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Review Paper

A Checklist for Zooplankton of Eastern and Southeastern Anatolia Regions (Turkey)

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ABSTRACT

A checklist on Turkey zooplankton was published by Ustaoglu in 2004 and totaly 427 species were reported. Among the zooplankton species in this checklist, 229 species recorded from Rotifera, 106 from Copepoda and 92 from Cladocera. The checklist of Rotifera published in 2012, reported 341 rotifer taxa. During the years since the last checklist process, many studies especially in Eastern and Southeastern Anatolia region of Turkey have been carried out and in this study we have prepared a current zooplankton checklist of Turkish inland waters in these regions. In all these regions 185 zooplankton species have been recorded to date.

Keywords: Zooplankton, Inland Waters, Check-list, Turkey

Doğu ve Güneydoğu Anadolu Bölgelerinin (Türkiye) Zooplankton Kontrol Listesi

ÖZET

2004 yılında Ustaoglu tarafından Türkiye zooplanktonu üzerine bir kontrol listesi yayınlandı ve 427 tür rapor edildi. Zooplankton türlerinden 229 tür Rotifera, 106 Copepoda ve 92 Cladocera türü olarak kaydedilmiştir. 2012'de yayınlanan Rotifera kontrol listesi'nde 341 rotifer türü rapor edildi. Son kontrol listesi işleme alındığından beri, özellikle Türkiye'nin Doğu ve Güneydoğu Anadolu bölgelerinde birçok çalışma yapıldı ve bu çalışmada Türkiye içsularının bu bölgelerinde güncel zooplankton kontrol listesi hazırlandı. Tüm bu bölgelerde günümüze kadar 185 zooplankton türü kaydedilmiştir.

Anahtar Kelimeler: Zooplankton, İç sular, Kontrol listesi, Türkiye

I. INTRODUCTION

THE zooplankton of freshwater systems has been recognized as an important energy resource for fish of small body size that, in turn, provide energy to piscivorous fish consumers higher up in the food web [1].

Rotifers, “the wheel animalcules”, are microscopic aquatic animals of the phylum Rotifera. Because of their high adaptability, these opportunistic organisms are widely distributed in freshwater. The phylum Rotifera is divided into 3 groups: Monogononta, Bdelloidea, and Seisonida. Monogonont rotifers live mainly in freshwater and 1570 species are known worldwide. Bdelloid rotifers which have 461 strictly parthenogenetic species known worldwide. Only 3 species known to belong to Seisonida live among marine ecosystems [2-3].

Generally, Zooplankton studies were conducted in the western regions of Turkey but zooplankton researchs in Eastern and Southeastern Anatolia regions has been neglected.

In recent years, scientists have gave importance to zooplankton research in these areas. This study aims to present a current checklist of zooplankton of Eastern and Southeastern Anatolia regions, based on compilation of previous inventory studies carried out until now.

II. MATERIALS

All published papers and theses from 1987 to 2013 were examined. The studies performed concerning the zooplankton of Eastern and Southeastern Anatolia regions are shown in Table 1.

Table1. The studies made at the Eastern and Southeastern Anatolia regions of Turkey

Dates	Number	Name of study
1987-1989	1	Dumont and Ridder (1987), Rotifers from Turkey [4];
1990-1992	-	-
1993-1995	1	Özdemir and Şen (1994), Zooplankton of Haringet Stream (Elazığ) [5];
1996-1998	1	Yıldız (1997), Seasonal and monthly distribution of zooplankton of Ercek Lake [6];
1999-2001	7	Saler and Şen (2000), Rotifers of Cip Dam Lake [7], Saler (Emiroğlu) <i>et all</i> (2000), The seasonal variations of Rotifers of Kömürhan Region of Euphrate River [8], Saler (2001), Rotifers of Keban Dam Lake [9], Saler (Emiroğlu) and Şen (2001), Rotifers of Zıkkım Stream which flows into Hazar Lake and their seasonal variations [10], Bekleyen (2001), A taxonomical study on the Rotifera fauna of Devegeçidi Dam Lake (Diyarbakır) [11], Tellioğlu (2001), Copepoda and Cladocera of Hazar Lake [12], Tellioğlu and Şen (2001), A taxonomical study on the Copepoda and Cladocera fauna of Hazar Lake (Elazığ) [13]
2002-2004	7	Saler and Şen (2002a), A taxonomical study on the Rotifera fauna of Tadım Pond (Elazığ) [14], Saler and Şen (2002b), Seasonal variation of Rotifera fauna of Cip Dam Lake (Elazığ-Turkey) [15], Tellioğlu and Şen (2002), A taxonomical study on the Rotifera fauna of Hazar Lake [16], Tellioğlu and Şen (2003), Seasonal distribution of Rotifera fauna in Hazar Lake (Elazığ-Turkey) [17], Bekleyen (2003), A taxonomical study on the zooplankton of Göksu Dam Lake (Diyarbakır) [18], Saler (2004), Observations on the seasonal variation of Rotifera fauna of Keban Dam Lake (Çemişgezek Region) [19], Ustaoglu (2004), A Check-list for zooplankton of Turkish inland waters [20],
2005-2007	7	Tellioğlu and Yılmaztürk (2005), A taxonomical study on the Cladocera and Copepoda of Keban Dam Lake [21], Bekleyen (2006), Copepoda and Cladocera fauna of Devegeçidi Dam Lake [22], Akman (2007), Seasonal distribution of Rotifers of Pertek Region of Keban Dam Lake [23], Kaya and Altındağ (2007a), Brachionidae (Rotifera: Monogononta) species from Turkey [24], Kaya and Altındağ (2007b), Some Cladoceran species from Turkish inland waters [25], Saler and Arslan (2007), Copepoda and Cladocera fauna of TMI 12 Pond [26], Tellioğlu (2007), Morphometric variables and individual volume of <i>Macrocyclops albidus</i> and <i>Cyclops vicinus</i> females (Copepoda, Cyclopoida) from Hazar Lake (Elazığ-Turkey) [27]
2008-2010	8	Bozkurt and Sagat (2008), Vertical distribution of zooplankton in Birecik Dam Lake (Turkey) [28], Kaya and Altındağ (2009), New record Rotifer species for the Turkish fauna [29], Özbay and Altındağ (2009), Zooplankton abundance in the River Kars, Northeast Turkey: impact of environmental variables [30], Saler (2009), Rotifers of Kepektaş Dam Lake (Elazığ-

2011-2013	7	<p>Turkey) [31], Bekleyen and İpek (2010), Composition and abundance of zooplankton in a natural aquarium, Lake Balıklıgöl (Şanlıurfa-Turkey) and new records [32], Saler and Şen (2010), Long term changes in Rotifera fauna of Gülüşkür Bay (Keban Dam Lake Elazığ-Turkey) [33], Kaya et al. (2010), Habitat selection, diversity and estimating the species richness of Rotifers in two ponds located in central Anatolia [34], Yıldız et al. (2010), Zooplankton composition of Van Lake coastline in Turkey [35],</p> <p>Saler (2011), Zooplankton of Munzur River (Tunceli-Turkey), [36], Saler and Haykır (2011), Zooplankton composition of Pülümür Stream (Tunceli-Turkey), [37], Saler et al. (2011), Zooplankton of Peri Stream (Tunceli-Türkiye), [38], Yıldız (2012), Zooplankton fauna of Zerne-Dam Lake (Van-Türkiye), [39], Ustaoglu et al.(2002) A checklist of Turkish Rotifers [40], Bulut and Saler (2013), Zooplankton of Kalecik Dam Lake (Elazığ) [41], Gürel (2013), Zooplankton of Orduzu Pond (Malatya) [42].</p>
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***Checklist**

Phylum: Rotifera Cuvier, 1817

Class: Euroatoria De Ridder, 1957

Subclass: Bdelloidea Hudson, 1884

Order: Philodinida

Family: Philodinidae Ehrenberg, 1838

Genus: Rotaria Scopoli, 1777

Rotaria neptunia (Ehrenberg, 1830)

Rotaria rotatoria (Pallas, 1766)

Genus: Philodina Ehrenberg, 1830

Philodina megalotrocha Ehrenberg, 1832

Philodina roseola Ehrenberg, 1832

Subclass: Monogononta Plate, 1889

Superorder: Pseudotocha Kutikova, 1970

Order: Ploimia Hudson & Gosse, 1886

Family: Epiphanidae Hanning, 1913

Genus: Epiphanes Ehrenberg, 1832

Epiphanes brachionus spinosa Rousselet, 1901

Epiphanes senta (O.F. Müller 1773)

Family: Brachionidae Ehrenberg, 1838

Genus: Brachionus Pallas, 1766

Brachionus angularis Gosse, 1851

Brachionus bidentatus Anderson, 1889

Brachionus budapestinensis Daday, 1885

Brachionus calyciflorus Pallas, 1766

Brachionus caudatus Barrois & Daday, 1894

Brachionus falcatus Zacharias, 1898

Brachionus plicatilis Müller, 1786

Brachionus urceolaris Müller, 1773

Brachionus quadridentatus Hermann, 1783

Genus: Keratella Bory de St. Vincent, 1822

Keratella cochlearis (Gosse, 1851)
Keratella tecta (Gosse, 1851)
Keratella quadrata (O.F. Müller, 1786)
Keratella tropica (Apstein, 1907)
Keratella valga (Ehrenberg, 1834)
Genus: Notholca Gosse, 1886
Notholca acuminata (Ehrenberg, 1832)
Notholca squamula (Müller, 1786)
Genus: Kellicottia Ahlstrom, 1938
Kellicottia longispina (Kellicott, 1879)
Genus: Anuraeopsis Lauterborn, 1900
Anuraeopsis coelata de Beauchamp, 1932
Anuraeopsis fissa Gosse, 1851
Family: Euchlanidae Ehrenberg, 1838
Genus: Euchlanis Ehrenberg, 1832
Euchlanis dilatata Ehrenberg, 1832
Euchlanis incisa Carlin, 1939
Euchlanis lyra Hudson, 1886
Euchlanis oropha Gosse, 1887
Genus: Tripleuchlanis Myers, 1930
Tripleuchlanis plicata (Levander, 1894)
Family: Mytilinidae Harring, 1913
Genus: Mytilina Bory de St. Vincent, 1826
Mytilina bisulcata (Lucks, 1912)
Mytilina mucronata (Müller, 1773)
Mytilina trigona (Gosse, 1851)
Mytilina spinigera Sache, 1912
Mytilina ventralis (Ehrenberg, 1830)
Family: Trichotriidae Harring, 1913
Genus: Trichotria Bory de St. Vincent, 1827
Trichotria curta (Skorikov, 1914)
Trichotria pocillum (Müller, 1776)
Trichotria tetractis (Ehrenberg, 1830)
Genus: Wolga Skorikov, 1903
Wolga spinifera (Western, 1894)
Family: Lepadellidae Harring, 1913
Genus: Colurella Bory de St. Vincent, 1824
Colurella adriatica Ehrenberg, 1831
Colurella colurus (Ehrenberg, 1830)
Colurella obtusa (Gosse, 1886)
Colurella uncinata (O.F. Müller, 1773)
Genus: Squatinella Bory de St. Vincent, 1826
Squatinella rostrum (Schmarda, 1846)
Genus: Lepadella Bory de St. Vincent, 1826
Lepadella acuminata (Ehrenberg, 1834)
Lepadella amphitropis Harring, 1916
Lepadella biloba Hauer, 1958
Lepadella costata Wulfert, 1940

Lepadella ovalis (Müller, 1786)
Lepadella patella (Müller, 1773)
Lepadella quadricarinata (Stenroos, 1898)
Lepadella triptera (Ehrenberg, 1832)
Family: Lecanidae Remane, 1933
Genus: Lecane Nitzsch, 1827
Lecane grandis (Murray, 1913)
Lecane luna (Müller, 1776)
Lecane ohioensis (Herrick, 1885)
Lecane pyriformis (Daday, 1905)
Lecane (Monostyla) bulla (Gosse, 1886)
Lecane (M.) closterocerca (Schmarda, 1859)
Lecane flexilis (Gosse, 1886)
Lecane furcata (Murray, 1913)
Lecane (M.) cornuta (Müller, 1786)
Lecane (M.) hamata (Stokes, 1896)
Lecane inermis (Bryce, 1892)
Lecane (M.) lamellata (Daday, 1893),
Lecane (M.) lunaris (Ehrenberg, 1832)
Lecane nana (Murray, 1913)
Lecane (M.) scutata (Harring & Meyers, 1926)
Lecane (M.) stenroosi (Meissner, 1908)
Lecane papuana (Murray, 1913)
Lecane quadridentata (Ehrenberg, 1830)
Lecane thienemanni (Hauer, 1938)
Lecane unguolata (Gosse, 1887)
Family: Proalidae Harring & Myers, 1924
Genus: Proalides De Beauchamp, 1907
Proalides subtilis (Rodewald, 1894)
Family: Notommatidae Hudson & Gosse, 1886
Genus: Monommata Bartsch, 1870
Monommata arndti Remane, 1933
Genus: Notommata Ehrenberg, 1830
Notommata glyfura Wulfert, 1935
Notommata cryptopus Gosse, 1886
Genus: Pleurotrocha Ehrenberg, 1830
Pleurotrocha petromyzon (Ehrenberg, 1830)
Genus: Taphrocompa Gosse, 1851
Taphrocompa selenura Gosse, 1887
Genus: Cephalodella Bory de St. Vincent, 1826
Cephalodella catellina (Müller, 1786)
Cephalodella forficula (Ehrenberg, 1830)
Cephalodella gibba (Ehrenberg, 1830)
Cephalodella forficata (Ehrenberg, 1832)
Cephalodella ventripes (Dixon-Nuttall, 1901)
Family: Trichocercidae Harring, 1913
Genus: Trichocerca Lamarck, 1801
Trichocerca capucina (Wierzejski & Zacharias, 1893)

Trichocerca collaris (Rousselet, 1896)
Trichocerca cylindrica (Imhof, 1891)
Trichocerca longiseta (Schrank, 1802)
Trichocerca porcellus (Gosse, 1851)
Trichocerca pusilla (Lauterborn, 1898)
Trichocerca rattus (Müller, 1776)
Trichocerca relictus Donner, 1950
Trichocerca (Diurella) similis (Wierzeski, 1893)
Trichocerca (D.) taurocephala (Hauer, 1931)
Trichocerca tenuior (Gosse, 1886)
Trichocerca vernalis (Hauer, 1936)
Trichocerca weberi (Jennings, 1903)

Family: Gastropodidae Haring, 1913

Genus: Gastropus Imhof, 1888

Gastropus stylifer Imhof, 1891

Genus: Ascomorpha Perty, 1850

Ascomorpha ovalis (Bergendahl, 1892)

Ascomorpha saltans Bartsch, 1870

Family: Scaridiidae Manfredi, 1927

Genus: Scaridium Ehrenberg, 1830

Scridium longicaudum (Müller, 1786)

Family: Synchaetidae Hudson & Gosse, 1886

Genus: Synchaeta Ehrenberg, 1832

Synchaeta oblonga Ehrenberg, 1832

Synchaeta pectinata Ehrenberg, 1832

Synchaeta stylata Wierzejski, 1893

Synchaeta verrucosa (Nipkow, 1961)

Genus: Polyarthra Ehrenberg, 1834

Polyarthra dolichoptera Idelson, 1925

Polyarthra vulgaris Carlin, 1943

Polyarthra remata Skorikov, 1896

Family: Asplanchnidae Eckstein, 1883

Genus: Asplanchna Gosse, 1850

Asplanchna priodonta Gosse, 1850

Asplanchna sieboldi (Leydig, 1854)

Asplanchna hyalinus (Haring, 1913)

Family: Dicranophoridae Haring, 1913

Genus: Dicranophorus Nitzsch, 1827

Dicranophorus epicharis Haring and Myers, 1928

Dicranophorus grandis (Ehrenberg, 1832)

Dicranophorus forcipatus (Müller, 1786)

Dicranophorus hauerianus Wiszniewski, 1939

Dicranophorus luetkeni (Bergendahl, 1892)

Dicranophorus secretus Donner, 1951

Genus: Encentrum Ehrenberg, 1838

Encentrum putorius Wulfert, 1936

Encentrum uncinatum (Milne, 1886)

Encentrum wiszniewski Wulfert, 1939

Superorder: Gnesiotrocha Kutikova, 1970
Order: Flosculariacea Haring, 1913
Family: Testudinellidae Haring, 1913
Genus: Testudinella Bory de St. Vincent, 1826
Testudinella mucronata (Gosse, 1886)
Testudinella patina (Hermann, 1783)
Testudinella reflexa (Gosse, 1887)
Testudinella truncata (Gosse, 1886)
Genus: Pompholyx Gosse, 1851
Pompholyx complanata Gosse, 1851
Genus: Ptygura Ehrenberg, 1832
Ptygura furcillata (Kellicott, 1889)
Family: Flosculariidae Ehrenberg, 1838
Genus: Floscularia Cuvier, 1798
Floscularia ringens (Linnaeus, 1758)
Family: Conochililidae Haring, 1913
Genus: Conochilus Ehrenberg, 1834
Conochilus dossuarius (Hudson, 1885)
Conochilus hippocrepis (Schränk, 1803)
Conochilus unicornis Rousselet, 1892
Family: Hexarthridae Bartos, 1959
Genus: Hexarthra Schmarda, 1854
Hexarthra fennica (Levander, 1892)
Hexarthra intermedia (Wiszniewski, 1929)
Hexarthra mira (Hudson, 1871)
Family: Filinidae Haring & Myers, 1926
Genus: Filinia Bory de St. Vincent, 1824
Filinia cornuta (Weisse, 1847)
Filinia longiseta (Ehrenberg, 1834)
Filinia opeliensis (Zacharias, 1898)
Filinia terminalis (Plate, 1886)
Order: Collothecacea Haring, 1913
Family: Collethecidae Haring, 1913
Genus: Colletheca Haring, 1913
Colletheca mutabilis (Hudson, 1885)
Colletheca ornata (Ehrenberg, 1832)
Phylum: Arthropoda Latreille, 1829
Subphylum: Crustacea Brünnich, 1772
Subclass: Phyllopoda Preuss, 1951
Order: Diplostraca Gerstaecker, 1866
Suborder: Cladocera Latreille, 1829
Family: Sididae Baird, 1850
Genus: Diaphanosoma Fischer, 1850
Diaphanosoma lacustris Korinek, 1981
Diaphanosoma mongolianum Ueno, 1938
Diaphanosoma orghidani Negrea, 1982
Diaphanosoma birgei Korinek, 1981
Family: Daphniidae Sars, 1865

Genus: Daphnia O:F. Müller, 1785

Daphnia cucullata Sars, 1862

Daphnia galeata Sars, 1864

Daphnia longispina O.F. Müller, 1875

Daphnia manga Straus, 1820

Daphnia similis Claus, 1876

Genus: Simocephalus Schoedler, 1858

Simocephalus vetulus (O.F. Müller, 1776)

Genus: Ceriodaphnia Dana, 1853

Ceriodaphnia dubia Richard, 1894

Ceriodaphnia megops Sars, 1862

Ceriodaphnia pulchella Sars, 1862

Ceriodaphnia reticulata (Jurine, 1820)

Family: Moinidae Goulden, 1968

Genus: Moina Baird, 1850

Moina macrocopa (Straus, 1820)

Moina micrura Kurz, 1874

Family: Macrothricidae Norman & Brady, 1867

Genus: Macrothrix Baird, 1845

Macrothrix hirsuticornis Norman & Brady, 1867

Macrothrix laticornis (Fischer, 1851)

Family: Bosminidae Baird, 1845

Genus: Bosmina Baird, 1845

Bosmina longirostris (O.F. Müller, 1785)

Genus: Pleuroxus Baird, 1845

Pleuroxus aduncus (Jurine, 1820)

Genus: Disparalona Fryer, 1968

Disparalona rostrata (Koch, 1841)

Genus: Chydorus Leach, 1816

Chydorus sphaericus (O.F. Müller, 1776)

Subfamily: Aloninae Frey, 1967

Genus: Alona Baird, 1843

Alona guttata Sars, 1862

Alona rectangula Sars, 1862

Genus: Graptoleberis Sars, 1862

Graptoleberis testudinaria (Fischer, 1848)

Genus: Leydigia Kurz, 1875

Leydigia acanthocercoides (Fischer, 1854)

Leydigia leydigi (Schoedler, 1863)

Genus: Biapertura Smirnov, 1971

Biapertura affinis (Leydig, 1860)

Hyocryptus sordidus (Lievin, 1848)

Family: Podonidae Mordukhai-Boltovskoi, 1968

Genus: Cornigerius Mordukhai-Boltovski, 1967

Cornigerius lacustris (Spandl, 1923)

Infraorder: Haplopoda Sars, 1865

Family: Leptodoridae Lilljeborg, 1861

Genus: Leptodora Lilljeborg, 1861

Leptodora kindtii (Focke, 1844)
Class: Maxillopoda Dahl, 1956
Subclass: Copepoda H.Milne-Edwards, 1840
Infraclass: Neocopepoda Huys & Boxshall, 1991
Superorder: Gymnoplea Giebesbrecht, 1882
Order: Calanoida Sars, 1930
Family: Diaptomidae G.O.Sars, 1903
Subfamily: Diaptominae Kiefer, 1932
Genus: Diaptomus Westwood, 1836
Diaptomus sp.
Genus: Acanthodiaptomus Kiefer, 1932
Acanthodiaptomus denticornis (Wierzejski, 1887)
Genus: Arctodiaptomus Kiefer, 1932
Arctodiaptomus byzantinus Mann, 1940
Arctodiaptomus osmanus Kiefer, 1974
Arctodiaptomus spinosus (Daday, 1891)
Genus: Sinodiaptomus Kiefer, 1932
Sinodiaptomus sarsi (Rylov, 1923)
Superorder: Podoplea Giesbrecht, 1882
Order: Cyclopoida Sars, 1918
Family: Cyclopoidae G.O.Sars, 1913
Subfamily: Eucyclopinae Kiefer, 1927
Genus: Macrocylops Claus, 1893
Macrocylops albidus (Jurine, 1820)
Genus: Eucyclops Claus, 1893
Eucyclops serrulatus (Fischer, 1851)
Subfamily: Cyclopinae Kiefer, 1927
Genus: Acanthocyclops Kiefer, 1927
Acanthocyclops robustus (G.O. Sars, 1863)
Genus: Cyclops O.F. Müller, 1785
Cyclops strennus Fischer, 1851
Cyclops vicinus Uljanin, 1875
Genus: Diacyclops Kiefer, 1927
Diacyclops bicuspidatus (Claus, 1857)
Genus: Thermocyclops Kiefer, 1927
Thermocyclops crassus (Fischer, 1853)
Thermocyclops dybowski (Lande, 1890)
Order: Poecilostomatoida Thorell, 1859
Family: Ergasilidae Nordmann, 1832
Genus: Ergasilus Nordmann, 1832
Ergasilus sieboldi Nordmann, 1832
Order: Harpacticoida Sars, 1911
Family: Ameiridae Monard, 1927
Genus: Nitokra Boeck, 1864
Nitokra hibernica (Brady, 1880)

*Taxonomically species and author names were written according to Segers (2007) [2], Ustaoglu (2004) [20], and Ustaoglu *et al* (2012) [40],

As a result of the studies during 1987 to 2013 period, the presence of 185 taxa has been reported at the Eastern and Southeastern Anatolia regions. All of these species 138 species (1 subspecies) from Rotifera 31 species from Cladocera and 16 species from Copepoda were reported.

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