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Copepod Associated with Ascidians from Korea. II. A New Species of *Botryllophilus* (Copepoda, Cyclopoida, Ascidicolidae) from Simple Ascidians at Chindo Island in the South Sea, Korea

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ABSTRACT

A new species of ascidicolid copepod associated with a simple ascidian, *Styela clava* Herdman, from Chindo Island in the South Sea, belonging to the genus *Botryllophilus*, is described under the name of *B. koreensis*.

Key words: *Botryllophilus koreensis*, new species, Ascidicolidae, Copepoda, Korea

INTRODUCTION

Illg and Dudley (1980) listed 25 species so far described in the genus *Botryllophilus* with their comments. They commented that 15 recognizable species were not able to determine among them and the remaining 10 nominal species could be distinguished from each other. But most of them are still insufficiently described.

Taxonomy of the genus *Botryllophilus* has been confused due to the lack of representative morphological characters. After Ooishi and Illg (1988) examined these 10 valid species in detail from the eastern, western and northern coastal waters of the Pacific, they divided them into 2 types (type A and type B) according to the characters of the urosome, anal segment, caudal rami, rostrum, appendages, and apparatus at the oviducal aperture.

We have found *Botryllophilus* specimens from the body cavity of simple ascidians *Styela clava* Herdman which were caught from an oyster bed net at Chindo Island in South Korea. We compared these specimens with 2 morpho-types of Ooishi and Illg (1988). We could identify them belonging to morpho-type A.

After fixation in 70% ethanol, the length of body was measured and dissected in lactic acid. All figures were drawn with the aid of drawing tube. We prepared illustration and description based on the female of the present new species.

DESCRIPTION

Family Ascidicolidae

Subfamily Botryllophilinae

***Botryllophilus koreensis*, n. sp. (Figs. 1-3)**

Type specimens. Female holotype (appendages of dissected and mounted on microslide) and paratypes (3 females including dissected 1 female) from the body cavity of simple ascidians *Styela clava* Herdman which were collected from an oyster bed net at Chindo Island in South Korea, on 23 July 1994, by Kyung-Sook Lee and In-Soon Seo. Holotype and paratypes have been deposited in the Department of Biology of Dankook University.

Female. Body (Figs. A-C) 1.05 mm in length (from top of cephalosome to end of caudal rami excluding spines). Cephalosome and pedigerous segments indistinctive. Cephalosome triangular, pedigerous segments gradually wide toward terminal end. Fifth leg transformed typical obliquely upward on posterior margin of fifth pedigerous segment. Ovisac not found. Urosome 5-segmented, with setules on both side of ventral margin, genital segment wider than long, genital apparatus located near dorso-lateral margin of first urosomal somite. Without prominent rostrum between first antenna.

First antenna (Fig. 1G) 4-segmented. First segment largest, with 5 large, 1 middle, 3 small smooth setae on anterior margin; most of larger setae implanted on quite large basal protuberances. Second segment with 3 large and 1 small smooth setae on anterior margin, larger setae implanted on quite large basal protuberances. Third segment with 1 large and 1 small smooth seta. Fourth segment very tapering distal part, with 1 long and strong terminal seta and 11 small setae on distal, anterior, and inner margins.

Second antenna (Figs. 1H, I) 4-segmented. First segment ractangular, small and unarmed, second segment elongated, slightly curved and unarmed, third segment ractangular, small and unarmed, fourth segment elongated, shorter than second segment, and with 2 denticulated strong spines on inner margin and 1 denticulated strong spine subterminally on inner margin and 4 stiff setae of gradually increasing length on distal margin. Subterminal spine and terminal stiff setae of right one much denticulated than left one.

Mandible (Fig. 2A) with unsegmented exopod and indistinctively 2-segmented endopod. Masticatory lamella of coxa with 2 short triangular teeth, 2 sharp teeth, and a row of closely set denticles. Exopod unsegmented, with 3 strong setae. Endopod indistinctively 2-segmented; first segment with 1 short and 1 long seta on distal margin, second segment with 2 long proximal setae and 2 long distal setae.

Maxillule (Fig. 2B); Major endite of coxopodite with 6 plumose setae. No segmentation lines observed between basis, endopod and exopod. Basis with 2 setae on inner margin and hairs on distal margin, endopod with 3 long setae, exopod represented by a finger-shaped outer-distal process, with

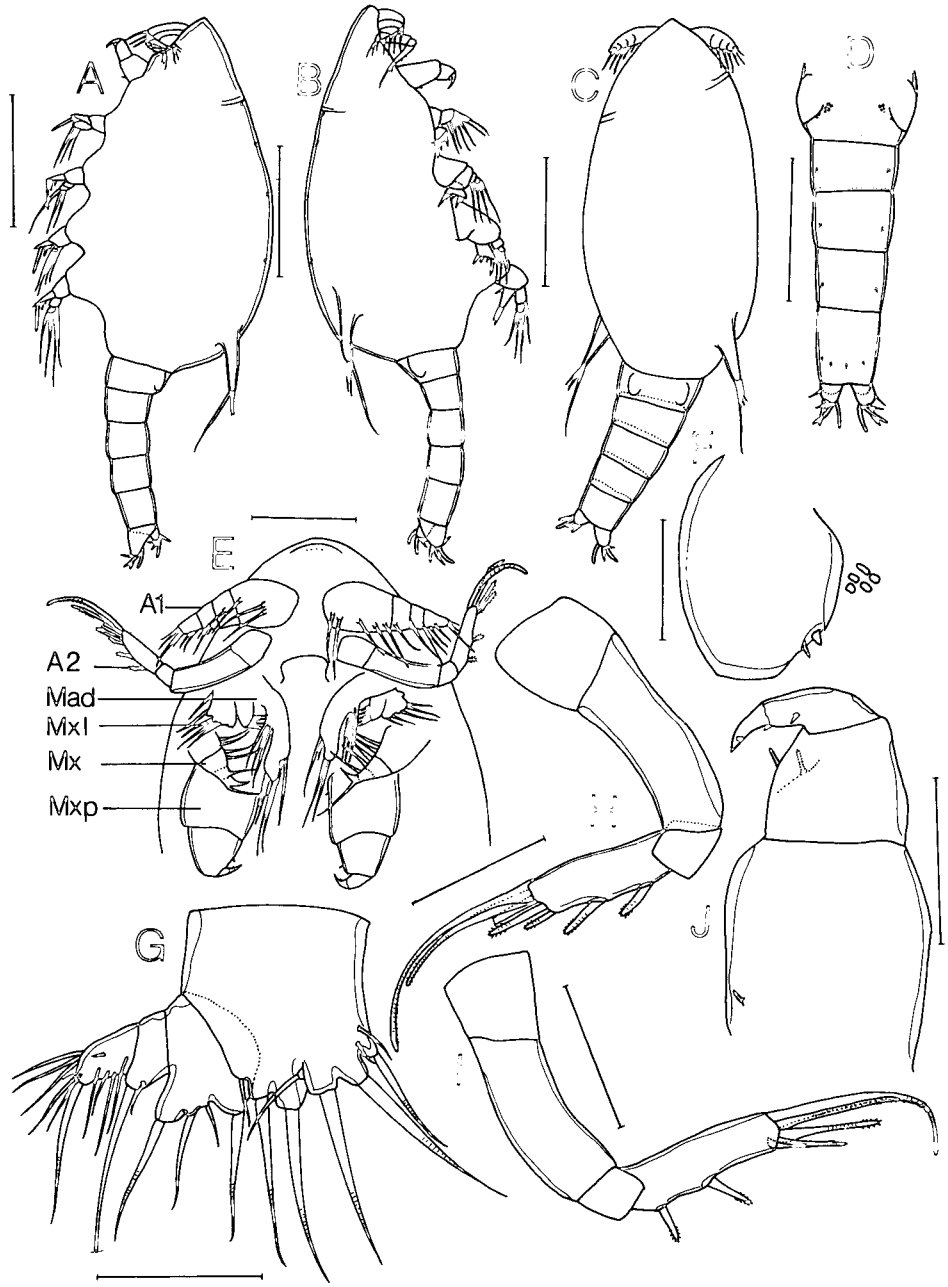

Fig. 1. *Botryllophilus koreensis*, n. sp., female, (A-C, paratype; D-J, holotype): A, habitus, left, lateral; B, habitus, right lateral; C, habitus, dorsal; D, urosome and caudal rami, dorsal; E, mouth part; F, oviducal apparatus; G, first antenna; H, second antenna, left; I, second antenna, right; J, maxilliped. Scales: A-C = 0.25 mm; D = 0.2 mm; E = 0.1 mm; F = 0.03 mm; G-J = 0.05mm.

3 long setae and distal margin of finger-shaped with hairs. Epipodite with 1 short seta on finger-shaped outer-distal process.

Maxilla (Fig. 2C) indistinctively 4-segmented. Basal segment with 2 long plumose setae on inner

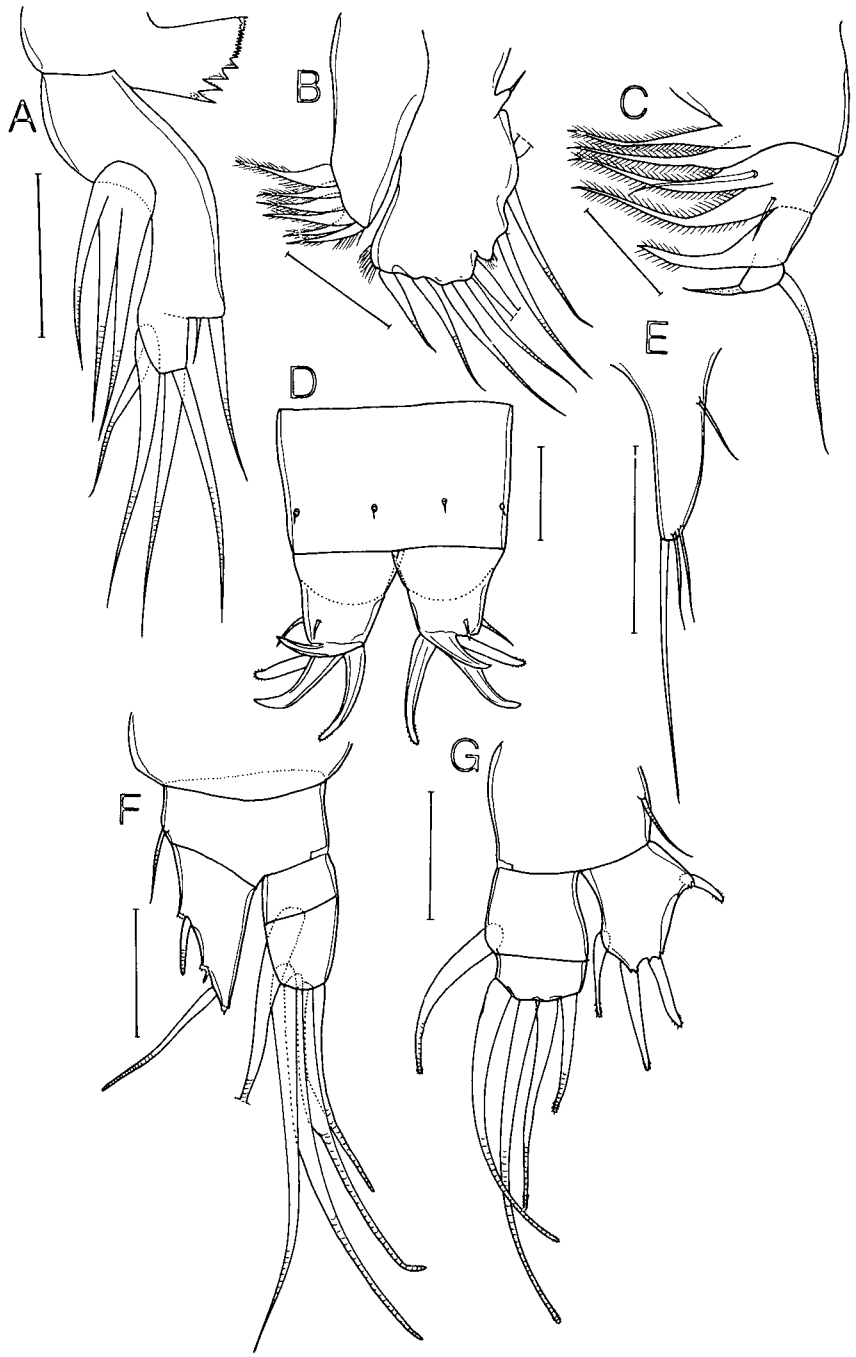

Fig. 2. *Botryllophilus koreensis*, n. sp., female holotype: A, mandible; B, maxillule; C, maxilla; D, anal segment and caudal rami, ventral; E, leg 5; F, left leg 4; G, right leg 4. Scales: A, D, F, G = 0.05 mm; B, C = 0.03 mm; E = 0.1 mm.

margin. Second segment with 2 long plumose setae on inner margin and 2 simple setae on inner face. Third segment with 1 strong plumose seta on inner margin. Fourth segment with 1 proximal and 1 distal simple seta.

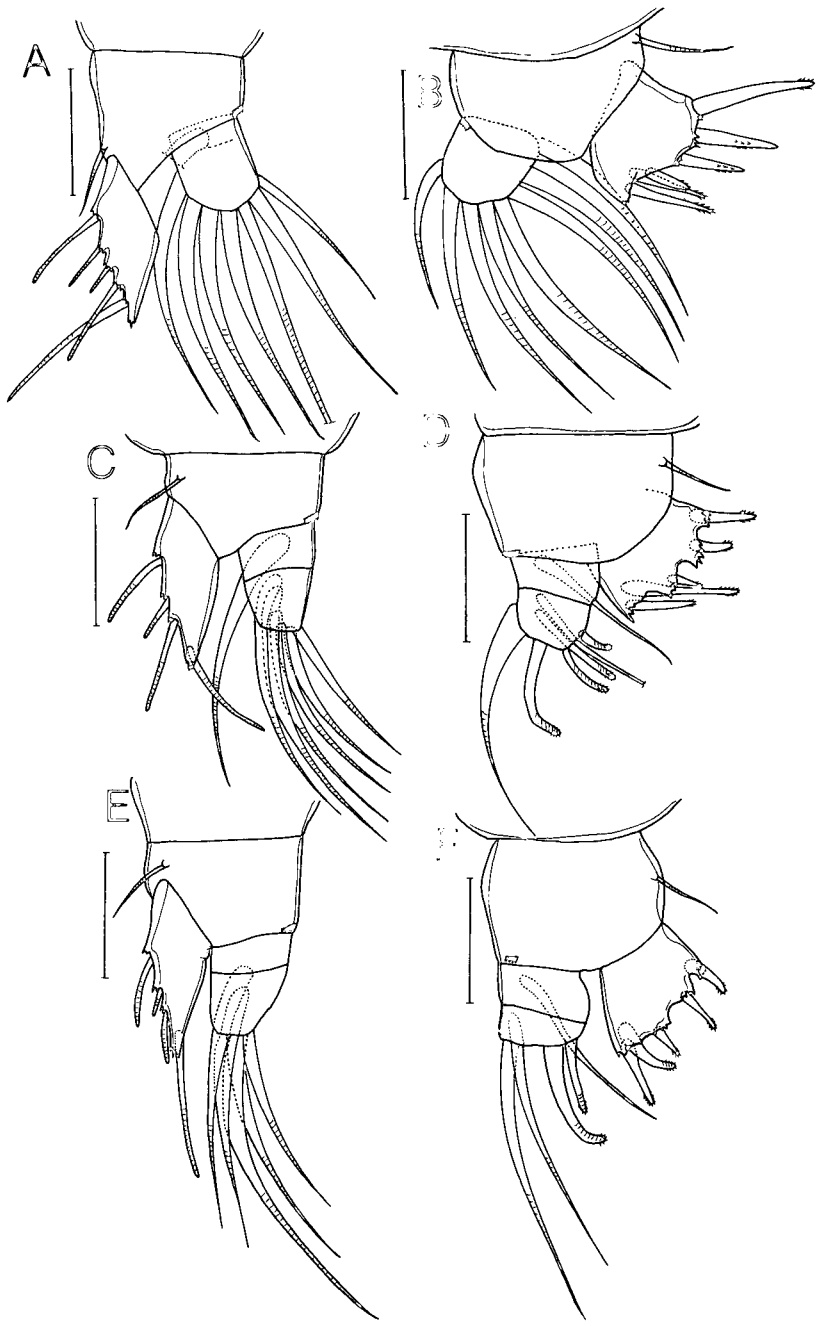

Fig. 3. *Botryllophilus koreensis*, n. sp. female. (A, C-F, holotype; B, paratype): A, left leg 1; B, right leg 1; C, left leg 2; D, right leg 2; E, left leg 3; F, right leg 3. Scales: A-F = 0.05 mm.

Maxilliped (Fig. 1J) consisted of 2 large, tapering segments. First segment with 1 proximal spine on inner margin. Second segment with a large curved claw, a pair of spines distally on medial margin. Large curved claw possibly made up 2 segments; first segment with 1 spine on medial margin and 1 spine on distal corner, second segment curved tapering distal portion, with 2 small spine-like process

on subdistal margin.

Exo- and endopod of legs 2-4 all asymmetric, but endopod of left and right leg 1 symmetric and exopod of left and right leg 1 asymmetric. Second protopod segment of left and right legs 1-4 with a row of spinules on inner coner margin and 1 simple seta on outer margin.

Endopod of left leg 1 (Fig. 3A) indistinctively segmented, with 8 long simple setae, exopod unimerous, with 4 lateral and 1 long proximal spiniform projections. Endopod of right leg 1 (Fig. 3B) unimerous, with 8 long simple setae, exopod unimerous, with 5 strong lateral spines and 1 more or less rudimentary inner spine. But, exopod of right leg of paratypes with all well developed 6 strong spines on lateral and inner margins.

Endopod of left leg 2 (Fig. 3C) bimerous; first and second segments with 1 and 6 long simple setae, respectively, exopod unimerous, with 3 lateral and 1 long proximal spiniform projections. Endopod of right leg 2 (Fig. 3D) bimerous; first segment with 1 long simple seta, second segment with 1 inner lateral seta and 1 inner lateral spiniform projection, 1 long distal seta and 3 proximal spiniform projections, exopod unimerous, with 4 lateral spines and 1 inner spine.

Endopod of left leg 3 (Fig. 3E) bimerous; first and second segments with 1 and 4 setae, respectively, exopod unimerous, with 3 lateral and 1 long proximal spiniform projections. Endopod of right leg 3 (Fig. 3F) bimerous; first segment with 1 lateral seta, second segment with 1 lateral seta, 1 distal seta and 2 proximal spiniform projections, exopod unimerous, with 4 lateral spines and 1 inner spine.

Endopod of left leg 4 (Fig. 2F) bimerous; first and second segments with 1 and 4 setae, respectively, exopod unimerous, with 2 lateral and 1 long proximal spiniform projections. Endopod of right leg 4 (Fig. 2G) bimerous; first segment with 1 lateral spiniform projection, second segment with 4 gradually long distal spiniform projections, exopod unimerous, with 1 inner lateral spine, 2 distal spines and 1 outer lateral spine.

Leg 5 (Fig.2E) unimerous, tapering, with 1 proximal seta dorsally, 2 subterminal short setae, 1 terminal long seta. No noticeable gap between 2 subterminal short setae.

Anal segment (Fig. 2D) longer than wide, ventral surface of anal segment without ornamental elements except 4 setules on lower portion.

Caudal rami (Fig. 2D) divergent, with 1 short seta on dorsal and lateral margins, respectively, with 4 curved strong spines on terminal surface ventrally medially, dorsally and laterally.

Oviducal apparatus located dorso-lateral margin of first urosomal somite, oviducal aperture covered by outer rounded cuticular flap, with 2 small triangular spines (proximal spine larger than distal seta-like element), inner edge of flap with 5 subconical projections.

Remarks. Main characters of type-A identified by Ooishi and Illg (1988) are as follows: 1) 5-segmented urosome, 2) exopods of right and left legs 1-4 unimerous, 3) without ornamentation on ventral margin of anal segment and caudal rami, and 4) without prominent rostrum. Because of not being available of the original descriptions of 5 species (*B. banyulensis* Brément, 1909; *B. bergensis* Schellenberg, 1921; *B. norvegicus* Schellenberg, 1921; *B. brevipes* Sars, 1921 and *B. inaequipes* Hansen, 1923) of type-A, we compared the present new species with 5 species of type A cited by Lang (1948).

The present species differs from *B. banyulensis* in the number of spines of exopod of right leg 4 and the number of segment of endopod leg 1; this new species has 4 long spines on exopod of right

leg 4, whereas 5 spines in *B. banyulensis*. The present species differs from *B. brevipes*, *B. bergensis* and *B. inaequipes* in the number of segments of endo-exopods of legs 1-4. Their formula of the number of segments are as follows.

	(leg 1)		(leg 2)		(leg 3)		(leg 4)	
	Exo,	End;	Exo,	End;	Exo,	End;	Exo,	End.
Present new species:	1,	1;	1,	2;	1,	2;	1,	2.
B. brevipes:	1,	1;	1,	1;	1,	1;	1,	1.
B. bergensis:	1,	1;	1,	1;	1,	1;	1,	1.
B. inaequipes:	1,	2;	1,	2;	2,	2;	2,	2.
B. banyulensis:	1,	2;	1,	2;	1,	2;	1,	2.

The body length of the present species is shorter than B. norvegicus which is 4.5 mm long.

Etymology. The specific name, "*koreensis*" is from the Republic of Korea, to which the type locality of the present species belongs.

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한국산 해초류(ascidians)에 공생하는 요각류
II. 진도산 해초류에 공생하는 요각류 1 신종

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요 약

남해의 진도에서 채집한 단체해초류인 *Styela clava* Herdman에 공생하는 Ascidicolidae과 요각류 1 신종을 *Botryllophilus koreensis*로 명명하여 기재한다.