



A New Species of *Vasco*, Barnard and Drummond (1978) (Amphipoda: Phoxocephalidae) from the Egyptian Red Sea Coast

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ABSTRACT

Vasco has been assigned to the family Phoxocephalidae since 1978. To date, only the species *V. brevidactylus* (Ledoyer, 1973) has been recognized within this family, and it has been found in the reefs of Madagascar's countryside. New amphipod specimens were collected during 2019-2020 from the soft bottom substrate of northern west coastal areas of the Red Sea (Egyptian coast). The collected materials closely resemble *Vasco brevidactylus* but differ in the following seven characteristics: urosomite 1 has three spines on the ventral lateral side, uropod 3 carries two long apical setae on the second article of the outer ramus, epimeron 2 has five sub-marginal bi-pectinate setae, the fourth article of the maxilliped lacks a mid-apical seta, the number of coxal setae on pereonite 1–3 is increased, the basal article of P1 and P2 has 2–3 long setae, and the mandible has six incisors. These differences are sufficient to distinguish between the species from Madagascar and the species from the Red Sea. A detailed description, fully illustrated material, and information on the occurrence and distribution of this species among the collection sites are provided.

INTRODUCTION

The amphipod family Phoxocephalidae is strictly marine and globally distributed, generally found as benthic fauna (Taylor, 2009). Approximately, one-third of the known species are predominantly found in Australian waters. Phoxocephalids were also recorded from the near sea water bodies such as the Mediterranean Sea with genera *Metaphoxus* and *Harpinia* (Lincoln, 1979). Particularly in the Red Sea, the amphipod family Phoxocephalidae has not been reported in previous biological explorations over the last two centuries. In contrast, the family has been well-represented in studies conducted in the northern and southern hemispheres. Despite phoxocephalids being recorded in the Indian Ocean, Indo-Pacific province and Pacific Ocean, none of its known species were recorded in the Red Sea until the work of Lyons and Myers (1993). They published a

new species, *Wildus spinitelson*, distinguished by a bi-articulate maxilla I palp. This was the first record of the family Phoxocephalidae from the Red Sea. *W. spinitelson* (**Lyons & Myers, 1993**) was described from coral rubble in the Gulf of Aqaba. On the other hand, **Atallah *et al.* (2021)** recorded individuals of another genus, *Metaphoxus*, from the Egyptian Red Sea coasts of Hurghada and Shalateen.

On taxonomic bases, Barnard and Drummond's research reported 88 species of Australian Phoxocephalidae; and their results rearranged phoxocephalidae to classify it into two subfamilies; Harpiniinae (**Barnard & Drummond, 1978**) and Phoxocephalinae (**Sars, 1891**). Phoxocephalinae is clearly distinguished by the presence of broad bases on pereopod 3. Barnard and Drummond in 1978 assigned the genus *Metaphoxus* (**Bonnier, 1896**) to Phoxocephalinae and characterized it by presence of eyes, a short article II of the first antenna, article I of second antenna not ensiform, right mandible with 3 toothed incisor and molar present not triturate and with one conical fused spine. Maxilla I, inner plate is being without setae and uni-articulate palp. Carpus of pereopods 3, 4 is being without posteroproximal setae. Uropod I peduncle is being without inter-ramal spike while rami of uropod's I-II not continuously spinose to apexes, without subapical spines or nails. Uropod III is typical, with one of rami longer than the peduncle. **Barnard (1960)** expressed the type *nomen conservandum* of the genus *Metaphoxus*, concluding that *Metaphoxus typicus* Bonnier, 1896, had no significant differences from *Metaphoxus pectinatus* Walker, 1896. However, Walker considered the latter species to be a junior synonym of *Phoxus simplex*, Spence Bate, 1858, which has not been identified with certainty from monotype, as it lies in a damaged condition. Consequently, based on a revision of the genus *Metaphoxus*, the following species were identified: *M. foltoni* (Scott) and *M. simplex* (Spence Bate), in addition to *M. frequens* Barnard.

A few additional species of *Metaphoxus* were described after **Barnard and Drummond (1978)**: *M. mintus*, *M. tuckatuck*, *M. tulearensis* and *M. yaranellus*. One of these mentioned species; *M. tulearensis* was placed in genus *Parametaphoxus* based on the presence of stout locking spines on pereopods 1 and 2. Recently, the genus *Metaphoxus* has been composed of the previous six species, in addition to *M. gruneri* Karaman and *M. varanus* Taylor, bringing the total number of species in its faunal composition to eight. Moreover, *Metaphoxus* has much more species reoriented to other genera after the huge revision of phoxocephalidae species by **Barnard and Drummond (1978)**. One of this species *Metaphoxus brevidactylus* Ledoyer, 1973 was transferred to a new genus called *Vasco*.

Genus *Vasco*, was distinguished from genus *Metaphoxus* by stunted dactyls of pereopods 1 & 2. The genus has not been recorded from any location other than the type locality in Madagascar so far. Hence, based on a new collection from the Red Sea, the researchers aimed to introduce and describe a new species of genus *Vasco* and provide enough information to distinguish the new species from its congener.

MATERIALS AND METHODS

All items analyzed in this study were gathered from a fisheries research project that focused on the Egyptian Red Sea coast. Surveys have included various habitats and depths, ranging from intertidal areas to depths of 35m. Nylon bags with a 15 x 15cm aperture opening size and a 0.5 mesh size were used to collect samples in the intertidal zone through snorkeling. The same type of nylon bags was used to collect subtidal samples, but with SCUBA diving (**Attallah *et al.*, 2021**). All samples were organized and distinguished before choosing *Vasco* specimens for additional study and verification. The specimen was dissected in a solution of equal parts 70% alcohol and glycerin, and then placed on glass microscope slides with a dissecting fluid. They were inspected using a LEICA DM LS2 compound microscope, and illustrations were created with a camera Lucida. The specimens were placed in the collections of the Al-Azhar Zoological Museum Cairo (AZMC) with the registration number (AZMCcam310101).



Fig. 1. Fresh photographs of *Vasco Amputatus* sp. nov.: male upper & female lower

RESULTS

Diagnostic characters of genus *Vasco*, Barnard and Drummond (1978)

DIAGNOSIS.—compound eyes present but weak; Article 2 of antenna 1 shortened, ventral setae confined apically. Article 1 of antenna 2 not ensiform; facial spines on article 4 in 2 rows; Right mandibular incisor with 3 teeth; molar not triturate, small, pillow-shaped, not bearing fuzz; palpal hump medium. Palp of maxilla 1 uniarticulate; Inner plate of maxillipeds ordinary; apex of palp article 3 not protuberant, dactyl elongate, apical claw distinct, elongate. Gnathopods weakly dissimilar, carpus of peraeopods 1-2 very short, palm oblique, gnathopodal hands rectangular. Basis of peraeopod 3 dilated, articles 4-5 of P3 & P4 medium to narrow, article two not setose posteriorly. Epimera 1-2 lacking long posterior setae, without midfacial setae, epimeron 3 rounded without long setae. Urosomite 1 naked, urosomite 3 without dorsal hook. Uropod 3 ordinary, elongated article 2 of outer ramus carrying 2 apical setae. Telson forked, each with apical spine.

Systematic section

Family: Phoxocephalidae, Sars, 1891

Subfamily: Phoxocephalinae, Sars, 1891

Genus: *Vasco*, Barnard and Drummond (1978):

Vasco Amputatus sp. nov.

Figs. 2–5

Material examined

Holotype: 1 mature female, 4.4mm, collected from the Safaga site (26°46'30"N, 33°56'42"E) in the intertidal zone during the summer season (AZMCCam310101).

Paratype: 1 mature male 3.7mm, from Hurghada (27°14'52.94"N, 33°50'56.64"E) at 15m depth, during autumn season.

Other paratypes: HURGHADA (Merit beach; (27° 14' 28.32" N & 33° 51' 2.88" E)), 35m, fine sandy substrate, Aug., 2019, 1♂, 15m, coral rubble and coarse sandy substrate, Nov., 2019, 3♂♂, 1♀, 0.5m, coarse sandy substrate, Mar., 2020, 1♀; 5 m, coral rubbles and coarse sandy substrate, Mar., 2020, 3♂♂, 1♀; 15m, coarse and medium sandy substrate, Mar., 2020, 1♀; 25m, coral rubble and coarse sandy substrate, Mar., 2020, 1♂, (Project # 30198, YR call-STDF).

SAFAGA (Main beach), 0.5m, fine sandy substrate, Aug., 2019, 4♂♂, 5♀♀, 5m, fine sandy substrate, Mar., 2020, 2♀♀. QUSEIR, 25m, medium and coarse sandy substrate, Aug., 2019, 1♀, 35m, coral rubbles and coarse sandy substrate, Aug., 2019, 1♀, 5m, fine and medium sandy substrate, Nov., 2019, 1♂, 15m, fine and medium sandy substrate, Mar., 2020, 1♂. ABO DABBAB, 25m, coral rubble, fine and coarse sandy substrate,

Nov., 2019, 1♂. SHALATEEN (23° 28' 58.08" N & 35° 29' 32.64" E), 35m, fine and medium sandy substrate, Aug., 2019, 1♂, (Project # 30198, YR call-STDF).

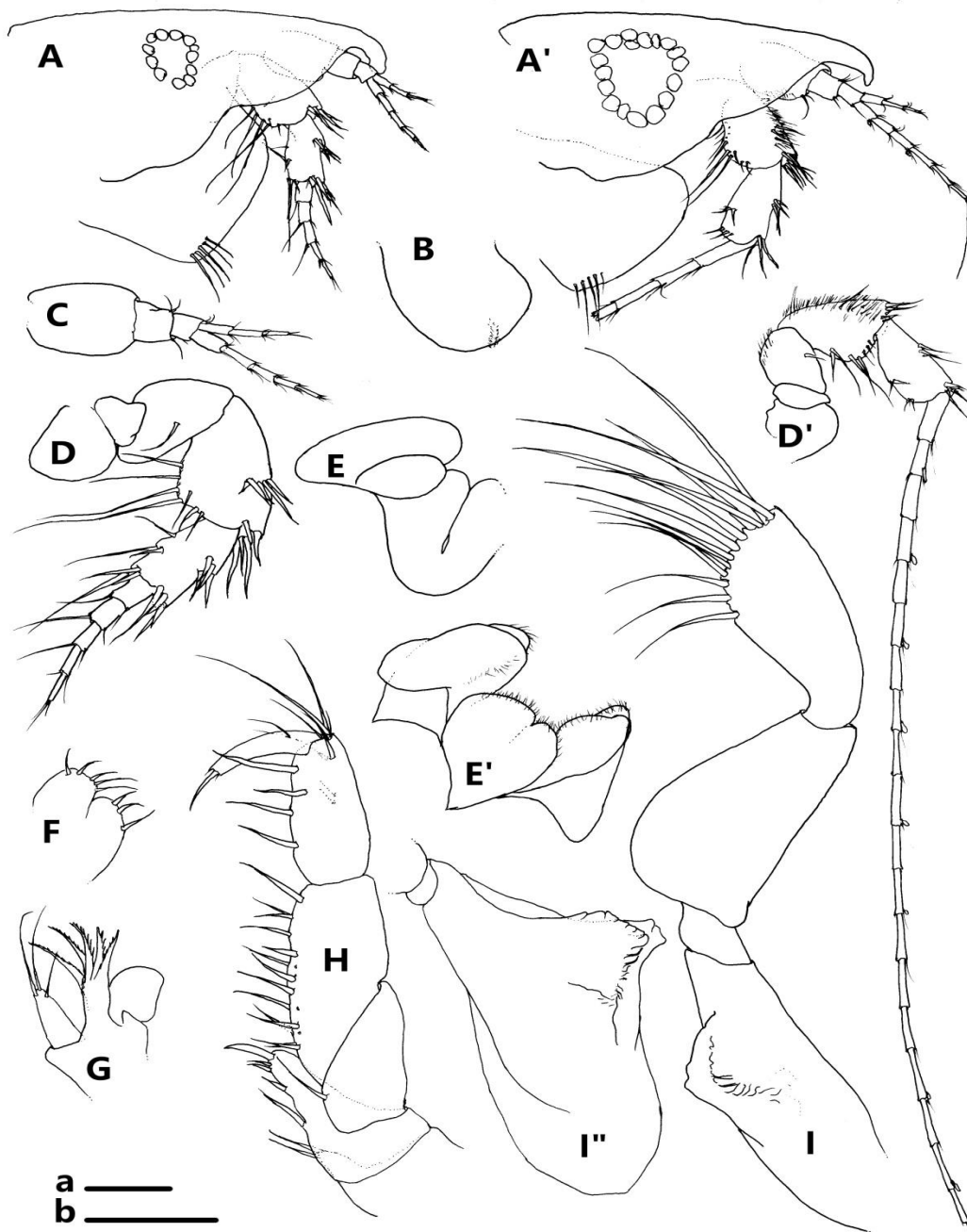


Fig. 2. *Vasco Amputatus* sp. nov. Holotype (AZMCcam310101) female 4.4mm: **A**; head, **C**; antenna 1, **D**; antenna 2, **E**, **F**, **G**, **H** & **I**; lower lip, maxilla 2, maxilla 1, maxilliped and R. mandible, **I'**; **L**. mandible. Paratype male: **A'**; head, **B**; upper lip, **D'**; antenna 2, **E'**; lower lip. Scales: **a**= 0.01mm for all except heads and **b**=0.3 for heads

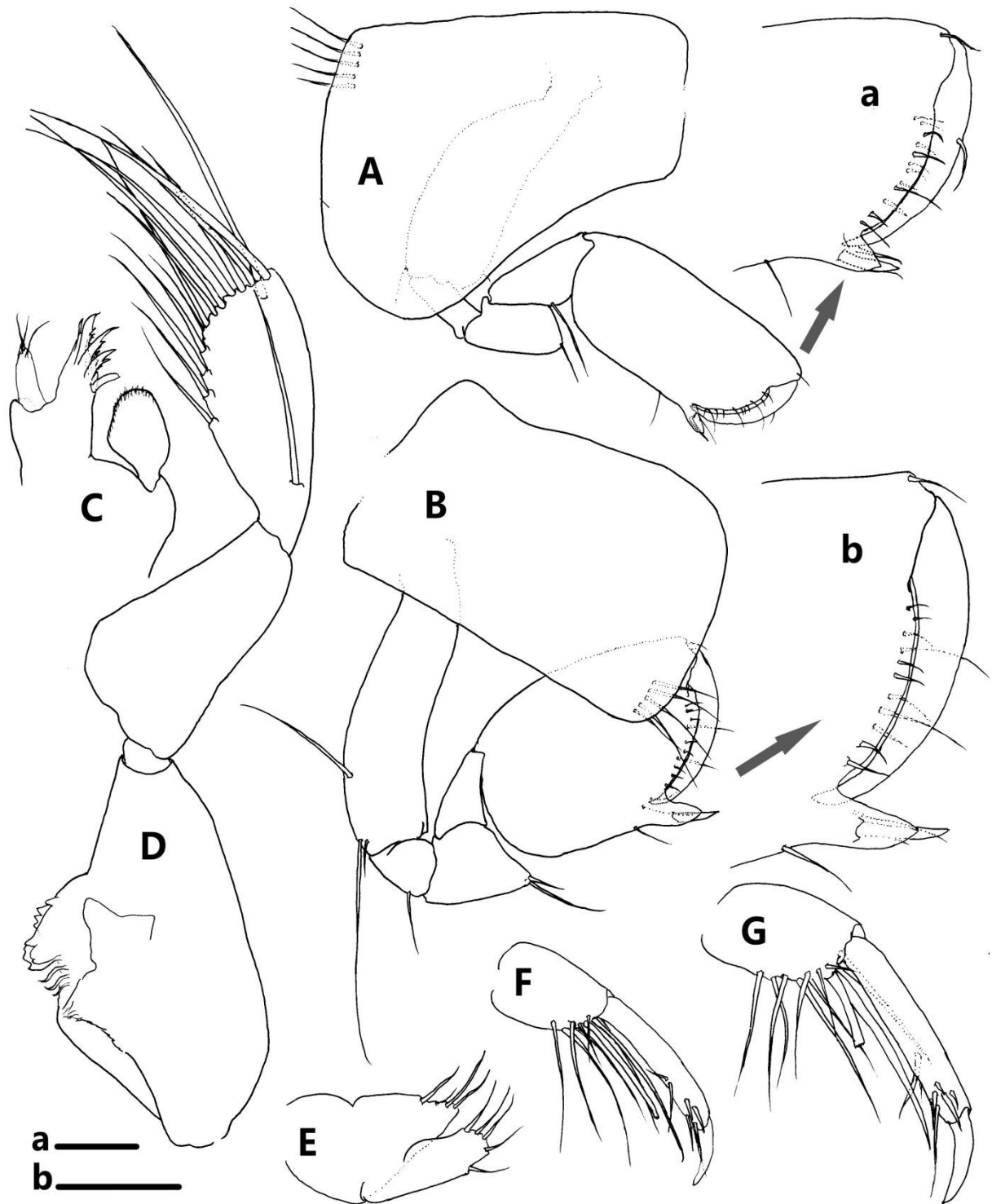


Fig. 3. *Vasco Amputatus* sp. nov. Holotype (AZMCcam310101) female 4.4mm: **A.** gnathopod 1; **B.** gnathopod 2; **a** & **b.** magnified palmer margins, Paratype male: **C, D, E, F** and **G.** maxilla 1, R. mandible, maxilla 2, P1 and P2 (carpus, propodus & dactyl). Scales: **a**=0.01mm for **C,D,E, F** & **G**, **b**=0.1 mm for **A** & **B**.

Etymology: Name “*amputatus*” latin word refers to the amputated hand-shaped for oostigates of females of this species.

Description: Holotype: Female, 4.4mm.

Head: *Rostrum* well developed, slightly terminal curved; eyes present, compound, inverted triangle in shape. *Antenna 1:* subequal to A2 peduncle, peduncle $a_1 > a_2 > a_3$; article 2 less than half of article 1, with anterodistal and posterodistal setae; main flagellum 5 articulate; accessory flagellum present, 3 article. *Antenna 2:* peduncle two folds as long as flagellum, no basal projection, article 4 with two row of facial spines, with long setae posteriorly, article 5 shorter than article 4, with 2 row of facial spines and few long spines posteriorly; flagellum 5 articles, with long postero-marginal setae. *Maxilliped:* palp 4 articulate, article 2 the largest, inner margin setose, article 4 with one claw apically, surrounded with small setae; outer plate triangle, with one terminal robust seta and four marginal setae distally, inner plate normal, with two apical setae. *Mandible:* molar simple, triangle, with rows of tiny setae, 2 toothed incisors, 6 toothed lacinia mobiles, asymmetrically, with 3–7 seta in one row; mandibular palp 3 articulate, article 1 the smallest, article 2 & 3 sub-equal, article 2 without setae, dilated proximally, article 3 with 9 apical setae and 3 marginal setae. Maxilla 1: palp uni-articulate, with 2 apical setae and one sub-terminal seta; outer plate with 5 serrate apical spines; inner plate lamellar and stouter, without setae. Maxilla 2: lobes barely asymmetrical, outer plate with 5 terminal setae, inner plate with 3 terminal setae. Lower lip, inner lip partially cleft.

Pereon: About two third body length excluding head, the first 3 Pereonites one third as long as pereon, coxa 1, long, slightly triangular with rounded anterodistal angle, with long 5 seta posteriorly; coxae 2–3, more rectangular, longer than coxa 1, with long setae posteriorly 5–7 respectively, gills present on pereonites 2–7, gradually decreased in size, oostigates present on pereonites 3–6, Amputated fingers-like (Fig. 4). Gnathopods similar slightly and dissymmetric, subcheliform. Gnathopod 1: base stout, sub-equal to the followed three articles, propodus almost rectangular, with transverse palm, with one long grasping spine postero-distally, marginally setose, dactyle generally smooth. Gnathopod 2 larger than gnathopod 1, with few long setae, propodus shorter, with oblique palm. Pereopod 1–2, base sub-equal to merus, with few very long setae, merus with postero-distal long setae, with few antero-distal setae, ischium the smallest article, carpus with postero-distal robust setae, propodus slender setae present at postero-distal level, ductyle one fourth of propodus. Pereopod 2, similar to pereopod 1 except, coxa without setae, ductyle as long as one third of propodus. Pereopod 3–5 basis dilated; coxa reduced in size gradually; ductyles 0.75x of propodus, antero-distally margin dentate. Pereopod 3 basis greater than twice width of ischium, basis not acuminate postero-distally, hairy on posterior margins. Pereopod 4 the longest, basis with sets of antero-marginal setae, with some normal and plumose setae postero-ventrally, merus, carpus, propodus similar, gradually reduced in volume. Pereopod 5 the shortest, basis about 0.5x of pereopod

without long postero-ventral setae, merus with some plumose setae on anterior and posterior margins.

Pleon: *Epimere* 1, 3 without facial setae, *Epimere* 3 strongly rounded. *Epimeron* 2 with 5 sub marginal long pectinate setae. *Urosomite* 1, largest, with three robust lateral setae, urosomites 2, 3 naked, smaller. *Uropods* 1–3 rami without apical nails. *Uropod* 1, peduncle; subequal to rami, with two proximal spines dorsally, two disto-terminal spines; external rami longer than internal one, without setae. *Uropod* 2; similar to uropod 1 but shorter. *Uropod* 3; peduncle 0.5x of outer rami, with 3 spines distally external side and one internally, outer rami biarticulate, article 1, more than two folds of article 2, dorsally setose and ventrally with one long distal seta, article 2 with 2 terminal long setae; Inner rami, slightly longer than half of article 1 of outer rami, with one short apical seta. *Telson*; forked, with one apical spine and one terminal seta, with two facial setae medially.

Sexual dimorphism

Male: very similar to the female in most of the body structure, but with A1 flagellum with 6 articles, terminal one with as long as the last three articles. A2 peduncle with facial fuzz on articles 3, 4, flagellum sub-equal to the body length. Eye well developed. Mandibular palp article 3 with one facial median long seta. Mx1 inner plate with fuzz. Mx2 outer plate with 7 terminal setae. Upper and Lower lips with numerous fuzzes. U3, with bipennate setae, inner rami sub-equal to outer rami first article. Dactyls of Pereopod 3, 4 slightly longer than female. and also the first record of this genus from the Red Sea. Also, researchers can differentiate between the present species and the other recorded species of family Phoxocephalidae (*Wildus spinitelson*, Lyons & Myers, 1993) by Mx1 palp which is two articles while one article in *Vasco amputatus* sp. nov.

Remarks:

The present materials are almost similar to the only assigned species to the genus, *Vasco brevidactylus* (Ledoyer, 1973) from (reef of Benthedi countryside) Boueni, Mayotte, Madagascar. Some of the body characters externally and others appear with dissection. (1) Our material has 3 spines on lateral side, ventrally on urosomite1, while *V. brevidactylus* naked; (2) Uropod3, article 2 of outer ramous elongate carrying 2 long apical setae, while short apical setae on *V. brevidactylus* (Fig. 5); (3) Epimera 1–3 without facial setae and epimeron 2 with 5 sub-marginal long bi-pectinate setae, while in the other, epimera 1, 2 lacking long posterior setae, without midfacial ventral setae and epimeron-3 rounded without long setae; (4) In *V. brevidactylus*, maxilliped palp 4th article with mid apical seta, while absent in the present materials; (5) Coxal setae of pereonite 1–3 increased in number from 5–7 in the present material, but only 4 setae in Madagascar materials; (6) Article 2 of P1 and P2 with 2–3 very long setae, as long as basal length (Fig. 4), while the other materials have short setae; (7) Right mandible has 3 teeth in *V. brevidactylus*, while the present material has 6 teeth.

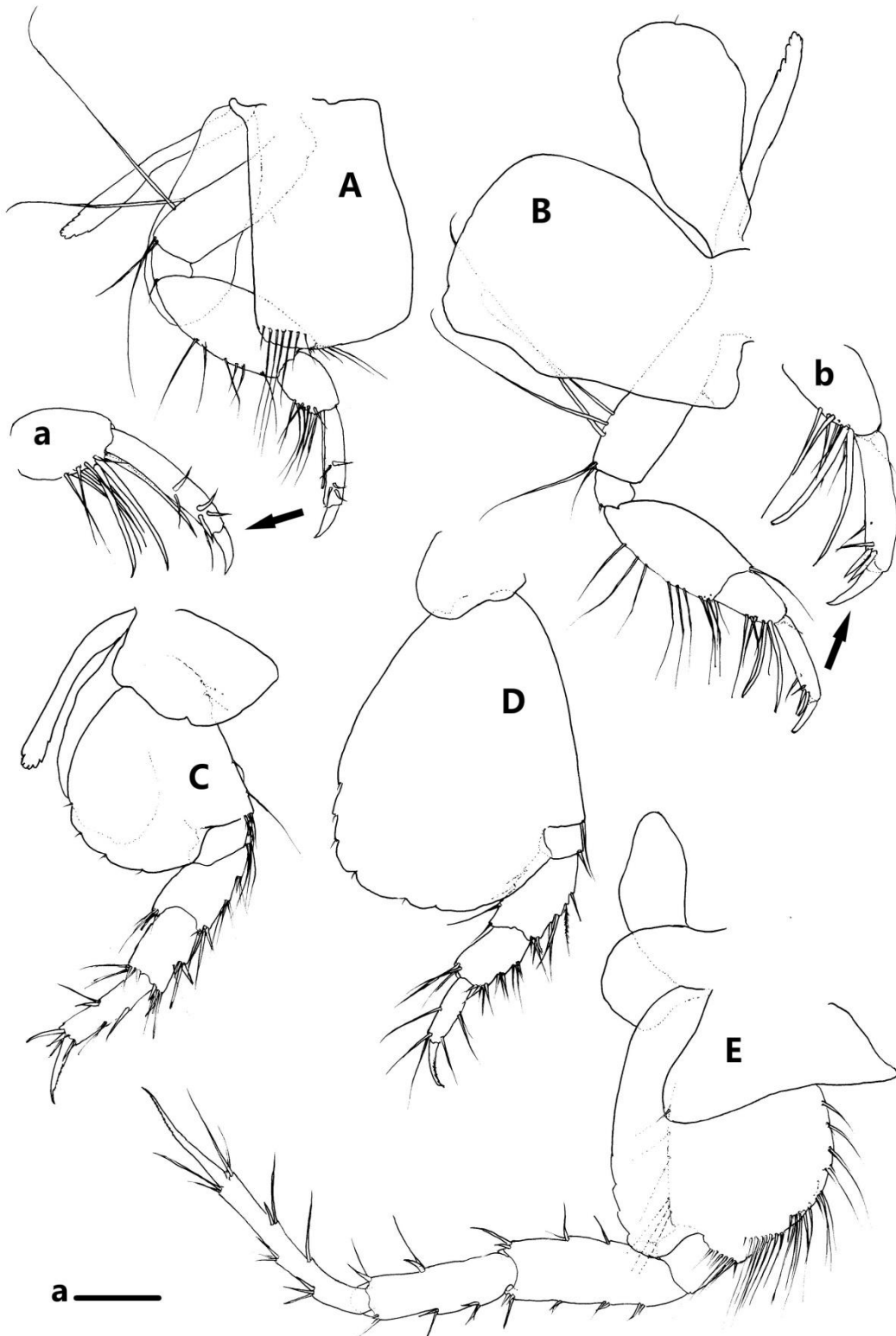


Fig. 4. *Vasco Amputatus* sp. nov. Holotype (AZMCcam310101) female 4.4mm: **A.** Pereopod 1; **B.** Pereopod 2; **a & b.** magnification of (carpus, propodus & dactyl); **C.** Pereopod 3; **D.** Pereopod 5; **E.** Pereopod 4. Scale: a=0.1mm.

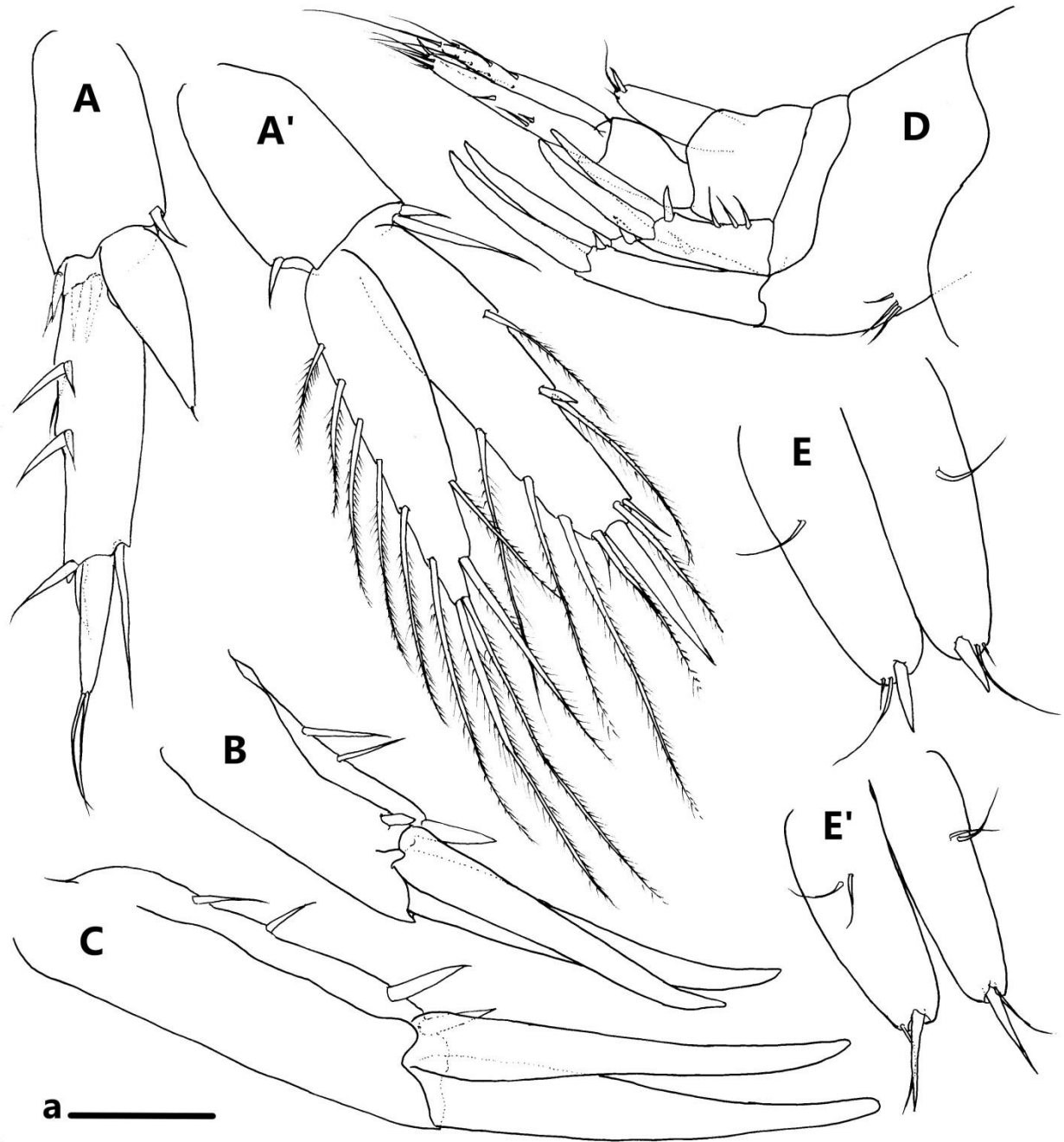


Fig. 5. *Vasco Amputatus* sp. nov. Holotype (AZMCcam310101) female 4.4mm: **A.** uropod 3; **B & C.** uropods 2 & 1; **D.** urosome; **E.** telson, Paratype male: **A'.** uropod 3; **E'.** telson. Scale: 0.01mm for all except urosome

Hence, based on the mentioned differences herein between the Madagascar materials and the Red Sea materials, it is clear to differentiate between both considering the Red Sea material as a new species for science.

Occurrence and geographical distribution

Specimens were collected during this study, covering the area from Hurghada to Halayeb. **Attallah (2021)** mentioned two specimens in his study belonging to family Phoxocephalidae, specifically the genus *Metaphoxus* (**Bonnier, 1896**); *Metaphoxus* sp., **Attallah et al. (2021)**. One specimen comes from Hurghada and the other from Shalateen. Both of these materials, and the other materials collected during this study belong to the genus *Vasco*, **Barnard and Drummond (1978)**; *Vasco Amputatus* sp. nov. based on continuous revision of the materials; this genus is distinguished from the former genus by the stunted P3 and P4 dactyls (**Barnard & Drummond, 1978**).

The new materials were collected mainly from sand substrate that varied in their grain size between coarse to fine sand (500 to 125 μ m) without biased toward any type of sandy substrate. In spite of similarity between sites grain size from Hurghada to Halayeb, the material examined was mainly collected from the northern part of the study area. Hurghada, Safaga and Quseir have 29 individuals alone while the rest individuals are scattered between Abo Dabab and Shalateen, no individuals were collected from Lahmi and Halayeb (Fig. 6). The maximum depth of the collected materials was 35m, but most individuals were captured from shallower depths.

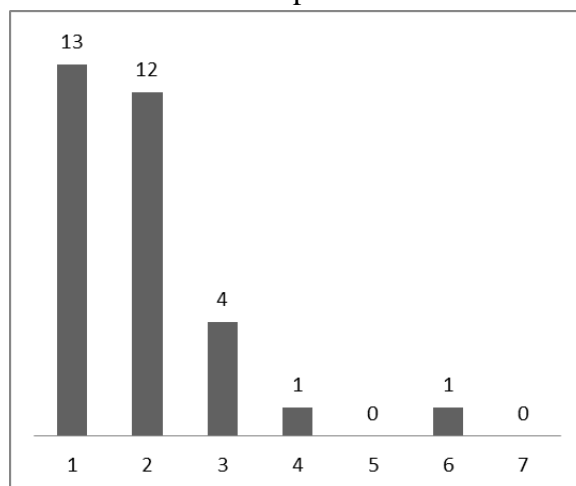


Fig. 6. Histogram showing the occurrence and distribution of *Vasco Amputatus* sp. nov. among the study sites: (1) Hurghada, (2) Safaga, (3) Quseir, (4) Abo Dabab, (5) Lahmi, (6) Shalateen and (7) Halayeb

CONCLUSION

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