



## The taxonomic research of Jules Richard on Cladocera (Crustacea: Branchiopoda) and his collection at the National Museum of Natural History, U.S.A.

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### Abstract

Jules Richard (1863–1945) contributed significantly to cladoceran taxonomy before he became Director of the Musée Océanographique de Monaco and assistant to Prince Albert I-er de Monaco. His collection, including slides and samples preserved in ethanol, was purchased by E. A. Birge, subsequently incorporated into the collection of David G. Frey, and later gifted to the National Museum of Natural History, Smithsonian Institution. A list of publications of Richard about cladocerans is presented, as well a list of all new taxa described by him (three genera and 37 taxa of species rank), with information about type localities, synonymies and taxonomic comments. Lectotypes and in some cases paralectotypes are selected for *Daphnia* (*Ctenodaphnia*) *bolivari* Richard, 1888; *D.* (*Daphnia*) *curvirostris insulana* Moniez in Richard, 1896; *Bosmina japonica* Poppe & Richard, 1890; *Grimaldina brazzai* Richard, 1892 and *Alona sarsi* Richard, 1891. Syntypes exist for *Alona moniezi* Richard, 1888 and *Pleuroxus letourneuxi* (Richard, 1888). The ethanol samples of Richard that may contain species for which there are no types are discussed. In addition, samples in the collection of David G. Frey from type localities of Richard's species are noted. These samples could be important for future revisions of the Richard's taxa. A redescription of *Pleuroxus letourneuxi* (Chydoridae, Chydorinae) is given; *Bosmina japonica* Poppe & Richard, 1890 (Bosminidae), a junior synonym of *B. longirostris* (O. F. Müller, 1776), also is redescribed.

**Key words:** Anomopoda, Ctenopoda, systematics, taxonomy, museum collections, lectotype

### Abbreviations for collections

**DGF**, collection of David G. Frey donated to the Smithsonian Institution's National Museum of Natural History, and kept at the Museum Support Center in Suitland, Maryland, U.S.A. **NHM**, the Natural History Museum, London, United Kingdom; **NMNH**, National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. **USNM**, preface to catalog numbers of the National Museum of Natural History.

### Introduction

Several biographies exist of the eminent French scientist Jules Richard (Portier 1945; Fage 1946; Rouch 1948; Damkaer 1995). Richard (18 November 1863 – 24 January 1945) is best known for his oceanographic research. He was the assistant to Prince Albert I-er de Monaco for many years, occupying positions of the Director of the Musée Océanographique de Monaco and director of the Prince's publication series. He also served as President of the Zoological Society of France (Portier 1945; Damkaer, manuscript).

His early scientific activities, however, concerned freshwater microcrustaceans, particularly cladocerans and copepods. His first paper was about reproduction in *Daphnia* (Richard 1884). There followed a series of fifty-eight publications on the taxonomy and faunistics of Cladocera that began toward the end of 1880's. As

a result of these efforts, Richard became a key figure in the taxonomy of Cladocera. His interests shifted to marine problems toward the end of the 19th century as his duties as Director of the Musée became more demanding (Fig. 1A). His last major paper on cladocerans was from 1898, although he published a short note on *Penilia* in 1905 (Richard 1905). At the beginning of the 20th century, E. A. Birge at the University of Wisconsin purchased Richard's collection of ethanol samples and slides. The exact date of purchase is not clear. Although Richard prepared a inventory of his collection for Birge (Fig. 2), only part of the collection may have been purchased by Birge. There is a bill of lading (Fig. 1B), and a letter to Birge from Richard acknowledging receipt of Birge's cheque (Fig. 1C) and Birge's inventory of samples purchased with number of tubes from each country. Richard may have decided to sell his collection when he understood that he would have no more time for research on cladocerans once in the employment of the Prince. Although Berner (1997) noted that the sale occurred "when Richard retired", this may refer to the time that Richard gave up working with cladocerans because he remained active in science up to his death in 1945 (Damkaer 1995; Damkaer, manuscript). Birge's collections, "as well samples, slides, and miscellaneous papers and notebooks" (Berner 1997), including Richard's slides and samples, were incorporated into the collection David G. Frey at Indiana University and gifted to the Smithsonian Institution's National Museum of Natural History (accession number 403774) upon Frey's death (Berner 1997). The Richard collection consists of 340 samples preserved in ethanol. Frey's collection is now kept at the Museum Support Center in Suitland, Maryland and curated by the Department of Invertebrate Zoology.

The purpose of this communication is to document Richard's contribution to cladoceran taxonomy and to report on that part of Richard's collection now deposited with the National Museum of Natural History. We also provide two examples of the importance of specimens preserved in Richard's samples to the redescription of his taxa.

## Methods

All samples and slides of Jules Richard at the Smithsonian's National Museum of Natural History were examined. Samples from type localities of his species were found among David G. Frey's hand-written list of Richard's samples in the collection of E. A. Birge. These samples were examined in order to determine if specimens of taxa originally described by Richard were present. Specimens were selected from the samples under a binocular stereoscopic microscope, placed on slides (in a drop of a glycerol) and studied under a compound microscope; most of these undissected specimens then were returned to their jars or tubes. Three adult parthenogenetic and three juvenile females of *Pleuroxus letourneuxi* and two adult females of *Bosmina japonica* were dissected under a stereoscopic microscope to study appendages and postabdomen. Drawings were prepared using a camera lucida attached to an Olympus CX41 microscope. A standard system was used for numeration of setae on thoracic limbs as initially proposed by Kotov (2000) for Aloninae and subsequently applied for Chydorinae (Smirnov *et al.* 2006).

## List of Richard's cladoceran papers (in chronological order)

### Sole-authored papers:

Richard, J. (1884) Reproduction d'une *Daphnia* (Pulex). *L'Union Scientifique*, 1884, 30–32.

Richard, J. (1887a) De la récolte & de la conservation des Entomostracés d'Eau Douce: Cladocères & Copépodes. *Feuille des Jeunes Naturalistes*, 17 (198), 81–85.

Richard, J. (1887b) Liste des Cladocères et des Copépodes d'eau douce observés en France. *Bulletin de la Société Zoologique de France*, 12, 156–164.

Richard, J. (1887c) Sur la faune pelagique de quelques lacs d'Auvergne. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, 105, 951–953 and 1186–1187.

Richard, J. (1888a) Cladocères et Copépodes non marins de la faune française. *Revue scientifique du Bourdonnais et du centre de la France*, 3, 57–70 and 4, 78–91.

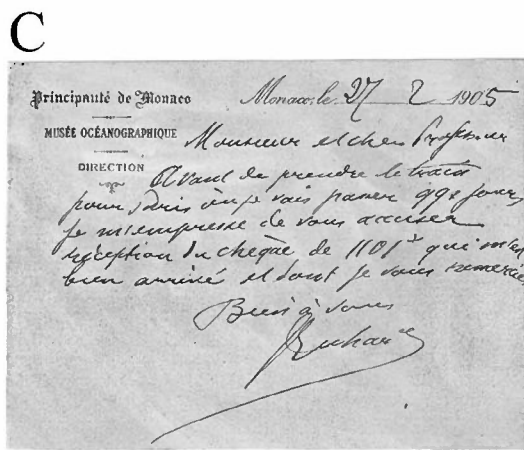
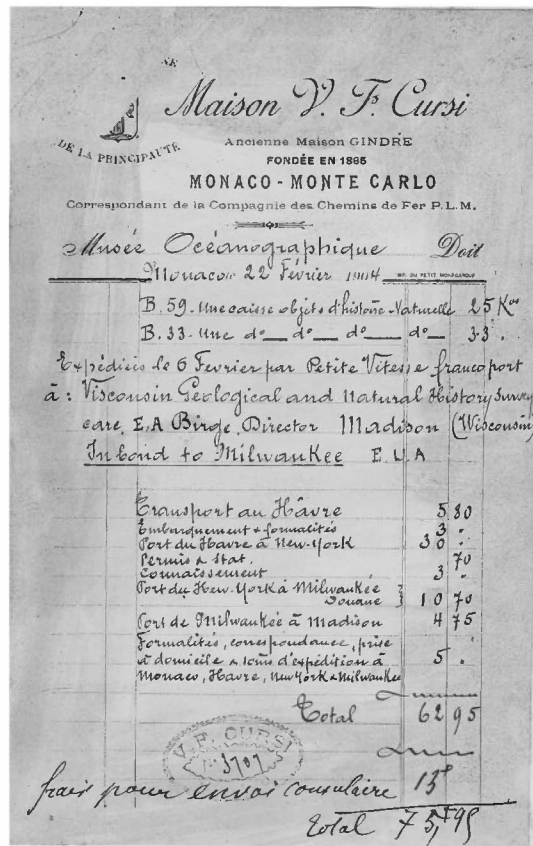
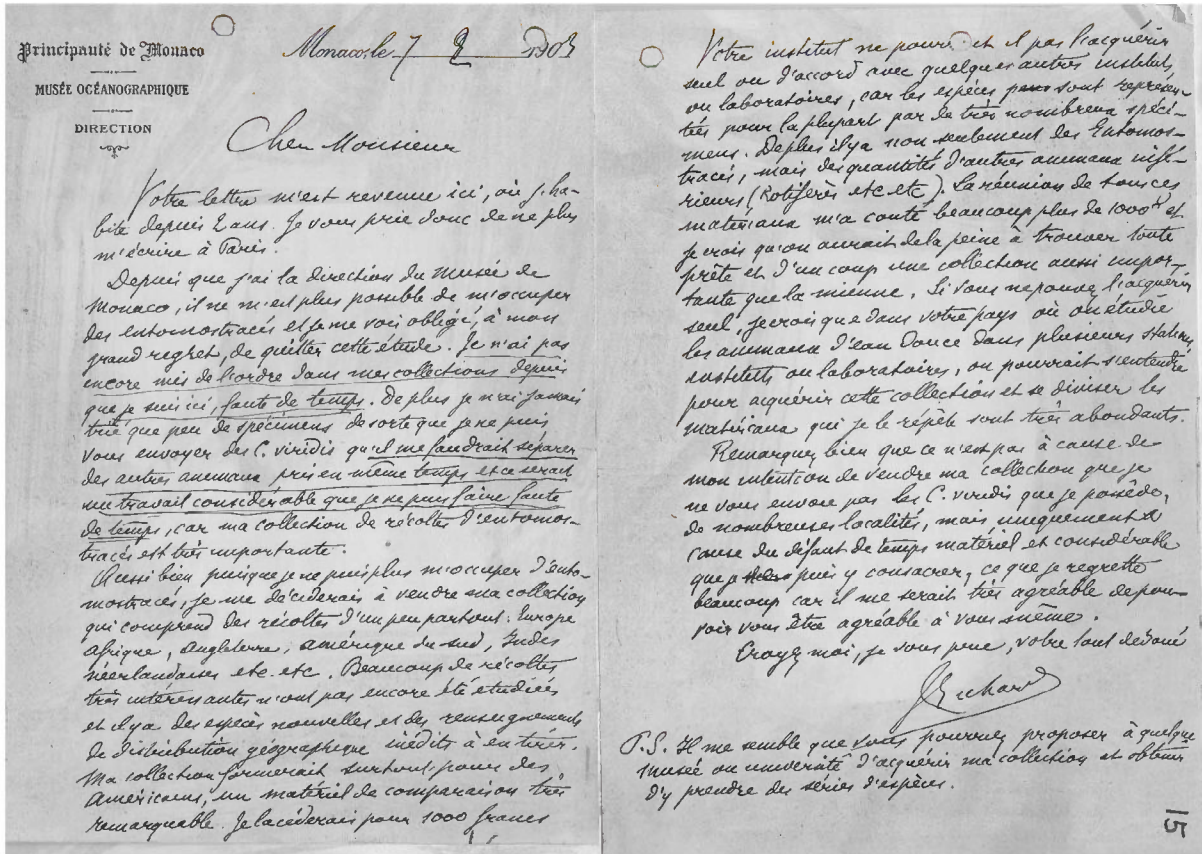


FIGURE 1. Letters of J. Richard, copies in the Collection of D. J. Frey, Smithsonian Institution's National Museum of Natural History, and kept at the Museum Support Center in Suitland, Maryland, U.S.A.: (A) 7 September 1903. Regrets that on becoming director of the Station at Monaco he has had to give up his study of the Cladocera. (B) 2 March 1904. Bill for the shipping expenses. (C) 27 February 1905. Acknowledges receipt of check for 1101 francs.

Principauté de Monaco  
 Musée Océanographique  
 DIRECTION

Monaco le 13 3 1903

Cher Monsieur

Ayant appris par votre lettre que vous  
 êtes disposé à examiner mes propositions,  
 je me suis décidé à jeter un coup d'oeil sur  
 l'ensemble de mes collections, d'une douzaine  
 et voici le résultat approximatif (car j'en ai  
 pas le temps) que j'ai pu faire de l'état  
 de ma collection se compose de plus de 700  
 flacons au total, et d'environ 50 préparations  
 microscopiques. Les flacons et tubes, comprenant  
 les récoltes, en alcool, la plupart, m'ont été  
 à la gelatine glycérinée, au au bismuth de l'acide.  
 Ces dernières, comprennent particulièrement des  
 pièces autotomiques, de copypode, d'ours, de  
 coquer, de sépie.

Voici quelques indications qui peuvent vous  
 être agréables :

France, côtes de montagne, de l'Auvergne	50
Alles (Département) Vichy etc.	50
Région de l'Alsace de la Sarre (tubes)	35
Carthage, Puy de Dôme, Reims, Alsace, Vézère	69
Font de Fontainebleau, Fontaine, Reims	69
Alger, m. l. de l'Algérie, de l'Algérie	60
Corse et environs	5
Haute Alpes	5
Canal du Midi (Toulon)	5
Vosges, lacs de Gérardmer	4

Les, des Jura	2
Lacs, lacs de la France, lacs, lacs	3
Portugal. Salubal	10
Haiti (auvent)	19
Boulhara Boulhara	2
Procland (Juliankaab, Jodkham)	8
Japon (lacs Tawandra, Enara etc)	11
Caucase (lacs élevés)	4
Nouvelle Sibirie (Mer Blanche)	12
Spitzberg	7
Quinque. Nouvelle Orléans	6
Etats Unis	10
Mexique	1
Venezuela	1
Perou	1
Argentine	3
Toumai (Siberie)	4
Finnmark	2
Wagatch	1
Corse Neuve	1
Russie	5
Macédoine (lacs)	2
Canaries	10
Palestine	3
Egypte	1
Chap	1
Japon	1
Georgie du Sud	1

Touk (A. S.)	11
Principauté de Monaco (lacs, lacs)	2
Chine	3
Grèce	1
Irlande	2
Nouvelle Sibirie	3
Suez	1
Norvège	30
Suisse (lacs de la Suisse, lacs)	6
Allemagne	30
Suède	10
Angleterre (lacs)	5
Belges	4
Rome	2
Sumatra	4
Ceylan	2
Madagascar	6
Espagne	26
Autriche (lacs, lacs, lacs, lacs)	18
Corse française	26
Sénégal	7
Algérie et Tunisie	62

Naturellement la faune française est la mieux  
 représentée.  
 La collection comprend de nombreux individus  
 types de lacs, lacs, lacs, lacs etc etc. de lacs, lacs, lacs,  
 que j'ai décrits. Elle comprend aussi beaucoup de  
 récoltes qui n'ont pas été publiées, notamment d'Algérie  
 de Tunisie, de Sénégal, de Corse, de Madagascar etc etc.  
 Ainsi que j'en ai dit dans l'ouvrage de lacs, lacs, lacs,  
 les parties brutes, c'est à dire lacs, lacs, lacs, lacs,  
 et on y trouve aussi les lacs, lacs, lacs, lacs,  
 etc etc qui n'ont pas été étudiés, même pour

La faune française. Il y a du matériel pour  
 plusieurs spécialistes pour lacs, lacs,  
 j'ai encore quelques flacons récoltés à ces lacs, lacs,  
 de lacs, lacs, lacs, lacs, etc, mais je  
 ne puis en déposer encore car ils ne m'appartiennent  
 plus.  
 Mais tout ce qu'il est le lacs, que j'en offre est plus  
 important que ce que j'en offre, car je ne l'ai pas  
 lacs, lacs, lacs, lacs, etc, mais je  
 n'aurai pas à le regretter si vous profitez de l'occa-  
 sion, j'espère que les renseignements donnés vous  
 suffiront.  
 Ce coup je vous prie cher Monsieur  
 avec mes meilleurs sentiments de vous  
 être de vous.  
 J. Richard

P.S. Il est bien entendu que le prix de 1000  
 est net et que les frais de port sont à la charge  
 de l'acquéreur. Je ferai le frais de remboursement.

FIGURE 2. Letter of J. Richard from 13 March 1903 with detailed inventory of his collection by number of tubes for each country. Original in DGF.

- Richard, J. (1888b) Entomostracés nouveaux on peux connus. *Bulletin de la Société Zoologique de France*, 13, 43–48.
- Richard, J. (1888c) Note zur *Moina bathycola* (Vernet). *Zoologischer Anzeiger*, 11, 118–119.
- Richard, J. (1888d) Recherches sur la faune des eaux du Plateau Central. Copepodes et Cladoceres. *Revue d'Auvergne, Clermont*, 1888, 243–254.
- Richard, J. (1889) Note sur les pêches effectuées par Lu Ch. Rabot dans les lacs Enara, Imandra et dans le Kolozero. *Bulletin de la Société Zoologique de France*, 14, 100–104.
- Richard, J. (1890a) Description du *Bradya edwardsi*, Copépode aveugle nouveau, vivant au bois de Boulogne avec divers entomostracés dans les eaux alimentées par le puits artésien de Passy. *Mémoires de la Société zoologique de France*, 3, 214–222.
- Richard, J. (1890b) Entomostracés d'eau douce recueillis à Belle Ile (Morbihan). *Bulletin de la Société Zoologique de France*, 15, 33–34.
- Richard, J. (1890c) Sur les Entomostracés et quelques autres animaux inférieurs des lacs de l'Auvergne. *Revue des Sciences Naturelles Appliquées*, 37, 472–481.
- Richard, J. (1891a) Entomostracés d'eau douce de Sumatra et de Celebes. *Zoologische Ergebnisse einer Reise in Niederländisch Ost-indien, herausgegeben von Dr. Max Weber (Brill: Leiden)*, 2, 118–128.
- Richard, J. (1891b) Sur les Entomostracés du lac Balaton. *Bulletin de la Société Zoologique de France*, 16, 135–137.
- Richard, J. (1892a) Animaux inférieurs, notamment Entomostracés, recueillis par M. le Prof. Steindachner dans les lacs de la Macédoine. *Annalen des K. K. Naturhistorischen Hofmuseum, Wien, Serie B, Botanik und Zoologie*, 7, 151–153.
- Richard, J. (1892b) *Grimaldina brazzai*, *Guernella raphaelis*, *Moinodaphnia mocquerysi*, cladocères nouveaux du Congo. *Mémoires de la Société zoologique de France*, 5, 213–226.
- Richard, J. (1892c) Sur la distribution géographique des Cladocères. In: Congrès international de Zoologie. Deuxième session à Moscou du 22–30 août 1892, Moscou. II. Section-Questions spéciales, concernant la biologie, la systématique et la faune. Première partie. Imperiale-Lithographie Laschkevich, Zmanensky et C-ie, Moscou: pp. 9–23.
- Richard, J. (1892d) Sur les Entomostracés des eaux douces du Chili. *Actes de la Société Scientifique du Chili*, 2 (2), 188–189.
- Richard, J. (1892e) Sur quelques Entomostracés de l'île Elbe et de l'île de Monte-Cristo. *Bulletin de la Société Zoologique de France*, 17, 225–228.
- Richard, J. (1894a) Cladocères recueillis par le Dr. Théod. Barrois en Palestine, en Syrie et en Égypte. *Revue biologique du Nord de la France*, 6, 360–378.
- Richard, J. (1894b) Entomostracés recueillis par M. E. Modigliani dans le lac Toba (Sumatra). *Annali del Museo Civico di Storia Naturale di Genova*, 14, 565–578.
- Richard, J. (1894c) Sur quelques animaux intérieurs des eaux douces du Tonkin (Protozoaires, Rotifères, Entomostracés). *Mémoires de la Société zoologique de France*, 7, 237–243.
- Richard, J. (1895a) Cladocères et copépodes recueillis par M. Kavraisky près de Tiflis et dans le lac Goktsha. *Bulletin de la Société Zoologique de France*, 20, 91–92.
- Richard, J. (1895b) Contribution a la faune des Entomostracés de la France. *Feuille des Jeunes Naturalistes*, 25 (294), 81–84, and 25 (295–296), 103–108.
- Richard, J. (1895c) Description d'un nouveau Cladocère, *Bosminopsis deitersi*, n. gen., n.sp. *Bulletin de la Société Zoologique de France*, 20, 96–98.
- Richard, J. (1895d) Révision des Cladocères. I. *Annales des Sciences Naturelles, Zoologie, 7th Serie*, 18, 279–389.
- Richard, J. (1895e) Sur quelques Entomostracés d'eau douce d'Haïti. *Mémoires de la Société zoologique de France*, 8, 189–199.
- Richard, J. (1896a) Révision des Cladocères. Deuxième Partie. Anomopoda. Famille III. – Daphnidae. *Annales des Sciences Naturelles, Zoologie, 8th Serie*, 2, 187–363.
- Richard, J. (1896b) Sur la faune des eaux douces des Açores. *Bulletin de la Société Zoologique de France*, 21,

171–178.

- Richard, J. (1896c) Sur la faune pélagique du Tegernsee. *Zoologischer Anzeiger*, 19, 28–29.
- Richard, J. (1896d) Sur la faune de quelques lacs élevés du Caucase d'après les récoltes de M. Kavraysky. *Bulletin de la Société Zoologique de France*, 21, 183–185.
- Richard, J. (1897a) Entomostracés de l'Amérique du Sud, recueillis par MM. U. Deiters, H. von Ihering, G.W. Müller et C.O. Poppe. *Mémoires de la Société zoologique de France*, 10, 263–301.
- Richard, J. (1897b) Entomostracés recueillis par M. Ch. Rabot à Jan Mayen et au Spitzberg. *Bulletin de la Société Zoologique de France*, 22, 193–198.
- Richard, J. (1897c) Entomostracés recueillis par M. le Directeur Steindacher dans les lacs de Janina et de Scutari. *Annalen des K.K. Naturhistorischen Hofmuseums*, 12, 63–66.
- Richard, J. (1897d) Sur deux Entomostracés d'eau douce recueillis par M. Chaffanjon en Mongolie. *Bulletin du Muséum d'histoire Naturelle*, 3, 131–135.
- Richard, J. (1897e) Sur quelques Entomostracés d'eau douce des environs de Buenos Aires. *Anales del Museo Nacional de Buenos Aires*, 5, 321–332.
- Richard, J. (1897f) Sur un oligochète et quelques entomostracés rares des environs de Paris. *Bulletin de la Société Zoologique de France*, 22, 224–226.
- Richard, J. (1898a) Copépodes et Cladocères de l'île Borkum. *Bulletin de la Société Zoologique de France*, 23, 166–168.
- Richard, J. (1898b) Sur la faune des eaux douces des îles Canaries. *Comptes rendus des seances de l'Academie des sciences, Paris*, 126, 439–441.
- Richard, J. (1898c) Sur la faune des eaux douces explorées en 1898 pendant la campagne du yacht Princesse-Alise (Lofoten, Spitsberg, Îles Beeren, Hope, de Barents et Færoer). *Mémoires de la Société Zoologique de France*, 11, 326–338.
- Richard, J. (1905) Sur des instruments destinés à la récolte et à l'examen préliminaire du plankton microscopique et sur la présence du genre *Penilia* dans la Méditerranée. *Bulletin du Musée océanographique de Monaco*, 52, 1–12.

#### Papers in collaboration:

- Blanchard, R. & Richard, J. (1890) Sur les crustacés des Sebchas et des chotts d'Algérie. *Bulletin de la Société Zoologique de France*, 15, 136–138.
- Blanchard, R. & Richard, J. (1891) Faune des lac salés d'Algérie. Cladocères et copépodes. *Mémoires de la Société Zoologique de France*, 4, 512–535.
- Blanchard, R. & Richard, J. (1897) Sur la faune des lacs élevés des Hautes Alpes. *Mémoires de la Société Zoologique de France*, 10, 43–61.
- Guerne, J. de & Richard, J. (1889a) Note sur les Entomostracés d'eau douce recueillis par M. Charles Rabot dans la province de Nordland, Norvège Septentrionale. *Bulletin de la Société Zoologique de France*, 14, 27–31.
- Guerne, J. de & Richard, J. (1889b) Sur la faune des eaux douces du Groenland. *Comptes Rendus de l'Académie des Sciences, Paris*, 108, 88–93.
- Guerne, J. de & Richard, J. (1891a) Entomostracés recueillis par M. Charles Rabot en Russie et en Sibérie. *Bulletin de la Société Zoologique de France*, 16, 232–236.
- Guerne, J. de & Richard, J. (1891b) Entomostracés, rotifères et protozoaires provenant des récoltes de M. E. Belloc dans les étangs de Cazau et de Hourtins (Gironde). *Bulletin de la Société Zoologique de France*, 16, 112–115.
- Guerne, J. de & Richard, J. (1891c) Sur quelques Entomostracés d'eaux douces de Madagascar. *Bulletin de la Société Zoologique de France*, 16, 223–224.
- Guerne, J. de & Richard, J. (1892a) Sur la faune des eaux douces de l'Islande. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, 114, 310–313.
- Guerne, J. de & Richard, J. (1892b) Sur la faune pélagique de quelques lacs des Hautes-Pyrénées. *Association Française pour l'avancement des sciences*, 21, 66–68.

- Guerne, J.de & Richard, J. (1892c) Voyage de la Goëlette Melita aux Canaries et au Sénégal 1899–1890. Cladocères et Copépodes d'eau douce des environs de Rufisque. *Mémoires de la Société Zoologique de France*, 5, 526–538.
- Guerne, J.de & Richard, J. (1892d) Voyage de M. Charles Rabot en Islande. Sur la faune des eaux douces. *Bulletin de la Société Zoologique de France*, 17, 75–80.
- Guerne, J.de & Richard, J. (1893a) *Canthocamptus grandidieri*, *Alona cambouei*, nouveaux entomostracés d'eau douce de Madagascar. *Mémoires de la Société Zoologique de France*, 6, 234–244.
- Guerne, J.de & Richard, J. (1893b) Sur la faune pélagique des lacs du Jura Français. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, 117, 187–189.
- Guerne, J.de & Richard, J. (1896) Première list des Copépodes et Cladocères d'eau douce du Portugal. *Bulletin de la Société Zoologique de France*, 21, 157–159.
- Poppe, S.A. & Richard, J. (1890) Note sur divers Entomostraces du Japan et de la Chine (*Leptodora*). *Bulletin de la Société Zoologique de France*, 15, 73–78.

### Richard's collection and other specimens in the NMNH

Information about all of Richard's 340 samples preserved in ethanol is incorporated to David G. Frey's handwritten catalogue of his collection ("Collection Accession" ledger) with numbers from 701 to 1041. These samples of Richard are located in three of Frey's boxes at the Museum Support Center in Suitland, Maryland. Specimens in most samples are in a good condition. A few of the 340 samples, e.g. #708 and #883, listed in the catalogue are not present in the boxes, and their fate is unclear. It appears that Frey copied to his own Collection Accession Ledger the information about Richard's collecting localities from Richard's sample labels, and this list have been checked for errors by Bernard H. Dussart in 1983.

Jules Richard did not make efforts to select types of his taxa he named (a practice widely followed at that time by taxonomists working with small crustaceans). However, he kept his samples and slides in a good order. Specimens in these samples cannot be regarded as types, and Richard did not leave any notes in the samples about specimens he had identified (with one exception, see below). However, in many cases, we can be reasonably certain that the specimens Richard examined in naming a particular species were taken from only one or few of the samples; in this sense these samples are more valuable than topotypic samples collected at a later date or by another taxonomist. As a result, these samples contain valuable specimens to further revision of the Richard's taxa. In addition to his Collection Accession ledger, David Frey prepared a separate set of inventory cards for all of his samples, including those of Richard. There is one inventory card for each sample, and on each card is recorded the name of each species from the sample determined by Frey or by colleagues who studied his samples. Some of Richards's samples were studied in detail by Frey, and his determinations, not Richard's, are presented on this set of cards.

Slides prepared by Jules Richard are stored in metal file cabinets A and E along with slides of E. A. Birge. Richard's slides are easily recognized by his calligraphic handwriting on the labels. The majority of Richard's slides are in good state, but many of Birge's semi-permanent slides are dried now. There is a special handwritten set of cards referring to Richard's slides, apparently made by Birge (Berner 1997). Finally, there is a set of cards made by Richard which refer to some small tubes. Apparently specimens were selected from these tubes by Richard and identified by him. Although there is a special small label "Richard's tubes" for this subset of cards among the Birge card catalog, unfortunately, these tubes are absent in the David G. Frey collection or in any other collection of NMNH. Aside from the samples that were sold by Jules Richard to E. A. Birge and eventually incorporated into the David G. Frey collection, efforts to discover whether other samples or slides of Richard are present in any other museums, for example Musée Océanographique de Monaco, were unsuccessful.

## Types of Jules Richard in the Natural History Museum, London, U.K.

There are types of four of Richard's taxa at the NHM in London. Specimens of two species, *Alona moniezi* and *Pleuroxus letourneuxi*, originally were deposited into the collection of Alfred M. Norman, and that collection was gifted and registered to the NHM in 1911 (see below). The origin of these specimens is unknown. After obtaining specimens identified by Richard, Norman subsequently may have marked them as types. Their labels (i.e. date of collection and collector) correspond well with Richard's publications, confirming their type status. In addition, lectotypes and paralectotypes of *Diaphanosoma modigliani* and *D. sarsi* also have been deposited with the NHM. These were selected by V. Kořínek from Richard's collection during Kořínek's visit to David G. Frey's laboratory in 1980 (V. Kořínek, personal communication to A. A. K.).

### Status of Richard's genera

1. *Grimaldina* Richard, 1892. Valid genus, see further comments in Smirnov (1992).
2. *Guernella* Richard, 1892. Valid genus, see further comments in Smirnov (1992).
3. *Bosminopsis* Richard, 1895. Valid genus, see further comments in Lieder (1996) and Kotov (1997a, b).

### Richard's taxa of species rank, ordered by family, with synonymies and notes on the specimens

#### Order Ctenopoda Sars, 1865

##### Family Sididae Baird, 1850

###### 1. *Diaphanosoma modigliani* Richard, 1894

*Diaphanosoma modigliani* Richard 1894b, p. 566–568, figs 1–3; Richard 1895d, p. 363–365, Pl. 15: figs 13–14, Pl. 16: fig. 22; Korovchinsky 1991, p. 180–184, figs 1A–K, 2A–E; Korovchinsky 1992, p. 42, figs 203–210; Korovchinsky 1998, p. 114, figs 1–8; Korovchinsky 2004, p. 304, 306, fig. 113.

**Type locality.** "Lac Toba" (Richard 1894b), North Sumatra, Indonesia.

**Type specimens.** Lectotype NHM 1980.234. Paralectotypes NHM 1980.235.

**Richard's specimens in DFG.** According to the hand-written catalogue, sample DGF 723 was from "Balige (Lac Toba, Sumatra)", coll. in 24.xi.1891 by M. E. Modigliani. However, according to the label in the jar 723, this sample is from Lake Titicaca and collected in 1969. So, the initial sample with number 723 is no longer present in the collection, and there are no other samples from Lake Toba in the Richard's collection now. Lectotype and paralectotypes were selected from this sample and sent to NHM by V. Kořínek during his visit to David G. Frey in 1971–1972.

**Comments.** This valid species is apparently rare, occurring only in Sumatra and Sulawesi, Indonesia (Korovchinsky 2004).

###### 2. *Diaphanosoma sarsi* Richard, 1894

*Diaphanosoma Sarsi* Richard 1894b, p. 568–570, figs 4–5; Richard 1895d, p. 365–367, Pl. 15: figs 1, 8; Korovchinsky 1981, p. 825–827, fig. 8; Korovchinsky 1992, p. 47–49, figs 236–245; Korovchinsky 2004, p. 316, figs 118 (3–7), 120 (1–4).

**Type locality.** "Lac Toba" (Richard, 1894b), North Sumatra, Indonesia.

**Type specimens.** Lectotype NHM 1981.834. Paralectotypes NHM 1981.835.



**Richard's material in DGF.** See *D. modigliani* for fate of sample DGF 723. Lectotype and paralectotypes were selected from the sample is no longer present in the collection and sent to NHM by V. Kořínek during his visit of David G. Frey in 1971–1972.

**Comments.** This is a valid, tropical-subtropical species of eastern hemisphere (Korovchinsky 2004).

### 3. *Penilia schmackeri* Richard, 1895

*Penilia schmackeri* Richard 1895d, p. 344–350, fig. 1; Pl. 15: figs 5, 7, 11, 17; Pl. 16: fig. 8.

**Type locality.** "mer près de l'île de Hong-Kong" (Richard 1895d), China.

**Richard's specimens.** Unknown.

**Comments.** Junior synonym of *Penilia avirostris* Dana, 1849 (Korovchinsky 2004).

## Order Anomopoda Sars, 1865

### Family Daphniidae Straus, 1820

#### 4. *Daphnia (Ctenodaphnia) bolivari* Richard, 1888

*Daphnia Bolivari* Richard 1888b, p. 47–48; Glagolev 1995, p. 54, Pl. 42: figs 7–10; Alonso 1996, p. 168–170, figs 75A–P; Benzie 2005, p. 99–103, figs 145–160.

*Daphnia atkinsoni* f. *bolivari* in Richard 1894a, p. 361–363, figs 1–2.

*Daphnia atkinsoni* var. *bolivari* in Richard 1896a, p. 202–204, Pl. 20: figs 3–4, 6; Gauthier 1937, p. 90–94, Pl. 5: figs E–J, Pl. 6: figs A–E, Pl. 7: fig. A.

**Type locality.** The description was based on a single specimen from "Valladolid" (Richard 1888b), Spain. Benzie (2005) reported Palestine as the type locality, but there is no reference to this region in Richard (1888).

**Richard's specimens in DGF. Lectotype (selected here)** USNM 1134573: Single female in relatively poor condition on slide (the only slide of this species) with Richard number 41, "Ciudad Real, M. I. Bolivar, X.?.1887, *Daphnia bolivari* (mh)".

**Comments.** Valid species (Glagolev 1995; Alonso 1996). Flössner (1972) initially listed *D. bolivari* as a junior synonym of *D. atkinsoni* Baird, 1859, but later Flössner (2000) considered *D. bolivari* valid.

#### 5. *Daphnia (Ctenodaphnia) chevreuxi* Richard, 1896

*Daphnia chevreuxi* Richard 1896a, p. 206–209, Pl. 20: figs 10–11, Pl. 21: fig. 4, Pl. 23: fig. 18, Pl. 24: fig. 4; Petkovski 1970, p. 139–142, figs 1–7; Flössner 1980, p. 65–67, fig. 3; Glagolev and Alonso 1990, p. 159–162; Glagolev 1995, p. 53, Pl. 41: figs 1–5; Benzie 2005, p. 125–128, figs 343–352.

**Type locality.** "Algérie: Environs de Bône (Guerrah El M'Krada, bord du lac Fetzara, marais des Kharézas, et abreuvoirs des environs de Bône)" (Richard 1896a).

**Richard's specimens.** Many females and males in samples DGF 730 and DGF 767, "Environs de Bône, Abreuvoir"; DGF 779, "Environs de Bône. Dans une abreuvoir"; DGF 783, "Environs de Bône"; DGF 761, "Guerrah el M'Krada. eau legerement salee"; DGF 797 "An bord du Guerrah el M'Krada".

Other samples from vicinities of Bône (DGF 725, 758, 764–766, 770, 773, 796) do not contain this taxon.

**Comments.** Valid species (Glagolev & Alonso 1990; Glagolev 1995; Benzie 2005).

## 6. *Daphnia (Daphnia) jardinei incerta* Richard, 1896

*Hyalodaphnia Jardinei* var. *incerta* Richard 1896a, p. 343–344, Pl. 25: fig. 6.

**Type locality.** Not described accurately; species descriptions based on samples from many localities in Germany, Czech Republic, Ukraine, Finland and U.S.A.

**Richard's specimens.** Unknown. The only sample from any of the listed European countries is DGF 958. However, this sample is from Borkum Island, Germany. Richard (1898a) refers to this sample but does not list any cladoceran taxa from it.

**Comments.** Junior synonym of *D. cucullata* Sars, 1862 according to Flössner (1972).

## 7. *Daphnia (Daphnia) curvirostris insulana* Richard, 1895

*Daphnia pulex* var. *insulana* Richard 1895b, p. 108, figs 4–5.

*Daphnia curvirostris* var. *insulana* Richard in Richard 1896a, p. 267–270, Pl. 21: figs 8, 15; Richard 1898a, p. 167.

**Type locality.** "Lille" (Richard 1895b), France.

**Richard's specimens in DGF. Lectotype (selected here)** USNM 1134575: Female in poor condition on slide of Richard number 35, labeled in pencil "*Daphnia insulana*, M 1887". [comment: M = Moniez].

**Paralectotype (selected here)** USNM 1134574: Female in poor condition on slide of Richard number 34, labeled in pencil "*Daphnia insulana*".

**Comments.** The morphology of the specimens on these two slides cannot be observed well enough to make a determination of the species from its description.

## 8. *Daphnia (Daphnia) lacustris vicina* Richard, 1896

*Daphnia lacustris* var. *vicina* Richard 1896a, p. 307–308, Pl. 24: fig. 1.

**Type locality.** "Loch Leven", Scotland, UK.

**Richard's specimens.** Unknown. No samples from Scotland exist in the Richard's collection.

**Comments.** Junior synonym of *D. hyalina* Leydig, 1860 according to Flössner (1972).

## 9. *Daphnia (Ctenodaphnia) psittacea wierzejskii* Richard, 1896

*Daphnia atkinsoni* Baird in Wierzejski 1895, p. 181, Pl. 2: fig. 1.

*Daphnia psittacea* var. *wierzejskii* Richard 1896a, p. 212–213.

**Type locality.** Not indicated accurately, the species described based on samples from a series of localities in Germany, Austria and England.

**Richard's specimens.** Unknown.

The only sample from any of the listed European countries is DGF 958. However, this sample is from Borkum Island, Germany. Richard (1898a) refers to this sample but does not list any taxa from it.

**Comments.** Richard (1896a) established this name by referring to Wierzejski's (1895) description of "*D. atkinsoni*". According to Flössner (1972) Wierzejski's specimens were *D. similis* Claus, 1876, so *D. psittacea wierzejskii* is a junior synonym of *D. similis*. The subsequently named *Daphnia wierzejskii* Lityński, 1913 is a junior homonym of the Richard's taxon.

**10. *Daphnia (Daphnia) schmackeri* Poppe et Richard, 1890**

*Daphnia Schmackeri* Poppe and Richard 1890, p. 74–76.

*Daphnia longispina* var. *schmackeri* Poppe et Richard in Richard 1896a, p. 298–299.

**Type locality.** "Lac Hakone, près Yokohama" (Poppe & Richard 1890), Honshu, Japan.

**Richard's specimens.** A few females from DGF 905, "Hakone. See bei Yokohama. Japan 5".

**Comments.** According to Flössner (1972, 2000) specimens of *D. schmackeri* belong to *D. longispina* so the name is a junior synonym of *D. longispina* O. F. Müller, 1776. However, genetic studies have demonstrated the presence of specimens belonging to a "non-European" species similar to *D. longispina* in Japan, but have not revealed specimens of *D. longispina* s. str. in Japan (Ishida et al. 2006; Ishida 2007). In Japan, specimens attributed to *D. schmackeri* probably are *D. dentifera* Forbes, 1893, a common pelagic species (Ishida 2007).

**11. *Daphnia (Ctenodaphnia) similis alluaudi* Richard, 1896**

*Daphnia similis* var. *Alluaudi* Richard 1896a, p. 227; Richard 1898b, p. 440, 441.

**Type locality.** "L'île de Fuerteventura" (Richard 1898b), Canary Islands.

**Richard's specimens.** Unknown. Two Richard's samples from Fuerteventura Island (DGF 706 and DGF 866) do not contain cladocerans.

**Comments.** Richard remarked only about the large size of this cladoceran (Richard 1896a, 1898b). This subspecies is a junior synonym of *D. similis* Claus, 1876 according to Flössner (1972).

**12. *Ceriodaphnia dubia* Richard, 1894**

*Ceriodaphnia dubia* Richard 1894b, p. 570–572, figs 6–8; Sars 1904, p. 631, Pl. 33: figs 2, 2a–b.

**Type locality.** "Lac Toba" (Richard 1894b), N. Sumatra, Indonesia.

**Richard's specimens.** Unknown. See discussion of sample DGF 723 under *Diaphanosoma modigliani*.

**Comments.** A valid species. Although similar specimens have been reported from many regions of the world, e. g. Europe (Flössner 1972, 2000; Alonso 1996), Canada, U.S.A., Bolivia, East Africa, Australia (Berner 1987), the species needs to be revised and specimens from different regions reconciled. The non-Indonesian populations particularly must be checked against specimens from the type locality.

**13. *Ceriodaphnia reticulata* var. *dubia* n.v. in Richard, 1896**

*Ceriodaphnia reticulata* Jurine, var. *dubia* n.v. in Richard 1896d, p. 184–185.

**Type locality.** "Lac Bougdáshene" = Bogdasheni Lake, Georgia.

**Richard's specimens.** Unknown. There are few samples from Georgia in DGF, but none from the type locality.

**Comments.** This taxon is a junior homonym of *Ceriodaphnia dubia* Richard, 1894.

**14. *Ceriodaphnia rigaudi* Richard, 1894**

*Ceriodaphnia rigaudi* Richard 1894c, p. 239–241.

? *Ceriodaphnia rigaudi* Richard in Richard 1894a, p. 367–370.

**Type locality.** "Une mare delà citadelle de Lao-Kay, poste avancé du Tonkin" (Richard 1894c), North Vietnam.

**Richard's specimens.** Many females, DGF 728, DGF 749, DGF 756, "Peche effective a Lao-Kay, Mare de la Citadelle, Fr. Indo-China". Two more samples DGF 748 and DGF 754 are from the vicinity of type locality, but there are no specimens of this species in them.

**Comments.** A species of the *C. cornuta*-complex (Berner 1985), recently found to be a hornless form of *C. cornuta* (D. B. Berner, personal communication), but specimens from different continents should be reconciled. Richard published two papers describing this species in 1894, but the article describing Mediterranean populations (Richard 1894a) referred to previous publication on Vietnam (Richard 1894c). Therefore the Vietnam locality should be considered the type locality of this species. The status of Mediterranean populations of *C. cf. rigaudi* mentioned by Richard (1894a) himself and by subsequent European authors (Alonso 1996), as well of populations from other regions of the world (Berner 1985), should be compared.

### 15. *Scapholeberis spinifera brevispina* Richard, 1897

*Scapholeberis spinifera* var. *brevispina* Richard 1897a, p. 281–283, figs 25–27; Richard 1897e, p. 329.

**Type locality.** "San Carlos de Chiloe", (Richard, 1897a) Chile.

**Richard's specimens.** Unknown.

**Comments.** Richard (1897a) stated that this is a junior synonym of *Daphnia spinifera* Nicolet, 1849. Dumont and Pensaert (1983) also recognized the name as a junior synonym of *D. spinifera* Nicolet, 1849.

### 16. *Simocephalus iheringi* Richard, 1897

*Simocephalus Iheringi* Richard 1897a, p. 279–281, figs 22–24.

**Type locality.** "Mares près Lourenço et à Rio Grande do Sul" (Richard 1897a), Brazil.

**Richard's specimens.** Unknown.

**Comments.** According to Orlova-Bienkowskaja (1998), *S. iheringi* is a junior synonym of *S. daphnoides*. However, a preliminary molecular-phylogenetic investigation (D. J. Taylor, personal communication) suggests an independent status for the South American populations, so *S. iheringi* is the name that should be applied only to the South American populations.

## Family Moinidae Goulden, 1968

### 17. *Moina dubia* Guerne & Richard, 1892

*Moina dubia* Guerne and Richard 1892c, p. 527–530, figs 1–2; Rey and Sain-Jean 1968, p. 92–93, fig. 9.

*Moina micrura dubia* Guerne et Richard in Smirnov 1976, p. 200, fig. 179.

**Type locality.** The species was described from samples taken in two localities. "Station 128. — Etang d'eau assez vaseuse, sorte de cuvette d'environ 20 mètres de diamètre située au milieu des dunes de sable, près du village nègre de Gounoûne, à 4 kilomètres à l'est de Rufisque" and "Station 145. — Fontaine de Hann, puits d'eau douée situé à 100 mètres du rivage de la baie de Hann, à environ 5 kilomètres de Dakar", both in Senegal (Richard 1892c).

**Richard's specimens.** Many females from DGF 707, "Etang près de Gounoûne, No.128, 5.IV.1890, M.

Chevreur" and DGF 716, "Fontaine de Hann, Senegal, N145, 8.V.1890, M. Chevreur".

**Comments.** This is a valid subspecies of *M. micrura* Kurz, 1874 according to Smirnov (1976).

### 18. *Moina weberi* Richard, 1891

*Moina weberi* Richard 1891a, p. 120–123, Pl. 10: figs 1–3.

**Type locality.** "lacs de Singkarah et de Maninjau (Sumatra)" (Richard 1891a), Indonesia.

**Richard's specimens.** A few well-preserved females in sample DGF 702, "Lac Singkarah (Sumatra) Pêche pelagique, surface, Max Weber, 3.V.1888"; many females in poor condition in sample DGF 703 from the same locality.

**Comments.** This is a junior synonym of *M. micrura* Kurz, 1874 according to Goulden (1968) and Smirnov (1976), but specimens reported as *M. micrura* from different areas may belong to a group of species (see Petrusek *et al.* 2004).

### 19. *Moina wierzejskii* Richard, 1895

*Moina brachiata* (Jurine) in Wierzejski 1893, p. 234–235, Pl. 5: figs 2–7.

*Moina Wierzejskii* Richard 1895e, p. 195–199, figs 9–13; Goulden 1968, p. 42–48, figs 17–19; Smirnov 1976, p. 206–208, figs 182, 187–188.

*Moina platensis* Birabén 1917, p. 264–266, figs 4–7; Birabén 1918, p. 118–123, figs 38–44.

**Type locality.** "Environs de Port-au Prince" (Richard 1895e), Haiti.

**Richard's specimens.** Many females and males from samples DGF 719, "Moulin de Drouillon"; DGF 751, "Mare Coucher Blain. Port au Prince"; DGF 800, "Mare T. Vienp. et Briqueterie. Port au Prince"; DGF 806, "Florian Armond-Rouge. Port au Prince"; DGF 836, "Carrefour. Port-au-Prince".

This species is absent from other samples taken in the vicinity of Port-au Prince (DGF 721, 727, 752, 805, 989), although *Moina* cf. *micrura* is present in the some of the samples.

**Comments.** Valid species, widely distributed in North, Central and South America (Goulden 1968; Smirnov 1976).

### 20. *Moinodaphnia mocquerysi* Richard, 1892

*Moinodaphnia Mocquerysi* Richard 1892b, p. 222–226, figs 7–8.

**Type locality.** No specific locality reported. All samples of Richard (1892b) were taken "sur le territoire de Mayoumba (Congo français)", now Gabon.

**Richard's specimens.** Females from samples DGF 851 and DGF 854 from "Fr. Eq. Africa" (no further information).

Samples DGF 708 and DGF 883 from "Mayoumba, Congo, Fr. Eq. Africa" are not present in DGF; these samples contained *Moinodaphnia* sp. according to identifications on this Frey's card.

**Comments.** Goulden (1968) regarded *M. mocquerysi* as a junior synonym of *M. macleayi* (King, 1853) described from Australia. If specimens of *M. macleayi* cannot be reconciled with those of *M. mocquerysi*, the latter name should be restricted to populations from Gabon.

## Family Bosminidae Baird, 1845

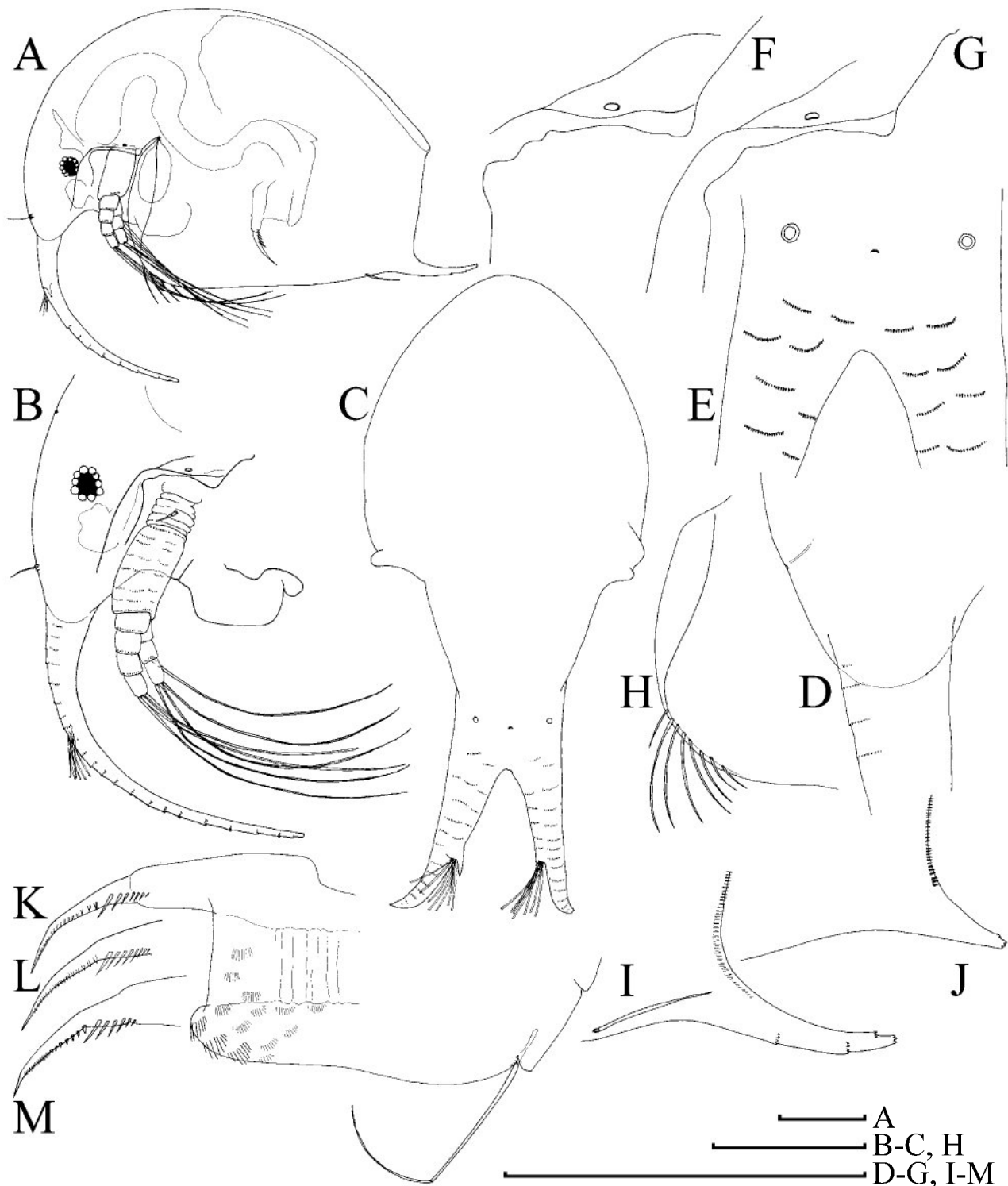
### 21. *Bosmina japonica* Poppe et Richard, 1890

*Bosmina japonica* Poppe and Richard 1890, p. 76–77.

Not *Bosmina* cf. *japonica* in Kořínek 1971, p. 292, figs 10F–H, 11A–D.

**Type locality.** "Lac Hakone, près Yokohama" (Poppe & Richard 1890), Honshu Island, Japan.

**Richard's specimens. Lectotype (selected here):** Parthenogenetic female in good state on slide with Richard number 174, labelled "*Bosmina japonica* P.R., Hakone see bei Yokohama (M. Schmacker)", USNM 1134576. Few females from sample DGF 0905, "Hakone. See bei Yokohama. Japan 5".



**FIGURE 3.** *Bosmina japonica* Poppe & Richard, 1890 (junior synonym of *B. longirostris*), parthenogenetic female from Lake Hakone, near Yokohama, Japan, from tube DGF 905: (A) Large adult, lateral view. (B) Head. (C) Head shield, anterior view. (D, E) Rostrum, lateral and anterior view. (F–G) Lateral head pore. (H) Anterior margin of valve. (I) Mucro of typical specimen. (J) Mucro of atypical specimen. (K) Postabdomen. (L–M) Postabdominal claw, external view. Scale bars: 0.1 mm.

**Redescription.** *Parthenogenetic female.* Body moderately compressed laterally in anterior view, relatively short and wide in lateral view, dorsal margin regularly curved from distalmost extremity to postero-dorsal angle, posterior margin straight, its height more than half of body height, ventral margin almost straight, with a shallow depression anterior to mucro (Fig. 3A). Head without an ocular dome (Fig. 3B). Frontal head pore small, located far from ventral margin of head shield (as seen from anterior side) at level of antennular sensory setae (Fig. 3C–E). Fornices well-developed, covering coxal part of antenna II. Lateral head pore small, ovoid, located near ventral margin of head shield (Fig. 3F–G). Compound eye small, ocellus absent. Labrum a fleshy appendage lacking significant projections, distal labral plate small. Ventral valve margin with a series of stout setae on its anterior portion, base of each located on internal surface of valve (Fig. 3H). “Seta kurzi” located on internal side of valve anterior to abovementioned depression near mucro, mucro strong and long with truncated tip supplied with a system of minute indentations, and 1–3 incisions on ventral side (Fig. 3I), incisions absent from rare specimens with shortened mucro (Fig. 3J). Series of minute setules at inner side of valve near posterior valve margin.

Thorax relatively long, with 6 limb pairs. Postabdomen strongly compressed laterally, with width approximately equal along all its length, with ventral (although functionally dorsal) margin almost straight (Fig. 3K). Preanal margin long, slightly concave, with groups of setules distally. Sides of postabdomen supplied with series of finer setules. Distal (anal) margin truncated, postero-dorsal angle as a projection. Postanal portion as a cylindrical projection bearing paired postabdominal claws. Each claw regularly bent, with two pectens on concave (dorsal) margin, distal pecten consists of short spinules, while proximal pecten consists of 6–8 rather strong and thin teeth (Fig. 3L–M). Postabdominal seta somewhat shorter than preanal margin, its distal section about 1.5 times shorter than distal one.

Antenna I fused with rostrum, rather long, its length from tip to tip of rostrum about 0.5 body lengths. Antennular (frontal) sensory seta located on rostrum. Free section of antenna I (not incorporated into rostrum) consists of a pre-aesthetasc portion, fused with rostrum, and a post-aesthetasc portion (Kotov et al. 2009), regularly bent in this taxon. Pre-aesthetasc portion straight, regularly narrowing distad in anterior view, an internal spine near a flat site of origin of aesthetascs. Post-aesthetasc portion directed ventrally and posteriorly, remarkably curved in lateral view. Both portions supplied with dorsoventral series of fine denticles.

Antenna II typical for the genus, six pairs of thoracic limbs with morphology indistinguishable from that in other species (Kotov 1996, 1997a).

**Ephippial female, male.** Unknown.

**Comments.** No differences were found between *B. japonica* and *B. longirostris* (O. F. Müller, 1776); the latter is a very common species very widely distributed (Kotov et al. 2009). Kořínek et al. (1999) arrived at the same conclusion after a study of a topotypic specimen from Lake Hakone.

## 22. *Bosminopsis deitersi* Richard, 1895

*Bosminopsis deitersi* Richard 1895c, p. 96–98, figs 1–4; Richard 1897a, p. 283–286, figs 28–31; Stingelin 1904, p. 584–586, Pl. 20: figs 7–10; Burckhardt 1909, p. 251; Burckhardt 1924, p. 221–228; Rey and Vásquez 1986a, p. 222–225, Pl. 2: figs 1–16; Kotov 1997a, p. 26–29, figs 1–2; Kotov 1997b, p. 6–26, figs 1–13.

*Bosminopsis macaguensis* Rey and Vásquez 1986a, p. 220–222, Pl. 1: figs 1–18.

*Bosminella Anisitsi* Daday 1903, p. 594–597, figs 1–3; Daday 1905, p. 199–00, Pl. 13: figs 1–5.

**Type locality.** “... l'eau douce à La Plata (Buenos-Aires)” (Richard 1895c), Argentina.

**Richard's specimens.** Unknown.

**Comments.** A valid species whose distribution is regarded as cosmopolitan; some Amazonian populations were re-examined by Kotov (1997a, b). Genetic distances among populations from different continents are great, suggesting a group of sibling species (D. J. Taylor, personal communication). As noted in the synonymy, *Bosminella Anisitsi* Daday, 1903 and *Bosminopsis macaguensis* Rey et Vásquez, 1986 are suggested synonyms of *B. deitersi* (Kotov 1997b).

**Family Macrothricidae Norman et Brady, 1867****23. *Grimaldina brazzai* Richard, 1892**

*Grimaldina Brazzai* Richard 1892b: 214–218, figs 1–3; Daday 1910, p. 130–139, Pl. 7: fig. 26; Rey and Saint-Jean 1968, p. 97, fig. 13; Fryer 1974, p. 236–238, figs 128–129; Smirnov 1976, p. 155–156, figs 137–139; Kořínek 1984, p. 50, fig. 26; Smirnov 1992, p. 107–109, figs 461–468; Silva-Briano 1998, p. 149–151, figs 1–10.

**Type locality.** "Mayoumba et Caca Muerca (Congo Français)" (Richard 1892b), now in Gabon.

**Richard's specimens. Lectotype (selected here)** USNM 1134577: Parthenogenetic female on slide with Richard number 207 labelled "*Grimaldina brazzai* Richard, ♀, Congo, Caca Muerca, 10 juin 1890".

Females from sample DGF 851 from "Fr. Eq. Africa" (no further information).

Samples DGF 855 and DGF 865 from "Caca Muerca. Fr. Eq. Africa" do not contain this species.

Sample DGF 708 from "Mayoumba. Congo, Fr. Eq. Africa", contained *Grimaldina brazzai* according to Frey's card, but is no longer present in the collection.

**Comments.** A valid species (Smirnov 1992), reported circumtropically but rare; non-African populations should be reconciled with specimens from type locality. Only African records are presented in the synonymy.

**24. *Guernella raphaelis* Richard, 1892**

*Guernella Raphaelis* Richard 1892b, p. 218–221, figs 4–5; Rey and Saint-Jean 1968, p. 97, fig. 14; Fryer 1974, p. 227–230, figs 110–112; Smirnov 1976, p. 156, figs 140–141; Kořínek 1984, p. 50–51, fig. 27; Smirnov 1992, p. 114, figs 485–490.

**Type locality.** "Mayoumba et à l'endroit nommé "Caca Muerca"" (Richard 1892b), Gabon.

**Richard's specimens.** A few females from samples DGF 851 and DGF 854 from "Fr. Eq. Africa" (no further information).

Samples DGF 855 and DGF 865 from "Caca Muerca. Fr. Eq. Africa" do not contain this taxon. Sample DGF 883 from "Mayoumba. Congo, Fr. Eq. Africa", which also contained *Guernella raphaelis* according to David Frey's card, is no longer present in the collection.

**Comments.** A valid species (Smirnov 1992), reported circumtropically but rare; non-African populations should be reconciled with specimens from type locality. Only African records were presented in the synonymy.

**25. *Macrothrix chevreuxi* Guerne et Richard, 1892**

*Macrothrix Chevreuxi* Guerne and Richard 1892c, p. 530–533, figs 3–6.

**Type locality.** "Rio Fresco, près Rufisque" and "un lieu dit "Caca Muerca", près Majumba", (Richard 1892c). The former now is in Senegal; the latter now is in Gabon.

**Richard's specimens.** A few females from samples DGF 854 from "Fr. Eq. Africa" (no further information).

Samples DGF 855 and DGF 865 from "Caca Muerca. Fr. Eq. Africa" do not contain this taxon. Samples DGF 708 and DGF 883 from "Mayoumba. Congo, Fr. Eq. Africa" are no longer in the collection but did not contain *Macrothrix* sp. according to David Frey's card. There are no *Macrothrix* in any of the samples from Senegal.

**Comments.** A junior synonym of *M. triserialis* according to Smirnov (1992). However, Dumont *et al.* (2002) and Kotov *et al.* (2004) believe that specimens reported as "*M. triserialis*" constitute a large assemblage of sibling species. The status of different African populations of *M. cf. triserialis* should be reconciled with specimens from type locality.



**26. *Macrothrix goeldi* Richard, 1897**

*Macrothrix Goeldi* Richard 1897a, p. 287–289, figs 32–34.

**Type locality.** "... en eau douée, en particulier près de Concepción et à Lunache" (Richard 1897a), Chile.

**Richard's specimens.** Unknown.

**Comments.** A junior synonym of *M. spinosa* according to Smirnov (1992), which is regarded now as a circumtropical species; however, specimens from different localities should be reconciled.

**Family Chydoridae Dybowski et Grochowski, 1894 emend. Dumont et Silva-Briano, 1998****27. *Alona alluaudi* Richard, 1898**

*Alona Alluaudi* Richard 1898b, p. 440–441; Richard 1898b, p. 439, 440.

**Type locality.** "Tenerife" (Richard 1898b), Canary Islands.

**Richard's specimens.** Unknown. There are no samples from Tenerife in Richard's collection at NMNH.

**Comments.** Richard (1898b) noted a large size for the genus, up to 1 mm, but no other differences from any other species were included. Van Damme *et al.* (2010b) considered the status of this species uncertain.

**28. *Alona cambouei* Guerne et Richard, 1893**

*Alona sp.?* in Guerne and Richard 1891c, p. 224.

*Alona Cambouei* Guerne and Richard 1893a, p. 242–244, figs 10–11; Richard 1894a, p. 372–374, figs 5–8; Richard 1894c, p. 241; Richard 1897a, p. 289–290; figs 35–36; Sinev 2001, p. 13–17, figs 34–58.

See further synonymy in Sinev (2001).

**Type locality.** "... environs de Tananarive" (Guerne & Richard 1893a), Madagascar.

**Richard's specimens.** Two parthenogenetic females in sample DGF 1041 labelled "Lac L'andohalo jans. Tananarive. Altitude absolute 1290 m.". Andohalo today is an urban area within town of Antananarive; if the type locality exists, most probably it has been significantly modified.

Only two other samples from Madagascar are listed in the catalogue, DGF 704 and DGF 972, but they contain no cladocerans.

**Comments.** A valid tropical-subtropical species adequately redescribed by Sinev (2001) with specimens from Sudan, Iraq and Uzbekistan. See Sinev (2001) and Van Damme *et al.* (2010b) for further comments.

**29. *Alona moniezi* Richard, 1888**

*Alona Moniezi* Richard 1888a, p. 24 (*nomen nudum*); Richard 1888b, p. 46–47; Richard, 1888d, p. 252; Moniez 1889, p. 347.

**Type locality.** "environs de Vichy, puis dans un bassin du parc de M. Du Buysson à Brout-Vernet (Allier)" (Richard 1888b), France.

**Syntypes in NHM.** NHM 1911.11.8.28509-28513, labelled as "*Alona moniezi*, Types, Vichy, France, 1888". NHM 1911.11.8.M.4136, two females labelled as "*Alona moniezi*, Types, = *Lynceus rectangulus*, Vichy, France, 1888".

**Richard's specimens in DGF. Syntypes (found here):** Many females and males in the sample DGF 744, "Chateau du Verten (Allier) (le Vernet), *Alona moniezi* Rich.". In contrast to all other samples, DGF 744

contains a label with an identification written by Richard (in the manner of his writing). So, these specimens were determined by the author of this taxon and are considered here as syntypes.

**Comments.** *A. moniezi* initially was published as a *nomen nudum* in a list of taxa (Richard 1888a). A formal description without illustrations was published (Richard 1888b) containing a reference to the first paper. This species belongs to the *A. elegans*-group which is similar to species of *Coronatella* Dybowski et Grochowski, 1894. Van Damme *et al.* (2010a) proposed that *A. moniezi* may be a hybrid of *A. elegans* and *C. rectangula*.

### 30. *Alona sarsi* Richard, 1891

*Alona Sarsi* Richard 1891a, p. 124, Pl. 10: figs 4–5.

**Type locality.** "Célèbes: Luwu" (Richard 1891a), Indonesia.

**Richard's specimens in DGF. Lectotype (selected here)** USNM 1134578: Parthenogenetic female, on slide, well-preserved, with Richard number 282, labelled "*Alona sarsi* Richard, ♀, Célèbes (Luwu), Max Weber, 1890". **Paralectotype (selected here)** USNM 1134579: Parthenogenetic female in relatively good state on slide with Richard number 281, labelled "*Alona sarsi* Richard, ♀, Célèbes, Luwu – Max Weber, 1890".

**Non-type specimens:** A few females in sample DGF 860, "Luwu. Célèbes".

**Comments.** Recent species description (Van Damme *et al.* 2010) should be revised using Richard's specimens.

### 31. *Coronatella poppei* (Richard, 1897)

*Alona Poppei* Richard 1897a, p. 290–292, figs 37–38; Smirnov 1971, p. 346, fig. 389; Rey and Vasquez 1986b, p. 155, figs 1–12.

? *Alona poppei* Richard in Delachaux 1919, p. 29, Pl. 2: figs 4–5.

*Coronatella poppei* (Richard) in Van Damme and Dumont 2008, p. 33.

**Type locality.** "... en eau douée, en particulier près de Concepción et à Lunache" (Richard 1897a), Chile.

**Richard's specimens.** Unknown.

**Comments.** Valid species of *Coronatella* Dybowski & Grochowski, 1894, neotropical distribution. African populations described by Delachaux (1917) and other authors belong to *C. anemae* Van Damme et Dumont, 2008; see further comments in Van Damme and Dumont (2008) and Van Damme *et al.* (2010b).

### 32. *Karualona muelleri* (Richard, 1897)

*Alona Mülleri* Richard 1897a, p. 292–294, figs 39–40.

*Alonella karua* (King) in Sars 1901, p. 59–60, Pl. 10: figs 2, 2a–d.

*Karualona muelleri* (Richard) in Sinev and Hollwedel 2005, p. 94–100, figs 1–33.

**Type locality.** "...en eau douée, en particulier près de Concepción et à Lunache" (Richard 1897a), Chile.

**Richard's specimens.** Unknown.

**Comments.** Valid species from South America recently redescribed from Brazil by Sinev and Hollwedel (2005). See further comments in Van Damme *et al.* (2010b).

### 33. *Leberis davidi* (Richard, 1895)

*Alona Davidi* Richard 1895e, p. 192–195, figs 5–8.

*Alona Davidi* var. *Iheringi* Richard 1897a, p. 294–296, figs 42–43.

*Alonella diaphana* (King) in Sars 1901, p. 60–61, Pl. 10: figs 3, 3a–b; Birabèn 1939, p. 663–665, figs 17–18.

*Alonella punctata* Daday 1905, p. 163–164, Pl. 10: figs 12–17.

*Leberis davidi* (Richard) in Sinev *et al.* 2005, p. 193–201, figs 60–150.

**Type locality.** "une mare à Drouillard, près de Port-au-Prince" (Richard 1895e), Haiti.

**Richard's specimens.** Unknown.

Of numerous samples from Haiti (DGF 719, 721, 727, 751, 752, 788, 792, 800, 8005, 806, 836, 909, 989) none contain specimens of *Leberis*.

**Comments.** Valid species recently redescribed from numerous South American localities by Sinev *et al.* (2005). Elias-Gutierrez and Valdez-Moreno (2008) found a similar species in Mexico. According to recent knowledge, *L. davidi* is widely distributed in the Neotropics, but a new, careful re-examination is needed.

### 34. *Leberis davidi iheringi* Richard, 1897

*Alona Davidi* var. *Iheringi* Richard 1897a, p. 294–296, figs 42–43.

not *Alona iheringi* Sars 1901, p. 49–51, Pl. 9: figs 2, 2a–c.

not *Alona iheringula* Kotov and Sinev 2004, p. 95–97, figs 1–8.

**Type locality.** "mares près Lourenço et à Rio Grande do Sul", Brazil (Richard 1897a).

**Richard's specimens.** Unknown.

**Comments.** Recently regarded as a junior synonym of *L. davidi* (Richard 1895) (see Sinev *et al.* 2005). *Alona iheringi* Sars, 1901 is a junior homonym of *A. davidi iheringi* Richard, 1897. The former name was replaced by *A. iheringula* Kotov & Sinev, 2004 (see Van Damme *et al.* 2010b).

### 35. *Pleuroxus letourneuxi* (Richard, 1888)

*Chydorus Letourneuxi* Richard 1888b, p. 46; Blanchard and Richard 1890, p. 137; Blanchard and Richard 1891, p. 513–514, figs 1–5; Richard 1894a, p. 376; Gurney 1909, p. 292, Pl. 11: figs 2–23; Gauthier 1928: fig. 44.

*Pleuroxus obtusirostris* Smirnov, 1965 in Smirnov 1966b, p. 339.

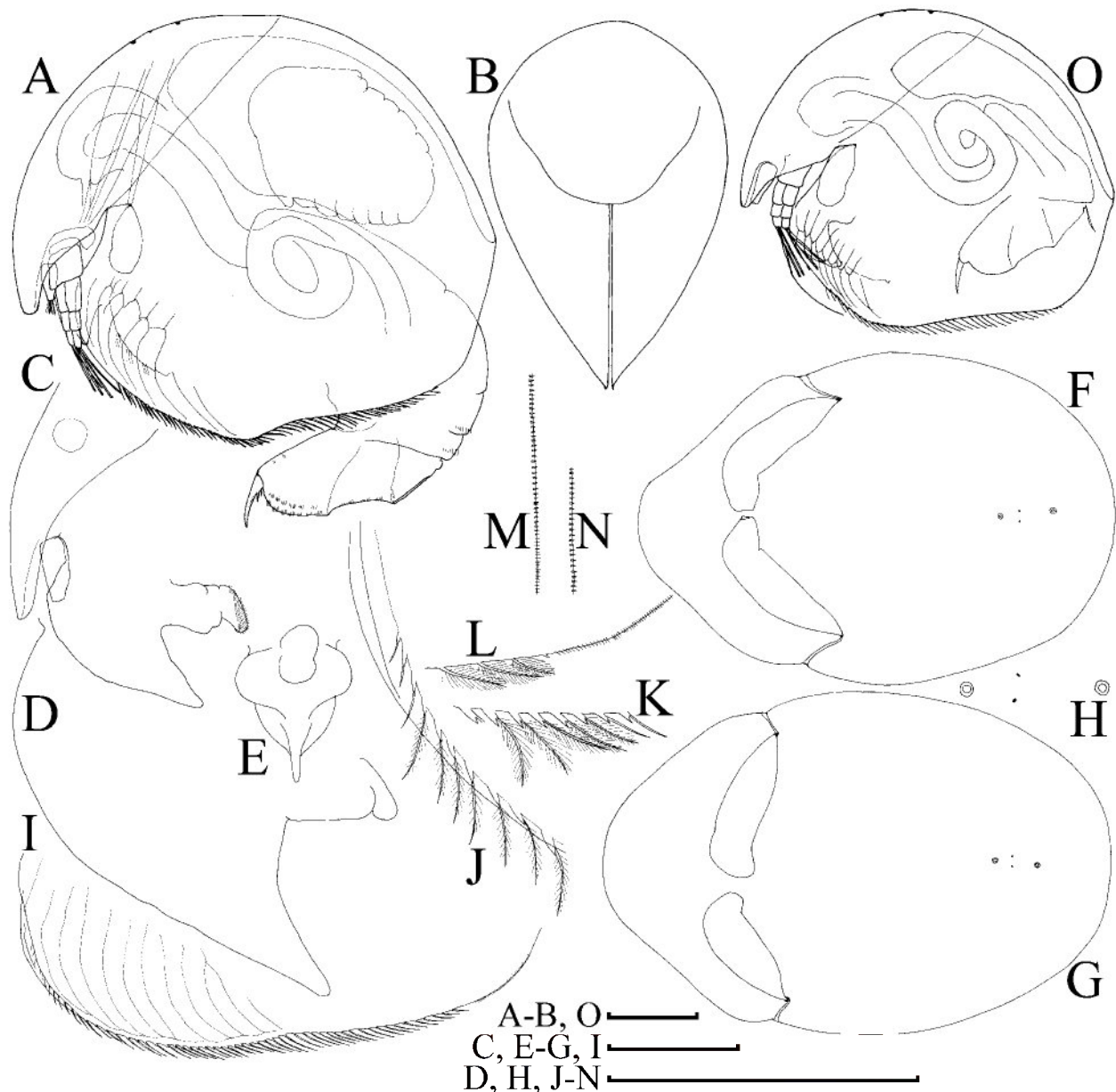
*Pleuroxus letourneuxi* (Richard) in Smirnov 1966a, p. 163–167, 176, figs 1–4; Smirnov 1971, p. 254–255, figs 254–257; Smirnov 1996, p. 61–64, figs 237–242.

**Type locality.** "une source à Bir-en-Nebech", Tunisia (Richard 1888b).

**Type specimen.** NHM 1911.11.8.M.4207, labelled as "*Chydorus letourneuxi*, Types, Ber-en-Nebeck, Tunis, 1888".

**Richard's specimens in DGF.** Many females from sample DGF 962, "Bir en Nebech. Tunisia, M. Letourneux".

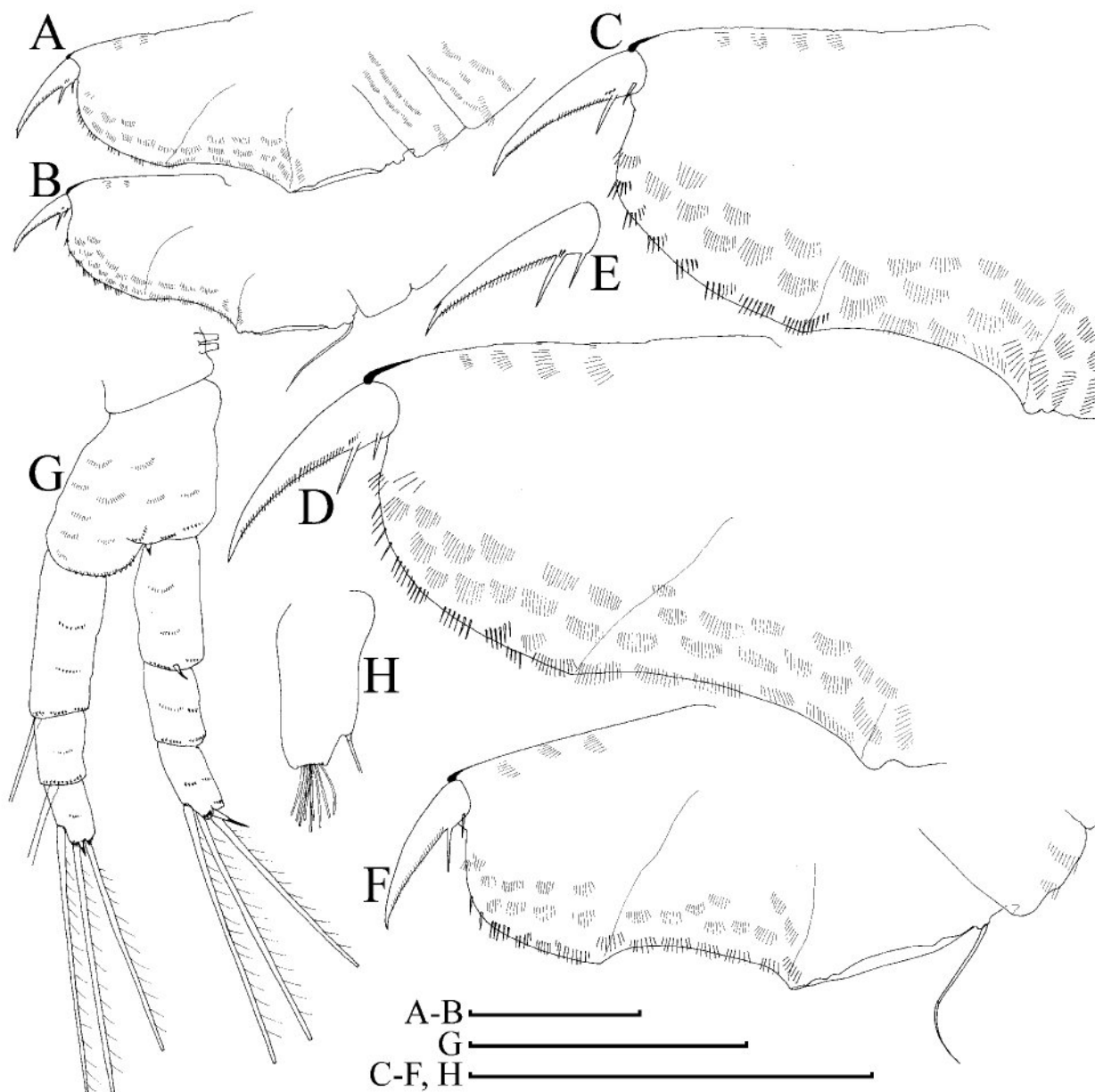
**Redescription.** *Parthenogenetic female.* Body transparent, in lateral view rounded, very deep for the genus (body height/ body length = 0.90–0.95 in adults), maximum height in middle (Fig. 4A, O). Dorsal margin evenly arched from tip of rostrum to well-defined posterodorsal angle, posterior margin straight, posteroventral angle broadly rounded, without teeth, ventral margin with a distinct prominence in middle. Striation expressed predominantly in anteroventral portions of valve. In anterior view body rounded-rhomboid, without a dorsal keel (Fig. 4B).



**FIGURE 4.** *Pleuroxus letourneuxi* (Richard, 1888), parthenogenetic female from Bir el Nebech, Tunisia, tube DGF 962: (A–B) Adult, lateral and anterior view. (C) Head. (D–E) Labrum, lateral and posterior view. (F–G) Head shield. (H) Dorsal head pores. (I) Valve. (J) Its anterior margin, inner view. (K) Its antero-ventral region. (L) Postero-ventral region. (M–N) Posterior margin of valve, inner view. (O) Juvenile. Scale bars: 0.1 mm

Head with short rostrum, protruding downward (Fig. 4C). Eye and ocellus poorly-preserved in Richard's specimens. Labrum with fleshy main body (Fig. 4D–E), small distal labral plate and a large medial labral keel having an elongated apex. Head shield ovoid, maximum width at mid-length, significantly posterior to mandibular articulation, rostrum broadly rounded; posterior margin of head shield also widely rounded (Fig. 4F–G). Two major head pores, PP = 1.5–2 IP. Lateral head pores minute located closer to anteriormost pore (Fig. 4H).

Valves large, ventral margin armed with numerous setae differing in size in different regions, all plumose and located marginally (Fig. 4I, K–L) except for those on anterior margin (Fig. 4J). A row of small setules situated on inner side of posterior valve margin close to margin, tips protrude beyond margin (Fig. 4M–N).



**FIGURE 5.** *Pleuroxus letourneuxi* (Richard, 1888), parthenogenetic female from Bir el Nebech, Tunisia, tube DGF 962: (A–B) Postabdomen of adults. (C–D) Its distal portion. (E) Postabdominal claw, external view. (F) Postabdomen of juvenile. (G) Antenna II of adult. (H) Antenna I. Scale bars: 0.1 mm.

Postabdomen wide, ventral margin almost straight (Fig. 5A–D, I). Preanal margin straight to slightly concave, approximately as long as anal or postanal margin, preanal-postanal angle well-defined, dorso-distal portion of postabdomen widely rounded, without distinct depression near base of claws. Each side of postanal portion with successive series of thin postanal teeth, not increasing in size distally, series evenly grading into series of setules on anal margin. Lateral to marginal teeth, two rows of fascicles consisting of short, fine setules. Postabdominal seta shorter than preanal margin, with proximal part longer than distal part. Postabdominal claw short (significantly shorter than preanal or anal margin), massive, slightly and evenly curved, with setules along ventral margin, a spinule distally on its dorsal margin, and two spines toward its base, proximal shorter than distal (Fig. 5E).

Antenna I not reaching tip of rostrum, slightly narrowing distally, without a basal peg (Fig. 5H). Antennular sensory seta slender, arising on a small prominence at last quarter of antennular length. Nine short aestetasci of slightly differing size. Antenna II relatively short, coxal part with two sensory setae, basis robust, with a rudimentary distal spine (Fig. 5G). Antennal branches relatively elongate, exopod and endopod

subequal in length, all segments cylindrical, antennal formula, setae 0–0–3/1–1–3, spines 1–0–1/0–0–1. Exopod and endopod apical swimming setae subequal in size. No chitinous insertions within distal segments. Lateral seta on proximal segment of endopod thinner and shorter than distal lateral seta. Spine on proximal segment of exopod small.

Paragnath as a shallow, setulated projection. Maxilla I as a projection with three setae (Fig. 6A)

Limb I (Fig. 6B). Accessory seta absent, ODL relatively small, a long, and a short seta both unarmed. IDL approximately as large as ODL, with series of setules; three IDL setae differing in size, similarly armed distally with short, fine setules. Endite 3 with three soft posterior setae (a–c) and somewhat shorter stiff anterior seta 1 (Fig. 6B: 1). Endite 2 with short anterior seta d, long setae e and f, and thin posterior seta 2 armed with minute setules distally. Endite 1 with long, slender posterior setae g–i, and anterior seta 3 similar to seta 2. Fascicles of thin setules on inner face of limb, plus bunches of longer thicker setules at ventral margin of limb, two slender ejector hooks of subequal size. A short seta, remnant of maxillar process, on limb base.

Trunk limb II (Fig. 6C–D). Exopodite subquadrangular, with a short seta. Inner margin of limb with eight scrapers, 1–2 specially long, 3–5 shorter, subequal in size, 6–8 short, also subequal in size. A series of small projections near distal setae, and a small sensillum near scraper 4. Distal armature of gnathobase with 2 series of thin setules, and four setae (1–4). Filter plate II with eight setae, two ventral elements shorter than the rest; proximal seta of filter plate inflated at base.

Trunk limb III (Fig. 6E–F). Exopodite sub-rectangular, with 4 distal setae of different sizes (1–4) and 3 lateral setae (5–7). Distal endite with 3 anterior setae (Fig. 6F: 1–3), all with minute setules distally; small sensillae near bases of setae 2 and 3. Basal endite with 4 anterior setae of subequal size (4–7), armed with small setules distally, a small bottle-shaped sensillum near seta 4. On posterior surface, 6 setae (a–f) of similar size, bilaterally armed with sparse, fine setules. Gnathobase separated from basal endite. Distal armature of gnathobase with large, bottle-shaped sensillum (1), 3 setae (2–4), plus setules. Filter plate III with 8 setae of similar size.

Trunk limb IV (Fig. 6G–H). Exopodite wide, subovoid, with 7 setae of unequal size (1–7). Inner-distal portion of limb IV with 4 marginal setae (1–4), distal seta with minute setules on distal section, setae 2–4 each with thick basal section and slender, setulated distal section, sensillae located near setae 2 and 3. On posterior surface, 4 soft setae (a–d). Gnathobase distinct with 4 distal setae. Filter plate with 6 setae.

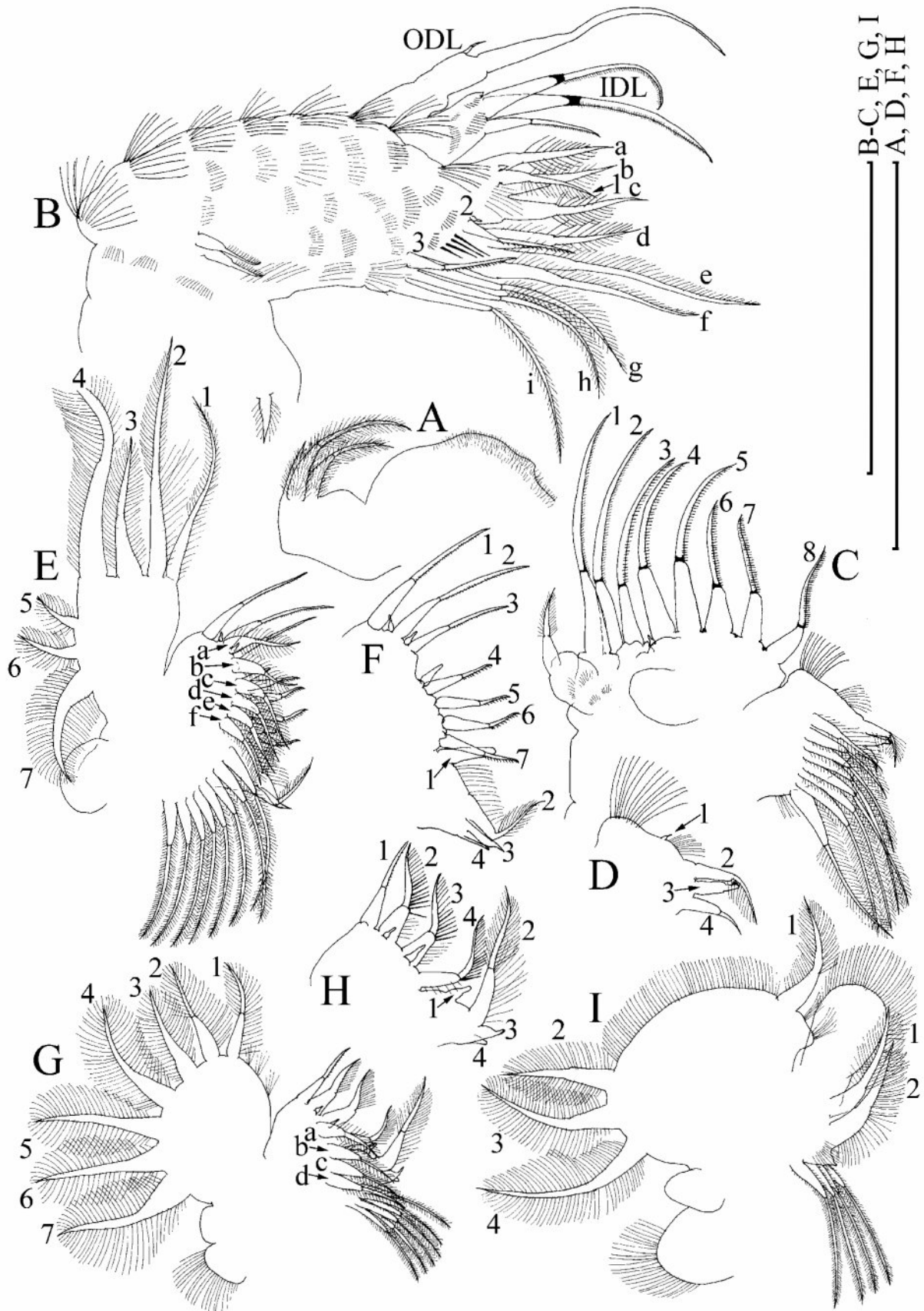
Trunk limb V (Fig. 6I): Exopodite large, subovoid, with a single distal seta 1 and 3 lateral setae (2–4), distal to seta 1 are 2 small projections bearing long setules. Inner limb portion as elongate, flat lobe, with setulated margins, setae 1 and 2 setulate. Distal armature of gnathobase as a single projection, filter plate V with 4 long setae.

*Ehippial female, Male.* See Gurney (1909, 1928). The descriptions do not correspond with contemporary level of detail, although the illustrations of the habitus of male and ehippial female (Gurney 1909, figs. 20, 23) are quite reliable.

Size. Parthenogenetic females 0.33–0.57 mm (in Richard's specimens), male 0.35 mm (Smirnov 1996).

**Differential diagnosis.** Among species of the *Pleuroxus* with deep body (see Frey 1991; Smirnov 1996; Kotov 2008), *P. letournexi* is remarkable in its (1) very small size, (2) sub-globular shape, (3) absence on any keel or ridge on dorsal portion of brood chamber and (4) presence of successive series of short, thin postanal teeth as in some other non-globular *aduncus*-like species (see Frey 1993a; Alonso 1996; Smirnov *et al.* 2006) and instead of strong singular teeth as in the majority of other sub-globular species. *P. letournexi*, without a basal peg on antenna I, is another *aduncus*-like species compromising Frey's (1993b) intergeneric subdivision of *Pleuroxus*, as was proposed earlier by Kotov (2008); the size of this peg differs even in some of the closest congeners (Kotov & Sheveleva 2008). The absence of a basal peg on antenna I in *P. letournexi*, as well as in few other species (Smirnov *et al.* 2006), differentiates these species from the remaining *aduncus*-like species. *P. letournexi* has a typical set of filter setae on the gnathobase of limbs II–V (8-8-6-4), which differentiates it from other *Pleuroxus*-like genera and from a few species of the *Pleuroxus* (see Frey 1991, 1993a–b; Kotov 2008).

**Comments.** Valid species, common in the Mediterranean area (Smirnov 1971, 1996).



**FIGURE 6.** *Pleuroxus letourneuxi* (Richard, 1888), appendages of parthenogenetic female from Bir el Nebech, Tunisia, tube DGF 962: (A) Paragnath and maxilla I. (B) Limb I. (C–D) Limb II and distal portion of its gnathobase. (E–F) Limb III and its inner portion. (G–H) Limb IV and its inner portion. (I) Limb V. Scale bars: 0.1 mm.

**36. *Ephemeroporus poppei* (Richard, 1897)**

*Chydorus Poppei* Richard 1897a, p. 296–297, figs 44–45; Sars 1901, p. 68–69, Pl. 11: figs 2, 2a–c; Delachaux 1919, p. 32–33, Pl. 3: figs 7–8; Birabèn 1939, p. 668–669, figs 22–24; Harding 1955, p. 351, fig. 99; Smirnov 1971, p. 306, figs 333, 335.

*Ephemeroporus poppei* (Richard) in Frey 1982, p. 237–238, Pl. 1: 7, 44–45; Smirnov 1996, p. 152.

**Type locality.** "... en eau douée, en particulier près de Concepción et à Lunache", Chile (Richard 1897a).

**Richard's specimens.** Unknown.

**Comments.** Valid species distributed throughout South America (Smirnov 1996).

**37. *Ephemeroporus barroisi* (Richard, 1894)**

*Pleuroxus Barroisi* Richard 1894a, p. 375–377, figs 9–12.

*Chydorus barroisi* (Richard) in Sars 1895, p. 25–28, Pl. 4: figs 9–13; Richard 1897a, p. 297; Smirnov 1971, p. 301, fig. 328.

*Ephemeroporus barroisi* (Richard) in Frey 1982, p. 234–237, Pl. 1: figs 9–12; Smirnov 1996, p. 156–159, figs 649–659.

Frey (1982) provides a more complete synonymy; however, the non-Mediterranean populations may belong to one or more sibling species.

**Type locality.** "Birket Abbâdi" (Richard 1894a) in "Ghuta Oasis 23 km E of center of Damascus and 4 km W of Attaiba" (Frey 1982), Syria. This pool dried many years ago (Frey 1982).

**Richard's specimens.** Apparently lost (Frey 1982).

**Comments.** Valid species. Frey (1982) considered the name a *nomen dubium*, based primarily on the absence of Richard's types, but Smirnov (1996) correctly noted that the species can be distinguished based on Richard's figures and descriptions. The name has been applied to populations found around the world (Smirnov 1996); in Asia they are found even in the Amur Basin (Kotov, unpublished). *Ephemeroporus* sp. described by Alonso (1987) may be this species. The non-Mediterranean populations remain to be reconciled with the Mediterranean populations.

**Discussion**

Jules Richard was recognized as a renowned cladoceran taxonomist by the end of the 19<sup>th</sup> century. He described 3 new genera of cladocerans and 37 new taxa of species rank, predominantly from non-European localities. His descriptions were among the best of that time, although the absence of information about thoracic limbs compromises some of them. His illustrations were realistic and adequately represented characters important for the cladoceran systematics. His new taxa were predominantly of L2 level description according to Van Damme *et al.* (2010b). It is remarkable that all 3 of his genera and 16 (43% of total number) of his species or subspecies are regarded as valid now, and some other taxa of species rank that have been synonymized subsequently may be found valid after revisions using his own specimens and samples.

Because Jules Richard was recognized as an excellent cladoceran taxonomist, three taxa were named after him during the period of his active taxonomic research: *Alona richardi* Stingelin, 1895; *Daphnia richardi* Burckhardt, 1899 and *Ceriodaphnia richardi* Sars, 1901. However, none of them is regarded as a valid species today. More recently he has been honored with *Leptodora richardi* Korovchinsky, 2009, a species named after him because Poppe and Richard (1890) reported unusually small adult females of *Leptodora* from Lake Sitai (China); this attribute, among other characters, is used to differentiate *L. richardi* (see Korovchinsky 2009).

Toward the end of the period of his active taxonomic research, Richard (1895d, 1896a) started a revision of the Cladocera of the world. Unfortunately, only the Ctenopoda and *Daphnia* parts were published by him for this revision. The taxonomic value of these publications is especially great, particularly for *Daphnia*, because no global revision of the world fauna of this genus has been undertaken since then, although a



compilation of recent literature is available (Benzie 2005). The absence of a complete revision of the genus *Daphnia* after 1896 is an important factor influencing studies of the biology of this important genus of cladocerans. Lack of such revisionary research, as undertaken by Richard, is one explanation for the paradoxical fact that in the 21st century well less than a half of estimated diversity of this common in any freshwater crustacean has been described (Forró *et al.* 2008).

Authors of older taxonomic works often did not select types for their taxa, and sometimes their descriptions and illustrations were very naive and inadequate. Even in case of relatively good descriptions, for example those of Richard, the status of some older taxa have changed several times during taxonomic research in the 20th century. Due to this, a re-investigation of specimens for which types were not designated, or have subsequently been lost, is a very important goal for contemporary taxonomic research. In general, an inventory of older collections is a necessary step in the constructing of an adequate cladoceran taxonomy. Collections of W. Lilljeborg (Frey 1978), G.-O. Sars (Frey 1982), E. Daday (Forró & Frey 1982), J. E. Schoedler (Forró 1984), T. Stingelin (Frenzel 1987), P. E. Müller (Frey 1989) and S. Ekman (Kotov & Gololobova 2005) previously have been rediscovered or have been re-examined. We now may add the collection of slides, and more importantly, samples that Jules Richard sold to E. A. Birge to this list of important older collections, and are pleased to demonstrate here that specimens of *Pleuroxus leutornexi* and *Bosmina japonica* from these samples can play a very important role in ongoing taxonomic research.

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