



New records of benthic amphipods, *Jassa slatteryi* Conlan, 1990 and *Ampithoe valida* Smith, 1873 (Crustacea: Peracarida: Amphipoda) for the Bay of Biscay, France, with morphological notes

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Abstract: *Jassa slatteryi* and *Ampithoe valida* were collected in the Bay of Biscay. *Jassa slatteryi*, a cosmopolitan species, was signalized before in European waters, in the Mediterranean Sea and in Brittany. Specimens collected in Arcachon Bay represent the second signalization on the European Atlantic coast. *Ampithoe valida*, a non-native species originally described in North America, was signalised in European waters before, in the Mediterranean Sea, Portugal and the Netherlands. Its presence in Arcachon Bay and Hossegor Lake is a first record on the French Atlantic coast for this species.

Résumé : Nouveaux signalements d'amphipodes benthiques, *Jassa slatteryi* Conlan, 1990 et *Ampithoe valida* Smith, 1873 (Crustacea : Peracarida : Amphipoda) du Golfe de Gascogne, France, et notes sur leur morphologie. *Jassa slatteryi* et *Ampithoe valida* ont été collectées dans le Golfe de Gascogne. *Jassa slatteryi*, une espèce cosmopolite, était signalée dans les eaux européennes en Mer Méditerranée et en Bretagne. Les individus collectés dans le Bassin d'Arcachon représentent le second signalement sur les côtes atlantiques européennes. *Ampithoe valida*, une espèce invasive originellement décrite en Amérique du Nord, était signalée dans les eaux européennes en Mer Méditerranée, au Portugal et aux Pays-Bas. Sa présence dans le Bassin d'Arcachon et le lac d'Hossegor représente le premier signalement sur la côte atlantique française.

Keywords: Amphipoda • *Jassa slatteryi* • *Ampithoe valida* • New records • Bay of Biscay

Introduction

Arcachon Bay has been studied from a long time. During the last 13 years, 4 theses were made (Blanchet, 2004; Salvo, 2010; Do, 2012; Dubois, 2012) with the macrofauna

biodiversity as a main or secondary axis of research. Different habitats in intertidal and subtidal were therefore studied: *Zostera (Zosterella) noltei* Hornemann seagrass, sand, mud, oyster reefs and 68 species for 28 family of amphipoda where therefore identified. *Ampithoe gammaroides* (Bate, 1856) and *Jassa falcata* (Montagu, 1808) were the only Ampithoidae and Ischyroceridae identified respectively. Other studies have shown the presence of other species in Arcachon Bay, including

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Ampithoe ferox (Chevreux, 1901) (Auby, 1991) and *Jassa ocia* (Bate, 1862) (Bachelet et al., 2003).

Ampithoe valida Smith, 1873, an Atlantic American and Pacific species (Conlan & Bousfield, 1982), is present in European waters since the 1990's (Pardal et al., 2000). *Jassa slatteryi* Conlan, 1990 was described from California, but specimens from many areas, including European waters, were used for morphological variation and distribution. The present paper reports two records of uncommon amphipod species in Arcachon Bay and Hossegor Lake: *Ampithoe valida* probably introduced with oyster transfers and *Jassa slatteryi*, a cosmopolite amphipod rarely sampled.

Material and Methods

Study areas

Arcachon Bay (Fig. 1) is a 180 km² macrotidal coastal lagoon situated on the south-western coast of France. This lagoon communicates with the Atlantic Ocean by a narrow channel and receives freshwater inputs in its south-eastern part (Leyre River). It is characterized by large intertidal flats (115 km²), whose lower parts are mainly occupied by oyster farms (10 km²) [Pacific oysters, *Crassostrea gigas* (Thunberg, 1793)]. In the inner lagoon, tidal channels represent 71 km², with 1.02 km² occupied by eelgrass beds (*Zostera marina* Linnaeus, 1753) (Plus et al., 2010).

Hossegor Lake (Fig. 1) is a small (0.9 km²), shallow, marine water body connected to the Atlantic Ocean by a very narrow channel and receiving fresh water by two small rivers (Bourret and Boudigau Rivers) in its southern part. Intertidal flats represent 0.28 km², and *Z. noltei* covers 0.012 km² (Trut et al., 2014). The lake has been highly modified by human activities (embanking, oyster farming, dredging). The maximum water depth is 4 m and the salinity ranges between 21 and 35 (Auby et al., 2015).

Material examined

Specimens of *Jassa slatteryi* were collected at four subtidal stations in Arcachon Bay and specimens of *Ampithoe valida* were collected at five stations in Arcachon Bay and a single one in Hossegor Lake (Fig. 1 & Table 1). Specimens were sampled during specific biodiversity surveys. Specimens were conserved and dissected in alcohol and some individuals were mounted on slides for study. Permanent slides were made using dimethylhydantoinformaldehyde resin. Specimens were observed under a Nikon SMZ25 stereomicroscope and a Nikon Eclipse E400 microscope, and photographed with a Nikon DS-Ri2 camera. Body length (BL) was measured with NIS-Elements Analysis software from anterior margin

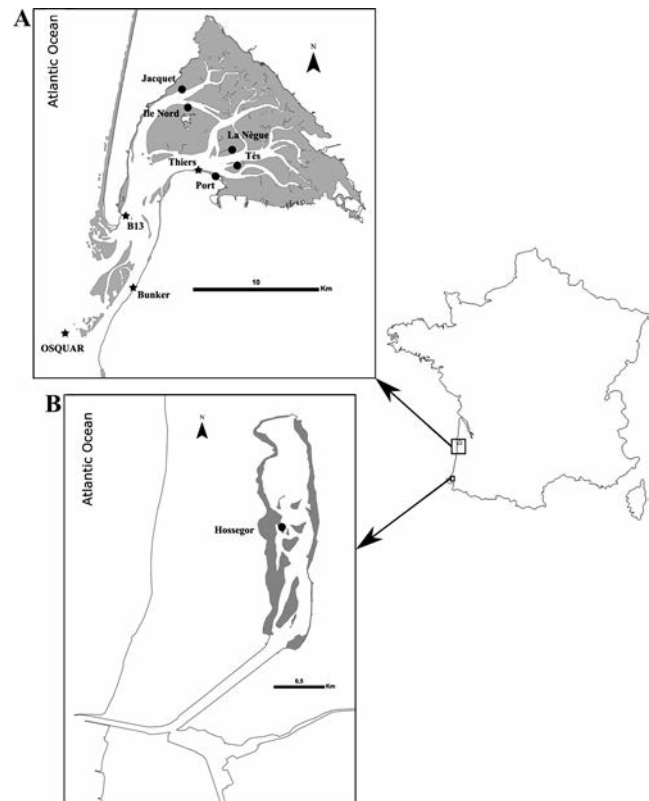


Figure 1. Sampling stations for *Jassa slatteryi* Conlan, 1990 (black star) and *Ampithoe valida* Smith, 1873 (black dots) in (A) Arcachon Bay and (B) Hossegor Lake. See code legend in Table 1.

of head to posterior end of telson. Drawings were carried out from pictures using Inkscape software. Some specimens examined in the scope of this study were deposited in the collection of the Muséum National d'Histoire Naturelle, Paris (MNHN).

Results

Jassa slatteryi was collected at four subtidal stations in 2013, 2014 and 2016: Thiers in slipper limpet bed, OSQUAR and Bunker in hydrozoans, navigation buoy B13 in mussel fouling. Different stages of maturity were collected: juveniles, adult females, minor and major form of adult males. In station Thiers, *J. slatteryi* showed low abundances without adult males with major form, whereas in station OSQUAR, Bunker and B13, *J. slatteryi* was very abundant and only 22 specimens in station OSQUAR, 24 specimens in station Bunker and 20 specimens in station B13 were collected for morphological comparisons (Fig. 1 & Table 1). Specimens of *Ampithoe valida* were collected between 2014 and 2016, mainly in intertidal oyster reefs in Arcachon Bay and Hossegor Lake. Most of the specimens

Table 1. Records of *Jassa slatteryi* and *Ampithoe valida* in Arcachon Bay and Hossegor Lake. N: number of individuals collected. Sites and stations: see figure 1.

Species	Date	Stations	Tidal level	Habitat	Latitude	Longitude	N	MNHN depository
<i>J. slatteryi</i>	7/3/13	B13	Subtidal	Mussel fouling	44°38' N	1°14' W	20	
-	6/18/14	Thiers	Subtidal	Slipper limpet bed	44°39' N	1°10' W	31	MNHN-IU-2014-12856 (1 specimen)
-	3/15/16	OSQUAR	Subtidal	Hydrozoans	44°32' N	1°17' W	22	MNHN-IU-2014-12857 MNHN-IU-2014-12858
-	5/14/16	Bunker	Subtidal	Hydrozoans	44° 34 'N	1° 14'W	24	MNHN-IU-2014-12859
<i>A. valida</i>	6/10/14	Jacquet	Intertidal	Oyster reef	44°40' N	1°05' W	1	
-	7/22/14	Jacquet	Intertidal	Oyster reef	44°40' N	1°05' W	1	
-	10/22/14	Jacquet	Intertidal	Oyster reef	44°40' N	1°05' W	6	MNHN-IU-2014-12860 (1 specimen)
-	11/5/14	Ile Nord	Intertidal	Oyster reef	44°42' N	1°10' W	8	
-	9/21/15	La Nègue	Intertidal	Oyster reef	44°40' N	1°08' W	15	
-	1/25/16	Tès	Intertidal	Oyster reef	44°40' N	1°07' W	22	
-	3/22/16	Hossegor	Intertidal	Oyster reef	43°40' N	1°25' W	11	
-	4/27/16	Port	Subtidal	Floating pontoons	44°39' N	1°09' W	31	MNHN-IU-2014-12861

were juveniles and females, very few adult males with highly developed gnathopod 2 were collected. Specimens of *J. slatteryi* and *A. valida* were mainly collected in Arcachon Bay, which may be partially attributed to a higher sampling effort in this area.

Description of *Jassa slatteryi* (Figs 2 & 3)

Based on adult male, BL: 4.3 mm, MNHN-IU-2014-12856, Arcachon Bay (SW France), station Thiers, June 18, 2014, dissected specimen (6 slides).

Body smooth; urosome segment 1 with a pair of erect setae dorsally. *Antenna 1* slightly shorter than antenna 2 peduncle; accessory flagellum 2 articles, flagellum 5 articles. *Antenna 2* peduncle article 5 and flagellum with dense pappose setae; flagellum with 4 articles (the last very small), article 1 about 53% of full length. *Gnathopod 1* merus, carpus and propodus more setose on inner face; basis with 1 anterodistal and 2 posterodistal setae on outer face and 1 anteromedial of distal part on inner face; carpus with 1 long and 1 short dorsolateral seta placed on inner face, the longest about 88% of carpus length; propodus with strong serrated setae on inner face; palm slightly concave, distal part of the palm delimited by 2 submarginal (one on each face) and 1 marginal cuspidate setae; dactyl cuspated along most of posterior margin, without facial striations, anterior margin with a proximal plumose seta. *Gnathopod 2* basis with 7 anterolateral (setae about 35% of segment width) and 2 posterodistal setae; ischium and merus with a posterodistal cluster of setae; carpus without anterodistal or posterodistal seta; propodus anterior margin with clusters of plumose setae and a subacute tooth about 16% of propodus length, tooth without setae, palm

delimited by a cluster of plumose setae and 2 very small cuspidate setae (one on each side); dactyl anterior margin with a proximal plumose seta. *Pereopods 3* and *4* basis anterior margin straight to slightly convex with long subdistal setae, posterior margin with marginal and distal long setae, anterior and posterior setae about half length of basis width; merus anterodistal lobe reaching end of carpus; carpus subtriangular; propodus width about 50% of length; dactylus anterior margin with a proximal plumose seta. *Pereopods 5-7* basis posterior margin slightly convex with a posterodistal lobe; merus reaching proximal part of carpus, about 15% of carpus length; carpus rectangular; propodus anterior margin with 1 subdistal and 2 distal cuspidate setae; dactyl posterior margin with proximal plumose seta, anterior margin smooth. *Uropod 1* peduncle with lateral cuspidate setae, posteroventral spinous process underlying 38% of inner ramus; inner and outer rami with 4 and 3 mid-dorsal cuspidate setae respectively and a cluster of distal cuspidate setae. *Uropod 2* peduncle with one inner and one outer distal cuspidate seta, posteroventral spinous process very small; inner ramus shorter than outer with 3 inner, 1 outer and 3 distal cuspidate setae; outer ramus with 0 inner, 4 outer and 4 distal cuspidate setae. *Uropod 3* peduncle with 4 average inner and 3 very short outer setae, 4 dorsodistal strong cuspidate setae and a cluster of distolateral setae on outer margin; inner ramus with only a distal cuspidate seta, outer and distal margin covered with many setules; outer ramus with 2 sequential, closely approximated cusps, dorsally recurved, half dorsodistal part covered with many setules, distal part with a strong curved cuspidate seta. *Telson* without apical setae, 3 lateral setae on each side.

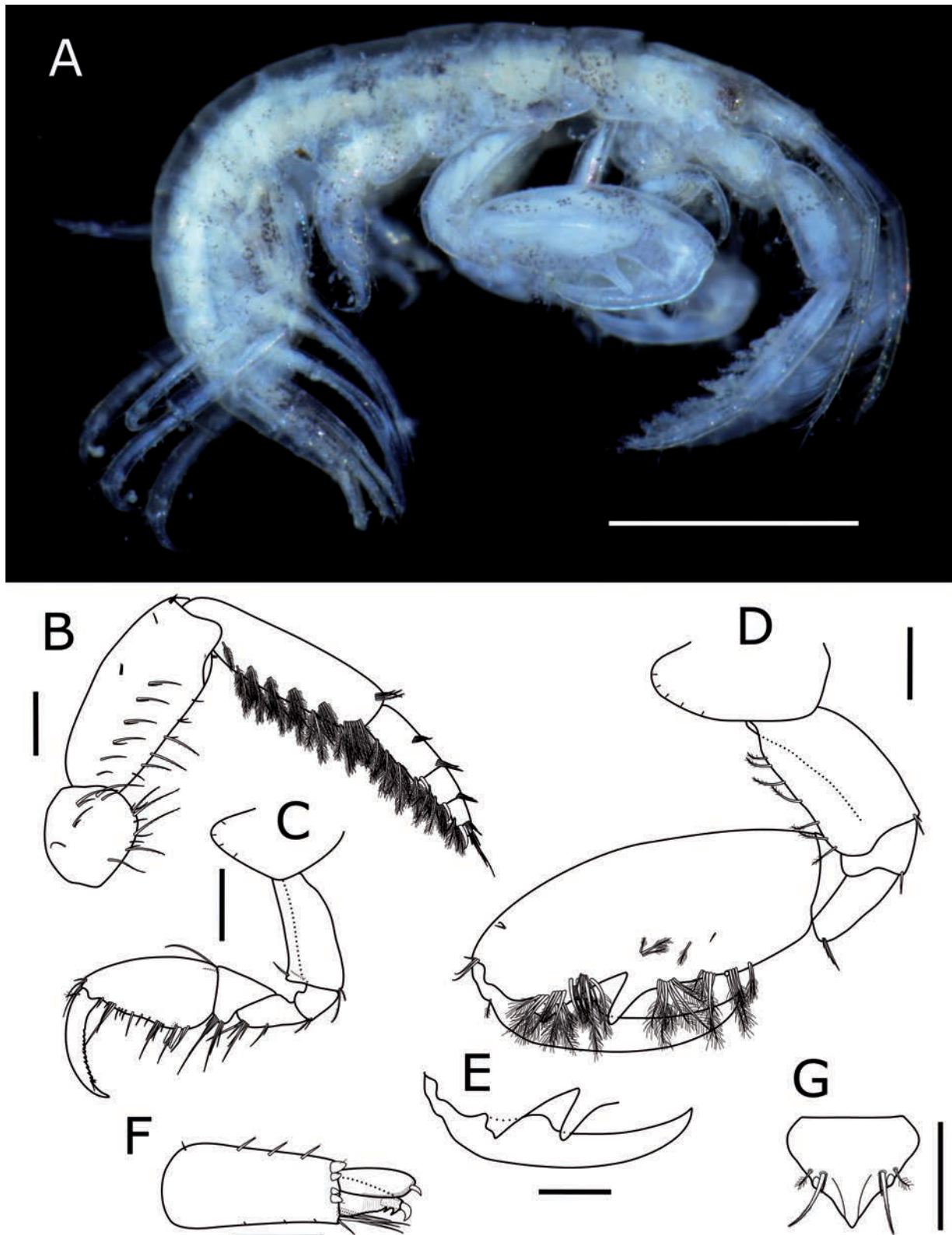


Figure 2. *Jassa slatteryi* Conlan, 1990: specimen from Arcachon Bay (SW France), station “Thiers”, June 18, 2014. Adult male, minor form, BL: 4.3 mm, MNHN-2014-12856. **A.** Lateral view. **B.** Left antenna 2, inner view. **C.** Left gnathopod 1, outer view. **D.** Left gnathopod 2, outer view. **E.** Left gnathopod 2, outer view of propodus (in part) and dactylus, setae not drawn. **F.** Left uropod 3, dorsal view. **G.** Telson, dorsal view. Scale bars: A: 1 mm. B, C, D, E: 0.2 mm. F, G: 0.1 mm.

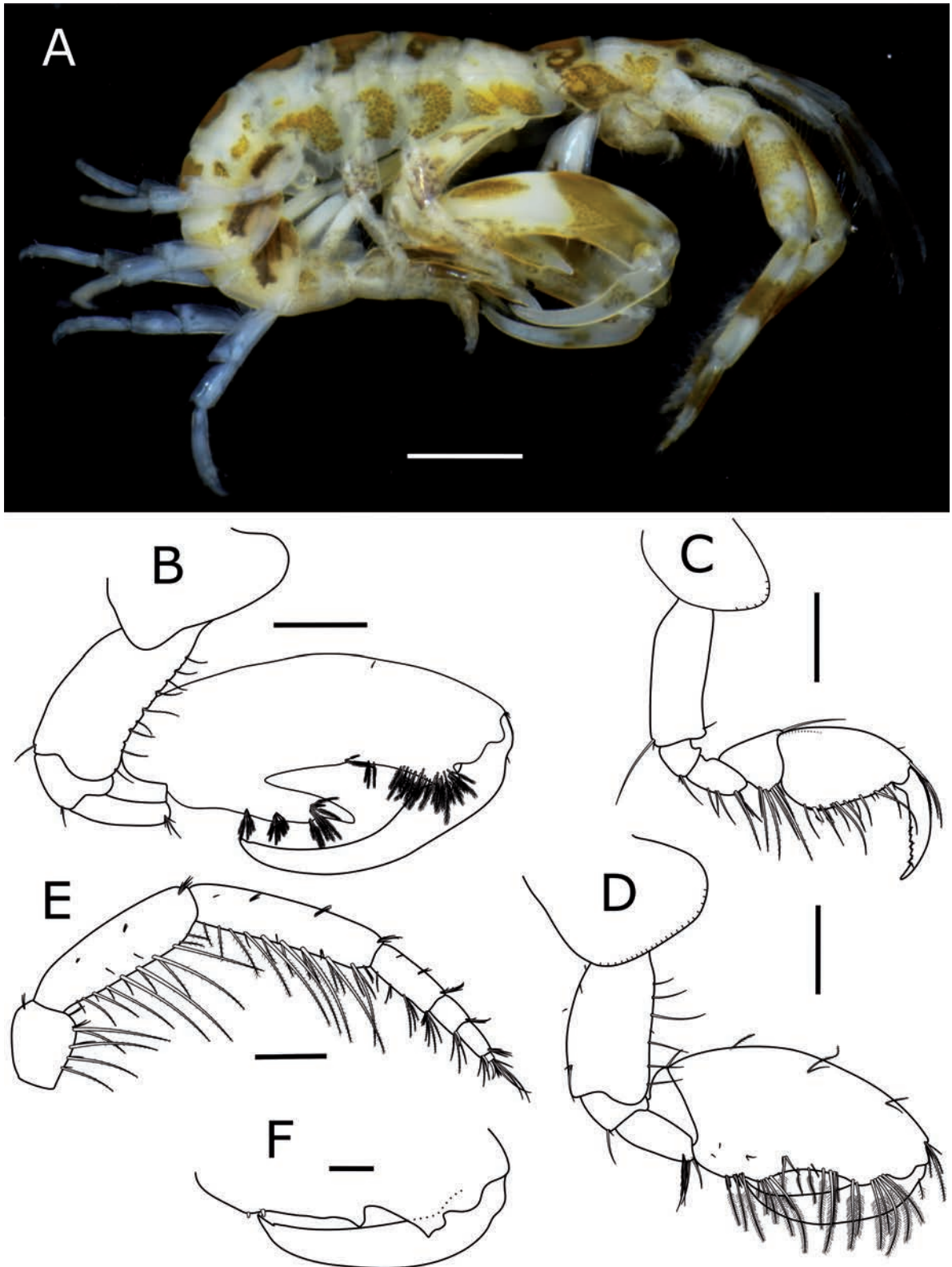


Figure 3. *Jassa slatteryi* Conlan, 1990: specimens from Arcachon Bay (SW France). Station “OSQUAR”, March 15, 2016. A-B: Adult male, major form, BL: 8.3 mm, MNHN-2014-12857; C-E: Adult female, BL: 4.4 mm; F: Adult female, BL: 8.6 mm. A. Lateral view. B. Right gnathopod 2, outer view. C. right gnathopod 1, outer view. D. Right gnathopod 2, outer view. E. Right antenna 2, outer view. F. Right gnathopod 2, outer view of propodus (in part) and dactylus, setae not drawn. Scale bars: A: 1 mm. B, C, D, E, F: 0.2 mm.

Female (sexually dimorphic characters based on female with oostegites, BL: 4.4 mm), Arcachon Bay (SW France), station Thiers, June 18, 2014 (Fig. 3). Antenna 2 peduncle article 5 and flagellum with less dense pappose setae, setae on peduncle article 5 longer; gnathopod 1 basis with posterodistal seta reaching end of ischium; gnathopod 2 basis posterolateral margin with few small setae, carpus with anterodistal seta; propodus much larger, palm concave, distal part of the palm delimited by 3 large cuspidate setae.

Variability

Juveniles and males minor form with dispersed pigmentations, antenna 1 reaching distal two-third of antenna 2 peduncle article 5 whereas adult females and males major form with distinctive banding and antenna 1 reaching proximal third in major form. Antenna 2 peduncle article 5 and flagellum with fewer and less dense pappose setae in smaller specimens. Gnathopod 1 distal part of the palm delimited by 2 submarginal (one on each face) and 1 to 4 marginal cuspidate setae; palmar margin straight to slightly convex in smaller specimens. Gnathopod 2 basis anterior margin with 3 to 7 setae in females, 7 to 10 in subadult males, 12 to 18 in adult males major form; males propodus tooth about 16 to 20% and 22 to 32% of propodus length for minor and major form respectively; propodus tooth with clusters of plumose setae on posterior margin only in major form; dactylus with or without a process on proximal part of posterior margin. Larger females comprise a major form with a small tooth in the middle on the gnathopod 1 palmar margin.

Description of *Ampithoe valida* (Figs 4 & 5)

Based on adult male, BL: 7.8 mm, MNHN-2014-12860, Arcachon Bay (SW France), station Jacquet, October 22, 2014, dissected specimen (17 slides) and adult male, BL: 11.6 mm, Arcachon Bay (SW France), station Port, April 27, 2016.

Body smooth; coxa 1-4 ventral margin with small setae, posteroventral corner with 1 to 5 long setae; coxa 5 deepest with small setae on ventral margin, large roundish anterior lobe and subrectangular posterior lobe; urosome segment 1 and 2 with a pair of erect setae dorsally. *Eyes* subovoid. *Antenna 1* and *2* sparsely setose, without spine; antenna 1 slightly longer than antenna 2, accessory flagellum absent. *Gnathopod 1* densely setose, carpus and propodus posterior margin very finely striated (difficult to see); basis anterior margin smooth, anterodistal corner with large lobe and a single setae, posterior margin with many long setae; ischium anterior margin smooth, posterior margin with clusters of setae increasing in length distally; carpus anterior and posterior margin widely setose, posterior

margin with a large carpal lobe, posterodistal corner with simple and serrate setae; propodus less setose on inner face, anterior margin widely setose, palmar margin regularly convex, defined by a single strong submarginal spine on inner face, distal part with a curved robust seta near dactylus insertion; dactylus with 1 seta on proximal anterior margin, posterior margin serrate. *Gnathopod 2* basis anterior margin with few and short setae, anterodistal corner with large lobe, posterior margin with long setae; ischium smooth except a posterodistal cluster of setae; carpus triangular; propodus very large, subrectangular, slightly larger distally, anterior and posterior margin sparsely setose, palmar margin transverse, with a subquadrate middle tooth, defined by a single small submarginal spine on inner face; dactylus with 1 setae on proximal anterior margin, posterior margin smooth. *Pereopods 3* and *4* with simple setae, no spines; basis slightly inflated; merus slightly widened anteriorly. *Pereopods 5-7* ischium, merus and carpus broad, with setae and no spine; propodus slender, slightly larger distally, anterior margin with 5 clusters of one strong spine and simple setae (setae increasing in number and length distally) and with one curved robust seta near dactylus insertion; dactylus with 1 seta on proximal posterior margin, anterior margin smooth. *Pereopod 5* shortest; basis as broad as long, roundish, posterior margin with small setae, anterior margin with fewer setae, small and long; *Pereopod 6-7* basis subrectangular, anterior margin with 5 small spines, posterior margin with few small setae, posterodistal corner with narrow lobe defined by small excavation near insertion of ischium. *Epimera 1-3* ventral margin smooth, posterodistal corner rounded with a small seta. *Uropod 1* longest; peduncle longer than rami, proximal half with 6 basofacial simple setae, distal half with 6 spines on outer margin and 2 spines on inner margin; rami subequal with a cluster of distal spines (1 strong and 3 smaller) on each ramus; outer ramus with 4 lateral spines on outer margin, inner margin bare; inner ramus with 2 spines on inner margin, outer margin bare. *Uropod 2* peduncle outer margin bare, inner margin with 3 spines; rami with apical cluster of spines, same as uropod 1; outer ramus shorter than inner ramus, outer margin with 3 spines, inner margin bare; inner ramus with 3 spines on inner margin, outer margin bare. *Uropod 3* shortest; peduncle longer than rami, plumose setae on inner margin, outer margin and ventral face, 1 small submarginal and 5 distal spines; outer ramus subequal to inner ramus, outer margin with a cluster of simple setae, inner margin bare, distal end with 2 strong apical spines; inner ramus with a single submarginal spine and an apical cluster of pappose setae and spines. *Telson* short, narrowing, lateral margin with short and long simple setae, apical cusps low with one long simple and 1 short pappose seta.

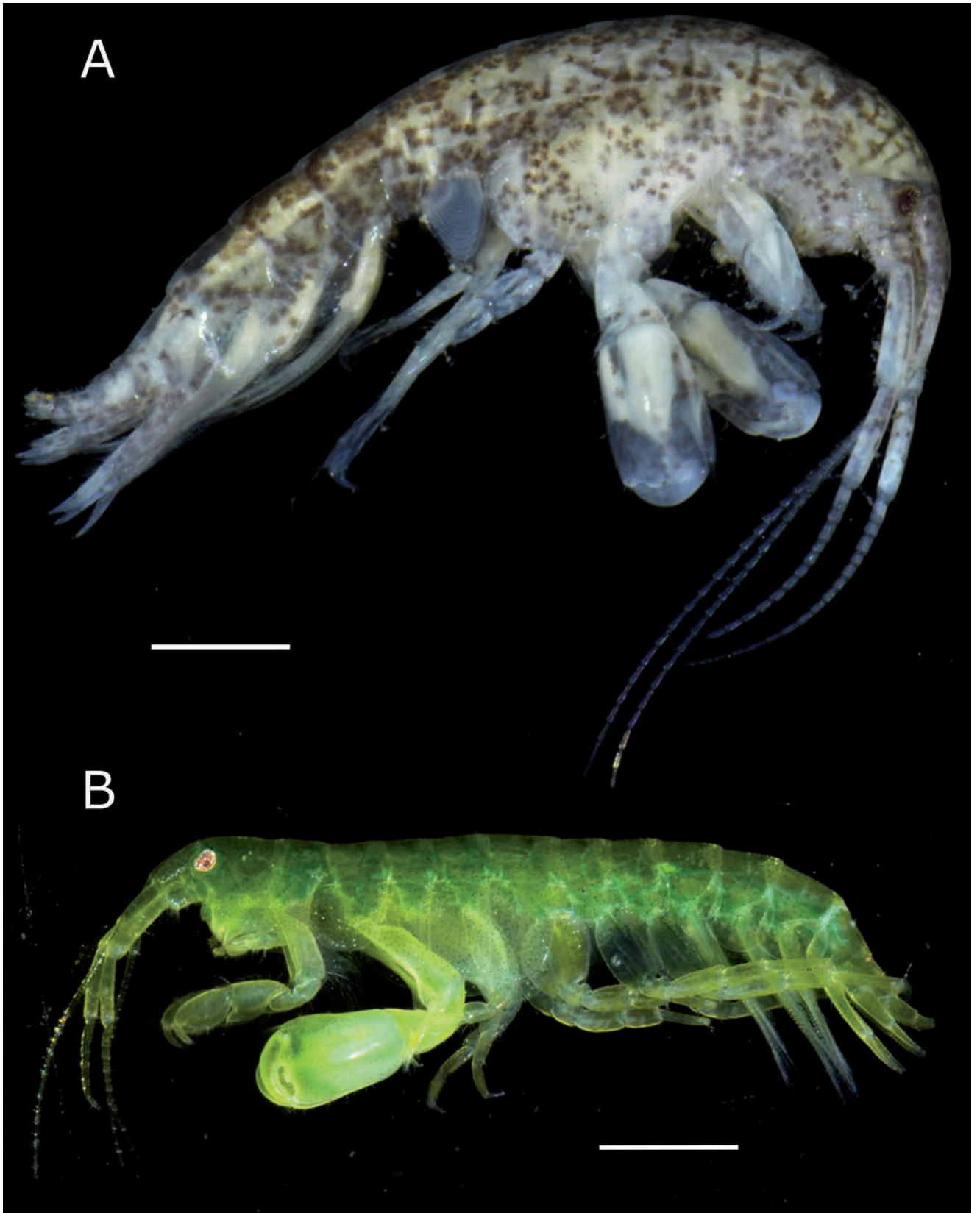


Figure 4. *Ampithoe valida* Smith, 1873: specimens from Arcachon Bay (SW France), adult males, lateral views. **A.** Station “Jacquet”, October 22, 2014, BL: 7.8 mm, MNHN-2014-12860. **B.** Station “Port”, April 27, 2016, BL: 11.6 mm. Scale bars: A: 1 mm. B: 2 mm.

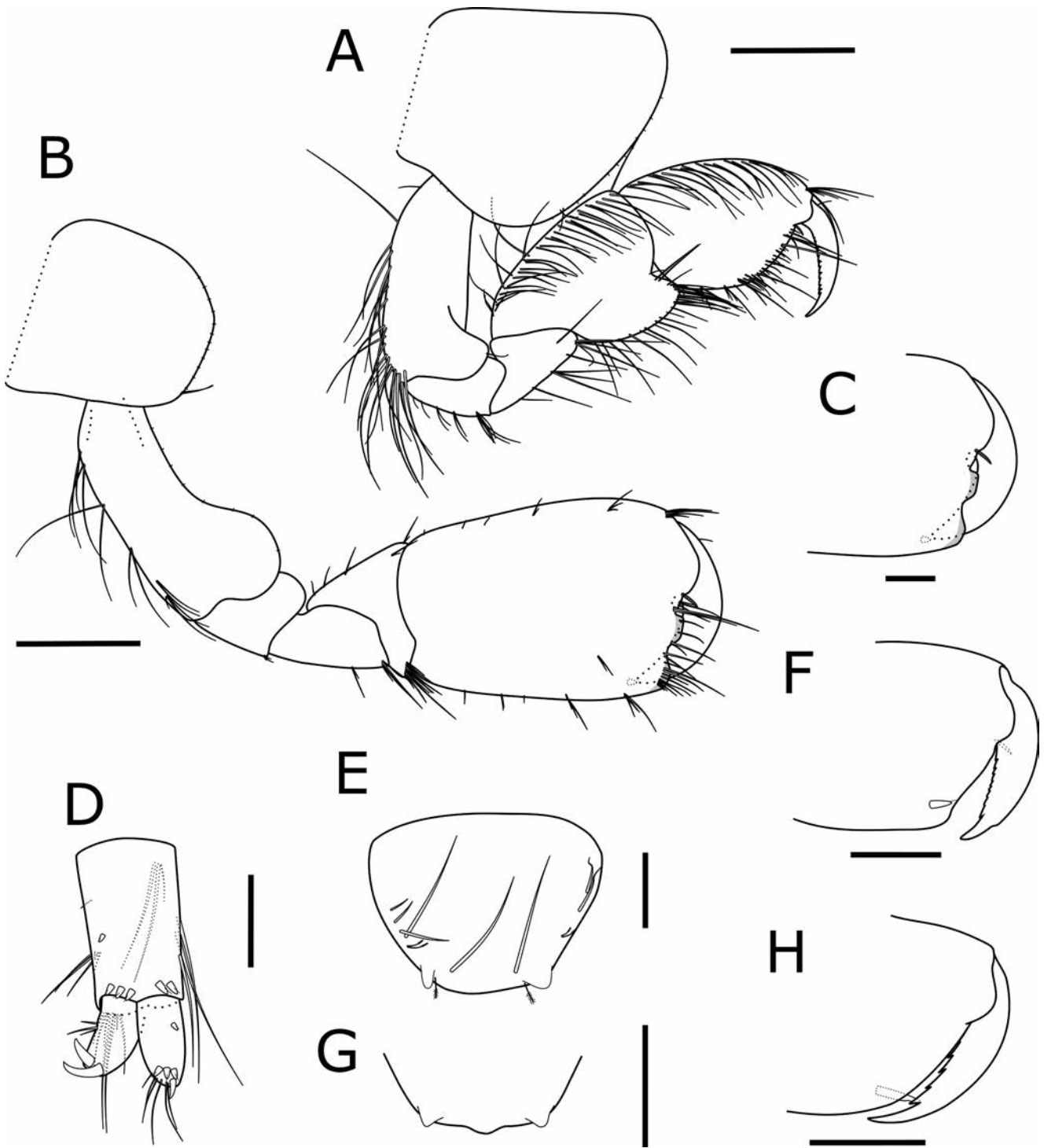


Figure 5. *Ampithoe valida* Smith, 1873: specimens from Arcachon Bay (SW France). Station “Jacquet”, October 22, 2014. **A-E.** Adult male, BL: 7.8 mm, MNHN-2014-12860. **F.** Adult male, BL: 6.3 mm. Station “La Nègue”, September 21, 2015. **G.** Adult female, BL: 15.8 mm. Station “Ile Nord”, November 5, 2014. **H.** Adult male, BL: 3.4 mm. **A.** Right gnathopod 1, outer view. **B.** Right gnathopod 2, outer view. **C.** Right gnathopod 2, propodus (in part) and dactylus, outer view, simple setae not drawn. **D.** Right uropod 3, dorsal view. **E.** Telson, dorsal view. **F.** Left gnathopod 2, inner view of propodus (in part) and dactylus, simple setae not drawn. **G.** distal part of telson, dorsal view, setae not drawn. **H.** Outer view of right gnathopod 2, propodus (in part) and dactylus, simple setae not drawn. Scale bars: A, B: 0.5 mm. C, D, F, G: 0.2 mm. E, H: 0.1 mm.

Female (sexually dimorphic characters based on female, BL: 6.4 mm), Arcachon Bay (SW France), station Jacquet, October 22, 2014. Gnathopod 1 less setose; posterior lobe of carpus less produced distally. Gnathopod 2 similar to female gnathopod 1, slightly larger; propodus palmar margin regularly convex.

Variability

Specimens with brown color and numerous stellate pigment spots to green color with many small black spots; eyes brown or reddish (Fig. 4). Male gnathopod 2 propodus with various shapes of palmar margin in relation to size of specimens: regularly convex in juveniles specimens, transverse and irregular for medium sized specimens, transverse with a subquadrate middle tooth for larger specimens, palmar margin defined by strong submarginal spine on inner face in subadult, smaller in larger specimens; dactylus serrate on posterior margin in juveniles and subadult, smooth in larger specimens. Uropod 3 peduncle and inner ramus with 0 or 1 submarginal spine, telson with distal end regularly convex or convex with a small process.

Discussion

Jassa slatteryi

Jassa slatteryi was originally described by Conlan (1990) in a revision of the genus *Jassa* with a world key. This species was described with material from California (holotype and allotype), additional material used for morphological variation and distribution came from Canada (British Columbia), United States (Alaska, Oregon, California), Mexico, Japan, South Korea, Galapagos Islands, Chile, Brazil, South Africa, Australia, New Zealand and in European waters. Recently, *J. slatteryi* was recorded in Argentina (Rumbold et al., 2015).

In European waters, *J. slatteryi* was recorded in Ireland, France, Spain and Croatia (Conlan, 1990; Beermann, 2013). On the French Atlantic coast, *J. slatteryi* was only recorded in Concarneau and Cap Coz (South Brittany, Conlan, 1990), the present paper represents the most southerly record in European Atlantic waters. However, *J. slatteryi* was also recorded in the Mediterranean coast, in Sète (named Cette in Conlan, 1990).

In accordance with the key in Conlan (1990), specimens from Arcachon Bay are characterized by: (1) antenna 2 peduncle article 5 and flagellum with plumose setae; (2) gnathopod 1 basis without a row of short setae along the length of the anterolateral margin; (3) gnathopod 1 carpus with long seta(e) at the anterodistal corner, slightly medial or dorsal; (4) gnathopod 2 basis with a row of setae along the length of the anterolateral margin; (5) gnathopod 2 basis

and propodus anteromarginal setae sparse and simple; (6) uropod 1 ventral peduncular spinous process at least $\frac{1}{4}$ to $\frac{1}{2}$ the length of the shortest ramus; (7) tip of telson without apical setae. Specimens from Arcachon Bay were in agreement with Conlan (1990)'s description.

In Chevreux & Fage (1925) and Lincoln (1979), two traditional references for identification of French Atlantic coast Amphipoda, 4 *Jassa* species are mentioned: *J. falcata*, *J. marmorata* Holmes, 1905, *J. ocia* and *J. pusilla* (Sars, 1894) (*J. dentex* (Czerniavski, 1868) is mentioned but is a synonym of *J. pusilla*). In Arcachon Bay, two additional *Jassa* species were recorded: *J. falcata* and *J. ocia*. The two other species mentioned in Lincoln (1979) occur in the Bay of Biscay (Bachelet et al., 2003). *J. slatteryi* differs from *J. falcata* and *J. pusilla* by gnathopod 2 anterolateral margin of basis with a row of setae along its length (vs without setae, or microscopic for *J. falcata* and *J. pusilla*). *J. slatteryi* differs from *J. marmorata*, a closely allied species, by the presence of long (about 88% of carpus size) and slightly medial or dorsal seta(e) on gnathopod 1 carpus at the anterolateral junction of the propodus (vs seta(e) minute and slightly lateral for *J. marmorata*, about 20% of carpus size). *J. slatteryi* also differs from *J. ocia* by gnathopod 2 propodus with 1 tooth on posterior margin (vs 2 distinct teeth for *J. ocia*).

J. slatteryi occurs in filamentous red algae, hydrozoans, mussel fouling and slipper limpet beds, just below water level to about 15m depth, mainly in polyhaline but also in mesohaline waters (Conlan, 1990; present work).

Ampithoe valida

A. valida was originally described by Smith in 1873 from North America Atlantic coast, a succinct description without figure. It was since recorded on the Pacific coast of North America (Alderman, 1936; Barnard, 1954; Bousfield, 1973; Conlan & Bousfield, 1982), the Japan Sea (Nagata, 1960; Kim & Kim, 1988) and in European waters (Marques, 1989; Cunha et al., 1999; Pardal et al., 2000; Faasse, 2015). In European waters, *Ampithoe valida* was recorded from the French Mediterranean coast, Portugal and The Netherlands (Faasse, 2015).

In European waters, 10 *Ampithoe* species have been recorded: *A. fastidiosa* Mateus & Mateus, 1991, *A. ferox*, *A. gammaroides*, *A. helleri* Karaman, 1975, *A. pomboi* (Mateus & Alfonso, 1974), *A. ramondi* Audouin, 1826, *A. riedli* Krapp-Schickel, 1968, *A. rubricata* (Montagu, 1818), *A. spuria* Krapp-Schickel, 1978 and *A. valida* Smith, 1873. Only *A. ferox* has a similar male gnathopod 2. *A. valida* differs from *A. ferox* by (1) coxa 1-4 with cluster of long setae on postero-distal corner (vs with small setae), (2) gnathopod 1 basis with many long setae on posterior margin (vs marginally bare), (3) gnathopod 1 carpus with large lobe (vs with small lobe) and (4) P5 basis anterior

margin with small and long setae (vs small setae). Furthermore, according to Bousfield (1973), *A. valida* present a maximum body length of 12 mm versus 6 mm for *A. ferox*. In the present work, the largest specimen examined was a female with body length about 15.8 mm. However, contrary to Faasse's (2015) observations, specimens examined showed propodus of pereopods 5-7 slightly larger distally, in accordance with figures of Barnard (1954) and Conlan & Bousfield (1982). Due to the similarity between *A. valida* and *A. ferox*, and according to Faasse (2015), past signalizations of *A. ferox* on the French Atlantic coast [Roscoff (Ledoyer, 1964) and Arcachon Bay (Auby, 1991)] must be taken with caution.

Ampithoe shimizuensis, another species not recorded in European waters, is very close to *Ampithoe valida*. Barnard (1954) and Conlan & Bousfield (1982) consider *Ampithoe valida* and *Ampithoe shimizuensis* synonymous. Kim & Kim (1988), according to Barnard (1965) observations, considered *A. shimizuensis* as a subspecies: *A. valida shimizuensis*. In addition to Kim & Kim (1988) characters to distinguish *A. valida shimizuensis* and *A. valida*, males gnathopod 1 setation can be used: basis posterior margin, carpus and propodus anterior margin densely setose in *A. valida* versus slightly setose in *A. valida shimizuensis*.

A. valida is present on sheltered coasts and in estuaries, mainly in mesohaline to brackish waters, from lower intertidal to 30m. Sexual maturity is reached between 6 and 12 mm for males, 5 and 12.5 mm for females (Bousfield, 1973; Conlan & Bousfield, 1982). According to Paulmier (1905), Conlan & Bousfield (1982) and Faasse (2015), the colour of live specimens varies from brown to green, with numerous stellate pigment spots, the green colour disappears in alcohol and formaldehyde. This character cannot be used for *Ampithoe* species identification in live specimens (Faasse, 2015).

General discussion

Jassa slatteryi is widely distributed in the world. In European waters, this species may be more widespread than currently known. *J. slatteryi*, which is not treated in European identification manuals, is probably misidentified as *J. marmorata*, a morphologically similar species present in traditional references for identification of French Atlantic coast Amphipoda.

According to Faasse (2015), and due to the similarity with *Ampithoe ferox*, date and vector of introduction of *A. valida* to European waters, particularly the Atlantic coast, are difficult to determine. Wasson et al. (2001) mentioned oyster culture, ship fouling and ballast water as potential introduction vector for *A. valida*. In Arcachon Bay, many non-indigenous species recently found were probably introduced with *Crassostrea gigas* culture: the bivalve *Arcuatula senhousia* (Benson, in Cantor, 1842) (Bachelet et

al., 2009), the isopod *Paranthurus japonica* Richardson, 1909 (Lavesque et al., 2013), and the amphipods *Grandidierella japonica* Stephensen, 1938 (Lavesque et al., 2014), *Melita nitida* (Gouillieux et al., 2016a), *Aoroides curvipes* Ariyama, 2004, *Aoroides longimerus* Ren & Zheng, 1996 and *Aoroides semicurvatus* Ariyama, 2004 (Gouillieux et al., 2016b). *Ampithoe valida* was probably introduced with oyster transfers from British Columbia or Japan in European waters, transfers between oyster European sites and ships dispersed the species. This species may be present in other oyster farming sites, but this has not yet been documented.

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