	–	–	–	R	–
L. dactyliseta	–	–	–	RRR	–	–
L. acuminata	–	–	–	–	RRR	–
L. quinquecostata	–	–	–	–	RRR	–
L. rhomboides	–	–	–	–	RR	–
L. heterodactyla	–	–	RR	–	–	–
Lecane nana	–	–	–	–	RRR	–
L. signifera	–	–	–	–	RRR	–
L. ludwigi	–	–	–	RRR	RRR	–
L. curvicornis	–	–	R	–	–	–
L. ungulata	–	RRR	–	RRR	–	–
L. papuana	–	–	–	–	RRR	–
L. aculeata	RRR	–	–	–	RRR	–
L. leontina	RRR	–	RRR	RR	RR	–
L. sympoda	RR	–	–	–	–	–
L. unguitata africana	–	–	RR	RRR	RRR	–
L. stenroosi	–	–	–	–	RRR	–
L. quadridentata	–	–	RRR	–	–	–
L. bulla	RR	–	C	–	RR	–
L. pyriformis	RR	–	–	–	RR	–
L. arcuata	–	–	–	RRR	–	–
L. hamata	RR	–	–	–	–	–
Cephalodella spec.	–	–	–	–	RRR	–
Trichocerca similis	RRR	–	–	–	–	–
Trichocerca pusilla	–	RR	–	–	–	–
Testudinella patina	RR	–	–	–	RR	–
Filinia longiseta	–	–	–	RRR	–	CCC
F. pejleri	RRR	–	–	–	–	–
Tetramastix opoliensis	–	–	–	RR	RR	CCC

1: Bahr el Ghazal (±8°45′ N, 29°15′ E), 30/5/1979; 2: Bahr el Zeraf (±7°35′ N, 30°30′ E), 23/6/1973; 3: id., 28/5/1979; 4: River Sobat (±9°N, 32°50′ E), 1/5/1973; 5: id., 27/5/1975; 6: Pibor River (±7°40′ N, 33°05′ E), 9/5/1973.

In the tributaries from which we have samples, relatively few planktonic species are mixed with a large number of littoral and periphytic species. These are present in widely varying numbers in the same biotope (sample 2 vs. 3, 4 vs. 5).

2.4 White Nile in several localities, between Adok and Khartoum

	1	2	3	4	5	6	7	8
Platyias patulus	RR	–	–	–	–	–	–	–
P. quadricornis								
'f. brevispina'	–	RRR	–	–	–	–	–	–
Brachionus falcatus	–	–	CC	–	–	–	RR	RRR
B. calyciflorus	RRR	–	RRR	–	–	–	R	RRR
B. angularis	RR	–	RRR	–	–	–	RR	–
B. caudatus	RRR	RRR	C	–	–	RR	RR	RR
Keratella tropica	C	RRR	CCC	RRR	–	R	R	RR
K. cochlearis	–	–	–	–	–	–	RR	–
Anuraeopsis fissa	RRR	–	–	–	–	–	–	–
Euchlanis dilatata	–	–	–	–	–	–	RR	–
Lecane luna	–	–	–	–	CC	–	–	–
Cephalodella gibba	–	–	–	–	–	–	RRR	–
Trichocerca ruttneri	RR	–	–	–	–	–	RR	RR
T. similis	–	–	–	–	–	RRR	–	–
Polyarthra remata	–	–	–	–	–	–	RRR	–
Polyarthra spec.	–	–	–	–	–	RRR	–	–
Conochilus unicornis	–	RRR	–	–	–	–	–	–
Hexarthra mira	–	–	RRR	–	–	–	–	–
Filinia longiseta	RR	–	C	–	–	–	RR	–

1: Adok (8° 10′ N, 30° 20′ E), May 1975; 2: Renk (11° 42′ N, 32° 48′ E), April 1973; 3: Esh Shawal (13° 32′ N, 32° 29′ E), s.d.; 4: Khartoum (15° 36′ N, 32° 32′ E), March 1975; 5: Bahr el Jebel, December 1965; 6: id., May 1975 (locality not specified); 7: Kalakla, March 1977; 8: id., June 1976 (locality not found on map).

The White Nile is much poorer in rotifers than its tributaries. Are most specimens killed by the strong current or are they being swept away?

Sixty-six rotifer species were found by us in the White Nile basin. Twenty-four of them are common to the Blue Nile and the White Nile. Of these, 12 are planktonic, 11 are periphytic-littoral and *Brachionus rubens* is phoretic on Cladocera.

3. Blue Nile in Khartoum (15° 36′ N, 32° 32′ E)

	1	2	3	4	5	6	7	8	9	10	11	12	13
Bdelloidea	–	–	–	+	–	–	–	–	–	–	–	+	–
Platyias patulus	–	–	–	–	–	–	–	–	–	–	RRR	–	–
Brachionus rubens	–	–	RRR	–	–	RR	–	–	–	–	–	–	–
B. falcatus	RRR	–	–	RR	–	–	C	–	R	RR	RRR	CCC	–
B. calyciflorus	–	–	RR	RRR	–	–	–	–	–	RR	–	RR	–
B. angularis	–	–	–	–	–	–	R	–	–	CC	–	RR	RRR
B. caudatus	RR	–	–	–	–	–	C	–	–	RR	–	CCC	–
Keratella tropica	RRR	–	–	R	–	–	CCC	–	–	CCC	RRR	CC	–
K. cochlearis	–	–	–	–	–	–	–	–	–	C	–	–	–
Anuraeopsis coelata	–	–	–	–	–	–	R	–	–	–	–	–	–
Lepadella ovalis	–	–	–	–	–	–	RR	–	–	–	–	–	–
L. dactyliseta	–	–	–	–	–	–	RRR	–	–	–	–	–	–
Lecane papuana	–	–	–	–	–	–	R	–	–	RR	–	–	–
L. obtusa	–	–	–	–	–	–	–	–	–	RR	–	–	–
L. closterocerca	–	–	–	–	–	–	–	–	–	RR	–	–	–
Trichocerca brachyura	–	–	–	–	–	–	RR	–	–	–	–	–	–
T. ruttneri	–	–	–	CCC	–	–	RR	RR	–	–	RRR	–	–
T. dixon-nuttalli	–	–	–	–	–	–	–	–	–	–	–	CC	–
T. similis	–	–	–	C	C	–	CCC	–	–	–	–	–	–
T. elongata	–	–	–	–	–	–	–	–	–	R	–	–	–
T. rattus	–	–	–	–	CCC	–	–	–	–	–	–	–	–

Blue Nile in Khartoum (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13
T. rattus 'f. carinata'	–	–	–	–	C	–	–	–	–	–	–	–	–
T. flagellata	–	–	–	–	–	–	–	–	–	–	–	RR	–
T. pusilla	–	–	–	–	–	–	RR	–	–	R	–	–	–
T. iernis	–	–	–	–	–	–	–	–	–	–	–	RR	–
T. chattoni	–	–	–	RR	–	–	–	–	–	–	–	–	–
Pompholyx complanata	–	–	–	–	–	–	RR	–	–	–	–	–	–
Conochilus unicornis	–	–	RRR	RRR	–	–	–	–	–	–	RRR	–	–
Hexarthra mira	–	–	–	RR	–	–	–	–	–	–	–	–	–
H. intermedia	–	–	–	–	–	–	RR	–	–	–	–	–	–
Filinia longiseta	–	RRR	–	RR	–	–	RR	–	–	C	–	–	–
F. pejleri	–	–	–	–	R	–	–	–	–	–	–	–	–
Filinia spec.	–	–	–	–	–	–	–	–	–	–	–	RRR	–
Tetramastix opoliensis	–	RR	–	RRR	R	–	–	–	–	–	RRR	CCC	–

1: 25/3/1969; 2: 10/4/1969; 3: 31/5/1969; 4: 2/11/1969; 5: 16/11/1969; 6: 26/11/1969; 7: 15/1/1970; 8: 28/3/1970; 9: 10/5/1970; 10: July 1970; 11: November 1974; 12: 22/6/1976; 13: 16/7/1976.

Judging from the samples examined, rotifer populations are very variable in the Blue Nile at Khartoum, both in species composition and in frequency. Beside non-identified Bdelloidea, 18 out of the 33 taxa met with belong to the species, common to both the Blue Nile and the White Nile. Five species were found in the White Nile basin only, viz. *Keratella cochlearis, Lecane papuana, Trichocerca pusilla, Hexarthra mira* and *H. intermedia*, whereas *Anuraeopsis coelata* and *Pompholyx complanata* seem to be confined to the Blue Nile in the Khartoum area. New for our rotifer list are: *Lecane obtusa, Trichocerca brachyura, T. dixon-nuttalli, T. elongata, T. rattus, T. rattus 'f. carinata', T. flagellata* and *T. iernis.*

4. Jebel Marra Mountains (12°38'N, 24°16'E) (leg. Abdel Kader Abdel Karim, Khartoum University)

	1	2	3	4		1	2	3	4
Bdelloidea	RRR	–	–	–	Lecane lunaris	RRR	C	–	–
Brachionus plicatilis	–	–	–	CCC	Trichocerca cavia	RRR	–	–	–
B. calyciflorus	–	–	R	–	T. longiseta	RRR	–	–	–
Lepadella patella	RR	–	–	–	Asplanchna spec.	–	–	RR	–
L. patella 'f. oblonga'	RR	–	–	–					

1: Wadi Korunga, 26/12/1965; 2: Wadi Mliru, s.d.; 3: Wadi Fik, s.d.; 4: s.d.

Remarks

1. One sample in Moghrabi's collection from the Nile basin remains unidentified. It contains an almost pure culture of Cladocera and Copepoda, among which the following rotifers were found:

Brachionus falcatus	RR
Brachionus calyciflorus	RR
Brachionus caudatus	RR
Keratella tropica	RRR
Keratella cochlearis	RR

2. In the series of samples from the Blue Nile at Khartoum, there was one tube without a date. It was the only sample in which *Platyias leloupi* occurred. This species was very rare; it was accompanied by *Oscillatoria* and *Spirogyra* fragments, by some diatoms and by numerous Cladocera.

5. Running and stagnant waters in N-E Sudan

	1	2	3	4	5	6	7	8	9	10
Bdelloidea	RR	–	–	–	C	–	CCC	–	CC	CCC
Rotaria spec.	–	–	–	–	–	–	–	–	–	CC
Brachionus quadridentatus melheni	RR	–	–	–	–	–	–	–	–	–
B. bidentatus	R	R	RR	–	–	–	–	–	–	–
B. plicatilis	–	–	–	–	–	RR	–	–	–	–
B. rubens	–	R	–	C	–	–	–	–	–	–
B. falcatus	RR	–	–	–	–	–	–	–	–	–
B. calyciflorus	–	–	C	–	RRR	–	–	–	–	–
B. budapestinensis	RRR	–	–	–	–	–	–	–	–	–
B. angularis	CC	RRR	–	–	–	–	–	–	–	–
B. caudatus	CC	–	–	–	–	–	–	–	–	–
Keratella quadrata	CCC	RR	RR	–	–	–	–	–	–	–
K. tropica	R	–	–	–	–	–	–	–	–	–
K. cochlearis	–	RRR	–	–	–	–	–	–	–	–
Notholca acuminata	R	–	–	–	–	–	–	–	–	–
Anuraeopsis fissa	–	–	–	–	RR	–	–	–	–	–
Euchlanis dilatata	–	RRR	–	–	–	–	–	–	–	RRR
Euchlanis spec.	–	–	–	–	R	–	–	–	RRR	–
Dipleuchlanis propatula	–	RRR	–	–	–	–	–	–	–	–
Mytilina ventralis	RR	–	–	–	–	–	–	–	–	–
Colurella obtusa	–	–	–	–	–	–	–	–	–	CC
C. adriatica	–	–	–	–	–	RR	–	–	–	–
Lepadella ovalis	RR	–	–	–	CC	R	–	–	CC	R
L. patella	–	–	–	–	C	–	R	–	–	–
Lecane nana	–	–	–	–	RR	–	–	–	–	–
Lecane luna	RR	–	–	–	C	–	–	–	–	–
L. curvicornis	RRR	–	–	–	–	–	–	–	–	–
L. papuana	R	–	–	–	–	–	–	–	–	–
L. sympoda	–	–	–	–	R	–	RR	–	–	–
L. furcata	–	–	–	–	–	–	–	–	–	RRR
L. lunaris	–	–	–	–	RR	–	–	–	–	–
L. bulla	–	–	–	–	CC	–	–	–	–	RRR
L. closterocerca	–	–	–	–	C	–	–	–	–	–
L. hamata	–	–	–	–	RR	–	RRR	–	–	C
Lecane spec.	–	–	–	–	RR	–	–	–	–	–
Cephalodella gibba	–	RRR	–	–	–	–	–	–	–	–
Cephalodella spec.	–	–	–	–	RRR	–	–	–	–	–
Trichocerca ruttneri	–	CCC	–	–	RR	–	–	–	RR	–
T. rattus	RR	–	–	–	–	–	–	–	–	–
T. pusilla	–	–	RRR	–	–	–	–	–	–	–
Polyarthra vulgaris	R	–	–	–	RR	–	–	–	–	–
P. dolichoptera	RRR	CCC	–	–	–	–	–	–	–	–
P. remata	–	–	–	–	RR	–	–	–	–	–
Asplanchna priodonta	R	RR	–	–	–	–	–	–	–	–
Dicranophorus spec.	RR	–	–	–	–	–	–	–	CCC	–
Testudinella patina 'f. triloba'	R	–	–	–	–	–	–	R	–	–
Pompholyx complanata	–	–	CC	–	–	–	–	–	–	–
Conochilus unicornis	RRR	–	–	–	–	–	–	–	–	–
Hexarthra intermedia	–	C	–	–	–	–	–	–	–	–
Filinia longiseta	CCC	–	–	–	–	–	–	–	–	–
F. pejleri	R	–	–	–	–	–	–	–	–	–
Tetramastix opoliensis	–	–	R	–	–	–	–	–	–	–

1: River Rahad (14°03′ N, 34°02′ E), 15/12/1981; 2: River Atbora at Shouwak (14°21′ N, 35°50′ E), 16/12/1981; t° = 26,5 °C, pH = 8.3; 3: New Alfa Canal, near Atbora (14°21′ N, 35°50′ E), 16/12/1981; t° = 25 °C, pH = 8.6; El Heidjiz, on the way to Kassera (15°10′ N, 36°40′ E), 16/12/1981; t° = 30 °C, pH = 8.5; 5: Khor Amat (18°45′ N, 37°04′ E), 17/12/1981; 6: Khor Ashat (18°38′ N, 37°14′ E), 18/12/1981; 7: Khor Khamop Sana (19°02′ N, 36°53′ E), 19/12/1981; 8: Khor Dim (shallow pool) (19°29′ N, 36°58′ E), 20/12/1981; 9: Khor Askaab I (19°02′ N, 36°48′ E), 19/12/1981; 10: Khor Askaab II (19°49′ N, 37°01′ E), 21/12/1981.

Two of the 10 samples involved, viz. 4 and 8, were collected in stagnant water. Both contain a single rotifer species. Sample 4 contains an almost pure culture of Crustacea, mostly Cladocera: the presence of *Brachionus rubens* on and among them is normal. The shallow pool of Khor Dim (sample 8) has much detritus, some blue and green algae, and many diatoms and Vorticella. Only few specimens of *Testudinella patina 'f. trilobata'* could be detected in it.

In the running waters, the number of rotifer species varied between 3 and 24. Planktonic and littoral-benthic species are almost equally represented. Though all samples were collected during the same short period, and most rivers are flowing down the Ethiopian plateau, there is not much resemblance in their rotifer populations.

6. Fishpond near to White Nile, south of Khartoum (15°37′ N, 32°36′ E) 26/12/1981

Bdelloidea	RR
Brachionus angularis	CCC
Keratella quadrata	RRR
Lecane luna	RRR
L. papuana	RRR
L. hamata	RRR
Conochilus unicornis	C
Filinia longiseta	RRR

All these species, except *Keratella quadrata*, had already been found in this part of Sudan.

7. Nile from the Egyptian border to Khartoum

For the rotifer fauna from the Egyptian border to Khartoum see list on pp. 124–125.

The nearer to Khartoum the richer the rotifer populations become, both in species composition and in frequency. The following species do not appear on our previous lists: *Keratella serrulata, Manfredium eudactylotum, Euchlanis meneta, Lophocharis oxysternon, Wolga spinifera, Colurella uncinata, Lepadella amphitropis, Cephalodella catellina, Trichocerca porcellus, Synchaeta stylata, Hexarthra fennica* and *H. oxyuris*.

8. Comments on selected species

In previous publications (De Ridder, 1981 and 1983) we studied the distribution in Africa of a large number of rotifers. In this paper, we complete this series with a selection of some other species.

8.1 *Rotaria neptunia*. A cosmopolitan species, living between plants and among detritus, rare in plankton (Voigt, 1957; Donner, 1965) under high saprobity (Sladecek, 1973; Pourriot, 1976). Found by Green (s.d.) in the Sudd region. Frequency not indicated.

It was recorded from Africa by Kirkman (1906): Natal; by Daday (1910b): Cape Province and Moçambique; by Jakubski (1912): Southern Highlands, Tanzania; by Hutchinson *et al.* (1932): Pans in Transvaal; by Gillard (1957): Lake Tanganyika, Zaïre; by Green (1960): Sokoto River, Nigeria; by Klimowicz (1961 and 1962) and by Ramadan *et al.* (1963): canals, agricultural drains and ponds in and in the region of Cairo, Egypt; by Hauer (1963): Lake Edku, near Alexandria, Egypt; by Wulfert (1965): Lake Bangweulu; by Pourriot (1968): Lake Tchad; by Green (1967): Lake Mobutu Sese Soko; by the same author (1967) for Uganda and (1979) for Lake Sonfon, Sierra Leone. Berzins (1973) cites it from the Azores.

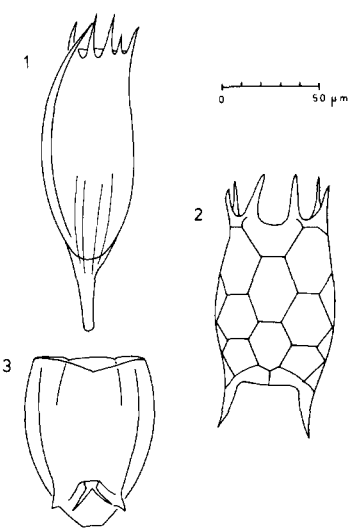

Fig. 1. 1: *Notholca acuminata;* 2: *Keratella serrulata;* 3: *Wolga spinifera.*

8.2 *Rotaria neptunoida.* Also living in high levels of water pollution. Donner (1965) indicates it only for Europe, but de Beauchamp (1932, 1939) found it in Lake Idi Amin Dada (Uganda) and Damas (1955) in Lake Bilila (Ruanda). Berzins (in Rzoska, 1956) lists it for the Nile in Khartoum (no frequency given) and saw it later (1973) in a lagoon on Sao Miguel, Azores.

8.3 *Brachionus dimidiatus.* This taxon, described by Bryce (1931) as a 'variety' of *B. calyciflorus,* proved to be a valid species, characteristic for natron lakes in tropical and subtropical areas. It was recorded in Egypt by Schmarda (1854) and by Wawrik (1960); in Lake Nakuru and Elmenteita, Kenya, by de Beauchamp (1932b); again for Lake Nakuru by Koste (1977); for Lakes Rombou and Latir, Tchad, by Pourriot, Iltis & Lévêque-Duwat (1967); for natron lakes of Kanem, NE Tchad, by Iltis & Riou-Duwat (1971); for Lake Naivasha, Kenya, by Pejler (1974), and for Lake Nakuru, Kenya, by Vareschi (1978). For Sudan, Green *et al.* (1979) noted it in Great and small Kariba Lakes, Djebel Marra.

8.4 *Brachionus budapestinensis.* This thermophilous species was first noted in Africa by Hutchinson *et al.* (1932): Brakpan, Transvaal, R.S.A. In the same year, de Beauchamp noted it in lakes in Kenya, and some years later (1939) in Lake Idi Amin Dada, Uganda. More recent records are: Sokoto River, Nigeria (Green, 1960); Lake George, Uganda (id., 1967); Kazinga Channel and Lake George, ibidem (Pejler, 1974). It occurs in our samples from Sennar Reservoir and from River Rahad (NE Sudan) but it is never abundant.

8.5 *Keratella serrulata.* Though cosmopolitan, *Keratella serrulata* seems to be mainly confined to temperate regions. We found only one reference for Africa: Gauthier, 1928: a marsh in the Akfadou Massif (altitude 1 100 m), Algeria.

In our samples, it occurred in the River Atbara, descending the Ethiopian plateau, and in an irrigation canal in Kaboushyia. In these stations, it was rare to very rare. (Unfortunately, we have no information about the physical conditions or the chemical composition of the waters concerned.) As for other tropical–subtropical stations, we have the indication for Florida by Ahlstrom (1943) and in more recent times, by Thomasson (1967) for Mt. William, East New Guinea (altitude between 3 560 and 3 920 m). As this author points out, after Löffler, 1965, waters in high mountains in tropical regions often show affinities to extra-tropical water bodies as to their thermal conditions and animal populations.

8.6 *Notholca acuminata.* The genus Notholca as a whole may be characterised as arctic-boreal; its members are cold-stenothermic (Ruttner-Kolisko, 1974). So we were surprised to find this species in a sample from River Rahad, NE Sudan, descending from the Ethiopian plateau. It was rare in our material. Gillard (1959) found *Notholca acuminata* as new for the fauna of Africa in a sample collected at Kabemba (Kwango River, Zaïre). For further consideration see chapter 'Remarks on the biogeography'.

8.7 *Anuraeopsis cristata.* Discovered by Berzins (in Rzoska, 1956) in fishponds near the White Nile in Khartoum. Following the same author (1962) it has not been found elsewhere. Following Koste (1978: 132) it is very near (if not indentical?) to *A. navicula* Rousselet.

8.8 *Anuraeopsis coelata.* Described by de Beauchamp, 1932, from Lake Nakavali, Kenya. Evens (1947) noted it as *A. punctata* for Lake Mweru, and Green (1960) as *A. navicula* in the River Sokoto, Nigeria. It was met with by Pourriot (1968) in Lake Tchad, by the same author (1971) in Lake Léré, and in the same year by Robinson & Robinson in the northern basin of Lake Tchad. Donner & Adeniji (1977) noted it from Lake Kainji, Nigeria, and Berzins (1982) from Tananarive, Madagascar.

In our samples, *Anuraeopsis coelata* was noted in Sennar Reservoir in January, 1965; it occurred there as a very rare species.

8.9 *Euchlanis meneta.* A cosmopolite in acid waters (Koste, 1978: 137), this species was first discovered in Africa in the Basse Casamance, Senegal (De Ridder, 1983). Its occurrence in the Nile at Dungala, where it was very rare, is the second record for this continent.

8.10 *Euchlanis oropha.* This name has priority over *E. parva* Rousselet, 1892. Under the latter name, it

Nile from the Egyptian border to Khartoum

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bdelloidea	–	RR	–	–	–	–	–	RR	–	–	RR	–	C	–	RR
Brachionus quadridentata tus melheni	–	–	–	–	–	–	–	–	–	–	–	–	R	RR	–
B. calyciflorus	–	–	–	RR	–	RR	R	–	–	–	–	RRR	–	R	RR
B. angularis	–	–	–	–	–	–	–	–	–	–	–	RRR	–	CCC	CCC
B. caudatus	–	–	–	–	–	–	–	–	–	–	–	–	–	CCC	CCC
Keratella tropica	RR	RRR	–	–	–	–	C	–	–	–	–	RRR	–	CC	RR
Keratella serrulata	–	–	–	–	–	–	–	–	–	–	–	–	R	–	RR
K. cochlearis	–	–	–	–	–	–	–	–	–	–	RRR	–	RRR	–	–
Anuraeopsis fissa	–	–	–	–	–	–	–	–	–	–	–	–	–	CCC	R
Manfredium eudactylotum	–	–	–	–	–	–	–	–	RRR	–	–	–	–	–	–
Euchlanis meneta	–	–	–	–	–	RRR	–	–	–	–	–	–	–	–	–
E. dilatata	RRR	–	–	–	–	RR	–	RRR	–	–	–	–	RRR	–	–
Lophocharis salpina	–	–	–	–	–	–	–	–	–	–	–	–	–	–	RR
L. oxysternon	–	–	–	–	–	RR	–	–	–	–	–	–	–	–	–
Wolga spinifera	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R
Colurella obtusa	–	–	–	–	–	–	–	RRR	RR	–	–	–	RRR	–	–
C. uncinata	–	–	–	–	–	–	–	–	–	–	–	–	RRR	–	–
Lepadella patella	–	RRR	–	–	–	–	–	RRR	RR	–	–	–	–	–	–
L. latusinus	–	–	–	–	–	–	–	–	–	–	–	–	CC	–	–
L. dactyliseta	–	–	–	–	–	–	–	–	–	–	–	–	–	–	RR
L. acuminata	–	–	–	–	–	–	–	RR	–	–	–	–	RR	–	–
L. amphitropis	–	–	RR	–	–	–	–	–	–	–	–	–	–	–	–
L. rhomboides	–	–	–	–	–	–	–	–	–	–	–	–	RR	–	–
Lecane luna	–	–	–	–	–	CC	–	–	–	–	–	–	RR	–	RR
L. curvicornis	–	–	–	–	–	RRR	–	–	–	–	–	–	–	–	–
L. papuana	–	–	–	–	–	C	RR	–	–	–	–	–	CC	RRR	–
L. lunaris	–	RR	–	–	–	–	–	–	–	–	–	–	–	–	–
L. pyriformis	–	–	–	–	RR	–	–	–	–	–	–	–	–	–	–
L. closterocerca	–	RRR	–	–	–	–	–	–	–	RR	RRR	–	RR	–	RRR
Notommata spec.	–	–	–	–	–	RRR	–	–	–	–	–	–	–	–	–

Nile from the Egyptian border to Khartoum (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cephalodella gibba	–	–	–	–	–	–	RR	–	–	R	–	RRR	–	–	–
C. catellina	–	RR	–	–	–	RR	–	–	–	–	–	–	RRR	RRR	–
Trichocerca ruttneri	–	–	–	–	–	–	–	–	–	–	–	–	RR	CC	RRR
T. porcellus	–	–	–	–	–	–	RR	–	–	–	–	–	–	–	–
T. similis	RR	–	–	–	–	–	–	–	–	–	–	–	–	–	RRR
T. chattoni	RRR	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Synchaeta stylata	–	–	–	–	–	–	–	–	–	–	–	–	–	CC	CCC
Polyarthra vulgaris	–	–	–	–	–	–	CCC	–	–	–	–	–		–	–
P. dolichoptera	–	–	–	–	–	–	–	–	–	–	–	–	–	CCC	RRR
P. dol. ♂	–	–	–	–	–	–	–	–	–	–	–	–	–	C	–
P. remata	–	–	–	–	–	–	–	–	–	–	–	–	–	R	RR
P. spec. 'f. aptera'	–	–	–	RR	–	–	–	–	–	–	–	–	–	–	–
Asplanchnopus hyalinus	–	–	–	–	–	–	–	–	–	–	–	–	–	CC	CCC
Asplanchna priodonta	–	–	–	–	–	–	CCC	–	–	–	–	–	–	RR	–
Dicronophorus spec.	–	–	–	–	–	–	–	–	–	–	RRR	–	RR	–	–
Hexarthra intermedia	–	–	–	–	–	–	–	–	–	–	–	–	–	–	RR
H. fennica	–	–	–	–	–	–	CC	–	–	–	–	–	–	–	–
H. fennica ♂	–	–	–	–	–	–	CC	–	–	–	–	–	–	–	–
H. oxyuris	–	–	–	–	–	–	RR	–	–	–	–	–	–	–	–
Filinia longiseta	–	–	–	CC	–	–	CCC	–	–	–	–	RRR	CC	–	R
F. pejleri	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R

1: Lake Nubia, Wadi Halfa (21°51′ N, 31°17′ E), 12/3/1982. Plankton; 2: Lake Nubia, Khor Sarah, 13/3/1982. Littoral. 3: Id., littoral, 14/3/1982; 4: Lake Nibia, Abu Haoua, 14/3/1982. Plankton. 5: Nile at Dungala (19°12′ N, 30°24′ E), 19/3/1982. Plankton; 6: Id. littoral; 7: Id. Pool in dry side-arm. 19/3/1982. Plankton; 8: Nile at Karima, 23/3/1982. Littoral; 9: Id. Pool. 23/3/1982. 10: Nile at Karima (18°32′ N, 31°48′ E), 23/3/1982. Plankton; 11: Nile at El Khab (18°32′ N, 33°45′ E), 25/3/1982. Plankton; 12: Nile, 10 km downstream of W Amour (18°48′ N, 33°02′ E), 26/3/1982. Plankton; 13: River Adbara (17°40′ N, 34° E), pool without fishes. 27/3/1982. Plankton; 14: Id., pool with fishes. 27/3/1982. Plankton; 15: Kaboushyia (16°51′ N, 33°44′ E), irrigation canal (stagnant water), 28/3/1982. Plankton.

has been mentioned in the limnological literature by Bryce (1931) for Ethiopia, as well as for Central and for South Africa, and by Hutchinson *et al.* (1932) for Transvaal, R.S.A. More recent references are: Evens (1947): River Luapula and Lake Mweru, Zaïre; Russell (1956): Ghana; Berzins (1959): Senegal; Hauer (1963): Egypt; Berzins (1973): Azores, and the same author (1982): Madagascar.

For Sudan, we have only one reference: White and Blue Nile at Khartoum, by Berzins (in Rzoska, 1956).

8.11 *Euchlanis deflexa.* This species was found by Berzins (in Rzoska, 1956) as a first record for Africa, in samples from the White and the Blue Nile at Khartoum.

8.12 *Tripleuchlanis plicata.* Cosmopolitan in all kinds of brackish waters, this species has been noted in Africa for Pokoase Dam, Ghana (Russell, 1956), for Egypt in Lake Edku, near Alexandria (Hauer, 1963) and for Morocco, Dayet Srij, Presahara, by Coussement (in litt.).

For Sudan, it has been found by Moghrabi (1972: 32) in Roseires Reservoir.

8.13 *Wolga spinifera.* Up until recent times, only known from Eurasia, between 37° and 52° latitude north (Koste, 1978: 155). It is a typical species from temperate climates. Koste (pers. comm.) found it also in Northern Iran. There is one record from Neotropis: Rio Parana, Argentina, also a temperate region (Koste & Paggi, 1982).

In our Sudanese samples, *Wolga spinifera* was present in an irrigation canal at Kaboushyia, where it was rare. This is the first record for Africa.

8.14 *Lepadella heterodactyla.* Known up until recent past only from Eastern Europe and from N. and S. America. We found this species in samples from the Basse Casamance, Senegal (De Ridder, 1983) (first record for Africa). In our Sudanese samples, *Lepadella heterodactyla* proved to be very rare in the Bahr el Zeraf on 28/5/1979.

8.15 *Lecane grandis.* The record of Berzins (in Rzoska, 1956): White and Blue Nile at Khartoum, is so far the only one for Africa.

8.16 *Lecane harringi.* We have only one record from Africa for this pantropical, stenohaline species: Lake Edku near Alexandria, Egypt (Hauer, 1963).

In our material, *Lecane harringi* occurred in a sample from Sennar Reservoir, collected in January, 1975, where it was rare.

8.17 *Lecane unguitata africana.* Discovered by Wulfert (1966) in material from Sokoto River, Nigeria, and described as a 'variety', it seems to be a valid subspecies for tropical regions.

We found this taxon in a sample from Bahr el Zeraf, collected on 28/5/1979 and in two samples from River Sobat, collected on 1/5/1973 and on 27/5/1975 respectively. In the three cases, it was rare to extremely rare.

8.18 *Lecane appendiculata.* The Mongalla swamps in Sudan (Daday, 1910a) is so far the only record for Africa of this brackish water species, characteristic for regions with a temperate climate (De Ridder, 1960: 184–186).

8.19 *Notommata brachyura 'f. triangulata'.* Discovered by Kirkman (1906) in Natal, R.S.A. Found by Green (1984) in the Sudd region of Sudan.

8.20 *Cephalodella catellina.* A cosmopolite in all kinds of fresh and brackish waters. It has long been known from Africa: Egypt (Daday, 1910a; Klimowicz, 1961a and 1961b; Hauer, 1963); Central Africa (Daday, 1910b); Ethiopia (Bryce, 1931); South Africa (Hutchinson *et al.*, 1932); Lake Kaingi, Nigeria (Donner & Adeniji, 1977); Basse Casamance (De Ridder, 1983); with doubt for Rio de Oro, NW Sahara (Dumont & Coussement, 1976).

In our Sudanese material, it proved to be rare to very rare in several localities between Khartoum and the Egyptian border: Lake Nubia (Khor Sarah), Dungala and River Atbara.

8.21 *Trichocerca cavia.* The first record for Africa for this cosmopolitan species is from the Basse Casamance, Senegal (De Ridder, 1983). In Sudan, we found it in Wadi Morunga, Jebel Marra Mountains, where it was rare in a sample collected on 26/12/1965.

Beside these records for the continent itself, there is one for Tananarive, Madagascar (Berzins, 1982).

8.22 *Trichocerca dixon-nuttalli.* Though a cosmopolitan species, *Trichocerca dixon-nuttalli* has been noted only a couple of times for Africa: Cape Province, R.S.A. (Daday, 1910b), Senegal (Berzins, 1959) and Lake Kainji, Nigeria (Donner & Adeniji, 1977). Berzins (in Rzoska, 1956) found it in the White and Blue Nile in Khartoum. We met with it in the Blue Nile at Khartoum (sample collected on 22/6/1976) where it was very common.

8.23 *Trichocerca birostris.* Koste (1978: 394) mentions *Trichocerca birostris* with doubt as valid species. Kutikova (1970: 315) places it in the synonymy of *T. similis* (Wierzejski, 1893). Under this name (and including *Diurella stylata* Eyferth, 1878), we discussed its distribution in De Ridder (1981: 49). To the list given there, the following records are to be added: Transvaal, R.S.A. (Hutchinson *et al.*, 1932); Lake Bangweulu (Thomasson, 1960); Nigeria (Egborge & Sagy, 1979); Sampali Bay, Lake Kariba (Magadza, 1980); Sudd region, Sudan (Green, 1984). As *Trichocerca birostris* it has only been recorded by Berzins (in Rzoska, 1956), and by the same author (1959) for Senegal.

Under the name of *Trichocerca similis,* we noted the species in our samples from Sennar Reservoir, Blue Nile south of Khartoum, Jebel Aulyia Reservoir, Bahr el Ghazal, Bahr el Jebel, Blue Nile in Khartoum and Lake Nibia. It means that *Trichocerca similis* is one of the most common species in Sudanese stagnant and running waters.

8.24 *Trichocerca lophoessa.* The record of Daday (1910a) for Twenfikia on the Nile in Sudan is so far the only one of this cosmopolitan (but rare) species for Africa.

8.25 *Trichocerca iernis.* Very rare in Africa: we only have references by Rousselet (1910) (as *Rattulus gracilis* (Tessin)) for the river Lofu, tributary of Lake Tanganyika, and by Cunnington (1920): same lake and its flood plain. We found it in samples from the Basse Cassamance, Senegal (De Ridder, 1983). Berzins (1982) records it in Madagascar.

In our Sudanese material, we found it in a sample from the Blue Nile in Khartoum, collected on 22/6/1976, where it was very rare.

8.26 *Trichocerca capucina.* Another cosmopolitan species, for which we found a single reference for Africa: Hartebeestdam near Pretoria, Transvaal (Huber-Pestalozzi, 1929). It was noted for Sudan by Berzins (in Rzoska, 1956) for the White and the Blue Nile in Khartoum.

8.27 *Synchaeta stylata.* We found only one reference for Africa for this thermophilous species: region of Cairo, Egypt (Klimowicz, 1961a). Record for Sudan: Berzins (in Rzoska, 1966): White and Blue Nile in Khartoum.

In our material, two samples contained it: River Atbara, pool with fish, and irrigation canal at Kaboushyia. In both samples this planktonic species was very abundant.

8.28 *Ploesoma truncatum.* Discovered as new for the Sudanese and also for the African fauna by Green (1984): Sudd region.

8.29 *Dicranophorus forcipatus.* Another cosmopolitan species, discovered for the Sudanese fauna by Monakov (1969: 184), but not seen again by later authors. It was already known in Africa from Natal and Zimbabwe (Rousselet, 1906).

8.30 *Pompholyx complanata.* Noted for Zimbabwe by Rousselet, 1906, and for Hartebeestdam, near Pretoria, Transvaal, by Huber-Pestalozzi, 1929.

In our samples, it occurred in Roseires Reservoir (s.d.) and in the Blue Nile in Khartoum (15/1/1970): in both cases it was rare.

8.31 *Hexarthra jenkinae.* This species was described by de Beauchamp (1932a), from Lake Elmenteita, Kenya. Koste (1977) describes a 'f. nakuru' from Lake Nakuru, Kenya also. The nominative form was found in Lake Nakuru by Vareschi (1978). The species proved to be present also in Lake Latir, Tchad (Pourriot, Iltis & Lévêque-Duwat, 1967) and in several temporary and permanent natron lakes in Kanem, Tchad (Iltis & Riou-Duwat, 1971). Cousement & Dumont (1980), however, raise the question of possible conspecificity of *Hexarthra jenkinae* and *H. fennica,* without being able to solve the problem.

In Sudan, *Hexarthra jenkinae* was found in Great and Small Kariba Lakes, Jebel Marra (Green *et al.*, 1979).

8.32 *Hexarthra fennica.* This species, cosmopolitan in all kinds of brackish waters, is known from most of the African continent: Egypt (Schmarda, 1854; Klimowicz, 1962; Hauer, 1963; Wawrik, 1960); Ethiopia (Bryce, 1931); Transvaal and Cape Province, R.S.A. (Hutchinson *et al.,* 1932); Algeria (Beadle, 1943); Edith Bay, Tanganyika (Gillard, 1957); Lagune Ebrié, Ivory Coast (Rahm, 1964); Rio de Oro, NW Sahara (Coussement & Dumont, 1980); Dayat Sry (Presahara) and Lake Ifni (High Atlas), Morocco (Coussement, in litt.).

We found *Hexarthra fennica* in a single sample, collected (19/3/1982) in a pool in a dry side-arm of the Nile in Dungala. Here it was very common. The male was also abundant in this sample.

8.33 *Hexarthra oxyuris.* In the sample mentioned in a previous paragraph, the Hexarthra population was bispecific: among *H. fennica* were several specimens of *H. oxyuris.* There were no transitory forms. This is the first record for Africa of this species, which occurs principally in temperate regions.

8.34 *Filinia pejleri.* Owing to the confusion reigning in the nomenclature of the genus Filinia, there is only one older record on the presence of *Filinia pejleri* in Africa: pans in the R.S.A. in Hutchinson *et al.,* 1932 (Hutchinson, 1964). Following Colvin (1971), the species is also present in Pongolo flood plain, Swaziland, R.S.A. Green (1967) noted it in Lakes Mobutu Sese Soko, Victoria and George in Uganda. It is probable, that several authors indicated as *Filinia terminalis* (which seems to be a cold stenothermic species, see Pejler, 1957a and 1957b, and Hutchinson, 1964), populations which in reality belong to *F. pejleri,* the latter being a pantropical organism (Koste, 1978: 575). Green found the species in the Sudd region. We saw *Filinia pejleri* in most of the Sudanese waters investigated: Sennar reservoir, Blue Nile in Wadi Medani, Jebel Aulyia reservoir, Lake Shamba, Bahr el Ghazal, Blue Nile in Khartoum, River Rahad and irrigation canal in Kaboushyia, but it was never abundant.

8.35 *Horaella brehmi.* The only record for Sudan is by Green (s.d.): Sudd region. The species is very rare in Africa. It has only been mentioned by Beadle (1963): crater lake Nkuguta, Uganda, and by Clarke (1978): River Swashi, Nigeria.

9. Remarks on the biogeography

Several authors (Dumont, 1978, 1981, 1982; Van Zinderen Bakker, 1980) have pointed out that important climatic changes have occurred in Africa in recent geological times. Beside fluctuations in aridity, temperature changes brought about by the Pleistocene ice ages (about 20 000 BP) are of great importance for zoogeography.

The lowering of temperature allowed European or Palaearctic animal species to migrate from north to south (Dumont, 1982: 20) and to invade the Ethiopian region. Rotifers (or their resting stadia) may have been among them. When deglaciation began, at ±18 000 BP) some may have remained as relicts in several water bodies, especially those of higher altitudes. In this way, the presence of *Keratella serrulata, Lecane appendiculata, Notholca acuminata, Wolga spinifera* and *Hexarthra oxyuris* in the Sudanese rotifer fauna can be explained. They may be relicts of a much richer Palaearctic fauna which occurred in the northern half of Africa. The presence of *Notholca acuminata* as far South as Central Africa (Kwango, Zaïre), see Gillard 1959: 234, could perhaps be explained in a similar way, but we still know very little about the past geographical climatic conditions that prevailed in this area between 20 000 and 18 000 BP.

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