한국동물분류학회지 제14권 제4호
The Korean Journal of Systematic Zoology
Vol. 14, No. 4: 371-381 (December 1998)

Taxonomy of the Freshwater Bryozoans from Korea

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ABSTRACT

Four species of freshwater bryozoans are reported from nine multipurpose Dams and three other reservoirs in Korea from November 1995 to September 1998. Among them, *Pectinatella magnifica* was recorded from Korea for the first time and is an introduced species from a foreign country. Ten species of freshwater bryozoans have been previously reported by Toriumi (1941c). Thus a total of eleven species of Korean freshwater bryozoans were reported up to the present.

Key words: Taxonomy, Freshwater Bryozoans, Korea

INTRODUCTION

Freshwater bryozoans are included to the Class Phylactolaemata (except *Paludicella articulata* belonging to the Class Gymnolaemata), one of three Class belonging to the Phylum Bryozoa. There are about 50 species living today. They were found in clear, well-oxygenated and quiet water containing an abundance of submersed vegetation during the warmer months of the year. They produce statoblasts, which are spreading throughout the world. These statoblasts help to endure dessication and severe temperatures in the winter, and reproduce asexually in the spring. The form of the statoblast is different in different genera and is diagnostic (Hyman, 1959).

There have been no papers on freshwater bryozoans of Korea since Toriumi (1941c), and only one survey reported from Taechungho which included sites of occurrence of the Korean freshwater bryozoans (공과 1인, 1995).

This research was supported by the grants from the Korea Water Resources Research Institute and Woosuk University, 1998.

Ten species of Korean freshwater bryozoans were reported until now (Toriumi, 1941c). They are: *Paludicella articulata* (Ehrenberg, 1831), *Fredericella sultana* (Blumenbach, 1779), *Plumatella emarginata* (Allman, 1844), *P. casmiana* (Van Beneden, 1848), *Hyalinella minuta* (Toriumi, 1941), *H. punctata* (Hancock, 1850), *Gelatinella toanensis* (Hozawa and Toriumi, 1940), *Stephanella hina* Oka, 1908, *Asajirella gelatinosa* (Oka, 1890) and *Lophopodella carteri* (Hyatt, 1866).

MATERIALS AND METHOD

Collections and surveys were done from nine reservoirs formed by nine multipurpose Dams (Soyanggang, Taechung, Chungju, Andong, Imha, Hapchun, Namgang, Chuam and Somjingang) and three other reservoirs (Paekak in Yonchon-gun, Kyonggi-do, Chonggye and Nodong in Kochang-gun, Chollabuk-do) during four years from November 1995 to September 1998 (Fig. 5).

The collected specimens were narcotized with menthol for about half an hour and fixed in a 5-10% neutral formaldehyde solution. Statoblasts, which is the key character of freshwater bryozoans, were taken from a gelatinous mass of colonies with needles, mounted with Canada balsam and photographed by a light microscope.

SYSTEMATIC DESCRIPTIONS

Phylum Bryozoa Ehrenberg, 1831 태형동물 문
Class Phylactolaemata Allman, 1856 피후 강
Order Plumatellida 깃털이끼벌레 목
Family Plumatellidae Allman, 1856 깃털이끼벌레 과
Genus *Plumatella* Lamarck, 1818 깃털이끼벌레 속

1. *Plumatella emarginata* (Allman, 1844) 톱니깃털이끼벌레 **(Fig. 1A, B)**

Plumatella repens var. *emarginata* Toriumi, 1941b, p. 198, fig.3; 1941c, p. 416, text-fig.3;

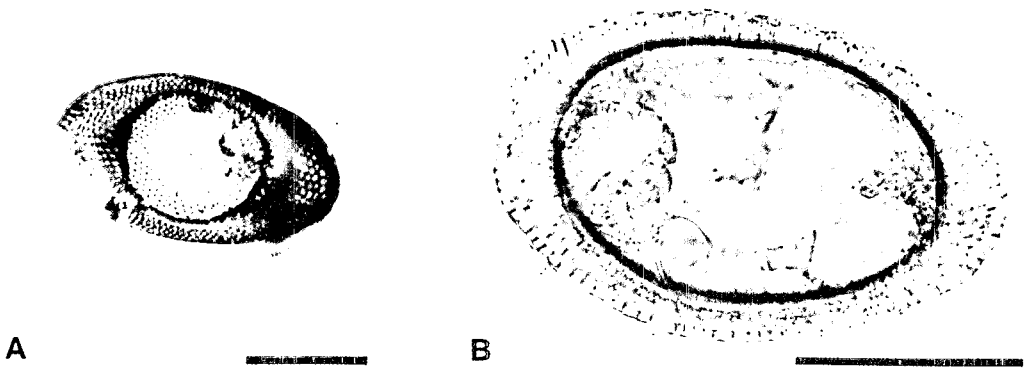

Fig. 1. *Plumatella emarginata*. A, dorsal view; B, ventral view. (bars = 0.2 mm).

1942a, p. 199; 1942b, p. 208.

Plumatella emargianta: Toriumi, 1952, p. 320; Lacourt, 1968, p. 77, pl. 3, fig. b, pl. 4, figs. a, b, pl. 5, figs. a, b, pl. 6, figs. a, b; pl. 12, fig. e, pl. 15, fig. 1; Mukai *et al.*, 1990, p. 51.

Material examined. Andongho, 24 July 1996, J. E. Seo; Taechungho, 17 Oct. 1996, J. E. Seo.

Description. A colony was not found. Only floatoblasts were found. Their shape is long oval, a little square at both ends and smoothly serrated on the margin; size is 0.48 mm long and 0.27 mm wide in average. Annulus covers more over the capsule on the dorsal surface than the ventral surface, and is wider at the poles than laterally. The capsule is granular and almost round on the dorsal valve. Its size is 0.23 mm long and 0.21 mm wide in average. Undried floatoblasts can also float on the water. No sessoblast was found.

Distribution. Korea (Paldangho, Taechungho, Andongho), Japan, Russia, China, Indo-West Pacific Ocean, Europe, Africa, Cosmopolitan.

Family Lophopodidae Rogick, 1935 총담이끼벌레 과

Genus Lophopodella Rousselet, 1904 총담이끼벌레 속

2. *Lophopodella carteri* (Hyatt, 1866) 총담이끼벌레 **(Fig. 2A, B)**

Lophopodella carteri: Toriumi, 1941a, p. 1; 1941b, p. 209; 1941c, p. 423; 1942, p. 212; Oda, 1955 p. 1; Toriumi, 1956a, p. 35; 1956b, p. 86; Tenny and Woolcott, 1962, p. 247; Bushnell, 1965, p. 240; Lacourt, 1968, p. 110; Oda, 1978, p. 19; Mukai, 1982, p. 25; Oda and

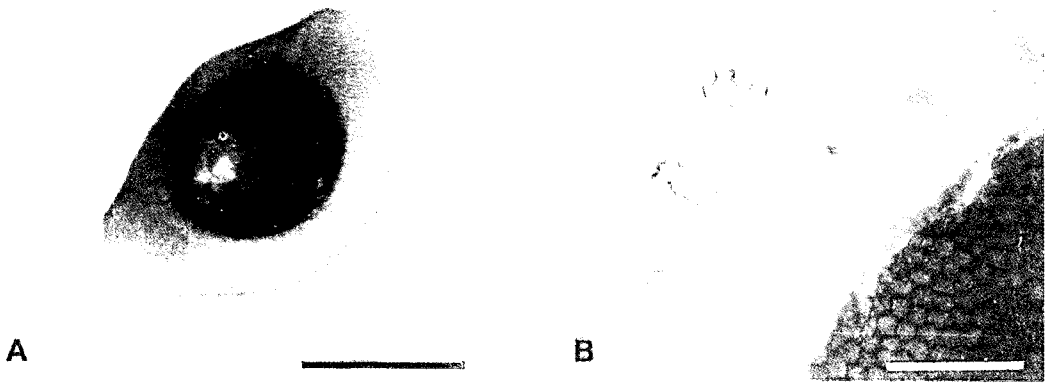

Fig. 2. *Lophopodella carteri*. A, statoblast (bar = 0.6 mm); B, spines (bar = 0.5 mm).

Mukai, 1985, p. 236; Massard *et al.*, 1992, p. 207; Kim, 1990, p. 21.

Material examined. Chuamho, 3 July 1996, J. E. Seo; Taechungho, 12 Sep. 1996, J. E. Seo; Taechungho, 17 Oct. 1996, J. E. Seo; Taechungho, 5 Aug. 1997, J. E. Seo.

Description. There was no colony collected. The floatoblast, only statoblast of this species, is usually flat, sometimes oval or saddle shaped and round or sqare at the both ends, which carry 7 to 21 spines decreasing in size from the middle towards the sides. The spines have marginal hooklets.

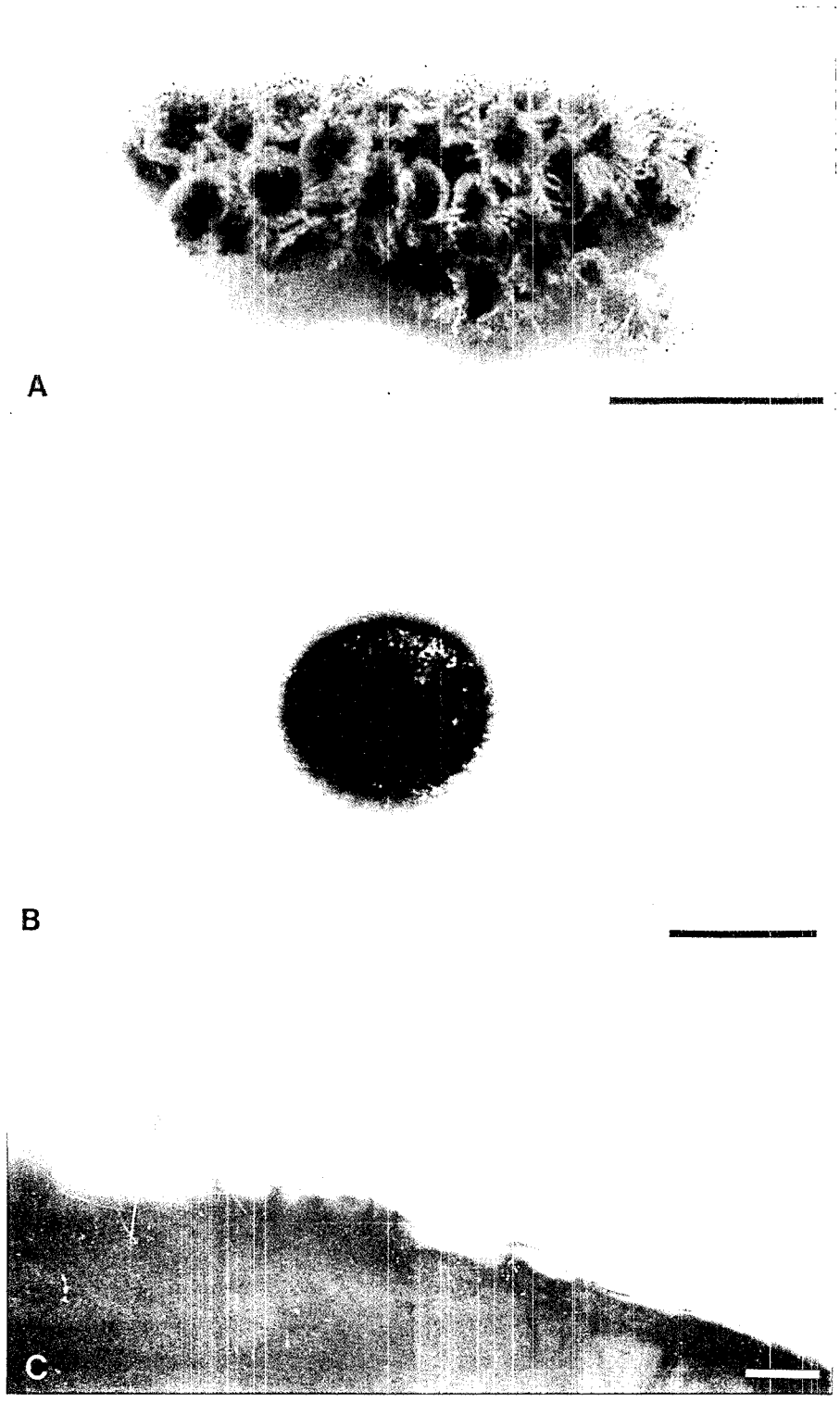

Fig. 3. *Asajirella gelatinosa*. A, colony (bar = 3 cm); B, statoblast (bar = 0.5 mm); C, spines (bar = 0.01 mm).

They are 1.33 mm long and 0.98 mm wide in average. The capsule is dark brown and nearly round, and its size is 0.62 mm long and 0.54 mm wide in average. Only dry floatoblasts float on the water.

Distribution. Korea (Taechungho, Talchungang, Okchungho, Chuamho), Japan, China, Miyanma, North America, Australia, India, Java, Israel, Africa.

Family Pectinatellidae Lacourt, 1968 빗이끼벌레 과

Genus *Asajirella* Oda and Mukai, 1989 아사지로이끼벌레 속

3. *Asajirella gelatinosa* (Oka, 1891) 우무이끼벌레 **(Fig. 3A-C)**

Pectinatella gelatinosa: Toriumi, 1941a, p. 1; 1941b, p. 208; 1941c, p. 422; 1942, p. 212; 1956a, p. 29; 1956b, p. 86; Lacourt, 1968, p. 101, pl. 17, figs. e, f; Tajima and Mukai, 1975, p. 205; Mukai, 1977, p. 19; Terakado and Mukai, 1978, p. 317; Oda and Nakamura, 1980, p. 38; Mukai and Oda, 1980a, p. 8; 1980b, p. 134, figs. 4, 5, 15-18, 35-41, 58; Tajima, 1980, p.25; Mukai, 1982, p. 25; Oda and Mukai, 1985, p. 237, fig. 4; Bakus and Mukai, 1987, p. 189.

Asajirella gelatinosa: Oda and Mukai, 1989, p. 401.

Material examined. Chuamho, 14 Nov. 1995, J. E. Seo; Taechungho, 17 Nov. 1995, J. E. Seo; Chuamho, 3 July 1996, J. E. Seo; Taechungho, 4 July 1996, J. E. Seo; Andongho, 24 July 1996, J. E. Seo; Namgangho, 25 July 1996, J. E. Seo; Okchungho, 26 July 1996, J. E. Seo; Chuamho, 8 Aug. 1996, J. E. Seo; Taechungho, 13 Aug. 1996, J. E. Seo; Chuamho, 5 Sep. 1996, J. E. Seo; Taechungho, 17 Oct. 1996, J. E. Seo; Chuamho, 18 Oct. 1996, J. E. Seo; Taechungho, 5 Aug. 1997, J. E. Seo; Chunggye reservoir, ? Sep. 1997, J. Y. Lee; Nodong reservoir, ? Sep. 1997, J. Y. Lee; Paekak reservoir, 18 Sep. 1998, S. J. Yoon.

Description. Colonies form a large mass, are attached on the substratum and are connected with a thick and transparent communal chitinous base. Colonies of 20mm in diameter, are fused and embedded in the gelatin. Zooids are arranged radially from the empty center. There are only floatoblasts which are the biggest statoblast among the freshwater bryozoans, dark brown in color, both rounded and squared in shape, and have about 140 small spines with two hooks coming out of the margin. The diameter of the floatoblasts are 1.34 to 1.5 mm and the length of the spines is about 0.024mm. The capsule is almost round and has a diameter of 0.56 to 0.63 mm. Only dry floatoblasts float on the water.

Distribution. Korea (Paekak reservoir, Taechungho, Chunggye reservoir, Nodong reservoir, Okchungho, Chuamho, Namgangho, Andongho), Japan, Taiwan, Miyanma, Indonesia, West Java, India, Ceylon.

Genus *Pectinatella* Leidy, 1851 빗이끼벌레 속

4. *Pectinatella magnifica* (Leidy, 1851) 큰빗이끼벌레(신칭) **(Fig. 4A-C)**

Pectinatella magnifica: Toriumi, 1956b, p. 86; Bushnell, 1965, p. 238; Lacourt, 1968, p. 98; Mawatari, 1973, p. 41; Everitt, 1975, p. 132; Oda, 1978, p. 19; Oda and Mukai, 1985, p. 238.

Material examined. Taechungho, 4 July 1996, J. E. Seo; Soyangho, 22 July 1996, J. E. Seo; Chungjuho, 23 July 1996, J. E. Seo; Okchungho, 26 July 1996, J. E. Seo; Taechungho, 5 Aug. 1997, J. E. Seo.

Description. The colony is rugby ball-shaped and reaches a diameter of about 50 cm. A thin crust

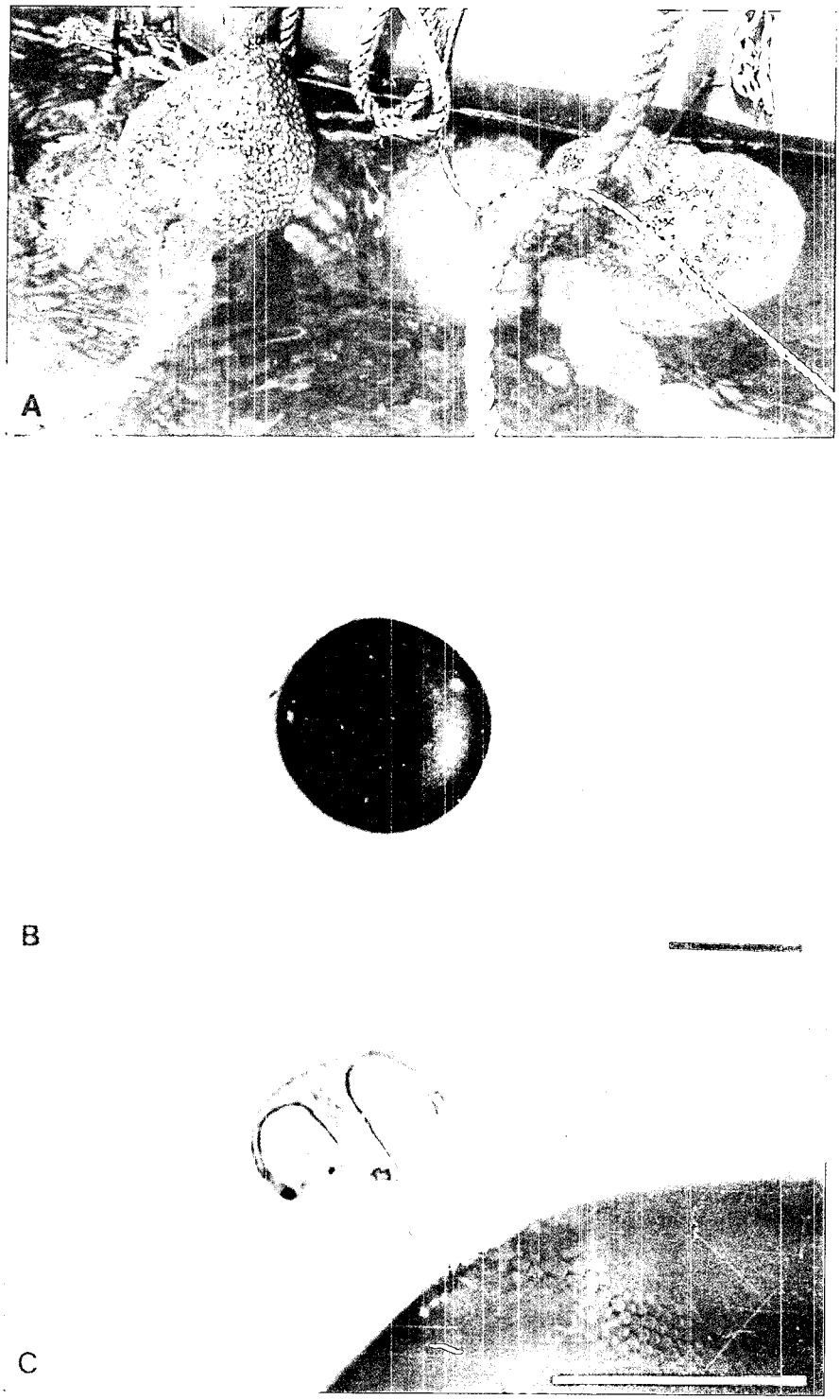

Fig. 4. *Pectinatella magnifica*. A, colony of inland aquafarm; B, statoblast (bar = 0.3 mm); C, spine (bar = 0.2 mm).

of zooids covers the gelatinous communal mass and is secreted from the zooids. The zooids are arranged in a rosette-shape. There is only one statoblast of this species, which is a floatoblast. It is round or slightly oval and usually has 14 spines with hook shaped ends; size is 0.90 to 1.06 mm long and 0.80 to 0.95 wide. The length of the spines is 0.18 to 0.24 mm. The capsule is brown and round, and its size is 0.60 to 0.65 mm long and wide. Undried floatblasts can float on the water.

Remarks. The first description of this species was made by Leidy from the Philadelphia region in 1851 (Oda, 1974) and the first report in Japan was done by Mawatari (1973). Mawatari concluded

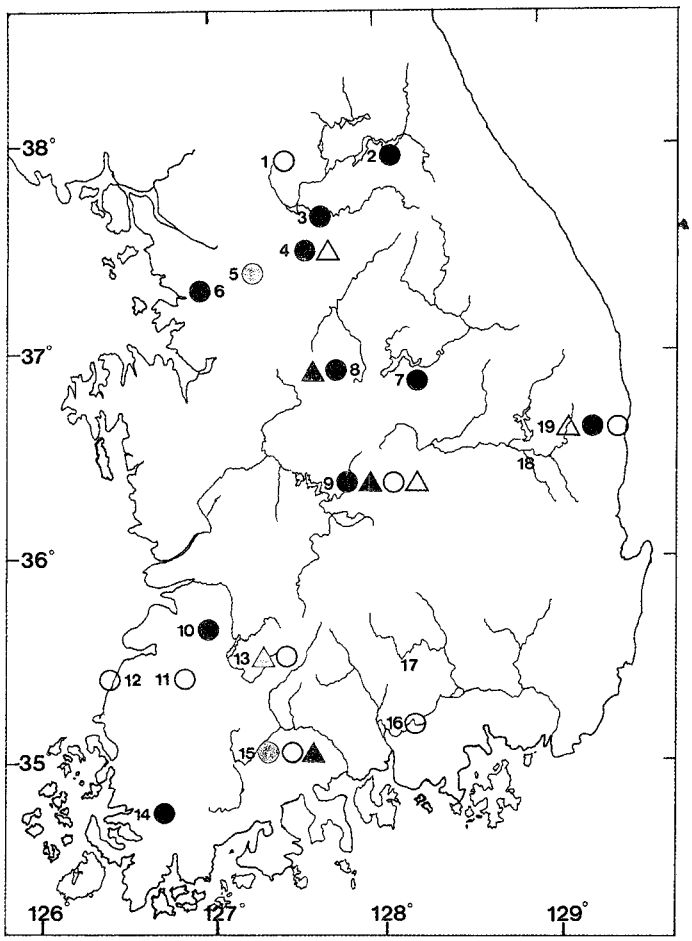

Fig. 5. A map showing the sites of the distribution of four Korean freshwater bryozoans reported in this paper: *Plumatella emarginata*, △; *Lophopodella carteri*, ▲; *Asajirella gelatinosa*, ○; *Pectinatella magnifica*, ●. 1, Paekak reservoir; 2, Soyangho; 3, Chungpyungho; 4, Paldangho; 5, Pundang reservoir; 6, Naksaeng reservoir; 7, Chungjuho; 8, Talchungang; 9, Taechungho; 10, Tongjingang; 11, Chunggye reservoir; 12, Nodong reservoir; 13, Okchungho (Somjingang Dam reserovoir); 14, Youngsanho; 15, Chuamho; 16, Namgangho; 17, Hapchunho; 18, Imhaho; 19, Andongho. The distribution of species at the seven locations 3, 4, 5, 6, 8, 10 and 14 is cited from a survey report of Chungchongbuk-do (공과 1인, 1995).

that a living statoblast was newly introduced from America across the Pacific Ocean. This species must be the introduced species from another country, America or Japan to Korea.

Distribution. Korea (Soyangho, Chungpyungho, Paldangho, Pundang reservoir, Naksaeng reservoir, Chungjuho, Taechungho, Tongjingang, Okchungho, Youngsanho, Chuamho, Andongho), Japan, Turkey, North and Central America, Germany, Bohemia, Rumania.

DISCUSSION

Ten species of Korean freshwater bryozoans were reported by Toriumi (1941c). Four species, including *Pectinatella magnifica* new to Korean fauna, are reported in this paper. Thus a total of eleven species have been recorded in Korean fauna of freshwater bryozoans.

Fig. 5 shows the distribution sites of the four species described in this paper. *Pectinatella magnifica* which is first recorded in Korea is the most abundant species in the reservoirs of Korea and was an introduced species from a foreign country. This species may have been introduced by statoblasts attached to the bottom of ships which initially crossed the Atlantic Ocean from North America to Europe (Hyman, 1959). The statoblast of this species demonstrated a strong tolerance to sea water for six months (Oda, 1990). Another hypothesis is that the introduction was done by a statoblast attached to fish imported for aquaculture (Massard and Geimer, 1991, 1995). *Pectinatella magnifica* was not included in the report by Toriumi (1941) and found from Taechungho by a fisherman since 1995. There are no exact clues about where and how the statoblast of this species was introduced to Korea. This species is not cosmopolitan and can't be overlooked because of its large gelatinous colony. Therefore this species must be the introduced to Korea. Concerning the spread within Korea, it is probable that statoblasts of this species were attached to a substance such as fishing equipment, which might accidentally have been carried to several reservoirs as the fishermen moved their fishing location . Also, the movement of birds might be related to the transportation of statoblasts (Oda, 1974). Further research on the distrubution of Korean freshwater bryozoans is needed in order to clarify the impact of introduced species on native species. No species was found from Hapchunho and Imhaho during our survey period.

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RECEIVED: 10 November 1998
ACCEPTED: 1 December 1998

한국산 민물 태형동물

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요 약

한국의 9개 다목적댐저수지와 그외 다른 3개 저수지로부터 1995년 11월부터 1998년 9월까지 채집된 민물 태형동물 4종을 보고한다. 이중 *Pectinatella magnifica*는 외국에서 유입된 종으로 우리나라에서는 처음으로 보고되는 종이며, 따라서 한국산 민물 태형동물은 모두 11종이 기록된다.