

THE ROTIFERS OF SPANISH RESERVOIRS: ECOLOGICAL, SYSTEMATICAL AND ZOOGEOGRAPHICAL REMARKS

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ABSTRACT

This article covers the rotifer data from a 1987/1988 survey of one hundred Spanish reservoirs. From each species brief information is given, focused mainly on ecology, morphology, zoogeography and distribution both in Spain and within reservoirs. New autoecological information on each species is also established giving conductivity ranges, alkalinity, pH and temperature for each. Original drawings and photographs obtained on both optical and electronic microscopy are shown of the majority of the species found.

In total one hundred and ten taxa were identified, belonging to 101 species, representing 20 families: Epiphanidae (1); Brachionidae (23); Euchlanidae (1); Mytilinidae (1); Trichotriidae (3); Colurellidae (8); Lecanidae (15); Proalidae (2); Lindiidae (1); Notommatidae (5); Trichocercidae (7); Gastropodidae (5); Synchaetidae (11); Asplanchnidae (3); Testudinellidae (3); Conochiliidae (5); Hexarthridae (2); Filiniidae (3); Collothecidae (2); Philodinidae (Bdelloidea) (1).

Thirteen species were new records for the Iberian rotifer fauna: *Keratella ticinensis* (Ehrenberg); *Lepadella* (X.) *astacicola* Hauer; *Lecane* (M.) *copeis* Haring & Myers; *Lecane tenuiseta* Haring; *Lecane* (M.) *tethis* Haring & Myers; *Proales fallaciosa* Wulfert; *Lindia annecta* Haring & Myers; *Notommata cerberus* Hudson & Gosse; *Notommata copeus* Ehrenberg; *Resticula nyssa* Haring & Myers; *Trichocerca vernalis* Hauer; *Gastropus hyptopus* Ehrenberg; *Collothea mutabilis* Hudson.

Key Words: Rotifera, plankton, heleoplankton, reservoirs

RESUMEN

Este artículo proporciona información sobre los rotíferos hallados en el estudio 1987/88 realizado sobre cien embalses españoles. Para cada especie se da una breve información, fundamentalmente sobre aspectos ecológicos, morfológicos, zoogeográficos, así como de su distribución en España y en los embalses. Se aporta información a la autoecología de cada especie (rangos de conductividad, alcalinidad, pH, temperatura). Se proporcionan las ilustraciones originales de la mayor parte de las especies (dibujos i microfotografías con microscopía óptica o electrónica).

Se identificaron ciento diez taxones, correspondientes a 101 especies, representando 20 familias: Epiphanidae (1); Brachionidae (23); Euchlanidae (1); Mytilinidae (1); Trichotriidae (3); Colurellidae (8); Lecanidae (15); Proalidae (2); Lindiidae (1); Notommatidae (5); Trichocercidae (7); Gastropodidae (5); Synchaetidae (11); Asplanchnidae (3); Testudinellidae (3); Conochiliidae (5); Hexarthridae (2); Filiniidae (3); Collothecidae (2); Philodinidae (Bdelloidea) (1).

Trece especies son nuevas citas para la fauna ibérica de rotíferos: *Keratella ticinensis* (Ehrenberg); *Lepadella* (X.) *astacicola* Hauer; *Lecane* (M.) *copeis* Haring & Myers; *Lecane tenuiseta* Haring; *Lecane* (M.) *tethis* Haring & Myers; *Proales fallaciosa* Wulfert; *Lindia annecta* Haring & Myers; *Notommata cerberus* Hudson & Gosse; *Notommata copeus* Ehrenberg; *Resticula nyssa* Haring & Myers; *Trichocerca vernalis* Hauer; *Gastropus hyptopus* Ehrenberg; *Collothea mutabilis* Hudson.

Palabras clave: Rotifera, plancton, heleoplankton, embalses

INTRODUCTION

One hundred and three reservoirs were extensively studied in 1972-75 (Margalef *et al.* 1976), and revisited 15 years later (1987-88). Both studies

examined the regional limnology of a country with scarcity of natural lakes.

Rotifers constitute an important part of the freshwater zooplankton. They are usually unimportant in terms of biomass (Ruttner-Kolisko, 1974), but

play a major role in energy transfer and nutrient cycling (Makarevic & Likens, 1979). Rotifers may disperse by means of their resting eggs and their biogeography has been subject of intense controversy (Dumont, 1980, 1983; De Ridder, 1981; Shiel *et al.*, 1989; De Manuel *et al.* 1992). Knowledge of the rotifer fauna of Spain is scarce. Velasco (1991) included 349 taxa but for a temperate region, this number seems too low. The most complete review of planktonic rotifers is found in Guiset (1976, 1977a), where the distribution of planktonic rotifers is related to reservoir typology.

There is large literature, including identification keys with abundant information on ecological and systematic aspects of rotifers from different regions of the world. In this sense, Pontin (1978) for the British Islands, Stemberguer (1979) for the Laurentian Great Lakes, Braioni and Gelmini (1983) for Italy, Pourriot & Francez (1986) for France and Koste and Shiel (1987a, 1989a, 1989b, 1990ab, 1991) and Shiel & Koste (1992) for Australia, are all examples of rotifer revisions and systematic compilations on systematic keys. However, not much autoecological and sinecological information of species is reported in these works.

This paper records all rotifer taxa found in a 1987-89 survey of one hundred and three Spanish reservoirs. In spite of the fact that samples were collected from plankton, a large number of taxa were typically littoral species, both peryphitic and heleoplanktonic.

The aim of this paper is to identify and determine the occurrence of planktonic and heleoplanktonic rotifers in Spanish reservoirs. For each taxon a brief bibliographical revision on ecological, systematic and biogeographical aspects is given first. Following, ranges of some physical and chemical variables (conductivity, alkalinity, pH and temperature) are indicated for localities where each species was found. Data on the geographical distribution of the taxa recorded in Spain is also given. The work includes original drawings and microscopic photographs of the majority of taxa.

Other investigations on rotifers deriving from this extensive survey may be found elsewhere:

brachionidae were reported in De Manuel (1991); communities and assemblages in De Manuel & Armengol (1993); relationships of each species with physical, chemical and biological variables in De Manuel & Jaume (1993, 1994) and a comparison between relationships found in the previous study and changes in distribution in Guiset & De Manuel (1993).

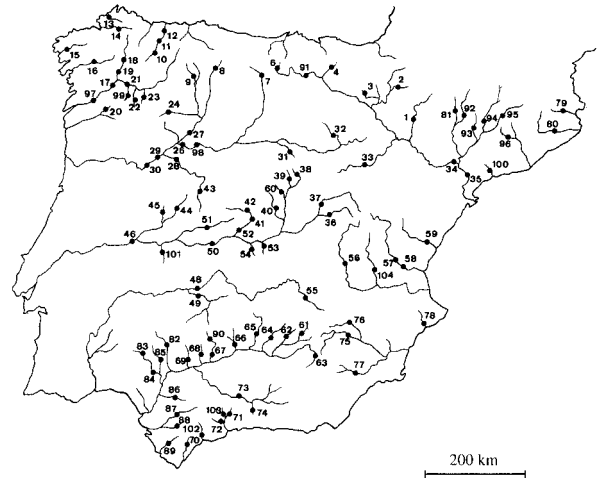


Figure 1. Reservoirs studied: 1 La Sotonera; 2 Yesa; 3 Alloz; 4 Urrunaga; 6 Ebro; 7 Aguilar de Campoo; 8 El Porma; 9 Barrios de Luna; 10 Salime; 11 Doiras; 12 Arbn; 13 Forcadas; 14 Ribeira; 15 Fervenza; 16 Portodemouros; 17 Velle; 18 Belesar; 19 Os Peares; 20 As Conchas; 21 San Esteban; 22 Chandrexa; 23 Bao; 24 Cernadilla; 26 Villalcampo; 27 Ricobayo; 28 Almendra; 29 Aldeadávila; 30 Saucelle; 31 Linares del Arroyo; 32 Cuerda del Pozo; 33 Tranquera; 34 Mequinença; 35 Flix; 36 Buendía; 37 Entrepeñas; 38 El Vado; 39 El Atazar; 40 Santillana; 41 San Juan; 42 Burguillo; 43 Santa Teresa; 44 Gabriel y Galán; 45 Borbollón; 46 Alcántara; 48 Orellana; 49 Zújar; 50 Valdecañas; 51 Rosarito; 52 Cazalegas; 53 Guajaraz; 54 Torcón; 55 Pefiarroya; 56 Alarcón; 57 Benaixeve; 58 Loriguilla; 59 Sitjar; 60 El Vellón; 61 Guadalmena; 62 Guadalén; 63 Tranco de Beas; 64 Rumblar; 65 Jandula; 66 Guadalmellato; 67 La Brefia; 68 Bembezar; 69 Retortillo; 70 Guadarranque; 71 Guadalteba; 72 Conde de Guadalhorce; 73 Iznajar; 74 Los Bermejales; 75 Cenajo; 76 Talave; 77 Puentes; 78 Amadorio; 79 Boadella; 80 Susqueda; 81 El Grado; 82 El Pintado; 83 Arcena; 84 La Minilla; 85 Cala; 86 Torre del Águila; 87 Bornos; 88 Guadalcacin; 89 Celemin; 90 Guadalnuño; 91 Sobron; 92 Barasona; 93 Sta. Anna; 94 Camarasa; 95 Oliana; 96 Sant Ponç; 97 Frieira; 98 San Romín; 99 Mao (Leboreiro); 100 Riudecanyes; 101 Cáceres (Guadiloba); 102 La Concepción; 103 Guadalhorce; 104 Contreras.

STUDY AREA AND METHODS

The study of Spanish reservoirs was carried out in two extensive surveys. One survey was done between November 1987 and March 1988, approximately the mixing period. The second survey was carried out from July to September 1988, when the water column was generally stratified. Fig. 1 gives the location of each reservoir.

Rotifer samples were collected with a Nyal plankton net 40 µm mesh size. Two replicate samples were taken from each reservoir. Each sample was taken as a vertical haul from 20 m deep to the surface in the deepest part of the reservoir. A qualitative sample was also taken as an horizontal haul 1-3 m deep while navigating softly about 2 minutes. Samples were anaesthetized with carbonated water and progressively preserved with formaldehyde to reach a 4% solution in water. A series of measurements of physical, chemical and biological variables were carried out *in situ*. Detailed information on methods from limnological investigations conducted in Spanish reservoirs can be found in Margalef *et al.*, (1976); Armengol *et al.*, (1990) and Riera *et al.*, 1992.

The work of the European rotifer fauna of Voigt (1957) and revised by Koste (1978) has been widely used as a general guide for identification. However, some reviews and monographs on particular genera and families have been used too: Ahlstrom (1940, 1943) and Koste & Shiel (1987a) for genera *Brachionus* and *Keratella*; Stemberger (1979) for *Synchaeta* species and Harring (1916) and Harring & Myers (1916, 1922, 1926) and Koste & Shiel (1990a) for genera *Lepudella*, *Lecane* and *Cephalodella*.

Mastax analyse were carried out in some taxa for taxonomic identifications. Some specimens (or part of them) were drawn with a *camera lucida* and, occasionally, photographed. Scanning electron microscopy (SEM) was used for distinguishing details of loricated rotifers, and was especially useful for the family Brachionidae. Preparation of specimens for SEM observation was made following Ansellem & Clement (1981).

Table 1. Number of species from each family identified in Spanish reservoirs (1987/88). *Número de especies de cada familia identificadas en los embalses españoles (1987/88).*

Families	no d'espècies
<i>Monogononta</i>	
F. Epiphaniidae	1
F. Brachionidae	23
F. Euchlanidae	1
F. Mytilinidae	1
F. Trichotriidae	3
F. Colurellidae	8
F. Lecanidae	15
F. Proalidae	2
F. Lindiidae	1
F. Notommatidae	5
F. Trichocercidae	7
F. Gastropodidae	5
F. Synchaetidae	11
F. Asplanchnidae	3
F. Testudinellidae	3
F. Conochiliidae	5
F. Hexarthridae	2
F. Filiniidae	3
F. Collothecaceae	2
<i>Digononta</i>	
F. Philodinidae	1

ROTIFERS OF THE RESERVOIRS. ECOLOGIC, SYSTEMATIC AND ZOOGEOGRAPHICAL ASPECTS

The 1987/1988 survey of Spanish reservoirs have been identified 110 rotifer taxa, corresponding to 101 species (Table 2) and representing 20 families (Table 1). Thirty five of these taxa were euplanktonic species while and the others were mainly heleoplanktonic. Thirteen species are new records for the rotifer fauna of Spain. Occurrence and abundance of each species in reservoirs is given in De Manuel (1997).

Rotifers are organized here by families, ordered according traditional criteria of Remane (1929-1933), and later modified by Koste (1978). Species in each family are ordered alphabetically.

Tabla 2. Planktonic and heleoplanktonic species, grouped by families, found in 101 studied Spanish reservoirs (1987-88). * new records for Spain. *Especies planctónicas y heleoplanktonicas, agrupadas por familias, que han sido halladas en los 101 embalses estudiados (1987-88).*
* nuevas citas para España.

(Monogononta)	<i>L. (X.) astacicolu</i> *	F. Synchaetidae
O. Ploimida		<i>Polyarthra olichoptera</i>
F. Epiphanidae	F. Lecanidae	<i>P. euryptera</i>
<i>Epiphanes senta</i>	<i>Lecane (M.) bulla</i>	<i>P. major</i>
	<i>L. (M.) closteroerca</i>	<i>P. remata</i>
	<i>L. (M.) copeis</i> *	<i>P. vulgaris</i>
F. Brachionidae	<i>L. crepida</i>	<i>Ploesoma hudsoni</i>
<i>Anuraeopsis fissa</i>	<i>L. flexilis</i>	<i>P. truncatum</i>
<i>Brachionus angularis</i>	<i>L. (M.) hamata</i>	<i>Synchaeta kitina</i>
<i>B. bidentata</i>	<i>L. hastata</i>	<i>S. oblonga</i>
<i>B. budapestinensis</i>	<i>L. inermis</i>	<i>S. pectinata</i>
<i>B. calyciflorus</i>	<i>L. luna</i>	<i>S. stylata</i>
<i>B. falcatus</i>	<i>L. (M.) lunaris</i>	
<i>B. leydigi</i>	<i>L. mira</i>	F. Asplanchnidae
<i>B. plicatilis</i>	<i>L. (M.) scutata</i>	<i>Asplanchna brightwelli</i>
<i>B. quadridentatus</i>	<i>L. (M.) stenroosi</i>	<i>A. girodi</i>
<i>B. urceolaris</i>	<i>L. tenuiseta</i> *	<i>A. priodonta</i>
<i>Keratella cochlearis</i>	<i>L. (M.) tethis</i> *	
<i>K. irregularis</i>		Gnesiotrocha
<i>K. quadrata</i>	F. Proalidae	S. O. Flosculariaceae
<i>K. testudo</i>	<i>Proales fallaciosa</i> *	F. Testudinellidae
<i>K. ticinensis</i> *		<i>Pompholyx sulcata</i>
<i>K. tropica</i>	F. Lindiidae	<i>Testudinellapatina</i>
<i>K. serrulata</i>	<i>Lindia annecta</i> *	<i>7: emarginula</i>
<i>K. valga</i>		
<i>Kellicottia longispina</i>	F. Notommatidae	F. Conochiliidae
<i>Notholca acuminata</i>	<i>Cephalodella forficula</i>	<i>Conochilus coenobasis</i>
<i>N. labis</i>	<i>C. gibba</i>	<i>C. dossuarius</i>
<i>N. squamula</i>	<i>Notommatu cerberus</i> *	<i>C. hippocrepsis</i>
<i>Platytas quadricornis</i>	<i>N. copeus</i> *	<i>C. natans</i>
	<i>Resticula nyssa</i> *	<i>C. unicornis</i>
F. Euchlanidae		
<i>Euchlanis dilatata</i>	F. Trichocercidae	F. Hexarthridae
	<i>Trichocerca cylindrica</i>	<i>Hexarthra fennica</i>
F. Mytilinidae	<i>T. porcellus</i>	<i>H. mira</i>
<i>Lophocharis salpina</i>	<i>T. pusilla</i>	
	<i>7: rousseletti</i>	F. Filinidae
F. Trichotriidae	<i>T. similis</i>	<i>Filinia longiseta</i>
<i>Trichotria pocillum</i>	<i>7: stylata</i>	<i>F. opoliensis</i>
<i>T. tetractis</i>	<i>7: vernalis</i> *	<i>F. terminalis</i>
<i>Wolga spinifera</i>		
F. Colurellidae	F. Gastropodidae	S.O. Collothecaceae
<i>Colurella adriatica</i>	<i>Ascomorpha ecuudis</i>	F. Collothecidae
<i>C. colurus</i>	<i>A. ovalis</i>	<i>Collotheca mutabilis</i> *
<i>C. uncinata</i>	<i>A. sultans</i>	<i>C. pelagica</i>
<i>Lepadella acuminata</i>	<i>Gastropus hyptopus</i> *	
<i>L. patella</i>	<i>G. stylifer</i>	(Digononta)
<i>L. ovalis</i>		O. Bdelloidea
<i>L. rhomboides</i>		F. Philodinidae
		<i>Rotariu neptunia</i>

Table 3. Number of reservoirs and inventories where species of the genus *Polyarthra* occurred in the survey 1987/88. *Número de embalses y muestras en los que se ha encontrado especies del género Polyarthra en el estudio de 1987/88.*

<i>Polyarthra</i> species	Number of stratified reservoirs	Number of mixed reservoirs	Number of inventories
<i>P. dolichoptera</i>	16	31	47
<i>P. euryptera</i>	9	7	16
<i>P. mujor</i>	54	45	99
<i>P. remata</i>	31	31	62
<i>P. vulgaris</i>	75	68	143
<i>P. euryptera</i> / <i>P. remutu</i>	4	2	6
<i>P. euryptera</i> / <i>P. vulgaris</i>	7	4	11
<i>P. euryptera</i> / <i>P. major</i>	4	4	8
<i>P. euryptera</i> / <i>P. dolichoptera</i>	2	1	3
<i>P. vulgaris</i> / <i>P. dolichoptera</i>	13	16	29
<i>P. vulgaris</i> / <i>P. remata</i>	22	20	42
<i>P. mujor</i> / <i>P. dolichoptera</i>	5	14	19
<i>P. major</i> / <i>P. vulgaris</i>	41	26	67
<i>P. mujor</i> / <i>P. remutu</i>	15	14	29
<i>P. dolichoptera</i> / <i>P. remata</i>	5	11	15

Family EPIPHANIDAE

Genus *Epiphanes* Ehrenberg

(Some literature includes this genus in the family Brachionidae)

Epiphanes senta (Muller, 1773)

Vorticella senta Müller, 1773; *Hydutina senta* Ehrenberg, 1830; *Epiphanes senta* (Müller) after Haring, 1913.

Ecology. Species are mainly heleoplanktonic, but can be found occasionally in plankton samples. Preferentially in small waterbodies, rare in lakes and reservoirs. More common in eutrophic water, it tolerates salinity (Ruttner-Kolisko, 1974). Resting eggs may resist long periods of drought, and their presence is possible in temporary waters. Some flagellate alga as *Phacus* and *Euglena*, are frequent components of its diet (Pourriot, 1965, 1977).

Cond: 206.3 $\mu\text{S cm}^{-1}$; Alk: 1767 peq l^{-1} ; pH: 7.52; Temp: 9.87 °C

Morphological features of interest. Present two colorless eyes. Uncus with six teeth and a very characteristic fulcrum, short and flat. Resting eggs completely covered by abundant short seta.

Geographical distribution. Cosmopolite. In Spain is only found occasionally.

Distribution in reservoirs. Rare. In last survey it was only present in winter samples from Ricobayo reservoir (27).

Family BRACHZONZDAE

Genus *Anuraeopsis* Lauterborn

Anuraeopsis fissa (Gosse, 1851)

Anuraea fissa Gosse, 1851; *Anuraeopsis fissa* Gosse, 1886.

Ecology. Planktonic rotifer, warm estenoterm. Termophil from eutrophic environments (Margalef, 1947, 1955). More frequent in small waterbodies. Feeds on bacteria and detritus (Pourriot, 1977). *Anuraeopsis fissa* may appear in the stomach contents of *Asplanchna* (Guiset, 1977c).

Cond: 183.4-351.3 $\mu\text{S cm}^{-1}$; Alk: 1297.2-1652 $\mu\text{eq l}^{-1}$; pH: 8-9.16; Temp: 23-25.5 °C

Morphological features of interest. The species is polymorphic in shape and size (Berzins, 1962). It does not present foot nor caudal spines as other brachionids. Asexual eggs present a short peculiar protuberance where the animal is subjected with the Weber organ (difficult to observe in contracted individuals).

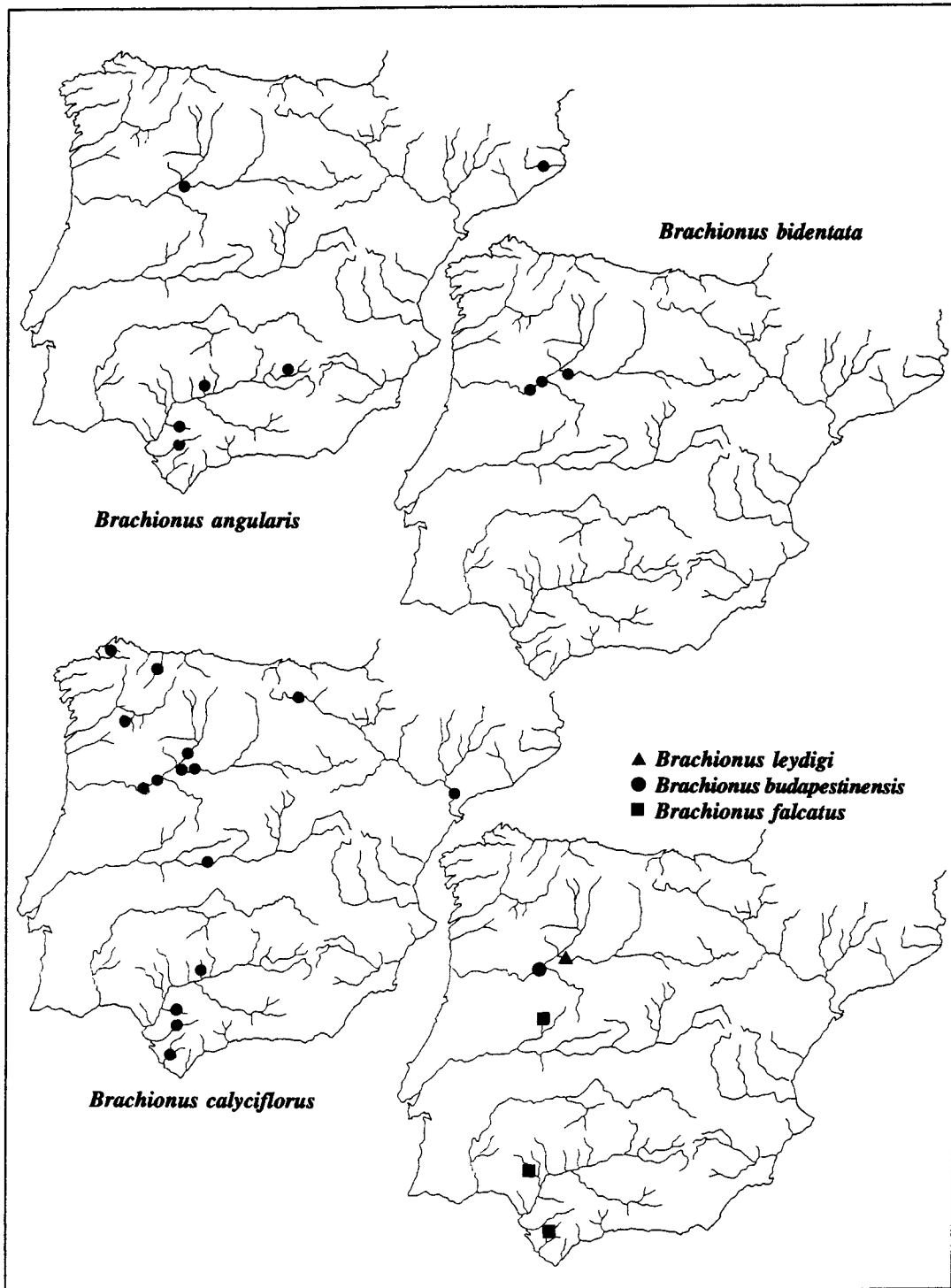


Figure 2. Distribution of some species of the genus *Brachionus* in Spanish reservoirs (survey 87/88). *Distribución de algunas especies del género Brachionus en los embalses españoles (estudio 87/88).*

Geographical distribution. Cosmopolite. It is common in the whole of the Iberian peninsula.

Distribution in reservoirs. In last survey this species was found in plankton samples from only four southern reservoirs, but in the 1972/75 survey it was collected in 28 samples from 18 localities.

Genus *Brachionus* (Pallas)

Brachionus angularis (Gosse, 1951) (Fig. 2) (Fig. 3,o)

Brachionus angularis angularis Koste, 1978.

Ecology. Planktonic species, common in superficial water. It can also be found in the littoral zone, among macrophytes. Euriterm, eurihaline and perennial. It presents its maximum in spring and autumn. It feeds on bacteria and detritus (Boon & Shiel, 1990), as well as on some algae groups (Pourriot, 1977) such as chlorococcales, volvocales, euglenales and central diatoms.

Cond: 169-3720 $\mu\text{S cm}^{-1}$; Alk: 1157.2-3038 peq l^{-1} ; pH: 7.7-9; Temp: 10.2-26.1 $^{\circ}\text{C}$

Morphological features of interest. It presents a great variability in size and shape. The dorsal plate of the lorica is considerably variable. Eggs are carried joined to the opening of the foot.

Geographical distribution. Cosmopolite. In Spain it has been found in numerous and widespread localities. Arévalo (1918, 1923) and Margalef (1948a) reported the presence of the taxon *B. angularis f. bidens* (Plate, 1886), characterized by the form of the lorica in the opening of the foot.

Distribution in reservoirs. In the most recent survey it has been found in six reservoirs (in 5 during the stratification period and in 1 during the mixing period). It was specially abundant in Guadalén (62).

Brachionus bidentata (Anderson, 1889) (Fig. 2)(Fig. 3, k)

Brachionus bidentatus Kertész, 1894; *Brachionus furculatus* Thorpe, 1891.

* *Ecology.* Planktonic species, prefers small waterbodies. Pourriot (1974) describes the elongation of the spines induced by the presence of

the predator rotifer *Asplanchna brightwelli*. It feeds on *Polytoma*, *Chlorella* and *Chlamidomonas* (Braioni & Gelmini, 1983).

Cond: 262-300 $\mu\text{S cm}^{-1}$; Alk: 2103-2213 peq l^{-1} ; pH: 7.5-7.8; Temp: 7.7-10.8 $^{\circ}\text{C}$

Morphological features of interest. It may be distinguished by the presence of lateral spines that are longer than the rest of spines. It is one of the most polymorphic species and several morphs have been described (*B. b. f. inermis*; *B. b. f. crassispeineus*; *B. b. f. testudinarius*; *B. b. f. jirovci*; *B. b. f. minor*).

Geographical distribution. Cosmopolite. In Spain it has been recorded only occasionally. The morph *B. b. f. inermis* (Rousselet, 1906) has frequently been found in littoral ponds from Cartagena (unpublished data from the author). *B. b. f. testudinarius* (Jakubsky, 1912) has not been found in the Iberian peninsula, but was collected in turbid temporary ponds from Menorca and Mallorca (De Manuel *et al.*, 1992).

Distribution in reservoirs. In last survey presence was first detected in mainland reservoirs. The morph *B. b. f. crassispeineus* (Hauer, 1963) has been found in 3 reservoirs: Villalcampo (26), Aldeadávila (29) and Saucelle (30).

Brachionus budapestinensis Daday, 1885 (Fig. 2) (Fig. 3,j)

Brachionus lineatus Skorikov, 1896; *Brachionus punctatus* Hempel 1896; *Brachionus similis* Leissing 1914.

Ecology. Species associated to high pH waters. Warm stenoterm. It tolerates moderate saline conditions. This species may be found in running waters.

Cond: 541 $\mu\text{S cm}^{-1}$; Alk: 3038 peq l^{-1} ; pH: 8.1; Temp: 24.3 $^{\circ}\text{C}$

Morphological features of interest. Lorica without caudal spines. Ornamentation and variable disposition of dorsal facets. Its size is very constant.

Geographical distribution. Cosmopolite. More commonly found in tropical and subtropical regions. In the Iberian peninsula it has previously been found by Guisande & Toja (1988) in the estuary of the river Guadalquivir. It has also been

collected in samples from small waterbodies near the coast of Cartagena (unpublished data from the author).

Distribution in reservoirs. Its presence in Villalcampo (26) is first reported in this study.

Brachionus calyciflorus Pallas 1766 (Fig. 2) (Fig. 3,d-g)

Brachionus pala Ehrenberg, 1838.

Ecology. Planktonic species; common. Occasional in running water. Euritherm in eutrophic water. Often abundant in small eutrophic waterbodies. Very tolerant of high chloride concentrations. Filter-feeding, it feeds on bacteria and detritus, chlorococcales, volvocales and euglenales (Pourriot, 1977).

Cond: 22-3720 $\mu\text{S cm}^{-1}$; Alk: 131-3667 peq l^{-1} ; pH: 6.6-9.1; Temp: 7.7-26.1 $^{\circ}\text{C}$

Morphological features of interest. Soft, sack-shaped lorica, with four anterior spines. Very polymorphic species in shape and size. Some morphotypes have been described:

B. c. f. dorcas (Gosse) (Fig 3, g) with a rounded posterior margin of the lorica and medial anterior spines longer than lateral spines.

B. c. f. ampiceros (Ehrenberg) (Fig 3, d-f) with postero-lateral spines of variable size. It presents spines on the opening of the foot.

The taxonomic value of these morphs are discussed, as some variability may be phenotypic and brought about by environmental factors. Gilbert (1967) found a positive influence on the development of posterior spines in the presence of the predator *Asplanchna*, interpreting the larger spines as a mechanism for mechanical defense. Posteriorly, Stemberger (1990) found an important relationship between the size of spines, the size of the lorica and the presence of *Asplanchna* and available food.

Geographical distribution. Cosmopolite. It is widespread throughout all the Iberian peninsula.

Distribution in reservoirs. In the recent study it has been found in 17 reservoirs, 13 in the stratification period and seven after mixing. In the previous study the species had been found in 28 reservoirs, preferentially in the basins of river Duero and river Tajo.

Brachionus falcatus Zacharias 1898 (Fig. 2)(Fig. 3,i)

Ecology. Planktonic species, termophilus. Autoecology is largely unknown.

Cond: 48-1423.5 $\mu\text{S cm}^{-1}$; Alk:266-2002 peq l^{-1} ; pH: 8.1-8.6; Temp: 23.6-25.5 $^{\circ}\text{C}$

Morphological features of interest. It presents six spines on the anterior dorsal margin. Intermedial spines detach by their length. Body ended by two long caudal spines, widely separated at their base. Relatively low variability in size and shape, with spines always well developed.

Geographical distribution. Pantropical and pansubtropical. Widely distributed in subtropical regions, especially in South-America. De Ridder (1981) contends that this species is clearly in geographical expansion. In the Iberian Peninsula it has been found occasionally (Monteiro, 1984; Guisande & Toja,1988). It has been found in a small waterbody in Extremadura ("charca de Berrueco", unpublished data from the author).

Distribution in reservoirs. An abundant population was found in summer samples from Bornos (87). Some specimens were collected in La Minilla (84) and Borbollón (45).

Brachionus leydigi Cohn, 1862 (Fig. 2)(Fig. 3,h)

Brachionus quadratus var. tridentatus (Zernov, 1901).

Ecology. Heleoplanktonic species, cold stenotherm. More frequent in small waterbodies, it tolerates relatively high salinity.

Cond: 262 $\mu\text{S cm}^{-1}$; Alk: 2103 peq l^{-1} ; pH: 7.5; Temp: 7.7 $^{\circ}\text{C}$

Morphological features of interest. The basal plate of the lorica presents a distinctive medial crest. The most characteristic feature of this species is the presence of three spines on the opening of the foot. Resting eggs with short and wide spines. *B. leydigi* is very polymorphic, Ahlstrom (1940) remarks the variability of the foot opening, as well as the morphology of the three spines.

Geographical distribution. Cosmopolite. In the Iberian peninsula it has been recorded in the estuary of the river Guadalquivir (Guisande &

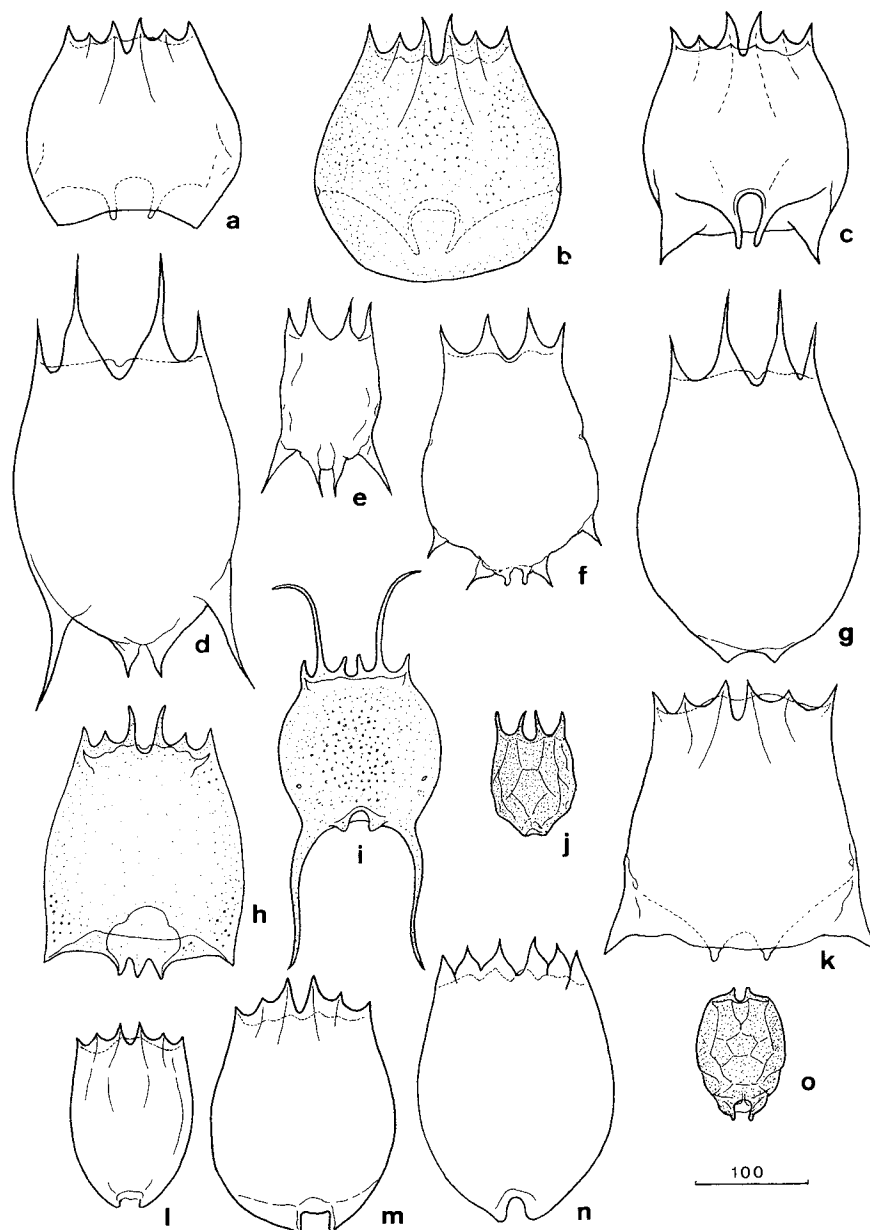


Figure 3. Taxa of the genus *Brachionus* found during the 87/88 survey of the Spanish reservoirs. Scale in μm . a, b, c, *Brachionus quadridentatus* Hermann: a, b, f. *cluniorbicularis* (Skorikov), from San Román and from Saucelle respectively; c, f. *brevispinus* Ehrenberg, from Sobrón; d, e, f, g, *B. calyciflorus* Pallas: d-f. *f. ampiceros* from Flix (d) and from San Román (e, f); g, f. *dorcas* Gosse, from Bornos; h, *B. leydigi* Cohn, from Villalcampo; i, *B. falcatus* Zacharias, from Bornos; j, *B. budapestinensis* Daday, from Villalcampo; k, *B. bidentata f. crassispineus* (Hauer), from Villalcampo; l, m, *B. urceolaris* Müller, from Villalcampo and from Aldeávila, respectively; n, *B. plicatilis* Müller, from Puentes; o, *B. angularis* (Gosse), from Bornos. *Taxones del género Brachionus encontrados en los embalses españoles (estudio 87/88)*. a, b, c, *Brachionus quadridentatus* Hermann: a, b, f. *cluniorbicularis* (Skorikov), de San Román y de Saucelle respectivamente; c, f. *brevispinus* Ehrenberg, de Sobrón; d, e, f, g, *B. calyciflorus* Pallas: d-f. *f. ampiceros* de Flix (d) y de San Román (e, f); g, f. *dorcas* Gosse, de Bornos; h, *B. leydigi* Cohn, de Villalcampo; i, *B. falcatus* Zacharias, de Bornos; j, *B. budapestinensis* Daday, de Villalcampo; k, *B. bidentata f. crassispineus* (Hauer), de Villalcampo; l, m, *B. urceolaris* Müller, de Villalcampo y de Aldeávila respectivamente; n, *B. plicatilis* Müller, de Puentes; o, *B. angularis* (Gosse), de Bornos.

Toja, 1988). However, this species has a northern distribution. In the river Duero basin, for instance it has been collected in several reservoirs and also in Villafáfila ponds (unpublished data from the author).

Distribution in reservoirs. In the 1987-88 survey *B. leydigi* was found in Villalcampo (26), in the river Duero basin. In the earlier survey in addition it was recorded in Aldeadávila (29), located in the same basin.

Brachionus plicatilis Müller 1786 (Fig. 3,n)

Brachionus mulleri Ehrenberg 1834; *Brachionus hepatolomeus* Gosse 1851; *Brachionus*

spatiosus Rousselet, 1912; *Brachionus orientalis* Rodewald, 1937.

Ecology. Planktonic and polithermic species. Inhabits waterbodies with a wide range of salinity (1 g l^{-1} - 97 g l^{-1}). Tolerates also low oxygen concentrations (Esparcia *et al.*, 1989). Dense populations are frequently seen, probably because no rotifers or other filter-feeding organisms can compete in highly saline conditions. Filterer and poliphagus; it feeds on organic detritus, bacteria, chlorococals, volvocales, euglenales, cryptomonadacea, cyanophita and also rhodophita (*Porphiridium*). It is probably the most investigated rotifer, and its ecology is well

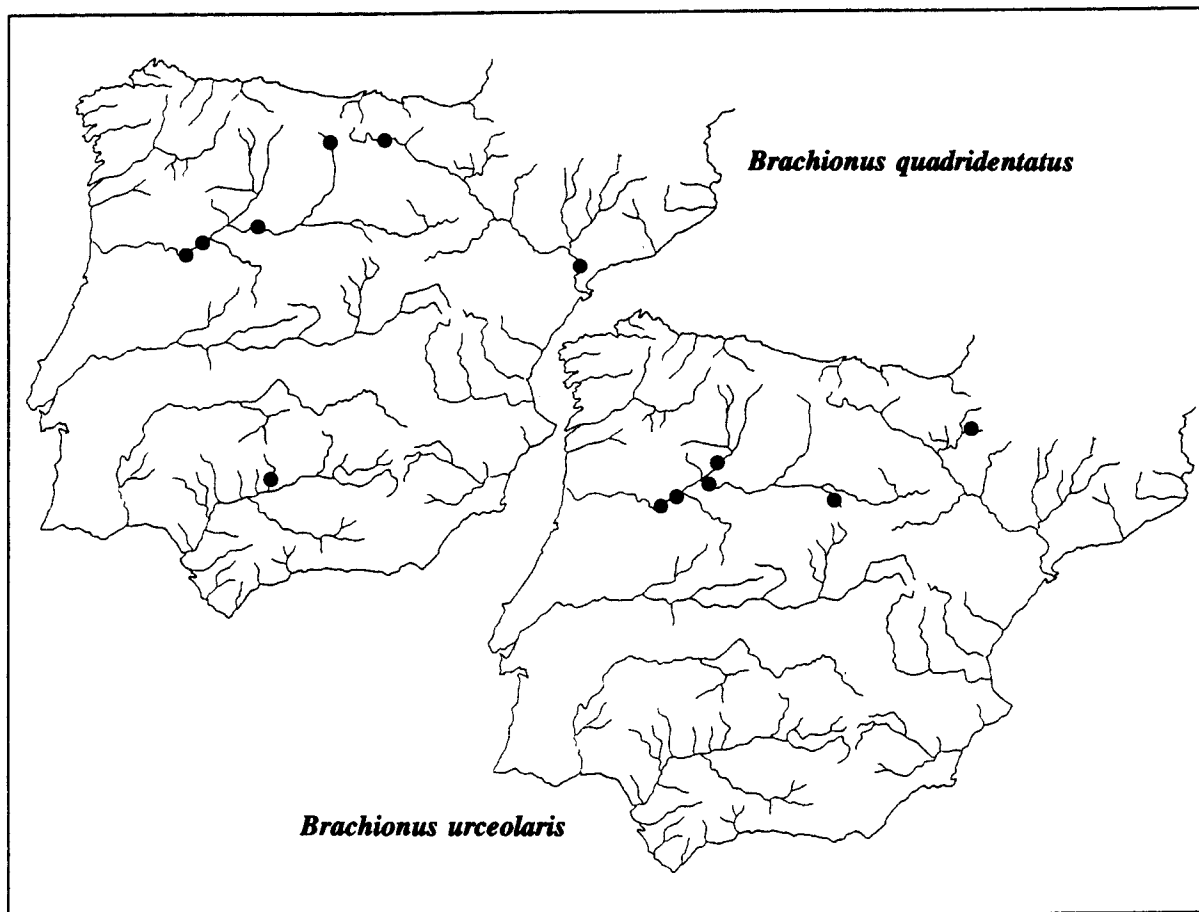


Figure 4. Distribution of *B. quadridentatus* and *B. urceolaris* in Spanish reservoirs (survey 87/88). *Distribución de B. quadridentatus y B. urceolaris en los embalses españoles (estudio 87/88).*

known (Walker, 1981). It is relatively easy to culture and in the last decades it has acquired great importance for aquaculture and research. Its importance has been extended fields as genetics and evolution (King & Snell, 1977; Snell & Hawkinson, 1983; King, 1989; among others).

Cond: 1423-3720 $\mu\text{S cm}^{-1}$; Alk: 1455-1927 $\mu\text{eq l}^{-1}$; pH: 8.2-8.5; Temp: 19.3-26°C

Morphological features of interest. The lorica is relatively soft and flexible. The species is characterized by the presence of four lobules in the anterior ventral plate. It presents a notable sexual dimorphism. There are many morphotypes of this species (Sudzuki, 1987; Koste 1980b).

Geographical distribution. Cosmopolite. In Iberian peninsula it has been collected in coastal ponds and endorheic ponds with high or moderate salinity. Serra & Miracle (1983) and Serra (1987) have studied the variability of this species across a range of environments found in the Iberian peninsula.

Distribution in reservoirs. It has been found in summer samples from three southern reservoirs: Puentes (77), Torre del Aguila (86) and Bornos (87). It was not found in previous surveys.

Brachionus quadridentatus Hermann, 1783 (Fig. 3,a-c)

Brachionus capsuliflorus Pallas, 1766; *Brachionus bakeri* Muller, 1786. *Brachionus brevispinus* Ehrenberg, 1832; *Brachionus cluniorbicularis* Skorikov, 1894.

Ecology. Heloplanktonic species. Common in small waterbodies and also in current waters. It prefers alkaline water. Eurihaline, it may live in moderate saline water.

Cond: 197.2-765.5 $\mu\text{S cm}^{-1}$; Alk: 1679-3545.5 $\mu\text{eq l}^{-1}$; pH: 8.1-9.1; Temp: 16.3-24°C

Morphological features of interest. The lorica normally ends in the posterior part in two lateral spines of variable length. It is a very variable species, Its posterior spines have negative allometric growth.

Geographical distribution. Cosmopolite, it is maybe the most common species of the genus *Brachionus*.

Distribution in reservoirs. Only the morphs

B. f. cluniorbicularis (Skorikov, 1894) and *B. f. brevispinus* (Ehrenberg, 1832) have been collected in seven reservoirs located in the northern area of the Iberian peninsula and only during the summer (Fig. 4).

Brachionus urceolaris Muller, 1773 (Fig. 3,m)

Tubipora urceus Linnaeus, 1758; *Brachionus nicaraguensis*, Schmarda, 1859; *Brachionus pyriformis*, Barrois & Daday, 1894.

Ecology. Mainly heleoplanktonic species, common in alkaline small waterbodies. Eurihaline, it tolerates relatively high salinity. It has been found in current waters.

Cond: 161.5-541 $\mu\text{S cm}^{-1}$; Alk: 618-3038 $\mu\text{eq l}^{-1}$; pH: 7.25-9; Temp: 7.35-24.3°C

Morphological features of interest. Dorsal anterior spines above a small basis. It presents an approximately rectangular dorsal opening of the foot. Ventral opening with semicircular shape. As other species of the genus, it has a great plasticity and presents abundant morphs and variability of size.

Geographical distribution. Cosmopolite. It has been collected throughout the Iberian peninsula.

Distribution in reservoirs. It has been identified in six reservoirs (Fig. 4), five belonging to the basin of the river Duero, preferentially during the mixing period. The distribution of this species found here is very similar to the distribution found in the previous study.

Genus *Keratella* Bory de St. Vincent

Keratella cochlearis (Gosse, 1851) (Fig. 5 a-f) (Fig. 6 b)

Anuraea cochlearis Gosse, 1851; *Anuraea longispina* Imhof, 1883; *Anuraea intermedia*, Imhof, 1885.

Ecology. Euplanktonic species. Very common in lakes and reservoirs, but uncommon in small waterbodies. Eurithermic, it tolerates a wide range of mineralization. It feeds on a great variety of algae as well as organic detritus and bacteria (Pourriot, 1965, 1977; Boon & Shiel, 1990). It is one of the most abundant prey found in the stomach of *Asplanchna* and *Ploesoma* (Guiset,

1977c). Some variables as temperature, food availability, as well the presence of predators, determine different morphs (Stemberguer & Gilbert, 1984), sometimes described as separate species. It also presents seasonal variations in morphology.

(*f. typica*) Cond: 14.7- 5326 $\mu\text{S cm}^{-1}$; Alk: 58-4681 peq l^{-1} ; pH: 6.3-10.1; Temp: 6-26.7 °C

(*f. tecta*) Cond: 22-5326 $\mu\text{S cm}^{-1}$; Alk: 131-3882 peq l^{-1} ; pH: 6.6-10.2; Temp: 6-26.7 °C

Morphological features of interest. It presents polymorphism in the size of the lorica and in the length of the caudal spine. Numerous varieties have been described, but controversy exists about the phenotypic or genotypic origin of differences. The distinction among morphs is based on the length of the caudal spine and on the size of the lorica:

K. cochlearis f. macracantha (Lauterborn, 1898) (Fig. 5 a), with a long caudal spine (80 - 110 μm).

K. cochlearis f. tecta (Gosse, 1851) (Fig. 5 e). Spineless morph. It constitutes the most smallest morph of the series. Koste & Shiel (1987b) considered this taxon as species (based on the first description of *Anuraea tecta*, Gosse, 1851).

K. cochlearis f. micracantha (Lauterborn, 1900) (Fig 5 c,d). Characterized by a shorter spine than the *typica* morph. It is an intermediate stadium between the typical form and the spineless one.

K. cochlearis var. hispida (Lauterborn, 1898) (Fig. 5 f), with a wider lorica than the *typica* morph, it is covered by small protuberances ("hair"), contrasting with the areolated ornamentation of other taxa of the series. The caudal spine is relatively short (Koste & Shiel, 1987b, confers it species category).

K. cochlearis var. robusta (Lauterborn, 1900). (Fig. 5 b). Lorica bigger than the *typica* morph. The caudal spine is generally long.

Geographical distribution. Cosmopolite. It is probably the most common rotifer and is widespread throughout the world (Ahlstrom, 1943). It is found across the whole Iberian peninsula, but its presence has not been detected in the Balearic archipelago (De Manuel *et al.*, 1992).

Distribution in reservoirs. It is found in most Spanish reservoirs. It is more frequent and abundant during the stratification period. *K. var. hispida*, (Fig. 4. f) has been found in Urrunaga (4), and it is the first record of this taxon in Spain.

Keratella irregularis (Muller, 1786) (Fig. 5 g-i and Fig 6 c)

Anuraea cochlearis var. irregularis Lauterborn, 1898.

Some authors (Carlin, 1943; Ruttner-Kolisko, 1974; Koste, 1978) considers it as a variety of *K. cochlearis*. Ahlstrom (1945), Kutikova (1970) and Pejler (1977), among others, relates it as *K. irregularis*, with species category.

Ecology. Euplanktonic species. Warm stenoterm. It is highly seasonal, occurring in late spring, with a maximum in summer and a fall in abundance in early autumn.

Cond: 19.6-808 $\mu\text{S cm}^{-1}$; Alk: 116.8-3545.5 peq l^{-1} ; pH: 7-9.9; Temp: 15.9-24.8 °C

Morphological features of interest. Very similar to *K. cochlearis*. Differences should be found in the dorsal morphology of the lorica. The distinctive character is the presence of a small medial plaque of pentagonal shape, slightly in the right, between carinal plaques (Fig. 6 c). Nipkow (1961) also found differences between the size and shape of resting eggs of *K. cochlearis* and *K. irregularis*.

Geographical distribution. Cosmopolite. Probably it has frequently been confused with *K. cochlearis*. For this reason, *K. irregularis* is not recorded in the checklist of Velasco (1990).

Distribution in reservoirs. It follows a latitudinal distribution. It is present in summer samples in northern reservoirs (Fig. 9). In the last study it has been identified during the stratified period in approximately 25% of reservoirs. In the previous study it was also found in summer, in 9% of Spanish reservoirs, as well in northern regions.

Keratella quadrata (Muller, 1786) (Fig. 7 a,b)

Brachionus quadratus Muller, 1786; *Anuraea aculeata* Erhenberg, 1832; *Keratella quadrata* after Bory de St. Vincent, 1822.

Ecology. Euplanktonic species. Perennial, it is not seasonal. It has a wide range of tolerance to

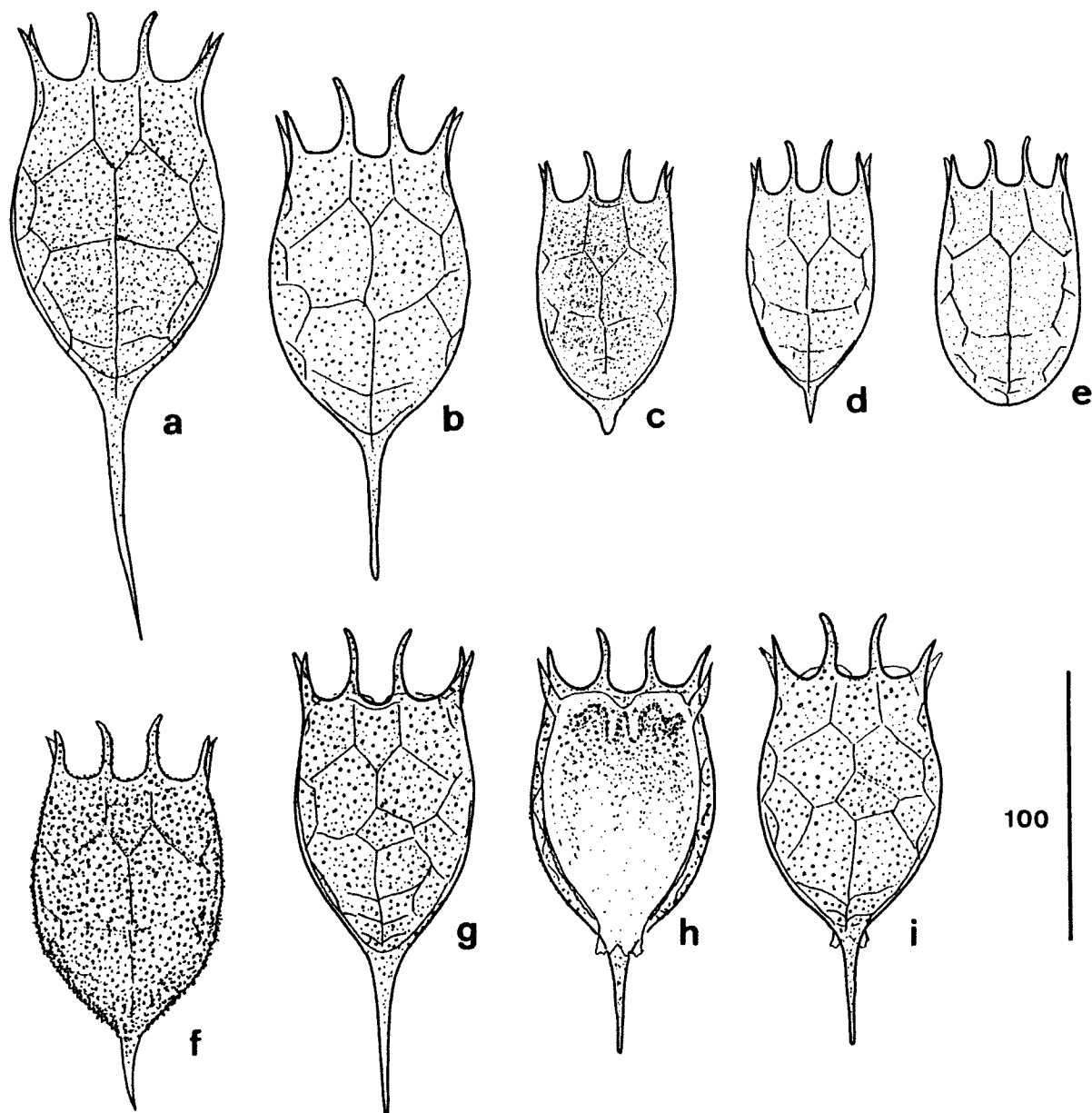


Figure 5. Some taxa of the genus *Keratella* found in Spanish reservoirs. Scale in μm . a-f. *Keratella cochlearis* (Gosse): a, f. *macracantha* from Fervenza; b, var. *robusta* from Frieira; c, d, f. *micracantha* from Bornos and from Riudecanyes, respectively; e, f. *tecta* from Riudecanyes; f, var. *hispida* from Urrunaga; g-i, *K. irregularis* (Lauterborn): g, from Sant Ponç; h, and, ventral and dorsal plate of the same species but from Salime. Algunos taxones del género *Keratella* encontrados en embalses españoles. Escala en μm . . a-f. *Keratella cochlearis* (Gosse): a, f. *macracantha* de Fervenza; b, var. *robusta* de Frieira; c, d, f. *micracantha* de Bornos y de Riudecanyes respectivamente; e, f. *tecta* de Riudecanyes; f, var. *hispida* de Urrunaga; g-i, *K. irregularis* (Lauterborn): g, de Sant Ponç; h, y, placas ventral y dorsal de la misma especie pero de Salime.

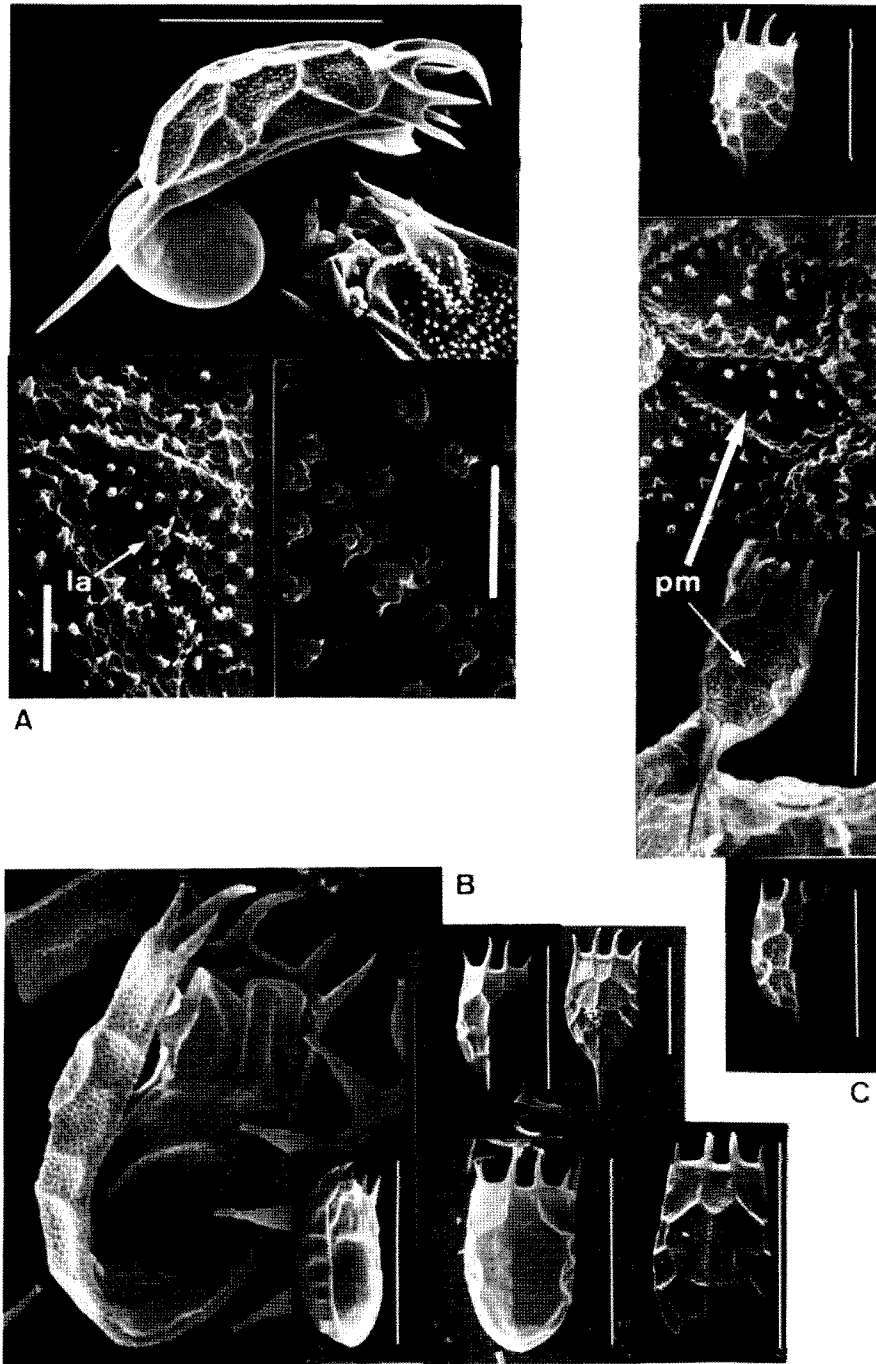


Figure 6. SEM photographs of some taxa of the genus *Keratella* in Spanish reservoirs. Scale bar is 100 μm (except for microstructures for which the scale bar is 5 mm). a. *Keratella quadrata* (Müller): female carrying an egg, ventral lorica; lateral antennae (la); granulation of the anterior ventral lorica. B. *K. cochlearis* (Gosse): *f. tecta* and *f. typica*. C. *K. irregularis* (Lauterborn): accessory median plate (pm). *Fotografías MES de algunos taxones del género Keratella identificados en embalses españoles*. la barra indica una escala de 100 μm (excepto para microestructuras en que esta es de 5 mm). a. *Keratella quadrata* (Müller): hembra llevando un huevo, lorica ventral; antena lateral (la); granulación de la lorica ventral anterior. b. *K. cochlearis* (Gosse): *f. tecta* y *f. typica*. c. *K. irregularis* (Lauterborn): placa accesoria media (pm).

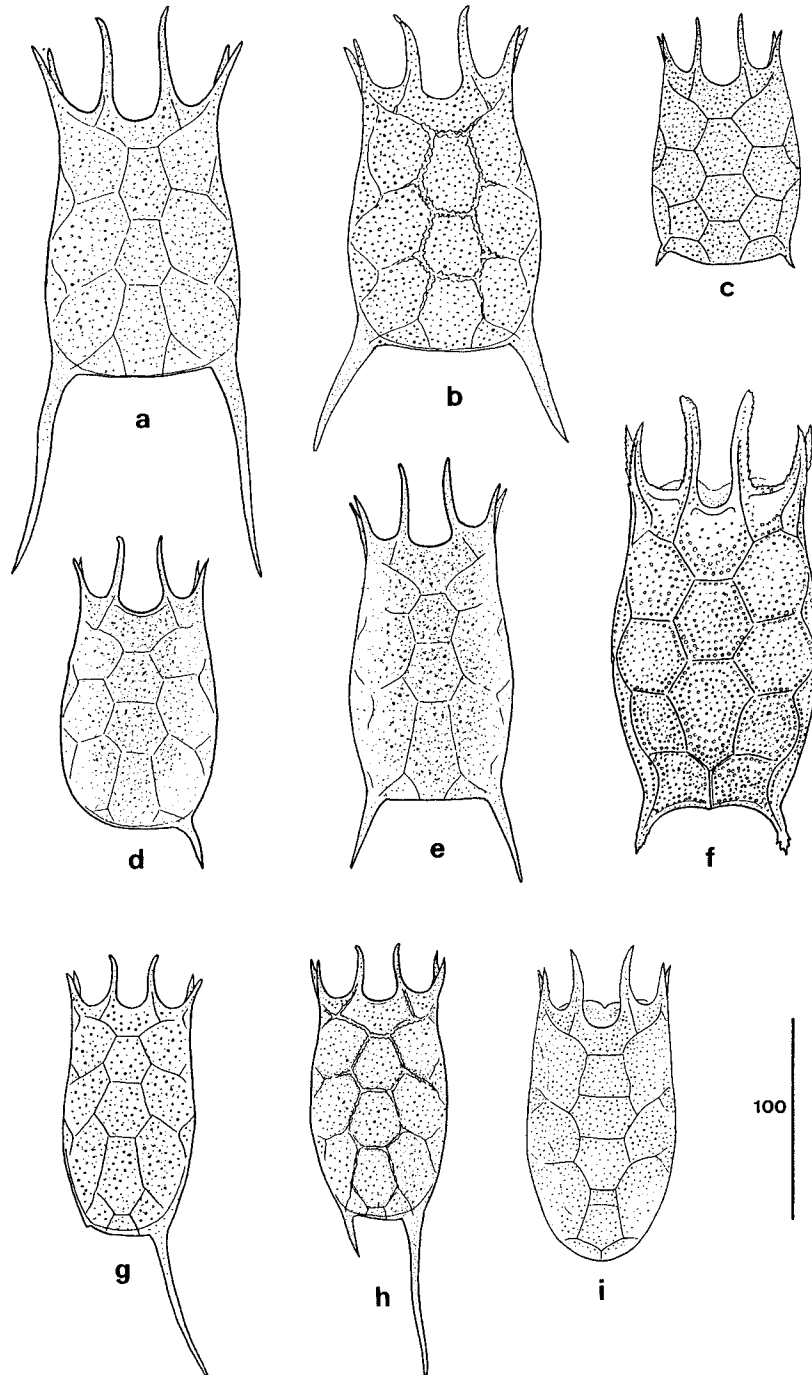


Figure 7. Some taxa of the genus *Keratella* in Spanish reservoirs. Scale in μm . a, b, *Keratella quadrata* (Müller), from Breña and from Susqueda, respectively; c, *K. testudo* (Ehrenberg), from Frieira; d, e, *K. valga* (Ehrenberg), from Frieira and As Conxas, respectively; f, *K. serrulata* (Ehrenberg) from Mao; g, h, *K. tropica* (Apstein), from Flix and from Bornos, respectively; and, i *K. ticinensis* (Callerio), from Frieira. Algunos taxones del género *Keratella* recolectados en embalses españoles. Escala en μm . a, b, *Keratella quadrata* (Müller), de La Breña y de Susqueda respectivamente; c, *K. testudo* (Ehrenberg), de Frieira; d, e, *K. valga* (Ehrenberg), de Frieira y As Conxas respectivamente f, *K. serrulata* (Ehrenberg) de Mao; g, h, *K. tropica* (Apstein), de Flix y de Bornos respectivamente; y, i *K. ticinensis* (Callerio), de Frieira.

mineralization and temperature. Poliphagous, it feeds on organic detritus and bacteria, chlorococcales, volvocales, euglenales, chrysophyceae and central diatoms (Pourriot, 1977).

Cond: 19.6-5326.6 $\mu\text{S cm}^{-1}$; Alk: 98-4681.7 $\mu\text{eq l}^{-1}$; pH: 6.64-10.18; Temp: 6.4-26.1 $^{\circ}\text{C}$

Morphological features of interest. Lorica generally almost rectangular; posteromedial plaque is hexagonal. Two caudal spines inserted at posterolateral corners of the lorica. Extremely polymorphic in size and also in the length of the caudal spines. Lorica surface with strong granulation. Mictic females, which produce resting eggs, usually present longer caudal spines, which are progressively reduced in successive generations (Ahlstrom, 1943). *K. quadrata* presents an allometric relationship between the caudal spines and the lorica (Margalef, 1948a; Pejler, 1962; Miracle, 1976; Guiset, 1977b).

Geographical distribution. Cosmopolite. Widely distributed across the Iberian peninsula.

Distribution in reservoirs. Very common in reservoirs (72%), but generally with not very abundant populations.

Keratella serrulata (Ehrenberg, 1838) (Fig. 7 f) (Fig. 8 a)

Anuraea serrulata Ehrenberg, 1838; *Keratella falcata* Ehrenberg, 1838; *Keratella serrulata* after Haring, 1913.

Ecology. According to Berzins & Pejler (1987), it is the only planktonic brachionidae specialist from acid waters. Common in acid water from bogs with *Sphagnum*. It feeds on chrysophyceae and volvocales (Pourriot, 1977).

Cond: 22 $\mu\text{S cm}^{-1}$; Alk: 131 $\mu\text{eq l}^{-1}$; pH: 6.6; Temp: 18.6 $^{\circ}\text{C}$

Morphological features of interest. Robust lorica, granulated or covered by short spines or granules. Anterior spines on margins are slightly serrated (Fig. 8.a). Posterior lateral corners of lorica with spines of variable length or spineless. Systematic diagnosis of the species is on the absence of the posteromedial plaque and the presence of a median line separating posterocarinial plaques. *K. serrulata* may be confused, by disposition of its plaques, with the species *Keratella*

procurva (Thorpe, 1891), which is smaller and with a lorica not robust. The latter species inhabits more alkaline waters.

Geographical distribution. Cosmopolite. It is not found in tropical regions. In the Iberian peninsula it has been collected in NW reservoirs (Margalef, 1955).

Distribution in reservoirs. It has been found in reservoirs from Galicia, NW. Spain (Fig. 9). It has also been collected in a recent study in Mao (99), a reservoir characterized by a low conductivity (19.75 mS cm^{-2}) and relatively acid pH (i.e. 6.83) and in Ribeira (14).

Keratella testudo (Ehrenberg, 1832) (Fig. 7 c)

Anuraea testudo Ehrenberg, 1832; *Anuraea aculeata brevispina* Weber, 1898; *Anuraea brevispina*, Gosse, 1851; *Keratella quadrata brevispina*, Edmondson & Hutchinson, 1934.

Ecology. Planktonic species. Mostly in small waterbodies. According Sladeczek (1983) it feeds on bacteria, organic detritus, chlorococals, euglenales, cryptomonadaceae, chrysophyceae and diatoms.

Cond: 50-81 $\mu\text{S cm}^{-1}$; Alk: 242-447.6 $\mu\text{eq l}^{-1}$; pH: 7.15-7.2; Temp: 10.2-18.9 $^{\circ}\text{C}$

Morphological features of interest. Trapezoidal lorica with a rounded posterior margin. Posterior spines very short, asymmetric and slightly divergent. The left-postero spine may be shorter than the right spine. It may be confused with the species *K. quadrata*, which has not two completely closed lateral facets, as *K. testudo* has (Fig. 8 b).

Geographical distribution. Cosmopolite. It is a rare species, occurring occasionally. In the Iberian peninsula it was first found by Wizniewski (1931) and Arévalo (1932); Fores *et al.* (1986) collected it in ponds of Delta del'Ebre, in the NW Spanish mediterranean coast.

Distribution in reservoirs. In this survey it has been found in Frieira (97), in winter samples, in low abundance. In the previous study of reservoirs it was collected from Susqueda (80) and Aldeadàvila (29).

Keratella ticinensis (Ehrenberg, 1834) (Fig. 7 i)

Anuraea curvicornis Ehrenberg, 1834; *Anuraea aculeata var. ticinensis* Callerio, 1920.

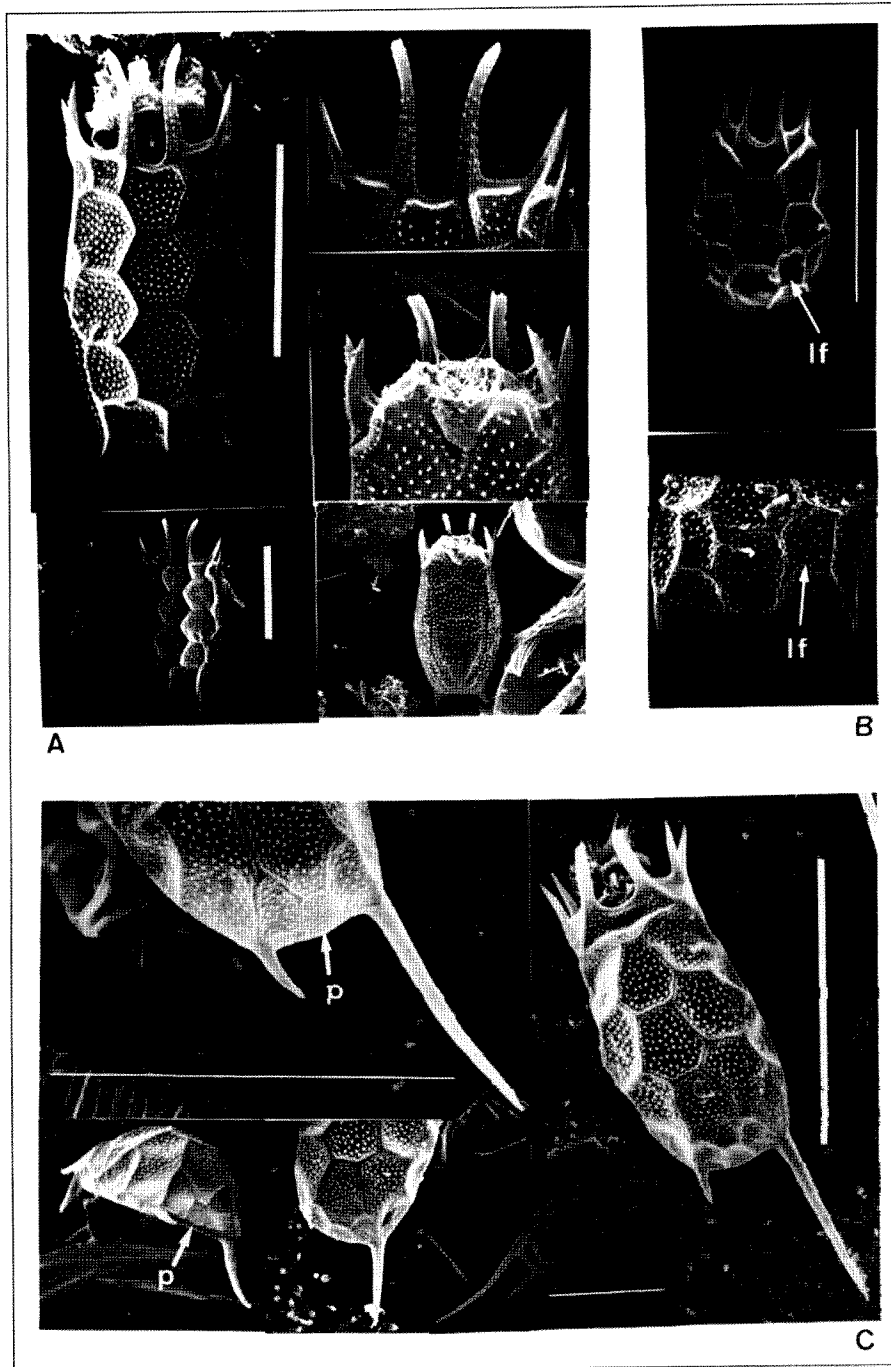


Figure 8. SEM photographs of some taxa of the genus *Keratella* in Spanish reservoirs. Scale bar is 100 μm . a. *Keratella serrulata* (Ehrenberg): serrated anterior spines, ornamentation of ventral lorica; b. *K. testudo* (Ehrenberg): lateral facets (lf) in slightly contracted specimens; c. *K. tropica* (Apstein): different views of the lorica, i.e. posterior facet (p) to the posteromedial facet. *Fotografías MES de algunos taxones de del género Keratella de los embalses españoles. Línea de escala 100 μm .* a. *Keratella serrulata* (Ehrenberg): espinas anteriores serruladas, ornamentación de la lóriga ventral; b. *K. testudo* (Ehrenberg): facetas laterales (lf) en individuos ligeramente contraídos; c. *K. tropica* (Apstein): diferentes vistas de la lóriga, de faceta posterior (p) a faceta posteromediana.

Ecology. Species from ephemeral and dystrophic waterbodies (Koste, 1978). Heteroplanktonic. Ruttner-Kolisko (1974) sustained that *K. ticinensis* is a transition species between *quadrata* and *serrulata* groups.

Cond: 77 $\mu\text{S cm}^{-1}$; Alk: 429.2 $\mu\text{eq l}^{-1}$; pH: 7.1; Temp: 9.6 $^{\circ}\text{C}$

Morphological features of interest. Oval lorica, rounded and spineless posterior end. Anterior spines are relatively long. It may present small protuberances in the dorsal part of the lorica. Anteromedial plaque is approximately squared and is a diagnostic trait. May be confused with spineless morphs of *K. cochlearis* (*K. c. f. tecta*, Fig. 4. e), but *K. ticinensis* is bigger, and the disposition of dorsal plaques is very distinctive. Its eggs are covered by short spines with curved ends.

Geographical distribution. It is considered as a cosmopolite species, but its actual distribution is European. The population found in reservoirs are the first record of this species in the Iberian peninsula.

Distribution in reservoirs. It has been found in winter samples in a survey by Frieira (97) in Galiza; (conductivity 77 mS cm^{-2} , pH 7.25).

Keratella tropica (Apstein, 1907) (Fig. 7 g,h) (Fig 8 c)

Anuraea valga f. tropica Apstein, 1907. *Keratella valga f. tropica* after Edmondson and Hutchinson, 1934.

Ecology. Euplanktonic species. Warm stenoterm, preferentially in alkaline waters.

Cond: 262-1065 $\mu\text{S cm}^{-1}$; Alk: 2103-3486.5 $\mu\text{eq l}^{-1}$; pH: 8.1-8.49; Temp: 18.5-24.5 $^{\circ}\text{C}$

Morphological features of interest. Rectangular lorica. Posterior spines unequal, with the right spine longer than left. The last can be absent even when right spine is quite long. *K. tropica* has a posteromedian remnant after the postero posteromedial plaque (Fig. 8 c), sometimes difficult to observe. This remnant is the only feature which differences it from *K. valga*. The lengths of spines and lorica are very variable, and there is an allometric relationship between them.

Geographical distribution. Pantropical and pansubtropical. It has frequently been found in

southern territories of the Iberian Peninsula, but occasionally also in northern waterbodies.

Distribution in reservoirs. It was collected in only eight reservoirs in the 72/75 survey, but in last study it has spread its distribution to 17 localities (Fig. 9).

Keratella valga (Müller, 1786) (Fig. 7 d,e)

Anuraea valga Ehrenberg, 1834; *Keratella valga* after Ahlstrom, 1943. There is controversy about the specific definition of *K. valga* and *K. tropica*. Ahlstrom (1943) considered *K. tropica* as a morph of *K. valga*, Ruttner-Kolisko (1974) included *K. valga* as a morphotype of *K. quadrata*. Recently, the tendency is to consider both taxa as separate species.

Ecology. Planktonic species, euriterm. Inhabits small waterbodies with low alkalinity. Feeds mainly on cryptomonadaceae and volvocales (Pourriot, 1977).

Cond: 51.5-78.3 $\mu\text{S cm}^{-1}$; Alk: 171-439.3 $\mu\text{eq l}^{-1}$; pH: 6.8-7 ; Temp: 7.8-9.4 $^{\circ}\text{C}$

Morphological features of interest. Very similar to *K. tropica*. Lorica broader at anterior end. No posteromedial remnant under posteromedial plaque. Caudal spine not very long, unequal in length or only one present. Resting eggs with prickly shell.

Geographical distribution. It has only been found in the Palearctic region and Australia (Pejler, 1977). Uncommon. In the Iberian peninsula it has occasionally been found in small waterbodies (De Ridder, 1962; Arévalo, 1923) and in some reservoirs.

Distribution in reservoirs. In both surveys some specimens of *K. Valga* were occasionally found, mainly in NW reservoirs with waters of low mineralization.

Genus *Kellicottia* Ahlstrom

Kellicottia longispinu (Kellicott, 1879) (Fig. 11 a) (Fig. 10)

Anuraea longispinu Kellicott, 1879

Ecology. Euplanktonic species. Perennial and mainly inhabitant of oligotrophic lakes. It is not found in small waterbodies. According to

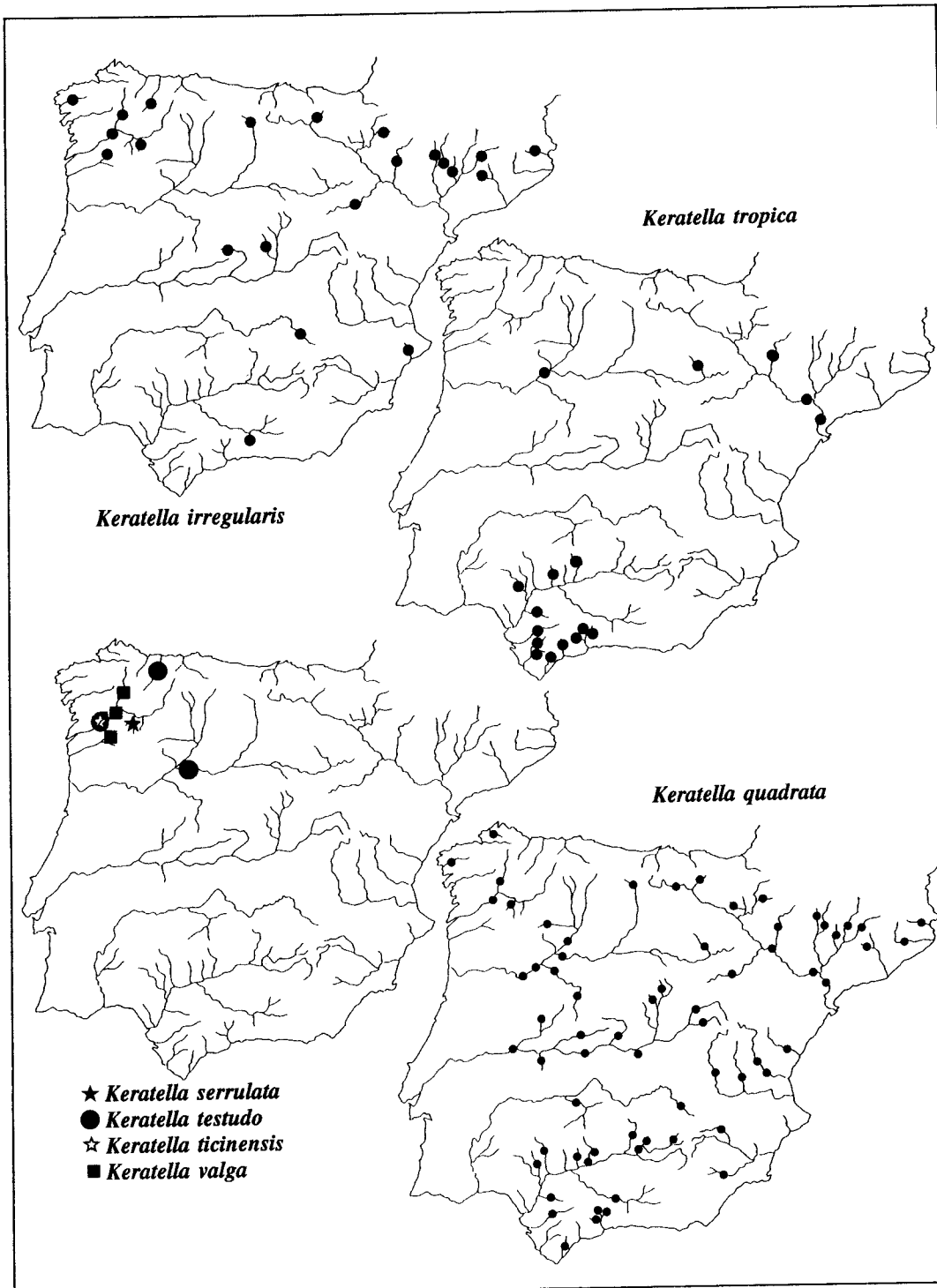


Figure 9. Distribution of some species of the genus *Keratella* found in Spanish reservoirs during the 87/88 survey . *Distribución de algunas especies de género Keratella en los embalses españoles (estudio 87/88).*

Pourriot (1977) it feeds on chrysomonadals and central diatoms.

Cond: 305-322 $\mu\text{S cm}^{-1}$; Alk: 1194-1996 $\mu\text{eq l}^{-1}$; pH: 8.2-8.5; Temp: 10.63-21.82 $^{\circ}\text{C}$

Morphological features of interest. This species has a distinctive morphology. Conical lorica, with a long caudal spine. Occipital margin with four or six asymmetrical spines of diverse length. Edmondson & Litt (1989) observed differences between biometry of populations from lakes of different temperature and latitudes.

Geographical distribution. Found frequently and in relatively abundance in lakes from the

Centre of Europe and also in lakes of the Pyrenean mountains. It was recorded for the first time in the Lake Banyoles in 1977 (Miracle & Vicente, 1983), probably a migrant from northern latitudes.

Distribution in reservoirs. For the first time it has been found in reservoirs, though in scarce numbers. Only collected in summer samples from two reservoirs in the NE of the Iberian Peninsula: Boadella (79) and Sta. Anna (93). Probably resting eggs of *K. longispina* reached these reservoirs from Pyrenean lakes, which are relatively close.

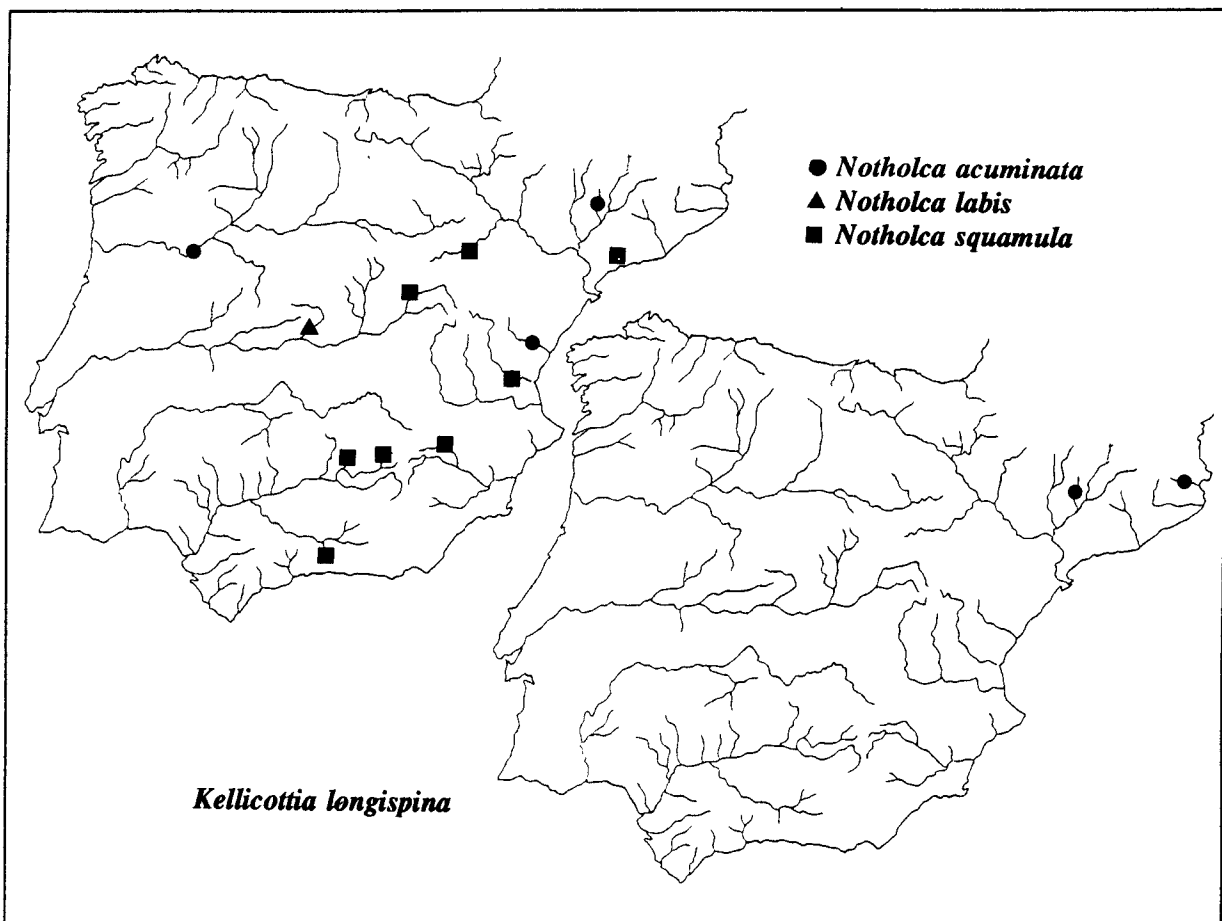


Figure 10. Distribution of some species of the genus *Notholca* and of *Kellicottia longispina* in Spanish reservoirs. *Distribución de algunas especies del género Notholca y de Kellicottia longispina en los embalses españoles.*

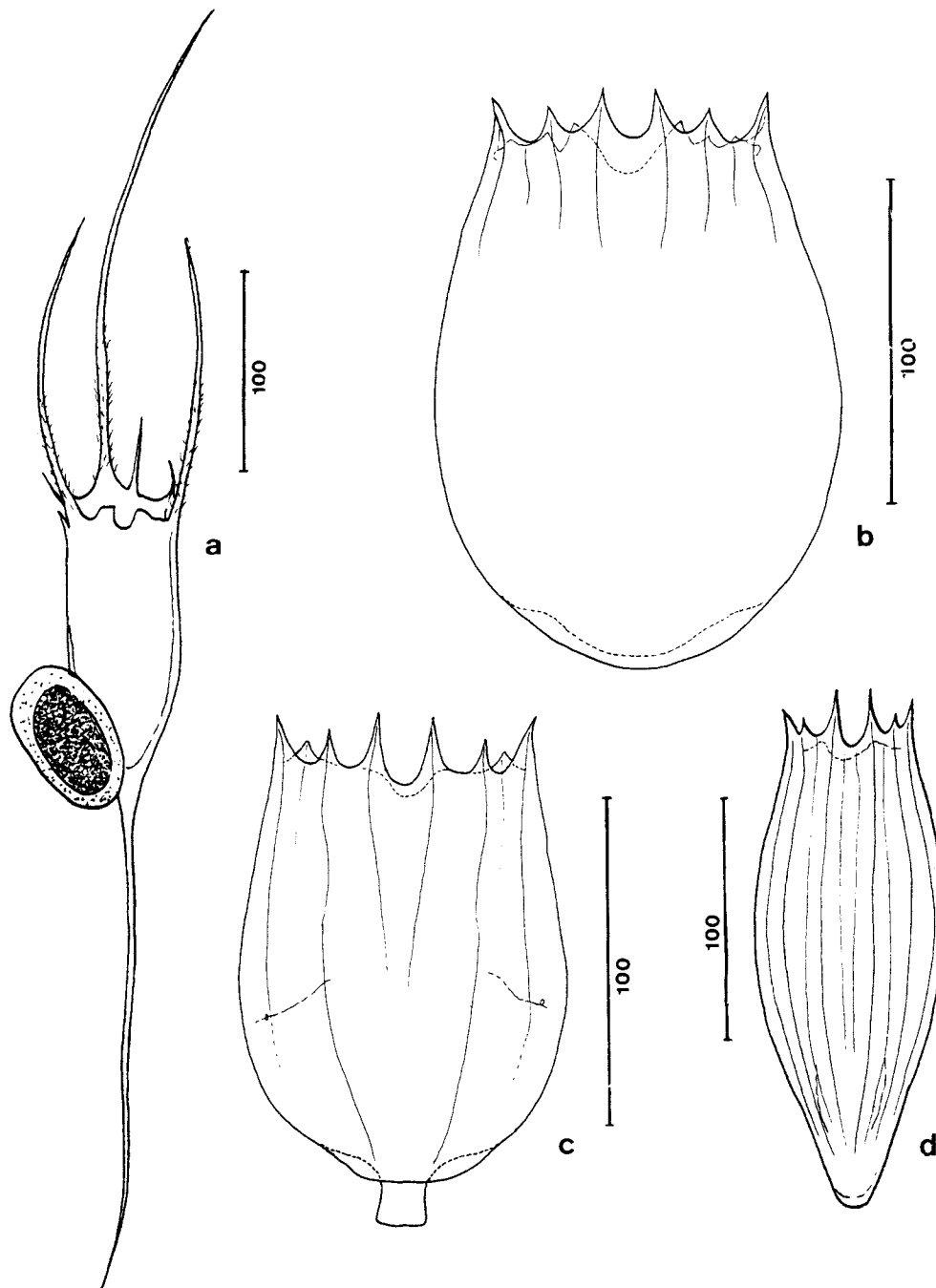


Figure 11. *Kellicottia longispina* and species of *Notholca* collected in Spanish reservoirs during the 87/88 survey. Scale in μm . a. *Kellicottia longispina* from Boadella; b. *Notholca squamula* from Bermejales; c. *N. labis* from Cazalegas; d. *Notholca acuminata* from St. Anna. *Kellicottia longispina* y especies de *Notholca* identificadas en los embalses españoles (estudio 87/88). Escala en μm . a. *Kellicottia longispina* de Boadella; b. *Notholca squamula* de Bermejales; c. *N. labis* de Cazalegas; d. *Notholca acuminata* de St. Anna.

Genus *Notholca* Gosse

Notholca acuminata (Ehrenberg, 1832) (Fig. 11 d) (Fig. 10)

Anuraea acuminata Ehrenberg, 1832.

Ecology. Heleoplanktonic species. Cold stenoterm. More frequent in littoral benthos than in plankton, where it is found occasionally. It feeds on central and pennal diatoms (Pourriot, 1977).

Cond: 293-821 $\mu\text{S cm}^{-1}$; Alk: 1996-3039.3 peq l⁻¹; pH: 7.69-8.2; Temp: 10.63- 11.57 °C

Morphological features of interest. Lorica longitudinally striated, with six spines on the anterior margin. It presents a caudal appendix of variable length.

Geographical distribution. It has been found in Europe, North of Africa and Asia Minor. Common in the Iberian Peninsula.

Distribution in reservoirs. In the previous study it was collected in eight plankton samples. In this survey it was also found in St. Anna (93) and in Sitjar (59), in winter samples.

Notholca labis Gosse, 1887 (Fig. 11 c) (Fig. 10)

Ecology. Heleoplanktonic species. Cold stenoterm, it may be inhabit considerably saline water.

Cond: 112 $\mu\text{S cm}^{-1}$; Alk: 779 peq l⁻¹; pH: 7.53; Temp: 9.5 °C

Morphological features of interest. Lorica elongated and oval, striated longitudinally, with almost rectangular and spade-shaped caudal extensions. Gosse compared its lorica with the handle of a dust pan (Fig. 11 c). Polymorphic.

Geographical distribution. Probably cosmopolite. Rare. In Spain it has only been found in reservoirs and in Pyrenean lakes (unpublished data).

Distribution in reservoirs. It was found in the previous study in Sobron (91). In the 1987/88 study it has been found in a reservoir of the basin of the river Tajo, Cazalegas (52) (Fig. 10), in samples taken during the mixing period.

Notholca squamula (Muller, 1786) (Fig. 11 b) (Fig. 10)

Brachionus squamula Muller, 1786.

Ecology. Planktonic species, but frequently found in littoral environments. It tolerates a wide range of salinity. Cold stenoterm. It feeds mainly on diatoms.

Cond: 189-1126.3 $\mu\text{S cm}^{-1}$; Alk: 689.5-4681.7 peq l⁻¹; pH: 7.9-8.5; Temp: 8.4-12.3 °C

Morphological features of interest. Lorica with rounded caudal margin, finely striated, with six spines on the anterior dorsal margin. The quotient length/width is always less than 2. It presents cyclomorphosis and it is frequently larger at low temperature.

Geographical distribution. It is the most common species of the genus and it is widespread throughout the Iberian Peninsula. In littoral ponds it may be easily confused with *N. salina* (Focke)

Distribution in reservoirs. It was found mainly in eutrophic reservoirs with alkaline waters. It has been collected in winter samples from eight localities of eastern areas of the Iberian Peninsula (Fig. 10).

Genus *Platytias* (Harring)

Platytias quadricornis (Ehrenberg, 1832)

Noteus quadricornis Ehrenberg, 1832; *Platytias quadricornis* (Ehrenberg) after Harring, 1913.

Ecology. Heleoplanktonic species. Prefers warm water and presents tolerance to moderate salinity. It is frequently found among littoral macrophytes (Pejler, 1977).

Cond: 305-765 $\mu\text{S cm}^{-1}$; Alk: 1194-3065 $\mu\text{eq l}^{-1}$; pH: 8-8.5; Temp: 21.82-22.8 °C

Morphological features of interest. Lorica with a pentagonal dorsal facet between two hexagonal facets. The species presents variability in the size and length of its caudal spines. Eggs are carried, like other brachionidae, on the opening of the foot.

Geographical distribution. Cosmopolite, more common in tropical and subtropical regions. In Spain it has occasionally been found, mainly coastal ponds: Doñana National Park (De Ridder, 1962); Cullera (Miracle & Vicente, 1983); and in rice fields of the delta of river Ebre (Forés *et al.* 1986).

Distribution in reservoirs. Rare. In the present study it has been found in plankton samples from Boadella (79) and Flix (35).

Family *EUCHLANIDAE*

Genus *Euchlanis* Ehrenberg

Euchlanis dilatata Ehrenberg, 1832

Ecology. Heleoplanktonic species. Frequent among macrophytes in small waterbodies. Tolerates moderate concentrations of salinity and may occur in fresh and brackish water. It prefers eutrophic water, especially when cyanobacteria are abundant. Pejler (1962) remarks it is a species that frequently appears attached to planktonic algae colonies. According to Carlin (1943), it feeds on organic detritus, bacteria, cyanophyceae and *Cyclotella*.

Cond: 19.6-823 $\mu\text{S cm}^{-1}$; Alk: 98-3757 $\mu\text{eq l}^{-1}$; pH: 6.3-9.6; Temp: 6.4-24 °C

Morphological features of interest. Ovoid body, lorica transparent and flexible. Lorica is truncate at its anterior margin and was a rounded posterior end. Posterior dorsal plate is divided by a deep elongate notch. Foot slender and two-jointed. Size is remarkably variable and several specific morphs have been described attending to the section and shape of the lorica.

Geographical distribution. Cosmopolite. It has been found all over Spain.

Distribution in reservoirs. In the 1987/188 survey it was identified in samples, from 19 reservoirs across the whole Iberian Peninsula, both from the stratification period and after mixing. In the previous study its occurrence was important in spring.

Family *MYTILINIDAE*

Genus *Lophocharis* Ehrenberg

Lophocharis salpina (Ehrenberg, 1834) (Fig. 12 c; Fig. 13)

Lepadella salpina Ehrenberg, 1834; *Metopidia salpina* Hudson & Gosse, 1889; *Lophocharis salpina* after Harring, 1916.

Ecology. Periphytic species, occasionally occurring in plankton. It inhabits preferentially

alkaline waterbodies. It also may be found in dystrophic environments.

Cond: 77-3130 $\mu\text{S cm}^{-1}$; Alk: 429.2-3038 $\mu\text{eq l}^{-1}$; pH: 7.1-8.1; Temp: 8.6-24.3 °C

Morphological features of interest. Robust lorica, of triangular section, with the anterior margin always serrated. It presents a dorsal keel with transverse folds mostly over caudal part of the lorica. *Trophi* malleate, with six teeth on uncus. Foot ventrally curved, with three joints and toes sharply pointed. It may be confused with *L. oxysternon* (Gosse, 1851), which does not present caudal folds on the dorsal keel.

Geographical distribution. Cosmopolite. It is an uncommon species, but has been found spread across the whole Iberian Peninsula territory (unpublished data), in spite of the fact that it has been recorded in few localities (Velasco, 1990).

Distribution in reservoirs. In the 1987/188 survey it was found in seven localities (Fig. 4.12), mainly in winter samples (mixing period).

Family *TRICHOTRIIDAE*

Genus *Trichotria* Bory de St. Vincent

Trichotria pocillum (Müller, 1776) (Fig. 12 e)

Trichoda pocillum Müller, 1776; *Dinocharis pocillum* Ehrenberg, 1830; *Trichotria pocillum*, Bory de St. Vincent, 1827.

Ecology. Periphytic species, heleoplanktonic. It feeds on organic detritus and algae, mainly diatoms from phytobenthos. It tolerates a wide range of mineralization.

Cond: 262-378.5 $\mu\text{S cm}^{-1}$; Alk: 2103-2987 $\mu\text{eq l}^{-1}$; pH: 7.5-8.1; Temp: 7.7-9.1 °C

Morphological features of interest. Robust lorica covering head, body and feet, like a shield of hexagonal section. Lorica ornamented with spicules and organized in regular facets (with similarities with the lorica of some brachionids). *Trophi* malleate. Foot with two long and slender toes. *T. pocillum* has a small spine in the last segment of the foot, just between the two toes (Fig. 12 e). This trait makes it possible to distinguish this species from *T. tetractis* (Ehrenberg, 1830).

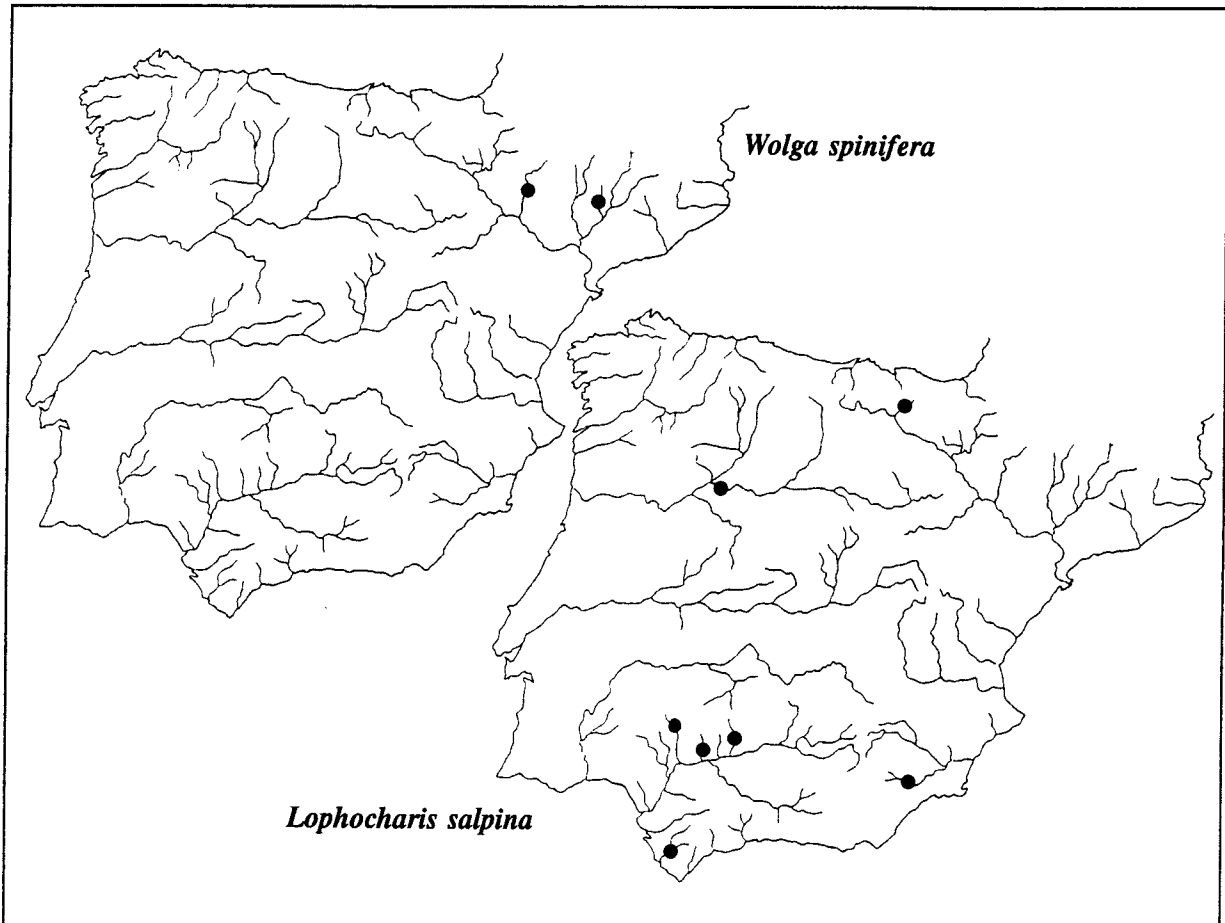


Figure 13. Distribution of *Lophocharis salpina* and *Wolga spinifera* in Spanish reservoirs (survey 87/88). *Distribución de Lophocharis salpina y Wolga spinifera en los embalses españoles (estudio 87/88).*

Geographical distribution. Cosmopolite. In Spain it is widespread.

Distribution in reservoirs. It has only been found only in winter samples, from Villalcampo (26) and Sobrón (91). In the previous survey it was collected in nine reservoirs.

Trichotria tetractis (Ehrenberg, 1830) (Fig. 12 d)

Dinocharis tetractis Ehrenberg, 1830;
Trichotria tetractis after Carlin, 1939.

Ecology. Ecological affinity with *T. pocillum*.

Cond: 435.5 $\mu\text{S cm}^{-1}$; Alk: 3545.5 $\mu\text{eq l}^{-1}$; pH: 8.1; Temp: 18.8 °C

Morphological features of interest. Lorica features are remarkably variable. Ornamentation and size may be very different. The absence of a short spine between toes on the last foot segment distinguishes it from *T. Pocillum* in the same genus.

Geographical distribution. Cosmopolite. In Spain less frequent than *T. pocillum*.

Distribution in reservoirs. It has been found in summer samples from Sobrón (91). In the previous study it was collected in five reservoirs.

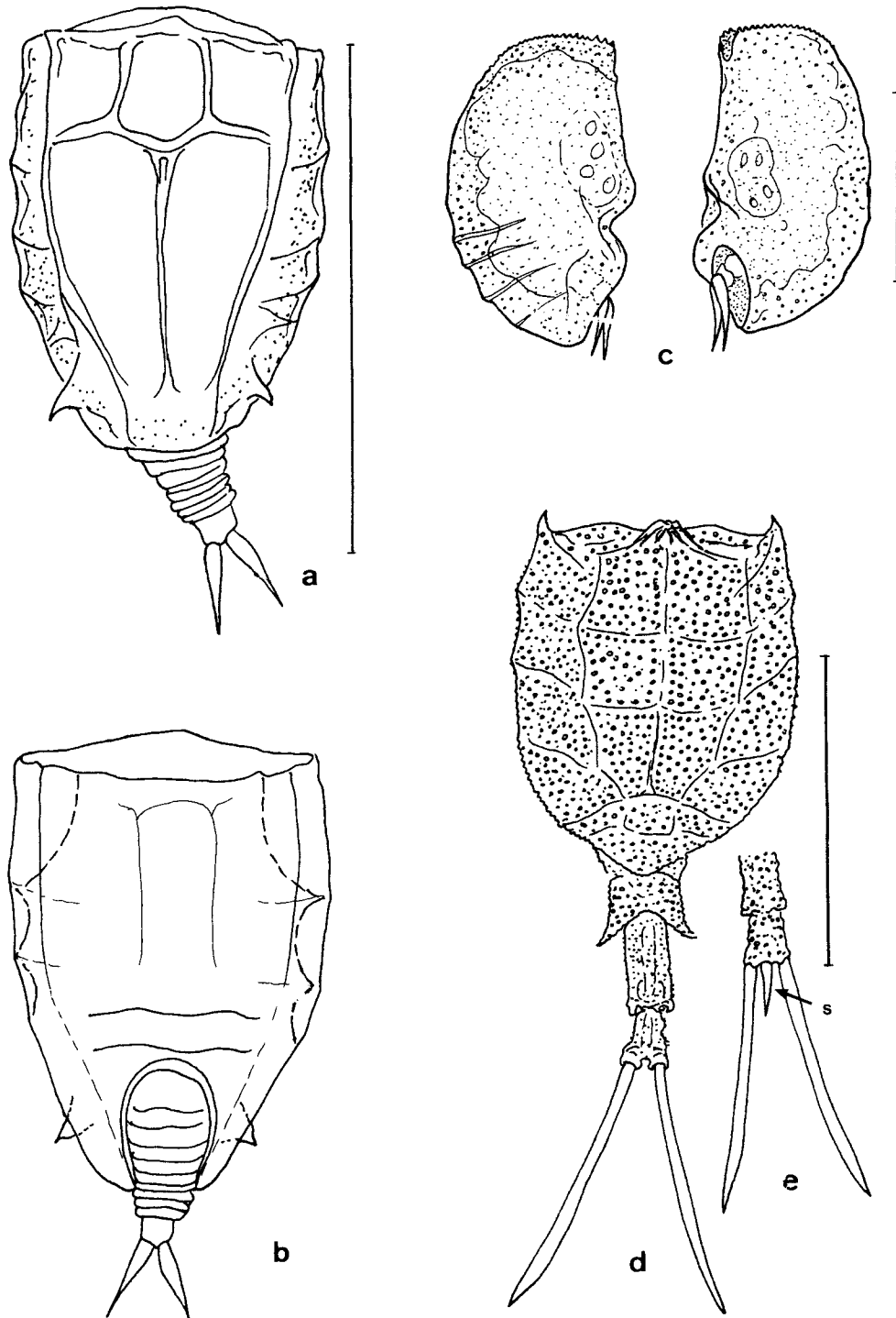


Figure 12. Rotifers of the families Mytilinidae and Trichotriidae found in Spanish reservoirs during the 87/88 survey. Scale bar is 100 μm long. *Rotíferos de las familias Mytilinidae y Trichotriidae identificados en los embalses españoles (estudio 87/88). Escala 100 μm .*

Genus *Wolga* Skorikov

Wolga spinifera (Western, 1894) (Fig. 12 a,b) (Fig. 13)

Distyla spinifera Western, 1894; *Cathypna spinifera* Murray, 1913; *Lecane spinifera*, Haring, 1913; *Wolga spinifera* after Skorikov, 1903.

Ecology. Heleoplanktonic species. Its ecology is not well known. Its presence in some Eastern reservoirs of the Iberian Peninsula (Fig. 4.12) suggest its preference for alkaline environments.

Cond: 351-359 $\mu\text{S cm}^{-1}$; Alk: 2014.8-2731 $\mu\text{eq l}^{-1}$; pH: 8.3-8.4; Temp: 18-20.4 $^{\circ}\text{C}$

Morphological features of interest. Lorica compressed, dorsally divided by two ribs that define a series of facets. Oval foot opening under a distinct transverse fold of the ventral plate. Toes short, slender, pointed. It presents two lateral dorsal spines at the level of the lateral antennae.

Geographical distribution. Probably cosmopolite. Rare, frequently found in Europe and Asia Minor (Berzins, 1978). In the Iberian Peninsula it has only been found in reservoirs.

Distribution in reservoirs. Recorded for the first time in Spain in the 1972/75 survey. According to Guiset (1977a), this species has possibly been introduced from higher latitudes and can now be found in more southern localities. In the recent study it has been found in St. Anna (93) and La Sotonera (1), both in the basin of the river Ebre.

Family *COLURELLIDAE*Genus *Colurella* Bory de St. Vincent

Colurella adriatica Ehrenberg, 1831 (Fig. 14 a,b)

Colurella lepta Diefenbach, 1912.

Ecology. Heleoplanktonic species. Eurihaline, occurring also in current water (in the littoral zone, among macrophytes).

Cond: 383.7 $\mu\text{S cm}^{-1}$; Alk: 3349.7 $\mu\text{eq l}^{-1}$; pH: 8.4; Temp: 23.5 $^{\circ}\text{C}$

Morphological features of interest. Lorica very variable in size and shape. It is characterized by the divergence of the posterior margin, which has a pointed and acute shape (Fig. 14). Pejler (1962) found a transition morph between *C. adriatica*

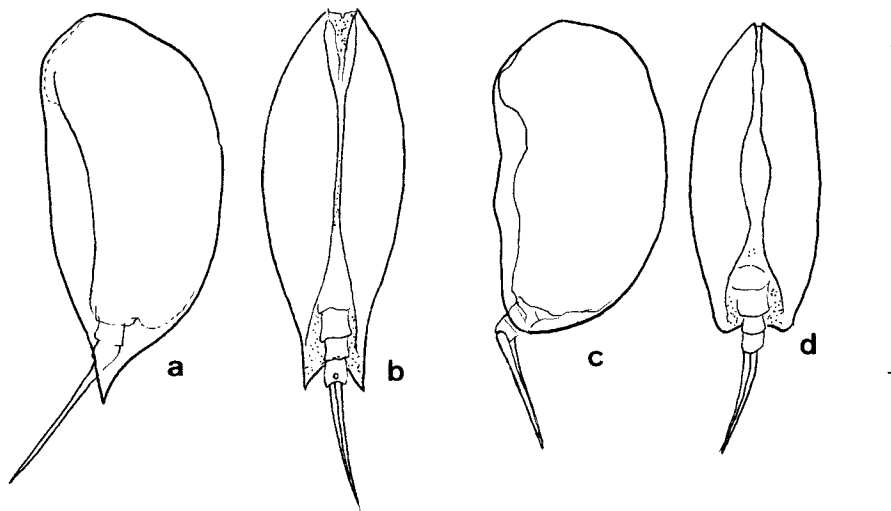


Figura 14. Some species of the genus *Colurella* found in Spanish reservoirs (survey 87/88). Scale 100 μm . a, b, *C. adriatica* lateral and ventral, from Cenajo; c, d, *C. colurus*, lateral and ventral, from Frieira. *Algunas especies del género Colurella identificadas en los embalses españoles (estudio 87/88). Escala 100 μm . a, b, C. adriatica lateral y ventral, de Cenajo; c, d, C. colurus, lateral i ventral, de Frieira.*

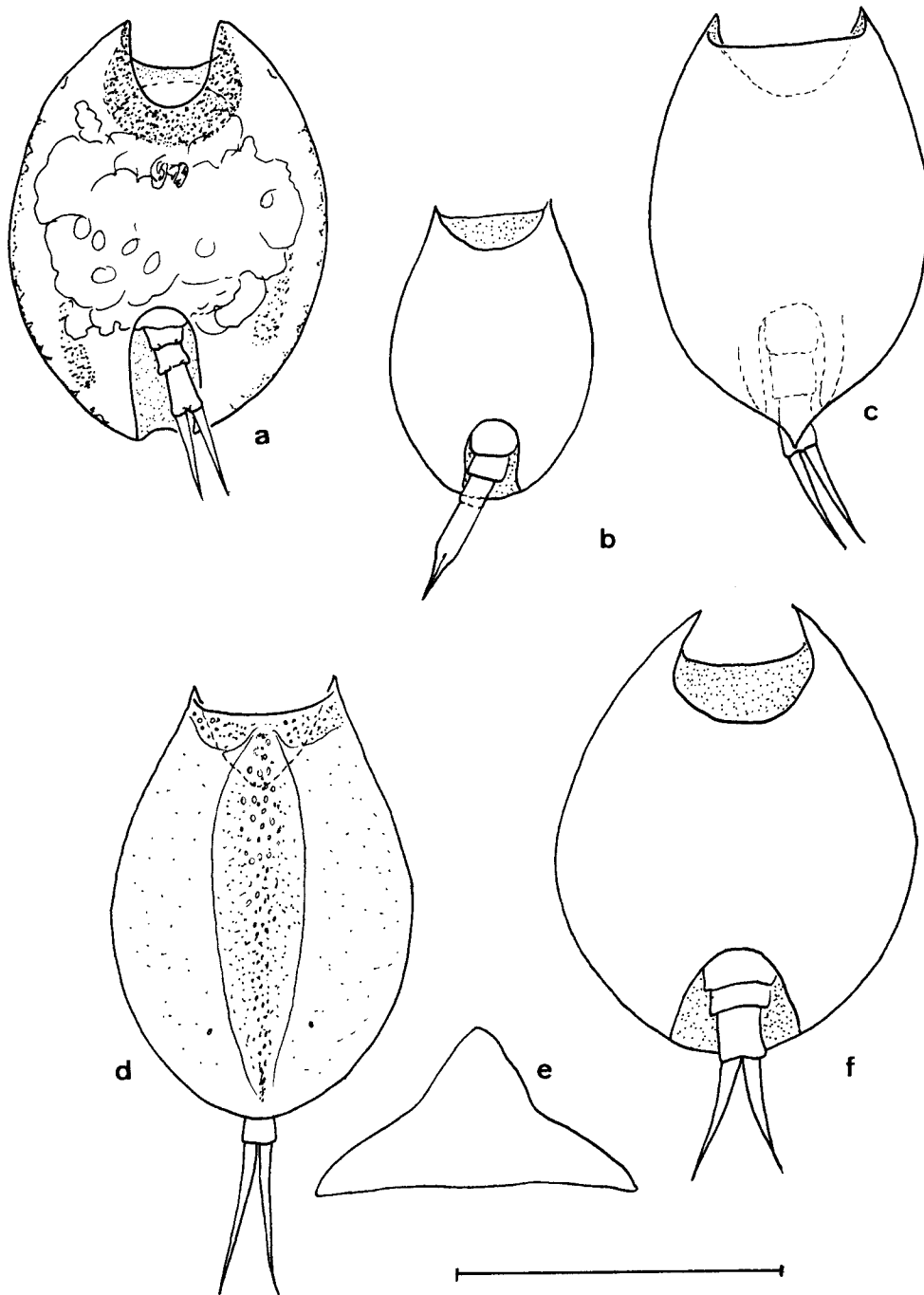


Figure 15. Species of the genus *Lepadella* found in Spanish reservoirs (survey 87/88). Scale 100 μm . a. *L. patella*, ventral, from Das Conxas; b. *L. acuminata*, dorsal, from Aguilar de Campoo; c. *L. (X.) astacicola*, ventral, El Vellón; d,e. *L. rhomboides*, d, dorsal, e, cross section, Guadalén; e. *L. ovalis*, ventral, from San Juan. *Especies del género Lepadella identificados en los embalses españoles (estudio 87/88)*. Escala 100 μm . a. *L. patella*, ventral, Das Conxas; b. *L. acuminata*, dorsal, de Aguilar de Campoo; c. *L. (X.) astacicola*, ventral, El Vellón; d,e. *L. rhomboides*, d, dorsal, e, sección transversal, Guadalén; e. *L. ovalis*, ventral, de San Juan.

and *C. colurus*. Different ecotypes have been described in relation to the size and shape of the lorica, as well as length of the foot. Both species increased their size with salinity (Hauer, 1924).

Geographical distribution. Probably cosmopolite. In Spain it has been found in numerous and widespread localities.

Distribution in reservoirs. It has been collected only in Cenajo (75), in summer samples. In the previous survey it was found in five reservoirs.

Colurella colurus Ehrenberg, 1830 (Fig. 14 c,d)

Monura colurus Ehrenberg, 1830; *Colurella colurus* after Haring, 1913.

Ecology. Heleoplanktonic species. Eurihaline. With similar ecological requirements *C. adriatica*.

Cond: 77 $\mu\text{S cm}^{-1}$; Alk: 429.2 peq l^{-1} ; pH: 7.1; Temp: 9.7 °C

Morphological features & interest. Relatively smaller than *C. adriatica*, it may be discriminated by the morphology of the posterior margin of the lorica, which is rounded in *C. colurus* (Fig. 14).

Geographical distribution. Cosmopolite. In the Iberian peninsula it has been found in fewer localities than expected from its know distribution (unpublished data).

Distribution in reservoirs. In the previous study it was found in seven reservoirs. In the last survey it was only found in Frieira (97) and only in winter.

Colurella uncinata (Muller, 1773)

Brachionus uncinatus Muller, 1773; *Colurella uncinata* after Haring, 1913.

Ecology. Periphytic species, occasional in plankton. It tolerates a wide range of mineralization.

Cond: 383.7 $\mu\text{S cm}^{-1}$; Alk: 3349.7 $\mu\text{eq l}^{-1}$; pH: 8.4; Temp: 23.5 °C

Morphological features & interest. Lorica with a head-opening smaller than the greatest lorica height. Lorica ends in its posterior end with a downward-curving short spine. Short toes.

Geographical distribution. Cosmopolite. In the Iberian Peninsula it is more common in Eastern regions (Velasco, 1990).

Distribution in reservoirs. It has been identi-

fied in Cenajo (75). In the previous survey it was collected in five reservoirs.

Genus *Lepadella* Bory de St. Vincent

The genus has been traditionally split into three subgenera distinguished by the morphology of the toes: *Lepadella* (equal toes; completely separate); *Heterolepadella* (unequal toes); *Xenolepadella* (joined toes; either totally or partially).

Lepadella acuminata (Ehrenberg, 1834) (Fig. 15 c; Fig. 16)

Metopidia acuminata Ehrenberg, 1834; *Lepadella acuminata* after Dujardin, 1841.

Ecology. Periphytic species, occasionally found in plankton. According to Koste (1978) it prefers slightly acid water.

Cond: 51.5-304.7 $\mu\text{S cm}^{-1}$; Alk: 171-2089 $\mu\text{eq l}^{-1}$; pH: 6.8-8.3; Temp: 7.8-19 °C

Morphological features & interest. Dorsal lorica with two lateral keels. Lorica ends with an acute margin. This character distinguishes this species from the other species in the genus.

Geographical distribution. Cosmopolite. In the Iberian Peninsula it has been found quite a few localities, all with low mineralization. It one of the most common species of this genus in high mountain lakes; for instance in Sierra Nevada (Morales-Baquero, 1987), as well as in Pyrenean mountains (Margalef, 1948b, and unpublished data).

Distribution in reservoirs. It has been found in three northern localities, Aguilar de Campoo (7), As Conxas (20) and Barasona (92), in all of them in summer samples. In the previous survey it was collected in five localities.

Lepadella (Xenolepadella) astacicola Hauer, 1926 (Fig. 15 b; Fig. 16)

Ecology. Littoral species. It has been described as inhabitant of the bronchial cavity of the river crayfish (of the genus *Astacus* and *Cwitharus*).

Cond: 158.3 $\mu\text{S cm}^{-1}$; Alk: 1099.3 $\mu\text{eq l}^{-1}$; pH: 9.19; Temp: 17.7 °C.

Morphological features & interest. Its most distinctive character is the complete fusion of the toe.

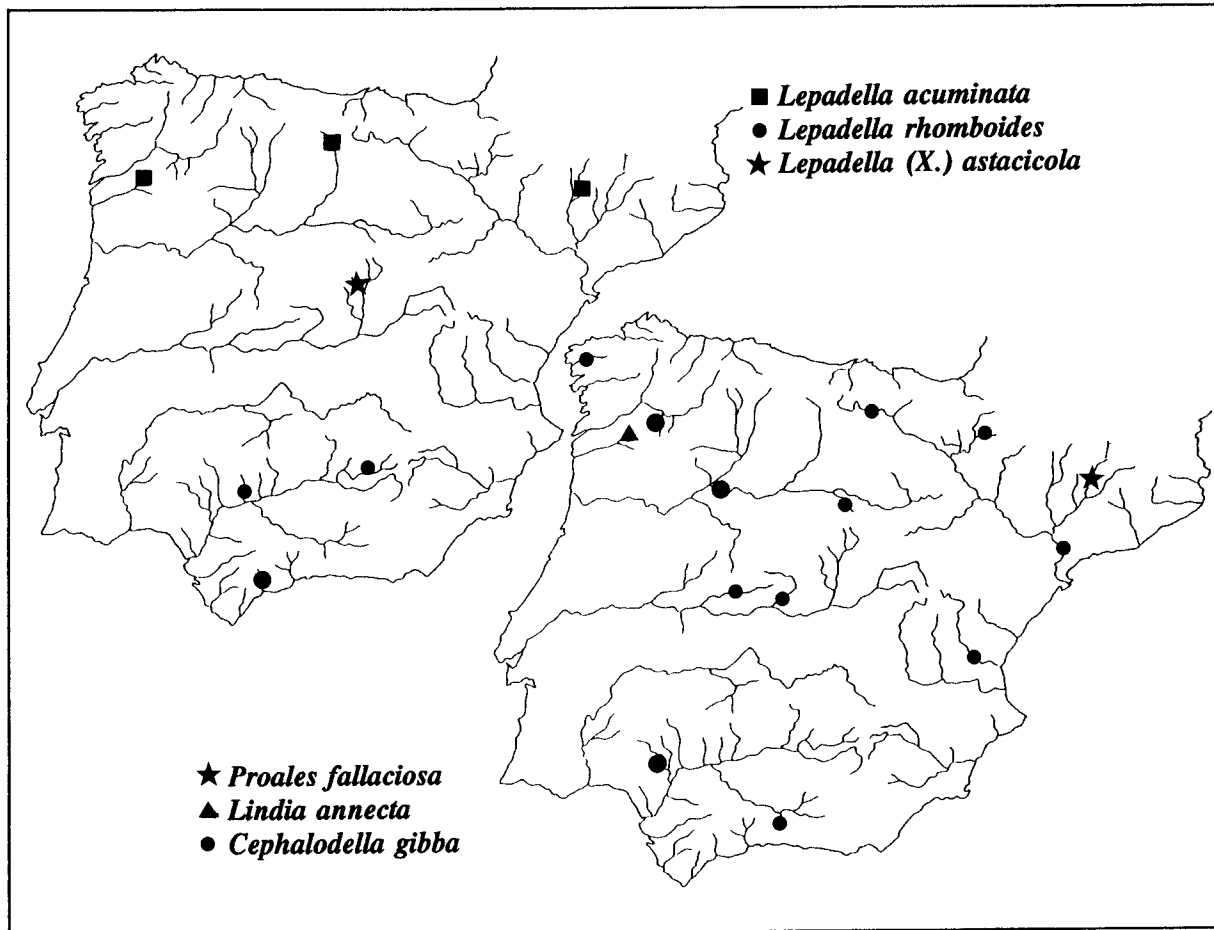


Figure 16. Distribution of some species of genera *Lepadella*, *Lindia* and *Cephalodella* in Spanish reservoirs during the 87/88 survey. *Distribución de algunas especies de los géneros Lepadella, Lindia y Cephalodella en los embalses españoles (estudio 87/88).*

Geographical distribution. Probably, its distribution is determined by the presence of crayfish. Results reported here are the first record of the species presence in the Iberian Peninsula.

Distribution in reservoirs. Interestingly, it has been found in plankton samples from El Vellón (60). Its presence in the plankton suggests that the species does not live exclusively in the brachial cavity of the crayfish, but occasionally have a heleoplanktonic habitat, or even live in different habitats during its life cycle.

Lepadella ovalis (Müller, 1786) (Fig. 15 f)

Brachionus ovalis, Müller, 1786; *Lepadella ovalis* after Ehrenberg, 1830; *Metopidia solidus*,

Gosse, 1851; *Metopidia ovalis* Anderson & Shepard, 1892.

Ecology. Heleoplanktonic, common in littoral zones, among macrophytes. Eurihaline, but more frequent in fresh water.

Cond: 48-498 $\mu\text{S cm}^{-1}$; Alk: 266-2468 $\mu\text{eq l}^{-1}$; pH: 8.58-9.14; Temp: 23.6-24 °C.

Morphological features of interest. Body depressed. Ventral lorica nearly flat, outline oval to circular. Head-opening with a ventral sinus of rhomboidal shape. Foot-opening variable. Resting eggs covered by, slightly curved robust spines

Geographical distribution. Cosmopolite. Present throughout the Iberian Peninsula.

Distribution in reservoirs. It has been collected in San Juan (41) and San Román (98). In the previous survey it was only found in one reservoir.

Lepadella patella (Muller, 1786) (Fig. 15 a)

Brachionus patella Müller, 1786; *Lepadella patella* after Bory de St. Vincent, 1826.

Ecology. Littoral species, periphytic, found occasionally in plankton from reservoirs, rivers and ponds. Uncommon in large waterbodies.

Cond: 20-823 $\mu\text{S cm}^{-1}$; Alk: 150-3667 $\mu\text{eq l}^{-1}$; pH: 6.7-9.3; Temp: 9.1-22.3 °C.

Morphological features of interest. Outline of the lorica variable, elliptical, with a food opening also variable U-or-V shaped. Ventral sinus with a wider frontal part. Foot-opening with two small pointed margins.

Geographical distribution. Cosmopolite. It is the most common species of the genus in the Iberian Peninsula.

Distribution in reservoirs. It has been found in 11 reservoirs spread across the Iberian Peninsula.

Lepadella rhomboides (Gosse, 1886) (Fig. 15 d,e; Fig. 16)

Metopidia rhomboides Gosse, 1886; *Lepadella rhomboides* after Haring, 1913.

Ecology. Periphytic species, heleoplanktonic. It tolerates a wide range of pH (Berzins & Pejler, 1987; Koste & Shiel, 1989b), but prefers alkaline water.

Cond: 250.3-433 $\mu\text{S cm}^{-1}$; Alk: 2047.3-2519 $\mu\text{eq l}^{-1}$; pH: 8.26-9; Temp: 24.9-26.7 °C.

Morphological features of interest. Lorica with a moderately high arched median keel. Dorsal sinus U-shaped, and ventral sinus V-shaped. Dorsal aperture of the head opening presents a collar which can be bordered by a thick granulated cuticle. Foot-opening U-shaped, with parallel sides. Long distal foot-segment. Toes relatively shorter and slightly curved.

Geographical distribution. Cosmopolite. In Spain it has only been collected in Alacant (Rojo & Oltra, 1986), on the Central Mediterranean coast, and in the Balearic archipelago (De Manuel *et al.*, 1992) because of this we expect a widespread distribution of this species.

Distribution in reservoirs. Found in summer samples from Guadalén (62), Retortillo (69) and La Concepción (102).

Family LECANIDAE

Genus *Lecane* Nitzsch

Several authors distinguish the genus *Monostyla* (with only one toe) from *Lecane* (with two toes). Both genus were initially included in the family *Euchlanidae*. Edmondson (1935) proposed unification, including both in the same genus *Lecane*. Later, Bartos (1959) sustained that *Monostyla* and *Lecane* belonged to the family Lecanidae, adding also the subgenus *Hemimonostyla* (intermediate forms where the fusion of the toes has only been partial). Koste (1978) gave to *Hemimonostyla* and *Monostyla* the taxonomic category of subgenus, later Koste & Shiel (1990a) separated *Lecane* and *Monostyla* as two different genera, and gives taxonomic category of genus to *Hemimonostyla*. More recently, Segers (1993) questioned the separation of the genus based only on the criteria of the fusion of the toes, and proposed synonymy between *Lecane*, *Monostyla* and *Hemimonostyla*.

Lecane (M.) bulla Gosse, 1851 (Fig. 18 a; Fig. 19)

Monostyla bulla Gosse, 1851.

Ecology. Periphytic species, occasionally found in plankton samples. Very common among macrophytes in small waterbodies. The species prefers high concentrations of carbonates.

Cond: 56.7-3590 $\mu\text{S cm}^{-1}$; Alk: 51.5-498 $\mu\text{eq l}^{-1}$; pH: 6.8-8.2; Temp: 10-19.35 °C

Morphological features of interest. It is characterized by a V-shaped dorsal opening of the lorica, and a small U-shaped notch on the posterior margin (where the dorsal antenna protrudes). It presents a long toe, ended by a claw with basal spicules and a undivided claw with a medial line undivided.

Geographical distribution. Cosmopolite. Common in the Iberian Peninsula and the Balearic Islands.

Distribution in reservoirs. Its distribution in Spanish reservoirs is preferentially in eastern

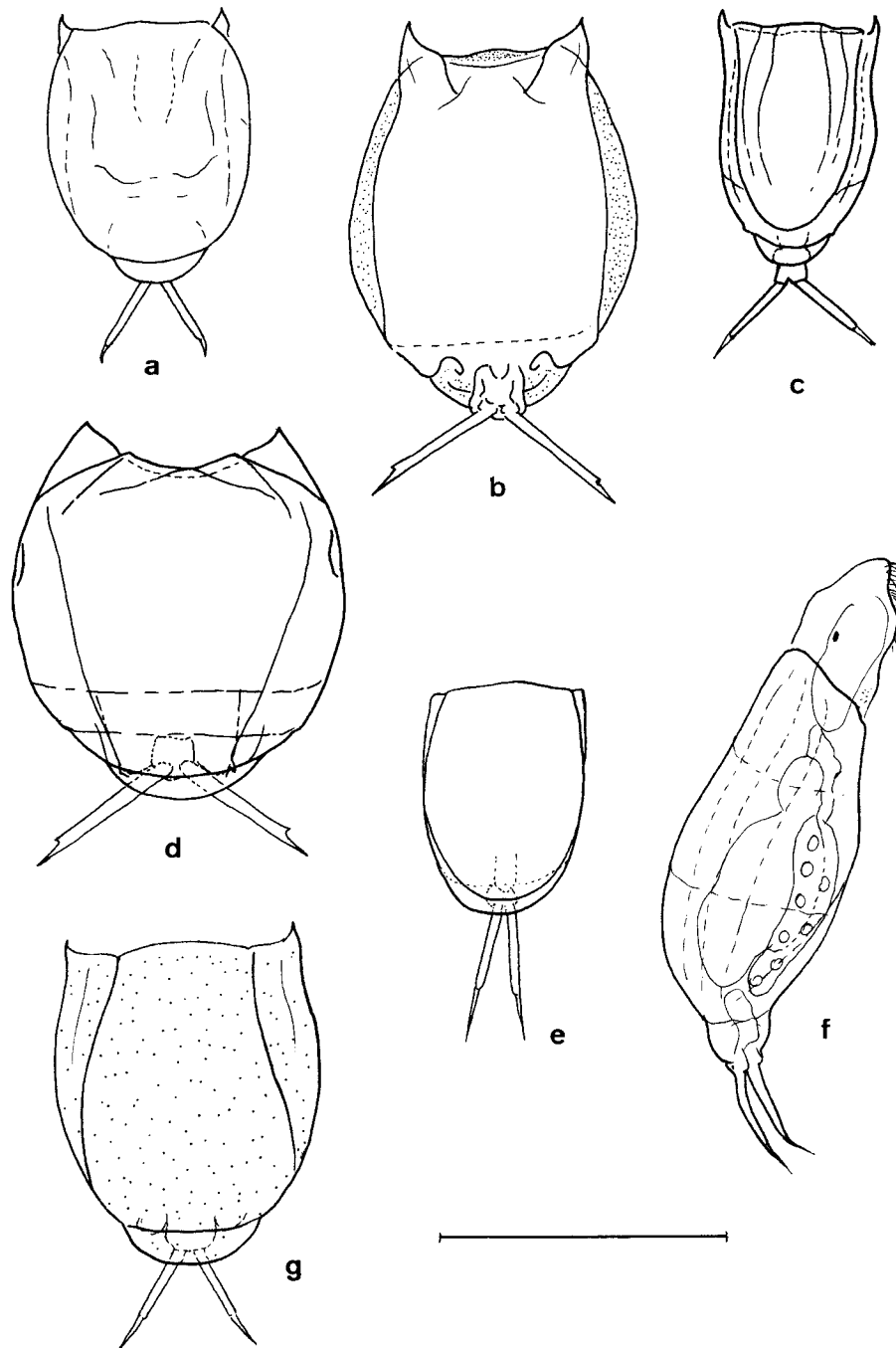


Figure 17. Some species of the genus *Lecane* found in Spanish reservoirs (survey 87/88). Scale 100 μm . a. *Lecane flexilis*, dorsal, from Arbón; b. *L. mira*, ventral, from Salime; c. *L. crepida*, dorsal, from La Concepción; d. *L. luna*, dorsal, from La Concepción; e. *L. tenuiseta*, dorsal, from Boadella; f. *L. inermis*, lateral, from Chandrexa; g. *L. hastata*, dorsal, from Villalcampo.

Algunas especies del género Lecane identificadas en los embalses españoles (estudio 87/88). Escala 100 μm . a. Lecane flexilis, dorsal, de Arbón; b. L. mira, ventral, de Salime; c. L. crepida, dorsal, de La Concepción; d. L. luna, dorsal, de La Concepción; e. L. tenuiseta, dorsal, de Boadella; f. L. inermis, lateral, de Chandrexa; g. L. hastata, dorsal, de Villalcampo.

regions, in reservoirs located in calcareous basins.

Lecane (M.) closterocerca (Schmarda, 1859) (Fig. 18 c)

Monostyla closterocerca Schmarda, 1859.

Ecology. Littoral species, frequently found in plankton samples. Tolerates a wide range of salinity.

Cond: 51.5-498 $\mu\text{S cm}^{-1}$; Alk: 171-3657.7 $\mu\text{eq l}^{-1}$; pH: 6.7-9.1; Temp: 7.8-24 °C

Morphological features of interest. Head aperture dorsal and ventral margins similar, V-shaped sinuses with widely-flaring convex sides; transverse ventral fold in front of foot. One long toe, minor than 1/3 body length and without claw:

Geographical distribution. Cosmopolite. It has been found occasionally in Spain (Velasco, 1990), but it is probably a very common species, widespread in the Iberian peninsula and Balearic archipelago.

Distribution in reservoirs. It has been found in six localities.

Lecane (M.) copeis Haring & Myers, 1926 (Fig. 18 d; Fig. 19)

Monostyla copeis Haring & Myers, 1926.

Ecology. Littoral species.

Cond: 351 $\mu\text{S cm}^{-1}$; Alk: 2014.8 $\mu\text{eq l}^{-1}$; pH: 8.37; Temp: 17.9 °C

Morphological features of interest. Head aperture margin coincident, slightly concave; transverse ventral fold in front of foot, with a short toe (less than 1/4 of its total body length) and spindle-shaped. Foot is enlarged in its mid-section and ended by a short acute claw which allows to distinguish this species from *L. closterocerca*.

Geographical distribution. Cosmopolite. Its occurrence in reservoirs constitutes the first record of this species in the Iberian Peninsula.

Distribution in reservoirs. Specimens have been identified in plankton samples from Sta. Anna (93).

Lecane (L.) crepida (Haring, 1914) (Fig. 17 c; Fig. 19)

Ecology. Littoral species. Warm stenoterm.

Cond: 383 $\mu\text{S cm}^{-1}$; Alk: 3882 $\mu\text{eq l}^{-1}$; pH: 8.8; Temp: 26.2 °C

Morphological features of interest. Head aperture margin slightly convex; concave by ventral margin. External angles with acute cusps curved internally. Dorsal plate smaller than ventral plate, the latter is strongly convex and is ornamented with divergent folds. Two long toes (more than a quarter of its total body length), with slender claws.

Geographical distribution. Tropical and subtropical distribution. Rare in the Iberian peninsula; it has been recorded previously by Wiszniewski (1931), Arévalo (1932) and Miracle (1976).

Distribution in reservoirs. In the latest survey it has been found only in summer samples from the reservoir La Concepción (102).

Lecane (L.) flexilis (Gosse, 1889) (Fig. 17 a; Fig. 19)

Distyla flexilis Hudson & Gosse, 1886; *Lecane flexilis* after Haring, 1913.

Ecology. Littoral species, occurring occasionally in plankton. High tolerance to alkalinity. Pejler (1962) found it more frequently in alkaline environments, and Koste (1978) records it as alkalophil. But Koste & Shiel (1990a) found it in slightly acid water.

Cond: 22-823 $\mu\text{S cm}^{-1}$; Alk: 131-3667 $\mu\text{eq l}^{-1}$; pH: 6.64-7.87; Temp: 9.50-21.13 °C

Morphological features of interest. Head aperture margin coincident and convex, with two short cusps at external angles. Dorsal plate faceted. Ventral plate narrower than dorsal. Toes long and slender, approximately a quarter of its total body length. Recurved claw with a small dorsal basal spicule.

Geographical distribution. Cosmopolite. It is a common species in littoral environments, but scarce in the Iberian Peninsula (Armengol *et al.*, 1975; Guiset, 1976; Morales-Baquero, 1987).

Distribution in reservoirs. It has been found in six localities, four reservoirs in the NW of the Iberian Peninsula. of low mineralized water.

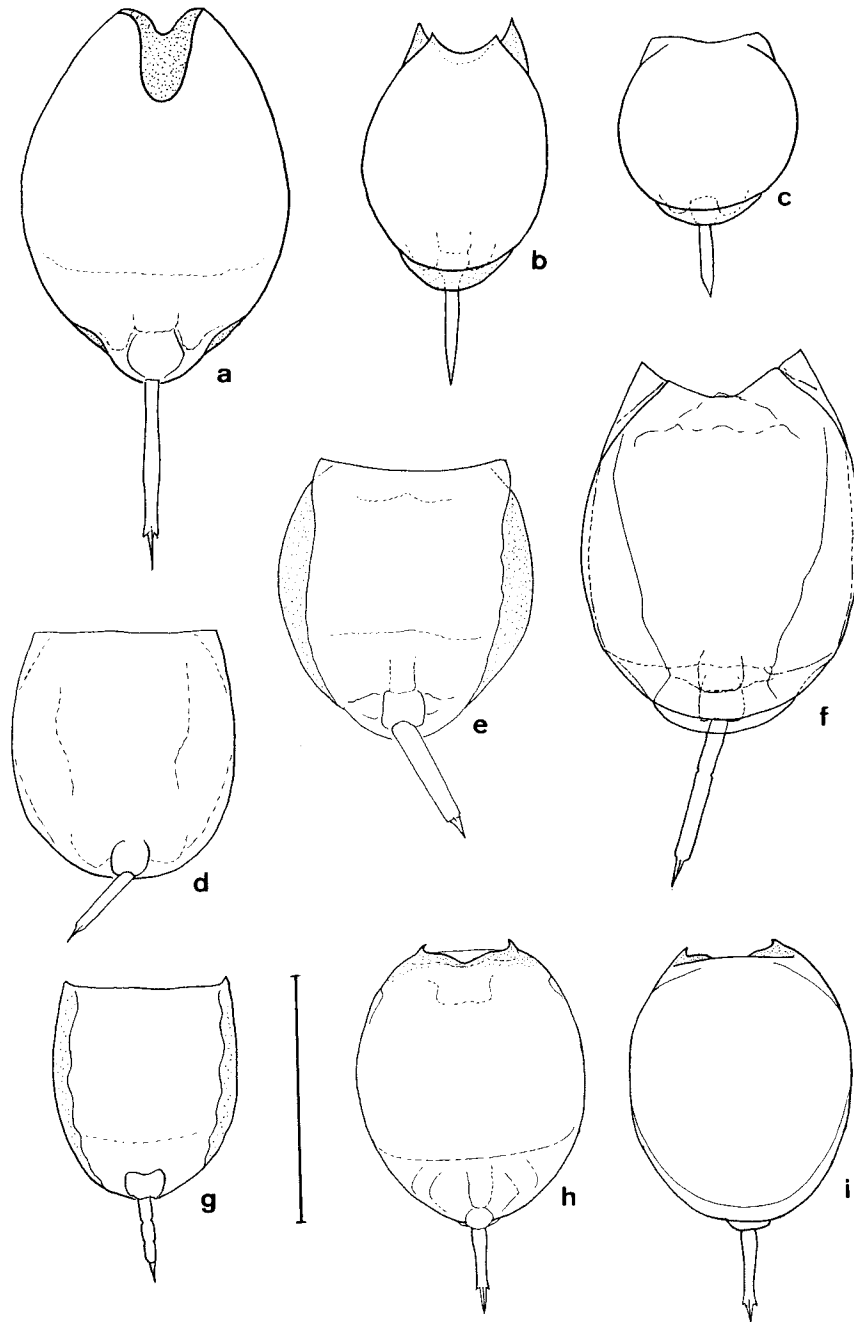


Figure 18. Some species of the genus *Lecane* found in Spanish reservoirs (survey 87/88). Scale bar 100 μm . a. *L. bulla*, ventral, from Boadella; b. *L. hamata*, dorsal, from Boadella; c. *L. closterocerca*, dorsal, from San Román; d. *L. copeis*, ventral from Sta. Anna; e. *L. tethis*, ventral, from St. Pong; f. *L. lunaris*, dorsal, from As Conchas; g. *L. scutata*, ventral, from Entrepeñas; h, i, *L. stenroosi*, h ventral, i dorsal, from La Concepción. *Algunas especies del género Lecane identificadas en los embalses españoles (estudio 87/88). Escala 100 μm .* a. *L. bulla*, ventral, de Boadella; b. *L. hamata*, dorsal, de Boadella; c. *L. closterocerca*, dorsal, de San Román; d. *L. copeis*, ventral de Sta. Anna; e. *L. tethis*, ventral, de St. Pong; f. *L. lunaris*, dorsal, de As Conchas; g. *L. scutata*, ventral, de Entrepeñas; h, i, *L. stenroosi*, h ventral, i dorsal, de La Concepción.

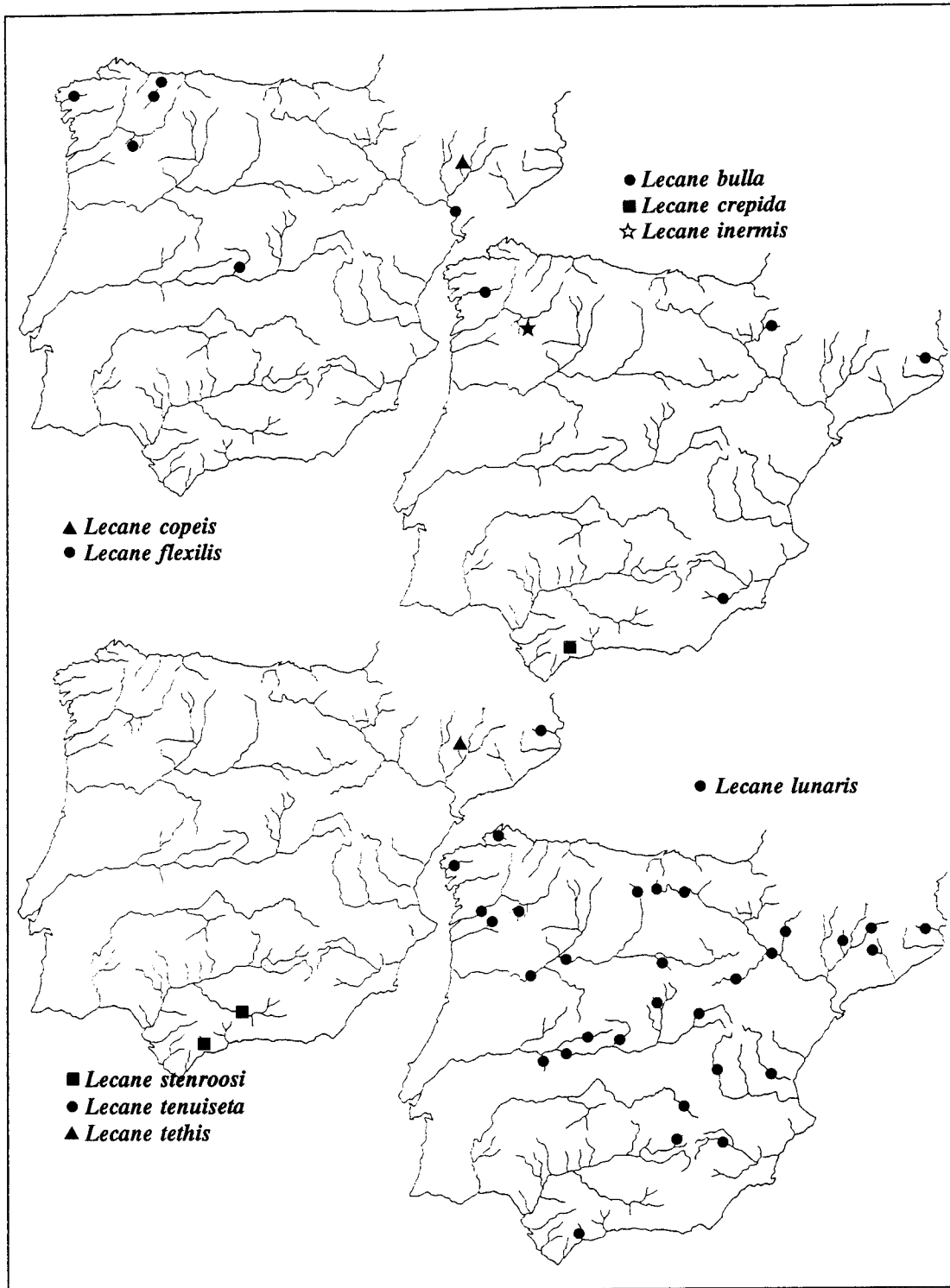


Figure 19. Distribution of some species of genus *Lecane* (survey 87/88). Distribución de algunas especies del género *Lecane* (estudio 87/88).

Lecane (M.) hamata Stokes, 1896 (Fig. 18 b)

Monostyla hamata stokes, 1896; *Lecane hamata*, after Myers, 1937.

Ecology. Periphytic species, littoral. Eurytopa.

Cond: 179.3-344 $\mu\text{S cm}^{-1}$; Alk: 1507.6-2799 peq l⁻¹; pH: 7.9; Temp: 11.9-13.5 °C

Morphological features of interest. Head aperture with a dorsally narrow U-shaped sinus. Dorsally it presents a V-shaped sinus with two rounded in its posterior end cusps. The ventral plate is extended with two acute cusps on either side of the head aperture. The dorsal plate presents regular facetting. It has a transverse fold and several longitudinal folds on the ventral plate. It has one short and slender toe without claw.

Geographical distribution. Cosmopolite. Selga (1952) and De Ridder (1962) found it in waterbodies of the Iberian Peninsula. In the Balearic archipelago it is a common species; frequent in farm ponds and drinking troughs (De Manuel, *et al.* 1992).

Distribution in reservoirs. In the 1987/88 survey it has been found in plankton samples from two reservoirs during the mixing period: Retortillo (69) and Boadella (79). In the 1972/75 survey it was found in winter and autumn, in five reservoirs, all of low mineralization.

Lecane (L.) hastata (Murray, 1913) (Fig. 17 g)

Cathypna hastata Murray, 1913; *Lecane hastata*, Harring & Myers, 1926.

Ecology. Littoral species, often present in fresh and slightly brackish waters.

Cond: 541 $\mu\text{S cm}^{-1}$; Alk: 3038 peq l⁻¹; pH: 8.1; Temp: 24.3 °C

Morphological features of interest. Head aperture margins not coincident; dorsal slightly convex, ventral straight. Two small spines at the external angles. Dorsal plate smaller than ventral, truncated posteriorly. Toes larger than a quarter of its total body length, terminating in a long acute claw.

Geographical distribution. Probably cosmopolite. It has been collected in waterbodies from Delta de l'Ebre (Forés *et al.* 1986) and in coastal ponds from Mallorca and Menorca (De Manuel *et al.* 1992).

Distribution in reservoirs. Rare. In the 1987/88 survey it was found in summer samples from Villalcampo (26).

Lecane (L.) inermis (Bryce, 1892) (Fig. 17 f; Fig. 19)

Distyla inermis Bryce, 1892; *Lecane inermis*, after Harring, 1913.

Ecology. Littoral species. Found mostly in warm waters, thermal springs, etc. (Kutikova, 1970, found it in a geyser environment at 62.5 °C).

Cond: 14.7 $\mu\text{S cm}^{-1}$; Alk: 74.7 peq l⁻¹; pH: 7.3; Temp: 19.4 °C

Morphological features of interest. Membranous, very flexible lorica, anterior margins coincident; ventral plate wider than dorsal, both without ornamentation. Foot segment rounded, it projects beyond the dorsal plate. The second foot segment projects beyond the lorica. Toes are short, straight and terminated in an acute recurved claw almost as long as the toe.

Geographical distribution. Cosmopolite. Rare, in Spain it has previously been found by Margalef (1948, 1949) and Donner (1970).

Distribution in reservoirs. It has been found only in the reservoir Chandrexa (22) in the north east of the Iberian Peninsula and only during summer.

Lecane (L.) luna (Muller, 1776) (Fig. 17 d)

Cercaria luna Muller, 1776; *Lecane luna*, after Nitzsch, 1827.

Ecology. Littoral and periphytic species. Eurytopic, common in freshwater environments. Heleoplanktonic, frequently occurring in plankton samples.

Cond: 14.7-907 $\mu\text{S cm}^{-1}$; Alk: 74.7-3882 peq l⁻¹; pH: 6.3-9.9; Temp: 9.5-26.2 °C

Morphological features of interest. Head aperture margins not coincident: both with deep lunate sinuses. External angles of ventral sinus cusp-like, dorsal sinus angles more blunt. Smooth dorsal plate almost circular with a broad medium anterior hump. Ventral plate is slightly narrower with a single transverse fold. Toes are one third of the total body length, terminated in a claw with a basal spicule.

Geographical distribution. Cosmopolite. It is a common, widespread lecanid.

Distribution in reservoirs. It has been found in plankton samples from 20 reservoirs, both in winter and in summer, distributed uniformly throughout the Iberian Peninsula.

Lecane (M.) lunaris (Ehrenberg, 1832) (Fig. 18 e; Fig. 19)

Lepadella lunaris Ehrenberg, 1832; *Monostyla lunaris* Ehrenberg, 1838.

Ecology. Littoral, it can be considered heleoplanktonic. This lecanid occurs frequently in the plankton. Eurytopic, it prefers eutrophic water.

Cond: 22-1126.3 $\mu\text{S cm}^{-1}$; Alk: 98-4681.7 $\mu\text{eq l}^{-1}$; pH: 6.3-9.2; Temp: 7.2-26.2 °C

Morphological features of interest. Head aperture narrow dorsally, with a V-shaped sinus posteriorly rounded. Ventral margin wide, sinus deep. Transverse dorsal fold at base of anterior sinus; toe long and slender, more than a third of total body length, with two annular constrictions. Claw long, slender, acutely pointed with two minute basal spicules. Diverse morphs and varieties have been described (*L. lunaris var. constricta*, Murray, 1913; *L. lunaris crenata*, Haring, 1913; *L. lunaris f. perplexa*, Ahlstrom, 1938).

Geographical distribution. Cosmopolite. Widely distributed through all the Iberian Peninsula territory.

Distribution in reservoirs. It has been found in numerous reservoirs (31), distributed throughout Spain during stratified conditions and after mixing. In the previous survey it had been collected in plankton samples from 40 localities.

Lecane (L.) mira (Murray, 1913) (Fig. 17 b)

Cathypna mira Murray, 1913; *Lecane mira* after Haring & Myers, 1926.

Ecology. Periphytic species; common in slightly acid waters. Rarely occurring in plankton.

Cond: 52 $\mu\text{S cm}^{-1}$; Alk: 320.2 $\mu\text{eq l}^{-1}$; pH: 7.2; Temp: 10.8 °C

Morphological features of interest. Head aperture margins not coincident: dorsal almost straight, ventral slightly concave; two stout trian-

gular cusps at external angles. Dorsal plate indistinctly faceted, with anterior row incomplete. Ventral plate with transverse fold; second foot segment visible beyond posterior segment; toes are about a quarter of total body length and terminate in stout claw with a basal spicule.

Geographical distribution. Cosmopolite. Mainly found in the Pyrenean mountains (Margalef, 1948b; unpublished data).

Distribution in reservoirs. It has been only found in the reservoir Salime (10), during mixing period.

Lecane (M.) scutata (Haring & Myers, 1926) (Fig. 18 g)

Monostyla scutata Haring & Myers, 1926; *Lecane scutata* Wiszniewski, 1954

Ecology. Littoral periphytic species. Koste & Shiel (1990a) recorded it is an acidophil species, common among *Sphagnum*, but it is probably more eurytopic.

Cond: 550.6 $\mu\text{S cm}^{-1}$; Alk: 3468 $\mu\text{eq l}^{-1}$; pH: 8.3; Temp: 8.4 °C

Morphological features of interest. Head aperture margins coincident, slightly concave; with sharp corners but no anterior spines. Lateral sulci are shallow, indistinct transverse fold of ventral plate; toe long, stout, of one third of the total body length and parallel-sided then tapering to a slender acute claw.

Geographical distribution. Cosmopolite. Rare, in Spain it has only been collected in ponds in South-East Spain (Rojo & Oltra, 1986) and in reservoirs.

Distribution in reservoirs. Rare. It has been found only in winter samples from Entrepeñas (37). In the 1972/75 survey it was collected in four localities.

Lecane (M.) stenroosi Meissner, 1908 (Fig. 18 h,i; Fig. 19)

Monostyla bicornis Stenroos, 1898; *Monostyla stenroosi* Meissner, 1908; *Lecane stenroosi* Wiszniewski, 1953.

Ecology. Littoral and periphytic species. Abundant in algal mats in ephemeral ponds (Koste & Shiel, 1990a). Warm stenoterm.

Cond: 383-1175.6 $\mu\text{S cm}^{-1}$; Alk: 2251.3-3882 peq l^{-1} ; pH: 8-8.8; Temp: 23.3-26.2 $^{\circ}\text{C}$

Morphological features of interest. Head aperture dorsally straight, ventrally with shallow rounded sinus with strongly convex sides. Two short stouts, incurved hooklike frontal spines. Lateral sulci very deep, particularly in anterior half, with characteristic constriction in ventral plate. Toe is long, stout, about one third of the total body length, slightly enlarged in middle. Claw is short, stout and acutely pointed, with two basal spicules.

Geographical distribution. Cosmopolite. Found by Wiszniewski (1931) and Arévalo (1932) in waterbodies in València (Central Mediterranean coast of Spain).

Distribution in reservoirs. Found in summer samples from La Concepcidn (102) and Iznajar (73). In the previous survey it was not found.

Lecane (L.) tenuiseta Harring, 1914 (Fig. 17 e)

Ecology. Littoral species. Eurytopic.

Cond: 344 $\mu\text{S cm}^{-1}$; Alk: 2799 $\mu\text{eq l}^{-1}$; pH: 7.9; Temp: 13.5 $^{\circ}\text{C}$

Morphological features of interest. Head aperture margins parallel, slightly convex; dorsal plate smooth, rounded posteriorly; ventral plate with a series of ridges. Lateral sulci are shallow; posterior segment broad, rounded, it protrudes beyond the dorsal plate. The second foot segment is not protruding. The toes are long, slender, approximately one third of the total body length, terminating in extremely long spine-like claws.

Geographical distribution. Cosmopolite. Rare, it is a new record for the Spanish rotifer fauna. It has also been collected in lake Sanabria (unpublished data).

Distribution in reservoirs. Scarcity in the reservoir Boadella (79), in samples from the stratification period.

Lecane (M.) tethis Harring & Myers, 1926 (Fig. 19)

Ecology. Periphytic species. It is a rare organism. Little autoecological information is available in the literature. Koste (1978) included it as

a synonymous of *L. (M.) furcata*, but they probably are two separate species, as there are considerable differences between the morphology of the lorica, specifically, in the distal part of the foot.

Cond: 449.7 $\mu\text{S cm}^{-1}$; Alk: 2773 peq l^{-1} ; pH: 8.3; Temp: 20.5 $^{\circ}\text{C}$

Morphological features of interest. Head aperture with coincident straight dorsal and ventral margins; regular facetting of dorsal plate; ventral plate also with longitudinal markings. Transverse fold in front of foot with two small semicircular folds. Toe long, one third of total body length, straight with slight taper. Claw long and slender, with a medium line.

Geographical distribution. Cosmopolite. Rare, it is a new record for the rotifer fauna of the Iberian Peninsula.

Distribution in reservoirs. Only one specimen was collected in summer samples from the reservoir Sant Ponç (96).

Family *PKOALIDAE*

Genus *Proales* Gosse

Proales fallaciosa Wulfert, 1937 (Fig. 20 a,b,c; Fig. 16)

Ecology. Heleoplanktonic species. Eurytopic, it prefers dystrophic ponds. It tolerates wide ranges of alkalinity, and may inhabit slightly acid waters too. It feeds on detritus, bacteria, algae, and microcrustacea and other invertebrates in decomposition (Koste & Shiel, 1990b).

Cond: 208.8 $\mu\text{S cm}^{-1}$; Alk: 1516.2 peq l^{-1} ; pH: 8.39; Temp: 18.84 $^{\circ}\text{C}$

Morphological features of interest. Body cylindrical (200 a 300 μm) without lorica, with medial bulge. It presents a soft and flexible cuticle, with longitudinal folds. Small rounded knob projecting dorsally between toes. Oblique corona. Small rostrum present. Virgate *trophy*, with seven teeth in left *uncus*, right with 5-6 teeth. *Manubrium* presents a wide lamella. Gastric glands are round to elongated. Foot glands with reservoirs. It may be confused with *Proales decipiens*, however the latter presents a different *trophy* structure, and does not has the characteristic dorsal knob between toes.

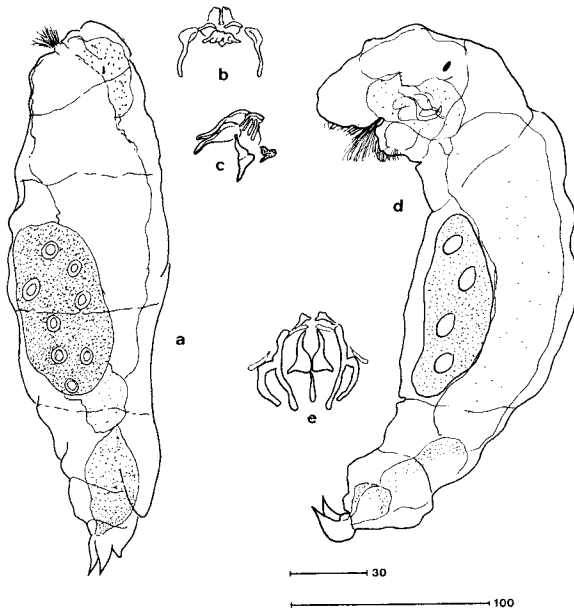


Figure 20. a,b,c, *Proales fallaciosa* Wulfert, found in Camarasa. a, contracted animal; b, lateral and c, sagittal view of mastax. d,e, *Lindia annecta* Haring & Myers, found in As Conchas. d, contracted animal; e, frontal view of mastax. Scale in μm (smaller scale bar for mastax). a,b,c, *Proales fallaciosa* Wulfert, de Camarasa. a, especimen contraido; b,c vista lateral y sagital del mastax. d,e, *Lindia annecta* Haring & Myers, de As Conchas. d, especimen contraido; e, vista frontal del mastax. Escala en μm (escala pequeña para el mastax).

Geographical distribution. Cosmopolite. Rare, specimens collected from reservoirs are the first records of this species for the Iberian Peninsula (also inhabits Pyrenean lakes, unpublished data).

Distribution in reservoirs. (Fig. 15). It has been collected in the reservoir Camarasa (94) during the stratification period. This species is more common in Pyrenees and had probably colonized the reservoir from resting eggs carried down by running water.

Family LINDIIDAE

Genus *Lindia* Dujardin (Fig. 4. 15; 20 d,e)

Lindia annecta Haring & Myers, 1922

Ecology. Periphytic species are common. It is rarely found in plankton, probably as a migrant.

Typical of *Sphagnum* bogs, it prefers low mineralized and slightly acid waters.

Cond: $51.5 \mu\text{S cm}^{-1}$; Alk: $171 \mu\text{eq l}^{-1}$; pH: 6.8; Temp: $7.85 \text{ }^\circ\text{C}$

Morphological features of interest. Body slender (300 a $350 \mu\text{m}$), transparent. Transverse folds give annular appearance. Head and neck sections are of similar length and width. The corona presents two small lateral auricles. It has two short conical and acute toes. *Trophi* virgate. *Fulcrum* short, quadrate. *Manubria* with wide lamellae, before hooked appendage (Fig. 19 e). *Uncus* with three teeth.

Geographical distribution. (Fig. 16). Probably cosmopolite. Rare. *Lindia annecta* is the first record for the Iberian peninsula.

Distribution in reservoirs. It has been found, in winter, in As Conchas (20).

Family NOTOMMATIDAE

Genus *Cephalodella* (Bory de St. Vincent)

Cephalodella forficula Ehrenberg, 1932 (Fig. 21 a)

Distemma forficula Ehrenberg, 1932;
Cephalodella forficula, after Haring, 1913.

Ecology. Littoral species, generally inhabitant of small waterbodies. Occasionally in plankton. It prefers slightly acid water, but it also may occur in alkaline environments.

Cond: $435.5 \mu\text{S cm}^{-1}$; Alk: $3545 \mu\text{eq l}^{-1}$; pH: 8.2; Temp: $18.8 \text{ }^\circ\text{C}$

Morphological features of interest. Elongate, spine-shaped body, slight constriction at neck; integument flexible, without lorica plates. Toes short, stout, recurved, about one fifth of the total body length. Toes have a distinctive transverse spicule row (2-4) on the dorsal median surface, terminating in a long spine. This character identified and distinguished *C. forficula* from other species.

Geographical distribution. Probably cosmopolite. In Iberian Peninsula it has rarely been recorded, but it is probably more common than records suggest. It has been found in the Balearic archipelago (De Manuel *et al.*, 1992) and in Pyrenean lakes (unpublished data).

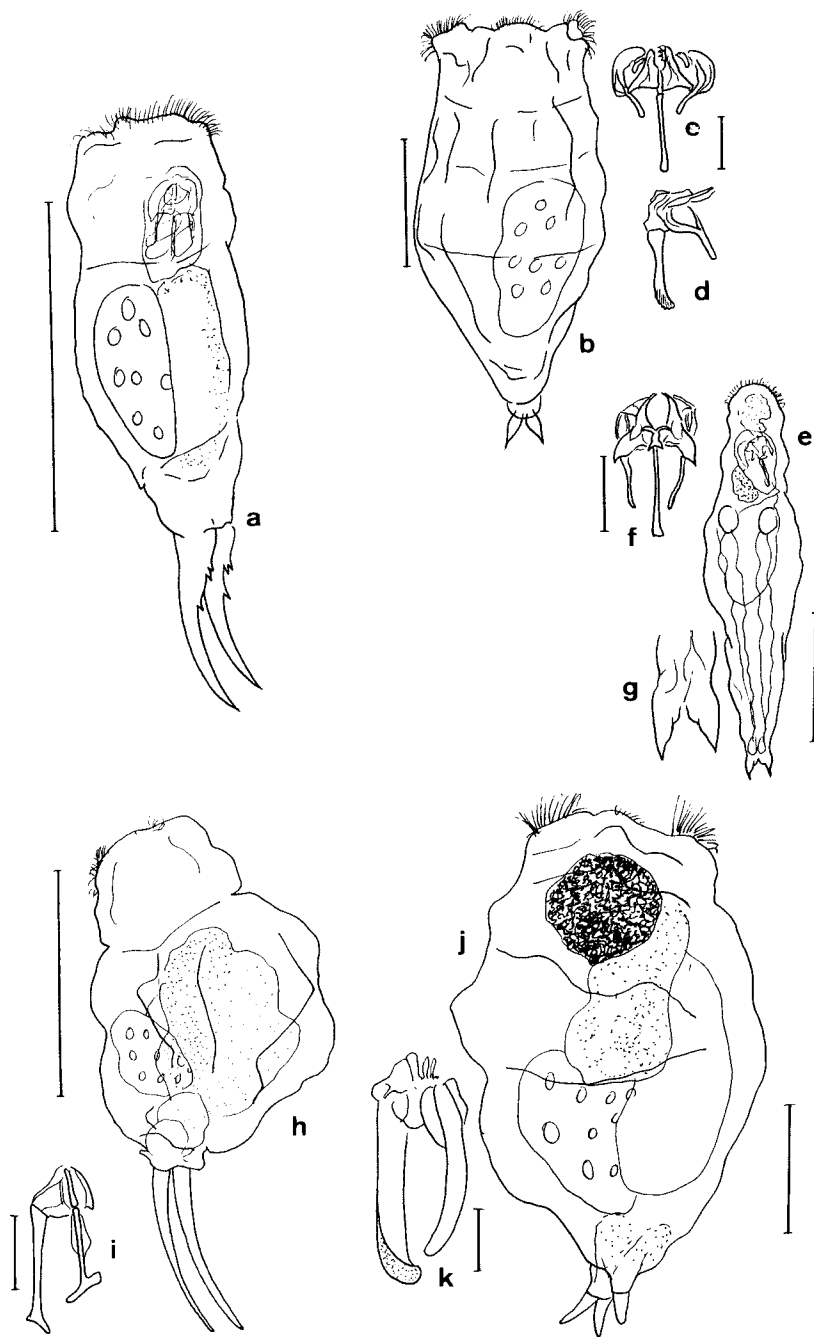


Figure 21. a, *Cephalodella forficula*, from Sobrón; b-d, *Notommata cerberus*, b, contracted animal, c, d, mastax, from Sobrón; e-g, *Reticula nyssa*, e, contracted animal, f, mastax, g, detail of foot; h-i, *Cephalodella gibba*, h, contracted animal, i, mastax; j, k, *Notommata copeus*, j, contracted animal, k, mastax, from Mao. Body scale bar: 100 μm ; Mastax scale bar: 20 μm . a, *Cephalodella forficula*, de Sobrón; b-d, *Notommata cerberus*, b, *especimen contraído*, c, d, *mastax*, de Sobrón; e-g, *Reticula nyssa*, e, *especimen contraído*, f, *mastax*, g, *detalle del pie*; h-i, *Cephalodella gibba*, h, *animal contraído*, i, *mastax*; j, k, *Notommata copeus*, j, *animal contraído*, k, *mastax*, de Mao. Escala corporal: 100 μm ; Escala del mastax: 20 μm

Distribution in reservoirs. It has been found in reservoir Sobron (91), in summer.

Cephalodella gibba Ehrenberg, 1832 (Fig. 16; Fig. 21 h,i)

Furcularia gibba Ehrenberg, 1932; *Cephalodella gibba*, after Haring & Myers, 1924.

Ecology. Heleoplanktonic species, common the littoral areas of fresh and brackish waterbodies. It may occasionally be found in the branquial chambers of some crustaceans. It feeds on unicellular algae, flagellates and ciliates. It is an eurytopic species, but it prefers cold waters

Cond: 19.7-950 $\mu\text{S cm}^{-1}$; Alk: 98.6-3667 peq l^{-1} ; pH: 6.6-8.48; Temp: 6.4-18.8 °C

Morphological features of interest. Body slightly elongated, compressed laterally, gibbous rump. Lorica with distinct plates. Toes long, straight or recurved, slender and of one third of the body length. Mastax large, with *manubrium* strongly crooked, hammer-shaped (Fig. 21 i).

Geographical distribution. Cosmopolite. It has been found throughout the Iberian Peninsula.

Distribution in reservoirs. It is a relatively common organism in plankton samples of reservoirs. In the 1972/75 survey this species was collected in 22 reservoirs. In the 1987/88 survey it has been found in 11 reservoirs (Fig. 16), mostly in winter (mixing period).

Notommata cerberus (Hudson & Gosse, 1886) (Fig. 21 b-c)

Copeus cerberus Hudson & Gosse 1834; *Notommata cerberus*, after de Beauchamp (1908)

Ecology. Littoral periphytic species. Omnivore, it feeds on rotifers, desmidiaceae, diatoms and flagellates. It was initially considered as an acidophyl species.

Cond: 435.5 $\mu\text{S cm}^{-1}$; Alk: 3545 $\mu\text{eq l}^{-1}$; pH: 8.2; Temp: 18.8 °C

Morphological features of interest. Body slender (300-600 μm), integument flexible; slight transverse folds between head and neck. Tail rounded, with median lobe and rudimentary lateral lobes. Toes slender, pointed and short. Mastax virgate, Y-shaped lamellae at base of ful-

crum; rami asymmetric, inner edges striate but not denticulate. Eyes not large and lenticular.

Geographical distribution. Cosmopolite. This is the first record for Iberian rotifer fauna.

Distribution in reservoirs. It was collected in Sobrón (99), during the summer campaign of the 1877/88 survey.

Notommata copeus Ehrenberg, 1834 (Fig. 21 j,k)

Notommatus copeus Ehrenberg, 1834.

Ecology. Littoral species, occasional in plankton. It feeds on filamentous algae (*Spyrogira*, *Zygnema*, *Mougeotia*). It prefers slightly acid waters.

Cond: 20 $\mu\text{S cm}^{-1}$; Alk: 99 peq l^{-1} ; pH: 7; Temp: 6 °C

Morphological features of interest. Large species (500-1000 μm), elongate body, truncated posteriorly. Tail with a conical projection with an articulated tip-segment. Foot with two broad segments. Very long ciliate auricles. Long setae on lateral antenna. Mastax virgate, asymmetric, left side more developed

Geographical distribution. Cosmopolite. It is the first record for the Iberian fauna.

Distribution in reservoirs. Only one specimen was collected in the reservoir Mao (99), in winter.

Resticula nyssa Haring & Myers, 1924 (Fig. 21 e-g)

Ecology. Littoral species, periphytic. It prefers low mineralized and slightly acid waters.

Cond: 435.5 $\mu\text{S cm}^{-1}$; Alk: 3545 peq l^{-1} ; pH: 8.2; Temp: 18.8 °C

Morphological features of interest. Vermiform body (300-630 μm), with longitudinal and transverse striae. Anterior protusion on head corresponds to the rostrum of other taxa. Foot is jointed, very short and broad. Toes are short, with a bulbous basal enlargement, and a type claw. Modified virgate mastax. *Fulcrum* long. *Rami* triangular with large asymmetric alulae. Basal apophysis prominent (Fig. 21 f).

Geographical distribution. Probably cosmopolite. It is a new record for the Iberian rotifer fauna.

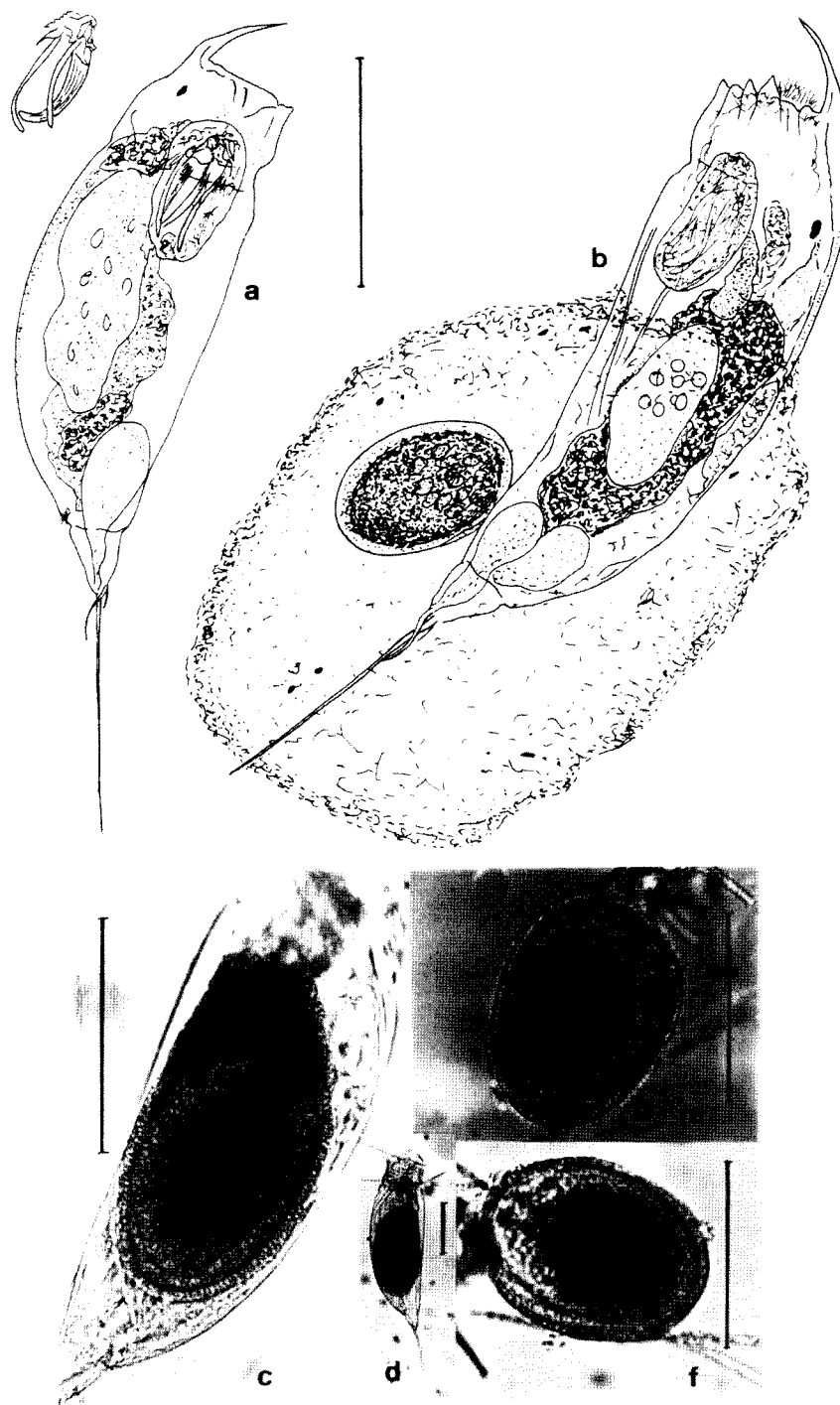


Figura 22. *Trichocerca cylindrica* : a, lateral view and mastax, from San Esteban; b, gelatinous mass and animal with amfictic egg, from Forcadas; c, d, photographs of an individual with resting eggs, from Cazalegas; e, f, resting eggs from plankton from Cazalegas. All scale bars are 100 μm long. *Trichocerca cylindrica* : a, vista lateral y mástax, de San Esteban; b, masa gelatinosa, animal y huevo amfictico, de Forcadas; c, d, fotografía de un espécimen con huevos durables, de Cazalegas; e, f, huevos durables del pláncton de Cazalegas. Escala: 100 μm .

Distribution in reservoirs. Found in summer samples from Sobrón (91), in the basin of the river Ebre.

Family *TRICHOCERCIDAE*

Genus *Trichocerca* Lamarck

Trichocerca cylindrica (Imhof, 1891) (Fig. 22; Fig. 23)

Mastigocerca cylindrica Imhof, 1891;
Trichocerca cylindrica, after Harring, 1913.

Ecology. Euplanktonic species. Warm stenoterm, it prefers low calcium concentrations. This is the only species of the genus that carries asexual eggs from hatching. Phytofagous, it feeds on algae, preferentially Crisophyceae (Pourriot, 1970).

Cond: 14.75-3720 $\mu\text{S cm}^{-1}$; Alk: 74.7-3038 peq l^{-1} ; pH: 7.2-9.6; Temp: 9.5-26.1 $^{\circ}\text{C}$

Morphological features of interest. Elongate, cylindrical body. It presents a very fine, and ventrally-curved acute spine on the median dorsal margin of the lorica. Longitudinal striae in head region with short keel and striates field. Left toe as long as body, right toe reduced to rudimentary. Animal occasionally in gelatinous sheath (Fig. 22,b). Eggs carried attached to parent. Males are toeless.

A population from reservoir Cazalegas were observed with large resting eggs (Fig. 22 c-f), of approximately 120 μm present both in side the animals and detached too. Koste (1978) included *Trichocerca chattoni* (Beauchamp, 1907). A warm stenoterm, as a variety of *T. cylindrica* (*T. cylindrica chattoni*). Size is the main difference between the two taxa and, indeed it maybe a case of cyclomorphosys. Guiset (1976) called this species.

Geographical distribution. Cosmopolite if both taxa are considered a unique species (i.e. *T. cylindrica* has holarctic distribution; *T. cylindrica chattoni* is pantropical and pansubtropical). It is found mostly in the western regions of the Iberian Peninsula.

Distribution in reservoirs. In the 1987/88 survey it has been found in 21 localities (only 19 in summer). Frequent in reservoirs in the NW of the

Iberian Peninsula and in the basin of the river Guadalquivir (Fig. 23).

Trichocerca porcellus (Gosse, 1886) (Fig. 23; Fig. 24 e,f)

Diurella tigris Bory de St. Vincent, 1824; *Monocerca porcellus* Gosse, 1886; *Coelopus porcellus*, Hudson & Goose, 1886; *Rattulus tigris* Stenroos, 1898; *Diurella orceklus*, Jennings, 1903.

Ecology. Heleoplanktonic species, it is preferentially found in oligosaprobic waters. It lays its eggs inside algae (*Aglaucoseria*, *Fragillaria* and *Dinobryon*).

Cond: 92 $\mu\text{S cm}^{-1}$; Alk: 332.6 peq l^{-1} ; pH: 7.1; Temp: 9.5 $^{\circ}\text{C}$

Morphological features of interest. Short, plump, distinctly curved body. Head sheath separated by constriction. Two anterior dorsal cusps, the right one slightly curved. Two toes, the left longer, the right shorter, usually held against ventral abdomen. When the animal is preserved and contracts, cephalic margin may resemble the head of a "little pig". *Trophi* is strongly asymmetric, with left manubrium robust and crooked. The left ramus presents an alula that is much longer than the right one. The specimens live longer in alkaline than in acid waters. The species may be confused with *T. musculus*, but the mastax presents differential features (Shiel & Koste, 1992).

Geographical distribution. Cosmopolite. It has previously been found in SE Spain by Rojo & Oltra (1986). One would expect a wider distribution.

Distribution in reservoirs. It has been found in Forcadas (13), in winter.

Trichocerca pusilla (Lauterborn, 1898)

Mastigocerca pusilla, Lauterborn, 1898; *Rattulus pusillus* Jennings, 1903; *Trichocerca pusilla*, after Harring, 1913.

Ecology. Heleoplanktonic species. Eurytopic, may be found in a wide range of salinities. Some species of the genus *Brachionus* occasionally have subitaneous eggs fixed in the lorica. It may suck the content of the eggs of other plankton rotifer species (Pourriot, 1970).

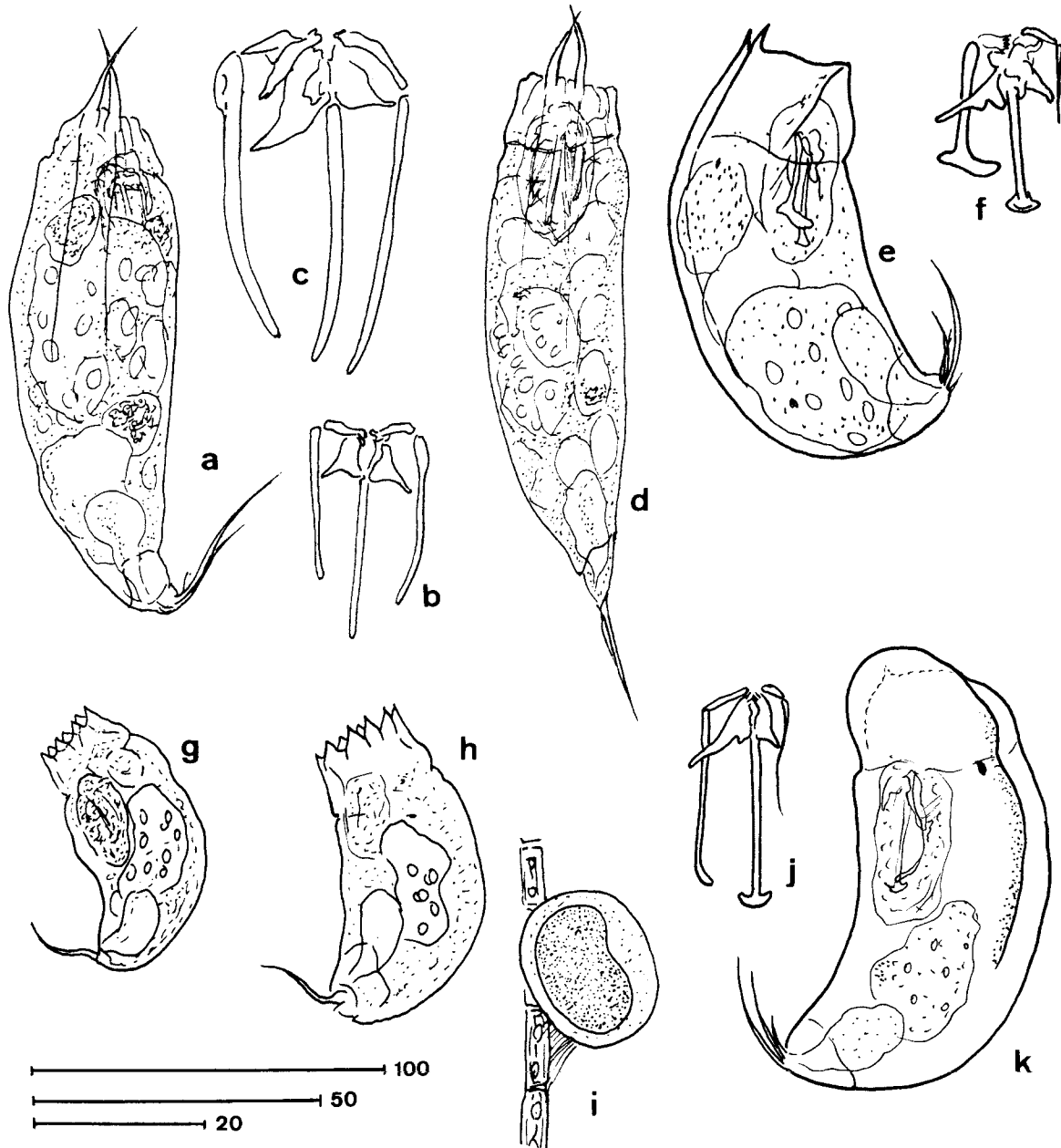


Figure 24. Some *Trichocerca* species found in plankton samples from Spanish reservoirs during the 87/88 survey. Scale bars in μm (100 μm for micrographs of bodies, 50 μm for mastax, 20 for mastax c). a-d, *T. similis*, a,b from Velle, c,d, from San Esteban; e, f, *T. porcellus*, from Forcadás; g-i, *T. rousseletti*, from Salime, i, amictic egg in *Aulacoseira granulata*; j, k *T. vernalis*, from Burguillo. *Algunas especies de Trichocerca identificadas en los embalses españoles (estudio 87/88)*. Escala lineal en μm (100 para el cuerpo, 50 par el mastax, 20 para el mastax c). a-d, *T. similis*, a,b de Velle, c,d, de San Esteban; e, f, *T. porcellus*, de Forcadás; g-i, *T. rousseletti*, de Salime, i, huevos amicticos en *Aulacoseira granulata*; j, k *T. vernalis*, de Burguillo.

Cond: 44-932 $\mu\text{S cm}^{-1}$; Alk: 273-2353.25 $\mu\text{eq l}^{-1}$; pH: 7.2-9.6; Temp: 10-26.2 $^{\circ}\text{C}$

Morphological features of interest. Small pyriform to fusiform body (70 - 120 μm), Left toe slightly shorter than body. Red eye dorsal to brain. Asymmetric mastax; rami with robust, outwardly directed alulae; left manubrium weakly curved, right manubrium shorter.

Geographical distribution. Cosmopolite. Found in numerous mainland localities. It is probably widespread throughout the Iberian Peninsula.

Distribution in reservoirs. Occasionally found in plankton samples from reservoirs, both in sum-

mer and in winter. In the 1987/88 survey it was found in six reservoirs.

Trichocerca rousseleti (Voigt, 1902) (Fig. 23; Fig. 24 g-i)

Coelopus rousseleti Voigt, 1901; *Mastigocerca minima*, Skorikov, 1913; *Diurella rousseleti* Jennings, 1903.

Ecology. Euplanktonic species, cold stenoterm. Often associated to algae blooms of *Aglaucoseria*; sometimes *T. rousseleti* attaches its eggs to the cells of this diatom genus (Fig. 24 i).

Cond: 48.2-84.6 $\mu\text{S cm}^{-1}$; Alk: 255-502 $\mu\text{eq l}^{-1}$; pH: 7-7.2; Temp: 9.6-11.4 $^{\circ}\text{C}$

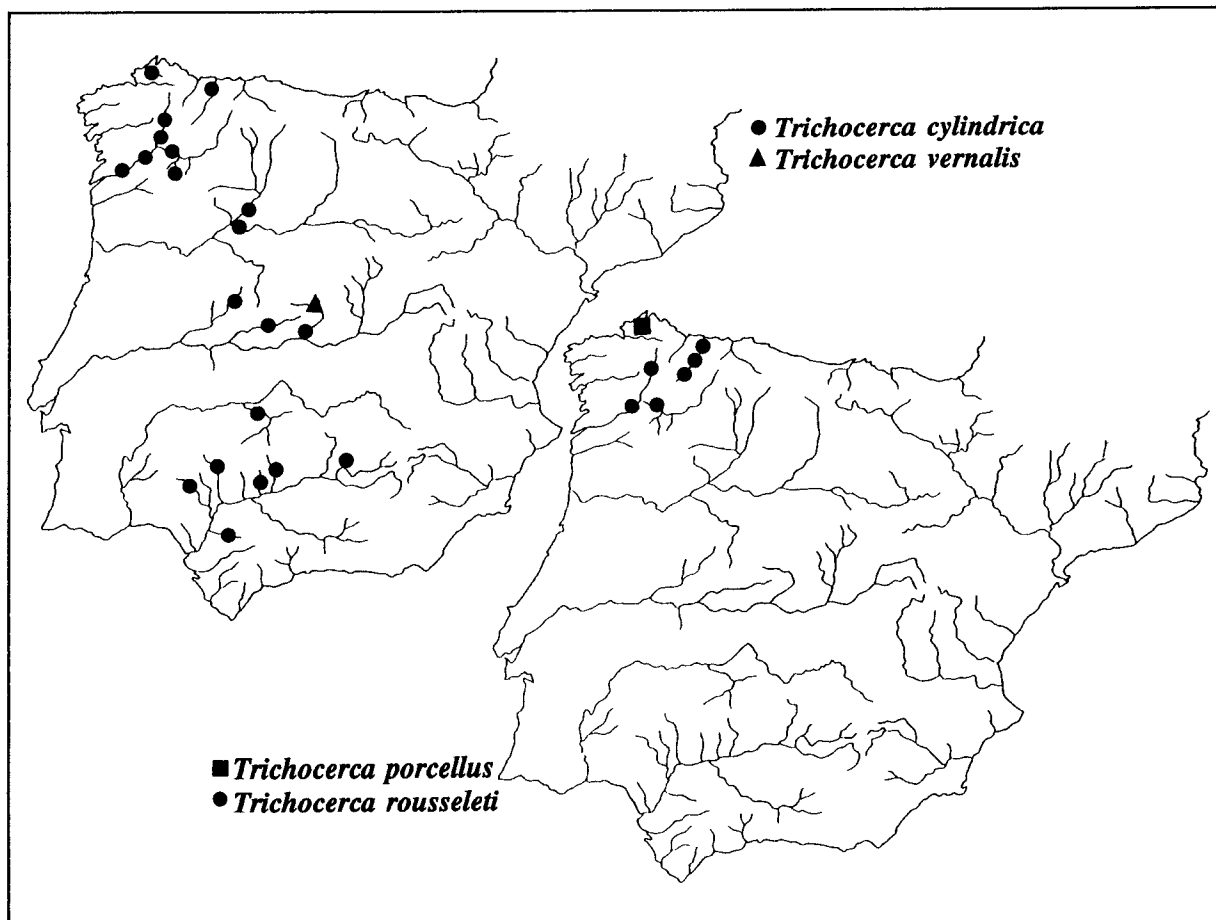


Figure 23. Distribution of some species of the genus *Trichocerca* (survey 1987/88). *Distribución de algunas especies del género Trichocerca (estudio 87/88).*

Morphological features & interest. Squared body, with arched dorsum. Anterior lorica margin with 8-9 projecting serration. Head clearly distinguished by transverse suture. Right toe about one half of the left, slender, easily overlooked. May be confused with *T. stylata*, but *T. rousseleti* is slightly shorter and the ramus presents a bifurcate alulae.

Geographical distribution. Probably cosmopolite. In Spain it has only been collected in reservoirs and in Pyrenean lakes (Miracle, 1978).

Distribution in reservoirs. It has been found in winter, in six reservoirs from the northwest Spain (Fig. 23).

Trichocerca similis (Wierzejski, 1893) (Fig. 23; Fig. 24 a-d)

Coelopus similis Wierzejski, 1893; *Rattulus bicornis*, Western, 1893; *Mastigocerca wolgensis* Meiszner, 1902; *Mastigocerca heterostyla* Daday, 1903.

Ecology. Planktonic species. It seems to prefer warmer waters. Its feeds on cryptomonadaceae and chrysophyceae, specially *Mallomonas* and *Dinobryon* (Pourriot, 1970). *T. similis* attaches its asexual eggs to other plankters. It is a common prey of predators rotifers as *Asplanchna* and *Ploesoma* (Guiset, 1977c).

Cond: 14.7-5326.6 $\mu\text{S cm}^{-1}$; Alk: 74.7-3882 peq l^{-1} ; pH: 7-9.63; Temp: 9.53-26.2 °C

Morphological features & interest. Fusiform body. Head sheath marked by distinct suture. Two characteristic slender, unequal occipital spines; two low keels extend back from spines. Foot with two unequal toes, about one third of total body length.

Geographical distribution. Probably cosmopolite. In the Iberian Peninsula it is widespread. It is also common in the Balearic archipelago (De Manuel *et al.*, 1992).

Distribution in reservoirs. It is the most common species of the genus *Trichocerca* collected in Spanish reservoirs. In the 1987/88 survey it was found in 38 samples (preferentially in summer), corresponding to 35 localities. In the 1972/76 survey it was collected in 41 reservoirs, though rarely in the Duero and Ebre river basins.

Trichocerca stylata (Gosse, 1851)

Monocerca stylata Gosse, 1851; *Diurella stylata* Eyfert, 1878; *Mastigocerca stylata* Hudson & Goose, 1886; *Rattulus stylatus* Jennings, 1903; *Trichocerca*

stylata after Harring, 1913..

Ecology. Planktonic species. Found in small waterbodies, but also in lakes and reservoirs. Occasionally this species may attach subitaneous eggs onto other planktonic rotifers. As well as *T. pusilla*, this species also feeds on the eggs of other planktonic rotifers (Pourriot, 1970).

Cond: 27 $\mu\text{S cm}^{-1}$; Alk: 107.3 peq l^{-1} ; pH: 7.1; Temp: 6.4 °C

Morphological features & interest. Body irregular in form, integument very flexible. Foot about one half of total body length. Trophi asymmetric, fulcrum hammer-shaped and left manubrium larger than right. May be easily confused with *T. Pusilla*. Indeed Ruttner-Kolisko, (1974) suggests that both are forms of the same species.

Geographical distribution. Cosmopolite. It has only been collected in the north-east of the Iberian peninsula by Margalef (1948a), and more recently also in artificial waterbodies in Menorca (De Manuel *et al.* 1992).

Distribution in reservoirs. It has been found in winter in El Vado (38) and in summer in Mao (99).

Trichocerca vernalis Hauer, 1936 (Fig. 23; Fig. 24 j,k)

Diurella vernalis Hauer, 1936; *Trichocerca vernalis*, after Wiszniewski, 1954.

Ecology. Periphytic species, occasionally found in the plankton. Rare, it may be found in ephemeral ponds, but also in reservoirs.

Cond: 47 $\mu\text{S cm}^{-1}$; Alk: 385 peq l^{-1} ; pH: 7.3; Temp: 7.37 °C

Morphological features & interest. Squat, vaulted to conical body. Left anterior margin with large rounded plate. Foot and toes curved forward. Asymmetric trophi, with a relatively big left manubrium, "hoquey-stick"-shaped; right manubrium small, fragile and thin. Details of the mastax help distinguish it from *T. brachiura* (Gosse).

Geographical distribution. Cosmopolite. It is a new record for the Iberian fauna.

Distribution in reservoirs. Several specimens were identified from winter samples of Burguillo (42), a reservoir located in the basin of the river Tajo.

Family GASTROPODIDAE

Genus *Ascomorpha* Perty

Ascomorpha ecaudis (Perty, 1850) (Fig. 25 c; Fig. 26); *Sacculus viridis* Bergendal, 1851; *Ascomorpha helvetica* Perty, 1852; *Ascomorpha germanica*, Leydig, 1854.

Ecology. Planktonic species, occasionally present in periphyton. It prefers warm waters and is more abundant in spring and autumn. According to Pourriot (1965), it feeds on flagellate algae (*Chlamidomonas*, *Trachelomonas*, *Cryptomonas*). Stemberger (1987) noted the importance of the mucus mass for catching food. This mass is found surrounding the animal (may be 1 mm in diameter, but is usually absent in preserved material). Food caught in the mucus is carried to the mouth thanks to a current caused by cilia movement. Mucus also gives protection from some predators. *A. ecaudis* may have symbiotic algae (*Zoochlorella*) within stomach wall cells.

Cond: 282.2 $\mu\text{S cm}^{-1}$; Alk: 2002 $\mu\text{eq l}^{-1}$; pH: 8.14; Temp: 25.10 °C

Morphological features of interest. It is characterized by the presence of four faecal bags forming a square. No apical tentacle. Spiny resting eggs. The analysis of a mastax is necessary to distinguish *A. ecaudis* from other species of the genus. Rami allules are triangular, with characteristic acute margins.

Geographical distribution. Probably cosmopolite. Frequent in Pyrenean lakes (unpublished data). Rare.

Distribution in reservoirs. *A. ecaudis* has only been found in La Minilla (84) in both surveys. Its presence in La Minilla constitutes the Southernmost record of this species in the Iberian peninsula.

Ascomorpha ovalis (Bergendal, 1892) (Fig. 25 d; Fig. 26)

Anapus ovalis Bergendal, 1892; *Chromogaster testudo* Lauterborn, 1893; *Ascomorpha testudo* Zacharias, 1894; *Anapus testudo* Weber, 1898; *Ascomorpha ovalis*, after Carlin, 1943.

Ecology. Planktonic species frequent in lakes and ponds. It prefers alkaline and bicarbonated water. It feeds on dinoflagellates, especially *Ceratium*. Its maxima coincides with those of *Ceratium* (Ruttner-Kolisko, 1974).

Cond: -1107 $\mu\text{S cm}^{-1}$; Alk: 321.3-3711.2 $\mu\text{eq l}^{-1}$; pH: 7.8-9.3; Temp: 24.8-10 °C

Morphological features of interest. Lorica constituted by two plates. Ventral plate oval. Variable number of accretion bodies and chromatophores in stomach wall. Trophi stylet-shaped, with hypofarinx for sucking the contents of *Ceratium* cells. Attachment to algae is done with a sickle-shaped palp.

Geographical distribution. Cosmopolite. Widespread in Spain.

Distribution in reservoirs. It was found to be widespread in Spanish reservoirs, especially in summer. More frequent in the East where waters are typically of moderate to high alkalinity.

Ascomorpha sultans Bartsch, 1870 (Fig. 25 e; 26)

Sacculus hyalinus Kellicott, 1888; *Ascomorpha agilis* Zacharias, 1893; *Ascomorpha hyalina*, Jennings, 1901.

Ecology. Planktonic species, inhabiting pelagic and littoral environments. More frequent in summer and autumn. Like *A. sultans*, its abundance is associated to the developing of *Ceratium*. According to Pourriot (1976), it also feeds on *Uroglena* and peridinidae. *A. saltans* co-occurred in seven localities with *A. ovalis* (Fig. 25), in spite of the fact this last species inhabits more alkaline environments.

Cond: 41-1175 $\mu\text{S cm}^{-1}$; Alk: 6.3-3882 $\mu\text{eq l}^{-1}$; pH: 6.6-9.3; Temp: 6.4-26.7 °C

Morphological features of interest. It presents one large fecal sac (i.e. accretion body). Trophi with well developed manubrium. Like *A. ovalis*, it presents a palp in the apical field. Chromatophores in stomach wall cells.

Geographical distribution. Cosmopolite. In Spain it is common in reservoirs, but there are

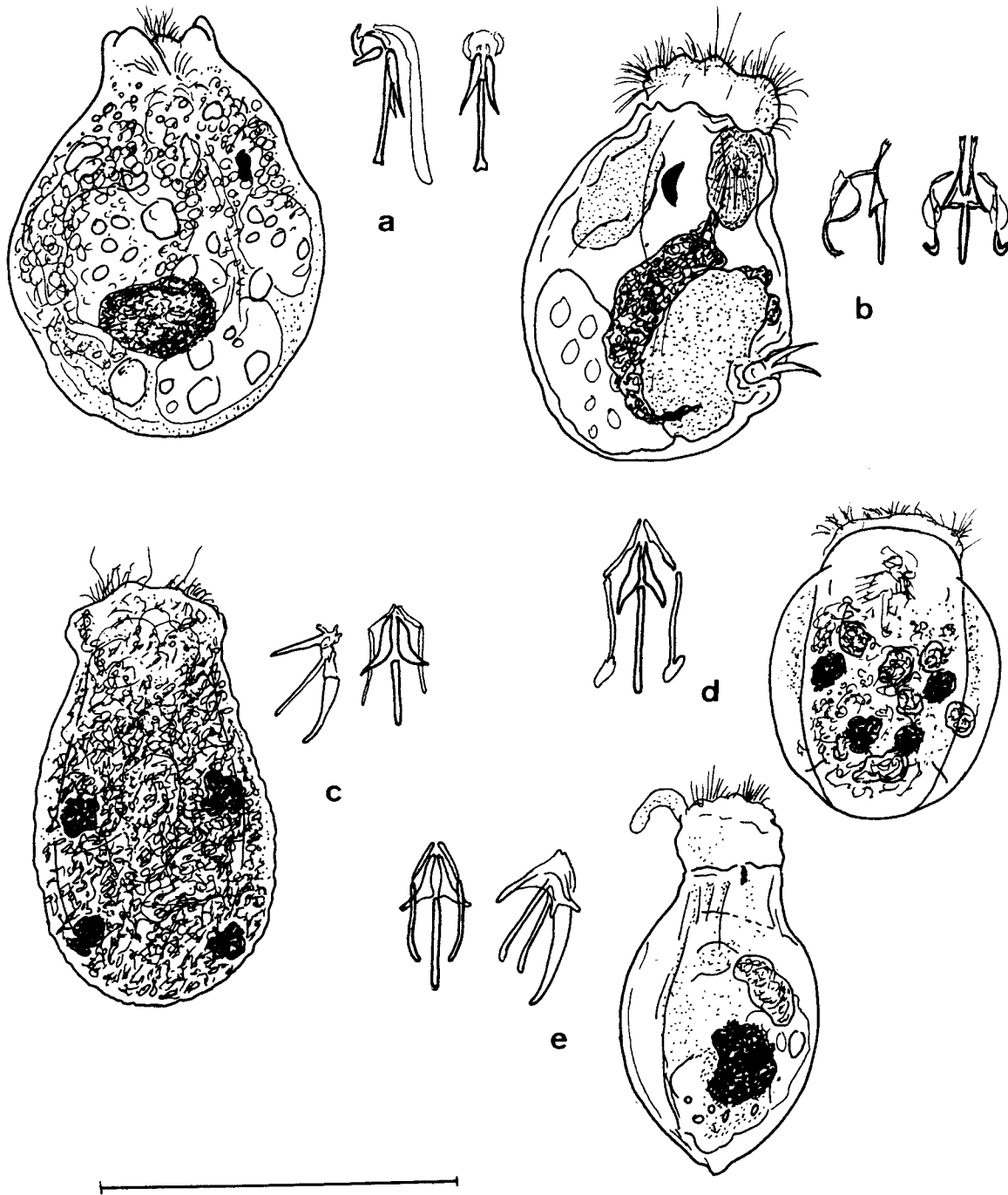


Figure 25. Gastropodidae found in Spanish reservoirs during the 87/88 survey. Scale bar is 100 μm long. a, *Gastropus stylifer*, mastax; b, *Gastropus hyptopus*, mastax; c, *Ascomorpha ecaudis*, mastax; d, *Ascomorpha ovalis*, mastax; e, *Ascomorpha saltans*, mastax. *Gastropodidae* identificados en los embalses españoles (estudio 87/88). Escala: 100 μm . a, *Gastropus stylifer*, mastax; b, *Gastropus hyptopus*, mastax; c, *Ascomorpha ecaudis*, mastax; d, *Ascomorpha ovalis*, mastax; e, *Ascomorpha saltans*, mastax.

few records in other environments. However, one would expect a more widespread distribution.

Distribution in reservoirs. High occurrence in reservoirs, especially during the stratification period. It has been collected in 20 localities on which four samples were taken in winter.

Genus *Gastropus* Perty

Gastropus hyptopus (Ehrenberg, 1838) (Fig. 25 b; Fig. 26)

Notommata hyptopus Ehrenberg, 1838; *Notops hyptopus* Hudson & Gosse, 1886; *Gastropus hyptopus* after Weber, 1898.

Ecology. Euplanktonic species, cold sterno-term. It feeds on *Peridinium*, but in warmer waters. It may feed on *Sinura* (Pourriot, 1965).

Cond: 50 $\mu\text{S cm}^{-1}$; Alk: 98 $\mu\text{eq l}^{-1}$; pH: 6.3; Temp: 9.5 °C

Morphological features of interest. Ventral foot bisegmented, ending with two acute toes. Sometimes difficult to distinguish in preserved material. Rami with anterior margin finely serrated. Vitellarium with 15 or more nuclei. Eyespot red and large.

Geographical distribution. Recorded in Europe, Asia and North-America, but probably cosmopolite. Rare, it is the first record for the rotifer Iberian fauna.

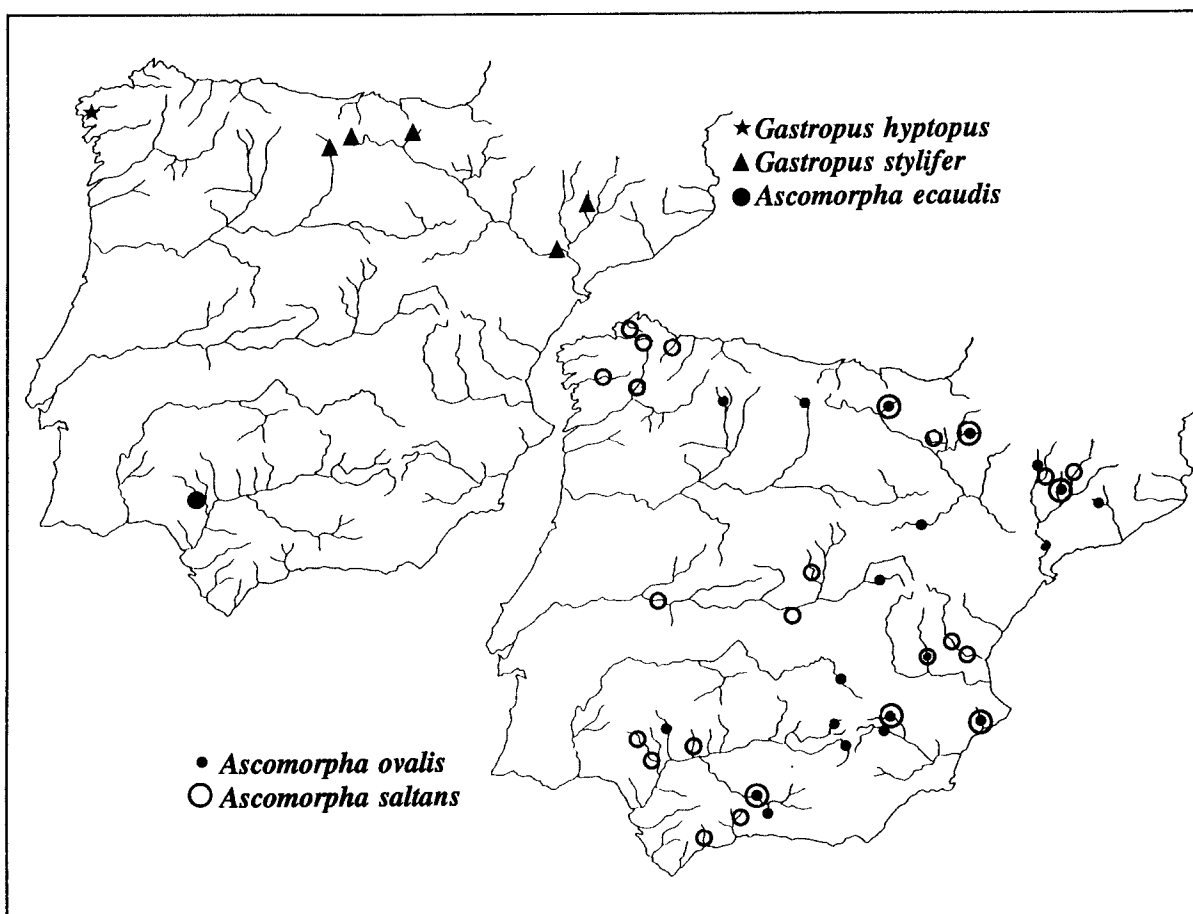


Figura 26 Distribution of some species of the family Gastropodidae in Spanish reservoirs (survey 1987/88). *Distribución de algunas especies de la familia Gastropodidae en los embalses españoles (estudio 87/88).*

Distribution in reservoirs. It has been found in winter samples from the reservoir Fervenza (15), the Westernmost reservoir of those studied under a oceanic-marine climatic regime.

Gastropus stylifer (Imhof, 1891) (Fig. 25; Fig. 26)

Notops pigmaeus Calman, 1892; *Hudsonella picta* Zacharias, 1893; *Sacculus orbicularis* Kellicott, 1897.

Ecology. Planktonic species. Warm stenoterm. According to Braioni & Gelmini (1983) this species is found in assembly with some colonial algae like *Volvox* and *Dinobryon*.

Cond: 197.2-1065 $\mu\text{S cm}^{-1}$; Alk: 1210.3-3486 peq l^{-1} ; pH: 7.8-8.4; Temp: 10.6-21 $^{\circ}\text{C}$

Morphological features of interest. Ventral foot, protruding from the middle of the body; one triangular toe. Anterior margin of cuticle undulated (this character may be observed in contracted specimens). Vitellarium with 4-8 nuclei. Tube of prepharynx long and slender for sucking cell content of dinoflagellates.

Geographical distribution. Cosmopolite. In the Iberian peninsula it has only been found in reservoirs and in plankton samples from some Pyrenean ponds (unpublished data).

Distribution in reservoirs. It has been found distributed across the basin of the river Ebro: i.e. Ebro, (6); Urrunaga, (4); Sta. Anna, (93); Mequinenza, (4). In the previous 1972/76 survey, it was collected in two Northern reservoirs, too.

Family SYNCHAETZDAE

Genus *Polyarthra* Ehrenberg

Polyarthra dolichoptera (Idelson, 1925) (Fig. 27)

Polyarthra platyptera var. *dolichoptera* Idelson, 1925; *Polyarthra dolichoptera*, after Carlin, 1943.

Ecology. Euplanktonic species; cold stenoterm, it tolerates low oxygen concentrations (Ruttner-Kolisko, 1974). Pourriot (1977) found that *Polyarthra* feeds on mainly cryptomanadaceae, chrysophyceae and central diatoms. Guiset (1977c) frequently found *P.*

dolichoptera in the stomach contents of *Asplanchna* and *Ploesoma*.

Cond: 27-3590 $\mu\text{S cm}^{-1}$; Alk: 98-387 peq l^{-1} ; pH: 6.33-9.18; Temp: 5.9-26.2 $^{\circ}\text{C}$

Morphological features of interest. *Polyarthra* is a genus with controversial systematics. For instance, it is difficult to discriminate between *P. dolichoptera* and *P. vulgaris* only attending to morphology. Both species have ventral finlets, but with differences difficult to distinguish under an optic microscope (Fig. 27 h,i). Lateral blades of *P. vulgaris* are relatively broader and shorter than in *P. dolichoptera*, with differences in the serrated margins (Fig. 27 f). The body of *P. dolichoptera* is slightly smaller than that of *P. vulgaris*. Resting eggs are always double-shelled with folded skin within shells (Fig. 27). There are also differences between both species in mastax morphology, specially in details of frami (Koste, pers. com.). Guiset (1977b) distinguishes *Polyarthra* species by measuring the dimensions of diagnostic traits: fulcrum length, resting egg and subitaneous egg diameters. Pejler (1956) maintained introgression between both species to explain that some individuals can have intermediate characters between both species (Fig. 27 j,k).

Geographical distribution. Cosmopolite. It is widespread throughout the Iberian Peninsula, but it is likely that some records of *P. dolichoptera* in reality correspond to *P. vulgaris* and viceversa.

Distribution in reservoirs. It is very common and its occurrence is higher in winter than in summer. In some reservoirs it may be confined to the hypolimnion during the stratification period. In the 1987/88 survey it was collected in 31 localities in winter and 14 in summer.

Polyarthra euryptera (Wierzejski, 1893) (Fig. 27; Fig. 28)

Polyarthra platyptera var. *euryptera* Wierzejski, 1893.

Ecology. Euplanktonic species. Warm stenoterm. It prefers low alkalinity and eutrophic waters. Seasonal in Mediterranean latitudes, with maxima in summer. More abundant in the epilimnion during the stratification period. *P.*

euryptera may be occasional prey for some predator rotifers such as *Asplanchna girodi* and *Ploesoma hudsoni* (Guiset, 1977 c).

Cond: 14-1175.6 $\mu\text{S cm}^{-1}$; Alk: 58.2-3711.2 $\mu\text{eq l}^{-1}$; pH: 6.3-9.9; Temp: 5.9-24.9 °C

Morphological features of interest. Large (150-170 μm). Vitellarium with 12 nuclei. Blades feather-like, broad (30 - 70 μm), shorter than the body length, with a serrated margin and lateral nerves (Fig. 27 c). No ventral finlets. Resting eggs large (85-110 μm), usually double-shelled, with folded skin between shells (Fig. 27 b).

Geographical distribution. Cosmopolite. In the Iberian Peninsula it has been found in various localities, mainly in reservoirs (Guiset, 1976).

Distribution in reservoirs. In the 1987/88 survey it was found in 13 reservoirs, nine in the stratification period and five in the mixing period. Guiset (1976), in the previous survey, found it in 40 localities, more often in reservoirs in the NW of Spain.

Polyarthra major (Burckhardt, 1900) (Fig. 27; Fig. 28)

Polyarthra platyptera var. major Burckhardt, 1900.

Ecology. Euplanktonic species, eurithermic in oligotrophic waters. In large waterbodies it often co-occurs with other species of the genus (Table 3). It has been found in the stomach content of *Asplanchna girodi* (Guiset 1977 c).

Cond: 14-1423.5 $\mu\text{S cm}^{-1}$; Alk: 58.2-3711.2 $\mu\text{eq l}^{-1}$; pH: 6.3-10; Temp: 6.45-25.5 °C

Morphological features of interest. No ventral finlets. Blades broad (20- 30 μm), feather-shaped (Fig. 27 b); length of blades less than a body length. Body larger than *P. vulgaris* and *P. dolichoptera*. Vitellarium with 8 nuclei.

Geographical distribution. Cosmopolite. It has been found throughout the Iberian Peninsula.

Distribution in reservoirs. Relatively higher occurrence during the stratification period. Frequently in both summer and winter samples (i.e. found in 51 reservoirs in winter and in 46 reservoirs in summer).

Polyarthra remata (Skorikov, 1896)(Fig. 27; Fig. 28)

Polyarthra platyptera var. remata Skorikov, 1896.

Ecology. Planktonic species, occasionally found in littoral environments. Miracle (1976) found it in Lake Banyoles (NE Spain). Its abundance is strongly correlated with temperature. It prefers to alkaline waters. It feeds mainly on flagellates. It is often found associated to other species of *Polyarthra*. It is usually prey to *Ploesoma hudsoni* and species of the genus *Asplanchna* (Guiset, 1977 c).

Cond: 14.7-3590 $\mu\text{S cm}^{-1}$; Alk: 74.7-3871.7 $\mu\text{eq l}^{-1}$; pH: 6.64-10; Temp: 6.4-25.7 °C

Morphological features of interest. It is the smallest species of the genus (<120 μm) found in reservoirs. Blades serrated, sword-shaped (Fig. 27 g) and of equal length; longer than body. No ventral finlets. The number of nuclei and the absence of ventral finlets permit to distinguish this species from *P. dolichoptera*. Both species may be easily confused in preserved material.

Geographical distribution. Cosmopolite. Widespread throughout all the Iberian Peninsula.

Distribution in reservoirs. Frequent in stratification and mixing periods. It has been found in more than half of reservoirs (Fig. 28).

Polyarthra vulgaris (Carlin, 1943) (Fig. 27)

Polyarthra trigla Ehrenberg, 1834; *Polyarthra trigla vulgaris* Pourriot, 1965.

Ecology. Euplanktonic species. Euritherm and perennial. It prefers superficial waters and very oxygenated environments (it is rarely found in hypolimnion). According to Pourriot (1977) it feeds on cryptomonadaceae, chrysophyceae and central diatoms. Guiset (1977c) found *P. vulgaris* was a frequent prey of *Asplanchna* and *Ploesoma*.

Cond: 14-3720 $\mu\text{S cm}^{-1}$; Alk: 68.3-4681.7 $\mu\text{eq l}^{-1}$; pH: 6.6-9.9; Temp: 5.9-26.7 °C

Morphological features of interest. Ventral finlets setiform and smooth (Fig. 27 h). Vitellarium with eight nuclei. Blades as long as body (8-20 μm broad), feather-like and slightly serrated (Fig. 27 e,j,k). Form and length of blades are not good characters to separate this species from *P. dolichoptera*. Both species have highly variable

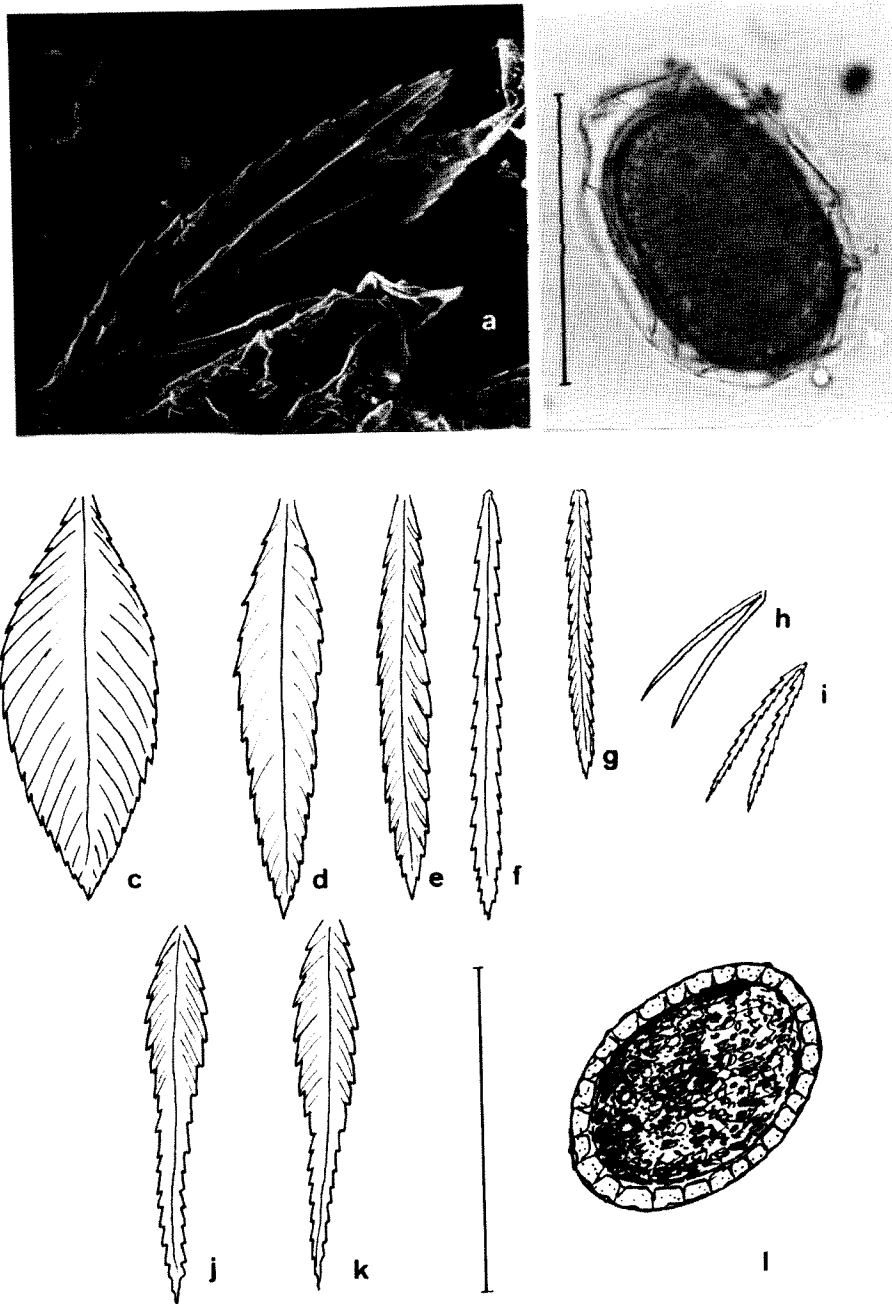


Figura 27. Structures of some species of the genus *Polyarthra* found in Spanish reservoirs during the 87/88 survey. a, blades from *P. major*, from Riudecanyes; b, resting egg from *P. euryptera*, from La Tranquera; c, blades from *P. euryptera*; d, blades from *P. major*; e, blades from *P. vulgaris*; f, blades from *P. dolichoptera*; g, blades from *P. remata*; h, i ventral finlets, h, *P. vulgaris*, i, *P. dolichoptera*; j, k, finlets from inter-medial forms *P. vulgaris/dolichoptera*; l, resting egg from *P. dolichoptera*. Scale bar is 100 μm . *Estructuras de algunas especies del género Polyarthra identificadas en los embalses españoles (estudio 87/88)*. a, apéndice de *P. major*, de Riudecanyes; b, huevo durable de *P. euryptera*, de La Tranquera; c, apéndice de *P. euryptera*; d, apéndice de *P. major*; e, apéndice de *P. vulgaris*; f, apéndice de *P. dolichoptera*; g, apéndice de *P. remata*; h, i apéndices ventrales, h, *P. vulgaris*, i, *P. dolichoptera*; j, k, apéndices de formas intermedias *P. vulgaris/dolichoptera*; l, huevo durable de *P. dolichoptera*. Escala 100 μm .

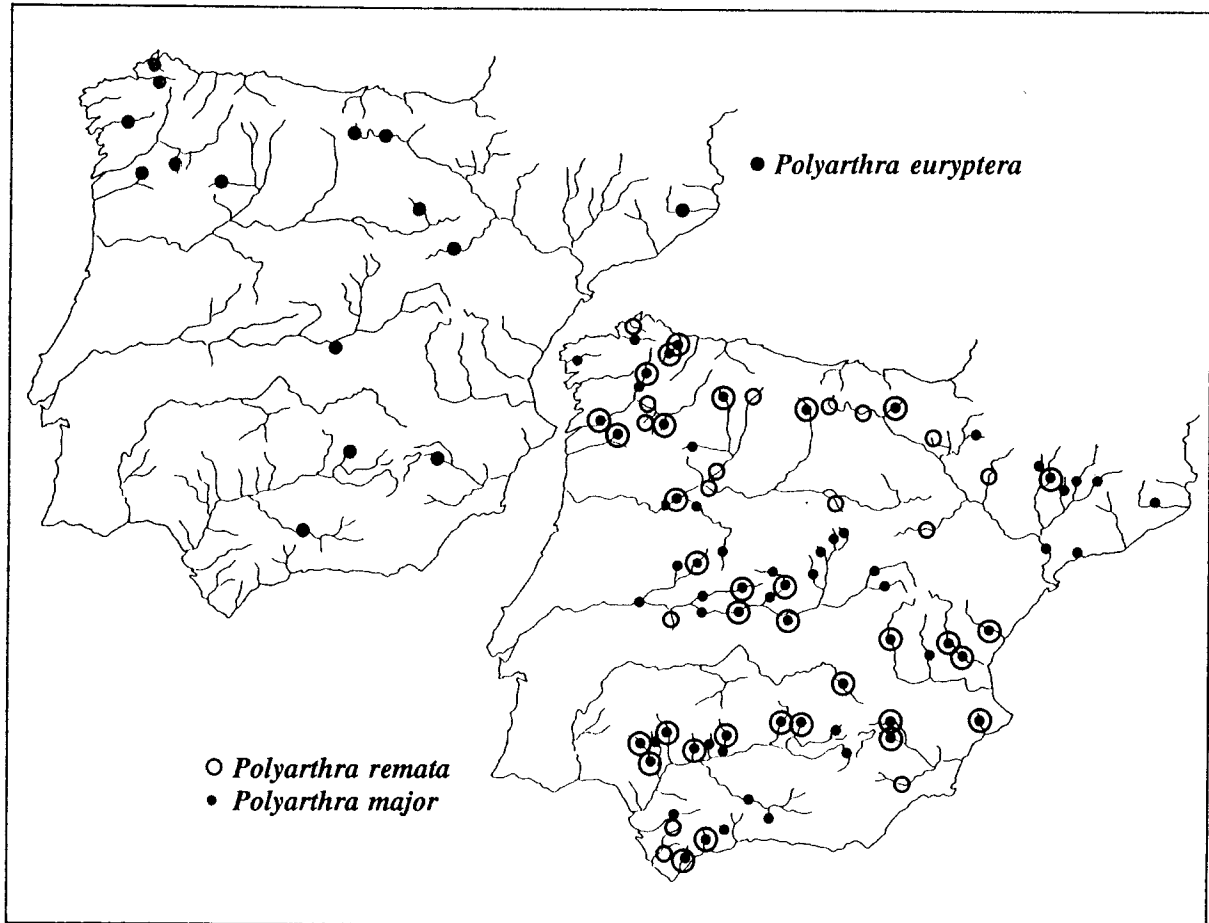


Figure 28. Distribution map for some species of the genus *Polyarthra* (survey 87/88). *Distribución de algunas especies del género Polyarthra (estudio 87/88).*

morphologic characters. It is also possible the hybridization between these two species, (Pejler, 1956).

Geographical distribution. Cosmopolite. It is the species of this genus that is more recorded in Spain. However, as has been pointed out, it is possible some of these records may have confused both species.

Distribution in reservoirs. Very frequent and abundant. In the 1987/88 survey it was found in 75 reservoirs in summer and in 70 in winter.

Genus *Ploesoma (Bipalpus)* Herrick, 1885

Ploesoma hudsoni (Imhof, 1891) (Fig. 31)

Gastropus hudsoni Imhof, 1891; *Gastroschiza flexilis* Jägerskiöld, 1892; *Bipalpus vesiculosus* Wierzejski & Zacharias, 1893; *Dictyonema hypopus* Lauterborn, 1893; *Ploesoma hudsoni* after Jennings, 1894.

Ecology. Euplanktonic. Seasonal, in summer it is found in lakes and in reservoirs of low alkalinity. Rare in ponds, it prefers slightly acid waters, with low mineralization. Omnivore, but considered as carnivore. It feeds on other rotifer species

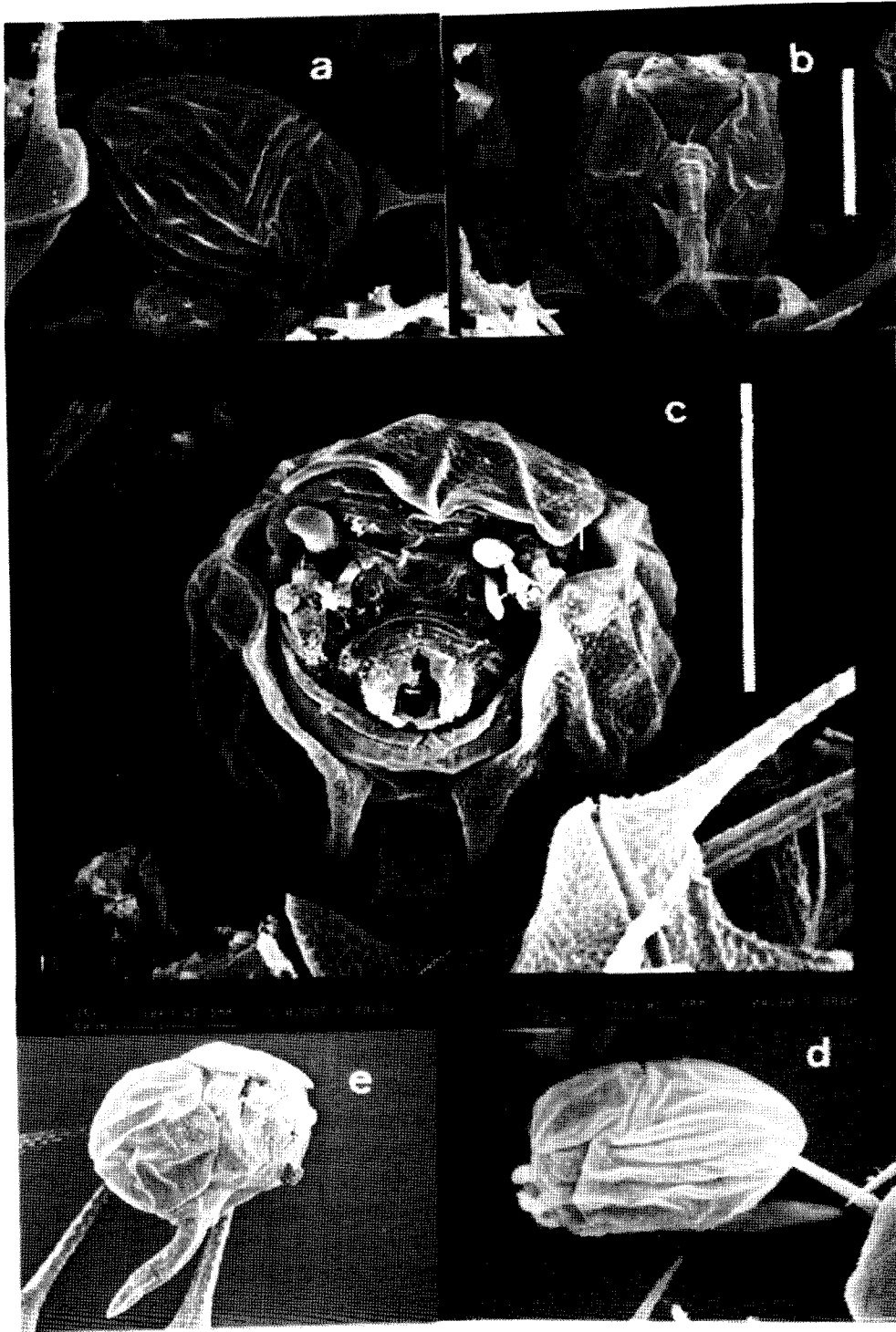


Figure 29. SEM micrographs of *Ploesoma truncatum* (Levander) collected in El Grado. a, dorsal view; b, ventral view; c, frontal view; c, d, lateral views. Scale bar 50 μm . *Microfotografías MEB de Ploesoma truncatum (Levander) muestreado en El Grado. a, vista dorsal; b, vista ventral; c, vista frontal; c, d, vista lateral. Escala lineal 50 μm .*

and various algae. Guiset (1977c), studied the stomach content of some populations of *P. hudsoni*, he found diatoms, dinoflagellates, volvocales, chlorococcales, desmidiaceae and rotifers (species of the genus *Polyarthra*, *Synchaeta*, *Keratella* and *Trichocerca*. As well as *Asplanchna priodonta*, another predator rotifer).

Cond: 14-293 $\mu\text{S cm}^{-1}$; Alk: 58.2-2470 $\mu\text{eq l}^{-1}$; pH: 6.3-9.67; Temp: 7.8-23.9 °C

Morphological features of interest. Large (300 to 600 μm). Lorica presents blisters or vacuoli ventrally situated, giving at the specie a "bubbly" appearance. No ventral furrow. Foot long, annular, ended with two large toes. Head with two finger-like palps. Large virgate trophy, that may be partially projected to catch prey.

Geographical distribution. Holartic (Koste, 1978). In the Iberian Peninsula it has been identified mostly in north-western waterbodies, but also in other northern localities (Margalef, 1973; Miracle, 1978; Telleria, 1981). It is also frequent in Pyrenean lakes (unpublished data).

Distribution in reservoirs. Mostly found in summer, in reservoirs from the north-west of Spain. Frequent in reservoirs of the river Miño basin. It has increased its area of distribution with respect to the previous study of the reservoirs (Fig. 31).

Ploesoma truncatum (Levander, 1894) (Fig. 4. 28; Fig. 31)

Gastroschiza truncata Levander, 1894; *Ploesoma truncatum* after Weber, 1898.

Ecology. Planktonic species. It may also be found in the littoral area, too. Warm stenoterm. It feeds on algae and other rotifers (Koste, 1982).

Cond: 291 $\mu\text{S cm}^{-1}$; Alk: 2206 $\mu\text{eq l}^{-1}$; pH: 8.4; Temp: 18.4 °C

Morphological features of interest. Smaller than *P. hudsoni* (150-300 μm). Lorica ringed with ventral furrow. Head-shield present, without teeth. Eye red. Head with two finger-like palps.

Geographical distribution. Probably cosmopolite. Rare. In Spain it had previously been collected in some reservoirs and in the Lakes of Ruidera (Armengol *et al.*, 1975)

Distribution in reservoirs. In the previous study of the Spanish reservoirs it was found in

Peñarroya (55), in the basin of the river Guadiana. It was then suggested that the species had probably colonized the reservoir from the Lakes of Ruidera (Guiset, 1976). In the 1987/88 survey it was found in El Grado (81), in summer and relatively far away from Peñarroya, suggesting that the species had colonized from Pyrenean lakes (in these, *P. truncatum* has not been recorded yet, but may be highly seasonal and therefore difficult to observe).

Genus *Synchaeta* Ehrenberg, 1832.

Synchaeta kitina (Rousselet, 1902) (Fig. 30 c,d; Fig. 31)

Synchaeta tremula var. *kitina* Rousselet, 1902; *Synchaeta kitina* Stemberger

Ecology. Euplanktonic species, it prefers slightly alkaline waters. High tolerance to salinity. During stratification it inhabits the epilimnion and its abundance is reduced with depth (Guiset, pers. com.). *S. kitina* may carry subitaneous eggs during a short time, but also eggs attached to planktonic diatoms have been also observed.

Cond: 20-1126 $\mu\text{S cm}^{-1}$; Alk: 146.5-3468 $\mu\text{eq l}^{-1}$; pH: 6.2-8.9; Temp: 7.3-24 °C

Morphological features of interest. Cone-shaped body (not contracted specimens). Head more or less flat. Externally very similar to *S. tremula* and *S. oblonga*. Size differences may be found (e.g. *S. kitina* is smaller), in the situation of the lateral antennae (e.g. in the case of *S. kitina* these are located on the base of the foot). All these characters, however, are difficult to see occulted in material that has been preserved. The main diagnostic characters are morphological (Fig. 30 c), particularly the shape and morphology of teeth in uncus (Stemberger, 1979). Resting eggs presents small spines.

Geographical distribution. Cosmopolite. Uniformly distributed throughout the Iberian Peninsula. *S. kitina* occurs mainly in coastal ponds and lagoons (Menéndez & Comín, 1986; Forés *et al.*, 1986; Oltra & Miracle, 1984; Pretus *et al.*, 1992). It is difficult to distinguish from other species of its genus (e.g. *S. littoralis*, Rousselet), which can be found the same environments.

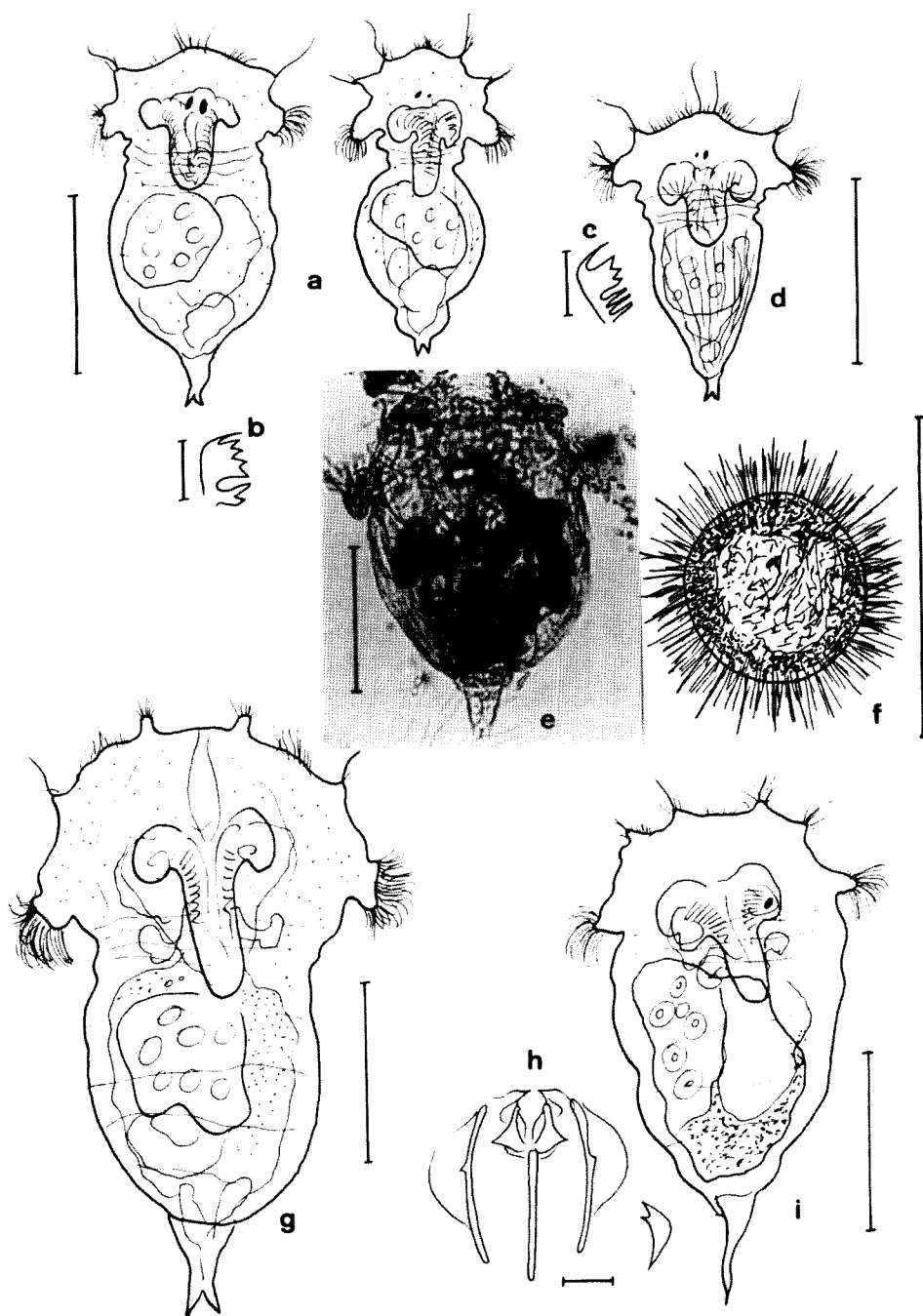


Figure 30. Species of the genus *Synchaeta* found in Spanish reservoirs during the 87/88 survey. Scale bars are 100 μm long except for photographs of mastax which are 20 μm long. a, b, *S. oblonga*, (left) from Boadella, (right) from Aldeávila, b, detail of unci; c, d, *S. kitina*, from Boadella, c detail of unci; e, g, *S. pectinata*, e, infected by *Bertramia aspersifera* from Forcadás, g, from Boadella; h, i, *S. stylata*, from Boadella, h, mastax and detail from unci. *Especies del género Synchaeta muestreadas en los embalses españoles (estudio 87/88)*. Escala: 100 μm excepto para mastax: 20 μm . a, b, *S. oblonga*, (izquierda) de Boadella, (derecha) de Aldeávila, b, detalle del unci; c, d, *S. kitina*, de Boadella, c detalle del unci; e, g, *S. pectinata*, e, infectado por *Bertramia aspersifera* de Forcadás, g, de Boadella; h, i, *S. stylata*, de Boadella, h, mastax y detalle del unci.

Distribution in reservoirs. In the 1987/88 study this species was not as abundant as other species of the genus. It was found in six reservoirs in summer and 11 in winter. In the 1972/76 study of the reservoirs its recorded occurrence was higher (37 localities).

Synchaeta oblonga (Ehrenberg, 1832) (Fig. 30 a,b)

Synchaeta neglecta Zacharias, 1901; *Synchaeta pectinata f. minor* Wesenberg-Lund, 1930.

Ecology. Euplanktonic species. Euritherm, but its abundance is higher in winter. More frequent in alkaline and eutrophic waters. High tolerance to salinity. It feeds on cryptomonadaceae and central diatoms (Pourriot, 1970). It often carries its eggs during a short time. *S. oblonga* is a common prey of *Asplanchna* (Guiset, 1977c).

Cond: 35-5326.6 $\mu\text{S cm}^{-1}$; Alk: 58.2-4681.7 peq l^{-1} ; pH: 6.3-8.8; Temp: 5.9-22.8 $^{\circ}\text{C}$

Morphological features of interest. Body well-shaped (<250 μm), head convex. No apical tentacles and double cerebral eye. Smaller than *S. pectinata*. However, in fixed specimens size is not sufficient to distinguish them and it is often necessary to examine mastax morphology. Specifically, size of the trophy and the unc comb-like ends (Fig. 30 b), are the characters to look for. Confusion is common with *S. kitina* and *S. tremula*, which may coexist. Carlin (1943) and Pejler (1957) suggested that *S. oblonga*, *S. tremula* and *S. lakowitziana*, were considered to be the same species, but later Pejler (1962) recognized them as three separate species. Ruttner-Kolisko (1974) grouped these three taxa (*Synchaeta g. tremula-oblonga*). Perhaps a revision of the genus is necessary, for example, the morphology of the mastax under SEM as a diagnostic criterion.

Geographical distribution. Cosmopolite. In the Iberian Peninsula it has been recorded mostly in reservoirs.

Distribution in reservoirs. It was one of the most common rotifers in the 1987/88 survey mainly during the mixing period (58 reservoirs). In the 1972/76 study it was found in only 21 localities.

Synchaeta pectinata (Ehrenberg, 1832) (Fig. 30 e,g)

Synchaeta inordax Gosse, 1851; *Hydatina pectinata* Acloque 1899.

Ecology. Euplanktonic species. Eurioic, perennial, it presents its maxima at low temperature. It may inhabit both small and large waterbodies. Phytophagous, it feeds on cryptomonadaceae, chrysophyceae, and central diatoms (Pourriot, 1970). It is frequently found infected by the microsporid *Plistophora (Bertramia) asperspora* (Fig. 30 e).

Cond: 14-1522.6 $\mu\text{S cm}^{-1}$; Alk: 58.2-4681.7 peq l^{-1} ; pH: 6.3-9.3; Temp: 5.9-25.5 $^{\circ}\text{C}$

Morphological features of interest. It presents two bristle-bearing apical tentacles. Length < 510 μm . Single eye. Teeth with pointed tips. Asexual eggs with oil drops and gelatinous case; resting eggs with blisters or short spines. Short foot, of conical shape, with two equal and relatively short toes. Vitellarium with eight large nuclei. Ruttner-Kolisko (1974) defined the *stylata-pectinata* group, constituted by a series of closely-related and very similar species.

Geographical distribution. Cosmopolite. *S. pectinata* is a widespread species in Spain.

Distribution in reservoirs. In the 1987/88 survey it was found in 30 reservoirs in summer and in 59 in winter. No pattern of distribution was apparent.

Synchaeta stylata (Wierzejski, 1893) (Fig. 30 f,h,i; Fig. 31)

Synchaeta wesenberg-lundi Pejler, 1957.

Ecology. Euplanktonic species, inhabitant of large waterbodies. Warm stenoterm; markedly seasonal (summer).

Cond: 47.3-1423.5 $\mu\text{S cm}^{-1}$; Alk: 225-3562.5 peq l^{-1} ; pH: 7.1-9.9; Temp: 8.7-25.5 $^{\circ}\text{C}$

Morphological features of interest. Body bell-shaped, or as a plump to slender cone. Head convex, no apical tentacles. Very similar to *Synchaeta pectinata*, but terminated with a slender foot with a long toe. Subitaneous eggs with oil drops and long thin bristles (Fig. 30 f). Teeth with pointed tips (Fig. 30 h).

Geographical distribution. Cosmopolite. It presents a northern distribution in Spain, but it

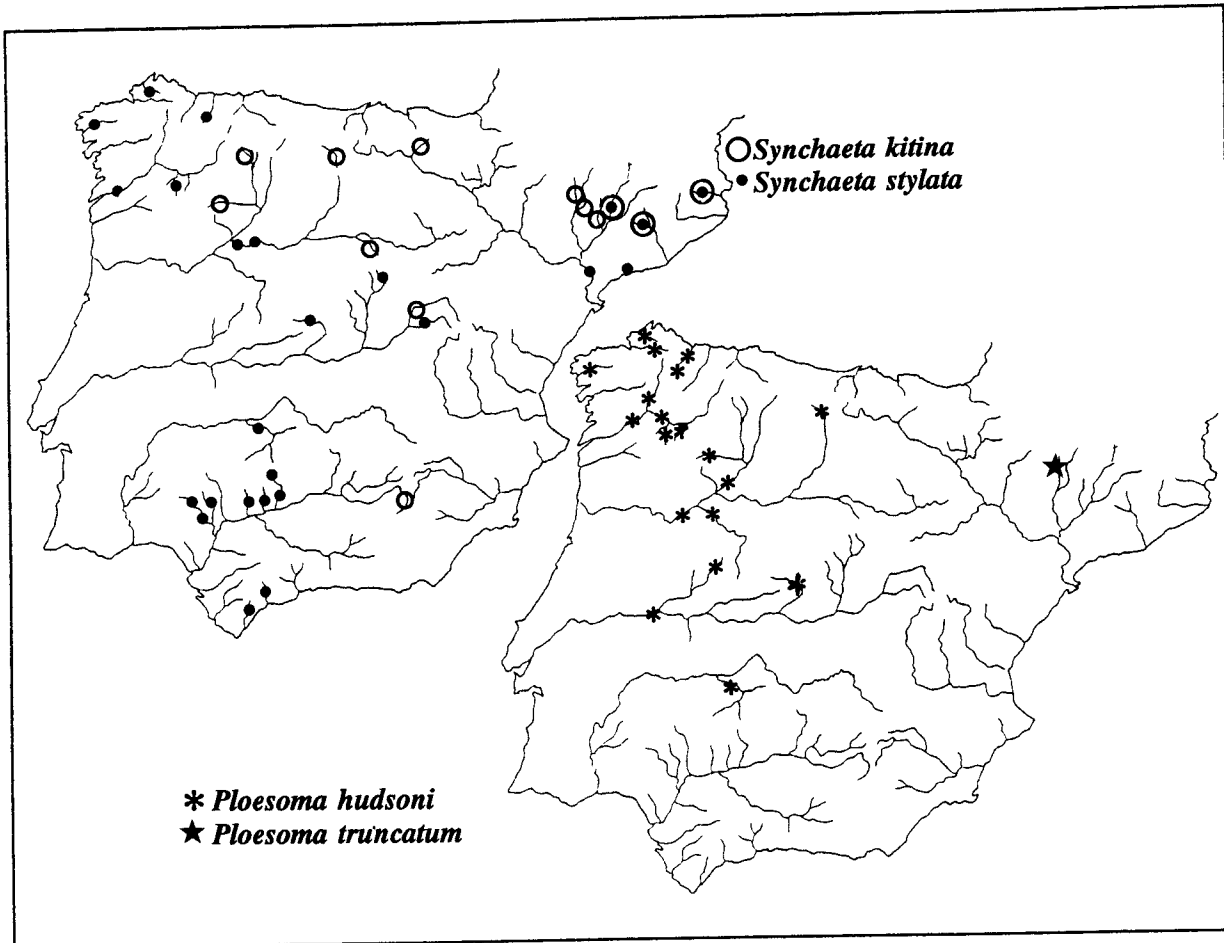


Figure 31. Distribution of some species of the genera *Synchaeta* and *Ploesoma* in Spanish reservoirs found during the 87/88 survey. *Distribución de algunas especies del género Synchaeta and Ploesoma en los embalses españoles (estudio87/88).*

has been found in the Delta de l'Ebre (Forés *et al.* 1986).

Distribution in reservoirs. It has extended its distribution. In the 1987/88 survey it was collected in 20 reservoirs in the stratification period and two during the mixing period. Previously, it had only been found in six reservoirs.

Family *ASPLANCHNIDAE*
Genus *Asplanchna* Gosse

Asplanchna brightwelli Gosse, 1850 (Fig. 32 d; Fig. 3.32)

Asplanchna bowesii Gosse, 1850; *Ascomorpha anglica* Perty, 1852; *Notommata anglica* Leydig, 1854; *Apus anglica* Schoch, 1886; *Apus ceylonica* Daday, 1898.

Ecology. Euplanktonic species. It feeds mainly on rotifers, but its diet is also composed by crustacean nauplii and a variety of algae. According to Salt (1977), *A. brightwelli* and *A. girodi* are food competitors. Guiset (1977c) found that *A. brightwelli* feeds positively selecting specimens of *Synchaeta*, *Polyarthra vulgaris/dolichoptera*, *P. remata*, *Pompholyx sulcata* and also *Filinia* and *Trichocerca* individuals, but shows negative

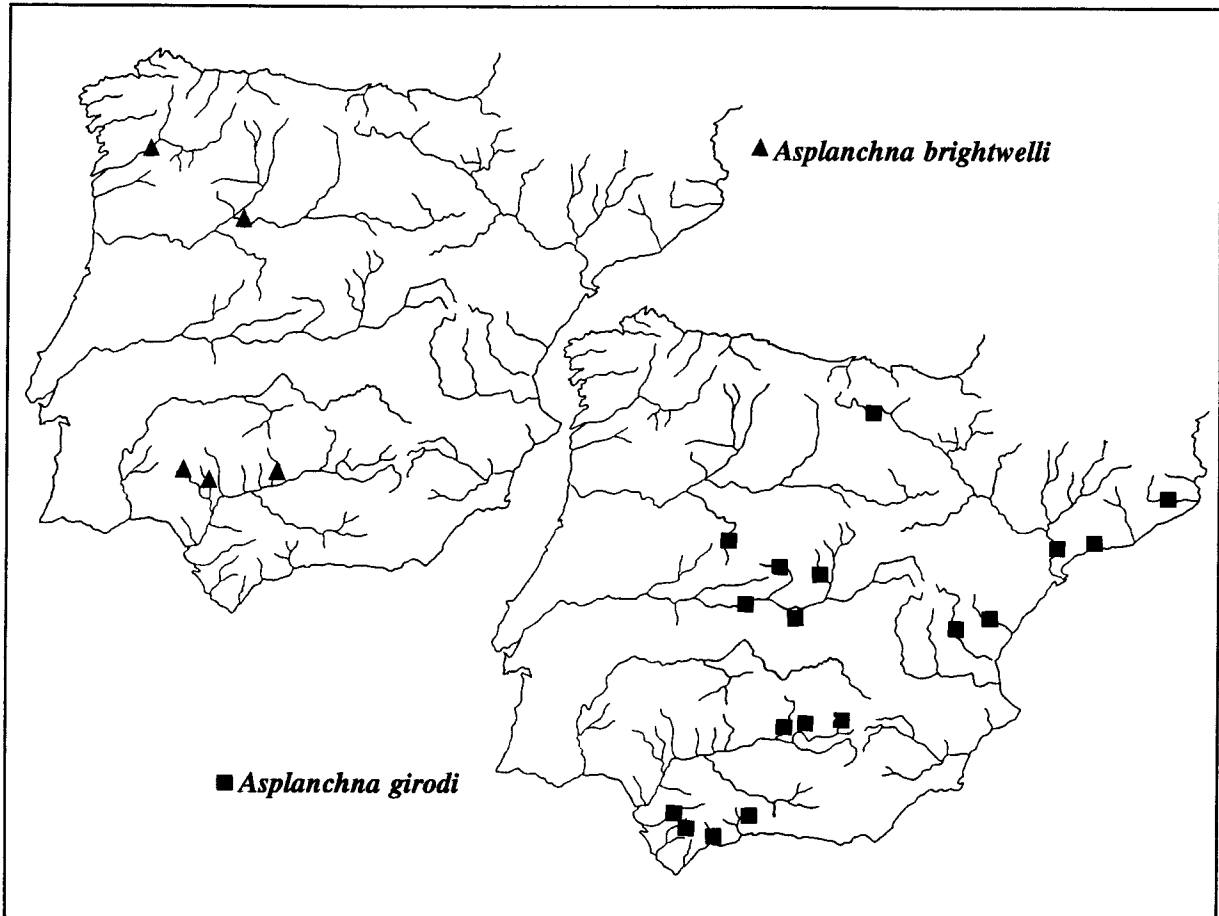


Figura 32. Distribution of some species of the genus *Asplanchna* in Spanish reservoirs (survey 1987/88). *Distribución de algunas especies del género Asplanchna en los embalses españoles (estudio 87/88).*

selection for specimens of *Brachionus*, *Keratella cochlearis*, large *Polyarthra* and individuals of its own species. The same author, however, found that rotifer diversity in the stomach content of *A. brightwelli* was not significantly different from the rotifer diversity of the reservoir. The presence of polymorphic individuals or a diet rich in tocopherol in diet induce mixis in cruciform females (Gilbert, 1967).

Cond: 79-541 $\mu\text{S cm}^{-1}$; Alk: 1297.2-3038 $\mu\text{eq l}^{-1}$; pH: 8.1-8.8; Temp: 17.5-26.2 $^{\circ}\text{C}$

Morphological features of interest. Sack-shaped body. It is the largest planktonic rotifer found in reservoirs (500- 1500 μm). It presents

plasticity in shape, mainly as a consequence of variations in food supply (Gilbert & Birky, 1971). Vitellarium lobed, with 32 nuclei, horseshoe-like. Tooth on inner margin of ramus well developed. Apophysis present (Fig. 33). Very similar and sometimes confused with *A. sieboldi*. Differences should be found in the number of flame bulbs of protonephridia (10-20: *A. brightwelli*; 40-100: *A. sieboldi*) and the number of nuclei of the vitellarium (16 in *A. sieboldi*).

Geographical distribution. Cosmopolite. In the Iberian Peninsula it has been found in the Guadalquivir estuary (Guisande & Toja, 1988) and in some reservoirs.

Distribution in reservoirs. In the 1987/88 survey it was found in summer samples from five reservoirs. In the previous study it was collected in seven localities, six of them during summer.

Asplanchna girodi (De Guerne, 1888) (Fig. 32 f; Fig. 33)

Ecology. Planktonic species, occasionally littoral. It prefers eutrophic and slightly alkaline waters. Guiset (1977c) found *A. girodi* feeds positively selecting species of *Synchaeta*, small *Trichocerca* and *Polyarthra vulgaris/dolichoptera*. Recently, *Pompholyx sulcata* and *Keratella cochlearis f. tecta* have also been found in its stomach content. *A. girodi* probably is in competition with the predator rotifer *Ploesoma hudsoni*.

Cond: 31.5-3720 $\mu\text{S cm}^{-1}$; Alk: 58-3882 $\mu\text{eq l}^{-1}$; pH: 6.3-9.9; Temp: 7.7-26.2 °C

Morphological features of interest. Protonephridia with 16 flame bulbs, 50 nuclei in vitellarium. The morphology of the mastax is the main distinguishable feature of this species (Fig. 32 f).

Geographical distribution. Cosmopolite. It is widespread in the Iberian Peninsula.

Distribution in reservoirs. It has been found in 21 samples, from 18 reservoirs. *A. girodi* is more frequent in summer.

Asplanchna priodonta Gosse, 1850 (Fig. 33 a-c, e)

Asplanchna krameri De Guerne, 1888; *Asplanchna priodonta pelagica* Zacharias, 1892.

Ecology. Euplanktonic species. Euriterm and perennial. Poliphagus, it feeds preferentially on plankton diatoms, dinoflagellates and rotifers. Its diet is less carnivorous than that of *A. girodi* (Guiset, 1977; Gilbert, 1980).

Cond: 19.6-1385 $\mu\text{S cm}^{-1}$; Alk: 98-4681 $\mu\text{eq l}^{-1}$; pH: 6.3-9.67; Temp: 5.9-25.9 °C

Morphological features of interest. Easily distinguishable from other species of its genus looking at the morphology of the mastax (Fig. 32 e): p.e. robust, acute uncus, rami serrated on inner edges, broad and free ends. Protonephridia are compact, with 4 flame bulbs each.

Geographical distribution. Cosmopolite. It is the most common species of the genus *Asplanchna* in

the Iberian Peninsula. It is also common in Pyrenean lakes.

Distribution in reservoirs. Very common; it has been found in 123 samples. In both studies it occurred in approximately the same frequency in the stratification and the mixing periods.

Family TESTUDINELLIDAE

Genus *Pompholyx* Gosse

Pompholyx sulcata (Hudson, 1885) (Fig. 34 c-g)

Ecology. Euplanktonic species. Euriterm in fresh and brackish waters. Feeds on detritus and bacteria (Pourriot, 1977). It prefers eutrophic environments. Asexual eggs attached to lorica by a filiform structure (Fig. 34 c). It is predated by *Asplanchna girodi* (Guiset, 1977c) and may be parasitized by the sporozoa *Plistophora asperspora*.

Cond: 45-1126.3 $\mu\text{S cm}^{-1}$; Alk: 225-3882 $\mu\text{eq l}^{-1}$; pH: 7-10.2; Temp: 6.4-26.2 °C

Morphological features of interest. Lorica not flattened dorso-ventrally. It presents four lobules, two lateral, one ventral and one dorsal (cross section as in Fig. 33, d). This is the main difference with the similar species *P. triloba*. It presents cyclo-morphosis, i.e. in winter it is slightly larger, with a longer lorica, than in summer (Fig. 34 e,f,g). Cloacal opening, where asexual eggs are attached is slightly curved ventrally. Eggs are round, up to 75 μm in size and sometimes carried on a retractile thread from a secretory gland. Resting eggs are dark, smooth and double-shelled.

Geographical distribution. Cosmopolite. It has been found in some localities in Spain. Its occurrence and abundance in reservoirs is high.

Distribution in reservoirs. It has been found in 65 reservoirs. More frequent and abundant during the stratification period. *P. sulcata* has increased its distribution area in relation to that delimited by the 1972/76 survey. In this latter survey it was found in 68 samples from 39 localities.

Genus *Testudinella* Bory de St. Vincent

Testudinella emarginula (Stenroos, 1898) (Fig. 34 b)

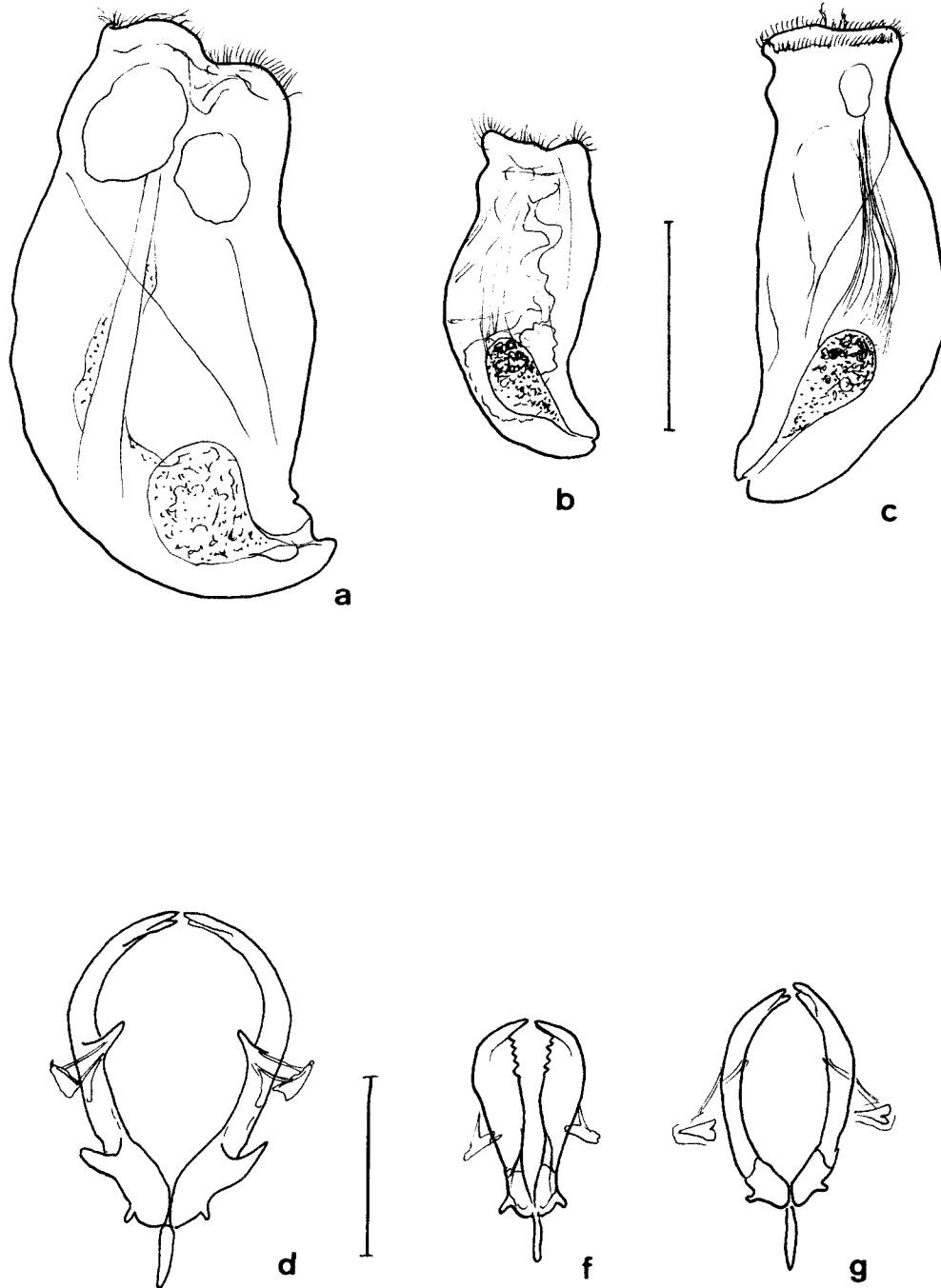


Figura 33. a-c, Some males of *Asplanchna pridonta* from: a, Linares del Arroyo, b, Guadalteba and c, Riudecanyes. Scale bar is 100 μ m long. d-f, Mastax of some species of the genus *Asplanchna*. d *A. brightwelli* from Velle, e, *A. pridonta* from San Juan, e, *A. girodi*, from Riudecanyes. Scale bar is 50 long μ m. a-c, algunos machos de *Asplanchna pridonta* de: a, Linares del Arroyo, b, Guadalteba, c, Riudecanyes. Escala 100 μ m. d-f, Mastax de algunas especies del género *Asplanchna*. d *A. brightwelli* de Velle, e, *A. pridonta* de San Juan, e, *A. girodi*, de Riudecanyes. Escala: 50 μ m.

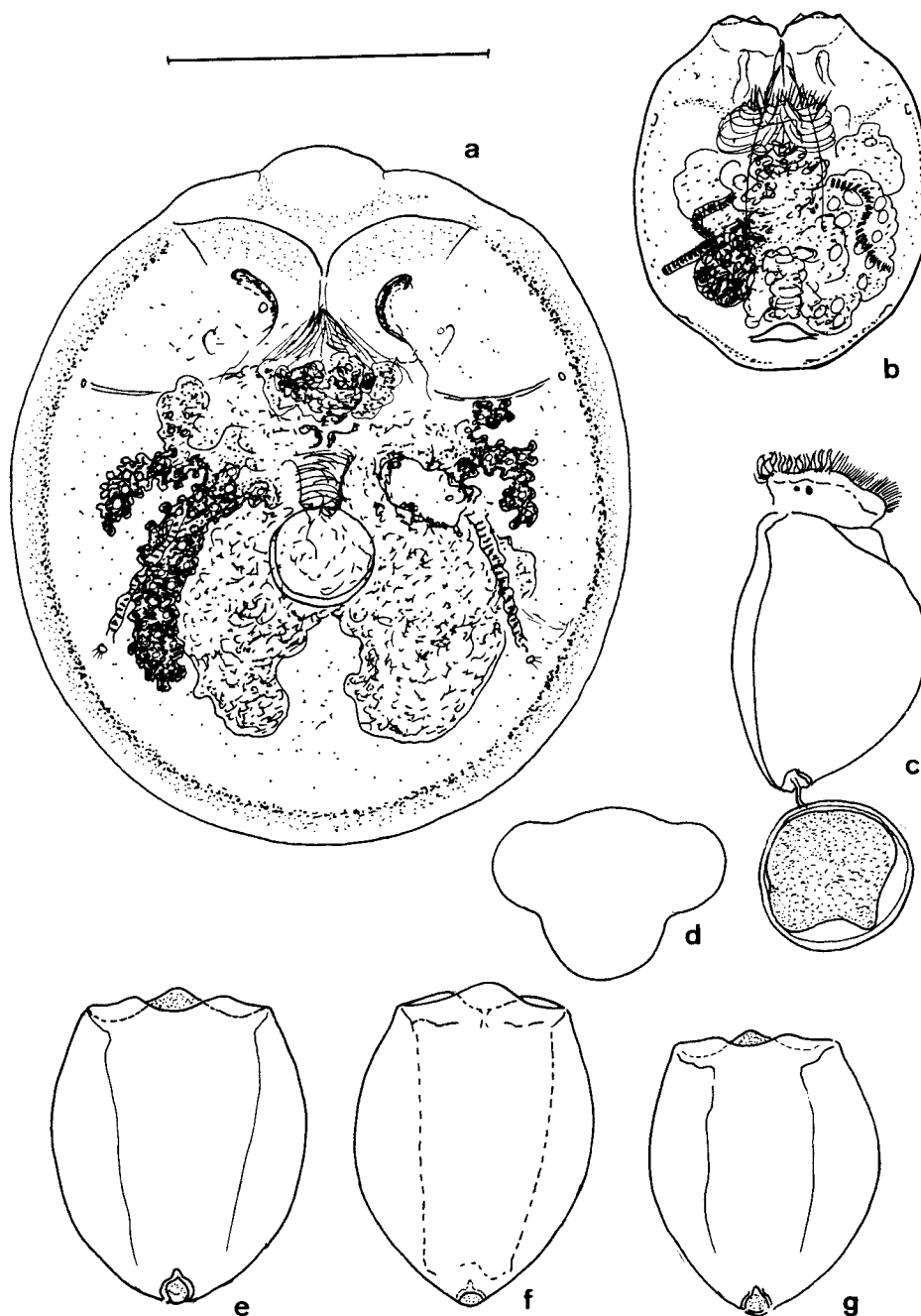


Figura 34. Some Testudinellidae found in Spanish reservoirs during the 87/88 survey. Scale bar is 100 μm . long. a, *Testudinella patina dendradena* from Ferverenza; b, *Testudinella emarginula* from As Conxas; c, d, e, f, g, *Pompholyx sulcata*. c, with egg from San Juan, d, cross section of the same specimen, e, ventral view (winter form) from Valdecañas, f, dorsal view (winter form) from La Minilla, g, ventral view (summer form) from San Juan. *Algunas Testudinellidae de los embalses españoles (estudio 87/88)*. Escala: 100 μm . a, *Testudinella patina dendradena* de Ferverenza; b, *Testudinella emarginula* de As Conxas; c, d, e, f, g, *Pompholyx sulcata*. c, con huevo de San Juan, d, vista transversal del mismo espécimen, e, vista ventral (forma de invierno) de Valdecañas, f, vista dorsal (forma de invierno) de La Minilla, g, vista ventral (forma de verano) de San Juan.

Pterodina emarginula Stenroos, 1898; *Pterodina incisa* Haring, 1913; *Pterodina emarginula* von Hofsten, 1909; *Testudinella emarginula* after Carlin, 1939; *Testudinella incisa* var. *emarginula*, Koste, 1978.

Ecology. Periphytic species; occasionally it may be found in plankton. Cold stenoterm, it tolerates a wide range of alkalinity, but may be collected in slightly acid waters. Its autoecology is not well-known.

Cond: 51.5- 262 $\mu\text{S cm}^{-1}$; Alk: 171- 2003 peq l^{-1} ; pH: 6.8-7.5; Temp: 7.7-7.8 °C

Morphological features of interest. Oval lorica, "boomerang"-shaped in section, slightly convex dorsally. Long foot, protruding from a circular foot opening on the ventral plate of the lorica.

Geographical distribution. Probably cosmopolite. It was first recorded in Spanish reservoirs by Guiset (1976). In the Iberian peninsula it has been found in ponds from Northwest and in Spanish Central region of La Mancha (unpublished data).

Distribution in reservoirs. Guiset (1976) found it in Fervenza (15). In the 1987/88 survey it was also found in winter samples in As Conxas(20), albeit in low numbers.

Testudinellapatina (Hermann, 1783)(Fig. 34 a)

Brachionus patina Hermann, 1783; *Proboscikidia patina* Bory de St. Vincent, 1826; *Pterodina patina* Ehrenberg, 1830; *Pterodina valvata* Hudson, 1871; *Testudinella patina* after Haring, 1913.

Ecology. Heleoplanktonic species. It occurs in plankton when there is abundance of phytobenthos and macrophytes. Euriterm and eurihaline, it tolerates high salinity. It feeds mainly on *Chlorella* and diatoms.

Cond: 50-541 $\mu\text{S cm}^{-1}$; Alk: 98-3545.5 peq l^{-1} ; pH: 6.3-8.89; Temp: 9.5-24.3 °C

Morphological features of interest. Lorica almost circular in outline, transparent and depressed, strongly flattened dorso-ventrally. Circular foot opening located almost in the middle of the ventral face; foot wrinkled, toes replaced by a circle of cilia. The form *T. patina dendradena* (Beauchamp, 1955), was found in two reservoirs characterized by

a branched vitellarium and by differences in the apical zone of lorica.

Geographical distribution. Cosmopolite. Recorded frequently in all the Iberian peninsula and Balearic archipelago. It is found specially in reservoirs and littoral ponds.

Distribution in reservoirs. In the 1987/88 survey it was collected in six reservoirs. In Forcadas (13) and Fervenza (15) the form *T. patina dendradena* (Fig 34 a) was identified. In the previous survey *Testudinella patina* was found in four localities.

Family CONOCHILIIDAE

Genus *Conochilus* Ehrenberg

Traditionally both genera, *Conochilus* and *Conochiloides*, have been considered separately, on the basis of differences in the position of the lateral antenna. This fact is very dependent on the coloniality of the species. Ruttner-Kolisko (1974) considered that this feature was not sufficient to warrant the separation into two genera.

Conochilus coenobasis (Skorikov, 1914)(Fig. 35 m,n)

Conochiloides coenobasis Skorikov, 1914; *Conochilus dossuarius* var *coenobasis*, Koste, 1978.

Ecology. Euplanktonic species. Warm stenoterm. It feeds preferentially on *Trachelomonas* (Koste, 1978). The anphoteric reproduction of this species (capacity of females to produce asexual and sexual eggs at the same time) has been described.

Cond: 41-202.3 $\mu\text{S cm}^{-1}$; Alk: 68.3-711.5 peq l^{-1} ; pH: 6.3-9.2; Temp: 7.4-25.2 °C

Morphological features of interest. Both ventral antenna are fused and are situated below the corona. Mouth in the middle of the corona. Asymmetric trophary, with three larger teeth on each uncus. Koste (1978) considered this taxon as a variety of the species *Conochilus dossuarius* (Hudson, 1885); differences should be found looking at the morphology of the uncus (Fig. 35, b,m).

Geographical distribution. Cosmopolite. In the peninsular territory it has only been found in reservoirs (Guiset, 1976).

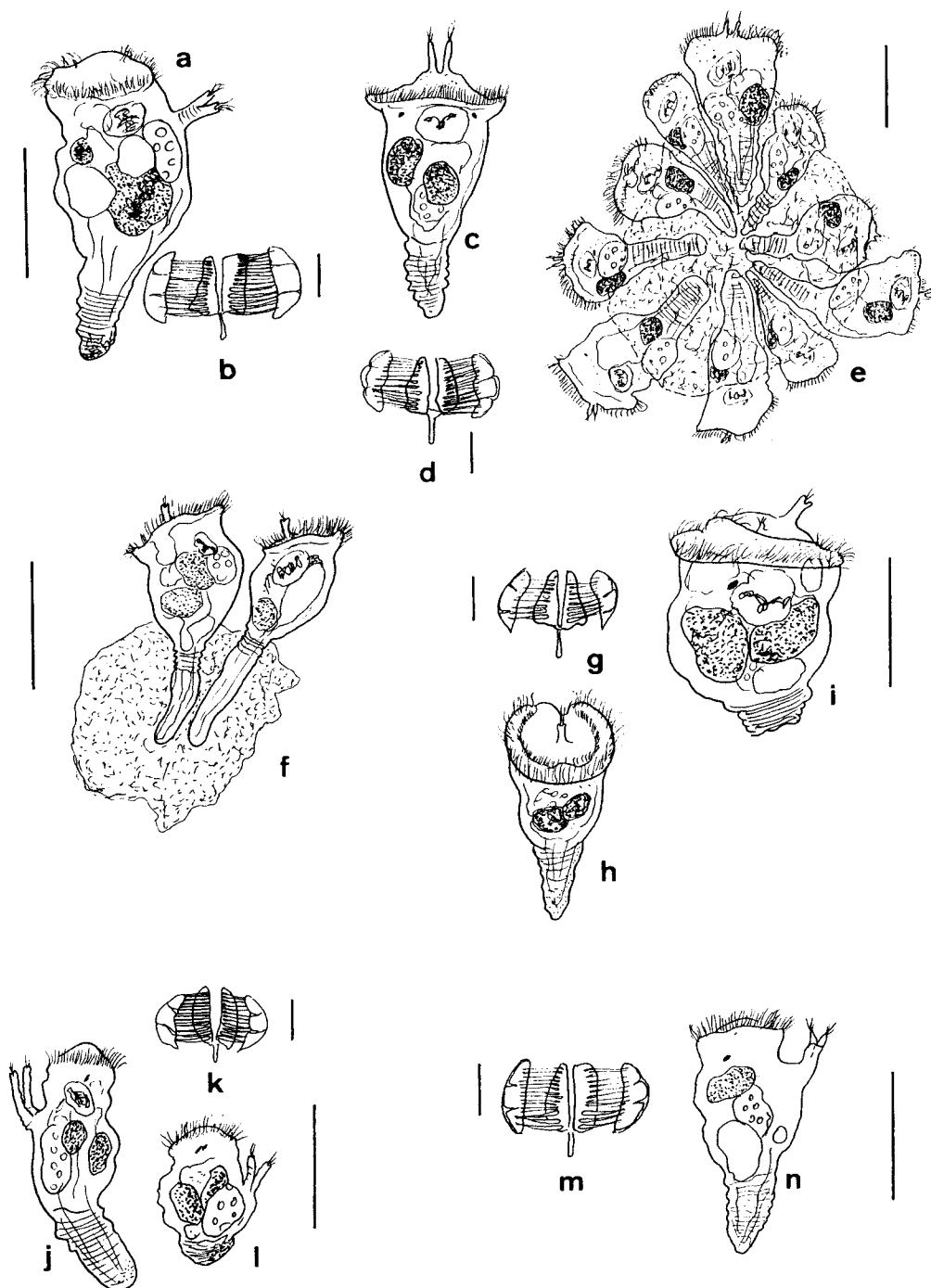


Figura 35. Species of the genus *Conochilus* found in the Spanish reservoirs during the 87/88 survey. Scale bar is 100 μm long (for mastax, 20 μm). a, b, *C. dossuarius* from Borbollón; c-e, *C. hippocrepis*, d'El Vado; f-i, *C. unicornis*, from Linares del Arroyo; j-l, *C. natans*, from Fervenza; m, n, *C. coenobasis*, from Guadiloba. *Especies del género Conochilus de los embalses españoles (estudio 87/88)*. Escala: 100 μm (mastax 20 μm). a, b, *C. dossuarius* de Borbollón; c-e, *C. hippocrepis*, de El Vado; f-i, *C. unicornis*, de Linares del Arroyo; j-l, *C. natans*, de Fervenza; m, n, *C. coenobasis*, de Guadiloba.

Distribution in reservoirs. It is collected in eight reservoirs, all located in the northwestern region of the Iberian Peninsula.

Conochilus dossuarius (Hudson, 1885) (Fig. 35 a,b)

Cephalosiphon dossuarius Hudson, 1886; *Conochiloides dossuarius* after Hlava, 1904.

Ecology. Euplanktonic species, warm stenoterm. More common in superficial waters. It prefers low alkalinity. According to Boon & Shiel (1990) it feeds on bacteria.

Cond: 48-1035 $\mu\text{S cm}^{-1}$; Alk: 169-2480 peq l^{-1} ; pH: 6.8-9.1; Temp: 6.4-24.6 °C

Morphological features of interest. Ventral antenna partly fused. Foot slender. Trophy asymmetrical, with three large teeth on one uncus and five on the other (Fig. 35, b).

Geographical distribution. Cosmopolite. Previous Iberian records of this species can only be found in Monteiro (1984), in Portugal and in Guiset (1976) in Spanish reservoirs and in ephemeral ponds of Doñana National Park (Mazuelos *et al.*, 1993).

Distribution in reservoirs. In the 1987/88 survey it was identified in seven reservoirs. In the previous study of 1972/76 it had been found in six localities all in the northwestern region of the Iberian Peninsula.

Conochilus hippocreppis (Schrank, 1803) (Fig. 35 c-e; Fig. 36)

Linza hippocreppis Skorikov, 1803; *Conochilus volvox* Ehrenberg, 1834; *Ptygura volvox* Dujardin, 1841; *Megalotrocha volvox*, Gosse, 1862; *Lacinularia volvox*, Schoch, 1868.

Ecology. Planktonic species, it may be found both in ponds and larger waterbodies. Colonial, it may form colonies of 30 to 60 individuals, joined in a gelatinous case. *C. hippocreppis* is a detritivore, probably feeding on bacteria (Pourriot, 1977).

Cond: 25.8-206.3 $\mu\text{S cm}^{-1}$; Alk: 98-1767 peq l^{-1} ; pH: 6.3-8.3; Temp: 6.4-15.4 °C

Morphological features of interest. Ventral antennae located on the apical field, either completely separate or only partly fused. Corona "horseshoe"-

shaped. Foot once extended may double the length of the body. In preserved material colonies are usually total or partially broken (Fig. 35 e).

Geographical distribution. Cosmopolite. In the Iberian peninsula it has only been found in the Spanish reservoirs (Guiset, 1976).

Distribution in reservoirs. In the 1987/88 survey it was found in four localities, all located in the north. In the previous study, *C. hippocreppis* was more frequently observed, and was collected in 30 samples from 20 reservoirs.

Conochilus natans (Seligo, 1900) (Fig. 35 j-1; Fig. 36)

Tubicolaria natans Seligo, 1900; *Conochilus natans* after Voigt, 1904; *Conochiloides natans* after Hlava, 1904.

Ecology. Euplanktonic species. Cold stenoterm; it may be very abundant in lakes and ponds. Solitary, never colonial.

Cond: 22-214.6 $\mu\text{S cm}^{-1}$; Alk: 58.2-767.4 peq l^{-1} ; pH: 6.3-8.6; Temp: 6-20.5 °C

Morphological features of interest. Ventral antennae are long and separate. Posterior end of the body is surrounded by a gelatinous case where eggs are placed. Trophi symmetric, with five or six large teeth on each uncus (Fig 35 k).

Geographical distribution. Cosmopolite. In the Iberian Peninsula previous records are found in Margalef (1949) from ponds in Baix Urgell (NE, Spain).

Distribution in reservoirs. It has been found in five localities, in the NE of Spain and preferentially in winter (Fig. 36).

Conochilus unicornis (Rousselet, 1892) (Fig. 35 f-i; Fig. 36)

Conochilus leptopus Forbes, 1893; *Conochilus limneticus* Stenroos, 1898; *Conochilus norvegicus* Burckhard, 1943.

Ecology. Euplanktonic species. Colonial; it form colonies of five to 12 individuals. The colony is encased in a gelatinous sheath. Seasonal, it is more frequent in summer. It prefers low to moderate eutrophy.

Cond: 50-576.5 $\mu\text{S cm}^{-1}$; Alk: 98-2002.6 peq l^{-1} ; pH: 6.3-8.89; Temp: 7.3-21.2 °C

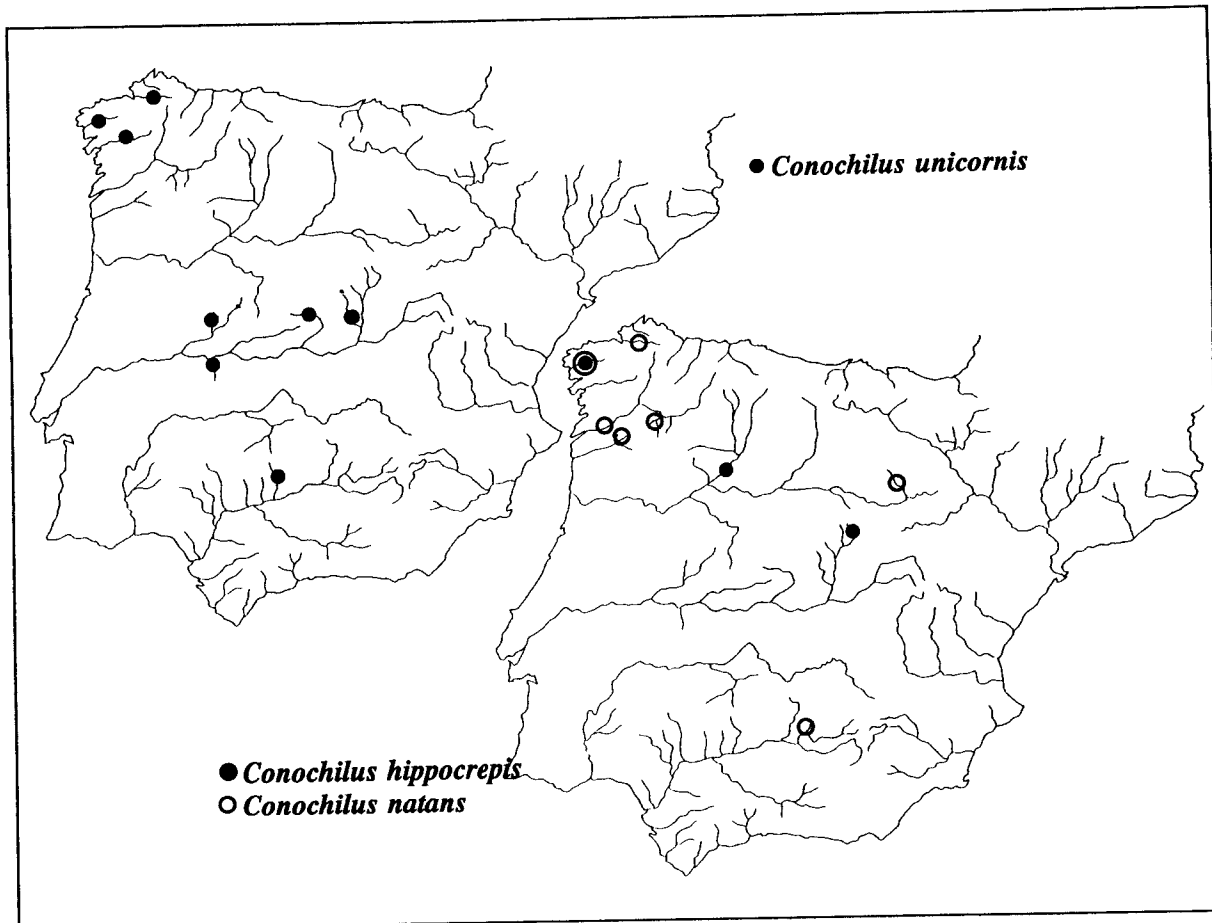


Figura 36. Distribution of some species of the genus *Conochilus* in Spanish reservoirs (survey 87/88). *Distribución de algunas especies del género Conochilus en los embalses españoles (estudio 87/88).*

Morphological features of interest. Usually colonies are break during fixation. Ventral antenni fused. Extended foot as long as the body. According to Pejler (1956), there is introgression between *C. unicornis* and *C. hippocrepis*, and transition forms can be found. These are characterized by the grade of fusion of their antennae, by the number of individuals of their colonies and by the proportion of the foot to body length.

Geographical distribution. Cosmopolite. It has been recorded in the north of the Iberian Peninsula. Margalef (1948b, 1949) and Miracle (1978) found it in Pyrenean lakes. This species has progressively colonized lower latitudes and

found in reservoirs south of the Pyrenean mountains.

Distribution in reservoirs. It has been found in 10 reservoirs. In the previous survey it was identified in 25 samples from 17 localities.

Family *HEXARTHRIIDAE*
Genus *Hexarthra* Schmarda

Hexarthra fennica (Levander, 1892) (Fig. 37 a-c; Fig. 38)

Pedalion fennicum Levander, 1892; *Pedalia fennica* Haring, 1913; *Hexarthra fennica* after Neal, 1951.

Ecology. Euplanktonic species. Eurihaline, it tolerates high salinity. Seasonal, it is found mainly in summer. It is common in coastal ponds.

Cond: 844.6-5326 $\mu\text{S cm}^{-1}$; Alk: 1913.5-3547.6 $\mu\text{eq l}^{-1}$; pH: 8.2-8.42; Temp: 19.3-22.8 $^{\circ}\text{C}$

Morphological features of interest. Underlip and caudal appendages not present. Seven teeth in uncus (Fig. 37 c). Smaller than *Hexarthra mira*.

Geographical distribution. Cosmopolite. Frequently found throughout the Iberian Peninsula and Balearic archipelago.

Distribution in reservoirs. In the 1987/88 survey it was identified in four reservoirs, all belonging to the oriental region of the Iberian peninsula (Fig. 38). This distribution was similar to that found in the previous survey.

Hexarthra mira (Hudson, 1871) (Fig. 37 d-g; Fig. 38)
Pedalion mira Hudson, 1871; *Pedalia mira*, Barrois, 1878; *Pedalion mirum* Hudson & Gosse, 1886; *Pedalia mira* Harring, 1913;

Ecology. Euplanktonic species. It prefers low mineralization, as opposed to *H. fennica*. Like other species of the genus, *H. mira* is seasonal and occurs mainly in summer. According to Pourriot (1977), it feeds on detritus and bacteria.

Cond: 14.7-1115.5 $\mu\text{S cm}^{-1}$; Alk: 68.3-3882 $\mu\text{eq l}^{-1}$; pH: 6.3-10; Temp: 7.8-26.2 $^{\circ}\text{C}$

Morphological features of interest. Underlip present. Two caudal processes at posterior end (Fig. 37, f). Six teeth on uncus (Fig. 37 e).

Geographical distribution. Cosmopolite. It has been frequently found in Spain.

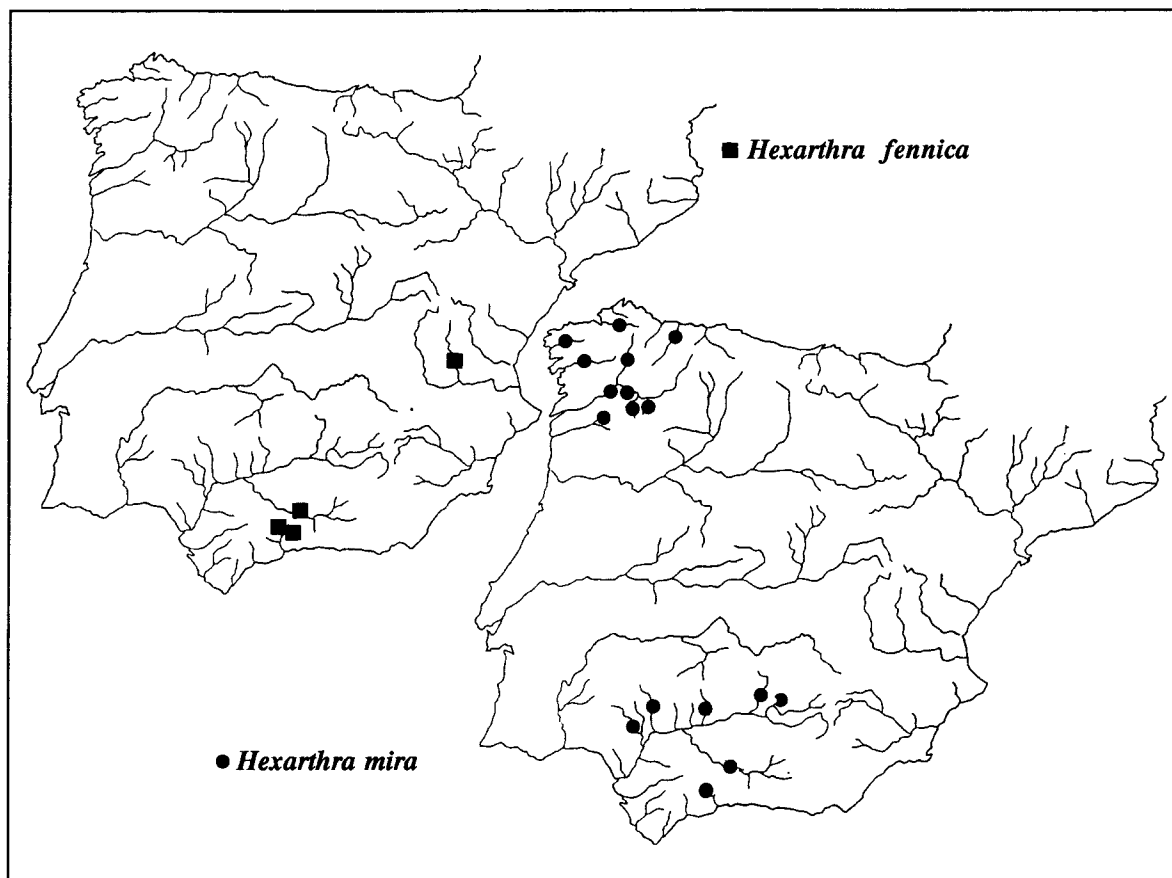


Figura 38. Species of the genus *Hexarthra* found in Spanish reservoirs (survey 87/88). *Especies del género Hexarthra muestreados en los embalses españoles (estudio 87/88).*

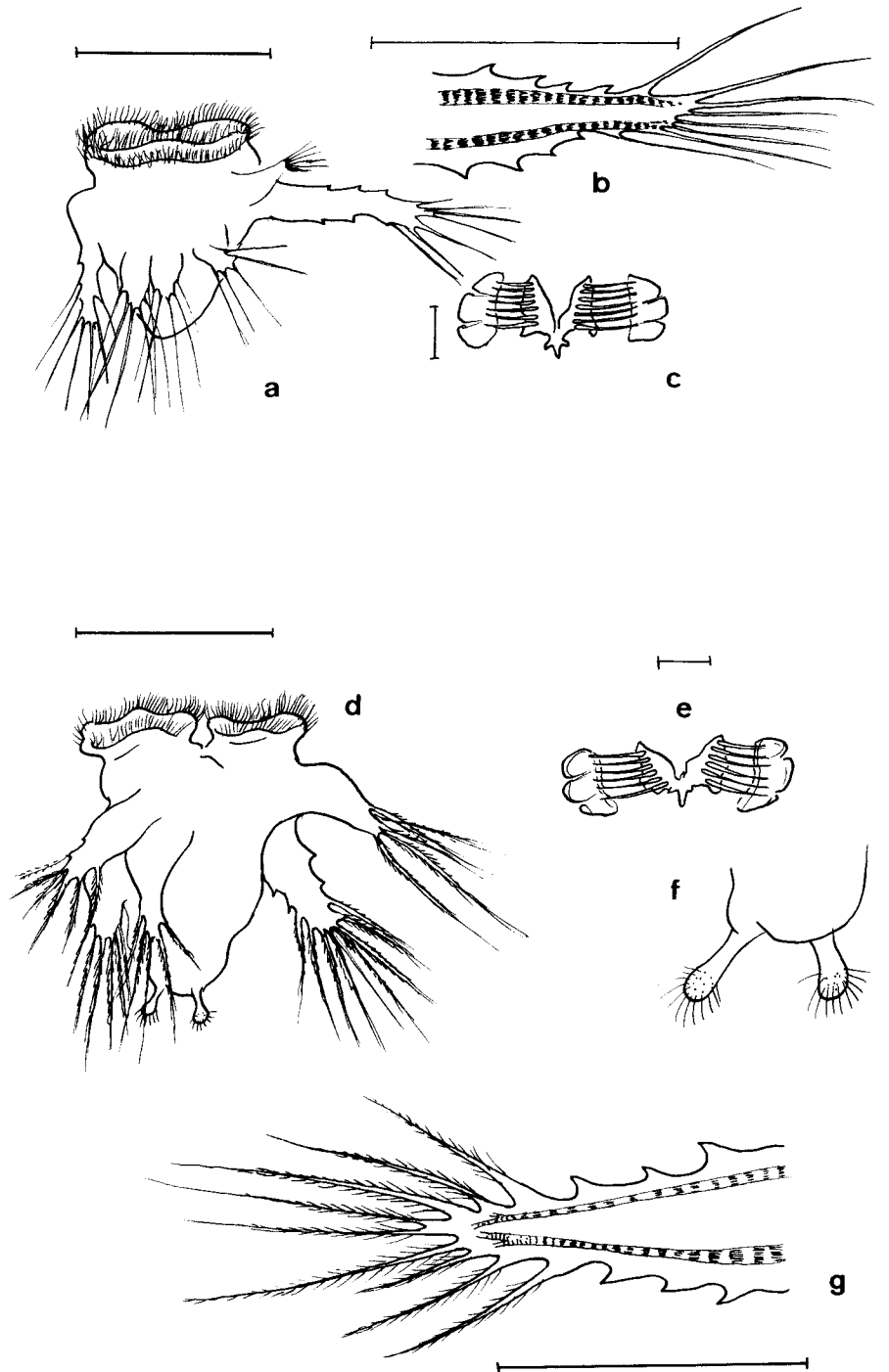


Figura 37. Species of the genus *Hexarthra* identified in Spanish reservoirs during the 87/88 survey. Scale bars are 100 μm long, mastax bars are 20 μm long. a-c, *Hexarthra fennica*, from Puentes, b ventral appendage, c mastax; d-g, *H. mira*, from Velle, e mastax, f caudal appendages, g ventral appendage. *Especies del género Hexarthra identificados en los embalses españoles (estudio 87/88)*. Escala: 100 μm , mastax 20 μm . a-c, *Hexarthra fennica*, de Puentes, b apéndice ventral, c mastax; d-g, *H. mira*, de Velle, e mastax, f apéndices caudales, g apéndice ventral.

Distribution in reservoirs. In the 1987/88 survey it was found in 17 localities, mainly in western region, where there is a predominance of siliceous materials. It was more commonly found during stratification period. In the previous survey it was collected in 39 samples from 34 reservoirs.

Family *FILINIIDAE*

Genus *Filinia* Bory de St. Vincent

There is considerable controversy around classification criteria for species of the genus *Filinia*. The suggestions given by Ruttner-Kolisko (1974), based on the biometry of bristles (total length, proportion body length, location) are not enough sufficient to be discriminate at the species level. In addition, these characters have strong variability (Miracle, 1976). Koste (1980), proposed a systematics based on the trophi morphology (mainly on the number of teeth on uncus). However, in this paper the criteria of Ruttner-Kolisko using features of the bristles, has been adopted for this genus.

Filinia longiseta (Ehrenberg, 1834) (fig. 39 a,b)

Thriarthra longiseta Ehrenberg, 1834;

Ecology. Euplanktonic species. Inhabitant on lakes, ponds, moorlands waters and brackish waters. It prefers warm and eutrophic environments. A filtrer, according to Pourriot (1965) it feeds mainly on particles 10 to 12 μm in size, as detritus, bacteria and algae like *Chlorella*, it probably competes with species of the genus *Conochilus* for food.

Cond: 31.5-3720 $\mu\text{S cm}^{-1}$; Alc: 58.2-3882 $\mu\text{eq l}^{-1}$; pH: 6.3-9.9; Temp: 7.7-26.2 $^{\circ}\text{C}$

Morphological features of interest. Ventrally it presents caudal bristles. These never are on the basal region. Lateral bristles are at least twice as long as those posterior. Several varieties have been described: *Filinia longiseta* var. *limnetica* (Zacharias 1893), characterized by a proportion length of lateral bristles to length of caudal bristle of more than 2. According to Carlin (1943) it has species category (*Filinia limnetica*). However, Ruttner-Kolisko (1974) considered it an ecological form of *F. longiseta*.

Geographical distribution. Cosmopolite. Widespread in the Iberian peninsula, but records are uncertain, Velasco (1990) (*E longiseta / limnetica*; *E longiseta / terminalis*). Probably some of these records correspond to *E hofmanni* (Koste, 1980).

Distribution in reservoirs. It occurs mainly in summer, in 20 reservoirs. During the mixing period it was found in 13 reservoirs. *F. longiseta* has an uniform distribution throughout Spain. In the previous survey it was collected in 18 localities, and the *limnetica* form was found in 30 reservoirs.

Filinia opoliensis (Zacharias, 1898) (Fig. 39 e-g; Fig. 41)

Tetramastix opoliensis Zacharias, 1898; *Filinia opoliensis* after Remane, 1933.

Ecology. Euplanktonic species. Warm stenoterm. It is found preferentially in large waterbodies with low alkalinity.

Cond: 48-5326.6 $\mu\text{S cm}^{-1}$; Alk: 266-3882 $\mu\text{eq l}^{-1}$; pH: 7.78-9.16; Temp: 22.8-26.73 $^{\circ}\text{C}$

Morphological features of interest. Fusiform. Lateral bristles wide at their base, placed just underneath the corona. Two unequal caudal bristles, of variable length. Microscopic analyses of several mastax showed this species to have 10/11 teeth on the uncus (Fig. 39 g). Some specimens had sexual eggs within their body (Fig. 39 f).

Geographical distribution. Common in tropical and subtropical regions. In the Iberian Peninsula it has been collected from mainly southern reservoirs.

Distribution in reservoirs. It has been found in 18 localities, all in the south and in summer (Fig. 41).

Filinia terminalis (Plate, 1886) (Fig. 39 c,d)

Thriarthra terminalis Plate, 1886.

Ecology. Euplanktonic species. Cold stenoterm. In reservoirs it was also collected in summer (stratification period). It probably inhabits cooler waters of the hypolimnion although this possibility could not be tested because samples concerned the whole water column. It prefers mesotrophic to eutrophic conditions.

Cond: 22-765.5 $\mu\text{S cm}^{-1}$; Alc: 131-3061.5 $\mu\text{eq l}^{-1}$; pH: 6.64-8.22; Temp: 7.3-22.8 $^{\circ}\text{C}$

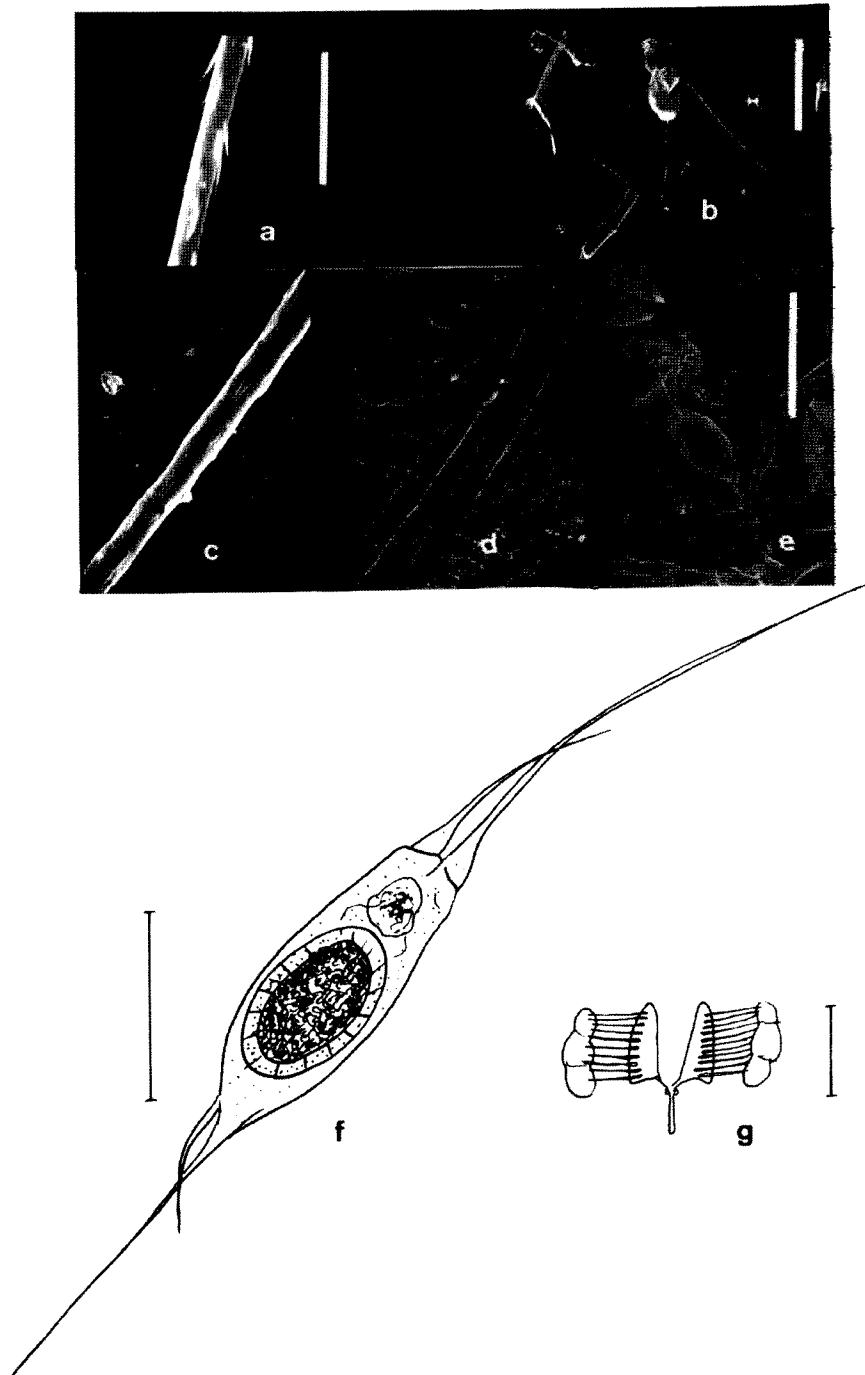


Figura 39. a, b, *F. longiseta*, from Guadalteba, a, SEM micrograph detail showing a lateral bristle (scale bar is 20 µm long), b, from Guadalteba (scale is 200 µm long); c, d, detail of lateral bristle of *F. terminalis*, from Guadiloba; e, SEM micrograph of *F. opoliensis*, from Guadalmellato (scale bar is 20 µm long); f, g, *F. opoliensis*, from Celemín, scale bar is 100 µm long, g, mastax, scale bar is 20 µm long. a, b, *F. longiseta*, de Guadalteba, a, detalle en MEB de una seda lateral (escala 20 µm), b, de Guadalteba, escala 200 µm; c, d, detalle al MEB de una seda lateral de *F. terminalis*, de Guadiloba; e, microfotografía MEB de *F. opoliensis* de Guadalmellato (escala 20 µm); f, g, *F. opoliensis*, de Celemín, escala 100 µm, g, mastax, escala 20 µm.

Morphological features of interest. Terminal posterior bristles on the caudal part (0 to 15 μm from the end of the body). Posterior bristles are almost as long as lateral ones (length of lateral bristles to length of caudal bristle is approximately 1.2). Ruttner-Kolisko (1974) added to these characters the absence of spines on bristles (Fig. 39 c,d). In this study, as in the previous, and in Miracle (1976) spines could be observed on bristles of this species. Insertion of caudal bristle may be difficult to precise in preserved material too. Koste (1980), in a revision of this genus, proposed as a distinctive character the analysis of the number of teeth on the uncus: 15/16 for *F. terminalis*.

Geographical distribution. Cosmopolite. In Spain it is widespread.

Distribution in reservoirs. In the 1987/88 survey it was found in 14 localities. Four in summer samples, in stratified reservoirs, probably from the hypolimnion. In the previous survey it was collected in 27 samples from 21 localities.

Family COLLOTHECACEAE

Genus *Collotheca* Haring

Collotheca mutabilis (Hudson, 1885) (Fig. 40 e,g; Fig. 41)

Floscularia mutabilis Hudson, 1885;
Collotheca mutabilis after Haring, 1913.

Ecology. Euplanktonic species, in spite of the fact that the genus is mainly represented by benthonic and sessile species. The animal is surrounded by a gelatinous case secreted by foot glands. It prefers warm water, and its occurrence is seasonal, i.e. it is more frequent in summer and autumn.

Cond: 19.6-154 $\mu\text{S cm}^{-1}$; Alk: 116.8-1071.5 peq l^{-1} ; pH: 6.6-9.98; Temp: 10.7-22.3 $^{\circ}\text{C}$

Morphological features of interest. Corona with two lobes, one ventral and one dorsal. There are several long cilia on lobes, longer than the cilia on the corona. These morphological characters on the corona are difficult to appreciate in fixed material. The case is wide, with a rounded end. Foot usually presents a spindle-shaped thickening.

Geographical distribution. Cosmopolite, more frequent in northern regions. It is the first record for the Iberian Peninsula.

Distribution in reservoirs. Identified in five reservoirs, all of them in the northwest (Fig. 41).

Collothecapelagica (Rousselet, 1893) (Fig. 40)

Floscularia pelagica Rousselet, 1893;
Collotheca pelagica after Haring, 1913.

Ecology. Euplanktonic species. Typical from large waterbodies. Warm stenoterm. It feeds on flagellate algae (Pourriot, 1965). Guiset (pers. communication) found in its digestive tract peridiniidae (12 to 28 μm in size), *Cyclotella*, *Cosmarium*, small flagellates and chlorococcales.

Cond: 14-3600 $\mu\text{S cm}^{-1}$; Alk: 58.2-4681.7 peq l^{-1} ; pH: 6.3-9.6; Temp: 5.9-26.2 $^{\circ}\text{C}$

Morphological features of interest. Corona unlobed, circular, although long cilia occur in five groups. These cilia are difficult to distinguish in fixed material. Foot is root-shaped and sometimes thickened.

Geographical distribution. Cosmopolite. In Spain it has only been collected in reservoirs (Guiset, 1976, Telleria, 1981).

Distribution in reservoirs. It is one of the most common species in Spanish reservoirs. It has been collected in 40 reservoirs in summer and 52 in winter.

BDELLOIDEA (DIGONONTA)

Family PHILODINIDAE

Genus *Rotaria* Scopoli

Rotaria neptunia (Ehrenberg, 1832) (Fig. 42)

Actinurus neptunius Ehrenberg, 1832; *Rotifer neptunius* Jennings, 1900; *Rotaria neptunia*, after Voigt, 1957.

Ecology. Heleoplanktonic species, occurring occasionally in plankton. Polisaprobic, typical from eutrophic waterbodies with high alkalinity. It may survive low oxygen concentrations.

Cond: 150-655.5 $\mu\text{S cm}^{-1}$; Alk: 1034.5-3882 $\mu\text{eq l}^{-1}$; pH: 7.5-8.8; Temp: 9.5-26.2 $^{\circ}\text{C}$

Morphological features of interest. Large, telescopic body, with a long segmented foot, ending with two spurs in the last segment. In the reservoirs studied, this species has been the only

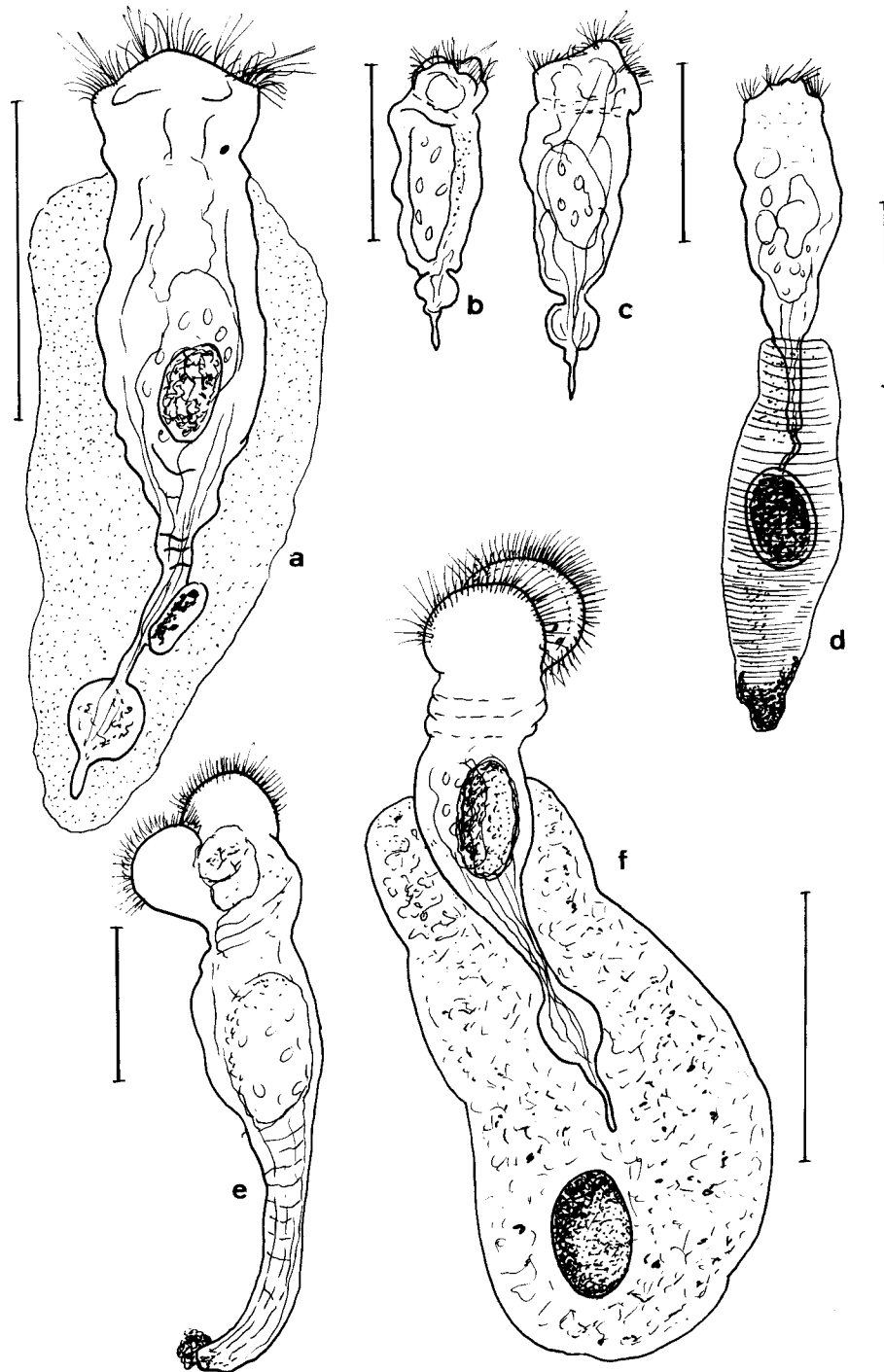


Figura 40. Species of the genus *Collotheca* in Spanish reservoirs found during the 87/88 survey. a-d, *Collotheca pelagica*, a from Jándula, b,c, from Portodemouros, d, from Arbón. e, f, *Collotheca mutabilis*, from Portodemouros. Scale bar 100 μm . *Especies del género Collotheca en los embalses españoles (estudio 1987/88)*. a-d, *Collotheca pelagica*, a de Jándula, b,c, de Portodemouros, d, de Arbón. e, f, *Collotheca mutabilis*, de Portodemouros. Escala 100 μm .

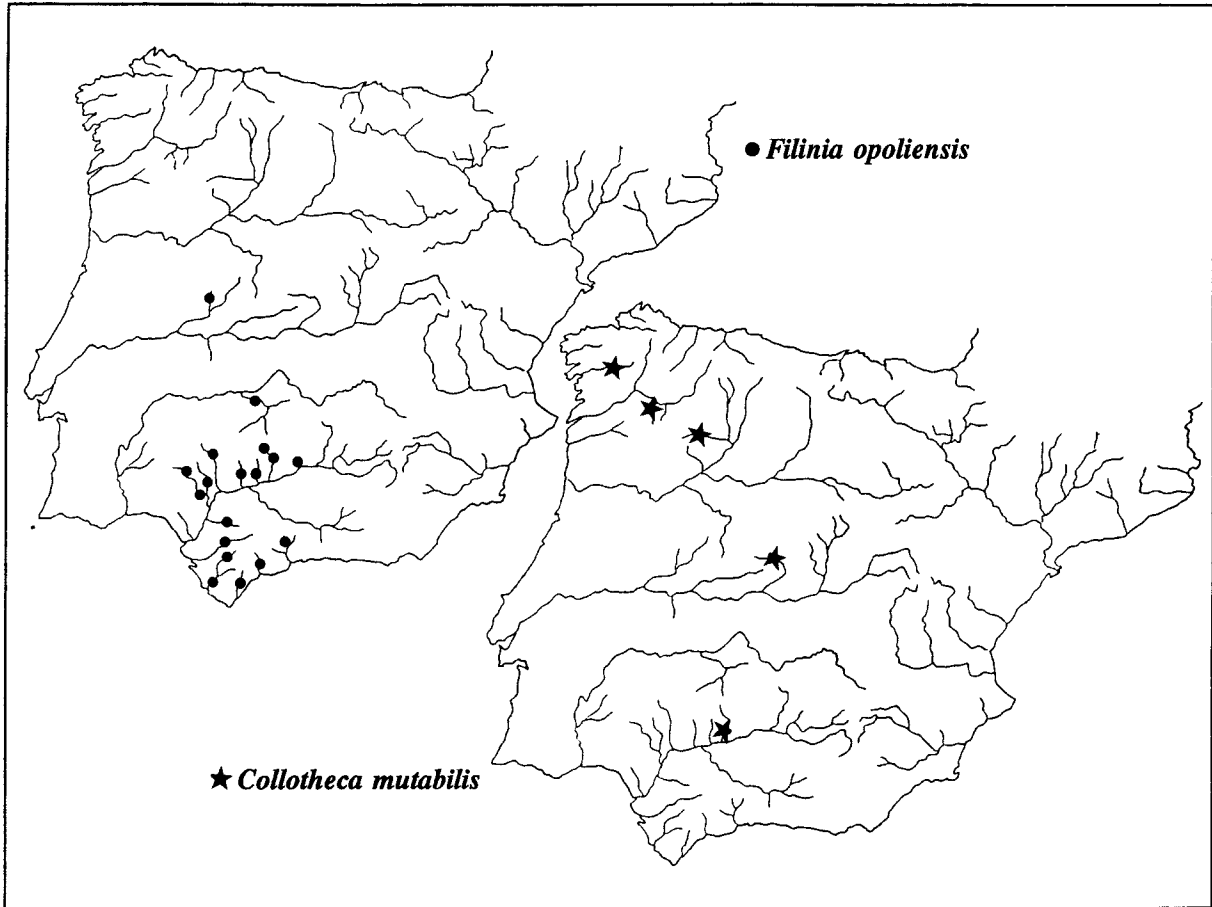


Figura 41. Distribution of some species of the genera *Filinia* and *Collotheca* in Spanish reservoirs found during the 87/88 survey. *Distribución de algunas especies de los géneros Filinia y Collotheca en los embalses españoles (estudio 87/88).*

bdelloidea whose taxonomic identity could be ascertained. Some individuals did not contract during preservation with formaldehyde or did so poorly, facilitating identification

Geographical distribution. Cosmopolite. It has been found in several Spanish localities, all in the north. Its presence may be expected, though, more southern latitudes in Spain.

Distribution in reservoirs. It has been collected occasionally and with low abundance in the plankton samples from four reservoirs: Oliana (95), Sobrón (91), La Tranquera (33) and Guadalmellato (66).

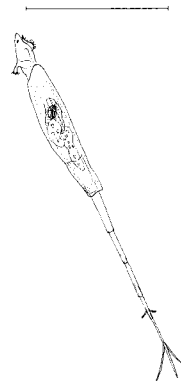


Figura 42. *Rotaria neptunia*, from Oliana. Scale bar is 100 μm long. *Rotaria neptunia*, de Oliana. Escala: 100 μm .

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