

## Report on the Alpheid Shrimp *Arete dorsalis* (Decapoda: Caridea: Alpheidae) from Korea

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### ABSTRACT

The continuous taxonomic study on decapods from Korean waters revealed that the alpheid shrimps collected from Jeju Island and Busan were identified as a species belonging to the genus *Arete* which is an unreported genus from Korean waters. The genus *Arete* can be distinguished from the most similar genus *Athanas* by the following. The chelae are broad and oval-shaped in *Arete*, but in *Athanas*, the chelae are more or less elongated. The number of carpal segments in the 2nd pereopod is four but five, exceptionally four or six in *Athanas*. The epipods are present on pereopod 1 and pereopod 2 in *Arete*, but on pereopod 1-3, exceptionally on pereopod 1 and pereopod 2 or pereopod 1-4 in *Athanas*. In this paper, *Arete dorsalis* is reported for the first time from Korean waters. Korean Alpheidae fauna now consists of 27 species of nine genera.

**Keywords:** Alpheidae, *Arete dorsalis*, Korea

### INTRODUCTION

Twenty-six species belonging to eight genera in the family Alpheidae have been reported in Korea [*Alpheus* Fabricius, 1798 (15 species), *Athanas* Leach, 1814 (2), *Automate* de Man, 1888 (1), *Betaeus* Dana, 1852 (2), *Prionalpheus* Banner and Banner, 1960 (1), *Salmonaeus* Holthuis, 1955 (1), *Stenalpheops* Miya, 1997 (1), *Synalpheus* Spence Bate, 1888 (3); one species of *Alpheus* (*A. heeia* Banner and Banner, 1975) and two species of *Athanas* (*A. japonicus* Kubo, 1936, *A. parvus* de Man, 1910) were reported through the larval studies without descriptions of adult morphology] (Yang and Kim, 1999, 2003; Koo and Kim, 2003a, 2003b, 2004a, 2004b, 2005a, 2005b, 2009, 2014; Yang, 2003; Yang and Anker, 2003; Yang and Ko, 2005; Yang et al., 2007).

The continuous taxonomic study on decapods collected from Korean waters revealed that one alpheid species belongs to the genus *Arete* previously unreported from Korean waters. The specimens were collected by scuba diving at depth of 10-18 m. The abbreviation "cl" refers to carapace

length from the tip of rostrum to the posterior dorsal margin. Drawings were made with the aid of a camera lucida. The specimens used in this study were deposited in the Marine Arthropod Depository Bank of Korea (MADBK), Seoul National University.

### SYSTEMATIC ACCOUNTS

Order Decapoda Latreille, 1802

Family Alpheidae Rafinesque, 1815

<sup>1</sup>\*Genus *Arete* Stimpson, 1860

<sup>2</sup>\**Arete dorsalis* Stimpson, 1860 (Fig. 1)

*Arete dorsalis* Stimpson, 1860: 32; Hayashi, 1995: 185, fig. 277c, d, fig. 278b, c; Li et al., 2008: 8.

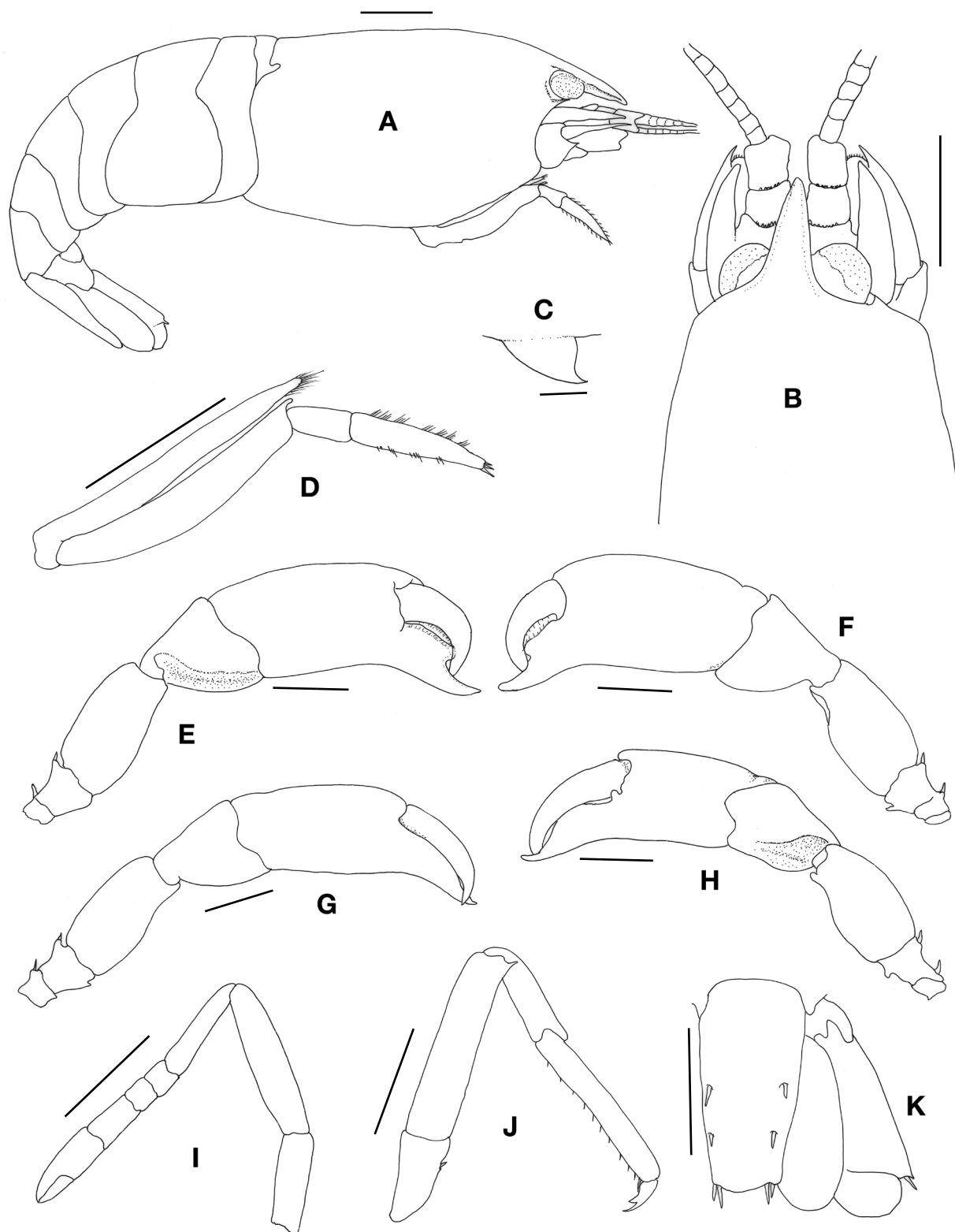
*Athanas dorsalis* (Stimpson, 1860): Banner and Banner, 1960: 151, figs. 5, 6; Banner and Banner, 1973: 324, fig. 10; Chace, 1988: 62.

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**Fig. 1.** *Arete dorsalis*, male, cl 4.9 mm: A, Anterior region and abdomen, lateral view; B, Anterior region, dorsal view; C, Carina below right first antennular segment; D, Right third maxilliped; E, Major (right) first pereopod, outer face; F, Same, inner face; G, Minor (left) first pereopod, inner face; H, Same, outer face; I, Left second pereopod; J, Right third pereopod; K, Telson and part of uropods. Scale bars: A, B, D-K=1 mm, C=0.25 mm.

**Material examined.** 1 male (cl 4.9 mm), by SCUBA diving, 18 m depth, Munseom (Jejudo Island), 23 Mar 2011, Park TS; 1 male (cl 2.6 mm), 1 juvenile, collected from the surface of sea urchin, *Mesocentrotus nudus*, by SCUBA diving, 10 m depth, Busan, 22 Sep 2016, Park JH.

**Description.** Body rather stout and glabrous. Rostrum (Fig. 1A, B) broadly elongated, anteriorly sharp triangle with tip acute, slightly overreaching distal end of second antennular segment; dorsal margin descending anteriorly.

Carapace smooth, not setose; dorsal margin slightly convex. Extra-corneal tooth acute, not overreaching anterior margin of eye; supra-corneal tooth and infra-corneal tooth absent. Eyes exposed in dorsal and lateral views. Pterygostomial margin rounded. Cardiac notch well-developed.

Antennules stout. First antennular segment with finely serrated distal margin and strong tooth-like carina extending from ventral inner margin; ventral part of carina acute anteriorly (Fig. 1C). Second segment with finely serrated distal margin, a little wider than long, about 2.0 times as long as visible part of first segment and shorter than third segment. Stylocerite broadly elongated, directing inwardly and falling short of distal end of third antennular segment.

Scaphocerite with lateral margin slightly convex; distal spine overreaching distal end of stylocerite, slightly falling short of distal end of third antennular segment; inner blade well-developed, slightly overreaching distal end of stylocerite. Basicerite with sharp lateral spine. Carpocerite falling far short of distal end of antennular peduncle.

Third maxilliped (Fig. 1A, D) almost reaching to distal end of antennular peduncle. Ultimate segment about 2.5 times as long as penultimate, tapering distally; distal end bearing three movable spines; inner face bearing dense setae. Penultimate segment rectangular, longer than wide. Antepenultimate segment with dorsal margin projecting anteriorly.

Major chela of right first pereopod (Fig. 1E, F) more than 2.5 times as long as broad, glabrous. Palm smooth without sculpturing, not much compressed, stouter posteriorly. Fingers occupying distal 0.3 of chela, gaping when closed. Movable finger without molar-like tooth, tip directing inwards; superior margin regularly arched and inferior margin bearing short, minute setae. Immobile finger with tip deflecting outwards and with superior margin bearing large broad tooth and short, tiny setae. Carpus swollen, cup-shaped, with broad depression inferiorly. Merus slightly less than 2.0 times as long as broad with inferior inner margin smooth and without spine at distal end. Ischium with one movable spine on each of distal and proximal end of superior margin and with blunt sub-distal tooth on inferior margin anteriorly.

Minor chela of left first pereopod (Fig. 1G, H) about 2.9 times as long as broad. Fingers occupying about distal 0.4 of chela and with acute tips overlapping, but not gaping,

bearing short tiny setae. Palm smooth without sculpturing. Carpus swollen, cup shaped, with broad depression inferiorly. Merus about 1.8 times as long as broad with inferior inner margin smooth and no spine at distal end. Ischium with one movable spine on each of distal and proximal end of superior margin and with blunt tooth on inferior margin anteriorly.

Second pereopod (Fig. 1I) with fingers of chela slightly less than palm. Carpus with four segments; first segment about 4.3 times as long as second; second segment almost as long as third and 0.5 times as long as fourth.

Third pereopod with dactylus (Fig. 1J) slightly more than 1/6 length of propodus, biunguiculate; tip slightly directing downward. Propodus about 1.8 times as long as carpus, with about 10 movable spines on inferior margin and one pair at distal end; distalmost spine overreaching distal 1/2 of dactylus. Merus about 4.5 times as long as broad and 2.3 times as long as carpus, bearing acute immovable spine on distal end of inferior margin. Ischium with tiny movable spine.

Fourth pereopod almost same as third pereopod. Ischium with tiny movable spine.

Fifth pereopod much narrower than third pereopod. Ischium with no movable spine.

Pleura (Fig. 1A) of first four abdominal somites broadly rounded. Sixth abdominal segment with articulated plate at anteroventral angle. Preanal plate acutely produced.

Telson (Fig. 1K) about 2.0 times as long as broad at anterior end, armed with two pairs of dorsal spines. Lateral margin almost straight. Posterior margin slightly produced at middle, armed with a pair of spines at each lateral end.

**Distribution.** Hong Kong (Stimpson, 1860; type locality), off Western Australia and in eastern Australia from New South Wales to the Herald Group in the Coral Sea. From Lord Howe Island and from Norfolk Island (Banner and Banner, 1973), Philippine (Chace, 1988), Japan (Hayashi, 1995), China (South China Sea: Hainan Island, Xisha Islands, Nansha Islands, Taiwan) (Li et al., 2008), Jejudo Island and Busan, Korea (present study).

**Remarks.** According to Banner and Banner (1973), this species has been reported from the Red Sea, Indian Ocean, Indonesia, Thailand, Japan, China, Kermadec Island, S. Africa, and across the central Pacific from the Marianas Islands to the Tuamotu Archipelago. However, Chace (1988) mentioned that “there is little doubt that *A. dorsalis* occurs throughout the Indo-Pacific area from the Red Sea and Indian Ocean to Thailand, Indonesia, Philippines, China, Japan, Australia, and eastward to the Tuamotu Archipelago.”

Banner and Banner (1960) placed the genus *Arete* in synonymy of *Athanas*. Anker and Jeng (2007) resurrected *Arete* from synonymy of *Athanas* when they established a new genus, *Rugathanas*. According to Anker and Jeng (2007),

the genus *Arete* can be distinguished from the genus *Athanas* by combination on the cheliped features (e.g., chelae broad, oval-shaped in *Arete*, more or less elongated in *Athanas*); the number of carpal segments in the 2nd pereopod (4 in *Arete*, 5 in *Athanas*, exceptionally 4 or 6); and the number of pereopodal epipods (on P1 and P2 in *Arete*, on P1-3 in *Athanas*, exceptionally on P1 and P2 or P1-4). They also mentioned that the genus *Arete* is a rare genus only containing four described species and at least 2 undescribed species: (1) *Arete dorsalis* Stimpson, 1860, (2) *A. acanthocarpus* (Miya and Miyake, 1968), (3) *Arete amboinensis* de Man, 1910 [specific status needs confirmation], (4) *Arete indicus* Coutiere, 1903, (5) *Arete* sp. nov. 1 - *Athanas indicus* - Suzuki, 1970: 5 (not Coutiere, 1903), (6) *Arete* sp. nov. 2 - *Athanas dorsalis* - Suzuki, 1970: 12 (not Stimpson, 1860). Anker and Jeng (2007) also noted that *Arete* requires revision at the species level and that the previous identifications of *Arete* species (e.g., Banner and Banner, 1960, 1973; Miya and Mijake, 1968; Suzuki, 1970; Bruce, 1989, 1990) are questionable.

## ACKNOWLEDGMENTS

This study was in part supported by “The Survey of Korean Indigenous Species” from National Institute of Biological Resources (NIBR) of Ministry of Environment of Korea, by the National Marine Biodiversity Institute Research Program (2016M02000), and by a grant from the Marine Biotechnology Program, funded by Ministry of Oceans and Fisheries of the Korean Government.

## REFERENCES

- Anker A, Jeng MS, 2007. Establishment of a new genus for *Arete borradalei* Coutière, 1903 and *Athanas verrucosus* Banner and Banner, 1960, with redefinitions of *Arete* Stimpson, 1860 and *Athanas* Leach, 1814 (Crustacea: Decapoda: Alpheidae). *Zoological Studies*, 46:454-472.
- Banner AH, Banner DM, 1960. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part V: the Indo-Pacific members of the genus *Athanas*. *Pacific Science*, 14:129-155.
- Banner DM, Banner AM, 1973. The alpheid shrimp of Australia, part I: the lower genera. *Records of the Australian Museum*, 28:291-382. <https://doi.org/10.3853/j.0067-1975.28.1973.407>
- Bruce AJ, 1989. A report on some coral reef shrimps from the Philippine Islands. *Asian Marine Biology*, 6:173-192.
- Bruce AJ, 1990. Redescriptions of five Hong Kong Caridean shrimps first described by W. Simpson, 1860. In: *Proceedings of the second marine biological workshop: the marine flora and fauna of Hong Kong and southern China* (Ed., Morton B), Hong Kong University Press, Hong Kong, pp. 569-610.
- Chace FA Jr, 1988. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907-1910, part 5: family Alpheidae. *Smithsonian Contributions to Zoology*, 466:1-99.
- Hayashi KI, 1995. Prawns, shrimps and lobsters from Japan (83). Family Alpheidae-genus *Arete*. *Aquabiology*, 17:184-187.
- Koo H, Kim W, 2003a. First report of the alpheid shrimp *Salmonus gracilipes* (Decapoda: Caridea: Alpheidae) from Korea. *Korean Journal of Systematic Zoology*, 19:43-48.
- Koo H, Kim W, 2003b. First report of snapping shrimp *Synalpheus neomeris* (Decapoda: Caridea: Alpheidae) from Korea. *Korean Journal of Systematic Zoology*, 19:245-250.
- Koo H, Kim W, 2004a. New reports of snapping shrimps, *Alpheus paralcycione* and *A. spongiorum* (Decapoda: Caridea: Alpheidae) from Korea. *Korean Journal of Systematic Zoology*, 20:21-29.
- Koo H, Kim W, 2004b. First report of snapping shrimp, *Automate dolichognatha* (Decapoda: Caridea: Alpheidae) in Korea. *Korean Journal of Systematic Zoology*, 20:39-44.
- Koo H, Kim W, 2005a. Occurrence of alpheid shrimp, *Alpheus albatrossae* (Decapoda: Caridea: Alpheidae) in Korea. *Korean Journal of Systematic Zoology*, 21:73-79.
- Koo H, Kim W, 2005b. Occurrence of alpheid shrimp, *Alpheus paracrinitus* (Decapoda: Caridea: Alpheidae) in Korea. *Korean Journal of Systematic Zoology*, 21:251-257.
- Koo H, Kim W, 2009. First record of snapping shrimp, *Prionalpheus sulu* (Decapoda: Caridea: Alpheidae) in Korea. *Korean Journal of Systematic Zoology*, 25:197-199.
- Koo H, Kim W, 2014. *Synalpheus jejuensis* n. sp. (Crustacea: Decapoda: Alpheidae) from Korea based on morphological and molecular study. *Animal Cells and Systems*, 18:351-357. <https://doi.org/10.1080/19768354.2014.967293>
- Li SZ, Liu RY, Liu JY, 2008. Studies on genus *Arete* Stimpson of Alpheidae (Crustacea, Decapoda) from China seas. *Acta Zootaxonomica Sinica*, 33:7-9.
- Miya Y, Mijake S, 1968. Revision of the genus *Athanas* of Japan and the Ryukyu Islands, with description of a new species (Crustacea, Decapoda, Alpheidae). *Publications from the Amakusa Marine Biological Laboratory, Kyushu University*, 1:129-162.
- Stimpson W, 1860. *Prodromus descriptionis animalium invertebratorum, 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*, 1860:22-47.
- Suzuki H, 1970. Taxonomic review of four alpheid shrimps belonging to the genus *Athanas*, with reference to their sexual phenomena. *Science Reports of the Yokohama National University. Section II, Biological and Geological Sciences*, 17:1-38.
- Yang HJ, 2003. Early zoeas of *Athanas japonicus* Kubo, 1936 (Decapoda, Caridea, Alpheidae) reared in the laboratory.

- Crustaceana, 76:443-452. <https://doi.org/10.1163/156854003322033843>
- Yang HJ, Anker A, 2003. New records of alpheid shrimps (Decapoda, Caridea, Alpheidae) from Korea. Korean Journal of Systematic Zoology, 19:1-9.
- Yang HJ, Kim CH, 1999. The early zoeal stages of *Alpheus heeia* Banner & Banner, 1975 reared in the laboratory (Decapoda, Caridea, Alpheidae). Crustaceana, 72:25-36.
- Yang HJ, Kim CH, 2003. Early zoeas of *Athanas parvus* De Man, 1910 (Decapoda: Caridea: Alpheidae) reared in the laboratory. Proceedings of the Biological Society of Washington, 116:710-718.
- Yang HJ, Ko HS, 2005. New record of *Alpheus pacificus* Dana (Decapoda: Alpheidae) from Korea. Journal of Fisheries Science and Technology, 8:34-38.
- Yang HJ, Koo H, Kim W, 2007. A new record of *Betaeus gelasinifer* Nomura and Komai (Decapoda: Caridea: Alpheidae) from Korea. Korean Journal of Systematic Zoology, 23:99-102.

Received December 6, 2016  
Revised January 4, 2017  
Accepted January 4, 2017