

## Description of a new species of *Alpheopsis* from the Azores, with remarks on *A. africana* HOLTHUIS, 1952 and other species of the *A. trispinosa* (STIMPSON, 1860) group (Crustacea, Decapoda, Caridea, Alpheidae)

by Arthur ANKER, Cédric D'UDEKEM D'ACUZ & Denis PODDOUBTCHENKO

### Abstract

*Alpheopsis azorica* n. sp. is described on the basis of one specimen collected in the Azores, and two specimens dredged off the Cape Verde Islands, in the eastern Atlantic Ocean. The new species was previously confused with *A. trispinosa* (STIMPSON, 1860) and *A. africana* HOLTHUIS, 1952, and belongs to the *A. trispinosa* species group. This very distinct and monophyletic species group contains nine further species characterized by the presence of orbital teeth and deep grooves on the palm of the chelipeds. Within the presumably non-monophyletic genus *Alpheopsis*, the *A. trispinosa* group would correspond to *Alpheopsis s. str.*

**Key words:** *Alpheopsis*, new species, Crustacea, Decapoda, Caridea, shrimp, Azores, Cape Verde, Atlantic.

### Résumé

*Alpheopsis azorica* n. sp., est décrite d'après un spécimen provenant des Açores, et deux spécimens obtenus par chalutage au large des îles du Cap-Vert, dans l'Est de l'Océan Atlantique. La nouvelle espèce avait été antérieurement confondue avec *A. trispinosa* (STIMPSON, 1860) et *A. africana* HOLTHUIS, 1952, et appartient au groupe d'espèces *A. trispinosa*. Ce groupe bien distinct et monophylétique contient neuf autres espèces caractérisées par la présence de dents orbitaires et de sillons profonds sur la paume des chélicères. A l'intérieur du genre *Alpheopsis*, qui est probablement non-monophylétique, le groupe *A. trispinosa* correspondrait à *Alpheopsis s. str.*

**Mots clés:** *Alpheopsis*, espèce nouvelle, Crustacea, Decapoda, Caridea, crevette, Açores, îles du Cap-Vert, Atlantique.

### Introduction

The genus *Alpheopsis* COUTIÈRE, 1897 is taxonomically one of the most difficult genera of the family Alpheidae and further presents a distinct nomenclatorial problem. The gender of *Alpheopsis* was not detailed in the brief original description by COUTIÈRE (1897), resulting in the currently confusing situation where many species assigned to *Alpheopsis* with an adjective species name carry masculine endings,

and some have feminine endings, and some have endings that could be applied to both genders. For instance, HOLTHUIS (1952a) used *A. trispinosus* (STIMPSON, 1860) and *A. africanus* HOLTHUIS, 1952, both with masculine endings; whilst BANNER & BANNER (1973) used *A. trispinosus*, but described one species as *A. undicola* BANNER & BANNER, 1973, with a feminine ending (masculine ending would be "*A. undicolus*"). The International Code of Zoological Nomenclature, 4th edition, art. 30.1.2.a states that Latin generic names ending in *-opsis* are feminine and the genus *Alpheopsis* has been put on the Official List of Zoological names as feminine (Opinion 559). However, HOLTHUIS (1993), who accepted that *Alpheopsis* is feminine, continued to use the combination *A. trispinosus*, despite *trispinosus* being clearly an adjective. A few authors (MACPHERSON, 1991; D'UDEKEM D'ACUZ, 1999; DAVIE, 2002; POORE, 2004) used either *A. africana* or *A. trispinosa*. Here we suggest feminizing the endings of all *Alpheopsis* species which are adjectives. Prof. L. B. HOLTHUIS (in litt.) confirmed us that *A. trispinosa* is the correct spelling.

*Alpheopsis s. lat.* (*sensu* BANNER & BANNER, 1973; CHACE, 1988) is a heterogeneous and rather poorly defined species assemblage lacking distinct autapomorphies, and therefore, most likely non-monophyletic (ANKER *et al.*, in prep.). Furthermore, from the currently recognized 21 species (CHACE, 1988) only about half are taxonomically well defined. Many species were described on the basis of single, often incomplete specimens, such as *A. biunguiculata* BANNER, 1953, *A. tetraarthri* BANNER, 1956, and *A. idiocarpus* COUTIÈRE, 1908. Others have vast geographical ranges, are morphologically variable, therefore, most likely representing species complexes, including *A. aequalis* COUTIÈRE, 1896 and *A. trispinosa* (STIMPSON, 1860) (A. ANKER, pers. obs.). Several other species of *Alpheopsis s. lat.* are still undescribed (A. ANKER, pers. obs.).

*Alpheopsis trispinosa* (originally described as *Betaeus trispinosus* by STIMPSON, 1860), is the type species of *Alpheopsis* (see HOLTHUIS, 1993), and has been reported from Australia, Madagascar, the Cape Verde Islands, the Azores and Florida (COUTIÈRE, 1897, 1899; SOLLAUD, 1932; HOLTHUIS, 1951; BANNER & BANNER, 1973, 1983; GORE,

1981). However, HOLTHUIS (1952a) stated that all specimens from the eastern Atlantic reported under the name *A. trispinosus* (COUTIÈRE, 1897, 1899; SOLLAUD, 1932; HOLTHUIS, 1951) should be referred to *A. africana* HOLTHUIS, 1952.

The type locality of *A. trispinosa* is Port Jackson, New South Wales, Australia (STIMPSON, 1860). Stimpson's original types are considered as lost (EVANS, 1967), but in the redescription of *A. trispinosa* by BANNER & BANNER (1973), a neotype was designated and deposited in the collections of the Australian Museum, Sydney (AM P8230, see DAVIE, 2002). The type locality of *A. africana* is off Pointa do Dandé, Angola (HOLTHUIS, 1952a). The most important feature distinguishing *A. africana* from *A. trispinosa* is the degree of the cheliped asymmetry. In *A. africana*, the chelipeds are subsymmetrical (i.e. slightly dissimilar) in shape, differing mainly in the proportions and the dentition of the cutting edges of their fingers, but are conspicuously unequal in size (HOLTHUIS, 1952a). In *A. trispinosa*, the chelipeds are symmetrical in shape, differing only slightly in the dentition, and are almost equal in size (BANNER & BANNER, 1973).

In August 2001 Dr. Peter WIRTZ (then working at the Department of Oceanography and Fisheries, University of the Azores, Horta) collected a complete ovigerous female *Alpheopsis* in a marine cave off Faial Island in the Azores. This specimen, first identified as *Alpheopsis* cf. *africana*, exhibited several subtle morphological differences with both *A. africana*, as described by HOLTHUIS (1952a) and *A. trispinosa*, as redescribed by BANNER & BANNER (1973). We reexamined the type series of *A. africana* deposited in the Institut Royal des Sciences Naturelles de Belgique, Brussels (IRScNB-KBIN); two specimens of *A. africana* dredged off Namibia and reported by MACPHERSON (1991), deposited in the Instituto de Ciencias del Mar, Barcelona (ICMD); two specimens dredged off the Cape Verde Islands and identified as *A. trispinosus* by H. COUTIÈRE, from the collections of the Muséum national d'Histoire naturelle, Paris (MNHN), and three specimens of *A. trispinosa* from Botany Bay, New South Wales, deposited in the Australian Museum, Sydney (AM). This reexamination confirmed that all three specimens from the Azores (the recently collected Faial specimen and the two older specimens examined by COUTIÈRE) belong to an undescribed species, closely related to *A. africana*, which is described as new herein. The Namibian material of *A. africana* is illustrated, thus providing additional figures to the scantily illustrated and poorly preserved type material of *A. africana* (HOLTHUIS, 1952a).

### Material and methods

The material examined for this study belongs to the collections of the IRScNB-KBIN, MNHN, ICM and AM (see above). All drawings were made with the aid of a camera lucida. The following abbreviations were used in the text: CL – carapace length (in mm), measured from the tip of the rostrum to the posterior margin of the carapace; TL – total length (in mm), measured from the tip of the rostrum to the posterior margin of the telson; P – pereopod; Mxp – maxilliped.

### Systematics

#### Family Alpheidae RAFINESQUE, 1815 Genus *Alpheopsis* COUTIÈRE, 1897

##### *Alpheopsis azorica* n. sp.

(Figs. 1-3)

*Alpheopsis trispinosus* (not STIMPSON); COUTIÈRE, 1897: 382; COUTIÈRE, 1899: 73, 190, 259, 315 (part.), figs. 26, 96, 120, 168, 228-231, 315, 396; COUTIÈRE, 1906: 377; SOLLAUD, 1932: 376; COUTIÈRE, 1938: 187; HOLTHUIS, 1951: 94 (part.).

*Alpheopsis africanus* HOLTHUIS, 1952a: 47 (part.), literature records only, not examined material (= *Alpheopsis africana* Holthuis, 1952).

*Alpheopsis africana*; D'UDEKEM D'ACÓZ, 1999: 103 (part.).

#### TYPE MATERIAL

Holotype: 1 ovigerous female, MNHN-Na 13678 (CL 5.4, TL 16.8), Monte da Guia near Horta, Faial Island, Azores, in large marine cave, depth: 35 m, coll. P. WIRTZ, 19 Aug 2001. OTHER MATERIAL EXAMINED. – MNHN-Na 13664, 1 ovigerous female (CL 3.5, TL 11.0), 1 male (CL 3.0, TL 8.1) identified as *A. trispinosus* STIMPSON [COUTIÈRE's handwriting], Collection Prince de Monaco, Station 1203, 15°54'N-22°54.45'W, off Porto da Praia de São Thiago, 4 miles southwest of Boa-Vista, Cape Verde Islands, dredge, depth 91 m, hard bottom with gorgonians, 18 Aug 1901.

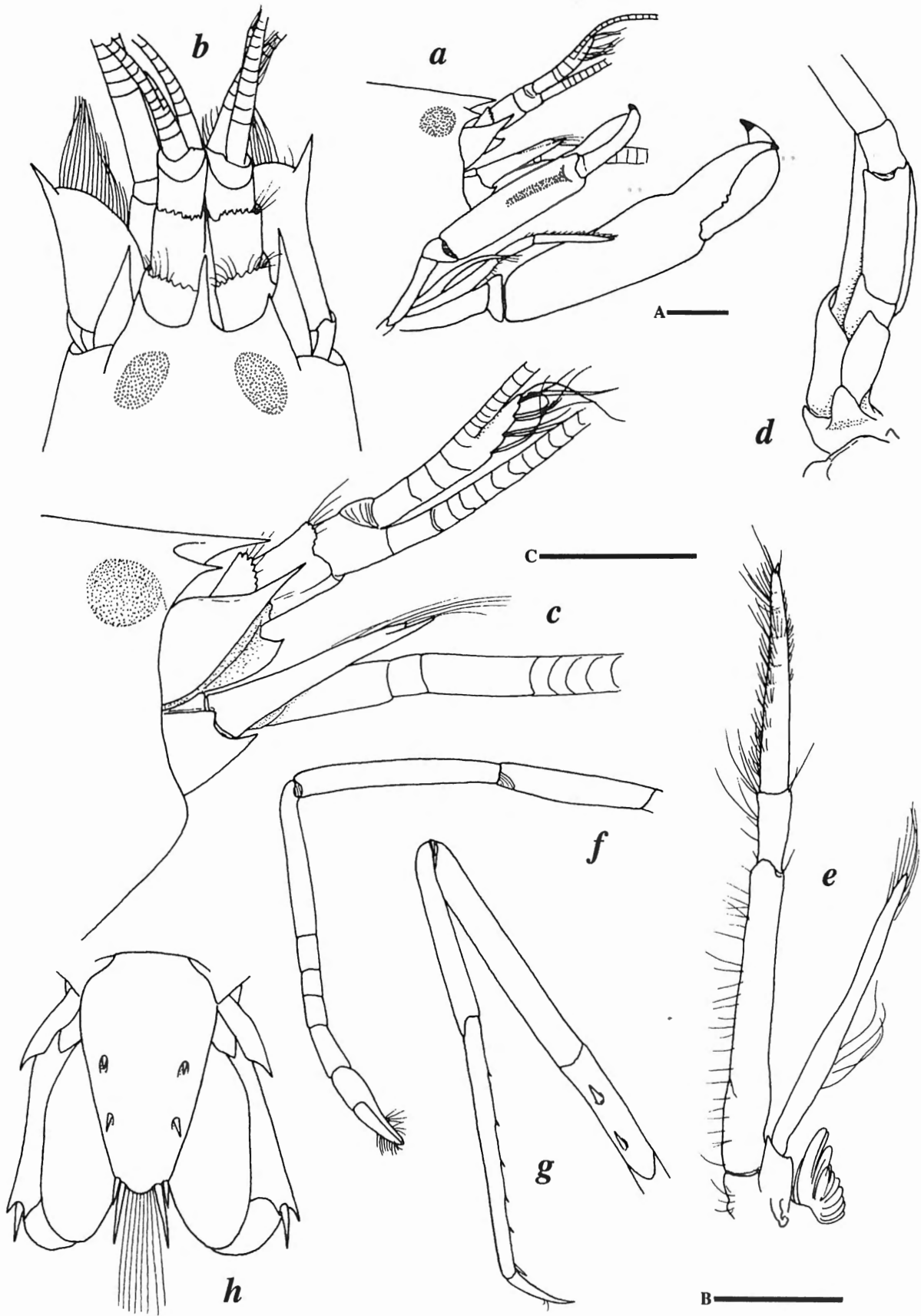
#### ETYMOLOGY

The new species is named after the type locality, the Portuguese islands of the Azores in the northeastern Atlantic Ocean. The species name is the feminine of the adjective *azoricus*.

#### DESCRIPTION

Carapace dorsally somewhat inflated, glabrous, laterally with shallow longitudinal depression. Rostrum moderately long, reaching from distal margin of first segment to falling short of middle of second segment of antennular peduncle (Figs. 1b, c, 3a, b), almost twice as long as broad at base; lateral margins slightly concave; rostral carina indistinct. Extra-corneal teeth well developed, acute, directed anteriorly; margin between rostrum base and extra-corneal teeth broadly concave (Fig. 1b). Pterygostomial angle rounded, not protruding (Fig. 1c). Cardiac notch deep. Eystalks completely covered by carapace, not visible in dorsal and lateral view (Fig. 1b, c), or sometimes anterior-most portion visible in dorsal and lateral view (Fig. 3a, b); cornea well developed, anteromesial margin slightly projecting (visible in ventral view only). Epistomial sclerites without acute projections. Ocellar beak not protruding in lateral view, visible in ventral view only.

Antennular peduncle moderately stout; second segment slightly longer than wide, not much longer than first and third segments; distal margin of first and second segment finely



**Fig. 1.** *Alpheopsis azorica* n. sp. ovigerous female, holotype (MNHN-Na 13678): a – anterior region of carapace, frontal appendages and chelipeds, lateral view; b – frontal region, dorsal view; c – same, lateral view; antenna, ventral view; d – antenna, ventral view; e – third maxilliped; f – second pereopod; g – third pereopod; h – telson and uropods. Scale bars 1 mm: A (a); B (b, f-h), C (c-e).

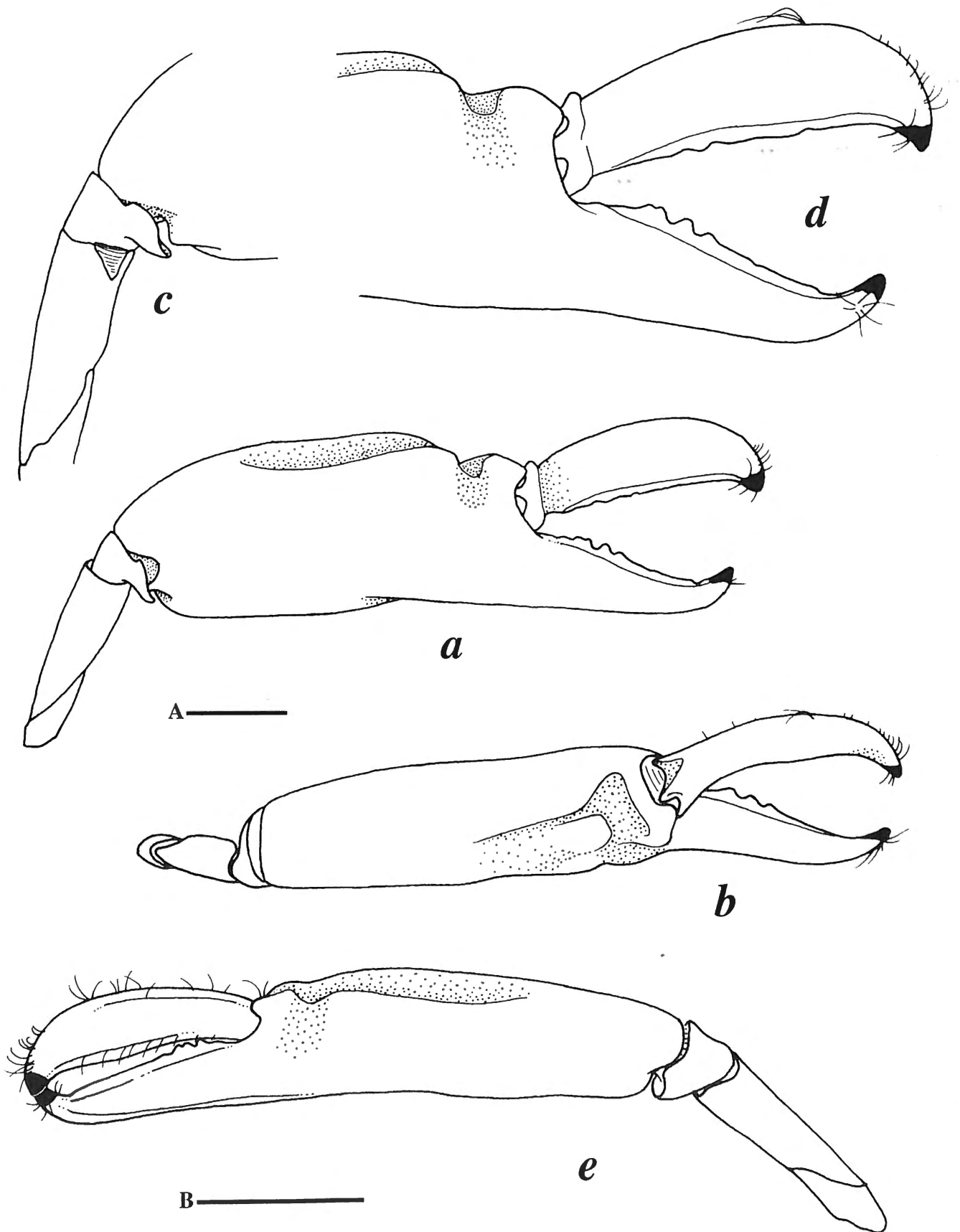
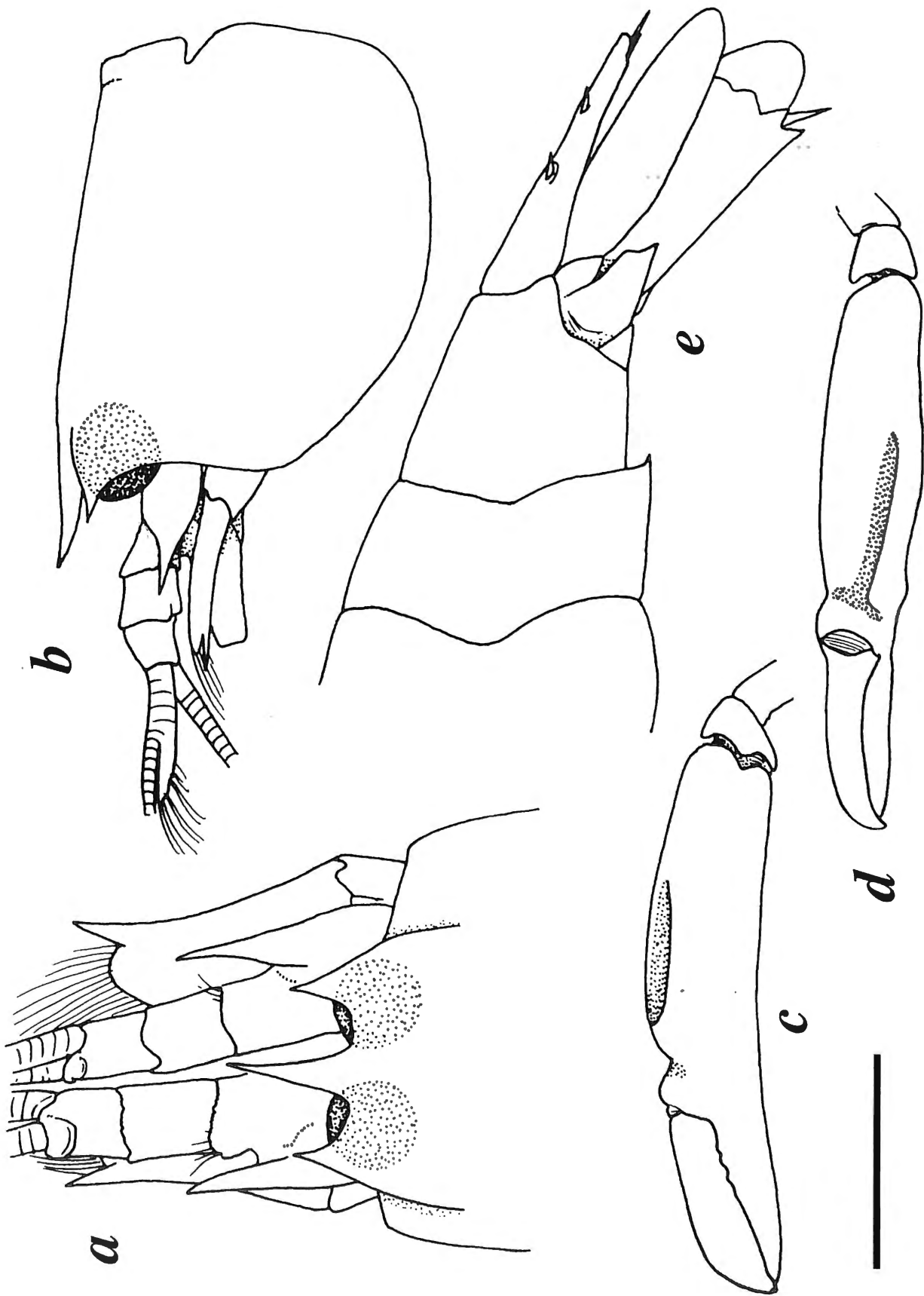


Fig. 2. *Alpheopsis azorica* n. sp., ovigerous female, holotype (MNHN-Na 13678): a – major cheliped, lateral view; b – same, dorsal view; c – same as a, detail of merus and carpus; d – same as a, detail of fingers; e – minor cheliped, lateral view. Scale bars 1 mm: A (a, b); B (c-e).



**Fig. 3.** *Alpheopsis azorica* n. sp., male, paratype (MNHN-Na 13664): a – frontal region, dorsal view; b – carapace and frontal appendages, lateral view; c – (minor ?) cheliped, lateral view; d – same, dorsolateral view; e – posterior abdominal somites and tail fan, lateral view; Scale bar 1 mm.

toothed (Fig. 1b, c); stylocerite reaching between 1/2 and 3/4 length of second segment, acute distally (Fig. 1b); ventromesial carina of first segment with large acute tooth (Fig. 1c); lateral flagellum biramous, shorter ramus composed of at least three segments bearing tufts of aesthetascs; proximal fused portion composed of at least three segments (Fig. 1c). Antenna with tubercle of antennal gland conspicuously protruding (Fig. 1d); basicerite bearing strong ventrolateral tooth (Fig. 1c); scaphocerite oval, anterior margin of blade slightly rounded; distolateral tooth strong, acute, reaching far beyond anterior margin of blade; carpocerite moderately stout, reaching beyond 3/4 of scaphocerite length, but not reaching distal margin of blade (Fig. 1c); flagellum relatively stout.

Labrum and paragnaths somewhat inflated. Mouthparts typical for genus. Mandible with incisor process bearing distally seven rounded teeth, third largest. Maxillule with palp bilobed, lower lobe with one robust seta, upper lobe with several setae. Maxilla and first maxilliped without specific features. Second maxilliped with epipod oval, slightly elongated. Third maxilliped slender (Fig. 1e); lateral plate subrectangular, distally with two subacute teeth (Fig. 1e); ultimate segment very setose, distally tapering, bearing 1 subapical spine (Fig. 1e); arthrobranch normally developed.

First pereopods (chelipeds) only slightly asymmetrical in shape but very unequal in size, carried extended (Fig. 1a); major cheliped more robust and about 1.5 times larger than smaller cheliped. Major cheliped (Fig. 2a-d) with ischium short, unarmed; merus more elongated, ventrally not depressed, unarmed; carpus short, cup-shaped, laterodistally with pronounced lobe (Fig. 2c); chela large compared to merus and carpus, subcylindrical, with ratio fingers/palm subequal to 5/8; palm with deep, transverse groove on dorsodistal margin (Fig. 2b) and deep longitudinal groove departing dorsomesially from transverse groove (Fig. 2a, b); ventral margin of palm slightly constricted (Fig. 2a); pollex straight except for curved tip, cutting edge armed with three rounded teeth on proximal 1/3 of pollex length, distal 2/3 unarmed (Fig. 2d); dactylus with distal margin convex, tip strongly curved, cutting edge unarmed except for one or two feeble teeth (Fig. 2d); finger tips corneous, crossing when fingers closed. Minor cheliped much more slender than major cheliped; ischium, merus and carpus similar in shape, chela more slender and with shallower grooves on palm (Fig. 2e), otherwise similar to that of major cheliped.

Second pereopod (Fig. 1f) with ischium about 3/4 length of merus; carpus with five articles having length ratio subequal to 5/1.2/1/1.2/2; chela simple, fingers longer than palm, with tufts of setae. Third pereopod (Fig. 1e) with ischium armed with two spines on ventrolateral margin; merus about twice length of ischium, about eight times as long as wide at base; carpus about 3/5 length of merus, unarmed; propodus slightly longer than merus, armed with six spines on ventral margin and one slender ventrodorsal spine proximal to dactylus; dactylus about 1/4 length of propodus, simple, slender, gradually curved, with tufts of setae. Fourth pereopod similar to third. Fifth pereopod more slender; ischium unarmed; merus, carpus and propodus similar to those of third pereopod, with slightly different proportions; propodus ventrally armed with three or four small spines, distal half

with at least 10 rows of short setae; dactylus similar to that of third and fourth pereopods.

Abdominal segments I-IV with posteroventral angles rounded; segment V with posteroventral angle angular, subacute (Fig. 3e); segment VI with subacute posterior projection; ventroposterior angle with triangular articulated plate; preanal plate posteriorly rounded. Male second pleopod with appendix masculina reaching far beyond appendix interna, not reaching distal margin of endopod, distally with a crown of slender spines. Telson (Fig. 1h) about twice as long as wide proximally (measured between posterior projections of abdominal segment VI); dorsal surface with two pairs of spines situated at some distance from lateral margin, anterior to mid-length and posterior to 2/3 length of telson, respectively; posterior margin rounded, bearing two pairs of slender posterolateral spines, mesial more than twice as long as lateral (Fig. 1h); anal tubercles absent. Uropods exceeding telson (Fig. 1h); sympodite with two teeth – stronger, acute lateral tooth and smaller, blunt mesial tooth; diaeresis with two strong acute teeth, one on each side of distolateral spine, almost straight from second tooth to mesial margin of exopod; distolateral spine long, slender, almost reaching posterior margin of exopod (Fig. 1h). Holotype female with 40-50 oval fairly large eggs (diameter 0.8 x 0.5 mm).

Gill formula: 5 pleurobranchs (P1-5); 1 arthrobranch (Mxp3); 0 podobranch (Mxp2); 2 lobed epipods (Mxp1-2); 3 mastigobranchs = strap-like epipods (Mxp3, P1-2); 3 sets of setobranchs (P1-3); 3 exopods (Mxp1-3).

#### COLOUR PATTERN

Not noted.

#### SIZE

The CL ranges from 3.0 to 5.4 mm, TL from 8.1 to 16.8 mm.

#### ECOLOGY

The holotype from the Azores was collected by SCUBA diving in a marine cave situated at a depth of about 35 m. The two Cape Verde specimens were dredged from hard bottoms at 91 m, together with crabs (*Xanthodes*, *Parthenope*) and gorgonians. It is possible that *A. azorica* n. sp. usually occurs in deeper water (between 50 and 100 m), and in shallower water is confined to submarine caves, which may serve as refuge for deep-water organisms (e.g., HART & ILIFFE, 1985).

#### DISTRIBUTION

The new species is presently known from the Azores and the Cape Verde Islands in the eastern Atlantic Ocean (COUTIÈRE, 1897, 1899; SOLLAUD, 1932; HOLTHUIS, 1951, 1952a; present study), with Faial Island, Azores, being the locality of collection of the holotype. The present description of *A. azorica* n. sp. excludes Azores from the distribution range of the closely related *A. africana* (as *A. trispinosus* in older literature), which occurs further south from Angola (HOLTHUIS, 1952a) to Namibia (MACPHERSON, 1991). The presence of *A.*

*africana* in the Cape Verde Islands (SOLLAUD, 1932; HOLTHUIS, 1951, both as *A. trispinosus*; HOLTHUIS, 1952a, as *A. africanus*) needs confirmation.

#### REMARKS

*Alpheopsis azorica* n. sp. is closely related to *A. africana*, but differs from it by several important features. In the type specimens of *A. africana*, the rostral tip does not reach the distal margin of the first segment of the antennular peduncle, contrary to *A. azorica* n. sp. (compare Figs. 1b, 3a, and Fig. 5a). In most specimens of *A. africana*, the extra-corneal teeth are nearly as long as the rostrum, whereas they are much shorter in *A. azorica* n. sp. (*ibid.*). In *A. africana*, the stylocerite is very slender, slightly overreaching the distal margin of the first segment of the antennular peduncle; in *A. azorica* n. sp. it is stouter, significantly overreaching this margin (*ibid.*). The scaphocerite, the antennular peduncle and the walking legs (third to fifth pereopods) of *A. africana* appear to be somewhat more slender compared to those of *A. azorica* n. sp. (compare Figs. 1 and 5, 7). Further, in *A. africana*, the lateral plate of the third maxilliped is ear-shaped, with one distal tooth, whereas in *A. azorica* n. sp., this plate is peculiarly shaped, with two teeth (compare Figs. 1e and 5e). Another important difference between *A. azorica* n. sp. and *A. africana* lies in the number of strap-like epipods (mastigobranchs): three (Mxp3 and P1-2) in *A. azorica* n. sp. and five (Mxp3 and P1-4) in *A. africana*. COUTIÈRE (1897, 1899) noted that all his specimens from the Azores (11 in

total) had only three strap-like epipods ("3 épip. seulement"). Most species of *Alpheopsis*, including *A. trispinosa* and *A. africana*, have five strap-like epipods (A. ANKER, pers. obs.); at least one species appears to have four (BANNER & BANNER, 1966, 1973), while *A. azorica* n. sp. has only three, which is a unique configuration within the genus *Alpheopsis*. *Alpheopsis azorica* n. sp. differs from *A. trispinosa* by the presence of an arthrobranch above the third maxilliped and by the absence of an acute projection on the epistomial sclerite near the base of the antennules. In the redescription of the latter species, BANNER & BANNER (1973) did not mention these features, but in all examined specimens of *A. trispinosa* from Botany Bay (AM) the arthrobranch is absent, while the epistomial sclerite bears a distinct acute projection. Such a projection, although a relatively blunt one, is also present in *A. africana*.

#### *Alpheopsis africana* HOLTHUIS, 1952 (Figs. 4-7)

*Alpheopsis africanus* HOLTHUIS, 1952a: 45, material examined, fig. 11 (at least part of literature records = *A. azorica* n. sp.); FRANSEN *et al.*, 1997: 34.

*Alpheopsis africana*; MACPHERSON, 1991: 406; D'UDEKEM D'ACQZ, 1999: 103 (part. only) [Azorean records = *A. azorica* n. sp.]

*Alpheopsis trispinosus* (not STIMPSON, 1860); SOLLAUD, 1932: 376 (part.); HOLTHUIS, 1951: 94 (part.).



Fig. 4. *Alpheopsis africana* Holthuis, 1952, frontal margin of four specimens from the type series from Angola (IRScNB-KBIN IG 16 808).



## MATERIAL EXAMINED

1 male (CL 5.6, TL 19.0), 1 female (CL 6.4, TL 21.2), ICMD 12/2005, Benguela XII, off Namibia, P-42, 28°57'S 14°56'E, depth 185 m, 24 Jan 1988; 3 females, 1 probable male (syntypes), in poor condition (TL 11-13), IRScNB-KBIN IG 16 808, S.V.R., Sta. A.S. 122, 8°30'S 13°E, 20 sea miles west of Pointa do Dandé, Angola, depth 150 m, 6-7 Feb 1949.

## DESCRIPTION OF MATERIAL FROM NAMIBIA (FIGS. 5-7)

Carapace dorsally slightly inflated, glabrous, laterally with shallow longitudinal depression. Rostrum moderately long, slightly longer (Fig. 5b) to distinctly longer (Fig. 5a) than orbital teeth, not reaching middle of first segment of antennular peduncle (Figs. 5a, b), about twice as long as broad at base; lateral margins straight; rostral carina indistinct. Extra-corneal teeth well developed, acute, directed anteriorly; margin between rostrum base and extra-corneal teeth shallowly concave (Fig. 5a) to obliquely concave (Fig. 5b). Pterygostomial angle rounded, protruding, furnished with setae (Fig. 5c). Cardiac notch deep (Fig. 5f). Eyestalks completely covered by carapace, not visible in dorsal view (Fig. 5a, b), anterior-most portion visible in lateral view (Fig. 5c); cornea well developed. Epistomial sclerites with distinct blunt projections. Ocellar beak not protruding in lateral view, visible in ventral view only.

Antennular peduncle relatively slender (Fig. 5a); second segment about 1.5 times longer than wide, equal to first segment and much longer than third segment; distal margin of first segment almost straight, inconspicuously serrated (Fig. 5a, c); stylocerite reaching proximal 1/4 length of second segment, acute distally (Fig. 5b); ventromesial carina of first segment with large acute tooth (Fig. 5d); lateral flagellum biramous, shorter ramus composed of at least three segments bearing tufts of aesthetascs; proximal fused portion composed of four segments (Fig. 5c). Antenna with tubercle of antennal gland conspicuously protruding; basicerite bearing strong ventrolateral tooth (Fig. 5c); scaphocerite elongated, slender, anterior margin of blade oblique, slightly convex; distolateral tooth strong, acute, reaching far beyond anterior margin of blade; carpocerite slender, reaching far beyond 3/4 of scaphocerite length, almost reaching distal margin of blade (Fig. 5c); flagellum rather slender.

Labrum and paragnaths somewhat inflated. Mouthparts typical for genus, similar to those of *A. azorica* n. sp. (see above). Third maxilliped slender (Fig. 5e); lateral plate ear-shaped, distally with one subacute tooth (Fig. 5e); ultimate segment moderately setose, very slender, distally tapering, bearing two slender apical spines (Fig. 5e); arthrobranch normally developed.

First pereopods (chelipeds) slightly asymmetrical in shape but very unequal in size, carried extended; major cheliped more robust and about twice as large as smaller cheliped. Major cheliped (Fig. 6a-d) with ischium short, unarmed; merus more elongated, slender, ventrally not depressed, unarmed; carpus short, cup-shaped, laterodistally with rounded lobe (Fig. 6b); chela large compared to merus and carpus

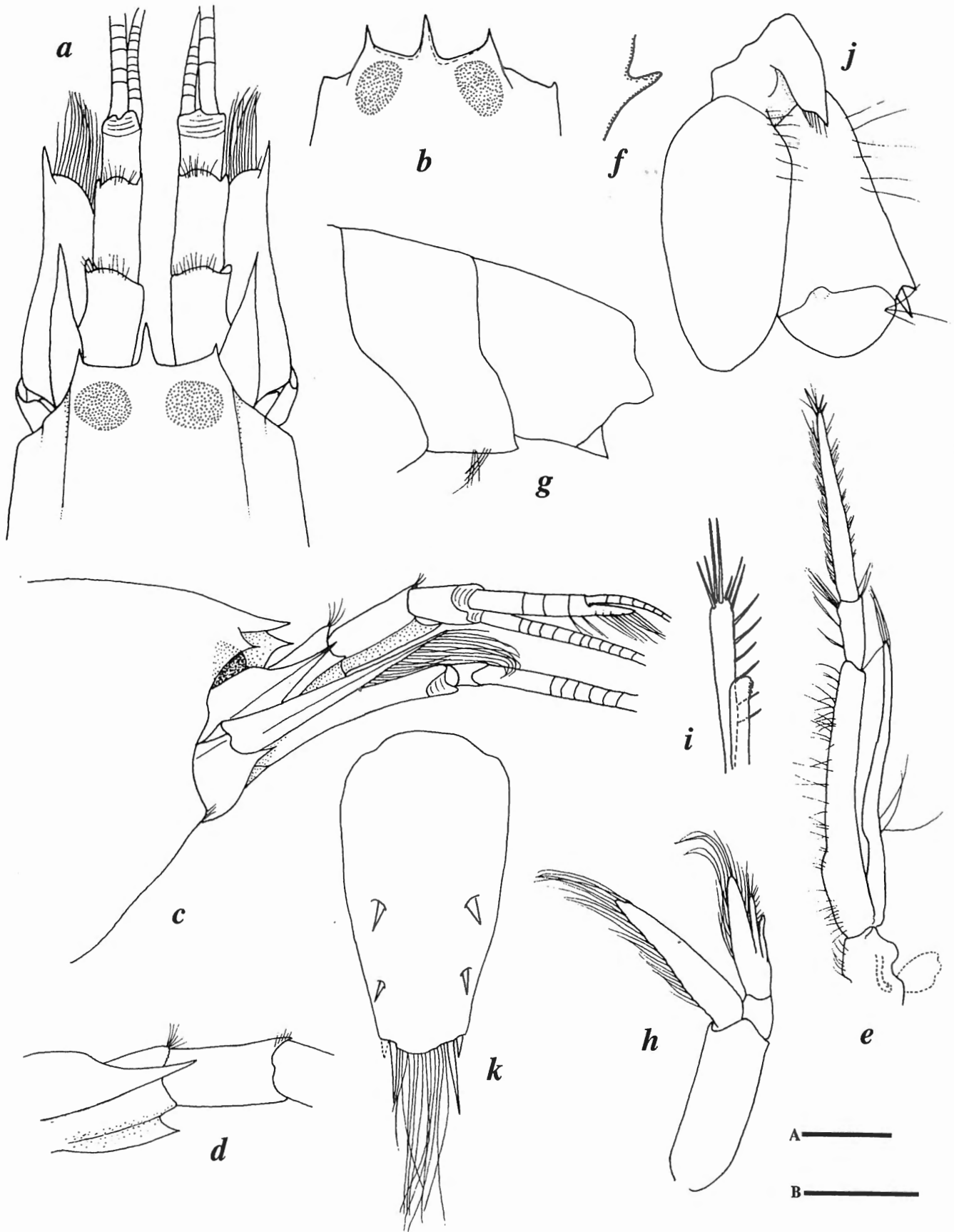
(Fig. 6a), subcylindrical, with ratio fingers / palm subequal to 1/2; palm with deep, transverse groove on dorsodistal margin (Fig. 2b) and deep longitudinal groove departing dorsomesially from transverse groove (Fig. 2a, b); ventral margin of palm shallowly concave (Fig. 2a); pollex straight except for curved tip, cutting edge armed with two-three small, rounded to subtriangular, teeth on proximal 1/3 of length, distal 2/3 unarmed (Fig. 2d); dactylus with distal margin convex, tip strongly curved, cutting edge unarmed (Fig. 6c, d); finger tips corneous, crossing when fingers closed. Minor cheliped (Fig. 6e-g) much more slender than major cheliped; ischium, merus and carpus similar in shape, chela more slender and with shallower grooves on palm (Fig. 6e, f), otherwise similar to that of major cheliped.

Second pereopod (Fig. 7a) with ischium about 3/4 length of merus; carpus with five articles having length ratio subequal to 4.5/1.2/1/1/2; chela simple, fingers longer than palm, with tufts of setae. Third pereopod slender (Fig. 7b-d), with ischium armed with two spines on ventrolateral margin (Fig. 7c); merus about 1.5 times length of ischium, almost 10 times as long as wide at base; carpus almost 4/5 length of merus, unarmed; propodus slightly longer than merus, armed with at least 10 spines or spine pairs on ventral margin and one pair of slender ventrodiscal spines proximal to dactylus (Fig. 7d); dactylus about 1/4 length of propodus, simple, slender, gradually curved, with tufts of setae (Fig. 7d). Fourth pereopod similar to third. Fifth pereopod (Fig. 7e, f) slender; ischium unarmed; merus, carpus and propodus similar to those of third pereopod, with slightly different proportions (cf. Fig. 7e); propodus ventrally armed with at least six spines, distal half with nine rows of setae; dactylus similar to that of third and fourth pereopods.

Abdominal segments I-IV with posteroventral angles rounded; segment V with posteroventral angle angular to subacute, not acute (Fig. 5g); segment VI with subacute posterior projection; ventroposterior angle with triangular articulated plate; preanal plate posteriorly rounded. Male second pleopod (Fig. 5h) with appendix masculina reaching far beyond appendix interna, not reaching distal margin of endopod, with a crown of slender spines distally and row of slender spines along one margin (Fig. 5i). Telson (Fig. 5k) about twice as long as wide proximally (measured between posterior projections of abdominal segment VI); dorsal surface with two pairs of spines situated far from lateral margin, posterior to mid-length and at about 3/4 length of telson, respectively; posterior margin rounded, bearing two pairs of slender posterolateral spines, mesial more than three times as long as lateral (Fig. 5k); anal tubercles absent. Uropods exceeding telson; sympodite with two teeth – much stronger, acute lateral tooth and inconspicuous, blunt mesial tooth (Fig. 5j); diaeresis with two strong acute teeth, one on each side of distolateral spine, straight except for a rounded incision from second tooth to mesial margin of exopod (Fig. 5j); distolateral spine moderately stout, far from reaching posterior margin of exopod (Fig. 1h).

Gill formula: 5 pleurobranchs (P1-5); 1 arthrobranch (Mxp3); 0 podobranch (Mxp2); 2 lobed epipods (Mxp1-2); 5 mastigobranchs = strap-like epipods (Mxp3, P1-4); 3 sets of setobranchs (P1-5); 3 exopods (Mxp1-3).





**Fig. 5.** *Alpheopsis africana* Holthuis, 1952, female (a, c-g, j, k) and male (b, h, i) from Namibia (ICMD 12/2005): a – frontal region, dorsal view; b – frontal margin, lateral view; c – frontal region, lateral view; d – antennule, lateral view; e – third maxilliped; f – cardiac notch; g – posterior abdominal somites; h – second pleopod; i – same, detail of appendix masculina; j – uropod; k – telson. Scale bars 1 mm: A (a-c, e-g); B (d, h, j, k); i drawn without scale.

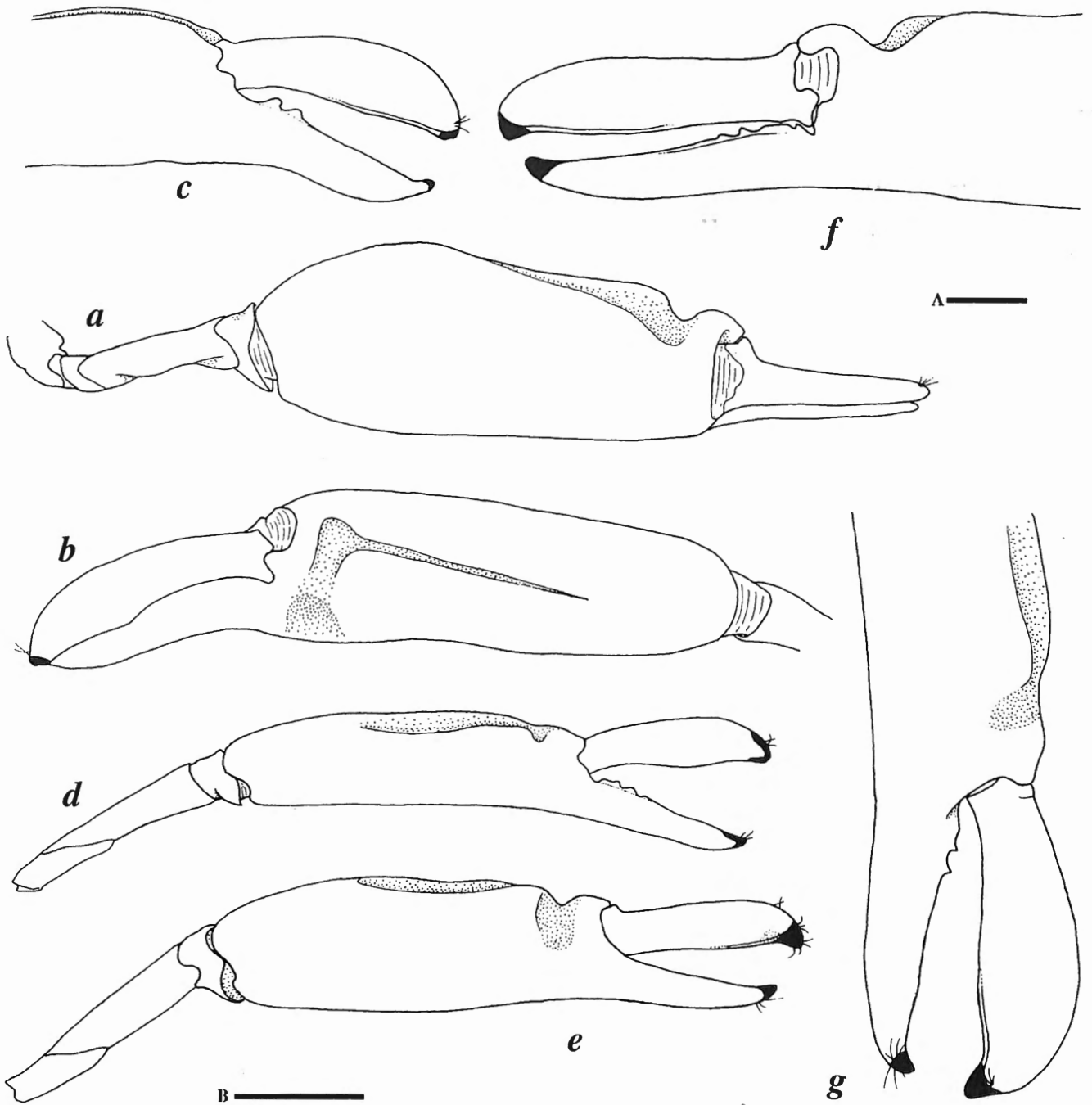


Fig. 6. *Alpheopsis africana* Holthuis, 1952, male (a-d) and female (e-g) from Namibia (ICMD 12/2005): a – male major cheliped, dorsolateral view; b – same, mesial view; c – same, detail of fingers in lateral view; d – male minor cheliped, mesial view; e – female (minor ?) cheliped, mesial view; f – same, detail of fingers, lateral view; g – same as f, mesial view. Scale bars 1 mm: A (a-e); B (f, g).

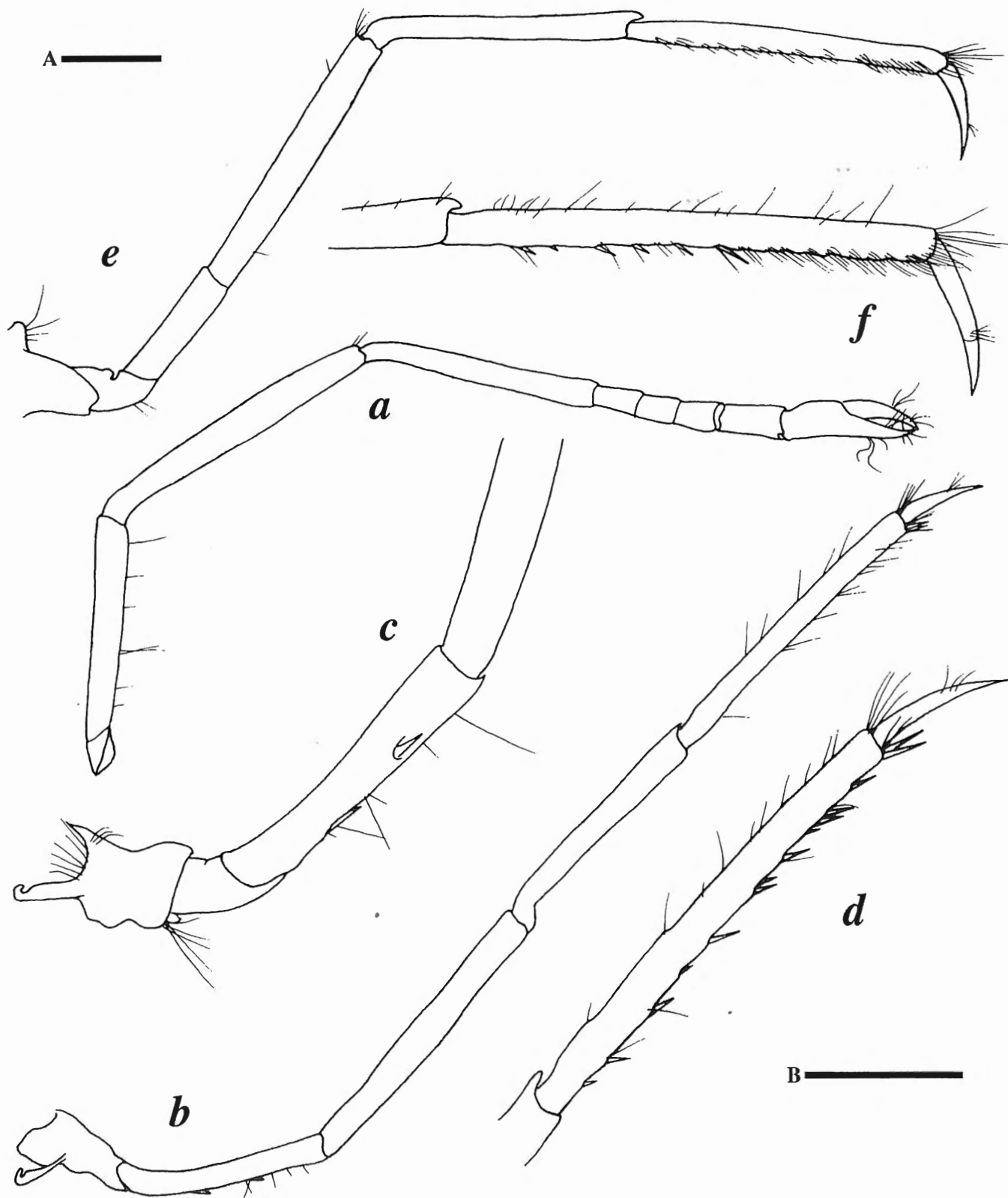


Fig. 7. *Alpheopsis africana* Holthuis, 1952, female from Namibia (ICMD 12/2005): a – second pereopod; b – third pereopod; c – same, detail of ischium; d – same, detail of propodus and dactylus; e – fifth pereopod; f – same, detail of propodus and dactylus (all in lateral view). Scale bars 1 mm: A (a, b, e); B (c, d, f).

## COLOUR PATTERN

Unknown.

## SIZE

The CL of the Namibian specimens ranges from 5.6 to 6.4 mm, TL from 19.0 to 21.2 mm, respectively. The type specimens from Angola were much smaller, with 11-13 mm TL.

## VARIATION

*Alpheopsis africana* appears to be quite variable in the configuration of the frontal margin, especially the shape and the relative length of the rostrum and orbital teeth (see Figs. 4 and 5a, b).

## HABITAT

Between 150 and 185 m, bottom type unknown.

## DISTRIBUTION

Angola (type locality, HOLTHUIS, 1952a); Namibia (MACPHERSON, 1991). According to Holthuis (1952a), the records of *A. trispinosa* from the Cape Verde Islands (SOLLAUD, 1932; HOLTHUIS, 1951) are referable to *A. africana*, however, this requires confirmation.

## REMARKS

*Alpheopsis africana* is closely related to *A. azorica* n. sp. described above. The differences between these two species are given under *A. azorica* n. sp. For a detailed description of the type material, see HOLTHUIS (1952a). HOLTHUIS (1952a) noted that the eggs of *A. africana* are fairly large (diameter 0.45-0.7 mm) and "not numerous", suggesting that the larval development in this species may be abbreviated.

## Discussion

*Alpheopsis azorica* n. sp. belongs to the *A. trispinosa* species group, which is very distinct from other *Alpheopsis* species groups and presumably monophyletic (ANKER, pers. obs.). This group is characterized by the presence of acute or rounded orbital (extra-corneal) teeth and deep grooves on the palm of both chelipeds, and contains 10 species: *A. azorica* n. sp. from the Azores and Cape Verde Islands; *A. africana* from southwestern Africa and perhaps Cape Verde Islands (see above); *A. chilensis* COUTIÈRE, 1896 from Chile and Peru (see COUTIÈRE, 1899; HOLTHUIS, 1952b; RETAMAL, 1981; WICKSTEN & MÉNDEZ, 1983; CARVACHO *et al.*, 2000; BOLTAÑA & THIEL, 2001); *A. equidactylus* (LOCKINGTON, 1877) from California (see LOCKINGTON, 1877; SCHMITT, 1921; WORD & CHARWAT, 1976; WICKSTEN, 1984); *A. diabolus* BANNER, 1956 from the western and central Pacific (see BANNER, 1956; BANNER & BANNER, 1964; 1966; 1967; 1968; 1974; 1978; CHACE, 1988); *A. shearmii* (ALCOCK & ANDERSON, 1899) from northwestern Indian Ocean (see ALCOCK & ANDERSON, 1899; BANNER & BANNER, 1977); *A. trispinosa* from temperate Australia and perhaps other Indo-

Pacific localities (see STIMPSON, 1860; HALE, 1941; BANNER & BANNER, 1973, 1983; DAVIE, 2002; POORE, 2004); *A. garricki* YALDWYN, 1971 from New Zealand and the Chatham Islands (see YALDWYN, 1971); *A. sp. aff. trispinosa* 1 from Florida (see GORE, 1981, as *A. trispinosus*); and *A. sp. aff. trispinosa* 2 from southern Japan (ANKER & PODDOUBTCHENKO, in prep.). The specific names *equidactylus* (= equal finger) and *diabolus* (= devil) are nouns in apposition and therefore remain invariable. The specific names *chilensis* (masculine and feminine endings are the same), *garricki* and *shearmii* (derived from person names) also remain unchanged. HOLTHUIS (1955) designated *A. trispinosa* as the type species of the genus *Alpheopsis*, so this group can be considered as *Alpheopsis s. str.* All other species currently placed in *Alpheopsis* may be assigned to other genera (A. ANKER, pers. obs.).

*Alpheopsis chilensis* differs from other species of the group mainly by the rounded orbital teeth, its large size (TL up to 30 mm), and when alive also by its distinctive colour pattern (COUTIÈRE, 1899; WICKSTEN & MÉNDEZ, 1983; CARVACHO *et al.*, 2000; A. ANKER, pers. obs.). *Alpheopsis equidactylus* is characterized, as its name suggests, by the equally developed chelipeds, and is also a relatively large species, reaching TL of 20 mm (SCHMITT, 1921; WORD & CHARWAT, 1976). *Alpheopsis diabolus* is a very distinctive species, immediately recognizable by the equally developed chelipeds, with dorsally convex, distally rounded dactylus (BANNER, 1956). Contrary to *A. equidactylus*, *A. chilensis* and *A. diabolus*, all of which inhabit relatively shallower waters (intertidal to about 85 m), *A. shearmii* is a true deep-water species, having been trawled from about 790 m (ALCOCK & ANDERSON, 1899). This species differs from the other species of the group by the shape of the posterior margin of the telson and the sculpture and the armature of the major chela (see BANNER & BANNER, 1977). The poorly described *A. garricki* YALDWYN, 1971 from New Zealand may prove to be a synonym of *A. trispinosa* (BANNER & BANNER, 1973; CHACE, 1988), but until more evidence is available this nominal species should be treated as distinct from *A. trispinosa*.

*Alpheopsis trispinosa* has subsymmetrical and subequal chelipeds differing from each other mainly in the armature of the fingers (BANNER & BANNER, 1973). In this species, the pollex is armed with teeth along the entire cutting edge; the dactylus of the third to fifth pereopods is relatively stout. These features are probably the most useful to separate *A. trispinosa* from the other species of the *A. trispinosa* group. The range of *A. trispinosa s. str.* (*sensu* STIMPSON, 1860 and BANNER & BANNER, 1973) is probably restricted to the temperate waters of Australia, including New South Wales, South Australia, Tasmania and Shark Bay, Western Australia (HASWELL, 1882; HALE, 1941; BANNER & BANNER, 1973; 1982; DAVIE, 2002; POORE, 2004). The two specimens reported as *A. trispinosa* from Nosy-Bé, Madagascar and La Réunion (BANNER & BANNER, 1983) were listed without a brief description or illustration. These specimens were dredged from considerable depths, 205 m and 302 m, respectively, while all Australian specimens of *A. trispinosa* were collected from shallower waters between 6 and 50 m, and in one exceptional case from 137 m (BANNER & BANNER,

1973). Thus the true taxonomic identity of these southwestern Indian Ocean specimens remains to be determined. The specimens of *A. trispinosa* reported by GORE (1981) were collected by a submersible on a deep-water coral reef off Key Largo, Florida, and deposited in the Indian River Coastal Zone Museum at Fort Pierce, Florida (IRCZM). In our opinion, the specimens from Florida are not likely to be *A. trispinosa*, because of biogeographical reasons, but also because of the differences in the dactylus of the third pereopod. The dactylus is much more elongated and slender in the specimen illustrated by GORE (1981) compared to that of the neotype of *A. trispinosa* (compare GORE, 1981, fig. 3F and BANNER & BANNER, 1973, fig. 14h). GORE's specimens most likely represent an undescribed species from the *A. trispinosa* species complex, *A. sp. aff. trispinosa* 1 (A. ANKER, pers. obs.).

### Acknowledgements

We wish express our thanks to Dr. Peter WIRTZ (previously Department of Oceanography and Fisheries, University of the Azores, Horta), who collected the holotype specimen of the new *Alpheopsis* and made it available for study. We would like to acknowledge Prof. A. Richard PALMER (Department of Biological Sciences, University of Alberta, Edmonton, Canada) for the financial support to the first author (AA) from his NSERC operating grant A7245; Dr. Enrique MACPHERSON (Centro de Estudios Avanzados de Blanes, CSIC, Girona, Spain) for sending interesting specimens; Mr. Régis CLEVA (Museum national d'Histoire naturelle, Paris, France) for providing details on the Prince de Monaco expedition; and Dr. Shane T. AHYONG (Australian Museum, Sydney, Australia) for his assistance during the author's stay at the Australian Museum in February 2001. Prof. L. B. HOLTHUIS and Dr. C. H. J. M. FRANSEN (Nationaal Natuurhistorisch Museum Naturalis, Leiden, The Netherlands) informed us about the correct spelling of the type species of the genus *Alpheopsis*.

### References

- ALCOCK, A. & ANDERSON A. R. S., 1899. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator", Commander T.H. HEMMING, R.N., Commanding, series 3, number 2: An account of the deep-sea Crustacea dredged during the surveying season of 1897-98. *Annals and Magazine of Natural History*, ser. 7, 3: 1-27 + 278-292.
- BANNER, A. H., 1956. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part I: Collections from the Mariana Archipelago. *Pacific Science*, 10(3): 318-373.
- BANNER, A. H. & BANNER, D. M., 1964. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part IX: Collections from the Phoenix and Line Islands. *Pacific Science*, 18(1): 83-100.
- BANNER, A. H. & BANNER, D. M., 1966. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part X: Collections from Fiji, Tonga and Samoa. *Pacific Science*, 20(2): 145-188.
- BANNER, A. H. & BANNER, D. M., 1967. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part XI: Collections from the Cook and Society Islands. *Occasional Papers of Bernice P. Bishop Museum*, 23(12): 253-286.
- BANNER, A. H. & BANNER, D. M., 1968. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part XII: Collections from the Marshall and Caroline Islands. *Micronesica*, 4(2): 261-294.
- BANNER, A. H. & BANNER, D. M., 1974. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part XVII: Additional notes on the Hawaiian alpheids: new species, subspecies and some nomenclatorial changes. *Pacific Science*, 28(4): 423-437.
- BANNER, A. H. & BANNER, D. M., 1977. *Alpheopsis shearmii* (Alcock & Anderson): a new combination with a redescription of the holotype (Decapoda, Alpheidae). *Crustaceana*, 32(2): 207-210.
- BANNER, A. H. & BANNER, D. M., 1983. An annotated checklist of the alpheid shrimp from the Western Indian Ocean. *Travaux et Documents de l'ORSTOM*, 158: 1-164.
- BANNER, D. M. & BANNER, A. H., 1973. The alpheid shrimp of Australia, part I: the lower genera. *Records of the Australian Museum*, 28(15): 291-382.
- BANNER, A. H. & BANNER, D. M., 1978. Annotated checklist of alpheid and ogyridid shrimp from the Philippine Archipelago and the South China Sea. *Micronesica*, 14(2): 215-257.
- BANNER, A. H. & BANNER, D. M., 1982. The alpheid shrimp of Australia, part III: the remaining Alpheids, principally the genus *Alpheus*, and the family Ogyrididae. *Records of the Australian Museum*, 34(1): 1-357.
- BOLTAÑA, S & THIEL, M., 2001. Associations between two species of snapping shrimp, *Alpheus inca* and *Alpheopsis chilensis* (Decapoda: Caridea: Alpheidae). *Journal of the Marine Biological Association of the United Kingdom*, 81(4): 633-638.
- CARVACHO, A., ZAVALA, P. & NIBALDO, B., 2000. Sobre la presencia en Chile de *Alpheopsis chilensis* COUTIÈRE, 1896 (Crustacea, Decapoda, Alpheidae). *Noticiario Mensual del Museo Nacional de Historia Natural (Santiago)*, 342: 11-14.
- CHACE, F. A. JR., 1988. The caridean shrimps (Crustacea: Decapoda) of the Albatross Philippine Expedition, 1907-1910, part 5: Family Alpheidae. *Smithsonian Contributions to Zoology*, 466: i-v + 1-99.
- COUTIÈRE, H., 1897. Note sur quelques genres nouveaux ou peu connus d'Alphéidés, formant la sous-famille des Alpheopsidés. *Bulletin du Muséum d'Histoire Naturelle, Paris*, 2(8) [year 1896]: 380-386.
- COUTIÈRE, H., 1899. Les "Alpheidae", morphologie externe et interne, formes larvaires, bionomie. *Annales des Sciences Naturelles, Zoologie*, série 8, 9: 1-560 + pls. 1-6. Masson et Cie éd., Paris.
- COUTIÈRE, H., 1906. Sur une nouvelle espèce d'*Alpheopsis*, *A. Haugi*, provenant d'un lac d'eau douce du bassin de l'Ogoué (voyage de M. Haug). *Bulletin du Muséum d'Histoire Naturelle, Paris*, 12(6): 376-380.
- COUTIÈRE, H., 1938. Note sur quelques genres nouveaux ou peu connus d'alphéidés, formant la sous-famille des Alphéopsidés. *Résultats des Campagnes Scientifiques, Monaco*, 97: 187.
- DAVIE, P. J. F., 2002. Crustacea: Malacostraca: Phyllocarida, Hoplocarida, Eucarida (Part 1). In Wells, A. & Houston, W.W.K. (eds) *Zoological catalogue of Australia*. Vol. 19.3A. Melbourne: CSIRO Publishing, Australia: i-xii + 1-551.
- EVANS, E. C., 1967. Syntypes of Decapoda described by William STIMPSON and James DANA in the collections of the British Museum (Natural History). *Journal of Natural History*, 1: 399-411.

- FRANSEN, C. H. J. M., HOLTHUIS, L. B., & ADEMA, J. P. H. M., 1997. Type-catalogue of the decapod Crustacea in the collections of the National Natuurhistorisch Museum, with appendices of pre-1900 collectors and material. *Zoologische Verhandelingen, Leiden*, 311: 1-344.
- GORE, R. H., 1981. Three new shrimps, and some interesting new records of Decapod Crustacea from a deep-water coral reef in the Florida Keys. *Proceedings of the Biological Society of Washington*, 94(1): 135-162.
- HALE, H. M., 1941. Decapod Crustacea. In: Johnston, H. (ed.), *British, Australian and New Zealand Antarctic Research Expedition, 1929-31 Reports*, Series B, 4(9): 257-286 + pl. 3.
- HART, C. W. & ILIFFE, T. M., 1985. The fauna of Atlantic marine caves: evidence of dispersal by sea floor spreading while maintaining ties to deep waters. *Proceedings of the Biological Society of Washington*, 98: 288-292.
- HASWELL, W. A., 1882. Description of some new species of Australian Decapoda. *Proceedings of the Linnean Society of New South Wales*, 6(4): 750-763.
- HOLTHUIS, L. B., 1951. The caridean Crustacea of tropical West Africa. *Atlantide Report*, 2: 7-187.
- HOLTHUIS, L. B., 1952a. Crustacés Décapodes, Macroures. *Expédition Océanographique Belge dans les eaux côtières africaines de l'Atlantique du Sud (1948-1949), Résultats Scientifiques*, 3(2): 1-88.
- HOLTHUIS, L. B., 1952b. Reports of The Lund University Expedition 1948-49. 5. The Crustacea Decapoda Macrura of Chile. *Lunds Universitets Årsskrift: Ny Följd, Avdelning 2, Medicin samt matematiska och naturvetenskapliga ämnen*, 47(10). *Kungliga Fysiografiska Sällskapets Handlingar, Ny Följd*, 62(10): 1-110.
- HOLTHUIS, L.B., 1955. The recent Genera of the Caridean and Stenopodidean Shrimps (Class Crustacea: Order Decapoda: Supersection Natantia) with Keys for Their Determination. *Zoologische Verhandelingen, Leiden*, 26: 1-157.
- HOLTHUIS, L.B., 1993. The recent genera of the Caridean and Stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea. C.H.J.M. FRANSEN & C. VAN ACHTERBERG (Eds.), *Nationaal Natuurhistorisch Museum, Leiden*: 1-328.
- International Commission on Zoological Nomenclature, 1999. International Code of Zoological Nomenclature, Fourth Edition adopted by the International Union of Biological Sciences. The International Trust for Zoological Nomenclature, the Natural History Museum, London.: i-xxix + 1-306.
- LOCKINGTON, W. N., 1877. Remarks on some new Alphei. *Proceedings of California Academy of Sciences*, 7: 35-43.
- MACPHERSON, E., 1991. Biogeography and community structure of the decapod crustacean fauna off Namibia (Southeast Atlantic). *Journal of Crustacean Biology*, 11(3): 401-415.
- Opinion 559. Determination of the gender to be attributed to six generic names in the Class Crustacea (Order Decapoda) and the addition of the names concerned to the Official List of Generic Names in Zoology. *Opinions and Declarations of the International Commission of Zoological Nomenclature*, 20: 283-292.
- POORE, G. C. B., 2004. Marine Decapod Crustacea of Southern Australia. A guide to identification. With chapter on Stomatopoda by Shane Ahyong. CSIRO Publishing, Collingwood, Australia: i-ix + 1-574 + pls 1-32.
- RETAMAL, M. A., 1981. Catalogo ilustrado de los crustáceos decápodos de Chile. *Gayana (Zool)*, 44: 1-110. Universidad de Concepción, Chile.
- SCHMITT, W. L., 1921. The marine decapod Crustacea of California with special reference to the decapod Crustacea collected by the United States Bureau of Fisheries Steamer "Albatross" in connection with the biological survey of San Francisco Bay during the years 1912-1913. *University of California Publications in Zoology*, 23: 1-470 + 50 pls.
- SOLLAUD, E., 1932. Sur un alphéidé d'eau douce, *Alpheopsis monodi* n. sp., recueilli par M. Th. Monod au Cameroun. *Bulletin de la Société Zoologique de France*, 57: 375-386.
- STIMPSON, W., 1860. Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro RINGOLD et Johanne RODGERS Ducibus, observavit et descripsit. Pars VIII. Crustacea Macrura. *Proceedings of the Academy of Natural Sciences of Philadelphia*, year 1860: 22-47.
- UDEKEM D'ACUZ, C. D', 1999. Inventaire et distribution des crustacés décapodes de l'Atlantique nord-oriental, de la Méditerranée et des eaux continentales adjacentes au nord de 25°N. Service Patrimoine Naturel, Muséum national d'Histoire naturelle, Paris. Collection Patrimoines Naturels, 40 : i-x + 383.
- WICKSTEN, M. K., 1984. New records of snapping shrimps (family Alpheidae) from California. *Proceedings of the Biological Society of Washington*, 97(1): 186-190.
- WICKSTEN, M. K. & MÉNDEZ, M. G., 1983. Nuevos registros de camarones carideos en el Peru. *Boletín de Lima*, 25: 1-15.
- WORD, J. Q. & CHARWAT, D. K., 1976. Invertebrates of southern California coastal waters. II. Natantia. El Segundo, California: Southern California Coastal Water Research Project: 1-238.
- YALDWYN, J. C., 1971. Preliminary descriptions of a new genus and twelve new species of Natant Decapod Crustacea from New Zealand. *Records of the Dominion Museum*, 7(10): 85-94.

Arthur ANKER

Smithsonian Tropical Research Institute

Att: Arthur Anker \_ Naos Unit 0948

APO AA 34002

USA

E-mail: anker@si.edu

Cédric D'UDEKEM D'ACUZ

Tromsø Museum (Department of Zoology)

University of Tromsø

N-9037 Tromsø

Norway

E-mail: cdudekem@tmu.uit.no

Denis PODDOUBTCHENKO

Smithsonian Tropical Research Institute

Att: Denis Poddoubtchenko \_ Naos Unit 0948

APO AA 34002

USA

E-mail: poddoubtchenkod@si.edu