

# New marine amphipod records on the Algerian coast

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*Recent sampling surveys (2011–2012) of the shallow (0–50 m) hard-bottom communities and re-examination of some soft-bottom communities (5–143 m) along the Algerian coast have allowed the collection of 33 species (five Caprelliidea, 27 Gammaridea and one Hyperiidea), which were not recorded before in the inventory of the marine amphipod fauna of Algeria (Bakalem & Dauvin, 1995; Grimes et al., 2009). This paper reports the number of specimens sampled for each of these 33 species and provides data on their geographical distribution and habitats. Fourteen of the species (43%) are considered to be endemic to the Mediterranean Sea; 15 others are north-eastern Atlantic and Mediterranean species, and the four last are cosmopolitan species. Twenty-nine of the new records are known for Italian waters and 19 in Greek waters where there is intensive amphipod inventory. The total number of marine amphipod fauna in Algeria is now 332.*

**Keywords:** amphipods, Algerian coast, new records, distribution

Submitted 5 September 2013; accepted 17 January 2014; first published online 4 March 2014

## INTRODUCTION

The first marine amphipod inventory of the Algerian coast was provided by Chevreux (1911) who recorded 117 species along the Algerian coast. Later, Bakalem & Dauvin (1995) compiled the first complete inventory of the benthic marine amphipod on the Algerian coast, accounting 253 species. Quantitative surveys made between 1995 and 2001 along the entire Algerian coast permitted to add 45 new amphipod species from ten bays from the Morocco frontiers to the Tunisian frontiers (Figure 1)(Grimes et al., 2009).

In this paper we report the results of recent fieldwork made along the Algerian littoral in two main areas of the western part of the Algerian coast, from the Beni Saf, Rachgoun and Habibas Islands in the Oran Bay, the Arzew Bay and from Chenoua–Kouali area in the western part of the Bou Ismail Bay, respectively (Figure 1). These new samplings permitted collection of 33 marine benthic amphipod species which had not been reported before (Chevreux, 1911; Bakalem & Dauvin, 1995; Grimes et al., 2009). For each species, data on the substratum type and the depth at which they were found are given. Then, ecological and biogeographical annotations are given for each species.

## MATERIALS AND METHODS

The fauna were sorted and identified (when possible) to the species taxonomic level, using the keys of Mediterranean

amphipod fauna established by Ruffo *et al.* (1982, 1989, 1993, 1998). The taxonomy was validated using the ERMS reference for amphipods introduced by Bellan-Santini & Costello (2001), which was consulted on 24 April 2013 and 28 October 2013. Between these dates, was the introduction of the new phylogeny and classification of Amphipoda by Lowry & Myers (2013), with the creation of a suborder among the Amphipoda: the Senticaudata. So the 2013 classification was taken into account in this paper. Table 1 gives the main information about the sampling locations and years which permitted the identification of new amphipod species for the Algerian coast. Three main habitats were sampled: soft-bottoms and *Posidonia oceanica* meadows with the Van Veen and Smith–McIntyre grabs and hard bottoms with manual sampling by autonomous diver (Table 1).

## RESULTS AND DISCUSSION

The new records (ind. for individual; and st. for station) for Algerian coast are:

Suborder SENTICAUDATA  
Family CAPRELLIDAE  
*Caprella grandimana* (Mayer, 1882)

## MATERIAL EXAMINED

3 ind. st. 16(1), 1 ind. st. 17(1), 2 ind. st. 18(1) and 2 ind. st. 18(3) for a total of 8 ind. from the Chenoua–Kouali area. The species found in several types of substratum: on hard bottoms with *Cystoseira* algae (0 m), in the *Cymodocea* and *Zostera* meadows (0.3 m), on gravel and pebble within

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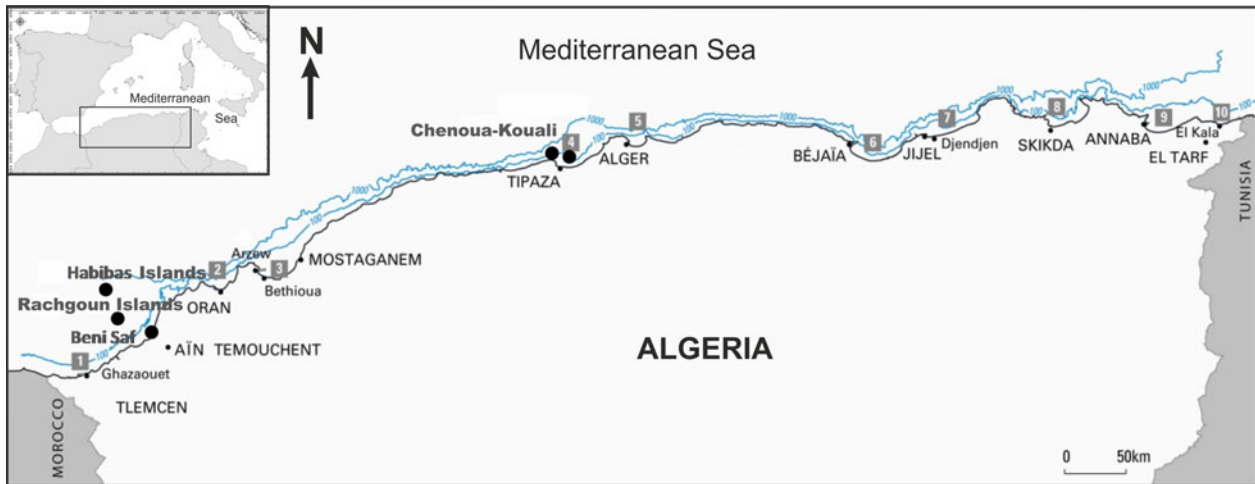


Fig. 1. Location of the sampling sites. Black circles, new prospected sites—the Beni Saf, Rachgoun and Habibas Islands in the Oran Bay and from the Chenoua–Kouali area in the western part of Bou Ismail Bay. Grimes *et al.* (2009) sites: 1. Ghazaouet Bay; 2. Oran Bay; 3. Arzew Bay; 4. Bou Ismail Bay; 5. Algiers Bay; 6. Béjaïa Bay; 7. Jijel Bay; 8. Skikda Bay; 9. Annaba Bay; and 10. El Kala Bay.

outcrops of hard bottoms (0.5–1 m), and in the *Posidonia oceanica* meadows (20–21 m).

#### LOCATION

In the Amphipoda of the Mediterranean, Ruffo *et al.* (1993) considered *C. grandimana* as a Mediterranean endemic species recorded in both eastern and western basins among algae (0–10 m). Then, the species was recorded on the Atlantic African Coast from Cap Spartel to Cap Blanc (Ruffo *et al.*, 1998; Guerra-Garcia *et al.*, 2000). It was very abundant in the seaweed *Stypocaulon scoparium* of Strait of Gibraltar (Guerra-Garcia *et al.*, 2009). Guerra-Garcia & Takeuchi (2002) reported the species on hard bottoms mainly composed of the seaweeds *Cystoseira usneoides*, *Asparagopsis armata*, *Cladostephus verticillatus* and *Haopteris scoparia* and the hydroid *Sertularella gayi*. Later, Guerra-Garcia *et al.* (2009) and Guerra-Garcia & Izquierdo (2010) confirmed the presence of *C. grandimana* in the Atlantic, probably occasional and restricted to localities within the influence of the Strait of Gibraltar; for the authors this species remained clearly an endemic Mediterranean species. Soler-Hurtado & Guerra-Garcia (2011) reported that the species was strictly associated with the algae *Asparagopsis armata* on the Iberian coasts from the Strait of Gibraltar. However, Vazquez-Luis *et al.* (2009) recorded *C. grandimana* in shallow waters invaded by the algae *Caulerpa racemosa* var. *cylindracea*. Zakhama-Sraieb

*et al.* (2008, 2009) reported that *C. grandimana* was one of the dominant crustacean species found in association with the algae *Corallina elongata* in the Raf Raf area (Tunisian coast).

*Caprella hirsuta* Mayer, 1890

#### MATERIAL EXAMINED

1 ind. st. 15(6), 3 ind. st. 16(8), 1 ind. st. 17(1), 2 ind. st. 18(3), 15 ind. st. 21(5), 1 ind. st. 25(1) and 2 ind. st. 32(7) for a total of 23 ind. recorded in the *Cystoseira* algae (0 m), hard bottoms with other algae (0–5 m), in the Mediterranean vermetid gastropod platform (0.3–2 m), and in the *Posidonia oceanica* meadows (9–1 m).

#### LOCATION

Considered as a Mediterranean endemic species (Ruffo *et al.*, 1993, 1998) *C. hirsuta* has been reported on the Atlantic African coast from Cap Spartel to Cap Blanc (Guerra-Garcia *et al.*, 2000). Guerra-Garcia & Takeuchi (2002) considered that the species was rarely collected on hard bottoms mainly composed of the algae *Cystoseira usneoides*, *Asparagopsis armata*, *Cladostephus verticillatus* and *Haopteris scoparia* and the hydroid *Sertularella gayi*, while Guerra-Garcia *et al.* (2009, 2010) and Guerra-Garcia & Izquierdo (2010) showed that it was very abundant in the algae *Stypocaulon scoparium* and *Corallina elongata* from the Strait of Gibraltar. Soler-Hurtado & Guerra-Garcia (2011) noted that the

Table 1. Main information about the sampling locations and sampling period; number of stations per sampling locations, range of depth sampling, sampling gear and sampling surface per location (m<sup>2</sup>).

Sampling locations	Sampling periods	Number of stations	Depth (m)	Sampling gear	Sampling surface (m <sup>2</sup> )
Rachgoun Island	August 2000	38	8–63	Van Veen grab	7.6
Habibas Islands	August 1997	22	29–143	Van Veen grab	5.5
Oran Bay	January 1985	48	10–120	Smith–Mc Intyre grab	9.6
Arzew Bay	January 1985	52	10–100	Smith–Mc Intyre grab	10.4
Chenoua–Kouali area (Bou Ismail Bay)	October 2011 and 2012; June and August 2012	70	0–50	Hand sampling by autonomous diver	70
Terga (Beni Saf)	January–February 2007	60	5–30	Van Veen grab	12

species was associated with the algae *Asparagopsis armata* on the Iberian coasts of the Strait of Gibraltar. Vazquez-Luis *et al.* (2009) recorded *C. hirsuta* in shallow waters invaded by the algae *Caulerpa racemosa* var. *cylindracea* and Zakhama-Sraieb *et al.* (2008, 2009) collected this species along the Tunisian coast on hard bottoms among the algae *C. elongata*. Christodoulou *et al.* (2013) reported this species from the Aegean Sea, always among the algae *Corallina elongata*.

*Caprella hirsuta* is common on epifauna such as the cirripeds *Balanus*, hydroids and algae from 0–30 m deep. The species prefers habitats with abundant detritus (Guerra-Garcia *et al.*, 2000; Vazquez-Luis *et al.*, 2009), and specimens from the Strait of Gibraltar are usually sediment-covered (Guerra-Garcia *et al.*, 2000).

*Caprella penantis* Leach, 1814

#### MATERIAL EXAMINED

3 ind. st. 32(7) on hard bottoms with algae at 5 m depth from the Chenoua–Kouali area.

#### LOCATION

This cosmopolitan species lives on algae and *Posidonia* meadows, and a variety of sessile species (Cnidarians, Bryozoans and Sponges) (McCain, 1968; Ruffo *et al.*, 1993; Díaz *et al.*, 2005). Guerra-Garcia & Garcia-Gomez (2001) found this species in the harbour of Ceuta (Strait of Gibraltar) in high hydrodynamics areas while Guerra-Garcia & Takeuchi (2002) reported abundant populations on hard bottoms mainly composed of the algae *Cystoseira usneoides*, *Asparagopsis armata*, *Cladostephus verticillatus*, *Hapteris scoparia* and the hydroid *Sertularella gayi*. Guerra-Garcia *et al.* (2009, 2010) and Guerra-Garcia & Izquierdo (2010) showed that *C. penantis* was associated with the algae *Stypocaulon scoparium* and *Corallina elongata* restricted to the Atlantic stations and the Strait of Gibraltar; Soler-Hurtado & Guerra-Garcia (2011) reported that the species was associated with the algae *Asparagopsis armata*, and this species was one of the most common crustacean species collected along the Atlantic Iberian coasts and in the Strait of Gibraltar. On the Tunisian coast Zakhama-Sraieb *et al.* (2008, 2009) collected this species on hard bottoms among *Posidonia oceanica* meadows, while Kitsos *et al.* (2005) and Zakhama-Sraieb *et al.* (2009) reported the association of *C. penantis* with the sea turtle *Caretta caretta* in the Aegean Sea and along the Tunisian coast.

*Caprella rapax* Mayer, 1890

#### MATERIAL EXAMINED

3 ind. st. 16(2), 1 ind. st. 16(1) and 2 ind. st. 16(4) from the Chenoua–Kouali on hard bottoms with algae and muddy sand (0.5 m) and on sand with *Posidonia oceanica* meadows (21 m).

#### LOCATION

Ruffo *et al.* (1993, 1998) reported this Mediterranean endemic species mainly found as endoparasitic in coarse sand in the Tyrrhenian Sea (Italy) and the Atlantic Iberian coast; it was also recorded from Ceuta (Strait of Gibraltar) by Guerra-Garcia & Takeuchi (2002). Later Christodoulou *et al.* (2013) collected this species in the Aegean Sea.

Gonzalez *et al.* (2008) showed that *C. rapax* was a characteristic species of *Posidonia oceanica* meadows.

*Deutella schieckei* Cavedini, 1982

#### MATERIAL EXAMINED

10 ind. st. IH97/22 on a deep station (84 m) on coarse sand and gravel with shell debris from the Habibas Islands, offshore Oran.

#### LOCATION

Ruffo *et al.* (1993) reported this Mediterranean endemic species on shallow hard bottom with algae (3–7 m). Guerra-Garcia *et al.* (2009) showed *D. schieckei* was associated with the seaweed *Stypocaulon scoparium* from some Mediterranean stations of the Strait of Gibraltar. Vazquez-Luis *et al.* (2009) reported *D. schieckei* in shallow waters invaded by *Caulerpa racemosa* var. *cylindracea* in *Posidonia* beds. Along the Spanish Mediterranean coasts, this species had been only reported from algae in shallow waters (Jimeno & Turon, 1995; Box *et al.*, 2006; Vazquez-Luis *et al.*, 2009) while around the Tunisian coast, Zakhama-Sraieb *et al.* (2008) reported *D. schieckei* on *Posidonia oceanica* meadows on three sites of the Tunisian coast (Tabarka, Bizerte and Raf Raf).

#### Family AMPITHOIDAE

*Cymadusa crassicornis* (A. Costa, 1857)

#### MATERIAL EXAMINED

3 ind. st. 16(3) from Chenoua–Kouali area. The species was found on hard bottoms with algae and *Cystoseira* spp. and *Cymadocea* meadows (0.7 m).

#### LOCATION

Ruffo *et al.* (1982) reported this species from the Mediterranean Sea, Black Sea and Red Sea in the infralittoral algae.

#### Family BOGIDIPELLIDAE

*Marinobogidiella tyrrhenica* (Schiecke, 1979)

#### MATERIAL EXAMINED

1 ind. st. 28(7) on hard bottoms with sand (2 m) from the Chenoua–Kouali area.

#### LOCATION

Ruffo *et al.* (1982) reported this species as a Mediterranean endemic species recorded in the Tyrrhenian Sea on coarse sand at 6 m depth.

#### Family CHEIROCRATIDAE

*Degeocheirocratus spani* G. Karaman, 1985

#### MATERIAL EXAMINED

19 stations (from 1 to 11 ind. per st.) at depths included between 19 and 63 m on mud and muddy sand from the Rachgoun Island, offshore Oran.

#### LOCATION

Ruffo *et al.* (1998) reported this Mediterranean endemic species from the Adriatic Sea on muddy bottoms at depths around 100 m.

Family DOGIELINOTIDAE  
*Parhyalella richardi* (Chevreux, 1902)

## MATERIAL EXAMINED

1 ind. st. 22(1) in the Mediterranean vermetid gastropoda platform (0.2 m) from the Chenoua–Kouali area.

## LOCATION

Menioui & Ruffo (1988) had reported this species from the Mediterranean Moroccan coast among the algae *Ulva rigida* and considered that it was rare in the Mediterranean Sea. Latter, Ruffo *et al.* (1993) reported *P. richardi* present in the Atlantic Ocean and the Mediterranean Sea in the littoral zone between stones and *Posidonia* litter.

## Family GAMMARIDAE

*Echinogammarus foxi* (Schellenberg, 1928)

## MATERIAL EXAMINED

1 ind. st. 1, 2 ind. st. 2 for a total of 3 ind. from the Arzew Bay (16 and 20 m depth) on coarse sand and gravel.

## LOCATION

Ruffo *et al.* (1982) reported *E. foxi* as a Mediterranean endemic species occurring in brackish coastal lagoons. Dauvin & Bellan-Santini (2002) considered the species as Mediterranean endemic living in sub-tropical warm waters.

*Echinogammarus stocki* Karaman, 1969

## MATERIAL EXAMINED

1 ind. st. 1 in a shallow station (16 m depth) on coarse sand and gravel from the Arzew Bay.

## LOCATION

Ruffo *et al.* (1982) reported *E. stocki* as a Mediterranean endemic species living under stones in shallow waters (0–1 m depth) in area under freshwater influence. Dauvin & Bellan-Santini (2002) considered the species as a Mediterranean endemic species living in sub-tropical warm waters.

*Rhipidogammarus rhipidiophorus* (Catta, 1878)

## MATERIAL EXAMINED

1 ind. on a deep (80 m) coarse sand and gravel with shell debris station (IH97/27) from the Habibas Islands offshore Oran.

## LOCATION

Ruffo *et al.* (1982) reported *R. rhipidiophorus* as a Mediterranean endemic species living under stones in shallow waters (0 m) in area under freshwater influence and in brackish waters. Dauvin & Bellan-Santini (2002) considered the species as a Mediterranean endemic species living in sub-tropical warm waters.

## Family ISCHYROCERIDAE

*Erichtonius argenteus* Krapp-Schickel, 1993

## MATERIAL EXAMINED

2 ind. st. 19(2), 2 ind. st. 20(2-1), 10 ind. st. 21(5), 4 ind. st. 21(4), 2 ind. st. 28(5) and 5 ind. st. 30/31(21), for a total of

25 ind. from the Chenoua–Kouali area at 3–16 m depth, on shallow hard bottoms with algae (3–4 m), *Posidonia oceanica* meadows (16 m) and fine sand with rock outcrops and *Posidonia oceanica* meadows (13–15 m).

## LOCATION

Ruffo *et al.* (1998) reported this Mediterranean endemic species from the Greek coasts among algae (*Cystoseira* spp.) in shallow waters (0 m).

*Erichtonius difformis* Milne-Edwards, 1830

## MATERIAL EXAMINED

1 ind. st. 20(2-1), 1 individual st. 29(3) and 1 individual st. 30/31(2bis) from the Chenoua–Kouali area on hard bottoms with *Posidonia oceanica* meadows (4 m), hard bottoms with algae mainly *Cystoseira* spp. (2–3 m), and sand with rock outcrops and *Posidonia oceanica* meadows (14–15 m).

## LOCATION

Ruffo *et al.* (1998) reported this Atlantic, Mediterranean species associated generally with *Zostera* and *Posidonia* meadows (0–15 m). Ortiz & Petrescu (2007) collected *E. difformis* on the Libyan coast, at 95 m depth on coarse/medium sand with gravels and maerl. Latter, Zakhama-Sraieb *et al.* (2008, 2009) reported this species on hard and sandy bottoms among algae and *Posidonia oceanica* meadows along the Tunisian coast.

*Microjassa cumbrensis* (Stebbing & Robertson, 1891)

## MATERIAL EXAMINED

3 ind. st. 25(1) on hard bottoms with algae at 2 m depth from the Chenoua–Kouali area.

## LOCATION

Ruffo *et al.* (1989) reported *M. cumbrensis* from the north-eastern Atlantic and the Mediterranean Sea from infralittoral to circalittoral depths among algae and on fine sand (22–40 m). Conradi & Lopez-Gonzalez (1999) had collected *M. cumbrensis* in the Strait of Gibraltar along the Iberian Peninsula among the algae *Codium vermimara* and on the Bryozoans *Bugula neritana*.

## Family MAERIDAE

*Elasmopus vachoni* Mateus & Mateus, 1966

## MATERIAL EXAMINED

1 ind. st. 16(8), 33 ind. st. 17(1), 1 ind. st. 17(2), 3 ind. st. 18(3), 1 ind. st. 21(4) and 2 ind. st. 27(5) for a total of 41 ind. of the Chenoua–Kouali area on hard bottoms with *Cystoseira* spp. (0–7 m) and in the *Posidonia oceanica* meadows (1–18 m).

## LOCATION

Menoui & Ruffo (1989) had recorded *E. vachoni* associated with the algae *Cystoseira stricta* on Morocco Mediterranean coast and Ruffo *et al.* (1998) reported the species from the western basin of the Mediterranean Sea (0–16 m) and also from the South Atlantic coast of Africa. Soler-Hurtado & Guerra-García (2011) showed that the species was associated with the algae *Asparagopsis armata* on Iberian coasts (Strait of Gibraltar and Atlantic stations near the Strait).

*Maera schieckei* Karaman & Ruffo, 1971

MATERIAL EXAMINED

1 ind. st. 8(3) on a sandy and gravelly bottom at 32 m depth in the Oran Bay.

LOCATION

Ruffo *et al.* (1982) considered *M. schieckei* as a Mediterranean endemic species found in the Tyrrhenian Sea at depths from 40 to 75 m.

Family MELITIDAE

*Abludomelita obtusata* (Montagu, 1813)

MATERIAL EXAMINED

1 ind. st. H3 from a mud station at 47 m depth in the Arzew Bay.

LOCATION

Ruffo *et al.* (1982) reported this Atlantic and Mediterranean species from depth 0–20 m from *Posidonia* meadows; this species occurred in the Atlantic on various types of soft-sediment, mainly mud (Dauvin & Bellan-Santini, 2002).

*Melita hergensis* Reid, 1939

MATERIAL EXAMINED

1 ind. st. 18(3) on *Posidonia oceanica* meadows (20–21 m) from the Chenoua–Kouali area.

LOCATION

Ruffo *et al.* (1982) reported this Atlantic and Mediterranean species living at shallow waters depth (0–30 m), under stones, on sandy bottoms with *Zostera* or *Posidonia oceanica*. Vazquez-Luis *et al.* (2009) had recorded *M. hergensis* in shallow waters on hard bottoms invaded by *Caulerpa racemosa* var. *cylindracea* along the Mediterranean Iberian coasts.

Family MICROPROTOPIDAE

*Microprotopus longimanus* Chevreux, 1887

MATERIAL EXAMINED

1 ind. st. 19(1) on shallow (1–2 m) hard bottoms with algae from the Chenoua–Kouali area.

LOCATION

Ruffo *et al.* (1989) reported this Atlantic and Mediterranean species on fine green epiphytic algae (depth 1–2 m).

Suborder GAMMARIDEA

Family AMPHILOCHIDAE

*Gitana longicarpus* Ledoyer, 1977

MATERIAL EXAMINED

1 ind. st. 25(1). on hard bottom with sand (2 m) from the Chenoua–Kouali area.

LOCATION

Ruffo *et al.* (1982) reported this Mediterranean endemic species for depth bathyal mud (320–360 m).

Family CRESSIDAE

*Cressa mediterranea* Ruffo, 1979

MATERIAL EXAMINED

1 ind. st. IH97/28 Habibas Islands on a deep (85 m) coarse sand and gravel with shell debris station and 1 ind. st. 15(2) on *Posidonia oceanica* meadows (21 m) from the Chenoua–Kouali area.

LOCATION

Ruffo *et al.* (1982) reported this Mediterranean endemic species, from the Tyrrhenian Sea, in the infralittoral zone among algae and *Posidonia* (3–15 m). Conradi & López-González (1999) collected in the Strait of Gibraltar on the bryozoans *Bugula neritana*.

Family CYPROIDEIDAE

*Peltocoxa mediterranea* Schiecke, 1977

MATERIAL EXAMINED

1 ind. st. 30/31(1) on hard bottoms with algae and *Posidonia oceanica* meadows (15 m) from the Chenoua–Kouali area.

LOCATION

Ruffo *et al.* (1982) reported this Mediterranean endemic species living in a various type of habitats as *Posidonia* meadows, hard bottom, sand, mud, and algae from 1 to 70 m depth. Menioui & Ruffo (1988) sampled a juvenile in the Strait of Gibraltar among the algae *Stypocaulon scoparium*.

Family IPHIMEDIIDAE

*Iphimedia brachygnatha* Ruffo & Schiecke, 1979

MATERIAL EXAMINED

2 ind. st. 17(3), 17 ind. st. 20(3), 13 ind. st. 20(2-2), 3 ind. st. 21(4), 1 ind. st. 21(5), 5 ind. st. 24 (1), 1 ind. st. 27(5), 3 ind. st. 29(3), 1 ind. st. 30/31(3), 1 ind. st. 30/31(2) and 6 ind. st. 32(6) for a total of 53 specimens sampled in 11 stations from the Kouali–Chenoua area at depths between 2 and 18 m on hard bottoms with algae (2–12 m) and *Posidonia oceanica* meadows (6–18 m).

LOCATION

Ruffo *et al.* (1982) reported this Mediterranean endemic species from the Western Basin and the Adriatic in infralittoral on hard bottoms among algae, sponges and polychaetes (5–20 m). Conradi & Lopez-Gonzalez (1999) had collected *I. brachygnatha* in the Strait of Gibraltar among the algae *Halopteris scorparia*.

*Iphimedia vicina* Ruffo & Schiecke, 1979

MATERIAL EXAMINED

9 ind. st. 18(3), 1 ind. st. 20(6-1), 2 ind. st. 32(4) from the Chenoua–Kouali area; 1 ind. st. L2 from the Terga area near Beni Saf, and 1 ind. st. 1(1) from the Arzew Bay. The species was collected on *Posidonia oceanica* meadows (4–21 m) and hard bottoms with algae (25–26 m).

LOCATION

Ruffo *et al.* (1982) reported this Mediterranean endemic species on infralittoral on hard bottoms among algae, sponges, bryozoans or hydroids (10–45 m). Conradi & Lopez-Gonzalez (1999) had collected *I. vicina* in the Strait of Gibraltar among the Bryozoans *Bugula neritana*.

## Family LYSIANASSIDAE

*Hippomedon bidentatus* Chevreux, 1903

## MATERIAL EXAMINED

1 ind. st. 7 from a mud bottom at 70 m depth in the Arzew Bay.

## LOCATION

Ruffo *et al.* (1989) reported this Atlantic and Mediterranean species from muddy bottoms at depths from 60 to 2500 m.

*Lepidepecreum crypticum* Ruffo & Schiecke, 1977

## MATERIAL EXAMINED

1 ind. st. 2 on coarse sand and gravel at 21 m depth in the Oran Bay.

## LOCATION

Ruffo *et al.* (1989) reported this Mediterranean endemic species as endopammic on shallow coarse sand (2–22 m). Conradi & López-González (1999) had found this species in the Strait of Gibraltar also in shallow coarse sand (19 m).

## Family SOPHROSYNIDAE

*Sophrosyne hispana* (Chevreux, 1888)

## MATERIAL EXAMINED

2 ind. st. 2(2) and 1 ind. st. 1 ind. st. 7(5) on deep (50 and 73 m) coarse sand and gravels from the Oran Bay.

## LOCATION

Ruffo *et al.* (1989) reported this Atlantic and Mediterranean species from sandy, muddy or detritic bottoms at depth from 100 to 500 m.

## Family STEGOCEPHALIDAE

*Stegocephaloides christianensis* (Boeck, 1871)

## MATERIAL EXAMINED

1 ind. st. IH97/RS and 2 ind. st. IH/23 on two deep (80 and 93 m) coarse sand and gravels with shell debris stations from the Habibas Islands, offshore Oran.

## LOCATION

Ruffo *et al.* (1993) reported this north-eastern Atlantic and Mediterranean species on deep muddy bottoms (90–1938 m). Ortiz & Petrescu (2007) had found this species on the Libyan coast at 80 m on coarse sand community with maerl and the algae *Halimeda* and *Udotea*.

## Family STENOTHOIDAE

*Stenothoe antennulariae* Della Valle, 1893

## MATERIAL EXAMINED

1 ind. st. IH97/22 on deep (84 m) coarse sand and gravel habitat from the Habibas Islands, offshore Oran.

## LOCATION

Ruffo *et al.* (1993) reported this Mediterranean endemic species from the Tyrrhenian Sea on hard bottom with Hydroids (50–80 m depth). Stefanidou & Voultziadou-Koukoura (1995) reported for the first time this species in

the eastern Mediterranean Sea basin where the species was found in association with the Ascidiaceans *Ascidella* sp. on sandy silt (15–20 m depth).

*Stenothoe elaschista* Krapp-Schickel, 1975

## MATERIAL EXAMINED

6 ind. st. 21(5), 1 ind. st. 28(7) and 1 ind. st. 30/31(2) from the Chenoua–Kouali area in three main habitats: hard bottoms with algae (2–3 m), *Posidonia oceanica* meadows and fine sand with rock outcrop and *Posidonia oceanica* meadows (14–15 m).

## LOCATION

Ruffo *et al.* (1993) reported this Mediterranean endemic species from the Tyrrhenian Sea on coarse or fine sand (0.5–40 m depth).

*Stenothoe gallensis* Walker, 1904

## MATERIAL EXAMINED

1 ind. st. 15(6). in the Mediterranean vermetid gastropoda platform (0–1 m depth) from the Chenoua–Kouali area.

## LOCATION

Ruffo *et al.* (1993) reported a cosmopolitan distribution for this species present in the Atlantic Ocean, the Caribbean Sea, the Red Sea, the Pacific Ocean, the Indian Ocean and the Mediterranean Sea (0–20 m). It was commonly recorded in the upper littoral in algae with high hydrodynamics rarely in depths greater than 4 m. Conradi & López-González (1999) had found for the first time the species in the Strait of Gibraltar on muddy bottoms (depth 15 m). Reported as a lessepsian species (Dauvin & Bellan-Santini, 2002; Zakhama-Sraieb *et al.*, 2009; Zakhama-Sraieb & Charfi-Cheikhrouka, 2010), Christodoulou *et al.* (2013) considered that *S. gallensis* should no longer be considered as a lessepsian migrant. Along the Tunisian coast *S. gallensis* was collected from *Posidonia oceanica* meadow on rocky habitats (Zakhama-Sraieb & Charfi-Cheikhrouka, 2010, Zakhama *et al.*, 2009). Soler-Hurtado & Guerra-García (2011) had collected this species associated only with the algae *Asparagopsis armata* on the Iberian coasts of the Strait of Gibraltar.

## Suborder HYPERIIDAE

## Family PLATYSCELIDAE

*Platyscelus serratulus* Stebbing, 1888

## MATERIAL EXAMINED

1 ind. st. IH97/RE on a deep (107 m) coarse sand and gravel with shell debris station from the Habibas Islands, offshore Oran.

## LOCATION

Christodoulou *et al.* (2013) reported for this planktonic species a cosmopolitan distribution.

## Suborder SENTICAUDATA

## Family PSEUDONIPHARGIDAE

*Pseudoniphargus africanus* Chevreux, 1901

Described from Annaba material by Chevreux (1901), this species was found on the Stora beach (Skikda Bay) by Delamare Deboutteville (1953). The species was not reported in the Bakalem & Dauvin (1995) and Grimes *et al.* (1999) lists and was found along the marine coastal zone of Algeria; it was not reported in recent times along the Algerian coast (Bakalem & Dauvin, 1995; Grimes *et al.*, 2009). Ruffo *et al.* (1982) reported this species in near shore brackish and fresh-water habitats.

## BIO-GEOGRAPHICAL CONSIDERATIONS

Table 2 gives the current status of the marine amphipod fauna inventory for the Algerian coast through the successive inventories. It accounts now for a total of 332 species including 17 Caprellidea, two Hyperidea, and 313 Gammaridea of the 451 species recorded in the mid-1990s for the Mediterranean fauna (Ruffo *et al.*, 1998) and 509 in the last known inventory (Christodoulou *et al.*, 2013). The new records concern mainly the Melitidae (six species) and the Caprellidae (five species). The samplings in new areas, on new habitats, such as hard bottoms and *Posidonia oceanica* meadows, and with new sampling techniques using divers for shallow hard bottoms, are the main causes of these additions. So, 18 records come from samples on hard bottoms, 13 on the *Posidonia oceanica* meadows, 12 on coarse sand and gravel and only three on mud bottom. Regarding the amphipod fauna of Algeria, to date the most diversified amphipod categories are: the Melitidae family (36 species), the Lysianassoidea superfamily (33), the Ampeliscidae family (29) and the Aoroidea superfamily (29). These four dominant categories account for 127 species (38% of the known species). Six other families account more than 10 species: Isaeidae (19), Caprellidae (16), Corophiidae (14), Oedicerotidae (14), Dexaminidae (11), Phoxocephalidae (11) and Hyalidae (10); they account a total of 95 species (29%). The ten more diversified families account for 67% of the total number of marine amphipod of the Algerian coast.

The number of Gammaridea marine amphipod (313 species) is at the same level of magnitude as that recorded along the French Mediterranean coast by Dauvin & Bellan-Santini (2002): 299 species. However, it is lower than found around the Italian Peninsula (365 species (Ruffo, 2010)). For the continental shelf, the Algerian Gammaridea amphipod diversity is higher than found for the Tunisian coast (133 species) (Zakhama-Sraieb *et al.*, 2009), the eastern Libyan coast (125 species) (Ortiz & Petrescu, 2007) or the Iberian Mediterranean coast (152 species) (Jimeno & Turon, 1995; De-la-Ossa-Caretto *et al.*, 2010). Dauvin *et al.* (2013) suggest that the impoverishment pattern of amphipod fauna recorded along the Algerian coast from the west to the east continues to the east, including the Libyan coast. This is probably due to the disappearance of cold temperate Atlantic species from the western to the eastern sectors of the North Africa coast, which are not under the Atlantic water influence. Christodoulou *et al.* (2013) observed a similar pattern and explained that the highest benthic amphipod species richness in the western Mediterranean Sea could be attributed to the fact that the influx of Atlantic species is initially limited to this large basin with a wide range of physico-chemical parameters, permitting the presence of both cold and warm

**Table 2.** Number of amphipod species per family along the Algerian coast according to Bakalem & Dauvin (1995), Grimes *et al.* (2009) and this study, taking into account the Amphipoda ERMS classification before Lowry & Myers (2013) publication.

Families	Before 1975	Bakalem & Dauvin (1995)	Grimes <i>et al.</i> (2009)	This study	Total
CAPRELLIDEA					
Caprellidae	9	1	1	5	16
Phtisicidae	1	–	–	–	1
GAMMARIDEA					
Ampeliscidae	6	21	2	–	29
Amphilochidae	4	1	–	1	6
Ampithoidae	4	2	–	1	7
Aoridae	13	13	3	–	29
Argissidae	–	–	1	–	1
Bathyporeiidae	1	3	2	–	6
Biancolinidae	–	–	1	–	1
Bogidiellidae	1	–	–	1	2
Cheluridae	1	–	–	–	1
Colomastigidae	1	–	–	–	1
Corophiidae	7	7	–	–	14
Cressidae	–	–	–	1	1
Dexaminidae	5	3	3	–	11
Eusiridae	3	3	2	–	8
Gammarellidae	–	–	1	–	1
Gammaridae	4	–	1	3	9*
Haustoriidae	1	–	–	–	1
Hyalidae	9	–	–	1	10
Iphimediidae	1	3	–	2	6
Isaeidae	8	9	1	1	19
Ischyroceridae	3	–	2	3	8
Leucothoidae	3	5	1	–	9
Liljeborgiidae	1	3	2	–	6
Lysianassidae	15	8	7	3	33
Megaluropidae	–	1	–	–	1
Melitidae	13	17	–	6	36
Melphidippidae	–	–	1	–	1
Oedicerotidae	6	3	5	–	14
Pardaliscidae	–	–	1	–	1
Phliantidae	1	–	–	–	1
Phoxocephalidae	4	5	2	–	11
Pleustidae	–	–	1	–	1
Podoceridae	3	–	1	–	4
Stegocephalidae	–	–	–	1	1
Stenothoidae	2	–	4	3	9
Talitridae	7	–	–	–	7
Urothoidae	2	5	–	–	7
HYPERIIDAE					
Hyperiididae	1	–	–	–	1
Platyscelidae	–	–	–	1	1
Total	139	113	45	33	332

\**Pseudoniphargus africanus* Chevreux, 1901.

water species. They also underlined that the high species number observed in the western Mediterranean could also be attributed to the extensive research efforts carried out in this area (Ruffo *et al.*, 1998).

Following the Zakhama-Sraieb *et al.* (2009) classification of species in geographical distribution (Table 3), the species are assembled in three main categories: group I (Atlantic–Mediterranean distribution), group II (Mediterranean endemic species) and group III (cosmopolitan species). The distribution takes also into account the last zoogeographical classification furnished in Christodoulou *et al.* (2013).

**Table 3.** Geographical distribution in the Mediterranean Sea of the 33 new marine amphipods recorded along the Algerian coast (see the text for references). Group I, (Atlantic–Mediterranean distribution); Group II (Mediterranean species); and Group III (cosmopolitan species). W, western basin of the Mediterranean Sea.

	Group	Morocco (Mediterranean)	Spain (Mediterranean)	France (Mediterranean)	Italy (excluded Adriatic)	Adriatic (Italy)	Tunisia	Libya	Greece
<i>Abludomelita obtusata</i> (Montagu, 1813)	I (W)	–	–	+	+	–	–	–	–
<i>Caprella grandimana</i> (Mayer, 1882)	I	+	+	+	+	–	+	–	+
<i>Caprella hirsuta</i> Mayer, 1890	I	+	+	+	+	–	+	–	–
<i>Caprella penantis</i> Leach, 1814	III	+	+	–	+	+	+	–	+
<i>Caprella rapax</i> Mayer, 1890	I	–	–	–	+	–	–	–	+
<i>Cressa mediterranea</i> Ruffo, 1979	I	–	+	–	+	–	–	–	+
<i>Cymadusa crassicornis</i> (A. Costa, 1853)	I	–	–	+	+	+	+	–	+
<i>Degocheirocratus spani</i> G. Karaman, 1985	II	–	–	–	–	+	–	–	–
<i>Deutella schieckei</i> Cavedini, 1982	II	–	+	–	+	–	+	–	–
<i>Echinogammarus foxi</i> (Schellenberg, 1928)	II	–	–	+	+	+	–	–	+
<i>Echinogammarus stocki</i> Karaman, 1969	II	–	–	+	+	+	–	–	+
<i>Erichtonius argenteus</i> Krapp-Schickel, 1993	II	–	+	–	–	+	–	–	+
<i>Erichtonius difformis</i> Milne-Edwards, 1830	I	–	+	–	+	–	+	+	+
<i>Elasmopus vachoni</i> Mateus & Mateus, 1966	I (W)	+	–	–	–	–	–	–	–
<i>Gitana longicarpus</i> Ledoyer, 1977	II (W)	–	–	+	–	–	–	–	–
<i>Hippomedon bidentatus</i> Chevreux, 1903	I	–	–	–	+	+	–	–	+
<i>Iphimedia brachygnatha</i> Ruffo & Schiecke, 1979	II (W)	–	+	–	+	–	–	–	–
<i>Iphimedia vicina</i> Ruffo & Schiecke, 1979	II	–	+	–	+	–	–	–	–
<i>Lepidepecreum crypticum</i> Ruffo & Schiecke, 1977	II	–	+	–	+	–	–	–	–
<i>Maera schieckei</i> Karaman & Ruffo, 1971	II (W)	–	–	–	+	–	–	–	–
<i>Marinobogidiella tyrrhenica</i> (Schiecke, 1979)	II (W)	–	–	–	+	–	–	–	–
<i>Melita hergensis</i> Reid, 1939	I	–	–	+	–	–	–	–	+
<i>Microjassa cumbrensis</i> (Stebbing & Robertson, 1891)	I	–	+	–	+	–	+	–	+
<i>Microprotopus longimanus</i> Chevreux, 1887	I (W)	–	+	–	+	–	–	–	–
<i>Parhyalella richardi</i> (Chevreux, 1902)	I (W)	+	–	+	+	–	–	–	–
<i>Peltocoxa mediterranea</i> Schiecke, 1977	I	+	–	+	+	–	–	–	+
<i>Platyscelus serratulus</i> Stebbing, 1888	III	–	–	–	+	+	–	–	+
<i>Rhipidogammarus rhipidiophorus</i> (Catta, 1878)	II	–	+	+	+	–	+	+	+
<i>Sophrosyne hispana</i> (Chevreux, 1888)	III	–	–	+	+	–	–	–	+
<i>Stegocephaloides christianensis</i> (Boeck, 1871)	I	–	–	+	+	–	+	+	+
<i>Stenothoe antennulariae</i> Della Valle, 1893	II	–	–	–	+	–	–	–	+
<i>Stenothoe elaschista</i> Kreapp-Sckickel, 1975	II (W)	–	–	–	+	–	–	–	–
<i>Stenothoe gallensis</i> Walker, 1904	III	+	+	+	+	–	+	–	+
<b>Total (Algerian coast = 33)</b>		<b>7</b>	<b>14</b>	<b>14</b>	<b>29</b>	<b>8</b>	<b>11</b>	<b>3</b>	<b>19</b>



Among the 33 new recorded species along the Algerian coast, 14 (43%) are in the group II, 16 in the group I and the four last ones in group III. Among group I, four species, and among the group II, five species, are known only in the western basin of the Mediterranean Sea (Table 3). The others are distributed in the western and eastern part of the Mediterranean Sea, except for *Degocheirocratus spani*, which is previously known only from the Adriatic Sea (Ruffo, 2010); this is the first record for the western basin of the Mediterranean Sea.

Among the cosmopolitan species, *Stenothoe gallensis* is categorized like eight other marine amphipods as Lessepsian species by Zakhama-Sraieb & Charfi-Cheikhrouha (2010). But this species, like three others previously recorded along the Algerian coast (Bakalem & Dauvin, 1995): *Cymadusa filosa* Savigny, 1816, *Unciolella lunata* Chevreux, 1911 and *Elasmopus pecteniscrus* (Bate, 1862) and considered as Lessepsian species, should no longer be considered as such, according to Chistodoulou *et al.* (2013).

Table 3 gives the presence (+) or absence (–) of the 33 new amphipod records in the Mediterranean according to the biogeographical synthesis of Ruffo (1998), plus recent papers at the scale of a region or a country:

- Morocco (Ruffo *et al.*, 1998; Menioui & Ruffo, 1988; Menioui, personal communication);
- Spain (Jimeno & Turon, 1995; Conradi M. & López-González, 1999; De-La-Ossa-Carretero *et al.*, 2010);
- France (Dauvin & Bellan-Santini, 2002);
- Italy (Ruffo, 2010);
- Tunisia (Zakhama-Sraieb *et al.*, 2009);
- Lybia (Ortiz & Petrescu, 2007);
- Greece (Stefanidou & Voultsiadou-Koukoura, 1995; Koukouras, 2010; Christodoulou *et al.*, 2013).

Twenty-nine of the new records are known for Italian waters and 19 in Greek waters, where there are intensive amphipod inventories. But only 14 species are shared with the Spain and France inventories. This comparison reveals also the lack of knowledge of amphipods from the Mediterranean Moroccan coast and probably also along the Libyan coast.

Apart from the Hyperidea (only two species recorded along the Algerian coast, against 69 for Italian waters and 104 for the Mediterranean Sea), the inventory of marine amphipod species, with 313 Gammaridea and 17 Caprellidae (23 for the Italian waters), can be considered as more or less complete for the continental shelf of the Algerian coast. New amphipod records could be rare in the future for this coastal part of the Algerian waters; probably numerous amphipod records could be found in deeper bathyal and abyssal marine zones, which are insufficiently sampled in the southern part of the western Mediterranean Sea.

## ACKNOWLEDGEMENTS

The authors are grateful to Lisa Ellen Spencer for help with the English version of this article, and two anonymous referees for their very useful comments on the first version of this paper.

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