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Cladocera (Crustacea: Branchiopoda) from the Pantanal (Brazil)

Ветвистоусые ракообразные Cladocera (Crustacea: Branchiopoda) Пантаналя (Бразилия)

Werner Hollwedel[1], Alexey A. Kotov[2] & Gerd-Oltmann Brandorff[3]
В. Холлведел[1], А. А. Котов[2], Г.-О. Брандорфф[3]

[1] Oldenburger Str. 16A, Varel, D-26316 Germany; e-mail: whollwedel@t-online.de
[2] A.N. Severtsov Institute of Ecology and Evolution, Leninsky Prospect 33, Moscow 119071 Russia; e-mail: golokot2000@mail.ru
[2] Институт проблем экологии и эволюции РАН им. А.Н. Северцова, Ленинский просп. 33, Москва 119071 Россия.
[3] Georg-Gröning-Str. 29A, Bremen, D-28209 Germany; e-mail: Gobrandorf@aol.com

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КЛЮЧЕВЫЕ СЛОВА: Cladocera, Anomopoda, Ctenopoda, морфология, систематика, таксономия, фауна, распределение, Бразилия, Пантаналь.

ABSTRACT: In 1996 and 1999, a series of samples was collected from seven localities in the southern Pantanal (Mato Grosso do Sul, Brazil). Fifty species belonging to one family of the Ctenopoda Sars, 1865, and six families of the Anomopoda Sars, 1865 have been identified. They are typical for tropical fauna of Brazil. Previous records of Cladocera from Pantanal are summarised, and a check-list of species from there is composed, consisting of 69 taxa determined to species level and 19 taxa to genera though some of these records require confirmation. The species list of the nearby Paraná region consists of 40 species. The morphology of some ilyocryptids, macrothricids, and chydorids has been studied in detail using optical and scanning electron microscopy; these results are described and illustrated. Current taxonomic problems are discussed.

РЕЗЮМЕ: В течение 1996 и 1999 гг. серия планктонных и бентосных проб была отобрана в семи точках Южного Пантаналя (штат Мато Гроссо ду Сул, Бразилия). В них было найдено пятьдесят видов из одного семейства отряда Ctenopoda Sars, 1865 и шести семейств отряда Anomopoda Sars, 1865, найденные животные типичны для тропической Бразилии. Проанализированы все предыдущие находки ветвистоусых ракообразных из Пантаналя, и составлен проверочный лист, включающий 69 таксона определенных до уровня вида и 19 — до уровня рода, некоторые из этих определений нуждаются в проверке. Для ближайшего района (Парана) отмечено 40 видов. Морфология некоторых представителей семейств Ilyocryptidae Smirnov, 1976 sensu Smirnov, 1992, Macrothricidae Norman & Brady, 1867 и Chydoridae Stebbing, 1902 была исследована под отпическим и сканирующим электронным микроскопом, эти результаты проиллюстрированы в данной статье. Обсуждены некоторые современные проблемы таксономии Cladocera.

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Introduction

Pantanal (Mato Grosso do Sul, Brazil) is an immense wetland in the heart of South America with an area of about 140 000 km^2. Its most important environmental factor is the fluctuating level of rivers and ground waters which results in inundations of varying duration and subsequent drying up of large areas. It is the controlling factor of the structure and function of the inundation area due to the cycling of nutrients and disposability of water. The floodplain is a very productive habitat for flora and fauna. Until now there has been only a single investigation into the effects of the annual water level fluctuations on the zooplankton [Espíndola, 1996]. In a lake connected to the Paraguay River *Moina minut*a dominated during high water periods, while *Diaphanosoma birgei* dominated during low water. Zooplankton reacts differently when the water level rises and falls with fluctuating ground water level, as is the case of the Nhecolândia region. Here there are many lakes, some of which dry up while others are saline [Mourão, 1989; Sakamoto et al., 1999]. Cladocerans and some copepods can survive these harsh conditions by producing resting eggs that are still viable even after passing through the digestive system of higher animals.

Calheiros & de Oliveira [1999] considered only 6 papers on the limnology of the Pantanal region. The first author to mention the Pantanal was Daday [1905], in his massive volume about the freshwater microfauna of Paraguay. He examined many samples collected by Prof. J. D. Anisits mainly from Paraguay, including one from "Corumba, Matto Grosso, inundation pool of the River Paraguay". From this sample he determined 17 cladoceran and two copepod species. We found 14 other papers with records of microcrustacean species: Matsumura-Tundisi [1986], Mourão [1989], Reid & Moreno [1990], Miranda [1992], Por [1995], Lima [1996], Espíndola et al. [1996], Reid (1997), Bonecker et al.

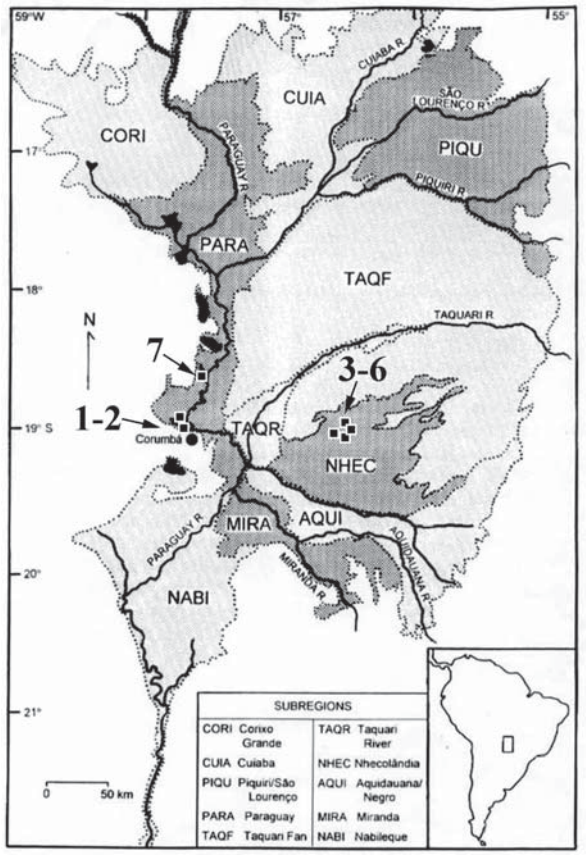


Fig. 1. Subregions of the Pantanal wetland (adopted from Hamilton et al. [1996] with kind permission of the E. Schweizerbart'sche Velagsbuchhandlung, Stuttgart).

Рис. 1. Подразделение Пантаналя на подрайоны (по Хамильтону и др. [Hamilton et al., 1996], с любезного разрешения E. Schweizerbart'sche Velagsbuchhandlung, Stuttgart).

[1998], Rocha & Por [1998], Heckman [1998a, 1998b], Santos-Silva et al. [1999], and Bezerra et al. [1999]. Four of these papers, Matsumura-Tundisi [1986], Reid & Moreno [1990], Reid [1997], Santos-Silva et al. [1999], dealt only with copepods; Miranda [1992] and Bezerra et al. [1999] determined the animals only to generic level; Daday [1905], Por [1995] and Rocha & Por [1998] presented in their lists not only Cladocera and Copepoda, but also Conchostraca and Ostracoda.

The Pantanal is not a uniform area. Eberhard [2000] wrote that it is a complex of ecosystems. Adámoli [1982] differentiated several phytogeographical areas, but for our purpose we use the subregions of Hamilton et al. [1996], which are more appropiate for freshwater animals (Fig. 1). A series of papers refers to crustaceans from the following six subregions:

Cuiabá River (CUIA): Heckman [1998 a, b];

Piquiri/São Lourenço Rivers (PIQU): Matsumura-Tundisi [1986], Lima [1996], Santos-Silva [1999];

Paraguay River (PARA): Daday [1905], Reid & Moreno [1990], Por [1995], Espíndola et al. [1996];

Nhecolândia (NHEC): Mourão [1989], Reid & Moreno [1990], Por [1995], Reid [1997];

Aquidauana/Negro Rivers (AQUI) and **Miranda River** (MIRA): Miranda [1992], Por [1995], Bonecker et al. [1998], Rocha & Por [1998], Bezerra et al. [1999].

This paper examines original samples from two subregions – the Paraguay River and Nhecolandia — of the Pantanal, summarises previous cladoceran surveys to produce a check-list for the region, and comments on the taxonomic status of some species

Study Area

Our samples were collected in the Paraguay River (samples 1–3, 7) and Nhecolândia subregions (samples 4–6) by colleagues of the Center of Agriculture Research in the Pantanal (EMBRAPA) (samples 1–2) and by one of the authors (GOB). These samples have already been studied by Koste [1999], who found 216 taxa of Rotifera.

Locality 1 (collected in 1996 and 1999) is Canal do Tamengo near the city of Corumbá, the outflow of the large floodplain lake Lagoa de Cáceres on the Bolivian side of the Paraguay River. The Canal do Tamengo is not a channel with strong currents but the waters flow slowly over a broad area. It has a mixture of waters from the Lagoa de Cáceres and waters from the Paraguay River which upstream leave the river channel and return through the Canal do Tamengo. The ionic content of the water is somewhat higher than that of the Paraguay River due to the release of solutes by weathering of carbonate rocks in the upland watersheds [Hamilton et al., 1999].

Locality 2 is the Paraguay River itself just above Corumbá. Water level fluctuations in 1996 were little more than two meters with high water in June/July. The hydrochemistry of this part of the river "represents a mixture of several upstream tributaries of diverse chemical composition" and "falls in the middle of the range of variation" of the Pantanal waters [Hamilton et al., 1999].

Locality 7 is Baia do Castelo, a floodplain lake on the right (west) side of the Paraguay River about 80 km north of Corumbá. The lake is intensively colonized by submerged and floating aquatic plants and receives water from many drainage channels from the surrounding higher lands. Oliveira & Calheiros [2000] studied the phytoplankton, which is dominated by the nanoplanctonic Cryptophyceae. Chemical data are given by Calheiros & Hamilton [1998], who reported that as the water of the Paraguay River flows over previously dry land there is a stimulation of decomposition rates of and leaching from aquatic materials. The resulting decrease of dissolved O_2 and increase of CO_2 causes fish die. How cladocerans are affected when this happens is not known. The sampling site "rompesaco" lies in the extreme northern part of the lake, which is intensively populated by floating vegetation and receives water through a channel from the Bolivian side.

Localities 4–6 are from the Nhecolândia subregion, which Hamilton et al. [1998] called the "Lake District". There are numerous lakes called baias, most of which are found at an altitude of less than 100 m [Fernandes et al., 1999]. They lie in fluvial sand deposits, which in former

times were extensive dune fields. The crests of these ancient dunes, called cordilheiras, are covered by forests. The climate is hot with a pronounced rainy season from November to March. Evaporation is high, which results in an annual water deficit [Soriano,1999]. Here there are many permanent and temporary freshwater ponds or "baias" and some saline lakes or "salinas" [Mourão, 1989; Sakamoto, 1999]. "The most dilute, and the most saline waters of the southern Pantanal are found" in the Nhecolândia subregion [Hamilton et al., 1999]. Mourão [1989] made an intensive study of the chemistry and the phytoplankton of two ponds and a saline lake. The "salina" exhibit an extremely high phytoplankton production but a very low diversity of zooplankton.

Material and Methods

The material from the Paraguay River was collected by towing a plankton net (58 µm) for five minutes slowly behind a boat. All the other samples were taken by a series of vertical net hauls and by washing out the roots of some floating water plants. All samples were fixed in 5 % formaldehyde solution.

Specimens were isolated from the samples under a stereomicroscope, placed on slides in glycerol-formaldehyde mixture, and dissected under a stereoscopic microscope for the study of their appendages and postabdomen. Drawings were prepared using a camera lucida attached to an Alphaphot compound microscope; optical photos were taken using Leitz-Dialux microscope with a system camera and interference optics. A few specimens of *Grimaldina brazzai* and *Onchobunops tuberculatus* were lyophilised, mounted on an aluminium stub, coated with gold, and examined under a scanning electron microscope (JEOL-840A).

Results

General comments

Fifty species belonging to the orders Ctenopoda Sars, 1865 (1 family) and Anomopoda Sars, 1865 (6 families) were identified in our samples (Tab. 1). The greatest number of species (30) was found in the Baia do Castelo rompesaco, followed by Canal do Tamengo (19), Baia 38 (19) and Paraguay River (18). The most abundant species in the baias were: *Diaphanosoma brevireme, Ceriodaphnia cornuta, Moina micrura, M. reticulata, Alonella dadayi, Chydorus ventricosus, Euryalona orientalis,* and *Notoalona globulosa*. A few specimens could not be

Table 1. Distribution of cladoceran species in water bodies of the southern Pantanal. Highest abundance of the species in a sample: • (1–3 specimens) — single, •• (4–10) — few, ••• (11–25) — several, •••• (26–100) — many, ••••• (more than 100) — masses. Abbreviations: eph — ephippium, pa — postabdomen.
Таблица 1. Распространение ветвистоусых ракообразных в водоемах южного Пантаналя. Обилие видов в пробе: • (1–3 экземпляра) — единично, •• (4–10) — немного, ••• (11–25) — среднее, •••• (26–100) — много, ••••• (более 100) — массовый вид. Условные обозначения: eph — эфиппиум, pa — постабдомен.

Species/ Localities:	1 Canal do Tamengo, 28.3.1996, 29.4.1998	2 River Paraguay, 2–12 1996	3 Baia 38, 1.10.1997	4 Baia 85 Salina, 1.10.1997	5 Baia 69, 1.10.1997	6 Baia 75, 1.10.1997	7 Baia do Castelo rompesaco, 23.4.1998
ORDER CTENOPODA Sars, 1865							
Sididae Baird, 1850							
Diaphanosoma brevireme Kořínek, 1981		•••••	••				•••••
Diaphanosoma spinulosum Herbst 1975	•						
Sarsilatona serricauda Sars, 1901			•		•		•••
ORDER ANOMOPODA SARS, 1865							
Daphniidae Straus, 1820							
Ceriodaphnia cornuta Sars, 1885		•••••	•••••		eph		•••
Ceriodaphnia reticulata (Jurine, 1820)		•••••					
Ceriodaphnia silvestrii Daday, 1902						•	•
Daphnia gessneri Herbst, 1967		•••••	••			••	
Simocephalus acutirostratus (King, 1853)							•••
Simocephalus latirostris Stingelin, 1906		•••					•

Table 1 (continuing).
Таблица 1 (продолжение).

Species/ Localities:	1 Canal do Tamengo, 28.3.1996, 29.4.1998	2 River Paraguay, 2–12 1996	3 Baia 38, 1.10.1997	4 Baia 85 Salina, 1.10.1997	5 Baia 69, 1.10.1997	6 Baia 75, 1.10.1997	7 Baia do Castelo rompesaco, 23.4.1998
ORDER CTENOPODA Sars, 1865							
Moinidae Goulden, 1967							
Moina micrura Kurz, 1875	•		••••				••
Moina minuta Hansen,1899		•••••			•		
Moina reticulata (Daday, 1905)		••	•••				••••
Moinodaphnia macleayi (King,1853)		••					
Ilyocryptidae Smirnov, 1976 sensu Smirnov, 1992							
Ilyocryptus sarsi Stingelin, 1913						•	
Ilyocryptus spinifer Herrick, 1882	•	••••	•				
Macrothricidae Norman & Brady, 1867							
Grimaldina brazzai Richard, 1882		••					••
Guernella raphaelis Richard, 1882	•						
Macrothrix elegans Sars, 1901	•	•••	•				••
Macrothrix spinosa King, 1853				••			•••
Onchobunops tuberculatus Fryer & Paggi, 1972							•
Bosminidae Sars, 1865							
Bosmina hagmanni Stingelin, 1904		•••••					
Bosmina tubicen Brehm, 1953	•	••	•••		••	•	•
Bosminopsis deitersi Richard, 1895	•	•••••	•		•		•
Chydoridae Stebbing, 1902							
Alona brasiliensis (Bergamin, 1935)	••						••
Alona guttata Sars, 1862							•
Alona iheringi Sars, 1901	•						
Alona monacantha Sars, 1901			•				•
Alona ossiani Sinev, 1998			•		shell, pa	shell, pa	
Alona rectangula Sars, 1862						••	
Alona verrucosa Sars, 1901			•		shell		•
Alonella dadayi Birge, 1910		•	••••				
Camptocercus dadayi Stingelin, 1913							•
Chydorus eurynotus Sars, 1901		•					
Chydorus nitidulus (Sars, 1901)							••
Chydorus pubescens Sars, 1901			shell				
Chydorus ventricosus Daday, 1898	••						••••
Chydorus sp.			•	shell	••	shell	•
Dunhevedia odontoplax Sars, 1901	•	•					•
Ephemeroporus hybridus (Daday, 1905)			•		shell		••

Table 1 (continuing).
Таблица 1 (продолжение).

Species/ Localities:	1 Canal do Tamengo, 28.3.1996, 29.4.1998	2 River Paraguay, 2–12 1996	3 Baia 38, 1.10.1997	4 Baia 85 Salina, 1.10.1997	5 Baia 69, 1.10.1997	6 Baia 75, 1.10.1997	7 Baia do Castelo rompesaco, 23.4.1998
ORDER CTENOPODA Sars, 1865							
Chydoridae Stebbing, 1902							
Ephemeroporus tridentatus (Bergamin, 1939)						•	
Euryalona orientalis (Daday, 1898)	••		•				••••
Karualona muelleri (Richard, 1897)	••				•		••
Kurzia polyspina Hudec, 2000	•						••
Leydigia cf. *striata* Biraben, 1939		•					
Leydigiopsis ornata Daday, 1905	•		•				•
Notoalona globulosa (Daday, 1898)	••				•		••••
Oxyurella longicaudis Birge, 1910	••						
Oxyurella sp.	•						
Pleuroxus sp.						•	
Pseudochydorus globosus (Baird, 1848)	•						
NUMBER OF TAXA	19	18	19	2	11	9	29

identified as they consisted of solitary individuals or shells. In the samples from Paraguay River pelagic *Daphnia, Ceriodaphnia, Moina* and *Bosmina* were dominant. The majority of species we found (39) are typical representatives of the tropical fauna (see Figs. 2, 5–6 for some optical photos). A significant number (27) is Neotropical, penetrating only the southern portion of Nearctic zone (Figs. 3–4, 7–9). About half of the species collected are new records for Pantanal (Tab. 2). To date the check-list of species from Pantanal, according to our and previously published data, consists of 68 taxa determined to species level, and a further 19 taxa to genera; however, some

Table 2. Occurrence of cladoceran species in the different subregions of the Pantanal (according to our and literature data), see comments below.
Таблица 2. Встречаемость ветвистоусых ракообразных в различных районах Пантаналя (по нашим и литературным данным), см. комментарии ниже.

Species	PARA This paper	NHEC This paper	PARA Daday [1905], Espindola et al. [1996]	NHEC Mourao [1989]	AQUI Bonecker et al. [1998], Miranda [1992], Bezerra et al. [1999]	MIRA Bonecker et al. [1998], Miranda [1992], Rocha & Por [1998]	PIQU Lima [1996]	CUIA Heckman [1998a, b], Rocha & Por [1998]
CTENOPODA								
Sididae								
Diaphanosoma birgei			x				x	X
Diaphanosoma brevireme	x	x	x					
Diaphanosoma spinulosum	x							
Diaphanosoma sp.				x	x	x		

Table 2 (continuing).
Таблица 2 (продолжение).

Species	PARA This paper	NHEC This paper	PARA Daday [1905], Espindola et al. [1996]	NHEC Mourao [1989]	AQUI Bonecker et al. [1998], Miranda [1992], Bezerra et al. [1999]	MIRA Bonecker et al. [1998], Miranda [1992], Rocha & Por [1998]	PIQU Lima [1996]	CUIA Heckman [1998a, b], Rocha & Por [1998]
CTENOPODA								
Sididae								
Latonopsis fasciculata			x					
Pseudosida sp.				x				
Sarsilatona serricaudata	x	x						
Sida crystallina (1)								X
ANOMOPODA								
Daphniidae								
Ceriodaphnia cornuta	x	x	x	x	x	x	X	X
Ceriodaphnia reticulata	x							
Ceriodaphnia rigaudi			x					
Ceriodaphnia silvestrii (2)	x	x						
Ceriodaphnia sp.					x	x		
Daphnia gessneri	x	x						
Daphnia sp.				x				
Megafenestra aurita (2)								X
Scapholeberis mucronata (2)			x					
Scapholeberis sp.						x		
Simocephalus acutirostratus	x							
Simocephalus latirostris	x							
Simocephalus serrulatus			x					X
Simocephalus sp.						x		
Moinidae								
Moina micrura (3)	x	x	x					X
Moina minuta	x	x	x	x				
Moina reticulata	x	x						
Moina sp.					x	x		
Moinodaphnia macleayi	x		x		x	x		
Moinodaphnia sp.						x		
Ilyocryptidae								
Ilyocryptus sarsi		x						
Ilyocryptus sordidus (2)						x		X
Ilyocryptus spinifer	x	x		x	x	x		X
Ilyocryptus sp.						x		
Macrothricidae								
Grimaldina brazzai	x							

Table 2 (continuing).
Таблица 2 (продолжение).

Species	PARA This paper	NHEC This paper	PARA Daday [1905], Espindola et al. [1996]	NHEC Mourao [1989]	AQUI Bonecker et al. [1998], Miranda [1992], Bezerra et al. [1999]	MIRA Bonecker et al. [1998], Miranda [1992], Rocha & Por [1998]	PIQU Lima [1996]	CUIA Heckman [1998a, b], Rocha & Por [1998]
ANOMOPODA								
Macrothricidae								
Guernella raphaelis	x							
Macrothrix elegans (4)	x	x	x					
Macrothrix latcornis (2)			x				X	
Macrothrix spinosa	x	x			x	x		
Macrothrix sp.						x		
Onchobunops tuberculatus	x							
Bosminidae								
Bosmina hagmanni	x		x		x	x	x	
Bosmina longirostris (2)				x				x
Bosmina macrostyla (2)			x					
Bosmina tenuirostris (2)			x					
Bosmina tubicen	x	x					x	
Bosmina sp.					x	x		
Bosminopsis deitersi (5)	x	x	x					
Bosminopsis sp.				x	x	x		
Chydoridae								
Acroperus sp.						x		
Alona brasiliensis (6)	x							
Alona costata								x
Alona dentifera (6)			x					
Alona guttata	x						x	
Alona iheringi (7)	x							
Alona intermedia			x					
Alona monacantha	x	x	x				x	
Alona ossiani		x						
Alona rectangula-type		x						
Alona verrucosa	x	x						
Alona sp.				x	x	x		
Alonella clathratula			x					
Alonella dadayi (8)	x	x	x			x	x	
Alonella sp.					x	x		
Camptocercus dadayi (9)	x					x		
Chydorus eurynotus	x							
Chydorus nitidulus	x							

Table 2 (continuing).
Таблица 2 (продолжение).

Species	PARA This paper	NHEC This paper	PARA Daday [1905], Espindola et al. [1996]	NHEC Mourao [1989]	AQUI Bonecker et al. [1998], Miranda [1992], Bezerra et al. [1999]	MIRA Bonecker et al. [1998], Miranda [1992], Rocha & Por [1998]	PIQU Lima [1996]	CUIA Heckman [1998a, b], Rocha & Por [1998]
ANOMOPODA								
Chydoridae								
Chydorus pubescens		x						
Chydorus sphaericus			x					
Chydorus ventricosus	x					x		
Chydorus sp.	x	x		x	x	x		x
Dunhevedia odontoplax	x					x		
Ephemeroporus hybridus	x	x						
Ephemeroporus tridentatus		x						
Euryalona orientalis	x	x				x		
Karualona karua (10)						x		
Karualona muelleri (10)	x	x						
Kurzia polyspina	x							
Leptorhynchus dentifer (2)			x					
Leydigia striata	x							
Leydigiopsis curvirostris						x		
Leydigiopsis cf. *megalops*						x		
Leydigiopsis ornata	x	x				x		
Leydigiopsis sp.						x		
Notoalona globulosa (11)	x	x				x		
Oxyurella longicaudis	x					x		
Oxyurella sp.	x					x		
Pleuroxus scopuliferus			x					
Pleuroxus sp.		x				x		
Pseudochydorus globosus	x							
ONYCHOPODA								
Polyphemidae								
Polyphemus sp. (1)						x		
Number of taxa	44	28	24	10	13	35	8	11

1) very dubious record;
2) record must be checked;
3) including *Moina micrura ciliata Daday, 1905,* which is regarded as a subspecies of *M. micrura* Kurz, 1875, but this must be checked;
4) including records of *M. superaculeata* and *M. triserialis*, which are apparently misidentifications of *M. elegans*;
5) *Bosminella anisitsi Daday, 1903* is a jun. syn. of *Bosminopsis deiter*si Richard, 1895;
6) recently transferred to the genus *Alona*, previously these were determined as *Alonella*;
7) see text;
8) *Phryxura dadayi = Alonella dadayi;*
9) Apparently determinations of *Camptocercus australis* were dealing with *C. dadayi;*
10) Recently separated into genus *Karualona* Dumont & Silva-Briano, 2000, previously these were determined as *Alona, Biapertura* or *Alonella*;
11) Earlier it was placed into *Indialona* or *Alonella*.

Table 3. Occurrence of cladoceran species in the Pantanal and Paraná (Brazil). See comments to species below table 2. Distribution: C — cosmopolitan, N — Neotropical, penetrating southern portion of Nearctic zone, H — Holarctic, sometimes penetrating other zones, T — tropicopolitan, U — unknown.
Таблица 3. Встречаемость ветвистоусых ракообразных в Пантанале и Паране (Бразилия), см. также комментарии к Таб. 2. Распространение: C — космополитическое, N — неотропическое с проникновением в южную часть неарктической зоны, H — голарктическое, изредка с проникновением в другие зоны, T — циркумтропическое, U — неясно.

Species	Distribution	Pantanal (this paper)	Pantanal (previous papers, in total)	Parana [Lansac-Toha et al., 1997]
CTENOPODA				
Sididae				
Diaphanosoma birgei	N		x	x
Diaphanosoma brevireme	N	x	x	x
Diaphanosoma fluviatile	N			x
Diaphanosoma spinulosum	N	x		x
Diaphanosoma sp.			x	
Latonopsis fasciculata	N		x	
Pseudosida sp.			x	
Sarsilatona serricauda	N	x		x
Sida crystallina	H		x	
ANOMOPODA				
Daphniidae				
Ceriodaphnia cornuta	C	x	x	x
Ceriodaphnia reticulata	C	x		
Ceriodaphnia rigaudi	T		x	
Ceriodaphnia silvestrii	N	x		
Ceriodaphnia sp.			x	
Daphnia gessneri	N	x		x
Daphnia sp.			x	
Megafenestra aurita	P		x	
Scapholeberis mucronata	P		x	
Scapholeberis sp.			x	x
Simocephalus acutirostratus	T	x		
Simocephalus latirostris	N	x		
Simocephalus serrulatus	C		x	x
Simocephalus vetulus	C			x
Simocephalus sp.			x	
Moinidae				
Moina micrura	C	x	x	
Moina minuta	N	x	x	x
Moina reticulata	N	x		
Moina sp.			x	
Moinodaphnia macleayi	T	x	x	
Moinodaphnia sp.			x	
Ilyocryptidae				
Ilyocryptus sarsi	N	x		
Ilyocryptus sordidus	C		x	

Table 3 (continuing).
Таблица 3 (продолжение).

Species	Distribution	Pantanal (this paper)	Pantanal (previous papers, in total)	Parana [Lansac-Toha et al., 1997]
ANOMOPODA				
Ilyocryptidae				
Ilyocryptus spinifer	T	x	x	x
Ilyocryptus sp.			x	
Macrothricidae				
Grimaldina brazzai	T	x		x
Guernella raphaelis	T	x		
Macrothrix elegans	N	x	x	x
Macrothrix laticornis	C		x	
Macrothrix spinosa	T	x	x	x
Macrothrix sp.			x	
Onchobunops tuberculatus	N	x		x
Bosminidae				
Bosmina hagmanni	N	x	x	x
Bosmina longirostris	C		x	
Bosmina macrostyla	N		x	
Bosmina tenuirostris	N		x	
Bosmina tubicen	N	x	x	x
Bosmina sp.			x	
Bosminopsis deitersi	C	x	x	x
Bosminopsis sp.			x	
Chydoridae				
Acroperus sp.			x	
Acroperus harpae	C			x
Alona affinis	C			x
Alona brasiliensis	N	x		
Alona costata	C		x	
Alona dentifera	N		x	x
Alona cf. *glabra*	U			x
Alona guttata	C	x	x	
Alona iheringi	N	x		
Alona intermedia	C		x	
Alona monacantha	U	x	x	x
Alona ossiani	N	x		
Alona rectangula-type	C	x		
Alona verrucosa	T	x		
Alona sp.			x	x
Alonella clathratula	T		x	
Alonella dadayi	N	x	x	x
Alonella sp.			x	
Camptocercus dadayi	N	x	x	x

Table 3 (continuing).
Таблица 3 (продолжение).

Species	Distribution	Pantanal (this paper)	Pantanal (previous papers, in total)	Parana [Lansac-Toha et al., 1997]
ANOMOPODA				
Chydoridae				
Chydorus eurynotus	T	x		x
Chydorus nitidulus	N	x		
Chydorus pubescens	T	x		x
Chydorus sphaericus	C		x	
Chydorus ventricosus	T	x	x	
Chydorus sp.		x	x	
Dunhevedia odontoplax	N	x	x	x
Ephemeroporus hybridus	N	x		
Ephemeroporus tridentatus	N	x		
Euryalona orientalis	T	x	x	x
Graptoleberis testudinaria	C			x
Karualona karua	T		x	x
Karualona muelleri	N	x		
Kurzia latissima	C			x
Kurzia polyspina	N	x		
Leptorhynchus dentifer	N		x	
Leydigia striata	N	x		
Leydigia sp.				x
Leydigiopsis brevirostris	N			x
Leydigiopsis curvirostris	N		x	x
Leydigiopsis cf. *megalops*	N		x	
Leydigiopsis ornata	N	x	x	
Leydigiopsis sp.			x	
Nicsmirnovius eximius	T			x
Notoalona globulosa	T	x	x	x
Oxyurella cf. *ciliata*	N			x
Oxyurella longicaudis	N	x	x	
Oxyurella sp.		x	x	
Pleuroxus scopuliferus	N		x	
Pleuroxus sp.		x	x	
Pseudochydorus globosus	C	x		
ONYCHOPODA				
Polyphemidae				
Polyphemus sp.	H		x	
Number of taxa		50	63	40

records are dubious while others must be confirmed by further investigations. Among the 40 species from the Paraná [Lansac-Tôha et al., 1997] there are 7 species that have not been found in the Pantanal (Tab. 3). We are sure that some of them, for example *Niscmirnovius eximius*, *Graptoleberis testudinaria* and *Oxyurella ciliata*, will eventually be found there, whereas *Alona affinis* is, most probably, a misidentification of *A. ossiani*.

Comments on selected species

A. Family ILYOCRYPTIDAE Smirnov, 1976 emend. Smirnov, 1992

1. *Ilyocryptus sarsi* Stingelin, 1913

COMMENTS: This species, which has recently been redescribed by Kotov et al. [2002: 208–219, Figs. 1–60] from material from the Pantanal (Baia 75), is one of the two most common *Ilyocryptus* species recorded from Brazil. It is unlike the European *I. sordidus* (Liévin, 1848) and most of the Brazilian records of "*I. sordidus*" (see Table 2 and 3) seem to be dealing with *I. sarsi* (also see Kotov et al. [2002]). Daday [1905] recorded *I. sordidus* in his Paraguayan samples but this is in fact *I. paranaensis* Paggi, 1989 (P. Štifter, personal communication based on study of Daday's original material). We did not find *I. paranaensis* in our material.

2. *Ilyocryptus spinifer* Herrick, 1882

COMMENTS: Kotov & Williams [2000: 68–79, Figs. 1–91] selected a neotype and redescribed *I. spinifer* s. str. from the North American continent. Kotov & Dumont [2000: 88–100, Figs. 1–149] analyzed many populations from different countries (see intensive synonymy in these publications) including material from Pantanal (Baia 38 and Baia do Castelo). This is one of the most common anomopods in tropical water bodies of different types. It is well-differentiated from other species.

B. Family MACROTHRICIDAE Norman & Brady, 1867 emend. Smirnov, 1992

3. *Grimaldina brazzai* Richard, 1892
Figs. 10–40.

Sars, 1901; 28–31, Pl. 5; Daday, 1905: 192–193; Martínez de Ferrato, 1966: 403, Pl. 2: Fig. 5; Fryer, 1974: 236–238, Figs. 128–129; Smirnov, 1976: 155–156, Figs. 137–140; Brandorff et al., 1982: 103, Fig. 79; Smirnov, 1992: 107–109, Figs. 461–468; Paggi, 1995: Figs. 87–88; Elmoor-Loureiro, 1998: 24; Silva-Briano, 1998: 149–151, Figs. 1–10.

Type locality: "Mayoumba et Caca Mueca", Congo, Africa

Parthenogenetic female: Body subquadrangular to ovoid, relatively high and significantly compressed laterally. Border between head and valves as a very shallow depression, dorsal margin of valves straight or even concave, postero-dorsal angle distinct. Dorsal margin finely serrated; this serration is connected with specific reticulations and looks like fish scales. On lateral surface of head and valves reticulation appears as a system of dorso-ventral striae. Head triangular-rounded, with short rostrum; ventral margin generally straight, with a small outgrowth like a transversal plate posterior to antenna I, a minute frontal head pore near distal extremity of rostrum, dorsal head pore completely absent. Labrum in general subquadrangular, with high, setulated projection at antero-ventral angle, naked projection at postero-ventral angle, and large, setulated distal labral plate. Compound eye small, ocellus somewhat smaller than eye, located near rostrum. Valves large, with numerous marginal setae; in anterior half of ventral margin these setae are thicker and shorter, while in posterior half longer and thinner. Postero-ventral region with series of short, setulated spines, a solitary seta located submarginally on inner surface dorsally to the series of spines. Posterior margin with fine setules. Postabdomen large, significantly compressed laterally, with longitudinal keel along entire preanal margin. Preanal margin with fine spines, subdivided into two lobes, a bunch of fine setules near the boundary between the lobes; postanal and anal margins with series of plumose setae, a solitary seta at posterior edge of anus. Postabdominal setae longer than postabdomen, with distal segment half the length of the basal segment. Postabdominal claw relatively robust, with a single basal spine, two rows of setules along dorsal margin and a series of fine setules along ventral margin. Antenna I long, thin, "rod-like" in terms of Smirnov [1992], with a sensory seta arising at distance ¼ of its length from base, setules along its posterior margin, a row of robust denticles around its distal end, and 9 aesthetascs of unequal size. Antenna II long, two sensory setae of similar size at coxal part, basal segment cylindrical, all branch segments elongated, with concentric rows of small denticles. Antennal formula: setae 0-0-1-3/1-1-3, spines 0-1-0/0-0-1. Swimming setae not too long (shorter than basal segment plus rami), the largest seta (basal lateral swimming seta of endopod) asymmetrically armed with short setules distally, all other lateral and apical setae with bilaterally setulated basal segments, and asymmetrically armed distal segments, chitinous insertions within each distal segment near joint with basal segment. All spines thin, about three times shorter than segments from which they arise. Limb I with ODL bearing a single, large seta, IDL with three setae, and gnathobase I with two setae of unequal size. Other limbs as described by Silva-Briano [1998]. Size 590–670 µm in our material, up to 820 µm according to Sars [1901].

Ephippial female and male: See Sars [1901].

COMMENTS: This taxon seems to be tropicopolitan, but must be revised. The most detailed revision of African and South American populations by Silva-Briano [1998] did not reveal any significant differences in their morphology, but only a very limited number of parthenogenetic females was studied.

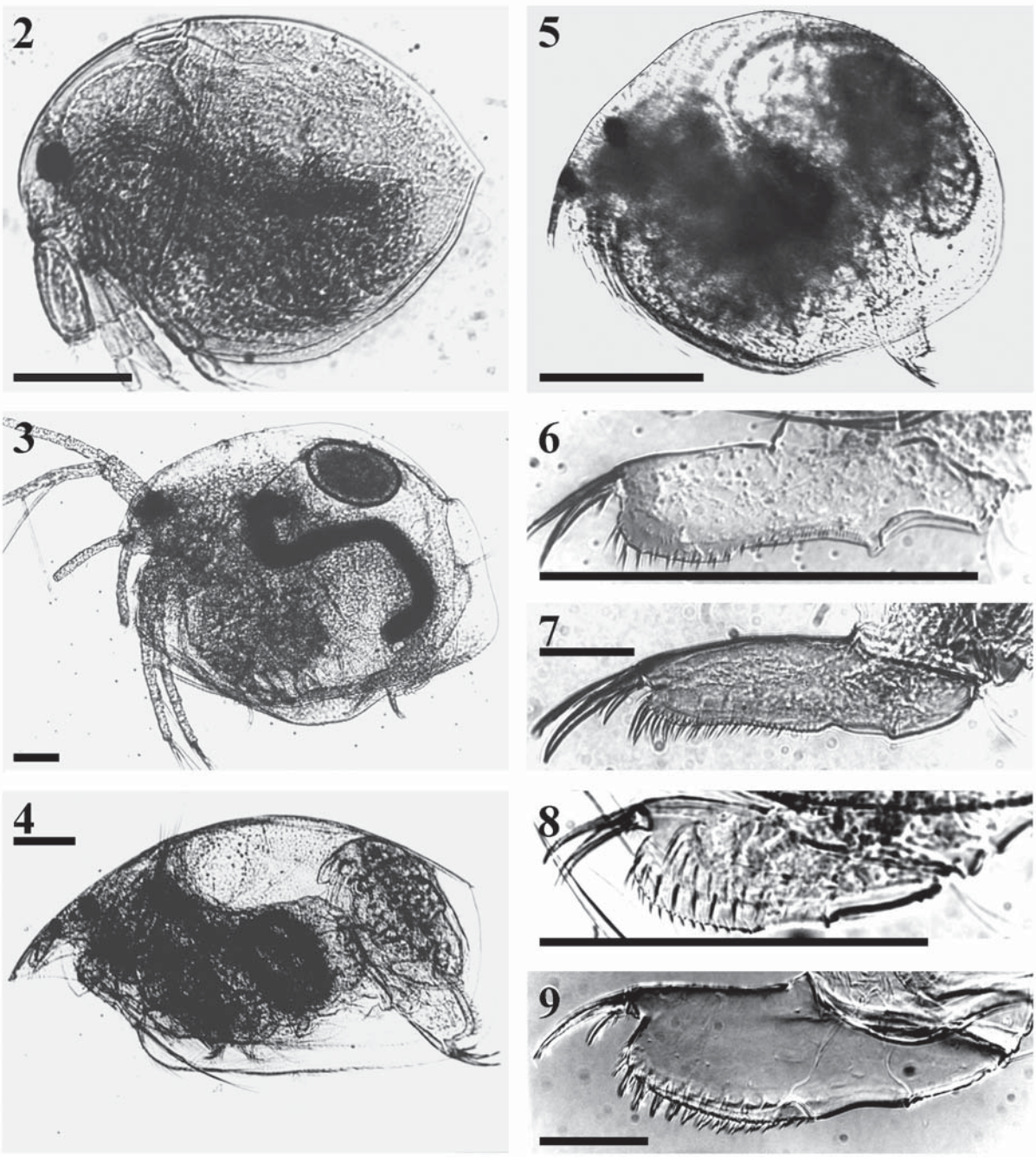
4. *Macrothrix elegans* Sars, 1901

COMMENTS: This species, described from Brazil, was for a long time confused with Afro-Asiatic *M. triserialis* Brady, 1886. Dumont et al. [2002] pointed out intercontinental differences of members from the *triserialis*-group, but decided that *M. superaculeata* Smirnov, 1982 is a junior synonym of *M. elegans*. More recently Kotov et al. [2003a] studied many Neotropical populations of *M. elegans* (see intensive synonymy here), including material from Baia do Castelo, and concluded that *M. superaculeata* is a valid, but relatively rare species. We did not find it in our Pantanal samples, but it will probably be found in the future. All previous determinations of *M. superaculeata* must be re-examined, because Smirnov's [1992] key, which determines both species by the presence or absence of large additional spines on segments of the 4-segmented antennal branch, is not correct, as both species have these spines.

5. *Macrothrix spinosa* King, 1853
Figs. 41–55.

Richard, 1897: 286–287 (*laticornis*); Sars, 1901: 36–37; Pl. 6: Figs. 10–12 (*squamosa*); Daday, 1905: 194–195 (*laticornis*); Harding, 1955: 339, Figs. 40–44 (*laticornis*); Smirnov, 1976: 72–79, Figs. 40–47; Smirnov, 1992: 29–35, Figs. 60–93; Elmoor-Loureiro, 1998: 25; Silva-Briano, 1998: 346–348, Figs. 1–45.

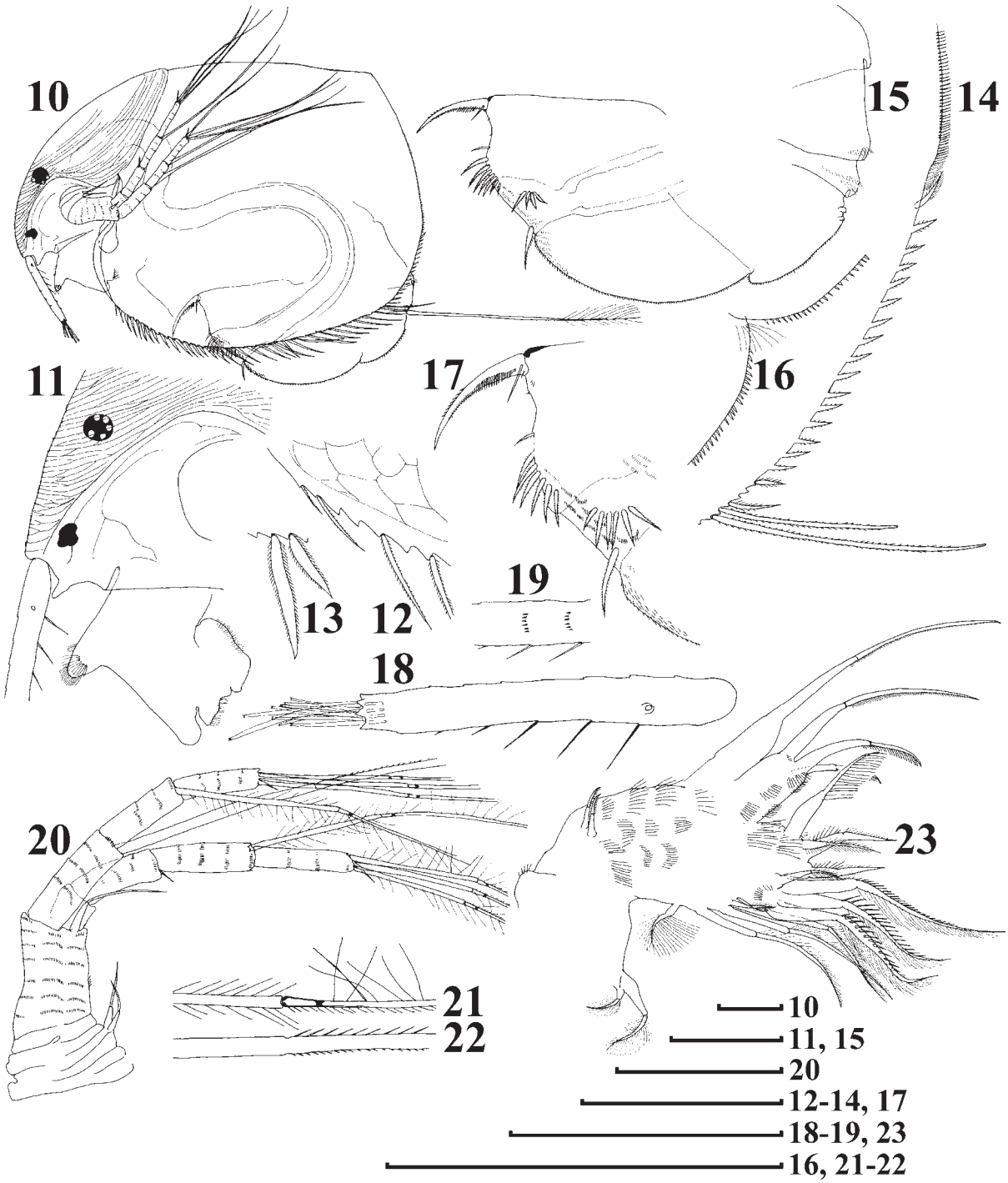
Type locality: "A pond between Sydney and Liverpool, now destroyed by urbanization" [Smirnov, 1992], New South Wales, Australia.



Figs. 2–9. Selected anomopods from Pantanal, Mato Grosso do Sul, Brazil: 2 — *Guernella raphaelis* from Canal do Tamengo; 3 — *Onchobunops tuberculatus* from Baia do Castelo; 4 — *Alona ossiani* from Baia 38 in Nhecolândia; 5 — *Chydorus ventricosus* from Baia do Castelo; 6 — its postabdomen; 7 — postabdomen of *Oxyurella longicaudis* from Canal do Tamengo; 8 — *Karualona muelleri* from Canal do Tamengo; 9 — postabdomen of *Alona ossiani* from Baia 38. Scales: 100 μm.

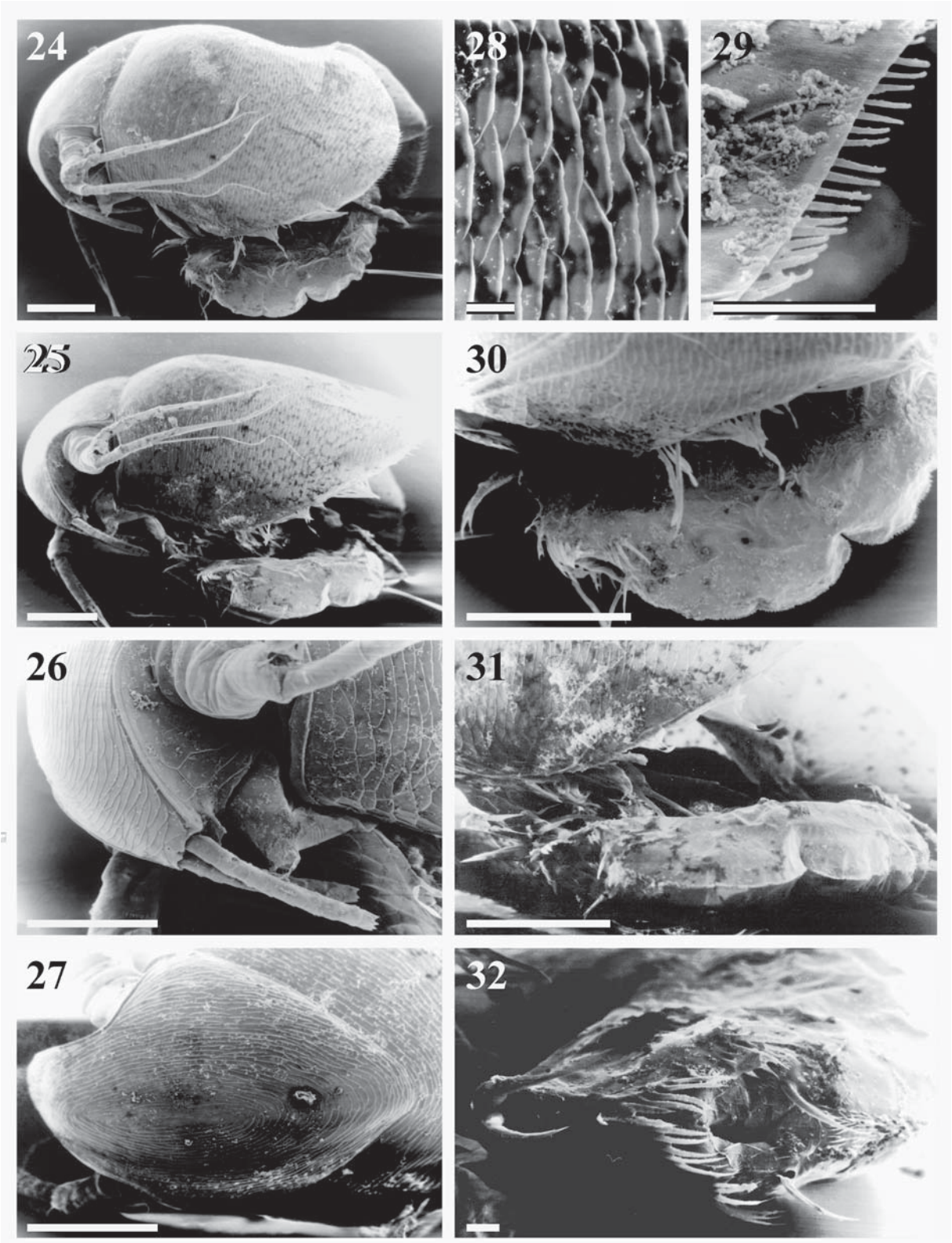
Рис. 2–9. Некоторые представители Anomopoda из Пантаналя, Мато Гроссо ду Сул, Бразилия. 2 — *Guernella raphaelis* из Canal do Tamengo; 3 — *Onchobunops tuberculatus* из Baia do Castelo; 4 — *Alona ossiani* из Baia 38; 5 — *Chydorus ventricosus* из Baia do Castelo; 6 — его постабдомен; 7 — постабдомен *Oxyurella longicaudis* из Canal do Tamengo; 8 — *Karualona muelleri* из Canal do Tamengo; 9 — постабдомен *Alona ossiani* из Baia 38. Масштаб: 100 μm.

Parthenogenetic female: Body ovoid in lateral view, somewhat compressed laterally, with well-developed dorsal keel. Dorsal margin finely serrated along entire length, regularly curved from tip of rostrum to rounded postero-dorsal angle. Reticulation well-expressed on head, valves, and postabdomen. Head relatively large, with relatively small, ovoid dorsal head pore; in lateral view head triangular-round, with short rostrum, minute frontal head pore near its tip, ventral margin of head concave. Eye large, ocellus small, located closer to tip of rostrum than eye. Labrum subquadrangular, with a small projection at postero-ventral angle and relatively large distal labral plate. Valves ovoid, with serrated free margin due to



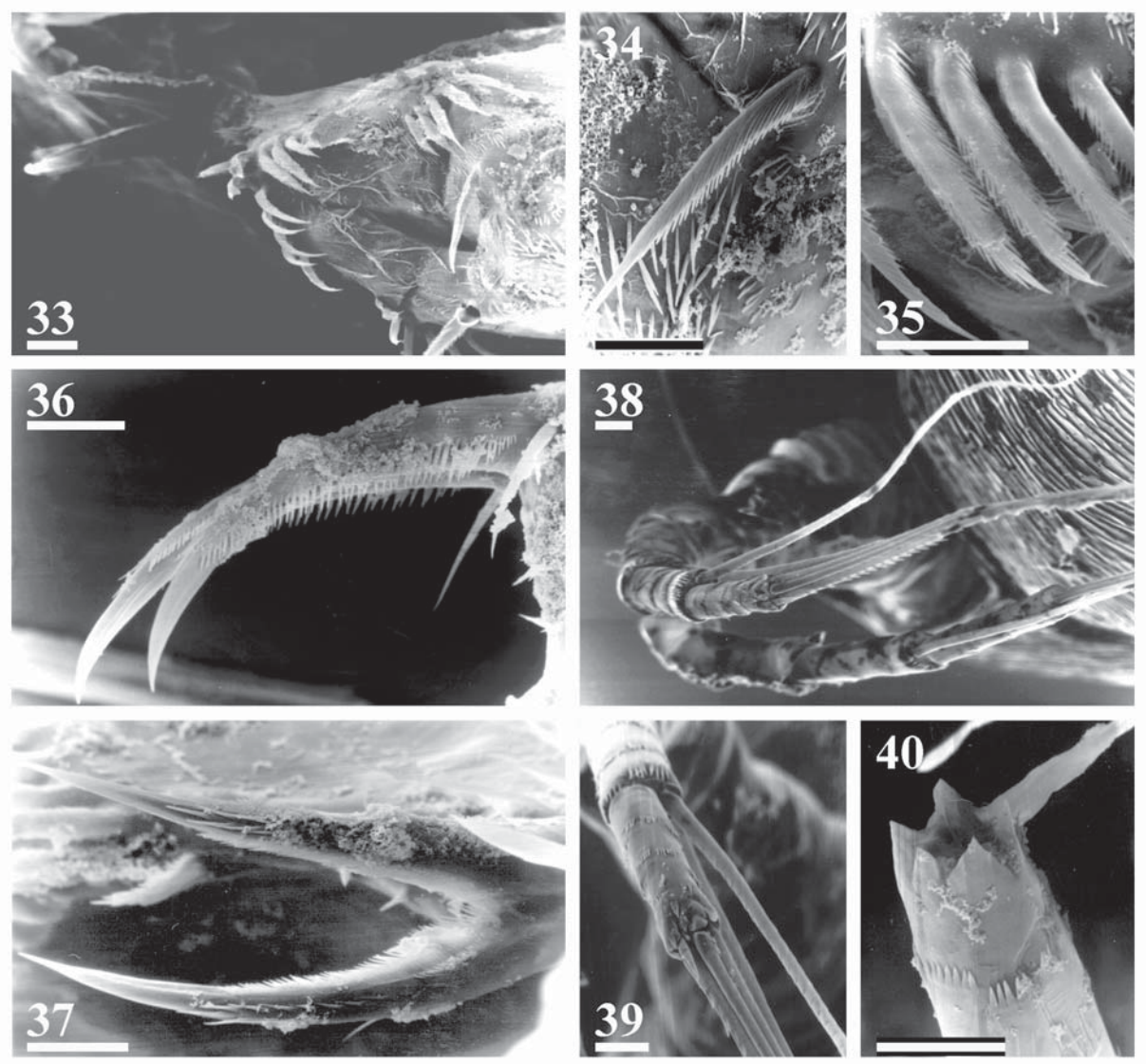
Figs. 10–23. *Grimaldina brazzai*, parthenogenetic female from Baia do Castelo: 10–11 — adult in lateral view and its head; 12–13 — setae at anterior portion and middle of ventral margin; 14 — postero-ventral portion of valve; 15–17 — postabdomen, its preanal margin and distal portion; 18–19 — antenna I and its medial portion; 20 — antenna II; 21–22 — its apical and largest (basal) lateral swimming seta; 23 — thoracic limb I. Scales: 100 μm.

Рис. 10–23. *Grimaldina brazzai*, партеногенетическая самка из Baia do Castelo: 10–11 — вид сбоку и голова; 12–13 — щетинки в передней части и середине брюшного края; 14 — задне-брюшная часть створки; 15–17 — постабдомен, его преанальный край и дистальная часть; 18–19 — антенна I и ее средняя часть; 20 — антенна II; 21–22 — ее апикальная и наибольшая латеральная плавательная щетинка; 23 — нога I. Масштаб: 100 μm.



Figs. 24–32. *Grimaldina brazzai*, parthenogenetic female from Baia do Castelo: 24–25 — adult in lateral and latero-ventral view; 26–27 — head in latero-ventral and dorsal view; 28 — reticulation of valves; 29 — armature of posterior margin of valve; 30–32 — postabdomen in lateral and dorsal view, and its distal portion in distal view. Scales: 100 μm for 24–27, 30–31; 10 μm for 28–29, 32.

Рис. 24–32. *Grimaldina brazzai*, партеногенетическая самка из Baia do Castelo: 24–25 — вид сбоку и латеро-вентрально; 26-27 — голова латеро-вентрально и со спины; 28 — скульптура створки; 29 — вооружение заднего края створки; 30–32 — постабдомен, вид сбоку и со спины, и его дистальная часть. Масштаб: 100 μm для 24–27, 30–31; 10 μm для 28–29, 32.



Figs. 33–40. *Grimaldina brazzai*, parthenogenetic female from Baia do Castelo: 33–35 — distal portion of postabdomen in dorsal view, and its setae; 36–37 — postabdominal claws in lateral and ventral view; 38–39 — antenna II and its distal segment; 40 — distal portion of antenna I. Scales: 10 μm.

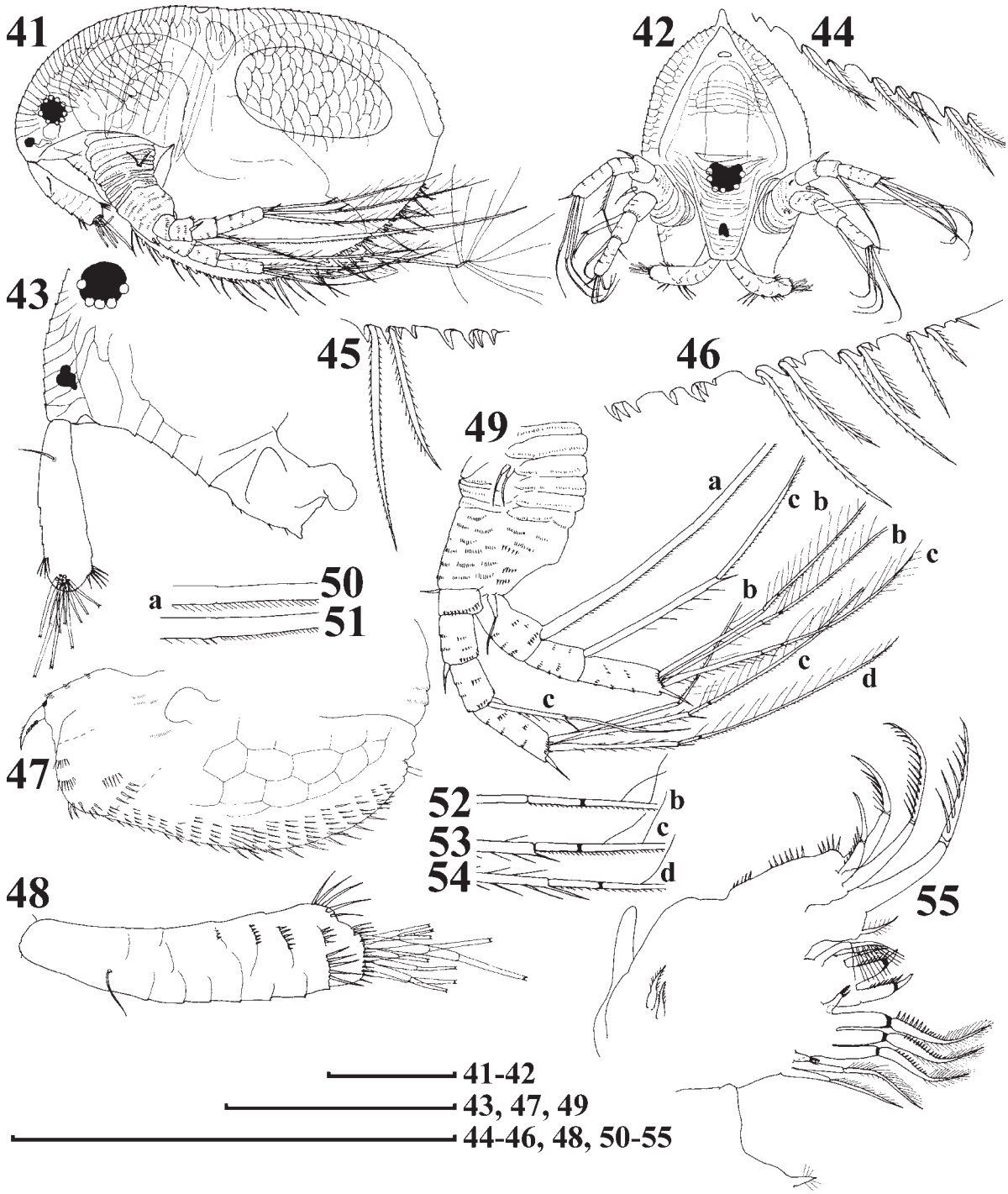
Рис. 33–40. *Grimaldina brazzai*, партеногенетическая самка из Baia do Castelo: 33–35 — дистальная часть постабдомена, вид со спины, и щетинки на ней; 36–37 — постабдоминальные когти, вид сбоку и с брюшной стороны; 38–39 — антенна II и ее дистальный членик; 40 — дистальная часть антенны I. Масштаб: 10 μm.

presence of marginal triangular teeth here and marginal setae articulated exactly to these teeth. Postabdomen sub-quadrangular, not bilobed, truncated distally, without a "heel" basally. Transverse rows of setules on preanal margin, postanal margin very small. Postabdominal setae short, as long as postabdomen or shorter, with very short distal segment, armed with a bunch of long setules. Postabdominal claws small, armed with rows of denticles along dorsal and ventral margins. Antenna I relatively short and robust for the genus, significantly widened distally, with a short sensory seta arising at distance of ¼ of antenna length from its base, with robust setules distally, row of setules around distal end, nine aesthetascs of significantly different sizes. Antenna II relatively large, with two sensory setae on coxal part, robust basal segment and elongated branches with rows of denticles. Antennal formula: setae 0-0-1-3/1-1-3, spines 0-1-0-1/0-0-1. Largest (basal lateral) seta significantly longer than the rest, unilaterally setulated, other setae armed in different manner, as is shown in Figs 52–54. Limb I with ODL supplied with a large and a rudimentary seta, IDL with 3 setae of different size and series of setules, a very short seta on gnathobase I. Size 320-450 μm in our material, up to 540 μm according to Smirnov [1992].

Ephippial female: was not described from South America.

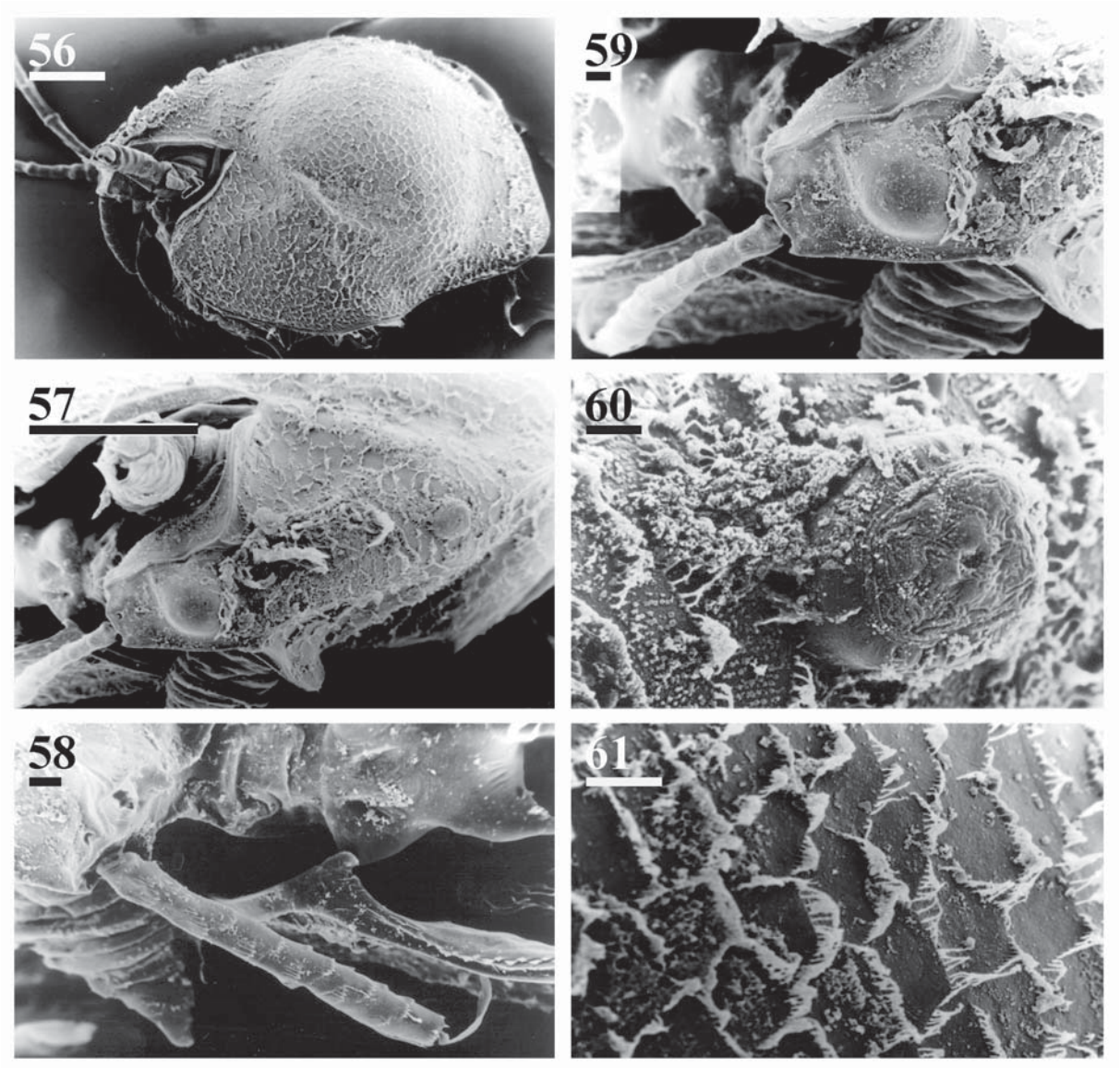
Male: see Smirnov [1992].

COMMENTS. Most probably, the *M. laticornis* reported by Richard [1897], Daday [1905] and Harding [1955] is *M. spinosa*, a very common species from South America. The difference between "serrated" and "squamose" dorsal outline of the valve — the main distinctive trait in all old and recently used keys — is quite subjective, and is not supported by any morphometric data for these conditions. This confusion accounts for many of the misidentifications from different regions of the world. Real differences between *laticornis* and



Figs. 41–55. *Macrothrix spinosa*, parthenogenetic female from Baia do Castelo: 41–42 — adult in lateral and anterior view; 43 — head; 44–46 — setae at antero-ventral, middle, and postero-ventral part of valve; 47 — postabdomen; 48 — antenna I; 49 — antenna II; 50–51 — largest basal (lateral) seta in two specimens; 52–54 — swimming setae of three types in antenna II; 55 — thoracic limb I. Scales: 100 μm.

Рис. 41–55. *Macrothrix spinosa*, партеногенетическая самка из Baia do Castelo: 41–42 — вид сбоку и спереди; 43 — голова; 44–46 — щетики в передне-брюшной, средней и задне-брюшной части створки; 47 — постабдомен; 48 — антенна I; 49 — антенна II; 50–51 — наибольшая латеральная щетинка двух самок; 52–54 — плавательные щетинки трех типов на антенне II; 55 — нога I. Масштаб: 100 μm.



Figs. 56–61. *Onchobunops tuberculatus*, parthenogenetic female from Baia do Castelo: 56 — adult in lateral view; 57–58 — head in dorsal and latero-ventral view; 59 — anterior head portion with frontal head pore and supra-ocular dome; 60 — dorsal head pore; 61 — sculpture of valves. Scales: 100 μm for 56–57, 10 μm for 58–61.

Рис. 56–61. *Onchobunops tuberculatus*, партеногенетическая самка из Baia do Castelo: 56 — вид сбоку; 57–58 — голова сбоку и латеро-вентрально; 59 — передняя часть головы с фронтальной головной порой и глазным куполом; 60 — спинная "головная пора"; 61 — скульптура створок. Масштаб: 100 μm для 56–57, 10 μm для 58–61.

spinosa groups concern the thoracic limbs [Silva-Briano, 1998; Silva-Briano et al., 1999]. Sars [1901] discussed differences between his *M. squamosa* and *M. laticornis*, but said nothing about *M. spinosa*, perhaps because he did not know King's species. Only a new, more detailed revision can reveal the true status of South American *spinosa*-like populations. Smirnov [1992] discussed the possibility of *M. goeldi* Richard, 1897 as a junior synonym of *M. spinosa*, but populations from the non-tropical regions of the southern South American continent ("*M. goeldi*") must be checked.

6. *Onchobunops tuberculatus* Fryer & Paggi, 1972
Figs. 3, 56–61.

Fryer & Paggi, 1972: 255–261, Figs. 1–13; Fryer, 1974: 204–211, Figs. 78–90; Smirnov, 1976: 148, Fig. 133; 1988: 76, Fig. 35; 1992: 106–107, Figs. 454–458; Paggi, 1995: Figs. 77–78; Silva-Briano, 1998: 136–138, Figs. 31–40; Silva-Briano & Dumont, 2001: 25–27, Figs. 31–40 (*Bunops*); Elías-Gutiérrez et al., 2001: 46, Fig. 13.

? Daday, 1905: 195, pl. 12: Figs. 15–17 (*Macrothrix gibbera*).

Type locality: "Madrejón Don Felipe also known as Laguna Ramirez — a lagoon lying between the Rio Colastine and the Rio Santa Fe, between the towns of Santa Fe and Paraná" [Fryer & Paggi, 1972], Argentina.

Parthenogenetic female: Body high, almost globular, with slight dorsal keel. Dorsal margin arched from tip of rostrum to broadly round postero-dorsal angle, border between head and valves not expressed. Reticulation on valves and head, rows of setules arising from striae of reticulation, due to this dorsal margin squamose. Head small, with straight ventral margin and convex dorsal margin, massive supra-ocular dome and a relatively large projection for dorsal head pore elevated under

the latter, rostrum short, with frontal head pore. Valves in general ovoid, a projection on ventral margin subdivides it into two seta-fringed flanges (see Fryer & Paggi [1972]); at anterior margin of valve there is an inwardly directed hook-like projection. Postabdomen bilobed, postabdominal seta short with a relatively long distal segment. Postabdominal claws relatively large. Antenna I, II and thoracic limbs described in detail by Silva-Briano [1998] and Silva-Briano & Dumont [2001]. Size 570–900 µm in our material, but up to 1100 µm according to Fryer & Paggi [1972].

Ephippial female and male unknown.

COMMENTS. Silva-Briano & Dumont [2001] have serious doubts in the validity of the genus *Onchobunops* Fryer & Paggi, 1972, and their argument based on the similarity of all thoracic limbs in *O. tuberculatus* and *Bunops serricaudata* (Daday, 1884) is quite convincing. Recently the system of "macrothricid-like anomopods" (in terms of Silva-Briano [1998]) has been under reconstruction (see Dumont & Silva-Briano [1998]), and we are not sure about the necessity of immediate rejection of "conventional" generic names. There are problems with the species name also: previous specimens described as *Macrothrix gibbera* Daday, 1905 are most probably this taxon, and "*gibbera*" is a pretender to "*tuberculatus*" keeping in mind the impossibility of replacing of the major synonym in this situation, according to paragraph 23.9.1. of ICZN [2000]. Unfortunately, Daday's type specimen (DAD II/ p-467) is in a very poor condition [Smirnov, 1992], and cannot be used to clarify this difficult taxonomic situation. The situation could be resolved by an investigation of animals from the exact type locality as reported by Daday [1905], but, most probably, conservation of "*tuberculatus*" must be confirmed in particular by the International Commission on Zoological Nomenclature.

C. Family CHYDORIDAE Stebbing, 1902 emend. Dumont & Silva-Briano, 1998

a. Subfamily Aloninae Dybowski & Grochowski, 1894 emend. Frey, 1967

7. "*Alona iheringi* Sars, 1901"

Sars, 1901: 49–51, Pl. 9: Figs. 2a–c (*Alona iheringi* n.sp.); Sinev, 2001: 113–119, Figs. 1–33.

Not *Alona davidi* var. *Iheringi* Richard, 1897: 294–296, Figs. 42–43.

COMMENTS: This species of the *Alona costata*-group, which is closely related to *A. rustica*, was redescribed by Sinev [2001]. He examined Sars' type material from São Paulo and additional material from Boa Vista. We found only one female in the Canal do Tamengo, with external morphology that agrees with the characteristic features of this species. *A. iheringi* Sars, 1901 is an unacceptable taxon, a junior synonym of *A. iheringi* Richard, 1897, which was not mentioned by either Sars [1901] or Sinev [2001]. This taxon must be renamed, and, most probably, should be described as a new species.

8. *Alona ossiani* Sinev, 1998
Figs. 4, 9.

Sars, 1901: 48–49, Pl. 9: Figs. 1a–c (*affinis*); Daday, 1905: 171 (*affinis*); Stingelin, 1913: 621; Birabén, 1939: 656–658, Figs. 7–8 (*affinis*); Elmoor-Loureiro, 1998: 33 (*Biapertura affinis*); Sinev, 1998: 105–110, Figs. 1–4.

COMMENTS: *Alona ossiani* is a newly described Neotropical species from the *A. affinis* group, which was described based on Sars' specimens from São Paulo [Sinev, 1998]. We found a single specimen as well as several shell remains that could definitely be identified by the well-developed posterodorsal corner of the carapace and the setules at the posteroventral corner. The position of the head pores as well as the carapace covered with fine striae are further characteristics of *Alona ossiani.*

9. *Karualona muelleri* (Richard, 1897)
Fig. 8.

COMMENTS: Dumont & Silva-Briano [2000] established a new genus *Karualona,* and recently the South American species *Alona muelleri* Richard, 1897 has been redescribed and translocated into this genus [Sinev & Hollwedel, 2003].

10. *Leydigia* cf. *striata* Birabén, 1939

Daday, 1905: 185, Pl. 11: Fig. 19 (*acanthocercoides*); Birabén, 1939: 661–663, Figs. 14–16; Harding, 1955: 242–243, Figs. 50–60 (*ciliata*); Smirnov, 1971: 454, 458 (Neotropical records).

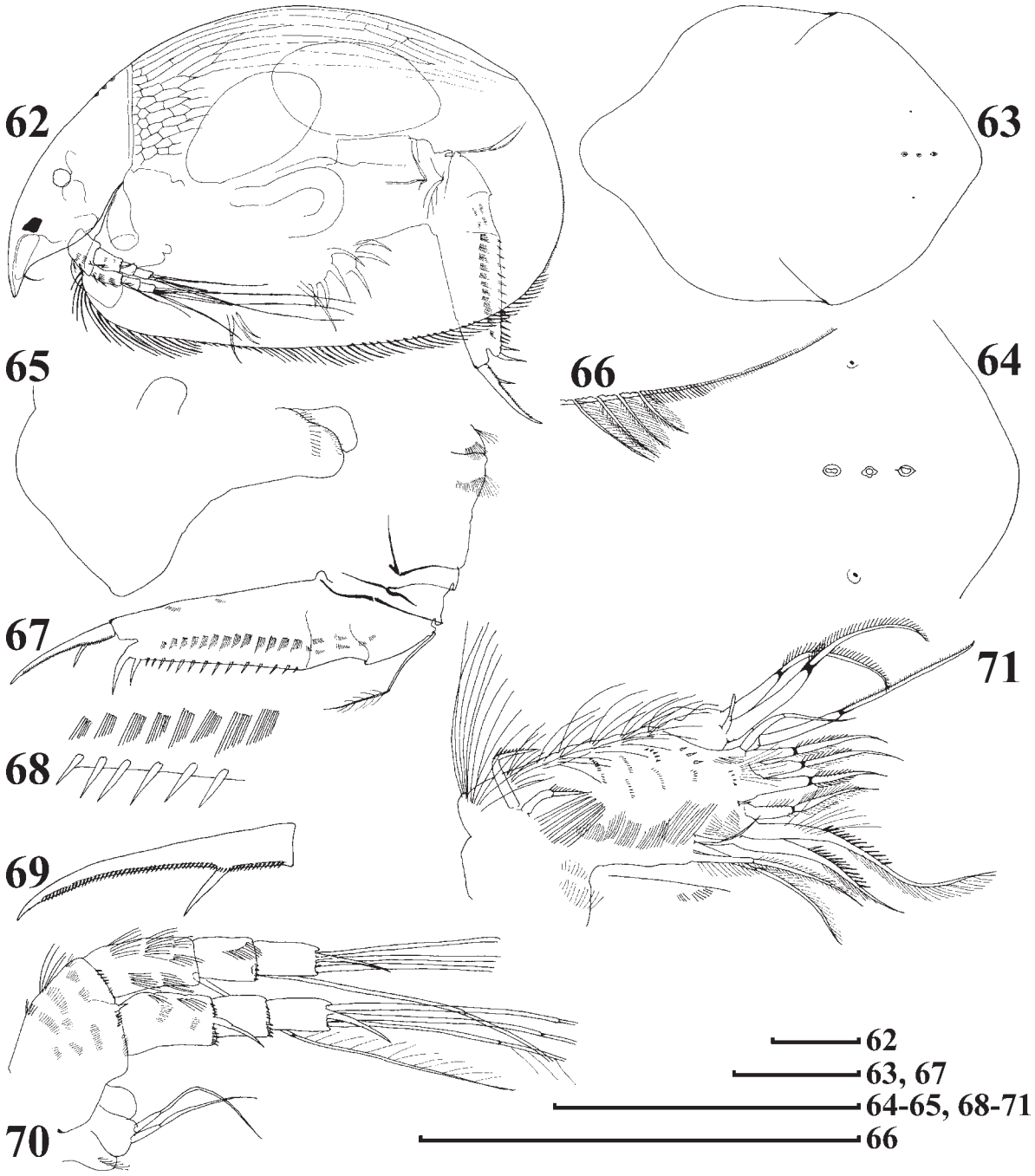
COMMENTS: Harding [1955] considered this species a junior synonym of *L. ciliata* Gauthier, 1939, but recently Kotov et al. [2003b] demonstrated differences between these two species.

11. *Oxyurella longicaudis* (Birge, 1910)
Figs. 7, 62–71.

Daday, 1905: 178–180, Pl. 11: Figs. 12–13 (*Euryalona tenuicaudis*); Birge, 1910: 1045–1048, Pl. 71: Figs. 3–4, 7 (*Odontalona*); Brehm & Thomsen, 1936: 216 (*Odontalona*); Brehm, 1938: 100, Fig. 5 (*Odontalona*); Bergamin, 1941: 163, Fig. 2; Martínez de Ferrato, 1966: 400–401, Pl. 2: Figs. 3–4; Smirnov, 1971: 496, Figs. 627–628; Elmoor-Loureiro, 1998: 37.

Type locality: Not clearly indicated: "Lake Charles, La.", from U.S.A., and "Demerara, South America", from unknown country [Birge, 1910: 1046]. Also, this author referred to Daday's [1905] description of *Euryalona tenuicaudis* from Paraguay as *O. longicaudis*, so Daday's specimens are included as members of the Birge's type series according to ICZN [2000]! The type locality must be determined by means of selection of the lectotype (from materials of Birge or Daday).

Parthenogenetic female: Body ovoid, elongated, compressed laterally. Dorsal margin regularly arched from tip of rostrum to practically completely smooth postero-dorsal angle, posterior margin regularly convex. Reticulation absent on head shield, while well-developed longitudinal striation present on valves. Head with relatively long rostrum, head shield somewhat elongated, with three major head pores without connection, postpore distance somewhat more than interpore distance, ocellus somewhat smaller than eye. Lateral head pores at distance similar to interpore distance from middle line of head shield. Labral keel triangular-round, large, with expressed apex, rows of setules in posterior portion of labrum, distal labral plate small. Valves ovoid, with numerous ventral marginal setae, fine setules submarginally on inner face of valve in region of postero-ventral angle and whole posterior margin. Postabdomen elongated, narrowing somewhat distally, with anal margin somewhat shorter than preanal margin, thin teeth along all postanal margin, only two distalmost teeth significantly larger than the rest, lateral fasicles of setules decreasing in size distally, and absent near largest



Figs. 62–71. *Oxyurella longicaudis*, parthenogenetic female from Canal do Tamengo: 62 — adult in lateral view; 63–64 — head shield and head pores; 65 — labrum; 66 — setae at postero-ventral portion of valve; 67–69 — postabdomen, its postanal margin, and postabdominal claws; 70 — antenna II; 71 — thoracic limb I. Scales: 100 μm.

Рис. 62–71. *Oxyurella longicaudis*, партеногенетическая самка из Canal do Tamengo: 62 — вид сбоку; 63–64 — головной щит и головные поры; 65 — лябрум; 66 — щетинки в задне-брюшной части створки; 67–69 — постабдомен, его постанальный край и постабдоминальный коготь; 70 — антенна II; 71 — нога I. Масштаб: 100 μm.

teeth, a deep embayment under base of claws. Postabdominal setae short, postabdominal claws relatively thin, curved distally, with a large basal spine located relatively far from base of claw. Antenna I not reaching tip of rostrum, with 9 aesthetascs. Antenna II relatively short, but thin, two sensory setae on coxal portion long, somewhat different in size, basal segment robust, with numerous rows of setules, branches relatively thin. Antennal formula: setae 0-0-3/1-1-3, spines 1-0-1/0-0-1, all spines relatively long. Limb I with ODL bearing a single long seta, and IDL with 2 setae and a rudiment of a third seta, no gnathobase on limb I. Size 520–635 μm in our material, maximal size more than that reported by Smirnov [1971].

Ephippial female: Unknown.

Male: Described poorly by Brehm [1938].

COMMENTS. This species is well-defined, and South and North American populations seem to belong to the same species. They are easily distinguished from other Neotropical species, *O. ciliata* Bergamin, 1939 (see Rey & Vasquez [1986]; Dimas Flores [2002]) in lacking setules on the labral keel. In contrast to *O. tenuicaudis* (Sars, 1862) and *O. brevicaudis* Michael & Frey, 1983, *O. longicaudis* has two especially robust teeth in distal portion of postabdomen and third seta on IDL.

b. Subfamily Chydorinae Stebbing, 1902

12. *Alonella dadayi* (Birge, 1910) Figs. 72–84.

Daday, 1905: 168–169, Pl. 10: Figs. 18–23 (*Leptorhynchus dentife*r); Stingelin, 1909: 644, Fig. 2 (*Leptorhynchus dentife*r); Birge, 1910: 1052; Brehm & Thomsen, 1936: 217, Fig. 9; Martínez de Ferrato, 1966: 398–399, Pl. 1: Figs. 5–7; Smirnov, 1971: 277, Fig. 290 (*Disparalona*); Green, 1972: 221; Paggi, 1995: Fig. 127 (*Phryxura*); Smirnov, 1996: 88–90, Figs. 328–331; Elmoor-Loureiro, 1998: 29 (*Disparalona*); Dimas Flores, 2002: 77, Pl. 1: Figs. A–F.

Type locality: Not reported accurately in the first description, only marked as "Louisiana, Tex." in a table on p. 1053. Also Birge [1910] referred to *Leptorhynchus dentifer* Daday, 1905, so Daday's material can be regarded a part of the Birge's type series according to ICZN [2000]! It is necessary to select a lectotype of this species also.

Parthenogenetic female: Body ovoid, moderately elongated, compressed laterally. Dorsal margin regularly arched from tip of rostrum to distinct postero-dorsal angle, posterior margin truncated, postero-ventral angle rounded, with series of small denticles, setules between them. Whole shell richly sculptured with longitudinal striation in dorsal portion and head shield, and polygonal reticulation in posterior portion of valves, parallel strokes within reticulation cells. Head large, with remarkably long, somewhat curved backwards rostrum, ocellus smaller than eye. Head pores on special narrow, non-reticulated plate, each of two major head pores with thin ring, postpore distance only 1/4 interpore distance, two minute pores on mid-line, somewhat closer to anterior major pore. Labral keel large, more or less triangular-round, with wavy anterior margin and apex directed posteriorly, distal labral plate relatively large. Postabdomen robust, high, narrowing distally, preanal margin much longer than anal margin, preanal angle inflated, obtuse or right angled, a series of especially long setules in this region; anal margin significantly concave, with small, numerous teeth. Postanal margin shorter than preanal margin, with 6–8 teeth. Postabdominal seta shorter than postabdomen, its distal segment shorter than basal one, with relatively long setules; postabdominal claws relatively short and thick, with robust basal spine at a distance from claw base, and a small additional spine closer to claw base. Antenna I thick, with fine, short sensory seta and 9 aesthetascs of different size. Antenna II relaticvely short, but elongated, antennal formula: setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Each swimming seta with distal segment armed with setules, and chitinous insertions near joint with basal segment. ODL I with a single naked seta, IDL with 3 setae, smallest naked. Size 240–270 µm in our material, up to 450 µm according to Smirnov [1996].

Ephippial female: unknown.

Male: Smirnov [1996] only gave the size as 200 µm.

COMMENTS. This is a very typical neotropical species of *Alonella*, remarkably different from others (see Smirnov [1996]).

13. *Ephemeroporus hybridus* (Daday, 1905) Figs. 85–96.

Daday, 1905: 158–159, Pl. 10: Figs. 5–7 (*Chydorus*); Stingelin, 1913: 629–630, Fig. 31 (*Chydorus*); Martínez de Ferrato, 1967: 329–330, Pl. 1: Fig. 11 (*Chydorus*); Smirnov, 1971: 306, Fig. 336 (*Chydorus*); Green, 1972: 220 (*Chydorus*); Frey, 1982: 238–243, Pl. 2: Figs. 1–8, Pl. III: Figs. 1–18, Pl. 4: Figs. 1–20; Rey & Vasquez, 1986: 152: Pl. 7: Figs. 1–12; Smirnov, 1996: 155–156, Figs. 643–648; Elmoor-Loureiro, 1998: 29.

Type locality: there is only a note "Paraguay" on labels of Daday's types in HNHM. Also, in his text, the author did not select the locality from the series of water bodies investigated, so the exact type locality is not clear [Smirnov, 1996].

Parthenogenetic female: Body globular, high and thick, dorsal margin regularly arched from tip of rostrum to a rounded, but visible, postero-dorsal angle, posterior margin straight or concave. Postero-ventral angle widely rounded, with single denticle, but in many females from Pantanal this denticle significantly or completely reduced, and with specialized short setae dorsally to the tooth. Head with well-developed rostrum directed downwards, ocellus somewhat smaller than eye. No head pores in adult state. Labral keel projected ventrally, with well-developed apex and single tooth at anterior margin (in a single female this tooth was greatly reduced). Valves ovoid, with polygonal reticulation, numerous short lines within cells of reticulation, setae in anterior portion of ventral edge marginal, in the middle absent, in posterior portion submarginal, densely setulated. Postabdomen elongated, narrowing somewhat distally, dorso-distal angle rounded, distal end truncated. Preanal margin long, preanal angle prominent, postanal margin with large teeth, 3 proximal anal teeth especially long. Postabdominal seta shorter than postabdomen, postabdominal claw regularly curved, with a long basal spine and a minute additional basal spine. Antennal formula: setae 0-0-3/ 0-1-3, spines 1-0-1/0-0-1, all spines very short. Limb I with IDL bearing a single seta, IDL with 3 seta of different size, gnathobase I with a single seta and setulated projection. Size 220–270 µm in our material, up to 320 µm according to Rey & Vasquez [1986].

Ephippial female: See Frey [1982].

Male: still unknown [Smirnov, 1996]

COMMENTS. Our *E. hybridus* was collected close to the presumed type locality. Our main conclusion is that it is necessary to be very careful with presence-absence of denticles at postero-ventral angle of valves as a key character for the discrimination of species within the genus *Ephemeroporus,* because in Pantanal populations these were reduced in many specimens. A similar situation was observed with another diagnostic feature, a tooth on labrum: in one specimen from Pantanal the tooth on the labrum was strongly reduced in size. In addition, Frey [1982] noted that there are several species in the world, not yet described, allied to *E. hybridus*.

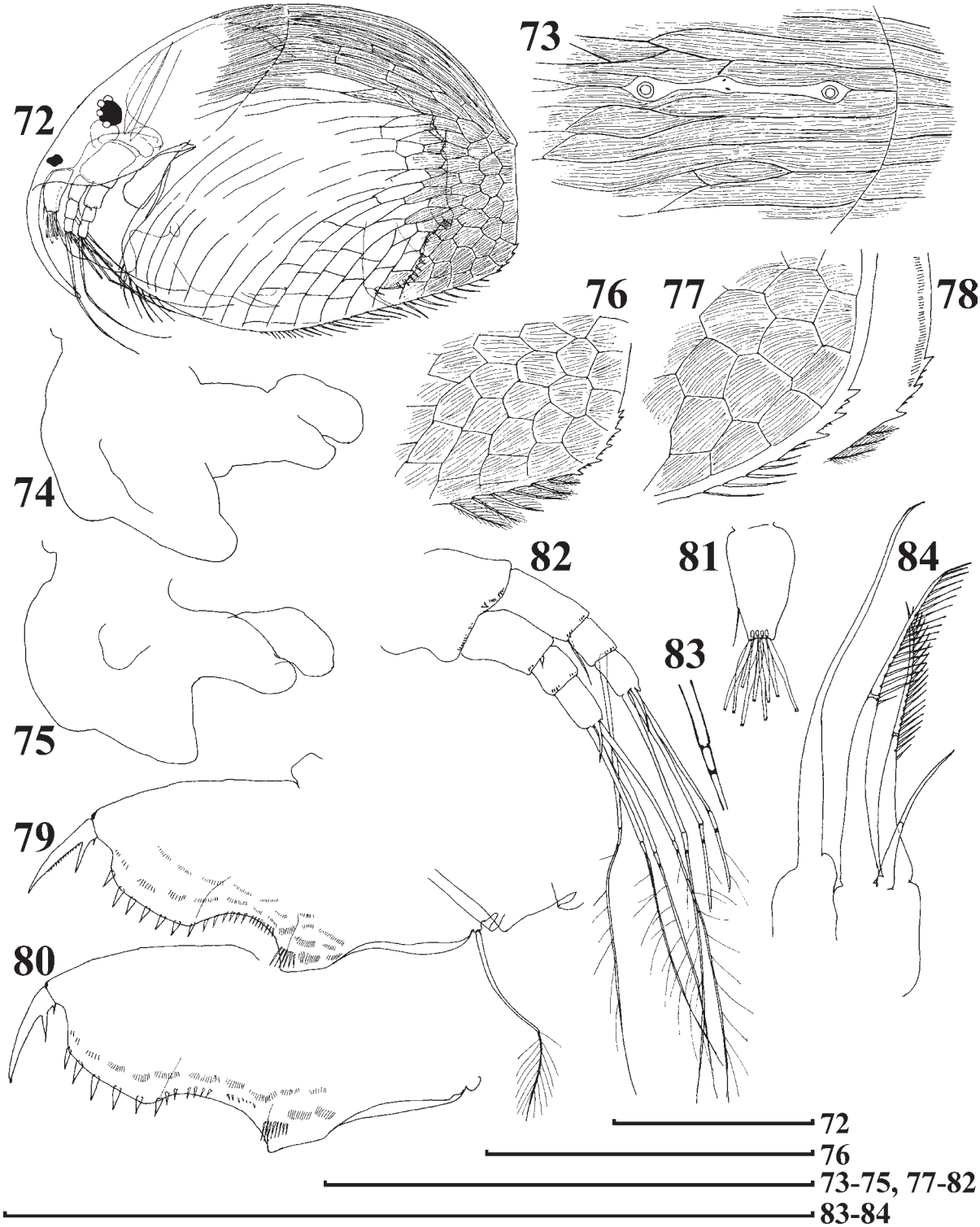
14. *Pseudochydorus globosus* (Baird, 1843) Figs. 97–108.

Bergamin, 1940: 99, Fig. 18 (*Chydorus*); Martínez de Ferrato, 1967: 328–329, Pl. 1: Figs. 6–7; Paggi, 1995: Figs. 104–106; Elmoor-Loureiro, 1998: 31.

Not Rey, 1993: 259, Figs. 26–27.

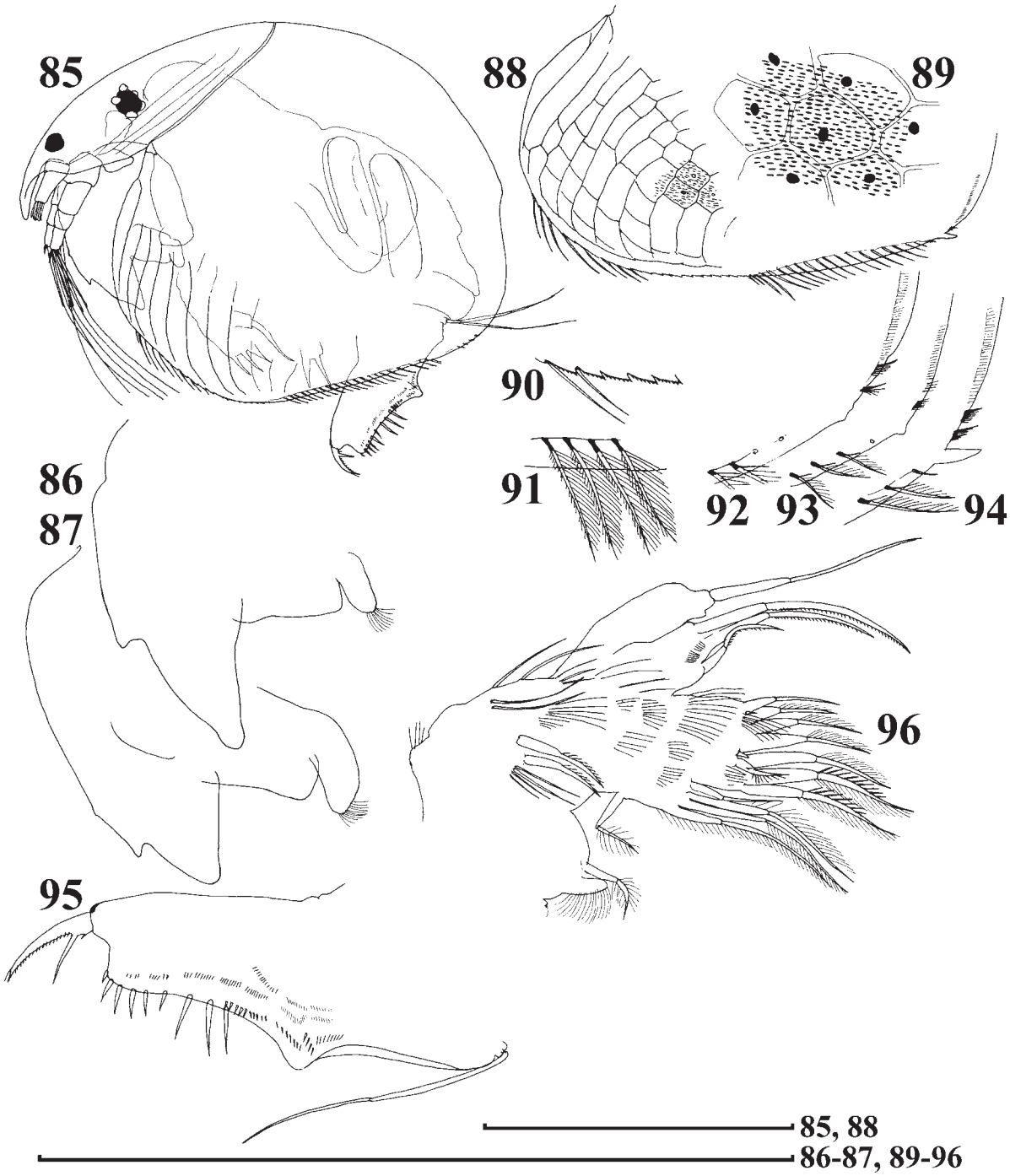
Type locality: "Ditch near Richmond; pond near Isleworth", United Kingdom, Europe.

Parthenogenetic female: Body subglobular to globular, thick, dorsal margin regularly arched from tip of rostrum to posterior margin, sometimes there is a slight prominence



Figs. 72–84. *Alonella dadayi*, parthenogenetic female from Baia 38: 72 — adult in lateral view; 73 — head pores; 74–75 — labrum; 76–77 — postero-ventral portion of valve in external view; 78 — the same in internal view; 79–80 — postabdomen; 81 — antenna I; 82–83 — antenna II and joint part of its swimming seta; 84 — distal portion of thoracic limb I. Scales: 100 μm.

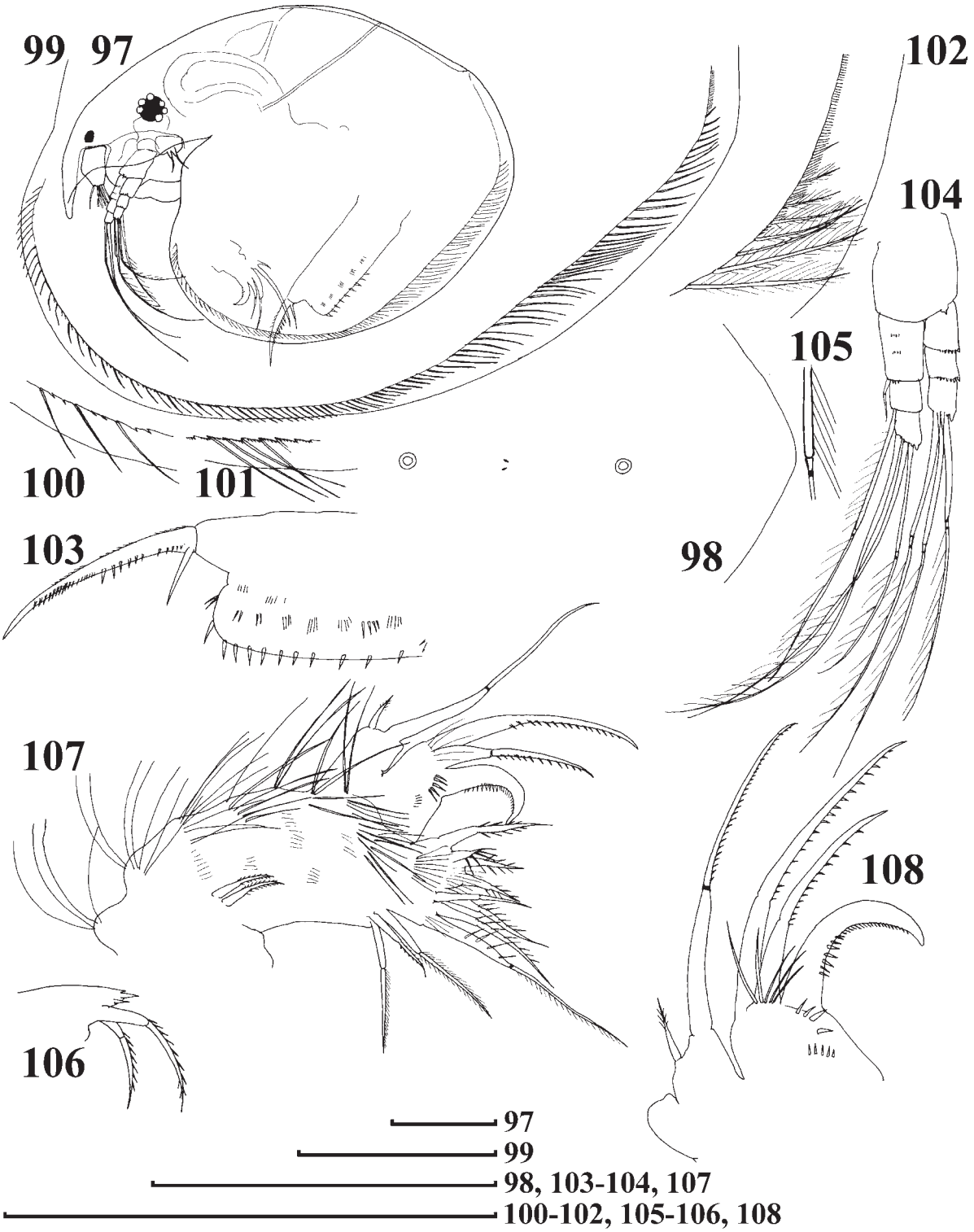
Рис. 72–84. *Alonella dadayi*, партеногенетическая самка из Baia 38: 72 — вид сбоку; 73 — головные поры; 74–75 — лябрум; 76–77 — задне-брюшная часть створку снаружи; 78 — изнутри; 79–80 — постабдомен; 81 — антенна I; 82–83 — антенна II и сочленение дистального и базального члеников плавательной щетинки; 84 — дистальная часть ноги I. Масштаб: 100 μm.



Figs. 85–96. *Ephemeroporus hybridus*, parthenogenetic female from Baia 38: 85 — adult in lateral view; 86–87 — labrum; 88–89 — valve and its sculpture; 90–91 — setae at middle and posterior portions of valve ventral margin; 92–94 — armature of postero-ventral angle in 3 valves; 95 — postabdomen; 96 — thoracic limb I. Scales: 100 μm.

Рис. 85–96. *Ephemeroporus hybridus*, партеногенетическая самка из Baia 38: 85 — вид сбоку; 86–87 — лябрум; 88–89 — створка и ее скульптура; 90–91 — щетинки в середине и задней части брюшного края; 92–94 — вооружение задне-брюшного угла трех разных створок; 95 — постабдомен; 96 — нога I. Масштаб: 100 μm.

under compound eye, postero-dorsal angle smooth. Reticulation not visible. Head with well-developed rostrum, two major head pores in mid-line of head shield, interpore distance greater than postpore one, small pores in mid-line also, between two major pores. Labral keel reduced. Valves ovoid, with setae submarginally on inner face along entire ventral margin. Postabdomen elongated, with parallel dorsal and ventral margins, preanal margin longer than anal margin, preanal angle somewhat prominent, postanal margin with small teeth, distal angle rounded. Basis of postabdominal claws remarkably prominent distally, postabdominal claw relatively long and thin, with a single basal spine immediately



Figs. 97–108. *Pseudochydorus globosus*, parthenogenetic female from Canal do Tamengo: 97 — adult in lateral view; 98 — head pores; 99–102 — armature of valve, and its antero-ventral, ventral and postero-ventral portions; 103 — distal portion of postabdomen; 104–105 — antenna II and joint portion of its swimming seta; 106 — maxilla I; 107–108 — thoracic limb I and its distal portion. Scales: 100 μm.

Рис. 97–108. *Pseudochydorus globosus*, партеногенетическая самка из Canal do Tamengo: 97 — вид сбоку; 98 — головные поры; 99–102 — вооружение створки, ее передне-брюшногй, брюшной и задне-брюшной части; 103 — дистальная часть постабдомена; 104–105 — антенна II и сочленение дистального и базального члеников ее плавательной щетинки; 106 — максиллаI; 107–108 — нога I и ее дистальная часть. Масштаб: 100 μm.

at its base, and spaced denticles along its dorsal margin. Antenna I short, robust, with 9 aesthetascs of different size. Antenna II relatively small, basal segment and segments of branches robust. Antennal formula: setae 0-0-3/1-1-3 (seta at basal endopod segment very short), spines 0-0-1/0-0-1, apical spines minute. Distal segments of swimming setae setulated, with chitinous insertions near joints with basal segments. No filter setae on any limbs or maxillae I. Limb I with ODL bearing a long and a short seta, IDL with three setae, shortest seta hook-like, and a bunch of robust setules. Other limbs not different from those described by Smirnov [1971]. Size 400-450 μm in our material.

Ephippial female, male: Unknown from the Neotropics.

COMMENTS. The size of the labral keel, which is used in all keys for the discrimination of *Chydorus* and *Pseudochydorus,* is in fact not a major difference between these genera; structure of limbs is a far more important trait; in Pantanal females all limbs were clearly non-filtering. We did not find any significant differences in the structure of thoracic limbs in Pantanal and European females, but our ideas on the latter were based on pictures of Fryer [1968] and Smirnov [1971], published around 30 years ago, that do not comply with recent standards of anomopod descriptions. The status of South American populations should be checked after a redescription of European *P. globosus* s. str. In contrast, Rey [1993: 259, Figs 26–27] most probably described *Chydorus*, not *Pseudochydorus*, from Lake Titicaca: the labral keel in her animal was small but existing, with expressed apex, and the postabdomen was not of the *Pseudochydorus*-type.

Discussion

The Pantanal fauna is quite typical of Brazil and Neotropical regions. The similarity of our species list with ones already published for these regions is quite obvious, especially bearing in mind that some differences can be explained by the changing taxonomic status of some species. Although no new species are presented in this paper, we have indicated many areas of confusion with European forms (see above) that require clarification, but they are not endemics of the Pantanal. Large South American rivers such as the Rio Paraguay flow through thousands of kilometres, and are important arteries for dispersion of freshwater species; as are the myriads of aquatic birds associated with the river banks that participate in dispersion of anomopod ephippia.

The definitive list of Brazilian Cladocera is far from complete, with new species being described all the time [Smirnov & Santos-Silva, 1995; Sinev & Hollwedel, 2002]. Brazilian investigators have published many lists of Cladocera from different regions, including the Pantanal [Lima et al., 1996, 1998] but detailed investigations including descriptions of some species have only been made for a few regions. These regions include the vicinity of São Paulo, Itatiba and Ipiranga (São Paulo State) [Sars, 1901], the city of São Paulo [Bergamin, 1940, 1941], the region of Rio Nhamundá (border of Pará and Amazonas) [Brandorff et al., 1982], Lagoa dos Patos (Rio Grande do Sul) [Montú & Gloeden, 1986], the region of Boa Vista (Roraima) [Smirnov & Santos-Silva, 1995], and Lençóis Maranhenses dune field (Maranhão) [Van Damme, in preparation]. Most of these surveys only examined a limited number of water bodies — about 10 or even fewer. Thus the majority of Brazil is waiting for thorough investigation of its cladoceran fauna.

Many previously established species, European as well as tropical, must be redescribed according to the new standards [Korovchinsky, 1996]. Not only rare but many very common Brazilian, other South American, and Australian species of the Anomopoda are described very poorly, and this has resulted in continual misidentifications.

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References

Adámoli J.O. 1982. O Pantanal e suas relações fitogeográficas com os Cerrados // Anais do Congresso Nacional de Botanica. Vol.32. P.109–119.

Alonso M. 1996. Crustacea, Branchiopoda. Fauna Iberica 7. Madrid: Consejo Superior de Investigaciones Cientificas. 486 pp.

Bergamin F. 1940. Os Cladocera. (Descrição sistemática das spécies encontradas no município de São Paulo) (Continuaзro) // Rev. Indúst. Animal, Nova Sér. Vol.3. No.1. P.98–101.

Bergamin F. 1941. Os Cladocera. (Descrição sistemática das espécies encontradas no município de São Paulo) (Continuação) // Bol. Indústr. Animal. Vol.4. No.1. P.162–166.

Bezerra M.A.O., Miranda J.C.A., Ferreira J.C.A., Ishi I.H. & Moreno I.H. 1999. Estudo da comunidade zooplanctônica da bacia do rio Miranda, Miranda – MS // Anais do II Simpósio sobre recursos naturais e sócio-econômicos do Pantanal. P.237–248.

Birabén M. 1939. Los Cladyceros de la familia "Chydoridae" // Rev. Soc. Argentina ciencias natur. Vol.17. P.651–671.

Birge E.A. 1910. Notes on Cladocera. IV // Trans Wisconsin Acad. Sci., Arts and Lett. Vol.16. P.1017–1066.

Bonecker C.C., Lansac-Tôha F.A. & Bini L.M. 1998. Composition of zooplankton in different environments of the Mato Grosso Pantanal, Mato Grosso, Brazil // An. VIII Sem. Reg. Ecol. Vol.3. P.1123–1135.

Brandorff G .O., Koste W. & Smirnov N.N. 1982. Structure of rotiferan and crustacean communities of the lower Rio Nhamundá, Amazonas, Brazil // Stud. Neotrop. Fauna Environ. Vol.17. P.69–121.

Brehm V. 1938. Dritter Bericht über die von Dr. O. Schubart in Brasilien gesammelten Onychura // Zool. Anz. Bd.122. S.94–103.

Brehm V. & Thomsen R. 1936. Brasilianische Phyllopoden und Arguliden gesammelt von Herrn Dr. O. Schubart // Zool. Anz. Bd.116. S.211–218.

Calheiros D.F. & Hamilton S.K. 1998. Limnological conditions associated with natural fish kills in the Pantanal wetland of Brazil // Verh. Intern. Verein. Limnol. Bd.26. S.2189–2193.

Calheiros D.F. & Oliveira M.D. 1999. Pesquisa limnológica no Pantanal: uma revisão // Anais do II simpósio sobre recursos naturais e sócio-econômicos do Pantanal. P.115–125.

Daday E. 1905. Untersuchungen über die Süsswasser-Mikrofauna Paraguays // Zoologica. Ser.18. Bd.44. No.3–6. P.1–374.

Dimas-Flores N. 2002. Contribución al conocimiento de la comunidad de los ordenes Anomopoda y Ctenopoda de la cuenca baja del Río Coatzacoalcos, Ms. Sci. Thesis, UNAM, Mexico City, 104 pp.

Dumont H.J. & Silva Briano M. 1998. A reclassification of the anomopod families Macrothricidae and Chydoridae, with the creation of a new suborder, the Radopoda (Crustacea: Branchiopoda) // Hydrobiologia. Vol.384. P.119–149.

Dumont H.J., Silva Briano M. & Babu K.K.S. 2002. A re-evaluation of the *Macrothrix rosea-triserialis* group, with the description of two new species (Crustacea Anomopoda: Macrothricidae) // Hydrobiologia. Vol.467. P.1–44.

Eberhard A. 2000. The Pantanal today, prospects for tomorrow. // Swarts F.A. (ed.). The Pantanal. St. Paul. Minnesota: Paragon House. P.77–91.

Elías-Gutiérrez M., Smirnov N.N., Suáres-Morales E. & Dimas-Flores N. 2001. New and little known cladocerans (Crustacea: Anomopoda) from southeastern Mexico // Hydrobiologia. Vol.442. P.41–54.

Elmoor-Loureiro L.M.A. 1998. Branchiopoda. Freshwater Cladocera // Young P.S. (ed.). Catalogue of Crustacea of Brazil 6. Rio de Janeiro: Museu Nacional. P.15–41.

Elmoor-Loureiro L.M.A. 2000. Brazilian cladoceran studies: where do we stand? // Nauplius. Vol.8. P.117–131.

Espíndola E.G., Matsumura-Tundisi T. & Moreno I.H. 1996. Efeitos da dinâmica hidrológica do sistema Pantanal Matogrossense sobre a estrutura da comunidade de zooplâncton da Lagoa Albuquerque // Acta Limnol. Brasil. Vol.8. P.37–57.

Fernandes E., Lucati H.M., Capellari B. & Queiroz Neto J.P. 1999. Modelo digital para tratamento de cartas topográficas do Pantanal da Nhecolândia // Anais II Simposio sobre Recursos Naturais e Sócio-econômicos do Pantanal. P.159–166.

Frey D.G. 1982. Relocation of *Chydorus barroisi* and related species (Cladocera, Chydoridae) to a new genus and description of two new species // Hydrobiologia. Vol.86. P.231–269.

Fryer G. 1968. Evolution and adaptive radiation in the Chydoridae (Crustacea: Cladocera): a study in comparative functional morphology and ecology // Phil. Trans. R. Soc. London, Ser. B. Vol.254. P.221–385.

Fryer G. 1974. Evolution and adaptative radiation in the Macrothricidae (Crustacea, Cladocera): a study in comparative functional morphology and ecology // Phil. Trans. R. Soc. London, Ser. B. Vol.269. P.137–274.

Fryer G. & Paggi J.C., 1972. A new cladoceran genus of the family Macrothricidae from Argentina // Crustaceana. Vol.23. P.255–262.

Green J. 1972. Freshwater ecology in the Mato Grosso, Central Brazil. II. Associations of Cladocera in meander lakes of the Rio Suiá Missú // J. Nat. Hist. Vol.6. P.215–227.

Hamilton S.K., Sippel S.J. & Melack J.M. 1996. Inundation patterns in the Pantanal wetland of South America determined from passive microwave remote sensing // Arch Hydrobiol. Bd.137. S.1–23.

Hamilton S.K., Souza O.C. & Coutinho M.E. 1998. Dynamics of floodplain inundation in the alluvial fan of the Taquari River (Pantanal – Brazil) // Verh. Internat. Verein. Limnol. Bd.26. P.916–922.

Hamilton S.K., Sippel S.J., Calheiros D.F. & Melack J.M. 1999. Chemical characteristics of Pantanal waters // Anais II Simposio sobre Recursos Naturais e Sócio-econômicos do Pantanal. P.89–100.

Harding J.P. 1955. Percy Sladen Trust expedition. XIX. Crustacea: Cladocera // Trans. Linn. Soc. London. Vol.1. P.329–354.

Heckman C.W. 1998a. The Pantanal of Poconé. Biota and ecology in the northern section of the world's largest pristine wetland. Dordrecht: Kluwer Academic Publishers. 564 pp.

Heckman C.W. 1998b. The seasonal succession of biotic communities in wetlands of the tropical wet-and-dry climatic zone: V. Aquatic invertebrate communities in the Pantanal of Mato Grosso, Brazil // Intern. Rev. Hydrobiol. Vol.83. P.31–63.

International Commission on Zoological Nomenclature (ICZN). 2000. International code of zoological nomenclature. Fourth edition. London: The Natural History Museum. 306 pp.

Korovchinsky N.M. 1996. Sididae & Holopedidae (Crustacea: Daphniiformes). The Hague: SPB Academic Publ. 82 pp.

Koste W. 1999. Über Rädertiere (Rotifera) aus Gewässern des südlichen Pantanal (Brasilien) // Osnabr. Naturw. Mitt. Bd.25. S.179–209.

Kotov A.A. & Dumont H.J. 2000. Analysis of the *Ilyocryptus spinifer* s. lat. species group (Anomopoda, Branchiopoda), with description of a new species // Hydrobiologia. Vol.428. P.85–113.

Kotov A.A., Dumont H.J. & Van Damme K. 2002. Redescription of *Ilyocryptus sarsi* Stingelin, 1913 // Hydrobiologia. Vol.472. P.207–222.

Kotov A.A., Garfias-Espejo T. & Elías-Gutiérrez M. 2003. Separation of two Neotropical species: *Macrothrix superaculeata* (Smirnov, 1982) *versus M. elegans* Sars, 1901 (Macrothricidae, Anomopoda, Cladocera) // Hydrobiologia (In press).

Kotov A.A., Van Damme K. & Elías-Gutiérrez M. 2003. Differentiation between African *Leydigia ciliata* Gauthier, 1939 and Neotropical *L.* cf. *striata* Birabén, 1939 (Chydoridae, Anomopoda, Cladocera) // Hydrobiologia Vol.505. P.179–197.

Kotov A.A. & Williams J.L. 2000. *Ilyocryptus spinifer* Herrick 1882 (Anomopoda, Branchiopoda): a redescription based on North American material and designation of a neotype from Minnesota // Hydrobiologia. Vol.428. P.67–84.

Lima D. 1996. Estrutura das comunidades zooplanctônica e fitoplanctônica do Lago Recreio – Pantanal de Barro de Melgaso – MT. Master thesis, Universidade Federal de São Carlos. P.1–186.

Lima A.F., Lansac-Toha F.A. & Bonecker C.C. 1996. Zooplankton in the floodplains of a tributary to the Paraná River in Mato Grosso D Sul, Brazil // Stud. Neotrop. Fauna Environ. Vol.31. P.112–116.

Lima A.F., Lansac-Tôha F.A., Velho L.F.M & Bini L.M. 1998. Environmental influence on planktonic cladocerans and copepods in the floodplain of the Upper River Paraná, Brazil // Stud. Neotrop. Fauna Environ. Vol.33. P.188–196.

Martínez de Ferrato A. 1966. Nuevos Cladoceros para las aquas Argentinas. Physis. Vol.26. P.397–403.

Martínez de Ferrato A. 1967. Nuevos cladoceros para las aguas argentinas II // Acta Zool. Lilloana. Vol.23. P.325–330.

Matsumura-Tundisi T. 1986. Latitudinal distribution of Calanoida copepods in freshwater aquatic systems of Brazil // Rev. Brasil Biol. Vol.46. P.527–553.

Miranda J.C.A. 1992. Levantamento zooplanctônico da bacia do Rio Miranda–MS. Corumbá: Monografia Universidade Federal de Mato Grosso do Sul. P.1–22.

Montú M. & Gloeden I.M. 1986. Atlas dos Cladocera and Copepoda (Crustacea) do estuário da Lagoa dos Patos (Rio Grande, Brasil) // Neritica, Pontal do Sul. Vol.1. P.1–134.

Mourão G.M. 1989. Limnologia de três lagoas (duas "baias" e uma "salina") do Pantanal da Nhecolândia, MS. Master thesis, Universidade Federal de São Carlos. P.1–135.

Oliveira M.D. & Calheiros D.F. 2000. Flood pulse influence on phytoplankton communities of the south Pantanal floodplain, Brazil // Hydrobiologia. Vol.427. P.101–112.

Paggi J.C. 1995. Crustacea Cladocera // Lopretto E.C. & Tell G. (eds.). Ecosistemas de aguas continentales. Metodología para su estudio. III. La Plata: Ediciones Sur. P.909–951.

Por F.D. 1995. The Pantanal of Mato Grosso (Brazil) // Monographiae Biologicae. Vol.73. Dordrecht: Kluwer Academic Publishers. 122 pp.

Reid J.W. 1997. *Argyrodiaptomus nhumirim*, a new species, and *Austrinodiaptomus kleerekoperi*, a new genus and species, with redescription of *Argyrodiaptomus macrochaetus* Brehm, new rank, from Brazil (Crustacea: Copepoda: Diaptomidae) // Proc. Biol. Soc. Wash. Vol.110. P.581–600.

Reid J.W. & Moreno I.H. 1990. The Copepoda (Crustacea) of the southern Pantanal, Brazil // Acta Limnol. Brasil. Vol.3. P.721–739.

Rey J. 1993. The Cladocera // Dejoux C.E. & Iltis A. (eds.). Lake Titicaca. Monographiae Biologicae. Vol.68. P.254–267.
Rey J. & Vásquez E. 1986. Cladocères de quelques corps d'eaux du bassin moyen de l'Orénoque (Vénézuéla) // Annls. Limnol. Vol.22. No.2. P.137–168.
Richard J. 1897. Entomostracés de l'Amérique du Sud, recueillis par MM. U. Deiters, H. von Ihering, G.W. Müller et C.O. Poppe // Mém. Soc. zool. France. T.10. S.263–301.
Rocha C.E.F. & Por F.D. 1998. Preliminary comparative data on the fauna of the pleuston in the southern Pantanal, Brazil, with emphasis on the microcrustaceans // Verh. Intern. Verein Limnol. Bd.26. S.2137–2140.
Rossa D.C., Lansac-Tôha F.A., Bonecker C.C. & Velho L.F.M. 2001. Abundance of cladocerans in the littoral regions of two environments of the Upper Paraná River floodplain, Mato Grosso do Sul, Brazil // Rev. Brasil. Biol. Vol.61. P.45–53.
Sakamoto A.Y., Quieirz Neto J.P., Fernandes E., Lucati H.M. & Capellari B. 1999. Topografia de lagoas salinas e seus entornos no Pantanal da Nhecolândia // Anais II Simposio sobre Recursos Naturais e Sócio-econômicos do Pantanal. P.127–135.
Santos-Silva E.N., Boxshall G.A. & Rocha C.E.F. 1999. The neotropical genus *Notodiaptomus* Kiefer, 1936 (Calanoida: Diaptomidae): Redescription of the type species *Notodiaptomus deitersi* (Poppe, 1891) and designation of a neotype // Stud. Neotrop. Fauna Environ. Vol.34. P.114–128.
Sars G.O. 1901. Contributions to the knowledge of the freshwater Entomostraca of South America, as shown by artificial hatching from dried material. 1. Cladocera // Arch. Math. Naturv. Bd.23. S.1–102.
Silva-Briano M. 1998. A revision of Macrothricid-like anomopods. Ph.D. Thesis, Ghent University. 388p.
Silva-Briano M., Dieu N.Q. & Dumont H.J. 1999. Redescription of *Macrothrix laticornis* (Jurine, 1820), and description of two new species of the *M. laticornis*-group // Hydrobiologia. Vol.403. P.39–61.
Silva-Briano M. & Dumont H.J. 2001. *Wlassicsia, Bunops* & *Onchobunops* (Anomopoda), three related genera // Hydrobiologia. Vol.442. P.1–28.
Sinev A.Y. 1998. *Alona ossiani* sp. n., a new species of the *Alona affinis* complex from Brazil, deriving from the collection of G. O. Sars (Anomopoda, Chydoridae) // Arthropoda Selecta. Vol.7. No.2. P.103–110.
Sinev A.Y. 2001. Redescription of *Alona iheringi* Sars, 1901 (Chydoridae, Anomopoda, Branchiopoda), a South American species related to *A. rustica* Scott, 1895 // Hydrobiologia. Vol.464. P.113–119.
Sinev A.Y. & Hollwedel W. 2002. *Alona brandorffi* sp. n. (Crustacea: Anomopoda: Chydoridae) — a new species from Brazil, related to *A. verrucosa* Sars, 1901 // Hydrobiologia. Vol.472. P.131–140.
Sinev A.Y. & Hollwedel W. 2003. Translocation of *Alona muelleri* Richard, 1897 in to the genus *Karualona* Dumont & Silva-Briano, 2000 (Bracnhiopoda: Anomopoda: Chydoridae) // Hydrobiologia (in press).
Smirnov N.N. 1971. Chydoridae fauni mira [Chydoridae of the world fauna] // Fauna SSSR. Rakoobraznye. Vol.1. No.2. P.1–531 [in Russian].
Smirnov N.N. 1976. Macrothricidae i Moinidae fauni mira [Macrothricidae and Moinidae of the world] // Fauna SSSR. Rakoobraznye. Vol.1. No.3. P.1–237 [in Russian].
Smirnov N.N. 1988. Cladocera (Crustacea) from Nicaragua // Hydrobiologia. Vol.160. P.63–77.
Smirnov N.N. 1992. The Macrothricidae of the world. // Guides to the identification of the microinvertebrates of the Continental Waters of the world. Vol.1. Amsterdam: SPB Acad. Publ. 143 pp.
Smirnov N.N. 1996. Cladocera: the Chydorinae and Sayciinae (Chydoridae) of the world // Guides to the identification of the microinvertebrates of the Continental Waters of the world. Vol.11. Amsterdam: SPB Acad. Publ. 197 pp.
Smirnov N.N. 2001. Recent changes and improvements in Aloninae taxonomy (Branchiopoda, Anomopoda, Chydoridae) // Arthropoda Selecta. Vol.10. No.1. P.1–4.
Smirnov N.N. & Santos-Silva E.N. 1995. Some littoral anomopods (Crustacea) from Central Amazonia // Hydrobiologia. Vol.315. P.227–230.
Soriano B.A. 1999. Caracterização climática da sub-região da Nhecolândia, Pantanal – MS // Anais II Simposio sobre Recursos Naturais e Sócio-econômicos do Pantanal. P.151–158.
Stingelin T. 1909. Mitteilung über einige Cladoceren aus Südamerika // Zool. Anz. Bd.24. S.641–644.
Stingelin T. 1914. Cladoceren aus den Gebirgen von Kolumbien // Mém. Soc. neuchâteloise Sci. nat. Bd.5. S.600–638.