



Late Quaternary marine ostracods of the Basque Basin (S Bay of Biscay): taxonomy and distribution

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ABSTRACT

Late Quaternary taxonomy and ecologic and age distributions of ostracods from the Basque Basin (S Bay of Biscay) are described. More than forty-four thousands ostracod specimens have been obtained from one hundred surface samples and core samples from six cores located in shelf and upper bathyal depths and other infrabathyal core as comparative deep reference. A total of 155 species have been taxonomically described, belonging to 67 genera. Most characteristic species (123) have been SEM figured, and ecologic-geographic distributions and ages have been provided for all species. The resulting database will be a useful help for palaeoceanographic and palaeoclimatologic studies of the region.

Keywords: Ostracod taxonomy, distribution, Late Quaternary, Basque Basin, Bay of Biscay.

RESUMEN

En este trabajo se describen la taxonomía y las distribuciones ecológicas y de edad de los ostrácodos del Cuaternario final en la Cuenca Vasca (S Golfo de Vizcaya). Más de cuarenta y cuatro mil especímenes han sido obtenidos de un centenar de muestras superficiales, así como de un total de seis sondeos localizados en la plataforma y talud superior y otro sondeo infrabathyal como material de comparación. Un total de 155 especies, incluidas en 67 géneros, han sido caracterizadas taxonómicamente. Las especies más importantes (123) han sido fotografiadas con MEB y se describen las distribuciones ecológicas y temporales de la totalidad de las especies. La base de datos resultante constituye una herramienta muy útil para estudios posteriores de la palaeoceanografía y paleoclimatología de esta región.

Palabras clave: Taxonomía de ostrácodos, distribución, Cuaternario final, cuenca Vasca, Golfo de Vizcaya.

1. INTRODUCTION

Quaternary palaeoceanographic and palaeoclimatic research of the N Atlantic included ostracod assemblages as useful indicators of major environmental changes (Cronin *et al.*, 1999, 2002; Horne *et al.*, 2012) and deep NE Atlantic modern ostracods have been described from several basins (Coles *et al.*, 1996; Didié & Bauch, 2000; Alvarez Zarikian, 2009; Yasuhara *et al.*, 2009; Yasuhara & Okahashi, 2015).

Previous studies on ostracods in the Bay of Biscay have considered modern bathymetric distributions in the northern Aquitanian margin (Caralp *et al.*, 1968; Peypouquet, 1970; Carbonel, 1971, 1973; Guillaume *et al.*, 1985). Coastal (<50 mwd) assemblages are characterised by *Palmoconcha guttata* (Norman), *Cytheromorpha robertsoni* (Brady), *Leptocythere pellucida* (Baird), *Semicytherura sella* (Sars) and *Semicytherura acuticostata* (Sars). Marine shelf (50-200 mwd) assemblages contain as major species *Carinocythereis carinata* (Roemer), *Pterygocythereis jonesii* (Baird), *Bosquetina dentata* (Müller) and species of the genus *Cytheropteron*. In the upper talus a new assemblage is found with *Cytheropteron rotundatum* Müller, *Cytheropteron alatum* Sars, *Argilloecia conoidea* (Sars) and *Henryhowella asperrima* (Reuss).

Deeper bathyal and abyssal waters are poorly represented by ostracods with *Cytherella lata* Brady, *Cytheropteron testudo* Sars, *Echinocythereis echinata* (Sars), *Buntonia corpulenta* (Brady & Norman) and juveniles of genus *Krithe*. In particular, a glacial pre-Holocene assemblage was described for the Capbreton Canyon area, with *Heterocyprideis sorbyana* (Jones), *Elofsonella concinna* (Jones), *Finmarchinella finmarchica* (Sars), *Eucytheridea bairdii* (Sars) and *Bythocythere constricta* Sars (Peypouquet, 1970).

In the Basque shelf, located in the southern Bay of Biscay, modern distributions of ostracods and foraminifers have been described taking into account the most representative species (Pascual *et al.*, 2008; Martínez-García, 2012). Quaternary oceanographic and climatic changes in this basin have been described considering the type of assemblages and the occurrence of indicative “Northern guest” species (Martínez-García, 2012; Martínez-García *et al.*, 2015). Other studies with ostracods in this region are mostly referring to transitional-estuarine areas in the Basque Country coasts (Rodríguez-Lázaro & Pascual, 1985; Pascual, 1990a, 1990b, 1991; Pascual & Carbonel, 1992; Pascual *et al.*, 1998, 2002) and Cantabria coast (Martín Rubio *et al.*, 2004, 2006; Martínez García *et al.*, 2013).

In a current research on the chronology, isotopic geochemistry and faunal distributions (foraminifers and ostracods; Rodríguez-Lázaro *et al.*, 2009, 2011, 2017), the ostracods are used to describe the palaeoenvironmental evolution of the southern region of Bay of Biscay during the late Quaternary.

Despite all these references, no synthetic work considering all the ostracod assemblages of the Basque Basin has been published to date. In this paper we describe by the first time the Late Quaternary ostracods from the Basque shelf areas and upper talus, providing with SEM pictures of most of the species as well as the stratigraphic and areal-ecologic distributions. This database will be a useful tool to further studies of the palaeoceanography and palaeoclimatology of this region.

2. MATERIAL AND METHODS

More than forty-four thousands ostracod specimens have been obtained for this work. Samples have been collected in surface sediments, five cores located in the southern margin of Capbreton Canyon (KS05-05, KS05-10, KS04-16, KS-16, KS-21), one core in the northern margin Oxybent-D), and another deep core (PP10-17), representative of deep Atlantic ostracods (Fig. 1). Data of cores and samples are indicated in Table 1. Martínez-García (2012) found ostracods in 89 surface samples (42 samples with >100 ind.), recording a total of 6026 valves belonging to 151 species (24 major, 28 secondary, 99 accessory) and studied in detail 47 species (28 genera). Modern assemblages are poorly represented by biocenoses (<1% of total ostracods) and more abundant species are *C. edwardsii*, *P. guttata*, *Pterygocythereis ceratoptera* (Bosquet) and *P. jonesii* (Martínez-García, 2012). The stratigraphic range of studied cores is from MIS5 to the Recent (Fig. 2).

All studied samples and specimens are stocked at the Palaeontology laboratory of the University of the Basque Country UPV/EHU.

3. SYSTEMATIC PALAEONTOLOGY

Described for each species: synonymy with known age and palaeoecology. Distribution in the Basque Basin and/or Bay of Biscay is indicated. As references for higher classification scheme we used Kempf (1986, 1987, 1988 and later supplements), Athersuch *et al.* (1989), Horne *et al.* (2002), World Ostracoda Database (Brandão *et al.*, 2017).

Class **OSTRACODA** Latreille, 1802

Subclass **MYODOCOPA** Sars, 1866

Order **HALOCYPRIDA** Dana, 1853

Suborder **CLADOCOPINA** Sars, 1866

Superfamily **CLADOCOPOIDEA** Sars, 1866

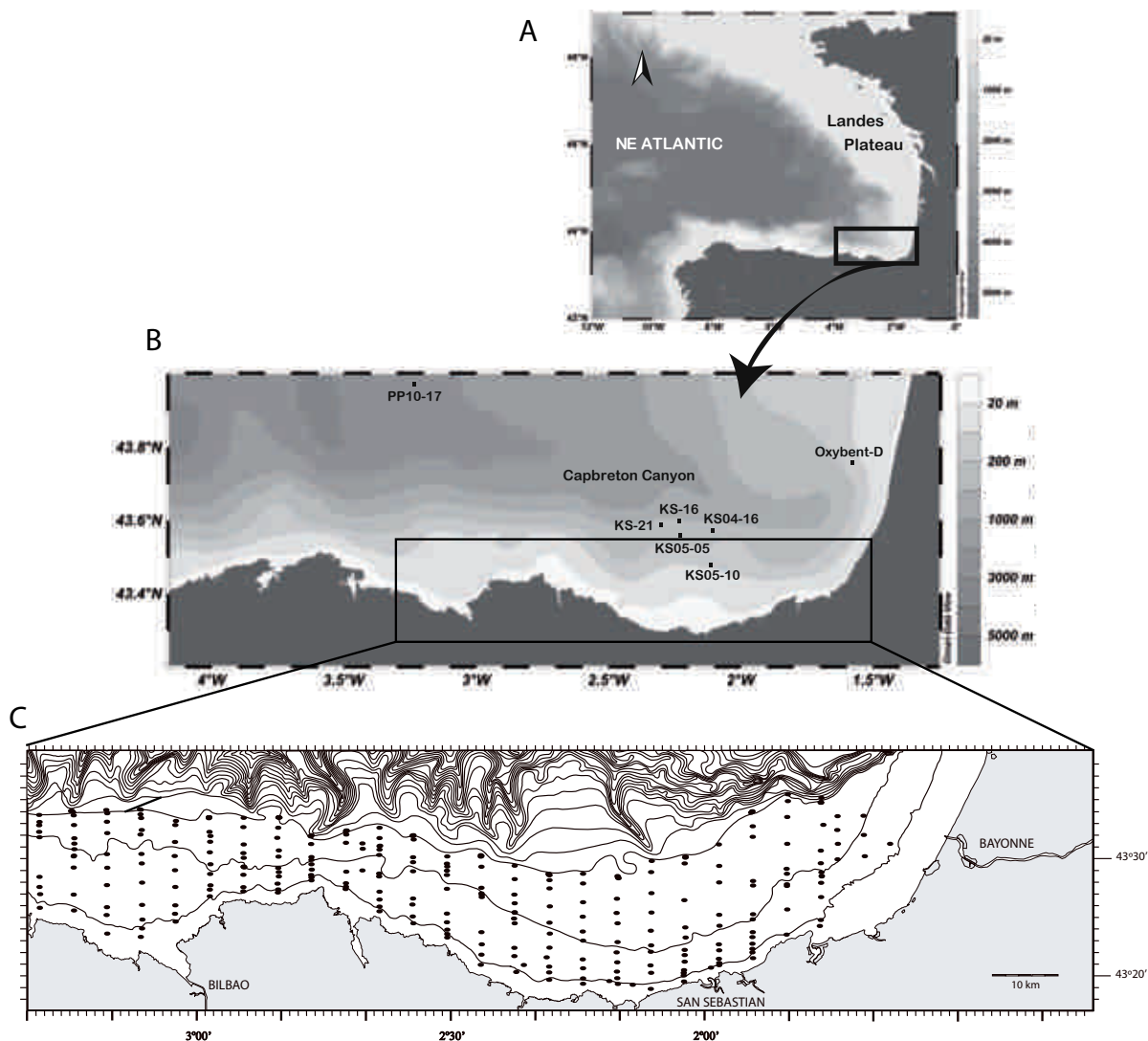


Figure 1. a-b) locations of studied cores in the S Bay of Biscay. KS- are cores, with detailed data indicated in Table 1. **c)** Location of surface samples in the Basque shelf. Map from Ocean Data View (<http://odv.awi.de>; Schlitzer, 2016).

Family **Polycopidae** Sars, 1866

Genus *Polycope* Sars, 1866

Type species *Polycope orbicularis* Sars, 1866

Polycope frequens G.W. Müller, 1894 *sensu*
Bonaduce *et al.*, 1976
(Fig. 3a)

1976 *Polycope frequens*; Bonaduce, Ciampo & Masoli, pl. 2, fig. 5. (Recent Adriatic Sea, in waters deeper than 110 m.).

1976 *Polycope frequens?*, Breman, pl. 5, fig. 52. (Recent Adriatic Sea).

Distribution. This species is very rare in the Recent Basque shelf.

Polycope cf. reticulata G.W. Müller, 1894
(Fig. 3b)

Remarks. This species is morphologically close to *Polycope reticulata* G.W. Müller, 1894, in Uffenorde (1972) of Recent Adriatic Sea.

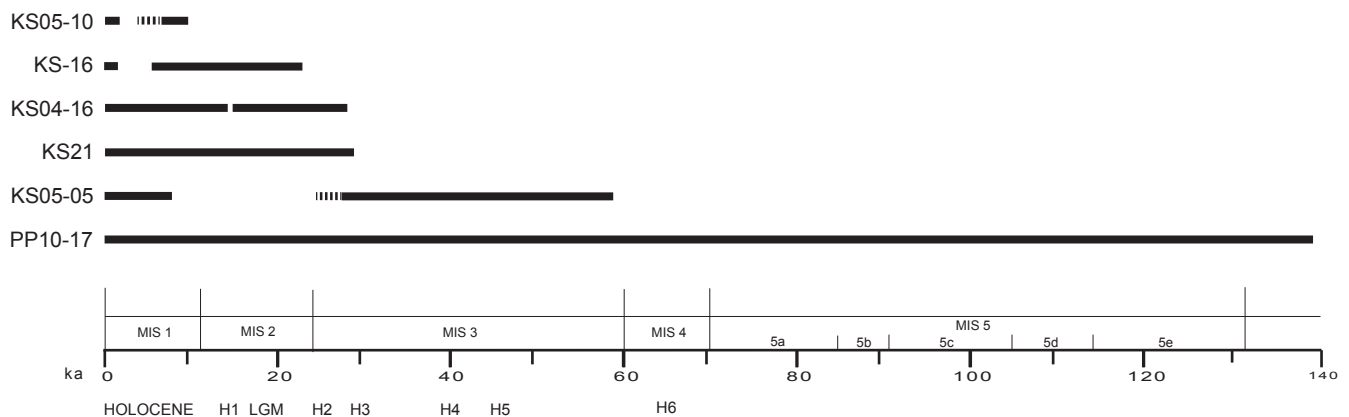
Distribution. Scarcely found in Early Holocene to Recent in the Basque shelf. Also present in MIS2, MIS3 of bathyal S Bay of Biscay.

Subclass **PODOCOPA** Sars, 1866

Order **PLATYCOPIIDA** Sars, 1866

Table 1. Locations and other data of studied cores and samples.

Core	Type	Cruise	Year	Latitude	Longitude	Depth (m)	Length (cm)	Reference
KS05-05	Kullenberg	Euska-3	2005	43°30'597 N	2°13'760 W	259	255	University of Bordeaux 1
KS05-10	Kullenberg	Euska-3	2005	43°22'765 N	2°06'744 W	114	254	University of Bordeaux 1
KS04-16	Kullenberg	Euska-2	2004	43°32'66 N	2°05'72 W	294	128	University of Bordeaux 1
KS-16	Kullenberg	Prosecan 4	2007	43°35'08 N	2°16'31 W	483	290	University of Bordeaux 1
KS-21	Kullenberg	Prosecan 4	2007	43°34'22 N	2°18'23 W	460	330	University of Bordeaux 1
PP10-17	Piston core	Sargass	2010	43°58.91 N	3° 14.02 W	2880	1792	Brocheray <i>et al.</i> (2014)
Oxybent-D	Multi-corer	Oxybent	1998-2000	43°43'19.1"N	1°33'25.2"W	150	20 cm x 8 cores	Carbonel (1997)
Surface samples	Schipeck/ Eckman	Euskased	2003	43°18'942 and 43°35'196 N	1°40'848 and 3°18'078 W	42.8 to 156	--	University of Bordeaux 1

**Figure 2.** Stratigraphic ranges of the studied cores. Some events are indicated: LGM: Last Glacial Maximum; H: Heinrich event.

Suborder **PLATYCOPINA** Sars, 1866

Superfamily **CYTHERELLOIDEA** Sars, 1866

Family **Cytherellidae** Sars, 1866

Genus *Cytherella* Jones, 1849

Type species *Cytherella ovata* (Roemer, 1841)

Cytherella alvearium Bonaduce, Ciampo &
Masoli, 1976
(Fig. 3c)

1979 *Cytherella alvearium*; Yassini, pl. 1, figs 8, 10.
(Recent, Algerian coastal bay).

1976 *Cytherella alvearium*; Bonaduce *et al.*, p. 20,
pl. 4, figs 5-8, 12. (Recent, Adriatic Sea).

2013 *Cytherella alvearium*; Cabral & Loureiro, pl. 1,
fig. 2. (Recent continental shelf and slope of Algarve,
Portugal).

2015 *Cytherella alvearium*; Martínez-García *et al.*,
pl. 1, fig. 10. (Late Quaternary, Basque shelf).

Distribution. This species is commonly found in this
basin in sediments from the interval MIS3-Recent. Live
individuals appear in silty sediments deeper than 120 m.

Cytherella lata Brady, 1880
(Fig. 3d)

1985 *Cytherella lata*; Guillaume *et al.*, pl. 106, figs 7, 8. (Quaternary, Bathyal E North Atlantic).

2015 *Cytherella lata*; Martínez-García *et al.*, pl. 1, fig. 11. (Late Quaternary, Basque shelf).

Distribution. In the Basque shelf it is found in the interval MIS3 to Recent. In modern sediments it is very rare in silts deeper than 90 m.

Cytherella robusta Colalongo & Pasini, 1980
(Fig. 3e)

1980 *Cytherella robusta*; Colalongo & Pasini, p. 78, pl. 6, figs 4-10. (Middle Pliocene-Pleistocene, Calabria, Italy).

2013 *Cytherella robusta*; Cabral & Loureiro, pl. 1, fig. 3. (Recent continental shelf and slope of Algarve, Portugal).

2015 *Cytherella robusta*; Yasuhara & Okahashi, figs 3, A, B. (Quaternary, deep N Atlantic).

Distribution. In the Basque shelf it is only found in MIS3 of the outer shelf.

Order **PODOCOPIDA** Sars, 1866

Suborder **BAIRDIOCOPINA** Gründel, 1967

Superfamily **BAIRDIOIDEA** Sars, 1866

Family **Bairdiidae** Sars, 1866

Genus *Neonesidea* Maddocks, 1969

Type species *Neonesidea schulzi* (Hartmann, 1964)

Neonesidea aff. *corpulenta* (G.W. Müller, 1894)
(Fig. 3f)

1976 *Neonesidea corpulenta*; Bonaduce *et al.*, pl. 5, fig. 1. (Recent, Adriatic Sea).

Distribution. Very rare in the Recent Basque shelf.

Neonesidea longevaginata (G.W. Müller, 1894)
(Fig. 3g)

1976 *Neonesidea longevaginata*; Bonaduce *et al.*, pl. 5, figs 8-11. (Recent, Adriatic Sea).

2013 *Neonesidea longevaginata*; Cabral & Loureiro, pl. 9, fig. 12. (Holocene, Portugal).

Distribution. In the Basque shelf it is present during all the Holocene. It also occurs in Recent mid-coarse sands deeper than 120 m.

Neonesidea mediterranea (G.W. Müller, 1894)
(Fig. 3h)

1976 *Neonesidea mediterranea*; Bonaduce *et al.*, pl. 5, fig. 6. (Recent, Adriatic Sea).

2015 *Neonesidea mediterranea*; Sciuto *et al.*, pl. 1, fig. 4. (Recent, Ionian Sea, Sicily).

Distribution. It is present in the Basque shelf during all the Holocene. In modern samples it appears in sandy and silty sediments 80-130 mwd in the Basque outer shelf.

Suborder **CYPRIDOCOPINA** Jones, 1901

Superfamily **CYPRIDOIDEA** Baird, 1845

Family **Candonidae** Kaufmann, 1900

Genus *Paracypris* Sars, 1866

Type species *Paracypris polita* Sars, 1866

Paracypris polita Sars, 1866
(Fig. 3i)

2013 *Paracypris polita*; Cabral & Loureiro, pl. 9, fig. 21. (Recent continental shelf and slope of Algarve, Portugal).

2015 *Paracypris polita*; Martínez-García *et al.*, pl. 1, fig. 20. (Late Quaternary, Basque shelf).

Distribution. In the Basque Basin this species is known from MIS3 to the Recent. Nowadays it can be found alive in silty clay and sands of depth ranges of 98-130 mwd.

Family **Macrocyprididae** G.W. Müller, 1912

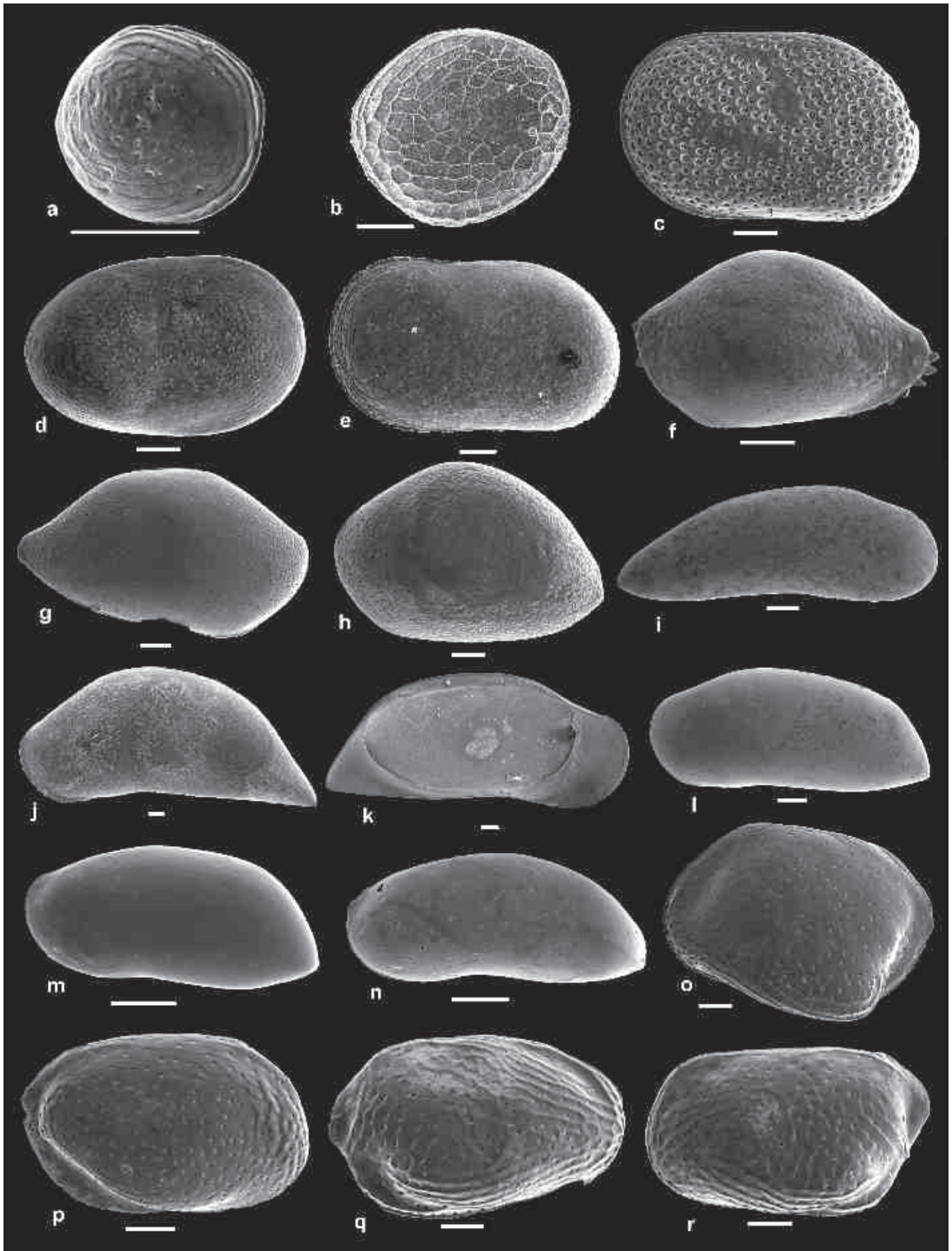
Genus *Macrocypris* Brady, 1867

Type species *Macrocypris minna* (Baird, 1850)

Macrocypris minna (Baird, 1850)
(Fig. 3j)

1989 *Macrocypris minna*; Athersuch *et al.*, p. 67, 68, fig. 23. (Recent British Isles – >50 mwd).

1990 *Macrocypris minna*; Maddocks, p. 43, pl. 3, figs 2-4. (Holocene NE Atlantic, continental shelf and slope – 54-1326 mwd).



Distribution. Very rare in the Recent of the Basque shelf. Final MIS3 and MIS2 in upper bathyal and mid-late Holocene to Recent in the inner Basque shelf.

Macrocypris tenuicauda Brady, 1880
(Fig. 3k)

1976 *Macrocypris tenuicauda*; Puri & Hulings, pl. 1, figs 11, 12. (Lectotypes of the Challenger expedition).

Distribution. Very rare in the Recent of the Basque shelf. This species has also been found in MIS2 and MIS5c of the bathyal Bay of Biscay.

Superfamily **PONTOCYPRIDOIDEA** G.W. Müller, 1894

Family **Pontocyprididae** G.W. Müller, 1894

Genus *Argilloecia* G.O. Sars, 1866

Type species *Argilloecia cylindrica* Sars, 1866

Argilloecia bensoni Barra, Aiello & Bonaduce, 1996
(Fig. 3l)

2015 *Argilloecia acuminata* G.W. Müller; Martínez-García *et al.*, pl. 1, fig. 2. (Late Quaternary, Basque shelf).

2015 *Argilloecia bensoni*; Yasuhara & Okahashi, figs 4 K-N. (Late Quaternary deep N Atlantic).

Distribution. MIS3 to Recent. It is very scarce in fine-grained sediments of the Recent Basque shelf (110-130 mwd).

Argilloecia aff. *conoidea* Sars, 1923
(Fig. 3m)

1928 *Argilloecia conoidea*; Sars, pl. 25. (Recent, Norway).

1979 *Argilloecia conoidea*; Yassini, pl. 10, fig. 6. (Recent, Algeria).

1980 *Argilloecia* sp.; Colalongo & Pasini, pl. 1, fig. 2. (Pleistocene, S Italy).

1996 *Argilloecia conoidea*; Whatley *et al.*, pl. 1, figs 3, 4. (Recent, East Greenland).

2013 *Argilloecia* aff. *conoidea*; Cabral & Loureiro, pl. 9, fig. 15. (Recent continental slope of Algarve, Portugal).

2015 *Argilloecia conoidea*; Martínez-García *et al.*, pl. 1, fig. 3. (Late Quaternary, Basque shelf).

Distribution. In the Recent Basque shelf it occurs very scarcely in fine sediments 80 to 150 mwd. Also found in MIS3 of this shelf.

Argilloecia sp. 1
(Fig. 3n)

Distribution. This species is close to *A.* aff. *conoidea*, but it differs by the more elongated outline and different anterior border. In the Basque Basin it is known from MIS3 to Recent. In modern sediments it is found in the depth interval of 70-120 mwd.

Suborder **CYTHEROCOPINA** Gründel, 1967

Superfamily **CYTHEROIDEA** Baird, 1850

Family **Bythocytheridae** Sars, 1866

Genus *Bythocythere* Sars, 1866

Type species *Bythocythere turgida* Sars, 1866

Bythocythere bradleyi Athersuch, Horne & Whittaker, 1983
(Fig. 3o)

Figure 3. Ostracod species from the Basque Basin. Legend for each specimen indicated as (valid for Figs 3-9): species & author, element (C, carapace; RV, right valve; LV, left valve), microphotograph code, sample, age. Unless indicated all are external views. Scale bars = 100 μ m. **a)** *Polycope frequens* G.W. Müller, 1894 *sensu* Bonaduce *et al.*, 1976, juvenile RV, ZTF737, Recent. **b)** *Polycope* cf. *reticulata* G.W. Müller, 1894, LV, 81-32, KS10-183 cm, Early Holocene. **c)** *Cytherella alvearium* Bonaduce, Ciampo & Masoli, 1976, LV, 1537, KS05-231 cm, MIS3. **d)** *Cytherella lata* Brady, 1880, RV, 1518, KS05-241 cm, MIS3. **e)** *Cytherella robusta* Colalongo & Pasini, 1980, LV, 1553, KS05-215 cm, MIS3. **f)** *Neonesidea corpulenta* (G.W. Müller, 1894), LV, ZTF670, Recent. **g)** *Neonesidea longevaginata* (G.W. Müller, 1894), RV, ZTF652, Recent. **h)** *Neonesidea mediterranea* (G.W. Müller, 1894), LV, ZTF651, Recent. **i)** *Paracypris polita* Sars, 1866, RV, 71-26, KS05 50 cm, modern Holocene. **j)** *Macrocypris minna* (Baird, 1850), LV, 82-33, KS05-192 cm, MIS3. **k)** *Macrocypris tenuicauda* Brady, 1880, LV interior view, 87-45, PP10-17-1551 cm, MIS5c. **l)** *Argilloecia bensoni* Barra, Aiello & Bonaduce, 1996, LV, 1552, KS05-215 cm. **m)** *Argilloecia* aff. *conoidea* Sars, 1923, LV, ZTF724, Recent. **n)** *Argilloecia* sp. 1, LV, ZTF645, Recent. **o)** *Bythocythere bradleyi* Athersuch, Horne & Whittaker, 1983, LV, 1559, KS05-200 cm, MIS3. **p)** *Bythocythere bradyi* Sars, 1926, female RV, ZTF659, Recent. **q)** *Bythocythere intermedia* Elofson, 1938, female RV, ZTF764, Recent. **r)** *Bythocythere zetlandica* Athersuch, Horne & Whittaker, 1983, LV, ZTF768, Recent.

1989 *Bythocythere bradleyi*; Athersuch *et al.*, p. 242, fig. 102; pl. 8, fig. 6. (Recent, British Isles).

Distribution. This species is not present in the Recent of the Basque Basin and it is rare in the Holocene and MIS3 of outer Basque shelf.

Bythocythere bradyi Sars, 1926
(Fig. 3p)

1989 *Bythocythere bradyi*; Athersuch *et al.*, p. 244, fig. 103; pl. 8, fig. 7. (Recent, British and Norwegian coastal waters – <80 mwd).

2013 *Bythocythere bradyi*; Cabral & Loureiro, pl. 1, fig. 7. (Recent outer estuarine, Portugal).

Distribution. Recent Basque and Landes shelves. Holocene and MIS3 of Basque outer shelf.

Bythocythere intermedia Elofson, 1938
(Fig. 3q)

1989 *Bythocythere intermedia*; Athersuch *et al.*, p. 246, fig. 104; pl. 8, fig. 8. (Recent, British Isles).

2013 *Bythocythere intermedia*; Cabral & Loureiro, pl. 1, fig. 8. (Recent outer estuarine and Holocene, Portugal).

Distribution. This species is rare in the Recent of the Basque shelf (70-130 mwd) and also in the early Holocene of the inner Basque shelf.

Bythocythere zetlandica Athersuch, Horne & Whittaker, 1983
(Fig. 3r)

1989 *Bythocythere zetlandica*; Athersuch *et al.*, p. 250, fig. 106; pl. 8, fig. 10. (Recent, British Isles).

Distribution. This species is scarcely found in the Recent of the Basque shelf.

Genus *Jonesia* Brady, 1866

Type species *Jonesia acuminata* (Sars, 1866)

Jonesia aff. *acuminata* (Sars, 1866)
(Fig. 4a)

1981 *Jonesia simplex* (Norman); Cronin, pl. 3, fig. 10. (Late Pleistocene, Champlain Sea).

1989 *Jonesia* aff. *acuminata*; Athersuch *et al.*, p. 252, fig. 107. (Recent, NW Europe and British Isles – <150 mwd).

1998 *Jonesia acuminata*; Freiwald & Mostafawi, pl. 60, fig. 6. (Recent, Norway fjord).

Distribution. This species is rarely occurring in the mid Holocene of the inner Basque shelf.

Genus *Pseudocythere* Sars, 1866

Type species *Pseudocythere caudata* Sars, 1866

Pseudocythere caudata Sars, 1866
(Fig. 4b)

1979 *Pseudocythere caudata*; Yassini, pl. 11, figs 18, 19. (Recent, Algeria).

2009 *Pseudocythere caudata*; Yasuhara *et al.*, pl. 4, figs 7-11. (Quaternary, deep NW Atlantic).

2013 *Pseudocythere caudata*; Cabral & Loureiro, pl. 1, fig. 9. (Recent continental shelf of Algarve, Portugal).

2015 *Pseudocythere caudata*; Yasuhara & Okahashi, figs 5F, 5G. (Late Quaternary, deep NE Atlantic).

Distribution. This species is very rare in all types of recent sediments in the Basque shelf. Also occurring in Holocene mid to outer shelf (not in recent samples), and MIS3, MIS2 in upper bathyal areas of this basin.

Genus *Sclerochilus* Sars, 1866

Type species *Sclerochilus contortus* (Norman, 1862)

Sclerochilus rudjakovi Athersuch & Horne, 1987
(Fig. 4c)

1989 *Sclerochilus rudjakovi*; Athersuch *et al.*, p. 270, fig. 115. (Recent, British Isles).

2015 *Sclerochilus rudjakovi*; Martínez-García *et al.*, pl. 1, fig. 24. (Late Quaternary, Basque shelf).

Distribution. This species is not present in surface samples but it is common in MIS3 to Holocene cores of the Basque Basin.

Family **Cuneocytheridae** Mandelstam, 1959

Genus *Cuneocythere* Lienenklaus, 1894

Type species *Cuneocythere semipunctata* (Brady, 1868)

Cuneocythere semipunctata (Brady, 1868)
(Fig. 4d)

1976 *Cuneocythere semipunctata*; Bonaduce *et al.*, p. 60, pl. 28, figs 11, 12. (Recent, Adriatic Sea. In sandy silt sediments less than 194 mwd).

1985 *Cuneocythere semipunctata*; Guillaume *et al.*, pl. 103, figs 5, 6. (Recent, outer shelf of Bay of Biscay).

1989 *Cuneocythere semipunctata*; Athersuch *et al.*, p. 120, fig. 47; pl. 3, fig. 5. (Recent, coasts of Ireland to SW France).

2013 *Cuneocythere semipunctata*; Cabral & Loureiro, pl. 1, fig. 12. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is present in the Basque Basin from MIS3 to the Recent. It can be found living in fine substrate (80-150 mwd).

Family **Cushmanideidae** Puri, 1974

Genus *Cushmanidea* Blake, 1933

Type species *Cushmanidea seminuda* (Cushman, 1906) Blake, 1933

Cushmanidea turbida (G.W. Müller, 1894)
(Fig. 4e)

1965 *Cushmanidea turbida*; Puri *et al.*, p. 87-199.

Distribution. Found in Holocene to Recent in the Basque shelf, in recent silty sediments (70-151 mwd).

Family **Cytheridae** Baird, 1850

Genus *Cythere* O.F. Müller, 1785

Type species *Cythere concentrica* (Williamson, 1847) Jones, 1849

Cythere lutea O.F. Müller, 1785
(Fig. 4f)

1941 *Cythere lutea*; Sylvester-Bradley, p. 27, figs 15-18.

1981 *Cythere lutea*; Cronin, pl. 4, figs 7, 8. (Late Pleistocene, Champlain Sea).

1985 *Cythere lutea*; Guillaume *et al.*, pl. 100, figs 3, 4. (Recent, shelf of Bay of Biscay).

1988 *Cythere lutea*; Cronin, pl. 2, fig. 5. (Pleistocene, postglacial NW Atlantic).

1989 *Cythere lutea*; Athersuch *et al.*, p. 80, fig. 27; pl. 1, fig. 1. (Recent, coasts of N Atlantic, from Norway to France).

2010 *Cythere lutea*; Frenzel *et al.*, pl. OS1-2, figs I-L. (Recent Baltic Sea).

Distribution. MIS3 to mid-late Holocene in the inner and outer Basque shelf.

Genus *Palmenella* Hirschmann, 1916

Type species *Palmenella limicola* (Norman, 1865) Hirschmann, 1916

Palmenella limicola (Norman, 1865) Hirschmann, 1916
(Fig. 4g)

1981 *Palmenella limicola*; Cronin, pl. 11, figs 1, 2. (Late Pleistocene, Champlain Sea).

1989 *Palmenella limicola*; Athersuch *et al.*, p. 82, fig. 28; pl. 1, fig. 2. (Recent, British Isles. Pan-Arctic – Hanai, 1970).

2004 *Palmenella limicola*; Ozawa, pl. 1, fig. 8. (Recent, outer shelf, 100-200 mwd, cold waters of N Japan).

Distribution. This species is scarcely found in the interval MIS3-late Holocene in the inner and outer Basque shelf.

Family **Cyherideidae** Sars, 1925

Genus *Heterocyprideis* Elofson, 1941

Type species *Heterocyprideis sorbyana* (Jones, 1857)

Heterocyprideis sorbyana (Jones, 1857)
(Fig. 4h)

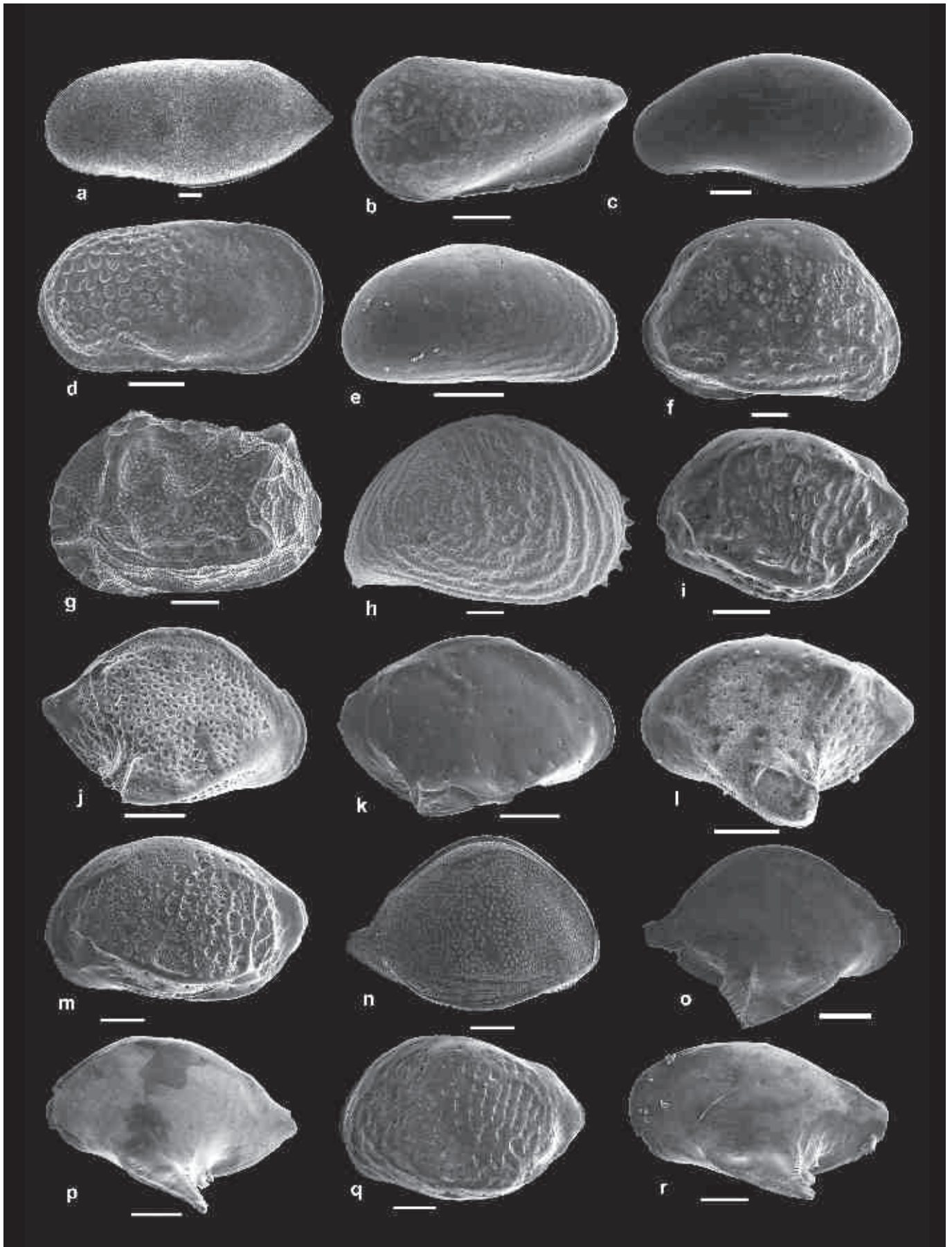
1981 *Heterocyprideis sorbyana*; Cronin, pl. 2, fig. 1. (Late Pleistocene, Champlain Sea).

1985 *Heterocyprideis sorbyana*; Guillaume *et al.*, pl. 105, figs 1, 2. (Glacial palaeoethanathocenoses to Recent, Bay of Biscay).

2006 *Heterocyprideis sorbyana*; Schornikov & Zenina, pl. 2, figs 9, 10. (Recent, Arctic Ocean).

2015 *Heterocyprideis sorbyana*; Schornikov, pl. 2, figs 4, 5, 7, 8 (in Russian).

Distribution. This species is known in Baltic Sea, Beaufort Sea and North Atlantic. In the Basque Basin it



is very rare in MIS3 of the outer shelf and late Holocene to Recent of the inner shelf.

Family **Cytheruridae** G.W. Müller, 1894

Genus *Cytheropteron* Sars, 1866

Type species *Cythere latissima* Norman, 1865

Cytheropteron dorsocostatum Whatley & Masson, 1979
(Fig. 4i)

1985 *Cytheropteron nodosum*; Guillaume *et al.*, pl. 101, fig. 3. (Recent, shelf of Bay of Biscay).

1989 *Cytheropteron dorsocostatum*; Athersuch *et al.*, p. 225, fig. 94; pl. 8, fig. 3. (Recent, N Atlantic, Norway to NW Spain).

1995 *Cytheropteron dorsocostatum*; Dickson & Whatley, pl. 1, figs 23, 24. (Recent, East N Atlantic from S Iberia to Norwegian waters; Hoxnian, British Isles).

2013 *Cytheropteron dorsocostatum*; Cabral & Loureiro, pl. 1, fig. 17. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. It is a common species of MIS3 to Recent in the outer shelf of the Basque Basin.

Cytheropteron hadriaticum Bonaduce, Ciampo & Masoli, 1976
(Fig. 4j)

1976 *Cytheropteron hadriaticum*; Bonaduce *et al.*, p. 93, pl. 54, figs 1-5. (Recent, Adriatic Sea, deep-water sediments – >70 mwd).

1979 *Cytheropteron hamatum*; Yassini, pl. 10, fig. 12. (Recent, Algeria coastal bay).

1985 *Cytheropteron rotundatum*; Guillaume *et al.*, pl. 104, fig. 3. (Recent, epibathyal Bay of Biscay).

Distribution. In the Basque Basin it is registered from the mid-late Holocene to the Recent. Doubtful record in the MIS2 of outer Basque shelf.

Cytheropteron cf. ruggierii Pucci, 1956 *sensu* Bonaduce, Ciampo & Masoli, 1976
(Fig. 4k)

1976 *Cytheropteron ruggierii*; Bonaduce *et al.*, pl. 55, fig. 1. (Recent, Adriatic Sea).

1979 *Cytheropteron rotundatum*; Yassini, pl. 10, fig. 21. (Recent, Algeria coastal bay).

1985 *Cytheropteron punctatum*; Guillaume *et al.*, pl. 104, figs 9, 10. (Recent, outer shelf of Bay of Biscay).

1989 *Cytheropteron inornatum*; Athersuch *et al.*, p. 226, fig. 95; pl. 8, fig. 4. (Recent, British Isles).

2003 *Cytheropteron inornatum*; Guernet *et al.*, p. 88, pl. 3, figs 11-13. (Quaternary, Gulf of Corinth, Greece).

2013 *Cytheropteron cf. ruggierii*; Cabral & Loureiro, pl. 2, fig. 1. (Recent continental shelf and slope of Algarve, Portugal).

2015 *Cytheropteron punctatum*; Martínez-García *et al.*, pl. 1, fig. 13. (Late Quaternary, Basque shelf).

Distribution. This species is important in the ostracod assemblages during the interval MIS3 to the Recent in the Basque Basin. In modern samples it is less abundant and is occurring in the outer shelf (120-150 mwd).

Cytheropteron crassipinatum Brady & Norman, 1889
(Fig. 4l)

1976 *Cytheropteron monoceros*; Bonaduce *et al.*, p. 94, pl. 56, figs 1, 3. (Recent, Adriatic Sea, deeper than 63 mwd in all types of sediments, being more abundant in sandy silt).

Figure 4. Ostracods from the Basque Basin. **a)** *Jonesia* aff. *acuminata* (Sars, 1866), LV, 81-9, KS10-117 cm, modern Holocene. **b)** *Pseudocythere caudata* Sars, 1866, LV, ZTF738, Recent. **c)** *Sclerochilus rudjakovi* Athersuch & Horne, 1987, LV, 1547, KS05-231 cm, MIS3. **d)** *Cuneocythere semipunctata* (Brady, 1868), RV, 82-32, KS05-195 cm, MIS3. **e)** *Cushmanidea turbida* (G.W. Müller, 1894), RV, ZTF644, Recent. **f)** *Cythere lutea* O.F. Müller, 1785, female RV, 1543, KS05-231 cm, MIS3. **g)** *Palmenella limicola* (Norman, 1865), LV, 1531, KS05-241 cm, MIS3. **h)** *Heterocyprideis sorbyana* (Jones, 1857), RV, 90-10, KS10-1 cm, Recent. **i)** *Cytheropteron dorsocostatum* Whatley & Masson, 1979, LV, ZTF680, Recent. **j)** *Cytheropteron hadriaticum* Bonaduce, Ciampo & Masoli, 1976, RV, ZTF683, Recent. **k)** *Cytheropteron cf. ruggierii* Pucci, 1956, *sensu* Bonaduce, Ciampo & Masoli, 1976, RV, 1555, KS05-215 cm, MIS3. **l)** *Cytheropteron crassipinatum* Brady & Norman, 1889, LV, ZTF682, Recent. **m)** *Cytheropteron pararcticum* Whatley & Masson, 1979, LV, 1538, KS05-231 cm, MIS3. **n)** *Cytheropteron testudo* Sars, 1869, RV, 1560, KS05-200 cm, MIS3. **o)** *Cytheropteron vespertilio* (Reuss, 1850) Brady, 1868, RV, 71-39, KS10-240 cm, Early Holocene. **p)** *Cytheropteron* aff. *vespertilio* (Reuss, 1850) Brady, 1868, LV, ZTF681, Recent. **q)** *Cytheropteron* sp. 1, LV, 90-43, KS10-235 cm. **r)** *Cytheropteron* sp. 2, LV, FCT659, Recent.

1979 *Cytheropteron monoceros*; Yassini, pl. 10, fig. 17. (Recent, Algerian coastal bay).

1980 *Cytheropteron monoceros*; Colalongo & Pasini, pl. 16, figs 9, 10. (Pleistocene, S Italy).

2013 *Cytheropteron monoceros*; Cabral & Loureiro, 2013, pl. 1, fig. 19. (Recent continental shelf and slope of Algarve, Portugal).

Distribution. This species is present in recent sediments deeper than 130 mwd preferably in silts.

Cytheropteron pararcticum Whatley & Masson, 1979 (Fig. 4m)

1988 *Cytheropteron pararcticum*; Cronin, pl. 4, fig. 5. (Pleistocene, postglacial NW Atlantic).

1995 *Cytheropteron pararcticum*; Dickson & Whatley, pl. 1, figs 11-13. (Quaternary cold N Atlantic and Subarctic seas. Recent from Arctic to Boreal provinces).

2004 *Cytheropteron champlainum*; Stepanova *et al.*, pl. 1, fig. 6. (Recent, Laptev Sea).

Remarks. *C. champlainum* Cronin, 1981, in Stepanova *et al.* (2004), Recent, Laptev Sea, is a very close form, with posterior caudal process a little more elongated (sexual dimorphism?), probably co-specific.

Distribution. In the Basque Basin only several valves of this species have been found in MIS3, in core samples of the outer shelf.

Cytheropteron testudo Sars, 1869 (Fig. 4n)

1976 *Cytheropteron testudo*; Breman, pl. 12, fig. 174. (Recent, Adriatic Sea).

1980 *Cytheropteron testudo*; Colalongo & Pasini, pl. 19, fig. 7. (Pleistocene, S Italy).

1985 *Cytheropteron testudo*; Guillaume *et al.*, pl. 106, figs 9, 10. (Recent, bathyal Bay of Biscay).

2011 *Cytheropteron testudo*; Faranda & Gliozzi, figs 12a, 12b. (Calabrian, Mediterranean).

2013 *Cytheropteron testudo*; Cabral & Loureiro, pl. 2, fig. 3. (Recent continental slope of Algarve, Portugal).

2015 *Cytheropteron testudo*; Martínez-García *et al.*, pl. 1, fig. 14. (Late Quaternary, Basque shelf).

Distribution. In the Basque Basin *C. testudo* is present in deeper outer shelf and epibathyal of the interval MIS3, MIS2 and in the inner shelf during the Holocene.

Cytheropteron vespertilio (Reuss, 1850) Brady, 1868 (Fig. 4o)

1976 *Cytheropteron alatum*; Breman, pl. 12, fig. 173. (Recent, Adriatic Sea).

1979 *Cytheropteron alatum*; Yassini, pl. 10, figs 14, 15. (Recent, Algerian coastal bay).

1980 *Cytheropteron alatum*; Colalongo & Pasini, pl. 8, fig. 1. (Pleistocene, S Italy).

1985 *Cytheropteron latissimum* (Norman, 1865); Guillaume *et al.*, pl. 103, figs 11, 12. (Recent, outer shelf of Bay of Biscay).

1987 *Cytheropteron lineoporosa*; Whatley & Coles, pl. 2, fig. 14. (MIS6, N Atlantic).

1998 *Cytheropteron alatum*; Freiwald & Mostafawi, pl. 59, fig. 7. (Recent, Norway fjord).

2013 *Cytheropteron volantium*; Cabral & Loureiro, pl. 2, fig. 5. (Recent continental shelf of Algarve, Portugal).

Remarks. *C. alatum* and *C. volantium* have been included in this morphologic group. Yasuhara *et al.* (2014) figured a topotype (RV) of *Cytheropteron vespertilio* with the same morphology of this group, so all are tentatively included in this specific name.

Distribution. This species is regularly present during MIS3 to Recent in the inner and outer Basque shelf.

Cytheropteron aff. *vespertilio* (Reuss, 1850) Brady, 1868 (Fig. 4p)

1976 *Cytheropteron vespertilio*; Bonaduce *et al.*, pl. 52, fig. 7. (Recent, Adriatic Sea).

2013 *Cytheropteron vespertilio*; Cabral & Loureiro, pl. 2, fig. 4. (Recent continental shelf of Algarve, Portugal).

Distribution. This species is present with low numbers in the inner and outer Basque shelf during all the Holocene, and a doubtful record in MIS2.

Cytheropteron sp. 1 (Fig. 4q)

Distribution. This species is rare in the early Holocene of the Basque inner shelf.

Cytheropteron sp. 2
(Fig. 4r)

Distribution. This species is rare in the Recent of the Basque shelf.

Cytheropteron sp. 3
(Fig. 5a)

Remarks. This species is affinis *Cytheropteron pyramidale* Brady, 1868, but it is left in open name waiting for more material to describe its taxonomy.

Distribution. This species is present in the MIS3 of the outer Basque shelf.

Genus *Oculocytheropteron* Bate, 1972

Type species *Oculocytheropteron praenuntatum* Bate, 1972

Oculocytheropteron nodosum (Brady, 1868)
(Fig. 5b)

1978 *Cytheropteron nodosum*; Robinson, pl. 5, fig. 2. (Ipswichian (MIS5e), marine environments).

1981 *Cytheropteron nodosum*; Cronin, pl. 7, fig. 8. (Late Pleistocene, Champlain Sea).

1987 *Cytheropteron nodosum*; Cronin & Compton-Gooding, pl. 5, fig. 7. (Pleistocene, NW Atlantic, site 613 – 2323 mwd).

1989 *Cytheropteron nodosum*; Athersuch *et al.*, p. 227, fig. 96; pl. 8, fig. 5. (Recent, NW European waters, Norway to Bay of Biscay).

1995 *Cytheropteron nodosum*; Dickson & Whatley, pl. 1, figs 3, 6, 10. (Recent, NE Atlantic).

2015 *Cytheropteron nodosum*; Martínez-García *et al.*, pl. 1, fig. 12. (Late Quaternary, Basque shelf).

Distribution. This is a common species in the inner and outer shelf of the Basque Basin during the interval MIS3 to Recent.

Genus *Cytherura* Sars, 1866

Type species *Cytherura gibba* (O.F. Müller, 1785)

Cytherura gibba? (O.F. Müller, 1785)
(Fig. 5c)

1976 *Semicytherura amorpha*; Bonaduce *et al.*, p. 70, pl. 41, figs 1-3. (Recent, Adriatic Sea – <135mwd).

1981 *Cytherura gibba*; Cronin, pl. 5, figs 1-4. (Late Pleistocene, Champlain Sea).

1988 *Cytherura gibba*; Cronin, pl. 2, fig. 1. (Pleistocene, postglacial NW Atlantic).

1989 *Cytherura gibba*; Athersuch *et al.*, p. 202, fig. 80; pl. 7, fig. 1. (Recent, brackish waters of NW Europe, Baltic and British Isles).

Distribution. This species is very scarce and have been recorded in Recent Basque shelf, in silty-sandy sediments 50-90 mwd. Another record is in MIS5a of deep Bay of Biscay.

Genus *Eucytherura* G.W. Müller, 1893

Type species *Eucytherura complexa* (Brady, 1867)

Eucytherura complexa (Brady, 1867)
(Fig. 5d)

1976 *Eucytherura complexa*; Bonaduce *et al.*, p. 85, pl. 48, figs 8-10. (Recent, Adriatic Sea).

2013 *Eucytherura complexa*; Cabral & Loureiro, 2013, pl. 2, fig. 7. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. In the Basque Basin this species is regularly present in the Holocene to Recent shelf (110-170 mwd), and only one record from the outer shelf in MIS3.

Eucytherura mistrettai Sissingh, 1972
(Fig. 5e)

1976 *Eucytherura mistrettai*; Bonaduce *et al.*, p. 85, pl. 49, figs 1-3. (Recent, Adriatic Sea – >70 mwd).

2013 *Eucytherura mistrettai*; Cabral & Loureiro, pl. 2, figs 8, 9. (Recent continental shelf of Algarve and Holocene, Portugal).

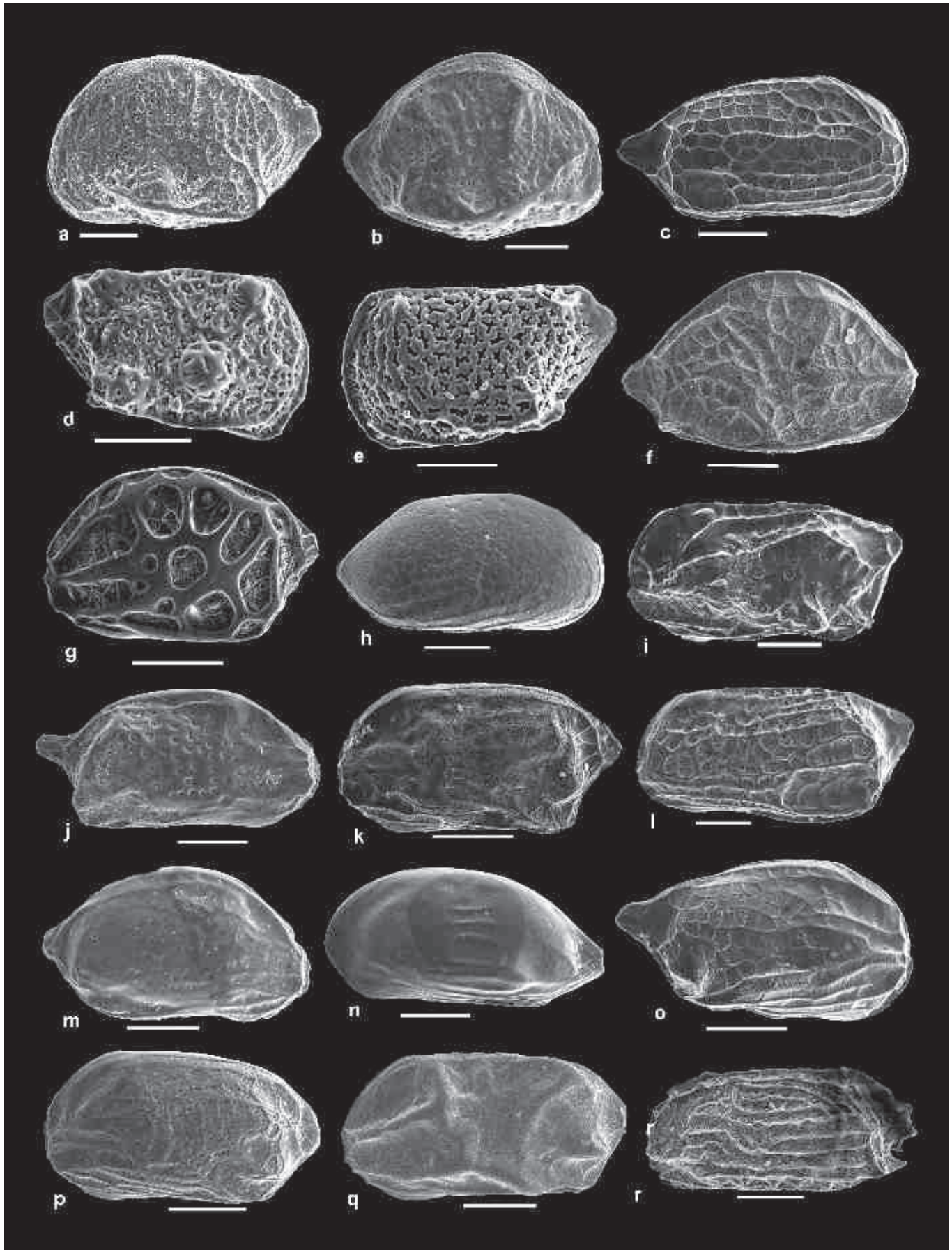
Distribution. In the Basque Basin it is found in the interval MIS3 to Recent in shelf environments. In modern samples it is present in all types of sediments from 120 to 150 mwd.

Genus *Hemicytherura* Elofson, 1941

Type species *Hemicytherura cellulosa* (Norman, 1865)

Hemicytherura aff. *clathrata* (Sars, 1866)
(Fig. 5f)

1988 *Hemicytherura clathrata*; Cronin, pl. 4, figs 9, 10. (Pleistocene, postglacial NW Atlantic).



1991 *Hemicytherura clathrata*; Cronin, pl. 12, fig. 20. (Early Pleistocene, Tjörnes, Iceland).

1998 *Hemicytherura clathrata*; Freiwald & Mostafawi, pl. 60, fig. 1. (Recent, Norway fjord).

2009 *Hemicytherura clathrata*; Whittaker & Horne, pl. 3, figs 1, 2. (MIS13 to early Holocene).

2010 *Hemicytherura clathrata*; Frenzel *et al.*, pl. OS1-3, fig. AL. (Post-glacial to Recent, Baltic Sea).

Distribution. This species is found in MIS3 to late Holocene in the outer Basque shelf. The specimens found in MIS3 deep bathyal Bay of Biscay are morphologically the same as the type species. Individuals from the Basque shelf have different lateral ornamentation, with discontinuous medium-lateral ridge.

Hemicytherura hoskini Horne, 1981
(Fig. 5g)

1981 *Hemicytherura hoskini*; Horne, p. 8, figs 13-18.

1989 *Hemicytherura hoskini*; Athersuch *et al.*, p. 206, fig. 82; pl. 6, fig. 10. (Recent, British Isles. Marine littoral, phytal).

2013 *Hemicytherura hoskini*; Cabral & Loureiro, pl. 2, fig. 14. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. This species have been recorded in MIS2 to Recent interval in the Basque shelf. In modern sediments it is found in fine sands and silts 50-112 mwd.

Genus *Microcytherura* G.W. Müller, 1894

Type species *Microcytherura broeckiana* (Brady, 1878)

Microcytherura fulva (Brady & Robertson, 1874)
(Fig. 5h)

1976 *Microcytherura fulva*; Bonaduce *et al.*, p. 89, pl. 57, figs 9-13. (Recent, Adriatic Sea).

2006 *Microcytherura fulva*; Cabral *et al.*, pl. 1, fig. 2. (Holocene Portugal. Marine shelf).

2013 *Microcytherura fulva*; Cabral & Loureiro, pl. 2, fig. 16. (Recent continental shelf and slope of Algarve and Holocene, Portugal).

Distribution. This is a secondary species in Recent sediments of the Basque shelf.

Genus *Semicytherura* Wagner, 1957

Type species *Semicytherura nigrescens* (Baird, 1838)

Semicytherura acuminata (G.W. Müller, 1894)
(Fig. 5i)

1976 *Semicytherura acuminata* Breman, pl. 10, fig. 149. (Recent, Adriatic Sea).

1976 *Semicytherura acuminata*; Bonaduce *et al.*, p. 68, pl. 39, figs 1, 3. (Recent, Adriatic Sea. Near-shore – 70-81mwd).

2013 *Semicytherura acuminata*; Cabral & Loureiro, pl. 2, fig. 19. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. Only found in Recent sediments of the Basque shelf.

Semicytherura angulata (Brady, 1868)
(Fig. 5j)

1989 *Semicytherura angulata*; Athersuch *et al.*, p. 211, fig. 85; pl. 7, fig. 4. (Recent, British Isles and NW Europe. Littoral marine to estuarine, phytal species).

2011 *Semicytherura angulata*; Faranda & Gliozzi, figs 17a, 17b (Calabrian, Mediterranean).

Figure 5. Ostracods from the Basque Basin. **a)** *Cytheropteron* sp. 3, LV, 81-6, KS05-200 cm, MIS3. **b)** *Oculocytheropteron nodosum* (Brady, 1868), RV, 1567, KS05-187 cm, MIS3. **c)** *Cytherura gibba?* (O.F. Müller, 1785), juvenile? RV, ZTF749, Recent. **d)** *Eucytherura complexa* (Brady, 1866), RV, ZTF690, Recent. **e)** *Eucytherura mistrettai* Sissingh, 1972, LV, ZTF691, Recent. **f)** *Hemicytherura* aff. *clathrata* (Sars, 1866), RV, 71-3, KS05-242 cm, MIS3. **g)** *Hemicytherura hoskini* Horne, 1981, LV, ZTF693, Recent. **h)** *Microcytherura fulva* (Brady & Robertson, 1874), RV, ZTF725, Recent. **i)** *Semicytherura acuminata* (G.W. Müller, 1894), LV, ZTF763, Recent. **j)** *Semicytherura angulata* (Brady, 1868), RV, FCT691, Recent. **k)** *Semicytherura* aff. *angulata* (Brady, 1868), LV, ZTF751, Recent. **l)** *Semicytherura arcachonensis* Yassini, 1969, LV, ZTF752, Recent. **m)** *Semicytherura* aff. *nigrescens* (Baird, 1838), RV, 1550, KS05-215 cm, MIS3. **n)** *Semicytherura* aff. *simplex* (Brady & Norman, 1889), LV, ZTF755, Recent. **o)** *Semicytherura* cf. *stilifera* Bonaduce *et al.*, 1976, *sensu* Cabral & Loureiro, 2013, RV, ZTF761, Recent. **p)** *Semicytherura tela* Horne & Whittaker, 1980, LV, 1554, KS05-215 cm, MIS3. **q)** *Semicytherura undata* (Sars, 1866), LV, 71-38, KS10-240 cm, early Holocene. **r)** *Semicytherura* sp. 1, LV, ZTF773, Recent.

2013 *Semicytherura angulata*; Cabral & Loureiro, pl. 3, fig. 3. (Holocene, Portugal).

Distribution. This species is very rare in recent Holocene of the Basque shelf. Also present in MIS2 of bathyal Bay of Biscay.

Semicytherura aff. *angulata* (Brady, 1868)
(Fig. 5k)

Distribution. This species is scarce in recent sediments of the Basque shelf.

Semicytherura arcachonensis Yassini, 1969
(Fig. 5l)

1985 *Semicytherura arcachonensis*; Guillaume *et al.*, pl. 101, figs 4, 5. (Recent, infralittoral Bay of Biscay).

2013 *Semicytherura arcachonensis*; Cabral & Loureiro, pl. 3, fig. 5. (Holocene, Portugal).

Distribution. This species is regularly present in the interval MIS3 to Recent in the Basque shelf. In modern sandy and silty sediments it is found in depths shallower than 80 mwd.

Semicytherura aff. *nigrescens* (Baird, 1838)
(Fig. 5m)

aff. 1989 *Semicytherura nigrescens*; Athersuch *et al.*, p. 208, fig. 83; pl. 7, fig. 2. (Recent, British Isles and NW Europe, Bay of Biscay to SW Greenland. Littoral marine to estuarine, phytal species).

Distribution. *S.* aff. *nigrescens* have been only found in MIS3 of the outer Basque shelf.

Semicytherura aff. *simplex* (Brady & Norman, 1889)
Yassini, 1969
(Fig. 5n)

aff. 1989 *Semicytherura simplex*; Athersuch *et al.*, p. 216, fig. 88; pl. 7, fig. 7. (Recent, British Isles and Mediterranean. Phytal, littoral).

aff. 2013 *Semicytherura simplex*; Cabral & Loureiro, pl. 3, fig. 13. (Holocene, Portugal).

Distribution. This species is rare in the modern Holocene of the Basque shelf.

Semicytherura cf. *stilifera* Bonaduce, Ciampo & Masoli, 1976
(Fig. 5o)

cf. 1976 *Semicytherura stilifera*; Bonaduce *et al.*, p. 80, pl. 43, figs 1-4. (Recent, Adriatic Sea. Deep shelf (71-224 mwd), more abundant in medium sands).

2013 *Semicytherura* cf. *stilifera*; Cabral & Loureiro, pl. 3, fig. 14. (Recent continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is occurring in the interval MIS3 to Recent in the Basque shelf, mostly in sandy and silty-clay sediments.

Semicytherura tela Horne & Whittaker, 1980
(Fig. 5p)

1989 *Semicytherura tela*; Athersuch *et al.*, p. 218, fig. 90; pl. 7, fig. 9. (Recent, British Isles and S Bay of Biscay. Littoral marine to brackish water species).

2013 *Semicytherura tela*; Cabral & Loureiro, pl. 3, fig. 17. (Recent littoral-outer estuarine and rockpool, living- and Holocene, Portugal).

Distribution. This species is rare in MIS3 and mid-late Holocene of the outer Basque shelf.

Semicytherura undata (Sars, 1866)
(Fig. 5q)

1985 *Semicytherura undata*; Guillaume *et al.*, pl. 101, figs 1, 2. (Recent, infralittoral Bay of Biscay).

1989 *Semicytherura undata*; Athersuch *et al.*, p. 220, fig. 91; pl. 7, fig. 10. (Recent, British Isles, Scandinavia and Arctic. Shallow sublittoral).

1991 *Hemicytherura undata*; Cronin, pl. 12, figs 16, 17, 19. (Early Pleistocene, Tjörnes, Iceland).

2013 *Semicytherura undata*; Cabral & Loureiro, pl. 3, fig. 18. (Holocene, Portugal).

Distribution. This species is found in MIS5, MIS3 in bathyal Bay of Biscay and in Holocene to Recent of the outer Basque shelf.

Semicytherura sp. 1
(Fig. 5r)

Distribution. This species is rarely found in Holocene-Recent and MIS3 sediments of the outer Basque shelf.

Semicytherura sp. 2
(Fig. 6a)

Distribution. This species is rarely found in Holocene-Recent sediments of the outer Basque shelf.

Family **Eucytheridae** Puri, 1954

Genus *Eucythere* Brady, 1868

Type species *Cythere declivis* Norman, 1865

Eucythere anglica Brady, 1868
(Fig. 6b)

1976 *Eucythere curta* Ruggieri; Breman, pl. 6, fig. 75. (Recent, Adriatic Sea).

1976 *Eucythere curta*; Bonaduce *et al.*, pl. 37, fig. 10. (Recent, Adriatic Sea).

1979 *Eucythere declivis* (Norman); Yassini, pl. 8, fig. 17. (Recent, Algeria coastal bay).

1985a *Eucythere anglica*; Horne & Whittaker, figs 7-10.

1989 *Eucythere anglica*; Athersuch *et al.*, p. 89, fig. 30; pl. 2, fig. 8. (Recent, British Isles).

2013 *Eucythere anglica*; Cabral & Loureiro, pl. 3, fig. 21. (Recent continental shelf and slope of Algarve, Portugal).

2015 *Eucythere anglica*; Martínez-García *et al.*, pl. 1, fig. 15. (Late Quaternary, Basque shelf).

Distribution. This species is very scarce in modern sediments, but appears regularly in the interval MIS3 to Recent of the inner and outer Basque shelf.

Eucythere curta Ruggieri, 1975
(Fig. 6c)

1976 *Eucythere curta*; Bonaduce *et al.*, pl. 37, fig. 9. (Recent, Adriatic Sea).

Distribution. This species is present in recent sandy sediments of the outer Basque shelf. A few valves have been found in MIS3 and late Holocene of this shelf.

Family **Hemicytheridae** Puri, 1953a

Genus *Aurila* Pokorny, 1955

Type species *Aurila convexa* (Baird, 1850)

Aurila convexa (Baird, 1850)
(Fig. 6d)

1976 *Aurila convexa*; Breman, pl. 9, fig. 120. (Recent, Adriatic Sea).

1979 *Aurila convexa*; Yassini, pl. 5, figs 7, 8. (Recent, Algerian coastal bay).

1985 *Aurila convexa*; Guillaume *et al.*, pl. 99, figs 3, 4. (Recent, phytal coastal Bay of Biscay).

1989 *Aurila convexa*; Athersuch *et al.*, p. 157, fig. 62; pl. 5, fig. 1. (Recent, British Isles to Mediterranean. Phytal to shallow sublittoral).

2003 *Aurila convexa*; Guernet *et al.*, p. 88, pl. 2, fig. 1. (Quaternary, Gulf of Corinthe, Greece).

2013 *Aurila convexa*; Cabral & Loureiro, pl. 4, fig. 4. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

Distribution. This is a common species in the inner Basque shelf during the interval early Holocene to Recent.

Aurila woutersi Horne, 1986
(Fig. 6e)

1986 *Aurila woutersi*; Horne, 13, p. 33-38.

1989 *Aurila woutersi*; Athersuch *et al.*, p. 160, fig. 64; pl. 5, fig. 2. (Recent, British Isles. Phytal to shallow sublittoral).

2013 *Aurila woutersi*; Cabral & Loureiro, pl. 4, fig. 5. (Holocene, Portugal).

2015 *Aurila woutersi*; Martínez-García *et al.*, pl. 1, fig. 4. (Late Quaternary, Basque shelf).

Distribution. This species is present in the inner Basque shelf during the interval early Holocene to Recent.

Genus *Caudites* Coryell & Fields, 1937

Type species *Caudites medialis* Coryell & Fields, 1937

Caudites calceolatus (Costa, 1853)
(Fig. 6f)

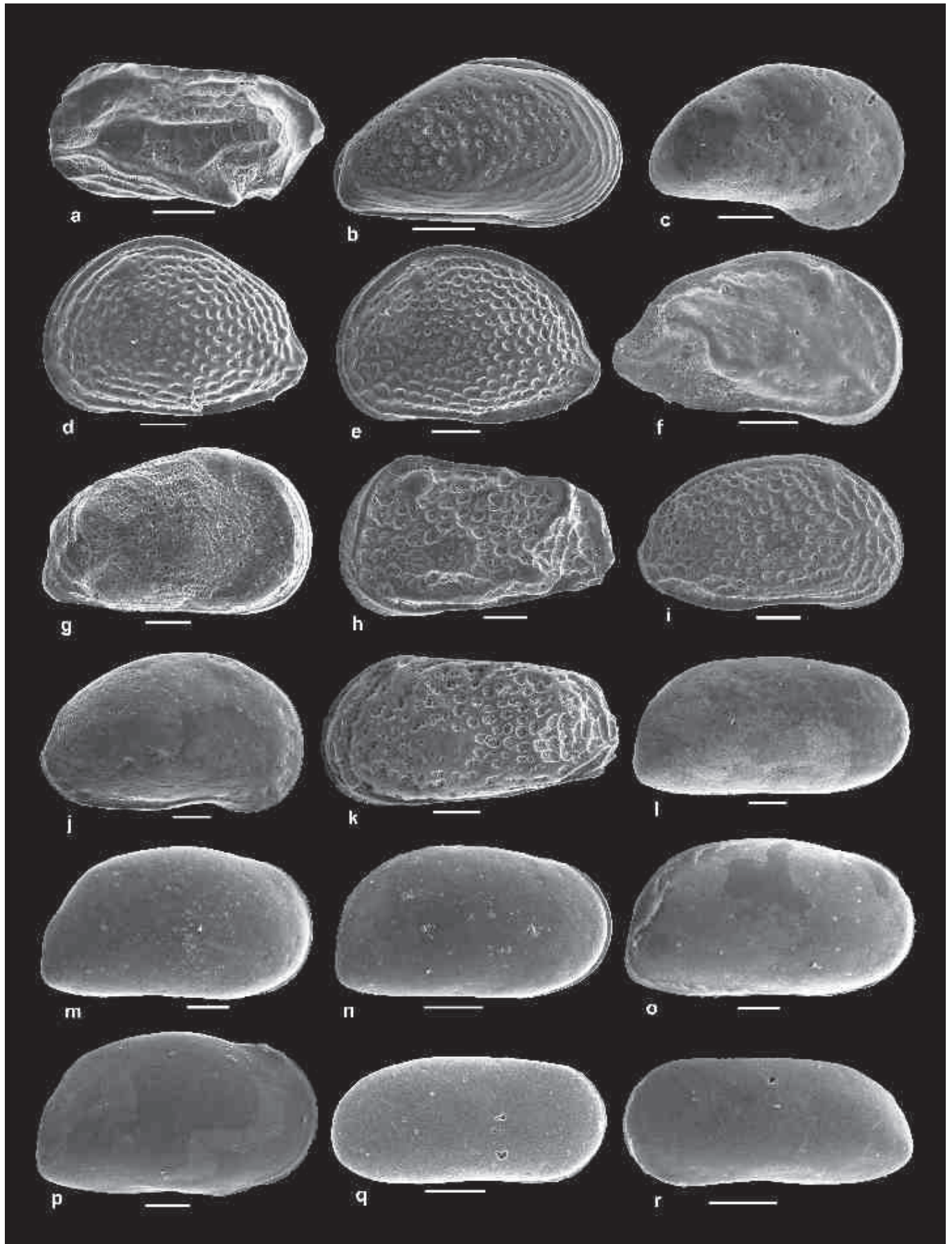
1976 *Caudites calceolatus*; Bonaduce *et al.*, pl. 26, figs 10, 12. (Recent, Adriatic Sea).

1994 *Caudites calceolatus*; Ruíz Muñoz, pl. 6, figs 1, 2. (Recent, shelf, Huelva, S Spain).

2013 *Caudites calceolatus*; Cabral & Loureiro, pl. 4, fig. 6. (Recent, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is found alive in recent sediments of the Basque shelf, with depth ranges of 50 to 120 mwd.

Genus *Elofsonella* Pokorny, 1955



Type species *Elofsonella concinna* (Jones, 1857)
Pokorny, 1955

Elofsonella concinna (Jones, 1857) Pokorny, 1955
(Fig. 6g)

1985 *Elofsonella concinna*; Guillaume *et al.*, pl. 105,
figs 3, 4. (Recent, glacial palaeoceanocoenoses of
Bay of Biscay).

1988 *Elofsonella concinna*; Cronin, pl. 2, figs 11, 12.
(Pleistocene, postglacial NW Atlantic).

1989 *Elofsonella concinna*; Athersuch *et al.*, p.
162, fig. 65; pl. 5, fig. 3. (Recent, British Isles,
Scandinavia, Iceland, NE N America. Mostly deep-
water species: 2-250 mwd total depth range, in silt
and sandy silt sediments).

2006 *Elofsonella* sp. A; Schornikov & Zenina, pl. 3,
figs 10, 11. (Recent, Arctic Ocean).

Distribution. This species is rarely found in MIS3,
MIS2 and in the Recent of the outer Basque shelf.

Genus *Finmarchinella* Swain, 1963

Type species *Finmarchinella finmarchica* (Sars,
1866)

Subgenus *Finmarchinella (Barentsovia)* Neale, 1974

Finmarchinella (Barentsovia) angulata (Sars, 1866)
(Fig. 6h)

1987 *Finmarchinella angulata*; Cronin & Ikeya, pl.
1, fig. 9. (Plio-Pleistocene, Japan).

1991 *Finmarchinella angulata*; Cronin, pl. 14, figs
10, 11. (Early Pleistocene, Tjörnes, Iceland).

2013 *Finmarchinella angulata*; Cabral & Loureiro,
pl. 4, fig. 7. (Holocene, Portugal).

Distribution. This species has been recorded in the
interval MIS3 to Recent of the Basque inner and outer
shelf.

Genus *Hemicythere* Sars, 1925

Type species *Hemicythere villosa* (Sars, 1866)

Hemicythere villosa (Sars, 1866)
(Fig. 6i)

1989 *Hemicythere villosa*; Athersuch *et al.*, p. 152,
fig. 60; pl. 4, fig. 8. (Recent, British Isles and NW
Europe. Littoral to shallow marine shelf in algae and
sediments).

2013 *Hemicythere villosa*; Cabral & Loureiro, pl. 4,
fig. 9. (Holocene, Portugal).

Distribution. This species is recorded in the interval
MIS3 to mid-late Holocene in the Basque inner and outer
shelf.

Genus *Heterocythereis* Elofson, 1941

Type species *Heterocythereis albomaculata* (Baird,
1838)

Heterocythereis albomaculata (Baird, 1838)
(Fig. 6j)

1957 *Heterocythereis albomaculata*; Wagner, p. 57,
pl. 24, figs 1-7. (Holocene, vegetated shelf, 2-30
mwd, N Europe and Mediterranean).

1979 *Heterocythereis albomaculata*; Yassini, pl. 5,
fig. 10. (Recent, Algerian coastal bay).

1979 *Heterocythereis albomaculata*; Athersuch &
Whittaker, p. 117-124.

1985 *Heterocythereis albomaculata*; Guillaume *et al.*,
pl. 110, figs 6a, 6b. (Recent, intertidal Bay of
Biscay).

Figure 6. Ostracods from the Basque Basin. **a)** *Semicytherura* sp. 2, LV, FCT689, Recent. **b)** *Eucythere anglica* Brady, 1868, C right view, 71-32, KS05-22 cm, late Holocene. **c)** *Eucythere curta* Ruggieri, 1975, RV, ZTF688, Recent. **d)** *Aurila convexa* (Baird, 1850), LV, ZTF648, Recent. **e)** *Aurila woutersi* Horne, 1986, LV, ZTF647, Recent. **f)** *Caudites calceolatus* (Costa, 1853), RV, FCT640, Recent. **g)** *Elofsonella concinna* (Jones, 1857), RV, 82-7, KS05-241 cm, MIS3. **h)** *Finmarchinella (Barentsovia) angulata* (Sars, 1866), LV, 1533, KS05-241 cm, MIS3. **i)** *Hemicythere villosa* (Sars, 1866), female RV, 71-40, KS10-240 cm, Early Holocene. **j)** *Heterocythereis albomaculata* (Baird, 1838), RV, ZTF699, Recent. **k)** *Urocythereis britannica* Athersuch, 1977, LV, 90-40, KS10-217 cm, Early Holocene. **l)** “*Krithe*” gr. *bartonensis* (Jones, 1857), RV, 1527, KS05-241 cm, MIS3. **m)** *Krithe dolichodeira* Bold, 1946, female RV, 1561, KS05-200 cm, MIS3. **n)** *Krithe minima* Coles, Whatley & Moguilevsky, 1994, female C right view, 90-53, KS05-242 cm, MIS3. **o)** *Krithe morkhoveni* Bold, 1960, RV, 90-51, KS05-242 cm, MIS3. **p)** *Krithe* gr. *pernoidea* (Bornemann, 1855), RV, KS10-49 cm, Middle Holocene. **q)** *Pseudopsammocythere similis* (G.W. Müller, 1894), RV, 81-39, KS05-145 cm, Middle Holocene. **r)** *Parakrithe* sp. 1, LV, 90-31, KS10-150 cm, Middle Holocene.

1989 *Heterocythereis albomaculata*; Athersuch *et al.*, p. 165, fig. 66; pl. 5, fig. 4. (Recent, British Isles).

2013 *Heterocythereis albomaculata*; Cabral & Loureiro, pl. 4, fig. 10. (Recent, littoral-outer estuarine and rockpool, living- continental shelf of Algarve and Holocene, Portugal).

2014 *Heterocythereis albomaculata*; Meireles *et al.*, pl. 5, figs A-G. (Recent, intertidal to 69 mwd, Azores).

2015 *Heterocythereis albomaculata*; Martínez-García *et al.*, pl. 1, fig. 16. (Late Quaternary, Basque shelf).

Distribution. This species is present in the Basque shelf during the interval MIS3 to Recent. Nowadays it is living in the inner and outer shelf (50-93 mwd).

Genus *Urocythereis* Ruggieri, 1950

Type species *Urocythereis favosa* (Roemer, 1838)

Urocythereis britannica Athersuch, 1977
(Fig. 6k)

1987 *Urocythereis favosa*; Aranki, pl. 19, fig. 8. (Recent, S Spain, shelf – 10-12 mwd).

1989 *Urocythereis britannica*; Athersuch *et al.*, p. 170, fig. 68; pl. 5, fig. 6. (Recent, British Isles and Bay of Biscay to Norway).

2010 *Urocythereis oblonga* (Brady, 1866); Nachite *et al.*, pl. 2, fig. 2. (Recent, Tahadart estuary, Maroc).

2013 *Urocythereis britannica*; Cabral & Loureiro, pl. 4, fig. 11. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

2015 *Urocythereis britannica*; Martínez-García *et al.*, pl. 1, fig. 26. (Late Quaternary, Basque shelf).

Distribution. This species is found from MIS3 to the Recent in the Basque shelf.

Family **Krithidae** Mandelstam, 1958

Genus *Kritha* Brady, Crosskey & Robertson, 1874

Type species *Ilyobates praetexta* Sars, 1866

“*Kritha*” gr. *bartonensis* (Jones, 1857)
(Fig. 6l)

1977 *Kritha bartonensis*; Peypouquet, figs 1, 12. (Quaternary, deep Bay of Biscay).

2015 *Kritha dolichodeira*; Martínez-García *et al.*, pl. 1, fig. 17. (Late Quaternary, Basque shelf).

Remarks. This species has recently been included in the genus *Thracella*, as *Thracella bartonensis* (Jones, 1857) Faure & Guernet, 1988 (Brandão *et al.*, 2017), but we left it provisionally in “*Kritha*” waiting for a revision of this genus by the authors.

Distribution. This species is found living today in low numbers in modern samples of the Basque shelf, but it was abundant in the interval MIS3-MIS2 in the outer shelf and during the Holocene in the inner shelf.

Kritha dolichodeira Bold, 1946
(Fig. 6m)

1994 *Kritha dolichodeira*; Coles *et al.*, p. 81, figs 3 L-Q; pl. 2, figs 13-18. (Quaternary, deep N Atlantic. Complete synonymies therein).

1996 *Kritha dolichodeira*; Coles *et al.*, pl. 4, figs 11-13. (Quaternary, Porcupine Basin, Ireland. Upper bathyal).

Distribution. This species is abundant in MIS5 to MIS2 of deep bathyal Bay of Biscay. In the outer Basque shelf only few juveniles have been found in MIS3.

Kritha minima Coles, Whatley & Moguilevsky, 1994
(Fig. 6n)

1994 *Kritha minima*; Coles *et al.*, p. 88, figs 3, EE-JJ; pl. 2, figs 16-18. (Quaternary, deep N Atlantic).

1996 *Kritha minima*; Coles *et al.*, pl. 4, figs 16-17. (Quaternary, Porcupine Basin, Ireland. Upper bathyal).

Distribution. This is a common species in deep Bay of Biscay during MIS2, MIS3, MIS5. It is very scarce in Recent samples of the outer Basque shelf.

Kritha morkhoveni Bold, 1960
(Fig. 6o)

1994 *Kritha morkhoveni*; Coles *et al.*, p. 94, pl. 3, figs 11-18. (Quaternary. Deep N Atlantic. Complete synonymies therein).

1996 *Kritha morkhoveni*; Coles *et al.*, pl. 4, figs 18-19. (Quaternary, Porcupine Basin, Ireland. Upper bathyal).

2015 *Kritha morkhoveni*; Martínez-García *et al.*, pl. 1, fig. 18. (Late Quaternary, Basque shelf).

Distribution. This species is abundant in MIS5 to MIS2 of deep bathyal Bay of Biscay. In the outer Basque shelf only few individuals have been found in MIS3.

Krithe gr. *pernoides* (Bornemann, 1855)
(Fig. 6p)

1994 *Krithe pernoides*; Coles *et al.*, p. 88, figs 5, EE-JJ; pl. 2, figs 16-18. (Quaternary, deep N Atlantic).

Distribution. This species is only found in MIS3 and early Holocene of the outer Basque shelf.

Genus *Pseudopsammocythere* Carbonnel, 1966

Type species *Paradoxostoma simile* G.W. Müller, 1894

Pseudopsammocythere similis (G.W. Müller, 1894)
(Fig. 6q)

2013 *Pseudopsammocythere similis*; Cabral & Loureiro, pl. 4, fig. 15. (Recent, continental shelf and slope of Algarve, Portugal).

Distribution. This species is very rare in modern samples, but it is common in the Holocene to the Recent in the outer Basque shelf.

Genus *Parakrithe* Bold, 1958

Type species *Parakrithe vermunti* (Bold, 1946) Bold, 1958

Parakrithe sp. 1
(Fig. 6r)

1977 *Parakrithe* sp. A2, ecotype 3.2; Peypouquet, figs 11, 32. (Bay of Biscay, 130-625 mwd).

Distribution. To date, this species has been only found in early Holocene and modern samples of the inner Basque shelf.

Parakrithe dimorpha Bonaduce, Ciampo & Masoli, 1976
(Fig. 7a)

2013 *Parakrithe dimorpha*; Cabral & Loureiro, pl. 4, fig. 14. (Recent, continental slope of Algarve, Portugal).

Distribution. This species is quite common in the deep bathyal MIS5, MIS4 Bay of Biscay but very rare in the outer Basque shelf during the Holocene.

Family **Leptocytheridae** Hanai, 1957

Genus *Callistocythere* Ruggieri, 1953

Type species *Callistocythere littoralis* (G.W. Müller, 1894)

Callistocythere curryi Horne, Lord, Robinson & Whittaker, 1990
(Fig. 7b)

1994 *Callistocythere rastrifera*; Ruíz Muñoz, pl. 2, figs 9, 10. (Recent, shelf, Huelva, S Spain).

2009 *Callistocythere curryi*; Whittaker & Horne, pl. 2, figs 7, 8. (MIS13 to MIS5e. British Isles).

2013 *Callistocythere curryi*; Cabral & Loureiro, pl. 4, fig. 17. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

Distribution. Only found in recent sediments of the Basque shelf.

Callistocythere littoralis (G.W. Müller, 1894)
(Fig. 7c)

1972 *Callistocythere littoralis*; Uffenorde, pl. 7, fig. 2. (Recent, N Adriatic Sea).

1976 *Callistocythere littoralis*; Bonaduce *et al.*, pl. 11, figs 1-5. (Recent, Adriatic Sea).

1976 *Callistocythere littoralis*; Breman, pl. 8, fig. 96. (Recent, Adriatic Sea).

1980 *Callistocythere littoralis*; Athersuch & Whittaker, p. 61-66.

1989 *Callistocythere littoralis*; Athersuch *et al.*, p. 108, fig. 41; pl. 2, fig. 4. (Phytal littoral to sublittoral species. Recent, NE Atlantic coasts to France and Mediterranean).

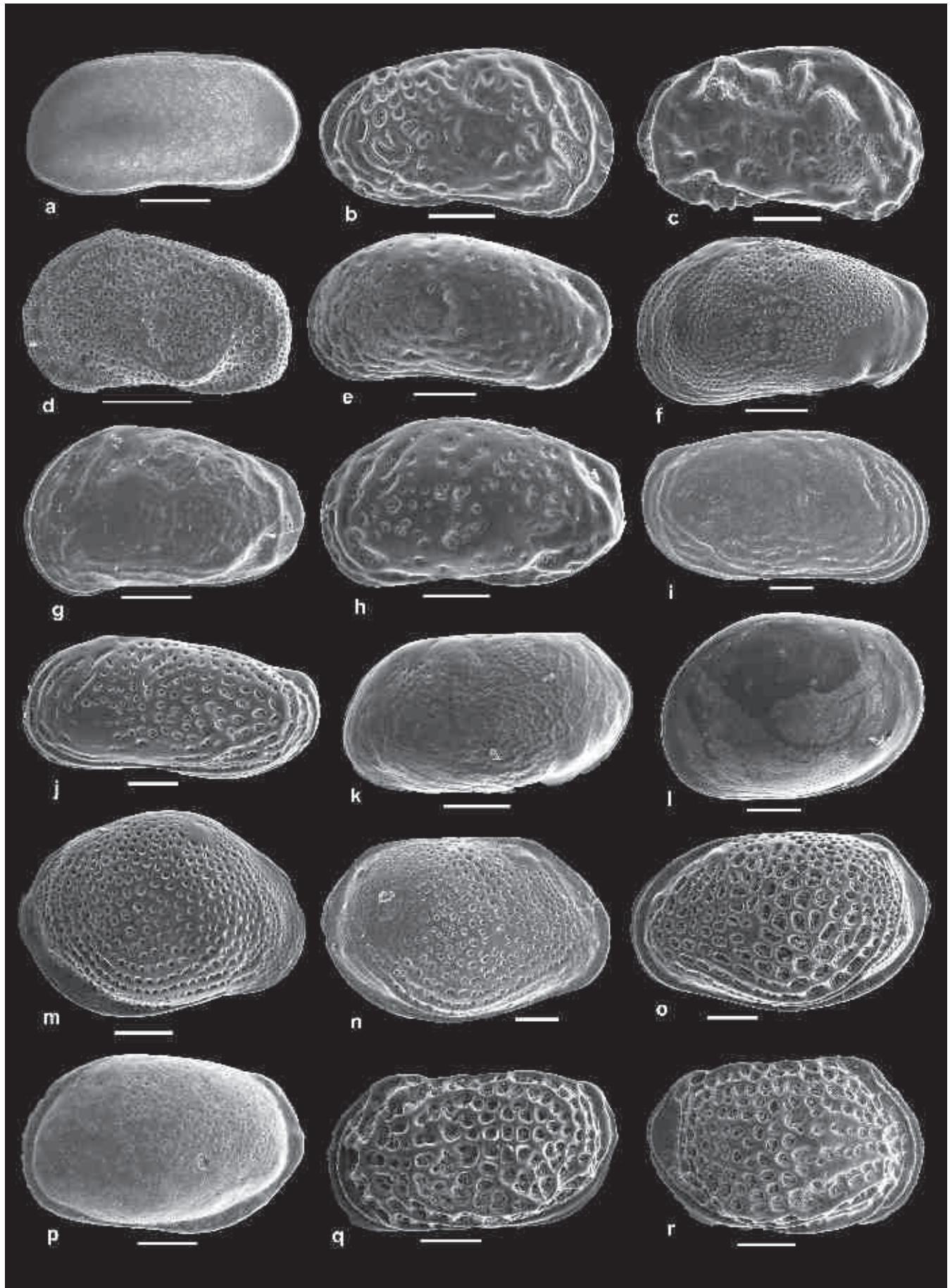
2013 *Callistocythere littoralis*; Cabral & Loureiro, pl. 4, fig. 21. (Recent, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is found in mid-late Holocene sediments of the Basque shelf.

Genus *Cluthia* Neale, 1973

Type species *Cluthia cluthae* (Brady, Crosskey & Robertson, 1874)

Cluthia keiji Neale, 1975a
(Fig. 7d)



1975a *Cluthia keiji*; Neale, 2-23, p. 141-148.
(Recent, Mediterranean off E Spain – 81 mwd).

1976 *Cluthia keiji*; Bonaduce *et al.*, p. 42, pl. 14, figs 1-5. (Recent, Adriatic Sea, shelf (>85 mwd) on silty/sandy sediments).

1976 *Cluthia keyi*; Breman, pl. 7, fig. 101. (Recent, Adriatic Sea).

1996 *Cluthia keiji*; Coles *et al.*, pl. 5, figs 1, 2. (Quaternary, Porcupine Basin, Ireland. Upper bathyal).

2013 *Cluthia keiji*; Cabral & Loureiro, pl. 5, fig. 3. (Recent, continental shelf of Algarve, Portugal. Continental shelf).

Distribution. This species is scarcely present in the Late Holocene of the Basque shelf in fine sandy, silty clay and rocky substrates (>80 mwd). A punctual record has been done in MIS2 of the outer Basque shelf.

Genus *Leptocythere* Sars, 1925

Type species *Leptocythere pellucida* (Baird, 1850)
Sars, 1925

Leptocythere baltica Klie, 1929
(Fig. 7e)

1985 *Leptocythere porcellanea*; Guillaume *et al.*, pl. 107, figs 11, 12. (Recent, intertidal shelf of Bay of Biscay).

1989 *Leptocythere baltica*; Athersuch *et al.*, p. 98, fig. 34; pl. 1, fig. 5. (Recent, NW European coasts, from the Bay of Biscay to the Baltic Sea. Shallow water (<10 mwd) in sands with algae).

2013 *Leptocythere baltica*; Cabral & Loureiro, pl. 5, fig. 4. (Recent estuarine (living), Portugal).

Distribution. This species is very scarce in samples of MIS3 and Holocene of the Basque shelf.

Leptocythere castanea (Sars, 1866)
(Fig. 7f)

1985 *Leptocythere castanea*; Guillaume *et al.*, pl. 107, figs 4, 5. (Recent, intertidal shelf of Bay of Biscay).

1989 *Leptocythere castanea*; Athersuch *et al.*, p. 100, fig. 35; pl. 1, fig. 6. (Recent, NW European coasts, from the Bay of Biscay to the Baltic Sea and S Greenland. Brackish water of estuaries in mud with algae).

2013 *Leptocythere castanea*; Cabral & Loureiro, pl. 5, fig. 5. (Holocene, Portugal).

Distribution. Due to the brackish-water character of this species, it is only found in few MIS3 and Holocene samples, very probably transported from the coast to the Basque shelf.

Leptocythere aff. *lacertosa* (Hirschmann, 1912)
(Fig. 7g)

1985 *Leptocythere lacertosa*; Guillaume *et al.*, pl. 107, figs 16, 17. (Recent, intertidal shelf of Bay of Biscay).

1989 *Leptocythere lacertosa*; Athersuch *et al.*, p. 102, fig. 36; pl. 1, figs 7, 8. (Recent, NW European coasts, from the Bay of Biscay to the Baltic Sea and Iceland. Brackish water of estuaries in mud or fine sand).

2013 *Leptocythere lacertosa*; Cabral & Loureiro, pl. 5, figs 9, 10. (Recent estuarine (living) and Holocene, Portugal).

Distribution. This species is only found in few Holocene and MIS3 samples, very probably transported from the coast to the Basque shelf.

Leptocythere macallana (Brady & Robertson, 1869)
(Fig. 7h)

Figure 7. Ostracods from the Basque Basin. **a)** *Parakrithe dimorpha* Bonaduce, Ciampo & Masoli, 1975, C right view, 81-40, KS05-145 cm, Middle Holocene. **b)** *Callistocythere curryi* Horne *et al.*, 1990, female RV, FCT693, Recent. **c)** *Callistocythere littoralis* (G.W. Müller, 1894), RV, ZTF662, Recent. **d)** *Cluthia keiji* Neale, 1975a, female LV, ZTF774, Recent. **e)** *Leptocythere baltica* Klie, 1929, female LV, ZTF711, Recent. **f)** *Leptocythere castanea* (Sars, 1866), juvenile LV, ZTF707, Recent. **g)** *Leptocythere* aff. *lacertosa* (Hirschmann, 1912), juvenile LV, FCT643, Recent. **h)** *Leptocythere macallana* (Brady & Robertson, 1869), female LV, ZTF709, Recent. **i)** *Leptocythere pellucida* (Baird, 1850), female RV, smooth form, 82-42, KS05-175 cm, MIS3. **j)** *Leptocythere pellucida* (Baird, 1850), male RV, ornate form, ZTF706, Recent. **k)** *Elofsonia pusilla* (Brady & Robertson, 1870), LV, ZTF712, Recent. **l)** *Loxoconcha elliptica* Brady, 1868, female LV, ZTF715, Recent. **m)** *Loxoconcha rhomboidea* (Fischer, 1855), female RV, ZTF722, Recent. **n)** *Loxoconcha* sp. 1 aff. *Loxoconcha linleyi* Horne, 1982, RV, 82-35, KS05-183 cm, MIS3. **o)** *Palmoconcha guttata* (Norman, 1865), male LV, ZTF720, Recent. **p)** *Palmoconcha laevata* (Norman, 1865), female LV, 1558, KS05-215 cm, MIS3. **q)** *Sagmatocythere multifora* (Norman, 1865), male LV, ZTF744, Recent. **r)** *Sagmatocythere* aff. *multifora* (Norman, 1865), female RV, 1524, KS05-241 cm, MIS3.

1985 *Leptocythere macallana*; Guillaume *et al.*, pl. 107, figs 14, 15. (Recent, intertidal shelf of Bay of Biscay).

1989 *Leptocythere macallana*; Athersuch *et al.*, p. 103, fig. 37; pl. 1, fig. 9. (Recent, NW European coasts, and Mediterranean. Shallow waters in sands with algae).

2013 *Leptocythere macallana*; Cabral & Loureiro, pl. 5, fig. 11. (Holocene, Portugal).

Distribution. This species is only found in few Recent samples of the Basque shelf.

Leptocythere pellucida (Baird, 1850)
(Figs 7i, 7j)

1979 *Leptocythere pellucida*; Yassini, pl. 3, fig. 2. (Recent, Algerian coastal bay).

1985 *Leptocythere pellucida*; Guillaume *et al.*, pl. 107, figs 1, 2. (Recent, intertidal shelf of Bay of Biscay).

1989 *Leptocythere pellucida*; Athersuch *et al.*, p. 96, fig. 33; pl. 1, figs 3-4. (Recent, NW European coasts, from France to the Baltic Sea and Norway. Marine sublittoral (<50 mwd) in sands with algae).

2013 *Leptocythere pellucida*; Cabral & Loureiro, pl. 5, fig. 12. (Holocene, Portugal).

Distribution. In the Basque shelf this species has been recorded only in few MIS3 and Holocene samples.

Family **Loxoconchidae** Sars, 1925

Genus *Elofsonia* Wagner, 1957

Type species *Elofsonia baltica* (Hirschmann, 1909)

Elofsonia pusilla (Brady & Robertson, 1870)
(Fig. 7k)

1989 *Elofsonia pusilla*; Athersuch *et al.*, p. 184, fig. 73; pl. 6, fig. 2. (Recent, British Isles. Marine in sandy substrates and brackish water in Baltic Sea and Gulf of Finland).

2013 *Elofsonia pusilla*; Cabral & Loureiro, pl. 5, fig. 20. (Holocene, Portugal).

Distribution. This species is only present in the Recent of the Basque shelf.

Genus *Loxoconcha* Sars, 1866

Type species *Loxoconcha rhomboidea* (Fischer, 1855) Sars, 1866

Loxoconcha elliptica Brady, 1868
(Fig. 7l)

1976a *Loxoconcha elliptica*; Athersuch & Whittaker, vol. 3 (19), p. 99-106. (Recent. British Isles. Brackish pool).

1976 *Loxoconcha elliptica*; Bonaduce *et al.*, pl. 67, fig. 10. (Recent, Adriatic Sea).

1987 *Loxoconcha elliptica*; Aranki, pl. 20, figs 7, 8; pl. 21, figs 1-5. (Recent. S Spain. Lagoon, living).

1989 *Loxoconcha elliptica*; Athersuch *et al.*, p. 176, fig. 70; pl. 5, fig. 8. (Recent. NW Europe and Mediterranean. Brackish water of estuaries, lagoons and pools with algae and mud).

1994 *Loxoconcha elliptica*; Ruíz Muñoz, pl. 6, figs 9-11. (Recent, estuaries, Huelva, S Spain).

2013 *Loxoconcha elliptica*; Cabral & Loureiro, pl. 6, fig. 3. (Recent, estuarine living, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is found in early Holocene and Recent sediments of the inner Basque shelf (<110 mwd).

Loxoconcha rhomboidea (Fischer, 1855)
(Fig. 7m)

1972 *Loxoconcha rhomboidea*; Uffenorde, pl. 8, fig. 10. (Recent, N Adriatic Sea).

1976b *Loxoconcha rhomboidea*; Athersuch & Whittaker, vol. 3 (17), p. 81-90. (Recent. S Norway. Brackish pool).

1976 *Loxoconcha rhomboidea*; Bonaduce *et al.*, pl. 59, figs 8-12. (Recent, Adriatic Sea).

1979 *Loxoconcha rhomboidea*; Yassini, pl. 6, figs 3, 4. (Recent, Algerian coastal bay).

1985 *Loxoconcha rhomboidea*; Guillaume *et al.*, pl. 102, figs 9, 10; pl. 109, figs 7-9. (Recent, Bay of Biscay. Intertidal and subtidal).

1989 *Loxoconcha rhomboidea*; Athersuch *et al.*, p. 174, fig. 69; pl. 5, fig. 7. (Recent. Coasts of Norway to Canary and Madeira Islands. Marine sublittoral phytal and outer estuarine).

1994 *Loxoconcha rhomboidea*; Ruíz Muñoz, pl. 7, figs 1, 2. (Recent, shelf, Huelva, S Spain).

2013 *Loxoconcha rhomboidea*; Cabral & Loureiro, pl. 6, fig. 5. (Recent, littoral -outer estuarine and rockpool living-, continental shelf and slope of Algarve and Holocene, Portugal).

Distribution. This species is regularly present in the Basque shelf during the interval MIS3 to Recent.

Loxoconcha sp. 1 aff. *Loxoconcha linleyi* Horne, 1982 (Fig. 7n)

1982 *Loxoconcha linleyi*; Horne, 9 (6), p. 33-40. (Recent, Canary Islands. Intertidal).

Distribution. This species has been so far found in MIS3 of the outer Basque shelf. A doubtful record has been done in mid-late Holocene of the inner shelf.

Genus *Palmoconcha* Swain & Gilby, 1974

Type species *Palmoconcha laevimarginata* (Swain & Gilby, 1974)

Palmoconcha guttata (Norman, 1865) (Fig. 7o)

1981 *Lindisfarnia guttata*; Athersuch & Horne, 8 (20), p. 117-124. (Recent, NE England. Sublittoral).

1985 *Loxoconcha guttata*; Guillaume *et al.*, pl. 102, figs 3, 4. (Recent, Bay of Biscay. Subtidal to outer shelf).

1989 *Palmoconcha guttata*; Athersuch *et al.*, p. 188, fig. 75; pl. 6, figs 5, 6. (Recent. NW Europe coastal waters – 10-90 mwd).

1994 *Palmoconcha guttata*; Ruíz Muñoz, pl. 7, figs 3-6. (Recent, shelf, Huelva, S Spain).

2013 *Palmoconcha guttata*; Cabral & Loureiro, pl. 6, fig. 8. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

2015 *Palmoconcha guttata*; Martínez-García *et al.*, pl. 1, fig. 19. (Late Quaternary, Basque shelf).

Distribution. This species is regularly present in the Basque shelf during the interval MIS3 to Recent. It can be found living in any type of substrate in the shelf, being more abundant in depth interval of 90-150 mwd.

Palmoconcha laevata (Norman, 1865) (Fig. 7p)

1979 *Loxoconcha turbida* Müller; Yassini, pl. 6, figs 5, 7. (Recent, Algerian coastal bay).

1981 *Lindisfarnia laevata*; Horne & Kilenyi, 8 (19), p. 107-116. (Recent, NE England. Sublittoral).

1989 *Palmoconcha laevata*; Athersuch *et al.*, p. 190, fig. 76; pl. 6, fig. 4. (Recent. NW Europe coastal waters – 0-90 mwd).

2013 *Palmoconcha laevata*; Cabral & Loureiro, pl. 6, fig. 9. (Recent, continental slope of Algarve and Holocene, Portugal).

Distribution. This species is regularly present in the Basque shelf during the interval MIS3 to Recent.

Genus *Sagmatocythere* Athersuch, 1976

Type species *Sagmatocythere napoliana* (Puri, 1963)

Sagmatocythere multiflora (Norman, 1865) (Fig. 7q)

1979 *Loxoconcha multiflora*; Yassini, pl. 6, figs 10, 11. (Recent, Algerian coastal bay).

2013 *Sagmatocythere multiflora*; Cabral & Loureiro, pl. 6, fig. 13. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

Distribution. In the Basque shelf, this species has been only recorded in the Recent.

Sagmatocythere aff. *multiflora* (Norman, 1865) (Fig. 7r)

aff. 1989 *Sagmatocythere multiflora*; Athersuch *et al.*, p. 194, fig. 78; pl. 6, fig. 7.

aff. 2013 *Sagmatocythere multiflora*; Cabral & Loureiro, pl. 6, fig. 13. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

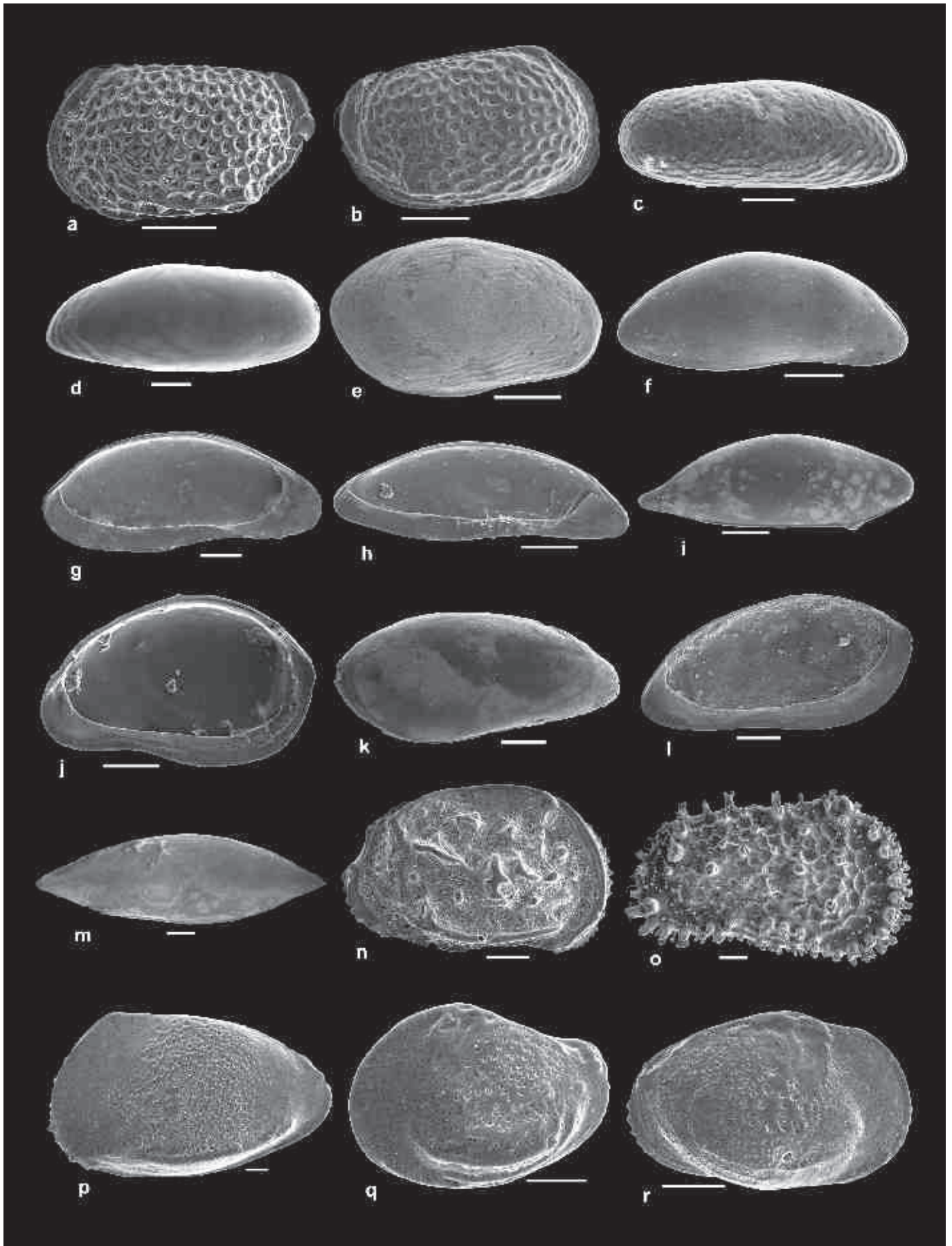
aff. 2015 *Sagmatocythere multiflora*; Martínez-García *et al.*, pl. 1, fig. 23. (Late Quaternary, Basque shelf).

Distribution. This species is present in the interval MIS3 to Recent in the Basque Basin.

Sagmatocythere variesculpta (Ruggieri, 1962) (Fig. 8a)

1993 *Loxocorniculum multireticulatum* Maybury, p. 101, pl. 20, figs 1-3. (Upper Pliocene, France).

2009 *Sagmatocythere variesculpta*; Whittaker & Horne, pl. 3, figs 16, 17. (MIS13 to ?MIS5e. Circum-Mediterranean distribution from the Pliocene. Supposedly extinct).



2013 *Sagmatocythere variesculpta*; Cabral & Loureiro, pl. 6, fig. 17. (Holocene, Portugal).

Distribution. This species has been recorded in the Recent of the Basque shelf.

Sagmatocythere aff. *variesculpta* (Ruggieri, 1962)
(Fig. 8b)

1986 *Sagmatocythere* aff. *variesculpta*; Ciampo, pl. 5, fig. 8. (Upper Miocene, Italy).

Distribution. This species has been recorded in the Recent of the Basque shelf.

Family **Neocytherideidae** Puri, 1957

Genus *Neocytherideis* Puri, 1952

Type species *Neocytherideis elongata* Puri, 1952

Neocytherideis subulata (Brady, 1868)
(Figs 8c, 8d)

1976 *Neocytherideis fasciata* (Brady & Robertson, 1874); Bonaduce *et al.*, p. 62, pl. 35, figs 6-10. (Recent, Adriatic Sea).

1976 *Neocytherideis fasciata*; Breman, pl. 6, fig. 79. (Recent, Adriatic Sea).

1979 *Neocytherideis faveolata*; Yassini, pl. 4, fig. 11. (Recent, Algerian coastal bay).

1982 *Neocytherideis subulata*; Athersuch, p. 233, pl. 1, figs 1-11; figs 1a-1g.

1985 *Neocytherideis subulata*; Guillaume *et al.*, pl. 108, figs 3-5. (Recent, intertidal of Bay of Biscay).

1985 *Neocytherideis fasciata*; Guillaume *et al.*, pl. 100, figs 1, 2. (Recent, intertidal of Cap Breton).

1987 *Neocytherideis fasciata*; Aranki, pl. 17, fig. 11. (Recent, S Spain, coastal – 12 mwd).

1989 *Neocytherideis subulata*; Athersuch *et al.*, p. 122, fig. 48; pl. 3, fig. 7. (Recent, British Isles and coasts of France. Sublittoral and inner shelf in fine sand sediments).

1994 *Neocytherideis subulata*; Ruíz Muñoz, pl. 3, figs 3, 4. (Recent, shelf, Huelva, S Spain).

2013 *Neocytherideis subulata*; Cabral & Loureiro, pl. 7, fig. 1. (Recent, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is present in the Holocene of the Basque shelf. In Recent sediments it is occurring in fine substrates 50 to 150 mwd. Doubtful record in MIS3 in the outer shelf.

Family **Paradoxostomatidae** Brady & Norman, 1889

Genus *Brunneostoma* Schornikov, 1993

Type species *Brunneostoma brunneum* (Schornikov, 1974) Schornikov, 1993

Brunneostoma sp.
(Fig. 8e)

Distribution. In this material *Brunneostoma* sp. are scarcely represented in the Recent and MIS2 of the Basque shelf.

Genus *Paracytherois* G.W. Müller, 1894

Type species *Paracytherois flexuosa* (Brady, 1867)

Paracytherois flexuosa (Brady, 1867)
(Figs 8f, 8g)

1976 *Paracytherois flexuosa*; Bonaduce *et al.*, pl. 71, fig. 6. (Recent, Adriatic Sea).

1989 *Paracytherois flexuosa*; Athersuch *et al.*, p. 314, fig. 137. (Recent, British Isles).

Figure 8. Ostracods from the Basque Basin. **a)** *Sagmatocythere variesculpta* (Ruggieri, 1962), female LV, ZTF743, Recent. **b)** *Sagmatocythere* aff. *variesculpta* (Ruggieri, 1962), female RV, FCT646, Recent. **c)** *Neocytherideis subulata* (Brady, 1868), juvenile RV, FCT649, Recent. **d)** *Neocytherideis subulata* (Brady, 1868), LV, ZTF728, Recent. **e)** *Brunneostoma* sp., RV, FCT656, Recent. **f)** *Paracytherois flexuosa* (Brady, 1867), C right view, FCT655, Recent. **g)** *Paracytherois flexuosa* (Brady, 1867), LV interior, 71-34, KS16-111 cm, MIS2. **h)** *Paracytherois* sp. 1, LV interior, FCT667, Recent. **i)** *Paracytherois* sp. 2, RV, FCT686, Recent. **j)** *Paradoxostoma* aff. *abbreviatum* Sars, 1866, female RV interior, ZTF736, Recent. **k)** *Paradoxostoma ensiforme* Brady, 1868, RV, ZTF733, Recent. **l)** *Paradoxostoma variabile* (Baird, 1835), RV interior, FCT684, Recent. **m)** *Paradoxostoma tenuissimum* (Norman, 1869), LV, 90-57, KS05-142 cm, Early Holocene. **n)** *Thaerocythere hoptonensis* (Brady, Crosskey & Robertson, 1874), female RV, ZTF747, Recent. **o)** *Actinocythereis dunelmensis* (Norman, 1865), RV, 1504, KS05-241 cm, MIS3. **p)** *Bosquetina tarentina* (Baird, 1850), male LV, 82-16, KS05-240 cm, MIS3. **q)** *Buntonia sublatissima* (Neviani, 1906), LV, 82-15, KS05-240 cm, MIS3. **r)** *Buntonia textilis* Bonaduce, Ciampo & Masoli, 1975, RV, 81-49, KS16-60 cm, MIS2.

2013 *Paracytherois flexuosa*; Cabral & Loureiro, pl. 8, fig. 2. (Recent, outer estuarine, Portugal).

Distribution. In the Basque Basin, this species has been recorded in MIS2 and Recent sediments of the outer shelf (130-150 mwd).

Paracytherois sp. 1
(Fig. 8h)

2009 *Paracytherois* sp.; Yasuhara *et al.*, pl. 19, figs 1-4. (Latest Quaternary, W Atlantic. Deep marine).

Distribution. This species has been recorded in upper bathyal sediments of the Bay of Biscay.

Paracytherois sp. 2
(Fig. 8i)

1976 *Paradoxostoma acuminatum*; Bonaduce *et al.*, pl. 71, fig. 14. (Recent, Adriatic Sea).

Distribution. This species has been recorded in Recent sediments of the outer Basque shelf and epibathyal Bay of Biscay.

Genus *Paradoxostoma* Fischer, 1855

Type species *Paradoxostoma dispar* Fischer, 1855

Paradoxostoma aff. *abbreviatum* Sars, 1866
(Fig. 8j)

aff. 1985b *Paradoxostoma abbreviatum*; Horne & Whittaker, p. 138, pl. 39, figs A, B.

aff. 1989 *Paradoxostoma abbreviatum*; Athersuch *et al.*, p. 278, pl. 119, figs A, B. (Recent, British Isles, Norway, Baltic, France. Littoral to sublittoral, in algae).

2011 *Paradoxostoma abbreviatum*; Faranda & Gliozzi, fig. 14a. (Early Pleistocene, Mediterranean).

2013 *Paradoxostoma* aff. *abbreviatum*; Cabral & Loureiro, pl. 7, fig. 13. (Recent, outer estuarine and Holocene, Portugal).

Distribution. This species is common in this basin, being recorded in the interval MIS3 to Recent in the Basque shelf. Nowadays it can be found in very fine sands (73-83 mwd). Also recorded in MIS3 of bathyal Bay of Biscay.

Paradoxostoma ensiforme Brady, 1868
(Fig. 8k)

1979 *Paradoxostoma triste*; Yassini, pl. 11, figs 1, 2. (Recent, Algerian coastal bay).

1985b *Paradoxostoma ensiforme*; Horne & Whittaker, p. 149, pl. 38, figs E, F.

2011 *Paradoxostoma ensiforme*; Faranda & Gliozzi, fig. 14a. (Pleistocene, Mediterranean).

2013 *Paradoxostoma ensiforme*; Cabral & Loureiro, p. 147, pl. 7, fig. 15. (Recent, outer estuarine and Holocene, Portugal).

2014 *Lanceostoma simplex* Meireles & Keyser; Meireles *et al.*, p. 23, pl. 5, figs d-f. (Holocene, Azores. Shallow marine).

Distribution. In this material this species is only scarcely represented in the Recent of the Basque shelf.

Paradoxostoma variable (Baird, 1835)
(Fig. 8l)

1985b *Paradoxostoma variable*; Horne & Whittaker, p. 188, figs 45A-C.

1989 *Paradoxostoma variable*; Athersuch *et al.*, p. 306, fig. 133. (British Isles, Norway, Sweden, Baltic Sea and N France. Littoral to sublittoral marine and estuarine, with algae).

Distribution. This species is only scarcely represented in the mid-late Holocene and Recent of the Basque shelf and epibathyal Bay of Biscay.

Paradoxostoma tenuissimum (Norman, 1869)
(Fig. 8m)

1976 *Machaerina tenuissima*; Bonaduce *et al.*, pl. 71, fig. 9. (Recent, Adriatic Sea).

1985b *Paradoxostoma tenuissimum*; Horne & Whittaker, p. 188, figs 44D-E, 45D-E.

2011 *Paradoxostoma tenuissimum*; Faranda & Gliozzi, fig. 16a. (Early Pleistocene, Mediterranean).

2013 *Paradoxostoma tenuissimum*; Cabral & Loureiro, pl. 7, fig. 19. (Recent, continental shelf, Portugal).

Distribution. In this material this species is very scarcely represented in the MIS3 and early Holocene of the Basque shelf.

Family **Thaerocytheridae** Hazel, 1967

Genus *Thaerocythere* Hazel, 1967

Type species *Thaerocythere crenulata* (Sars, 1866)

Thaerocythere hoptonensis (Brady, Crosskey & Robertson, 1874)
(Fig. 8n)

1994 *Thaerocythere lusitanica*; Ruíz Muñoz, p. 176, pl. 5, figs. 5, 6. (Recent, shelf, Huelva (S Spain). Fine to very fine sands – 5-16 mwd).

1997 *Thaerocythere hoptonensis*; Wood & Whatley, p. 12, pl. 2, figs 6-8. (Pliocene to Recent, East N Atlantic, British Isles to Morocco).

2013 *Thaerocythere hoptonensis*; Cabral & Loureiro, pl. 8, fig. 5. (Recent, outer estuarine, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species is rarely found in the Recent of the Basque shelf. Doubtful record in late Holocene of the inner Basque shelf.

Family **Trachyleberididae** Sylvester-Bradley, 1948

Genus *Actinocythereis* Puri, 1953b

Type species *Cythere exanthemata* (Ulrich & Bassler, 1904)

Actinocythereis dunelmensis (Norman, 1865)
(Fig. 8o)

1981 *Acanthocythereis dunelmensis*; Cronin, pl. 8, figs 1, 2. (Late Pleistocene, Champlain Sea).

1988 *Acanthocythereis dunelmensis*; Cronin, pl. 2, fig. 9. (Pleistocene, postglacial NW Atlantic).

1989 *Acanthocythereis dunelmensis*; Athersuch *et al.*, p. 133, fig. 52; pl. 3, fig. 10. (Recent, British Isles, Norway, Greenland. Marine, sublittoral – 50-100 mwd).

2006 *Acanthocythereis dunelmensis*; Schornikov & Zenina, pl. 2, figs 13-15. (Recent, Arctic Ocean).

2015 *Acanthocythereis dunelmensis*; Martínez-García *et al.*, pl. 1, fig. 1. (Late Quaternary, Basque shelf).

Remarks. This species has been traditionally included in *Acanthocythereis* Howe, 1963, but recently it has been changed to genus *Actinocythereis* by Brandão *et al.* (2017).

Distribution. This species is regularly present in the Basque shelf during the interval MIS3 to Recent.

Genus *Bosquetina* Keij, 1957

Type species *Bosquetina pectinata* (Bosquet, 1852) Keij, 1957

Bosquetina tarentina (Baird, 1850)
(Fig. 8p)

1976 *Bosquetina dentata*; Bonaduce *et al.*, p. 48, pl. 31, figs 9-10. (Recent, Adriatic Sea).

1985 *Bosquetina dentata*; Guillaume *et al.*, pl. 103, figs 9, 10. (Recent, circalittoral of Bay of Biscay).

2013 *Bosquetina tarentina*; Cabral & Loureiro, pl. 8, fig. 7. (Recent, continental shelf of Algarve –living- and Holocene, Portugal).

Distribution. *B. tarentina* is regularly present in the Basque shelf from MIS3 to the present, being alive in the outer shelf in waters deeper than 126 mwd in all kind of sediments.

Genus *Buntonia* Howe, 1935

Type species *Buntonia shubutaensis* Howe & Chambers, 1935

Buntonia sublatissima (Neviani, 1906)
(Fig. 8q)

1976 *Buntonia sublatissima*; Bonaduce *et al.*, pl. 33, figs 6-8. (Recent, Adriatic Sea).

2013 *Buntonia sublatissima*; Cabral & Loureiro, pl. 8, fig. 8. (Recent, continental shelf and slope of Algarve, Portugal).

Distribution. This species is scarce in the Basque outer shelf during MIS3 and Recent.

Buntonia textilis Bonaduce, Ciampo & Masoli, 1976
(Fig. 8r)

1976 *Buntonia textilis*; Bonaduce *et al.*, p. 55, pl. 33, figs 1-5. (Recent, Adriatic Sea).

1980 *Buntonia textilis*; Colalongo & Pasini, pl. 2, figs 5, 6. (Pleistocene, deep marine, Vrica, Calabria, Italy).

2013 *Buntonia textilis*; Cabral & Loureiro, pl. 8, fig. 9. (Recent, continental slope of Algarve, Portugal).

2014 *Buntonia textilis*; Yasuhara *et al.*, pl. fig. 7, figs 3, 4. (Recent, Icelandic deep-sea waters).

2015 *Buntonia textilis*; Yasuhara *et al.*, figs 31A-E. (Pleistocene, NE Atlantic. Deep marine).

2015 *Buntonia textilis*; Martínez-García *et al.*, pl. 1, fig. 5. (Late Quaternary, Basque shelf).

Distribution. This species is occurring in the Basque shelf during the interval MIS3 to Recent. It can be found in all type of substrates, mainly in silty sand in waters deeper than 140 m.

Genus *Carinocythereis* Ruggieri, 1956

Type species *Carinocythereis carinata* (Roemer, 1838)

Carinocythereis carinata (Roemer, 1838)
(Fig. 9a)

1976 *Carinocythereis antiquata antiquata*; Breman, pl. 8, fig. 103. (Recent, Adriatic Sea).

1979 *Carinocythereis antiquata*; Yassini, pl. 5, figs 12, 13. (Recent, Algerian coastal bay).

1980 *Carinocythereis carinata*; Ruggieri & Russo, pl. 2, fig. 8. (Upper Miocene, Italy).

1987a *Carinocythereis carinata*; Athersuch & Whittaker, 14 (23), p. 97-102. (Late Pliocene, N Italy).

1989 *Carinocythereis carinata*; Athersuch *et al.*, p. 136, fig. 53; pl. 4, fig. 1. (Recent, British Isles, Atlantic coast of France, Mediterranean. Marine sublittoral, 2-60 mwd).

2006 *Carinocythereis carinata*; Mostafawi & Matzke-Karasz, pl. 1, fig. 1. (Pliocene, Greece) [For a complete synonymy].

2013 *Carinocythereis carinata*; Cabral & Loureiro, pl. 8, fig. 10. (Recent, continental shelf and slope of Algarve, Portugal.).

2015 *Carinocythereis carinata*; Martínez-García *et al.*, pl. 1, fig. 6. (Late Quaternary, Basque shelf).

Distribution. *C. carinata* is a common species in this basin, from the MIS3 to the present time, where it can be found alive in fine sediments of inner and outer shelf.

Carinocythereis whitei (Baird, 1850)
(Fig. 9b)

1976 *Carinocythereis antiquata*; Bonaduce *et al.*, pl. 25, figs 8-10. (Recent, Adriatic Sea).

1976 *Carinocythereis antiquata bairdi* Uliczny; Breman, pl. 8, fig. 104. (Recent, Adriatic Sea).

1979 *Carinocythereis carinata carinata*; Yassini, pl. 4, fig. 12. (Recent, Algerian coastal bay).

1985 *Carinocythereis carinata*; Guillaume *et al.*, pl. 109, figs 2-6. (Recent, outer shelf of Bay of Biscay).

1987b *Carinocythereis whitei*; Athersuch & Whittaker, 14 (24), p. 103-110. (Recent, SW Wales).

1987 *Carinocythereis carinata*, *Carinocythereis antiquata*; Aranki, pl. 5, figs 3-7. (Early Pliocene, S Spain, shelf – 10-12 mwd).

1989 *Carinocythereis whitei*; Athersuch *et al.*, p. 137, fig. 54; pl. 4, fig. 2. (Recent, British Isles, Atlantic coast of France, Mediterranean. Marine sublittoral, 2-60 mwd).

1992 *Carinocythereis whitei*; Bonaduce *et al.*, pl. 14, fig. 7. (Late Miocene, Gulf of Gabès, Tunisia).

1994 *Carinocythereis whitei*; Ruíz Muñoz, pl. 24 fig. 3. (Recent, shelf, Huelva, S Spain).

2006 *Carinocythereis carinata*; Mostafawi & Matzke-Karasz, pl. 1, figs 2, 3. (Pliocene, Greece).

2008 *Carinocythereis whitei*; Faranda & Gliozzi, pl. 5, fig. 9. (Plio-Pleistocene, Roma, Italy).

2013 *Carinocythereis whitei*; Cabral & Loureiro, pl. 8, fig. 11. (Recent, continental shelf and slope of Algarve and Holocene, Portugal.).

2014 *Carinocythereis whitei*; Meireles *et al.*, p. 3, pl. 6, figs F-G. (Holocene, Azores. Inner shelf).

2015 *Carinocythereis whitei*; Martínez-García *et al.*, pl. 1, fig. 7. (Late Quaternary, Basque shelf).

Distribution. *C. whitei* is regularly present in the Basque Basin from MIS3 to the present time, where it can be found in fine sediments mostly of the outer shelf.

Carinocythereis sp.
(Fig. 9c)

2008 *Carinocythereis whitei*; Faranda & Gliozzi, pl. 5, fig. 9. (Plio-Pleistocene, Roma, Italy).

Remarks. This is a tuberculated form of *Carinocythereis*, differing from *C. carinata* and *C. whitei* by the virtual absence of lateral ridges.

Distribution. This species has been only found in few MIS3 and Recent samples of the outer Basque shelf.

Genus *Celtia* Neale, 1973

Type species *Celtia quadridentata* (Baird, 1850)

Celtia quadridentata (Baird, 1850)
(Fig. 9d)

1975b *Celtia quadridentata*; Neale, 2 (46), p. 287-294. (Pleistocene to Recent).

1979 *Falunia quadridentata*; Yassini, pl. 7, figs 7, 8. (Recent, Algerian coastal bay).

1985 *Carinocythereis quadridentata*; Guillaume *et al.*, pl. 103, figs 3, 4. (Recent, outer shelf of Bay of Biscay).

1989 *Celtia quadridentata*; Athersuch *et al.*, p. 140, fig. 55; pl. 4, fig. 3. (Recent, British Isles. Norway to the Bay of Biscay. Marine sublittoral, deeper than 75 m).

2013 *Celtia quadridentata*; Cabral & Loureiro, pl. 8, fig. 12. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

2015 *Celtia quadridentata*; Martínez-García *et al.*, pl. 1, fig. 8. (Late Quaternary, Basque shelf).

Distribution. *C. quadridentata* is a common species in the interval MIS3 to Recent in the Basque shelf.

Genus *Costa* Neviani, 1928

Type species *Costa variornata* Hartmann, 1974

Costa runcinata (Baird, 1850)
(Figs 9e, 9f)

1979 *Costa edwardsii*; Yassini, pl. 7, figs 1, 2. (Recent, Algerian coastal bay).

1985 *Costa edwardsii*; Guillaume *et al.*, pl. 102, figs 1, 2. (Recent, inner and outer shelf of Bay of Biscay).

1989 *Costa runcinata*; Athersuch *et al.*, p. 142, fig. 56; pl. 4, fig. 14. (Recent, British Isles, Atlantic coasts of France and Spain, Mediterranean. Marine sublittoral 20-49 mwd, mostly on silty substrates).

1994 *Costa edwardsii*; Ruíz Muñoz, pl. 4, figs 4-7. (Recent, shelf, Huelva, S Spain).

2013 *Costa runcinata*; Cabral & Loureiro, pl. 1, fig. 9. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

2015 *Costa edwardsii*; Martínez-García *et al.*, pl. 1, fig. 9. (Late Quaternary, Basque shelf).

2015 *Costa edwardsii*; Sciuto & Meli, pl. 1, fig. 7. (Pleistocene, SE Italy).

Distribution. This species has been recorded regularly in MIS3 to modern samples of the outer Basque shelf, where it is living today in fine substrates 70-140 mwd.

Genus *Rectotrachyleberis* Ruggieri, 1952

Type species *Rectotrachyleberis hamata* (G.W. Müller, 1894)

Rectotrachyleberis punctatissima (Ruggieri, 1962)
(Fig. 9g)

1973 non *Costa punctatissima*; Doruk, 1 (46), p. 253-256. (Upper Pliocene, Italy).

1987 *Costa punctatissima*; Aranki, pl. 5, fig. 10. (Early Pliocene, S Spain).

1994 *Costa punctatissima*; Ruíz Muñoz, p. 165, pl. 4, figs 8, 9. (Recent, shelf, Huelva, S Spain. Fine sands substrates; biocenoses deeper than 10 m).

Distribution. This species has been recorded in MIS3 to modern samples of the outer Basque shelf, where it is living today.

Genus *Echinocythereis* Puri, 1954

Type species *Echinocythereis garretti* (Howe & Mcguirt in Howe, Hadley *et al.*, 1935)

Echinocythereis aff. *echinata* (Sars, 1866)
(Fig. 9h)

2009 *Echinocythereis echinata*; Alvarez Zarikian, pl. P9, figs 3, 4. (Late Quaternary, N Atlantic IODP 1314, deep ocean).

2013 *Echinocythereis echinata*; Cabral & Loureiro, p. 157. (Recent, continental slope of Algarve, Portugal).

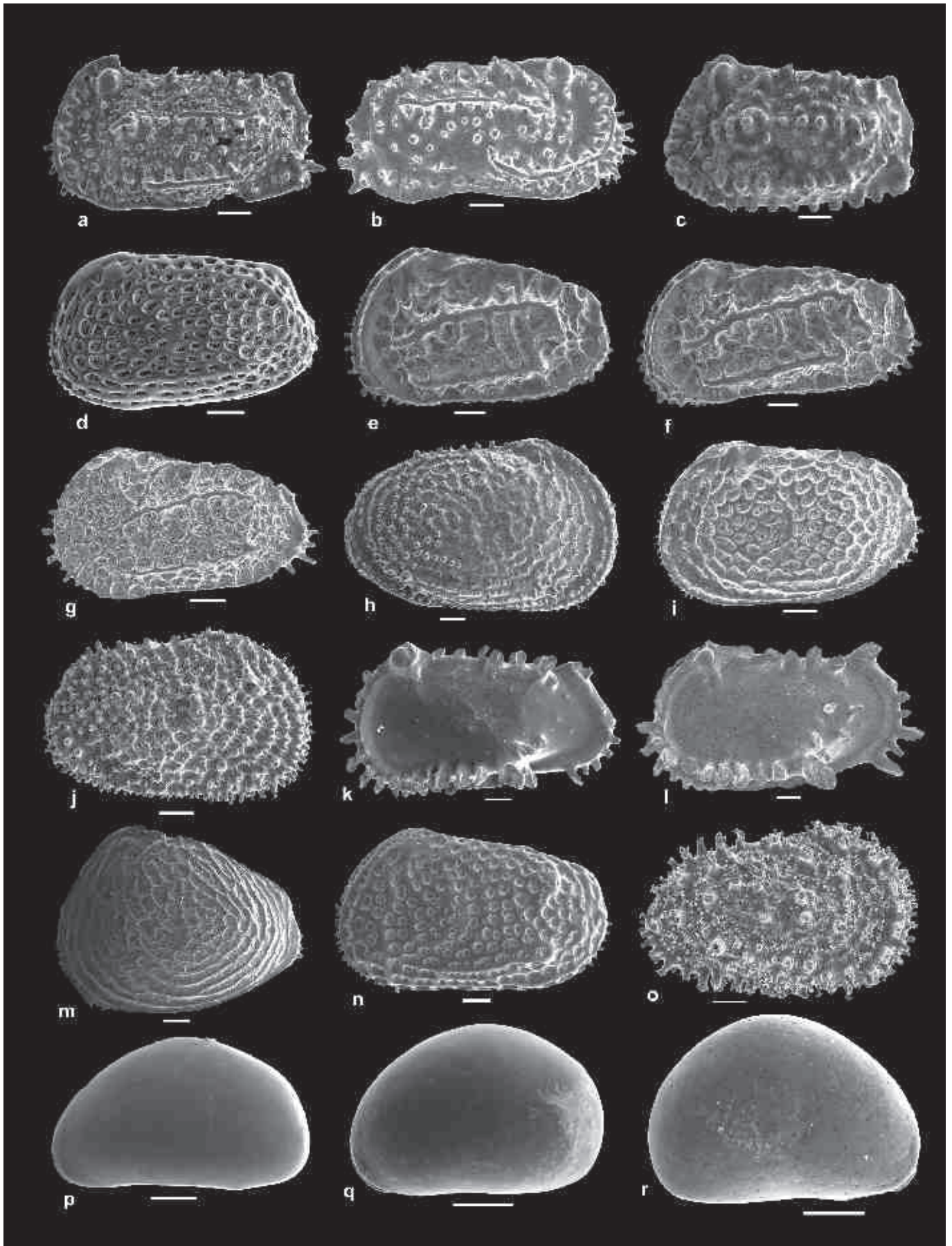
2014 *Echinocythereis echinata*; Yasuhara & Okahashi, pl.-fig. 8, figs 2, 3. (Late Quaternary, site 980, NE Atlantic. Deep marine, upper bathyal).

2015 *Echinocythereis echinata*; Yasuhara & Okahashi, figs 16A-D. (Late Quaternary, NE Atlantic. Deep marine, upper bathyal).

2015 *Echinocythereis echinata*; Yasuhara *et al.*, figs 48A-O. (Middle Miocene to Recent, N Atlantic. Deep marine).

2015 *Echinocythereis echinata*; Brandão & Karanovic, fig. 2, figs A, B; fig. 3, figs A, B. (Type locality, coast of Norway, Oslo Fjord – 55-91 mwd). [For complete synonymy and updating of this species].

Distribution. *E. aff. echinata* is present in the Basque Basin in deep outer shelf and bathyal cores during MIS5 (a, b, d) and MIS3 to Recent. In surface samples it is found in depths of 80-130 m, mostly in sandy substrates.



Echinocythereis laticarina (Brady, 1868)
(Fig. 9i)

1976 *Echinocythereis laticarina*; Bonaduce *et al.*, p. 52, pl. 61, fig. 11. (Recent, Adriatic Sea).

1979 *Echinocythereis laticarina*; Yassini, pl. 12, figs 3-4. (Recent, Algerian coastal bay).

1985 *Echinocythereis laticarina*; Guillaume *et al.*, pl. 104, figs 7-8. (Recent, circalittoral-epibathyal of Bay of Biscay).

Distribution. This species is regularly present in the Basque shelf during the interval MIS3 to Recent.

Genus *Henryhowella* Puri, 1957

Type species *Cythere evax* Ulrich & Bassler, 1904

“*Henryhowella*” sp.
(Fig. 9j)

2009 *Henryhowella dasyderma*; Alvarez Zarikian, pl. P9, figs 6-8. (Late Quaternary, N Atlantic IODP 1314, deep ocean).

2013 *Henryhowella* spp.; Brandão & Yasuhara, pl. 2, figs a, b, d. (Challenger station 296. Fig. c, station 302. SE Pacific. Off Chile, deep ocean – 3338 mwd).

2015 *Henryhowella dasyderma*; Alvarez Zarikian, pl. 10, figs 7, 8. (Pleistocene, S Pacific. IODP 329. Deep ocean).

Remarks. Brandão & Yasuhara (2013) included *Henryhowella dasyderma* (Brady, 1880) in the genus *Ayressoleberis* Brandão & Yasuhara, 2013. Morphologically “*Henryhowella*” sp. is very close to *A. dasyderma*, but we let it in open nomenclature waiting for a more complete study.

Distribution. This species has been found in MIS3 and mid-late Holocene to Recent in the outer Basque shelf. In surface samples it occurs in very fine sands 130-150 mwd.

Genus *Pterygocythereis* Blake, 1933

Type species *Pterygocythereis jonesii* (Baird, 1850)

Pterygocythereis ceratoptera (Bosquet, 1852)
(Fig. 9k)

1976 *Pterygocythereis ceratoptera*; Bonaduce *et al.*, p. 53, pl. 30, figs 1-2. (Recent, Adriatic Sea. Shelf, 71-160 mwd in fine sands and silts).

2013 *Pterygocythereis ceratoptera*; Cabral & Loureiro, pl. 8, fig. 18. (Recent, continental shelf of Algarve, Portugal).

2015 *Pterygocythereis ceratoptera*; Martínez-García *et al.*, pl. 1, fig. 21. (Late Quaternary, Basque shelf).

Distribution. *P. ceratoptera* is a dominant species in these assemblages. It has been regularly recorded from MIS3 to the modern Basque shelf, where it is living at 90 to 152 mwd.

Pterygocythereis jonesii (Baird, 1850)
(Fig. 9l)

1976 *Pterygocythereis jonesii*; Bonaduce *et al.*, p. 54, pl. 29, figs 1-2. (Recent, Adriatic Sea. Shelf, optimum 80-170 mwd in fine sands to silts).

1978 *Pterygocythereis jonesii*; Athersuch, p. 9-16.

1979 *Pterygocythereis jonesii*; Yassini, pl. 4, fig. 1. (Recent, Algerian coastal bay).

1985 *Pterygocythereis jonesii*; Guillaume *et al.*, pl. 103, figs 7-8. (Recent, circalittoral of Bay of Biscay).

1989 *Pterygocythereis jonesii*; Athersuch *et al.*, p. 146, fig. 58; pl. 4, fig. 6. (Recent. British Isles, Denmark, French and Spanish coasts, Mediterranean. Marine sublittoral up to 200 mwd).

2008 *Pterygocythereis jonesii*; Faranda & Gliozzi, pl. 7, fig. 2. (Plio-Pleistocene, Roma, Italy).

Figure 9. Ostracods from the Basque Basin. **a)** *Carinocythereis carinata* (Roemer, 1838), female LV, ZTF666, Recent. **b)** *Carinocythereis whitei* (Baird, 1850), male RV, 81-30, KS05-183 cm, MIS3. **c)** *Carinocythereis* sp., LV, ZTF664, Recent. **d)** *Celtia quadridentata* (Baird, 1850), LV, 1512, KS05-24 cm, MIS3. **e)** *Costa runcinata* (Baird, 1850), female LV, 82-26, KS05-210 cm, MIS3. **f)** *Costa runcinata* (Baird, 1850), male LV, 82-28, KS05-210 cm, MIS3. **g)** *Rectotrachyleberis punctatissima* (Ruggieri, 1962), LV, 81-28, KS10-183 cm, Early Holocene. **h)** *Echinocythereis* aff. *echinata* (Sars, 1866), RV, 1566, KS05-187 cm, MIS3. **i)** *Echinocythereis laticarina* (Brady, 1868), LV, 81-27, KS10-183 cm, Early Holocene. **j)** “*Henryhowella*” sp., RV, 1539, KS05-231 cm, MIS3. **k)** *Pterygocythereis ceratoptera* (Bosquet, 1852), LV, 1502, KS05-241 cm, MIS3. **l)** *Pterygocythereis jonesii* (Baird, 1850), LV, 82-29, KS05-210 cm, MIS3. **m)** *Rabilimis mirabilis* (Brady, 1868) Hazel, 1967, LV, KS10-45 cm, Holocene. **n)** *Robertsonites* cf. *tuberculatus* (Sars, 1866), female LV, 1564, KS05-187 cm, MIS3. **o)** *Trachyleberis?* sp., RV, 81-54, KS16-71 cm, MIS2. **p)** *Xestoleberis* aff. *dispar* G.W. Müller, 1894, LV, ZTF783, Recent. **q)** *Xestoleberis* aff. *rubens* Whittaker, 1978, LV, ZTF776, Recent. **r)** *Xestoleberis* sp., RV, 1529, KS05-241 cm, MIS3.

2013 *Pterygocythereis jonesii*; Cabral & Loureiro, pl. 8, fig. 19. (Recent, continental shelf and slope of Algarve and Holocene, Portugal).

2015 *Pterygocythereis jonesii*; Martínez-García *et al.*, pl. 1, fig. 22. (Late Quaternary, Basque shelf).

Distribution. *P. jonesii* is another dominant species in these assemblages. It has been regularly recorded from MIS3 to the modern Basque shelf, where it is living at depths more than 90 m in all type of substrates, more preferably in fine sediments.

Genus *Rabilimis* Hazel, 1967

Type species *Rabilimis mirabilis* (Brady, 1868) Hazel, 1967

Rabilimis mirabilis (Brady, 1868) Hazel, 1967 (Fig. 9m)

2000 *Rabilimis mirabilis*; Didié & Bauch, pl. 4, fig. 8. (MIS4, NE Atlantic).

2007 *Rabilimis mirabilis*; Stepanova *et al.*, pl. 3, fig. 9. (Recent, Kara and Laptev Seas).

2017 *Rabilimis mirabilis*; Gemery *et al.*, pl. 23, fig. 7. (Recent, Chukchi Sea, Arctic Ocean).

Distribution. This species is very rare in mid-late Holocene and Recent of the inner Basque shelf.

Genus *Robertsonites* Swain, 1963

Type species *Robertsonites gubikensis* Swain, 1963

Robertsonites cf. tuberculatus (Sars, 1866) (Fig. 9n)

1981 *Robertsonites tuberculatus*; Cronin, pl. 8, fig. 5. (Late Pleistocene, Champlain Sea).

1988 *Robertsonites tuberculatus*; Cronin, pl. 2, fig. 10. (Pleistocene, postglacial NW Atlantic).

1989 *Robertsonites tuberculatus*; Athersuch *et al.*, p. 148, fig. 59; pl. 4, fig. 7. (Recent, British Isles and Arctic. Marine sublittoral up to 75 mwd).

Distribution. In the Basque Basin, this species has been recorded in MIS3, MIS2 and few individuals in Recent samples of the outer shelf.

Genus *Trachyleberis* Brady, 1898

Type species *Trachyleberis scabrocuneata* (Brady, 1880) Brady, 1898

Trachyleberis? sp. (Fig. 9o)

1997 ?*Acanthocythereis coreana*; Huh & Whatley, p. 39, pl. 3, figs 6-7. (Miocene Pohang Basin, SE Korea).

2006 *Acanthocythereis acanthoderma*; Schornikov & Zenina, pl. 2, fig. 15. (Recent, Arctic Ocean).

2015 "*Trachyleberis*" sp.; Martínez-García *et al.*, pl. 1, fig. 25. (Late Quaternary, Basque shelf).

Remarks. This species is provisionally placed in the genus *Trachyleberis?*, waiting for a revision of this spinose trachyleberid, which is morphologically close to *Actinocythereis* Puri, 1953b, and *Croninocythereis* Yasuhara *et al.*, 2015.

Distribution. In the Basque Basin this species is regularly present in MIS3 and MIS2 in the outer shelf, while in the Holocene it is occurring in the inner shelf. Also occurring in MIS5d of the deep Bay of Biscay.

Family **Xestoleberididae** Sars, 1928

Genus *Xestoleberis* Sars, 1866

Type species *Xestoleberis aurantia* (Baird, 1838)

Xestoleberis aff. *dispar* G.W. Müller, 1894 (Fig. 9p)

1976 *Xestoleberis dispar*; Bonaduce *et al.*, pl. 73, figs 1-3. (Recent, Adriatic Sea).

Distribution. This species has been recorded in the interval MIS3 to Recent in the Basque shelf. In modern samples it is found in all types of substrates up to 122 mwd.

Xestoleberis aff. *rubens* Whittaker, 1978 (Fig. 9q)

aff. 1978 *Xestoleberis rubens* sp. nov. Whittaker, p. 35-44.

aff. 1989 *Xestoleberis rubens*; Athersuch *et al.*, p. 238, fig. 101. (Recent, British Isles and Atlantic coast of France. Marine phytal).

aff. 2013 *Xestoleberis rubens*; Cabral & Loureiro,

pl. 9, fig. 7. (Recent, estuarine, continental shelf of Algarve and Holocene, Portugal).

Distribution. This species has been recorded in the interval MIS2 to Recent in the Basque shelf. In modern samples it is found in fine sand substrates 50-70 mwd.

Xestoleberis sp.
(Fig. 9r)

Distribution. In the Basque Basin, this species has only been recorded in MIS3 in the outer shelf.

Taxonomic list of other species. Taxonomic list of species not included in the systematic chapter due to their scarcity in the Basque Basin. Age and distribution in the Basque Basin/Bay of Biscay are indicated.

Argilloecia acuminata G.W. Müller, 1894. MIS5 to Recent, deep bathyal Bay of Biscay.

Argilloecia sp. 2. MIS2, MIS3, deep bathyal Bay of Biscay.

Argilloecia sp. 3. MIS3, MIS4, deep bathyal Bay of Biscay.

Argilloecia sp. 4. MIS3, deep bathyal Bay of Biscay.

Australoecia cf. *posteroacuta* Coles & Whatley, 1989. MIS3 and early Holocene, outer Basque shelf and MIS4, MIS2, deep bathyal Bay of Biscay.

Basslerites teres (Brady, 1869). Recent, Basque shelf.

Buntonia (*Quasibuntonia*) *radiatopora* (Seguenza, 1880). MIS5b, deep bathyal Bay of Biscay.

Bythocypris sp. MIS2, MIS4, Recent, deep bathyal Bay of Biscay.

Bythocythere eugeneschornikovi Yasuhara, Okahashi & Cronin, 2009. MIS5c, deep bathyal Bay of Biscay. Doubtful record in Neoglacial Holocene of the outer Basque shelf.

Cytheridea acuminata? (Bosquet, 1852). MIS3 of the outer Basque shelf.

Cytheropteron sp. 4. Very rare in the Recent Basque shelf.

Elofsonella sp. MIS3, deep bathyal Bay of Biscay.

Eucytherura? sp. Early Holocene of the inner shelf.

Hemicythere rubida (Brady, 1868). MIS3, deep bathyal Bay of Biscay.

Hemicythere sp. Early Holocene of inner shelf.

Krithe aff. *pernoides* (Bornemann, 1855). MIS2, upper bathyal Bay of Biscay.

Krithe pernoides sinuosa (Bornemann, 1855). MIS5 and early Holocene, deep bathyal Bay of Biscay.

Krithe trinidadensis Bold, 1958. MIS5 to MIS3, deep bathyal Bay of Biscay.

Legitimocythere sp. MIS5c, deep Bay of Biscay.

Leptocythere tenera (Brady, 1868) Sars, 1925. Early Holocene, inner Basque shelf.

Paracytheridea cuneiformis (Brady, 1886). Mid-late Holocene, inner Basque shelf.

Paracytherois productum Yasuhara, Okahashi & Cronin, 2009. MIS4, MIS5b, deep Bathyal Bay of Biscay.

Paradoxostoma sp. 1. Recent, epibathyal Bay of Biscay.

Paradoxostoma sp. 2. Recent, epibathyal Bay of Biscay.

Paradoxostoma sp. 3. Recent, epibathyal Bay of Biscay.

Paradoxostoma sp. 4. Recent of the Basque shelf.

Pontocypris acuminata (G.W. Müller, 1894). Recent, Basque shelf.

Propontocypris intermedia (Brady, 1868). Recent, Landas shelf.

Propontocypris pirifera (G.W. Müller, 1894). Recent, Landas shelf.

Pseudocythere gr. *caudata* Sars, 1866. MIS3 to Recent, outer shelf and bathyal Bay of Biscay.

Pseudocythere calcarata (Seguenza, 1880). MIS2, deep bathyal Bay of Biscay.

Sarsicytheridea bradyi (Norman, 1865). MIS3, outer shelf.

4. BIOSTRATIGRAPHY AND PALAEOECOLOGY

Stratigraphic and ecologic ranges of the described 155 ostracod species are shown in Figure 10. Most of the records range from MIS3 to Recent. Records from MIS4, MIS5 are from deep bathyal core PP10-17 and are here included to complete depth records of many of the species from the Basque shelf. Holocene has been divided into early, mostly warm (Hypsithermic), and mid-late, mostly cold (Neoglacial). We only found 19 species living today in this basin.

Modern ostracod assemblages in the Basque shelf are regulated by the sediment-type, the amount of organic matter, the oxygen content and depth, and dominated by *Costa runcinata*, *Pterygocythereis ceratoptera-jonesii*,

Ostracods Basque Basin									
	Living	Recent	Neoglacial	Hypsithermic	MIS 2	MIS 3	MIS 4	MIS 5	
									Estuarine
									Inner shelf
									Outer shelf
									Epibathyal
									Mesobathyal-Abyssal
<i>Actinocythereis dunelmensis</i> (Norman, 1865)		x	x	x	x	x			
<i>Argilloecia acuminata</i> G.W. Müller, 1894	x	x	x		x	x	x	x	
<i>Argilloecia</i> aff. <i>conoidea</i> (Sars, 1923)		x							
<i>Argilloecia bensoni</i> Barra, Aiello & Bonaduce, 1996	x	x	x	x	x	x			
<i>Argilloecia</i> sp. 1		x	x	x	x	x			
<i>Argilloecia</i> sp. 2					x	x			
<i>Argilloecia</i> sp. 3						x	x		
<i>Argilloecia</i> sp. 4						x			
<i>Aurila convexa</i> (Baird, 1850)		x	x	x					
<i>Aurila woutersi</i> Home, 1986		x	x	x	x				
<i>Australoecia</i> cf. <i>posteroacuta</i> Coles & Whatley, 1989				x	x	x	x		
<i>Basslerites teres</i> (Brady, 1869)	x								
<i>Bosquetina tarentina</i> (Baird, 1850)	x	x	x	x	x	x			
<i>Brunneostoma</i> spp.		x			x				
<i>Buntonia (Quasibuntonia) radiatopora</i> (Seguenza, 1880)								5b	
<i>Buntonia sublatissima</i> (Neviani, 1906)		x				x			
<i>Buntonia textilis</i> Bonaduce, Ciampo & Masoli, 1975		x	x	x	x	x			
<i>Bythocypris</i> aff. <i>affinis</i> (Brady, 1886)		x							
<i>Bythocypris</i> sp.					x				
<i>Bythocythere bradleyi</i> Athersuch, Home & Whittaker, 1983			x	x		x			
<i>Bythocythere bradyi</i> Sars, 1926		x	x	x		x			
<i>Bythocythere eugeneschornikovi</i> Yasuhara, Okahasi & Cronin, 2009			?					5c	
<i>Bythocythere intermedia</i> Elofson, 1938		x		x					
<i>Bythocythere zetlandica</i> Athersuch, Home & Whittaker, 1983		x							
<i>Callistocythere curryi</i> Home, Lord, Robinson & Whittaker, 1990		x							
<i>Callistocythere littoralis</i> (G.W. Müller, 1894)		x	x						
<i>Carinocythereis carinata</i> (Roemer, 1838)	x	x	x	x	x	x			
<i>Carinocythereis</i> sp.		x				x			
<i>Carinocythereis whitei</i> (Baird, 1850)		x	x	x	x	x			
<i>Caudites calceolatus</i> (Costa, 1853)	x	x							
<i>Celtia quadridentata</i> (Baird, 1850)		x	x	x	x	x			
<i>Cluthia keiji</i> Neale, 1975			x	x	x				
<i>Costa runcinata</i> (Baird, 1850)	x	x	x	x	x	x			
<i>Cuneocythere semipunctata</i> (Brady, 1868)	x	x	x	x	x	x			
<i>Cushmanidea turbida</i> (G.W. Müller, 1894)		x	x	x					
<i>Cythere lutea</i> O.F. Müller, 1785			x	x	x	x			
<i>Cytherella alvearium</i> Bonaduce, Ciampo & Masoli, 1975	x	x	x	x	x	x			
<i>Cytherella lata</i> Brady, 1880		x	x	x	x	x			
<i>Cytherella robusta</i> Colalongo & Pasini, 1980						x			
<i>Cytheridea acuminata?</i> (Bosquet, 1852)						x			
<i>Cytheropteron crassipinatum</i> Brady & Norman, 1888		x							
<i>Cytheropteron dorsocostatum</i> Whatley & Masson, 1979		x	?	?	?	x			
<i>Cytheropteron hadriaticum</i> Bonaduce, Ciampo & Masoli, 1976		x	x			x			
<i>Cytheropteron pararcticum</i> Whatley & Masson, 1979						x			
<i>Cytheropteron</i> cf. <i>ruggieri</i> Pucci, 1956		x	x	x	x	x			
<i>Cytheropteron vespertilio</i> (Reuss, 1850) Brady, 1868		x	x	x	x	x			
<i>Cytheropteron</i> aff. <i>vespertilio</i> (Reuss, 1850) Brady, 1868		x	x	x	x				
<i>Cytheropteron testudo</i> Sars, 1870		x	x		x	x			
<i>Cytheropteron</i> sp. 1				x					
<i>Cytheropteron</i> sp. 2		x							
<i>Cytheropteron</i> sp. 3						x			
<i>Cytheropteron</i> sp. 4		x							
<i>Cytherura gibba?</i> (O.F. Müller, 1785)		x						x 5a	
<i>Echinocythereis</i> aff. <i>echinata</i> (Sars, 1866)		x	x	x	x	x		a, b, d	
<i>Echinocythereis laticarina</i> (Brady, 1868)		x	x	x	x	x			
<i>Elofsonella concinna</i> (Jones, 1857)		x			x	x			
<i>Elofsonella</i> sp.						x			
<i>Elofsonia pusilla</i> (Brady & Robertson, 1870)		x							
<i>Eucythere anglica</i> Brady, 1868		x	x	x	x	x			
<i>Eucythere curta</i> Ruggieri, 1975		x	x			x			
<i>Eucytherura complexa</i> (Brady, 1867)		x	x	x		x			
<i>Eucytherura mistrettai</i> Sissingh, 1972		x	x	x	x	x			
<i>Eucytherura?</i> sp.				x					
<i>Finnmarchinella (Barentsovia) angulata</i> (Sars, 1866)		x	x	x	x	x			
<i>Hemicythere rubida</i> (Brady, 1868)						x			
<i>Hemicythere</i> sp.				x					
<i>Hemicythere villosa</i> (Sars, 1866)			x	x	x	x			
<i>Hemicytherura</i> aff. <i>clathrata</i> (Sars, 1866)			x	x	x	x			
<i>Hemicytherura hoskini</i> Home, 1981		x	x	x	x				
<i>Henryhowella</i> sp.		x	x			x			
<i>Heterocyprideis sorbyana</i> (Jones, 1857)						x			
<i>Heterocythereis albomaculata</i> (Baird, 1838)	x		x	x	x	x			
<i>Jonesia</i> aff. <i>acuminata</i> (Sars, 1866)				x					
<i>"Krithe" gr. bartonensis</i> (Jones, 1857)	x	x	x		x	x			
<i>Krithe dolichodeira</i> Bold, 1946					x	x	x	x	

<i>Krithe minima</i> Coles, Whatley & Mogueilevsky, 1994	x		x	x	x				
<i>Krithe morkhoveni</i> Bold, 1960			x	x	x	x			
<i>Krithe</i> aff. <i>pernoides</i> (Bornemann, 1855)				x					
<i>Krithe</i> gr. <i>pernoides</i> (Bornemann, 1855)			x		x				
<i>Krithe pernoides sinuosa</i> (Bornemann, 1855)			x						x
<i>Krithe trinidadensis</i> Bold, 1958					x	x			x
<i>Legitimocythere</i> sp.									5c
<i>Leptocythere baltica</i> Klie, 1929		x	x		x				
<i>Leptocythere castanea</i> (Sars, 1866)		x	x		x				?
<i>Loxoconcha elliptica</i> Brady, 1868	x	x							
<i>Leptocythere</i> aff. <i>lacertosa</i> (Hirschmann, 1912)	x	x			x				?
<i>Leptocythere macallana</i> (Brady & Robertson, 1869)	x								
<i>Leptocythere pellucida</i> (Baird, 1850)		x	x		x				
<i>Leptocythere tenera</i> (Brady, 1868) Sars, 1925					x				
<i>Loxoconcha rhomboidea</i> (Fischer, 1855)	x	x	x	x	x	x			
<i>Loxoconcha</i> sp. 1 aff. <i>Loxoconcha linleyi</i> Home, 1982					?				x
<i>Macrocypris minna</i> (Baird, 1850)	x	x	x	x	x	x			
<i>Macrocypris tenuicauda</i> Brady, 1880						x			5c
<i>Microcytherura fulva</i> (Brady & Robertson, 1874)	x								
<i>Neocytherideis subulata</i> (Brady, 1868)		x	x	x		x			
<i>Neonesidea</i> aff. <i>corpulenta</i> (G.W. Müller, 1894)	x								
<i>Neonesidea longevaginata</i> (G.W. Müller, 1894)		x	x	x					
<i>Neonesidea mediterranea</i> (G.W. Müller, 1894)	?	x	x	x					
<i>Oculocytheropteron nodosum</i> (Brady, 1868)		x	x	x	x	x			
<i>Palmenella limicola</i> (Norman, 1865)			x		x	x			
<i>Palmococoncha guttata</i> (Norman, 1865)	x	x	x	x	x	x			
<i>Palmococoncha laevata</i> (Norman, 1865)		x	x	x	x	x			
<i>Paracypris polita</i> Sars, 1866	x	x	x	x	x	x			
<i>Paracytheridea cuneiformis</i> (Brady, 1886)			x						
<i>Paracytherois flexuosa</i> (Brady, 1867)	x				x				
<i>Paracytherois productum</i> Yasuhara, Okahashi & Cronin, 2009							x		5b
<i>Paracytherois</i> sp. 1	x								
<i>Paracytherois</i> sp. 2	x								
<i>Paradoxostoma</i> aff. <i>abbreviatum</i> Sars, 1866	x	x	x	x	x				
<i>Paradoxostoma ensiforme</i> Brady 1868	x								
<i>Paradoxostoma tenuissimum</i> (Norman, 1869)					x		x		
<i>Paradoxostoma variabile</i> (Baird, 1835)	x	x							
<i>Paradoxostoma</i> sp. 1	x								
<i>Paradoxostoma</i> sp. 2	x								
<i>Paradoxostoma</i> sp. 3	x								
<i>Paradoxostoma</i> sp. 4	x								
<i>Parakrithe dimorpha</i> Bonaduce, Ciampo & Masoli, 1975		x	x			x			x
<i>Parakrithe</i> sp. 1	x				x				
<i>Polycope frequens</i> G.W. Müller, 1894, sensu Bonaduce et al., 1975	x								
<i>Polycope</i> cf. <i>reticulata</i> (G.W. Müller, 1894)		x	x	x	x	x			
<i>Pontocypris acuminata</i> (G.W. Müller, 1894)	x								
<i>Propontocypris intermedia</i> (G. Brady, 1868).	x								
<i>Propontocypris pirifera</i> (G.W. Müller, 1894)	x								
<i>Pseudocythere calcarata</i> (Seguenza, 1880)						x			
<i>Pseudocythere caudata</i> Sars, 1866	x	x	x	x	x				
<i>Pseudocythere</i> gr. <i>caudata</i> Sars, 1866	x	x			x	x			
<i>Pseudopsammocythere similis</i> (G.W. Müller, 1894)		x	x	x					
<i>Pterygocythereis ceratoptera</i> (Bosquet, 1852)	x	x	x	x	x	x			
<i>Pterygocythereis jonesii</i> (Baird, 1850)	x	x	x	x	x	x			
<i>Rabilimis mirabilis</i> (Brady, 1868) Hazel, 1967			x	x					
<i>Rectotrachyleberis punctatissima punctatissima</i> (Ruggieri, 1962)	x	x			x	x	x		
<i>Robertsonites</i> cf. <i>tuberculatus</i> (Sars, 1866)	x					x	x		
<i>Sagmatocythere multifora</i> (Norman, 1865)	x								
<i>Sagmatocythere</i> aff. <i>multifora</i> (Norman, 1865)	x	x	x	x	x				
<i>Sagmatocythere variesculpta</i> (Ruggieri, 1962)	x								
<i>Sagmatocythere</i> aff. <i>variesculpta</i> (Ruggieri, 1962)	x								
<i>Sarsicytheridea bradyi</i> (Norman, 1865)									X
<i>Sclerochilus rudjakovi</i> Athersuch & Home, 1987	?	x	x	x	x				
<i>Semicytherura acuminata</i> (G.W. Müller, 1894)	x								
<i>Semicytherura angulata</i> (Brady, 1868)		x	x			x			
<i>Semicytherura arcachonensis</i> Yassini, 1969	x	x	x	x	x				
<i>Semicytherura</i> aff. <i>S. angulata</i> (Brady, 1868)	x								
<i>Semicytherura</i> aff. <i>nigrescens</i> (Baird, 1838)									x
<i>Semicytherura</i> aff. <i>simplex</i> (Brady & Norman, 1889) Yassini, 1969	x	x							
<i>Semicytherura</i> cf. <i>stilifera</i> Bonaduce et al., 1976, sensu Cabral & Loureiro, 2013	x	x	x	x	x				
<i>Semicytherura tela</i> Home & Whittaker, 1980					x	x			
<i>Semicytherura undata</i> (Sars, 1866)		x	x			x			x 5e
<i>Semicytherura</i> sp. 1	x	x	x			x			
<i>Semicytherura</i> sp. 2	x	x	x						
<i>Thaerocythere hoptonensis</i> (Brady, Crosskey & Robertson, 1874)	x	x							
<i>Trachyleberis?</i> sp.	x	x	x	x	x				5d
<i>Urocythereis britannica</i> Athersuch, 1977	x	x	x	x	x				
<i>Xestoleberis</i> aff. <i>dispar</i> G.W. Müller, 1894	x	x	x	x	x				
<i>Xestoleberis</i> aff. <i>rubens</i> Whittaker, 1978	x	x	x	x					
<i>Xestoleberis</i> sp.									x

Figure 10. Alphabetic list of the 155 studied ostracod species from the Basque Basin. Occurrences in the interval MIS5 to Recent and ecological distributions are shown.

Palmoconcha guttata, *Carinocythereis carinata* and *Oculocytheropteron nodosum*. In muddy sediment, *P. guttata* dominates in shallow waters (<100 mwd) and *P. jonesii* in the outer shelf.

Several ecologic assemblages can be recognised at generic level in this basin, with a variable number of species (Fig. 10). Deep (bathyal) assemblages are characterised by species of the genera *Cytheropteron* (12 spp.), *Kriithe* (8 spp.), *Argilloecia* (7 spp.), *Buntonia* (3 spp.), *Bythocythere* (3 spp.), *Cytherella* (2 spp.), *Echinocythereis* (2 spp.), *Pseudocythere* (2 spp.), *Parakriithe* (2 sp.), *Australoecia* (1 sp.), *Finmarchinella* (1 sp.), *Hemicythere* (1 sp.), *Henryhowella* (1 sp.), *Legitimocythere* (1 sp.), *Macrocypris* (2 spp.).

The outer shelf bears species of the genera *Paradoxostoma* (7 spp.), *Semicytherura* (7 spp.), *Paracytheroidea* (4 spp.), *Sagmatocythere* (4 spp.), *Carinocythereis* (3 spp.), *Neonesidea* (3 spp.), *Bythocythere* (2 spp.), *Eucythere* (2 spp.), *Eucytherura* (2 spp.), *Palmoconcha* (2 spp.), *Polycope* (2 spp.), *Propontocypris* (2 spp.), *Pseudocythere* (2 spp.), *Costa* (1 sp.), *Cuneocythere* (1 sp.).

Inner shelf assemblage contains *Leptocythere* (4 spp.), *Aurila* (2 spp.), *Loxoconcha* (2 spp.), *Xestoleberis* (2 spp.), *Caudites* (1 sp.), *Celtia* (1 sp.), *Hemicytherura* (1 sp.).

There are also present some representatives of outer estuarine ostracods: *Leptocythere* (3 spp.), *Semicytherura* (2 spp.), *Loxoconcha* (1 sp.).

Finally, we found several specimens of species (*Cypria ophthalmica* (Jurine), *Ilyocypris gibba?* (Ramdohr), *Limnocythere inopinata* (Baird), *Pseudocandona* sp.) typical of riverine-lacustrine environments that have been transported to the shelf by the rivers.

5. CONCLUSIONS

- 1) Taxonomy of 155 ostracod species have been characterised in the Late Quaternary of the Basque Basin by the first time.
- 2) Biostratigraphic repartitions of these species have been depicted for MIS5 to Recent interval.
- 3) Main (palaeo)ecologic assemblages have been recognised at generic level from the bathyal to coastal environments in this basin.

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