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Two New Species of Genus *Attheyella* (Harpacticoida, Canthocamptidae) from Springs of Korea

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샘에서 채집한 *Attheyella* 속의 하르팍티쿠스류 2신종

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摘 要

경상남도 창녕군 영산면 소재 함박산과 제주도 한라산의 샘에서 채집한 하르팍티쿠스류 2종이 *Attheyella* 속에 속하는 신종으로 밝혀져 각각 *A. paucisetosa* 와 *A. byblis*로 명명하여 기재한다.

Key words: Systematics, freshwater, Harpacticoida Canthocamptidae, *Attheyella*, Korea.

The genus *Attheyella* Brady, 1880 comprises about 70 species or subspecies in six subgenera (Dussart and Defaye, 1990), which were found in a wide range of habitats, but mainly in littorals of various water bodies and often in ground waters.

In Korea, only one species [*Attheyella* (*Attheyella*) *coreana* Miura, 1969] was reported as a new species from four caves of South Korea (Miura, 1969), which has not been found elsewhere in the world yet. Thereafter, as a result of examining the freshwater harpacticoid specimens collected from 120 localities

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or more including 32 springs, the authors recognized three species of the genus *Attheyella*, which comprise *A. coreana* that was turned out to be one of the most dominant species in mountain waters, especially in the springs of South Korea, and two new species. This paper deals with the two new species from two springs, each of Mt. Hambak and Mt. Halla.

All the specimens were dissected, drawn and measured in lactic acid, later mounted in polyvinyl lactophenol. Figures were made with the aid of camera lucida. Type specimens are deposited in the Department of Biology, Taegu University.

Family Canthocamptidae Sars, 1906

Genus *Attheyella* Brady, 1880

Subgenus *Attheyella* Chappuis, 1929

***Attheyella (Attheyella) paucisetosa*, n. sp.**

(Figs. 1-2)

Type specimen. Holotype: ovigerous female, a spring at Mt. Hambak in Yöngsan-myöñ, Ch'angnyöng-gun, Kyöngsangbuk-do (35° 27' 10" N, 128° 32' 33" E), July 22, 1987, C. Y. Chang *leg.* Paratype: 1♀, same locality as holotype (pH 7.5, water temperature: 12.8°C), May 12, 1992, C. Y. Chang *leg.*

Holotype female. Body fairly minute and dumpling, about 0.51mm long, excluding rostrum and caudal setae. Tintured with pale brown. Integument of cephalothorax and pleurotergite of each thoracic somite (Figs. 2a-b) hirsute and serrated along their hind edges. All abdominal somites (Fig. 1a) also hirsute; each posterolateral face armed with a row of spinules. Genital segment much wider than long. Anal operculum a little convexed (Fig. 1a), with minute spinules or hairs on its posterior margin. Egg sac oblong, containing 15 eggs.

Caudal ramus somewhat oval (Fig. 1a), conspicuously longer than broad (1.61 times). Inner dorsal surface of ramus with broad chitinous tubercle. Inner margin with a oblique row of spinules. Outer apical seta slender and very short. Inner median apical seta about 3 times longer than outer one, and swollen at its base.

Antennule (Fig 1b) of 7 articles, short and stubby. Aesthetasc on article 4 very long (about 1.4 times longer than sum of articles 5-7). Exopod of antenna (Fig. 2c) 1-segmented, with total 4 setae. Precoxa of mandible (Fig. 2d) armed with a few rather stout spinules and comb-like projections; endopod with 1 inner seta and 3 apical setae; exopod absent. Basis of maxilliped (Fig. 2e) bearing a long seta on subapical inner edge; endopod rather stubby (1.5 times longer than wide), armed with two longitudinal rows of spinules; claw slightly longer than endopodal segment.

Thoracic leg 1 (Fig. 1c) with both exopod and endopod composed of 3 segments; first segment of endopod not reaching end of second exopodal segment. Endopods of legs 2-3 (Fig. 1d-e) consist of 2 segments; distal segments of both legs slender, each bearing 2 sharp inner setae and 2 apical setae. Endopod of leg 4 (Fig. 2f) 2-segmented; proximal one with a seta on its distal corner; inner margin of second segment with only 1 seta markedly. The ornamentation of legs 1-4 as follows:

Leg 1 basis 1-1 exp 0-1; 1-1; 0,2,2
 enp 1-0; 1-0; 1,1,1
 Leg 2 basis 0-1 exp 0-1; 1-1; 1,2,3
 enp 1-0; 2,2,1
 Leg 3 basis 0-1 exp 0-1; 1-1; 2,2,3
 enp 1-0; 2,2,1

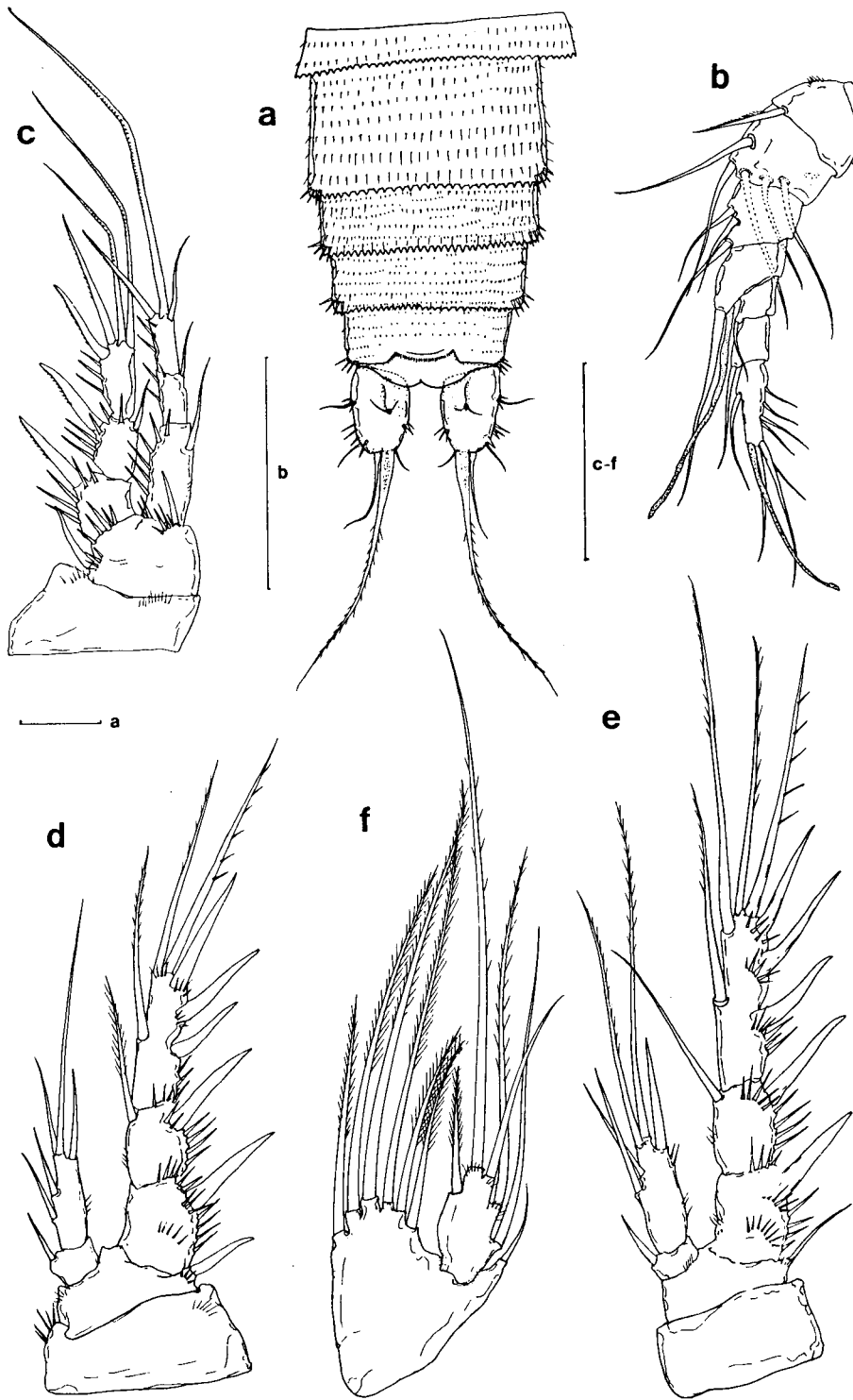


Fig. 1. *Attheyella (Attheyella) paucisetosa*, n. sp., female holotype: a, urosome, dorsal; b, antennule; c, leg 1; d, leg 2; e, leg 3; f, leg 5. (scale bars: 50 μ m)

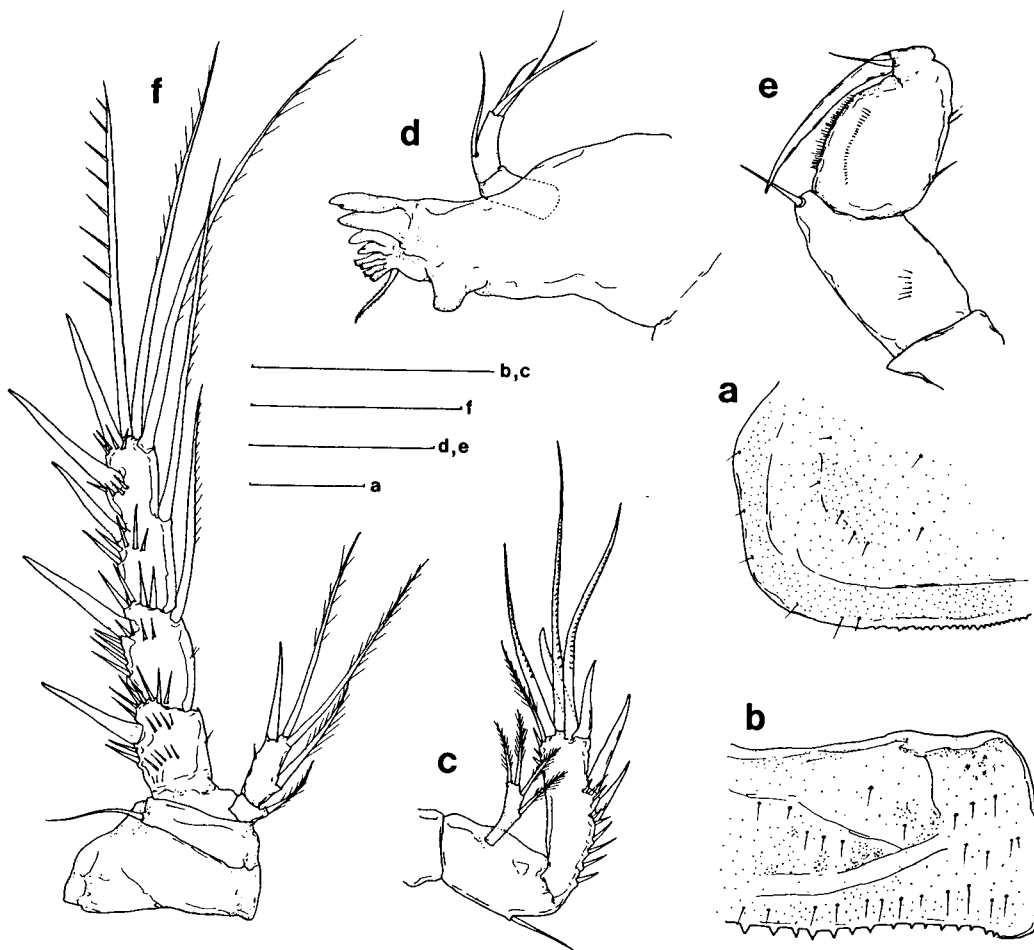


Fig. 2. *Attheyella (Attheyella) paucisetosa*, n. sp., female holotype: a, cephalothoracic integument; b, pleurotergite of second thoracic somite; c, antenna; d, mandible; e, maxilliped; f, leg 4. (scale bars - c, d: 25 μ m; remainder: 50 μ m)

Leg 4 basis 0-1 exp 0-1; 1-1; 2,2,3
 enp 1-0; 1,2,1

Basipod of leg 5 (Fig. 1f) bearing 6 terminal setae of different length, much longer into the middle. Distal segment somewhat oval, about 1.6 times longer than wide, with total 5 setae comprising 1 inner subapical, 2 apical and 2 outer setae.

Male. Unknown.

Habitats. Collected from a spring, oozing out through cracks of rock located in foothill (200m high) of Mt. Hambak, with *Maraenobiotus brucei* (Richard), *Bryocamptus zschokkei caucasicus* (Borutzky), and *B. (Limocamptus) hiemalis yunnanensis* (Borutzky).

Etymology. *pauci-*: few; *setosa*: setous, both in Latin. The specific name is taken from scarcity of setae on the inner margins of distal endopodal segments of legs 3-4 in behalf of the related congeneric species.

Remarks. This species belongs to subgenus *Attheyella*, for the first endopodal segment of leg 1 is conspicuously short. Until now, 18 species or subspecies have been known in this subgenus (Dussart and Defaye, 1990), and the present species seems to be most related to *A. crassa* (Sars) or *A. orientalis* Chappuis group by its basic scheme of caudal rami and leg 5. However the present new species is characteristic in having fewer setae on the inner margins of second endopodal segments of legs 3-4 and 7-articulated antennule. Moreover, this species is distinguished from *A. crassa* by the shape of distal joint of leg 5; from *A. orientalis* by not possessing protruded anal operculum or hyaline membrane, respectively.

A. (A.) paucisetosa, n. sp. is discernable from the cave-dwelling species of East Asia like *A. coiffaiti* Chappuis, 1958, *A. morimotoi* Miura, 1962 (both from Japan) and *A. coreana* Miura, 1969 (from Korea) by the oval-formed distal segment of leg 5, not the peculiarly elongated one. The present species is presumed to be a intermediate form between the littoral and genuine subterranean ones.

Subgenus *Mrazekiella* Chappuis, 1929

***Attheyella (Mrazekiella) byblis*, n. sp.**

(Fig. 3-5)

Material. Holotype ♀: a spring near the top of Mt. Halla in Cheju I. (33° 21' 31" N, 126° 31' 44" E, about 1720m in altitude), May 7, 1989, C. Y. Chang *leg.*, dissected and mounted (slide No. Cr3233-699-890507-1); allotype (♂): collection details as holotype, slide No. Cr3233-699-890507-1; paratypes: 2♂♂, 4(2 ovi.) ♀♀, of which one male and two females dissected, with same collection details as holotype.

Holotype female. Body (Fig. 3a) fairly large and cylindrical, about 0.82mm long, excluding rostrum and caudal setae, tinged yellowish gray or pale brown in alcohol. Cephalothorax with some scattering hairs on dorsal surface and along lateral margin. Thoracic segments and abdominal segments with rows of innumerable minute setules. Genital segment much wider than long, and weakly constricted at proximal one third of lateral margin. Anal operculum a little convexed (Fig. 4a) with minute spinules or hairs on its posterior margin.

Caudal rami (Fig. 4a) divergent and a little narrowed posteriorly; 1.18 times as long as broad. Dorsal surface of ramus with longitudinal chitinous tubercle near dorsal seta located at proximal quarter of ramus. Inner side of caudal ramus obliquely haired. Outer terminal seta slender and very short; inner median apical seta about 3.5 times longer than outer one.

Antennule (Fig. 3b) of 8 articles, exceeding the length of cephalothorax. Aesthetasc on article 4 not reaching posterior margin of article 7, and shorter than aesthetasc of last article. Articles 6 and 8 prominently long. Exopod of antenna (Fig. 3c) 1-segmented, with total 4 setae. Precoxa of mandible (Fig. 4b) armed with a few rather stout spinules and comb-like projections; endopod with 1 inner seta and 3 apical setae; exopod absent. Maxillula (Fig. 4c) with 7 warped claw-like spines and 1 seta on cutting edge of precoxa; inner process of coxa bearing 2 apical setae; basis with 3 apical setae and 6 setae on ventral edge. Basis of maxilliped (Fig. 4e) bearing a long seta on subapical inner edge; endopod slender (2.1 times longer than wide), armed with 2 longitudinal rows of spinules; claw a little longer than endopod.

Exopods of thoracic legs 1-4 and endopods of legs 1-3 3-segmented; endopod of leg 4 2-segmented. First endopodal segment of leg 1 (Fig. 3d) much longer than whole length of exopod. Proximal segment of leg 4 with a seta on its inner distal corner. Ornamentation of legs 2-4 (Figs. 4f-h) as follows:

Leg 2 basis 0-1 exp 0-1; 1-1; 1,2,3

enp 1-0; 1-0; 2,2,1
 Leg 3 basis 0-1 exp 0-1; 1-1; 2,2,3
 enp 1-0; 1-0; 2,2,1
 Leg 4 basis 0-1 exp 0-1; 1-1; 2,2,3
 enp 1-0; 2,2,1

Basipod of leg 5 (Fig. 3e) bearing 6 terminal spines of different length, of which innermost one about

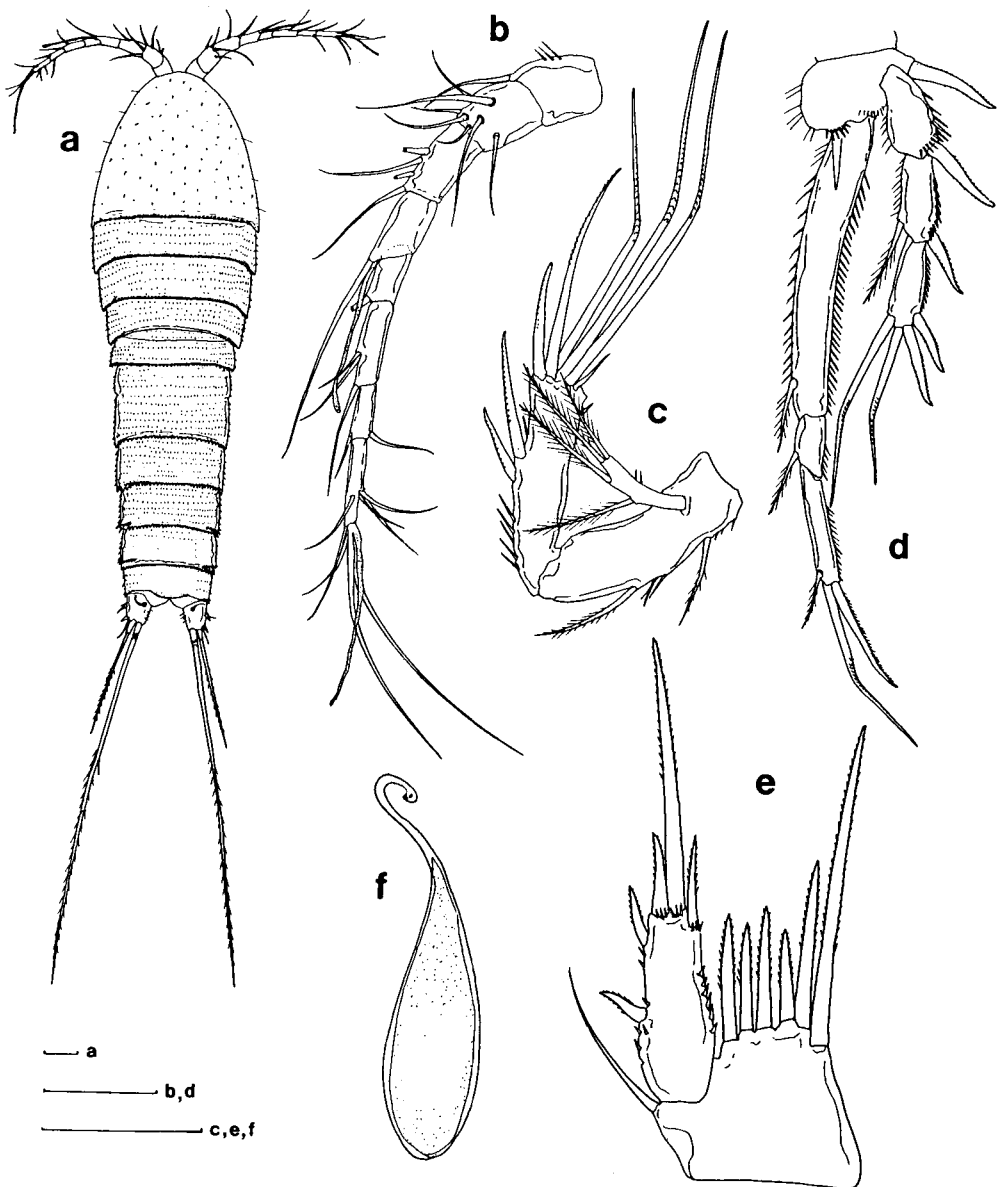


Fig. 3. *Attheyella* (*Mrazekiella*) *byblis*, n. sp., female holotype: a, habitus, dorsal; b, antennule; c, antenna; d, leg 1; e, leg 5; f, spermatophore. (scale bars: 50 μ m)

2 times or more as long as the others, and next one the second. Distal segment somewhat rectangular, about 2.7 times longer than wide, bearing total 5 spines(1 inner subapical, 2 apical and 2 outer ones), with

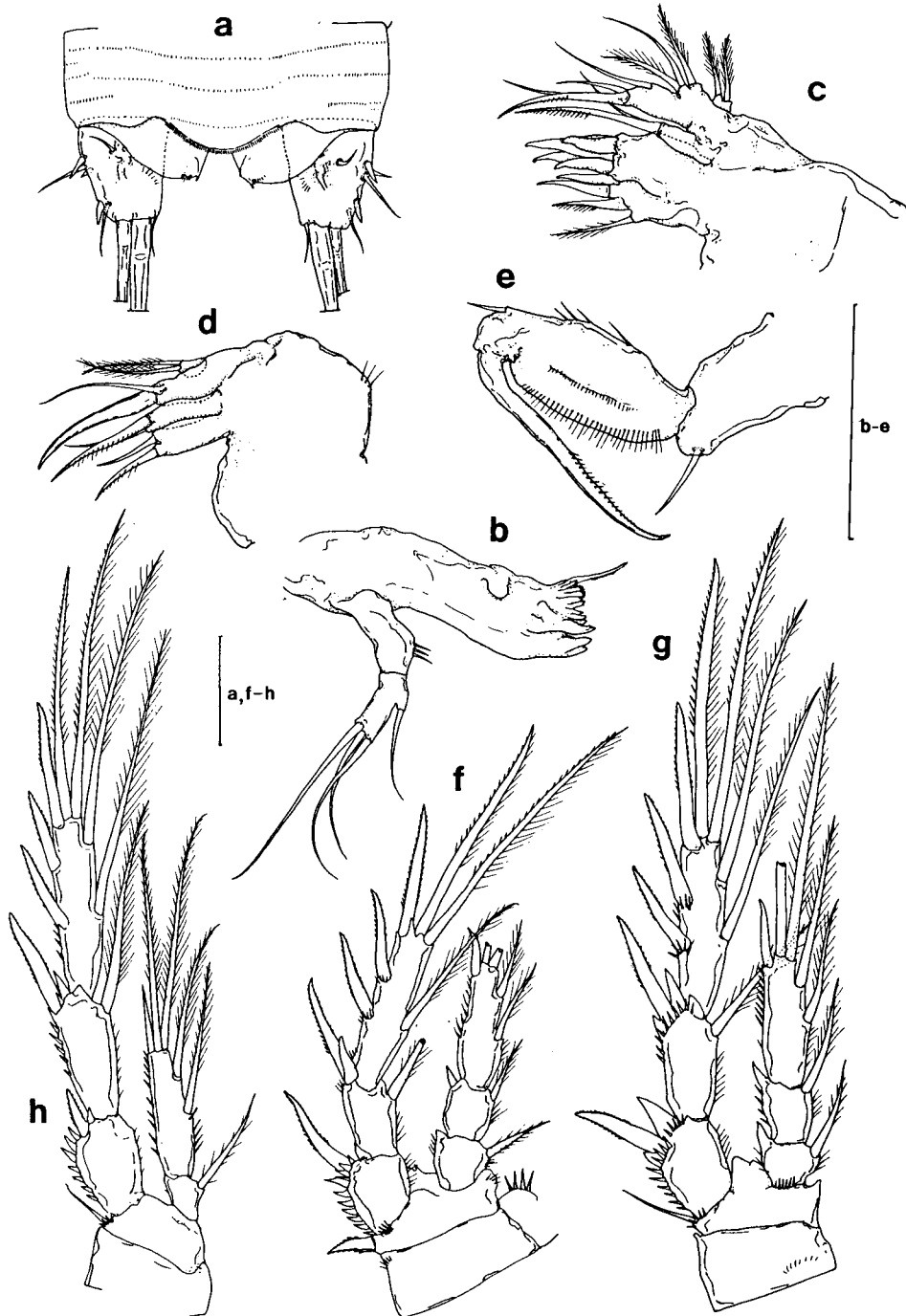


Fig. 4. *Attheyella* (*Mrazekiella*) *byblis*, n. sp., female holotype: a, caudal ramus; b, mandible; c, maxillula; d, maxilla; e, maxilliped; f, leg 2; g, leg 3; h, leg 4. (scale bars: 50 μ m)

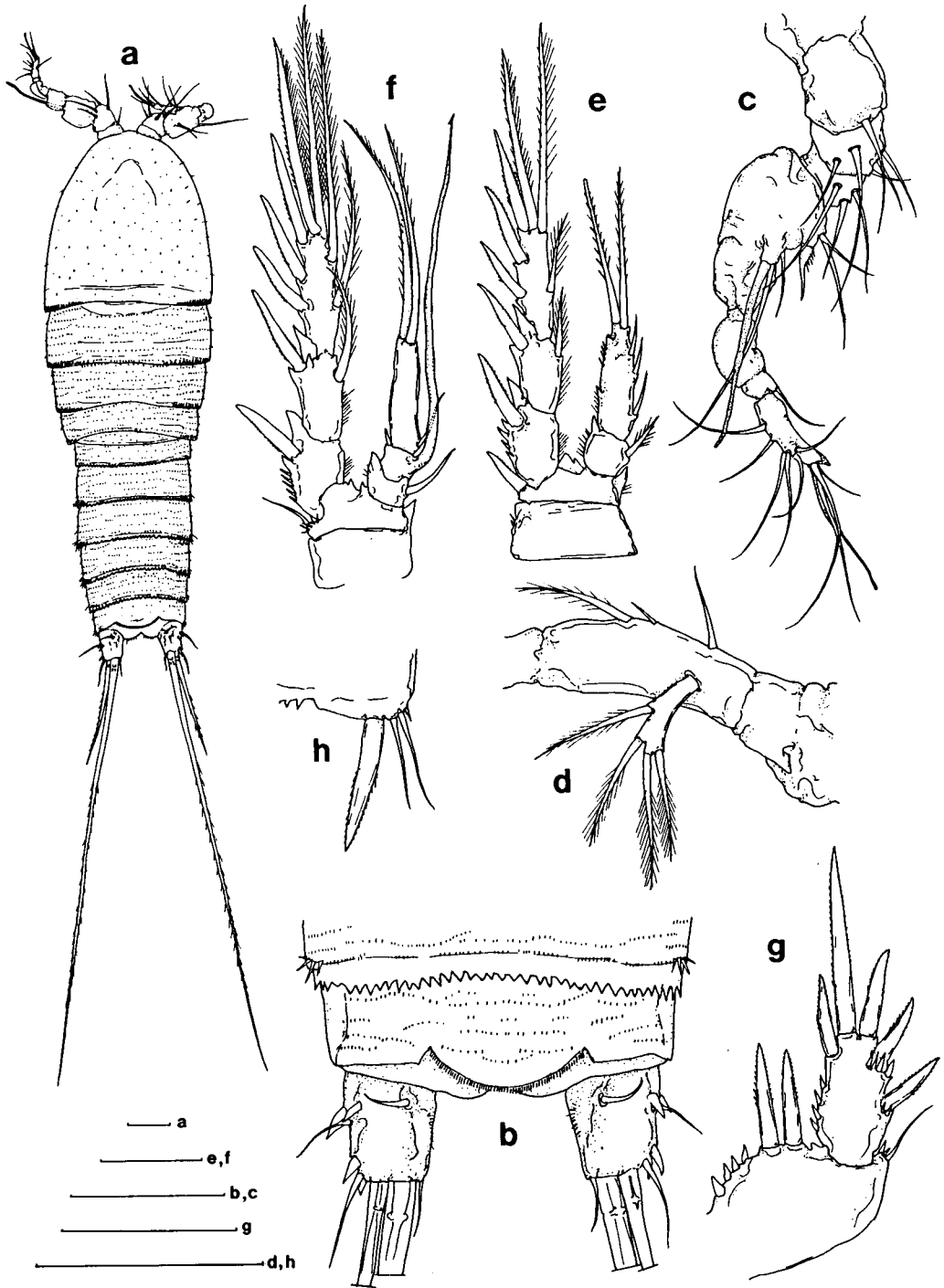


Fig. 5. *Attheyella* (*Mrazekiella*) *byblis*, n. sp., allotype (male): a, habitus, dorsal; b, caudal ramus, dorsal; c, antennule; d, leg 2; e, leg 3; f, leg 5; g, leg 6. (scale bars: 50 μ m)

groups of triangular spinules on inner sides of distal segment.

Allotype (male). Body shape(Fig. 5a) similar to female, about 0.61mm long. Anal operculum rounded and not protruded(Fig. 5b), bearing fine hairs on hind edge. Caudal rami(Fig. 5b) a little divergent and somewhat rectangular, 1.13 times longer than wide; chitinous tubercle conspicuous between dorsal seta and inner margin of ramus.

Antennules(Fig. 5c) prehensile; article 4 much swollen, with a long aesthetasc nearly reaching the middle of last article. Endopod of leg 2(Fig. 5e) 2-segmented; distal one bearing 3 spine-like setae on its inner margin. Endopod of leg 3(Fig. 5f) 3-segmented; proximal segment with a sharp inner spine; process(apophysis) on inner margin of second segment possessing terminal barb, far beyond tip of exopod; distal segment much elongated, nearly twice as long as sum of 2 preceding ones, and beyond second exopodal segment, ending 2 slender setae, outer one a little longer than inner one. Lateral spine of exopod 2 of leg 3 not greatly enlarged. Leg 4 nearly same as in female. Basipod of leg 5(Fig. 5g) bearing 2 spines, inner one slightly longer than that of outer one(about 1.15 times); exopod less than twice(1.86 times) as long as broad, bearing total 5 setae of which innermost one located on distal quarter of inner margin of exopod. Leg 6(Fig. 5h) with 1 inner spine and 2 outer setae. Spermatophore(Fig. 3f) bottle-shaped, plumping out posteriorly.

Type specimens collected together with *Bryocamptus (Limocamptus) heimalis yunnanensis* (Borutzky).

Variations. Length to width ratio of exopod of leg 5 ranges 2.56-2.72 in females dissected, and 1.83-1.86 in males. Inner spine on basipod of leg 5 in males 1.15-1.32 times longer than outer one. Other characteristics showed no significant variations.

Etymology. *byblis*, a Greek, means a nymph changed into a spring.

Remarks. The present new species is closely related to the group of *A. (M.) borutzkyi* Smirnov, 1930, *A. (M.) stachanovi* Borutzky, 1931, and *A. (M.) amurensis* Borutzky, 1936, which are restricted to Far East of Asia and distinguished from the other remaining 24 species or subspecies of subgenus *Mrazekiella* in having two-segmented endopods of both leg 2 and leg 3 in female.

The present species is distinctly discernible from *A. (M.) borutzkyi* in possessing one more seta on inner margin of distal joint of leg 2 and leg 4 in both male and female; from *A. stachanovi* without protruding anal operculum and with an inner seta on proximal endopodal segment of leg 4. *A. (M.) byblis*, n. sp. is very similar to *A. amurensis*, which was described by Borutzky(1936) with a single male from the Amur River, and then redescribed by Shen and Sung(1973) on the basis of specimens collected from Manchourie. *A. byblis* differs from *A. amurensis* in having somewhat long and barbed apophysis, and not-enlarged spine on second exopodal segment in male leg 3. Besides that, the exopod of antenna bears four setae in *A. byblis*, whereas only three in *A. amurensis* Borutzky (*sensu* Shen and Sung, 1973).

ABSTRACT

Two new species belonging to the genus *Attheyella* of Canthocamptidae, collected from two springs each of Mt. Hambak and Mt. Halla of South Korea, are described under the name of *Attheyella (Attheyella) paucisetosa* and *Attheyella (Mrazekiella) byblis*, respectively.

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