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Annotated checklist and insular distribution of freshwater microcrustaceans (Copepoda: Calanoida & Cyclopoida; Cladocera: Anomopoda & Ctenopoda) in the Philippines

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Abstract. This checklist puts together available information on the taxonomy, distribution, and current status of freshwater microcrustacean zooplankton in the Philippines. To date, 81 species have been recorded from Philippine inland waters, including 55 cladoceran and 36 copepod species, in two cladoceran orders (six families); and in two copepod orders (four families). The level of endemicity and distribution patterns of microcrustaceans in the archipelago's freshwater systems reflects the island's origins, biogeographical status, and location in the tropics. However, there are problems: in terms of taxonomy, species level identification is often doubtful and further study on systematics and biogeography is needed to settle conflicts in identification. This is demonstrated by the 29 synonymies and misidentifications detected in previous Philippine records. In addition, the introduction of non-native species of fishes, zooplankton, and other aquatic organisms has begun negatively impacting inland aquatic biodiversity in the country, which is further exacerbated by eutrophication and other environmental changes.

Key words. zooplankton, taxonomy, diversity, tropics, inland waters

INTRODUCTION

The Philippines is an archipelagic nation of approximately 7,000 islands in Southeast Asia. It has a total land area of 300,000 km^2, 92% of which is found on the 11 largest islands (Dickerson et al., 1928). Geographically, the country can be grouped into three major island groups: Luzon, Visayas, and Mindanao. The largest island group, Luzon, covers 47 percent of the total land area and is situated in the north. Mindanao, located in the south and the second largest group, and Visayas, a group of smaller islands in the central Philippines, occupy 34% and 19% of the total land area respectively. The country's location and geographic origins make it a megadiverse country in terms of degree of endemism and number of endemic organisms per unit area (Myers et al., 2000; Ong et al., 2002). Among the biodiverse habitats in the Philippines, inland water systems are yet to be fully understood. Freshwater resources/bodies cover at least 2,000 km^2 of the total land area of the Philippines. They include 211 lakes, 18 major river systems and 22 marshes, swamps and small reservoirs, which provide energy, irrigation, and food from both open water fisheries and aquaculture (DENR-PAWB, 2009). Wetlands and inland waters in the country contain at least 1,616 species of aquatic flora and at least 3,675 species of aquatic fauna (Ong et al., 2005). One of the most understudied groups in aquatic ecosystems are the freshwater zooplankton, composed of rotifers (Phylum Rotifera) and freshwater microcrustaceans (Copepoda, Cladocera, and Ostracoda). This group of organisms act as an intermediate level between photosynthetic producers and higher order consumers. Interest in freshwater zooplankton research has recently shifted from temperate to sub-tropical and tropical countries especially those located in Central and South America, China and Southeast Asia.

Freshwater zooplankton research in the country began in the late 19th century, considerably more recently compared to the nearly 300 years of zooplankton research in Europe, America, and Australia. The first record of a zooplankton species from the Philippines was by Semper (1872) who discovered and described a novel species of rotifer, *Trochosphaera aequatorialis*, from a rice field (Mamaril & Fernando, 1978). It then took another 50 years for the publication of

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additional studies on Philippine zooplankton. These papers focused more on freshwater microcrustaceans. They were part of more extensive research on the species diversity and distribution of Oriental cladocerans and copepod species in Southeast Asian countries as part of the Wallacea-Tressler Expedition (Wright, 1928; Kiefer, 1930; Brehm, 1938; Kiefer, 1938; Woltereck et al., 1941; Brehm, 1942). This research effort not only listed species of freshwater zooplankton in the region but also formulated ecological tools in studying tropical zooplankton. The research on freshwater zooplankton taxonomy, systematics and distribution continued in a sporadic way after World War II. In 1954, several freshwater bodies in Metro Manila were surveyed and a total of eight species in four cladoceran families were noted (Cheng & Clemente, 1954). After a decade, Uéno (1966) recorded eight cladoceran and two copepod species from Lake Taal (Luzon Island). Petersen & Carlos (1984) listed 15 cladoceran and 25 copepod species from major lakes in Luzon and Lake Lanao in Mindanaos. Lastly, a comprehensive survey of microcrustacean zooplankton species in Philippine freshwaters resulted in two important works, viz. Mamaril & Fernando (1978), and Mamaril (1986). These two papers included a total of 125 freshwater microcrustacean species (49 cladocerans and 9 copepods) and provided taxonomic illustrations, morphological descriptions, and taxonomic keys for all species.

The past decade was marked by a renewed interest on the study of freshwater microcrustaceans, with the advent of more sophisticated and intensive zooplankton researches in the country. Mamaril (2001) gave a summary of all recorded species of freshwater zooplankton in different freshwater ecosystems throughout the country. Since 2008, several papers dealt with various aspects of limnology, zooplankton ecology, taxonomy, and distribution. Many of these contributed new information on freshwater microcrustacean taxonomy and distribution and led to the discovery of new distribution records for Lake Paoay, northern Luzon (Aquino et al., 2008), and Lake Taal, southern Luzon, including the rare endemic calanoid, *Pseudodiaptomus brehmi* Kiefer, 1938, and the neotropical invasive calanoid copepod, *Arctodiaptomus dorsalis* (Marsh, 1907) (Papa & Zafaralla, 2011; Papa et al., 2012b). This was immediately followed by a paper that highlighted the occurrence of *A. dorsalis* in 19 other Philippine lakes (Papa et al., 2012a). Papa & Hołyńska (2013) updated the information on the distribution of Cyclopidae in Philippine lakes highlighting new records for *Mesocyclops taihokuensis* Harada, 1931, the redescription of *Mesocyclops microlasius* Kiefer, 1981 and the discovery of a new species, *Mesocyclops augusti* Papa & Hołyńska, 2013 from Lake Siloton (Mindanao, Philippines). Previous information on records of Philippine cladocerans is summarised and critically analysed by Korovchinsky (2013a). Pascual et al. (2014) provided an update on the cladoceran fauna of 86 inland water bodies throughout the country. The most recent paper on the distribution of Philippine cyclopid copepods was that of Dela Paz et al. (2016), which documented the cyclopid fauna of major islands in the Visayas region (central Philippines).

The increase in published information on Philippine freshwater zooplankton has provided better insight on its diversity in the archipelago, however, the lack of a comprehensive checklist for this group hampers future efforts in knowing over-all diversity of freshwater fauna in the country. In light of this, the authors provided checklist of Philippine freshwater microcrustaceans (Copepoda: Calanoida & Cyclopoida; Cladocera: Anomopoda & Ctenopoda) by consolidating published accounts to validate taxonomic status and insular distribution of these taxa in the Philippines.

MATERIAL AND METHODS

Data were gathered from all published papers on freshwater zooplankton in the Philippines from 1928 to 2016. All papers were evaluated wherein taxonomic descriptions, distributions and remarks were thoroughly summarised by M.L. Lopez. In addition, samples deposited in the University of Santo Tomas – Zooplankton Reference Collection (UST-ZRC) collected and identified by R. Papa, D. Tordesillas, J. Pascual, E. Rizo, B. Han, H. Dumont, S. Guinto and E. dela Paz from 2008 to 2015 were also included in this study. Overall, the microcrustacean zooplankton of 139 sampling sites have been included in this study (Fig. 1).

TAXONOMIC CHECKLIST

Class Maxillopoda Dahl, 1956
Subclass Copepoda Milne-Edwards, 1840
Order Calanoida Sars, 1903
Family Diaptomidae Baird, 1850

***Arctodiaptomus dorsalis* (Marsh, 1907)**

Synonyms in Philippine literature: None.

Philippine records: Tuyor & Baay, 2001; Papa et al., 2012a, 2012b; Metillo et al., 2014; and Rizo et al., 2015.

General geographic distribution: Nearctic and Central America. Ranges from Gulf of Mexico and the Caribbean Sea regions, and from the southern United States to Central America and northern South America.

Distribution in the Philippines. Luzon: Albay–Lago del Ray; Batangas–Lake Taal; Camarines Sur–Lake Buhi, Lake Bato, Lake Baao, Bicol River (Naga), and Camarines Sur sports complex; Laguna–Lake Caliraya, Lake Lumot–Mahipon, Lake Tadlak, Lake Sampaloc, Lake Bunot, Lake Calibato, Lake Mohicap, Lake Palakpakin, Lake Pandin, and Lake Yambo; Manila-Laguna-Rizal: Laguna de Bay. Mindoro: Lake Naujan. Mindanao: Lanao del Sur–Lake Lanao; South Cotabato–Lake Sebu and Lake Siloton.

Remarks. *Arctodiaptomus dorsalis* is a neotropical species originally described from lakes near New Orleans, Louisiana, U.S.A. In the Philippines, Tuyor & Baay (2001) noted its occurrence in lakes Laguna de Bay, Mainit, and Sebu. The Laguna Lake Development Authority 1996–2005 report for seven lakes of San Pablo, Laguna noted the presence of *A. dorsalis* in these lakes. Papa et al. (2012a) first reported the biological invasion of this species in 18 out of 27 lakes surveyed in the Philippines (Fig. 2). The spread to new localities has been attributed to aquaculture, and this species

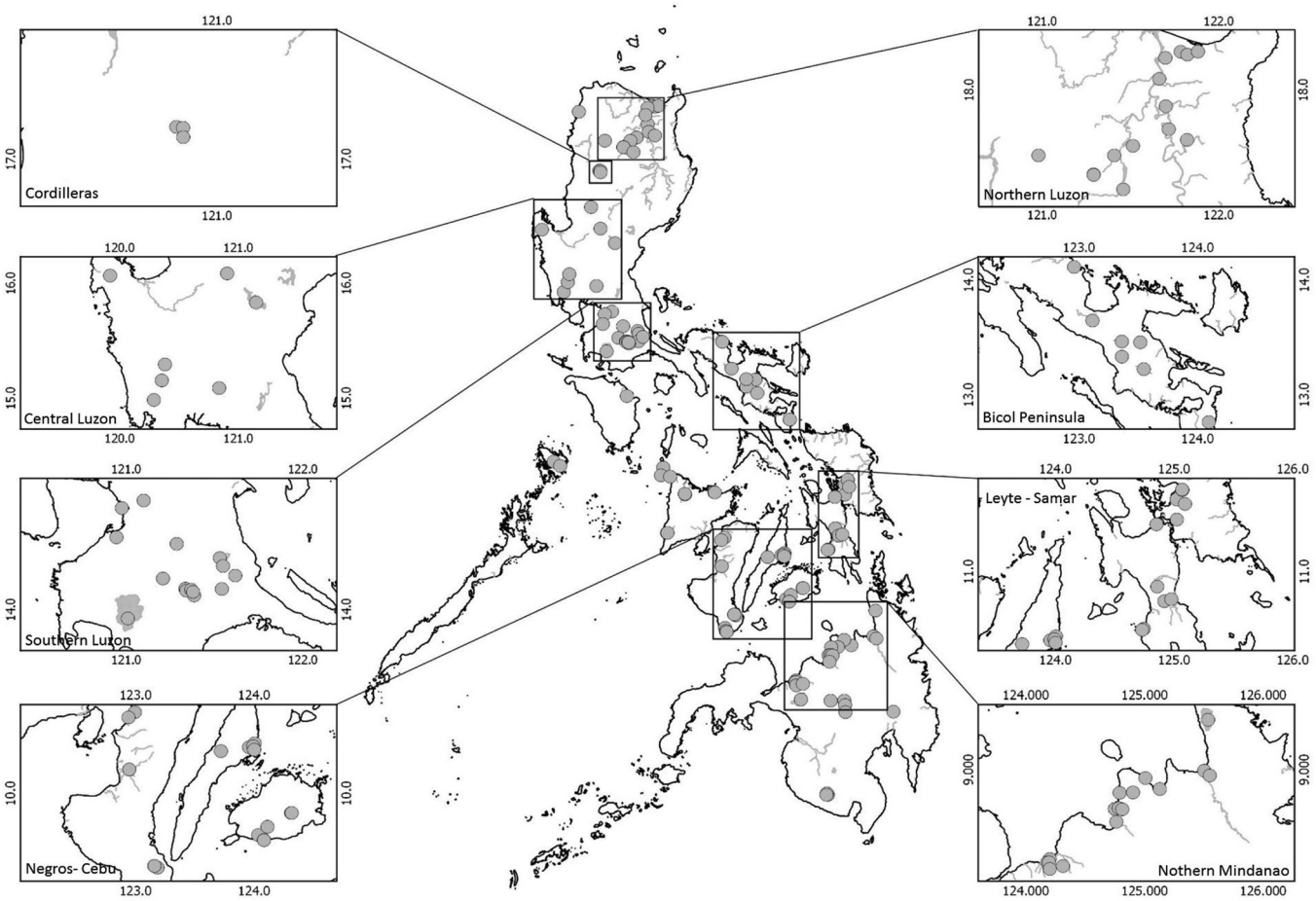

Fig. 1. Sampling sites of recent collecting efforts for microcrustacean zooplankton (2008–2015) in the Philippines. See Table 1 for details of localities.

was also found to benefit from eutrophic environments (Reid, 2007).

***Filipinodiaptomus vexillifer* (Brehm, 1933)**

Synonyms in Philippine literature: *Diaptomus vexillifer* Brehm, 1933.

Philippine record: Brehm, 1933; Petersen & Carlos, 1984.

General geographic distribution: So far known only from Lake Danao, Philippines.

Distribution in the Philippines. Leyte: Lake Danao.

Remarks. Endemic. The earliest and only taxonomic reference stating the presence of *D. vexillifer* in Lake Danao was written by Brehm (1933). Papa et al. (2012a) pointed out its unresolved taxonomic status. Recent morphological and molecular work confirmed it as a *Filipinodiaptomus* Lai et al. (1979) (Li et al., in press).

***Filipinodiaptomus insulanus* (Wright, 1928)**

Synonyms in Philippine literature: *Diaptomus insulanus* Wright, 1928; *Diaptomus sensibilis* Kiefer, 1928a.

Philippine records: Wright, 1928; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 1986, 2001; Tuyor & Baay, 2001; Aquino et al., 2008; and Papa et al., 2012a.

General geographic distribution: Philippines (Luzon and Visayan Islands).

Distribution in the Philippines. Luzon: Ilocos Norte–Lake Paoay; National Capital Region–La Mesa Dam and Marikina; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangan Dam; Tarlac–Concepcion. Leyte: Lake Danao.

Remarks. Endemic. Recent sampling collections (Papa et al., 2012b) only observed the species in Lake Paoay, whereas before it was noted in Laguna de Bay in 1978 and 2001 (Mamaril & Fernando, 1978; Mamaril, 2001) and in Lake Danao by Tuyor & Baay (2001).

***Mongolodiaptomus birulai* (Rylov, 1922)**

Synonyms in Philippine literature: None.

Philippine records: Lai et al., 1979; Petersen & Carlos, 1984; Mamaril, 1986, 2001; and Papa et al., 2012a.

General geographic distribution: Oriental Indomalaya and Palaearctic.

Distribution in the Philippines. Luzon: Ilocos Norte–Lake Paoay and San Nicolas; Benguet–Baguio City.

Remarks. Distribution in the Philippines is limited to northern Luzon. The species was first reported by Mamaril & Fernando (1978) and Lai et al. (1979) who examined samples collected by D.G. Frey from Baguio City. It was also recently recorded in Lake Paoay (Aquino et al., 2008).

***Tropodiaptomus australis* Kiefer, 1936**

Synonyms in Philippine literature: None.

Philippine records: Brehm, 1942; Lai et al., 1979; Kiefer, 1982; Petersen & Carlos, 1984; Mamaril, 1986, 2001.

General geographic distribution: Australasian.

Distribution in the Philippines. Luzon: Cagayan–Buguey;

Ilocos Norte–Lake Paoay; National Capital Region–La Mesa Dam, Marikina, UP Campus; and Laguna–Calamba.
Remarks. This species was not found in samples collected in 2008–2015. Lake Paoay, where the species was previously collected from is now dominated by *M. birulai* and *A. dorsalis* (Papa et al., 2012a). Current occurrence of the species in Philippine freshwaters remains unknown.

***Tropodiaptomus gigantoviger* Brehm, 1933**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1942; Lai et al., 1979; Kiefer, 1982; Petersen & Carlos, 1984; Mamaril, 1986, 2001.
General geographic distribution: Philippines (Luzon and Mindanao Islands).
Distribution in the Philippines. Luzon: Manila-Laguna-Rizal: Laguna de Bay. Mindanao: Lanao del Sur–Lake Lanao and Marawi City.
Remarks. Endemic. This species was not found in samples collected in 2008–2015. Samples from Laguna de Bay and Lake Lanao, where the species was previously recorded, are now dominated by *A. dorsalis* (Papa et al., 2012a; Metillo et al., 2015). Current fate of the species in Philippine freshwaters is unknown.

***Tropodiaptomus lanaonus* Kiefer 1982**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1982.
General geographic distribution: Philippines (Mindanao Island).
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Endemic. This species was not found in samples collected in 2008–2015. Current fate of the species in Philippine freshwaters is unknown.

***Tropodiaptomus vicinus* (Kiefer, 1930)**
Synonyms in Philippine literature: *Tropodiaptomus malaicus prasinus* Brehm, 1933 (Table 3).
Philippine records: Lai et al., 1979; Kiefer, 1982; Petersen & Carlos, 1984; Mamaril, 1986, 2001.
General geographic distribution: Oriental Indomalaya.
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Camarines Sur–Lake Buhi. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. This species was not found in samples collected in 2008–2015. Lake Lanao, Lake Taal, and Lake Buhi, where the species was previously recorded, are now dominated by *A. dorsalis* (Papa et al., 2012a; Metillo et al., 2014). Current occurrence of the species in Philippine freshwaters uncertain.

Family Pseudodiaptomidae Sars, 1902

***Pseudodiaptomus brehmi* Kiefer, 1938**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1938; Petersen & Carlos, 1984; Walter et al., 2006; Papa & Zafaralla, 2011; and Papa et al., 2012b.
General geographic distribution: Philippines (Greater Luzon Island).
Distribution in the Philippines. Luzon: Batangas–Lake Taal. Mindoro: Lake Naujan.
Remarks. Endemic. This is probably the only exclusively freshwater pseudodiaptomid in the Philippines. *Pseudodiaptomus brehmi* was recorded in Lake Taal (Papa & Zafaralla, 2011) but is no longer found in its type locality, Lake Naujan (Mindoro Island), where it has already been displaced by the invasive *A. dorsalis*.

***Pseudodiaptomus smithi* Wright, 1928**
Synonyms in Philippine literature: None.
Philippine record: Wright, 1928 and Petersen & Carlos, 1984.
General geographic distribution: Philippines.
Distribution in the Philippines. Luzon: National Capital Region–Manila.
Remarks. Endemic. Taxonomic status of *P. smithi* and its occurrence in the Philippine freshwaters should be verified. The species was not collected in recent sampling collections of Mamaril (1986, 2001) and Papa et al. (2012a).

***Pseudodiaptomus trihamatus* Wright, 1937**
Synonyms in Philippine literature: None.
Philippine record: Petersen & Carlos, 1984.
General geographical distribution: Oriental Indomalaya. Found in Vietnam, Philippines, and Japan.
Distribution in the Philippines. Luzon: Quezon–Pagbilao.
Remarks. Occurrence of *P. trihamatus* in Philippine freshwaters should be verified. The species was not found in recent sampling collections by Mamaril (1986, 2001) and Papa et al. (2012a).

Order Cyclopoida Burmeister, 1834
Family Cyclopidae Rafinesque, 1815
Subfamily Cyclopinae Rafinesque, 1815

***Cryptocyclops linjanticus* (Kiefer, 1928b)**
Synonyms in Philippine literature: None.
Philippine records: Woltereck et al., 1941.
General geographic distribution: Afro-Asian.
Distribution in the Philippines. Camiguin: Mambajao.
Remarks. Genus needs revision; Philippine record needs confirmation (Papa & Hołyńska, 2013).

***Mesocyclops aspericornis* (Daday, 1906)**
Synonyms in Philippine literature: None.
Philippine records: Hołyńska, 2000; Tuyor & Baay, 2001; Papa & Hołyńska, 2013; and Dela Paz et al., 2016.
General geographic distribution: Pantropical.
Distribution in the Philippines. Luzon: Bulacan–Bulihan swamp and rice field; Laguna–IRRI rice field; Nueva Ecija–Mayapyap River, Irrigation canal. Cebu: Brgy. Danglag and Lake Danao. Camiguin: Mambajao.
Remarks. *Mesocyclops aspericornis* occurs throughout the tropics. Comparisons of specimens from the Neotropics and West Africa to those from Central and Southeast Asia showed variations in the spinule ornamentation of the caudal surface of antennary basipodite (Hołyńska, 2000). *Mesocyclops aspericornis* is a benthic cyclopid and may be found in littoral vegetation (Reid & Saunders, 1986; Hołyńska, 2000).

***Mesocyclops augusti* Papa & Hołyńska, 2013**
Synonyms in Philippine literature: None.
Philippine records: Papa & Hołyńska, 2013.
General geographic distribution: Philippines (Mindanao Island).
Distribution in the Philippines. Mindanao: South Cotabato–Lake Siloton.
Remarks. Recorded from Vietnam and Philippines. *Mesocyclops augusti* is closely related to *M. dissimilis* (Lake Biwa, Japan).

***Mesocyclops microlasius* Kiefer, 1981**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1981; Tuyor & Baay, 2001; Papa & Hołyńska, 2013; and Dela Paz et al., 2016.
General geographic distribution: Philippines.
Distribution in the Philippines. Luzon: Ilocos Norte–Lake Paoay; Manila-Laguna-Rizal: Laguna De Bay. Cebu: Lake Danao. Mindanao: South Cotabato–Lake Sebu.
Remarks. Endemic. Described from a concrete pond in Manila (Kiefer, 1981) and later collected in Mindanao by Tuyor & Baay (2001). However, its Mindanao record needs confirmation. This species is also found in northern Luzon (Papa & Hołyńska, 2013) and was recorded outside Luzon Island for the first time by Dela Paz et al. (2016). Phylogenetic analysis revealed that closest relative of *M. microlasius* is *M. geminus* from East Borneo (Papa & Hołyńska, 2013).

***Mesocyclops thermocyclopoides* Harada, 1931**
Synonyms in Philippine literature: all the Philippine records of *Mesocyclops leuckarti* (Claus, 1857) are misidentifications and many of those may refer to *M. thermocyclopoides*.
Philippine records: Uéno, 1966; Tuyor & Baay, 2001; Papa & Hołyńska, 2013; and Dela Paz et al., 2016.
General geographic distribution: Indonesia (Java, Flores?), Malaysia, Burma, Thailand, Cambodia, Vietnam, China, Taiwan, Japan (Ryukyu Is.).
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Camarines Sur–Lake Buhi; Laguna–Lake Caliraya, Lake Lumot-Mahipon, Lake Palakpakin, Lake Tadlak, and Calamba River; Manila-Laguna-Rizal: Laguna de Bay. Mindoro: Lake Naujan. Panay: Capiz–Fish pond in the municipality of Pontevedra, and Panitan River. Negros: Negros Oriental–Fishpond in the municipality of Siaton. Mindanao: Agusan del Sur–Lake Mainit. Sulu Archipelago: Lake Seit, Jolo.
Remarks. Distribution is widely spread in the Philippine archipelago.

***Mesocyclops woutersi* Van de Velde, 1987**
Synonyms in Philippine literature: None.
Philippine records: Dela Paz et al., 2016.
General geographic distribution: Its known distribution also includes North Australia, Papua New Guinea, Vanuatu, Laos, Vietnam, South China, Taiwan, Japan and South Korea.
Distribution in the Philippines. Cebu: Lake Lamak. Negros: Negros Oriental–Lake Balinsasayaw.
Remarks. *Mesocyclops woutersi* collected from Negros and Cebu islands were the first records of the species in the Philippines and also from insular SE Asia (Dela Paz et al., 2016).

***Mesocyclops ogunnus* Onabamiro, 1957**
Synonyms in Philippine literature: None.
Philippine records: Hołyńska, 2000; Papa & Hołyńska, 2013.
General geographic distribution: Africa. Algeria, Natal. Asia. Uzbekiztan, Japan (Kyushu). Brazil and Caribbean Cayman Islands.
Distribution in the Philippines. Luzon: Bulacan–San Miguel: Malasipit River; Cagayan–Tuguegarao City, Pinacanauan River, and Tawi River.
Remarks. The native range of *M. ogunnus* includes both tropical and subtropical regions of Africa and Asia.

***Thermocyclops crassus* (Fischer, 1853)**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1938; Woltereck et al., 1941; Petersen & Carlos, 1984; Mamaril, 1986, 2001; Tuyor & Baay, 2001; Aquino et al., 2008; Papa & Zafaralla, 2011; and Dela Paz et al., 2016.
General geographic distribution: Europe, Asia, Papua New Guinea, Australia, Northand Central America (introduced in the New World).
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Bulacan–Bustos Dam, Malolos; Benguet–Baguio City; Camarines Sur–Lake Buhi, and Lake Bato; Cagayan–Buguey; Camarines Sur–Naga City; Ilocos Norte–Lake Paoay and San Nicolas; Laguna–Lake Tadlak, Lake Bunot, Lake Yambo, Lake Mohicap, Lake Sampalok, Lake Palakpakin, and IRRI Rice field; National Capital Region–Marikina, La Mesa Dam, UP Diliman campus, and Manila; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Cabanatuan and Pantabangan; Quezon–Pagbilao, Lucban; Rizal–Binangonan; Sorsogon–Lake Bulusan; Tarlac–Conception. Mindoro: Lake Naujan. Cebu: Lake Danao and Estaca River. Negros: Negros Oriental–Lake Balinsasayaw. Leyte: Lake Danao. Mindanao: Agusan del Sur–Lake Mainit; Lanao del Sur–Lake Lanao; South Cotabato–Lake Lahit and Lake Sebu. Sulu Archipelago: Lake Seit, Jolo (?).
Remarks. *Thermocyclops crassus* is widespread in Eurasia, tropical and temperate parts of Australia, and northeastern U.S.A. (likely introduced) (Mirabdullayev et al., 2003). In the Philippines, it is common in the freshwater ecosystems of Luzon, Visayas and Mindanao. *Thermocyclops crassus* is supposed to be a complex of species (Mirabdullayev et al., 2003).

***Thermocyclops decipiens* (Kiefer, 1929)**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1938; Woltereck et al., 1941; Petersen & Carlos, 1984; Tuyor & Baay, 2001; Papa & Hołyńska, 2013; and Dela Paz et al., 2016.
General geographic distribution: Pantropical.
Distribution in the Philippines. Luzon: Cavite–Dasmariñas Pond; Laguna–Calamba River and IRRI Rice field; Manila-Laguna-Rizal: Laguna de Bay. Mindoro: Lake Naujan. Panay: Aklan–Mangayaw Falls; Capiz–Mambusao Dam, Fishpond in the municipality of Pontevedra, Fishpond in the municipality of Mambusao, and Panitan River. Bohol: Malinao Dam.

Cebu: Lake Malubog and Lake Cumbar. Negros: Negros Oriental–Fishpond in Siaton and Lake Balanan. Mindanao: Agusan del Sur–Lake Mainit; South Cotabato–Lake Lahit, Lake Sebu, and Lake Seloton.
Remarks. *Thermocyclops decipiens* is a Pantropical species with good ecological tolerance and dispersal capabilities, known to inhabit small or large freshwater bodies.

***Thermocyclops philippinensis* (Marsh, 1932)**
Synonyms in Philippine literature: None.
Philippine records: Marsh, 1932.
General geographic distribution: Philippines (Luzon Island).
Distribution in the Philippines. Luzon: National Capital Region–Manila.
Remarks. Endemic species reported only from Manila (Marsh, 1932). Its occurrence in its type locality as well as adjoining areas is yet to be verified. Current geographic distribution of the species remains unknown.

***Thermocyclops taihokuensis* Harada, 1931**
Synonyms in Philippine literature: None.
Philippine records: Papa & Hołyńska, 2013 and Dela Paz et al., 2016.
General geographic distribution: East and Central Asia.
Distribution in the Philippines. Luzon: Camarines Sur–Lake Bato and Lake Baao; Laguna–Lake Pandin, Lake Bunot, Lake Mohicap, Lake Palakpakin, Lake Sampalok. Leyte: Lake Bito and BFAR Regional Aquaculture Freshwater Production.
Remarks. Also recorded from Taiwan, China, Korea, Japan, Viet Nam, Kazakhstan, Uzbekistan, Tajikistan, Far East of Russia (Mirabdullayev et al., 2003). It is commonly collected in fishponds and small waterbodies (Mirabdullayev et al., 2003).

***Thermocyclops wolterecki* Kiefer, 1938**
Synonyms in Philippine literature: None.
Philippine records: Kiefer, 1938; Woltereck et al., 1941; and Petersen & Carlos, 1984.
General geographic distribution: North Australia (Kimberley region, Queensland), Papua New Guinea, Vanuatu, Laos, Vietnam, South China, Taiwan, Japan (Ryukyu Is., Honshu Is.), South Korea.
Distribution in the Philippines. Mindanao: Lanao del Sur - Lake Lanao.
Remarks. The limnetic and littoral forms of this species have distinct morphometric characters (Chaicharoen et al., 2011).

***Microcyclops varicans* (Sars, 1863)**
Synonyms in Philippine literature: None.
Philippine records: Woltereck et al., 1941; Mamaril, 1986, 2001; and Tuyor & Baay, 2001.
General geographic distribution: Reported from Eurasia, Africa, the Americas, and Western Australia.
Distribution in the Philippines. Luzon: BenguetAlbay–Legaspi City; Benguet–Baguio City; Batangas–Lake Taal and San Luis; Bulacan–Bustos Dam and Malolos; Cagayan–Buguey, Camarines Sur–Naga City; Ilocos Norte–Lake Paoay, San Nicolas, and Laoag; Laguna–Lake Pandin, Calamba, Los Baños, IRRI, Lumban, and Magbitac; National Capital Region–Marikina, Pasig City, La Mesa Dam, UP Diliman Campus, and Muntinlupa City; Nueva Ecija–Cabanatuan, Pantabangan Dam, and Bicos; Pampanga–Candaba; Quezon–Pagbilao, Lucena, and Lucban; Rizal–Binangonan; Tarlac–Concepcion and Bamban. Mindoro: Calapan, Lake Naujan, and Roxas. Cebu: Cebu City, Consolacion. Leyte: Tolosa, Tanauan, and Lake Danao. Negros: Negros Oriental–Lake Balinsasayaw. Mindanao: Agusan del Sur–Lake Mainit; Lanao del Sur–Lake Lanao; Surigao del Norte–Surigao City.
Remarks. Alleged occurrence in the Philippines – the records of *M. varicans* likely refer to other species (Papa & Holyńska, 2013). Non-European records including those from the Philippines need to be confirmed; species range limits are insufficintly known (Papa & Hołyńska, 2013).

Family Cyclopidae Rafinesque, 1815
Subfamily Eucyclopinae Kiefer, 1927

***Ectocyclops phaleratus* (Koch, 1838)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001; Tuyor & Baay, 2001; and Aquino et al., 2008.
General geographic distribution: Cosmopolitan.
Distribution in the Philippines. Luzon: Albay–Legaspi; Batangas–IRRI Magbitac, Lake Taal; Bulacan–Malolos; Ilocos Norte–Lake Paoay. Mindoro–Lake Naujan and Calapan; Quezon–Pagbilao and Lucban. Leyte: Tolosa and Lake Danao. Mindanao: Lanao del Sur–Lake Lanao; Surigao del Norte–Surigao City.
Remarks. The genus is in urgent need of taxonomic revision; Philippine records of *E. phaleratus* needs confirmation (Papa & Hołyńska, 2013).

***Eucyclops serrulatus* (Fischer, 1851)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001; Tuyor & Baay, 2001; and Aquino, 2008.
General geographic distribution: Native range of the species is likely restricted to the Palearctic region (Alekseev & Sanoamuang, 2006).
Distribution in the Philippines.
Luzon: Benguet–Baguio City; Batangas–Lake Taal; Bulacan–Bustos Dam; Ilocos Norte–Lake Paoay and Laoag; National Capital Region–Marikina and La Mesa Dam; Nueva Ecija–Palayan; Quezon: Pagbilao and Lucban. Mindoro: Lake Naujan. Cebu: Cebu City. Negros: Negros Oriental–Lake Balinsasayaw. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Alleged occurrence in the Philippines – all records of *E. serrulatus* may refer to other species in the Philippines, very likely it does not occur in the country.

***Paracyclops affinis* (Sars, 1863)**
Synonyms in Philippine literature: None.
Philippine records: Tuyor & Baay (2001)
General geographic distribution: Southeast and East Asia.
Distribution in the Philippines. Luzon: Not specified in source. Sulu Archipelago: Lake Seit and Jolo.
Remarks. Not found in recent sampling (2008–2015). Philippine record needs immediate verification.

***Paracyclops fimbriatus* (Fischer, 1853)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril & Fernando, 1978; Mamaril, 2001; Tuyor & Baay, 2001; and Aquino et al., 2008.
General geographic distribution: Eurasia.
Distribution in the Philippines. Luzon: Albay–Legaspi; Ilocos Norte–Lake Paoay; Laguna–Los Baños; National Capital Region–Marikina. Mindanao: Agusan del Sur–Lake Mainit; Lanao del Sur–Tamparan.
Remarks. *Paracyclops*. *fimbriatus* has often been confused with other species in the past, the Philippine records also need confirmation (Papa & Hołyńska, 2013).

***Tropocyclops prasinus* (Fischer, 1860)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril & Fernando, 1978; Mamaril, 1986, 2001; and Aquino et al., 2008.
General geographic distribution: Central America, Europe, South Africa, Southeast Asia, and Australia.
Distribution in the Philippines. Luzon: Bulacan–Bustos; Ilocos Norte–Lake Paoay; Laguna–Los Baños, IRRI compound; National Capital Region–La Mesa Dam, Pasig, and Muntinlupa City. Cebu: Cebu City. Mindanao: Misamis Oriental - Cagayan de Oro; Lanao del Sur - Lake Lanao and Marawi City.
Remarks. This species is supposed to be a cosmopolitan planktonic organism reported from the whole of Eurasia, Africa, North and South America (Silva, 2008) and Brazil (Perbiche-Neves et al., 2007; Perbiche-Neves et al., 2015). Recent works (Lee & Chang, 2007) however suggest that some records may refer to other species.

Class Branchiopoda Latreille, 1817
Suborder Cladocera Latreille, 1829
Infraorder Ctenopoda Sars, 1865
Family Sididae Baird, 1850

***Diaphanosoma dubium* Manuilova, 1964**
Synonyms in Philippine literature: Often misidentified as *Diaphanosoma brachyurum* (Liévin, 1848), *Diaphanosoma modigliani* Richard, 1894 and *Diaphanosoma tropicum* Korovchinsky, 1998.
Phirlippine records: Pascual et al., 2014.
General geographic distribution: A species found in Russia, China, Mongolia, Bangladesh, Thailand, Sri Lanka, Vietnam and Malaysia.
Distribution in the Philippines. Luzon: Camarines Sur–Lake Baao; Naga–Bicol River; Laguna–Lake Bunot, Lake Yambo, Lake Mohicap, Lake Palakpakin, Lake Pandin, Lake Sampaloc, and Lake Caliraya; Manila-Laguna-Rizal: Laguna de Bay; Tarlac–Lake Tambo. Mindanao: Agusan del Norte–Agusan River.
Remarks. Specimens collected from China (Ming Lake, Jinan University, Guangzhou City) have a strongly curved apical antennal spine whereas the Philippine specimens have a straight spine. The species is common in mesotrophic to eutrophic lakes, reservoirs and fish ponds. It is primarily limnetic and can co-exist with other sidids and a variety of limnetic cladocerans.

***Diaphanosoma excisum* Sars, 1885**
Synonyms in Philippine literature: *Diaphanosoma brachyurum* (Liévin, 1848).
Philippine records: Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 2001; Papa & Zafaralla, 2011; Papa et al., 2012b; and Pascual et al., 2014.
General geographic distribution: Distributed in tropical and subtropical Australia, India, Eastern China, Nepal and possibly Northern Africa.
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Benguet–Ambuklao Dam; Cagayan–Lake Nalbuan, Lake Calig, Lake Nagatutuan, Lake Cansiritan, Lake Cassily; Camarines Sur–Lake Bato, Lake Baao, and Lake Buhi; Ilocos Norte - Lake Paoay; Kalinga–Tabuk; Laguna–Lake Bunot, Lake Yambo, Lake Mohicap, Lake Palakpakin, Lake Pandin, Lake Sampaloc, Lake Tadlak, Lake Calibato, and Lake Lumot-Mahipon; National Capital Region–La Mesa Dam, Pasig River, and Marikina River; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangan Dam; Pangasinan–Burgos; Tarlac–Lake Tambo; Zambales–Lake Mapanuepe. Mindoro: Lake Naujan. Bohol: Malinao Dam. Leyte: Lake Bito. Mindanao: Agusan del Norte–Lake Mainit; Bukidnon–Lake Pulangi and Lake Pinamaloy; Lanao del Norte–Agos IV Dam and Tubod-Mayahay River; Lanao del Sur–Lake Lanao; and South Cotabato–Lake Siloton.
Remarks. This species is common in water bodies with aquaculture, and co-existing with other limnetic cladocerans (Chatterjee et al., 2013). Further analysis of DNA sequences and morphological variation in separate populations is needed to determine accurate distribution of *Diaphanosoma* species (Paggi & da Rocha, 1999). It can be differentiated from *D. sarsi* with the prominent dorsal portion of its head and more massive antennae (Korovchinsky, 1992).

***Diaphanosoma modigliani* Richard, 1894**
Synonyms in Philippine literature: the name *modigliani* has often erroneously been applied to what in reality is *Diaphanosoma tropicum* Korovchinsky, 1998 and *Diaphanosoma dubium* Manuilova, 1964.
Philippine records: Brehm, 1938; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; and Mamaril, 2001.
General geographic distribution: Past records suggested *D. modigliani* to be widely distributed in tropical Asia Korovchinski (1992).
Distribution in the Philippines. Luzon: Manila-Laguna-Rizal: Laguna de Bay. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. *Diaphanosoma tropicum* and *D. dubium* populations may have been misidentified under the name '*D. modigliani*' by Idris & Fernando (1981), and Rajapaksa & Fernando (1982) from Malaysia, Kanduru (1981) Sri Lanka and South India. It is possible to recognise species correctly from diagnostic features such as a conelike head, curved apical spine of upper antennal branch and the number of denticles along the ventroposterior valve margins (Korovchinsky, 1998).

***Diaphanosoma sarsi* Richard, 1894**
Synonyms in Philippine literature: *Diaphanosoma brachyurum* (Liévin, 1848).

Philippine records: Brehm, 1938; Woltereck, 1941; Mamaril & Fernando, 1978; Petersen & Calos, 1984; Mamaril, 2001; Aquino et al., 2008; Papa & Zafaralla, 2011; Papa et al., 2012b; and Pascual et al., 2014.
General geographic distribution: Found in tropical and sub-tropical Asia. Populations have been found in Nepal, Eastern China, Australia, New Guinea, New Caledonia, New Hebrides, Guam and few sites in tropical Africa (Korovchinsky, 1992, 2001, 2013b)
Distribution in the Philippines. Luzon: Batangas–Lake Taal and Taal Crater Lake; Benguet–Ambuklao Dam; Cagayan–Lake Nalbuan, Lake Nagatutuan, and Lake Bangalau; Camarines Sur–Lake Baao and Lake Buhi; Ilocos Norte–Lake Paoay; Kalinga–Kalinga; Laguna–Lake Bunot, Lake Yambo, Lake Mohicap, Lake Pandin, Lake Sampaloc, Lake Tadlak, Lake Calibato, Lake Lumot-Mahipon, and Lake Caliraya; National Capital Region–Manila, Pasig River, and Marikina River; Manila-Laguna-Rizal: Laguna de Bay; Pampanga–Candaba Swamp; Sorsogon–Lake Bulusan; Tarlac–Lake Tambo; Zambales–Lake Mapanuepe. Mindoro: Lake Naujan. Bohol: Malinao Dam. Negros: Negros Oriental–Balinsasayao Lake. Leyte: Lake Danao and Lake Bito. Negros Oriental: Balinsasayao Lake. Mindanao: Agusan del Norte–Lake Mainit; Agusan River; Lanao del Norte–Agos IV Dam, Tubod-Mayahay River; Bukidnon: Lake Apo, Lake Pulangi and Lake Pinamaloy; Lanao del Sur–Lake Lanao; and South Cotabato–Lake Lahit.
Remarks. The species can be found in a wide range of water bodies from large ancient lakes to rice fields. Common sidid found in lotic ecosystems. Prefers shallow waters with heavy vegetation but can also be observed in the limnetic zones of lakes. Recent observations noted its common distribution but sparse abundance, co-existing with *D. excisum*, *D. dubium* and *D. tropicum* which are eutrophic species. *D. sarsi* has a noticeable sloping dorsal portion of its head that can easily differentiate it from other closely related species.

***Diaphanosoma volzi* (Stingelin, 1905)**
Synonyms in Philippine literature: None.
Philippine records: Korovchinsky, 1995.
General geographic distribution: Widely distributed in the tropics and subtropics of Eastern hemisphere. Found to be present in China, Australia, Southeast Asia, and Sudan.
Distribution in the Philippines. Luzon: National Capital Region–Marikina (small pond) and Pasig (pond); Bulacan: Norzagaray and San Miguel.
Remarks. A rare, little-known species. Philippine populations were re-identified and re-described by Korovchinsky (1995) using collections of C. H. Fernando. Typically inhabits small, shallow, vegetated water bodies, littoral zone of lakes and rivers. Recent collections did not show any records of *D. volzi* in Luzon Island. Possibly, it is a member of the genus *Neodiaphanosoma,* along with *D. birgei* (Paggi & da Rocha, 1999).

***Diaphanosoma tropicum* Korovchinsky, 1998**
Synonyms in Philippine literature: Often misidentified as *Diaphanosoma dubium* Manuilova, 1964 and *Diaphanosoma modigliani* Richard, 1894.
Philippine records: Korovchinsky, 1998; Papa & Zafaralla, 2011; Papa et al., 2012b; and Pascual et al., 2014.
General geographic distribution: Species recorded in India, Sri Lanka, China, Thailand and Malaysia.
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Camarines Sur–Lake Bato, Lake Baao, and Lake Buhi; Ilocos Norte–Lake Paoay; Laguna–Lake Bunot, Lake Palakpakin, Lake Pandin, and Lake Lumot-Mahipon; Manila-Laguna-Rizal: Laguna de Bay; Tarlac: Lake Tambo.
Remarks. Found in lakes and reservoirs with ongoing aquaculture activities, co-existing with other limnetic cladocerans. It is an adaptive species that can survive slightly brackish water and a wide range of physico-chemical variables. It is differentiated from *D. modigliani* and *D. dubium* by its curved antennal spine and prominently curved postabdomen.

***Latonopsis australis* Sars, 1888**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Uéno, 1966; Mamaril & Fernando, 1978; Mamaril, 1986, 2001; and Pascual et al., 2014.
General geographic distribution: Tropical and subtropical Australia, Asia, Africa and America (Harding & Petkovski, 1963). Temperate localities have also been reported in Italy, Yugoslavia Bulgaria and Northern America (Korovchinsky, 1992).
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Cagayan–Lake Calig; National Capital Region–La Mesa Dam. Mindoro: Lake Naujan. Leyte: Lake Danao. Mindanao: Lanao del Sur–Lake Lanao; Maguindanao–Lake Balut.
Remarks. Found in littoral zones of lakes, reservoirs, and other water bodies with good vegetation. It also thrives in the limnetic zones of pools but prefer bottom sediments for its habitat. It is a poorly known species with a possibility of being a species group.

Infraorder Anomopoda Stebbing, 1902
Family Bosminidae Baird, 1845

***Bosmina fatalis* Burckhardt, 1924**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Cheng & Clemente, 1954; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 1986; Mamaril, 2001; Papa & Zafaralla, 2011; Papa et al., 2012b; and Pascual et al., 2014.
General geographic distribution: Reported in East Asian lakes and reservoirs. Can also be found in the temperate zone, north to the subtropical and tropical areas in Japan, Philippines, China, and Indonesia (Kořinek, 2002).
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Benguet–Ambuklao Dam; Cagayan–Lake Bangalau; Camarines Sur–Lake Buhi and Lake Bato; Laguna–Lake Tambo, Lake Palakpakin, Lake Kalibato, Lake Yambo, Lake Tadlak, Lake Caliraya, and Lake Lumot-Mahipon; National Capital Region–Manila, Pasig River, and Marikina River; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangan Dam; Rizal–Binangonan; Sorsogon–Lake Bulusan. Mindoro: Lake Naujan. Negros Oriental: Lake Kabalin-an. Leyte: Lake Danao. Mindanao: Agusan del

Norte–Lake Mainit; Lanao del Norte–Agos IV Dam; Lanao del Sur–Lake Lanao; South Cotabato–Lake Lahit, Lake Siloton, and Lake Sebu.
Remarks. *Bosmina fatalis* collected in the Philippines were compared to the same species sampled in Lake Taihu, China (type locality) and found that Philippine samples are bigger with body length ranges in 0.4–0.6 mm with long rostrum fused with antennules of variable length and shape.

***Bosmina longirostris* (Müller, 1785)**
Synonyms in Philippine literature: Often misidentified as *Bosmina fatalis* Burckhardt, 1924.
Philippine records: Brehm, 1938; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 1986, 2001; and Aquino et al., 2008.
General geographic distribution: Cosmopolitan.
Distribution in the Philippines. Luzon: Ilocos Norte–Lake Paoay. Leyte: Lake Danao. Negros: Negros Oriental–Bacolod.
Remarks. Comparison between the results of the present survey and previous ones revealed that *Bosmina longirostris* was not present in more recently collected samples. Morphological variations in rostrum structure, postabdominal and carapace spines in some populations of *B. fatalis* could have led to misidentification of *B. longirostris*. To avoid confusion in its taxonomy, Goulden & Frey (1963) proposed the use of the lateral head pore (LHP) pattern as diagnostic characters.

***Bosminopsis deitersi* Richard, 1895**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 1986, 2001; and Pascual et al., 2014.
General geographic distribution: Widely distributed in the tropics.
Distribution in the Philippines. Luzon: Cagayan: Lake Bangalau; Camarines Sur: Lake Bato and Lake Baao; National Capital Region–Manila. Mindoro: Lake Naujan. Mindanao: Lanao del Sur: Lake Lanao.
Remarks. *Bosminopsis deitersi* collected in the Philippines was compared with the species in Lake Taihu, China and revealed the same morphological characters except for the setae at the tip of the antennule which are not present in samples from the Philippines (Kořinek, 2002).

Family Chydoridae Dybowski & Grochowski, 1894

'*Alona*' *affinis* (Leydig, 1860)
Synonyms in Philippine literature: *Biapertura affinis* (Leydig, 1860).
Philippine records: Brehm, 1938.
General geographic distribution: Distributed in Eurasia, but the group is cosmopolitan.
Distribution in the Philippines. Camiguin: Mambajao.
Remarks. Described as *Lynceus affinis* Leydig, 1860 from Friedrichshafen and Langenargen, Konstanz (Lake Constance), Germany (Leydig, 1860). Types probably lost. Valid species. Smirnov (1971) selected *A. affinis* as type species of *Biapertura*, a polyphyletic assemblage that was later abandoned (Fryer, 1968; Sinev, 1997, 1999; Van Damme & Dumont, 2008a) although the name remains available. The species can be cited as *Alona affinis* (Leydig, 1860), pending a new generic affiliation (this holds true for several other '*Alona*' in the Philippines as well. European populations are characterised in Alonso (1996) and Sinev (1997, 2009), the latter with descriptions of limb morphology. *A. affinis* has a number of siblings worldwide (e.g., Sinev, 1997, 2009).

'*Alona*' *archeri* Sars, 1888
Synonyms in Philippine literature: None.
Philippine record: Brehm, 1938.
General geographic distribution: Australia and Southeast Asia.
Distribution in the Philippines. Mindoro: Calapan.
Remarks. Valid species of the *Alona pulchella* complex. Redescribed by Sinev (2002), including limb morphology.

'*Alona*' *cambouei* Guerne & Richard, 1893
Synonyms in Philippine literature: None.
Philippine records: Mamaril & Fernando, 1978; Mamaril, 1986, 2001; and Uéno, 1966.
General geographic distribution: It has a wide range of distribution from South and West Africa, Tropical and sub-topical Asia and the Middle-East.
Distribution in the Philippines. Luzon: Laguna–Lake Tadlak; National Capital Region–La Mesa Dam.
Remarks. Separated from the *Alona pulchella* group and treated as an independent species in 2001 by Sinev. The main difference between the two species is their headpores where *A. cambouei*'s head pores are connected to each other, and its smaller size.

'*Alona*' *guttata* Sars, 1862
Synonyms in Philippine literature: None.
Philippine records: Mamaril & Fernando, 1978; Mamaril, 1986; Mamaril, 2001.
General geographic distribution: Palearctic.
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Widespread valid species but may contain yet undescribed sister species worldwide (Sinev, 2002; Kotov et al., 2012). Philippine records may need revision as sibling species may be present in Southeast Asia. A systematic taxonomical revision is needed, as this species is considered as one of the most common Aloninae.

'*Alona*' *intermedia* Sars, 1862
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938.
General geographic distribution: Cosmopolitan.
Distribution in the Philippines. Mindanao: South Cotabato–Guinang.
Remarks. Occurs worldwide (Idris, 1983; Flössner, 2000). A complex with different species, not yet unraveled or revised (Smirnov, 1971; Chengalath, 1987; Van Damme & Dumont, 2008b). Listed as *Biapertura intermedia* in Smirnov (1971) with two subspecies, *Biapertura intermedia intermedia* and *Biapertura intermedia minor*.

'*Alona*' *pseudanodonta* Brehm, 1933
Synonymised name in Philippine literature: None.
Philippine records: Brehm, 1933, 1938.
General geographic distribution: Not enough information. Specimen described from Mindanao Island, Philippines.
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Dangiagan.
Remarks. No information on types. May be close to *A. verrucosa*, but true affinities are unclear. In Smirnov (1971), it was treated as a valid species of *Biapertura*, with two subspecies, *B. pseudoanodonta pseudoanodonta* Brehm, 1933, and *B. pseudanodonta anodonta* Daday, 1905. This was taxonomically incorrect. In addition, the assignment of two subspecies under *pseudoanodonta* by Smirnov (1971) is based on presence or absence of tubercles, a character that describes varieties (e.g., *A. tuberculata* Kurz, 1875). For now, Van Damme et al. (2010) prefer to list *A. pseudanodonta* Brehm, 1933, and *A. anodonta* Daday, 1905 as two separate taxa of which the details are unknown. Possible member of the genus *Anthalona* (Van Damme et al., 2011).

'*Alona*' *pulchella* King, 1853
Synonymised name in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001; and Pascual et al., 2014.
General geographic distribution: Africa, Australia, and Asia.
Distribution in the Philippines. Luzon: Benguet–Ambuklao Dam; Cagayan–Buguey, Lake Calig, Lake Nalbuan, and Chico River; Camarines Sur–Lake Baao, and Lake Danao; Laguna–Lake Tadlak; Quezon–Lucban; and Tarlac–Concepcion. Mindanao: Agusan del Norte–Lake Mainit, Agusan River; and Lanao del Norte–Agos IV Dam.
Remarks. Considered as a species group with tropical to sub-tropical distribution in Asia, Africa, and Australia. In South East Asia and Australia, several species exist of the *A. pulchella*-complex (Sinev, 2001a, 2001b). Fairly common in littoral zones of lakes, rivers and streams.

'*Alona*' *sarasinorum* Stingelin, 1900
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938.
General geographic distribution: Celebes, Sulawesi, Indonesia.
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Dangiagan.
Remarks. Species inquirendum, but with unmistakable characters, yet insufficiently described. Seems closest to *Leberis* Smirnov, 1989 due to dorsal keel, postabdomen and habitus but limbs are unpublished (Maiphae et al., 2005) and may reveal surprises. Drawings in Frey (1991) under its junior synonym *A. taraporevalae* Shirgur & Naik (1977) and in Idris (1983) under *A.* cf. *sarasinorum*.

***Euryalona orientalis* (Daday, 1898)**
Synonyms in Philippine literature: None.
Philippine records: Cheng & Clemente, 1954; Mamaril, 1986, 2001.
General geographic records: Neotropical, Oriental Indomalaya, and Australia.
Distribution in the Philippines. Luzon: Albay–Legaspi; Bulacan–Malolos; Cagayan–Buguey; Camarines Sur–Naga; National Capital Region–San Juan River, Marikina, UP Diliman Campus, and Pasig; Manila-Laguna-Rizal: Laguna de Bay.
Remarks. *Euryalona orientalis* was originally described as *Alonopsis orientalis* from Sri Lanka (Daday, 1898). Sars (1901) established the genus *Euryalona,* with a description of a new species *E. occidentalis* from Brazil. However, the differential diagnosis for the two species was not given. Since then taxa morphologically similar to these two 'species', from different parts of the world, have been recorded under the specific names orientalis or occidentalis (Scourfield, 1902; Stingelin, 1904; Brehm, 1933; Harding, 1957; Paggi, 1980; Van Damme & Maiphae, 2013), based largely on their 'Eastern' or 'Western' occurrence. Rajapaksa & Fernando (1987b) examined the types of both species and confirmed that E. occidentalis is a synonym of E. orientalis.

***Karualona mulleri* Richard, 1897**
Synonyms in Philippine literature: None.
Philippine record: Cheng & Clemente, 1954.
General geographic distribution: Chile and Brazil but may inhabit in wider range that includes the entire Neotropics.
Distribution in the Philippines. Luzon: National Capital Region–San Juan River.
Remarks. Existence in the Philippines must be validated. Species distribution is limited in neotropics. Allocated to *Karualona* Dumont & Silva-Briano 2000 by Sinev & Hollwedel (2005), as *Karualona muelleri* (Richard, 1897). One of two well described Neotropical *Karualona* species, the other is *K. penuelasi* Dumont & Silva-Briano, 2000. Redescribed in detail by Sinev & Hollwedel (2005) from the Neotropics.

***Kurzia longirostris* (Daday, 1898)**
Synonyms in Philippine literature: *Pseudoalona longirostris* Harding, 1957.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Afrotropical, Australasian, Neotropical, and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Albay–Legaspi; Bulacan–Bustos Dam, Malolos; National Capital Region–La Mesa Dam, Marikina, UP Diliman Campus, Pasig; Metro Manila-Laguna-Rizal: Laguna del Bay. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Originally described from Sri Lanka by Daday (1898) as *Alona longirostris*. It occurs in all types of habitats from permanent to temporary water bodies. Distribution may need to be reassessed with purely oriental species *K. brevilabris*.

***Leberis macronyx* (Daday, 1898)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Oriental Indomalaya.
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. First described as *Alona macronyx* from Sri Lanka (Daday, 1898) and moved to *Indialona* Petkovski,

1966 (Rajapaksa & Fernando, 1987a). The taxonomy of this species needs to be revised and its distribution updated. Van Damme et al. (2010) suggested this species be classified in its own monotypic genus as the morphological evidence suggested it is neither *Alona* nor *Indialona*. Sinev & Kotov (2012) placed this taxon to the genus *Leberis*.

***Leydigia acanthocercoides* (Fischer, 1854)**
Synonyms in Philippine literature: None.
Philippine records: Cheng & Clemente, 1954; Mamaril, 1986, 2001.
General geographic distribution: Paleartic and common in tropical and sub-tropical Asia.
Distribution in the Philippines. Luzon: Albay–Legaspi; Batangas–Nasugbu; Bulacan–Bustos Dam, Malolos; Laguna–Calamba; National Capital Region–San Juan River, La Mesa Dam, Marikina, and UP Diliman Campus; Manila-Laguna-Rizal: Laguna de Bay; Quezon–Pagbilao. Mindanao: Lanao del Sur–Lake Lanao and Bacolod Chico; Surigao del Sur–Surigao.
Remarks. Considered a species-group by Kotov (2009). Southeast Asian population needs further study as there is a possibility of finding sibling species within the region.

***Oxyurella singalensis* (Daday, 1898)**
Synonymis in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001; and Pascual et al., 2014.
General geographic distribution: Common in tropical and subtropical Asia, Africa and Australia.
Distribution in the Philippines. Luzon: Albay–Legaspi; Bulacan–Malolos; Cagayan–Binag Dam and Lake Nalbuan; Laguna–Lake Sampaloc, and Lake Calibato; National Capital Region–La Mesa Dam, Marikina, UP Diliman Campus, and Pasig; Manila-Laguna-Rizal: Laguna de Bay; Pampanga–Candaba; Quezon–Pagbilao, Lucban. Mindoro: Calapan. Leyte: Tolosa and Tanauan. Mindanao: Lanao del Sur–Marawi.
Remarks. Found in sandy and muddy sediments of littoral zones of lakes and reservoirs (Smirnov, 1984; Adamczuk, 2014).

***Alonella excisa* (Fischer, 1854)**
Synonyms in Philippine literature: *Alonella kulczynskii* Grochmalicki, 1915.
Philippine records: Brehm, 1938; Mamaril, 1986, 2001.
General geographic distribution: Cosmopolitan.
Distribution in the Philippines. Luzon: Bulacan–Bustos Dam, Malolos; Ilocos Norte–Lake Paoay; National Capital Region–La Mesa Dam; Nueva Ecija: Pantabangan Dam; Tarlac–Concepcion. Leyte: Lake Lanao. Negros: Negros Occidental–Bacolod. Mindanao: Lanao del Sur–Lake Dagiangan and Marawi; Surigao del Norte–Surigao.
Remarks. One of the most common species of *Alonella*, distributed worldwide. Common in littoral areas, it can survive different kinds of substrates and density of vegetation. It is also observed from lowland water bodies to high altitude mountain lakes (Smirnov, 1996). Apparently a species complex in south Asia (Kotov et al., 2013b).

***Chydorus eurynotus* Sars, 1901**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Neotropical and Australia.
Distribution in the Philippines. Luzon: Bulacan–Bustos Dam; National Capital Region–La Mesa Dam and Marikina; Quezon–Lucban; Sorsogon–Lake Bulusan. Mindoro: Calapan. Mindanao: Lanao del Sur–Lake Lanao and Marawi City.
Remarks. First described from South America, circumtropical in distribution. A highly variable species, distribution of the species needs to be re-assessed as the species may represent a species group or quite different taxa (Smirnov, 1996). Recent papers showed that *Chydorus idrisi* from South Vietname belongs to the *C. eurynotus* complex group (Sinev, 2014).

***Chydorus hermanni* Brehm, 1933**
Synonyms in Philippine literature: None.
Philippine record: Brehm, 1933.
General geographic distribution: Oriental Indomalaya and Australia.
Distribution in the Philippines. Luzon: National Capital Region Manila.
Remarks. Species inquirendum. It was vaguely described by Brehm (1933) and needs further analysis on its taxonomy to further validate its species status (Smirnov, 1971, 1996).

***Chydorus parvus* Daday, 1898.**
Synonyms in Philippine literature: None.
Philippine record: Mamaril, 1986, 2001.
General geographic distribution: Afrotropical and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Cagayan–Buguey; Ilocos Norte–Lake Paoay; National Capital Region–La Mesa Dam, Marikina, and UP Diliman Campus; Manila-Laguna-Rizal: Laguna de Bay; Pampanga–Candaba; Quezon–Lumban and Pagbilao. Mindoro: Lake Naujan. Mindanao: Lanao del Sur–Lake Lanao and Bacolod Chico.
Remarks. Indo-Malayan species first described in Sri Lanka. It differs from other *Chydorus* species by the presence of 1–3 knobs inside the anterior margin of the valve (Smirnov, 1996).

***Chydorus sphaericus* (Müller, 1785)**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Woltereck, 1941; and Pascual et al., 2014.
General geographic distribution: It has a possible worldwide distribution but are less morphologically variable in the tropics (Belyaeva & Taylor, 2009).
Distribution in the Philipines. Luzon: National Capital Region–Manila; and Palawan–Lake Malbato. Mindanao: Bukidnon–Lake Pinamaloy; Misamis Oriental–Lake Danao.
Remarks. Recognised as a species complex and can possibly be separated into several good species (Duigan & Murray, 1987; Belyaeva & Taylor, 2009). It occurs in both littoral and limnetic zones. It is dominant in highly eutrophic waters with dense macrophyte cover.

***Chydorus ventricosus* Daday, 1898**
Synonyms in Philippine literature: None.

Philippine records: Mamaril, 1986, 2001; and Aquino et al., 2008.
General geographic distribution: Afrotropical, Neotropical, anf Oriental Indomalaya.
Distribution in the Philippines. Luzon: Benguet–Baguio; Bulacan–Bustos Dam; Cagayan–Buguey; Ilocos Norte–Laoag and Lake Paoay. Mindanao: Lanao del Sur–Bacolod Chico.
Remarks. Since its original description from Sri Lanka by Daday, there have been numerous reports in the literature of *C. ventricosus* from different geographical areas under the same or different names, however, the correct identification of some of the earlier records appears doubtful (Smirnov, 1996). In 1979, Michael & Hann redescribed *C. ventricosus* and *C. reticulatus* to clearly differentiate the two species (Michael & Hann, 1979).

***Dadaya macrops* (Daday, 1898)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geopgraphic distribution: Afrotropical, Australasian, Neotropical, and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Bulacan–Bustos Dam; National Capital Region–La Mesa Dam, Marikina, and Pasig; Quezon–Lumban, Magbitac, and Pagbilao. Mindanao: Lanao del Sur–Marawi.
Remarks. It occurs commonly in rice fields and has its structural specialisation for the habit of swimming on the underside of the surface film of water (Rajapaksa & Fernando, 1982).

***Dunhevedia crassa* King, 1853**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Mamaril, 1986, 2001.
General geographic distribution: Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, and Paleartic.
Distribution in the Philippines. Luzon: Batangas–Lake Taal, Nasugbu; Bulacan–Bustos Dam, Malolos; Cagayan–Buguey; Ilocos Norte–Lake Paoay; Laguna–Calamba, IRRI Compound, and UP Los Banos Campus; National Capital Region–La Mesa Dam, Marikina, UP Diliman Campus; Nueva Ecija–Pantabangan Dam; Pampanga–Candaba; Quezon–Pagbilao. Mindoro: Calapan. Negros: Negros Occidental–Bacolod. Mindanao: Cagayan de Oro–Cagayan de Oro; Lanao del Sur–Lake Lanao. Camiguin: Mambajao.
Remarks. Originally described in Australia, it has a wide distribution worldwide though commonly found in warm latitudes (Michael & Sharma, 1988; Smirnov, 1992). It has a strong preference for warm climate and has a good tolerance of salinity.

***Dunhevedia serrata* Daday, 1898**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Afrotropical, Australasian, and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Albay–Legaspi; Bulacan–Malolos; Camarines Sur: Naga; National Capital Region–La Mesa Dam, Marikina; Quezon–Lucban. Negros: Negros Occidental–Bacolod. Leyte–Tolosa and Tanauan. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Daday (1898) recorded *D. serrata* as having longitudinal lines on the carapace. However, examination of material from Sri Lanka as well as from other surrounding countries, revealed that in addition to these lines there were some polygonal reticulations because of the connection of the longitudinal lines by vertical striae (Michael & Sharma, 1988). Smirnov (1971) illustrated this character in African material. Specimens examined from Malaysia, India, Indonesia, Philippines, and Africa (Nigeria) are very similar to the Sri Lanka taxon. This species is known from the Oriental and the Ethiopian regions, and Daday (1901) recorded it in the Australasian region in New Guinea.

***Ephemeroporus barroisi* (Richard, 1894)**
Synonyms in Philippine literature: *Chydorus barroisi* (Richard, 1894).
Philippine records: Pascual et al., 2014.
General geographic distribution: Found also in Australia, Iraq, Argentina, Thailand, Vietnam China and Far East Russia.
Distribution in the Philippines. Luzon: Cagayan–Binag Dam, Lake Nalbuan, Lake Calig, and Lake Baao; Ilocos Norte–Lake Paoay. Negros: Negros Oriental: Lake Kabalin-an. Leyte: Lake Danao. Mindanao: Agusan del Norte–Lake Mainit; South Cotabato–Lake Lahit and Lake Siloton.
Remarks. There are probaly several congener species in South Asia (Kotov et al., 2013; Van Damme et al., 2013). Commonly found in littoral zones of ponds and reservoirs and stream.

***Pleuroxus aduncus* (Jurine, 1820)**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Afrotrpical, Australasian, Neartic, Neotroipical, Oriental Indomalaya, and Paleartic.
Distribution in the Philippines. Luzon: Bulacan–Malolos; National Capital Region–La Mesa Dam; and Nueva Ecija–Pantabangan Dam. Mindoro: Lake Naujan. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Europe being the main area of *P. aduncus*, the full range of similar forms extends to Asia and Australia. The postabdomen characteristic of *P. aduncus* may vary, within the limits characteristic of this species, in form, size, and distribution of anal teeth. The number of marginal setae on valve varies within a certain range (Frey, 1991). Labral keel is variable and may be sometimes distorted in shape (abnormal). Length of terminal setae of the endopod may vary in relation to the ramus length.

***Pleuroxus* (*Picripleuroxus*) *quasidenticulatus* (Smirnov, 1996)**
Synonyms in Philippine literature: None.
Philippine records: Pascual et al., 2014.
General geographic distribution: Found also in Australia, Iraq, Argentina, Thailand, Vietnam, China and Far East Russia.
Distribution in the Philippines. Luzon: Cagayan–Lake Nalbuan and Lake Cansiritan.
Remarks. Recently redescribed and reviewed by Sinev & Sanoamuang in 2013, the status of *Picripleuroxus* as a genus is questioned and demoted to a subgenus. Commonly found

in littoral zones of ponds and reservoirs and streams (Frey, 1993; Sinev & Sanoamuang, 2013).

***Pleuroxus* (*Picripleuroxus*) *similis* Vávra, 1900**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: It is recorded from South America to Central Asia, and Australia (Smirnov, 1996; Chatterjee et al., 2013).
Distribution in the Philippines. Luzon: Bulacan–Bustos Dam; and National Capital Region–Marikina.
Remarks. The holotype of this species is lost (Smirnov, 1996). Records in the Philippines must be further validated.

Family Daphniidae Straus, 1820

***Ceriodaphnia cornuta* Sars, 1885**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Uéno, 1966; Mamaril & Fernando, 1978; Petersen & Carlos, 1984; Mamaril, 1986, 2001; Aquino et al., 2008; Papa & Zafaralla, 2011; Papa et al., 2012b.
General geographic distribution: Well distributed in the tropics and subtropics of all continents (Kořinek, 2002).
Distribution in the Philippines. Luzon: Batangas–Lake Taal; Benguet–Baguio; Bulacan–Bustos; Cagayan–Cagayan; Ilocos Norte–Paoay Lake: Laguna: IRRI compound; National Capital Region–Manila, La Mesa Dam, Marikina, and UP Diliman Campus; Nueva Ecija–Pantabangan Dam; Quezon–Pagbilao and Lucena; Sorsogon–Bulusan Lake. Cebu: Consolacion. Negros: Negros Oriental–Lake Balinsasayao; Negros Occidental–Bacolod. Leyte: Lake Danao. Mindanao: Lanao del Sur–Lake Lanao; and Surigao del Norte–Surigao del Norte.
Remarks. One of the species of *Ceriodpahnia* that develop cuticular defences in the presence of predators (Zaret, 1969; Serpe et al., 2009; Rietzler et al., 2010). This species is considered as a group of sibling species with clear continental pattern (Sharma & Kotov, 2013). Populations in different continents needs re-evaluation to determine taxonomic status in the species complex.

***Ceriodaphnia pulchella* Sars, 1862**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001; Petersen & Carlos, 1984.
General geographic distribution: Common pelagic species in lakes, reservoirs and ponds worldwide. It is recorded from the Palearctic to tropical Africa and Asia to temperate South America (Kořinek, 2002).
Distribution in the Philippines. Negros: Negros Occidental–Bacolod. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. This species can be distinguished by noting the posterior margin of the carapace. A row of thin hairs continues till the rear edge is present, while the posterodorsal angle shows presence of a spine which is laid almost parallel to its edge (Sharma, 2014).

***Ceriodaphnia reticulata* (Jurine, 1820)**
Synonyms in Philippine literature: None.
Philippine records: Petersen & Carlos, 1984.
General geographic distribution: Afrotropical, Neartic, Neotropical, Oriental Indomalaya, and Paleartic.
Distribution in the Philippines. Luzon: Pampanga–Candaba.
Remarks. Found in all water bodies but European populations have been found to prefer the littoral areas with good vegetation. Tropical and subtropical populations needs to be re-evaluated morphologically to determine if they are similar species or a different taxa (Kořinek, 2002).

***Ceriodaphnia rigaudi* Richard, 1894**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Woltereck, 1941; and Cheng & Clemente, 1954.
General geographic distribution: Neotropical and was also noted in India and Australia.
Distribution in the Philippines. Luzon: Batangas–Lake Taal and Taal Volcano Crater Lake; Laguna–Tadlak Lake; National Capital Region–UP Diliman Campus. Leyte: Lake Danao. Negros: Negros Oriental–Lake Balinsasayao.
Remarks. Its taxonomic status is unclear. It is a possible ecomorph of *Ceriodaphnia cornuta*, but without horns on the head (Zaret, 1969).

***Scapholeberis kingi* Sars, 1888**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Mamaril, 1986, 2001.
General geographic distribution: Occurs in tropical and subtropical Australia, Southeast Asia, India, China, Middle-East and Africa.
Distribution in the Philippines. Luzon: Albay–Legaspi; Batangas–Mabitak and Nasugbu; Cagayan–Cagayan; Camarines Sur–Naga; Ilocos Norte–San Nicolas; Laguna–Calamba; National Capital Region–Manila, La Mesa Dam, Marikina, UP Diliman Campus, and Pasig; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangan Dam; Quezon–Lumban, Pagbilao; Tarlac–Concepcion. Leyte: Tolosa. Negros: Negros Occidental–Bacolod. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Prefers littoral zone of lakes with vegetation and can be observed swimming with the ventral side of the valve attached to the water surface (Dumont & Pensaert, 1983), feeding on the hyponeuston.

***Simocephalus acutirostratus* (King, 1853)**
Synonyms in Philippine literature: None.
Philippine records: Cheng & Clemete, 1954; Mamaril & Fernando, 1978; Mamaril, 1986, 2001.
General geographic distribution: This species has been recorded from Australia, Philippines, Sri Lanka, Venezuela and Africa.
Distribution in the Philippines. Luzon: Bulacan–Bustos Dam; Cagayan–Cagayan; National Capital Region–Marikina and San Juan River.
Remarks. Considered as a species group. The range of this species needs to be re-evaluated as it is usually misused for other species but Australian and Southeast Asian population ranges can be identified with certainty (Orlova-Bienkowskaja, 2001).

***Simocephalus latirostris* Stingelin, 1906**
Synonyms in Philippine literature: None.
Philippine records: Mamaril & Fernando, 1978; Mamaril, 1986, 2001.
General geographic distribution: Distributed in tropical and subtropical South and Central America. It also has records in Australia and Southeast Asia.
Distribution in the Philippines. Luzon: Albay–Legaspi; Batangas–Nasugbu; Benguet–Baguio; Bulacan–Bustos; Cagayan–Cagayan; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Cabanatuan, Pantabangan Dam; Pampanga–Candaba; Quezon–Lucban, Pagbilao; Tarlac–Concepcion. Mindoro: Calapan. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Species range outside of South and Central America need to be further evaluated as the name is commonly misused for *S. heilongjiangensis* (Orlova-Bienkowskaja, 2001).

***Simocephalus serrulatus* (Koch, 1841)**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938.
General geographic distribution: Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, ad Paleartic.
Distribution in the Philippines. Mindanao: Lanao del Sur–Lake Dangiagan.
Remarks. Variable species found in Europe, Asia, North and South America and Australia. It has many recognised subspecies and molecular analysis is suggested to determine its overall genetic diversity (Orlova-Bienkowskaja, 2001).

***Simocephalus vetulus* (Müller, 1776)**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Woltereck, 1941; Cheng & Clemente, 1954; Mamaril & Fernando, 1978; Mamaril, 1986, 2001.
General geographic distribution: Europe and North Africa.
Distribution in the Philippines. Luzon: National Capital Region–San Juan River; Manila-Laguna-Rizal: Laguna de Bay. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. Philippine records needs to be re-evaluated as the species is only found in Europe and North Africa. Possibly misidentified with closely related species such as *S. mixtus*, *S. vetuloides* and *S. elizabethae* (Yoon & Kim, 2000; Orlova-Bienkowskaja, 2001).

Family Macrothrichidae Norman & Brady, 1867

***Grimaldina brazzai* Richard, 1892**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Mamaril, 1986, 2001.
General geographic distribution: The species was recorded in Mexico, Australia and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Bulacan–Malolos; National Capital Region–Marikina and Pasig. Mindanao: Lanao del Sur–Lake Dangiagan, Lake Lanao, and Marawi.
Remarks. The only known species of the genus *Grimaldina*. It is distributed within the tropics. Differentiated from other members of family Macrothricidae by having a wide oval body, a missive postabdomen and a head not separated from the carapace. It also has outgrowths in the ventral outline of its head near the base of the antennule (Harding, 1957; Smirnov, 1992).

***Guernella raphaelis* Richard, 1892**
Synonyms in Philippine literature: None.
Philippine records: Mamaril, 1986, 2001.
General geographic distribution: Widely distributed in the tropics as well as subtropical China. Afrotropical, Australasian, Neotropical, and Oriental Indomalaya.
Distribution in the Philippines. Luzon: Bulacan–Malolos; National Capital Region–Marikina, UP Diliman Campus, and Pasig. Cebu: Consolacion. Leyte: Tanauan. Negros: Negros Occidental–Bacolod. Mindanao: Lanao del Sur–Lake Lanao.
Remarks. The only known species of the genus *Guernella.* Commonly found in vegetation of littoral zones of lakes and ponds (Harding, 1957; Smirnov, 1992).

***Macrothrix spinosa* King, 1853**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Woltereck, 1941; Mamaril, 1986, 2001.
General geographic distribution: Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, and Paleartic.
Distribution in the Philippines. Luzon: Bataan–Orani and Abucay; Batangas–Nasugbu and San Luis; Benguet–Baguio; Bulacan–Bustos Dam, and Malolos; Cagayan–Buguey; Camarines Sur–Naga; Ilocos Norte–San Nicolas; La Union–Aringay; Laguna–Calamba, IRRI compound, Los Banos, and Lumban; National Capital Region–La Mesa Dam, Marikina, and UP Diliman Campus; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Cabanatuan and Bicos; Quezon–Pagbilao; Rizal–Binangonan; Tarlac–Bamban. Mindoro: Roxas. Mindanao: Cagayan de Oro–Cagayan de Oro; Lanao del Sur–Lake Lanao; Surigao del Sur–Surigao; South Cotabato–Guinang.
Remarks. A common species of *Macrothrix* in tropical and subtropical freshwaters. It has serrulations along the dorsal margin of its head and valves, but is best distinguished from the related, temperate-zone *M. laticornis* by the presence of serrated postabdomen (Silva-Briano et al., 1999; Smirnov, 1992).

***Macrothrix triserialis* Brady, 1886**
Synonyms in Philippine literature: None.
Philippine records: Brehm, 1938; Cheng & Clemente, 1954; Mamaril, 1986, 2001.
General geographic distribution: It has a pantropical and subtropical distribution.
Distribution in the Philippines. Luzon: Albay–Legaspi; Bulacan–Bustos Dam and Malolos; Laguna–Calamaba; National Capital Region–Marikina, UP Diliman Campus, Pasig, and San Juan River. Mindoro: Calapan.
Mindanao: Cagayan de Oro–Cagayan de Oro; Lanao del Sur–Lake Dangiagan; Misamis Oriental–Misamis Oriental.
Remarks. Its taxonomy is quite complicated, forming a species group with a related temperate-zone taxon *M. rosea* (*M. rosea-triserialis* species group) (Smirnov, 1992; Dumont & Silva-Briano, 1998; Dumont et al., 2002).

Family Ilyocryptidae Smirnov, 1992

***Ilyocryptus spinifer* Herrick, 1882**

Synonyms in Philippine literature: *Ilycryptus longiremis* Sars, 1888 and *Ilyocryptus verrucosus* Daday, 1905.

Philippine records: Mamaril, 1986, 2001.

General geographic distribution: This is a common species distributed from North and South America, South Asia and Australia.

Distribution in the Philippines. Luzon: Batangas–Nasugbu; Bulacan–Bustos Dam and Malolos; Cagayan–Buguey; National Capital Region–La Mesa Dam, Marikina, and UP Diliman Campus; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangan Dam. Negros: Negros Occidental–Bacolod; Negros Oriental–Sibulan. Mindanao: Agusan del Norte–Lake Mainit; Lanao del Sur–Lake Lanao.

Remarks. It is the dominant species of Family Ilyocryptidae in most freshwater bodies of the tropics and subtropics (Jeong et al., 2012; Kotov & Sanoamuang, 2005). It is usually associated with large tropical lakes with a good coverage of vegetation (Kotov & Stifter, 2006). Philippine population needs to be compared with others to determine morphological differences among population and identify probable sibling species (Frey, 1982; Kotov & Elías-Gutiérrez, 2009; Kotov & Sanoamuang, 2004).

Family Moinidae Goulden, 1968

***Moina brachiata* (Jurine, 1820)**

Synonyms in Philippine literature: None.

Philippine records: Petersen & Carlos, 1984; Mamaril, 1986, 2001.

General geographic distribution: It is widely distributed in north temperate regions. Reported mostly in Continental Europe, England, Russia, and Mongolia. Its distribution extends southward to Italy and Greece, and has been collected from North Africa as well as South Africa.

Distribution in the Philippines. Luzon: Ilocos Norte–San Nicolas; National Capital Region–Marikina; Laguna–Los Baños.

Remarks. *Moina brachiata* was not encountered in the recent samples (2008–2016). The authors propose that early records of this species in the country were misidentified *M. micrura.* Goulden (1968) and Fernando (2002) limit distribution of this species in north temperate regions of Europe and some localities in Northern Africa. The species should not be confused with *M. micrura*, which has a smaller body size of 0.5–1.2 mm, a different head shape, and a large pecten on the end-claws of the postabdomen.

***Moina micrura* Kurz, 1875**

Synonyms in Philippine literature: *Moina dubia parva* Jenkin, 1934, *Moina weismanni* Ishikawa, 1896, and *Moina macrophthalma* Stingelin, 1914. Previous Philippine specimens often misidentified as *Moina macrocopa* (Straus, 1820).

Philippine records: Cheng & Clemente, 1954; Petersen & Carlos, 1984; Mamaril, 1986; Mamaril, 2001; and Aquino et al., 2008.

General geographic distribution: Palearctic, Australia, tropics and subtropics of America, Africa, Europe, and far East and Southeast Asia specifically in India, Indonesia and Taiwan (Goulden, 1968; Kořinek, 2002).

Distribution in the Philippines. Luzon: Albay–Legaspi; Batangas–Nasugbu and Lake Taal; Benguet–Ambuklao Dam; Cagayan–Lake Nagatutuan; Camarines Sur–Lake Buhi; Ilocos Norte–Lake Paoay; La Union–San Jose; Laguna–IRRI compound, Lake Bunot; Lake Palakpakin; Lake Sampaloc; Lake Pandin; Lake Kalibato; Lake Tadlak; Lake Caliraya; and Lake Lumot-Mahipon; National Capital Region–Marikina, UP Diliman Campus, Pasig River, and Marikina River; Manila-Laguna-Rizal: Laguna de Bay; Nueva Ecija–Pantabangaan Dam; Pampanga–Candaba; Pangasinan–Fishpond in Pangasinan; Tarlac–Concepcion and Lake Tambo; Zambales–Lake Mapanuepe. Mindoro: Lake Naujan. Leyte: Lake Danao. Negros: Negros Oriental–Lake Balinsasayao. Mindanao: Cagayan de Oro–Cagayan de Oro; Lanao del Norte–Lake Lanao; Misamis Oriental–Lake Gumaod, South Cotabato–Lake Siloton, Lake Lahit, and Lake Sebu.

Remarks. *Moina micrura* can be distinguished from other moinids based from its small size and the small pecten on the end-claws, and by the complete absence of hairs on both the head and shell. A total of eight clades of the *micrura*-like taxa (five North American and three Eurasian) were noted (Bekker et al., 2016).

***Moina macrocopa* (Straus, 1820)**

Philippine records: Cheng & Clemente, 1954; Petersen & Carlos, 1984; Mamaril, 1986, 2001; and Aquino et al., 2008.

Synonyms in Philippine literature: *Moina brachiata* (Jurine, 1820) and *Moina micrura* Kurz, 1875.

General geographic distribution: Reported from many parts of the tropical and subtropical regions of the world. Neartic, Neotropical, and Oriental Indomalaya.

Distribution in the Philippines. Luzon: Ilocos Norte–Lake Paoay; National Capital Region–Muntinlupa and San Juan River.

Remarks. Early records of *M. macrocopa* in several lakes and ponds in Luzon lack taxonomic descriptions and illustrations, which has caused confusion in the identity of *M. macrocopa* and other moinids present in the Philippines. Goulden (1968) noted the distinct absence of supraocular depression in the species. Average total body size ranges from 1.0–1.5mm making it larger compared to other moinids. Moreover, presence of hairs in the head and body is also a good distinguishing character for *M. macrocopa*. The species was not noted in recent samples by Pascual et al. (2014).

***Moinodaphnia macleayi* King, 1853**

Synonyms in Philippine literature: None.

Philippine records: Petersen & Carlos, 1984; Mamaril, 1986; Mamaril, 2001; and Pascual et al., 2014.

General geographic distribution: It is distributed throughout the humid tropics specifically in Africa, Australia, South America, Caribbean Islands, Philippines and India (Kořinek, 2002).

Distribution in the Philippines. Luzon: Albay–Legaspi; Bataan–Bataan; Cagayan–Lake Calig; Kalinga–Asibanglan; Laguna–Calamba; National Capital Region–La Mesa Dam,

Table 1. List of sampling sites visited in the years 2008–2015 for the collection of microcrustacean zooplankton in the Philippines.

Site No.	Name	Municipality/City	Province	Latitude	Longitude	Island
1	Nalbuan	Buguey	Cagayan	18.2232	121.7833	Luzon
2	Calig Lakes	Buguey	Cagayan	18.2064	121.8216	Luzon
3	Lake Bangalau	Sta. Teresita	Cagayan	18.2243	121.8811	Luzon
4	Binag Dam	La-lo	Cagayan	18.1874	121.6969	Luzon
5	Cansiritan	Cansiritan	Cagayan	17.9037	121.6991	Luzon
6	Lake Nagatutuan	Gattaran	Cagayan	18.0643	121.6624	Luzon
7	Cagayan River	Tuguegarao	Cagayan	17.7695	121.7157	Luzon
8	Lake Cassily	Tuao	Cagayan	17.6717	121.5128	Luzon
9	Callao Caves	Penablanca	Cagayan	17.7069	121.8194	Luzon
10	Chico River (upstream)	Pinukpuk	Kalinga	17.6158	121.4069	Luzon
11	Temporary Pool	Asibanglan	Kalinga	17.5042	121.2900	Luzon
12	Limos Stream	Limos	Kalinga	17.5019	121.2900	Luzon
13	Laoagan Resort (fish pond)	Tabuk	Kalinga	17.4169	121.4580	Luzon
14	Lake Paoay	Paoay	Ilocos Norte	18.1212	120.5405	Luzon
15	Lake Danum	Sagada	Mt. Province	17.0945	120.8843	Luzon
16	Underground River	Sagada	Mt. Province	16.0853	120.9035	Luzon
17	Bokong Falls	Sagada	Mt. Province	17.0921	120.9035	Luzon
18	Sumaging Cave	Sagada	Mt. Province	17.0645	120.9039	Luzon
19	Chico River (downstream)	Bontoc	Ifugao	17.6158	120.9773	Luzon
20	Ambuklao Dam	Bokod	Benguet	16.4593	120.7450	Luzon
21	Pangasinan Fish Pond	Burgos	Pangasinan	16.0667	119.9167	Luzon
22	Pantabangan Lake	Pantabangan	Nueva Ecija	15.8322	121.1483	Luzon
23	Lake Mapanuepe	San Marcelino	Zambales	14.9822	120.2860	Luzon
24	Mt. Pinatubo Crater Lake	Mt. Pinatubo	Zambales	15.1526	120.3530	Luzon
25	Lake Tambo	Santa Juliana	Tarlac	15.2917	120.3792	Luzon
26	Candaba Swamp	Pampanga	Pampanga	15.0863	120.8365	Luzon
27	Marikina River	Marikina	Metro Manila	14.6400	121.0972	Luzon
28	Pasig River	Metro Manila	Metro Manila	14.5956	120.9736	Luzon
29	Imus River	Imus	Cavite	14.4241	120.9427	Luzon
30	Laguna de Bay	Several surrounding municipalities & cities	Metro Manila, Laguna & Rizal	14.3855	121.2845	Luzon
31	Lake Tadlak	Tadlak	Laguna	14.1826	121.2065	Luzon
32	Lake Caliraya	Lumban-Cavinti-Kalayaan	Laguna	14.3031	121.5295	Luzon
33	Lake Lumot-Mahipon	Lumban-Cavinti-Kalayaan	Laguna	14.2558	121.5470	Luzon
34	Lake Sampalok	San Pablo	Laguna	14.1212	121.5405	Luzon
35	Lake Bunot	San Pablo	Laguna	14.0831	121.3831	Luzon

Site No.	Name	Municipality/City	Province	Latitude	Longitude	Island
36	Lake Yambo	San Pablo	Laguna	14.1998	121.6164	Luzon
37	Lake Mohikap	San Pablo	Laguna	14.1229	121.3340	Luzon
38	Lake Palakpakin	San Pablo	Laguna	14.1112	121.3388	Luzon
39	Lake Pandin	San Pablo	Laguna	14.1167	121.3667	Luzon
40	Lake Calibato	San Pablo	Laguna	14.1042	121.3772	Luzon
41	Lake Taal	Several surrounding municipalities & cities	Batangas	13.9484	121.0073	Luzon
42	Daet River	Daet	Camarines Norte	14.1139	122.9558	Luzon
43	Bicol River	Naga	Camarines Sur	13.6467	123.1107	Luzon
44	Lake Buhi	Buhi	Camarines Sur	13.4567	123.5142	Luzon
45	Lake Bato	Iriga	Camarines Sur	13.3317	123.3589	Luzon
46	Lake Baao	Baao	Camarines Sur	13.4638	123.3589	Luzon
47	Lake Danao	Albay	Camarines Sur	13.2226	123.5435	Luzon
48	Lake Bulusan	Mt. Bulusan	Sorsogon	12.7616	124.0916	Luzon
49	Lake Malbato	Coron	Palawan	12.0300	120.1166	Palawan
50	Lake Kayangan	Coron	Palawan	11.9540	120.2241	Palawan
51	Lake Laguna	Malay	Aklan	11.9246	121.9603	Panay
52	Tamarog River	Libertad	Antique	11.7893	121.9223	Panay
53	Aklan River	Libacao	Aklan	11.4787	122.3039	Panay
54	Dalanas River	Tibiao	Antique	11.2480	122.0682	Panay
55	Brgy. Julita (fishpond)	Libacao	Aklan	11.4688	122.3195	Panay
56	Brgy. Sublangon (fishpond)	Pontevedra	Capiz	11.4688	122.8266	Panay
57	Brgy. Tumalalud (fishpond)	Mambusao	Capiz	11.4164	11.4164	Panay
58	Brgy. Guadalupe (fishpond A)	Libacao	Aklan	11.4562	122.3285	Panay
59	Brgy. Guadalupe (fishpond B)	Libacao	Aklan	11.4506	122.3299	Panay
60	Ibajay River	Ibajay	Aklan	11.7317	122.1780	Panay
61	Brgy. Julita (lagoon)	Libacao	Aklan	11.4673	122.3238	Panay
62	Mambusao Dam	Mambusao	Capiz	11.4164	122.4004	Panay
63	Mangayaw Falls	Libacao	Aklan	11.4483	122.3326	Panay
64	Panay River	Libacao	Aklan	11.4961	122.8198	Panay
65	Panitan River	Panitan	Capiz	11.4632	122.7691	Panay
66	Brgy. Tabuc (pond)	Pontevedra	Capiz	11.4909	122.8289	Panay
67	District 3 (pond)	Sibalom	Antique	10.7876	122.0247	Panay
68	Jose Irrigation Water System	Sibalom	Antique	10.7876	122.0315	Panay
69	Brgy. Guia (spring)	Pandan	Antique	11.7676	122.0764	Panay
70	Tibiao River	Tibiao	Antique	11.3021	122.0535	Panay

Site No.	Name	Municipality/City	Province	Latitude	Longitude	Island
71	Calbiga River	Calbiga	Eastern Samar	13.1695	121.3484	Samar
72	Lulugayan Falls	Calbiga	Eastern Samar	11.6283	125.0187	Samar
73	Quary Cold Spring Resort	Hinabangan	Western Samar	11.7109	125.0676	Samar
74	Brgy. Mugdo (pond)	Hinabangan	Western Samar	11.7142	125.0655	Samar
75	Brgy. Tominamos (deep well)	Santa Rita	Western Samar	11.4533	125.0206	Samar
76	Lake Danao	Ormoc	Leyte	11.5895	125.0897	Leyte
77	Lake Bito	McArthur	Leyte	10.8681	124.8556	Leyte
78	Diong River	Javier	Leyte	10.7410	124.9159	Leyte
79	Busay Falls	Babatngon	Leyte	11.4082	124.8483	Leyte
80	BFAR Regional Aquaculture Freshwater Production	Babatngon	Leyte	11.4111	124.8490	Leyte
81	Poblacion (deep well)	Inopacan	Leyte	10.5009	124.7414	Leyte
82	Poblacion (fish pond)	Inopacan	Leyte	10.4906	124.7286	Leyte
83	Lake Malubog	Toledo City	Cebu	10.3667	123.7169	Cebu
84	Brgy. Danglad (pond)	Consolacion	Cebu	10.3998	123.9541	Cebu
85	Estaca River	Compostela	Cebu	10.4352	124.0012	Cebu
86	Lake Cumbar	Liloan	Cebu	10.4091	123.9894	Cebu
87	Lake Lamak	Liloan	Cebu	10.3794	123.9973	Cebu
88	Lake Danao	Danao	Cebu	10.7582	124.9746	Pacijan
89	Malinao Dam	Pilar	Bohol	9.8277	124.3093	Bohol
90	Loboc River	Loboc (upstream)	Bohol	9.6350	124.0312	Bohol
91	Loboc River	Bilar (downstream)	Bohol	9.7069	124.1092	Bohol
92	Brgy. Lumanoy (irrigation system)	Lila	Bohol	9.5916	124.0798	Bohol
93	Brgy. Lumanoy (fish pond)	Lila	Bohol	9.5905	124.0798	Bohol
94	Lake Danao	Dumaguete	Negros Oriental	9.8279	124.3133	Negros
95	Lake Balinsasayaw	Dumaguete	Negros Oriental	9.3506	123.1831	Negros
96	Lake Kabalin-an	Mt.Talinis	Negros Oriental	9.3664	123.1553	Negros
97	Uba River	Talisay	Negros Occidental	10.7063	122.9916	Negros
98	Brgy. Alunan (deep well A)	Bacolod City	Negros Occidental	10.6604	122.9378	Negros
99	Brgy. Alunan (deep well B)	Bacolod City	Negros Occidental	10.6605	122.9376	Negros
100	Brgy. Alunan (deepwell C)	Bacolod City	Negros Occidental	10.6607	122.9371	Negros
101	Mambukal Resort (Lagoon)	Murcia	Negros Occidental	10.5131	123.1039	Negros
102	Brgy. Mailum Dam	Bago City	Negros Occidental	10.5131	123.0883	Negros

Site No.	Name	Municipality/City	Province	Latitude	Longitude	Island
103	Brgy. Mailum (irrigation system)	Bago City	Negros Occidental	10.4813	123.0688	Negros
104	Lake Linao	Hinigaran	Negros Occidental	10.2303	122.9250	Negros
105	Brgy. Bagroy (canal)	Binalbagan	Negros Occidental	10.2020	122.9308	Negros
106	Guintubdan River	La Carlota City	Negros Occidental	10.2067	122.9441	Negros
107	Brgy. Guintubdan (deep well)	La Carlota City	Negros Occidental	10.2072	122.9443	Negros
108	Bago City (canal)	Bago City	Negros Occidental	10.2071	122.9443	Negros
109	Lake Balanan	Siaton	Negros Oriental	9.1351	123.0007	Negros
110	Caticugan (fish pond)	Siaton	Negros Oriental	9.0827	123.0143	Negros
111	Pilapil (canal)	Siaton	Negros Oriental	9.0641	123.0265	Negros
112	Siaton River	Siaton	Negros Oriental	9.0638	123.0274	Negros
113	Lake Naujan	Naujan	Oriental Mindoro	9.3664	123.1566	Mindoro
114	Lake Mainit	Mainit	Agusan del Sur	9.4339	125.5331	Mindanao
115	fish pond	Magsaysay	Misamis Oriental	8.9899	125.5003	Mindanao
116	Agusan River	Butuan	Agusan del Norte	8.9481	125.5471	Mindanao
117	Gingoong River	Gingoong	Misamis Oriental	8.8301	125.1261	Mindanao
118	Cold springs	Albuig	Misamis Oriental	8.9258	125.0045	Mindanao
119	Cagayan River	Kabugapit	Misamis Oriental	8.8000	124.9000	Mindanao
120	rice field	Longalog	Misamis Oriental	8.7974	124.7868	Mindanao
121	Magkaambos Cave	Longalog	Misamis Oriental	8.6565	124.7472	Mindanao
122	Kabulig River	Kabulig	Misamis Oriental	8.6565	124.7472	Mindanao
123	Lake Danao	Jasaan	Misamis Oriental	8.6636	124.7801	Mindanao
124	Lake Gumaod	Jasaan	Misamis Oriental	8.6535	124.8093	Mindanao
125	Tagaloan River	Tagaloan	Cagayan de Oro	8.5442	124.7593	Mindanao
126	Tubod-Mayahay River	Tubod	Iligan City	8.2198	124.1986	Mindanao
127	Tumuga Bridge	Tubod	Iligan City	8.1908	124.1782	Mindanao
128	Maria Cristina Falls	Iligan	Lanao del Norte	8.1913	124.1918	Mindanao
129	Agos IV Dam	Iligan	Lanao del Norte	8.1334	124.1986	Mindanao
130	Tinago Falls	Iligan	Lanao del Norte	8.1591	124.3093	Mindanao
131	Lake Lanao	Marawi	Lanao del Sur	7.8866	124.2781	Mindanao
132	Lake Napalit	Pangantucan	Bukidnon	7.8659	124.7796	Mindanao
133	Lake Apo	Valencia	Bukidnon	7.8667	125.0082	Mindanao
134	Lake Pulangi	Valencia	Bukidnon	7.7889	125.0214	Mindanao
135	Lake Tutay	Don Carlos	Bukidnon	7.6669	125.0278	Mindanao
136	Lake Pinamaloy	Don Carlos	Bukidnon	7.6738	125.8350	Mindanao
137	Lake Siloton	General Santos	South Cotabato	6.2259	124.7310	Mindanao
138	Lake Lahit	General Santos	South Cotabato	6.2517	124.7150	Mindanao
139	Lake Sebu	General Santos	South Cotabato	6.2274	124.7085	Mindanao

Table 2. Insular distribution of microcrustacean zooplankton noted in the Philippines.

Taxa	Geographic distribution in the Philippines							General distribution
	Lu	Mn	Ne-Pa	Pal	Cam	Min	Jo	
Calanoida Sars, 1903								
Arctodiaptomus dorsalis (Marsh, 1907)	*	*				*		Neartic and Central America
Filipinodiaptomus vexillifer (Brehm, 1933)			*					Philippine endemic
Filipinodiaptomus insulanus (Wright, 1928)	*		*					Philippine endemic
Mongolodiaptomus birulai (Rylov, 1922)	*							Oriental Indomalaya and Palaearctic
Tropodiaptomus australis Kiefer, 1936	*							Australasian
Tropodiaptomus gigantoviger Brehm, 1933	*					*		Philippine endemic
Tropodiaptomus lanaonus Kiefer 1982						*		Philippine endemic
Tropodiaptomus vicinus (Kiefer, 1930)	*					*		Oriental Indomalaya
Pseudodiaptomus brehmi Kiefer, 1938	*	*						Philippine endemic
Pseudodiaptomus smithi Wright, 1928	*							Philippine endemic
Pseudodiaptomus trihamatus Wright, 1937	*							Oriental Indomalaya
Cyclopoida Burmeister, 1834								
Cryptocyclops linjanticus (Kiefer, 1928b)					*			Afro-Asian
Mesocyclops aspericornis (Daday, 1906)			*					Pantropical
Mesocyclops augusti Papa & Hołyńska, 2013						*		Philippine endemic
Mesocyclops microlasius Kiefer, 1981	*		*			*		Philippine endemic
Mesocyclops thermocyclopoides Harada. 1931	*	*	*			*		Southeast Asia, China, and Japan
Mesocyclops woutersi Van de Velde, 1987			*					Australiasia
Mesocyclops ogunnus Onabamiro, 1957	*							Africa, Japan, Brazil, and Cayman Island
Thermocyclops crassus (Fischer, 1853)	*	*	*			*		Europe, Asia, Australiasia, and North and Central America
Thermocyclops decipiens (Kiefer, 1929)	*	*	*			*		Pantropical
Thermocyclops philippinensis (Marsh, 1932)	*							Philippine endemic

Taxa	Geographic distribution in the Philippines							General distribution
	Lu	Mn	Ne-Pa	Pal	Cam	Min	Jo	
Thermocyclops taihokuensis Harada, 1931	*		*					East and central Asia
Thermocyclops wolterecki Kiefer 1938						*		Australasia, Southeast Asia, China, and Japan
Microcyclops varicans (Sars, 1863)	*	*	*			*		Eurasia, Africa, the Americas, and Western Australia
Ectocyclops phaleratus (Koch, 1838)	*	*	*			*		Cosmopolitan
Eucyclops serrulatus (Fischer, 1851)	*	*	*			*		Paleartic
Paracyclops affinis (Sars, 1863)	*						*	Southeast and East Asia
Paracyclops fimbriatus (Fischer, 1853)	*					*		Euroasia
Tropocyclops prasinus (Fischer, 1860)	*		*			*		Central America, Europe, South Africa, Southeast Asia, and Australia.
Cladocera Latreille, 1829								
Diaphanosoma dubium Manuilova, 1964	*					*		Russia, Sout Asia, and Southeast Asia
Diaphanosoma excisum Sars, 1885	*	*	*			*		Australia, India, China, Nepal, and Africa
Diaphanosoma modigliani Richard, 1894	*					*		Tropical Asia
Diaphanosoma sarsi Richard, 1894	*	*	*			*		Nepal, Eastern China, Australia, New Guinea, New Caledonia, New Hebrides, Guam and few sites in tropical Africa
Diaphanosoma volzi (Stingelin, 1905)	*							China, Australia, Southeast Asia, and Sudan
Diaphanosoma tropicum Korovchinsky, 1998	*							India, Sri Lanka, China, Thailand and Malaysia.
Latonopsis australis Sars, 1888	*	*	*			*		Australia, Asia, Africa, Europe, and America
Bosmina fatalis Burckhardt, 1924	*	*	*			*		East and Southeast Asia
Bosmina (*Bosmina*) *longirostris* (Müller, 1785)	*		*					Cosmopolitan
Bosminopsis deitersi Richard, 1895	*	*				*		Tropicopolitan
'*Alona*' *affinis* (Leydig, 1860)					*			Euroasia
'Alona' archeri Sars 1888		*						Australia and Southeast Asia
'*Alona' cambouei* Guerne & Richard, 1893	*							South and West Africa, Tropical and sub-topical Asia and the Middle-East.
'Alona' guttata Sars 1862						*		Palearctic
'Alona' intermedia Sars 1862						*		Cosmopolitan
'Alona' pseudanodonta Brehm, 1933						*		Philippine endemic (?)

Taxa	Geographic distribution in the Philippines							General distribution
	Lu	Mn	Ne-Pa	Pal	Cam	Min	Jo	
'Alona' pulchella King, 1853	*					*		Africa, Australia, and Asia
'*Alona' sarasinorum* Stingelin, 1900						*		Celebes, Sulawesi, Indonesia.
Euryalona orientalis (Daday, 1898)	*							Neotropical, Oriental Indomalaya, and Australia.
Karualona mulleri Richard, 1897	*							Neotropical
Kurzia longirostris (Daday 1898)	*							Afrotropical, Australasian, Neotropical, and Oriental Indomalaya.
Leberis macronyx (Daday, 1898)						*		Oriental Indomalaya.
Leydigia acanthocercoides (Fischer 1854)	*					*		Paleartic and common in tropical and sub-tropical Asia
Oxyurella singalensis (Daday, 1898)	*	*	*			*		Tropical and subtropical Asia, Africa and Australia
Alonella excisa (Fischer, 1854)	*		*			*		Cosmopolitan
Chydorus eurynotus Sars, 1901	*	*				*		Neotropical and Australia
Chydorus hermanni Brehm, 1933	*							Oriental Indomalaya and Australia
Chydorus parvus Daday 1898	*	*				*		Afrotropical and Oriental Indomalaya
Chydorus sphaericus (Müller, 1785)	*					*		Pantropical
Chydorus ventricosus Daday, 1898	*					*		Afrotropical, Neotropical, anf Oriental Indomalaya
Dadaya macrops (Daday 1898)	*					*		Afrotropical, Australasian, Neotropical, and Oriental Indomalaya
Dunhevedia crassa King 1853	*	*	*			*		Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, and Paleartic.
Dunhevedia serrata Daday, 1898	*		*			*		Afrotropical, Australasian, and Oriental Indomalaya
Ephemeroporus barroisi (Richard, 1894)	*		*			*		Australia, Iraq, Argentina, Thailand, Vietnam China and Far East Russia. Distribution in the Philippines
Pleuroxus aduncus (Jurine, 1820)	*	*				*		Afrotrpical, Australasian, Neartic, Neotroipical, Oriental Indomalaya, and Paleartic.
Pleuroxus (*Picripleuroxus*) *quasidenticulatus* (Smirnov, 1996)	*							Australia, Iraq, Argentina, Thailand, Vietnam China and Far East Russia
Pleuroxus (*Picripleuroxus*) *similis* Vávra, 1900	*							South America to Central Asia, and Australia
Ceriodaphnia cornuta Sars, 1885	*		*			*		Tropics and subtropics of all continents

Taxa	Geographic distribution in the Philippines							General distribution
	Lu	Mn	Ne-Pa	Pal	Cam	Min	Jo	
Ceriodaphnia pulchella Sars 1862			*			*		Palearctic to tropical Africa and Asia to temperate South America
Ceriodaphnia reticulata (Jurine 1820)	*							Afrotropical, Neartic, Neotropical, Oriental Indomalaya, and Paleartic.
Ceriodaphnia rigaudi Richard 1894	*		*					Neotropical and was also noted in India and Australia
Scapholeberis kingi Sars, 1888	*		*			*		Tropical and subtropical Australia, Southeast Asia, India, China, Middle-East and Africa.
Simocephalus acutirostratus (King 1853)	*							Australia, Philippines, Sri Lanka, Venezuela and Africa
Simocephalus latirostris Stingelin 1906								Tropical and subtropical South and Central America and also Australia and Southeast Asia.
Simocephalus serrulatus (Koch 1841)						*		Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, ad Paleartic
Simocephalus vetulus (Müller, 1776)	*					*		Europe and North Africa
Grimaldina brazzai Richard 1892	*					*		Mexico, Australia and Oriental Indomalaya
Guernella raphaelis Richard, 1892	*		*			*		Afrotropical, Australasian, Neotropical, China, and Oriental Indomalaya
Macrothrix spinosa King, 1853	*	*				*		Afrotropical, Australasian, Neartic, Neotropical, Oriental Indomalaya, and Paleartic
Macrothrix triserialis Brady, 1886	*	*				*		Pantropical and subtropical distribution
Ilyocryptus spinifer Herrick 1882	*		*			*		North and South America, South Asia and Australia
Moina brachiata (Jurine 1820)	*							Continental Europe, England, Russia, South Africa, and Mongolia
Moina micrura Kurz, 1875	*	*	*			*		Palearctic, Australia, tropics and subtropics of America, Africa, Europe, and far East and Southeast Asia.
Moina macrocopa (Straus, 1820)	*							Tropical and subtropical regions of the world. Neartic, Neotropical, and Oriental Indomalaya.

Taxa	Geographic distribution in the Philippines							General distribution
	Lu	Mn	Ne-Pa	Pal	Cam	Min	Jo	
Moinodaphnia macleayi King, 1853	*	*	*					Africa, Australia, South America, Caribbean Islands, Philippines and India

Lu, Greater Luzon; Mi, Mindoro; Ne-Pa, Negros-Panay; Pal, Greater Palawan; Cam, Camiguin; Min, Mindanao; Jo, Jolo.

UP Diliman Campus, Marikina, and Pasig; and Rizal–Tanay. Mindoro: Roxas. Cebu: Lake Mabulog.

Remarks. *Moinodaphnia* can be distinguished from most *Moina* by the presence of an ocellus below the eye and is located above the origin point of the antennules. The antennules are long and movable. The females are laterally flattened, and the dorsal margin of the shell has a sharp keel. The second antennae are very characteristic because the distal segment of the exopod has four rather short setae rather than three long setae. The postabdomen is long. Only one sexual egg is normally deposited in the ephippium. The supraocular depression is absent. *Moinodaphnia* also has a different distribution and habitat than *Moina*. It prefers to be in small temporary ponds, small lakes, swamps and pools. It lives near the mud or in the weeds where it filters the water surrounding the weeds.

DISCUSSION

The present checklist provides an updated taxonomy and distribution of the microcrustacean zooplankton in the Philippines. Overall, a total of 84 species, consisting of 11 calanoid and 18 cyclopoid copepod species and 55 cladoceran species, were included in this listing. It is estimated that there are at least 620–720 species of cladocerans worldwide (Forró et al., 2008; Kotov et al., 2013a). Approximately 7–8% of these species have now been recorded in Philippine inland waters, which in turn constitutes 51% and 18% of the total cladoceran diversity of the Oriental Indomalayan and Southeast Asian regions, respectively (Korovchinsky, 2013a). Among the copepods, the recorded species of Calanoida and Cyclopoida amount to at least 7% of the regional diversity and 1.27% of the average global diversity (Boxshall & Defaye, 2008). In terms of endemicity, the Philippines have eight copepods and one cladoceran thus far. The very low endemicity rate for cladocerans coincides with that observed for the region, wherein only at least 21 species and one genus were found to be endemic in Oriental Indomalaya (Forró et al., 2008). On the other hand, the level of regional endemism in freshwater copepods is remarkable, however, the number of copepod endemics in the country is far less than the known levels in the Oriental region, which has an intermediate level (73.2%) of endemism (Boxshall & Defaye, 2008). These numbers at least reflect the intensity of research (since 1880) rather than real patterns of diversity in the country thus, suggesting that majority of the dominant planktonic taxa communities of Southeast Asia, remain taxonomically unexplored. The insular distribution of the listed species is summarised in Table 2. The species composition of Philippine cladocerans is most similar to that of tropical to subtropical and temperate Asia and Australia. The rest were mainly from the tropics or subtropics of the eastern hemisphere and only few were northern in origin. The copepod diversity, being dominated by family Cyclopidae and Diaptomidae, shows high similarity with those of neighboring regions that extend as far as Papua New Guinea–Australia, and dispersal from the Asian continent to Australia as suggested by Hołyńska (2006). This agrees with the analysis of Boxshall & Defaye (2008) that the Oriental region (Southeast Asia + India) had the greatest similarity with Australia (including New Guinea).

For many Philippine micrcrustacean zooplankton species, their taxonomy remains unresolved (Korovchinsky, 2013b). Many descriptions of Philippine species lack adequate information on their important taxonomic characters, and this has often led to misidentification (summarised in Table 3) in previous records (Pascual et al., 2014). Compounding this problem, many type specimens have been lost, preventing re-examination and posing obstacles for a detailed re-description of several species. The taxonomic status of most of these species will have to be clarified. Comparison of species diversity across Southeast Asia is needed to obtain a true species richness for the region. Interest in the research of tropical freshwater microcrustaceans has recently gained popularity helping consolidate material on their systematics and biogeography. This may allow researchers to access new data to close the information gap on the species present in Philippine inland waters. DNA analysis, along with new and enhanced morphological data, is needed to determine and stabilise species identities. It will also facilitate the comparison of populations across the archipelago and across the region. Increased sampling efforts should be directed at more types of water bodies such as rice fields, swamps, temporary pools, caves, groundwater and moist vegetation (Dumont, 1983, 1994; Dumont & Negrea, 1996), as these are habitats that have been overlooked for a long time and have a high probability of yielding additional taxa. Additional surveys in understudied islands and other isolated areas in the Philippines are expected to contribute greatly to a better understanding of the diversity of freshwater microcrustaceans. These efforts should not only focus on identifying possible new taxa but also critically reviewing existing literature by analysing different populations. This checklist aims to provide a step towards increased interest and clarity in the study of freshwater microcustacean systematics and biogeography in the Philippines.

Table 3. List of taxonomic synonymies and misidentification in microcrustacean zooplankton in the Philippines.

Family	Taxa	Philippine Records	Taxonomic status
Family Diaptomidae Baird, 1850	*Diaptomus insulanus* Wright, 1928	Wright, 1928; Kiefer, 1928a; Brehm, 1942	Synonym of *Filipinodiaptomus insulanus* (Wright, 1928). Revisions in the genera level done by Lai et al. (1979)
	Diaptomus sensibilis Kiefer, 1928a	Kiefer, 1930	Synonym of *Filipinodiaptomus insulanus* (Wright, 1928). Revisions in the genera level done by Lai et al. (1979)
	Tropodiaptomus malaicus prasinus Brehm, 1933	Brehm, 1942; Petersen & Carlos, 1984	Synonym of *Tropodiaptomus prasinus* Brehm, 1933. Philippine records were misidentified. Specimens are actually *Tropodiaptomus vicinus* (Kiefer, 1930)
Family Cyclopidae Rafinesque, 1815	*Mesocyclops leuckarti* (Claus, 1857)	Woltereck et al., 1941; Petersen & Carlos, 1984; Mamaril, 1986, 2001	Philippine records were misidentified. Specimens probably refer to *Mesocyclops thermocyclopoides* (Papa & Hołyńska, 2013).
	Cryptocyclops linjanticus (Kiefer, 1928b)	Woltereck et al., 1941	Microcyclops linjanticus (Kiefer, 1928b).
	Paracyclops affinis (Sars, 1863)	Tuyor & Baay, 2001	Synonym of *Ectocyclops affinis* (Sars, 1863)
Family Sididae Baird, 1850	*Diaphanosoma brachyurum* (Liévin, 1848)	Cheng & Clemente, 1954	Philippine records may have referred to *D. excisum*, *D. sarsi*, or *D. dubium*
	Pseudosida bidentata Herrick, 1882	Cheng and Clemente, 1954; Mamaril & Fernando, 1978; Mamaril, 1986, 2001	Southeast Asian and Indian specimens were re identified as *P. szalayi* (Korovchinsky, 1992, 2010). Philippine populations might be *P. szalayi* but still requires further verifications
Family Chydoridae Dybowski & Grochowski, 1894	*Alona bukobensis* Welther, 1897	Brehm, 1938	Synonym of *Coronatella bukobensis* (Weltner, 1897)
	Alona circumfimbriata Megard, 1967	Mamaril & Fernando, 1978; Mamaril, 1986, 2001	Synonym of *Coronatella circumfimbriata* (Megard, 1967)
	Alona davidi Richard, 1895	Mamaril & Fernando, 1978; Mamaril, 1986, 2001	Synonym of *Leberis davidi* (Richard, 1895)
	Alona verrucosa Sars, 1901	Brehm, 1938	Synonym of *Anthalona obtusa* Van Damme et al., 2011
	Biapertura affinis (Leydig, 1860)	Mamaril, 1986; Mamaril, 2001	Synonym of *Alona affinis* (Leydig, 1860)
	Biapertura karua (King, 1853)	Mamaril, 1986	Synonym of *Alona karua* (King, 1853) and *Karualona karua* (King 1853)
	Biapertura pseudoverrucosa Smirnov, 1971	Mamaril, 1986, 2001; Aquino et al., 2008	Synonym of *Alona pseudoverrucosa* (Sars, 1901)

Family	Taxa	Philippine Records	Taxonomic status
Family Chydoridae Dybowski & Grochowski, 1894	*Camptocercus uncinatus* Smirnov, 1971	Mamaril, 1986, 2001; Pascual et al., 2014	Philippine specimens must be revisited for possible misidentification with another species *C. vietnamensis*
	Indianlona globulosa (Daday, 1898)	Mamaril, 1986, 2001	Synonym of *Notoalona globulosa* (Daday, 1898)
	Alonella karua (King, 1853)	Brehm, 1938	Synonym of *Alona karua* (King, 1853) and *Karualona karua* (King 1853)
	Alonella kulczynskii Grochmalicki, 1915	Brehm, 1938	Synonym of *Alonella excisa* (Fischer, 1854)
	Alonella sculpta Sars, 1901	Brehm, 1938	Synonym of *Notoalona sculpta* (Sars, 1901)
	Chydorus barroisi (Richard, 1894)	Brehm, 1938; Woltereck, 1941; Petersen & Carlos, 1984; Mamaril, 1986; Mamaril, 2001; and Aquino et al., 2008	Philippine specimens were most likely *E. barroisi*
Family Daphniidae Straus, 1820	*Daphnia pulex* Leydig, 1860	Petersen & Carlos, 1984	Misidentified specimen. *Daphnia* species are not present in the Philippines
Family Macrothricidae Norman & Brady, 1867	*Macrothrix laticornis* (Jurine 1820)	Brehm, 1938 and Cheng & Clemente, 1954	Philippine records may refer to *Macrothrix spinosa* King, 1853
Family Ilyocryptidae Smirnov, 1992	*Ilycryptus longiremis* Sars, 1888	Brehm, 1938 and Cheng & Clemente, 1954	Synonym of *Ilyocryptus spinifer* Herrick 1882
	Ilyocryptus verrucosus Daday, 1905	Brehm, 1938	Synonym of *Ilyocryptus spinifer* Herrick 1882
Family Moinidae Goulden, 1968	*Moina dubia* Guerne & Richard, 1892	Brehm, 1938	Synonym of *Moina micrura* Kurz, 1875
	Moina macrophthalma Stingelin, 1914	Brehm, 1938	Synonym of *Moina micrura* Kurz, 1875
	Moina weismanni Ishikawa, 1896	Cheng & Clemente, 1954	Synonym of *Moina micrura* Kurz, 1875
	Moina dubia parva Jenkin, 1934	Uéno, 1966	Synonym of *Moina micrura* Kurz, 1875

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