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Checklist and distribution of cladocerans and leptodorans (Crustacea: Branchiopoda) from Austria*

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Abstract

A species list (including subspecies and hybrids) of 103 cladocerans (93 Anomopoda, 6 Ctenopoda, 1 Haplopoda, 3 Onychopoda) inhabiting water bodies in Austria is given. More than 3000 records from 1122 localities are listed. For each species the following information is presented: known localities in Austria, altitudinal distribution and highest record in Austria, world distribution and habitat preferences. Ecological remarks are added if relevant. Distribution maps of 80 species are presented. Two species, viz. *Diaphanosoma orghidani* and *Bunops serricaudatus*, collected from backwaters of the Danube River, are new for the country; the former was found in the plankton of three ponds near Haslau, the latter in the benthos of the Lobau.

Key words: Cladocera, Austria, inventory, geographical distribution.

Zusammenfassung

Die vorliegende Arbeit enthält ein Inventar von 103 Cladoceren-Arten (mit Unterarten und Hybriden) (93 Anomopoda, 6 Ctenopoda, 1 Haplopoda, 3 Onychopoda) aus österreichischen Gewässern. Es wurden über 3000 Fundmeldungen aus 1122 Gewässern berücksichtigt. Für jede Art werden die Fundorte, die Höhenverbreitung in Österreich, die Habitatsansprüche sowie die weltweite Verbreitung angegeben. Die Verbreitung von 80 Arten ist kartographisch dargestellt. Zwei Arten aus Nebengewässern der Donau sind Neumeldungen für Österreich: *Diaphanosoma orghidani* aus dem Plankton dreier Autümpel bei Haslau und *Bunops serricaudatus* aus dem Benthal eines Tümpels in der Lobau.

Introduction

The documentation of cladocerans in Austria has a long tradition starting in the 19th century. First reports are those from IMHOF (1885) and STEUER (1887). Some regions have been studied more intensively than others. STEUER (1901), PESTA (1928), VORNATSCHER (1938), MITIS (1940) and FORRÓ (1993, 1996) specifically investigated the region of Vienna and its surroundings. The waterbodies of Seewinkel and the Neusiedler See have been studied by PESTA (1954), LÖFFLER (1957, 1959, 1960a, 1960b,1979), HERZIG (1979), FORRÓ (1990), METZ & FORRÓ (1989) and WOLFRAM & al. (1999).

Numerous publications include information about taxonomy and faunistics of cladocerans from the Austrian Alps. Among them are those from HAEMPEL (1918), PESTA

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* This paper is dedicated to the late Gernot Bretschko in recognition for his contribution to knowledge of freshwater meiofauna.

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(1923, 1926, 1935, 1937, 1938, 1952) and BREHM (1907, 1911, 1912,1914, 1936). The cladoceran fauna of Kärnten was documented by FINDENEGG (1933, 1934, 1936, 1938, 1948), TURNOWSKY (1946a, 1946b, 1961) and STEUER (1970, 1971); a red list was recently compiled by JERSABEK (1999). Cladocera from lakes of the Salzkammergut region were studied mainly by LANGHANS (1911) and NAUWERCK (1988, 1991a, 1993). Cladocerans from the province of Tirol were documented by STEINBÖCK (1955), SCHABER (1981, 1983, 1985, 1988) and REED (1970) and those from Voralberg by WAWRIK (1954, 1958). WAWRIK (1966) also investigated the cladoceran fauna of 236 fish ponds in the Waldviertel region (Niederösterreich).

In their contribution to the Limnofauna Europea, HRBÁČEK & al. (1978) recorded 94 species for the "central mid-mountain range" ("zentrale Mittelgebirge") and 80 species for the Alps and the Hungarian plains each. Although the Austrian territory is included in both regions, it was not possible to extract a separate species list for Austria.

In the last two decades, several authors worked on cladoceran taxonomy (DUMONT & PENSAERT 1983; ALONSO 1996; SMIRNOV 1992, 1996; FLÖSSNER 2000; NEGREA 1983; NEGREA & al. 1999; KOROVCHINSKY 2000b) and influenced the taxonomy of this group in central Europe. One new family (Ilyocryptidae SMIRNOV, 1976), two genera (*Megafenestra* DUMONT & PENSAERT, 1983 and *Paralona* SRÁMEK-HUŠEK, STRAŠKRABA & BRTEK, 1962), several subgenera (within *Pleuroxus* and *Simocephalus*), one species (*Diaphanosoma orghidani* NEGREA, 1982) have been erected. Additionally, two subfamilies have been elevated to familiy status (Acantholeberidae SMIRNOV, 1976; Eurycercidae KURZ, 1875) and one genus (*Moina* BAIRD, 1850) has been relocated.

In the present study, published records from all over the country were only included when the determination of species appeared to be correct. In order to confirm some of the species or to apply nomenclatural corrections, reference material from the collection of the Museum of Natural History of Vienna was studied.

Unpublished information includes collections made during the past two decades, especially in the Alps (by S. Gaviria, C.D. Jersabek and R. Schabetsberger) and the eastern part of the country (by Forró, Gaviria). Unpublished records from faunistic surveys done by other scientists related to benthic species of the Seewinkel (G. Wolfram, Donabaum & Wolfram OEG, Vienna) and of pounds in Vienna and surroundings (Ph. Wenzl, TB für Biologie Dr. Gaviria-Melo, Vienna) and planktonic species from some alpine lakes (B. Tartarotti, Innsbruck; P. Schaber, Salzburg) were also considered.

Due to the high diversity of habitats in the backwaters of the Danube River, the cladoceran fauna of 16 additional backwater sites between Oberösterreich (Machland) and the Austrian border with the Slovakian Republic (near Engelhartstetten) was investigated.

Recently, an species list of cladocerans from Austria was published (GAVIRIA-MELO & al. 2003) but not information about specific localities, dates of collection and names of collectors was included. This article shows species distribution in the 15 established aquatic ecoregions and running water bioregions of the country (MOOG & al. 2001) and their functional feeding guilds.

The aim of the present inventory is to put together and update a comprenhensive list of species recorded from Austria and to compile localities of species occurrence.

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Material and methods

The material studied by the authors is deposited at the Museum of Natural History of Vienna (NHMW) and in the authors' archive collections. The Museum's collection includes animals classified in 66 inventory numbers and belonging to 27 species (Tabs. 1 – 3).

Tab. 1: Voucher material (alcohol preserved) deposited at the NHMW; L., *Lathonura*; I., *Ilyocryptus*, M., *Macrothrix*; S., *Streblocerus*; D., *Diaphanosoma*; T., *Tretocephala*; C., *Camptocercus*; f; female; Nr., inventory number; [1)] determinator, Pesta;

Nr.	species	locality	date	collector	individuals
16795	*L. rectirostris*	T, Schilfsee near Brixlegg-Kramsach	11-08-1922	Pesta	3 f
16797	*L. rectirostris*	T, Schilfsee near Brixlegg-Kramsach	21-07-1923	Pesta	4 f
16798	*L. rectirostris*	T, Schilfsee near Brixlegg-Kramsach	01-11-1932	Pesta	7 f
16799	*L. rectirostris*	W, Stadlau, swamp	22-09-1893	Koelbel	9 f
16801	*L. rectirostris*	W, Stadlau, swamp	22-09-1893	Koelbel	6 f
16802	*I. agilis*	W, Leopoldau, backwater of Danube	03-07-1933	Vornatscher	14 indiv.
16804	*I. sordidus*	T, Zeinergraben near Mötz	08-1925	Pesta	4 indiv.
16805	*I. sordidus*	O, Almsee	09-07-1927	Zeithinger	8 indiv.
16806	*M. laticornis*	W, Alte Donau	06-03-1924	Pesta	15 indiv.
16808	*M. hirsuticornis*	T, Unterer Seebisee	15-08-1911	Pesta	8 indiv.
16809	*M. rosea*	B, Seewinkel, Silberlacke	14-05-1936	Marburn[1)]	5 indiv.
16810	*M. rosea*	B, Zicklacke northern Oberer Stinkersee	-06-1935	?	10 indiv.
16811	*S. serricaudatus*	T, Gerlosplatte near Krimml, swamp	18-08-1924	Pesta	17 indiv.
16812	*S. serricaudatus*	T, Grüne Lacke (Laperlacke), Gschöpswasser, Zillertal	13-08-1933	Pesta	8 indiv.
16814	*S. serricaudatus*	T, swamp-pond near Krummsee, Unterinntal	04-09-1935	Pesta	3 f
16815	*S. serricaudatus*	T, Kühbodentümpel, Zillertal	-08-1939	Pesta	8 indiv.
16816	*S. serricaudatus*	T, swamp-pond on Arlberg, Eastern Alps	21-08-1936	Pesta	6 indiv.
16816	*S. serricaudatus*	T, Maiensee, Arlberg	20-08-1936	Pesta	7 indiv.
16817	*D. brachyurum*	W, Stadlau, swamp	09-06-1893	Koelbel	118 indiv.
16819	*D. brachyurum*	O, Attersee	30-08-1919	Pesta	5 indiv.
19836	*D. orghidani*	N, Regelsbrunn, Schüttlau	10-09-1998	Gaviria	9 f
19838	*T. ambigua*	N, Engelhartstetten, forest pond near bridge	25-09-2002	Gaviria	7 f
19839	*C. rectirostris*	W, Stadlau, swamp	-01-1893	Koelbel	1 f

Phylogenetic classification of orders and families follows DUMONT & NEGREA (2002). Taxonomy used is based in FLÖSSNER (2000). The reported localities of the species are listed and included in distribution maps (Figs. 1 – 10). Altitudinal distribution of species divided in vegetation zones, as well as highest and, in some cases, lowest altitudinal records for each species are indicated. An account of the world distribution of the species is given based in ALONSO (1996), BROOKS (1957), FLÖSSNER (2000), LIEDER (1996), KOROVCHINSKY (1992), KOTOV (1995), MARGARITORA (1985), NEGREA (1983),

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ORLOVA-BIENKOWSKAYA (2001), RIVIER (1998), SMIRNOV (1974, 1992, 1996), and our own records in Austria, Hungary and Colombia. The known localities of twenty widely distributed species in Austria were not listed or included in the maps. Particular auto-ecological remarks are added if they are relevant.

Tab. 2: Voucher material (alcohol preserved) deposited at the NHMW; M., *Moina*; D., *Daphnia*; S., *Simocephalus*; C., *Ceriodaphnia*; f., female; p., parthenogenetic female; e., ephippial female; Nr., inventory number; [1)] determinator, Pesta; [2)] determinator, Steuer; revisor, Gaviria.

Nr.	species	locality	date	collector	individuals
19791	*M. macrocopa*	K, Villach	15-04-1877	Koelbel	13 f (p.), 3 f (e.)
19793	*M. brachiata*	K, pond betw. Drau and St. Kanzian	06-1894	Handlirsch	16 f (p.), 23 f (e.)
19795	*M. brachiata*	S, pond in "Klöling", southern Lungau	06-1894	Handlirsch	>1000 indiv.
19796	*D. obtusa*	S, pond near Kammsee, Mühlhäuserhöhe	07-1922	Holdhaus[1)]	77 f (p.)
19798	*D. obtusa*	S, Kammsee, Mühlhäuserhöhe	08-1923	Holdhaus[1)]	29 f (p.)
19799	*D. obtusa*	S, Kammsee, Mühlhäuserhöhe	08-1923	Holdhaus[1)]	14 f (p.), 1 f (e.)
19801	*D. obtusa*	N, pond on Schwaigboden, Raxalpe	06-1931	Pesta	10 f (p.), 15 f (e.)
19803	*D. obtusa*	K, pond on Saualpe	06-09-1896	Steuer	25 f, 5 m
19805	*D. pulex*	N, Kirchberg am Wagram, horse-pond	?	Ferrari	35 f (p.), 5 f (e.)
19806	*D. pulex*	N, pond near Klosterneuburg-Kierling	07-07-1940	Samassa[1)]	5 f (p.)
19807	*D. obtusa*	K, Pfannocksee	08-1922	Holdhaus[1)]	8 f (p.)
19808	*D. atkinsoni*	B, Zicklacke near Illmitz	03-05-1931	Kühnelt[1)]	15 f (e.), 2 e.
19809	*S. serrulatus*	K, Magdalenensee	12-04-1877	Koelbel[2)]	1 f
19811	*S. serrulatus*	W, Alte Donau, inundated grassland near train station	19-06-1926	Pesta	2 f (p.)
19812	*S. serrulatus*	K, Magdalenensee	12-04-1877	Koelbel	7 f, 4 juv.
19814	*S. serrulatus*	W, Stadlau, backwater pond	01-1893	Koelbel	8 f (p.)
19815	*S. vetulus*	W, Stadlau, backwater pond	01-1893	Koelbel	148 f
19817	*S. exspinosus*	B, pond west of Unterer Stinkersee	06-06-1935	Mazek-Fiala[1)]	3 f (p.)
19830	*C. rotunda*	O, Krottensee near Gmunden	14-04-1877	Koelbel	40 f, 2 m
19832	*C. rotunda*	W, Stadlau, swamp	01-1893	Koelbel	83 ind.
19833	*C. rotunda*	W, Alte Donau	29-03-1924	Pesta	46 f
19834	*C. rotunda*	W, forest pond in "Himmel", 19th district	08-07-1934	Pesta	8 f (e.)
19835	*S. congener*	W, Hanselgrund, lower Lobau	25-09-2002	Gaviria	4 f
19840	*D. obtusa*	T, pond on Alpmoos	30-07-1931	Pesta	3 f (e.), 9 m, 5 f (juv.)
19841	*D. middendorffiana*	K, Anderlesee on "Blutige Alm"	01-1893	Holdhaus	6 f (p.), 2 juv.

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Tab. 3: Voucher material (animals mounted on slides) deposited at the NHMW; L., *Lathonura*; M., *Macrothrix*; S., *Simocephalus*; D., *Diaphanosoma*; M., *Moina*; D. *Daphnia*; S., *Simocephalus*; A., *Alona*; C., *Ceriodaphnia*; B., *Bunops*; f., female; m, male; p., parthenogenetic female; e., ephippial female; Nr., inventory number; [1)] determinator, Pesta; revisor, Gaviria, [2)] determinator, Steuer; revisor, Gaviria.

Nr.	species	locality	date	collector	individuals
16796	*L. rectirostris*	T, Schilfsee near Brixlegg-Kramsach	11-08-1922	Pesta	1 f
16800	*L. rectirostris*	W, Stadlau, swamp	22-09-1893	Koelbel	1 f
16803	*I. agilis*	W, Leopoldau, backwater of Danube	03-07-1933	Vornatscher	1 f
16807	*M. laticornis*	W, Alte Donau	06-03-1924	Pesta	1 f
16813	*S. serricaudatus*	T, Grüne Lacke (Laperlacke), Gschöpswasser, Zillertal	13-08-1933	Pesta	1 f
16818	*D. brachyurum*	W, Stadlau, swamp	09-06-1893	Koelbel	1 f
19792	*M. macrocopa*	K, Villach	15-04-1877	Koelbel	1 f
19794	*M. brachiata*	K, pond betw. Drau and St. Kanzian	06-1894	Handlirsch	1 f
19797	*D. obtusa*	S, pond in "Klöling", southern Lungau	07-1922	Holdhaus[1)]	1 f (p.)
19800	*D. obtusa*	N, pond in Schwaigboden, Raxalpe	06-1931	Pesta	1 f
19802	*D. obtusa*	T, pond on Alpe Alpmoos	30-07-1931	Pesta	1 f
19804	*D. obtusa*	K, pond on Saualpe	06-09-1896	Steuer	1 f (e.)
19898	*D. pulex*	N, Kirchberg am Wagram, horse-pond	?	Ferrari	1 f
19810	*S. serrulatus*	K, Magdalenensee	12-04-1877	Koelbel[2)]	1 m
19813	*S. serrulatus*	K, Magdalenensee	12-04-1877	Koelbel	1 f
19816	*S. vetulus*	W, Stadlau, backwater pond	01-1893	Koelbel	1f
19818	*S. exspinosus*	B, pond west of Unterer Stinkersee	06-06-1935	Mazek-Fiala[1)]	1f (p.)
19819	*A. costata*	N, Lunzer Untersee, southern littoral (0-2 m)	22-06-1922	Pesta	1 f
19831	*C. rotunda*	O, Krottensee near Gmunden	14-04-1877	Koelbel	2 f, 1 m
19837	*B. serricaudatus*	W, Hanselgrund, lower Lobau	07-07-1998	Gaviria	1 f

Results

A total of 103 species, subspecies and hybrids were found in the country. Twelve cladoceran families including 40 genera are represented in Austria.

Checklist

For each species, the localities are arranged by Austrian provinces (B, Burgenland; K, Kärnten; N, Niederösterreich; O, Oberösterreich; S, Salzburg; ST, Steiermark; T, Tirol; V, Vorarlberg and W, Wien). The altitudinal range of the species is based on the principal vegetation zones: lowlands (< 200 m), colline (< 600/800 m northern/southern slope), montane (600/800 – 1500/1700 m), subalpine (1500/1700 – 2000/2300 m) and alpine (> 2000/2300 m). Following abbreviations on the listed localities mean: "GW", groundwater; "pers. comm.", personal communication; "pers. obs", personal observation.

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Order Anomopoda SARS, 1865

Family Acantholeberidae SMIRNOV, 1976

Genus *Acantholeberis* LILLJEBORG, 1853

Acantholeberis curvirostris (O.F. MÜLLER, 1776)

Daphne curvirostris O.F. MÜLLER 1776: 200.

Localities: Salzburg: Filzmoos, Pongau (FLÖSSNER 2000); Überling-Alm, Lungau (FLÖSSNER 2000); Steiermark: Seetaler Alpen (HARTMANN 1915).

General distribution: Austria: known only from three localities in the montane zone, S; highest record: Überling-Alm, S (~1500 m) (Fig. 9). **World:** holarctic; in Europe, predominantly boreo-montane.

Habitat: acid bogs; pH: 3.9 – 5.6.

Family Bosminidae BAIRD, 1845

Genus *Bosmina* BAIRD, 1845

Subgenus *Bosmina* s.str. BAIRD, 1845

Bosmina (*Bosmina*) *longirostris* (O.F. MÜLLER, 1785)

Lynceus longirostris O.F. MÜLLER 1785: 76.
Bosmina (*Bosmina*) *longirostris* — LIEDER, 1996: 33 – 36.

Localities: Burgenland: 13, Kärnten: 16, Niederösterreich: 21, Oberösterreich: 7, Salzburg: 7, Steiermark: 15, Tirol: 14, Vorarlberg: 1, Wien: 14.

General distribution: Austria: all over the country; lowlands up to alpine zone; highest record: Lauterersee, T (2400 m).**World:** considered cosmopolitan by several authors (ALONSO 1996; NEGREA 1983). LIEDER (1996) affirms that populations of eastern Asia and America could belong to the subgenus *Sinobosmina* LIEDER, 1957.

Habitat: groundwater (accidentally stygophile), rivers, plankton in littoral of lakes, plankton in ponds; prefers eutrophic waters; in continental waters up to salinity of 2.

Subgenus *Eubosmina* SELIGO, 1900

Bosmina (*Eubosmina*) *coregoni* BAIRD, 1857

Bosmina coregoni BAIRD, 1857: 24.
Bosmina (*Eubosmina*) *coregoni* — LIEDER, 1996: 56 – 58.

Localities: Kärnten: Afritzer See (FINDENEGG 1953; STEUER 1971), Faakersee (STEUER 1897; FINDENEGG 1953), Feldsee (STEUER 1971), Großer Magdalenensee (PESTA 1923), Keutschachersee (STEUER 1897), Klopeiner See (FINDENEGG 1935), Längsee (FREY 1955, 1956), Lausnitzsee, Niedere Tauern (?) (PESTA 1926), Millstätter See (FINDENEGG 1935; WEBER 1958), Ossiacher See (STEUER 1897; PESTA 1923; FINDENEGG 1934, 1935; STEUER 1971), Turnersee (STEUER 1970), Weißensee (STEUER 1897; FINDENEGG 1936, 1943a, 1943b, 1953; STEUER 1971), Wörthersee (PESTA 1923; FINDENEGG 1933, 1935, 1943a,

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1943b); Niederösterreich: Danube River, reservoir Altenwörth (WEIGAND 1996; ZOUFAL 1990), Erlaufsee (PESTA 1923), Lunzer Mittersee (PESTA 1923), Lunzer Obersee (PESTA 1923), Lunzer Untersee (RUTTNER 1930); Oberösterreich: Attersee (PESTA 1923; MÜLLER 1976, 1977), Mondsee (PESTA 1923; LIEPOLT 1935; NAUWERCK 1988, 1991a, 1991b, 1995); Salzburg: Wallersee (NAUWERCK 1991a; RECKENDORFE 1992; Jersabek pers. obs. 1998); Steiermark: Altausseer See (PESTA 1923; STUNDL 1953b), Etrachsee (?) (STUNDL 1953b), Leistensee, Niedere Tauern (STUNDL 1953b), Leopoldsteinersee (PESTA 1923; STUNDL 1953a; METZ 1966), Unterer Giglachsee, Niedere Tauern (?) (PESTA 1924); Tirol: Achensee (ZACHARIAS 1903; PESTA 1923); Vorarlberg: Lünersee (HUTER 1967); Wien: Alte Donau (Gaviria pers. obs. 1997; MAYER & al. 1997; MIKSCHI & SCHWEIGER 1988); Austrian Alps (NAIDENOW 1994); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: mountain lakes from colline up to the montane zone; Danube River; highest record: Lunzer Obersee, N (1113 m) (Fig. 1). **World:** originally palearctic; since the 1950ies in the Great Lakes and north-eastern North America.

Habitat: rivers, backwaters of rivers, pelagic zone of lakes, fishponds; from eutrophic to polytrophic waters, rare in mesotrophic waters.

Remarks: several reports from oligotrophic subalpine and lowland lakes are doubtful and probably relate to *Bosmina longispina* (e.g. oligotrophic Unterer Giglachsee, ST). Avoids oligotrophic lakes (LIEDER 1996).

Bosmina (*Eubosmina*) *longicornis* SCHOEDLER, 1866

Bosmina longicornis SCHOEDLER, 1866: 47.

Localities: Kärnten: Magdalenensee (STEUER 1897), Ossiachersee (STEUER 1897); Wörthersee (STEUER 1897); Salzburg: Grabensee (Jersabek pers. obs. 1998), Mattsee (Jersabek pers. obs. 1998), Obertrumer See (Jersabek pers. obs. 1998), Wallersee (Jersabek pers. obs. 1998).

General distribution: Austria: known only from 3 lakes in the Lower Alps in K and from 4 lakes in S; colline zone; highest record: Wallersee, S (504 m) (Fig. 1). **World**: palearctic.

Habitat: pelagic zone of lakes, generally epipelagic, lives in mesotrophic, eutrophic and polytrophic lakes.

Bosmina (*Eubosmina*) *longispina longispina* LEYDIG, 1860

Bosmina longispina LEYDIG, 1860: 207.
Bosmina (*Eubosmina*) *longispina* — LIEDER, 1996: 39 – 42.

Localities: Burgenland: Neusiedler See (AUER 1995); Kärnten: Großer Gradensee (BMLF 1998), Klopeiner See (KORINEK 1971), Millstätter See (since 1967 ?) (LÖFFLER 1983; STEUER 1971), Ossiacher See (PESTA 1923; KORINEK 1971; STOTZ 1975; WAPPIS 1980), Wörther See (KORINEK 1971); Niederösterreich: Drescher-pond, Jaidhof/ Gföhl, Waldviertel (WAWRIK 1966), Erlaufsee (RUTTNER 1939; STEUER 1967), Lunzer Obersee (MIKSCHI 1990), Lunzer Untersee (PESTA 1923; RUTTNER 1930, 1939 (sub *B. coregoni-longispina)*; KORINEK 1971), Waldviertel, Brunn a. W. (WAWRIK 1966); Oberösterreich: Almsee (ZEITLINGER 1928), Attersee (PESTA 1923; MÜLLER 1977; MOOG 1978, 1979; SCHABER 1985 (sub *B. longispina*); JERSABEK pers. obs. 1999), Gosausee (NAUWERCK 1991a), Hallstätter See (LORENZ 1898 (sub *B. bohemica*); RÜHE 1915 (sub *B.coregoni longispina*), HAEMPEL 1918 (sub *B.coregoni longispina*), LANGHANS 1911; PESTA 1923; RUTTNER 1939; JERSABEK pers. obs. 1999)), Mondsee (PESTA 1923; HERZIG 1985b; NAUWERCK 1988, 1991a, 1991b, 1995), Nussensee (NAUWERCK 1991a), Schwarzensee (NAUWERCK 1991a), Traunsee (CLAUS 1877; CORI 1898; BREHM & ZEDERBAUER 1906; LANGHANS 1908, 1911; RÜHE 1915 (sub *B. coregoni – longispina*); PESTA 1923 (sub *B. coregoni - longispina*); RUTTNER 1939; HAMANN 1954; MÜLLER 1982;

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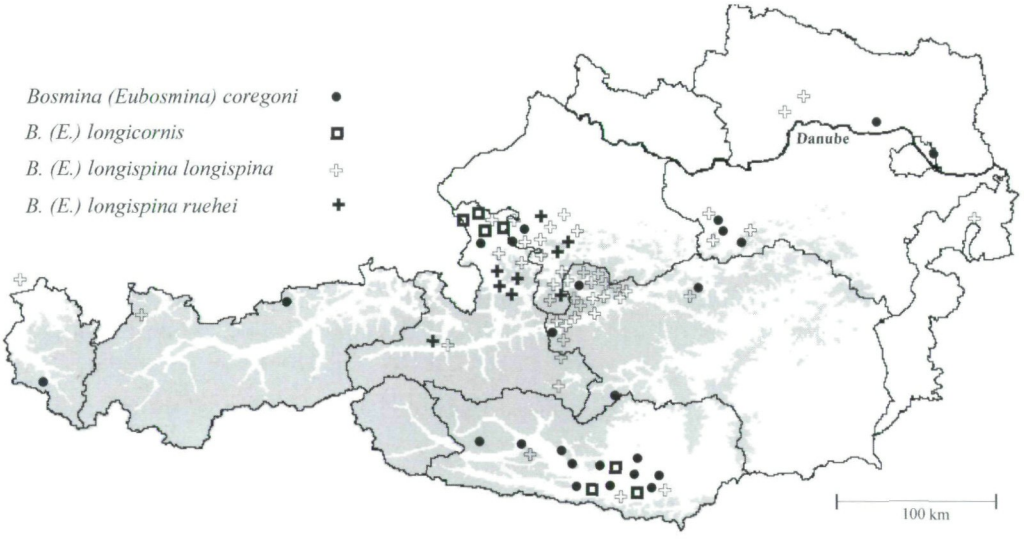

Fig. 1: Distribution map of species of *Bosmina* (except *B. longirostris*).

JERSABEK pers. obs. 1999); Salzburg: Fuschlsee (NAUWERCK 1991a; Jersabek pers. obs. 1998), Mattsee (Jersabek pers. obs. 1998), Wolfgangsee (PESTA 1923 (sub *B. coregoni* and sub *B. coregoni – longispina* forma *bohemica*)); RUTTNER 1939; Jersabek pers. obs. 1999), Zeller See (NAUWERCK 1991a; Jersabek pers. obs. 1998), Steiermark: Ahornsee, Dachstein (SCHABETSBERGER pers. obs. 1997), Altausseer See (LANGHANS 1911; RUTTNER 1939; NAUWERCK 1991a), Elmsee, Ausseerland, Totes Gebirge (STUNDL 1953b (sub *B. coregoni*)), Finetsee, Dachstein (Schabetsberger pers. obs. 1997), Grafenberger See, Dachstein (Schabetsberger pers. obs. 1997), Grundlsee (LANGHANS 1911; RÜHE 1915 (sub *B. coregoni*); RUTTNER 1939; MODER 1986; NAUWERCK 1991a; LIEDER 1996), Grundelsee (Lieder 1996), Grüne Lacke, Dachstein (Schabetsberger pers. obs. 1997), Hinterer Lahngangsee, Ausseerland, Totes Gebirge (STUNDL 1953b (sub *B. coregoni*)), Karsee, Dachstein (Schabetsberger pers. obs. 1997), Lahngangsee (RUTTNER 1939), Leopoldsteinersee (RUTTNER 1939), Miesbodensee, Dachstein (Schabetsberger pers. obs. 1997), Oberer Giglachsee (PESTA 1923 (sub *B. coregoni* var. *longispina*)), Ödensee (STUNDL 1953a (sub *B. coregoni*)), Schwarzensee, Tauplitzalm (STUNDL 1953a (sub *B. coregoni*)), Schwarzer See (STUNDL 1953b (sub *B. coregoni*)), Steirer See, Tauplitzalm (STUNDL 1953b (sub *B. coregoni*)), pool near Karsee, Dachstein (Schabetsberger pers. obs. 1997), Toplitzsee (RUTTNER 1939; STUNDL 1953a (sub *B. coregoni*); NAUWERCK 1991a), Vorderer Lahngangsee (LANGHANS 1911; STUNDL 1953b (sub *B. coregoni*); PESTA 1923); Tirol: Alkusersee Schobergruppe, Hohe Tauern, Osttirol (BMLF 1998), Haidersee (PESTA 1923); Vorarlberg: Bodensee (PESTA 1923; KOROVCHINSKY 2000a); Danube River (NAIDENOW 1998).

General distribution: Austria: in all provinces except W; from colline to alpine zone; in B and V only one record each; highest record: Großer Gradensee, Schobergruppe, Hohe Tauern, K (2488 m) (Fig. 1). **World:** holarctic.

Habitat: pelagic zone of lakes; not present in strong eutrophic waters.

Remarks: rare in central Europe and Austria; with increasing eutrophication, a trophic gradient may be expected along the line *Bosmina (Eubosmina) longispina longispina*, *Bosmina (Eubosmina) longispina ruehei, Bosmina (Eubosmina) coregoni* and *Bosmina (Bosmina) longirostris* (NAUWERCK 1991a). NAIDENOW (1998) and LIEDER (1996) mention that the species should be expected in the Austrian Danube.

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Bosmina (Eubosmina) longispina ruehei LIEDER, 1957

Eubosmina longispina ruehei LIEDER, 1957: 40.
Bosmina (Eubosmina) ruehei — LIEDER, 1996: 44 – 45.

Localities: Oberösterreich: Attersee (NAUWERCK 1991a; Jersabek pers. obs. 1999), Hallstätter See (RUTTNER 1939 (sub *B. longispina*); NAUWERCK 1991a; NAUWERCK & RITTERBUSCH-NAUWERCK 1993; JERSABEK pers. obs. 1999), Traunsee (*Locus typicus)* (RUTTNER 1939 (sub *B. longispina*); LIEDER 1957; NAUWERCK 1991a; Jersabek pers. obs. 1999), Vorderer Langbathsee (NAUWERCK 1991a); Salzburg: Fuschlsee (Jersabek pers. obs. 1998), Hintersee (NAUWERCK 1991a), Wiestalsee (NAUWERCK 1991a), Wolfgangsee (RUTTNER 1939 (sub *B. longispina*); NAUWERCK 1991a; Jersabek pers. obs. 1999), Zeller See (Jersabek pers. obs. 1998).

General distribution: Austria: known only from Salzkammergut and Zeller See in Pinzgau, S (colline zone); highest known record: Zeller See (750 m) (Fig. 1). **World:** only known from Austria.

Habitat: pelagic zone of lakes.

Remarks: the subspecies was previously considered to be endemic to the Salzkammergut, but has now also been recorded in the Zeller See (Pinzgau, S). In LIEDERS's opinion (1996), populations of *Bosmina (Eubosmina) longispina ruehei* could actually be an hybrid form between *Bosmina (Eubosmina) longispina* and *Bosmina (Eubosmina) longicornis*. That could be the case with some populations of the Salzkammergut region.

Family Chydoridae STEBBING, 1902

Subfamily Aloninae DYBOWSKI & GROCHOWSKI, 1894

Genus *Acroperus* BAIRD, 1843

Acroperus angustatus SARS, 1863

Acroperus angustatus SARS, 1863: 217.

Localities: Niederösterreich: Lunzer Untersee (PESTA 1923); Oberösterreich: Attersee (PESTA 1923), Hallstätter See (PESTA 1923); Salzburg: Faistenauer Hintersee (PESTA 1923), Zeller See (PESTA 1923; FLÖSSNER 2000); Steiermark: Grundlsee (PESTA 1923), Ödensee (PESTA 1923), ponds near Graz (HARTMANN 1915).

General distribution: Austria: known from 5 lakes in the Salzkammergut region, O, S, ST. In the colline zone, Lunzer Untersee, N and several ponds near Graz, ST; highest record: Ödensee near Kainisch, ST (764 m) (Fig. 2). **World:** palearctic.

Habitat: benthos of slow running rivers, lakes and ponds; prefers oligotrophic waters (ALONSO 1985).

Remarks: less frequent than *A. harpae*.

Acroperus harpae (BAIRD, 1835)

Lynceus harpae BAIRD, 1835: 100.

Localities: Kärnten: 16, Niederösterreich: 13, Oberösterreich: 14, Salzburg: 14, Steiermark: 20, Vorarlberg: 2; Wien: 17.

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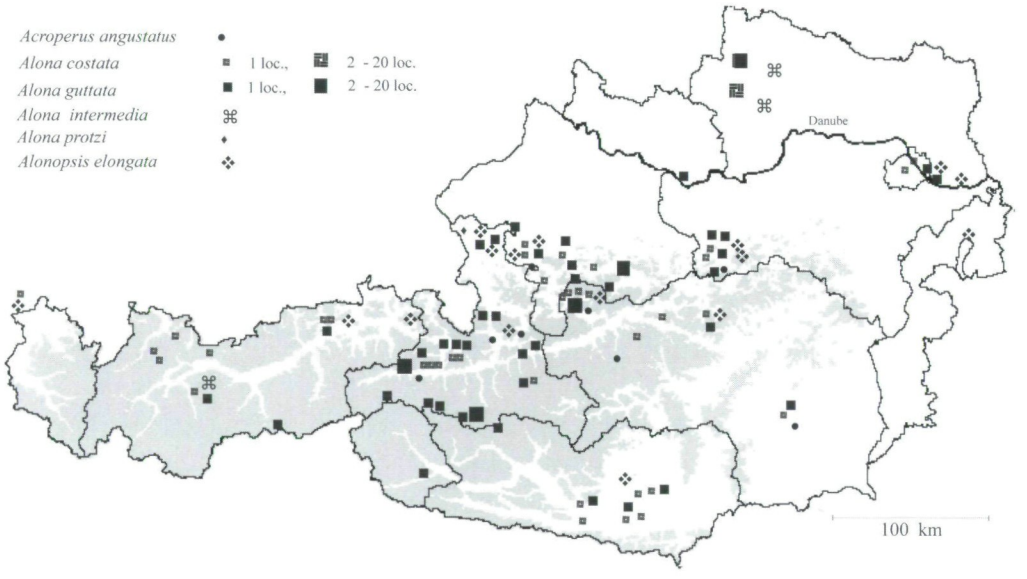

Fig. 2: Distribution map of species of *Acroperus* (except *A. harpae*), *Alona* (except *A. affinis*, *A. karelica*, *A. quadrangularis* and *A. rectangula*) and *Alonopsis*.

General distribution: Austria: with exception of B (no records) and two localities in V (Bodensee and Tilisunasee) (PESTA 1923), known all over the country; from colline to alpine zone; highest records: Tilisunasee, V (2102 m) and Oberer Sonntagskarsee, ST (2036 m) (PESTA 1923). **World:** holarctic, ethiopic, oriental, neotropic.

Habitat: groundwater (stygophile) (NEGREA & POSPISIL 1995), benthos of slow running rivers, backwaters, lakes (littoral and profundal zone), ponds, salt ponds; prefers habitats with macrophytes and/or detritus.

Genus *Alona* BAIRD, 1843

Alona affinis (LEYDIG, 1860)

Leydigia affinis LEYDIG, 1860: 223.
Alona affinis — BEHNING, 1941: 312.
Biapertura affinis — SMIRNOV, 1971: 467.

Localities: Burgenland: 2; Kärnten: 37; Niederösterreich: 38; Oberösterreich: 12; Salzburg: 42; Steiermark: 23; Tirol: 30; Vorarlberg: 2; Wien: 2.

General distribution: Austria: throughout the country, but more common in the Alps and in the hills of the Waldviertel, N; rare in the Seewinkel region; lowlands up to alpine zone; highest record: Schlickersee, Stubaital, T (2500 m) (PESTA 1923). **World:** cosmopolitan.

Habitat: groundwater (stygophile), benthos of rivers and backwaters, littoral and profundal zone of lakes, permanent and temporary ponds, phytothelmata; common between macrophytes.

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Alona costata SARS, 1862

Alona costata SARS, 1862: 286.

Localities: Kärnten: Großer Magdalenensee (STEUER 1897; PESTA 1923), Jeserzer See (STEUER 1897; PESTA 1923), Längsee (FREY 1955, 1956), St. Leonhardsee (STEUER 1897 (sub *A. lineata*), Tihojasee (STEUER 1897 (sub *A. lineata*)), Turnersee (SAMPL 1970), Wörthersee (PESTA 1923); Niederösterreich: fishponds (15) in Waldviertel (WAWRIK 1966), Lunzer Obersee (PESTA 1924; MIKSCHI 1990), Lunzer Untersee (PESTA 1923; NHMW 19819); Oberösterreich: Almsee (ZEITLINGER 1928), Attersee (LANHANS 1911; PESTA 1923), Hallstätter See (LANHANS 1911; PESTA 1923), Egelsee near Stockwinkel a. Attersee (LANHANS 1911), Josersee, Hochschwab (PICHLER 1939), Kaltenbachteich, Ischler Hausberg (ZACH 1983 (sub *A. guttata*)), Traunsee (PESTA 1923); Salzburg: fishponds (2) in Hinterthal (JERSABEK 1987), pond in Hinterthal (JERSABEK 1987), pond near Weikertsham (JERSABEK 1986), ponds (3) in golf-course Zeller See (JERSABEK 1986); Steiermark: Augstsee (LANHANS 1911; PESTA 1923), Gaishornsee (PESTA 1923), Grundlsee (LANHANS 1911; PESTA 1923), Grüner See near Tragöss (BRETSCHKO 1966), Hinterer Lahngangsee (LANHANS 1911; PESTA 1923), Josersee, Hochschwab (PICHLER 1939), Ödensee (LANHANS 1911; PESTA 1923), pond near Graz (HARTMANN 1915), Sommersbergersee (LANHANS 1911; PESTA 1923); Tirol: Buchsee (PESTA 1924), first "Strad"-Teich in Tarrenz, north of Imst (PESTA 1924), Krummsee, Nordtiroler Kalkalpen (PESTA 1924), "Loar" near Brixlegg-Kramsach (PESTA 1938), Mittersee on Fernpaß (PESTA 1923), Piburger See (FÜREDER 1995), Reintalersee, Nordtiroler Kalkalpen (PESTA 1924), Reithersee (PESTA 1923), second "Strad"-Teich in Tarrenz, north of Imst (PESTA 1924), Wildsee near Seefeld (PESTA 1924); Vorarlberg: Albona-bog-pond (WAWRIK 1954), Bodensee (PESTA 1923); Wien: Alte Donau (STEUER 1901), Lusthauswasser, Prater (VORNATSCHER 1938); Danube (NAIDENOW 1998).

General distribution: Austria: colline and montane zones, not present in sub-alpine and alpine zones; highest record: Hinterer Lahngangsee, ST (1560 m); no records from B and Osttirol (Fig. 2). **World:** holarctic, oriental, ethiopic and neotropic regions.

Habitat: benthos of slow running rivers and lakes, permanent and temporary ponds.

Alona guttata SARS, 1862

Alona guttata SARS, 1862: 287.

Localities: Kärnten: Feldsee (SCHARF 1995), Großer Magdalenensee (STEUER 1897; PESTA 1923), Jeserzersee (STEUER 1897; PESTA 1923), Längsee (FREY 1955, 1956),bog-pond near Kölnbreinspeicher, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1992b), Weizelsdorfer Badesee (FRESNER 1995); Niederösterreich: bogs near Lunzer Obersee (BEIER 1928), fishponds (7) in Waldviertel (WAWRIK 1966), Lunzer Mittersee (PESTA 1924), Lunzer Obersee (PESTA 1923), Lunzer Untersee (PESTA 1923), pond on Seekopf near Lunz (BREHM & RUTTNER 1926); Oberösterreich: Attersee (LANHANS 1911; PESTA 1923), Hallstätter See (LANHANS 1911; PESTA 1923), Herzerlsee (bog pond), Sengsengebirge (JERSABEK & SCHABETSBERGER 1992a), Krottensee near Gmunden (JERSABEK & SCHABETSBERGER 1994), Machland, Mittelwasser (HINTEREGGER & GAVIRIA pers. obs. 2001), Schafferteich (ZEITLINGER 1928), bogs (5) in Feichtau, Sengsengebirge (JERSABEK & SCHABETSBERGER 1992a), pond in Pöndorf (Jersabek pers. obs. 2001), Traunsee (PESTA 1923), Wildensee (LANHANS 1911; PESTA 1923); Salzburg: bog pond on Graukogel, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989), bog near hunting-lodge at Reedsee (JERSABEK & SCHABETSBERGER 1989; 1992c), bog east of hunting-lodge near Reedsee (JERSABEK & SCHABETSBERGER 1992c), excavation-pond in Piesendorf (JERSABEK 1986), Gamskarlsee, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1992b), gravel-ponds (2) in Piesendorf (JERSABEK 1986), Karslbader Weiher in Salzburg (Jersabek pers. obs. 1989), Mitterastensee, Goldberggruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1991), Oberer See in Kühkar, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989), ponds (3) in golf-course in Zeller See (JERSABEK 1986), ponds (3) on Grinnköpfel near Dienten (JERSABEK 1987), pond near Leitternsee, Radstätter Tauern (JERSABEK 1986), ponds (2) on Ortbergscharte, Goldberggruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1991), pond near Pinzgauer Spaziergang (JERSABEK 1986), pond near Rossboden, Forstau (JERSABEK 1986), ponds (3) on Schlossalm, Gasteiner Tal, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989), ponds (2) on Schmittenhöhe (JERSABEK 1986), ponds (2) east of

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Nachtkarwand, Goldberggruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1991),pond Lucialacke near Niedernsill (JERSABEK 1986), Reedsee, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989, 1992c), pond near Strasswalchen (Jersabek pers. obs. 1999), pond near Henndorf (Jersabek pers. obs. 1999), pond at University in Salzburg (Jersabek pers. obs. 1987); Steiermark: Augstsee (LANHANS 1911; PESTA 1923), Grundlsee (LANHANS 1911; PESTA 1923), Leopoldsteinersee (METZ 1966), Ödensee (LANHANS 1911; PESTA 1923), pond on Egelgrubenalm (LANHANS 1911), pond on Lenauhügel in Aussee (LANHANS 1911), ponds near Graz (HARTMANN 1915), puddle below Lenauhügel in Aussee (LANHANS 1911), Sommersbergersee (LANHANS 1911; PESTA 1923), trout-pond near Grundlsee (LANHANS 1911); Tirol: Berglsteinersee (PESTA 1923, 1924), Kühbodentümpel, Zillertaler Alpen (PESTA 1939), Piburger See (THALER 1975; FÜREDER 1995), Tristacher See in Lienz (PESTA 1926); Wien: Alte Donau (STEUER 1901), Untere Lobau, Eberschüttwasser (GW & benthos) (NEGREA & POSPISIL 1995); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: with exception of B and V, known throughout the country; from lowlands to alpine zone; highest record: Oberer See in Kühkar, Ankogelgruppe, S (2276 m). **World:** cosmopolitan.

Habitat: springs and groundwater (stygophile), benthos of rivers and backwaters, littoral zone of lakes, phytotelmata.

Alona intermedia SARS, 1862

Alona intermedia SARS, 1862: 286.
Biapertura intermedia — SMIRNOV, 1971: 475.

Localities: Niederösterreich: Groß Haslau (WAWRIK 1966), Reinpolzter-pond, Waldviertel (WAWRIK 1966; FLÖSSNER 2000); Tirol: Piburger See (FÜREDER 1995; WINDER & al. 2000).

General distribution: Austria: known from only 2 localities in the Waldviertel, N and the Piburger See, T (915 m, highest record) (Fig. 2). **World:** cosmopolitan (SMIRNOV 1971).

Habitat: brooks and rivers, benthos of lakes and reservoirs, ponds; prefers oligotrophic waters.

Alona karelica STENROOS, 1897

Alona karelica STENROOS, 1897: 52.

Localities: Steiermark: Graz (FLÖSSNER 2000).

General distribution: Austria: Graz, ST. **World**: palearctic and neotropic.

Habitat: littoral zone of lakes, ponds, bogs; eurythermic; in oligotrophic to low eutrophic waters.

Remarks: one of the rarest cladoceran species. FLÖSSNER (2000) considers the report in Graz as uncertain.

Alona protzi HARTWIG, 1900

Alona protzi HARTWIG, 1900: 228.

Localities: Salzburg: Grabensee (FLÖSSNER 2000).

General distribution: Austria: only known from Grabensee (503 m) in the Flachgau region, S (Fig. 2). **World:** western Palearctic (uncommon).

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Habitat: groundwater, stony bottom of rivers, littoral zone (sediments and macrophytes) of lakes.

Alona quadrangularis (O.F. MÜLLER 1776)

Lynceus quadrangularis O.F. MÜLLER 1776: 199.

Localities: Burgenland: 5; Kärnten: 6; Niederösterreich: 15; Oberösterreich: 13; Salzburg: 12; Steiermark: 12; Tirol: 12; Vorarlberg: 1; Wien: 4.

General distribution: Austria: throughout the country, from lowlands to alpine zone; highest record: moss-ponds on Graukogel, Ankogel-Gruppe, Hohe Tauern, S (2492 m); in V only known from Tilisunasee (ZSCHOKKE 1890); in B only known from 5 waterbodies in the Seewinkel (Darscho, Fuchslochlacke, Höllacke, Kühbrunnlacke and Unterer Stinkersee) (Wolfram pers. comm. 1997). **World:** holarctic, ethiopic and neotropical.

Habitat: springs, groundwater (hyporheic zone), benthos of rivers and backwaters, littoral and profundal zone of lakes, bogs; rare in temporary ponds, salt ponds and among weeds; common on muddy bottoms.

Alona rectangula SARS, 1861

Alona rectangula SARS, 1861: 160.

Localities: Burgenland: 42; Kärnten: 2; Niederösterreich: 9; Oberösterreich: 8; Salzburg: 11; Steiermark: 7; Tirol: 2; Vorarlberg: 1; Wien: 5.

General distribution: Austria: common in lowlands, colline and montane zones, rare in subalpine and alpine zones; highest records: Gossenköllesee, T (2413 m) and Unterer Höhkarsee, Ankogelgruppe, Hohe Tauern, S (~ 2400 m). **World:** palearctic and northern ethiopic region.

Habitat: same as *Alona quadrangularis*, but common in temporary waters and salt ponds; groundwater (stygophile); prefers eutrophic waters.

Genus *Alonopsis* SARS, 1862

Alonopsis elongata (SARS, 1861)

Alona elongata SARS, 1861: 161.
Acroperus elongatus — SMIRNOV, 1966: 116.

Localities: Burgenland: Neusiedler See (LÖFFLER 1979 (sub *Acroperus elongatus*)); Kärnten: Längsee (FREY 1955, 1956); Niederösterreich: backwaters near Orth (RECKENDORFER 2000 (sub *Acroperus elongatus*)), Lunzer Obersee (BREHM & RUTTNER 1926), Lunzer Untersee (PESTA 1924); Oberösterreich: Attersee (LANHANS 1911; PESTA 1923), Mondsee (GAVIRIA pers. obs. 1999); Salzburg: Faistenauer Hintersee (PESTA 1923), Mattsee (PESTA 1923), Wallersee (PESTA 1923); Steiermark: Grundlsee (LANHANS 1911; PESTA 1923), Leopoldsteinersee (METZ 1966); Tirol: Achensee (BREHM 1912; PESTA 1923), Pillersee, Kitzbühler Alpen (BREHM 1907; PESTA 1923); Vorarlberg: Bodensee (PESTA 1923); Wien: Untere Lobau, Kühwörther Wasser (HOLAREK 1999 (sub *Acroperus elongatus*)); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: not common, most localities in lowlands and colline zones, a single record from the montane zone: Lunzer Obersee, N (1113 m, highest record) (Fig. 2). **World:** northern and central Palearctic.

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Habitat: littoral (with detritus, sand, stones or macrophytes) of lakes; in Austria limited to middle-sized and large lakes, with a single record from a backwater lake near the Danube River.

Genus *Camptocercus* BAIRD, 1843

Camptocercus lilljeborgi SCHOEDLER, 1862

Camptocercus lilljeborgi SCHOEDLER, 1862: 24.

Localities: Oberösterreich: Egelsee near Scharfling (JERSABEK pers. obs. 1986), Egelsee near Stockwinkel a. Attersee (LANHANS 1911; PESTA 1923); Vorarlberg: Bodensee (FLÖSSNER 2000).

General distribution: Austria: only known from 3 lakes of the Lower Alps, V, O; colline zone; highest record: Egelsee near Stockwinkel a. Attersee, O (621 m) (Fig. 3). **World:** western Palearctic.

Habitat: benthos of backwaters, littoral zone of lakes and ponds; prefers areas with swimming waterplants and shallow bays.

Camptocercus rectirostris SCHOEDLER, 1862

Camptocercus rectirostris SCHOEDLER, 1862: 25.

Localities: Kärnten: Jeserzer See (STEUER 1897; PESTA 1923), Klopeiner See (STEUER 1897; HOFFER & KRAUSS 1909; PESTA 1923), Längsee (FREY 1955, 1956), Magdalenensee (STEUER 1897; PESTA 1923), Turnersee (SAMPL 1970); Niederösterreich: March River (SPANDL 1924), Thaya River (SPANDL 1924), Waldviertel (FLÖSSNER 2000); Oberösterreich: Egelsee near Stockwinkel a. Attersee (LANHANS 1911 (sub *Camptocercus biserratus*)), Traunsee (PESTA 1923); Salzburg: Mattsee (PESTA 1923), Prebersee (GAVIRIA pers. obs. 2001); Steiermark: ponds near Graz (HARTMANN 1915); Tirol: Piburger See (THALER 1975); Wien: Lusthauswasser, Prater (VORNATSCHER 1938), Obere Lobau, Oberleitner Wasser (PFAFFENWIMMER 1986), swamp near Stadlau (NHMW 19839), Untere Lobau – Mittelwasser, Mühlleitner Furt (PFAFFENWIMMER 1986).

General distribution: Austria: backwaters of Danube River, W, Thaya and March rivers, N, lakes in the Lower Alps, K (5), O (2), S (1), ponds near Graz, ST, and Waldviertel, N; two alpine lakes: Piburger See, T (915 m) and Prebersee, S (1515 m, highest record) (Fig. 3); lowlands, colline and montane zones. **World:** palearctic, mainly temperate zone.

Habitat: benthos of rivers and backwaters, littoral (macrophyte zones of lakes and ponds).

Genus *Graptoleberis* SARS, 1862

Graptoleberis testudinaria (FISCHER, 1848)

Lynceus testudinarius FISCHER, 1848: 191.

Localities: Burgenland: Neusiedler See (LÖFFLER 1979); Kärnten: Jeserzersee (STEUER 1897 (sub *Alona testudinaria*); PESTA 1923), Längsee (FREY 1955, 1956); Niederösterreich: Fadenbach, Eckartsau (GAVIRIA pers. obs. 2003), lower Thaya River (FORRÓ 1993), Lunzer Untersee (PESTA 1923), Schwarzteich, Weitra (WAWRIK 1966); Oberösterreich: Almsee near Grünau (ZEITLINGER 1928; JERSABEK pers. obs. 1990), Attersee (LANHANS 1911; PESTA 1923), Egelsee near Scharfling (JERSABEK pers. obs. 1986), Gleinkersee (ZEITLINGER 1928), Hallstätter See (LANHANS 1911; HAEMPEL 1918; PESTA 1923), Egelsee near Stockwinkel a. Attersee

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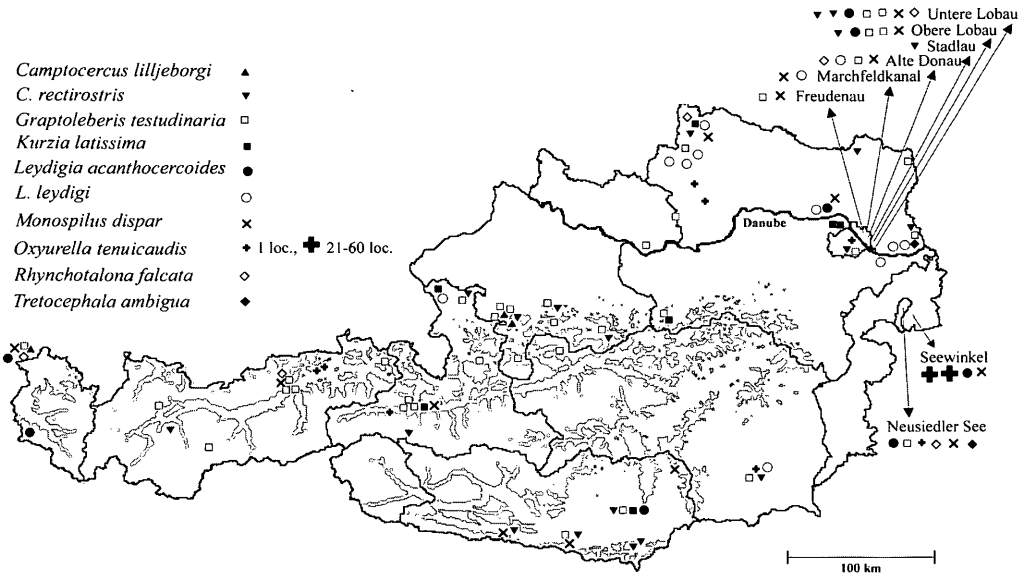

Fig. 3: Distribution map of species of *Camptocercus*, *Graptoleberis*, *Kurzia*, *Leydigia*, *Monospilus*, *Oxyurella*, *Rhynchotalona* and *Tretocephala*.

(LANHANS 1911; PESTA 1923), Machland, Mittelwasser (GAVIRIA pers. obs. 2001), small reservoir in Grünau (GAVIRIA pers. obs. 1998); Salzburg: Faistenauer Hintersee (PESTA 1923), Mattsee (PESTA 1923), ponds (3) on golf-course Zeller See (JERSABEK 1986); Steiermark: Grundlsee (LANHANS 1911; PESTA 1923; Jersabek pers. obs. 1987), ponds near Graz (HARTMANN 1915); Tirol: Krummsee, Unteres Inntal (BREHM 1907; PESTA 1923, 1924), "Loar" in Brixlegg-Kramsach (PESTA 1938), Mutterbergersee, Stubaier Alpen (WÖGRATH & al. 1995), Pillersee, Kitzbühler Alpen (BREHM 1907; PESTA 1923), Second "Strad"-Teich in Tarrenz, north of Imst (PESTA 1924), Reintalersee, Unteres Inntal (BREHM 1907; PESTA 1923, 1924); Vorarlberg: Bodensee (PESTA 1923); Wien: Alte Donau (MIKSCHI & SCHWEIGER 1988), Danube River (SCHÖNBAUER 1999), Lusthauswasser, Prater (VORNATSCHER 1938), Heustadelwasser, Prater (Wenzl pers. comm. 2002); Obere Lobau - Kleines Schilloch, 13-er Werk (PFAFFENWIMMER 1986), Untere Lobau, Eberschüttwasser, Mittelwasser (PFAFFENWIMMER 1986); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: lowlands and colline zone of K, N, O, ST, T and W; one single record from the alpine zone: Mutterbergersee, T (2483 m, highest record) (Fig. 3). **World:** cosmopolitan (SMIRNOV 1971).

Habitat: benthos of rivers and lakes (littoral and sublittoral down to 14 m depth), permanent ponds; prefers waters with macrophytes.

Genus *Kurzia* DYBOWSKI & GRUCHOWSKI, 1894

Kurzia latissima (KURZ, 1875)

Alonopsis latissima KURZ, 1875: 40.

Localities: Kärnten: Längsee (FREY 1955, 1956); Niederösterreich: backwaters (2) near Klosterneuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), Heidenreichstein (FLÖSSNER 2000), Lunzer Obersee (PESTA 1924; BREHM & RUTTNER 1926); Salzburg: Grabensee (FLÖSSNER 2000), Zellersee (FLÖSSNER 2000).

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General distribution: Austria: only known from backwaters of Danube River, N, one site in the Waldviertel, N, Lunzer Obersee, N (1113 m, highest record) and 3 lakes of the Lower Alps in K (1) and S (2) (Fig. 3); lowlands, colline and montane zones. **World:** holarctic and neotropic (Cuba, Colombia).

Habitat: benthos of backwaters, lakes, swamps and ponds; acidophilic (down to pH 4.2).

Genus *Leydigia* KURZ, 1875

Leydigia acanthocercoides (FISCHER, 1854)

Lynceus acanthocercoides FISCHER, 1854: 431-433.

Localities: Burgenland: Neusiedler See (SCHIEMER 1979; FORRÓ & METZ 1987; FORRÓ 1990, 1992a; WAIS 1991, 1993; WOLFRAM 1991, 1993; HERZIG & al. 1994; AUER 1995), Szerdahelyer Lacke, Seewinkel (LÖFFLER 1959); Kärnten: Längsee (FREY 1955, 1956); Niederösterreich: Danube reservoir Altenwörth (Jersabek pers. obs. 1986); Vorarlberg: Bodensee (FLÖSSNER 2000), Tilisunasee (ZSCHOKKE 1890 (sub *Lynceus acanthocercoides*), 1900; PESTA 1923); Wien: Obere Lobau, Großenzersdorfer Arm (PFAFFENWIMMER 1986), Untere Lobau, Mittelwasser (PFAFFENWIMMER 1986); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: known from 7 sites from the eastern lowlands, Längsee, K, and Bodensee, V (Fig. 3); in Tilisunasee (2102 m) probably introduced temporarily (FLÖSSNER 2000); lowlands to colline zone **World:** cosmopolitan with exception of Australia; postglacial form probably originating in the South.

Habitat: benthos of rivers, lakes and ponds; prefers muddy littoral zones, eutrophic waters.

Leydigia leydigi (SCHOEDLER, 1862)

Lynceus quadrangularis— LEYDIG, 1860: 221.
Alona leydigii SCHOEDLER, 1862: 27.
Leydigia quadrangularis— LILLJEBORG, 1900: 494.

Localities: Niederösterreich: backwaters near Orth (RECKENDORFER 2000), Danube reservoir near Altenwörth (Jersabek pers. obs. 1985), Fadenbach, Orth (Gaviria pers. obs. 2001), fishponds (4), Waldviertel (WAWRIK 1966), Haslau, Schüttlau (Gaviria pers. obs. 1998), Marchfeldkanal (GAVIRIA 1994); Salzburg: Grabensee (FLÖSSNER 2000); Steiermark: ponds near Graz (HARTMANN 1915); Wien: Alte Donau (STEUER 1901 (sub *L. quadrangularis*)), Marchfeldkanal (GAVIRIA 1994); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: limited to backwaters of Danube River, N, W, several ponds in Waldviertel, N, Graz, ST, and Grabensee, S (Fig. 3); lowlands to colline zone; highest record: Friedensteich, Zwettl, N (615 m). **World:** holarctic and neotropic.

Habitat: benthos of rivers, backwaters and lakes (littoral to profundal zone), permanent and temporary ponds; prefers muddy bottoms; eutrophic waters.

Genus *Monospilus* SARS, 1861

Monospilus dispar SARS, 1861

Monospilus dispar SARS, 1861: 165.
Monospilus tenuirostris — FISCHER, 1854: 427.

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Localities: Burgenland: Neusiedler See (FORRÓ & METZ 1987; FORRÓ 1990; HERZIG & al. 1994), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b); Kärnten: Großer Magdalenensee (STEUER 1897 (sub *M. tenuirostris*); PESTA 1923), Ratzteich (FRESNER 1995), Seebachsee, south of Wörthersee (STEUER 1897 (sub *M. tenuirostris*); PESTA 1923), St. Leonhard-Teich (STEUER 1897 (sub *M. tenuirostris*)); Niederösterreich: backwaters near Gießgang, Greifenstein (GAVIRIA 1998), Marchfeldkanal (GAVIRIA 1994, pers. obs. 1995), Schwarzteich, Heidenreichstein (WAWRIK 1966); Salzburg: Zellersee (PESTA 1923); Tirol: Achensee (IMHOF 1885 (sub *M. tenuirostris*); PESTA 1923); Vorarlberg: Bodensee (FLÖSSNER 2000); Wien: Alte Donau (STEUER 1901 (sub *M. tenuirostris*)), Danube River, Freudenau, Donauinsel (GAVIRIA pers. obs. 2000), Untere Lobau, Eberschüttwasser (GW & Benthos) NEGREA & POSPISIL 1995), Obere Lobau, Großenzersdorfer Arm (PFAFFENWIMMER 1986), Untere Lobau, Eberschüttwasser (PFAFFENWIMMER 1986).

General distribution: Austria: mainly eastern lowlands (Danube and backwaters, N, W, Neusiedler See and Seewinkel, B); known also from one pond in Waldviertel, N, 2 lakes and 2 ponds in K and 3 lakes in the Lower Alps in S (1), T (1), V (1); highest record: Zellersee, S (750 m) (Fig. 3). **World:** holarctic, ethiopic and New Zealand.

Habitat: groundwater, benthos of rivers and backwaters, littoral to profundal zone of lakes (most abundant between 1 – 8 m depth); lives on sandy and muddy bottoms.

Genus *Oxyurella* DYBOWSKI & GROCHOWSKI, 1894

Oxyurella tenuicaudis (SARS, 1862)

Alona tenuicaudis SARS, 1862: 285.

Localities: Burgenland: Darscho (LÖFFLER 1959; WOLFRAM pers. comm. 1996, 1997), Neusiedler See (PESTA 1954; FORRÓ & METZ 1987; FORRÓ 1990; WAIS 1991, 1993; WOLFRAM 1991, 1993; HERZIG & al. 1994; AUER 1995), ponds (8) in Seewinkel (METZ & FORRÓ 1989), ponds (13) in Seewinkel (LÖFFLER 1957), ponds (16) in Seewinkel (WOLFRAM & al. 1999), Albersee, Seewinkel (Wolfram pers. comm. 1997), ponds (9) in Seewinkel (WOLFRAM pers. comm. 1997), ponds (18) (LÖFFLER 1959), well near Illmitz (LÖFFLER 1960a), Kirchsee in Seewinkel (LÖFFLER 1959; WOLFRAM pers. comm. 1997), Mittlerer Stinkersee (WOLFRAM pers. comm. 1997), Oberer Stinkersee (WOLFRAM pers. comm. 1997), Runde Lacke (LÖFFLER 1959; Wolfram pers. comm. 1997), Salziger See (rest of western part) (LÖFFLER 1959), Unterer Stinkersee (LÖFFLER 1959; Wolfram pers. comm. 1996, 1997, 1998); Niederösterreich: fishpond in Groß Hauslau (WAWRIK 1966), Himmelsteich near Ottenschlag (WAWRIK 1966); Salzburg: pond Lucialacke near Niedernsill (JERSABEK 1986); Steiermark: ponds near Graz (HARTMANN 1915); Tirol: Krummsee, Nordtiroler Kalkalpen (PESTA 1924), «Loar» near Brixlegg-Kramsach (PESTA 1938); Wien: Lusthauswasser, Prater (VORNATSCHER 1938).

General distribution: Austria: Neusiedler See and 40 ponds in Seewinkel, B, one former record (1938) from Wien, 2 ponds in Waldviertel, N, one pond in Niedernsill, S, several ponds near Graz, ST and 2 lakes in the Lower Inntal, T; lowlands and colline zones; highest record: Himmelsteig (821m), Ottenschlag, Waldviertel, N (Fig. 3). **World:** cosmopolitan with exception of Northern America (SMIRNOV 1971; ALONSO 1996).

Habitat: benthos of lakes, permanent and temporary ponds, marshes, salt ponds; oligohaline (up to salinity of 5); eutrophic waters.

Genus *Rhynchotalona* NORMAN, 1903

Rhynchotalona falcata (SARS, 1861)

Alona falcata SARS, 1861: 162.

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Localities: Niederösterreich: Mühl-Teich, Litschau (WAWRIK 1966); Tirol: Achensee (BREHM 1912); Vorarlberg: Bodensee (not clear if still present) (FLÖSSNER 2000); Wien: Alte Donau (STEUER 1901 (sub *Alona falcata*)), Eberschüttwasser (GW & Benthos) (NEGREA & POSPISIL 1995), Untere Lobau, Eberschüttwasser (PFAFFENWIMMER 1986); Danube River (NAIDENOW 1998).

General distribution: Austria: known only from 3 backwaters of the Danube, W, one pond in Litschau, Waldviertel, N, Bodensee, V and Achensee, T (930 m, highest record) (Fig. 3); from lowlands to the montane zone. **World:** holarctic.

Habitat: groundwaters (occasional), backwaters of rivers, benthos of lakes and large ponds; prefers sandy bottoms.

Genus *Tretocephala* FREY, 1965

Tretocephala ambigua (LILLJEBORG, 1900)

Alonopsis ambigua LILLJEBORG, 1900: 440.

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961 (sub *Alonopsis ambigua*); LÖFFLER 1979; FORRÓ & METZ 1987); Niederösterreich: forest-pond in Engelhartstetten, near bridge (Gaviria pers. obs. 2002; NHMW 19838).

General distribution: Austria: only known from Neusiedler See, B and a forest-pond near Engelhartstetten, N (Fig. 3). **World:** palearctic (rare species).

Habitat: backwaters, small waterbodies, temporary and permanent ponds in forests; prefers waters rich in macrophytes.

Subfamily Chydorinae DYBOWSKI & GROCHOWSKI, 1894

Genus *Alonella* SARS, 1862

Alonella excisa (FISCHER, 1854)

Lynceus excisus FISCHER, 1854: 428.

Localities: Burgenland: 7; Kärnten: 13; Niederösterreich: 3; Salzburg: 35; Steiermark: 6; Tirol: 19; Vorarlberg: 1; Wien: 3.

General distribution: Austria: throughout the country, but scarce in the lowlands; frequent in subalpine and alpine zones; highest record: bog-pond near Graukogel, Ankogel-Gruppe, Hohe Tauern, S (2492 m) (JERSABEK & SCHABETSBERGER 1989). **World:** cosmopolitan.

Habitat: littoral and sublittoral zone of lakes, permanent and temporary ponds: lives on stony and sandy bottoms with detritus, with or without macrophytes; acidophilic (down to pH 3.8), prefers waters with low organic content.

Alonella exigua (LILLJEBORG, 1853)

Lynceus exiguus LILLJEBORG, 1853: 79.

Localities: Burgenland: Neusiedler See (LÖFFLER 1979); Kärnten: Längsee (FREY 1955, 1956); Niederösterreich: Hauser-pond, Litschau (WAWRIK 1966), Lunzer Obersee (MIKSCHI 1990); Oberösterreich:

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Gleinkersee (ZEITLINGER 1928); Salzburg: Karsee near Groß Sadnig, Hohe Tauern (BREHM 1936), Mattsee (PESTA 1923), pasture pond near Stuhlfelden (JERSABEK 1986), bog-pond north of Pöham (JERSABEK 1987), pond Lucialacke, Niedernsill (JERSABEK 1986), Wallersee (PESTA 1923), Zellersee PESTA 1923); Steiermark: ponds near Graz (HARTMANN 1915),bog-pond near Filzmoos, Hochschwab (PICHLER 1939); Tirol: Buchsee (PESTA 1924), Gschwandkopfsee, southwest of Seefeld (PESTA 1924), Krummsee, Nordtiroler Kalkalpen (PESTA 1924), «Loar» in Brixlegg-Kramsach (PESTA 1938), Mutterbergersee, Stubaier Alpen (WÖGRATH & al. 1995); Wien: Lusthauswasser, Prater (VORNATSCHER 1938); Danube River and backwaters (NAIDENOW 1998); Austrian Alps (NAIDENOW 1994); 11 waters bodies (LANHANS 1911).

General distribution: Austria: recorded from all provinces except for V, but scarce: In W, B and K only known from one site each; scarce in the lakes of the Lower Alps; highest record: Mutterbergersee, Stubaier Alps, T (2483 m) (Fig. 4). **World:** holarctic and ethiopic.

Habitat: benthos of backwaters, littoral zone of lakes, permanent ponds; lives in waters rich in macrophytes, can attach below the leaves.

Alonella nana (BAIRD, 1843)

Acroperus nanus BAIRD, 1843: 92.

Localities: Kärnten: 6; Niederösterreich: 6; Oberösterreich: 3; Salzburg: 33; Steiermark: 4; Tirol: 19; Wien: 12.

General distribution: Austria: with exception of B and V, known throughout the country; lowlands, colline, montane, subalpine and alpine zones; highest record: Mutterbergersee, T (2483 m) (WÖGRATH & al. 1995); frequent in small waterbodies and moss ponds. **World:** holarctic.

Habitat: groundwater (occasional), slow running waters, littoral and profundal zone of lakes, permanent ponds; without sediment preferences.

Genus *Anchistropus* SARS, 1862

Anchistropus emarginatus SARS, 1862

Anchistropus emarginatus SARS, 1862: 290.

Localities: Oberösterreich: Traunsee (Wolfram pers. comm. 2002); Salzburg: Mattsee (FLÖSSNER 2000); Steiermark: Grundlsee (LANHANS 1911); Vorarlberg: Bodensee (FLÖSSNER 2000).

General distribution: Austria: only known from 3 lakes of the Lower Alps (Fig. 4); colline zone; highest record: Grundlsee, ST (709 m). **World:** central and northern Palearctic.

Habitat: benthos of rivers, backwaters, lakes; scarce in ponds; ectoparasite of *Hydra*.

Genus *Chydorus* LEACH, 1816

Chydorus gibbus SARS, 1890

Chydorus gibbus SARS, 1890: 80.

Localities: Oberösterreich: Attersee (PESTA 1923); Salzburg: Mattsee (PESTA 1923), Zeller See (FLÖSSNER 2000); Vorarlberg: Bodensee (FLÖSSNER 2000).

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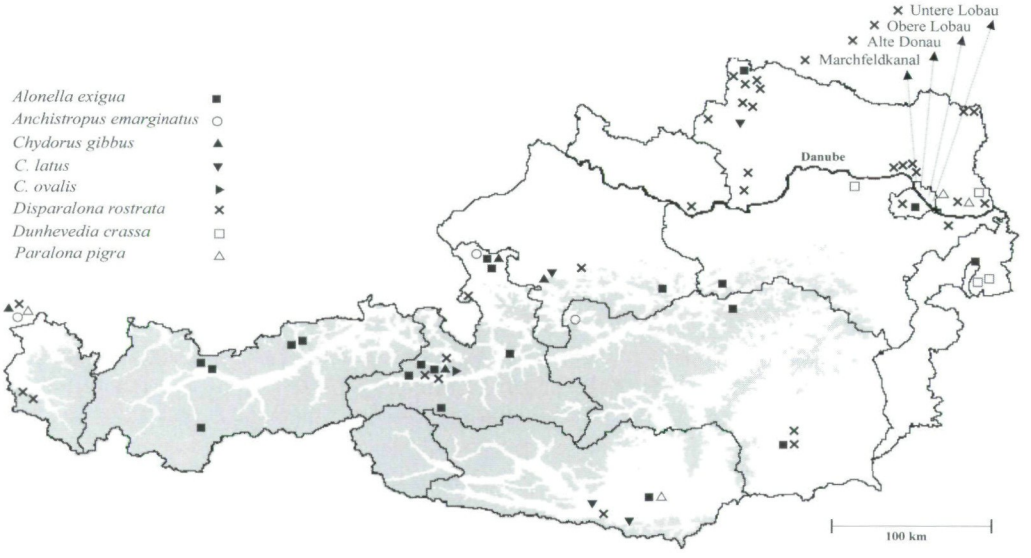

Fig. 4: Distribution map of species of *Alonella* (except *A. excisa* and *A. nana*), *Anchistropus*, *Chydorus* (except *C. sphaericus*), *Disparalona*, *Dunhevedia* and *Paralona*.

General distribution: Austria: only known from 4 lakes of the Lower Alps (Fig. 4); colline zone, highest record: Zeller See, S (749 m). **World:** holarctic.

Habitat: benthos of rivers (rare), lakes, ponds; prefers the littoral zone, not among dense vegetation, stony and sandy bottoms.

Chydorus latus Sars, 1862

Chydorus latus Sars, 1862: 289.

Localities: Kärnten: Großer Magdalenensee (Steuer 1897), Keutschachersee (Steuer 1897; Pesta 1923); Niederösterreich: Edelhof-pond, Zwettl (Flössner 2000); Oberösterreich: Attersee (Flössner 2000).

General distribution: Austria: only known from 3 lakes of the Lower Alps, K(2), O (1) and one pond in Waldviertel, N (535 m, highest record) (Fig. 4); colline zone. **World:** palearctic; known from up to 2175 m in the Alps (not Austria), but not a typical high mountain species (Flössner 2000).

Habitat: springs, benthos of rivers, littoral zone of lakes, small waterbodies, bogs; sandy and muddy bottoms, reed zone, weeds.

Chydorus ovalis Kurz, 1875

Chydorus ovalis Kurz, 1875: 79 – 80.

Localities: Salzburg: Zeller See (Flössner 2000).

General distribution: Austria: only known from Zeller See, S (749 m) in the Lower Alps (Fig. 4); colline zone. **World:** northern Holarctic.

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Habitat: littoral zone of lakes, permanent and temporary ponds and marshes, bogs; prefers acidic bogs.

Chydorus sphaericus (O.F. MÜLLER, 1776)

Lynceus sphaericus MÜLLER 1776: 199.

Localities: Burgenland: 101; Kärnten: 49; Niederösterreich: 128; Oberösterreich: 23; Salzburg: 67 (?); Steiermark: 37; Tirol: 53; Vorarlberg: 11; Wien: 19.

General distribution: Austria: throughout the country; frequent in salt ponds, B, backwaters of Danube River, N; in the Alps distributed in all vegetation zones; highest records in Hohe Tauern, Ankogel-Gruppe, S: Unterer Höhkarsee (2400 m) (LUGER 2000) and bog-pond near Graukogel (2492 m) (JERSABEK & SCHABETSBERGER 1989). **World:** cosmopolitan; it is the most common and ubiquitous cladoceran species.

Habitat: springs, groundwater (stygophile), all benthic habitats, pelagic zone of eutrophic lakes when filamentous algae are present..

Genus *Disparalona* (FRYER, 1968)

Disparalona rostrata (KOCH, 1841)

Lynceus rostratus KOCH, 1841: 36.12.
Alonella rostrata — SARS, 1861: 284.
Alona rostrata — P.E. Müller, 1867: 182.
Rhynchotalona rostrata — BEHNING, 1941: 272.
Phrixura rostrata — ALONSO, 1996: 295.

Localities: Kärnten: gravel pond in Weizelsdorf (FRESNER 1995; KÄRNTNER INST. SEENFORSCHUNG 1994); Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996), backwaters, inundated meadow and forest near Gießgang, Greifenstein (GAVIRIA 1998), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), Danube reservoir Altenwörth (JERSABEK pers. obs. 1985), fish-ponds (100) in Waldviertel (WAWRIK 1966 (sub *Rhynchotalona rostrata*)), Haslau, Schüttlau (Gaviria pers. obs. 1998), lower Thaya River (FORRÓ 1993), Marchfeldkanal (GAVIRIA 1994), March River (SPANDL 1924), Thaya River (SPANDL 1924); Oberösterreich: Machland, Mittelwasser (GAVIRIA pers. obs. 2001), Traunsee (LANHANS 1908 (sub *Alona rostrata*)); Pesta 1923); Salzburg: excavation-ponds (2) in Piesendorf (JERSABEK 1986), Karlsbader Weiher in Salzburg (JERSABEK pers. obs. 1986), pond on golf-course in Zeller See (JERSABEK 1986); Steiermark: ponds near Graz (HARTMANN 1915); Vorarlberg: Bodensee (PESTA 1923), Lünersee (ZSCHOKKE 1900 (sub *Rhynchotalona rostrata*); PESTA 1923), Tilisunasee (ZSCHOKKE 1900 (sub *Rhynchotalona rostrata*); PESTA 1923); Wien: Alte Donau (STEUER 1901 (sub *Alona rostrata*)), Obere Lobau (PFAFFENWIMMER 1986), Lusthauswasser, Prater (VORNATSCHER 1938), Marchfeldkanal (GAVIRIA 1994), Untere Lobau, Hanselgrund (Gaviria pers. obs. 2002), Untere Lobau, Kühwörther Wasser (HOLAREK 1999), Untere Lobau, Schwarzes Loch (Gaviria pers. obs. 1998).

General distribution: Austria: mainly lowlands (Danube River and backwaters) N, W and the Waldviertel, N; single records from small lakes or ponds in Graz, ST, Weizelsdorf (1), K and Salzburg (1), S; only known from 2 lakes of the Lower Alps: Traunsee, O and Bodensee, V; typical for lowlands and colline zone; absent in montane and subalpine zone; two single record from alpine zone: Lünersee (1957 m) and Tilisunasee (2102 m, highest record), V (Fig. 4). **World:** cosmopolitan with exception of Australia.

Habitat: benthos of rivers and backwaters, littoral and profundal zone of lakes, bogs, permanent ponds; stony, sandy and muddy bottom, occasionally among weeds.

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Genus *Dunhevedia* KING, 1853

Dunhevedia crassa KING, 1853

Dunhevedia crassa KING, 1853: 261.

Localities: Burgenland: Salzsee (METZ & FORRÓ 1989), Seewinkel (METZ & FORRÓ 1991); Niederösterreich: forest-pond in Engelhartstetten, near bridge (Gaviria pers. obs. 2002), Pöchlarn (BREHM 1911; FLÖSSNER 2000).

General distribution: Austria: outside the Alps; in the Seewinkel, B and 2 ponds near Danube River in Pöchlarn and Engelhartstetten, N (Fig. 4); lowlands. **World:** cosmopolitan, but absent from South America.

Habitat: permanent and temporary small waterbodies, salt ponds; warm stenothermic.

Genus *Paralona* SRÁMEK-HUŠEK, STRAŠKRABA & BRTEK, 1962

Paralona pigra (SARS, 1861)

Chydorus piger SARS, 1861: 163.
Paralona pigra — SMIRNOV, 1996: 148 – 150.

Localities: Kärnten: Längsee (FREY 1955, 1956 (sub *Chydorus piger*)); Niederösterreich: Ententeich, Gerasdorf (Gaviria pers. obs. 1994), Marchfeldkanal (Gaviria pers. obs. 1995); Vorarlberg: Bodensee (FLÖSSNER 2000).

General distribution: Austria: two lakes in the Lower Alps in K and V, the Marchfeldkanal and one pond in Gerasdorf, N (Fig. 4); lowlands and colline zone; highest record: Längsee, K (550 m). **World:** holarctic, ethiopic and neotropic regions.

Habitat: slow running rivers, backwaters, littoral of lakes, permanent ponds; prefers muddy bottoms and acidic environments.

Genus *Pleuroxus* BAIRD, 1843

Subgenus *Peracantha* BAIRD, 1843, emend. FREY, 1993

Pleuroxus (*Peracantha*) *truncatus* (O.F. MÜLLER 1785)

Lynceus truncatus O.F. MÜLLER 1785: 75.
Peracantha truncata — BAIRD, 1843: 94.

Localities: Kärnten: 15; Niederösterreich: 16; Oberösterreich: 11; Salzburg: 22; Steiermark: 8; Tirol: 12; Wien: 11.

General distribution: Austria: absent from B and V; common in backwaters of Danube River, in lakes and ponds of the colline and montane zones, present in the subalpine zone (Fig. 5); highest record: Schwarzsee, Turracher Höhe, ST/K (1850 m) (PESTA 1923). **World:** palearctic.

Habitat: springs, groundwater (hyporheic zone of rivers), benthos of streams and rivers, littoral zone of lakes, ponds; prefers bottoms with vegetation; tolerates highly eutrophic waters.

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Subgenus *Picripleuroxus* FREY, 1993

Pleuroxus (*Picripleuroxus*) *denticulatus* BIRGE, 1879

Pleuroxus denticulatus BIRGE, 1879: 96; — SMIRNOV 1996.

Localities: Niederösterreich: Tulln (FORRÓ 1999; GAVIRIA 2002).

General distribution: Austria: only known from a pond in Tulln (177 m) (Fig. 5). **World:** holarctic, with higher number of reports from North America; uncertain reports from China and Africa.

Habitat: groundwater (hyporheic zone of rivers), benthos of rivers and lakes, rice fields, ponds, artificial reservoirs; lives among weeds and on muddy sediments; closely bound to substrate.

Pleuroxus (*Picripleuroxus*) *laevis* SARS, 1861

Pleuroxus laevis SARS, 1861:164.

Localities: Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996), Danube River, backwaters between Greifenstein and Wien (MOOG & al. 2000), Fadenbach in Orth (Gaviria pers. obs. 2001), Hauswehr, Heidenreichstein (WAWRIK 1966); Salzburg: Grabensee (FLÖSSNER 2000), Zeller See (FLÖSSNER 2000); Steiermark: Grundlsee (LANHANS 1911; PESTA 1923), ponds near Graz (HARTMANN 1915); Tirol: Piburger See (FÜREDER 1995); Wien: Lusthauswasser, Prater (VORNATSCHER 1938), Obere Lobau - Hoher Spitz, Seeschlacht (GAVIRIA pers. obs. 1998), Untere Lobau, Eberschüttwasser (GW) (NEGREA & POSPISIL 1995); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: few reports; absent from B; lowlands: 3 backwaters of Danube River N and W, ponds near Graz; colline zone: 3 lakes in the Lower Alps, S (2), ST (1); one single record from the montane zone: Piburger See, T (915 m, highest record) (Fig. 5). **World:** reports from the palearctic region and Australia.

Habitat: backwaters, littoral of lakes and shallow waterbodies, bogs, marshes, permanent and temporary ponds; more frequent in clear water with macrophytes.

Subgenus *Pleuroxus* s.str. BAIRD, 1843, emend. FREY, 1993

Pleuroxus (*Pleuroxus*) *trigonellus* (O.F. MÜLLER 1785)

Lynceus trigonellus O.F. Müller 1785: 74.

Localities: Burgenland: Seewinkel - Andauer Lacke, Einsetz- (Kröten-) Lacke, Froschgraben near Zick-See, Grundllacke, Hallabernlacke, Martenthallacke, Oberer Herrnsee, southern Krainerlacke, Weißer See (LÖFFLER 1959); Kärnten: Großer Magdalenensee (STEUER 1897; PESTA 1923), Längsee (FREY 1955, 1956); Niederösterreich: fishponds (4) in Waldviertel (WAWRIK 1966), Lunzer Obersee (PESTA 1923; BREHM & RUTTNER 1926); Oberösterreich: Attersee (LANHANS 1911), Machland, Alter Naar and backwater-pond (Gaviria pers. obs. 2001); Salzburg: pasture pond near Stuhlfelden (JERSABEK 1986); Steiermark: Sackwiesensee, Hochschwab (PICHLER 1939); Tirol: Hintersteinersee near Kufstein (PESTA 1926), Reintalersee, Unteres Inntal (BREHM 1907; PESTA 1924); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: lowlands: Seewinkel B, backwaters of Danube River in Machland, O; colline zone: Waldviertel N, four lakes in the Lower Alps K (2), S (1), T (2); montane zone: 2 reports from Lunzer Obersee, N (1113 m) and Sackwiesensee, Hochschwab, ST (1421 m, highest record) (Fig. 5). **World:** holarctic.

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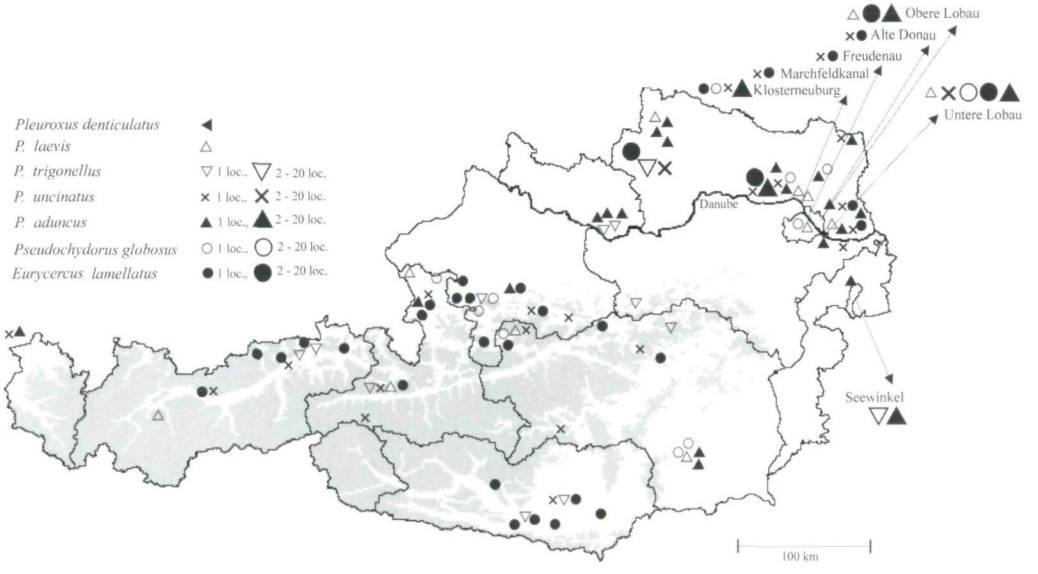

Fig. 5: Distribution map of species of *Pleuroxus* (except *P. truncatus* and *P. aduncus*), *Pseudochydorus* and *Eurycercus*.

Habitat: benthos of rivers (scarce), littoral and profundal zone (scarce) of lakes, ponds, bogs; muddy, sandy and stony bottoms rich in detritus, weeds; prefers acidic waters.

Pleuroxus (*Pleuroxus*) *uncinatus* BAIRD, 1850

Pleuroxus uncinatus BAIRD, 1850: 135.
Lynceus personatus — LEYDIG, 1860: 227.

Localities: Kärnten: Längsee (FREY 1955, 1956); Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996), backwaters near Orth (RECKENDORFER 2000), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), Danube reservoir Altenwörth (JERSABEK pers. obs. 1986, ZOUFAL 1990), fishponds (10) in Waldviertel (WAWRIK 1966), Marchfeldkanal (GAVIRIA 1994, pers. obs. 1995), Regelsbrunn (G.W.) (Gaviria pers. obs. 1995), Thaya River (SPANDL 1924); Oberösterreich: Almsee (ZEITLINGER 1928), Gleinkersee (ZEITLINGER 1928); Salzburg: Prebersee (GAVIRIA pers. obs. 2001), Wallersee (IMHOF 1885 (sub *P. personatus*); PESTA 1923), Zellersee (PESTA 1923); Steiermark: Grundlsee (LANHANS 1911 (sub *P. bairdi* var. *uncinatus);* PESTA 1923), Lambrechtersee (PESTA 1923), Leopoldsteinersee (littoral) (METZ 1966); Tirol: Reintalersee, Nordtiroler Kalkalpen (PESTA 1924), Wildsee near Seefeld (PESTA 1924); Vorarlberg: Bodensee (PESTA 1923); Wien: Alte Donau (STEUER 1901 (sub *P. personatus*)), Danube River, Freudenau, Donauinsel (Gaviria pers. obs. 2000), Untere Lobau, Kühwörther Wasser (HOLAREK 1999), Marchfeldkanal (GAVIRIA 1994, pers. obs. 1995); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: Danube River and backwaters as well as hills of Waldviertel (most frequent), Lower Alps and central high alpine regions up to 1515 m (Prebersee, S, highest record) (Fig. 5); lowlands, colline and montane zones. **World:** holarctic, highest frequency in temperate Europe.

Habitat: groundwater (hyporheic zone), benthos of rivers, littoral and profundal (scarce) zone of lakes, permanent and temporary ponds; in the genus *Pleuroxus* this species is most strongly bound to the bottom; sandy bottoms with detritus, weeds, muddy bottoms (abundant).

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Subgenus *Tylopleuroxus* FREY, 1993

Pleuroxus (*Tylopleuroxus*) *aduncus* (JURINE, 1820)

Monoculus aduncus JURINE, 1820: 152.

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961; LÖFFLER 1979; FORRÓ & METZ 1987; FORRÓ 1990, 1992a; WOLFRAM 1993), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b), ponds (4) in Seewinkel (METZ & FORRÓ 1991), Seewinkel - Andauer Lacke, Froschgraben south of Zick-See, Hallabernlacke (LÖFFLER 1959); Niederösterreich: backwaters (6) near Klosterneuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), forest-pond in Engelhartsstetten, near bridge (GAVIRIA pers. obs. 2002), backwaters, inundated meadow and forest near Gießgang, Greifenstein (GAVIRIA 1998), Fadenbach near Orth (GAVIRIA pers. obs. 2001), fishponds (3) in Waldviertel (WAWRIK 1966), Haslau, Schüttlau (GAVIRIA pers. obs. 1998), lower Thaya River (FORRÓ 1993), Marchfeldkanal (GAVIRIA 1994), Wolkersdorf (Gaviria pers. obs. 1995); Oberösterreich: Krottensee near Gmunden (JERSABEK & SCHABETSBERGER 1994), Machland - Alter Naar, Mittelwasser and backwater-well (GAVIRIA pers. obs. 2001); Salzburg: pond at University in Salzburg (Jersabek pers. obs. 1987); Steiermark: ponds near Graz (HARTMANN 1915); Vorarlberg: Bodensee (PESTA 1923); Wien: Marchfeldkanal (GAVIRIA 1994), Obere Lobau - Großenzersdorfer Arm, Kleines Schilloch, 13-er Werk (PFAFFENWIMMER 1986), Untere Lobau - Eberschüttwasser, Mittelwasser (PFAFFENWIMMER 1986), Hanselgrund (Gaviria pers. obs. 2002), Schwarzes Loch (Gaviria pers. obs. 1998); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: lowlands and colline zone; highest record: Krottensee near Gmunden, O (590 m); not known from K and T, in ST only near Graz, in S only in one locality (Fig. 5). **World:** cosmopolitan with exception of Australia and austral South America.

Habitat: groundwater (hyporheic zone), benthos of rivers, artificial channels, littoral zone of lakes, permanent ponds, weeds.

Remarks: a very variable species; all forms without a peg at the base of the antenna should not be considered to belong to *Pleuroxus aduncus*.

Genus *Pseudochydorus* FRYER, 1968

Pseudochydorus globosus (BAIRD, 1843)

Chydorus globosus BAIRD, 1843: 90.

Localities: Niederösterreich: backwaters (2) near Klosterneuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), Wolkersdorf (GAVIRIA pers. obs. 1995); Oberösterreich: Attersee (LANHANS 1911 (sub *Chydorus globosus*); PESTA 1923), Kaltenbachteich, Ischler Hausberg (ZACH 1983); Salzburg: Mattsee (PESTA 1923); Steiermark: Grundlsee (LANHANS 1911 (sub *Chydorus globosus*); PESTA 1923), ponds near Graz (HARTMANN 1915); Wien: Lusthauswasser, Prater (VORNATSCHER 1938), Untere Lobau – Hanselgrund (Gaviria pers. obs. 2002), Lausgrundwasser (Gaviria pers. obs. 1998), Meeresspitz (Gaviria pers. obs. 1998).

General distribution: Austria: eastern lowlands N, W; colline zone of O, S, ST; not known from B, K, T, V; highest record: Grundlsee, ST (709 m) (Fig. 5). **World:** cosmopolitan with exception of South America.

Habitat: backwaters of rivers, littoral and profundal (scarce) zone of lakes, ponds, weeds, stony bottom with periphyton, muddy bottom (scarce); feeds on decomposing cladocerans.

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Family Daphniidae SARS, 1865

Subfamily Daphniinae FLÖSSNER, 2000

Genus *Ceriodaphnia* (DANA, 1853)

Ceriodaphnia dubia RICHARD, 1894

Ceriodaphnia dubia RICHARD, 1894: 570.

Localities: Burgenland: Seewinkel - Andauer Lacke, Darscho, Grundlacke, Hutweidenlacke, Lange Lacke, Nördliche Silberlacke, Wörtenlacke, Xix-See (LÖFFLER 1959); Seewinkel – wells near Lange Lacke and near Mittlerer Stinkersee (LÖFFLER 1960a); Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996); backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), fish-ponds (6) in Waldviertel (WAWRIK 1966 (sub *C. affinis*)); Oberösterreich/Salzburg: Salzkammergut (FLÖSSNER 2000); Steiermark: pool below Lenauhügel in Ausseerland (LANHANS 1911 (sub *C. affinis*)).

General distribution: Austria: lowlands: Seewinkel B, backwaters of Danube River N, W; colline zone: Waldviertel N, Salzkammergut O/S, ST; highest record: pool below Lenauhügel in Ausseerland, ST (750 m) (Fig. 6). **World:** cosmopolitan with exception of Australia.

Habitat: littoral zone of lakes and ponds, common among weeds, pelagic in big lakes of the tropics, backwaters and rivers.

Ceriodaphnia laticaudata P.E. MÜLLER 1867

Ceriodaphnia laticaudata P.E. MÜLLER 1867: 130.

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961; LÖFFLER 1979; FORRÓ & METZ 1987; FORRÓ 1990), puddle (locality not specified) (SPANDL 1926), Seewinkel – well in Neuhof near Tadten, well near Alber-See, well near Darscho-Lacke, well near Grundlacke, well near Oberer Stinkersee, well in Podersdorf, well near Runde Lacke, well in Rust, well in Luß near Podersdorf (LÖFFLER 1960a); Kärnten: gravel lake in Weizelsdorf (FRESNER 1995; KÄRNTNER INST. SEENFORSCHUNG 1994); Niederösterreich: fish-ponds (3) in Waldviertel (WAWRIK 1966), ponds (2) near Haslau, Schüttlau (GAVIRIA pers. obs. 1998), small pond in Zwingendorf (JERSABEK pers. obs. 2000), Lunzer Untersee (BREHM 1913/14; PESTA 1923), Orth, Fadenbach (GAVIRIA pers. obs. 2001); Oberösterreich: Krottensee near Gmunden (LANHANS 1911; JERSABEK & SCHABETSBERGER 1994); Salzburg: Krottensee (PESTA 1923), pasture pond near Piesendorf (JERSABEK 1986).

General distribution: Austria: lowlands: Seewinkel and Neusiedler See, B; backwaters of the Danube near Haslau, N; colline zone: Waldviertel, Lunzer Untersee, two waterbodies in S and one in K; highest record: Lunzer Untersee, N (608 m) (Fig.6). **World:** holarctic and ethiopic.

Habitat: littoral zone of shallow lakes, ponds, mixed lakes down to 10 m depth; prefers to live among water-weeds and in muddy substrate.

Ceriodaphnia megops SARS, 1862

Ceriodaphnia megops SARS, 1862: 277.

Localities: Niederösterreich: backwaters (5) of Klosterneuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000); fish-ponds (6) in Waldviertel (WAWRIK 1966), ponds

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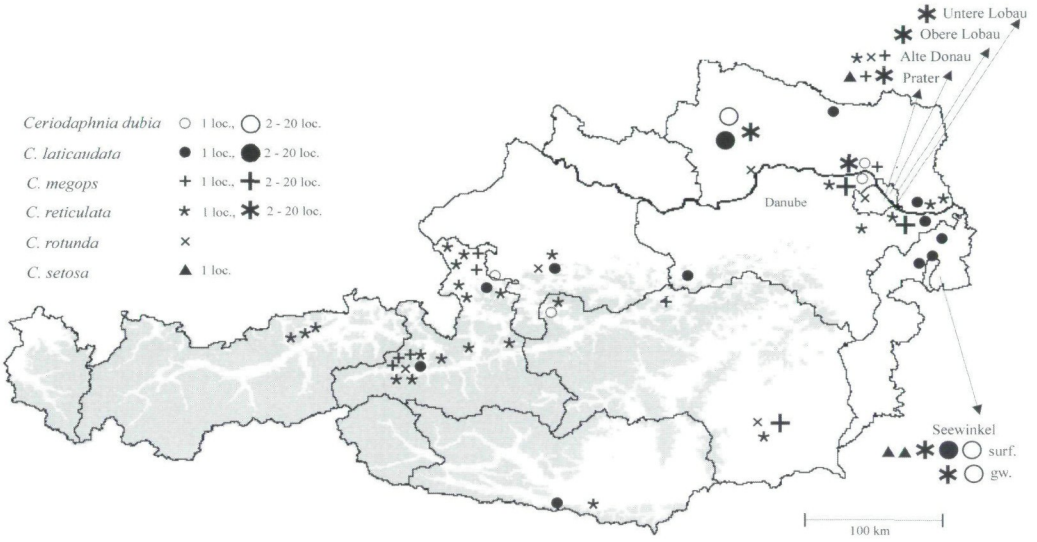

Fig. 6: Distribution map of *Ceriodaphnia* (except *C. pulchella* and *C. quadrangula*); surf., surface water; gw., groundwater.

(3) near Haslau, Schüttlau (Gaviria pers. obs. 1998); Salzburg: pasture ponds (2) in Piesendorf (JERSABEK 1986), pasture pond in Stuhlfelden (JERSABEK 1986), gravel lake Lucialacke in Niedernsill (JERSABEK 1986), gravel-pond Kladensky in Strasswalchen (Jersabek pers. obs. 1999), gravel-pond Sedlmaier in Henndorf (JERSABEK pers. obs. 1999); Steiermark: Gaishornsee (PESTA 1923), ponds near Graz (frequent) (HARTMANN 1915); Wien: Alte Donau (STEUER 1901), Alte Donau (Wasserpark) (Gaviria pers. obs. 1997), Lusthauswasser, Prater (VORNATSCHER 1938).

General distribution: Austria: lowlands: backwaters of the Danube River N, W; colline zone: waterbodies in Waldviertel (6) N, S (6), single record from ST, Gaishornsee (700 m, highest record). (Fig. 6). **World:** holarctic.

Habitat: same as *C. laticaudata*, however rare in small waterbodies.

Ceriodaphnia pulchella SARS, 1862

Ceriodaphnia pulchella SARS, 1862: 276.

Localities: Burgenland: 1; Kärnten: 13; Niederösterreich: 33; Oberösterreich: 4; Salzburg: 9; Steiermark: 11; Tirol: 6; Vorarlberg: 1; Wien: 4.

General distribution: Austria: throughout the country, but most frequent in lowland areas and colline zone; only three records from sub-alpine zone (Grafenberger See and Schwarzsee in the Dachstein area, ST and Arlbergalm near Galzig, V); highest record: Arlbergalm (2082 m) (WAWRIK 1958) (Fig. 6). **World:** holarctic and neotropic.

Habitat: occasionally in groundwater (NEGREA & POSPISIL 1995), typical in plankton of ponds, backwaters of rivers, rare in big lakes; tolerates salinity up to 4.5, and pH down to 6; eutrophic waters.

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Ceriodaphnia quadrangula (O.F. MÜLLER 1785)

Daphnia quadrangula O.F..MÜLLER 1785: 90.

Localities: Burgenland: 8; Kärnten: 9; Niederösterreich: 6; Oberösterreich: 5; Salzburg: 32; Steiermark: 11; Tirol: 19; Wien: 1.

General distribution: Austria: with exception of W with one single record (Untere Lobau, Hanselgrund) and V (no records), widely distributed in all provinces; lowlands, colline, montane and subalpine zone; one single record from alpine zone: bog in Graukogel, Ankogelgruppe, Hohe Tauern, S (2492 m, highest record) (JERSABEK & SCHABETSBERGER 1989). **World:** holarctic and neotropical.

Habitat: pelagic and littoral zone of lakes, ponds; common in temporary ponds and lakes with high turbidity.

Ceriodaphnia reticulata (JURINE, 1820)

Ceriodaphnia reticulata JURINE, 1820: 139.

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961; HERZIG 1973, 1975, 1979; METZ & FORRÓ 1989; LÖFFLER 1979; FORRÓ & METZ 1987; AUER 1995; Gaviria pers. obs. 1997; KOROVCHINSKY 2000a), 21 sodic ponds of Seewinkel (LÖFFLER 1959; METZ & FORRÓ 1989; FORRÓ 1992b), well near Illmitz and well near Szerdahelyer pond (LÖFFLER 1960a); well in Siebenmahd near Apetlon (LÖFFLER 1960a), spring near Sieggraben (LÖFFLER 1960b); Kärnten: Wörthersee (STEUER 1897; PESTA 1923); Niederösterreich: backwaters (6) near Klosterneuburg (FORRÓ 1996), Gießgang Greifenstein (GAVIRIA 1998), Moosbrunn (Gaviria pers. obs. 1998), lower Thaya River (FORRÓ 1993), ponds (5) in Waldviertel (WAWRICK 1966); Oberösterreich: Krottensee near Gmunden (LANHANS 1911); Salzburg: bog near Burmoos (JERSABEK 1986), forest-pond in Stierling near Oberndorf (JERSABEK 1986), golf-pit near Zeller See (JERSABEK 1986), gravel lake near Piesendorf (JERSABEK 1986), Karlsbader Weiher in Salzburg (Jersabek pers. obs. 1986), Krotensee (PESTA 1923), Salzachsee in Salzburg (JERSABEK 1989), pasture pond in Hauptmannsdorf near Niederstill (JERSABEK 1987); pasture pond near Flachau (JERSABEK 1987); pasture pond in Maxdorf near Lamprechsthausen (JERSABEK 1987), pasture pond in Pfarrwerfen near Bischofshofen (JERSABEK 1987); Steiermark: ponds near Graz (HARTMANN 1915), puddles between Gallhofkogel and Röthelstein near Aussee (LANHANS 1911); Tirol: forest-pond near Brixlegg-Kramsach (PESTA 1935); Krummsee (PESTA 1924); "Loar" near Brixlegg-Kramsach (PESTA 1935); Wien: Alte Donau (MIKSCHI & SCHWEIGER 1988), sand-pit south of Lusthauswasser, Prater (VORNATSCHER 1938), Obere Lobau: Hohe Spitz and Seeschlacht (Gaviria pers. obs. 1998), puddle north of Lusthaus, Prater (VORNATSCHER 1938), Untere Lobau: Lausgrundwasser and Meerespitz (Gaviria pers. obs. 1998), backwaters of Danube River (NAIDENOW 1998).

General distribution: Austria: lowlands B, N, W and colline zone N, S, ST; backwaters of Danube River and Thaya River, N; one lake in K (Wörthersee) and O (Krottensee near Gmund) each; no record from V; highest record: pasture pond near Piesendorf, S (780 m) (Fig. 6). **World:** cosmopolite with exception of Australia.

Habitat: pelagic zone of lakes, ponds, bogs, rice fields, reservoirs, backwaters and rivers; tolerates salinity up to 2,1; slighly eutrophic waters.

Ceriodaphnia rotunda SARS, 1862

Ceriodaphnia rotunda SARS, 1862: 275.

Localities: Niederösterreich: Edenbiegelteich, Jaidhof/Gföhl, Waldviertel (WAWRIK 1966); Oberösterreich: Krottensee near Gmunden (NHMW 19830, 19831); Salzburg: Zeller See (FLÖSSNER 2000); Steiermark: Graz (waterbody not specified) (FLÖSSNER 2000); Wien: Alte Donau (STEUER 1901; NHMW 19833), forest-pond in "Himmel" (NHMW 19834), swamp of Stadlau (NHMW 19832).

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General distribution: Austria: rare, only known from six localities; lowlands to colline zone; highest record: Zeller See, S (750 m) (Fig. 6). **World:** palearctic, main distribution in Eastern Europe.

Habitat: same as *Ceriodaphnia laticaudata* but prefers higher eutrophic waters.

Ceriodaphnia setosa MATILE, 1890

Ceriodaphnia setosa MATILE, 1890: 128.

Localities: Burgenland: Seewinkel – southern Silberlacke, Zicksee near St. Andrä (LÖFFLER 1959); Wien: Lusthauswasser, Prater (within *Schoenoplectus*) (VORNATSCHER 1938).

General distribution: Austria: only known from two waterbodies of Seewinkel, B and one from W (old record) (VORNATSCHER 1938); no reports in Austria after 1959; lowlands; highest record: Prater, W (171 m) (Fig. 6). **World:** palearctic.

Habitat: shallow lakes, ponds, backwaters, mostly found among water-weeds.

Genus *Daphnia* O.F. MÜLLER 1785

Subgenus *Ctenodaphnia* DYBOWSKI & GROCHOWSKI, 1895

Daphnia (*Ctenodaphnia*) *atkinsoni* BAIRD, 1859

Daphnia atkinsoni BAIRD, 1859: 280.

Localities: Burgenland: ponds (11) in Seewinkel (METZ & FORRÓ 1989), ponds (22) in Seewinkel (LÖFFLER 1959), pond in Seewinkel (KÜHNELT 1955), Neubruchlacke (SCHALL 1990), Zicklacke near Illmitz (NHMW 19808), draw-well in Seewinkel (STUNDL 1938); Niederösterreich: pond in Zwingendorf (Jersabek pers. obs. 2000), ponds (2) in Zwingendorf (Jersabek pers. obs. 2000).

General distribution: Austria: only known from Seewinkel, B and Zwingendorf, N (186 m, highest record); lowlands (Fig. 7). **World:** palearctic, with highest frequency around the Mediterranean Sea and the aride region of Eastern Europe.

Habitat: temporary ponds; tolerates salinity up to 20 (NEGREA 1983).

Daphnia (*Ctenodaphnia*) *magna* STRAUS, 1820

Daphnia magna STRAUS, 1820: 159.

Localities: Burgenland: 54 ponds + 4 wells; Niederösterreich: 7; Salzburg: 1.

General distribution: Austria: lowlands: Seewinkel B, Oberwaltersdorf N, backwaters of Danube River (Regelsbrunn and Klosterneuburg); colline zone: Waldviertel (pond near Göpfritz) and Weinviertel (pond in Zwingendorf) N, pond in the city of Salzburg S; highest record: Göpfritz, N (576 m) (Fig.7). **World:** holarctic and ethiopic, introduced to Malaysia, Singapore and Colombia.

Habitat: temporary and permanent ponds, small lakes, rare in backwaters, frequent in arid zones (thermophilic); euryhaline, tolerates salinity up to 8; highly eutrophic to polytrophic waters.

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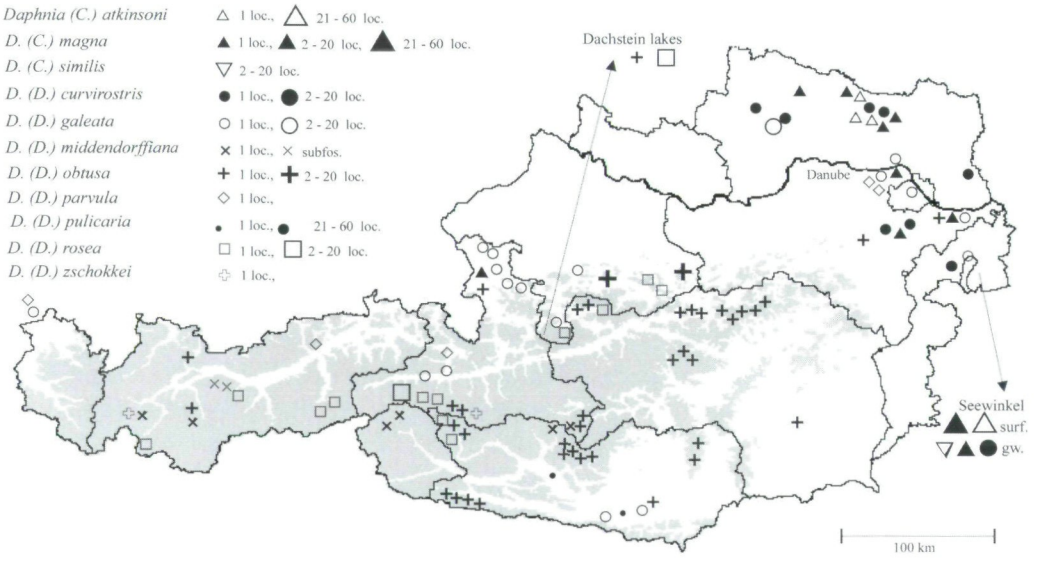

Fig. 7: Distribution map of species of *Daphnia* (except *D. cucullata*, *D. hyalina*, *D. longispina*, *D. pulex*, *D.* x *krausi* and *D.* x *obscura*); surf., surface water; gw., groundwater.

Daphnia (*Ctenodaphnia*) *similis* Claus, 1876

Daphnia similis Claus, 1876: 364.

Localities: Burgenland: Seewinkel – wells near Lan-Lacke, Northern Krainerlacke, Schwarzer See, Southern Krainerlacke (Löffler 1960a), Kleine Neubruchlacke in Seewinkel (Metz & Forró 1989).

General distribution: Austria: limited to Seewinkel B (Fig. 7). **World:** southern Holarctic region.

Habitat: groundwater, temporary ponds; prefers waters with high turbidity and high conductivity, salinity up to 12.

Subgenus *Daphnia* s.str. O.F. Müller 1785

Daphnia (*Daphnia*) *cucullata* Sars, 1862

Daphnia jardinii Baird, 1857: 24 (Nomen oblitum).
Daphnia cucullata Sars, 1862: 271.

Localities: Burgenland: 1; Kärnten: 12; Niederösterreich: 35; Oberösterreich: 4; Salzburg: 10; Tirol: 3; Wien: 12.

General distribution: Austria: widespread in K, N, and S, few records from O (Attersee, Höllerer See, Mondsee, Traunsee), T (Lanzersee near Innsbruck, Reithersee and Schwarzsee near Kitzbühel), one record from B (Neusiedler See), no records from ST and V; lowlands to colline zone; highest record: Afritzer See, K (715 m) (since 1967) (Löffler 1983; Sampl 1971). **World:** palearctic.

Habitat: pelagic zone of lakes and ponds, backwaters.

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Daphnia (*Daphnia*) *curvirostris* EYLMANN, 1887

Daphnia curvirostris EYLMANN, 1887: 17.

Localities: Burgenland: wells (15) in Seewinkel and Rust (1) (LÖFFLER 1960a); Niederösterreich: pond in Zwingendorf (Jersabek pers. obs. 2000); pasture in Marchegg (GAVIRIA pers. obs. 1997), Moosbrunn (Feldbusch) (Gaviria pers. obs. 1997), lake in «La Fontana» near Oberwaltersdorf (Gaviria pers. obs. 1997), Waldviertel (FLÖSSNER 2000); Wien: Untere Lobau – Hanselgrund, Lausgrundwasser (Gaviria pers. obs. 1998).

General distribution: Austria: known from wells in B and from some waterbodies in N: four ponds, two backwaters of the Danube River, one inundated pasture of the March River and one pond in Waldviertel; lowlands, rare in the colline zone; highest record: Waldviertel (~ 500 m) (Fig. 7). **World:** holarctic.

Habitat: wells, shallow temporary ponds, backwaters, areas flooded by rivers, rare in permanent ponds; eurythermic.

Daphnia (*Daphnia*) *galeata* SARS, 1863

Daphnia galeata SARS, 1863: 213.

Localities: Burgenland: Neusiedler See (HERZIG 1979; KOROVCHINSKY 2000a); Kärnten: Faakersee (STEUER 1897), Wörthersee (STEUER 1897); Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996), backwaters near Regelsbrunn (HOLAREK 1999), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), fishponds (17) in Waldviertel (WAWRIK 1966 (sub *D. hyalina* ssp. *galeata*)); Oberösterreich: Hallstätter See (RUTTNER 1939; JERSABEK 1999, pers. obs.), Traunsee (RUTTNER 1939; HAMANN 1954; MÜLLER 1982; Jersabek 1999, pers. obs.); Salzburg: gravel pit in Piesendorf (JERSABEK 1986), Fuschlsee (Jersabek pers. obs. 1998), Grabensee (Jersabek pers. obs. 1998), Mattsee (JERSABEK pers. obs. 1998), Obertrumer See (JERSABEK pers. obs. 1998), Wallersee (Jersabek pers. obs. 1998), Wolfgangsee (RUTTNER 1939; JERSABEK 1999 pers. obs.), Zeller See (Jersabek pers. obs. 1998); Vorarlberg: Bodensee (since 1956) (WALZ & al. 1987; FLÖSSNER 2000; KOROVCHINSKY 2000a; WEIDER & STICH 1992); Wien: Danube, Freudenau (Gaviria pers. obs. 2000).

General distribution: Austria: mainly in Waldviertel and backwaters of the Danube River N, and lakes of S; in K and O known from two lakes each, in B and V from one lake each; not recorded from ST and T; lowlands to colline zone; highest record: Zeller See, S (750 m) (Fig. 7). **World:** holarctic and neotropic.

Habitat: mainly in pelagic zone of lakes and reservoirs, permanent ponds, plankton of backwaters and rivers; tolerates acidity down to pH 5.

Daphnia (*Daphnia*) *hyalina* LEYDIG, 1860

Daphnia hyalina LEYDIG, 1860: 151.

Localities: Kärnten: 16; Niederösterreich: 165; Oberösterreich: 5; Salzburg: 9; Steiermark: 4; Tirol: 2; Vorarlberg: 1; Wien: 3.

General distribution: Austria: mainly in lowlands of N and W; in the colline zone of N (Waldviertel, 154 ponds), K, O and S; single records from the lower montane zone of N (Erlaufsee) and T (Achensee); single record from V (Kölbelesee); absent in B; highest record: Achensee, T (900 m) (PESTA 1923; SAMPL 1967). **World:** palearctic.

Habitat: pelagic zone of lakes, ponds, backwaters and rivers (rare).

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Remarks: the record from Schwarzsee, Turracher Höhe, ST / K (PESTA 1923) is doubtful. Originally *Daphnia hyalina* was the only *Daphnia* species in the large prealpine lakes (FLÖSSNER 2000).

Daphnia (*Daphnia*) *longispina* (O.F. MÜLLER 1776)

Daphnia longispina O.F.MÜLLER 1776: 199.

Localities: Burgenland: 26; Kärnten: 36; Niederösterreich: 168; Oberösterreich: 19; Salzburg: 22; Steiermark: 32; Tirol: 35; Vorarlberg: 11; Wien: 13.

General distribution: Austria: known throughout the country; lowlands, colline, montane, subalpine and alpine zones; highest record: pond near Magdeburger Hütte, Solstein area, T (2637 m) (PESTA 1935). **World:** palearctic, limited to the temperate zone.

Habitat: pelagic zone of lakes, ponds, backwaters and rivers.

Daphnia (*Daphnia*) *middendorffiana* FISCHER, 1851

Daphnia middendorffiana FISCHER, 1851: 157.

Localities: Kärnten: Anderlesee, "Blutige Alm" (NHMW 19841); Tirol: Bödensee, Lasörling-Gruppe, Osttirol (SCHABER, pers. comm. 1995; JERSABEK pers. obs. 2002), Drachensee, Mieminger Gebirge (LÖFFLER 1983; SCHABER 1988; NAIDENOW 1994), Eissee, Timmeltal, Osttirol (Schaber, pers. comm. 1995), Gmairer See in Samnaun (SCHABER 1988), Gossenköllesee (ephippia and furcal claws in sediment) (MORITZ 1984), Moalandlsee, Ötztaler Alpen (SCHABER 1988), Vorderer Finstertaler See (subfossile ephippia) (BRETSCHKO 1976, 1995); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: presently limited to the alpine zone (5 lakes) in T (2), Osttirol (2) and K (1); in the past also known from the upper subalpine zone: Drachensee, T (1920 m; until 1970 ?) and Vorderer Finstertaler See, T (2250 m); disappeared from Gossenköllesee, T (2413 m); lowest present record: Bödensee, Ostirol (2300 m); highest record: Moalandlsee, T (2530 m) (Fig. 7). **World:** holarctic, limited to the arctic and alpine region.

Habitat: cold shallow lakes and ponds.

Daphnia (*Daphnia*) *obtusa* KURZ, 1875

Daphnia obtusa KURZ, 1875: 16.

Localities: Kärnten: Pfannocksee, south-east slope of Pfannockspitze (PESTA 1924 (sub *D. pulex* var. *obtusa*)), pond in Hörtendorf (FINDENEGG 1948), pond on northern slope of Zollnerhöhe, Karnische Hauptkette (TURNOWSKY 1946a), pond near trail to Schwarzsee, Grünau, Turracher Höhe (FINDENEGG & TURNOWSKY 1935), pond in Rinsennockkar, Turracher Höhe (FINDENEGG & TURNOWSKY 1935), pond on Saualpe (STEUER 1897; NHMW 19803, 19804), pond on Turracher Sattel (FINDENEGG 1948), pond near Dellacher Alm, Zollnerhöhe (TURNOWSKY 1946b), pond north of Schoberriegel, Turracher Höhe (FINDENEGG & TURNOWSKY 1935), ponds (3) on Maderkopf, Karnische Alpen (TURNOWSKY 1961), Prititschkarsee No. 18, Hohe Tauern (TURNOWSKY 1946b), Saualmseen (FINDENEGG 1943b), Turracher Schwarzsee (FINDENEGG 1943b); Niederösterreich: backwater near Regelsbrunn (HOLAREK 1999), pond in Schwaigboden, Raxalpe (PESTA 1933 (sub *D. pulex*), NHMW 19800); Oberösterreich: bogs (4) in Feichtau, Sengsengebirge (JERSABEK & SCHABETSBERGER 1992a), Herzerlsee (bog pond), Sengsengebirge (JERSABEK & SCHABETSBERGER 1992a), pond on Bärwurzanger, Dachstein (SCHABETSBERGER, pers. obs. 1997), ponds (6) in Feichtau, Sengsen-

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gebirge (JERSABEK & SCHABETSBERGER 1992a); Salzburg: Klölingtümpelsee, Bundschuhgraben (NHMW 19796, 19797, PESTA 1924 (sub *D. pulex* var. *obtusa*), Mühlhauserhöhenkammsee near Thomabach (NHMW 19799; PESTA 1924 (sub *D. pulex* var. *obtusa*), pond on Schmittenhöhe (JERSABEK 1986), ponds (2) east of Nachtkarwand, Goldberggruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1991), puddle near Karlsbader Weiher in Salzburg (Jersabek pers. obs. 1989); Steiermark: Augstsee (LANHANS 1911; PESTA 1923, pond near Edelrautehütte, Bösenstein (PICHLER 1939 (sub *D. pulex obtusa*)), pond on Hoher Zölz, Eisenerzer Reichenstein (PICHLER 1939 (sub *D. pulex obtusa*)), pond near Klammkogel, Totes Gebirge (JERSABEK pers. obs. 1990), pond near Neubergsee, Dachstein (Schabetsberger, pers. obs. 1997), pond near Sarsteinhütte, Sarstein (JERSABEK pers. obs. 1997), pond on Scheiblalm, Bösenstein (PICHLER 1939 (sub *D. pulex obtusa*)), pond below Mühlhauserhöhenkammsee (NHMW 19798; PESTA 1924 (sub D. *pulex* var. *obtusa*)), pond below Aibl-Sattel, Totes Gebirge (Jersabek pers. obs. 1990), pond between Spielkogel and Brunnkogel, Admonter Reichenstein (PICHLER 1939 (sub *D. pulex obtusa*)), pond east of Geipahöhe (PESTA 1924 (sub *D. pulex* var. *obtusa*)), pond near Filzmoos, Hochschwab (PICHLER 1939 (sub *D. pulex obtusa*)), pond near Sackwiesenalm, Hochschwab (PICHLER 1939 (sub *D. pulex obtusa*)), ponds near Elmsee, Ausseer Land (LANHANS 1911), ponds near Graz (HARTMANN 1915), pond south of Mödlinger Hütte, Admonter Reichenstein (PICHLER 1939 (sub *D. pulex obtusa*)), puddles (2) near trail to Bösenstein (PICHLER 1939 (sub *D. pulex obtusa*), Sackwiesensee, Hochschwab (PICHLER 1939 (sub *D. pulex obtusa*)); Tirol: pond on Alpmoos-Alpe (NHMW 19801, 19802, 19840; PESTA 1935), puddle in "Auf der Nase", Obergurgl (REED 1970); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: mainly in montane and subalpine zones of K, S, ST and O; two single records from T; two records from lowlands: S (city of Salzburg) and N (Regelsbrunn); only two records from the colline zone: Hörtendorf, K and pond near Graz ST; highest record: pond near Edelrautehütte, Bösenstein, ST (2395 m) in alpine zone (Fig. 7). **World:** holarctic, ethiopic, South America, New Zealand.

Habitat: temporary and permanent ponds, generally with poor vegetation and rich in muddy sediment. Long ventral setae are probably a morphological adaptation to muddy substrates (FLÖSSNER 2000); tolerates acidity down to pH 5.

Daphnia (*Daphnia*) *parvula* FORDYCE, 1901

Daphnia parvula FORDYCE, 1901: 144.

Localities: Niederösterreich: backwaters (2) near Klosterneuburg (FORRÓ 1996; GAVIRIA 2002), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000); Salzburg: near Zeller See (FLÖSSNER 2000); Tirol: Reithersee (SCHABER 1983); Vorarlberg: Bodensee (FLÖSSNER 2000; KOROVCHINSKY 2000a).

General distribution: Austria: known only from two localities in the eastern lowlands N and three localities of the colline zone; highest record: near Zeller See, S (750 m) (Fig. 7). **World:** originally *Daphnia parvula* is an American species, but was introduced into European waters in the 1970ies, possibly through passive dispersal of ephippians with amphibious vehicles.

Habitat: pelagic zone of lakes, reservoirs, permanent ponds, backwaters; tolerates low oxygen concentration down to 1 $mg \cdot l^{-1}$.

Daphnia (*Daphnia*) *pulex* LEYDIG, 1860

Daphnia pulex Leydig, 1860: 117.

Localities: Burgenland: 16; Kärnten: 10; Niederösterreich: 76; Salzburg: 6; Steiermark: 16; Vorarlberg: 2; Wien: 3.

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General distribution: Austria: with exception of O and T, known throughout the country; lowlands, colline and montane zone; old records of the subalpine and alpine zone of the Alps (TURNOWSKY 1946b; PICHLER 1939; STEINBÖCK 1955) are most probably taxonomic confusions with *D. obtusa* and *D. pulicaria*. **World:** cosmopolitan with exception of Australia.

Habitat: small lakes and permanent ponds, swamps, backwaters; tolerates low oxygen content; eutrophic waters.

Daphnia (Daphnia) pulicaria FORBES, 1893, emend. HRBÁČEK, 1959

Daphnia pulex var. *pulicaria* FORBES, 1893: 242.
Daphnia (*pulex*) *pulicaria* HRBÁČEK, 1959: 121.

Localities: Kärnten: Millstätter See und Wörther See (FLÖSSNER 2000); Niederösterreich: fish-ponds (53) at Waldviertel (WAWRIK 1966); Vorarlberg: Bodensee (introduced in 1974) (FLÖSSNER 2000).

General distribution: Austria: widespread in the Waldviertel region, N; found in K (2 lakes) and V (one lake); colline zone (Fig. 7). **World:** difficult to define as it has been confused with *Daphnia pulex* in the past (ALONSO 1996).

Habitat: pelagic zone of lakes and permanent ponds; prefers larger lakes than *Daphnia pulex*.

Daphnia (*Daphnia*) *rosea* SARS, 1862

Daphnia rosea SARS, 186: 268.

Localities: Kärnten: Großer Gradensee, Schober-Gruppe, Hohe Tauern (BMLF 1998), Kreuzsee, Schober-Gruppe, Hohe Tauern (Tartarotti pers. comm. 1996; BMLF 1998); Oberösterreich: Feichtauer Seen (JERSABEK & SCHABETSBERGER 1990), Kleiner Feichtauer See, Sengsengebirge (JERSABEK & SCHABETSBERGER 1992a), puddle near Seekarwand, Dachstein (Schabetsberger, pers. obs. 1997); Salzburg: Grosser Erzwiessee, Goldberggruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1991), Oberer Bockhartsee, Goldberggruppe, Hohe Tauern (LUGER 2000), Oberer See in Kühkar, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989), Seehornsee, Steinernes Meer (LUGER 1998), Unterer Bockhartsee, Goldberggruppe, Hohe Tauern (LUGER 2000), Unterer See in Kühkar, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989), Windschnurrsee, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989); Steiermark: Dreibrüdersee, Totes Gebirge (JERSABEK & SCHABETSBERGER 1996), Finetsee, Dachstein (Schabetsberger, pers. obs. 1997), Miesbodensee, Dachstein (SCHABETSBERGER, pers. obs. 1997), Silberkarsee, Dachstein (Schabetsberger, pers. obs. 1997); Tirol: Hirschebensee, Kühtai (REED 1970), pond in Fundustal, Kühtai (REED 1970), Oberer Wesendlekarsee and Wesendlkarsee, Zillertaler Alpen (SCHABER 1988), Wasensee, Engadiner Alpen (BMLF 1998), Austrian Alps (NAIDENOW 1994).

General distribution: Austria: limited in Austria to subalpine and alpine zones of K, O, S, ST and T; lowest record: Miesbodensee, ST (1600 m); highest record: Großer Gradensee, K (2488 m) (Fig. 7). **World:** holarctic; outside Austria also found in the montane zone (FLÖSSNER 2000).

Habitat: pelagic zone of small mountain lakes, ponds (rare); tolerates acidic waters with pH down to 4.8.

Daphnia (*Daphnia*) *zschokkei* STINGELIN, 1894

Daphnia zschokkei STINGELIN, 1894: 378.

Localities: Salzburg: Tauernmoossee, Enzinger Boden (FLÖSSNER 2000); Tirol: Timmelsjochsee (FLÖSSNER 2000).

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General distribution: Austria: only known from two mountain lakes in S and T; in Austria in subalpine and alpine zones; highest record: Timmelsjoch See, T (2520 m) (Fig. 7). **World:** for a long time considered to be limited to the Alps; presently known from Corsica, Lapland and Mongolia.

Habitat: pelagic zone of oligotrophic lakes and bogponds, rare in astatic ponds

Daphnia (*Daphnia*) x *krausi* FLÖSSNER, 1993 (= *Daphnia galeata* x *cucullata*)

Daphnia cucullata var. *procurva* — POPPE, 1887: 280.
Daphnia Cederströmii — HELLICH, 1877: 39.
Daphnia x *krausi* FLÖSSNER, 1993:74.

Localities: Oberösterreich/Salzburg: Salzkammergut (FLÖSSNER 2000).

General distribution: Austria: Salzkammergut O/S, colline zone. **World:** Europe, Russia. Also found in lowland zones (FLÖSSNER 2000).

Habitat: pelagic zone of lakes, ponds, backwaters; abundant in water with strong fish predation due to high reproductive rates (sub in *Daphnia galeata*) and small size (sub in *Daphnia cucullata)*; tolerates highly eutrophic conditions.

Remarks: in his report for the Salzkammergut region FLÖSSNER (2000) does not list the lakes where the hybrid lives. In the lower alpine lakes it seems to be less frequent than its parental species. It is not clear if *Daphnia* (*Daphnia*) x *krausi* is fertile.

Daphnia (*Daphnia*) x *obscura* FLÖSSNER, 2000 (= *Daphnia hyalina* x *galeata*)

Localities: Vorarlberg: Bodensee (FLÖSSNER 2000; KOROVCHINSKY 2000a).

General distribution: Austria: only known from Bodensee, V; colline zone. **World:** there is little information about this hybrid. Known from Austria, Germany, Holland, southern Sweden, northern Italy and Russia (near Moscow).

Habitat: pelagic zone of lakes, reservoirs, gravel pits and backwaters; in some lakes co-occurring with its parental species; in Bodensee, it prefers deep water (> 30 m) during summer and early fall together with *Daphnia hyalina*.

Genus *Simocephalus* SCHOEDLER, 1858

Subgenus *Corocephalus* ORLOVA-BIENKOWSKAJA, 1998

Simocephalus (*Corocephalus*) *serrulatus* (KOCH, 1841)

Daphnia serrulata KOCH, 1841: 35.14.

Localities: Kärnten: pool near St. Leonhard (STEUER 1897), Magdalenensee (NHMW 19809, 19810, 19812, 19813); Niederösterreich: Danube River at Klosterneuburg (Gaviria pers. obs. 1993); Oberösterreich/Salzburg: Salzkammergut (FLÖSSNER 2000); Steiermark: ponds near Graz (HARTMANN 1915), Sommersbergersee in Ausseerland (LANHANS 1911; PESTA 1923); Tirol: Buchsee (PESTA 1924); Wien: Alte Donau (STEUER 1901; VORNATSCHER 1938), backwaters near Stadlau (NHMW 19814), Danube River, Donauinsel (GAVIRIA pers. obs. 1993), Heustadelwasser, Prater (VORNATSCHER 1938), inundated meadow near "station" (not specified which station), Alte Donau (NHMW 19811); Danube River and backwaters (NAIDENOW 1998).

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General distribution: Austria: known only from 12 localities in 7 provinces; absent in B and V; lowlands and colline zones; a single report from the montane zone: Sommersbergersee in Ausseerland, ST (900 m, highest record) (Fig. 8). **World:** cosmopolitan; in Europe, more frequent in eastern region.

Habitat: littoral zone of small lakes and ponds, backwaters and rivers, inundation plains; among water-weeds; tolerates pH values down to 3.9.

Subgenus *Echinocaudus* ORLOVA-BIENKOWSKAJA, 1998

Simocephalus (Echinocaudus) congener (KOCH, 1841)

Daphnia congener KOCH, 1841: 35.13.
Simocephalus exspinosus var. *congener* LILLJEBORG, 1900: 177.

Localities: Niederösterreich: Orth, Fadenbach (GAVIRIA pers. obs. 2001), ponds (2) near Haslau, Schüttlau (Gaviria pers. obs. 1998); Salzburg: pasture pond in Stuhlfelden (JERSABEK 1986); Steiermark: ponds near Graz (HARTMANN 1915); Wien: Obere Lobau, Seeschlacht (Gaviria pers. obs. 1998), Untere Lobau, Hanselgrund (Gaviria pers. obs. 2002, NHMW 19835), Lausgrundwasser, Meeresspitz (Gaviria pers. obs. 1998); trail north of Lusthauswasser, Prater (VORNATSCHER 1938).

General distribution: Austria: eastern N and W (backwaters of Danube River), one record from ST and S each; lowlands and colline zone; highest record: Stuhlfelden, S (800 m) (Fig. 8). **World:** as it was confused with *Simocephalus exspinosus* in the past, its range needs to be redefined; it occurs with certainty in central and Eastern Europe and in Siberia (ORLOVA-BIENKOWSKAYA 2001).

Habitat: phytal zone of small lakes and ponds, in backwaters of rivers; often occurs together with *Simocephalus exspinosus*.

Simocephalus (Echinocaudus) exspinosus (DE GEER, 1778)

Monoculus spinosus DE GEER, 1778: 457.
Daphnia exspinosa — KOCH, 1841: 35.11.

Localities: Burgenland: Dorfsee, Seewinkel (LÖFFLER 1959), Herrnsee, Seewinkel (LÖFFLER 1959), irrigation channel Froschgraben, south of Xix-See (LÖFFLER 1959), Neusiedler See (PESTA 1954; LÖFFLER 1979; FORRÓ & METZ 1987; FORRÓ 1990, 1992a; WAIS 1993, 1995; GAVIRIA pers. obs. 1996), Oberer (Northern) Herrnsee (LÖFFLER 1959), ponds (6) in Seewinkel (LÖFFLER 1959), ponds (5) in Seewinkel (METZ & FORRÓ 1989), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b), pond west of Unterer Stinkersee (NHMW 19817, 19818), Seewinkel - wells at Zeisel-Feld near Podersdorf, Arbesthal-Lacke, Alber See, Zick-See (LÖFFLER 1960a), Unterer Stinkersee, Seewinkel (LÖFFLER 1959), Weißer See (northern and southern part), Seewinkel (LÖFFLER 1959), Xix-See, Seewinkel (LÖFFLER 1959), Zicksee near Illmitz (LÖFFLER 1959); Kärnten: Großer Magdalenensee (STEUER 1897; PESTA 1923); Niederösterreich: backwaters (5) near Klosterneuburg (FORRÓ 1996), backwaters near Orth (RECKENDORFER 2000), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), forest-ponds (2) near Engelhartstetten, close to Danube bridge (GAVIRIA pers. obs. 2002), forest-pond near Marchegg, Wienertür (GAVIRIA pers. obs. 1997), Gießgang at Greifenstein, backwaters (GAVIRIA 1998), Lunzer Obersee (PESTA 1924 - pers. comm. BREHM), Hummel-Teich, Kirchberg a.W., Waldviertel (WAWRIK 1966); Oberösterreich: Krottensee near Gmunden (JERSABEK & SCHABETSBERGER 1994); Salzburg: pasture pond in Piesendorf (JERSABEK 1986), pond Lucialacke, Niedernsill (JERSABEK 1986); Wien: Lusthauswasser, Prater (MITIS 1940), trail north of Lusthauswasser, Prater (VORNATSCHER 1938), sand-pit south of Lusthauswasser, Prater (VORNATSCHER 1938).

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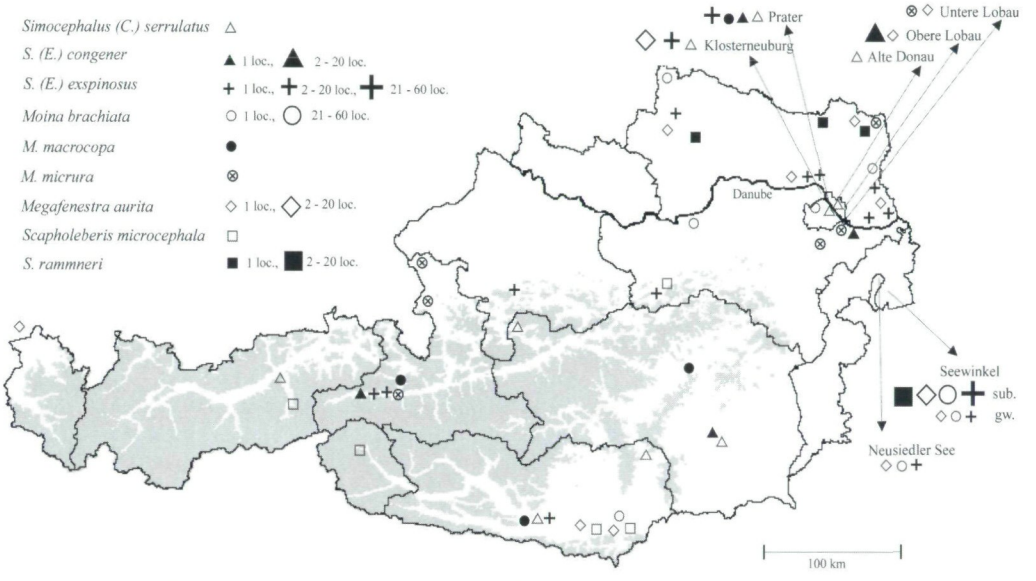

Fig. 8: Distribution map of species of *Simocephalus* (except *S. vetulus*), *Moina*, *Megafenestra* and *Scapholeberis* (except *mucronata*); surf., surface water; gw., groundwater.

General distribution: Austria: mainly in eastern lowlands of B, N and in W; in colline zone 4 records: S (2), O (1) and K (1); in the montane zone known only from Lunzer Obersee, N (1113 m, highest record) (Fig. 8). **World:** cosmopolitan, but rare in the mountains.

Habitat: phytal zone of small lakes, permanent and temporary ponds, swamps, backwaters, rare in littoral of rivers and big lakes; euryhaline, tolerates salinity up to 4, and pH down to 5.

Subgenus *Simocephalus* s.str. SCHOEDLER, 1858, emend. ORLOVA-BIENKOWSKAJA, 1998

Simocephalus (*Simocephalus*) *vetulus* (O.F. MÜLLER 1776)

Daphnia vetula O.F. MÜLLER 1776: 199.

Localities: Burgenland: 23; Kärnten: 9; Niederösterreich: 29; Oberösterreich: 6; Salzburg: 13; Steiermark: 13; Tirol: 17; Vorarlberg: 1; Wien: 22.

General distribution: Austria: throughout the country; common in lowlands, colline and montane zone; rare in sub-alpine zone: bog pond, Albonaalps, T (1800 m) (PESTA 1937), pond near Gschößwand, Zillertaler Alpen, T (1800 m) (PESTA 1937), pond in Fundustal, Kühtai, T (1900 m, highest record; REED 1970). **World:** Europe and North Africa; in other regions it is replaced by closely related species such as *Simocephalus mixtus, S. vetuloides, S. gibbosus, S. elisabethae* and *S. punctatus*, previously identified as *Simocephalus vetulus* (ORLOVA-BIENKOWSKAJA 2001).

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Habitat: wells (stygophile), littoral zone of all types of stagnant water, low abundances in plankton, temporarily attached to water plants, slow running waters; it is the most common species among water-weeds (ALONSO 1996); tolerates salinity up to 2 and pH values down to 4.4.

Subfamily Moininae GOULDEN, 1968

Genus *Moina* BAIRD, 1850

Moina brachiata (JURINE, 1820)

Monoculus brachiatus JURINE, 1820: 131.

Localities: Burgenland: Albersee (LÖFFLER 1959 (sub *M. rectirostris*); SCHALL 1990), Apetlon (SPANDL 1926), Burgenland (SPANDL 1926 (sub *M. rectirostris*)), draw-well I and III in Seewinkel (STUNDL 1938 (sub *M. rectirostris*)); Einsetzlacke (STUNDL 1938 (sub *M. rectirostris*)), Halbjochlacke, Seewinkel (SCHALL 1990), Neusiedler See (PESTA 1923, 1954; KOROVCHINSKY 2000a), Oberer (northern) Herrnsee (LÖFFLER 1959 (sub *M. rectirostris*)), Oberer Stinkersee (LÖFFLER 1959 (sub *M. rectirostris*)), pond in Seewinkel (KÜHNELT 1955), ponds (30) in Seewinkel (LÖFFLER 1959 (sub *M. rectirostris*)), Runde Lacke (STUNDL 1938; LÖFFLER 1959 (sub *M. rectirostris*)), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b), Silberlacke in Seewinkel (STUNDL 1938 (sub *M. rectirostris*)), Unterer Stinkersee (LÖFFLER 1959 (sub *M. rectirostris*)), waterbodies (3) in Seewinkel (LÖFFLER 1957 (sub *M. rectirostris*)), waterbodies (28) in Seewinkel (METZ & FORRÓ 1989), well in St. Andrä (LÖFFLER 1959), Zicksee (LÖFFLER 1959 (sub *M. rectirostris*)); Kärnten: pond between the Drau River and St. Kanzian (NHMW 19793, 19794, 19795); Niederösterreich: Hofteich near Litschau (WAWRIK 1966 (sub *M. rectirostris*)), puddles near Stillfried (SPANDL 1926 (sub *M. rectirostris*)), side-waters of Danube River at Pöchlarn (BREHM 1911); Steiermark: Kainisch ? (LANHANS 1911), Wiesenlacke ? (LANHANS 1911); Wien: Gersthof (SPANDL 1926); Danube River (NAIDENOW 1998).

General distribution: Austria: limited mainly to Seewinkel and Neusiedler See, B, with two records in backwaters of the Danube River, N, one record each from K, Gersthof, W, Stillfried a.d. March, N and the Waldviertel, N; mainly lowlands, colline zone (rare); highest record: Litschau, Waldviertel, N (580 m) (Fig.8). **World:** palearctic and ethiopic.

Habitat: typical form in plankton of permanent and temporary small stagnant waters, backwaters; warm stenothermic; tolerates high alkalinity up to 145 meq$\cdot l^{-1}$ and pH up to 11; strongly eutrophic to polytrophic waters.

Moina macrocopa (STRAUS, 1820)

Daphnia macrocopus STRAUS, 1820: 161.

Localities: Kärnten: Villach (NHMW 19791, 19792 (sub *M. fischeri*); STEUER 1897 (sub *M. fischeri*); Salzburg: Zeller See (FLÖSSNER 2000); Steiermark: Leoben (FLÖSSNER 2000); Wien: path north of Lusthauswasser, Prater (temporary) (VORNATSCHER 1938).

General distribution: Austria: only known from three localities in the colline zone K, S, ST and one locality in the lowlands in W; highest record: Zeller See, S (750 m) (Fig. 8). **World:** the subspecies *macrocopa* is distributed in the Paleartic, Oriental & Ethiopic regions. In North America the subspecies *americana* exists (GOULDEN 1968).

Habitat: typical form in plankton of small waterbodies rich in organic material; tolerates high salinity up to 22; strongly eutrophic waters.

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Moina micrura KURZ, 1875

Monoculus rectirostris — JURINE, 1820: 134.
Moina micrura KURZ, 1875: 13.

Localities: Niederösterreich: backwater near Regelsbrunn (HOLAREK 1999), lower Thaya River (FORRÓ 1993), southern pond of golf-course "La Fontana", Oberwaltersdorf (Gaviria pers. obs. 2000); Salzburg: pasture pond near Piesendorf (JERSABEK 1986), puddle near Karlsbader Weiher, Salzburg (JERSABEK pers. obs. 1989), gravel lake Bürmoos (JERSABEK pers. obs. 2001); Wien: Untere Lobau, Kühwörther Wasser (HOLAREK 1999); Danube River (NAIDENOW 1998).

General distribution: Austria: known only from the eastern N and W, and three waterbodies in S; lowlands and colline zones; highest record: Piesendorf, S (780 m) (Fig. 8). **World:** cosmopolitan, it is the most widely distributed species of the genus.

Habitat: permanent ponds, plankton of lakes and reservoirs, backwaters and rivers; prefers waters with turbidity; population densities up to 8000 indiv.$\cdot l^{-1}$; warm stenothermic; eutrophic waters.

Subfamily Scapholeberinae DUMONT & PENSAERT, 1983

Genus *Megafenestra* DUMONT & PENSAERT, 1983

Megafenestra aurita (FISCHER, 1849)

Daphnia aurita FISCHER, 1849: 39.
Scapholeberis aurita — HELLICH, 1877: 47.

Localities: Burgenland: Einsetz- (Kröten) Lacke, Seewinkel (LÖFFLER 1959), Neusiedler See (LÖFFLER 1979; FORRÓ & METZ 1987; FORRÓ 1990, 1992a), Seewinkel (METZ & FORRÓ 1991), Seewinkel, Salzsee (METZ & FORRÓ 1989), well at Mittlerer Stinkersee, Seewinkel (LÖFFLER 1960a); Kärnten: Gösselsdorfer See (PESTA 1923), Klopeiner See (PESTA 1923); Niederösterreich: backwaters (5) near Klosterneuburg (FORRÓ 1996), forest-pools (2) between Engelhartstetten and Danube bridge (Gaviria pers. obs. 2002), Gießgang Greifenstein, inundated meadow (GAVIRIA 1998), lower Thaya River (FORRÓ 1993), Waldviertel (FLÖSSNER 2000); Vorarlberg: Bodensee (FLÖSSNER 2000); Wien: backwaters of Danube River (FLÖSSNER 2000), Obere Lobau, Hoher Spitz (Gaviria pers. obs. 1998), Untere Lobau, Lausgrundwasser (Gaviria pers. obs. 1998).

General distribution: Austria: known from eastern N, W and B, from Waldviertel, N, from two lakes in K and from Bodensee,V; lowlands and colline zones; probably highest record in Waldviertel (exact site not reported) (FLÖSSNER 2000) and Gösselsdorfer See, K (500 m) (Fig. 8). **World:** palearctic and South Africa.

Habitat: littoral zone of lakes (rare) and especially ponds, swamps, backwaters, rivers (rare).

Genus *Scapholeberis* SCHOEDLER, 1858

Scapholeberis microcephala SARS, 1890

Scapholeberis microcephala SARS, 1890: 38.
Scapholeberis obtusa — HELLICH, 1877: 46.

Localities: Kärnten: Gösselsdorfer See (STEUER 1897 (sub *S. obtusa*); HOFFER & KRAUSS 1909), Klopeiner See (STEUER 1897 (sub *S. obtusa*); HOFFER & KRAUSS 1909); Niederösterreich: swamp at Lunzer See (FLÖSSNER 2000); Tirol: Defereggen Alpen, Osttirol (locality not specified) (FLÖSSNER 2000), Zillertal (FLÖSSNER 2000).

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General distribution: Austria: only known from two lakes in K and one waterbody in T, Osttirol and N each; colline zone (Fig. 8). **World:** palearctic, in Europe with boreo-montane distribution.

Habitat: indicator of oligotrophic, acid water with low calcium content like *Sphagnum* – bogs; tolerates pH down to 4; commonly co-occurring with *Acantholeberis*.

Scapholeberis mucronata (O.F. MÜLLER, 1776)

Daphnia mucronata O.F. MÜLLER 1776: 200.

Localities: Burgenland: 20; Kärnten: 5; Niederösterreich: 55; Oberösterreich: 5; Salzburg: 34; Steiermark: 8; Tirol: 13; Vorarlberg: 1; Wien: 15.

General distribution: Austria: distributed throughout the country, from lowlands to colline, montane and subalpine zones; from the alpine zone only known from Oberer Kühkarsee, Ankogelgruppe, Hohe Tauern, S (2276 m, highest record) (JERSABEK & SCHABETSBERGER 1989); in V only known from Bodensee. **World:** palearctic and northern nearctic.

Habitat: hyponeustonic in permanent and temporary waterbodies rich in vegetation, swamps, backwaters, littoral of large reservoirs and lakes (rare); warm stenothermic.

Scapholeberis rammneri DUMONT & PENSAERT, 1983

Scapholeberis rammneri DUMONT & PENSAERT, 1983: 28.
Scapholeberis kingi — RAMMNER 1928: 326.

Localities: Burgenland: Neusiedler See (FORRÓ & METZ 1987; FORRÓ 1990, 1992a), pools (5) in Seewinkel (METZ & FORRÓ 1989), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b); Niederösterreich: lower Thaya River (FORRÓ 1993), Ottenstein, Waldviertel (FLÖSSNER 2000), Riegersburg (Gaviria pers. obs. 1998).

General distribution: Austria: only known from Seewinkel and Neusiedler See in B, backwaters of lower Thaya River and in northern N; lowlands to colline zones; highest record: Ottenstein, N (510 m) (Fig. 8). **World:** holarctic.

Habitat: wells, shallow lakes, permanent and temporary ponds, littoral zone, it is able to live in the water surface (hyponeustonic), backwaters and rivers; uncommon at higher elevations.

Family Eurycercidae KURZ, 1875

Genus *Eurycercus* BAIRD, 1843

Subgenus *Eurycercus* FREY, 1975

Eurycercus (*Eurycercus*) *lamellatus* (O.F. MÜLLER, 1776)

Lynceus lamellatus O.F. MÜLLER, 1776: 199.

Localities: Kärnten: Faakersee (STEUER 1897; PESTA 1923), Gösselsdorfer See (STEUER 1897; HOFFER & KRAUSS 1909), Großer Magdalenensee (STEUER 1897; PESTA 1923), Längsee (FREY 1955, 1956), Millstätter See (PESTA 1923), Wörthersee (STEUER 1897; PESTA 1923); Niederösterreich: backwaters (2) near Kloster-

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neuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), fishponds (11) in Waldviertel (WAWRIK 1966), forest-pond near Engelhartsstetten, near bridge (Gaviria pers. obs. 2002), Gießgang near Greifenstein, backwaters, inundated meadow and forest (GAVIRIA 1998), Kamp River near Altenwörth (JERSABEK pers. obs. 1986), Marchfeldkanal (GAVIRIA 1994, 1995); Oberösterreich: Almsee near Grünau (ZEITLINGER 1928; JERSABEK pers. obs. 1990), Attersee (PESTA 1923), Egelsee near Scharfling (Jersabek pers. obs. 1986), Hallstätter See (LORENZ, 1898; LANHANS 1911; HAEMPEL 1918; PESTA 1923), Kaltenbachteich, Ischler Hausberg (ZACH 1983), Traunsee (LANHANS 1911; PESTA 1923); Salzburg: Karlsbader Weiher in Salzburg (Jersabek pers. obs. 1986), pond at University in Salzburg (Jersabek pers. obs. 1989), Zellersee (PESTA 1923); Steiermark: Gaishornsee (PESTA 1923), Grundlsee (LANHANS 1911), Leopoldsteinersee (littoral) (METZ 1966); Tirol: Achensee (IMHOF 1885; STEUER 1897; BREHM 1912; PESTA 1923), Mariasteinersee (BREHM 1907; PESTA 1923), Pillersee (BREHM 1907; PESTA 1923), Reintalersee (PESTA 1923), Wildsee in Seefeld (PESTA 1924); Wien: Alte Donau (STEUER 1901), Alte Donau (on *Stratiotes*) (VORNATSCHER 1938), Danube River, Freudenau, Donauinsel (Gaviria pers. obs. 2000), Marchfeldkanal (GAVIRIA 1994; pers. obs. 1995). Obere Lobau - Kleines Schilloch, Oberleitnerwasser, 13-er Werk (PFAFFENWIMMER 1986), Untere Lobau – Eberschüttwasser, Großenzersdorfer Arm, Mittelwasser (PFAFFENWIMMER 1986), Hanselgrund (Gaviria pers. obs. 2002); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: backwaters of Danube River N, W, western Waldviertel N, lakes and ponds of the lowlands, colline and montane (scarce) zones; highest record: Achensee, T (930 m) (Fig. 5). **World:** palearctic.

Habitat: benthos of rivers, backwaters, littoral and profundal zone of lakes, permanent and temporary ponds, weeds, sandy bottom with detritus.

Family Ilyocryptidae SMIRNOV, 1976

Genus *Ilyocryptus* SARS, 1861

Ilyocryptus acutifrons SARS, 1862

Ilyocryptus acutifrons SARS, 1862: 283.

Localities: Burgenland: Seewinkel, Zicksee at St. Andrä (LÖFFLER 1959); Oberösterreich: Mondsee (Jersabek pers. obs. 1995); Vorarlberg: Bodensee (FLÖSSNER 2000).

General distribution: Austria: known only from one locality in B, O and V each; lowlands; highest record: Mondsee, O (479 m) (Fig. 9). **World:** palearctic and ethiopic (NEGREA 1983); records from North America are doubtful.

Habitat: littoral and profundal benthos of lakes, ponds, backwaters, rivers; muddy substrate, among water-weeds and reed.

Ilyocryptus agilis KURZ, 1878

Ilyocryptus agilis KURZ, 1878: 406.

Localities: Burgenland: Neusiedler See (SCHIEMER 1979); Niederösterreich: backwater near Orth (RECKENDORFER 2000), brut-pond near Kirchberg a. W., Waldviertel (WAWRIK 1966), Danube reservoir Altenwörth (Jersabek pers. obs. 1985), Schlossteich in Heidenreichstein (WAWRIK 1966), Schwarz-Teich in Weitra (WAWRIK 1966); Tirol: Piburger See (FÜREDER 1995); Wien: Leopoldau (NHMW Nr. 16802, 16803), Lusthauswasser, Prater (VORNATSCHER 1938; MITIS 1940), Untere Lobau, Eberschüttwasser (GW) (NEGREA & POSPISIL 1995); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: known from eastern lowlands of N and W, Walviertel, N, Neusiedler See, B and one locality in T; backwaters of Danube River N, W; highest

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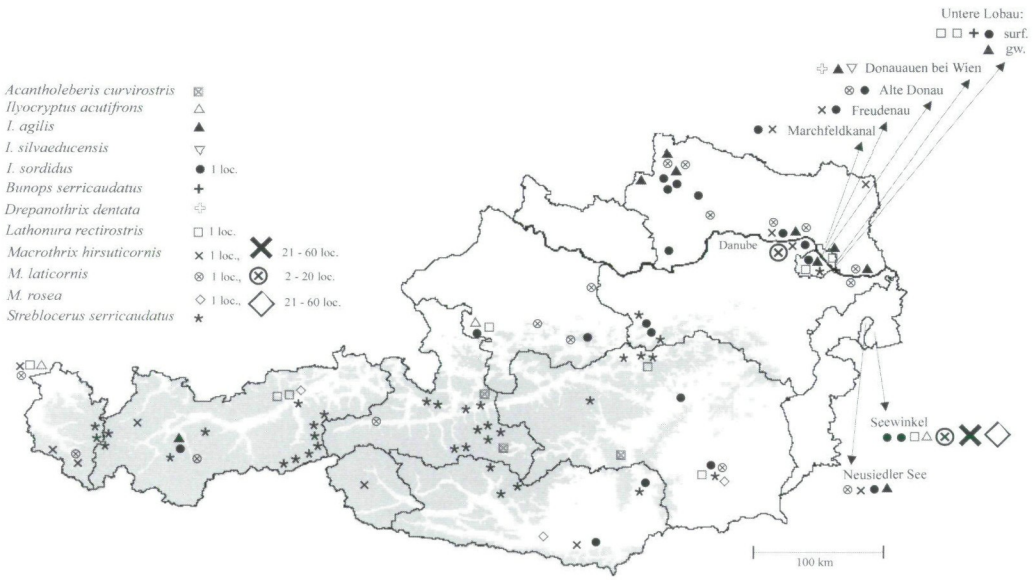

Fig. 9: Distribution map of species of Acantholeberidae, Ilyocryptidae and Macrothricidae.

record: Piburger See, T (930 m) (Fig. 9). **World:** palearctic, neotropic (MARGARITORA 1985), equatorial Africa and Taiwan (SMIRNOV 1976), China.

Habitat: groundwater (rare), benthos of lakes, gravel ponds, backwaters, rivers, coastal lagoons; among water-weeds; less substrate-bound than *Ilyocryptus sordidus*; tolerates salinity up to 2.3 and pH down to 5.

Ilyocryptus silvaeducensis ROMIJN, 1919

Ilyocryptus silvaeducensis ROMIJN, 1919: 535.

Localities: Wien: backwaters of Danube River in Wien (FLÖSSNER 2000).

General distribution: Austria: only known from backwaters of Danube River in W (exact locality not reported) (FLÖSSNER 2000); lowlands (Fig. 9). **World:** palearctic, most records from Holland.

Habitat: deep benthos of lakes, temporary and permanent ponds; prefers muddy and sandy substrates; among vegetation.

Ilyocryptus sordidus (LIÉVIN, 1848)

Ilyocryptus sordidus LIÉVIN, 1848: 34.

Localities: Burgenland: Neusiedler See (ZAKOVSEK 1961; DONNER 1972; SCHIEMER 1979; WAIS 1991, 1993; WOLFRAM 1991, 1993; HERZIG & al. 1994), pools (2) in Seewinkel (WOLFRAM & al. 1999), Seewinkel – Darscho, Martinhoflacke (Wolfram pers. comm. 1997); Kärnten: Gösselsdorfer See (STEUER 1897; HOFFER & KRAUSS 1909; PESTA 1923), St. Leonhardsee (STEUER 1897; PESTA 1923); Niederösterreich: Danube reservoir Altenwörth (Jersabek pers. obs. 1985), Danube River at Klosterneuburg (Gaviria pers. obs. 1993),

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Danube River near Langenzersdorf (Gaviria pers. obs. 1993); fish-ponds (4) in Waldviertel (WAWRIK 1966), Lunzer Mittersee (BREHM 1913/14; PESTA 1923), Marchfeldkanal (GAVIRIA 1994, pers. obs. 1995), Seebach in Lunz (BREHM & RUTTNER 1926); Oberösterreich: Almsee (NHMW 16805), Mondsee (Jersabek pers. obs. 1985; NAUWERCK 1988); Steiermark: ponds near Graz (HARTMANN 1915), Sixt-Teich near Leoben (PICHLER 1939); Tirol: Piburger See (THALER 1975; WINDER & al. 2000), Zeinergraben near Mötz (NHMW 16804); Wien: Alte Donau (STEUER 1901), Danube River, Freudenau, Donauinsel (Gaviria pers. obs. 2000), Lusthauswasser (VORNATSCHER 1938; MITIS 1940), Untere Lobau, Hanselgrund (Gaviria pers. obs. 2002).

General distribution: Austria: lowlands B, N, W; colline zones K, N, O, ST, T; one single record from montane zone: Piburger See, T (930 m, highest record) (Fig. 9). **World:** palearctic, ethiopic and neotropical.

Habitat: littoral benthos of lakes, reservoirs, ponds, gravel ponds, backwaters and rivers; ALONSO (1996) reports the species from deep waters; strongly bound to muddy substrates in which it penetrates down up to 10 cm; tolerates low oxygen content.

Family Macrothricidae NORMAN & BRADY, 1867

Genus *Bunops* BIRGE, 1893

Bunops serricaudatus (DADAY, 1884)

Macrothrix serricaudata DADAY, 1884: 181.

Localities: Wien: Untere Lobau, Hanselgrund (Gaviria pers. obs. 1998; NHMW 19837).

General distribution: Austria: only known from one locality in W (Fig. 9). **World:** holarctic.

Habitat: shallow lakes, ponds, swamps, bogs and backwaters; among water-weeds; substrates rich in detritus; low densities; warm stenothermic.

Genus *Drepanothrix* SARS, 1861

Drepanothrix dentata (EURÉN, 1861)

Acantholeberis dentata EURÉN, 1861: 118.

Localities: Wien: backwaters of Danube River, east of Wien (FLÖSSNER 2000).

General distribution: Austria: only known from backwaters of Danube River in W (exact locality not reported) (FLÖSSNER 2000); lowlands (Fig. 9). **World:** holarctic, mainly in the North.

Habitat: benthos of littoral and profundal zones of lakes, ponds, bogs and backwaters; pH: 4.5 – 8.5.

Genus *Lathonura* LILLJEBORG, 1853

Lathonura rectirostris (O.F. MÜLLER, 1776)

Daphne rectirostris O.F. MÜLLER 1776: 2402.

Localities: Burgenland: pond (SPANDL 1926); Oberösterreich: Egelsee near Stockwinkel a. Attersee (LAN-

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HANS 1911; PESTA 1923); Steiermark: Gaishornsee (PESTA 1923), ponds near Graz (HARTMANN 1915); Tirol: Krummsee, Nordtiroler Kalkalpen (PESTA 1924), Schilfsee near Brixlegg-Kramsach (PESTA 1938; NHMW 16795, 16796, 16797, 16798); Vorarlberg: Bodensee (FLÖSSNER 2000); Wien: Gersthof (SPANDL 1926), swamp near Stadlau (filled up) (NHMW 16799, 16800, 16801), Untere Lobau, Hanselgrund (Gaviria pers. obs. 2002), Untere Lobau, Meeresspitz (Gaviria pers. obs. 1998).

General distribution: Austria: lowlands of B and W; colline zone of O, S, ST, T and V; highest record: Gaishornsee, ST (700 m) (Fig. 9). **World:** holarctic.

Habitat: springs, benthos of lakes down to 15 m depth, ponds, swamps, bogs and backwaters; among water-weeds; tolerates pH down to 5.5.

Genus *Macrothrix* BAIRD, 1843

Macrothrix hirsuticornis NORMAN & BRADY, 1867

Macrothrix hirsuticornis NORMAN & BRADY, 1867: 10.

Localities: Burgenland: Albersee (LÖFFLER 1959), Fuchslochlacke (Wolfram pers. comm. 1996, 1997), Golser See (LÖFFLER 1959), Kirchsee (LÖFFLER 1959), Neusiedler See (PESTA 1954; ZAKOVSEK 1961; FORRÓ 1990, 1992a; WAIS 1991, 1993; WOLFRAM 1991, 1993; HERZIG & al. 1994), Oberer Stinkersee (LÖFFLER 1959), pools (7) in Seewinkel (LÖFFLER 1957), pools (18) in Seewinkel (METZ & FORRÓ 1989), Seewinkel (METZ & FORRÓ 1991; FORRÓ 1992b), pools (3) in Seewinkel (WOLFRAM & al. 1999), pools (12) in Seewinkel (LÖFFLER 1959), pool in Seewinkel (WOLFRAM pers. comm. 1997), Unterer Stinkersee (LÖFFLER 1959; WOLFRAM pers. comm. 1997); Kärnten: Seebachsee (PESTA 1923); Niederösterreich: backwaters near Klosterneuburg (FORRÓ 1996), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), lower Thaya River (FORRÓ 1993); Tirol: Lavantsee, Osttirol (PESTA 1926), Unterer Seewisee, Lechtaler Alpen (PESTA 1923; NHMW 16808; sub Seebisee); Vorarlberg: Bodensee (FLÖSSNER 2000), Lünersee (PESTA 1923), Tilisunasee (PESTA 1923); Wien: Danube River, Freudenau, Donauinsel (Gaviria pers. obs. 2000), Marchfeldkanal (GAVIRIA 1994, pers. obs. 1995); Danube River and backwaters (NAIDENOW 1998); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: eastern lowlands of B, N and W; colline zone of K and V (one locality each); not reported from montane zone; sub-alpine zone of Osttirol and V; one record from alpine zone: Unterer Seewisee, T (2229 m, highest record) (Fig. 9). **World:** palearctic. All other records require re-examination (SMIRNOV 1992).

Habitat: benthos of lakes down to 100 m depth, ponds, salt ponds, swamps, backwaters and rivers; tolerates salinity up to 43; range of pH: 5.1 – 10.1.

Macrothrix laticornis (JURINE, 1820)

Monoculus laticornis JURINE, 1820: 151.

Localities: Burgenland: Neusiedler See (PESTA 1923; SCHIEMER 1979; FORRÓ & METZ 1987; WAIS 1991, 1993; WOLFRAM 1991, 1993; HERZIG & al. 1994), Szerdahelyer Lacke in Seewinkel (LÖFFLER 1959), waterbodies (11) in Seewinkel (LÖFFLER 1957); Oberösterreich: reservoir near Staning (Gaviria pers. obs.1993), small reservoir in Grünau (GAVIRIA pers. obs.1998); Niederösterreich: backwaters (2) near Klosterneuburg (FORRÓ 1996), backwaters near Orth (RECKENDORFER 2000), backwaters of Danube River between Greifenstein and Wien (MOOG & al. 2000), Danube reservoir Altenwörth (Jersabek pers. obs. 1985), fish-ponds (3) in Waldviertel (WAWRIK 1966), Regelsbrunn (Gaviria pers. obs. 1995); Salzburg: meadow-pond near Stuhlfelden (JERSABEK 1986); Steiermark: ponds near Graz (HARTMANN 1915); Tirol: puddle on Ochsenkopf, Obergurgl (REED 1970); Vorarlberg: Bodensee (PESTA 1923), Tilisunasee (ZSCHOKKE 1900; PESTA 1923); Wien: Alte Donau (STEUER 1901; NHMW 16806); Danube River and backwaters (NAIDENOW 1998);

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Austrian Alps (NAIDENOW 1994).

General distribution: Austria: eastern lowlands of B, N and W; colline zone of O, N (Waldviertel), S, ST and V; no records in montane zone; two single records in subalpine zone: Ochsenkopf, T (1840 m) and Tilisunasee, V (2102 m, highest record) (Fig. 9). **World:** cosmopolitan except Australia. Records from the tropics require re-examination (SMIRNOV 1992; FLÖSSNER 2000).

Habitat: benthos of lakes and reservoirs down to 20 m depth, but prefers shallow waters, ponds, backwaters and rivers; among water-weeds; prefers sandy (ALONSO 1996) and muddy substrates.

Macrothrix rosea (JURINE, 1820)

Monoculus roseus JURINE, 1820: 150.

Localities: Burgenland: Fuchslochlacke (Wolfram pers. comm. 1996, 1997), pools (5) in Seewinkel (LÖFFLER 1959), Mittlerer Stinkersee (Wolfram pers. comm. 1997), Runde Lacke (STUNDL 1938; Wolfram pers. comm. 1997), Seewinkel (METZ & FORRÓ 1991), Silberlacke (NHMW 16809), Stundlacke (Wolfram pers. comm. 1997), Unterer Stinkersee (Wolfram pers. comm. 1996, 1997, 1998), waterbodies (3) in Seewinkel (METZ & FORRÓ 1989), waterbodies (6) in Seewinkel (WOLFRAM & al. 1999), Weißer See (LÖFFLER 1959), Zicklacken (NHMW 16810); Kärnten: Großer Magdalenensee (STEUER 1897; PESTA 1923); Oberösterreich: Vorderer Oberberger See (could not be located on the map) (LANHANS 1911; PESTA 1923); Steiermark: ponds near Graz (HARTMANN 1915); Tirol: Schilfsee near Brixlegg-Kramsach (PESTA 1938), Oberer Schwenzer See in Obergurgl (REED 1970); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: mainly found in lowlands in B; few records in the colline zones of K, ST (one locality each), T (two localities); no records from montane and subalpine zones; one single record from high alpine zone (?): Oberer Schwenzer See, T (2764 m) (Fig. 9). **World:** palearctic. Records from Malaysia, Philippines and America are doubtful (FLÖSSNER 2000).

Habitat: prefers small lakes, temporary and permanent ponds, backwaters; among water-weeds; muddy substrates; tolerates pH down to 5.5.

Remarks: *Macrothrix rosea* is considered a warm stenothermic species (ALONSO 1996; FLÖSSNER 2000). Thus, the alpine record from Tirol must be considered doubtful.

Genus *Streblocerus* SARS, 1862

Streblocerus serricaudatus (FISCHER, 1849)

Daphnia serricaudata FISCHER, 1849: 46.

Localities: Kärnten: peat bog pond near Kölnbrein-reservoir, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1992b), Hirschlacke at Nockspitz-region (PESTA 1937), Schwarzsee, Turracher Höhe (FINDENEGG 1953; FINDENEGG & TURNOWSKY 1935), St. Leonharder-Teich (STEUER 1897); Niederösterreich: bog near Lunzer Obersee (BREHM 1913/14), floating meadow in Lunzer Obersee (BEIER 1928), swamp near Lunzer Obersee (BREHM & RUTTNER 1926); Salzburg: peat bog ponds (2) near Reedsee, Ankogelgruppe, Hohe Tauern (JERSABEK & SCHABETSBERGER 1989; 1992c), bog north of Pöham (JERSABEK 1987), Laitternsee, Radstätter Tauern (JERSABEK 1986), Pond at Laitternsee (JERSABEK 1986), pond near Mayr Alm, Radstätter Tauern (JERSABEK 1986), pond on path to Hochkeil, Bischofshofen (JERSABEK 1988), pond in Peterarzkar, Radstätter Tauern (JERSABEK 1986), pond on Rossboden, Forstau (JERSABEK 1986), ponds (2) on Grinnköpfl near Dienten (JERSABEK 1987); Steiermark: bog near Filzmoos (PICHLER 1939),

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forest-pond north of Mödlinger Hütte, Admonter Reichenstein (PICHLER 1939), Hochschwab (FLÖSSNER 2000), Kleiner Scheiblsee, Bösenstein (PICHLER 1939), ponds near Graz (HARTMANN 1915); Tirol: bog on Arlberg (NHMW 16816), bog on Gerlosplatte (PESTA 1952; NHMW 16811), bog near Krummsee, Unteres Inntal (NHMW 16814), Gerlosplattensumpf (PESTA 1926; NHMW 16811), Grüne Lacke (Laperlacke), Gschöpswasser, Zillertal (NHMW 16812, 16813), Kühbodentümpel, Zillertaler Alpen (PESTA 1939; NHMW 16815), Laperlacke auf Gschößwand, Zillertaler Alpen (PESTA 1935), Maiensee, north-east of Arlberg (PESTA 1937; NHMW 16816), Piburger See (FÜREDER 1995), Schwarzmoostümpel, Kühtai (REED 1970), puddle in Zirbenwald, Obergurgl (REED 1970); Vorarlberg: Albona-bog (WAWRIK 1954), «Grundwasseraufstoß» in St. Christoph (WAWRIK 1958); Wien: Lusthauswasser, Prater (VORNATSCHER 1938); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: one single record in lowlands, W; few records in colline zones of K, S and ST; mainly montane and subalpine zones of K, S, ST, T and V; highest record: Obergurgl, Zirbenwald, T (2180 m) (Fig. 9). **World:** holarctic and neotropical.

Habitat: benthos (littoral) of lakes and permanent ponds, bogs; prefers silty and detritic substrates; among water-weeds; poor swimmer; pH: 4.4 – 7.5.

Order Ctenopoda SARS, 1865

Family Holopedidae SARS, 1865

Genus *Holopedium* ZADDACH, 1855

Holopedium gibberum ZADDACH, 1855

Holopedium gibberum ZADDACH, 1855: 159.

Localities: Niederösterreich: fish-ponds (18) in Waldviertel (WAWRIK 1966); Steiermark: ponds (2) near Graz (HARTMANN 1915); Tirol: pond in Fundustal, Kühtai (REED 1970); Wien: Untere Lobau, Kühwörther Wasser (HOLAREK 1999 ?); Austrian Alps (NAIDENOW 1994).

General distribution: Austria: colline zones in N (Waldviertel) and ST (Graz); record from Lobau in W doubtful; single record from subalpine zone: Kühtai, T (1900 m, highest record) (Fig. 10). **World:** northern holarctic and delta of Volga River.

Habitat: pelagic zone of softwater-lakes with low calcium content (< 25 $mg \cdot l^{-1}$), low conductivity, pH: 4 – 7.5 (KOROVCHINSKY 1992); cold stenothermic; oligotrophic to mesotrophic waters (FLÖSSNER 2000).

Family Sididae SARS, 1865

Genus *Diaphanosoma* FISCHER, 1850

Diaphanosoma brachyurum (LIÉVIN, 1848)

Sida brachyura LIÉVIN, 1848: 20.

Localities: Burgenland: 18; Kärnten: 33; Niederösterreich: 50; Oberösterreich: 7; Salzburg: 16; Steiermark: 13; Tirol: 11; Vorarlberg: 1; Wien:16.

General distribution: Austria: in all provinces, mainly lowlands and colline zones; six records from the montane zone: Piburger See (915 m), T (WINDNER & al. 2000),

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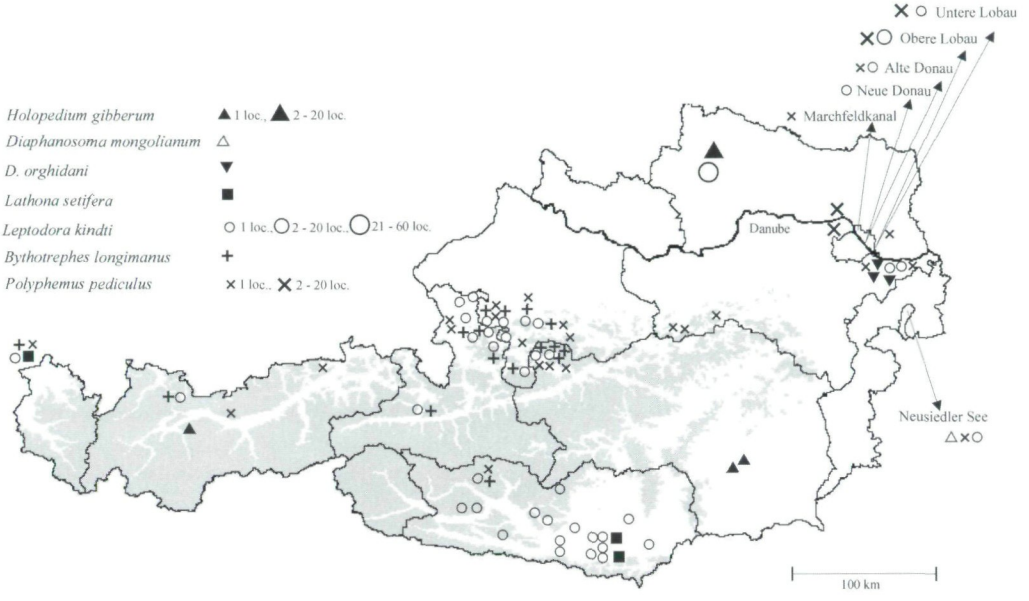

Fig. 10: Distribution map of species of Ctenopoda (except *Diaphanosoma brachyurum* and *Sida crystallina*), Haplopoda and Onychopoda.

Haidensee (115 m), T (SCHABER 1981), Möserer See near Seefeld (1182 m), T (PESTA 1926), Auerlingssee (1400 m), ST (PESTA 1923), Vorderer Lahngangsee (1555 m), ST (LANHANS 1911) and Miesbodensee, Dachstein (1600 m, highest record), ST (SCHABETSBERGER, pers. obs. 1997). **World:** palearctic (*Diaphanosoma brachyurum* s. str.). Similar forms of vague taxonomic status occur in Asia, Africa and America (KOROVCHINSKY 1992).

Habitat: planktonic, inhabits upper layers of pelagic and littoral zones of lakes and reservoirs, ponds, swamps, backwaters and rivers; pH: 4 – 9.2 (more frequently 5 – 6.5); salinity up to 7; warm stenothermic.

Diaphanosoma mongolianum (UÉNO, 1938, emend. KOROVCHINSKY, 1987)

Diaphanosoma mongolianum UÉNO, 1938: 2.

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961 (sub *D. brachyurum*); HERZIG 1973, 1975, 1979, 1980, 1984; SCHABER 1985 (sub *D. brachyurum*); FORRÓ & METZ 1987; AUER 1989, 1994, 1995; FORRÓ 1990; LEITNER 1990 (sub *D. brachyurum*); WAIS 1991, 1993; HERZIG & al. 1994; Gaviria pers. obs. 1996).

General distribution: Austria: only known from Neusiedler See, B (117 m) (Fig. 10). **World:** palearctic and ethiopic.

Habitat: planktonic, inhabits lakes, reservoirs, ponds and rivers; pH: 6.5 – 7.4; warm stenothermic.

Remarks: Biology little known as it was often confused with *Diaphanosoma brachyurum* in the past (e.g. in Austria until the 1990ies).

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Diaphanosoma orghidani NEGREA, 1982

Diaphanosoma orghidani NEGREA, 1982: 32.

Localities: Niederösterreich: ponds (3) near Haslau, Schüttlau (GAVIRIA pers. obs. 1998, NHMW 19836).

General distribution: Austria: only known from three backwaters of the Danube River near Haslau, N (~180 m); lowlands (Fig. 10). **World:** palearctic, Sudan.

Habitat: plankton of pelagic and littoral zones of lakes, reservoirs, ponds, backwaters and rivers; pH: 6.4 – 7.9; salinity up to 14.8; warm stenothermic.

Genus *Latona* STRAUS, 1820

Latona setifera (O.F. MÜLLER, 1776)

Daphnia setifera O.F. MÜLLER, 1776: 200.

Localities: Kärnten: Jeserzer See (STEUER 1897), Keutschacher See (STEUER 1897); Vorarlberg: Bodensee (not reported recently, probably extinct there; cf. PESTA 1923; FLÖSSNER 2000).

General distribution: Austria: only known from lakes in K and V; colline zone; highest record: Jeserzer See, K (620 m) (Fig. 10). **World:** holarctic with boreo-montane distribution.

Habitat: benthos of lakes, ponds and slow running waters; inhabits sandy and sandy-silty substrates near the shore; pH: 4.4 – 9; jumping movement over the bottom.

Genus *Sida* STRAUS, 1820

Sida crystallina (O.F. MÜLLER, 1776)

Daphne crystallina O.F. MÜLLER, 1776: 2405.

Localities: Kärnten: 18, Niederösterreich: 15, Oberösterreich: 6, Salzburg: 11, Steiermark: 4, Tirol: 8, Vorarlberg: 1, Wien: 10; Danube River and backwaters (NAIDENOW 1998); Danube River (DUDICH 1967).

General distribution: Austria: with exception of B, known in all provinces; lowlands of N and W; most localities in colline zones of K, O, S, ST, T and V; four single records from the montane zone: Speicher Koralpe (~1000 m), ST (SOMMER 1996), Lambrechtersee (1050 m), ST (PESTA 1923), Möserer-See near Seefeld (1182 m), T (PESTA 1926) and Wildsee near Seefeld (1180 m), T (PESTA 1924). **World:** holarctic, isolated localites in Vietnam, Argentina, Colombia and Peru (KOROVCHINSKY 1992).

Habitat: phytal zone of lakes and permanent ponds, backwaters and rivers, mainly in waters dominated by *Potamogeton* (NEGREA 1983), occasionally in pelagic zone of lakes; pH: 4.2 – 9.2 (more frequently 5 – 9); salinity up to 7.8; tolerates low oxygen contents down to 0.9 mg·l^{-1}; eutrophic waters.

Remarks: of 3 subspecies described by KOROVCHINSKY (1992), only *Sida crystallina crystallina* occurs in Austria.

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Order Haplopoda SARS, 1865

Family Leptodoridae LILLJEBORG, 1861

Genus *Leptodora* LILLJEBORG, 1861

Leptodora kindti (FOCKE, 1844)

Polyphemus kindtii FOCKE, 1844: 108.
Leptodora hyalina — LILLJEBORG, 1861: 265

Localities: Burgenland: Neusiedler See (HERZIG 1979, 1980, 1995; FORRÓ & METZ 1987; AUER 1989, 1994; WAIS 1991, 1993; HERZIG & al. 1994; Korovchinsky 2000a); Kärnten: Afritzer See (FINDENEGG 1953; SAMPL 1971), Aichwaldsee at Latschach (FINDENEGG 1943b), Faakersee (STEUER 1897; PESTA 1923; FINDENEGG 1953), Farchtensee (FINDENEGG 1943b), Feldsee (Brennsee) (FINDENEGG 1953; SAMPL 1971; SCHARF 1995), Forstsee (FINDENEGG 1953), Hafnersee (SCHIEMER & al. 1982), Keutschacher See (PESTA 1923; FINDENEGG 1938, 1953), Klopeiner See (STEUER 1897; HOFFMANN & KRAUSS 1909; PESTA 1923; FINDENEGG 1935, 1943a, 1953), Längsee (FINDENEGG 1953), Magdalenensee (FINDENEGG 1953), Millstätter See (STEUER 1897; PESTA 1923; FINDENEGG 1935, 1943a, 1953; NERESHEIMER & RUTTNER 1929; WEBER 1958), Ossiacher See (STEUER 1897; KEISSLER 1905; PESTA 1923; FINDENEGG 1934, 1935, 1953; SAMPL 1971; STOTZ 1975; WAPPIS 1980), Plaschischensee (STEUER 1897), Pressegger See (FINDENEGG 1953), Rauschelesee (FINDENEGG 1953), Turracher See (FINDENEGG 1943b, 1953), Weißensee (FINDENEGG 1943b, 1953), Worstnigsee (STEUER 1897; PESTA 1923), Wörther See (STEUER 1897; PESTA 1923; FINDENEGG 1933, 1935, 1943a, 1953); Niederösterreich: backwater at Haslau (HEILER 1993), backwater at Regelsbrunn (HEIN 1993; HOLAREK 1999), fish-ponds (42) in Waldviertel (WAWRIK 1966); Oberösterreich: Attersee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; BRUNNTHALER & al. 1901; LANHANS 1911; PESTA 1923; MÜLLER 1976; MOOG 1976, 1977, 1978, 1979; Jersabek pers. obs. 1999), Fuschlsee (PESTA 1923), Hallstätter See (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; LORENZ, 1898; KEISSLER 1903; HAEMPEL 1918; PESTA 1923; JERSABEK pers. obs. 1999; NAUWERCK & RITTERBUSCH-NAUWERCK 1993), Höllerer See (NAUWERCK 1993), Mondsee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; PESTA 1923; RUTTNER 1939; HERZIG 1985a, 1985b; NAUWERCK 1988, 1992, 1995, 1996), Schwarzensee on Schafberg (LANHANS 1911; PESTA 1923), Traunsee (CLAUS, 1877; IMHOF 1885 (sub *L. hyalina*); STEUER 1897; CORI, 1898; KEISSLER 1901; BREHM & ZEDERBAUER 1906; LANHANS 1908 (sub *L. hyalina*) 1911; PESTA 1923; RUTTNER 1939; HAMANN 1954; Jersabek pers. obs. 1999), Vorderer Langbathsee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; PESTA 1923); Fuschlsee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; Jersabek pers. obs. 1998), Grabensee (MÜLLER & al. 1980; Jersabek pers. obs. 1998), Krottensee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; PESTA 1923), Mattsee (MÜLLER & al. 1980; Jersabek pers. obs. 1998), Obertrumer See (DANECKER 1980; MÜLLER & al. 1980; Jersabek pers. obs. 1998), Wallersee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; RECKENDORFER 1992; Jersabek pers. obs. 1998), Wolfgangsee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; LANHANS 1911; RUTTNER 1939; Jersabek pers. obs. 1999), Zeller See (Jersabek pers. obs. 1998); Steiermark: Altausseer See (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; LANHANS 1911; PESTA 1923), Grundlsee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; LANHANS 1911; PESTA 1923; RUTTNER 1939; STUNDL 1953a; MODER 1986); Tirol: Plansee (IMHOF 1885 (sub *L. hyalina*); STEUER 1897; PESTA 1923); Vorarlberg: Bodensee (PESTA 1923); Wien: Alte Donau (STEUER 1901; PESTA 1928; MIKSCHI & SCHWEIGER 1988; GAVIRIA pers. obs. 1997); Neue Donau (MIKSCHI 1986), Obere Lobau - Alte Naufahrt (PFAFFENWIMMER 1986), Kleines Schilloch (PFAFFENWIMMER 1986), Untere Lobau, Kühwörther Wasser (HOLAREK 1999); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: lowlands of B, N and W; colline zone of K, N, O, ST, S and V; one single record from montane zone: Plansee, T (935 m, highest record) (Fig. 10). **World:** holarctic, introduced to Sri Lanka.

Habitat: pelagic zone of lakes and reservoirs; rare in large ponds, backwaters and rivers; tolerates salinity up to 5.

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Order Onychopoda SARS, 1865

Family Cercopagidae LEYDIG, 1860

Genus *Bythotrephes* LEYDIG, 1860

Bythotrephes longimanus longimanus LEYDIG, 1860

Bythotrephes longimanus LEYDIG, 1860:244..

Localities: Kärnten: Millstätter See (probably extinct since 1967; cf. SAMPL 1971, 1975; LÖFFLER 1983; JERSABEK 1999) (STEUER 1897; PESTA 1923; FINDENEGG 1935, 1943b, 1953; ISCHREYT 1939); Oberösterreich: Attersee (IMHOF 1885; LANHANS 1911; PESTA 1923; ISCHREYT 1939; MÜLLER 1976; MOOG 1976, 1977, 1978, 1979; Jersabek pers. obs. 1999), Fuschlsee (ISCHREYT 1939; Jersabek pers. obs. 1998), Hallstätter See (IMHOF 1885; LORENZ, 1898; KEISSLER 1903; LANHANS 1911; HAEMPEL 1918; PESTA 1923; ISCHREYT 1939; NAUWERCK & RITTERBUSCH-NAUWERCK 1993; Jersabek pers. obs. 1999), Mondsee (IMHOF 1885; PESTA 1923; ISCHREYT 1939; HERZIG 1985a, 1985b; NAUWERCK 1988, 1992, 1995, 1996; DOKULIL & al. 1990; PLANKENSTEINER 1992), Traunsee (CLAUS, 1877; IMHOF 1885; CORI 1898; BREHM & ZEDERBAUER 1906; LANHANS 1908, 1911; PESTA 1923; ISCHREYT 1939; RUTTNER 1939; HAMANN 1954; MÜLLER 1982; Jersabek pers. obs. 1999), Vorderer Langbathsee (IMHOF 1885; PESTA 1923); Salzburg: Krottensee (IMHOF 1885; PESTA 1923), Wolfgangsee (IMHOF 1885; LANHANS 1911; PESTA 1923; ISCHREYT 1939; RUTTNER 1939; Jersabek pers. obs. 1999), Zeller See (PESTA 1923); Steiermark: Altausseer See (IMHOF 1885; LANHANS 1911; PESTA 1923; ISCHREYT 1939; RUTTNER 1939), Grundlsee (IMHOF 1885; LANHANS 1911; PESTA 1923; ISCHREYT 1939; RUTTNER 1939; MODER 1986), Toplitzsee (LANHANS 1911; PESTA 1923), Vorderer Lahngangsee (LANHANS 1911; PESTA 1923); Tirol: Plansee (IMHOF 1885; PESTA 1923); Vorarlberg: Bodensee (PESTA 1923; KOROVCHINSKY 2000a).

General distribution: Austria: colline zone of O, S, St and V; probably extinct in K; a single record each from the montane zone (Plansee, T, 975 m) and the sub-alpine zone (Vorderer Lahngangsee, ST, 1555 m, highest record; now probably extinct due to fish stocking; Jersabeck, pers. obs.) (Fig. 10). **World:** palearctic, introduced to North America in the 1970ies.

Habitat: exclusively in deep lakes in the Alps, elsewhere in shallow lakes but rare; tolerates pH down to 5.1.

Remarks: two subspecies have been reported in Austria (FLÖSSNER 2000): *Bythotrephes longimanus longimanus* LEYDIG, 1860 and *Bythotrephes longimanus styriacus* ISCHREYT, 1939. The latter is restricted to the Salzkammergut region, viz. Hallstätter See, Altausseer See, and probably further lakes in the district, ST.

Bythotrephes longimanus styrianus ISCHREYT 1939

Bythotrephes longimanus LEYDIG, 1860: 244.

Localities: Oberösterreich: Hallstätter See (FLÖSSNER 2000) ; Steiermark: Altausseer See (FLÖSSNER 2000).

General distribution: Austria: colline zone of O and St, Altausseer See (~700 m, highest record. **World:** endemic from the Salzkammergut in Austria, elsewhere unkown.

Habitat: exclusively in deep lakes in the Alps, elsewhere in shallow lakes but rare; tolerates pH down to 5.1.

Remarks: Populations of *Bythotrephes longimanus styriacus* are probably present in further lakes of the district, ST.

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Family Polyphemidae BAIRD, 1845

Genus *Polyphemus* O.F. MÜLLER 1785

Polyphemus pediculus (LINNÉ, 1761)

Localities: Burgenland: Neusiedler See (PESTA 1954; ZAKOVSEK 1961; LÖFFLER 1979); Kärnten: Millstätter See (STEUER 1897; FINDENEGG 1943b), Raiblersee (PESTA 1923), Treimischer pond near Viktring (JERSABEK pers. obs. 1985), upper Hallegger-pond (FINDENEGG 1943b); Niederösterreich: backwaters (4) near Klosterneuburg (FORRÓ 1996), backwater near Regelsbrunn (HOLAREK 1999), inundated meadow and forest of Gießgang, Greifenstein (GAVIRIA 1998), Erlaufsee (PESTA 1923; RUTTNER 1939; SAMPL 1967), Haslau, Schüttlau (GAVIRIA pers. obs. 1998), Lunzer Obersee (BREHM 1913/14; PESTA 1923; MIKSCHI 1990), Marchfeldkanal (GAVIRIA 1994), pond in Seehof, Lunz am See (BREHM & RUTTNER1926); Oberösterreich: Almsee (ZEITLINGER 1928), Egelsee near Scharfling (Jersabek pers. obs. 1986), Kaltenbachteich, Ischler Hausberg (ZACH 1983), Mondsee (NAUWERCK 1988), Traunsee (CLAUS, 1877; IMHOF 1885; CORI, 1898; LANHANS 1908, 1911; PESTA 1923; RUTTNER 1939; HAMANN 1954; JERSABEK pers. obs. 1999), Vorderer Langbathsee (IMHOF 1885); Salzburg: fish-ponds (2) in Hinterthal (JERSABEK 1987), Grabensee (Jersabek pers. obs. 1998), Karlsbader Weiher in Salzburg (Jersabek pers. obs. 1986), gravel lake Bürmoos (Jersabek pers. obs. 2001), pond at University of Salzburg (Jersabek pers. obs. 1989); Steiermark: Kammersee near Bad Aussee (LANHANS 1911; PESTA 1923), Ödensee (LANHANS 1911; PESTA 1923), Vorderer Lahngangsee (LANHANS 1911; PESTA 1923); Tirol: Hintersteiner-See near Kufstein (PESTA 1926), Wildsee near Seefeld (PESTA 1924); Vorarlberg: Bodensee (PESTA 1923); Wien: Alte Donau (JOSEPH 1913; PESTA 1928; VORNATSCHER 1938; Gaviria pers. obs. 1997), Marchfeldkanal (GAVIRIA 1994), Obere Lobau - Kleines Schilloch, Oberleitnerwasser, 13-er Werk (PFAFFENWIMMER 1986), Untere Lobau – Eberschüttwasser, Großenzersdorfer Arm (PFAFFENWIMMER 1986), Hanselgrund (Gaviria pers. obs. 2002), Kühwörther Wasser (HOLAREK 1999), Schwarzes Loch (GAVIRIA pers. obs. 1998), Unteres Lausgrundwasser (PFAFFENWIMMER 1986); Danube River and backwaters (NAIDENOW 1998).

General distribution: Austria: lowlands B (Neusiedler See only), N and W; colline zone K, N, O, S, ST and V; montane zone of K, ST and T; one subalpine record in ST: Vorderer Lahngangsee (1555 m; highest record) (Fig. 10). **World:** holarctic.

Habitat: usually near the shore of large lakes and reservoirs, permanent and temporary ponds, backwaters and slow running waters, occasionally pelagic (RIVIER 1998); among waterweeds, sandy and stony littoral zones; tolerates acidic water down to pH 3.9; warm stenothermic.

Notes on general distribution and ecology

From an approximate number of 600 species of cladocerans currently known worldwide (KOROVCHINSKY 2000b) and 154 species reported for Europe (HRBÁČEK & al. 1978), 103 taxa were found in Austria. This represents 17 % and 66 % of the world's and European species number, respectively. A similar species richness is known for Italy (102) (MARGARITORA 1985), Romania (113) (NEGREA 1983) and Germany (113) (FLÖSSNER 2000; LIEDER 1996).

Only 10 of the species occurring in Austria (*Bosmina longirostris*, *Simocephalus serrulatus*, *Simocephalus exspinosus*, *Moina micrura*, *Alona affinis*, *Alona guttata*, *Alona intermedia*, *Graptoleberis testudinaria*, *Alonella excisa* and *Chydorus sphaericus*) are cosmopolites.

Ten other species found in Austria (*Ceriodaphnia dubia*, *Ceriodaphnia reticulata*, *Daphnia pulex*, *Moina macrocopa*, *Macrothrix laticornis*, *Acroperus harpae*, *Alona costata*, *Leydigia acanthocercoides* and *Disparalona rostrata*) occur on all continents

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except Australia. A third group of 14 species has a wide distribution sharing the holarctic region with one, two or three biogeographical regions. Otherwise and possibly due to the involuntary human phoresis (e.g. ship transport), some species presently show a disjunct distribution in remote areas, such as *Pleuroxus laevis* in the palearctic and Australian regions or *Scapholeberis microcephala* in the palearctic region and South Africa. There are 24 holarctic species in Austria and 25 that are exclusively palearctic.

Some species have a limited distribution within the country. Species exclusively restricted to the sub-alpine and/or alpine regions are *Daphnia middendorffiana*, *Daphnia zschokkei*, and *Daphnia rosea,* while *Acantholeberis curvirostris* is currently only known from the montane region. Another group, consisting of *Ceriodaphnia setosa*, *Daphnia atkinsoni*, *Daphnia similis*, *Tretocephala ambigua*, *Dunhevedia crassa*, *Pleuroxus denticulatus*, *Bunops serricaudatus*, *Drepanothrix dentata*, *Ilyocryptus silvaeducensis, Diaphanosoma mongolianum* and *Diaphanosoma orghidani,* is absent from the mountainous regions and largely restricted to the eastern territories. From the latter group, *Tretocephala ambigua*, *Dunhevedia crassa*, *Pleuroxus denticulatus*, *Bunops serricaudatus*, *Drepanothrix dentata, Ilyocryptus silvaeducensis* and *Diaphanosoma orghidani* are exclusive inhabitants of backwaters of the Danube River. *Daphnia similis*, as a typical inhabitant of waterbodies with high conductivity, is limited to Seewinkel.

Although *Streblocerus serricaudatus* and *Daphnia obtusa* are distributed from lowlands up to the alpine zone, their main distribution corresponds to the montane and the alpine zones. *Scapholoberis rammneri* is not found within the Alps, but its distribution is limited to the eastern lowlands and the Bohemian Massif (Waldviertel).

Some species have been reported from a single locality only. *Diaphanosoma mongolianum* is only found in the pelagic zone of Neusiedler See, where it forms an important part of the zooplankton community (HERZIG 2001). Benthic species reported from a single waterbody are *Pleuroxus denticulatus* (Tulln), *Bunops serricaudatus* (Untere Lobau), *Alona karelica* (Graz) and *Alona protzi* (Grabensee in Salzburg). *Ilyocryptus silvaeducensis* was reported from backwaters of the Danube River near Wien (cf. FLÖSSNER 2000) without information about the specific locality. It has not been found since. Species such as *Alona intermedia, Acroperus angustatus*, *Daphnia similis*, *Moina macrocopa*, *Scapholeberis microcephala*, *Ilyocryptus acutifrons* and *Acantholeberis curvirostris* are known from only a few waterbodies and are also considered rare. *Bosmina longispina ruehei* is endemic to Austria and only known from the Salzkammergut region and the Zeller See. *Bythotrephis longimanus styrianus* endemic to Austria, is unknown elsewhere.

Some species have a wider distribution in the country, like *Holopedium gibberum* and *Daphnia pulicaria*, but most of their known localities are concentrated in one region (Waldviertel).

Latona setifera must be considered extinct in Austria, as it has not been found since over 100 years (JERSABEK 1999). In the past, this species of Sididae inhabited the littoral zones of Jeserzer See and Keutschacher See in Kärnten (STEUER 1897; see also PESTA1923). In Germany the species is considered strongly endangered (FLÖSSNER 2000).

Another species considered endangered in Austria is *Bythotrephes longimanus.* Its natural habitat are deep oligotrophic to mesotrophic lakes. The species once inhabitated the Millstätter See, but since 1967 it was not found again (SAMPL 1971; LÖFFLER 1983; JERSABEK 1999), possibly due to the discharge of industrial waste water into the lake.

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In some high mountain lakes of the Alps and due to the introduction of fish, two daphnid species (*Daphnia middendorffiana* and *Daphnia rosea*) have regionally disappeared (LÖFFLER 1983). In the past, *Daphnia middendorffiana* was one of the main crustacean components in the pelagic zone of Gossenköllesee in Tirol, documented by the presence of ephippians in the sediments (MORITZ 1984). With the introduction of the trout *Salmo trutta* f. *fario* in the 15th century (PECHLANER 1966), the cladoceran community was dramatically affected and *Daphnia middendorffiana* disappeared from the lake. It is possible that *Cyclops abyssorum* also contributed to its extinction there (LÖFFLER 1983). This *Daphnia* also disappeared (1970 ?) from Drachensee in Tirol (LÖFFLER 1983) due to trout stocking and the presence of *Cyclops abyssorum tatricus*.

The existence of *Alona karelica* reported once from Graz is considered doubtful (FLÖSSNER 2000).

GAVIRIA (2002) summarised the recent immigration of three cladocerans into Austrian waters: *Daphnia parvula,* originating from North America, appeared in Bodensee in the 1970ies, later in Zeller See and recently (since 1996) in the backwaters of the Danube River near Klosterneuburg (FORRÓ 1996). *Pleuroxus denticulatus*, also an American species, was found in Germany since 1973; in 1999 it was reported for the first time in the backwaters of the Austrian Danube near Tulln (FORRÓ 1999). *Drepanothrix dentata* was recently reported (FLÖSSNER 2000) from one backwaterbody upstream from Wien (without specific locality, name of the collector or Steuering date). As this species was not known for the region (HRBÁČEK & al. 1978), it must therefore be considered a recent immigrant to Austria.

During the present study *Diaphanosoma orghidani* was collected in three backwater ponds at Haslau, near the Danube River. In Europe, this palearctic species occurs in Germany, the Czech Republic, and in its eastern and southeastern parts; the species was probably introduced with ships to the Austrian Danube.

Another species new to the Austrian fauna is *Bunops serricaudatus.* This species was recently collected in the Lobau in Wien, and was not found before probably due to its low densities.

In the palearctic region the species is also known from Germany, Poland, Sweden, the Czech Republic, the Balkans, the Carpathian and Pannonian regions and the Caucasus in Asia (FLÖSSNER 2000; NEGREA 1983).

The physical and chemical properties of the water influences the distribution of the species as well. For instance, some cold-stenothermic species like *Daphnia middendorffiana*, *Daphnia zschokkei* and *Daphnia rosea* are limited to cold waterbodies of the Alps. *Holopedium gibberum* is also a cold-stenothermic species and its distribution in Austria is limited to the Waldviertel and some waterbodies within the Alps. All *Moina*-species are typically warm-stenothermic and their major population development occurs in summer; in Austria they are restricted to waters below 800 m altitude. *Dunhevedia crassa,* another warm-stenothermic species, is limited to backwaters of the Danube River.

Salinity limits the distribution of some species. In Austria, *Daphnia similis* is restricted to sodic ponds of the Seewinkel. *Daphnia atkinsoni* and *Daphnia magna*, also halotolerant species, have their main distribution in the sodic ponds of the Seewinkel.

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Acantholeberis curvirostris and *Scapholeberis microcephala* are acidophilic and therefore only found in acidic bogs.

In stagnant waters the trophic condition strongly influences the presence and abundance of the cladoceran species. Two species typical of oligotrophic waters are *Acroperus angustatus* and *Daphnia zschokkei*, while *Holopedium gibberum* inhabits oligotrophic to mesotrophic waters.

Species limited to eutrophic waters are *Moina micrura*, *Bosmina longirostris,* both species of *Leydigia*, *Ceriodaphnia pulchella* and *Diaphanosoma mongolianum.* Moreover, *Moina macrocopa* inhabits strongly eutrophic waters, whereas *Moina brachiata* also occurs in polytrophic waters.

However, quantitative preferences for certain trophic conditions have not yet been investigated and established as has been done for macrozoobenthic species of running waters (saprobic categories; MOOG 1995, 2002).

Groundwater cladocerans are poorly known in Austria (LÖFFLER 1960a, 1960b; NEGREA & POSPISIL 1995). No stygobiontic species have been found, although several studies report a distinct groundwater component in south-eastern European cladoceran communities (BRANCELJ 1990, 1992; BRANCELJ & SKET 1990). Until now, 7 stygophilic and 9 stygoxenic species have been reported from the Lobau in Wien (NEGREA & POSPISIL 1995), and 8 species from groundwaters in Burgenland (LÖFFLER 1960a, 1960b).

Although cladocerans also occur in the potamoplankton of rivers, they are a less important component in the crustacean fauna of the stream bed compared to copepods. Higher densities are only found in the littoral zone of slow running sections. Reports of cladocerans of Austrian rivers are limited to the Danube River (SCHALLGRUBER 1944; HUMPESCH & MOOG 1994; NAIDENOW 1985, 1994, 1998; WEIGAND 1996; SCHÖNBAUER 1999), its backwaters (NAIDENOW 1998; MOOG & al. 2000) and a man-made channel of the river (GAVIRIA 1994). In the Danube River, 27 planktonic and benthonic species have been reported (NAIDENOW 1998), and a similar number (28) was found in the present compilation.

Typical species of the Danube potamoplankton are *Bosmina longirostris*, *Bosmina coregoni*, *Ceriodaphnia pulchella* and four *Daphnia*-species (*D. galeata, D. hyalina, D. longispina* and *D. cucullata)*. Typical benthic species of the Danube River and the Marchfeld channel are the chydorids *Acroperus harpae*, *Alona affinis*, *Alona quadrangularis*, *A. rectangula*, *Chydorus sphaericus, Leydigia leydigi, Pleuroxus uncinatus*, the ilyocryptid *Ilyocryptus sordidus* and the macrothricid *Macrothrix hirsuticornis*. Most of them show morphological adaptations to water currents. *Disparalona rostrata, Sida crystallina* and two species of *Simocephalus* (*S. serrulatus* and *S. vetulus*) are also characteristic of the Marchfeld channel and dynamic backwaters of the Danube River, and should also occur in the river itself.

The number of species previously reported for the backwaters of the Danube River was 31 (NAIDENOW 1998; MOOG & al. 2000), but has now been raised to 70. Inhabitants typical of isolated backwaters of the river are *Daphnia curvirostris*, *Ceriodaphnia dubia*, *Alonella exigua*, *Dunhevedia crassa*, *Kurzia latissima, Pleuroxus trigonellus* and *Drepanothrix dentata*.

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Additional surveys of backwaters of the Danube River (particularly of benthic communities), of the potamal zone (plankton and littoral) of other rivers in the country and the inclusion of groundwaters could increase the present inventory, and contribute to a better understanding of the distribution of some species. Poorly investigated regions are the Innviertel and Mühlviertel in Oberösterreich, the colline zone of southern Steiermark and the province of Vorarlberg.

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