

DATA ARTICLE

## Invertebrate species list of coastal lagoons in the Balearic Islands

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### Abstract

1 - Coastal lagoons are particular ecosystems, since they are ecotones between terrestrial, freshwater and marine ecosystems, being characterized by a high temporal variability. Because of these characteristics, coastal lagoons have very peculiar abiotic and biotic conditions that require investigation if we are to understand their complex ecological functions. In this study, a list of invertebrate species from coastal lagoons in the Balearic archipelago is provided in order to enhance the knowledge of their aquatic fauna. This study reports on the existence of 123 species, from 135 genera and 24 families. The most common taxa were *Chironomus* spp. (Meigen, 1803) and *Halocladius* spp. (Hirvenoja, 1973) (Diptera, Chironomidae), *Hydrobia ventrosa* (Montgou, 1803) (Gastropoda, Hydrobiidae), *Cyprideis torosa* (Jones, 1850) (Ostracoda, Cytherideidae), *Lekanesphaera hookeri* (Leach, 1814) (Isopoda, Sphaeromatidae) and Naididae (Oligochaeta).

**Keywords:** coastal lagoons, Balearic Islands, invertebrates, taxonomic list

### Introduction

The study of biological diversity is necessary for the conservation and sustainable management of natural resources, as was declared by the Convention on Biological Diversity in Rio de Janeiro (1992). Knowledge of taxonomic diversity is a fundamental requisite to conserve any ecosystem. This is especially true for the conservation of vulnerable ecosystems, such as coastal lagoons. In particular, the composition of aquatic invertebrate communities in coastal lagoons is relatively poorly known, and most

of the management efforts are focused on the conservation of a small number of species, primarily water-birds (Boix et al., 2008). In the case of Balearic Islands, coastal lagoons are the most important reservoirs of water, after ground water. Thus, basic studies that document biota in these ecosystems are of great importance.

Coastal lagoons are ecotones between freshwater, marine and terrestrial ecosystems, and are highly dynamic environmentally (i.e. chemistry of the system) and biotically (i.e., biological community) (Zaldívar et

al., 2008; Joyce *et al.*, 2005). Coastal lagoon communities are generally considered to be comprised of opportunistic and specialist species derived from freshwater, marine and brackish sources (Barnes, 1988). In the case of the Balearic Islands, taxonomic studies of aquatic invertebrates have been focused on specific taxonomic groups and there are few comprehensive and extensive studies dealing with the whole community. The majority of taxonomic lists were produced by natural parks managers, works derived from PhDs or official reports (e.g., Pretus, 1991; Riddiford, 1998 and references therein, Boix *et al.*, 2009). In the present study, we aim to improve the knowledge of the invertebrate species from coastal lagoons in the Balearic Islands. With this objective, a list of invertebrate species found in 34 permanent coastal lagoons is provided. This is the first research to document the invertebrate community from such a high number of natural permanent coastal lagoons in the four main islands of the Balearic archipelago (Majorca, Minorca, Ibiza and Formentera).

## Material and Methods

### Study Area

The Balearic Islands are located in the Eastern Mediterranean Sea, characterized by dry summers and mild winters, with the most important rainfall occurring during fall and spring (Britton & Crivelli, 1993). We have selected a network of sampling sites covering a wide range of abiotic conditions of the permanent coastal lagoons, including the four main islands of the Balearic archipelago: Majorca, Minorca, Ibiza and Formentera. Majorca is the largest island (3620.42 km<sup>2</sup>), followed by Minorca (694.40 km<sup>2</sup>), Ibiza (571.04 km<sup>2</sup>) and Formentera (82.49 km<sup>2</sup>). A total of 34 natural coastal lagoons were sampled between February and March 2008. Moreover, large and heterogeneous lagoons were divided into different sampling sites (up to six) (e.g., Albufera de Mallorca: 6 sampling sites; Albufera des Grau: 3 sampling sites) in order to collect the maximum number of species. A list of the coastal lagoons is provided in Table 1 and their locations in Figure 1.

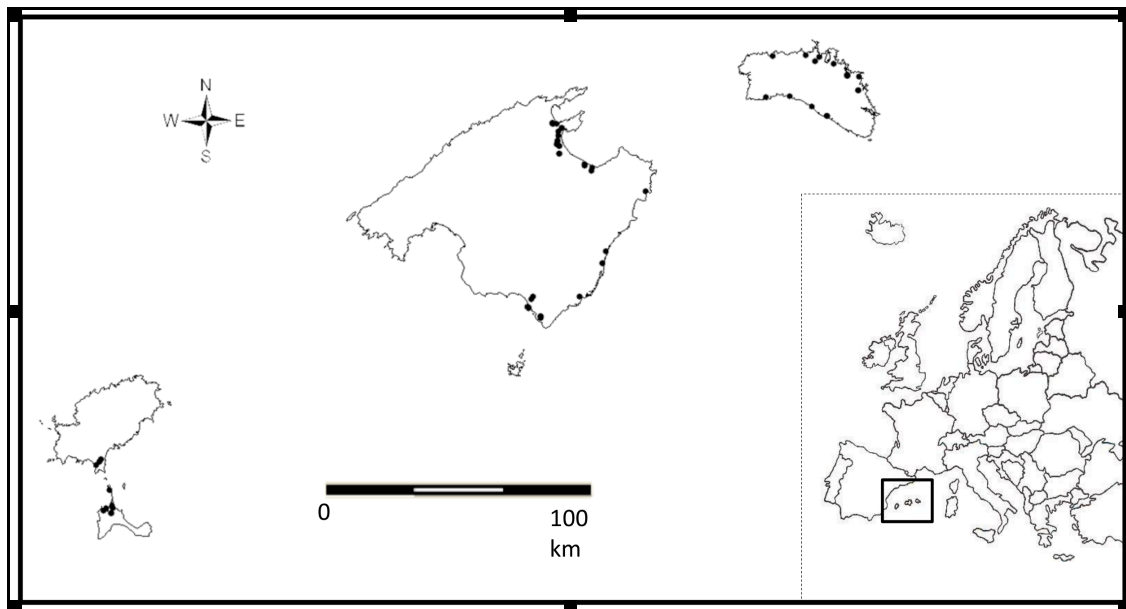


Figure 1. Map of the Balearic Islands where the location of the studied coastal lagoons is shown (black points).

Table 1 - List of coastal lagoons studied with the corresponding number codes. The sample code number used, the name of the coastal lagoon, the island, the samplers (PLM: Paloma Lucena-Moya; BHA: Begoña Hermida Andrade), the date and the UTM coordinates (zone 30) are shown. Prat i Salines de Mongofre (Addaia) is the name given for three different but very close coastal lagoons, so numbers 35, 36, 37 have the same name but relate to different sampling sites. Tank 1= heater, tank 2= crystallizer and tank 3= evaporator were differentiated in the case of the saltworks.

Number	Name	Island	Sampler	Date	UTM X	UTM Y
1CA	Salines Eivissa (tank 1)	Ibiza	PLM; BHA	10/03/2008	359382	4302725
1CR	Salines Eivissa (tank 2)	Ibiza	PLM; BHA	10/03/2008	360013	4302947
1EV	Salines Eivissa (tank 3)	Ibiza	PLM; BHA	10/03/2008	358702	4301853
2	Salines Eivissa	Ibiza	PLM; BHA	10/03/2008	360503	4303920
3	Ses Feixes de Talamanca	Ibiza	PLM; BHA	10/03/2008	365658	4308443
6	Estany des Peix	Formentera	PLM; BHA	11/03/2008	362390	4288106
5	Estany Pudent	Formentera	PLM; BHA	11/03/2008	364005	4286520
4	Es Brolls	Formentera	PLM; BHA	11/03/2008	363934	4286512
7CA	Salines de Formentera (tank 1)	Formentera	PLM; BHA	11/03/2008	364117	4288861
7CR	Salines de Formentera (tank 2)	Formentera	PLM; BHA	11/03/2008	364114	4288913
8	Estany de s'Espalmador	Formentera	PLM; BHA	12/03/2008	363277	4294077
9	Albufera de Mallorca	Majorca	PLM; BHA	23/02/2008	509655	4404768
10	Albufereta de Pollença	Majorca	PLM; BHA	08/03/2008	507516	4411891
11	Prat Maristany-Estany Ponts	Majorca	PLM; BHA	24/02/2008	509391	4408102
12	Estany de Son Bauló	Majorca	PLM; BHA	21/02/2008	514324	4400765
13	Estany de Son Real	Majorca	PLM; BHA	21/02/2008	517878	4398892
14	Estany de Na Borges	Majorca	PLM; BHA	21/02/2008	520234	4397713
15	Estany de Canyamel	Majorca	PLM; BHA	08/03/2008	537736	4390015
16	Estany de Cala Magraner	Majorca	PLM; BHA	20/02/2008	524664	4370847
17	Estany de Cala Murada	Majorca	PLM; BHA	20/02/2008	523677	4366997
18	Font de Nalis	Majorca	PLM; BHA	20/02/2008	516153	4356116
19	S'Amarador	Majorca	PLM; BHA	08/03/2008	515924	4355446
20	Estany de ses Gambes	Majorca	PLM; BHA	09/03/2008	503620	4349975
21	Estany des Tamarells	Majorca	PLM; BHA	26/02/2008	503447	4352220
22CA	Salines de la Colònia de Sant Jordi (tank 1)	Majorca	PLM; BHA	14/03/2008	499204	4352845
22CR	Salines de la Colònia de Sant Jordi (tank 2)	Majorca	PLM; BHA	14/03/2008	499111	4352695
22EV	Salines de la Colònia de Sant Jordi (tank 3)	Majorca	PLM; BHA	25/02/2008	499699	4352656
23CA	Salobrar de Campos (tank 1)	Majorca	PLM; BHA	14/03/2008	500378	4355478
23CR	Salobrar de Campos (tank 2)	Majorca	PLM; BHA	14/03/2008	500385	4355486
23EV	Salobrar de Campos (tank 3)	Majorca	PLM; BHA	14/03/2008	500942	4356157
24	Prat de Fontanelles	Majorca	PLM; BHA	25/02/2008	476624	4376141
25	Albufera des Grau	Minorca	PLM; BHA	28/02/2008	606788	4422598
26	Gola de Cala en Porter	Minorca	PLM; BHA	03/03/2008	596604	4414427
27	Prat de Son Bou	Minorca	PLM; BHA	03/03/2008	591640	4417289
28	Gola del Torrent de Trebaluger	Minorca	PLM; BHA	02/03/2008	584429	4420711
29	Prat de Bellavista - Son Saura (Sud)	Minorca	PLM; BHA	02/03/2008	576661	4420306
30	Gola del Torrent d'Algaiarens	Minorca	PLM; BHA	01/03/2008	578950	4433488
31	Gola i maresme de Binimel·la	Minorca	PLM; BHA	01/03/2008	589828	4433852
32	Prat de Lluriac - Tirant	Minorca	PLM; BHA	01/03/2008	594092	4433196
34	Albufera de Mercadal - Son Saura (Nord)	Minorca	PLM; BHA	29/02/2008	598779	4431108
35	Prats i Salines de Mongofre (Addaia)	Minorca	PLM; BHA	04/03/2008	603158	4427475
36	Prats i Salines de Mongofre (Addaia)	Minorca	PLM; BHA	27/02/2008	603101	4427331
37	Prats i Salines de Mongofre (Addaia)	Minorca	PLM; BHA	27/02/2008	603077	4427337
38	Prat de Morella	Minorca	PLM; BHA	29/02/2008	607064	4427090

### *Biological sampling and identification*

Invertebrate samples were collected using a sweep net (0.25 x 0.25 m frame net, 250 µm sieve), and following a protocol based on the multi-habitat survey (Briers and Biggs, 2005; Barbour et al., 1999). We took 20 “sweeps” of 0.5 m, so the total area sampled was 2.5 m<sup>2</sup> (0.25\*0.5\*20). The sampling was carried out in a littoral band (ca. 50 x 3 m) of each coastal lagoon; samples were preserved in 70% ethanol, and once in the laboratory they were sorted using sieves of different pore size (5 mm, 1 mm and 0.1 mm). All invertebrates were identified to genus or species except for some taxa of Diptera, Oligochaeta, Polychaeta, Acari and Lepidoptera that were identified to family level, and Nematoda that remained as class. Moreover, some individuals were identified to family level because their small size did not allow a higher taxonomic resolution (e.g., some individuals of Odonata or Heteroptera orders). An Olympus U-TV1X 40X compound and Nikon SMZ645 5X dissecting microscope were used for the identification (see Lucena-Moya et al., 2009 for further details).

### **Results and discussion**

The invertebrates found in the coastal lagoons of the Balearic Islands are listed below. The list is ordered by phylogenetic hierarchical taxonomic order following Fauna Ibérica (CSIC, 2004-2009). Species nomenclature was based on the following data bases: Integrated Taxonomic Information System (ITIS) (National Museum of Natural History Washington, D.C., 2009), the species 2000 & ITIS Catalogue of Life (Bisby et al., 2009), ZipcodeZoo (The Bay Science Foundation 2004-2008) and The World Register of Marine Species (WORMS) (Appeltans et al., 2009). In the taxonomic list, numbers in brackets correspond to the coastal lagoon where the taxa were found. The correspondence between each number code and coastal lagoon identity

is shown in Table 1.

The study records the presence of 123 species corresponding to 135 genera and 24 families. The commonest taxa were Chironomus spp. (Diptera, Chironomidae) present in 24 localities (55% of total), Halocladus spp. (Diptera, Chironomidae) (22 localities, 50%), Hydrobia ventrosa (Gastropoda, Hydrobiidae) (19 localities, 43%), Cyprideis torosa (Ostracoda, Cytherideidae) (17 localities, 39%), Lekanospaera hookeri (Isopoda, Sphaeromatidae) (15 localities, 34%) and Naididae (Oligochaeta) (14 localities, 32%).

All taxa are characteristic of brackish waters. These results are in agreement with the higher percentage of coastal lagoons of intermediate salinity (i.e., mesohaline: 6-30‰) in the Balearic Islands, since 42.62% of the sampling sites are mesohaline, 32.79% are euhaline (>30‰) and 24.59% are oligohaline (<5‰) (Lucena-Moya et al., 2009). The coastal lagoons with higher species richness were those with higher numbers of microhabitats such as the Albufera de Mallorca (73 taxa), Prat i Salines de Mongofre (33 taxa), Albufera des Grau (27 taxa), Albufereta de Pollença (22 taxa). Our results are in agreement with positive relationships reported between species richness and the number of available habitats observed for a variety of other taxa and habitats (e.g., Stewart et al., 2000). High richness also corresponded to coastal lagoons with low salinity content, such as Gola de Cala en Porter (31 taxa), Albufera de Mercadal - Son Saura (Nord) (29 taxa), Gola i maresme de Binimel·là (29 taxa), Prat de Son Bou (22 taxa), Prat de Bellavista - Son Saura (Sud) (21 taxa).

The inverse relationship between salinity and number of taxa has also been broadly reported (Williams *et al.*, 1990; Williams, 1998). Finally, high species richness was also observed in euhaline coastal lagoons

in good conservation status, such as Font de Nalis (21 taxa) and Ses Gambes (20 taxa).

Species richness in the remaining coastal lagoons ranged between 1 and 19 taxa.

**Phylum PLATYHELMINTHES**

**Class TURBELLARIA**

**Order TRICLADIDA**

**Family DUGESIIDAE**

*Dugesia* spp. Girard, 1850 (6, 23EV)

**Family PLANARIIDAE**

*Planaria* spp. O. F. Müller, 1776 (11, 20)

**Phylum NEMATODA**

**Class NEMATODA** (3, 6, 9, 11, 18, 20, 29, 31)

**Phylum MOLLUSCA**

**Class GASTROPODA**

**SubClass PROSOBRANCHIA**

**Order VETIGASTROPODA**

**Family Trochidae**

*Phorcus mutabilis* (Philippi, 1846) (11)

**Order NEOTAENIOGLOSSA**

**Family CERITHIIDAE**

*Cerithium vulgatum* Bruguière, 1792 (11)

**Family HYDROBIIDAE**

*Hydrobia acuta* (Draparnaud, 1805) (10, 11, 37)

*Hydrobia ventrosa* (Montgou, 1803) (1EV, 4, 9, 10, 11, 12, 13, 14, 17, 18, 19, 25, 27, 28, 30, 31, 35, 36, 37)

*Mercuria emiliana* (Paladilhe, 1869) (9)

**SubClass HETEROBRANCHIA**

**Order HETEROSTROPHA**

**Family RISSOELLIDAE**

*Rissoa labiosa* (Montagu, 1803) (11)

**SubClass PULMONATA**

**Order BASOMMATOPHORA**

**Family PHYSIDAE**

*Physa fontinalis* (Linnaeus, 1758) (9, 26, 34)

**Family LYMNAEIDAE**

*Lymnaea truncatula* O. F. Müller, 1774 (11)

**Family PLANORBIDAE**

*Gyraulus laevis* (Alder, 1838) (33)

**Family ANCYLIDAE**

*Ancylus fluviatilis* O. F. Müller, 1774 (9, 26, 33, 38)

**Class BIVALVIA**

**SubClass HETERODONTA**

**Order VENEROIDA**

**Family CARDIIDAE**

*Cerastoderma glaucum* (Poiret, 1789) (10, 13, 17, 23EV, 25, 35, 37)

**Phylum ANNELIDA**

**Class HIRUDINEA**

**Order RHYNCHOBDELLIDA**

**Family GLOSSIPHONIDAE**

*Glossiphonia* spp. Johnson, 1817 (11, 37)

**Class OLIGOCHAETA**

**SubClass TUBIFICATA**

**Order HAPLOTAXIDA**

**Family NAIDIDAE** (9, 11, 12, 14, 15, 25, 26, 27, 29, 30, 31, 32, 34, 38)

**Family TUBIFICIDAE** (3, 4, 6, 9, 11, 15, 16, 18, 36)

**Class POLYCHAETA**

**Order ACICULATA**

**SuperFamily NEREIDIDACEA**

**Family NEREIDIDAE**

*Nereis* spp. Linnaeus, 1758 (9, 10, 11, 12, 13, 14, 25, 28, 31, 36)

**Order CANALIPALPATA**

**Family SERPULIDAE**

*Ficopomatus enigmaticus* (Fauvel 1923) (9, 10, 11, 12, 13, 14, 17, 19, 25, 28, 30)

*Hydroides dianthus* (Verrill, 1873) (11)

**Phylum ARTHROPODA**

**SuperClass CHELICERATA**

**Class ARACHNIDA**

- Order TROMBIDIFORMES
  - InfraOrder HYDRACARINA
    - Family HYDRACHNIDAE (9, 15, 18, 21, 27, 32)
- SuperClass CRUSTACEA
  - Class BRANCHIOPODA
    - SubClass SARSOSTRACA
      - Order ANOSTRACA
        - Family ARTEMIIDAE
          - Artemia salina* (Linnaeus, 1758) (1EV, 1CA, 1CR, 2, 7CA, 7CR, 8, 22CA, 22CR, 23CA)
      - SubClass DIPLOSTRACA
        - SuperOrder CLADOCERA
          - Order ANOMOPODA
            - Family DAPHNIIDAE
              - Daphnia (Daphnia) rosea* G. O. Sars, 1862 (33)
              - Daphnia (Ctenodaphnia) magna* Straus, 1820 (9, 21, 35, 38)
              - Simocephalus exspinosus* (DeGeer, 1778) (9, 25, 27)
              - Simocephalus vetulus* (O. F. Müller, 1776) (32, 33, 34)
              - Scapholeberis rammneri* Dumont y Pensaert, 1983 (34)
            - Family CHYDORIDAE
              - Pleuroxus aduncus* (Jurine, 1820) (29, 31, 32)
              - Chydorus sphaericus* (O. F. Müller, 1776) (33, 34)
    - Class OSTRACODA
      - SuperFamily DARWINULOIDEA
        - Family DARWINULIDAE
          - Darwinula stevensoni* (Brady and Robertson, 1870) (9)
          - Microdarwinula zimmeri* (Menzel 1916) (9)
      - SuperFamily CYPRIODOIDEA
        - Family CANDONIDAE
          - SubFamily CANDODINAE
            - Candona angulata* O. F. Müller, 1900 (30)
            - Fabaeformiscandona fabaeformis* (Fischer, 1851) (9)
          - SubFamily CYCLOCYPRIDINAE
            - Cypria sywulae* Meisch, 2000 (9)
        - Family ILYOCIPRIDIDAE
          - Ilyocypris gibba* (Ramdohr, 1808) (25)
        - Family CYPRIDIDAE
          - SubFamily CYPRIDINAE
            - Cypris bispinosa* Lucas, 1849 (33)
          - SubFamily HERPETOCYPRIDINAE
            - Herpetocypris chevreuxi* (G. O. Sars, 1896) (27, 38)
          - SubFamily EUCYPRIDINAE
            - Eucypris virens* (Jurine, 1820) (32)
          - SubFamily CYPRINOTINAE
            - Heterocypris incongruens* (Ramdohr, 1808) (3, 5, 8, 9, 24, 30)
            - Heterocypris salina* (Brady, 1868) (4, 27)
          - SubFamily CYPRIDOPSINAE
            - Cypridopsis vidua* (O. F. Müller, 1776) (26, 29, 31)
            - Sarscypridopsis aculeata* (Costa, 1847) (9, 25, 27, 30, 35, 38)
            - Aurila arborescens* (Brady, 1865) (11)
      - SuperFamily CYTHEROIDEA
        - Family CYTHERIDEIDAE
          - Cyprideis torosa* (Jones, 1850) (1EV, 3, 4, 5, 9, 10, 11, 12, 13, 14, 20, 23EV, 25, 28, 30, 31, 37)
        - Family LOXOCONCHIDAE
          - Loxoconcha elliptica* Brady, 1868 (9, 10, 25)
    - Class COPEPODA
      - Order CALANOIDA
        - Family TEMORIDAE
          - Eurytemora velox* (Lilljeborg, 1853) (10)
          - Hetercope appendiculata* Sars, 1863 (38)
        - Family PSEUDODIAPTOMIDAE
          - Calanipeda aquaedulcis* Kritschagin, 1873 (9, 11, 14, 15, 28, 31, 32)
        - Family DIAPTOMIDAE
          - Arctodiaptomus salinus* (Daday, 1885) (9, 21, 24)
          - Arctodiaptomus wierzejskii* (Richard, 1888) (35)
      - Order CYCLOPOIDA
        - Family CYCLOPIDAE
          - SubFamily EUCYCLOPINAE
            - Eucyclops serrulatus* (Fischer, 1851) (27, 29, 31, 32, 33)

- Eucyclops graeteri* (Chappuis, 1927) (29, 31)  
*Macrocyclus albidus* (Jurine, 1820) (9, 26, 29, 31)  
*Macrocyclus fuscus* (Jurine 1820) (26)  
*Paracyclops* cf. *fimbriatus* (9)  
*Ectocyclus* cf. *phaleratus* (9)  
**SubFamily CYCLOPINAE**  
*Acanthocyclus einslei* Mirabdullayev & Defaye, 2004 (32)  
*Acanthocyclus trajani* Mirabdullayev & Defaye, 2004 (27, 29, 30, 31)  
*Diacyclops bicuspidatus* (Claus, 1857) (9, 21, 25, 27, 32, 33, 35)  
*Megacyclus gigas* (Claus, 1857) (9, 27, 29, 31)  
*Megacyclus viridis viridis* (Jurine, 1820) (9, 32, 33, 34, 38)
- Order HARPACTICOIDA**  
**Family CANUELLIDAE**  
*Canuella perplexa* T. et A. Scott, 1893 (11)  
**Family CANTHOCAMPTIDAE**  
*Bryocamptus* spp. Chappuis, 1928 (6)  
**Family CLETODIDAE**  
*Cletocamptus retrogressus* Schmankevitch, 1875 (8,35)
- Class MALACOSTRACA**  
**Order AMPHIPODA**  
**Family AORIDAE**  
*Microdeutopus gryllotalpa* Costa, 1853 (9, 11)  
**Family CALLIOPIIDAE**  
*Apherusa mediterranea* cf. (19)  
**Family COROPHIIDAE**  
*Corophium insidiosum* Crawford, 1937 (11, 17)  
*Corophium multisetosum* Stock, 1952 (28)  
*Corophium orientale* Schellenger, 1928 (9, 11, 37)  
*Corophium sextonae* Crawford, 1937 (25)  
**Family GAMMARIDAE**  
*Echinogammarus pungens* (H. Milne Edwards, 1840) (28)  
*Gammarus aequicauda* (Martynov, 1931) (9, 10, 11, 12, 18, 19, 21, 25, 28, 30, 31)  
*Gammarus insensibilis* Stock, 1966 (11, 25, 28)  
**Family TALITRIDAE**  
*Orchestia gammarellus* (Pallas, 1766) (25)  
*Orchestia stephensi* Cecchini, 1928 (4)  
**Family LYSIANASSIDAE** (6)  
**Family OEDICEROTIDAE** (6)
- Order ISOPODA**  
**InfraOrder ASELLOTA**  
**Family ASELLIDAE**  
*Proasellus coxalis* (Dolfus, 1892) (9)  
**InfraOrder FLABELLIFERA**  
**Family SPHAEROMATIDAE**  
*Lekanesphaera hookeri* (Leach, 1814) (3, 9, 10, 11, 12, 14, 17, 18, 19, 24, 25, 27, 28, 30, 31)  
**SubOrder ONISCOIDEA**  
**Family LIGIIDAE**  
*Ligia oceanica* (Linnaeus, 1767) (15)  
**Family TRICHONISCIDAE**  
*Titanethes* spp. Schioedte, 1849 (25)  
**SubOrder VALVIFERA**  
**Family IDOTEIDAE**  
*Idotea pelagica* cf. (6)
- Order TANAIDACEA**  
**Family TANAIDEA**  
*Tanais dulongii* (Audouin, 1826) (9, 11)
- Order DECAPODA**  
**InfraOrder NATANTIA**  
**Family PALAEMONIDAE**  
*Palaemonetes varians* (Leach, 1914) (14, 17, 21, 23EV, 31)  
*Palaemon elegans* Rathke, 1837 (10, 11, 16, 19, 23EV)
- SuperClass INSECTA**  
**Class EUENTOMATA**  
**Order Odonata**  
**Family LESTIDAE**  
*Lestes viridis* (Van der Linden, 1825) (25, 26)  
**Family COENAGRIONIDAE**

- Ceragrion tenellum* (Villiers, 1789) (9, 29, 31)  
*Ischnura elegans* (Van der Linden, 1820) (4, 9, 12, 30, 32, 34)  
*Ischnura pumilio* (Charpentier, 1825) (9,27,29, 31,34)
- Family AESCHNIDAE**  
*Aeshna mixta* (Latreille, 1805) (9, 31)  
*Anax* spp. Leach, 1815 (34)  
*Anax parthenope* (Selys, 1839) (9)  
*Hermianax ephippiger* (Burmeister, 1839) (9, 12, 21, 26, 33, 34)
- Family LIBELLULIDAE**  
*Orthetrum brunneum* (Fonscolombe, 1837) (14,27,32)  
*Orthetrum cancellatum* (Linnaeus, 1758) (9,14,27,30)  
*Crocothemis erythraea* (Brullé, 1832) (9, 26, 34)  
*Sympetrum flaveolum* (Linnaeus, 1758) (33)  
*Sympetrum fonscolombei* (Selys, 1841) (21)
- Order EPHEMEROPTERA**  
**Family BAETIDAE**  
*Cloeon dipterum* (Linnaeus, 1761) (27, 32)  
*Cloeon simile* Eaton,1870 (9, 21, 26, 32, 34, 38)
- Order HETEROPTERA**  
**InfraOrder GERROMORPHA**  
**SuperFamily GERROIDEA**  
**Family HYDROMETRIDAE**  
*Hydrometra stagnorum* (Linnaeus, 1758) (34)
- InfraOrder NEPOMORPHA**  
**SuperFamily NOTONECTOIDEA**  
**Family NOTONECTIDAE**  
*Anisops sardeus* Herrich-Schäffer, 1849 (9)  
*Notonecta viridis* Delcourt, 1909 (9)
- Family PLEIDAE**  
*Plea minutissima* Leach, 1817 (33, 34)
- SuperFamily NAUCOROIDEA**  
**Family NAUCORIDAE**  
*Naucoris maculatus* Fabricius, 1798 (9)
- SuperFamily CORIXOIDEA**  
**Family CORIXIDAE**  
**SubFamily CORIXINAE**  
*Corixa* spp. Geoffroy, 1762 (31, 35)  
*Corixa affinis* Leach,1817 (32)  
*Sigara* spp. Fabricius, 1775 (9, 35)  
*Sigara lateralis* Leach,1817 (38)  
*Sigara selecta* (Fieber, 1848) (24, 22EV)  
*Sigara stagnalis* (Leach, 1817) (10, 18, 21, 29, 35)
- Order COLEOPTERA**  
**InfraOrder ADEPHAGA**  
**Family GYRINIDAE**  
*Gyrinus* spp. Ad. Geoffroy, 1762 (38)  
*Gyrinus caspius* cf. (34)
- Family HALIPLIDAE**  
*Haliplus* (Neohaliplus) *lineatocollis* (Marsham, 1802) (30, 35)  
*Haliplus* (Haliplus) *fluviatilis* Aubé, 1836 (33)
- Family NOTERIDAE**  
*Noterus laevis* Sturm, 1834 (9, 26, 29, 30, 31, 34)
- Family DYTISCIDAE**  
**SubFamily LACCOPHILINAE**  
*Laccophilus* spp. Lv Leach, 1815 (29, 31)
- SubFamily HYDROPORINAE**  
*Hydrovatus cuspidatus* (Kunze, 1818) (29, 31)  
*Hydroporus* spp. Lv. Clairville, 1806 (10, 24)  
*Hydroporus pubescens* (Gyllenhal, 1808) (10, 24)  
*Hydroporus tessellatus* Drapiez, 1819 (34)  
*Scarodytes* spp. Lv. Gozis, 1914 (35, 36, 23EV)  
*Stictionectes* spp. Lv Brinck, 1943 (9)  
*Deronectes* spp. Lv. Sharp, 1882 (15)  
*Deronectes moestus* (Leprieur,1874) (9)  
*Nebrioporus* spp. Lv./Ad. Régimbart, 1906 (5, 20, 21, 35)  
*Nebrioporus* (*Zimmermannius*) *ceresyi* (Aubé, 1836) (2, 5, 7CR, 18, 20, 22CA, 23EV, 24, 35)
- SubFamily COLYMBETINAE**  
*Rhantus* (*Rhantus*) *frontalis* cf. (9)  
*Meladema* spp. Lv. Laporte, 1835 (10)



- SubFamily DYTISCINAE**  
*Cybister (Scaphinectes) lateralimarginalis* (De Geer, 1774) (9)
- InfraOrder POLYPHAGA**
- Family HELOPHORIDAE**  
*Helophorus (Rhopalohelophorus) dorsalis* Marsham, 1802  
(35, 36)
- Family HYDROPHILIDAE**  
*Berosus* spp. Lv./Ad. Leach, 1817 (4, 9, 10, 18, 20, 22EV, 23EV, 24, 25, 27, 33, 35)  
*Berosus (Berosus) affinis* Brullé, 1835 (9,33,35,1EV)  
*Berosus (Berosus) signaticollis* (Charpentier, 1825)(33)  
*Berosus (Enoplurus) cf. spinosus* (4, 35)  
*Berosus (Enoplurus) fulvus* Kuwert, 1888  
*Paracynus aeneus* (Germar, 1864) (18, 35, 36)  
*Anacaena* spp. Ad. Thomson, 1859 (34)  
*Laccobius* spp. Lv. Erichson, 1837 (35)  
*Helochares lividus* (Forster,1771) (30)  
*Helochares punctatus* Sharp, 1869 (26, 34)  
*Enochrus* spp. Lv. Thomson, 1859 (35, 36)  
*Enochrus (Lumetus) bicolor* (Fabricius, 1792) (3, 20, 23EV, 24, 25, 34, 35, 36)  
*Cymbiodyta marginella* (Fabricius, 1792) (34)  
*Hydrobius fuscipes* (Linnaeus, 1758) (35)  
*Limnoxenus niger* (Zschach, 1788) (9)
- Family HYDRAENIDAE**  
*Ochthebius (Ochthebius) auriculatus* cf. (20, 23)  
*Ochthebius (Ochthebius) corrugatus* Rosenhauer, 1856 (5, 8, 18, 20, 22CA, 22EV, 23EV, 23CA)
- Family DRYOPIDAE**  
*Dryops* spp. Ad.Olivier, 1791 (4)  
*Helichus* spp. Lv. Erichson, 1847 (15)
- InfraOrder ELATERIFORMIA**
- Family SCIRTIDAE**  
*Hydrocyphon* spp. Lv. Redtenbacher 1858 (4)  
*Cyphon* spp. Lv. Paykull, 1799 (4)
- Order DIPTERA**
- InfraOrder NEMATOCERA**
- Family LIMONIIDAE** (9, 20, 26, 29, 31, 34)
- Family PSYCHODIDAE**  
*Pericoma* spp. Walker, 1856 (4)
- Family DIXIDAE**  
*Dixella* spp. Dyar & Shannon, 1924 (9, 21, 29, 31, 36)
- Family CULICIDAE**  
*Aedes* spp. Meigen 1818 (18, 20, 22CA, 22EV, 24, 35)
- Family CERATOPOGONIDAE**
- SubFamily DASYHELEINAE**  
*Dasyhelea* spp. Kieffer, 1911 (9, 10, 14, 17, 18, 20, 22EV, 29, 31,35, 36, 38)
- Family CHIRONOMIDAE**
- SubFamily TANYPODINAE**  
*Procladius (Holotanypus) spp.* Roback, 1982 (9, 10, 12, 14, 17, 19, 25, 27, 30, 35, 38)  
*Nilotanypus* spp. Kieffer, 1923 (9, 26, 34)  
*Tanypus* spp. Meigen, 1803 (29, 31)
- SubFamily ORTHOCLADIINAE**  
*Corynoneura* spp. Winnertz, 1846 (9, 15, 26, 27, 29, 30, 31, 32, 34)  
*Cricotopus (Cricotopus) spp.* van der Wulp, 1874 (9, 12, 15, 21, 25, 27, 34)  
*Halocladius (Halocladius) spp.* Hirvenoja, 1973 (5,8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24, 25, 30, 32, 33, 35, 36, 37)  
*Psectrocladius (Psectrocladius) spp.* Kieffer, 1906 (9, 13, 15, 26)
- SubFamily CHIRONOMINAE**
- Tribu CHIRONOMINI**  
*Baeotendipes* spp. Kieffer, 1913 (1EV, 5, 9, 10, 18, 22CA, 23EV)  
*Chironomus* spp. Meigen, 1803 (3, 5, 8, 9, 10, 11, 12, 3, 14, 16, 17, 20, 21, 22CA, 22EV, 23CA, 25, 27, 29, 30, 31, 32, 37, 38)  
*Chironomus (Chironomus) salinarius* Kieffer in Thienemann, 1915 (2, 20)  
*Dicrotendipes* spp. Kieffer, 1913 (35)  
*Kiefferulus* spp. Goetghebuer, 1922 (9, 32)  
*Microtendipes* spp. Kieffer, 1915 (15)

- Paratendipes* spp. Kieffer, 1911 (26)  
*Polypedilum* spp. Kieffer, 1912 (9, 32)  
**Tribu TANYTARSINI**  
*Micropsectra* spp. Kieffer, 1909 (9)  
*Paratanytarsus* spp. Thienemann & Bause, 1913 (9, 27, 32, 34)  
**InfraOrder BRACHYCERA**  
**Family STRATIOMYIDAE**  
*Nemotelus* spp. Geoffroy, 1762 (8, 9, 10, 15, 18, 20, 21, 23EV, 24, 25, 34, 36)  
*Oxycera* spp. Meigen, 1803 (34)  
**Family TABANIDAE**  
*Tabanus* spp. Linnaeus, 1758 (35)  
**Family DOLICHOPODIDAE** (1EV, 15, 18, 20, 22CA)  
**InfraOrder CYCLORRHAPHA**  
**Family SCIOMYZIDAE** (18, 20)  
**Family EPHYDRIDAE**  
*Ephydra* spp. Fallén, 1810 (2, 3, 7CA, 7CR, 8, 18, 22CA, 22EV, 22CR, 23CA, 24)  
*Scatella* spp. Robineau-Desvoidy, 1830 (4, 35)  
**Family MUSCIDAE** (19)  
**Order TRICHOPTERA**  
**Family PSYCHOMYIIDAE**  
*Lype phaeopa* (Stephens, 1836) (9)  
**Order LEPIDOPTERA**  
**Family PYRALIDAE** (25)

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