

Distribution, habitats and biogeography of four families of aquatic Coleoptera of the Balearic Islands (Spain)

(Coleoptera: Hydraenidae, Helophoridae, Hydrochidae, Hydrophilidae)

L.F. VALLADARES & J. GARCÍA-AVILÉS

Abstract

The presence of 17 species of Hydraenidae and 27 aquatic Hydrophiloidea in the Balearic Islands (Mallorca, Menorca, Ibiza and Formentera) is based on intense sampling carried out recently. Various species are newly recorded for the archipelago, *Ochthebius lobicollis* REY is also new to the Iberian area. The distribution, abundance and habitat preferences of each species is shown for each island. Various significant biogeographical aspects are pointed out with special emphasis on the differences in species richness between the islands.

Key words: Coleoptera, Hydraenidae, Hydrophiloidea, Balearic Islands, habitats, biogeography.

Introduction

Previous knowledge of the aquatic Coleoptera of the Balearic Islands is very disperse. The first references to the polyphagan families (Hydraenidae, Helophoridae, Hydrochidae and Hydrophilidae) in the islands can be found in the catalogues and studies of naturalists at the end of the 19th and beginning of the 20th centuries, such as CARDONA (1872, 1875, 1878), SCHAUFUSS (1881), ESTELRICH et al. (1885), MORAGUES (1889), RÉGIMBART (1898), BREIT (1908, 1909), JORDÁ (1927), TENENBAUM (1915), SIETTI (1930, 1931, 1932) and VILARRUBIA & ESPAÑOL (1933). Later works of importance are those by SOLER & MONTES (1977) on Ibiza, PONS (1987) on Menorca and WHITEHEAD (1993) on Mallorca. VALLADARES & MONTES (1991a) list the species of Hydraenidae in the Balearic Islands and we shall refer to this work on many occasions to avoid exhaustive listings of previous works. For their part, PONS & PALMER (1996) have carried out an extensive inventory of the endemic fauna of the Balearic Islands which includes species of this group.

Material and methods

During winter (February and March) and spring (May and June), 1988, several sampling campaigns of aquatic insects were carried out in the Balearic Islands (GARCÍA-AVILÉS 1990). A total of 246 sites were sampled across Mallorca (120), Menorca (68), Ibiza (41) and Formentera (17). Specimens of the groups studied were found in 8 previous samplings which have been added to these sites (1 on Mallorca and 7 on Menorca). Figure 1 shows the geographical location of the Balearics. A list of sampling sites is given at the end of the paper.

The sampling sites are intended to cover the different aquatic habitats in the Balearic Islands. As a whole, the lack of permanent water courses, almost exclusively reduced to some streams from the Tramuntana and Levante mountains on Mallorca and the Algendar ravine on Menorca, stands out. Mallorca and Menorca have a greater diversity of aquatic environments with an abundance of

mostly seasonal streams. Ibiza shows reduced diversity with very few streams or ponds. This is encountered by the many "albercas" (small man-made ponds for irrigation with cement or stone walls) which serve as a refuge for many aquatic species of insects. Formentera is very limited with mostly brackish water due to its small surface area and tabular relief.

The abundance on each island is defined by the proportion of sites from which recorded: very abundant (> 50 %), abundant (30 % - 50 %), common (15 % - 29 %), scarce (5 % - 14 %), rare (< 5 %) and very rare (only 1 site).

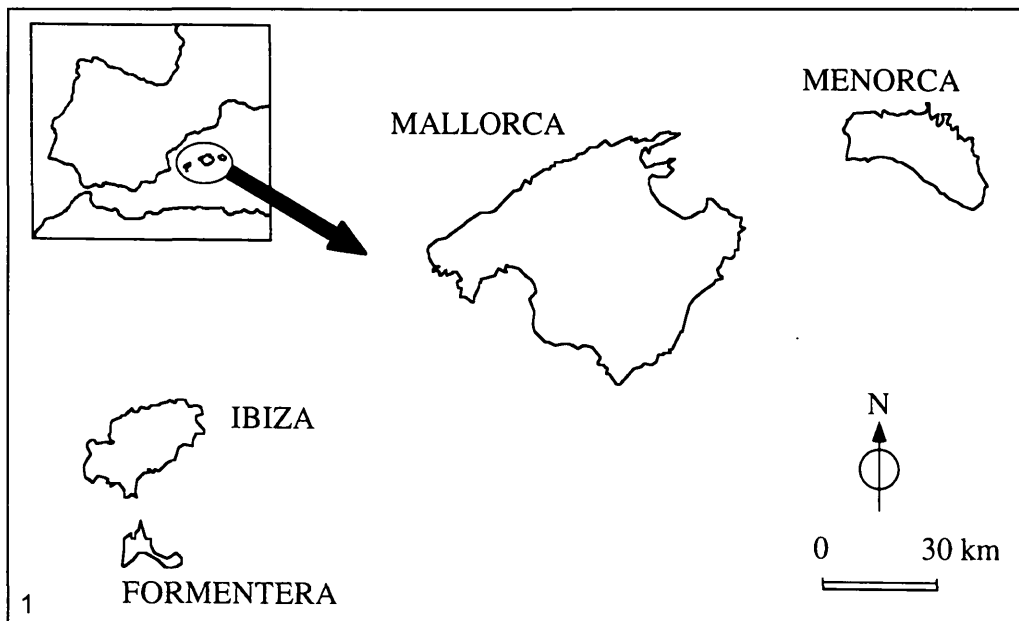


Fig. 1: Geographical location of the Balearic Islands.

Faunistic results

A total of 17 aquatic Hydraenidae and 27 Hydrophiloidea species are recorded. The discovery of a new species, described recently as *Limnebius minoricensis* by JÄCH et al. (1996) on the island of Menorca, and the first record in the Balearic Islands of *Ochthebius lobicollis* REY, a species not previously recorded from the Iberian Peninsula, *Ochthebius grandipennis* FAIRMAIRE, and *Ochthebius poweri* RYE, stand out among the Hydraenidae. As far as the Hydrophilidae are concerned, *Helophorus minutus* FABRICIUS, *Anacaena lutescens* (STEPHENS), *Enochrus politus* KÜSTER and *Coleostoma orbiculare* (FABRICIUS) are recorded for the first time. The presence of *Chasmogenus livornicus* (KUWERT) is also confirmed in the Balearics, which corroborates the distribution of this species in the western Mediterranean.

The islands and sampling sites, abundance on each island, general distribution and previous recorded presence in the Balearic Islands as well as habitat preference and other observations made are given for each of the species recorded. Very doubtful old sightings and clearly erroneous ones, not confirmed by the abundant material studied have been removed from this study. Assignations of synonyms or incorrect identifications are indicated in the text or reference is made to VALLADARES & MONTES (1991a) in the case of the Hydraenidae.

Hydraenidae

Hydraena (Phothydraena) testacea CURTIS, 1830

Mallorca: Scarce (sites: 2, 11, 12, 68, 69, 71, 89, 91). Menorca: Very rare (site: 186). Ibiza: Very rare (site: 201).

Western Palearctic, only found previously on Mallorca (TENENBAUM 1915; BERTHÉLEMY 1986; VALLADARES & MONTES 1991a).

Found in permanent freshwater sites like streams, sources, "albercas" or ponds fed by springs with or without vegetation. It is one of the few species of the genus that also occupies lentic environments.

Hydraena (Hydraena) balearica d'ORCHYMONT, 1930

Mallorca: Scarce (sites: 5, 9, 12, 14, 27, 32, 68, 69, 71, 81, 84, 92, 94, 98, 104, 105, 111). Menorca: Scarce (sites: 140, 141, 147, 159, 184). Ibiza: Rare (sites: 190, 211).

Endemic to the Balearics, present on the three larger islands (VALLADARES & MONTES 1991b) and WHITEHEAD (1993) in the Vall de Bóquer, Mallorca.

It is mainly present in permanent freshwater lotic sites (sources and streams), with or without vegetation and a variable substratum basically of pebbles and gravel. Its endemism and the fragility of its habitats on the islands make this species one of the most threatened in the Balearics, particularly on Ibiza where it is almost extinct (VALLADARES & MONTES 1991b). According to WHITEHEAD (1993) it is part of an entomological faunal association which indicates a well preserved freshwater environment in the islands. PONS & PALMER (1996) catalogue its conservation situation (IUCN) as Vulnerable.

Limnebius furcatus BAUDI, 1872

Menorca: Common (sites: 131, 141, 149, 150, 151, 156, 162, 164, 165, 186, 254).

Spread throughout the Mediterranean, it has been recorded in Pollensa on Mallorca (d'ORCHYMONT 1938, 1945) and Menorca (VILARRUBIA & ESPAÑOL 1933; COMPTE 1968).

It is found in permanent freshwater ponds and streams, with or without macrophytes. Various authors (FERRO 1979; VALLADARES 1989) associate it with stagnant environments with abundant aquatic vegetation and even brackish waters (DELGADO 1995).

Limnebius maurus BALFOUR-BROWNE, 1978

Mallorca: Very rare (site: 93). Ibiza: Scarce (sites: 201, 204, 224).

Distribution restricted to the Iberian Peninsula, northern Morocco and the Balearic Islands where it was already recorded from Mallorca (BREIT 1909; SIETTI 1931; d'ORCHYMONT 1938), Menorca (VILARRUBIA & ESPAÑOL 1933; PONS 1987) and Ibiza (JÄCH 1993a) although it appears under the name of *L. nitidus* (MARSHAM, 1802) in older works.

It is typical of springs or ponds fed by springs, thus it is found in permanent freshwater environments with or without associated vegetation, in the Balearic Islands. This species occupies a wide variety of environments (VALLADARES 1989; SÁINZ-CANTERO & ALBA-TERCEDOR 1991; DELGADO 1995).

Limnebius minoricensis JÄCH, VALLADARES & GARCÍA-AVILÉS, 1996

Menorca: Rare (sites: 142, 184).

Endemic to the Balearics recorded in two small permanent streams of slightly brackish waters in the north of Menorca (JÄCH et al. 1996).

Ochthebius (Asiobates) aeneus STEPHENS, 1835

Mallorca: Very rare (site: 85). Menorca: Common (sites: 131, 137, 141, 145, 147, 149, 161, 162, 176, 254).

Western Palearctic, it was already known from the four sampled islands (TENENBAUM 1915; FOSTER 1990; JÄCH 1990b).

Euryoecious species, preferably found in stream backwaters and permanent ponds, freshwater and slightly brackish, with or without vegetation.

***Ochthebius (Asiobates) dilatatus* STEPHENS, 1829**

Mallorca: Common (sites: 10, 28, 29, 31, 53, 54, 55, 62, 63, 64, 66, 69, 77, 83, 85, 88, 89, 90, 101, 102, 104, 105, 112). Menorca: Abundant (sites: 125, 126, 130, 131, 132, 133, 136, 137, 138, 139, 140, 141, 142, 145, 147, 148, 149, 150, 151, 155, 157, 160, 161, 162, 165, 168, 170, 171, 172, 175, 176, 185, 186, 248, 253, 254).

Atlantic-Mediterranean distribution, recorded from Mallorca, Menorca and Ibiza by various authors (KUWERT 1890; BREIT 1909; TENENBAUM 1915; SIETTI 1931, 1932; VILARRUBIA & ESPAÑOL 1933; JÄCH 1990b). PONS & PALMER (1996) continue to quote it as *O. impressicollis numidicus* REITTER, 1872, which is a synonym of *O. dilatatus* STEPHENS (JÄCH 1990b).

It is the most abundant species of the Balearic Hydraenidae, occupying very diverse habitats from streams (slow current) to ponds, mostly permanent and freshwater or slightly brackish, normally with abundant vegetation. These and other similar data from the Iberian Peninsula (VALLADARES 1986) contradict the halobiont character indicated for this species by HANSEN (1987) in Scandinavia.

***Ochthebius (Asiobates) maculatus* REICHE, 1872**

Mallorca: Very rare (site: 45).

Mediterranean species, already known from Mallorca (BREIT 1908, 1909; TENENBAUM 1915; JÄCH 1990b).

It was collected in the so-called Estany de Ses Gambes, a permanent salt-water coastal lagoon.

***Ochthebius (Ochthebius) corrugatus* ROSENHAUER, 1856**

Mallorca: Rare (sites: 44, 45). Ibiza: Very rare (site: 226).

Mediterranean element (Jäch, pers.com.), already known from Mallorca, Menorca, Ibiza and Formentera (TENENBAUM 1915; PONS 1987; VALLADARES & MONTES 1991a).

Characteristic of salt water environments like salt marshes and saltworks, with or without vegetation, these habitat preferences coincide with those indicated in the Segura basin (DELGADO 1995).

***Ochthebius (Ochthebius) grandipennis* FAIRMAIRE, 1879**

Menorca: Very rare (site: 141).

New to the Balearic Islands. Western Mediterranean distribution, it had been located in the south and southeast of Iberia (JÄCH 1989; DELGADO 1995), but its presence in the Balearics was previously unknown.

The capture site was a small permanent pond fed by sources, with a sandy substratum and a conductivity of 2140 $\mu\text{S}/\text{cm}$, situated in a dune area close to the sea. DELGADO (1995) found it in semipermanent but heavily mineralized watercourses in the Segura basin.

***Ochthebius (Ochthebius) lobicollis* REY, 1885**

Menorca: Rare (sites: 147, 248).

Known from the Pyrenees, southern France, Sardinia and Capri Island (JÄCH 1990a). These records indicate the presence of this species in the Balearic Islands for the first time; there is no record of *O. lobicollis* from the Iberian Peninsula.

It was located in two small ponds in the north of the island with a slate substratum (Cabo de Favàritx), permanent or semi-permanent, slightly brackish water and without vegetation.

***Ochthebius (Ochthebius) nanus* STEPHENS, 1829**

Mallorca: Very rare (site: 102). Menorca: Very rare (site: 161).

Distributed in western Europe and North Africa, its presence on Mallorca and Ibiza was already known (BREIT 1909; TENENBAUM 1915; SIETTI 1931; SOLER & MONTES 1977; BALFOUR-BROWNE 1978; JÄCH 1992b).

It was recorded from permanent freshwater sites, a small lagoon fed by a spring (Estany de la Font de Sant Joan) on Mallorca and a stream with a very slow current on Menorca, both with abundant submerged as well as emergent vegetation. These shore habitats with an abundance of macrophytes are cited by various authors (FERRO 1979; VALLADARES 1986) as characteristic of the species.

***Ochthebius (Ochthebius) pilosus* WALTL, 1835**

Ibiza: Very rare (site: 208).

Western Mediterranean species, only mentioned specifically on Menorca in the Balearics (PONS 1987; JÄCH 1989).

Located in a permanent pond on the dry bed of the Santa Eulalia river, freshwater, rock and silt substratum and abundant aquatic vegetation.

***Ochthebius (Ochthebius) poweri* RYE, 1870**

Mallorca: Rare (sites: 32, 72). Menorca: Very rare (site: 145).

Atlantic-Mediterranean species recorded in the Balearic Islands for the first time. Only known from Málaga (JÄCH et al. 1999), Jaén and Portuguese Estremadura (VALLADARES & MONTES 1991a) in the Iberian Peninsula.

It has been recorded from Mallorca from a spring and a stream, both permanent, swiftly-flowing freshwater environments. The record from Menorca is from a slightly brackish pond.

***Ochthebius (Ochthebius) punctatus* STEPHENS, 1829**

Menorca: Very rare (site: 145).

Atlanto-Mediterranean in distribution. Previously recorded from Mallorca, Menorca and Ibiza by various authors which were listed by VALLADARES & MONTES (1991a).

Located in a small permanent or semi-permanent pond of slightly brackish water in the north of Menorca. Although it has been related to salty coastal waters it can penetrate semi-permanent gullies with a lower salt content (DELGADO 1995), usually associated with submerged vegetation.

***Ochthebius (Ochthebius) subpictus* WOLLASTON, 1857**

Mallorca: Rare (sites: 29, 30, 42, 44). Menorca: Scarce (sites: 129, 130, 131, 137, 175). Formentera: Very rare (site: 233).

Mediterranean species, previously known from Mallorca, Menorca and Formentera (VALLADARES & MONTES 1991a).

It occupies permanent salty water environments like salt marshes and streams with a silted substratum and with or without vegetation.

***Ochthebius (Ochthebius) viridis* PEYRON, 1858**

Mallorca: Very rare (site: 116). Menorca: Rare (sites: 121, 150, 248).

Spread throughout the Mediterranean, it had already been recorded on these two islands and Ibiza (BREIT 1909; TENENBAUM 1915; PONS 1987; JÄCH 1992c).

On the islands it lives in permanent ponds with or without vegetation and waters with a conductivity of 2700 - 6300 $\mu\text{S/cm}$.

Helophoridae

Helophorus (Helophorus) maritimus REY, 1885

Menorca: Scarce (sites: (147, 150, 155, 248).

Its distribution is Mediterranean and it had already been recorded from Menorca (PONS 1987).

Located in permanent freshwater or slightly brackish ponds, normally without vegetation and with a silted substratum, this habitat coincides with that stated for the species in other Iberian locations (VALLADARES 1995).

Helophorus (Atracthelophorus) brevipalpis BEDEL, 1881

Menorca: Scarce (sites: (130, 131, 137, 150, 151, 165, 170, 186, 253).

Spread throughout Europe including the Mediterranean islands, and Asia Minor, it has only been observed on Menorca in the Balearics (PONS 1987).

It is found in permanent freshwater environments (ponds and slow flowing streams), with abundant vegetation and a silted substratum. It is an euryoecious species (HANSEN 1987; SÁINZ-CANTERO & ALBA-TERCEDOR 1991; VALLADARES 1995) and a good colonizer (FERNANDO 1958), so it can occupy temporary habitats. Therefore its presence on only one island in the survey and always in permanent environments is surprising.

Helophorus (Rhopalhelophorus) fulgidicollis MOTSCHULSKY, 1860

Mallorca: Very rare (site: 28). Menorca: Scarce (sites: 122, 123, 124, 130, 132, 134, 162, 248).

European species recorded from Mallorca (SCHAUFUSS 1881; BREIT 1909) under the name *Helophorus filitarsis* SCHAUFUSS, 1881. Also observed on Menorca (PONS 1987).

Located exclusively in temporary as well as permanent stagnant waters, with or without vegetation, muddy substratum and very variable conductivity (400 - 18000 $\mu\text{S}/\text{cm}$). Its presence in saline areas concurs with what was indicated by ANGUS (1992).

Helophorus (Rhopalhelophorus) illustris SHARP, 1916

Mallorca: Rare (sites: 28, 29).

North Mediterranean species, its presence on Menorca had been recorded by PONS (1987) although systematic validity was doubtful. This sighting as well as the validity of this species were later confirmed by ANGUS (1992). RIBERA et al. (1996) have recently recorded its presence in coastal wetlands in Catalonia (in the north of the Iberian Peninsula).

It was sighted on the banks of permanent brackish water environments with vegetation, which coincides with what ANGUS (1992) has indicated for this species.

Helophorus (Rhopalhelophorus) minutus FABRICIUS, 1775

Menorca: Abundant (sites: 124, 126, 130, 131, 132, 134, 137, 138, 140, 141, 142, 145, 147, 149, 150, 155, 160, 162, 165, 175, 176, 182, 185, 186, 248, 252, 254).

Distributed throughout Europe, including the Iberian Peninsula, these are the first records for the Balearic Islands.

Widely distributed throughout the island of Menorca, it occupies permanent stagnant environments with very variably mineralized waters, with or without vegetation and above all a muddy substratum. Although it lives in varied habitats, its preference for ponds which are rich in vegetation and generally eutrophic is known (ANGUS 1992; VALLADARES 1995).

Helophorus (Rhopalhelophorus) longitarsis WOLLASTON, 1864

Mallorca: Rare (sites: 20, 53, 55). Menorca: Very rare (site: 124).

Western Palearctic species. It had only appeared as an old record on Mallorca (SCHAUFUSS 1881) under *Helophorus punientanus* SCHAUFUSS, 1881.

Found in temporary or semi-permanent freshwater ponds with vegetation and muddy bottoms. It

is a stagnant water species which can stand a high degree of eutrophication (HANSEN 1987; ANGUS 1992; VALLADARES 1995).

Hydrochidae

Hydrochus grandicollis MULSANT, 1844

Mallorca: Rare (sites: 11, 88, 93). Menorca: Rare (sites: 165, 187, 249). Ibiza: Rare (sites: 190, 201).

Western Mediterranean distribution. It had been recorded from the Balearics as this species or as "*Hydrochus nitidicollis* MULSANT, 1844", on Mallorca (BREIT 1909; TENENBAUM 1915; JORDA 1927; SIETTI 1931, 1932), Menorca (CARDONA 1872; VILARRUBIA & ESPAÑOL 1933; PONS 1987) and Ibiza (SIETTI 1931).

On the banks of permanent freshwater streams and ponds, always with aquatic vegetation.

Hydrophilidae

Berosus (s.str.) *affinis* BRULLÉ, 1835

Menorca: Common (sites: 124, 125, 131, 132, 134, 137, 138, 141, 150, 154, 155, 162, 176, 182, 186, 252).

Western Palearctic. Curiously, it was known from Mallorca (MORAGUES 1889; SIETTI 1930, 1931; BIGOT 1958; SCHÖDL 1993) and Ibiza (SIETTI 1931; ESPAÑOL 1943; SOLER & MONTES 1977), but not from Menorca.

It occupies stagnant environments, ponds as well as streams which are generally permanent and with vegetation and fresh or slightly brackish water. The euryoecious character of this species, which is associated with submerged vegetation, has been recorded (AOUAD & AGUESSE 1991; SÁNCHEZ et al. 1992).

Berosus (s.str.) *hispanicus* (KÜSTER, 1847)

Mallorca: Scarce (sites: 28, 29, 30, 66, 86, 88, 89, 103, 117). Menorca: Common (sites: 121, 122, 130, 131, 132, 136, 137, 140, 141, 160, 161, 165, 172, 175, 183, 248, 253). Ibiza: Very rare (site: 216).

Western Palearctic. It is the most widely distributed species of the genus in the Balearics where it was already known on the three larger islands (CARDONA 1875; BREIT 1909; TENENBAUM 1915; SOLER & MONTES 1977; PONS 1987; SCHÖDL 1993).

Located in a wide variety of freshwater as well as saline aquatic environments which are normally lentic, permanent and vegetated. This ecology coincides completely with that indicated by other authors (SÁNCHEZ et al. 1992; DELGADO 1995) for the Iberian Peninsula.

Berosus (s.str.) *signaticollis* (CHARPENTIER, 1825)

Menorca: Very rare (site: 143).

Western Palearctic species previously recorded from Menorca (PONS 1987) and the Balearics (SCHÖDL 1993) without stating a particular island.

The capture site, Prat de Lluriac, is a large shallow area, often flooded, with a muddy bottom and 2800 $\mu\text{S}/\text{cm}$ conductivity. This species' normal habitat is stagnant waters with macrophytes (VALLADARES 1995).

Berosus (*Enoplurus*) *fulvus* (KÜSTER, 1888)

Mallorca: Rare (sites: 41, 42).

Palearctic. It has recently been recorded on Mallorca (SCHÖDL 1991) and Menorca (PONS 1987).

A typical maritime species (DELGADO 1995), record in the Salobrar de Campos - extensive salt marshes situated in the south of Mallorca.

***Anacaena bipustulata* (MARSHAM, 1802)**

Mallorca: Scarce (sites: 5, 11, 12, 69, 70, 71, 88, 92, 93, 94). Menorca: Rare (sites: 165, 170, 249, 253). Ibiza: Scarce (sites: 190, 201, 204, 223, 229).

Western Palearctic. It had already been recorded in the Balearic Islands on Mallorca (MORAGUES 1889; TENENBAUM 1915), Menorca (RODRÍGUEZ-FEMENÍAS 1887; VILARRUBIA & ESPAÑOL 1933; PONS 1987) and Ibiza (SOLER & MONTES 1977).

Located on the edges of springs, streams and ponds formed by water sources. It could be defined as typical of permanent freshwater environments with little or no current and with vegetation. This habitat selection coincides more with that indicated for this species in other Iberian regions (LAGAR 1984; SÁINZ-CANTERO & ALBA-TERCEDOR 1991; VALLADARES 1995) than with that given by BERGE HENEGOUWEN (1986) in Holland where it is typical in estuaries and salt water.

***Anacaena lutescens* (STEPHENS, 1829)**

Mallorca: Very rare (site: 29). Menorca: Common (sites: 126, 131, 132, 138, 141, 142, 147, 150, 151, 154, 161, 165, 170, 175, 176, 185, 186, 248).

A Holarctic species recorded for the first time in the Balearics. However, the sighting of *Anacaena limbata* (FABRICIUS, 1792) by PONS (1987) on Menorca, confirming that of VILARRUBIA & ESPAÑOL (1933), may actually be this species. The same could have happened in the case of some of the old records (SCHAUFUSS 1881; CARDONA 1872; TENENBAUM 1915) of *Anacaena globulus* (PAYKULL, 1798) although this would need to be confirmed.

Classified as euryoecious (HANSEN 1987; SÁINZ-CANTERO & ALBA-TERCEDOR 1991; VALLADARES 1995), it occupies freshwater or slightly brackish and vegetated permanent ponds and streams with little or no current in the Balearics.

***Paracymus aeneus* (GERMAR, 1824)**

Mallorca: Very rare (site: 30). Ibiza: Very rare (site: 226). Formentera: Rare (sites: 230, 236).

Western Palearctic. Known from Mallorca (BREIT 1909; TENENBAUM 1915; SIETTI 1931; WOOLDRIDGE 1978; WHITEHEAD 1993) and Ibiza (TENENBAUM 1915). Other records of the genus *Paracymus* in the Balearics, such as *P. schneideri* KUWERT, 1888 (synonym of *P. relaxus* REY, 1884) on Mallorca (BREIT 1909) and Menorca (PONS 1987), *P. scutellaris* on Mallorca (TENENBAUM 1915) and *P. phalacroides* on Mallorca cited by BREIT (1909) as *P. punctillatus* REY, 1885 are almost certainly incorrect and thus belong to this species. Only the record of *P. maximus* on Ibiza by ESPAÑOL (1943) could be correct, given the presence of this species in Tunisia.

It is typical of permanent salt marshes and saltworks without vegetation, which confirms the halophilous character of this species (WOOLDRIDGE 1978; HANSEN 1987).

***Laccobius (Dimorpholaccobius) moraguesi* RÉGIMBART, 1898**

Mallorca: Scarce (sites: 12, 65, 73, 81, 84, 91, 104, 119). Menorca: Scarce (sites: 141, 164, 184, 186, 248, 254). Ibiza: Scarce (sites: 191, 194, 195, 212).

Described from Mallorca (RÉGIMBART 1898) this species is distributed throughout the Mediterranean area (GENTILI 1989). It had been recorded from Ibiza (TENENBAUM 1915) and Menorca (PONS 1987). The record of *L. atrocephalus* REITTER, 1872 quoted by WHITEHEAD (1993) on Mallorca requires confirmation as it could be *L. moraguesi*.

Recorded from the edges of permanent freshwater lotic environments (streams and springs) with moderate or slow currents, with or without vegetation.

***Helochares lividus* (FORSTER, 1771)**

Mallorca: Scarce (sites: 21, 44, 52, 61, 90, 101, 119). Menorca: Scarce (sites: 121, 136, 140, 155, 157, 160, 161, 186). Ibiza: Very rare (site: 190).

Western Palearctic, it was already recorded from these three islands (CARDONA 1872, 1875; MORAGUES 1889; BREIT 1909; TENENBAUM 1915; SOLER & MONTES 1977; HANSEN 1982; PONS

1987; PONS & PALMER 1996), at times as *H. lividus* var. *ludovici* SCHAUFUSS, 1869 (without any taxonomic validity) or mistakenly as *H. griseus* (Fabricius, 1787) by SIETTI (1931, 1932).

Located in generally permanent stagnant freshwater habitats, with marginal vegetation and a muddy substratum. It is a very common species on the vegetated banks of all types of aquatic environments (VALLADARES 1995) but very rare in salty waters (DELGADO 1995). In spite of this, PONS (1987) recorded it from saline environments on Menorca.

***Chasmogenus livornicus* (KUWERT, 1889)**

Menorca: Very rare (site: 248).

A species known from the eastern Mediterranean (HEBAUER 1992) and recently recorded from the Ebro delta (RIBERA et al. 1996). Its presence had already been recorded as sporadic by PONS (1987) on Menorca. It is likely that the record of *Helochaeres melanophthalmus* MULSANT, 1844, given by SOLER & MONTES (1977) for Ibiza is really this species, which would corroborate the opinion by d'ORCHYMONT (1936) about the absence of *H. melanophthalmus* in Spain (and Europe). The capture site is a pond without vegetation and with a slate substratum in the north of Menorca.

***Enochrus (Lumetus) bicolor* (FABRICIUS, 1792)**

Mallorca: Very rare (site: 44). Menorca: Very rare (site: 248). Formentera: Very rare (site: 235).

Paelearctic. Previously recorded on Mallorca (BREIT 1909; TENENBAUM 1915; SIETTI 1931; BIGOT 1958), Menorca (PONS 1987) and Ibiza (ESPAÑOL 1943) with the synonym *E. maritimus* THOMSON, 1853. According to RIBERA et al. (1997) the record of BREIT (1909) must be attributed to *E. ater* (KUWERT). The records of *E. testaceus* on these three islands (CARDONA 1878; MORAGUES 1889; TENENBAUM 1915) should be attributed to *E. bicolor* or *E. ater*.

Typical of salty environments (salt marshes) with a muddy substratum, this species preferred habitat (HANSEN 1987) had already been indicated by PONS (1987) in his sightings on Menorca.

***Enochrus (Lumetus) melanocephalus* (OLIVIER, 1792)**

Mallorca: Very rare (site: 90).

A western Palearctic species previously recorded from Mallorca (BREIT 1909; TENENBAUM 1915). Collected at a pond formed by a freshwater stream with abundant macrophytes and a sand and mud bottom.

***Enochrus (Lumetus) halophilus* (BEDEL, 1878)**

Mallorca: Very rare (site: 47). Menorca: Rare (sites: 129, 130, 134).

Western Palearctic. It was only known from an old record by BREIT (1909) on Menorca in the Balearics.

It was located in lentic environments, from freshwater ponds (815 $\mu\text{S}/\text{cm}$) with aquatic vegetation to brackish water marshes (37400 $\mu\text{S}/\text{cm}$) without vegetation. It is a halobiontic species of coastal environments (HANSEN 1987).

***Enochrus (Lumetus) ater* (KUWERT, 1888)**

Mallorca: Very rare (site: 44). Menorca: Very rare (site: 133).

Mediterranean-Turanian species. It has recently been recorded from Mallorca by RIBERA et al. (1997).

Located in permanent lentic environments (marshes) of brackish water with a muddy substratum and abundant aquatic vegetation. It is a typical inhabitant of well vegetated stagnant waters (basically on the coast) but usually absent from highly saline waters (RIBERA et al. 1997).

***Enochrus (Lumetus) politus* KÜSTER, 1849**

Mallorca: Rare (sites: 30, 39). Menorca: Very rare (site: 128). Ibiza: Very rare (site: 216). Formentera: Very rare (site: 246).

Mediterranean-Turanian and Macaronesian, including the Iberian Peninsula. New record for the Balearic Islands.

Collected in permanent lentic environments (mainly marshes) of brackish water, with abundant helophytous vegetation and muddy or sandy substratum. RIBERA et al. (1997) found this species in small streams with highly mineralised water over marl or gypsum soils.

***Hydrobius convexus* BRULLÉ, 1835**

Mallorca: Very rare (site: 62). Menorca: Scarce (sites: 132, 141, 151, 184, 185, 186, 248).

Northwestern Mediterranean, previously recorded from Mallorca (MORAGUES 1889; COMPTE 1968) and Menorca (TENENBAUM 1915; COMPTE 1968; PONS 1987).

It was located in permanent freshwater lentic environments (ponds and stagnant areas of streams), with or without aquatic vegetation. In other areas it occupies this type of habitat though with a constant presence of submerged macrophytes (VALLADARES 1995).

***Hydrobius fuscipes* (LINNAEUS, 1758)**

Menorca: Rare (sites: 132, 138, 141, 248).

Holarctic species: it was known on Mallorca (TENENBAUM 1915) and Menorca (VILARRUBIA & ESPAÑOL 1933; PONS 1987) in the Balearics.

Recorded in environments similar to those of the previously mentioned species, all in the north of Menorca. Various authors (HANSEN 1987; VALLADARES 1995) indicate that it is a common species in stagnant waters, always associated with submerged vegetation.

***Hydrophilus pistaceus* (CASTELNAU, 1840)**

Mallorca: Rare (sites: 7, 90). Menorca: Scarce (sites: 126, 131, 132, 141, 155, 156, 186). Ibiza: Very rare: (site: 189).

Western Mediterranean. Various authors had already recorded its presence on Mallorca, Menorca and Ibiza (CARDONA 1872; MORAGUES 1889; BREIT 1909; TENENBAUM 1915; SIETTI 1931; COMPTE 1968; SOLER & MONTES 1977; PONS 1987).

A species characteristic of deep stagnant waters with abundant vegetation (VALLADARES 1995), it occupies permanent freshwater lentic environments (ponds, "albercas" and streams) with aquatic plants in the Balearics.

***Coleostoma orbiculare* (FABRICIUS, 1775)**

Mallorca: Very rare (site: 31).

Euroasiatic species widely distributed in the Iberian Peninsula and recorded in the Balearic Islands for the first time.

It was collected from a seasonal freshwater stream without current, with abundant vegetation and a muddy bottom. This habitat verifies the preference of this species for environments rich in organic material.

***Coleostoma hispanicum* (KÜSTER, 1848)**

Mallorca: Very rare (site: 65).

Spread throughout the western Mediterranean and the Canary Islands, it had already been recorded on Mallorca (BREIT 1909; SIETTI 1930, 1932) and Menorca (CARDONA 1872; PONS 1987).

It was collected in a small freshwater irrigation channel with a strong current and without vegetation. SÁINZ-CANTERO & ALBA-TERCEDOR (1991), DELGADO (1995) and VALLADARES (1995) associate it with the banks of various bodies of water, generally with vegetation.

Species quoted but not captured

Species not recorded in this study but quoted in recent publications and whose presence can be considered definite or highly probable are listed. Those recorded before 1940 and not captured since have been excluded as they are either considered incorrect or their continued presence in the Balearics is now very dubious and requires confirmation.

Ochthebius (s.str.) *glaber* MONTES & SOLER, 1988

Endemic to Iberian Peninsula and the Balearic Islands and adapted to hypersaline environments, it has recently been recorded from Menorca (JÄCH 1992a).

Ochthebius (s.str.) *quadrioveolatus* WOLLASTON, 1854

Known in the Mediterranean, British and Macaronesian islands and Saudi Arabia. Flowing water species only recorded on Ibiza (JÄCH 1989).

Ochthebius (*Calobius*) *quadricollis* MULSANT, 1844

Western Mediterranean distribution. A rock-pool species: this environment was not searched during this study. It has been recorded from the coasts of Mallorca, Menorca, Ibiza and Formentera (PONS 1987; VALLADARES & MONTES 1991a; JÄCH 1993b). This species has been confirmed by URBANELLI et al. (1996).

Ochthebius (*Cobalius*) *subinteger* MULSANT & REY, 1861

Known in the Mediterranean, Black Sea and Indian Ocean. Like the previously named species, with which it often co-habits, it lives in coastal ponds or rock-pools and has been observed on Mallorca, Menorca and Ibiza (VALLADARES & MONTES 1991a).

Helophorus (*Trichelophorus*) *alternans* GENE, 1836

A basically Mediterranean species. PONS (1987) confirms the presence of this species on Menorca, which allows us to validate the records by TENENBAUM (1915) on Mallorca and VILARRUBIA & ESPAÑOL (1933) and COMPTE (1968) on Menorca.

Berosus (*Enoplurus*) *jaechi* SCHÖDL, 1991

A Mediterranean element recorded from Mallorca (SCHÖDL 1991). The record of *Berosus guttalis* REY, 1883 by BREIT (1909) probably corresponds to this species.

Laccobius (*Microlaccobius*) *alternus* MOTSCHULSKY, 1855

A Mediterranean species. GENTILI & CHIESA (1975) detected one specimen on Mallorca among the type series of *L. moraguesi* RÉGIMBART, 1898.

Cymbiodyta marginella (FABRICIUS, 1792)

A European species recorded by BIGOT (1958) and WHITEHEAD (1993) on Mallorca and PONS (1987) on Menorca.

Hydrophilus piceus (LINNAEUS, 1758)

Eurosiberian species recorded in the past from Menorca (CARDONA 1872) and Mallorca (TENENBAUM 1915) but not confirmed. The presence nowadays of this species in the Ebro and Llobregat deltas on the coast of Catalonia and Castellón (RIBERA et al. 1995, 1996) does not mean that its presence on the islands, at least historically or sporadically, should be discarded.

Limnoxenus niger (ZSCHACH, 1788)

A species spread widely throughout Iberia, recently record by PONS (1987) and WHITEHEAD (1993) from Menorca and Mallorca, respectively, confirm those by CARDONA (1872) and TENENBAUM (1915) on the same islands under denominations of "*Hydrobius oblongus*" and "*Limnoxenus oblongus*" respectively.

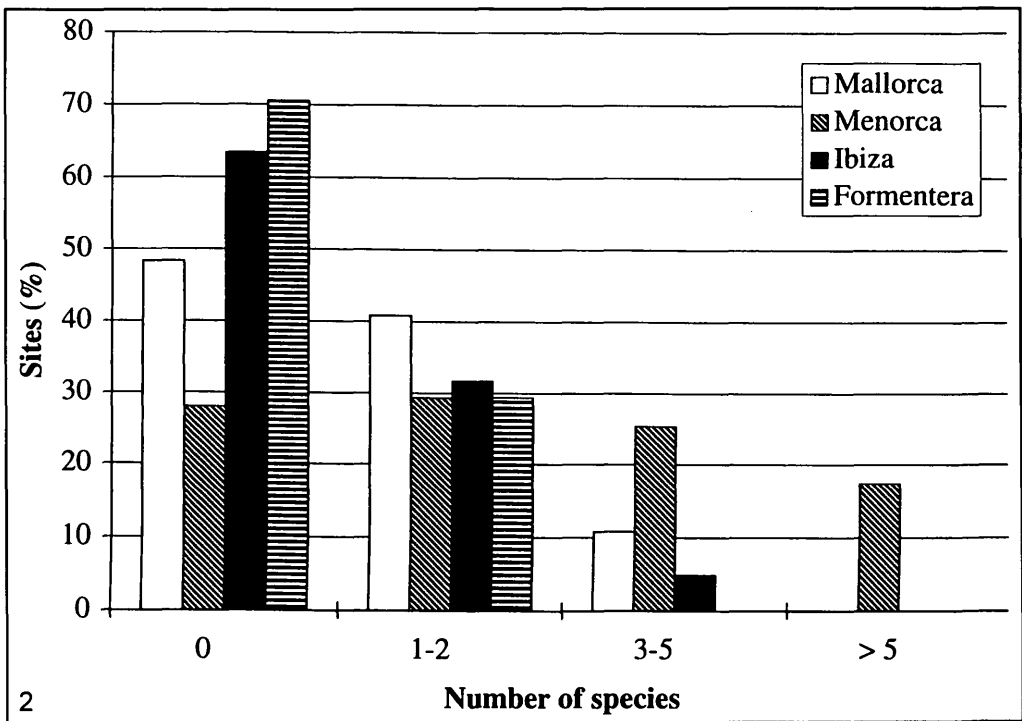


Fig. 2: Percentage of sampling sites and number of species on each island.

Biogeographical and habitat considerations

Variation between islands in the species richness of Hydraenidae and Hydrophiloidea stands out immediately when the data are examined. The island of Menorca, only one-fifth as large as Mallorca, shows greater species richness in Hydraenidae as well as Hydrophiloidea. Thus, whilst the presence of 15 species of Hydraenidae and 26 Hydrophiloidea is confirmed on Mallorca, species richness is 19 and 28, respectively, on Menorca.

Amongst the hypotheses that attempt to explain species-area relationships is the equilibrium theory of island biogeography (MCARTHUR & WILSON 1967). This theory explains species number on an island as resulting from a dynamic equilibrium between extinction and immigration rates. Under this, and a number of other models, species richness on a particular island is a function of island area. Such an "area effect" on richness is not evident for either groups of aquatic beetles on Mallorca and Menorca. A similar situation is seen with other groups of aquatic insects in the Balearics (GARCÍA-AVILÉS 1990), where species richness on the two islands is very similar or, as in the case of aquatic Heteroptera (GARCÍA-AVILÉS et al. 1996), actually higher on the smaller island.

The usual explanation for these exceptions to the species-area relationship is based on a possible greater diversity of habitat on the islands with a smaller surface area and a larger number of species. However, that explanation is not valid in this case as both islands have a very similar diversity of habitats. It is possible that the better degree of conservation of the aquatic ecosystems

on Menorca and, above all, the more permanent character of its lentic ecosystems could explain this greater species richness in comparison with Mallorca. In contrast to Menorca, Ibiza has a slightly smaller surface area but a much more reduced species richness (13 Hydraenidae and 11 Hydrophiloidea), above all because of the almost complete absence of lotic environments and also the severe deterioration of its aquatic environments and overexploitation of aquifers. There is a very reduced number of species (4 Hydraenidae and 3 Hydrophiloidea), all characteristic of saline environments, on Formentera due to its small size and the almost complete lack of fresh water.

On looking more closely at species distribution across the sites, very low diversity is observed on a general level (Fig. 2). Thus the percentage of sites where no species was captured is over 48 % throughout the islands, except Menorca (28 %). Only 1 or 2 species were found at most positive sampling sites, except Menorca again, the only island with sites where more than five species were found (17.33 %).

From a chorological point of view the composition of faunal elements of both groups show similar proportions in the Balearics to those of other areas of the Iberian Peninsula, except for the percentage of Hydraenidae. On these islands there are only two species exclusively endemic to the Balearics (*Hydraena balearica* and *Limnebius minoricensis*) and one Ibero-balearic endemic characteristic of hypersaline waters (*Ochthebius glaber*). The presence of species distributed through the western Mediterranean and Macaronesia also stands out. These have a high dispersal capacity: *Helophorus longitarsis*, *Enochrus politus*, *Coleostoma hispanicum*, *Ochthebius quadrioveolatus* and *Ochthebius quadricollis*, the last being characteristic of coastal rock-pools.

Comparing the Balearic faunal composition of these two groups with that known in nearby areas like the Segura river basin in the southeast of the Iberian peninsula (DELGADO 1995), similarity is about 52 % at the species level. The great difference in richness: 79 species in the Segura as opposed to 54 in the Balearics, can be explained by insularity as well as the smaller surface area and lack of epicontinental water habitats on the islands. Only the high number of *Ochthebius* species stands out in both areas (26 and 16, respectively) with the presence of various common species adapted to saline or hypersaline environments.

Acknowledgements

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List of sampling sites

Location and characteristics of the sampling sites. Habitat types: stream (1), pond (2), "alberca" (3), marsh (4), spring (5) and reservoir (6).

Number	Sampling sites	U.T.M.	Altitude	Habitat
M A L L O R C A				
1	Route C-710	31SDE885082	660	5
2	Pareis	31SDE839113	2	1
3	Pareis	31SDE839114	1	1
4	Binibona	31SDE934040	140	2
5	Comafreda	31SDE907069	580	5
6	Comafreda	31SDE900065	620	1
7	Manut	31SDE913104	500	1
8	Llinàs	31SDE987141	140	1

9	Ternelles	31SEE006159	80	1
10	Massanella	31SDE967003	60	1
11	Almedrà	31SDE853003	360	1
12	Almedrà	31SDD853991	200	1
13	Puig de Massanella	31SDE879048	540	2
14	Sa Riera	31SDD611855	160	1
15	Sa Riera	31SDD591860	220	1
16	Puigpunyent	31SDD593858	220	3
17	Es Xalet de Betlem	31SDD829598	80	2
18	Es Xalet de Betlem	31SDD829600	80	2
19	Betlem	31SDD850609	60	2
20	S'Aguila de'n Cuart	31SDD831616	80	2
21	Son Alegre	31SDD839667	100	2
22	Son Alegre	31SDD839666	100	2
23	Son Alegre	31SDD838668	100	2
24	Son Alegre	31SDD837669	100	2
25	Son Alegre	31SDD838669	100	2
26	Avall	31SDD685941	240	1
27	Es Cocó d'en Llorito	31SDD697997	180	1
28	El Rec	31SEE056138	10	1
29	Albufereta de Pollensa	31SEE072135	0	4
30	Port d'Alcudia	31SEE107103	0	4
31	Binicaubell	31SED084900	60	1
32	Embalse de Cúber	31SDE837048	740	5
33	Es Prat de Massanella	31SDE856047	800	5
34	Gorg Blau	31SDE840053	640	1
35	Canal de Estela	31SEE101061	0	4
36	Canal Gran	31SEE096055	1	1
37	Canal de Sa Siurana	31SEE062054	1	1
38	Canal Gran	31SEE063053	1	1
39	Muro	31SEE067044	1	1
40	Albufera de Alcudia	31SEE065050	1	4
41	Salobrar de Campos	31SED013565	0	4
42	Salobrar de Campos	31SED003570	0	4
43	Banyes de Sant Joan	31SED016577	2	3
44	Colonia de Sant Jordi	31SDD998527	0	4
45	Estany de Ses Gambes	31SED038502	0	4
46	Estany de Es Tamarells	31SED033522	0	4
47	Sa Porrassa	31SDD590730	1	2
48	Sa Porrassa	31SDD590730	1	2
49	Sa Font Seca	31SDD469795	160	5
50	Sa Font Seca	31SDD466797	220	2
51	Road to Sant Telm	31SDD453814	20	3
52	Cabrianes	31SDD820647	120	2
53	Sa Bugaderia	31SDD817652	120	2
54	Es Puig de Ros de Dalt	31SDD816673	120	2
55	Es Puig de Ros de Dalt	31SDD816673	120	2
56	Es Puig de Ros de Dalt	31SDD820673	120	3
57	Es Puig de Ros de Dalt	31SDD820673	120	2
58	Es Puig de Ros de Dalt	31SDD820673	120	2
59	Es Puig de Ros	31SDD819672	120	3
60	Es Camp Vell	31SDD829671	100	3
61	Sa Vinya	31SDD831666	100	2
62	Road in Petra	31SED108836	80	1
63	Es Cocons	31SED287979	180	1
64	Ermita de Betlem	31SED269989	240	5
65	Ermita de Betlem	31SED283983	240	1
66	Ses Torretes	31SED297933	100	1
67	Subauma	31SDE828081	700	3
68	Subauma	31SDE828081	700	5
69	Es Gorg des Diners	31SDE829081	700	1
70	Road C-710	31SDE867086	620	5
71	Road C-710	31SDE867086	620	3
72	Cúber dam	31SDE826043	750	1
73	Cúber dam	31SDE826043	750	1
74	Cúber dam	31SDE823040	747	6
75	Gorg Blau dam	31SDE846064	610	6
76	Road C-710	31SDE846072	610	5

77	Prat de Sant Jordi	31SDD798756	10	3
78	Prat de Sant Jordi	31SDD801761	20	3
79	Sant Jordi	31SDD805782	10	3
80	Prat de Sant Jordi	31SDD809800	10	3
81	Major de Sóller	31SDE754011	60	1
82	S'Olla	31SDE755011	60	5
83	Major de Sóller	31SDE755016	40	1
84	Fornalutx	31SDE779035	100	1
85	Sa Mesquida	31SED358948	40	1
86	Na Mayans	31SED345942	60	1
87	Cala de Sa Font	31SED389927	0	5
88	Sa Farinera	31SED352923	40	1
89	Sa Farinera	31SED353925	40	3
90	Canyamel	31SED377904	0	1
91	Fuente Major, Sa Granja	31SDD618909	380	5
92	Esporles	31SDD618909	380	1
93	Clot de S'Aigo	31SDD616926	320	2
94	Banyalbufar	31SDD586937	10	1
95	Road C-710	31SDD572928	180	3
96	Source of Ca N'Aleta	31SDD572926	180	3
97	Source of Ca N'Aleta	31SDD572926	180	3
98	Sa Menta	31SDD570917	180	5
99	Sa Menta	31SDD570917	180	3
100	Estellencs	31SDD562898	140	1
101	Alcudia	31SEE073025	10	4
102	Font de Sant Joan	31SEE077021	10	5
103	Na Borges	31SED201972	0	1
104	Mal Torrent de Massana	31SDE975061	60	1
105	Sant Miquel	31SDE970048	20	1
106	Source of S'Olivaret	31SDD831987	320	3
107	Source of S'Olivaret	31SDD831987	320	5
108	Sollerix	31SDD849916	140	1
109	Pina	31SDD948833	120	1
110	Es Vivero (Palma)	31SDD733828	20	3
111	Sant Jordi	31SEE013149	60	1
112	Ermita de Betlem	31SED269988	240	1
113	Escorca	31SDE871084	660	5
114	Albenya	31SDD941765	240	3
115	Albenya	31SDD941765	240	5
116	Felanitx	31SED123706	80	2
117	Felanitx	31SED125705	80	2
118	Source of La Reina	31SDD733985	480	5
119	Sóller	31SDE744038	10	1
120	Source of S'Estret	31SDD689941	260	3

MENORCA

121	Road to Sa Mesquida	31SFE103184	40	2
122	Road to Sa Mesquida	31SFE102184	40	2
123	Sa Mesquida	31SFE099195	1	4
124	Sa Bassa Verda de Sa Mesquida	31SFE092195	40	2
125	Sa Mesquida	31SFE098187	1	1
126	Sa Mesquida	31SFE090186	10	1
127	Es Grau	31SFE079233	0	4
128	Gola de la Albufera de Es Grau	31SFE081227	0	4
129	Es Prat de la Albufera de Es Grau	31SFE062231	1	4
130	Es Prat de la Albufera de Es Grau	31SFE063230	1	4
131	Es Prat	31SFE057226	10	2
132	Es Puntarró	31SFE057228	10	1
133	Albufera de Es Grau	31SFE069228	0	4
134	Housing state Shangri-là	31SFE070218	20	2
135	Cala Tirant	31TEE943330	1	2
136	Tirant	31TEE942333	0	1
137	Tirant	31TEE936325	10	1
138	Tirant	31TEE923319	10	1
139	Binimel-là	31TEE899340	0	1
140	Binimel-là	31TEE894323	10	1

141	Cavalleria beach	31TEE919350	2	2
142	Sanitja	31TEE928357	2	1
143	Prat de Lluriac	31TEE933319	10	2
144	Favàritx	31SFE080284	3	2
145	Favàritx	31SFE073284	2	1
146	Prat de Morella	31SFE071272	0	4
147	Favàritx	31SFE071284	2	1
148	Algendar	31SEE823240	10	1
149	Algendar	31SEE823240	10	1
150	Clot d'El's Tres Jurats	31SFE037219	10	2
151	Es Puntarró	31SFE030224	20	1
152	Clot d'es Guix	31SFE013246	80	2
153	Clot d'es Guix	31SFE011248	80	3
154	Son Toni Martí	31SEE807278	120	2
155	Binigafull	31TEE761317	40	2
156	Sa Bassa Verda de Algaiarens	31TEE799343	120	2
157	Algendar	31SEE823229	10	1
158	Algendar	31SEE824220	1	1
159	Algendar	31SEE825257	20	1
160	Algendar	31SEE826258	20	1
161	Algendar	31TEE847296	40	1
162	Binisuesets	31TEE846295	40	2
163	En Simón	31SFE055177	3	5
164	Fuente de En Simón	31SFE055177	3	1
165	Sant Joan	31SFE059176	2	1
166	Source of Sant Joan	31SFE066171	3	3
167	Sant Joan	31SFE066174	1	1
168	Cala En Porter	31SEE969143	1	1
169	Son Bou	31SEE913177	0	4
170	Torre Solí	31SEE913186	3	5
171	Son Boter	31SEE903192	5	1
172	La Vall	31TEE793332	5	1
173	La Vall	31TEE792330	6	3
174	La Vall	31TEE790337	1	1
175	Ses Salines	31TEE961312	1	1
176	Ses Salines	31TEE958312	1	2
177	Es Port de Fornells	31TEE961314	0	4
178	Barranco de Algendar	31SEE822239	10	2
179	S'Alberg Vell	31SEE830265	60	5
180	En Cumaru	31TEE788340	1	5
181	Son Saura	31SEE768207	3	1
182	Ets Alocs	31TEE843342	0	1
183	Ets Alocs	31TEE847340	5	1
184	Ets Alocs	31TEE848340	5	1
185	Santa Catarina de Dalt	31SFE033250	60	2
186	Na Vermella	31SFE033241	40	1
187	Ses Font-rodones	31SEE912241	80	5
188	Ses Font-rodones	31SEE912241	80	3

I B I Z A

189	Sant Miquel	31SCD649258	20	3
190	Santa Eulalia river	31SCD639191	120	1
191	Brols d'es Bosquetell	31SCD582202	100	1
192	Brols d'es Bosquetell	31SCD582202	100	3
193	Brols d'es Bosquetell	31SCD584206	100	5
194	Horts de Corona	31SCD535227	40	5
195	Horts de Corona	31SCD537228	20	3
196	Pla de Santa Agnès	31SCD551225	180	3
197	Sant Antoni	31SCD554166	10	3
198	Fuente Refila	31SCD689188	60	5
199	En Torres	31SCD705253	200	5
200	Cala Portinatx	31SCD702262	120	3
201	Cala de Xarraca	31SCD701287	5	2
202	Las Salinas	31SCD607046	1	4
203	Source of Juliberta	31SCD536067	80	3
204	Source of Juliberta	31SCD537067	80	5

205	Source of Juliberta	31SCD543070	120	3
206	En Ballet	31SCD561084	120	5
207	Source of En Mestre	31SCD570080	160	2
208	Santa Eulalia river	31SCD725160	3	1
209	Santa Eulalia river	31SCD725160	11	2
10	Sant Carles	31SCD744188	20	3
211	Atzaró	31SCD736203	80	5
212	Atzaró	31SCD736203	80	3
213	Atzaró	31SCD736203	80	1
214	Road to Es Canar	31SCD751175	10	3
215	Road C-733	31SCD652119	20	3
216	Ibiza	31SCD641084	5	1
217	Port d'es Torrent	31SCD503146	5	3
218	Es Cubells	31SCD503053	100	3
219	Es Cubells	31SCD514068	100	3
220	Es Cubells	31SCD510060	120	3
221	Port d'es Torrent	31SCD504146	5	3
222	Brols d'es Bosquetell	31SCD583206	100	3
223	Port de Sant Miquel	31SCD649256	40	1
224	En Covetes	31SCD781243	2	5
225	Road to Cala Vedella	31SCD501092	200	5
226	Las Salinas	31SCD600024	0	4
227	Es Cubells	31SCD503051	80	5
228	Fuente Paredada	31SCD570084	100	5
229	Fuente Paredada	31SCD570084	100	2

FORMENTERA

230	Estany Pudent	31SCC647883	0	4
231	Estany Pudent	31SCC647883	0	4
232	Estany Pudent	31SCC647884	0	4
233	Es Brols del Estany Pudent	31SCC633875	0	5
234	Cala Saona	31SCC602840	2	2
235	Estany Pudent	31SCC647863	0	4
236	Estany Pudent	31SCC648864	0	4
237	Ses Fontanelles	31SCC751830	60	1
238	Ses Fontanelles	31SCC752831	60	1
239	Ses Fontanelles	31SCC752830	60	1
240	Punta de sa Creu	31SCC740828	60	2
241	Punta de sa Creu	31SCC741828	60	2
242	Es Caló	31SCC702825	1	3
243	Porto-Saler	31SCC612866	20	2
244	Porto-Saler	31SCC612866	20	2
245	Es Estanyets	31SCC613876	0	4
246	Cala Saona	31SCC601841	1	2

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Dr. Luis F. VALLADARES

Departamento de Biología Animal, Facultad de Biología, Universidad de León, E - 24071 León, Spain

Dr. Javier GARCÍA-AVILÉS

Centro de Investigaciones Ambientales, c/ San Sebastián, 71, E -28791 Soto del Real, Madrid, Spain

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