

Additional findings of *Albunea carabus* (Linnaeus, 1758) (Decapoda, Anomura, Hippoidea) in Italian waters

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The first findings of the anomuran Albunea carabus (Linnaeus, 1758) from the southeastern coasts of Sicily are documented, improving knowledge on the distribution of this poorly known species around the island and in the Mediterranean Sea. The distribution of records in the whole basin is updated.

Key words: Crustacea, Anomura, *Albunea carabus*, Sicily, Mediterranean Sea

INTRODUCTION

The sand crab *Albunea carabus* (Linnaeus, 1758) (Decapoda, Anomura, Hippoidea) is the single species of the family Albuneidae living in the Mediterranean Sea. It is known from the eastern Atlantic and the Mediterranean Sea, mainly from its western coasts, such as those of Italy, Spain, Algeria, Tunisia (BOYKO, 2002; PEREIRA *et al.*, 2008). The species was considered rare in the past, especially in the eastern part of the Mediterranean, but recent records confirmed the “apparent rarity” of *A. carabus*, as expected by BOYKO (2002). In fact, apart the already known occurrence documented in Israel, Lebanon and the southern coasts of Turkey (HOLTHUIS & GOTTLIEB, 1958; BOYKO, 2002; KATAĞAN & ÇEVİK, 2003), *A. carabus* has been recently reported for

the first time from the Aegean waters (CORSINI-FOKA & KALOGIROU, 2013) and along the Egyptian Mediterranean coasts (ABDELSALAM & RAMADAN, 2017), widening noticeably the knowledge of the geographical distribution of this sand crab in the eastern Mediterranean Sea.

Few scattered findings of *A. carabus* have been documented from Italy: in the Tyrrhenian Sea, namely along the coasts of Lazio (MONCHARMONT, 1969), also along the northeastern coasts of Sicily, at Mortelle, Messina, four specimens, and the western coasts of Calabria, one specimen, in 1992 (GIACOBBE & SPANÒ, 1996); also reported from the Sardinian Channel in 1997-2002 (MURA & CORDA, 2011) and from the Strait of Sicily, along the southwestern coast of Sicily, at Marinella, two specimens, in 1996 (SPANÒ *et al.*, 1999), while recently it has been

recorded from the eastern waters of the island (SCUDERI *et al.*, 2017). As reported in HOLTHUIS (1954) and GIACOBBE & SPANÒ (1996), RAFINESQUE (1814) has recorded the species from Sicily, but he did not mention the precise locality. Constantine Samuel Rafinesque Schmaltz was employed as secretary to the U.S. Consul in Sicily Mr. Abraham Gibbs, who was a banker as well a merchant. Since he could speak French, English and Italian, besides enjoying a good position in the consulate in Palermo, Rafinesque was a privileged man and he could devote all his free time to his interests in natural history. His acquaintance with the English naturalist William Swainson, who was posted in nearby Messina in the Commissary of Accounts Department of the British Army, was greatly important. Rafinesque and Swainson undertook several excursions in the outskirts of Palermo from 1807 to 1812 in order to botanize and to collect insects, marine creatures and birds. Thanks to their common interests in natural history research they developed a friendly relationship which continued until 1840 with mutual exchange of letters, news and specimens. Many specimens of marine creatures were given by William Swainson to Rafinesque for study and description (Charles Boewe 2000, *in litteris*); we are convinced that the specimen of "*Albunea symnista*" Fabricius mentioned by RAFINESQUE (1814) could have been collected most likely on the beach of Mortelle, Messina (SWAINSON, 1989).

The species burrows into sandy environment at depth from a few meters down to 50-60 m, mainly in habitat characterized by high turbidity and remarkable hydrodynamism (GIACOBBE & SPANÒ, 1996; SPANÒ *et al.*, 1999) and, like cofamiliar species, presents pelagic larval phases (SERIDJI, 1988; MURPH & FAULKES, 2013).

In the present study, new information on the distribution of *A. carabus* in the waters of southern Sicily and the Tyrrhenian Sea is given through the report of findings carried out in the last two decades. The distribution of records of the species in the Mediterranean waters is furthermore updated.

MATERIAL AND METHODS

Three individuals of *A. carabus* were collected by trammel-nets in the waters of southeastern Sicily and identified following BOYKO (2002). The specimens were deposited at the Museo Civico di Storia Naturale di Comiso (Province of Ragusa) (MSNC), under the catalogue number MSNC 4553. Carapace length CL, carapace width (CW) and length of abdominal somites and telson STL were measured under a stereomicroscope by use of a caliper to the nearest 0.01 mm, following KATAĞAN & ÇEVİK (2003). Carapace length CL was measured from the midpoint of the anterior margin (including rostrum) to the midpoint of the posterior concavity; carapace width CW was measured as the distance between the lateral anterior margins of the carapace; the length of abdominal somites and telson STL was measured from the anterior margin of the first somite to the posterior tip of telson. Sex was determined under a stereomicroscope, by observing the position of the gonopores (on the coxa of the third pereopod in females or the coxa of the fifth pereopod in males) (BOYKO, 2002).

A fourth specimen (♀) has been collected by a private citizen during summer 2012 at the beach of Tre Fontane, Campobello di Mazara (Trapani), southwestern coast of Sicily. Another specimen of unknown sex was captured on 22 May 2018 at Agropoli (Province of Salerno, Campania), southern Tyrrhenian Sea, with trammel-net, on sandy bottom. Apart photographic documentation, no other information is available for these last two findings.

The Mediterranean findings of the species, including those newly reported here, are listed in Table 1 and their distribution is given in Fig. 1.

RESULTS AND DISCUSSION

A male of *A. carabus*, MSNC 4553-1 (Fig. 2a), CL 16.2 mm, CW 19.6 mm, telson partially damaged, was collected on 3 May 2000 on sandy bottom at 8 m of depth, at 300 m distance from the mouth of Irmínio river (Ragusa) (36° 46.381'N, 14° 35.065'E). After seventeen years,

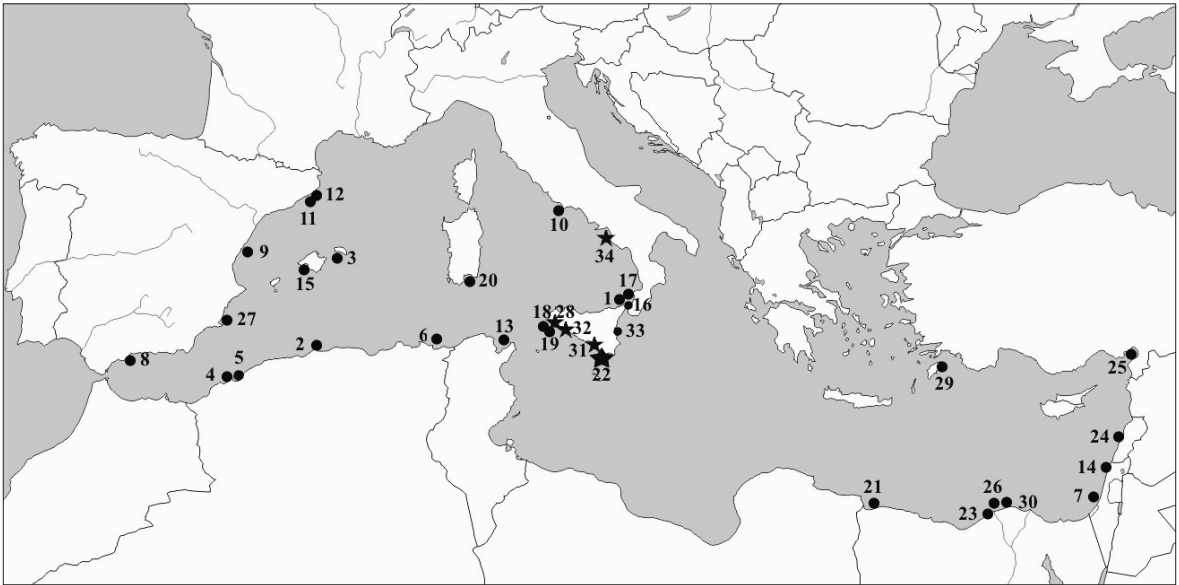


Fig. 1. Locations of records of *Albunea carabus* in the Mediterranean (●, previous records, ★ present study). Details in Table 1

a second specimen, female, MSNC 4553-2, CL 16.6 mm, CW 18.5 mm, STL 17.2 mm, weight 4 g, was found on 15 April 2017 on sandy bottom at 6-7 m of depth, at 300 m distance from the mouth of Irminio river as above (36° 46.229'N,

14° 35.491'E). A third specimen, an ovigerous female, MSNC 4553-3 (Fig. 2b, c), CL 20.3 mm, CW 2.8 mm, STL 20.8 mm, weight 8 g, was detected on 5 May 2017 on sandy bottom at 8 m of depth, at 300 m distance from the Sailing

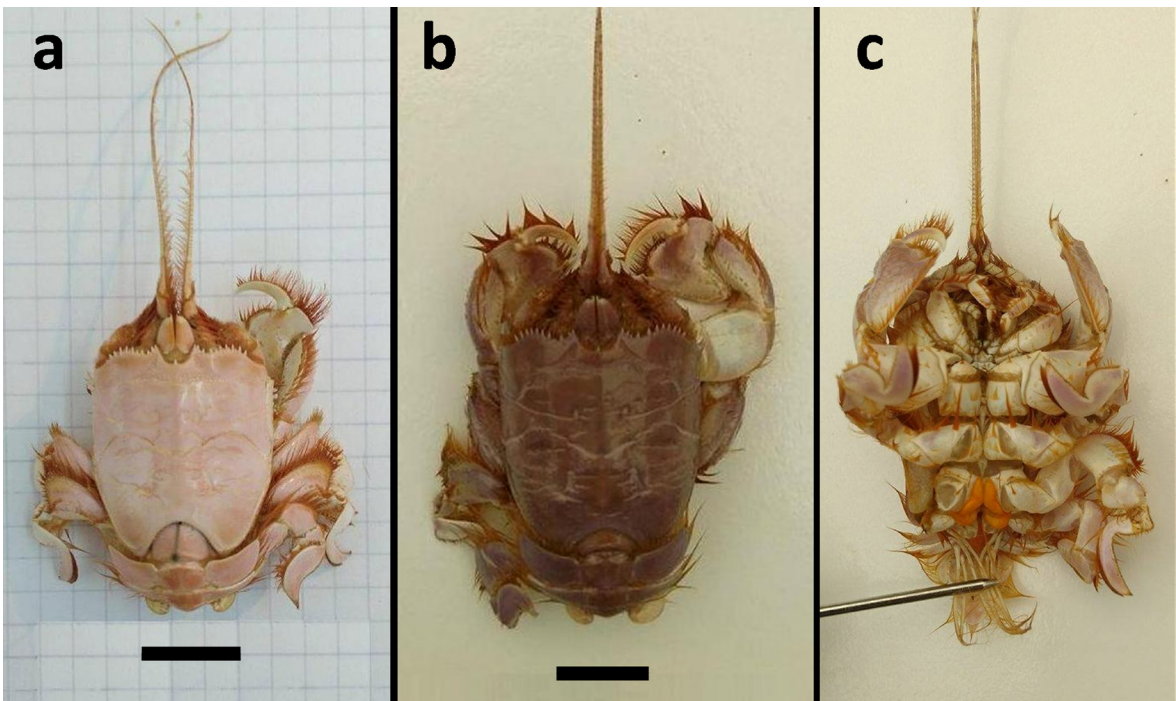


Fig. 2. *Albunea carabus* from Italy: the preserved specimen MSNC 4553-1 (Carapace length 16.2 mm) collected off the outlet of Irminio river, Sicily, May 2000 (a), and the fresh ovigerous female MSNC 4553-3 (Carapace length 20.3 mm), collected off Marina di Ragusa, Sicily, May 2017 (b: dorsal view, c: ventral view). Black bar: 10 mm

Table 1. Updated Mediterranean records of *Albunea carabus* (modified from Pereira et al., 2008). (N: Number of specimens; ID: number of location records shown in Fig. 1; * Date of publication)

Region	Year of finding	Latitude	Longitude	N/Sex	CL (mm)	Depth (m)	Reference	ID
Italy (Sicily)	1814						Rafinesque (1814)	1
Algeria (Cap Matifou, Alger)	1840-1842			5			Lucas (1849)	2
	1850			12		30-40	Lucas (1853)	2
Spain (Menorca)	1874*						Larrinúa y Azcona (1874), Bolivar (1875)	3
Algeria (Oran)	1881			2♂	12.1-13.3		Milne-Edwards & Bouvier (1900)	4
				1♀	18.6			4
Algeria (Gulf of Oran)	1900			1♀	20.7		Milne-Edwards & Bouvier (1900)	5
Algeria (Rade de Bône)	1908			3♀	13.9-18.1	15-20	Boyko (2002)	6
Israel (Nahr-Rubin)	1920			1♀	14.7		Aharoni (1937)	7
Spain (Malaga)	1933*						Miranda Rivera (1933)	8
Spain (Playa de Castellón, Valencia)	1961*			1♂, 1♀			Zariquiey-Alvarez (1961)	9
Italy (Lazio-eastcentral Tyrrhenian Sea)	1969	14°15'N	13°36'E	3♂	16.5-19	3-4	Moncharmont (1969)	10
				1♀	22.5			10
Spain (Arenys de Mar, Barcelona)	1971			1♂	18.6	3-7	Rubió & Holthuis (1972)	11
Spain (Canet de Mar, Barcelona)	1972			2♂	18.1-19.2	5	Rubió & Holthuis (1972)	12
Spain (Arenys de Mar, Barcelona)	1972-1973			4♂	19.1-21	3-6	Boyko (2002)	11
	1973			2♂	18-19.5	4-5		11
Tunisia	1973			1♂	16.5		Rubió & Holthuis (1972)	13
Spain (Arenys de Mar, Barcelona)	1974			1♂	20.3	3-6	Boyko (2002)	11
Israel (Haifa Bay)	1987			1♀	16.5		Boyko (2002)	14
Spain (Majorca)	1988*						Garcia Socias & Gracia (1988)	15
Italy (northeastern Sicily-south Tyrrhenian Sea)	1992	38°16,7'N	15°36,3'E	3♂	20-25	5	Giacobbe & Spanò (1996)	16
				1♀	23			16
Italy (western coasts of Calabria-south Tyrrhenian Sea)	1992	38°26,1'N	15° 52,8'E	1♂	23	20	Giacobbe & Spanò (1996)	17
Italy (southwestern Sicily-Strait of Sicily)	1996	37°35,38'N	12°50,22'E	1♂	13	2,5	Spanò et al. (1998)	18
	1996	36°50,43'N	14°27,22'E	1♀	15	5		19

Italy (southeast Sardinia-Sardinian Channel)	1997-2002					Mura & Corda (2011)	20
Egypt (Sidi Barrani)	2000		1♂	65-66		Abdelsalam & Ramadan (2017)	21
Italy (southeastern Sicily)	2000	36°46,381'N 14°35,065'E	1♂	16.2	8	Current study	22
Egypt (Qayet Bey, Alexandria)	2001		1♂	18.9	7,5	Abdelsalam & Ramadan (2017)	23
Lebanon (Beirut)	2002*		2♀	16.3-16.6		Boyko (2002)	24
Turkey (Iskenderun-northeastern Mediterranean)	2002	36°30,00'N 35°20,67'E	1♂	19	25	Katağan & Çevik (2003)	25
Egypt (Eastern Harbor of Alexandria)	2002		1♂		11	Abdelsalam & Ramadan (2017)	26
Spain (Murcia)	2012		1			Puerta C.*	27
Italy (southwestern Sicily)	2012		1♀			Current study (Passannante C., pers. comm.)	28
Greece (Rhodes)	2012		1♀	18.6	50	Corsini-Foka & Kalogirou (2013)	29
Egypt (Abu Qir)	2015		1♂		21	Abdelsalam & Ramadan (2017)	30
Italy (southeastern Sicily)	2017	36°46,229'N 14°35,491'E	1♀	16.6	6-7	Current study	31
Italy (southeastern Sicily)	2017	36°46,696'N 14°33,698'E	1♀	20.3	6-7	Current study	32
Italy, Sicily (Ionian Sea)	2017		many			Scuderi <i>et al.</i> (2017)	33
Italy (Campania-south Tyrrhenian Sea)	2018	40°21,505'N 14°59,816'E	1		3-4	Current study	34

* <http://www.biodiversidadvirtual.org> (visited on 15/3/2018)

Club of Marina di Ragusa (36° 46.696'N, 14° 33.698'E) (Fig. 1) (Table 1).

The morphological features of the specimens were in accordance with those described by BOYKO (2002). The coloration of fresh adult was dorsally brown-reddish, antennular flagellae ringed with purple and yellowish brown (Fig. 2b).

Depths of collection, substrate and values of carapace lengths of our specimens are in agreement with previous records (GIACOBBE & SPANÒ, 1996; BOYKO, 2002; PEREIRA *et al.*, 2008; CORSINI-FOKA & KALOGIROU, 2013; ABDELSALAM & RAMADAN, 2017) (Table 1).

The collection of samples using fishing gears set at late afternoon and retrieved at early morning, such as trammel-nets of the present cases, or shrimp trap (CORSINI-FOKA & KALOGIROU, 2013), could probably indicate an increased activity of the sand crabs during the night. As reported by

McCawley *et al.* (2006), the red snapper *Lutjanus campechanus* (Poey, 1860) fed on more water-column organisms during the day and more sand- or mud-associated organisms at night, including *Albunea paretii* Guérin-Méneville, 1853 in Alabama artificial reefs.

The presence of an intense orange coloration in the female MSNC 4553-3, collected in May (Fig. 2c), could suggest the summer season as the reproduction period of the species in the area. Ovigerous females of the albuneid *Lepidopa benedicti* Schmitt, 1935 were found from late spring through summer at South Padre Island, Texas, on the western coast of Gulf of Mexico (FAULKES, 2017), while *Albunea symnista* (Linnaeus, 1767) showed two distinct reproductive peaks, one in January and another in July, on Madras coasts, India (SUBRAMONIAN & PANNEERSELVAM, 1985).

As mentioned above, *A. carabus* lives on sandy environments where the water is prevalently turbid, often with high hydrodynamism, including estuaries (GIACOBBE & SPANÒ, 1996; SPANÒ *et al.*, 1999). In agreement with the above, two of the specimens here described were found close to the mouth of a river.

The species is widely distributed in the Mediterranean Sea, although, up to date, it is not reported from various regions, such as the Libyan coasts and most of the Ionian and Aegean waters (Table 1) (Fig. 1).

The biology of this sand crab deserves to be studied in depth in order to know its circadian rhythm and its reproductive, territorial and feeding activities.

CONCLUSIONS

The current records significantly amplify our knowledge on the geographical distribution of *A. carabus* in the shallow soft bottoms of the southern coasts of Sicily and fill a lack of information also for the southeastern Tyrrhenian coasts. Besides scientific biological surveys on benthic fauna, the findings described here attest that information and observations provided by fishery operators and local or tourist citizens

involved in diving and fishery and, generally, in marine biology (citizen scientists), represent an incontestably highly valuable support in monitoring marine biodiversity, improving furthermore knowledge on the geographical distribution of species.

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Dodatni nalaz vrste, *Albunea carabus* (Linnaeus, 1758) (Decapoda, Anomura, Hippoidea) u talijanskim vodama

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SAŽETAK

Autori dokumentiraju dodatne nalaze vrste *Albunea carabus* (Linnaeus, 1758) s jugoistočnih obala Sicilije, poboljšavajući tako znanje o rasprostranjenosti ove slabo poznate vrste oko otoka i u Sredozemnom moru. Ažurirana je distribucija zapisa u cijelom bazenu.

Ključne riječi: rakovi, Anomura, *Albunea carabus*, Sicilija, Sredozemno more