First Record of *Synalpheus africanus* Crosnier & Forest, 1965 (Caridea, Alpheidae) in the Egyptian Mediterranean Coast

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Abstract. The snapping shrimp *Synalpheus africanus* Crosnier & Forest, 1965 is recorded for the first time in the Egyptian Mediterranean coast. During August and September 2018, specimens were accidentally collected from the associated fouling communities of the Eastern Harbor of Alexandria city, Egypt. It is the second species of genus *Synalpheus* Spence Bate, 1888 to be recorded in the Egyptian Mediterranean waters. A brief re-description with illustrative photos, distribution, and remarks for discrimination from other recorded alpheid shrimps are provided.

Keywords: Alpheidae; *Synalpheus africanus*; systematic; first record; Alexandria; Egypt.

1. Introduction

Alpheid shrimps are a profoundly variable taxon of crustacean decapod, including more than 600 species disseminated in 47 genera (De Grave and Fransen 2011). Members of family Alpheidae (snapping shrimps) are characterized by: the first pair of pereopods is extremely uneven and such asymmetry begins in the juvenile stage (Young *et al.*, 1994). The major chela of this appendage is exceptionally well developed, with constant and movable fingers of indeed strange morphology (tooth-cavity system). The chela creates a powerful snapping sound which is a standout amongst the most capable heard sounds in the environments where these creatures live (Versluis *et al.*, 2000; Anker *et al.*, 2006). This cheliped is utilized to catch preys and in agonistic interactions (Nolan and Salmon 1970).

Efficient snapping claws are only developed within family Alpheidae (Anker *et al.*, 2006), which incorporates the dominant

genera of *Alpheus* Fabricius, 1798; *Metalpheus* Coutière, 1908; *Pomagnathus* Chace, 1937; *Racilius* Paul'son, 1875 and *Synalpheus* Spence Bate, 1888 constitute about 75 % of alpheid species. The snapping claw encouraged the broad radiation experienced by these shrimps (Anker *et al.*, 2006). The minor chela has slim fingers, which are not adjusted for sound generation, but are frequently utilized for nutrition, and burrowing (Govind *et al.*, 1988).

Alpheus Fabricius, 1798 is the most diverse genus of family alpheidae, and represented by more than 300 described species (De Grave and Fransen 2011; Almeida *et al.*, 2014; Bracken-Grissom and Felder 2014; Anker *et al.*, 2015). Meanwhile, *Synalpheus* Spence Bate, 1888 is the second-diverse genus of the family (Anker *et al.*, 2012), with more than 250 species and subspecies (WoRMS, 2018). Members of genus *Synalpheus* are important components of coral reef and bottom fauna communities in all tropical and subtropical seas

(Dardeau, 1984). In the Egyptian Mediterranean waters, genus *Synalpheus* was represented by only one species; *S. gambarelloides* (known as *S. laevimanus*) in the coastal water of Alexandria (Balss, 1936). While it is known from the entire Mediterranean Sea (Holthuis and Gottlieb 1958).

According to Crosnier & Forest (1965, 1966), *Synalpheus africanus* has been collected from the eastern Atlantic, the Cape Verde Islands, near Biafra Bay, Guinea (Conakry), and the islands of São Tomé, Príncipe and Annobon. In the Mediterranean Sea, this species has been recorded from different areas: Israel (Lewinsohn and Holthuis 1964); Morocco's coasts (Lagardère, 1971); Greece (Koukouras and Kattoulas 1974); Alboran Sea and southern Spain (García Raso, 1988; García Raso and Fernández Muñoz 1988); and the Italian waters (Bacci *et al.*, 2010). However, it was included in the inventory of decapod crustaceans in the north-eastern Atlantic, the Mediterranean and adjacent inland waters north of 25 ° N (d'Udekem d'Acoz, 1999), and registered also from the Canary Islands (González-Pérez, 1995; Quiles *et al.*, 2001).

The present study aims to document the first record of the tropical East Atlantic *Synalpheus africanus* Crosnier & Forest, 1965 which was collected accidentally with fouling communities from the Egyptian Mediterranean waters. A brief re-description with illustrative photos, distribution, and remarks for discrimination from other recorded alpheid shrimps are given.

2. Material and Methods

During August and September 2018, specimens of *Synalpheus africanus* Crosnier & Forest, 1965 were accidentally sampled while collecting fouling samples from the hard substrates in front of (Building of Oceanography department, Alexandria

University) in the Eastern Harbor of Alexandria city, Egypt (Fig. 1).

Fig. 1. The Eastern Harbor of Alexandria, Egypt, showing the collection site.

Specimens were sorted out and then preserved in 70% ethanol, and deposited in the Collection of Taxonomy & Biodiversity of Aquatic Biota (TBAB) laboratory, National Institute of Oceanography and Fisheries, Alexandria branch, Egypt; and Oceanography Department, Faculty of Science, Alexandria University, Egypt. Later, specimens were examined carefully to identify the species using relevant scientific publications such as (Lewinsohn and Holthuis 1964; Crosnier and Forest 1965, 1966; Anker *et al.*, 2012).

Specimens were studied using stereo-zoom microscopes (Models Optika SZM-2 & Novex P-20). Length measurements of individuals were made to the closest 0.01 mm using an advanced digital caliper. Microphotographs were made under a light microscope with a mounted Nikon digital camera (Model D3200).

The carapace length (CL) was measured in mm along a mid-dorsal line from the tip of the rostrum to the posterior margin of the carapace.

3. Results

3.1 Systematic Account

Family: Alpheidae Rafinesque, 1815

Genus: *Synalpheus* Spence Bate, 1888

Synalpheus africanus Crosnier & Forest, 1965

Fig. 2-6

3.2 Materials Examined

Only three samples were collected, one ovigerous female, CL= 8.33 mm; two males with CL= 8.58 and 7.15 mm.

3.3 Synonymized Names

Synalpheus hululensis africanus Crosnier & Forest, 1965: 607, Fig. 2; Crosnier & Forest, 1966: 292, Fig. 29a-g; Lagardère, 1971: 82, Fig. 159-167; García Raso and Fernández Muñoz, 1988: 306; González Pérez, 1995: 77.

Synalpheus tumidomanus africanus - d'Udekem d'Acoz, 1999: 107; Quiles *et al.*, 2001: 10; Bacci *et al.*, 2010: 821.

Synalpheus hululensis - Lewinsohn and Holthuis, 1964: 49, Fig. 2a-h; Koukouras and Kattoulas, 1974: 374; García Raso, 1988: 254, 257 (not *S. hululensis* Coutière, 1908).

3.4 Description

Synalpheus africanus Crosnier & Forest, 1965 is a small snapping shrimp (Fig. 2).

- Carapace

Rostrum slender reaching at least the distal third of the first article of the antennular peduncle, and inserting in the middle of a depression for separating the two acute orbital spines (Fig. 3C). The pterygostomial angle of the carapace with an acute tooth (Fig. 3B). Stylocerite, triangular and very acute, exceeding the middle second article of the antennular peduncle. The external spine of basicerite, acute, twice as long as the internal one, clearly exceeding the anterior extremity of the first antennular peduncle, while the distal tooth of scaphocerite exceeding the antennular peduncle (Fig. 3C).

Fig 2. Whole mount of *Synalpheus africanus* Crosnier & Forest, 1965.

Fig 3. *Synalpheus africanus*. A. Ovigerous female, Lateral view. B. Anterior carapace, lateral view. C. Anterior carapace of male specimen, dorsal view. a.p., antennular peduncle; b., basicerite; l., lamella of scaphocerite; o.s., orbital spine; p.a., pterygostomial angle; r., rostrum; s., stylocerite; t.s., tooth of scaphocerite. Arrows indicate spines of basicerite.

- Thoracic legs (Pereiopods)

For the first pereiopods, forceps of the major cheliped with a maximum height nearly at its mid length, and 2.5 to 3 times longer than high (Fig. 4A). The length of the fingers slightly greater than half that of the palmar region; the upper edge of the latter carrying one tooth distally, short, broad, flattened, very blunt peak, sometimes reduced to a tuber. The merus upper edge armed with a distal spiny tooth, tip slightly curved downward. Forceps of the minor cheliped with about 2.8 times longer than high; fingers a little shorter than the palm (Fig. 4B). The second pereiopods with equal length, forceps with slightly longer fingers than the palmar region; its length slightly shorter than half that of carpus; carpus with five segments, first segment about as long as sum of the following distal four segments (Fig. 5A). Constant finger supplied with more bunches of bristles than the movable one.

Fig. 4. *Synalpheus africanus*. First pereopods, A. Major cheliped, lateral view. B. Minor cheliped, lateral view. c., carpus; d. s., distal spine; d.t., distal tooth; f., fingers; m., merus; p., palm.

In the next three pairs of pereopods, the dactyli with a biunguiculate end; the ventral unguis shorter, more strongly curved than the dorsal one (terminal nail). The third thoracic paws (Fig. 5B) with a dactyli, four times shorter than the propodus; the latter armed on its lower edge, carrying 9 spiniform bristles, the two distals of which linked. The carpus, with half the length of propodus, bearing a spine distally on its lower edge. Length of merus equals about four times its height, and nearly equivalent to seven sixths of the propodus. The fifth pereopods with a merus equals to two-thirds of that of the third legs and of substantially the same length as the propodus; at lower level, the latter bearing transverse rows of bristles on its distal two-thirds (Fig. 5C).

- Abdomen

In both sexes, the pleurons of the second abdominal segment largely rounded and those of the sixth forming a slightly acute, blunt-pointed angle. In males, the first segment of

the pleurons with strong, acute tooth, directed backwards and downwards (Fig. 6A); the lower edge of the third and fifth segment of the pleurons, almost straight, forming an obtuse angle with the supero-posterior edge, meanwhile the lower edge of the fourth segment meeting with the supero-posterior edge at a right angle. Male pleopods without "appendix interna" or "appendix masculina" (Fig. 6B); those of the females with an "appendix interna" on the second to fifth pair of pleopods (Fig. 6C).

Fig. 5. *Synalpheus africanus*. A. Second pereopod, lateral view. B. Third pereopod, lateral view. C. Fifth pereopod, lateral view. c., carpus; ch., chela; d., dactylus; i., ischium; m., merus; pr., propodus. Arrows indicate the rows of bristles.

Fig. 6. *Synalpheus africanus*. A. Male abdominal segments, lateral view. B. Male second pleopod. C. Female second pleopod. D. Telson, dorsal view. a.i., appendix interna; a.t., acute tooth; c., carapace; p.s., posterolateral spines; t., thorn.

- Telson

The telson with very slightly concave lateral edges in their posterior half and a

convex posterior margin; its dorsal surface bearing two pairs of thorns, one inserted towards its middle and the other at the level of the posterior quarter; with two pairs of posterolateral spines (Fig. 6D).

3.5 Distribution and Life Habits

Synalpheus africanus is a tropical species distributed in Eastern Atlantic: Mediterranean Sea: from Gibraltar to Israel; Morocco; Cape Verde; Gulf of Guinea: tropical Gulf of Guinea northwards to the warm-temperate waters around the Canary Islands, São Tomé and Príncipe, Annobón (Crosnier and Forest, 1966; d'Udekem d'Acoz, 1999; Quiles *et al.*, 2001; Bacci *et al.*, 2010; Anker *et al.*, 2012). It is clear that this species is distributed into the Mediterranean Sea through the Strait of Gibraltar. The Atlantic-Mediterranean connection through the Strait of Gibraltar is a particularly important area for decapod larval dispersal (Pires *et al.*, 2018).

Mainly free snapping shrimp living in crevices of rocks and coralline algae, sometimes among *Antipathes* sp. in Cape Verde or *Mesophyllum lichenoides* in southern Spain (García Raso and Fernández Muñoz, 1988) or *Dendrophyllia cornigera* in Israel (Anker *et al.*, 2012).

3.6 Remarks

Regarding the alpheid shrimps of the Egyptian Mediterranean Sea, Balss (1927) recorded *Alpheus edwardsii* (Audouin, 1827) as (*A. audouini*) from Port Said. Meanwhile in (1936) he recorded one species of genus *Athanas*, three species of genus *Alpheus*, and one species of genus *Synalpheus* in the fishery grounds near Alexandria. The list has comprised *Athanas nitescens* (Leach, 1813), *Alpheus glaber* (Olivi, 1792) [incorrectly named as *A. ruber*], *A. dentipes* Guérin, 1832, *A. lobidens* De Haan, 1849 as (*A. crassimanus* Heller, 1862), and *Synalpheus gambarelloides*

(Nardo, 1847) as [*S. laevimanus* (Heller, 1862)].

Other records of the eastern Mediterranean Sea have included *Alpheus inopinatus* Holthuis and Gottlieb, 1958, *A. macrocheles* (Hailstone, 1835), *A. rapacida* De Man, 1908 and *A. migrans* Lewinsohn and Holthuis, 1978 from Israel (Holthuis and Gottlieb, 1958; Lewinsohn and Holthuis, 1964; Lewinsohn and Galil, 1982). *Alpheus macrocheles* was first recorded in the eastern Mediterranean Sea by Adensamer (1898) from Sporades, Greece and later it was recorded by (Koukouras and Kattoulas, 1974) from Evvoia.

On the Turkish Coasts, Bakir *et al.* (2014) recorded eight species: *A. dentipes*, *A. edwardsii*, *A. glaber*, *A. inopinatus*, *A. lobidens*, *A. macrocheles*, *A. migrans* and *A. rapacida*. *Alpheus lobidens* was also found in Lattakia area, Syria (Hasan *et al.*, 2008). However, the present study documents the first record of *Synalpheus africanus* from the Egyptian Mediterranean waters.

Synalpheus africanus Crosnier and Forest, 1965 is characterized by: Rostrum slender, usually longer than the two orbital spines; stylocerite sharp, not reaching distal margin of second article of antennular peduncle; basicerite of antenna armed with sharp external spine and smaller internal one, external spines clearly exceeding the anterior extremity of the first antennular peduncles; major chela with palm less than twice as long as fingers; and telson tapering posteriorly, with lateral margin slightly concave in posterior half. The present specimens agree well with the description of this species (as *S. hululensis africanus*) provided by Crosnier and Forest (1965, 1966).

It is well known that genus *Synalpheus* is more closely related to genus *Alpheus*. However, members of genus *Synalpheus* can be distinguished as follows: carapace of genus

Synalpheus usually with produced pterygostomial angle (rounded and never angular in genus *Alpheus*) and telson without anal tubercles (usually with anal tubercles in genus *Alpheus*). Moreover, carpus of the second pereopods demonstrates an additional difference between the two genera: in genus *Synalpheus*, first article usually about as long as sum of the distal four articles meanwhile in genus *Alpheus*, the first article usually shorter than sum of the four following articles (Banner and Banner, 1975).

On the other hand, genus *Athanas* can be discriminated from the two recorded genera of the Egyptian Mediterranean waters (*Alpheus* and *Synalpheus*) by the following criteria: rostrum long, well developed; supra-, extra- and infracorneal spines usually present with varying degrees of development; corneas of eyes exposed anteriorly and largely dorsally and laterally. As well as, it is always without the cylinder and the plunger characteristic of genus *Alpheus* (Banner and Banner, 1973) (*i.e.* major chela of genus *Alpheus* is cylindrical, with dactylus plunger of the claw which usually bears stamen-shaped sensillae on its distal end).

Despite the fact that the two species of genus *Synalpheus* of the Egyptian Mediterranean waters (the previously recorded *S. gambarelloides* and the newly recorded *S. africanus*) are similar, they can be easily distinguished by: the orbital spines are strongly pointed in *S. africanus* (Fig. 3B, C), being blunt in *S. gambarelloides*; the stylocerite in *S. africanus* extends behind the middle of the second segment of the antennular peduncle (Fig. 3C), while it drops to reach the base of that segment in *S. gambarelloides*; the lamella of the scaphocerite in *S. africanus* is actually well progressed, reaching to somewhere around two thirds of the length of the scaphocerites tooth (Fig. 3C), while in *S. gambarelloides*, this

lamella is reduced to a little flap at the base of the tooth; the antennal peduncle in *S. africanus* exhibits two prominent acute teeth close to the base of the scaphocerite (the outer tooth is the longest but drops to reach as far as the stylocerite and the inner one is considerably little smaller but well-formed and strongly pointed) (Fig. 3C), meanwhile in *S. gambarelloides* the outer tooth reaches beyond the stylocerite and is clearly pointed, but the inner tooth, is completely missing here; the palm of the large cheliped in *S. africanus* ends dorsally at most in a blunt lobe or tooth, while in *S. gambarelloides* it ends in a solid strongly pointed anterior spine. Moreover, the minor first cheliped of *S. gambarelloides* bears a conspicuous tuft of hairs on the upper edge of the dactylus (moving finger); such tuft is not existing in *S. africanus*.

In conclusion, the present study confirms the existence of snapping shrimp *Synalpheus africanus* Crosnier & Forest, 1965 for the first time in the Egyptian Mediterranean waters. This finding adds to the biodiversity of fauna in the Egyptian Mediterranean Sea. This species can be distinguished from its congeneric sister species (*S. gambarelloides*) based on the following characteristics: shape of the orbital spines, the length of the stylocerite relative to the antennular peduncle, the development of the lamella of the scaphocerite relative to the length of the tooth, shape and size of teeth of the antennal peduncle, at the base of the scaphocerite, the dorsal shape of the end of the major cheliped and the availability of conspicuous tuft of hairs on the upper edge of the dactylus (moving finger).

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أول تسجيل لسينألفيس أفريكانيس كروسنير وفوريست، ١٩٦٥ (الإربيانات، الروبيان المزمجر) على ساحل البحر المتوسط المصري

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المستخلص. تم تسجيل الروبيان المزمجر سينألفيس أفريكانيس كروسنير وفوريست، ١٩٦٥م لأول مرة في الساحل المصري للبحر المتوسط. خلال شهرى أغسطس وسبتمبر ٢٠١٨، تم تجميع العينات بالمصادفة من مجتمعات الحشف البحري في الميناء الشرقي لمدينة الأسكندرية، مصر. وهو النوع الثاني من جنس سينألفيس سبنس باتي ، ١٨٨٨ الذي يتم تسجيله في مياه البحر المتوسط المصرية. وهناك إعادة وصف موجز لهذا النوع مدعم بصور توضيحية، وتوزيعه، وملاحظات لتمييزه عن الأنواع الأخرى المسجلة من الروبيان المزمجر.

كلمات مفتاحية: الروبيان المزمجر، *Synalpheus africanus*، تصنيف، أول تسجيل، الأسكندرية، مصر.