

Checklist of Cladocera and Copepoda Taxa in Iraqi Waters

Feryal Ameen Merza

Department of Biology, Faculty of Science, University of Kufa, Najaf, Iraq

Abstract: The present study aimed to survey the zooplankton composition (Cladocera and Copepoda) in Iraqi waters. These data were taken from a zooplankton survey in Iraqi waters, involving freshwater and marine waters. A total of 185 taxa belong to 102 cladocerans and 83 copepods belong to 152 species have determined in a zooplankton checklist. Cladocera being the richest with 89 species. Among the Cladocera families, Chydoridae and Daphniidae showed a greater number of species, in contrast with the lower richness of Copepoda.



Introduction

Zooplankton dominate by four main groups: Protozoa, Rotifera, Cladocera, and Copepoda. Cladocera and Copepoda are an essential component of the crustacean zooplankton. Zooplankton play the main role in the food chain (Manickam et al., 2014), as they transfer energy made from phytoplankton to other organisms such as fish. Zooplankton are considered as indicators of ecological quality in aquatic systems. They have global distribution and their species are sensitive to change in ecological circumstances, nutrient enrichment (Jha and Barat, 2003) and several levels of contamination (El-Bassat, 2007). Because of this importance, zooplanktons have been investigated from different internal ecosystems of Iraq. The first survey on the zooplankton in Iraq is that of Gurney in 1921 (Gurney, 1921), who recognized 15 species of zooplankton. The aim of this research is to provide a list of species of Cladocera and Copepoda to present a basis for further zooplankton surveys from Iraqi water.

Material and Methods

Literature review. Information was taken from a zooplankton research in the area of Iraq, involving freshwater and marine investigations. The research performed regarding Cladocera and Copepoda in Iraq: Abbas (2015), Abbas et al. (2014), Abdul - Hussein et al. (1989), Abdulwahab and Rabee (2015), Adday and

Ali(2011),Ahmed (2007), Ajeel and Abbas (2012), Ajeel and Abbas (2013), Ajeel (2012), Ajeel et al. (2015), Akbar et al. (2005), Al-Saboonchi et al (1986), Al-Ameen (2013), Al-Daraji, (2002a, 2002b), Al-Doori (2009, 2012),Ali et al. (2000), Ali et al. (2001), Al-Laami et al. (1998), Al-Laami et al. (1996), Al-Sodani et al. (2007), Gurney (1921), Khalaf, (1988), Khamees et al. (2015), Matlob (2004), Mohamed (2011), Mohamed et al (2004),Mohammad (1965),Muften (2002), Nashaat (2001), Rabee, (2007, 2010), Rahdi (2005), Rahemo and Ami (2012), Sabri et al. (1989), Sabri et al. (1993), Sabri et al. (2001).

Results and Discussion

The checklist of cladocerans and copepods of Iraqi waters has 185 taxa (152 identified to species level) which include 102 cladocerans (55.135%) and 83 copepods (44.864%) (Table 1,2).The diversity (distinct composition)of cladocerans and copepods found in Iraqi waters reflect their different limnological characteristics.

Table 1. Number genera and taxa within zooplankton groups.

Group	Taxa	Percentage	Genera	Percentage
Cladocera	102	55.135%	89	58.55%
Copepoda	83	44.864%	63	41.44%
Total	185	100%	152	100%

Table 2.List of zooplankton that found in Iraq.

Group	Family	Taxa	References
Cladocera	Bosminidae	<i>Bosmina coregoni</i>	Akbar, et al(2005), Al-Ameen(2013),Al-Doori (2009), Al-Doori (2012),Ali, et al. (2000), Ali, et al (2001), Mohammed (1965), Rabee (2007), Rahdi, et al. (2005),Sabri et al. (1989), Sabri et al. (1993),Sabri et al. (2001)

	<i>Bosmina longirostris</i>	Abdulwahab and Rabee (2015), Adel(2010), Akbar, et al(2005), Ajeel and Abbas(2012), Al-Doori (2009), Al-Doori (2012), Ali, et al.(2001), Ali, et al. (2000), Al-Ameen(2013), Al-Laami,(1998), Gurney (1921), Matlob (2004), Muften, et al. (2002), Nashaat (2001), Rabee (2007), Rahdi, et al. (2005), Rahemo and Ami (2012), Sabri et al. (1989), Sabri et al. (1993), Sabri et al. (2001).	
	<i>Bosmina sp.</i>	Al-Ameen(2013).	
	<i>Bosmina eridionalis</i>	Abbas, et al. (2014)	
Chydoridae	<i>Alona affinis</i>	Ajeel(2012), Akbar, et al(2005), Al-Sodani et al. (2007), Rahdi, et al. (2005).	
	<i>Alona karua</i>	Abdulwahab and Rabee (2015), Ajeel and Abbas(2012), Al-Sodani et al. (2007), Rahdi, et al. (2005).	
	<i>Alona costata</i>	Abbas, et al(2014), Abdulwahab and Rabee (2015), Ajeel and Abbas(2013), Al-Ameen.(2013), Matlob (2004), Mohammed (1965), Muften, et al. (2002), Sabri et al. (1993), Rahdi, et al. (2005), Rabee (2010).	
	<i>Alona cambouei</i>	Ajeel and Abbas(2012)	
	<i>Alona guttata</i>	Abdulwahab and Rabee (2015), Al-Ameen(2013), Matlob (2004), Muften, et al. (2002), Rabee (2007), Rabee (2010), Rahdi, et al. (2005), Sabri et al. (1993).	
	<i>Alona intermedia</i>	Rahdi, et al. (2005), Matlob (2004), Muften, et al. (2002), Sabri et al. (1993).	
	<i>Alona monocanthar</i>	Al-Ameen (2013).	
	<i>Alona rectangula</i>	Abdulwahab and Rabee (2015), Ajeel and Abbas(2013), Al-Ameen(2013), Akbar, et al.(2005), Gurney (1921), Rahdi, et al. (2005), Sabri et al. (1993).	
	<i>Alona quadrangularis</i>	Rahdi, et al. (2005),	
	<i>Alona sp.</i>	Al-Ameen (2013), Rahdi, et al. (2005).	
		Akbar, et al(2005)	
		<i>Alona circumfimbriata</i>	Al-Saboonchi et al. (1986).
		<i>Alona rustica</i>	Abbas, et al(2014).
		<i>Alonopsis sp.</i>	Rahdi, et al. (2005).
		<i>Alonella cladyi</i>	Al-Doori (2012).
		<i>Alonella acutirostris</i>	Rahdi, et al. (2005).
		<i>Alonella sp.</i>	Al-Sodani et al. (2007).
		<i>Alonella diaphana</i>	Abbas, et al(2014), Ajeel and Abbas(2013).
		<i>Alonella excise</i>	Al-Doori (2009).
		<i>Alonella dentifera</i>	Al-Doori (2009), Sabri, et al.(1993).
		<i>Camptocercus rectirostris</i>	Abdulwahab and Rabee (2015), Ajeel and Abbas(2013), Ali, (2001), Al-Ameen (2013), Rahdi, et al. (2005).
		<i>Camptocercus sp.</i>	Al-Ameen (2013).
		<i>Camptocercus oklahomensis</i>	Al-Sodani et al. (2007).
		<i>Camptocercus rectirostris</i>	Abbas, et al(2014), Al-Sodani et al. (2007), Sabri et al. (1993).

<i>Camptocercus uncinatus</i>	Ajeel and Abbas(2012).
<i>Chydorus sp.</i>	Al-Ameen (2013).
<i>Chydorus piger</i>	Abdulwahab and Rabee (2015), Al-Sodani et al. (2007), Rahdi, et al. (2005).
<i>Chydorus gibbus</i>	Abdulwahab and Rabee (2015), Al-Doori (2009),Al-Sodani et al. (2007), Matlob (2004), Rahdi, et al. (2005).
<i>Chydorus ovalis</i>	Ali, et al.(2001), Al-Sodani et al. (2007).
<i>Chydorus sphericus</i>	Abbas, et al(2014), Ajeel and Abbas(2012), Ajeel and Abbas(2013),Akbar, et al(2005),Al-Ameen (2013), Al-Laami,(1998),Al-Saboonchi et al.(1986), Ali, et al. (2000),Ali (2001), Gurney (1921), Matlob (2004), Mohammed (1965),Muften, et al. (2002),Nashaat (2001), Rabee (2007),Rabee (2010),Rahdi, et al. (2005), Sabri et al. (1993).
<i>Chydorus pulx</i>	Ajeel(2012).
<i>Chydorus latus</i>	Al-Doori (2009),Matlob (2004),
<i>C. ventricosus</i>	Al-Saboonchi et al.(1986).
<i>Graptoleberis testudinaria</i>	Al-Ameen(2013).
<i>Leydigia acanthocercoides</i>	Al-Ameen(2013), Rahdi, et al. (2005),Abbas, et al. (2014).
<i>Leydigia macrodonta</i>	Sabri et al. (1993), Abbas, et al.(2014)
<i>Leydigia quadrangularis</i>	Al-Ameen(2013),
<i>Monospilus dispar</i>	Rahdi, et al. (2005).
<i>Pleuroxus paraplesius</i>	Abbas, et al. (2014).
<i>Pleuroxus sp.</i>	Al-Ameen (2013), Ali, et al.(2001).
<i>Pleuroxus striatus</i>	Al-Ameen (2013).
<i>Pleuroxus aduncus</i>	Al-Saboonchi et al.(1986).
<i>Pleuroxus similis</i>	Al-Saboonchi et al.(1986).
<i>Pleuroxus nastatus</i>	Matlob (2004).
<i>Pleuroxus trigonellus</i>	Sabri et al. (1993).
<i>Indialona macronyx</i>	Al-Saboonchi et al.(1986).
<i>Rhynchotalona falcata</i>	Rahdi, et al. (2005).
<i>Eurycecus lamellatus</i>	Mohammed (1965).
<i>Eurycecus glacialis</i>	Al-Saboonchi et al.(1986).
<i>Ephemeroporus</i>	Sabri et al. (1993).

	<i>barroisi</i>	
	<i>Oxyurella</i> sp.	Matlob (2004).
	<i>Dunhevedia crassa</i>	Abbas, et al(2014), Ajeel(2012), Ajeel and Abbas(2012) , Ajeel and Abbas(2013).
Daphniidae	<i>Ceriodaphnia</i> sp.	Al-Ameen (2013).
	<i>Ceriodaphnia lacustris</i>	Al-Sodani et al. (2007), Rahdi, et al. (2005).
	<i>Ceriodaphnia laticaudata</i>	Al-Sodani et al. (2007), Rahdi, et al. (2005).
	<i>Ceriodaphnia carnura</i>	Ajeel(2012).
	<i>Ceriodaphnia reticulata</i>	Abdulwahab and Rabee (2015), Al-Ameen(2013), Ali, (2001) Ali, et al. (2000), Al-Laami,(1998), Gurney (1921) Mohammed (1965),Nashaat (2001), Rahdi, et al. (2005), Rabee (2010), Sabri et al. (2001), Sabri et al. (1993)
	<i>Ceriodaphnia rigaudi rigandi</i>	Abbas, et al(2014), Abdulwahab and Rabee (2015), Ajeel and Abbas(2012, 2013), Al-Doori (2012), Muften, et al. (2002),Rabee (2010), Rahdi, et al. (2005),Sabri et al. (1989), Sabri et al. (2001).
	<i>Daphnia</i> sp.	Al-Ameen(2013),Al-Laami,(1998), Muften, et al. (2002), Nashaat (2001), Rahdi, et al. (2005).
	<i>Daphnia dubia</i>	Akbar, et al(2005).
	<i>Daphnia laevis</i>	Al-Ameen (2013),Rabee (2007),Rahdi, et al. (2005).
	<i>Daphnia exilis</i>	Abbas, et al(2014).
	<i>Daphnia hyalina</i>	Abbas, et al(2014), Ajeel and Abbas(2012).
	<i>Daphnia galeata Sars</i>	Muften, et al. (2002), Rahdi, et al. (2005),Rabee (2007),Rabee (2010).
	<i>Daphnia longiremis</i>	Al-Ameen (2013), Rahdi et al. (2005).
	<i>Daphnia longispina</i>	Al-Ameen (2013), Gurney (1921), Mohammed (1965).
	<i>Daphnia lumholtzi</i>	Abbas, et al(2014), Al-Doori (2009), Al-Doori (2012),Gurney (1921), Rabee (2007), Sabri et al. (1993).
	<i>Daphnia pulex</i>	Ajeel and Abbas(2012), Akbar, et al(2005), Al-Ameen(2013),Mohammed (1965), Rabee (2007), Rahdi, et al. (2005),Rahemo and Ami (2012), Sabri et al. (1989), Sabri et al. (1993).
	<i>Daphnia similis</i>	Al-Ameen (2013).
	<i>Daphnia magna,</i>	Ajeel and Abbas(2012),Akbar, et al(2005), Mohammed (1965),Rabee (2007),Rahdi, et al. (2005).
	<i>Simocephalus</i> sp.	Al-Ameen (2013).
	<i>Simocephalus expinosus</i>	Abbas, et al(2014), Ajeel and Abbas(2013), Ajeel(2012), Al-Ameen (2013), Ali, et al. (2000), Ali, et al.(2001), Gurney (1921), Matlob (2004), Mohammed(1965), Rabee (2007),Sabri et al. (1993).
<i>Simocephalus vetulus</i>	Abbas, et al(2014), Abdulwahab and Rabee (2015),Ajeel and Abbas(2012),Akbar, et al(2005), Al-Ameen (2013),Al-Doori (2009),Matlob (2004) ,Nashaat (2001) , Rahdi, et al. (2005).	
<i>Simocephalus serrulatus</i>	Al-Doori (2009).	
<i>Simocephalus</i>	Ajeel and Abbas(2013).	

		<i>vetuloides</i>	
		<i>Scapholeberis kingi</i>	Abbas, et al(2014), Abdulwahab and Rabee (2015), Akbar, et al(2005), Al-Laami,(1998), Al-Sodani et al. (2007), Matlob (2004), Mohammed (1965),Nashaat (2001), Rahdi, et al. (2005).
		<i>Scapholeberis mucronata</i>	Gurney (1921).
	Hyocryptidae	<i>Ilyocryptus agilis</i>	Abbas, et al(2014), Ajeel and Abbas(2012).
		<i>Hyocryptus sordidus</i>	Al-Ameen (2013),Matlob (2004), Rahdi, et al. (2005),Sabri et al. (1993).
		<i>Hyocryptus spinifer</i>	Ajeel and Abbas(2012).
	Leptodoridae	<i>Leptodora Kinditii kindtii</i>	Al-Doori (2009), Muften, et al. (2002).
	Lepidoziaceae	<i>Kurzia longirostris</i>	Ajeel and Abbas(2012).
	Lynceidae	<i>Lynceus</i> sp.	Ajeel and Abbas(2012).
	Macrothricidae	<i>Macrothrix</i> sp.	Al-Laami,(1998).
		<i>Macrothrix hirsuticornis</i>	Al-Ameen (2013).
		<i>Macrothrix laticornis</i>	Al-Ameen (2013),Muften, et al. (2002), Rahdi, et al. (2005), Sabri et al. (1993).
		<i>Macrothrix rosea</i>	Al-Ameen (2013), Mohammed (1965).
		<i>Macrothrix montana</i>	Rahdi, et al.(2005).
		<i>Macrothrix rectirostris</i>	Akbar, et al(2005).
		<i>Macrothrix spinosa</i>	Abbas, et al.(2014), Ajeel and Abbas(2012),Ajeel and Abbas(2013).
	Moinidae	<i>Moina brachiata</i>	Ajeel and Abbas(2012), Ajeel (2012).
		<i>Moina micrura</i>	Ajeel and Abbas(2012), Al-Doori (2009),Al-Doori (2012),Sabri, et al. (1993).
		<i>Moina affinis</i>	Abbas, et al. (2014), Abdulwahab and Rabee (2015),Ajeel and Abbas(2013),Muften, et al. (2002), Rabee (2007),Rabee (2010),Rahdi, et al. (2005).
		<i>Moina rectirosris</i>	Akbar, et al(2005).
	Sididae	<i>Diaphanosoma brachyurum</i>	Abbas, et al(2014), Ajeel and Abbas(2012),Ajeel and Abbas(2013), Al-Ameen (2013),Muften, et al. (2002), Rabee (2007),Rabee (2010), Rahdi, et al.(2005), Sabri et al. (1989), Sabri et al. (1993).
		<i>Diaphanosoma orghidani</i>	Ajeel and Abbas(2012).
		<i>Latonopsis fasciulata</i>	Abbas, et al(2014).
		<i>Latonopsis occidentalis</i>	Al-Ameen (2013).
		<i>Sida crystalline</i>	Mohammed (1965).
Copepoda	Acartiidae	<i>Acartia</i> sp.	Ajeel(2012).
		<i>Acartia pacifica</i>	Ajeel(2012).
		<i>Acartiella</i>	Abbas(2015), Ajeel(2012).

	<i>faensis</i>	
Aegisthidae	<i>Aegisthus</i> sp.	Ajeel(2012).
Ameiridae	<i>Nitocra spinipes</i>	Abdulwahab and Rabee (2015), Matlob (2004).
	<i>Nitocra cacustris</i>	Abdulwahab and Rabee (2015).
	<i>Nitocra lacustris</i>	Muften, et al. (2002).
Calanidae	<i>Canthocalanus pauper</i>	Khalaf (1988).
Canthocamptida	<i>Bryocamptus</i> sp.	Al-Ameen (2013),Matlob (2004).
	<i>Canthocampus staphylinus</i>	Gurney (1921).
	<i>Elaphoidella grandidieri</i>	Al-Saboonchi et al. (1986).
	<i>E sewelli</i>	Al-Saboonchi et al. (1986).
	<i>Moraria</i> sp.	Matlob (2004).
	<i>Mesochra</i> sp.	Matlob (2004).
	<i>Mesochra lilljeborgi</i>	Matlob (2004).
Centropagidae	<i>Limnocalanus</i> sp.	Al-Ameen (2013).
	<i>Centropages</i> sp.	Ajeel(2012).
	<i>Centropages tenuiremis</i>	Khalaf (1988).
Clausocalanidae	<i>Clausocalanus minor.</i>	Ajeel(2012), Khalaf (1988).
Cyclopidae	<i>Cyclops</i> sp.	Al-Ameen (2013), Al-Laami,(1998), Nashaat (2001), Rahemo and Ami (2012).
	<i>Cyclops crassicaudis</i>	Al-Doori (2012).
	<i>Cyclops strenuous</i>	Al-Ameen (2013).
	<i>Cyclops scutifer</i>	Al-Doori (2012).
	<i>Cyclops hyalinus</i>	Al-Doori (2012).
	<i>Cyclops vernalis</i>	Al-Doori (2009, 2012),Al-Saboonchi et al.(1986).
	<i>Cyclops visinus venustus</i>	Al-Doori (2009), Gurney (1921),Muften, et al. (2002).
	<i>Cyclops dimorphus</i>	Al-Doori (2009,2012).
	<i>Apocyclops dengizicus</i>	Ahmed (2007), Mohammed(2004).
	<i>Eucyclops</i> sp.	Al-Ameen (2013), Al-Laami,(1998), Al-Saboonchi et al.(1986), Matlob (2004).
	<i>Eucyclops speratus</i>	Matlob (2004).
	<i>Eucyclops agilis</i>	Al-Laami,(1998), Al-Sodani et al. (2007), Gurney (1921), Matlob (2004),Muften, et al. (2002).
	<i>Eucyclops</i>	Abdulwahab and Rabee (2015).

	<i>prionop</i>	
	<i>Eucyclops macrurus</i>	Muften, et al. (2002).
	<i>Ectocyclops agalis</i>	Abdulwahab and Rabee (2015).
	<i>Ectocyclops speratus</i>	Abdulwahab and Rabee (2015).
	<i>Paracyclops affinis</i>	Abdulwahab and Rabee (2015), Al-Doori (2009), Matlob (2004).
	<i>Paracyclops funpriatus</i>	Al-Laami, (1998), Al-Sodani et al. (2007), Matlob (2004), Muften, et al. (2002).
	<i>Paracyclops fimbriatus</i>	Abdulwahab and Rabee (2015), Muften, et al. (2002).
	<i>Halicyclops sp.</i>	Abdulwahab and Rabee (2015), Al-Ameen (2013), Matlob (2004), Muften, et al. (2002), Rabee (2010).
	<i>Macrocyclus sp.</i>	Al-Ameen (2013).
	<i>Macrocyclus albidus</i>	Abdulwahab and Rabee (2015), Matlob (2004).
	<i>Macrocyclus ater</i>	Abdulwahab and Rabee (2015).
	<i>Microcyclus varicans</i>	Al-Saboonchi et al. (1986).
	<i>Mesocyclops laukatri</i>	Al-Doori (2009), Muften, et al. (2002), Sabri et al. (1989), Sabri et al. (2001).
	<i>Thermocyclops crassus</i>	Al-Saboonchi et al. (1986).
	<i>Tropocyclops prasinus</i>	Abdulwahab and Rabee (2015).

Diaptomidae	<i>Arctodiaptomus salinus</i>	Ajeel (2012).
	<i>Diaptomus sp.</i>	Al-Ameen (2013), Rahemo and Ami (2012).
	<i>Diaptomus reighardi</i>	Al-Doori (2009).
	<i>Diaptomus vulgaris</i>	Gurney (1921).
	<i>Diaptomus dilobatus</i>	Al-Doori (2012).
	<i>Diaptomus leptopus</i>	Al-Doori (2012).
	<i>Diaptomus birgei</i>	Abdulwahab and Rabee (2015), Al-Doori (2012).
	<i>Diaptomus dorsalis</i>	Abdulwahab and Rabee (2015).
	<i>Diaptomus sarsi</i>	Abdulwahab and Rabee (2015).
	<i>Diaptomus</i>	Muften, et al. (2002).

	<i>franciscanus</i>	
	<i>Phyllodiptomus irakiensis</i>	Ajeel(2012).
Ectinosomatidae	<i>Microsetella rosea</i>	Ajeel(2012).
Ergasilidae	<i>Ergasilus</i> sp.	Khamees, et al. (2015), Matlob (2004).
	<i>Ergasilus irakiensis</i>	Daraji(2002)b, Khamees, et al. (2015).
	<i>Ergasilus cynanceiensis</i>	Daraji(2002), Khamees, et al. (2015).
	<i>E. versicolor</i>	Muften, et al. (2002).
	<i>Ergasilus boleophthalmi</i> sp.n.	Adday and Ali(2011).
Eucalanidae	<i>Eucalanus subcrassus</i>	Ajeel(2012) , Khalaf (1988).
Euchaetidae	<i>Euchaeta concina</i>	Khalaf (1988).
Euterpinidae	<i>Eurerpina acurifrons</i>	Ajeel(2012).
Lernaeidae	<i>Learneae</i> sp.	Matlob (2004), Muften, et al. (2002).
Laophontidae	<i>Onychocampus mohammed</i>	Matlob (2004).
Oithonidae	<i>Oithona plunifera</i> .	Ajeel(2012).
Oncaeiidae	<i>Oncaea conifera</i>	Ajeel(2012).
	<i>Oncaea cleve</i>	Ajeel(2012).
Paracalanidae	<i>Acrocalanus gibber</i>	Ajeel(2012), Khalaf (1988).
	<i>Bestiolina arabica</i>	Abbas (2015), Ajeel(2012).
	<i>Paracalanus aculeatus</i>	Ajeel(2012), Khalaf (1988).
	<i>Paracalanus crassirostris</i>	Abbas (2015), Ajeel (2012), Khalaf (1988).
	<i>Parvocalanus crassirostris</i>	Ajeel(2012).
Parastenocarididae	<i>Parastenocaris starreti</i>	Matlob (2004).
pseudodiptomidae	<i>Pseudodiptomus</i> sp.	Ajeel(2012).
	<i>Pseudodiptomus marinus</i>	Ajeel(2012).
	<i>Pseudodiptomus ardjuna</i>	Abbas(2015), Mohamed(2011).
Tachidiidae	<i>Microarthridion</i> sp.	Matlob (2004).

		<i>Tachidius</i> sp.	Abdulwahab and Rabee (2015).
		<i>Temora turbinata</i>	Khalaf (1988).
	Temoridae	<i>Temora discaudata</i>	Khalaf (1988).

As a result, Copepoda was observed in lower richness, compared to the Cladocera. Cladocera contains ten families, among these families, Chydoridae represented by 43 species and Daphniidae presented 23 species. All other Cladocera families were represented by one to seven species as indicated in Table (2). This review listed 152 species, due to the scarcity of studies on zooplankton from waters in Iraq.

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