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박사학위논문

제주 해역 대형동물의
분류학적 연구

A Taxonomic Study on Bryozoans from Jeju Island, South
Korea

수원대학교 대학원

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이 논문을 박사학위논문으로 제출함.

2016 년 12 월

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국문 초록

태형동물은 유생시기에 수중에서 부유생활을 하다가 기질에 부착하여 고착생활하는 군체성 수서 부착동물로 일부 민물에 서식하는 종을 제외하고, 주로 해안가부터 깊은 심해, 극지방부터 열대해역의 모든 바다에서 살고 있다. 전 세계에 5,869종이 서식하는 것으로 알려져 있지만(Bock and Gordon, 2013), 전자현미경과 분자생물학적 기법을 이용하여 지속적으로 연구한다면 8,000종 이상 서식할 것으로 예상된다(Ryland, 2005). 일반적으로 태형동물은 자포동물인 산호, 히드라 또는 해조류와 형태가 유사하여 일반인에게는 생소한 동물이지만, 해안가와 항구에서 쉽게 관찰할 수 있는 동물이다. 주로 조개껍질, 바위, 대형 갈조류, 망그로브 뿌리와 같은 단단한 부착기질이 있는 곳이면 어디에나 서식한다(Ryland, 1970; 1973; Uttley and Bullivant, 1972; Banta, 1980; Hayward, 1985; Song, 1985; Hageman, 2000; Kuklinski *et al.* 2005; Seo, 2005; Grischenko, 2007). 또한 선체의 바닥, 발전소의 냉각수 유입관이나 해수 유입관 등에 서식하는 오손동물(fouling animal)로서 인간에게 여러 가지 피해를 주는 동물로 알려져 있다(Ryland, 1970; Gordon and Mawatari 1992; Seo, 2005). 그러나 태형동물은 손해만 끼치는 동물은 아니다. 선체의 바닥에 부착하여 서식하는 태형동물의 경우, 전 세계적으로 선박을 이용한 교류가 활발한 현대 사회에서는 원산지로부터 태형동물의 분포를 확산시킬 수 있기 때문에 동물지리학적으로 매우 중요한 역할을 한다.(Seo, 2005). 일부 태형동물의 조직으로부터 얻어낸 천연물질은 인간에게 이익을 제공한다. 예를 들면 우리나라의 항구에서 흔히 관찰할 수 있는 큰다발이끼벌레(*Bugula neritina*)의 경우에는 항암효과가 탁월한 화합물질 Bryostatin I을 생성한다. 이 화합물질은 피부암 치료에 좋은 효과가 있다고 알려져 있다.

우리나라에서 태형동물이 가장 많이 보고된 지역은 제주도이다. 이곳은 쿠로시오 난류가 북상하는 아열대 기후대에 속하는 섬으로 다양한 해양생물이 서식하고 있다. 이 지역에 해양생물이 다양한 이유는 따뜻한 쓰시마 난류의 영향, 안정적인 광조건 그리고 용승으로 인한 영양염의 충분한 공급으로 해양생물이 살아가기에 적합하고 안정적이기 때문이다(Kang *et al.* 1996). 제주도는 암반조간대와 항구가 많기 때문에 부착동물인 태형동물이 서식하기에 좋은 조건을 많이 가지고 있으며, 겨울철에도 온화한 날씨를 유지하기 때문에 다른 지역보다 태형동물을 쉽게 관찰할 수 있다. 제주도는 쿠로시오해류의 지류인 쓰시마 난류의 영향을 받기 때문에 다른 해역(동해, 서해, 남해) 보다 해산무척추동물상이 매우 특이하며, 고착성동물인 자포동물류, 태형동물류, 피낭동물류 등 많은 종이 제주 해역에 많이 분포한다(Song and Won, 1992). 그리고 쓰시마 난류는 제주도를 통하여 대한해협을 지나 우리나라의 남해, 동해 그리고 일본으로 유입되면서 해양생물의 유충을 전달해 주는 역할도 함께하기 때문에 태형동물의 분포를 확산시킬 수 있다.(Seo, 2005).

현재까지 우리나라에서 확인된 해산 태형동물은 총 135종이고, 그중 제주도에 서식하는 해산 태형동물은 103종이며, 약 76%에 해당한다. 그동안 보고된 선행 연구에서 보듯이 국내에서 태형동물이 가장 다양하게 서식하는 곳은 제주도이다. 요즘에는 태평양 남쪽에서부터 올라오는 해류의 영향으로, 제주도를 비롯한 우리나라 주변의 해역은 열대해역의 지표종 출현빈도가 증가하고 미기록종 역시 다수 출현하며, 열대종이 서식하기 적합할 정도로 수온이 높아지고 있다(Kim *et al.* 2008). 또한 인간 활동에 의하여 의도적 또는 비의도적으로 기존에 분포하지 않았던 종이 다른 지역으로부터 운반되어 번식하는 외래종도 증가하고 있다(Carlton, 2001). 지속적인 인간의 활동에 의한 외래종의 유입과 기후로 인한 생물서식처에 대한 환경이 변한다면 우리나라는 제주도의 해양생물부터 변하게 될 것이다.

본 연구는 태형동물이 가장 많이 서식하는 제주도의 태형동물의 다양성을 밝히기 위한 연구이다. 태형동물의 분류학적 연구를 통하여 태형동물의 생태적 연구의 일환으로 태형동물과 부착기질의 선호도와 제주지역의 특산종 및 태형동물의 선호 환경을 밝히기 위해 수행하였다.

주제어

태형동물, 제주도, 분류학, 다양성, 부착기질

I. 서론

태형동물(Phylum Bryozoa)은 군체성 부착동물로서 민물에 서식하는 일부 종을 제외하고는 대부분 바다에 살고 있으며, 전 세계에 5,869종이 알려져 있다(Bock and Gordon, 2013). Ryland (2005)는 전자현미경과 분자생물학적 기법을 이용하여 지속적으로 연구한다면 약 8,000종 정도가 있을 것으로 예상하였지만, 현재 태형동물을 연구하는 학자들은 더 많은 종이 서식할 것으로 추정한다. 태형동물은 흔히 이끼벌레(moss animal)로 불리며, 군체의 형태가 자포동물인 산호와 히드라 또는 해조류와 유사하여 사람들에게 혼동을 주는 동물이다. 바다에 생활하는 현생종은 연체동물의 패각, 바위, 대형 해조류, 배의 바닥, 양식장의 부착물 등 기질이 단단한 곳이면 어디에서나 부착하여 생활한다. 일부 태형동물은 선박의 밑바닥, 그리고 발전소의 냉각수 유입관 등에 서식하는 전형적인 오손동물(fouling animal)로서 우리에게 막대한 손해를 끼치는 동물로 알려져 있다.

태형동물은 크게 3강으로 구성되어 있으며, 민물에 서식하는 피후강(Class Phylactolaemata), 바다에 서식하는 협후강(Class Stenolaemata)과 나후강(Class Gymnolaemata)이다. 민물에 서식하는 태형동물은 각피나 젤라틴질로 구성되어 있으며, 99%가 물이고 해산에 서식하는 태형동물은 대부분이 석회성분이다. 태형동물은 군체성 동물(colonial animal)로서 개충(zoooid)으로 구성되어 있으며, 개충에 있는 촉수를 이용하여 먹이 활동을 하는 여과성 섭식자(filter feeder)이다.

한국산 해산 태형동물에 대한 분류학적 연구는 Okada(1923)가 대한해협으로부터 49종을 보고한 것이 최초이다. 그 후 Kamita and Sato(1941)가 “인천만의 해안동물상” 속에 1종을 기록하였다. 국내에서 한국산 태형동물을 최초로 기록한 사람은 김훈수와 노분조(1969)로서 추자도의 생물상에서

3종을 기재 없이 보고하였다. 한국자연보존협회조사보고서(김훈수 등, 1978; Rho *et al.*, 1979; Rho and Lee, 1980)에서 각각 3종, 1종 그리고 13종의 태형동물이 목록으로만 보고되었고 Kim and Choe(1987)은 소청도로부터 1종을 역시 증명만 기록하였다. 태형동물에 관한 분류학적 연구는 Rho and Chung(1975)으로 한국연안으로부터 13종을 보고한 것이 처음이며 그 후 본격적인 분류학적 연구가 이루어져 Rho and Song(1980)가 무낭류 17종, Rho and Kim(1981)이 협후류와 나후류 30종을 보고하였으며 Rho and Seo(1984, 1985, 1986, 1988, 1990)가 1신종을 포함하여 121종을 보고하였다. Song(1985)은 월성과 서천의 오손부착동물에 관한 연구에서 23종의 오손태형동물을 보고하였다. 그후 Seo and Rho(1989)가 유낭류 25종을 보고하였다. Seo(1992, 1993, 1994, 1996, 1998a, b, 1999, 2000, 2001, 2002a, b, 2003)가 해산 태형동물에 관한 분류학적 연구를 계속적으로 진행하였으며 Song and Won(1992)이 제주도의 태형동물 17종을 보고하였다. 한편 Gong and Seo(2003, 2004)는 각각 우리나라의 어항에서 발견되는 오손태형동물 25종과 14종을 보고하였다. Seo(2005)에 한국동식물도감 제 40권 동물편(태형동물)에서 한국의 태형동물을 총 정리하여 피후강 9종, 협후강 4종, 나후강 109종을 정리하였다. 그리고 Seo and Min (2009)이 한국 연안의 순구류에 대한 분류학적 연구에서 71종을 정리하였으며, 또한 Seo *et al.* (2009)는 산호에 부착하여 서식하는 보키반타이끼벌레(*Bantariella bocki*)를 보고하였고, Seo(2009)는 *Bicellariella fragilis*를 신종으로 보고하였다. Min and Seo(2016)에서 가거도의 태형동물상으로 32종을 보고하였다. 그리고 Chea *et al.* (2016)가 서귀포해역의 태형동물의 분류학적 연구에서 96종의 태형동물을 보고하였다. 따라서 현재까지 연구된 한국산 해산 태형동물은 총 135종이다.

제주도의 태형동물에 처음으로 언급된 것은 Kim and Rho(1969)가 제주의 추자도 생물상을 보고하면서 흰수염이끼벌레(*Crisia eburneodenticulata*),

나선주머니이끼벌레(*Amathia distans*) 그리고 세방가시이끼벌레(*Tricellaria occidentalis*)의 3종을 기재 없이 처음으로 보고하였다. 그리고 제주도의 태형동물류에 관한 분류학적 연구는 Rho and Chung(1975)이 13종, Rho and Song(1980)이 17종, Rho and Kim(1981)이 28종, Rho and Seo(1984, 1986, 1990)가 각각 14종, 52종, 19종 그리고 Seo and Rho(1989)가 16종을 보고하였다. Song and Won(1992)이 제주도의 태형동물 17종을 보고하였고, Seo(1992, 1993, 1994, 1996, 1999, 2003)가 제주를 포함한 해산 태형동물의 분류학적 연구를 지속적으로 진행하였다. 그 후 Seo(2005)가 한국동식물도감 제40권 태형동물편에서 담수 태형동물 10종과 해산 태형동물 112종(제주도 83종)의 한국산 태형동물을 총망라하여 정리하였다. Seo and Min (2009)이 한국 연안의 순구류에 대한 분류학적 연구에서 71종을 정리하였으며, 그 중 34종이 제주도에 서식하는 태형동물이다. Seo *et al.* (2009)는 제주도의 산호에 부착하여 서식하는 보키반타이끼벌레(*Bantariella bocki*)를 보고하였고, Seo(2009)는 제주도에 서식하는 *Bicellariella fragilis*를 신종으로 보고하였다. 그리고 Chea *et al.* (2016)가 서귀포해역의 태형동물의 분류학적 연구에서 투구이끼벌레(*Hiantopora intermedia*), 톱니바구니이끼벌레(*Gregarinidra serrata*), 빗방패이끼벌레(*Canda pecten*), 나사이끼벌레(*Margaretta tenuis*), 화산조두체이끼벌레(*Mucropetraliella philippinesis*) 그리고 둥근난실말발바위이끼벌레(*Petraliella globulata*)를 보고하였다. 따라서 현재까지 제주도에서 서식하는 태형동물은 103종이다.

제주도는 우리나라에서 가장 큰 섬으로 쿠로시오 해류의 지류인 쓰시마 난류의 영향을 받는 아열대 기후대에 속하는 섬이다. 이 지역은 난류의 영향, 안정적인 광조건 그리고 용승으로 인한 영양염의 충분한 공급으로 해양생물이 살아가기에 적합하고 안정적이다(Kang *et al.*, 1996). 또한 적도부근에서 발생하여 북상한 쿠로시오 해류의 영향으로 다양한 해양생물의 유생이 함께 이동한다. 이러한 이유 때문에 제주도는 태형동물을 비롯한 해양 생물

이 다양하다. 그리고 제주도는 SCUBA diving을 이용하여 조사할 수 있는 조사 지역이 많고, 겨울철에도 수온이 차갑지 않으므로, 계절에 상관없이 태형동물을 쉽게 관찰할 수 있다. 그리고 조하대를 비롯하여 해양생물이 안정적으로 부착하여 서식할 수 있는 조간대와 어업활동이 활발한 항구가 많기 때문에 외부로부터 유입되는 태형동물은 쉽게 관찰할 수 있다. 이러한 환경 조건 때문에 제주도는 해산 태형동물이 다양한 것으로 알려져 있다.

제주도 태형동물의 분류학적 연구에서는 제주도 지역의 해산 태형동물의 분류학적 연구를 통하여 해산 태형동물의 적합한 환경 및 분포를 파악하는데 목적을 두고 있다.

II. 실험재료 및 방법

1. 채집 및 보관

제주도 해역의 해산 태형동물에 관한 연구를 위해 2008년 8월부터 2015년 12월 까지 제주 연안 24개 지점에서 채집하였다(Figure 1). 대부분의 연구 재료는 암반 조간대와 항구에 서식하는 군체는 핀셋, 끌 그리고 칼을 이용하여 맨손으로 채집하였다. 조하대인 경우 수심 40m 이내(암반, 돌맹이, 연체동물의 패각, 해조류, 자포동물인 산호류, 환형동물인 다모류, 다른 태형동물, 그리고 어구 등)에 서식하는 군체는 SCUBA diving을 통해 직접 채집하였다. 채집한 재료는 현장에서 생태사진을 찍은 후 해수로 세척하여 자연 건조시키거나 95%의 에틸알코올 (ethyl alcohol)에 고정한 후 해양태형동물 자원 기탁등록보조기관(Marine Bryozoans Resources Bank of Korea - MBRBK)에 DB를 입력한 후 표본을 보관하였다.

2. 종의 동정 및 분석

표본은 해부현미경(Stemi 2000-C, Stemi SV6)으로 군체와 개충의 배열상태 그리고 외부형태를 관찰하여 동정하였으며, 단단한 부착기질에 부착한 군체나 크기가 큰 군체는 드릴(Model 395, Racine, WI, Germany)를 이용하여 필요한 부분을 잘라내고 초음파 세척기로 세척한 후 관찰하였다. 미세구조는 Clorox (sodium hypochlorite solution)와 증류수를 넣어 표벽에 붙은 불순물을 제거하고, 드라이오븐에서 건조시켜 수분을 완전히 제거하였다. 그리고 관찰할 재료를 골드코팅 (gold coating)을 하여, 주사전자현미경 (Scanning Electron Microscope: JEOL JSM - 6701F at 10 kV accelerating voltage)으로 관찰하였다. 관찰한 SEM 사진은 그림파일(JPG, TIF)로 저장하여 관리하였다.

- 1) 제주도에 서식하는 태형동물의 분류학적 연구.
- 2) 본 연구에서 관찰되지 않은 종 분석.
- 3) 항구, 조간대에 서식하는 태형동물 분석.
- 4) 수심과 수온에 따른 문섬의 태형동물 목록.
- 5) 부착기질에 대한 연구.

3. 개충의 형태 및 분류학적 형질

태형동물은 수많은 개충(zoid)들로 구성된 군체성 동물(colonial animal)이다. 군체의 형태는 원반형(discoid)과 피복형(encrusting), 가지형(branched), 처음에는 기충을 피복한 후 덩어리(massive)를 형성하는 기립형(erect) 등 다양하다(Figure 2). 해산 태형동물의 군체는 정상적인 기능을 할 수 있는 통상개충(autozoid)과 특수기능을 할 수 있는 이형개충(heterozoid)으로 이루어져 있다. 통상개충은 먹이활동을 하는 정상적인 개충을 말하며, 표면이 석회질화가 되어 있고 물이 들어오고 나갈 수 있는 구멍이 있다. 물에 의하여 조정낭의 압력이 증가와 감소로 인하여 촉수의 출입을 조정하며, 촉수의 출입은 개충의 끝 또는 앞쪽에 있는 개구를 통하여 이루어지며 키틴질의 구개가 개구를 여닫는다. 이형개충은 특수화된 형태를 가지면서 특수 기능을 수행하는 개충으로 조두체와 빈개충이 있다. 조두체는 각 개충의 방어와 청소를 담당한다(Figure 2).



Figure 1. Collection localities in Jeju Island.

1. 직구도(Jikgudo); 2. 수령섬(Suryeongseom); 3. 다무래미 (Damunemi-Damuraemi); 4. 예초리(Yechori); 5. 절명이(Jeolmyeongi); 6.

제주항(Jeju port); 7. 북촌리(Bukchonri); 8. 김녕항(Gimnyeong port); 9. 행원리(Haengwonri); 10. 종달두문포(Jongdaldumunpo); 11. 우도(Udo); 12. 성산포(Seongsanpo); 13. 숲섬(Supseom); 14. 문섬(Munseom); 15. 서귀포항(Seogwipo port); 16. 범섬(Beomseom); 17. 강정(Gangjeong); 18. 화순항(Hwasun port); 19. 용머리해안(Yongmeori beach); 20. 송악(Songak); 21. 마라도(Marado); 22. 모슬포항(Moseulpo port); 23. 무릉리(Mureungri); 24. 비양도(Biyangdo).

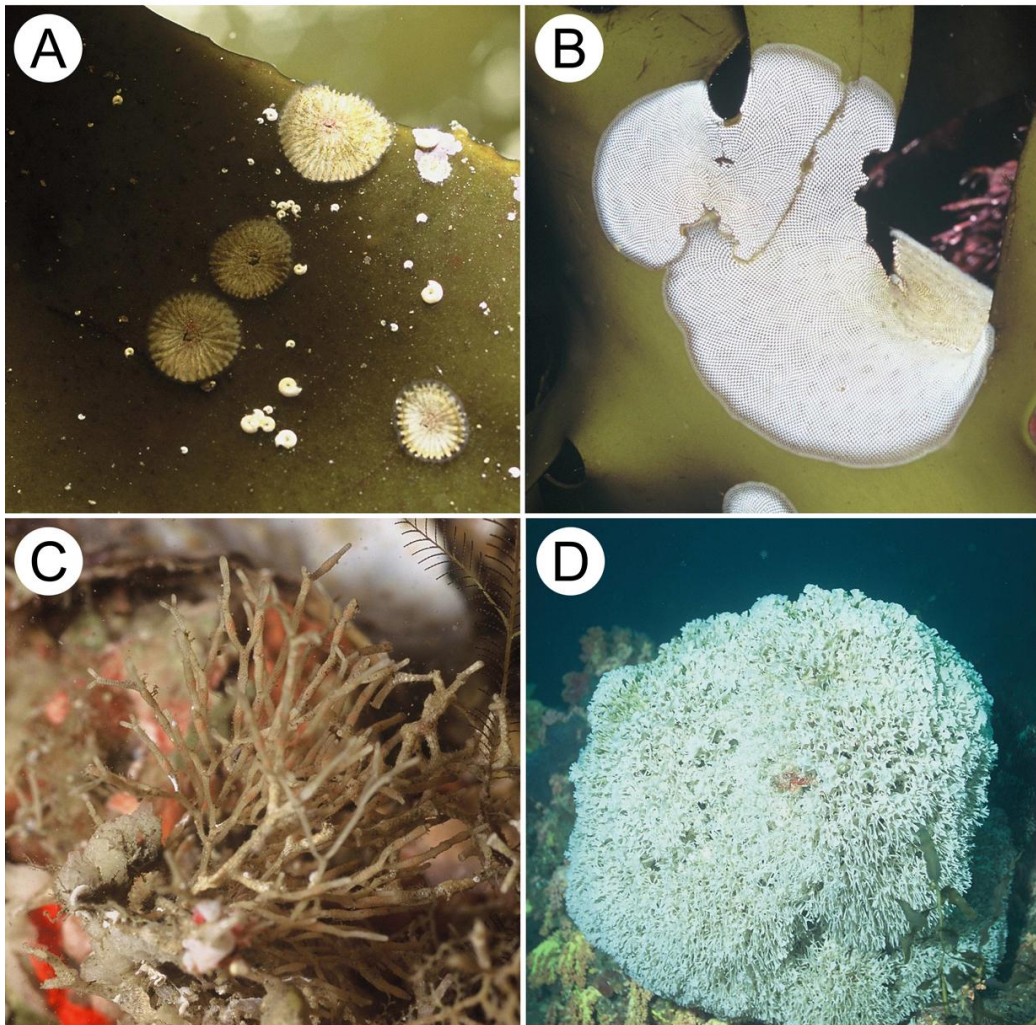


Figure 2. Various types of the colonies in Bryozoa.

- A. 원반형(discoid): 풀크라관이끼벌레 B. 피복형(encrusting): 관막이끼벌레
C. 가지형(branched): 마디이끼벌레 D. 기립형(erect): 두겹막이끼벌레.

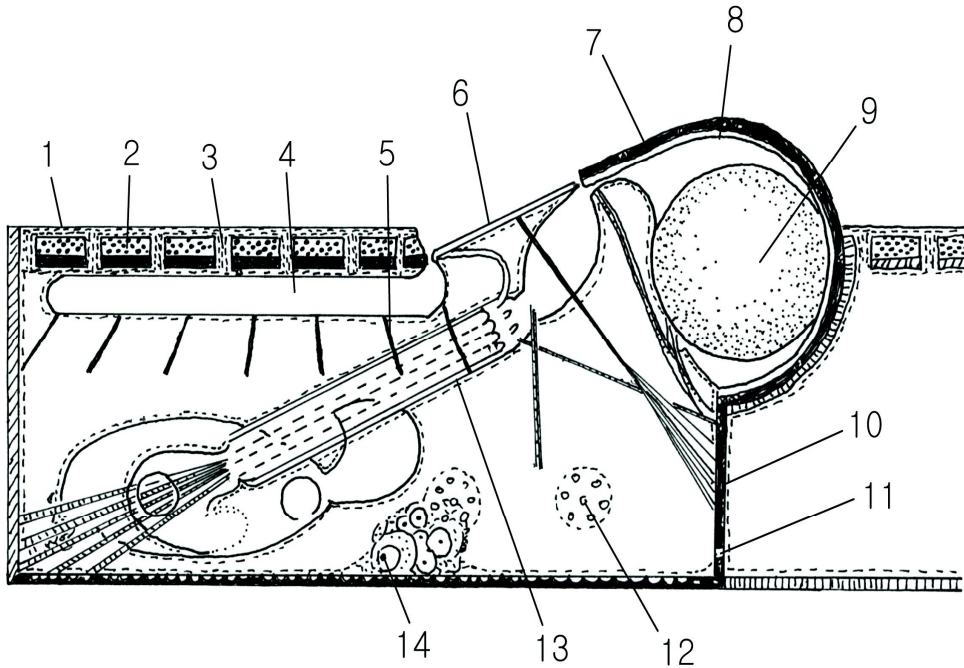


Figure 3. Morphology of autozooidis in Bryozoa.

1. 각피(cuticle) 2. 체벽상강(hypostegal coelom) 3. 헛구멍(pseudopore) 4. 조정낭(ascus) 5. 측근(parietal muscle) 6. 구개(operulum) 7. 외난실(ectooecium) 8. 내난3실(entooecium) 9. 배(embryo) 10. 가로벽(transverse wall) 11. 개충간 구멍(interzooidal pore) 12. 격벽(septum) 13. 촉수초(tentacular sheath) 14. 난소(ovary) (참고. Seo, 2005).

III. 결과

1. 제주도의 해산 태형동물 목록

Phylum Bryozoa Ehrenberg, 1831 태형동물문

Class Stenolaemata Borg, 1926 협후강

Order Cyclostomata Busk, 1852 원구목

Suborder Tubuliporina Hagenow, 1851 관이끼벌레아목

Family Tubuliporidae Lamarck, 1816 관이끼벌레과

Genus *Tubulipora* Lamarck, 1816 관이끼벌레속

1. *Tubulipora pulchra* MacGillivray, 1885 폴크라관이끼벌레

Tubulipora pulchra MacGillivray, 1885: 95; Robertson, 1910a: 250–252, pl. 23, figs. 32–35; Okada, 1917d: 347; 1928: 489, pl. 24, fig. 3, text-fig. 6a, e; O'Donoghue and O'Donoghue, 1925: 95; 1926: 71; Sakakura, 1935b: 116; Okada and Mawatari, 1937: 445, pl. 11, fig. 9; 1938: 447; Mawatari, 1952c: 262; 1955: 46; 1963: 5; Osburn, 1953: 653, pl. 68, figs. 2–4; Mawatari and Mawatari, 1974a: 350, pl. 28, fig. 2; Rho and Seo, 1986: 37, pl. 1, figs. 1–4, pl. 2, figs. 1, 2; Lu, 1991: 32, pl. 1, fig. 13, pl. 3, fig. 8; Seo, 2005: 275, pls. 7, 8.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Jeju port, 15 Aug. 2008 (B.S. Min); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang).

Substratum. Stones and lobe of seaweed.

Remarks. This species is characteristic in having the dorsal attachment process to the substratum and attachment disk with the marginal square processes (Seo, 2011), and is found only from Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (South China Sea, West coast of North America, Australia).

Suborder Articulata Busk, 1859 관절이끼벌레아목

Family Crisiidae Johnston, 1838 수염이끼벌레과

Genus *Crisia* Lamouroux, 1812 수염이끼벌레속

2. *Crisia eburneodenticulata* Smitt, 1865 흰수염이끼벌레

Crisia eburneodenticulata Smitt, 1865: 5, pl. 6; Waters, 1916: 474, pl. 16, figs. 4, 5; Okada, 1917c: 337; 1928: 486; 1933: 216; Calvet, 1927: 37; Borg, 1933: 517; Okada and Mawatari, 1935: 143; 1938: 446; Mawatari, 1952c: 262; 1955: 45; 1963: 5; Kluge, 1975: 179, fig. 75; Gostilovskaya, 1962: 70; Androsova, 1965: 80; Kim and Rho, 1969: 75; Mawatari and Mawatari, 1973: 96, text-fig. 2, pl. 1, figs. 5, 6; Rho and Chung, 1975: 49, pl. 1, figs. 1-2; D'Hondt, 1977a: 62; Rho *et al.*, 1979: 112; Rho and Lee, 1980: 118; Rho and Kim, 1981: 60; Lu, 1991: 30, pl. 1, fig. 3; Song and Won, 1992: 123; Seo, 1998a: 208; 1998b: 417; 2005: 277, pls. 9, 10A.; Gong and Seo, 2003: 4.

Material examined. Mureungri at Daejeongeup 8 May 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan.

2010 (B.S. Min, and H.J. Yang); Songak, 15 May 2010 (J.J. Sim, and B.I. Kim); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min, H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Stones, worm tubes, sponges, anthozoans, tangled with a hydrozoans and seaweeds.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (South China Sea, Philippine, Australia), Atlantic Ocean (North Sea, Mediterranean Sea, Naples, Monaco), Arctic Ocean (Northern Sea of USSR).

***3. *Crisia* n. sp. (Figure 4)

Material examined. Marado Island, 14 Nov. 2010 (B.S. Min); Munseom Island, 5 Oct. 2009; Munseom Island, 5 Oct. 2009; 19 Jan. 2010; Supseom Island, 20 Nov. 2009.

Substratum. Sponges, anthozoans and seaweeds.

Description. Colony free from Sponges, anthozoans and seaweeds, but entangled in substrata and covering entire colony of anthozoans and seaweeds, looking like wad of cotton or thin thread, erect or rather, fluffy. Colony erect, attached to substratum with numerous rootlets, thin and bend slightly forward. Internode slightly wide and flat, narrowing proximally (1671–2105 μm long). One internode of 14–24 zooids (14–16 in most). Branch ramified at 6–12th zooids (6–10th in most). Zooids (276–421 μm long and 131–151 μm wide) fused with each other proximally with

single orifice(57–63 μm long and 50–76 μm wide) protruding like short tube with sharp lateral process. Joints black. Gonozooids not observed.

Substratum. Sponges, anthozoans and seaweeds.

Distribution. Korea (Jeju Island).

Remarks. *Crisia* n. sp. is be similar to *Crisia eburneodenticulata* Smitt, 1865. However, this new species is clearly characterized with hooks.

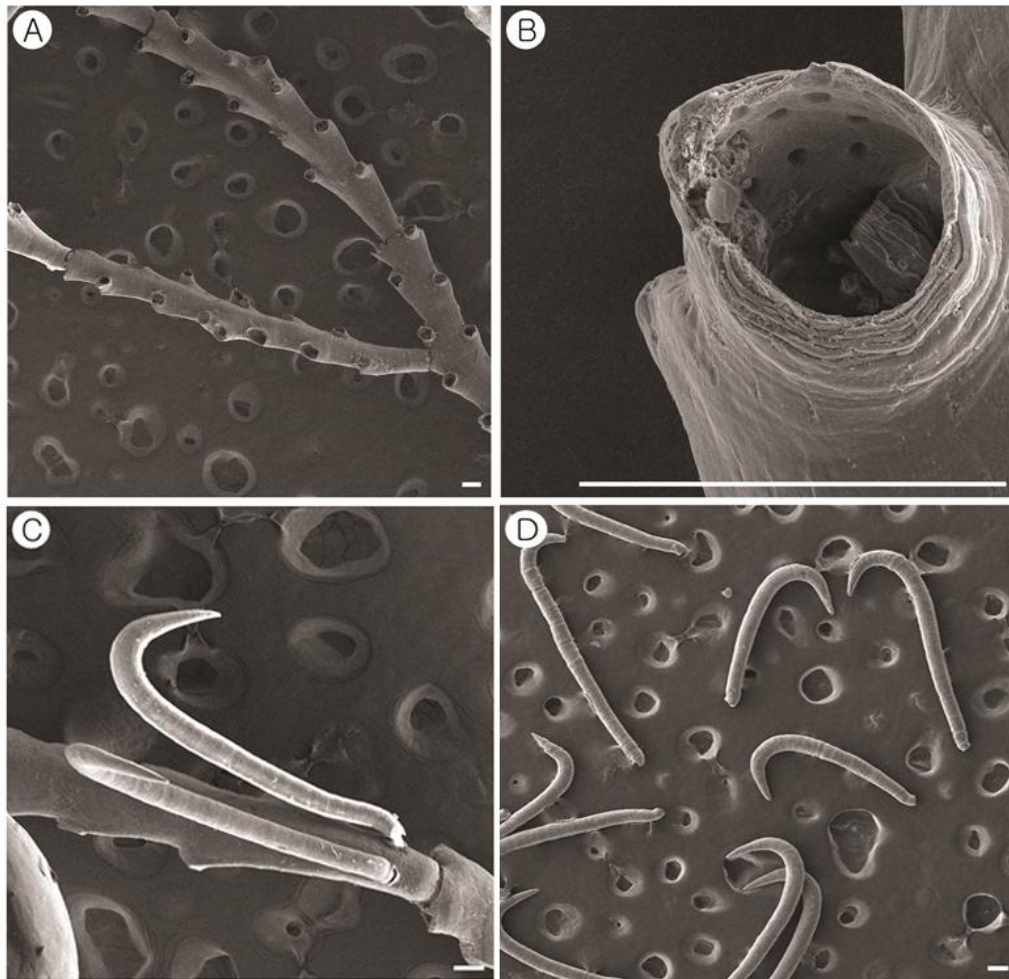


Figure 4. *Crisia* n. sp. A, zooids; B, orifice; C, hooks of basal; D, hooks. Scale bars = 100 μm (A–D).

Suborder Cancellata Gregory, 1896

Family Horneridae Smitt, 1867

Genus *Hornera* Lamouroux, 1821

****4. *Hornera lichenoides* (Linnaeus, 1758) (Figure 5)**

Millepora lichenoides Linnaeus 1758: p. 791.

Hornera lichenoides: Hincks 1880: p. 468, pl. 67, figs. 1–5; Marcus 1940: p. 78; Kluge 1962: p. 165; 1975: p. 193; Hayward & Ryland, 1985: 116–118, figs. 41a–d.

Material examined. Marado Island. 14 Nov. 2010; Biyangdo Island, 24 Sep. 2011.

Substratum. Rocks.

Description. Colony erect, robust, richly branched, heavily calcified, attached by a thickened encrusting base, the stem up to 10–50 mm diameter; commencing as a flat or curved two-dimensional fan, developing later as a complex, reticulate three-dimensional form, often exceeding 60–80 mm high, with equivalent or larger horizontal spread. Branches cylindrical in small colonies markedly tapered distally in larger colonies, dividing dichotomously at intervals of 1–3mm; initially each ramus of equal thickness, with further growth one becomes predominant, constituting the main leader, growing upward and outward, the other filling in spaces in the network. Anastomoses occur rarely. Apertures of autozooids face outward, away from axis of colony. Boundaries between autozooids unclear except at growing tip, frontal surface of colony large pores. Basal surface with pores. Gonozooids sporadically distributed on basal surface, large or long, conspicuous calcification, densely perforated.

Distribution. Korea (Jeju Island). Atlantic Ocean (Norway), Arctic Ocean (British waters, Siberia to Greenland)

Remarks. *Hornera lichenoides* is a boreal–arctic species and in British waters is known to occur only off the Shetland Isles and the Hebrides. Ryland (1963) reported it from depths greater than 50 m in western Norway. In arctic waters it is widespread from Siberia to Greenland (Kluge, 1975).

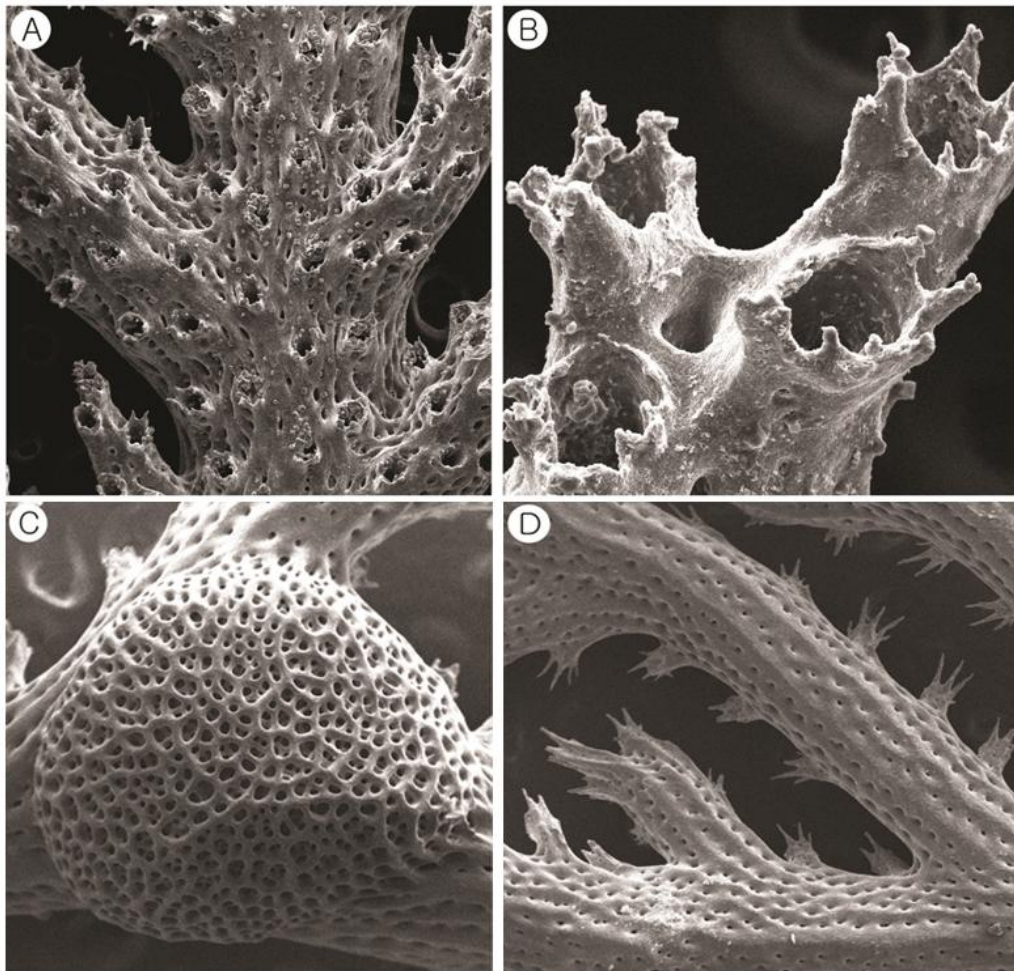


Figure 5. *Hornera lichenoides*. A, zooids; B, orifice; C, ovicells; D, basal surface.

Suborder Rectangulata Waters, 1887 직사각이끼벌레아목

Family Lichenoporidae Smitt, 1866 접시이끼벌레과

Genus *Disporella* Gray, 1848 접시이끼벌레속

5. *Disporella novaehollandiae* (d'Orbigny, 1853) 노바접시이끼벌레

Discoporella novaezelandiae Busk, 1875: 32, pl. 30, fig. 2.

Lichenopora novaezelandiae: Waters, 1887c: 261; Ortmann, 1890: 65, pl. 2, fig. 10; Jullien and Calvet, 1903: 164; Harmer, 1915: 155, pl. 12, figs. 6–11; Okada, 1917a: 355; 1923: 220; Livingstone, 1927: 69; Marcus, 1937b: 198, fig. 6; Mawatari, 1952c: 262; 1955: 50; Osburn, 1953: 705, pl. 74, fig. 4; Soule, 1963: 12; Gordon, 1967: 63; Rho and Kim, 1981: 60, pl. 1, fig. 5; Hayward and Cook, 1983: 137; Rho and Seo, 1986: 33; Bergey and Denning, 1987: 430; Cuffey and Cox, 1987: 88; Ryland and Hayward, 1992: 227, pl. fig. 2a, b; Seo, 2005: 279, pls. 10B–12.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Jongdaldumunpo, 16 Aug. 2008 (B.S. Min); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Seaweed, cement test panels.

Remarks. Colonies encrust the seaweed.

Distribution. Korea (East Sea, Jeju Island), Japan, Pacific Ocean (Strait of Korea, Gulf of California, Australia, Great Barrier Reef, New Zealand), Indian Ocean, Atlantic Ocean (South Africa), Cosmopolitan.

Genus *Patinella* Gray, 1848

6. *Patinella radiata* (Audouin, 1826) 꽃접시이끼벌레

Melobesia radiata Audouin, 1826: 235, pl. 6, fig. 3.

Lichenopora radiata: Hincks, 1880a: 476–479, pl. 68, figs. 9, 10; Ortmann, 1890: 64, pl. 4, fig. 23; Jullien and Calvet, 1903: 164; Norman, 1909: 281; Robertson, 1910a: 262, pl. 24, figs. 46, 47; Barroso, 1915: 420; Okada, 1917a: 355; 1928: 494, text-fig. 11; Marcus, 1920: 98; O'Donoghue and O'Donoghue, 1923: 157; 1926: 74; O'Donoghue, 1924: 26; Canu and Bassler, 1925: 71; 1928b: 163, pl. 29, figs. 1, 2; 1929a: 556, pl. 88, figs. 1–6; Livingstone, 1927: 69; Sakakura, 1935a: 42; Okada and Mawatari, 1935: 146; 1938: 447; Osburn, 1940: 334; 1947a: 6; Mawatari, 1952c: 262; 1955: 50; 1963: 5; Balavoine, 1959: 263, pl. 1, figs. 4–5; Kluge, 1975: 202, fig. 87; Fey, 1971: 217; Hayward, 1971: 487; 1976a: 17; Mawatari and Mawatari, 1974a: 355, pl. 30, fig. 1; Geraci, 1974: 53; Unsal, 1975: 45; Brood, 1976: 299, fig. 17 H, I; Rho and Chung, 1975: 49, pl. 2, fig. 4; D'Hondt, 1976: 553; 1977a: 62; 1986b: 707; Rho and Kim, 1981: 60; Ziko, 1985: 19, pl. 4, figs. 1–5; Rho and Seo, 1986: 33; 2005: 280, pls. 13; Alvarez, 1990: 28; 1993: 262; Lu, 1991: 37, pl. 3, fig. 7; Gong and Seo, 2003: 4.

Material examined. Gimnyeong port, 17 Aug. 2009 (B.S. Min, H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Jeju port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Unknown.

Remarks. Colonies encrust the seaweed. It occurs widely throughout the Mediterranean but reports from elsewhere should be regarded doubtfully (Borg, 1944). It is unlikely that Kluge's (1962) record from arctic waters refers to this species.

Distribution. Korea (East Sea, South Sea, Jeju Island), Japan, Pacific

Ocean (Sout China Sea, Philippines, West coast of North America, Australia, New Caledonia), Indian Ocean (SE Africa), Atlantic Ocean (Gulf of Mexico, Caribbean Sea, Porto Rico, United Kingdom, Lundy, Mediterranean Coast, Madeira), Arctic Ocean (Northern Sea of USSR), Cosmopolitan.

Class Gymnolaemata Allman, 1856 나후강

Order Ctenostomata Busk, 1852 즐구목

Suborder Victorellina Jebram, 1973 빅토르이끼벌레아목

Superfamily Victorelloidea Hincks, 1880 빅토르이끼벌레상과

Family Nolellidae Harmer, 1915 진흙이끼벌레과

Genus *Nolella* Gosse, 1855 진흙이끼벌레속

7. *Nolella stipata* Gosse, 1855 진흙이끼벌레

Cylindroecium papuense Busk, 1886a: 38, pl. 8, fig. 2.

Nolella papuensis: Harmer, 1915: 53, pl. 4, figs. 10-20; Livingstone, 1927: 66; Silén, 1942c: 23; Rho and Kim, 1981: 61, pl. 4, figs. 1, 2; Rho and Seo, 1986: 33; Seo, 2005: 283, pl. 14, Fig. 23.

Material examined. Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Worm tubes.

Remarks. The morphology of this species is not fixed because the zooids are coated with detrital particles and shrunken a lot (Seo, 2011). In case of other areas, this species is a fouling bryozoan attaching the ropes hanging on the wharf.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Makassar, Borneo, Australia), Indian Ocean (Flores).

Suborder Vesicularina Johnston, 1847 주머니이끼벌레아목

Superfamily Vesicularioidea Johnston, 1847 주머니이끼벌레상과

Family Vesiculariidae Johnston, 1847 주머니이끼벌레과

Genus *Amathia* Lamouroux, 1812 나선주머니이끼벌레속

8. *Amathia convoluta* Lamouroux, 1816 메꽃주머니이끼벌레

Amathia convoluta Lamouroux, 1816: 160; Harmer, 1915: 64, pl. 5, figs. 1-5; Livingstone, 1927: 66; Hastings, 1932: 407; Marcus, 1922a: 443; 1937a: 136, pl. 27, fig. 73; Osburn, 1940: 339; 1944: 23, fig. 13; Maturo, 1957: 22, figs. 10, 11; Soule, 1963: 16; Shier, 1964: 650; Rho and Chung, 1975: 50, pl. 3, figs. 7, 8; Rho and Kim, 1981: 61; D'Hondt, 1983d: 65; ; Seo, 2005: 287, pl. 15, Fig. 24.

Distribution. Korea (Jeju Island), Pacific Ocean (Gulf of California, Australia, Great Barrier Reef), Atlantic Ocean (Chesapeake Bay, North Carolina, Florida, Porto Rico, Brazil).

9. *Amathia distans* Busk, 1886 나선주머니이끼벌레

Amathia distans Busk, 1886a: 33, pl. 7, figs. 1-1c.; Waters, 1910: 243, pl. 24, fig. 7; 1914: 848; Harmer, 1915: 68, pl. 5, figs. 6, 7; Marcus, 1937b: 134, pl. 27, fig. 72; 1941b: 28, fig. 29; 1949: 2; 1955: 313; Okada and Mawatari, 1938: 446; Osburn, 1940: 339; 1947a: 7; Silén, 1941: 27; Mawatari, 1952c: 262; 1963: 5; Prenant and Bobin, 1956: 283, fig. 127; Maturo, 1957: 23, fig. 12; Soule, 1963: 17; Gordon, 1967: 48, fig. 5; Soule and Soule, 1968: 209; Cook, 1968a: 228; 1985: 197; Kim and Rho, 1969: 75; Hayward, 1971: 488; Rho and Chung, 1975: 50, pl. 2, figs. 5, 6; D'Hondt, 1975b: 623; 1983d: 65; 1985d: 408; 1995: 13; Kim *et al.*, 1978: 107; Rho and Lee, 1980: 118; Rho and Kim, 1981: 61; Winston, 1982: 110, fig. 10; Rho and Seo, 1986: 33; Je *et al.*, 1997: 49; Seo, 1998a: 208; 1998b:

417; Gong and Seo, 2003: 5; 2004: 12; 2005: 289, pls. 16, 17, Fig. 25.

Material examined. Jeju port, 15 Aug. 2008 (B.S. Min); Gimnyeong port, 15 Aug. 2008 (B.S. Min); Seogwipo port, 15 Aug. 2008 (B.S. Min); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (B.S. Min); Biyangdo Island, 24 Sep. 2011 (J.E. Seo, and B.S. Min); Beomseom Island, 3 Jun. 2015 (B.S. Min, and K.J. Jung); Haengwon. 4 Jun. 2015 (B.S. Min, and K.J. Jung); Gapado Island, 5 Jun. 2015 (J.J. Sim, and B.I. Kim); Marado Island, 4 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Seaweed, worm tubes. rope.

Remarks. This is also a fouling bryozoan attaching to the fishing nets and rope.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Gulf of California, Hawaii, Australia, New Zealand, Polynesia), Indian Ocean (India, Red Sea, Zanzibar), Atlantic Ocean (North Carolina, Florida, Caribbean Sea, Porto Rico, Brazil, United Kingdom, France, Dakar, Africa).

Genus *Vesicularia* Thompson, 1830 주머니이끼벌레속

10. *Vesicularia harmeri* Silén, 1942 주머니이끼벌레

Vesicularia harmeri Silén, 1942c: 25, text-figs. 18-20; Rho and Kim, 1981: 62, pl. 3, figs. 2-4; Seo, 2005: 292, pl. 18, Fig. 27.

Distribution. Korea (Jeju Island,), Japan.

Suborder Stoloniferina Ehlers, 1876 줄기이끼벌레아목

Superfamily Valkerioidea Jebram, 1973 가동이기벌레상과

Family Mimosellidae Hincks, 1877 총상이기벌레과

Genus *Bantariella* Jebram, 1973 반타이기벌레속

11. *Bantariella bocki* (Silen, 1942) 보키반타이기벌레

Mimosella bocki Silén, 1942: 29, figs. 21-24; Banta, 1968: 251; D'Hondt, 1983: 77, fig. 43F, G.

Material examined. Munseom Island, 26 Aug. 2008 (J.R. Lee); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 7 May 2009 (B.S. Min); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang).

Substratum. Black corals, such as *Antipathes japonica* and *Antipathes lata*, and sea fans.

Remarks. The colonies were picked up from the black corals as if they were some wads of cotton, because they have entirely covered and concealed the surfaces of the black corals and sea fans (Ji Eun Seo, Seung Jik Suh and Bum Sik Min, 2009). In winter the lowest seawater temperature of Munseom Island is 14°C and the low water temperature may lead to the highest invasion rates of *B. bocki* on the black corals (Moon and Song, 2007). The correlation between *B. bocki* and seawater temperature will need further review (Ji Eun Seo, Seung Jik Suh and Bum Sik Min, 2009). This species is found only from the Jeju Island.

Distribution. Korea (Jeju Island; shore of Seogwipo), Japan (Bonin Islands southward far away from main land of Japan).

Genus *Mimosella* Hincks, 1851 총상이기벌레속

12 *Mimosella verticillata* (Heller, 1867) 총상이끼벌레

Valkeria verticillata Heller, 1867: 129, pl. 6, fig. 4.

Mimosella verticillata: Harmer, 1915: 81: 7, figs. 8-10; Marcus, 1937a: 243, fig. 32; Silén, 1941: 28; Prenant and Bobin, 1956: 264, fig. 117; Hayward, 1976a: 14, fig. 3; D'Hondt, 1979g: 461; 1983d: 65; 1988b: 514; Rho and Kim, 1981: 62, pl. 3, figs. 7-9; Rho and Seo, 1986: 33; Limousin, 1986: 210, fig. 41; Alvarez, 1992: 279; Seo, 2005: 283, pl. 19, Fig. 28.

Distribution. Korea (East Sea, Jeju Island), Japan, Pacific Ocean (Bonin Islands), Indian Ocean (Indonesia), Atlantic Ocean (United Kingdom, Lundy, France, Spain, Adriatic Sea, Marmara Sea, Saint Helena).

Order Cheilostomata Busk, 1852 순구목

Suborder Inovicellata Jullien, 1888 무난실아목

Superfamily Aeteoidea Smitt, 1867 자루이끼버렐상과

Family Aeteidae Smitt, 1867 자루이끼벌레

Genus *Aetea* Smitt, 1867 자루이끼벌레속

13. *Aetea anguina* (Linné, 1758) 자루이끼벌레

Sertularia anguina Linné, 1758: 816.

Aetea anguina: Hincks, 1880a: 4, pl. 1, figs. 4, 5; Busk, 1884: 2; Jullien and Calvet, 1903: 122; Robertson, 1905: 244, pl. 4, figs. 1-4; Norman, 1909: 283; Osburn, 1910: 220, pl. 21, fig. 14, 14a; 1940: 345, pl. 1, fig. 8; 1944: 28; 1947a: 8; 1950: 11, pl. 1, fig. 3; Thornely, 1916: 159; 1924: 6; Marcus, 1920: 66; 1937a: 199; 1937b: 26, pl. 5, fig. 8; 1940: 104, fig. 55; 1941b: 15, fig. 3; 1950: 2; 1955: 278; Canu and Bassler, 1920: 179, pl. 32, figs. 2, 3; 1923: 49, pl. 24, fig. 15; Harmer, 1926: 194, pl. 13, figs. 3, 4; O'Donoghue and O'Donoghue, 1926: 85; Okada, 1929: 16, text-fig. 4;

Livingstone, 1929: 60; Hastings, 1930: 702; 1932: 408; 1943: 471, fig. 57 A-C; Stach, 1937: 377; Silén, 1941: 12; 1954a: 10; O'Donoghue and Watteville, 1944: 409; Lacourt, 1949: 291; Mawatari, 1952c: 262; 1956: 115, fig. 1a; 1963: 6; 1973a: 412, fig. 1; Maturo, 1957: 32, fig. 24; Vigeland, 1958: 4; Soule, 1959: 2; Shier, 1964: 606; Rogick, 1964: 176; Prenant and Bobin, 1966: 80, figs. 17, 18; Gordon, 1967: 49, fig. 7; Braga, 1968: 7; Cook, 1968a: 136, fig. 2D; 1985: 81; Fey, 1971: 195; Hayward, 1971: 481; 1976a: 2; 1995a: 52, fig. 46. Moyano G., 1973b: 5; Unsal, 1975: 39; Ryland and Hayward, 1977: 44, fig. 13; D'Hondt, 1979g: 459; 1982c: 11; 1987b: 45; 1988b: 514; 1991b: 20; Rho and Song, 1980: 149, pl. 1, figs. 1-3; Ambrogi, 1981: 74, fig. 24; Limousin, 1986: 236, fig. 53a; Lopez Gappa and Lichtschein, 1988: 95; 1990: 9; Rho and Seo, 1990: 147; Alvarez, 1991: 186; Seo, 1992: 143; 2005: 298, pl. 20; Song and Won, 1992: 123; Chae *et al.*, 2016: 553.

Material examined. Seogwipo port, 15 Aug. 2008 (B.S. Min); Munseom Island, 26 Aug. 2008 (J.R. Lee); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seogwipo port, 4 Jan. 2012 (Min and H.J. Yang); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Seaweed, hydrozoans, worm tubes, other bryozoan (*Amastigia xishaensis*) and tangled with bryozoan (*Crisia eburneodenticulata*, *Fenestrulina malusii*).

Remarks. In Korea, it is found from the South Sea and Jeju Island.

Common, widespread on all British coasts, and throughout the world except in polar waters (Ryland, and Hayward, 1977).

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (South China Sea, West coast of North America, Chile, Australia, Great Barrier Reef, New Zealand), Indian Ocean (Indies), Atlantic Ocean (East coast of North America, Caribbean Sea, Brazil to Patagonia, European Seas, North coast of Mediterranean Sea, Africa, Madeira, Nightingale Island), Antarctic, North America (fossil), Cosmopolitan.

Suborder Scrupariina Silén, 1941

Superfamily Scruparioidea Gray, 1848

Family Scrupariidae Busk, 1852

Genus *Scruparia* Oken, 1815

****14. *Scruparia ambigua* (d'Orbigny 1841) (Figure 6)**

Eucratea ambigua d'Orbigny 1841: pl. 3, figs 13–17.

Eucratea chelata var. *gracilis*: Hincks 1880: 14.

Scruparia ambigua: Hastings 1941: 465; Ryland 1965: 23; Prenant and Bobin 1966: 99; Ryland, and Hayward, 1977: 50, fig. 16; De Blauwe, 2009: 160, fotos 133–135.

Material examined. Munseom Island, 20 Apr. 2014 (B.S. Min).

Substratum. Bryozoan (*Brettia mollis*).

Description. Colony repent and erect, uniserial chains of autozooids. Repent chains branch by lateral budding; erect chains arise from an adnate zooid, and subsequently themselves branch by frontal budding. Zooids long and slender (375–437 μm long, 102–125 μm wide); with the oval frontal membrane (125–150 μm long, 72–90 μm wide) almost parallel

to the basal wall of the zooid. Reproductive zooids arising as frontal buds from encrusting or erect autozooids; frontal membrane of the reproductive zooid. Ovicell globular, cornu at the end (175–184 μm long, 138 μm wide), Ancestrula not observed.

Remarks. This species encrusts bryozoan (*Brettia mollis*). In Korea, it is found from the Jeju Island. In British coasts, Generally common on all coasts, and distributed throughout the world except in polar waters. Settlement has been recorded between June and October. Ancestrula not adhering directly to the substratum, but attached by the first two daughter zooids, which arise respectively as distal and frontal buds; from these in turn the characteristic budding pattern is established. And *S. ambigua*, found on algae, hydroids, bryozoans, stones and shells from the lower shore and shallow sublittoral down to 50 m or more (Ryland and Hayward, 1977). In New Zealand, Polypide with ten tentacles.

Distribution. Korea (Jeju Island). Pacific Ocean (New Zealand), Atlantic Ocean (British), Cosmopolitan.

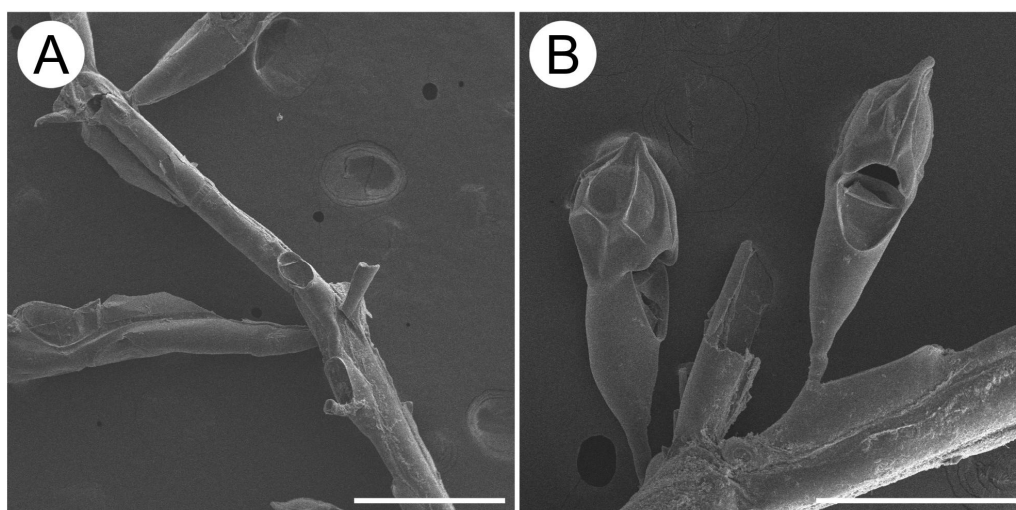


Figure 6. *Scruparia ambigua*. A, zooids; B, ovicells. Scale bars: A=500 μm ;

B=300 μ m.

Suborder Malacostega Levinsen, 1909 연한이끼벌레아목

Superfamily Membraniporoidea Busk, 1854 막이끼벌레상과

Family Membraniporidae Busk, 1854 막이끼벌레과

Genus *Biflustra* d'Orbigny, 1852 두겹막이끼벌레속

15. *Biflustra crenulata* (Okada, 1923) 두겹막이끼벌레

Membranipora crenulata Okada, 1923: 224, fig. 24.

Membranipora savartii: Rho and Seo, 1985: 54, pl. 1, figs. 1-3, pl. 2, figs. 1, 2; Rho and Seo, 1990: 147; Liu, 1991: 57; Seo, 2005: 303, pls. 24B-26A.

Biflustra crenulata: Tilbrook, 2006, pl. 2B; Chae *et al.*, 2016: 553.

Material examined. Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Mureungyeonan, 16 May 2010 (J.J. Sim, and B.I. Kim); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Rocks, cement test panels and stones.

Remarks. This species is a fouling bryozoan and is easily identified with the dentate process arising from the cryptocyst toward the opesia (Seo, 2010).

Distribution. Korea (South Sea, Jeju Island and Yellow Sea), Cosmopolitan.

16. *Biflustra perfragilis* MacGillivray, 1881 유연두겹막이끼벌레

Biflustra perfragilis MacGillivray, 1881: 27; Chae *et al.*, 2016: 553.

Amphiblestrum perfragile: Ortmann, 1890: 29, pl. 2, fig. 5.

Membranipora perfragilis: Osburn, 1950: 24, pl. 2, fig. 8: Rho and Seo, 1990: 147; Seo, 1998a: 208; Gong and Seo, 2003: 5; Seo, 2005: 302, pls. 21B-24A.

Material examined. Munseom Island, 26 Aug. 2008 (J.R. Lee); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 4 Jan. 2012 (Min and H.J. Yang).

Substratum. Seaweeds stem.

Remarks. This species encrusts corals and the stem of seaweeds, and is the typical fouling bryozoan frequently attaching to ropes hanging on the wharf and aquaculture cages. The cryptocyst in the specimen from California (Osburn, 1950) was narrower than the one of Korean specimens. There was even no cryptocyst in Japanese specimen by the illustration of Ortmann (1890). Besides, incipient interzooecial avicularium was found in the specimen from California, even though it appeared to be rare. However, no avicularim was seen in Korean specimens. Thus, Korean specimens need to be reviewed, and then can be described as a new species. (Seo, 2010).

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (California, Australia).

Genus *Membranipora* Blainville, 1830 막이끼벌레속

*17. *Membranipora serrilamella* Osburn, 1950 톱니막이끼벌레

Membranipora serrilamella Osburn, 1950: 22, pl. 1, figs. 12, 13; Mawatari, 1956: 115; Lu, 1991: 38, pl. 4, fig. 11; Soule et al., 1995: 39, pl. 4 A-D.

Membranipora serrata: Robertson, 1908: 268, pl. 16, figs. 20, 21, 21a; Rho and Seo, 1990: 147, pl. 1, figs. 1, 2; 2005: 304, pls. 26B, 27.

Material examined. Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Seaweeds (*Ecklonia cava*).

Remarks. This species is thin than the other species of *Membranipora* in zooids. *Membranipora serrilamella* is similar to *Membranipora tuberculata* in terms of forming the thin and broad incrustation on the frond and stem of kelp. However, the former is easily distinguishable from the latter by having much smaller tubercles on gymnocyst.

Distribution. Korea (South Sea, Jeju Island and Yellow Sea), Japan, Pacific Ocean (South China Sea, Queen Charlotte Island, Vancouver, British Columbia to Southern California, Panama).

18. *Membranipora tuberculata* (Bosc, 1802) 관막이끼벌레

Flustra tuberculata Bosc, 1802: 143.

Nichtina tuberculata: Canu and Bassler, 1929a: 80, pl. 5, fig. 6; Okada, 1934b: 3, pl. 1, fig. 1.

Nitscheina tuberculata: Calvet, 1931: 50.

Membranipora tuhuelcha: Robertson, 1908: 265, pl. 15, figs. 16, 17, pl. 16, fig. 18.

Membranipora tuberculata: Thornely, 1907: 185; Norman, 1909: 286;

Marcus, 1922b: 14, fig. 8a, b; 1937b: 33, pl. 5, fig. 12; 1939: 124, pl. 6, fig. 4A, B; 1955: 279; Osburn, 1940: 349; 1944: 30, fig. 19; 1947a: 9; 1950: 23, pl. 2, figs. 4-6; Silén, 1941: 17, figs. 12, 13, pl. 1, fig. 1; Rogick and Croasdale, 1949: 63; Mawatari, 1952c: 262; 1963: 6; 1974a: 23, fig. 2, pl. 2, figs. 1-4; Shier, 1964: 609; Lagaaij, 1952: 17, pl. 1, figs. 1, 2; Maturo, 1957: 33, figs. 25, 26; Soule and Duff, 1957: 88; Balavoine, 1959: 263; Soule, 1959: 4; Androsova, 1963: 22, pl. 1, fig. 1; Rogick, 1964: 177; Prenant and Bobin, 1966: 115, fig. 29; Moyano G., 1966: 8; 1973b: 4; 1991: 314; Powell, 1967a: 164, pl. 1, fig. 2; Cook, 1968a: 138, pl. 9, fig. d; 1968b: 120, pl. 2, figs. C, D, text-fig. 1; 1985: 82; Pinter, 1969: 204; Reider and D'Hondt, 1976: 843; Banta and Carson, 1977: 385, fig. 2A; Banta, 1980: 369, fig. 24.19; D'Hondt, 1980: 758; 1981b: 9; 1985c: 42; 1985d: 408; 1991a: 163; 1995: 13; Rho and Song, 1980: 149, pl. 2, figs. 4, 5; Winston, 1982: 119, fig. 27; Gordon, 1984: 24, pl. 1, A; Rho and Seo, 1986: 34; 1990: 147; Liu, 1992: 115; Song and Won, 1992: 123; Soule *et al.*, 1995: 37, pl. 3 A-D; Seo, 1992: 143; 1998a: 208; 1998b: 417; 2005: 305, pls. 28-30A; Gong and Seo, 2003: 5; Chae *et al.*, 2016: 553.

Material examined. Yongmeori coast, 15 Aug. 2008 (B.S. Min); Gimnyeong port, 15 Aug. 2008 (B.S. Min); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Chagwido Island, 7 Jan. 2009 (H.S. Kim); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Mureungri at Daejeongeup 8 May 2009 (B.S. Min and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov.

2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Biyangdo Island, 25 Sep. 2011 (J.E. Seo, and B.S. Min); Hahyo port, 5 Jan. 2012 (B.S. Min and H.J. Yang); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Seaweeds(*Ecklonia cava* and *Sargassum*), sponges and stones.

Remarks. This species is usually encrusting algae (*Ecklonia cava* and *Sargassum* spp.), and is fouling species attached to buoys and plastic pipes. This inhabits mainly the temperate, subtropical and tropical area. *Membranipora tuberculata* older zooids with the prominent tubercles by heavy calcification (Seo, 2010).

Distribution. Korea (East Sea, South Sea, and Jeju Island), Japan, Pacific Ocean (South China Sea, Philippines, Vancouver I. to Peru, Hawaii, New Zealand, Polynesia), Indian Ocean (India, Red Sea), Atlantic Ocean (Patagonia to North America, North Sea, Europe from Spain to Norway, Mediterranean Sea, Egypt, Madeira, Africa coast), Cosmopolitan.

Suborder Flustrina Smitt, 1868 고요이끼벌레아목

Superfamily Calloporoidea Norman, 1903 단단이끼벌레상과

Family Chaperiidae Jullien, 1888 달음판이끼벌레과

Genus *Crassimarginatella* Canu, 1900 연후이끼벌레속

****19. *Crassimarginatella kumatae* (Okada, 1923) (Figure 7)**

Membranipora kumatae Okada, 1923: 223, figs 19, 20.

Crassimarginatella kumatae: Harmer 1926: 224; Silén 1941: 24, fig. 19;

Androsova 1958: 105, fig. 14; Mawatari and Mawatari 1980: 62, fig. 17 (cum syn.); Hirose 2010: 31, pl. 50A, B.

Crassimarginatella crassimarginata: Rho and Seo 1986: 37, pl. 3; Seo 2005: 313, pls 33B, 34; Seo 2010: 26, fig. 10 (non *Membranipora crassimarginata* Hincks, 1880).

Material examined. Seogwipo, 19 Oct. 1973.

Substratum. Bryozoan (*Brettia mollis*).

Description. Colony encrusting, up to about 40 mm diameter. Autozooids (265 - 402 μm long, 152 - 308 μm wide) longer and more elongate-oval of colony. Gymnocyst smooth, moderately well developed proximally, narrowing laterally and especially distally. Cryptocyst narrow, granular, of even width around the entire opesia (189 - 271 μm long, 137 - 179 μm wide). Periancestrular zooids with 4 - 5 spines. Avicularium (183 μm long, 163 μm wide) subvicarious, less than half the size of an autozoid, surrounded by 4 autozooids. Ooecium (136 - 156 μm long, 152 - 197 μm wide) hyperstomial, ectooecium mostly membranous except for a narrow circumferential band of calcification. Ancestrula (142 μm long, 129 μm wide) circular, with large round opesia and 11 gymnocystal spines.

Remarks. Rho and Seo (1986) first recorded this species in Korean waters from Jeju Island, South Sea, as *Crassimarginatella crassimarginata*. The Korean species is *C. kumatae*, first described from the Straits of Korea (Okada 1923). *C. crassimarginata* species identification is mistaken. The Korean species, *C. crassimarginata* change to *C. kumatae*. *C. kumatae* most resembles its congener *C. crassimarginata* similar, For example, *C. kumatae* has pivot bar complete,

whereas, *C. crassimarginata* is not complete pivot bar.

Distribution. Korea (South Sea, Jeju Island and traits of Korea), Japan: SSagami Bay, Ogasawara (Bonin) Islands; 27 - 300 m on various hard substrata.

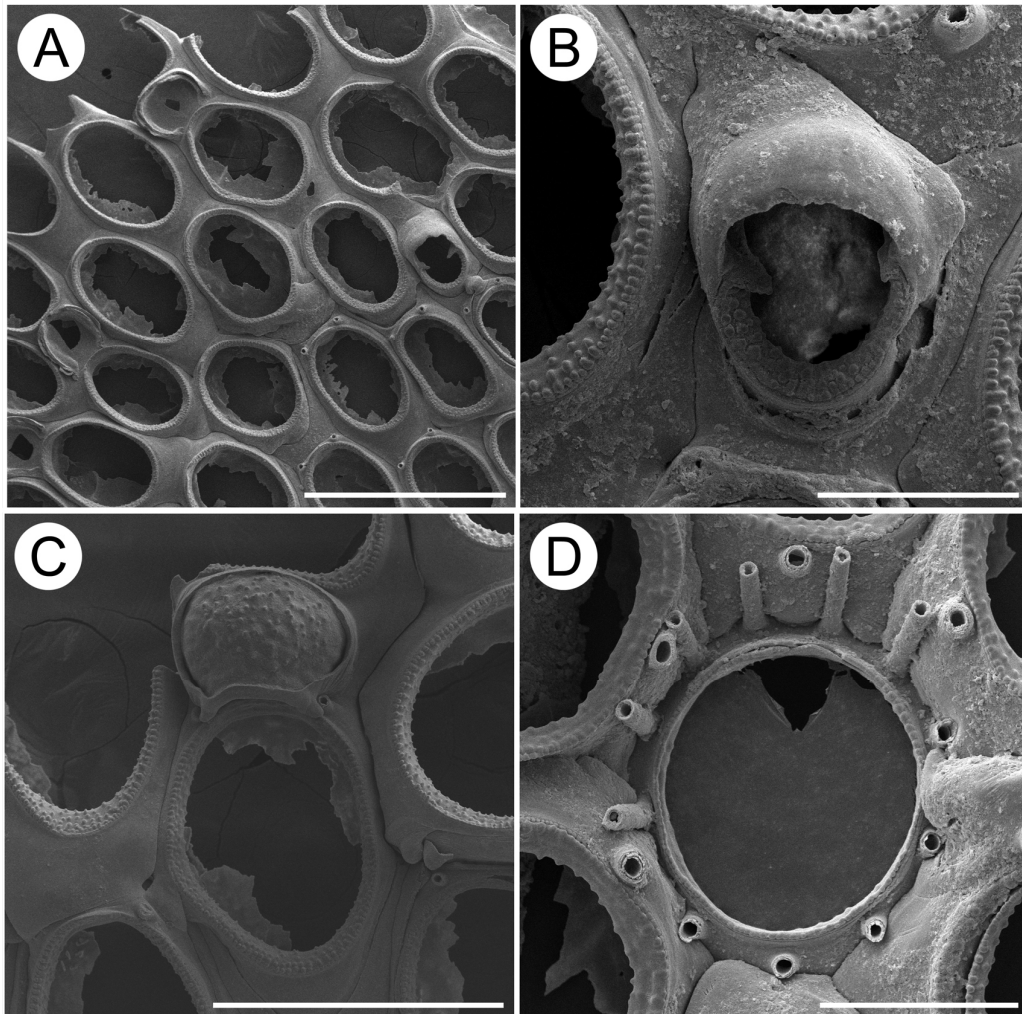


Figure 7. *Crassimarginatella kumatae* A, zooids; B, avicularia; C, ovicell; D, ancestrula. Scale bars: A=500, B, D=100 μ m, C=300 μ m.

Genus *Ellisina* Norman, 1903 엘리시나이끼벌레속

20. *Ellisina canui* (Sakakura, 1935) 카누이끼벌레

Amphiblestrum canui Sakakura, 1935a: 9, pl. 1, fig. 9, text-fig. 1; 1935b: 107.

Ellisina canui: Silén, 1941: 37, figs. 43-46, pl. 2, fig. 7; Mawatari, 1952c: 270, fig. 5; 1963: 7; Mawatari and Mawatari, 1981: 48, fig. 12; Liu, 1983: 171; Rho and Seo, 1986: 38, pl. 4, figs. 1, 2; Seo, 1992: 144; 2005: 315, pl. 35.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (East China Sea).

Family Antroporidae Vigneaux, 1949 굴이끼벌레과

Genus *Antropora* Norman, 1903 굴이끼벌레속

21. *Antropora granulifera* (Hincks, 1880) 공굴이끼벌레

Membranipora granulifera Hincks, 1880a: 232, pl. 14, fig. 11-14.

Antropora granulifera: Norman, 1909: 288; Harmer, 1926: 232, pl. 14, figs. 11-14; Marcus, 1937a: 203, fig. 9; Osburn, 1940: 359; 1950: 2, 53, pl. 4, fig. 5; Mawatari, 1952: 262; Cook, 1968a: 149; 1968b: 138, text-fig. 9; 1985: 95; Mawatari and Mawatari, 1981: 28, fig. 2; Rho and Seo, 1984: 77, pl. 1, fig. 1; 1986: 34; D'Hondt, 1986b: 701; Winston, 1986: 5; Ryland and Hayward, 1992: 229, fig. 2c; Tilbrook, 1998: 27, 29, fig. 1A; Tilbrook *et al.*, 2001: 41, fig. 2G; Seo, 2005: 318, Fig. 29.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Philippine, Eastern Pacific, Australia, Great Barrier Reef, Vanuatu, New Caledonia), Indian Ocean (India, Red Sea), Atlantic Ocean (Porto Rico, Bahamas, Panama, Madeira, West Africa).

Genus *Chaperia* Jullien, 1891 달음판이끼벌레속

22. *Chaperia acanthina* (Lamouroux, 1825) 바늘이끼벌레

Flustra acanthina Lamouroux, 1825: 605.

Chaperia (flustra) acanthina: O'Donoghue and O'Donoghue, 1926: 86.

Chaperia acanthina: Calvet, 1904: 11; Kluge, 1914: 675, text-fig. 46; Marcus, 1921a: 88; 1955: 281; Livingstone, 1927: 54; 1929: 100; Hastings, 1932: 412; Silén, 1941: 46; O'Donoghue and Watteville, 1944: 414; Brown, 1952: 95, fig. 45; O'Donoghue 1957: 74; Vigeland, 1958: 6; Gordon, 1967: 51, fig. 14; 1986: 38, pl. 9, E, F; Uttley and Bullivant, 1972: 17; Hayami, 1975: 102, pl. 13, fig. 6; Mawatari and Mawatari, 1984: 112, fig. 1; D'Hondt, 1986b: 701; Moyano G., 1991: 317; Scholz, 1991: 281, pl. 3, fig. 3; Seo, 1998a: 209, fig. 1A, B; Seo, 2005: 321, pl. 39; Chae *et al.* 2016: 553.

Material examined. Beomseom Island, 8 Jan. 2009 (J.R. Lee).

Substratum. Unknown (usually stones).

Remarks. This species is newly collected from the Jeju Island.

Distribution. Korea (South Sea and Jeju Island), Japan, Pacific Ocean (Bonin Island, Philippine, Chatham Island, Vancouver I., Puget Sound, Chile, Sulu Island, Australia, Torres Strait, New Caledonia), Indian Ocean, Atlantic Ocean (Falkland Island, Brazil, Patagonia, Natal, Norway, South Africa).

Family Hiantoporidae Gregory, 1893

Genus *Hiantopora* MacGillivray, 1887

23. *Hiantopora intermedia* (Kirkpatrick, 1890) 투구이끼벌레

Membranipora radificera var. *intermedia* Kirkpatrick, 1890: 612, 615;

Thornely, 1907: 186.

Membranipora intermedia: Waters, 1898 p. 681.

Hiantopora intermedia: Harmer, 1926 p. 239; Mawatari, 1952 p. 263;
Mawatari and Mawatari, 1986 p. 241; Chae *et al.* 2016: 553, fig. 2.

Tremopora intermedia: Canu and Bassler, 1929: 114.

Material examined. Beomseom Island, 27 Aug. 2009.

Substratum. Unknown.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Torres Strait),
Indian Ocean (Burma).

Superfamily Flustroidea Lamouroux, 1821 꼬인이끼벌레상과

Family Flustridae Lamouroux, 1821 꼬인이끼벌레과

Genus *Gregarinidra* Barroso, 1949 무리이끼벌레속

24. *Gregarinidra serrata* (MacGillivray, 1869) 톱니바구니이끼벌레

Membranipora serrata MacGillivray, 1869: 131.

Spiralaia spinuligera: Okada and Mawatari, 1936: 53.

Spiralaia serrata: Silén, 1941: 57; Mawatari, 1952: 272; 1965: 599.

Hippoflustra serrata: Mawatari and Mawatari, 1979: 35.

Gregarinidra serrata: Gordon, 1984: 25; 1986: 28; Chae *et al.*, 2016: 554,
fig. 3.

Material examined. Genmeunyeo underwater cave, 7 Jan. 2011 (B.S.
Min, and H.J. Yang).

Substratum. Gastropod shells, rocks and sponges.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (New Zealand;
Hauraki Gulf, Auckland Harbours, Foveaux Strait)

25. *Gregarinidra corbula* Seo, 1996 바구니이끼벌레

Gregarinidra corbula Seo, 1996: 46, pl. 2; 2005: 323, pl. 40.

Distribution. Korea (Jeju Island),

Genus *Terminoflustra* Silén, 1941 끝꼬인이끼벌레속

26. *Terminoflustra sagamiensis* (Okada, 1921) 끝꼬인이끼벌레

Carbasea sagamiensis Okada, 1921: 23, text-fig. 3.

Terminoflustra sagamiensis: Silén, 1941: 55, figs. 66, 67, pl. 3, fig. 10; Mawatari, 1952c: 263; Mawatari and Mawatari, 1979: 42, fig. 10, pl. 1, fig. C; Rho and Seo, 1990: 148, pl. 2, figs. 1, 4; Seo, 2005: 325, pls. 41, 42.

Distribution. Korea(Jeju Island), Japan.

Superfamily Buguloidea Gray, 1848 다발이끼벌레상과

Family Bugulidae Gray, 1848 다발이끼벌레과

Genus *Bicellariella* Levinsen, 1909

27. *Bicellariella fragilis* Seo, 2009 민들레이끼벌레

Bicellariella fragilis Seo, 2009: 79; Chae *et al.* 2016: 554.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, seaweeds.

Remarks. In Korea, it is found only from the Jeju Island.

Distribution. Korea (Jeju Island).

Genus *Bugula* Oken, 1815 다발이끼벌레속

28. *Bugula californica* Robertson, 1905 캘리포니아이끼벌레

Bugula californica Robertson, 1905: 267, pl. 10, fig. 49, pl. 16, fig. 100; O'Donoghue and O'Donoghue, 1923: 162; 1926: 91; Marcus, 1937b: 71, pl. 15, fig. 37 A, B; Okada and Mawatari, 1938: 451; Osburn, 1950: 156, pl. 23, fig. 1, pl. 24, fig. 2; Mawatari, 1952c: 264; 1956: 121; 1963: 7; Soule, 1959: 41; Soule and Soule, 1968: 210; Kubanin, 1975: 116; Rho and Song, 1980: 156; Liu, 1984b: 285, figs. 32, 33; Song, 1985: 74; Banta and Redden, 1990: 795; Seo, 1992: 146; 2005: 327, pls. 43, 44; Soule *et al.*, 1995: 112, pl. 38, A-B; Gong and Seo, 2003: 7; 2004: 12.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Ropes hanging on the wharf, sack.

Remarks. This species is a fouling bryozoan.

Distribution. Cosmopolitan. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (China, Hong Kong, Vancouver I., Hawaii, Galapagos Islands, West coast of North America), Atlantic Ocean (Mexico, Brazil).

29. *Bugula dentata* (Lamouroux, 1816) 치상이끼벌레

Acamarchis dentata Lamouroux, 1816: 135, pl. 3, figs. 3a.

Bugula dentata: Busk, 1852a: 46, pl. 35; Waters, 1887b: 91, pl. 4, fig. 14;

Ortmann, 1890: 25, pl. 1, fig. 20; Norman, 1909: 285, pl. 38, fig. 3; Yanagi and Okada, 1918: 421; Marcus, 1922a: 422, fig. 1; O'Donoghue, 1924: 33; Harmer, 1926: 439, pl. 30, figs. 5, 6, pl. 32, figs. 21–25; Livingstone, 1927: 51; 1929: 53; Okada, 1934b: 5, pl. 1, fig. 9; Okada and Mawatari, 1937: 435; 1938: 450; Osburn, 1940: 389; Silén, 1941: 105, figs. 141–143, pl. 8, figs. 27, 28; Hastings, 1943: 429; O'Donoghue and Watteville, 1944: 419; Mawatari, 1952c: 264; Rho and Chung, 1975: 51, pl. 5, figs. 14–15; Hayward and Cook, 1983: 42; Liu, 1984b: 279, figs. 4, 24, 25; Rho and Seo, 1984: 78; 1986: 34; 1990: 150; Song, 1985: 71; Winston, 1986: 6; D'Hondt, 1986b: 711; Moyano G., 1991: 315; Ryland and Hayward, 1992: 232, fig. 4; Seo, 1992: 146; 1998a: 210; 1998b: 417; 2005: 329, pls. 45, 46; Je *et al.*, 1997: 49; Chae *et al.* 2016: 555.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Worm tubes, rocks.

Remarks. This species is easily recognizable by its color of colony is dark green.

Distribution. Cosmopolitan. Korea (East Sea, South Sea, Jeju Island,

Yellow Sea), Japan, Pacific Ocean (China, Puget Sound, Chile, Loyalty Island, Australia, Great Barrier Reef, Tasmania, New Zealand, New Caledonia), Indian Ocean (Red Sea), Atlantic Ocean (Porto Rico, Brazil, Africa, South Africa, Cape Verde Island, Madeira).

30. *Bugula neritina* Linné, 1758 큰다발이끼벌레

Bugula neritina Linné, 1758: 815; Busk, 1852a: 44, pl. 43; 1884: 42; Waters, 1887b: 91, pl. 4, figs. 3, 15; 1909: 135, pl. 11, figs. 1-3; Ortmann, 1890: 24, pl. 1, fig. 17; Robertson, 1905: 266, pl. 9, fig. 47, pl. 16, fig. 97; Thornely, 1907: 183; 1911: 141; Guérin-Ganivet, 1911: 6; Kluge, 1914: 635, text-fig. 21; Barroso, 1915: 413; Yanagi and Okada, 1918: 424; Osburn, 1920: 126; 1940: 389; 1947a: 22; 1950: 154, pl. 23, fig. 3, pl. 24, fig. 3; Marcus, 1920: 69; 1937b: 66, pl. 13, fig. 34; 1941b: 20, fig. 13; 1950: 3; Canu and Bassler, 1925: 16, pl. 1, figs. 6-8; 1928a: 17; O'Donoghue and O'Donoghue, 1926: 90; Hastings, 1927: 334; 1930: 704; 1943: 430; Calvet, 1927: 9; 1931: 61; Livingstone, 1929: 53; Okada, 1929: 13, pl. 1, fig. 1; 1934b: 5, pl. 1, fig. 9; Okada and Mawatari, 1937: 435; 1938: 451; Silén, 1941: 108; O'Donoghue and Watteville, 1944: 414; Mawatari, 1952c: 264; 1963: 7; O'Donoghue, 1957: 83; Maturo, 1957: 42, fig. 37; 1966: 560; Soule, 1959: 39; Balavoine, 1959: 267, pl. 3, fig. 2; Androsova, 1963: 26, pl. 2, fig. 8; 1971: 145; Shier, 1964: 624; Prenant and Bobin, 1966: 492, fig. 158, VII, fig. 159, III, fig. 161, I, II, fig. 162; Gordon, 1967: 53, fig. 19; 1986: 45, pl. 15, A; Soule and Soule, 1968: 211; Cook, 1968a: 157; 1985: 116; Pinter, 1969: 206; Geraci and Relini, 1970: 109; Powell, 1971: 769; Fey, 1971: 201; Karim, 1973: 18; Unsal, 1975: 40; Kubanin, 1975: 115, 117; D'Hondt, 1975b: 625; 1979f: 335; 1991a: 164; Ryland and

Hayward, 1977: 162, fig. 78; Rho and Lee, 1980: 118; Banta, 1980: 373, fig. 24.35; Ambrogi, 1981: 109, fig. 33; Winston, 1982: 129, fig. 32; 1986: 6; Liu, 1984b: 276, figs. 20, 21; Kubota and Mawatari, 1985: 82, fig. 6; Limousin, 1986: 349, fig. 105; Frensen, 1986: 66; D'Hondt, 1988a: 193; 1988b: 515; Hayward, 1988b: 289; Banta and Redden, 1990. p. 795; Rho and Seo, 1990: 150; Moyano G., 1991: 315; Alvarez, 1991: 187; Seo, 1992: 146; 1998a: 212; 1998b: 417; 2005: 330, pls. 47-49; Reverter *et al.*, 1995: 125; Soule *et al.*, 1995: 107, pl. 35, A-D; Gong and Seo, 2003: 7; 2004: 12, fig. 2B; Chae *et al.* 2016: 555.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Hwasun port, 15 Aug. 2008 (B.S. Min); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Hwasun port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (J.E. Seo, B.S. Min and H.J. Yang).

Substratum. Ropes hanging on the wharf, plastic bags, seaweed, cement test panels.

Remarks. *B. neritina* is a cosmopolitan species distributed through the ocean as a typical fouling bryozoan. It is also the second common fouling bryozoan next to *Watersipora subtorquata* and found to be worldwide distributed by ships. This species is the source of antineoplastic substances, Bryostatin 1, 2, 3 and 4 (Seo, 2010). According Seo and Min (2009), this species is not yet found from Jeju Island waters, though. However, *B. neritina* was to be found from Seogwipo waters(Chae, *et al.*, 2016), and Jeju port, Hwasun port, Seogwipo port in

this study. This species is reported for the first time from the Jeju Island.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (South China Sea, Philippine, Vancouver I. to California, Hawaii, Galapagos Islands, Chile, Australia, New Zealand), Indian Ocean (India, Pakistan, Sumatra, Red Sea, Suez Canal, Mauritius), Atlantic Ocean (East coast of North America, Caribbean Sea to Brazil, European Seas, Mediterranean Coast, SW Africa), Arctic Ocean, Cosmopolitan.

***31. *Bugula robusta* MacGillivray, 1869 떡갈이끼벌레**

Bugula robusta MacGillivray, 1869: 129; Harmer, 1926: 435, pl. 32, figs. 1-7; O'Donoghue and Watteville, 1944: 414; Rho and Seo, 1984: 79, pl. 2, fig. 3; Liu, 1984b: 277, figs. 22, 23; 1991: 73; D'Hondt, 1986b: 711; 1988a: 193; Winston, 1986: 6; Scholz, 1991: 285, pl. 4, figs. 4-6; Seo, 2005: 331, pls. 50, 51A.

Material examined. Seopseom Island, 20 Nov. 2009 (B.S. Min and H.J. Yang).

Substratum. sponges.

Remarks. This species is reported for the first time from the Jeju Island. The two record in Korea is from Mipo in 1981, Tongyeong in 2006 so far. This seems to be tropical species because it is mainly collected Indo-Pacific Islands in terms of zoogeographical study. In Korea, it is found from the South Sea and Jeju Island.

Distribution. Korea (South Sea, Jeju Island), Pacific Ocean (China, Philippine, Puget Sound, New Caledonia), Indian Ocean (Indonesia, Red

Sea), Atlantic Ocean (Israel), Cosmopolitan.

32. *Bugula subglobosa* Harmer, 1926 꽃다발이끼벌레

Bugula subglobosa Harmer, 1926: 444, pl. 32, figs. 15–18; Silén, 1941: 105, figs. 144–148; Mawatari, 1952c: 264; 1963: 7; Rho and Song, 1980: 156, pl. 3, figs. 7–10; Rho and Seo, 1984: 79; 1986: 34; 1990: 150; Liu, 1984b: 284, figs. 29, 30; Ryland and Hayward, 1992: 234, fig. 6; Seo, 2005: 333, psl. 51B–53A; Chae *et al.* 2016: 555.

Bugula californica: Rho and Chung, 1975: 51, pl. 5, figs. 16–18 [not *Bugula californica* Robertson, 1905].

Material examined. Munseom Island, 26 Aug. 2008 (J.R. Lee); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 7 May 2009 (B.S. Min); Jeolmyeongdo Island in Hachujado Island, 4 Nov. 2009 (H.S. Kim); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks and worm tubes.

Remarks. Most colonies were collected from Jeju Island except one site from South Sea.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean

(China, Great Barrier Reef).

Genus *Dendrobeania* Levinsen, 1949 수지콩이끼벌레속

33. *Dendrobeania longispinosa* (Robertson, 1905) 긴극수지콩이끼벌레
Beania longispinosa Robertson, 1905: 277.

Dendrobeania longispinosa: Osburn, 1950: 168, pl. 25, figs. 4, 5; McCain and Ross, 1974: 13; Liu, 1984b: 295, fig. 45; Bergey and Denning, 1987: 424, fig. 21.51; Seo, 1992: 147, pl. 1, fig. 4; 2005: 336, pl. 57; Soule *et al.*, 1995: 101, pl. 32 A-C.

Distribution. Korea (Jeju Island), Pacific Ocean (China, California to Mexico, Santa Carolina Island).

34. *Dendrobeania murrayana* (Johnston, 1847) 무라이수지콩이끼벌레
Flustra murrayana Johnston, 1847: 347.

Bugula murrayana: Busk, 1852a: 46, pl. 59; 1880: 233; Hincks, 1880a: 92, pl. 14, figs. 2-9; Levinsen, 1886: 310, pl. 26, figs. 3-6; Norman, 1894: 123; 1903: 581; Nordgaard, 1896: 13; 1906: 8; Waters, 1900: 52; Robertson, 1900: 320; 1905: 266, pl. 10, fig. 48, pl. 16, figs. 98, 99; 1910b: 228; Kluge, 1908: 518; Osburn, 1910: 226, pl. 22, fig. 26, 26a; 1912: 277; Marcus, 1919: 261; O'Donoghue, 1923: 162; O'Donoghue and O'Donoghue, 1925: 99.

Bugula (Dendrobeania) murrayana: Borg, 1930: 80, figs. 84, 85; 1933: 529.

Dendrobeania murrayana: Levinsen, 1916: 435; Nordgaard, 1918: 25; 1924: 6; Marcus, 1940: 191, fig. 100; 1950: 3; Lacourt, 1949: 290; 1978: 8; Osburn, 1950: 165, pl. 25, fig. 1; Kluge, 1975: 393; Gostilovskaya, 1962: 78; Hansen, 1962: 25; Rogick, 1964: 177; Prenant and Bobin, 1966: 473,

fig. 155, I-VIII, XI; Powell, 1967b: 253; 1968: 2290; Eggleston, 1975: 16; Ryland and Hayward, 1977: 174, fig. 84; Rho and Seo, 1984: 79, pl. 1, figs. 5-7; 1990: 150; Kramp, 1934: 13; Bergey and Denning, 1987: 426, fig. 21.52; Seo, 1992: 147; 2005: 338, pls. 58, 59.

Dendrobeatia (*Bugula*) *murrayana*: Calvet, 1931: 64.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (Philippine, Bering Sea to Vancouver Island), Atlantic Ocean (Woods Hole, United Kingdom, Greenland, North Sea, Scandinavia to France, Iceland), Arctic Ocean (White Sea, Kara Sea, Northern Sea of USSR, Arctic Canada), Cosmopolitan.

Family Beaniidae Canu and Bassler, 1927 콩이끼벌레과

Genus *Beania* Johnston, 1840 콩이끼벌레속

35. *Beania discodermiae* (Ortmann, 1890) 두겹질콩이끼벌레

Diachoseris discodermiae Ortmann, 1890: 26, pl. 1, fig. 23.

Beania (*diachoris*) *discodermiae*: Okada and Mawatari, 1936: 57.

Beania discodermiae: Harmer, 1926: 415, pl. 28, figs. 9, 10; Silén, 1941: 95, figs. 118, 119; Hastings, 1943: 410; Mawatari, 1952c: 264; 1963: 7; Redier, 1969: 8; Rho and Seo, 1984: 80, pl. 3, fig. 2; 1986: 35; Liu, 1984b: 258, fig. 5; Gordon, 1984: 45, pl. 11, D, E; 1986: 57; Winston, 1986: 5; Seo, 1992: 148; Gong and Seo, 2003: 8; Seo, 2005: 340, pls. 60-62A; Chae *et al.* 2016: 555.

Material examined. Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang).

Substratum. Other bryozoan (*Adeonella lichenoides*).

Remarks. This species is a fouling bryozoan (Seo, 2005, 2010; Seo and Min, 2009).

Distribution. Korea (East Sea, South Sea, Jeju Island), Japan, Pacific Ocean (China, New Guinea, Mindanao, New Zealand), Indian Ocean (Red Sea).

36. *Beania hexaceras* (Ortmann, 1890) 육콩이끼벌레

Diachoseris hexaceras Ortmann, 1890: 26, pl. 1, fig. 30.

Beania hexaceras: Yanagi and Okada, 1918: 427; Okada and Mawatari, 1938: 453, pl. 24, fig. 12; Mawatari, 1952c: 264; Silén, 1941: 94, figs. 113–117; Rho and Song, 1980: 155, pl. 3, figs. 10, 12; Rho and Seo, 1984: 81; 1986: 34; 1990: 150, pl. 2, figs. 5–8; Song, 1985: 74; Seo, 1992: 147, pls. 2, 3; 1998a: 212; 1998b: 417; 2005: 341, pls. 62B–64A; Je *et al.*, 1997: 49.

Material examined. Gimnyeong port, 15 Aug. 2008 (B.S. Min); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Seaweeds and shells.

Remarks. This species is attaching on the seaweeds like thin fragile. The spines are somewhat variable in numbers and location.

Distribution. Korea (East Sea, South Sea, Jeju Island, and Yellow Sea), Japan.

37. *Beania magellanica* (Busk, 1852) 마젤라니카콩이끼벌레

Diachoris magellanica Busk, 1852a: 54; Ortmann, 1890: 25, pl. 1, fig. 22; Waters, 1879b: 120, pl. 12, fig. 1.

Beania (Diachoris) magellanica: Stach, 1937: 379.

Beania magellanica: Waters, 1896: 16; 1904: 28, pl. 8, fig. 7a-c; Kluge, 1914: 648, text-fig. 29a; Yanagi and Okada, 1918: 427; Marcus, 1920: 73; 1922b: 4, fig. 1 a-c; O'Donoghue, 1924: 33; 1957: 83; Harmer, 1926: 412, pl. 28, figs. 1-4, text-fig. 21; Livingstone, 1929: 60; Calvet, 1931: 70; Silén, 1941: 94; Hastings, 1943: 414, figs. 34C, 35G; O'Donoghue and Watteville, 1944: 414; Osburn, 1950: 171, pl. 25, fig. 9; Mawatari, 1952c: 264; Soule, 1959: 44; Prenant and Bobin, 1966: 555, fig. 191; Unsal, 1975: 42; D'Hondt, 1979a: 57; 1979g: 459; Hayward and Cook, 1983: 42; Rho and Seo, 1984: 80, pl. 3, fig. 1; 1986: 35; 2005: 342, pls. 64B, 65A; Gordon, 1984: 46, pl. 11, H; 1986: 58; Winston, 1986: 5; D'Hondt, 1986b: 702; Limousin, 1986: 333, fig. 96; Lopez Gappa and Lichtschein, 1988: 94; 1990: 19; Moyano G., 1991: 315; Ryland and Hayward, 1992: 235; Hayward, 1995a: 150, fig. 118.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Philippine, Puget Sound, Gulf of California, Chile, Australia, North Australia, Great Barrier Reef, New Zealand, New Caledonia), Atlantic Ocean (Brazil, Argentina, Mediterranean Sea, Spain, Italy, Turkey, Cape Verde Island, South Africa), Antarctic.

38. *Beania mirabilis* Johnston, 1840 줄콩이끼벌레

Beania mirabilis Johnston, 1840: 272, text-figs. 1, 2; Landsborough, 1852:

369, pl. 19, fig. 75; Busk, 1852a: 32, pl. 24, figs. 4, 5; Hincks, 1880a: 96, pl. 4, figs. 8-10; Waters, 1896: 17; Robertson, 1905: 276, pl. 12, figs. 63, 64, text-fig. 1; Harmer, 1926: 419, pl. 28, fig. 15; O'Donoghue and O'Donoghue, 1926: 91; Hastings, 1930: 705; Marcus, 1937a: 209; 1937b: 60, pl. 12, fig. 29; 1940: 176, fig. 92; 1950: 3; Okada and Mawatari, 1938: 453; Osburn, 1940: 398; 1947: 24; 1950: 170, pl. 26, fig. 8; Silén, 1941: 98; 1943: 10; 1951: 570; Mawatari, 1952c: 264; 1963: 7; Soule, 1959: 43; Androsova, 1963: 27, pl. 2, fig. 9; Prenant and Bobin, 1966: 552, fig. 190; Cook, 1968a: 163; 1985: 120; Fey, 1971: 201; Hayward, 1971: 482; Unsal, 1975: 41; Geraci, 1974: 36, pl. 2, fig. 13; Kubanin, 1975: 116; Rho and Song, 1980: 156, pl. 3, figs. 13, 14; Winston, 1982: 133, fig. 45; 1986: 5; Rho and Seo, 1984: 80; Liu, 1984b: 267, fig. 12; Fransen, 1986: 85; D'Hondt, 1987b: 46; Alvarez, 1990: 26; Scholz, 1991: 286, pl. 5, figs. 3, 4; Seo, 1992: 147; Seo, 2005: 344, pls. 65B, 66.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min).

Substratum. Cement test panels.

Distribution. Korea (East Sea, South Sea, Jeju Island), Japan, Pacific Ocean (South China Sea, Philippine, West coast of North America, Galapagos Islands, Sulu Archipelago, Torres Strait, New Zealand), Indian Ocean (Red Sea), Atlantic Ocean (Florida to Brazil, United Kingdom, Sweden, Denmark, France, Mediterranean Sea, Italy, Turkey, West Africa), Cosmopolitan.

39. *Beania petiolata* Harmer, 1926 엽병콩이끼벌레

Beania petiolata Harmer, 1926: 416, pl. 28, fig. 19; Silén, 1941: 97, fig. 124; Rho and Seo, 1984: 81, pl. 3, fig. 3; Liu, 1984b: 263, fig. 8; 1991: 73;

Seo, 2005: 345, Fig. 30.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (China, Halmaheira, New Guinea).

40. *Beania vegae* Silén, 1941 강장콩이끼벌레

Beania vegae Silén, 1941: 97, figs. 125–128; Rho and Seo, 1984: 81, pl. 3, fig. 4; Kubota and Mawatari, 1985: 83, fig. 7; Seo, 1992: 147; 1998a: 212; 2005: 347, pls. 67, 68.

Distribution. Korea (Jeju Island), Japan.

Family Epistomidae Gregory, 1903 염주이끼벌레과

Genus *Synnotum* Peiper, 1881 염주이끼벌레속

41. *Synnotum aegyptiacum* Audouin, 1826 염주이끼벌레

Synnotum aegyptiacum Audouin, 1826: 243; Osburn, 1920: 126; 1940: 402; 1947a: 25; 1950: 151, pl. 13, fig. 5; Harmer, 1926: 398, pl. 27, figs. 3, 4; Hastings, 1927: 332; 1930: 702; 1932: 408; Marcus, 1938: 27, pl. 5, fig. 12; 1955: 290; Silén, 1941: 90; Hastings, 1943: 391; Mawatari, 1952c: 264; 1963: 8; Maturo, 1957: 42, fig. 36; Soule, 1959: 38; Shier, 1964: 623; Prenant and Bobin, 1966: 461, fig. 152; Unsal, 1975: 40; Rho and Song, 1980: 155, pl. 3, figs. 5, 6; Winston, 1982: 127; 1986: 10; Rho and Seo, 1984: 83; 1990: 152; Liu, 1984a: 299, fig. 43; Gordon, 1984: 43, pl. 10, E, F; Fransen, 1986: 57; Limousin, 1986: 324, fig. 93; Bergey and Denning, 1987: 426, fig. 21.41; D'Hondt, 1988a: 193; Scholz, 1991: 283, pl. 5, fig. 1; Seo, 1992: 146; 2005: 348, pls. 69, 70; Tilbrook *et. al.*, 2001: 52.

Distribution. Korea (South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (China Sea, Philippines, California, Vanuatu, Great Barrier Reef,

New Zealand), Indian Ocean (Indonesia, Red Sea), Atlantic Ocean (North Carolina, Florida to Brazil, Mediterranean Sea, Spain, Turkey, Israel, South Africa).

Family Candidae d'Orbigny, 1851 사탕이끼벌레과

Genus *Amastigia* Busk, 1852 이은이끼벌레속

42. *Amastigia rudis* (Busk, 1852) 막대이은이끼벌레

Carborea rudis Busk, 1852b: 377; Ortmann, 1890: 23, pl. 1, fig. 8.

Caberea rudis Busk, 1851: 377; 1852a: 38, pl. 46; 1884: 30; Okada, 1917b: 235; Yanagi and Okada, 1918: 419.

Amastigia rudis: Harmer, 1926: 349, pl. 23, figs. 9-13; Okada, 1934b: 9, pl. 1, fig. 6; Sakakura, 1935b: 109; Okada and Mawatari, 1935: 137; 1938: 453; Silén, 1941: 80; Osburn, 1950: 127, pl. 16, figs. 3-5; Mawatari, 1952c: 263; 1963: 8; Soule and Duff, 1957: 102; Rho and Seo, 1984: 82, pl. 4, figs. 1-4; 1986: 34; 1990: 151; Liu, 1984a: 261, figs. 6, 7; D'Hondt, 1986b: 702; Seo, 1992: 146; 1998b: 418; 2005: 350, pls. 71, 72A; Song and Won, 1992: 123; Je *et al.*, 1997: 49; Gong and Seo, 2003: 8; Chae *et al.* 2016: 555.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Beomseom Island, 7 May 2009 (B.S. Min); Seopseom Island, 13 Oct. 2009 (B.S. Min, H.J. Yang, and B.I. Kim); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang);

Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Rocks, sponges, worm tubes and tangled with a hydrozoans.

Remarks. This species is known to be a fouling bryozoan encrusting the anchors (Seo, 2005, 2010; Seo and Min, 2009). But, they are usually well represented on rocks in subtidal to the Jeju Island.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (West Pacific Ocean, China Seas, Gulf of California, Hawaii, Mindanao, Makassar Strait, Kai Island, Australia, New Caledonia), Indian Ocean (Timor, South Australia, Bass Strait).

43. *Amastigia xishaensis* Liu, 1984 볼록이은이끼벌레

Amastigia xishaensis Liu, 1984a: 263, fig. 10; Rho and Seo, 1990: 151, pl. 5, figs. 1-4; Seo, 1992: 146; 2005: 352, pls. 72B-74A; Chae *et al.* 2016: 556.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Beomseom Island, 7 May 2009 (B.S. Min); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung);

Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, worm tubes, seaweeds stem, sponges, oyster shells and ascidians.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (Jeju Island), Pacific Ocean (China, China Sea).

Genus *Caberea* Lamouroux, 1816 이끼벌레속

44. *Caberea boryi* (Audouin, 1826) 보리이끼벌레

Crisia boryi Audouin, 1826: 242.

Caberea boryi: Busk, 1852a: 38, pl. 16, figs. 4, 5; Norman, 1868: 5; 1909: 285; Hincks, 1880a: 61, pl. 8, figs. 9–11; Waters, 1887b: 89; 1896: 9; Jullien and Calvet, 1903: 124; Calvet, 1904: 7; Thornely, 1911: 140; Canu and Bassler, 1920: 191, 194, pl. 81, figs. 33, 34; 1925: 17; 1928a: 22; 1930: 19, 21, pl. 2, figs. 9–12; O'Donoghue and O'Donoghue, 1923: 161; Harmer, 1926: 362, pl. 24, figs. 13–15; Hastings, 1932: 411; 1943: 367, fig. 19 A, B; Sakakura, 1935b: 109; Silén, 1941: 81; Marcus, 1941a: 46, pl. 1, fig. 3A, B; Osburn, 1950: 129, pl. 15, figs. 4–6; Mawatari, 1952c: 263; 1963: 8; Prenant and Bobin, 1966: 449, fig. 127, VI, fig. 148; Cook, 1968a: 171; Fey, 1971: 199; Unsal, 1975: 40; Geraci, 1974: 38, pl. 2, fig. 7; Kubanin, 1975: 118; Hayward, 1976a: 7; Ryland and Hayward, 1977: 129, fig. 61; D'Hondt, 1978a: 449; 1979g: 459; 1986b: 702; 1988a: 193; Rho and Song, 1980: 153, pl. 2, figs. 10–13; Rho and Seo, 1984: 82; 1986: 34; 1990: 151; Liu, 1984a: 280, figs. 24, 25; Limousin, 1986: 810, fig. 85; Gordon, 1986:

67, pl. 25, A-C; Hayward, 1988b: 286; Alvarez, 1991: 187; Lu, 1991: 47, pl. 7, fig. 5; Pouyet and Moissette, 1992: 47, pl. 6, figs. 3-5; Seo, 1992: 145; Song and Won, 1992: 123; Seo, 2005: 352, pls. 74B-76; Chae *et al.* 2016: 556.

Material examined. Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J. E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, K.J. Jung).

Substratum. Seaweeds, sponges, rocks, oyster shells, anthozoans, other bryozoan (*Adeonella lichenoides*) and tangled with seaweeds.

Remarks. This species has huge scutum, compared with the other species belonging to *Caberea*, so is easily distinguished (Seo, 2005, 2010).

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (China Sea, Vancouver Islands, Australia, New Zealand, New Caledonia), Indian Ocean (Red Sea), Atlantic Ocean (Brazil to Magellan Strait, United Kingdom, Lundy, France, Mediterranean Coast, Mauritania, Madeira, Africa), Antarctic Ocean, Cosmopolitan.

45. *Caberea hataii* Okada, 1929 하태이끼벌레

Caberea hataii Okada, 1929: 13, pl. 1, fig. 2, pl. 4, fig. 2, text-fig. 2; Sakakura, 1935b: 109; Okada and Mawatari, 1937: 437; Silén, 1941: 82, figs. 96, 97, pl. 5, fig. 19, fig. 22; Mawatari, 1952c: 263; 1963: 8; 1988: 145; Rho and Song, 1980: 153, pl. 2, figs. 7-9; Liu, 1984a: 275, fig. 19; Rho and Seo, 1986: 34; 1992: 145; Gong and Seo, 2003: 8; Seo, 2005: 355, pls. 77, 78.

Distribution. Korea (East Sea, Jeju Island), Japan, Pacific Ocean (China Seas).

46. *Caberea lata* Busk, 1852 라타이끼벌레

Caberea lata Busk, 1852b: 378: 39, pl. 47, figs. 1-3; Thornely, 1907: 183; Yanagi and Okada, 1918: 418; Marcus, 1922a: 424; Harmer, 1926: 360, pl. 24, figs. 7-9; Hastings, 1932: 411; Okada, 1934b: 7; Okada and Mawatari, 1935: 136; 1938: 452; Sakakura, 1935a: 16, pl. 3, fig. 7; 1935b: 108; Silén, 1941: 81; 1954a: 13; Mawatari, 1952c: 263; 1963: 8; Rho and Chung, 1975: 52, pl. 4, 21-23; Rho and Song, 1980: 153; Liu, 1984a: 271, fig. 16; Rho and Seo, 1984: 82; 1986: 34; 1990: 151; D'Hondt, 1986b: 702; Seo, 1992: 145; 1998a: 212; 2005: 356, pls. 79-81A; Song and Won, 1992: 123; Je *et al.*, 1997: 49; Gong and Seo, 2003: 8.

Carborea lata: Ortmann, 1890: 22, pl. 1, fig. 5.

Caberea lata var. *tsushimensis*: Okada, 1923: 221, figs. 12-14.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Jeolmyeongdo Island in Hachujado Island, 4 Nov. 2009 (H.S. Kim); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang).

Substratum. Rocks, sponges, barnacles, stones and worm tubes.

Remarks. *C. lata* was collected from various the substrata such as sponges, other bryozoans, corals, seaweeds, shells, worm tubes and fishing nets. The stone is newly added to the substratum of this species. This species is a fouling bryozoan collected from fishing nets. But, they are usually well represented on rocks in subtidal to the Jeju Island.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (China, China Sea, Makassar Strait, New Guinea, Australia, Queensland, Cumberland, New Zealand, New Caledonia), Indian Ocean (Sumbawa, Flores, Timor, Bass Strait).

Genus *Canda* Lamouroux, 1816 방패이끼벌레속

47. *Canda pecten* Thornely, 1907 빗방패이끼벌레

Canda pecten Thornely, 1907: 182; Harmer, 1926: 389; Lu, 1991: 49; Tilbrook, 2006: 5; Chae *et al.*, 2016: 556, fig. 4.

Material examined. Genmeunyeo underwater cave, 7 Jan. 2011 (B.S. Min, and H.J. Yang).

Substratum. Stones.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (China, Solomon Islands), Indian Ocean (Burma, Andaman Islands, Madagascar, Indonesia; Strait of Makassar and Java Sea).

48. *Canda retiformis* Pourtales, 1867 거물칸다이끼벌레

Canda retiformis Pourtales, 1867: 110; Thornely, 1907: 182; 1911: 141; 1916: 160; Canu and Bassler, 1929a: 212, pl. 9, figs. 11, 12; Okada and

Mawatari, 1936: 56; Osburn, 1940: 388; Mawatari, 1952c: 263; Marcus, 1955: 290, figs. 38-40; D'Hondt, 1985b: 522; Rho and Seo, 1990: 151, pl. 3, figs. 2-4; Lu, 1991: 49, pl. 4, fig. 1; Seo, 2005: 358, pls. 81B, 82; Chae *et al.*, 2016: 557.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang).

Substratum. Unknown.

Remarks. This species is found only from Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (South China Sea, Philippines Island, Sulu Island.), Indian Ocean (India, Zanzibar Strait), Atlantic Ocean (Florida, Gulf of Mexico, Porto Rico, Brazil).

Genus *Scrupocellaria* van Beneden, 1845 가시이끼벌레속

49. *Scrupocellaria diadema* Busk, 1852 가시이끼벌레

Scrupocellaria diadema 1852b: 370; Ortmann, 1890: 22, pl. 1, fig. 4; Thornely, 1907: 181; Yanagi and Okada, 1918: 414; Marcus, 1921b: 4; 1922a: 425, fig. 2; Okada, 1923: 221; 1934b: 6, pl. 1, fig. 7; Harmer, 1926: 375, pl. 25, figs. 20-25; Livingstone, 1927: 52; Canu and Bassler, 1929a: 211: 9, figs. 4, 5; Hastings, 1932: 410; Okada and Mawatari, 1936: 55; 1938: 452; Silén, 1941: 89; Mawatari, 1952c: 263; 1963: 8; Prenant and Bobin, 1966: 424, fig. 127, V, fig. 139; Redier, 1969: 7; Rho and Chung, 1975: 50, pl. 3, figs. 9-10; Rho and Song, 1980: 154, pl. 3, fig. 4; Rho and Seo, 1984: 81; 1986: 34; 1990: 150; Liu, 1984a: 288, figs. 32, 33; 1991: 69; D'Hondt, 1986b: 702; Winston, 1986: 9; Hayward, 1988b: 285, fig. 3c; Lu, 1991: 46, pl. 4, fig. 4; Scholz, 1991: 284, pl. 3, figs. 6, 7; Ryland and

Hayward, 1992: 236, fig. 7; Seo, 1992: 145; 2005: 360, pls. 83, 84; Song and Won, 1992: 123; Chae *et al.*, 2016: 557.

Material examined. Munseom Island, 26 Aug. 2008 (J.R. Lee); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Beomseom Island, 7 May 2009 (B.S. Min); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, H.J. Yang); Gangjeong, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Biyangdo Island, 24 Sep. 2011 (J.E. Seo, B.S. Min); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, hydrozoans, worm tubes, stacked to sponges, sponges, tangled with seaweeds, other bryozoan (*A. xishaensis*).

Remarks. This species is mostly found from Jeju Island.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (Strait of Korea, China, China Sea, Philippine, Australia, Great Barrier Reef, New Caledonia), Indian Ocean (Indonesia, Red Sea), Atlantic Ocean (France, Mauritania), Cosmopolitan.

50. *Scrupocellaria maderensis* Busk, 1860 모가시이끼벌레

Scrupocellaria maderensis Busk, 1860: 280; Norman, 1909: 284; Harmer, 1926: 372, pl. 25, figs. 16-19; Osburn, 1940: 387; Silén, 1941: 89; 1954a: 13; Mawatari, 1952c: 276, fig. 11; 1963: 8; Prenant and Bobin, 1966: 428, fig. 141; Cook, 1968a: 170; D'Hondt, 1979f: 333; Rho and Song, 1980: 154, pl. 3, figs. 1-3; Liu, 1984a: 284, fig. 27; Limousin, 1986: 319, fig. 89; Winston, 1986: 9; Hayward, 1988b: 283; D'Hondt, 1988a: 193; 1995: 13; Moyano G., 1991: 320; Ryland and Hayward, 1992: 236; fig. 7; Seo, 2005: 361, pls. 85, 86A.

Material examined. Munseom Island, 26 Aug. 2008 (J.R. Lee); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang).

Substratum. Fishing nets.

Remarks. This species looks more strong and stiff because the branches of colony are wider than *S. diadema* (Seo, 2010).

Distribution. Korea (South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Philippine, Chile, Australia, Queensland, Great Barrier Reef, Polynesia), Indian Ocean (East Indies, Zanzibar, Mauritius), Atlantic Ocean (Gulf of Mexico, Porto Rico, France, Spain, Adriatic Sea, Israel, Cape Verde Island, West Africa).

Genus *Tricellaria* Fleming, 1828 세방가시이끼벌레속

51. *Tricellaria dubia* Silén, 1941 털세방가시이끼벌레

Tricellaria dubia Silén, 1941: 78, figs. 93-95; Rho and Song, 1980: 152, pl. 2, figs. 3-6; Seo, 2005: 363, pls. 86B, 87.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Bonin Island).

**52. *Tricellaria longispinosa* (Yanagi and Okada, 1918) 긴세방가시
이끼벌레**

Menipea longispinosa Yanagi and Okada, 1918: 408, pl. 6, fig. 3,
text-fig. 1.

Tricellaria longispinosa: Harmer, 1923: 356; Silén, 1941: 74, fig. 87, pl. 5,
figs. 17, 18; Rho and Seo, 1984: 83, pl. 4, figs. 5, 6; 1990: 152; Liu,
1984a: 267, figs. 13, 14; Seo, 2005: 364, pls. 88, 89.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean
(China).

53. *Tricellaria occidentalis* (Trask, 1857) 세방가시이끼벌레

Menipea occidentalis Trask, 1857: 113, pl. 4, fig. 4; Robertson, 1905: 254,
pl. 6, figs. 22-25; Yanagi and Okada, 1918: 409; Okada and Mawatari,
1936: 59; 1937: 437.

Menipea compacta: Ortmann, 1890: 21.

Menipea compacta var. *dilatata*: Ortmann, 1890: 21, pl. 1, fig. 2.

Menipea occidentalis catalinensis: Robertoson, 1905: 255, pl. 6, figs. 26,
27; Yanagi and Okada, 1918: 409; Okada, 1929: 15, pl. 1, fig. 3; Okada
and Mawatari, 1937: 437.

Tricellaria occidentalis: Harmer, 1923: 354, fig. 10; O'Donoghue and
O'Donoghue, 1925: 99; Okada and Mawatari, 1936: 57; Silén, 1941: 79;
Osburn 1950: 122, pl. 13, figs. 6, 7; Mawatari, 1952c: 263; 1963: 8;
Androsova, 1959: 45, pl. 1, fig. 6; Gordon, 1967: 56, fig. 24; Pinter, 1969:
206; Kim and Rho, 1969: 75; Rho and Chung, 1975: 52, pl. 6, figs. 19-21;

Kubanin, 1975: 117, fig. 2d; Rho and Lee, 1980: 119; Rho and Song, 1980: 152; Rho and Seo, 1984: 83; 1986: 34; 1990: 151; Liu, 1984b: 265, figs. 3A, 11; Kubota and Mawatari, 1985: 85, figs. 8, 9; Song, 1985: 71, 74; Bergey and Denning, 1987: 426, fig. 21.39; Lu, 1991: 50, pl. 4, fig. 3; Seo, 1992: 145; 1998a p. 212; 1998b: 418; Song and Won, 1992: 123; Je *et al.*, 1997: 49; Gong and Seo, 2003: 9; 2004: 14; Seo, 2005: 365, pls. 90–92; Chae *et al.*, 2016: 557.

Tricellaria occidentalis catalinensis: Osburn, 1950: 122, pl. 13, figs. 8, 9.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Seogwipo port, 15 Aug. 2008 (B.S. Min); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 9 Jan. 2009 (B.S. Min, H.J. Yang); Jeju port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Hwasun port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Jeju port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (J.E. Seo, B.S. Min and H.J. Yang); Daepo port, 5 Jan. 2012 (B.S. Min and H.J. Yang); Wimi port, 6 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Plastic bag, seaweeds, oyster shells.

Remarks. This species is not only one of three commonest fouling bryozoans (*Waterispora subtorquata* and *Bugula neritina*), but also the second commonest in intertidal zone of South Korea. This species found among *Sargassum* from rocky intertidal zone. They cause serious harm to human economic activities by attaching to buoys, ship hulls, fishing nets, anchors of ships and all the fishing devices (Seo, 2010).

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (China, Hong Kong, South China Sea, Sakhalin, Puget Sound, British Columbia to Mexico, New Zealand).

Superfamily Microporoidea Gray, 1848 은공이끼벌레상과

Family Steginoporellidae Hincks, 1884 단추이끼벌레과

Genus *Labioporella* Harmer, 1926 입술이끼벌레속

54. *Labioporella sinuosa* Osburn, 1940 입술이끼벌레

Labioporella sinuosa Osburn, 1940: 377; 1950: 109, pl. 11, fig. 12; Soule and Duff, 1957: 98; Soule, 1959: 31; Shier, 1964: 619; Banta and Carson, 1977: 390, fig. 2D; Banta, 1980: 373, fig. 24.30; Rho and Seo, 1986: 38, pl. 5, figs. 1, 2; Winston, 1986: 8; Seo, 2005: 370, pls. 94, 95.

Material examined. Beomseom Island, 8 Jan. 2009 (J.R. Lee).

Substratum. Unknown.

Remarks. In Korea, it is found only from the Jeju Island.

Distribution. Korea (Jeju Island), Pacific Ocean (from Gulf of California to Ecuador, Great Barrier Reef), Atlantic Ocean (Florida, Costa Rica, Porto Rico).

55. *Labioporella sinuosa* Osburn, 1940 굽은입술이끼벌레

Labioporella sinuosa Osburn, 1940: 377; 1950: 109, pl. 11, fig. 12; Soule and Duff, 1957: 98; Soule, 1959: 31; Shier, 1964: 619; Banta and Carson, 1977: 390, fig. 2D; Banta, 1980: 373, fig. 24.30; Rho and Seo, 1986: 38, pl. 5, figs. 1, 2; Winston, 1986: 8; Seo, 2005: 371, pl. 96; Chae *et al.*, 2016: 557; Chae *et al.*, 2016: 558.

Distribution. Korea (Jeju Island), Pacific Ocean (from Gulf of California

to Ecuador, Great Barrier Reef), Atlantic Ocean (Florida, Costa Rica, Porto Rico).

Genus *Steginoporella* Smitt, 1873 단추이끼벌레속

56. *Steginoporella magnilabris* (Busk, 1854) 큰단추이끼벌레

Membranipora magnilabris Busk, 1854: 62, 113.

Steganoporella magnilabris: Busk, 1884: 75, pl. 23, fig. 2; Ortmann, 1890: 30, pl. 2, fig. 7; Thornely, 1911: 145; 1916: 162; Canu and Bassler, 1923: 63, pl. 14, figs. 12, 13; 1928a: 52, pl. 7, figs. 8–10, pl. 32, fig. 6; 1929a: 144, pl. 15, figs. 1, 2; Okada, 1923: 224; Harmer, 1926: 277, pl. 17, figs. 1–3, 7, 9, 12, text-fig. 10; Livingstone, 1928: 114; O'Donoghue and Watteville, 1935: 205; Stach, 1935: 341; Okada and Mawatari, 1935: 130; 1938: 450; Osburn, 1940: 375; 1947a: 18; Silén, 1941: 62; O'Donoghue and Watteville, 1944: 414; Mawatari, 1952c: 263; 1963: 7; Marcus, 1955: 284, fig. 25; Cook, 1964d: 53; 1968a: 153; 1985: 108; Redier, 1969: 6; Powell, 1971: 769; Pouyet and David, 1979: 784, text-fig. 2, pl. 1, figs. 6–7; D'Hondt, 1979f: 339; 1983c: 142; Rho and Song, 1980: 150, pl. 1, figs. 9, 10; Rho and Seo, 1984: 77; 1986: 34; 1990: 149; Lu, 1991: 43, pl. 4, fig. 12; Seo, 1992: 144; 2005: 372, pl. 97; Je *et al.*, 1997: 49; Chae *et al.*, 2016: 558.

Steginoporella magnilabris: Winston, 1984: 10, figs. 17, 18; 1986: 10; Ryland and Hayward, 1992: 240, fig. 10b.

Material examined. Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Rocks, Sponges and stones.

Remarks. This species inhabits shallow tropical waters. Therefore, Korean and Japanese waters seem to be the northern limit of this species (Seo, 2010). Gageodo Island belonging to the Yellow Sea affected by the warm current (Seo, 2009).

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (Strait of Korea, East China Sea, South China Sea, Philippines, Hawaii, Australia, Great Barrier Reef), Indian Ocean (Red Sea), Atlantic Ocean (Bahamas, Gulf of Mexico to Brazil, SW Africa), North America (fossil), Cosmopolitan.

Family Thalamoporellidae Levinsen, 1909 안방이끼벌레과

Genus *Thalamoporella* Hincks, 1887 안방이끼벌레속

57. *Thalamoporella lioticha* (Ortmann, 1890) 미끈안방이끼벌레

Micropora lioticha Ortmann, 1890: 30, pl. 2, fig. 11; Okada, 1923: 225.

Thalamoporella lioticha: Canu and Bassler, 1929a: 150, pl. 17, figs. 1, 2; Silén, 1941: 64; Mawatari, 1952c: 263; Rho and Seo, 1984: 77, pl. 1, figs. 2-4; 1990: 149; Seo, 1992: 144; 1998a: 212; 1998b: 41; 2005: 374, pls. 98, 99.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Gimnyeong port, 17 Aug. 2009 (B.S. Min, H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Mureungri at Daejeongeup, 16 May 2010 (J.J. Sim, and B.I. Kim); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang,

and K.J. Jung).

Substratum. Rocks, cement test panels, sponges.

Remarks. This species is fouling bryozoans.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (East China Sea, Philippine).

58. *Thalamoporella sibogae* Soule, Soule and Chaney, 1992 시보가안
망이끼벌레

Thalamoporella sibogae Soule *et al.*, 1992: 56, figs. 77-81; Seo, 2005: 376, pls. 100-102; Chae *et al.*, 2016: 558.

Thalamoporella rozieri: Harmer, 1926 (part): 292, pl. 19, figs. 3-13; Rho and Seo, 1990: 149, pl. 4, figs. 1-5 [not *T. rozieri* (Savigny and Audouin, 1826)]; 2005: 376, pls. 100-102.

Material examined. Yechori at Hachujado Island, 3 Nov. 2009 (B.S. Min and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang).

Substratum. Stones and other bryozoan (*Adeonella lichenoides*).

Remarks. This species is found only from the Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Philippines, Makassar Strait, Sulu Archipelago, Banda Sea).

Superfamily Cellarioidea Lamouroux, 1821 마디이끼벌레상과

Family Cellariidae Lamouroux, 1821 마디이끼벌레과

Genus *Cellaria* Ellis and Solander, 1786 마디이끼벌레속

59. *Cellaria punctata* (Busk, 1852) 마디이끼벌레

Salicornaria punctata Busk, 1852b: 366.

Cellaria triangularis Ortmann, 1890: 32, pl. 2, fig. 13; Okada, 1921: 30, text-fig. 7; 1923: 225; 1934b: 11, pl. 1, fig. 8; Okada and Mawatari, 1935: 132.

Cellaria punctata: Harmer, 1926: 337, 340, pl. 21, figs. 14-16, text-fig. 13, a; Hastings, 1932: 413; Marcus, 1937a: 206, fig. 13; 1937b: 282, pl. Id; Okada and Mawatari, 1938: 450; Silén, 1941: 70, figs. 85, 86; 1954a: 12; Mawatari, 1952c: 275, fig. 10, pl. 12, fig. 6; Rho and Song, 1980: 151, pl. 2, figs. 1, 2; Rho and Seo, 1984: 78; 1990: 149; Lu, 1991: 44, pl. 6, fig. 1; Seo, 1992: 145; 1998a: 213; 1998b: 418; 2005: 378, pl. 103; Je *et al.*, 1997: 49; Tillbrook *et al.*, 2001: 58; Seo, 2005: 378, pl. 103; Chae *et al.*, 2016: 558.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Beomseom Island, 7 May 2009 (B.S. Min); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Jeolmyeongdo Island in Hachujado Island, 4 Nov. 2009 (H.S. Kim); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, sponges.

Remarks. This species was reported as a fouling bryozoan for the first time by Seo and Min (2009). But, they are usually well represented on rocks in subtidal to the Jeju Island.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Strait of Korea, China Sea, Philippines, Vanuatu, Madura St., Makassar, Celebes, Kai Is, New Guinea, Australia), Indian Ocean (Sumbawa, Timor, Flores), Atlantic Ocean (Mauritania, South Africa), Cosmopolitan.

Unplaced Anascan Genus 소속불명속

Genus *Brettia* Dyster, 1858 곤봉이끼벌레속

60. *Brettia mollis* Harmer, 1926 곤봉이끼벌레

Brettia mollis Harmer, 1926: 198, pl. 23, figs. 1, 2; Mawatari, 1973b: 619, fig. 4; Seo, 2005: 379, pl. 104.

Bugula mollis: Banta and Redden, 1990: 795.

Material examined. Jeolmyeongdo Island in Hachujado Island, 4 Nov. 2009 (H.S. Kim); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Biyangdo Island, 24 Sep. 2011 (J.E. Seo, and B.S. Min).

Substratum. Tangled with a hydrozoans.

Remarks. This species is characterized very weakness form. In Korea, it is found only from the Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Galapagos Islands), Indian Ocean (East Indian).

Suborder Ascophora Levinsen, 1909 유낭아목

Infraorder Acanthostega Levinsen, 1902 가시지붕하목

Superfamily Catenicelloidea Busk, 1852 연쇄방이끼벌레상과

Family Catenicellidae Busk, 1852 연쇄방이끼벌레과

Genus *Catenicella* de Blainville, 1830 연쇄방이끼벌레속

61. *Catenicella elegans* Busk, 1852 미끈이이끼벌레

Catenicella elegans Busk, 1852b: 361, pl. 1, fig. 2; Marcus, 1922a: 431, fig. 7; Redier, 1971b: 531.

Vittaticella elegans: Livingstone, 1927: 57; 1929: 99; Hastings, 1932: 448; Stach, 1935: 345; 1937: 382; Okada and Mawatari, 1938: 460; Osburn, 1940: 464, pl. 9, figs. 78, 79; 1952: 286, pl. 31, figs. 1-2; O'Donoghue and Watteville, 1944: 421; Mawatari, 1952c: 265; Silén, 1954a: 15; Harmer, 1957: 769, pl. 50, fig. 2; O'Donoghue, 1957: 85; Vigeland, 1958: 9; Powell, 1967b: 237, text-fig. 13, pl. 3, fig. a; Uttley and Bullivant, 1972: 53; Cadee, 1973: 3, fig. 1 a-c; Rho and Chung, 1975: 53, pl. 7, figs. 25, 26; Rho and Kim, 1981: 69; Rho and Seo, 1984: 87; 1986: 35; D'Hondt, 1986b: 705; Gordon, 1989: 24; Moyano G., 1991: 321; Seo, 1992: 149; Song and Won, 1992: 124; Je *et al.*, 1997: 49; Seo, 2005: 382, pls. 105-107A; Chae *et al.*, 2016: 558.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Bukchon, 26 Aug. 2008 (J.R. Lee); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S.

Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, worm tubes, sponges, fishing nets, stones and other bryozoan (tangled with *C. eburneodenticulata*).

Remarks. This species is a fouling bryozoan. Colony attaches to the fishing nets, sponges, other bryozoans and stones. A lot of colonies are found from Jeju Island. This species inhabits warm waters.

Distribution. Korea (South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Chatham Island, Puget Sound, Chile, Australia, Tasmania, New Zealand, New Caledonia), Indian Ocean (Red Sea, Bass Strait), Atlantic Ocean (Porto Rico, North Sea, Mediterranean Sea, Africa, Madeira), Cosmopolitan.

Infraorder Umbonulomorpha Gordon, 1989 흑이끼벌레하목

Superfamily Adeonoidea Busk, 1884 사슴뿔이끼벌레상과

Family Adeonidae Busk, 1884 사슴뿔이끼벌레과

Genus *Adeona* Lamouroux, 1812 사슴뿔이끼벌레속

62. *Adeona japonica* (Ortmann, 1890) 사슴뿔이끼벌레

Adeonella japonica Ortmann, 1890: 54, pl. 4, fig. 11; Okada, 1917c: 278; 1920: 628, pl. 8, fig. 9, text-fig. 6; Okada and Mawatari, 1935: 140; 1938: 460.

Adeona japonica: Mawatari, 1952c: 285, pl. 12, fig. 1; Rho and Seo, 1986: 36; Seo, 2005: 389, pls. 110B, 111A.

Distribution. Korea (Jeju Island), Japan.

Family Adeonellidae Busk, 1884 아데오넬라과

Genus *Adeonella* Busk, 1884 아데오넬라속

63. *Adeonella lichenoides* (Lamarck, 1816) 넓적부리이끼벌레

Eschara lichenoides Lamarck, 1816: 176.

Eschara platalea Busk, 1854: 90, pl. 105, figs. 1-3, pl. 108, fig. 4.

Adeonella platalea: Busk, 1884: 183, pl. 21, figs. 1a, 2a, 3, 3a, 4, 4a; Marcus, 1921: 13, fig. 7; Harmer, 1957: 809, pl. 53, figs. 2, 4-8, 10, 12, text-fig. 82, 84, I-K; Hayward, 1983: 582, figs. 1A, C, D; 1988: 126, figs. 1C, 2, 3; Seo and Rho, 1989: 211, pl. 5, figs. 1-3; Seo, 1992: 152; Song and Won, 1992: 124; Seo, 2005: 391, pls. 111B-115.

Adeonella lichenoides: Hayward, 1988a: 126, figs. 2, 3; Chae *et al.*, 2016: 558.

Material examined. Gimnyeong port, 15 Aug. 2008 (B.S. Min); Hwasun port, 15 Aug. 2008 (B.S. Min); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang), 7 May 2009 (B.S. Min); Munseom Island, 26 Aug. 2008 (J.R. Lee); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Haengwon, 16 May 2010 (J.J. Sim, and B.I. Kim); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Biyangdo Island, 24 Sep. 2011 (J.E. Seo, and B.S. Min); Geumdegiyeo, 12 Sep. 2013 (B.S. Min); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min

and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, corals, stones, cement test panels, worm tubes, fishing lines, sponges and ropes.

Remarks. This species is a fouling bryozoan. This species is usually encrusting corals on stones, and is found only from Jeju Island waters.

Distribution. Korea (Jeju Island), Pacific Ocean (Philippines to Australia, Celebes, Aru Island), Indian Ocean (Bass St.).

Superfamily Umbonuloidea Canu, 1904 흑이끼벌레상과

Family Celleporariidae Harmer, 1957 섬유이끼벌레과

Genus *Celleporaria* Lamouroux, 1821 섬유이끼벌레속

***64. *Celleporaria aperta* (Hincks, 1882) 구멍섬유이끼벌레**

Schizoporella aperta Hincks, 1882: 126, pl. 5, fig. 3.

Celleporaria aperta: Harmer, 1957: 673, pl. 42, figs. 11–13, text-fig. 56; Cook, 1965c: 442; 1968a: 175; 1985: 144; Powell, 1967a: 167; 1969: 159, figs. 4, 7; Song, 1985: 71, 74; Winston, 1986: 12; Scholz, 1991: 294, pl. 8, fig. 3, pl. 9, fig. 6, pl. 10, fig. 3; Ryland and Hayward, 1992: 251, fig. 14d, e; Gong and Seo, 2004: 14; Seo, 2005: 394, pls. 116, 117.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Unknown.

Remarks. This species is a fouling bryozoan collected from test panels in the power plants at Wolseong and Seochon (Seo, 2009). This species is newly found for the first time from the Jeju Island waters.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Philippine, Queensland, Great Barrier Reef), Indian Ocean (Ceylon, Indonesia, Red Sea), Atlantic Ocean (Jamaica, Mediterranean Coast, West Africa), Cosmopolitan.

***65. *Celleporaria brunnea* (Hincks, 1884) 갈색섬유이끼벌레**

Cellepora brunnea Hincks, 1884: 56; O'Donoghue and O'Donoghue, 1926: 21.

Holoporella brunnea: Hastings, 1930: 731: 16, fig. 7, 108-110; Osburn, 1952: 496, pl. 62, figs. 10-12; Soule and Duff, 1957: 127; Soule, 1961: 33; Pinter, 1969: 210.

Celleporaria brunnea: Soule and Soule, 1973: 601, fig. 79; Banta, 1980: 396, fig. 24, 103; Soule *et al.*, 1995: 267, pl. 101A-C; Seo and Min 2009: 29, Fig. 7.

Material examined. Jeju port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Ropes, Fishing lines, oyster shells.

Remarks. This species encrusting hard substrates. Depths from intertidal to over 200m. This species is the one of the commonest species in California and Baja California waters (Soule *et al.*, 1995), so it is considered to be the introduced species from eastern Pacific Ocean.

This species is usually encrusting on hard substrates, and it is newly found for the first time from the Jeju-do Island waters and a fouling bryozoan found from ropes hanging on the wharf.

Distribution. Korea (South Sea, Jeju Island), Pacific Ocean (British Columbia southward to Ecuador. One of the most common species in California and Baja California waters).

66. *Celleporaria fusca* (Busk, 1854) 검은섬유이끼벌레

Cellepora fusca Busk, 1854: 88, pl. 119, fig. 2, pl. 120, fig. 6; Androsova, 1959: 53, pl. 3, fig. 17.

Holoporella fusca: Livingstone, 1927: 65; Hastings, 1932: 447.

Celleporaria fusca: Harmer, 1957: 680, pl. 43, figs. 1-7; Redier, 1969: 12; 1971a: 157; D'Hondt, 1986b: 706; Hayward, 1988b: 345, fig. 16d; Seo, 1994: 191-192, pls. 3, 4; 2005: 395, pls. 118-120A; Ryland and Hayward, 1992: 253, fig. 15a-d.

Distribution. Korea (Jeju Island), Pacific Ocean (Australia, Great Barrier Reef, Loyalty Is., New Caledonia, Polynesia), Indian Ocean (Ceylon, Red Sea, Mauritius, Bass Strait), Indo-Pacific Ocean.

67. *Celleporaria triangula* Seo, 1994 세모섬유이끼벌레

Celleporaria triangula Seo, 1994: 190, pls. 1, 2; 2005: 397, pls. 120B, 121.

Distribution. Korea (South Sea, Jeju Island).

68. *Celleporaria wakayamensis* (Okada and Mawatari, 1938) 섬유이끼벌레

Holoporella wakayamensis Okada and Mawatari, 1938: 462, pl. 24, fig. 14,

text-fig. 7.

Celleporaria wakayamensis: Seo and Rho, 1989: 207, pl. 1, figs. 1, 2; Seo, 1992: 148; 1998a: 213; 1998b: 419; 2005: 398, pls. 122, 123; Chae *et al.*, 2016: 558.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Munseom Island, 26 Aug. 2008 (J.R. Lee); Bukchon, 26 Aug. 2008 (J.R. Lee); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Gimnyeong port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang).

Substratum. Anthozoans, oyster shells and cement test panels.

Remarks. This species is newly reported as a fouling bryozoan herein.

Distribution. Korea (South Sea, Jeju Island and Yellow Sea) and Japan.

Family Exochellidae Bassler, 1935 우뚝이끼벌레과

Genus *Escharoides* Milne-Edwards, 1836 혀입이끼벌레속

69. *Escharoides excavata* (MacGillivray, 1860) 난로이끼벌레

Lepralia excavata MacGillivray, 1860: 166.

Escharoides excavata: Livinstone, 1925: 197; Brown, 1952: 301, figs. 227, 228; Powell, 1967b: 231, text-fig. 11; Gordon, 1984: 72, pl. 24, E; Rho and Kim, 1981: 66, pl. 2, fig. 3, pl. 6, figs. 9, 10; Song, 1985: 71; Rho and Seo, 1986: 36; Seo, 1992: 148; Seo, 2005: 400, pls. 124, 125.

Distribution. Korea (East Sea, South Sea, Jeju Island and Yellow Sea),

Pacific Ocean (California, Galapagos Islands, Australia, New Zealand),
Indian Ocean (Red Sea).

Genus *Exochella* Jullien, 1888 파리이끼벌레속

70. *Exochella tricuspis* (Hincks, 1881) 삼천파리이끼벌레

Mucronella tricuspis Hincks, 1881: 125.

Exochella areolata Okada and Mawatari, 1937: 440, pl. 11, figs. 3-5,
text-fig. 3; Rho and Lee, 1980: 119.

Exochella tricuspis: Brown, 1952: 289; Powell, 1967: 312; Uttley and
Bullivant, 1971: 45; Gordon, 1984: 71, pl. 24, A-C; Hayward, 1991: 310,
fig. 4C, D.

Material examined. Jikgwido Island in Sangchujado Island, 5 Nov. 2009
(B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and
H.J. Yang).

Substratum. Unknown.

Remarks. This species is newly found for the first time from the Jeju
Island waters.

Distribution. Korea (Jeju Island and Yellow Sea), Japan and southern
Pacific.

Infraorder Lepraliomorpha Gordon, 1989 다형이끼벌레하목

Superfamily Smittinoidea Levinsen, 1909 입이끼벌레상과

Family Smittinidae Levinsen, 1909 입이끼벌레과

Genus *Parasmittina* Osburn, 1952 측입이끼벌레속

71. *Parasmittina areolata* (Canu and Bassler, 1927) 측입이끼벌레

Smittina areolata Canu and Bassler, 1927b: 23.

Parasmittina areolata: Soule and Soule, 1973: 392, figs. 4E-G; Rho and Kim, 1981: 66, pl. 6, figs. 3-5; Hayward, 1988b: 298, pl. 4e; Seo, 2005: 403, pls. 126, 127; Chae *et al.*, 2016: 559.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min).

Substratum. Cement test panels.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (Jeju Island), Japan, Pacific Ocean, Indian Ocean (Mauritius).

72. *Parasmittina contraria* Seo, 1993 반향측입이끼벌레

Parasmittina contraria Seo, 1993: 39, pls. 4, 5; 1998a: 214; 2003: 134; 2005: 404, pls. 128, 129; Chae *et al.*, 2016: 559.

Material examined. Seopseom Island, 27 Aug. 2008 (J.R. Lee); Gimnyeong port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Haengwon, 16 May 2010 (J.J. Sim, and B.I. Kim); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang).

Substratum. Sponges, shells of mollusca, cement test panels.

Remarks. This species is endemic to Jeju Island waters, Geojedo Island and South Sea so far. Gageodo Island of the Yellow Sea is newly added to the fauna of *P. contraria*. However, Gageodo Island is located in the farthest west-southern of the Yellow Sea which is strongly affected by the Kuroshio Warm Current. It is considered that *P. contraria* seems to be a warm temperate or subtropical species (Seo, 20009). It is a fouling

bryozoan collected from cement test panels. Colony encrusts the sponge (*Discodermia japonica*) and also is a fouling species attaching to fishing nets. This species is endemic to Korea, which had been reported as a new species from Korean waters and is definitely a subtropical species because most colonies are only from Jeju waters (Seo, 2010).

Distribution. Korea (South Sea, Jeju Island and Yellow Sea).

73. *Parasmittina crosslandi* (Hastings, 1930) 슬측입이끼벌레

Smittina crosslandi Hastings, 1930: 726.

Parasmittina crosslandi: Osburn, 1952: 418, pl. 48, figs. 1, 2; Soule, 1961: 37; Cook, 1968a: 214; 1985: 188; Powell, 1971: 772; Soule and Soule, 1973: 382, fig. 2E, F; Banta and Carson, 1977: 408, figs. 24-25; Banta, 1980: 388, fig. 24.84; Winston, 1986: 21; Cuffey and Cox, 1987: 87; Seo, 1993: 38, pl. 3; Seo, 2005: 405, pls. 130, 131A.

Material examined. Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang).

Substratum. Unknown.

Remarks. Colony attached to the other bryozoans and corals (Seo, 2010).

Distribution. Korea (Jeju Island and Yellow Sea), Pacific Ocean (Hawaii, Coast of California, Gulf of California to Columbia), Atlantic Ocean (Caribbean Sea, Panama Canal, Senegal to Ghana, West Africa).

***74. *Parasmittina delicatula* (Busk, 1884) 고운입이끼벌레**

Mucronella delicatula Busk, 1884: 156, pl. 18, fig. 2.

Smittina aviculata Mawatari, 1952c: 280, fig. 15.

Parasmittina delicatula: Soule and Soule, 1973: 401, 403, 404, fig. 6D-F;

Gordon, 1984: 95, pl. 35, A; 1989: 53, pl. 28, F; Seo, 2002b: 136, fig. 1; 2005: 407, pls. 131B-133.

Material examined. Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min and H.J. Yang).

Substratum. Unknown.

Remarks. Colony attached to the stem of seaweed, other bryozoans and hydrozoans (Seo, 2010). This species is newly found for the first time from the Jeju Island waters.

Distribution. Korea (Jeju Island and Yellow Sea), Japan, Pacific. Korea (South Sea, Jeju Island and Yellow Sea), Japan, Pacific Ocean (Hawaii, Australia, New Zealand).

75. *Parasmittina serrula* Soule and Soule, 1973 톱니조두체입이끼벌레

Parasmittina serrula Soule and Soule, 1973: 386, 388, 389, fig. 3D-F; Gordon, 1984: 96, pl. 35, B, C; Winston, 1984: 23, fig. 45; 1986: 22; Scholz, 1991: 325, pl. 20, figs. 1, 2, 4; Ryland and Hayward, 1992: 272, figs. 23e, f, 24a; Tilbrook *et al.*, 2001: 76, fig. 14E, F; Seo, 2003: 135; Seo, 2005: 410, pls. 136, 137A; Chae *et al.*, 2016: 559.

Smittina raigii: Rho and Seo, 1986: 40, pl. 10, figs. 3-4 [not *S. raigii* (Audouin, 1826)].

Material examined. Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang).

Substratum. Oyster shells.

Remarks. This species is fouling bryozoans attached to the eel cages. Colony attached to other bryozoans and corals (Seo, 2010). In Korea, it

is found only from Jeju Island.

Distribution. Korea (Jeju Island), Pacific Ocean (Philippines, Hawaii, Great Barrier Reef, Vanuatu, New Zealand), Atlantic Ocean (Gulf of Mexico, Caribbean Sea, Belize, Jamaica).

76. *Parasmittina triangularis* (Mawatari, 1952) 세모측입이끼벌레

Smittina triangularis Mawatari, 1952c: 282, fig. 16.

Parasmittina triangularis: Song, 1985: 71, 74; Rho and Seo, 1986: 41, pl. 12, figs. 1-3; Seo, 1993: 38; Seo, 2005: 411, pls. 137B, 138; Chae *et al.*, 2016: 559.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Seopseom Island, 27 Aug. 2008 (J.R. Lee); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang).

Substratum. Cement test panels, sponges and calcific diatomaceous.

Remarks. This species is fouling bryozoans attached to the test panels (Seo, 2011).

Distribution. Korea (East Sea, Jeju Island, Yellow Sea), Japan.

Genus *Pleurocodonellina* Soule and Soule, 1973 종사촌이끼벌레속

77. *Pleurocodonellina signata* (Waters, 1889) 길쭉종사촌이끼벌레

Smittia signata Waters, 1889: 17, pl. 3, figs. 4-6.

Smittina signata: Harmer, 1957: 928, pl. 63, figs. 4-6.

Pleurocodonellina signata: Winston and Heimberg, 1986: 21, figs. 51-54; Ryland and Hayward, 1992: 273, 276, fig. 24b; Seo, 2005: 413, pls. 139, 140.

Parasmittina elongata: Song and Won, 1992: 124; Seo, 1993: 38, pl. 2;

2003: 135.

Distribution. Korea (Jeju Island), Japan, Indian Ocean (India).

Genus *Smittina* Norman, 1903 입이끼벌레속

78. *Smittina torques* Powell, 1967 목걸이입이끼벌레

Smittina torques Powell, 1967b: 325; Gordon, 1984: 91, pl. 32 E; 1989: 51; Seo, 2005: 414, pls. 141, 142A.

Smittina malleolus: Seo, 1993: 37, pl. 1; 2003: 134 [not *S. malleolus* (Hincks, 1884)].

Distribution. Korea (South Sea, Jeju Island), Pacific Ocean (China Sea, Galapagos Islands, Ecuador, Celebes Strait, New Zealand, New Caledonia), Indian Ocean (India, Ceylon, Red Sea, Mergui), Atlantic Ocean (Florida, Caribbean Sea, West Indies, Bay of Santos).

Genus *Smittoidea* Osburn, 1952 태양입이끼벌레속

79. *Smittoidea pacifica* Soule and Soule, 1973 태양입이끼벌레

Smittoidea pacifica Soule and Soule, 1973: 380, fig. 1F-H; Rho and Kim, 1981: 65, pl. 5, figs. 4, 5; Song, 1985: 71, 74; Winston, 1986: 28; Cuffey and Cox, 1987: 87; Ryland and Hayward, 1992: 268, fig. 21a-c; Tilbrook, *et al.*, 2001: 78; Seo, 2003: 135; 2005: 416, pls. 142B, 143; Gong and Seo, 2003: 12; Chae *et al.*, 2016: 559.

Smittoidea reticulata: Osburn, 1952: 409, pl. 48, figs. 9, 10; Seo, 1993: 40, pl. 6 [not *S. reticulata* (MacGillivray, 1842)].

Material examined. Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang).

Substratum. Rocks.

Remarks. This species is fouling bryozoan collected from fishing nets (Seo, 2009).

Distribution. Korea (East Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Philippines, Hawaii, Galapagos Islands, Great Barrier Reef, Vanuatu, Torres Strait), Indian Ocean, Atlantic Ocean (Venezuela).

80. *Smittoidea prolifica* Osburn, 1952 입이끼벌레

Smittoidea prolifica Osburn, 1952: 408, pl. 48, figs. 7-8; Soule, 1961: 33; McCain and Ross, 1974: 14; Banta, 1980: 388, fig. 24.81; Rho and Seo, 1986: 41, pl. 11, figs. 1, 2; Seo, 1993: 40; 1998b: 421; 2005: 417, pls. 144-146A; Chae *et al.*, 2016: 559.

Smittia reticulata Roberston, 1908: 306, pl. 23, figs. 75, 76.

Smittina landsborovii: Song, 1985: 71 [not *S. landsborovii* (Johnston, 1847)].

Smittina levis: Song, 1985: 71, 74 [not *S. levis* (Kirkpatrick, 1890)].

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Beomseom Island, 8 Jan. 2009 (J.R. Lee); Bukchon, 26 Aug. 2008 (J.R. Lee); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang).

Substratum. Rocks, cement test panels and hydrozoans.

Remarks. This species is a typical fouling species encrusting the test panels for ecological experiment, fishing nets or weirs as well as other bryozoans or worm tubes (Seo, 2010).

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (California, NW Pacific).

Family Bitectiporidae MacGillivray, 1895 중앙조두체이끼벌레과

Genus *Metroperiella* Canu and Bassler, 1917 종이끼벌레속

81. *Metroperiella montferrandii* (Audouin, 1826) 철빛종이끼벌레

Flustra montferrandii Audouin, 1826: 240.

Schizomavella montferrandii: Livingstone, 1927: 63.

Lepralia montferrandii: Waters, 1909: 171, pl. 17, figs. 15-18.

Leparlia montferrandii: Hastings, 1932: 414.

Codonellina acuta: Rho and Kim, 1981: 65, pl. 5, figs. 6-8; Rho and Seo, 1986: 36; Seo, 1993: 41; Je *et al.*, 1997: 49.

Lepralia obtusata Ortmann, 1890: 41, pl. 3, fig. 13; Okada, 1923: 227; Okada and Mawatari, 1938: 457.

Codonellina obtusata: Mawatari, 1952: 280; Kataoka, 1960: 396; Rho and Seo, 1984: 85; 1986: 36; Seo, 1993: 41; Seo, 1998b: 420.

Codonellina montferrandii: Harmer, 1957: 1049, pl. 69, figs. 25, 26, 30; Mawatari, 1963: 9; Lagaaij, 1963: 196, pl. 6, fig. 3; Cook, 1968: 216; 1985: 188; Hayward, 1974: 384, fig. 5d; Gordon, 1984: 77, pl. 26, A; Rho and Seo, 1984: 86, pl. 5, fig. 5; Winston, 1986: 16; D'Hondt, 1986: 704; 1995: 13; Cuffey and Cox, 1987: 87; Seo, 1993: 41; 1998a: 213; 2005: 421, pls. 148-150; Seo and Min, 2009: 33; Chae *et al.*, 2016: 559.

Metroperiella montferrandii: Tilbrook *et al.*, 2001: 75, fig. 15F.

Material examined. Bukchon, 26 Aug. 2008 (J.R. Lee); Beomseom Island, 7 May 2009 (B.S. Min); Gimnyeong port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S.

Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks, sponges, anthozoans, hydrozoans, other bryozoan, tunicates, oyster shells, bivalve shells, ropes and worm tubes.

Remarks. In Korea, it is found from the South Sea, Jeju Island and Yellow Sea.

Distribution. Korea (South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Australia, New Zealand, Polynesia, New Caledonia), Indian Ocean (Ceylon, Red Sea, Port Phillip), Atlantic Ocean (Gulf of Mexico, Caribbean Sea, Netherlands, Coast of tropical West Africa).

Genus *Schizomavella* Canu and Bassler, 1842 작은구멍이끼벌레속

82. *Schizomavella acuta* (Osburn, 1952) 뽕족작은구멍이끼벌레

Schizomavella auriculata acuta Osburn, 1952: 332, pl. 38, figs. 7–9.

Schizomavella acuta: Soule *et al.*, 1995: 211, pl. 78A–D, fig. 20; Seo, 2005: 423, pls. 152; Chae *et al.*, 2016: 560.

Smittoidea levis: Song, 1985: 3, 6; Seo, 1998a: 214 [not *S. levis* (Kirkpatrick, 1890)].

Material examined. Beomseom Island, 12 Oct. 2009 (B.S. Min, H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang).

Substratum. Rocks and oyster shells.

Remarks. The Jeju Island is recorded as new distribution of this species (Chae *et al.*, 2016).

Distribution. Korea (East Sea, South Sea and Jeju Island), Japan, Pacific Ocean (Philippines, South Pacific Ocean, Australia, Torres St., New Caledonia), Indian Ocean (Red Sea).

Family Watersiporidae Vigneaux, 1949 물구멍이끼벌레과

Genus *Watersipora* Neviani, 1895 물구멍이끼벌레속

83. *Watersipora platypora* Seo, 1999 큰입이끼벌레

Watersipora platypora Seo, 1999: 223, fig. 3; 2005: 425, pl. 153; Chae *et al.*, 2016: 560.

Dakaria bidentata: Rho and Seo, 1984: 85, pl. 6, figs. 1, 2 [not *D. bidentata* (Ortmann, 1890)].

Watersipora arcuata: Seo, 1992: 150 [not *W. arcuata* (Banta, 1969)].

Material examined. Bukchon, 26 Aug. 2008 (J.R. Lee); Seopseom Island, 27 Aug. 2008 (J.R. Lee); Mureungri at Daejeongeup 8 May 2009 (B.S. Min and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Sponges, oyster shells, other bryozoan (*Thalamoporella lioticha*), ropes and sponges.

Remarks. This species is endemic to Korean waters so far (Seo, 2009,

2010).

Distribution. Korea (South Sea, Jeju Island), Japan.

84. *Watersipora subtorquata* (d'Orbigny, 1852) 자주빛이끼벌레

Cellepora subtorquata D'Orbigny, 1852: 399.

Watersipora cucullata: Marcus, 1937: 118; 1938: 46.

Watersipora subovoidea: Kamita and Sato, 1941: 3; Cook, 1968a: 184; Geraci and Relini, 1970: 118; Unsal, 1975: 44; Geraci, 1974: 48, pl. 8, fig. 40; D'Hondt, 1979g: 460; Rho and Kim, 1981: 63, pl. 4, figs. 6, 7; Winston, 1982: 139, fig. 66; Rho and Seo, 1984: 84; Song, 1985: 71, 74; Cook, 1985: 149; Limousin, 1986: 396, fig. 129; Winston, 1986: 30; Kim and Choe, 1987: 363; Seo and Rho, 1989: 208; Scholz, 1991: 292, pl. 13, fig. 2; Seo, 1992: 149; 1998b: 420; Je *et al.*, 1997: 49.

Dakaria subovoidea: Harmer, 1957: 1022, pl. 69, figs. 11, 12, 14, text-fig. 111; Balavoine, 1959: 272, pl. 4, fig. 6; Mawatari, 1963: 10; Uttley and Bullivant, 1972: 37; Rho and Lee, 1980: 119.

Watersipora subtorquata: Ryland, 1974c: 345; Soule and Soule, 1985: 295; Winston, 1986: 30; D'Hondt, 1988a: 199; Gordon, 1989: 40, pl. 20, B-H; Seo, 1999: 222, fig. 1; 2005: 426, pls. 154-156; Gong and Seo, 2003: 11; 2004: 14, fig. 2F.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Seogwipo port, 15 Aug. 2008 (B.S. Min); Hwasun port, 15 Aug. 2008 (B.S. Min); Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Jeju port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang);

Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Jeju port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (J.E. Seo, B.S. Min and H.J. Yang); Hahyo port, 5 Jan. 2012 (B.S. Min and H.J. Yang); Wimi port, 6 Jan. 2012 (B.S. Min and H.J. Yang); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Cement test panels, plastic bags, oyster shells, sponges and ropes.

Remarks. This species is the commonest species from Korean waters. It is found from any localities and substratum in Korea. This species is being researched genetically because it can be found worldwide (Seo, 2010). This species is usually found intertidal zone and pier, but Gapado Island and Seopseom Island specimen collected the subtidal zones from 20–25 m in depth.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Hong Kong, Chatham Island, Philippine, Torres Strait, Great Barrier Reef, New Zealand, New Caledonia), Indian Ocean (Ceylon, Indonesia, Red Sea), Atlantic Ocean (Bermuda, Florida, West Indies, Brazil, European Seas, Mediterranean Coast, Cape Verde Islands, West Africa), Cosmopolitan.

Superfamily Schizoporelloidea Jullien, 1883 구멍이끼벌레상과

Family Schizoporellidae Jullien, 1903 구멍이끼벌레과

Genus *Schizoporella* Hincks, 1887 구멍이끼벌레속

85. *Schizoporella unicornis* (Johnston, 1847) 한구멍이끼벌레

Lepralia unicornis Johnston, 1847: 329, pl. 57, fig. 1.

Schizoporella unicornis: Hincks, 1880a: 238, pl. 35, figs. 1-5; Ortmann, 1890: 49, pl. 3, fig. 35; Jullien and Calvet, 1903: 138; Waters, 1909: 143, pl. 12, figs. 12, 13; Osburn, 1910: 236, pl. 25, figs. 48, 48a-e, pl. 30, fig. 91; 1920: 126; 1932b: 373; 1940: 419; 1944: 43, fig. 27; 1947a: 28; 1952: 317, pl. 37, figs. 1, 2; Levinsen, 1916: 452; Barroso, 1917: 496; Nordgaard, 1918: 56; Marcus, 1920: 81; O'Donoghue, 1924: 42; Livingstone, 1926: 85; 1927: 61; Hastings, 1927: 336; 1930: 720; Calvet, 1928: 6; Okada, 1929: 20, text-fig. 7; Borg, 1933: 534; Kramp, 1934: 18; Marcus, 1937a: 215; 1937b: 83, pl. 17, fig. 44; 1940: 237, fig. 121; 1941b: 22; 1950: 3; Rogick and Croasdale, 1949: 66, figs. 57-63; Lacourt, 1949: 300; Mawatari, 1952c: 264; 1963: 9; Lagaaij, 1952: 65, pl. 5, fig. 7; Maturo, 1957: 49, figs. 52, 53; Androsova, 1959: 47, pl. 2, fig. 8; 1963: 27; Shier, 1964: 629; Soule, 1961: 9; Rogick, 1964: 178; Gordon, 1967: 57, fig. 27; Soule and Soule, 1968: 212; Cook, 1968a: 191; Pinter, 1969: 207; Geraci and Relini, 1970: 114; Fey, 1971: 205; Androsova, 1971: 147; Hayward, 1971: 484; McCain and Ross, 1974: 13; Unsal, 1975: 42; Geraci, 1974: 42, pl. 7, figs. 34-37; Kubanin, 1975: 123; Eggleston, 1975: 18; Hayami, 1975: 108, pl. 15, fig. 6; Pouyet, 1976: 65; Hayward, 1976a: 9; Hayward and Ryland, 1979: 168, fig. 67; Ambrogi, 1981: 125, fig. 38; Winston, 1982: 145; Rho and Seo, 1984: 84, pl. 5, figs. 1, 2; Song, 1985: 71; Cook, 1985: 160; D'Hondt, 1987b: 47; 1990a: 54; Bergey and Denning, 1987: 437, fig. 21.7; Seo and Rho, 1989: 209; Li, 1990: 47, text-fig. 11; Lu, 1991: 55, pl. 14, fig. 1; Seo, 1992: 151; 1998b: 421; 2005: 429, pls. 157, 158; Soule *et al.*, 1995: 204, 207, pl. 75, A-F; Gong and Seo, 2003: 11; 2004: 14; Chae *et al.*, 2016: 560.

Schizopodrella unicornis: Canu and Bassler, 1925: 29; Osburn, 1932a: 443.

Material examined. Jeju port, 14, 15 Aug. 2008 (B.S. Min); Seogwipo port, 15 Aug. 2008 (B.S. Min); Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Jeju port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Hwasun port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Seogwipo port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (J.E. Seo, B.S. Min and H.J. Yang); Wimi port, 6 Jan. 2012 (B.S. Min and H.J. Yang); Pyoseon port, 6 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Cement test panels, oyster shells.

Remarks. This species is a fouling bryozoan, and is newly added from the Jeju Island (Chae *et al.*, 2016).

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (China Sea, Hong Kong, California to Mexico, Hawaii, Australia, Queensland, New Zealand), Atlantic Ocean (Hudson Bay, East Coast of North America, Porto Rico, Caribbean Sea, Panama Canal, Brazil, European Seas, North coast of Mediterranean Sea, West Africa), Arctic Ocean.

Family Margaretidae Harmer, 1957

Genus *Margaretta* Gray, 1843

86. *Margaretta tenuis* Harmer, 1957 나사이끼벌레

Margaretta tenuis Harmer, 1957: 840; Hayward, 1988: 330; Chae *et al.*,

2016: 560, fig. 5.

Material examined. Marado Is., 14 Nov. 2010 (B.S. Min).

Substratum. Rocks.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (Jeju Island), Pacific Ocean (Philippine, Australia).

Family Hippopodidae Levinsen, 1909 말발이끼벌레과

Genus *Hippopodina* Levinsen, 1909 말발이끼벌레속

87. *Hippopodina feegeensis* (Busk, 1884) 말발이끼벌레

Lepralia feegeensis Busk, 1884: 144, pl. 22, figs. 9-9b; Livingstone, 1926: 94.

Hippopodina feegeensis: Levinsen, 1909: 353, pl. 24, figs. 3a-f; Thornely, 1911: 150; Livingstone, 1927: 63; Canu and Bassler, 1928b: 133, pl. 34, figs. 1, 2; Hastings, 1932: 413; Marcus, 1937b: 116, pl. 23, fig. 62 A, B; Osburn, 1940: 412, pl. 7, figs. 54, 55; 1952: 292, pl. 31, figs. 6-8; Mawatari, 1952c: 265; Brown, 1952: 275, fig. 206; Harmer, 1957: 974, pl. 67, figs. 7-9; Soule and Duff, 1957: 107; Powell, 1967a: 169, pl. 2, fig. 11; 1969: 160, figs. 2, 6, 8; Soule and Soule, 1968: 212; 1971: 771; Banta and Carson, 1977: 413; Winston, 1984: 19, fig. 41; 1986: 20; Winston and Heimberg, 1986: 16, figs. 28-30; Hayward, 1988b: 319; Scholz, 1991: 305, pl. 13, fig. 3; Ryland and Hayward, 1992: 256; Seo, 1992: 150, pl. 1, figs. 6, 7; 2005: 431, pl. 159. ; Tilbrook *et al.*, 2001: 88; Chae *et al.*, 2016: 560.

Material examined. Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, H.J. Yang); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul.

2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks and sponges.

Remarks. In Korea, *H. feegeensis* found only from Jeju Island. This species is known to be a warm species. The temperature of the water was 20–24°C at the time of collecting. Jeju Island seems to be the northern limit of this species (Seo, 2005; 2011).

Distribution. Korea (Jeju Island), Pacific, Indian and Atlantic.

Family Pacificincolidae Liu and Liu, 1999

Genus *Pacificincola* Liu and Liu, 1999

****88. *Pacificincola perforata* (Okada and Mawatari, 1937) (Figure 8)**
Mucronella perforata Okada and Mawatari, 1937: 442, pl. 11, fig. 8, text fig. 4a–c.

Hippoporina perforata: Huang *et al.* 1990, p 744, fig. 8, c.

Pacificincola perforata: Liu and Liu, 1999: 340, text-fig. 1a–c, pl. 1, figs. 1–5; Liu *et al.*, 2001: 572, pl. 44, figs. 1, 2; De Blauwe, 2006: 140, figs. 1–3; Grischenko *et al.*, 2007: 1122, fig. 30.

Material examined. Gangjeong, 10 Jul. 2011.

Substratum. Rocks.

Description. Colony encrusting, coherent, greyish white, forming unilaminar patch, up to about 2 cm in diameter, light yellow color when alive. Zooids subhexagonal, elongate ovoid, or irregularly rectangular, 434–590µm long, 252–389µm wide, separated by a groove and suture line. All zooids of one type. Frontal wall slightly convex, granulated, evenly perforated with circular pores. Orifice semicircular, longer than wide, 93–155µm long, 82–141µm wide; wide shallow sinus laterally confined by a

pair of pointed small triangular condyles. Peristome distinct lateral lappets, with proximal raised umbo and a small opening of kenozooid between umbo and orifice. Ovicell globose, prominent, hyperstomial, 230–235 μm long, 253–281 μm wide, closed by operculum, recumbent on frontal wall of distal zooid and partially overhanging orifice, frontally imperforate, irregular nodular, sometimes with finely tuberculate radiating ribs, with series of marginal pores. No spines and avicularia. Interzooidal communication via multiporous septula. Ancestrula elongate oval, 343–390 μm long, 201–247 μm wide, similar to autozooids, frontal wall finely granulated and evenly perforated with numerous pores. Ancestrular orifice roughly circular, 52–56 μm long, 76–81 μm wide. Ancestrula buds smaller zooids, two distolaterally and two laterally, surrounded by zooids.

Remarks. Okada and Mawatari (1937) originally described *Pacificincola perforata* from Onagawa Bay on the Pacific side of northern Honshu in Japan. Afterwards, it was reported from the Hong Kong in China (Huang *et al.*, 1990), and from the coastal waters of China (Liu and Liu, 1999) and from the coast of Hokkaido Island in Japan (Grischenko *et al.*, 2007). Recently introduced to the Atlantic coast of Europe (De Blauwe, 2006). Liu and Liu (1999) used *P. perforata* from the coastal waters of China as the type species for the new genus *Pacificincola* and a new family Pacificincolidae.

Pacificincola perforata is similar to *P. aviculifera* (Osburn, 1914) in having a similar, bell-shaped orifice, evenly perforate frontal walls, crescentic proximal suboral arch with a central cavity covered by membrane, and imperforate granular hyperstomial ovicells. However: *perforata* differences from *P. aviculifera* in the shape of ovicells. The

ovicell of *P. perforata* has tuberculate radiating ribs, while the *P. aviculifera* has no tuberculate radiating ribs and helmet-shaped with a flared proximal rim (see Winston, JE., 2005).

We observed *P. perforata* at coasts of southern Korea, where it was commonly attached to rocks, oyster shells Pacific oysters (*Crassostrea gigas*), bivalve shells (*Mytilus galloprovincialis*), plastics on the surface. Grischenko (2006) described the morphology of this species in detail. *P. perforata* are usually encrusting and tightly attaching to the substrate. The species are able to develop erect growths that those can't observed. Following Liu and Liu (1999) the orifice width ranges from 72 to 108 μm , which is remarkably smaller than for the European material (De Blauwe, 2006).

Distribution. Korea (Jeju Island), Japan (Yatarojima near Onagawa Bay, northern Honshu, 34 m in depth; Akkeshi Bay on the Pacific side of Hokkaido). China (Qingdao in Shandong Province; Shipu in Zhejiang Province; Pingtan Island, Xiamen, and Dongshan Island in Fujian Province; Daya Bay and Dapeng Bay in Guangdong Province, and Hong Kong and its neighboring waters, 0–15 m in depth), Atlantic coast of Europe (France, Netherlands). France (Bay of Arcachon). Netherlands (Goesse Sas in the Oosterschelde; Yerseke).

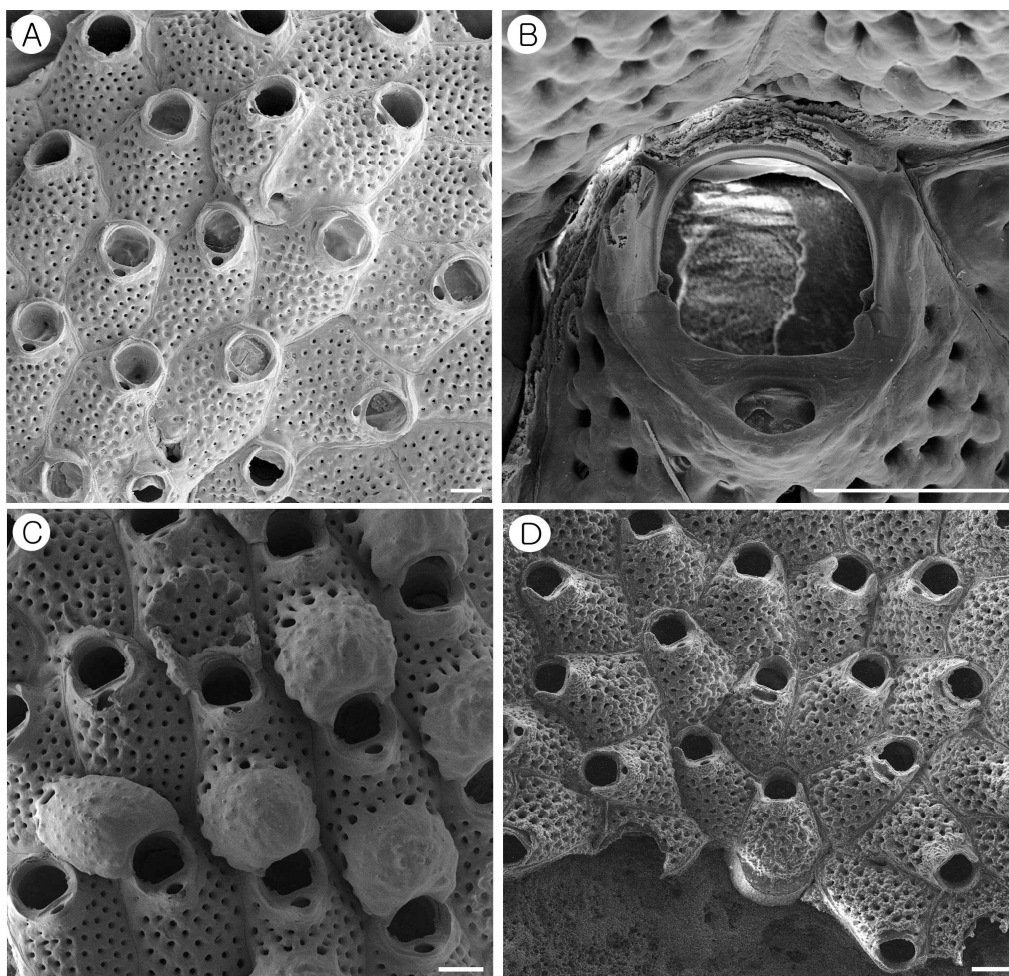


Figure 8. *Pacificincola perforata*. A, zooids; B, orifice; C, ovicells; D, ancestrula and daughter zooids. Scale bars: A-D=100 μ m.

Genus *Primavelans* De Blauwe, 2006

***89. *Primavelans* n. sp. (Figure 9)

Mucronella perforata: Rho and Seo, 1985: 4, pls. 9, 10. [not *Pacificincola perforata* (Okada and Mawatari, 1937)]

Material examined. Munseom Island, 6 Oct. 2009 (J.E. Seo, B.S. Min and H.J. Yang); 21 Nov. 2009; 19 Jan. 2010 (B.S. Min and H.J. Yang);

Gapado Is., 5 Jul. 2015 (B.S. Min, H.J. Yang and J.K. Jung).

Substratum. Anthozoan, (sea fans), hydrozoan, rocks.

Description. Colony encrusting substratum of flat type at intertidal zone and sometimes rising into forming frilled massive colony when older in the subtidal zone, up to about 20 cm in maximum diameter, light yellow, orange when alive. Zooids irregularly rectangular to hexagonal, ovoid, 403–740 μ m long, 229–296 μ m wide, separated by a groove and interzooidal sutures. All zooids of one type. Frontal wall slightly convex, granulated and evenly perforated with large pores except just proximal to orifice. Orifice subcircular, wider than long, 163–184 μ m long, 170–209 μ m wide, the wide shallow sinus laterally confined by downcurved triangular condyles. Peristome not developed rim, with proximal raised umbo and a small opening of kenozooid between the umbo and the orifice. Ovicell large, globose, conspicuous, granulated, 364–415 μ m long, 326–381 μ m wide generally with a few pores on surface, overlying the frontal wall of next distal zooid. The process of ovicell is with radiating fine rib and mature ovicell is without rib. Ovicell with a pair of collars on around condyles. Most covered with zooidal operculum. No spines and avicularia. Ancestrular subcircular, 88–92 μ m long, 96–100 μ m wide, budding a triplet of daughter zooids, one distally and two laterally.

Remarks. *Primavelans* n. sp. appears to be similar to *Primavelans insculpta* (Hincks, 1882) in having a similar unilaminar and encrusting, bilaminar lobes and frills, irregularly rectangular to hexagonal, colony form, semicircular of the orifice, peristome a low rim, shelf-like condyles, perforated frontal wall, ovicell hyperstomial. However, this new species differs from the latter in several characters: (1) Male and female zooids

of *Primavelans* n. sp. are all of the same type, whereas they are zooids of two types in *P. insculpta*. (2) They have not *P. insculpta* with imperforated ovicell. (3) *Primavelans* n. sp. have not ribbing on ovicells, in contrast to the well-developed ribs on ovicells of *P. insculpta*. (4) The other characteristic feature of this new species have ovicell with a pair of collars. And *Primavelans* n. sp. most *Primavelans mexicana* (Soule, Soule and Chaney, 1995) in having a similar encrusting, hexagonal, semicircular of the orifice, colony form, located condyles, perforated frontal wall, ovicells large, with nodular surface, with flaps at the corners. However: *mexicana* differs from *Primavelans* n. sp. shape of peristome. The peristome of *P. mexicana* peristome raised into a collar except in fertile zooids (Soule, Soule and Chaney, 1995), while *Primavelans* n. sp. is peristome no raised. This new species is clearly characterized by ovicell. They have not *P. mexicana* with imperforated ovicell. *P. mexicana* by having more numerous frontal walls pores somewhat bigger.

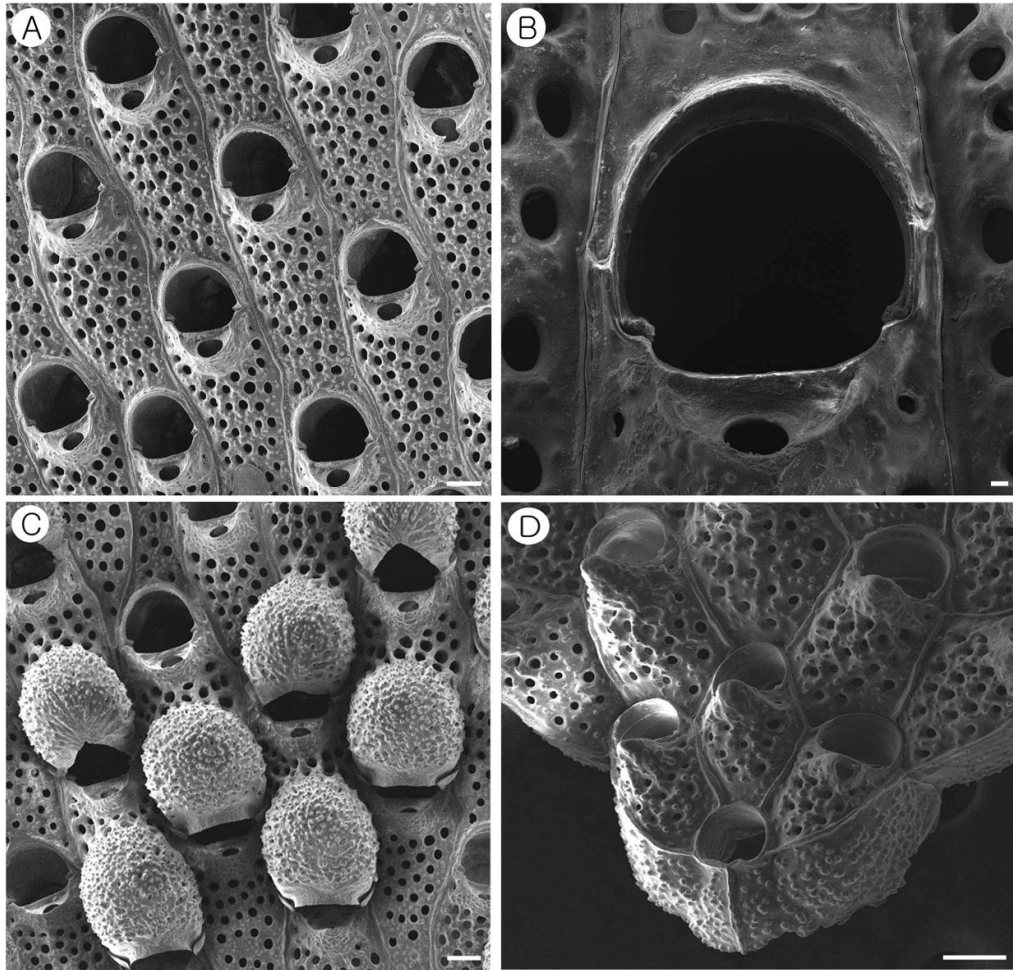


Figure 9. *Primavelans* n. sp. A, zooids; B, D-shaped orifice; C, ovicells with pores; D, ancestrula covered by two daughter zooids with remaining orifice. Scale bars: A, C-D=100 μ m, B=10 μ m.

Family Lanceoporidae Harmer, 1957 창구멍이끼벌레과

Genus *Calyptotheca* Harmer, 1957 은협이끼벌레속

90. *Calyptotheca symmetrica* (Ortmann, 1890) 상칭은협이끼벌레

Lepralia symmetrica Ortmann, 1890: 40, pl. 3, fig. 11.

Calyptotheca symmetrica: Seo and Rho, 1989: 209, pl. 3, figs. 1-3; Seo,

1992: 152; 1998b: 420; 2005: 433, pls. 160, 161; Song and Won, 1992: 124.

Material examined. Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Oyster shells and worm tubes.

Remarks. This is a fouling bryozoan collected from tires hanging on the wharf. This species is a fouling species encrusting the tires protecting the piers from damage as well as seaweed stems, shells or corals (Seo, 2010). But In Jeju Island attaching to oyster shells and worm tubes.

Distribution. Korea (South Sea and Jeju Island) and Japan.

91. *Calypsotheca wasinensis* (Waters, 1913) 은협이끼벌레

Schizoporella nivea var. *wasiensis* Waters, 1913: 504, pl. 70, figs. 1-3.

Calypsotheca wasiensis: Harmer, 1957: 1017, pl. 68, figs. 15, 20, 21, 24, 32, 33; Rho and Seo, 1985: 55, pl. 6, figs. 1, 2, pl. 7, figs. 1, 2, pl. 8, figs. 1, 2; 1986: 35; Winston, 1986: 12; Winston and Heimberg, 1986: 18, figs. 41, 42; D'Hondt, 1986b: 703; Seo and Rho, 1989: 209; Scholz, 1991: 312, pl. 16, fig. 3; Seo, 1992: 152; 1998b: 420; 2005: 434, pls. 162, 163; Chae *et al.*, 2016: 561.

Material examined. Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Damunemi in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Haengwon, 16 Jun. 2010 (J.J. Sim, and B.I. Kim); Seongsanpo, 1 Apr. 2011 (B.S. Min, and H.J.

Yang); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Hydrozoans and seaweeds.

Remarks. *Calyptotheca wasinensis* were collected from Jeju Island except two localities from the South Sea and Yellow Sea. This species is likely to be a subtropical and tropical species and the Yellow Sea is strongly affected by the warm current (Seo, 2010). This species is usually collecting the summer season. The temperature of the water was 23°C at the time of collecting.

Distribution. Korea (South Sea, Jeju Island, and Yellow Sea), Pacific Ocean (Philippines, Singapore, Banda Sea, Torres Strait, New Caledonia), Indian Ocean (Ceylon, Indonesia, Andaman Island, Bali, Red Sea, Zanzibar, Africa).

Genus *Emballotheca* Levinsen, 1909 못이끼벌레속

92. *Emballotheca pacifica* Harmer, 1957 태양못이끼벌레

Emballotheca pacifica Harmer, 1957: 1088, pl. 67, figs. 3-5; D'Hondt, 1986b: 704; Rho and Seo, 1986: 39, pl. 7, figs. 1, 2; Seo and Rho, 1989: 209; Ryland and Hayward, 1992: 260, fig. 18d; Seo, 2005: 435, pls. 164, 165; Chae *et al.*, 2016: 561.

Material examined. Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang).

Substratum. Rocks, stones, oyster shells and bivalve shells.

Remarks. In Korea, it is found only from the Jeju Island. This species seems to be the subtropical species, but also from the southern Pacific

Ocean (Seo, 2010).

Distribution. Korea (Jeju Island), Pacific Ocean (China Sea, Makassar Strait, Great Barrier Reef, New Caledonia).

Family Cryptosulidae Vigneaux, 1949 숨은이끼벌레과

Genus *Cryptosula* Canu and Bassler, 1925 숨은이끼벌레속

93. *Cryptosula pallasiana* (Moll, 1803) 숨은이끼벌레

Eschara pallasiana Moll, 1803: 64.

Lepralia pallasiana: Busk, 1854: 81, pl. 83, figs. 1, 2; Waters, 1879a: 42; Hincks, 1880a: 297, pl. 33, figs. 1-3, pl. 24, fig. 4; Kirkpatrick, 1888a: 13; Nordgaard, 1896: 24; Norman, 1909: 305; Osburn, 1910: 240, pl. 25, fig. 54, pl. 30, fig. 89; Guerin-Ganivet, 1911: 16; Marcus, 1919: 268; O'Donoghue, 1925: 19; Waters, 1926: 428; Calvet, 1927: 30; Unsal, 1975: 44.

Lepralia (Smittina) pallasiana: Borg, 1930: 93, fig. 111.

Hippodiplosia pallasiana: Okada, 1929: 25, pl. 2, fig. 4, pl. 5, fig. 1; Mawatari, 1952c: 265.

Cryptosula pallasiana: Canu and Bassler, 1925: 33, pl. 7, fig. 11; 1928a: 36; Marcus, 1940: 253, fig. 130; 1942: 58, pl. 1, fig. 1; 1950: 3; Lacourt, 1949: 301; Rogick and Croasdale, 1949: 55; Osburn, 1952: 470, pl. 57, figs. 4, 5; Brown, 1952: 274, fig. 205; O'Donoghue, 1957: 91; Maturo, 1957: 58, fig. 64; Androsova, 1959: 47, pl. 1, fig. 7; Mawatari, 1963: 10; Rogick, 1964: 178; Gordon, 1967: 60, fig. 38; 1989: 39, pl. 20, A; Pinter, 1969: 209; Geraci and Relini, 1970: 116; Fey, 1971: 207; Hayward, 1971: 486; 1976a: 10; McCain and Ross, 1974: 14; Kubanin, 1975: 120; Egglestons, 1975: 19; Redier and D'Hondt, 1976: 855; Lacourt, 1978: 5; Hayward and Ryland,

1979: 90, fig. 30; Ambrogi, 1981: 118, fig. 36; Winston, 1982: 139, fig. 67; D'Hondt, 1982c: 13; 1987b: 47; 1988b: 515; 1990a: 54; 1991b: 20; Limousin, 1986: 398, fig. 130; Bergey and Denning, 1987: 437; Moyano G., 1991: 317; Seo, 1992: 150, pl. 1, fig. 5; 1998b: 420; Soule *et al.*, 1995: 174, pl. 63 A, B; Gong and Seo, 2003: 10–11; Seo, 2005: 437, pls. 166, 167; Chae *et al.*, 2016: 561.

Material examined. Jeju port, 14 Aug. 2008 (B.S. Min); Seogwipo port, 15 Aug. 2008 (B.S. Min); Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 9 Jan. 2009 (B.S. Min, and H.J. Yang); Jeju port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 18 Aug. 2009 (B.S. Min, and H.J. Yang); Seogwipo port, 28 Jun. 2010 (B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Seogwipo port, 4 Jan. 2012 (B.S. Min and H.J. Yang).

Substratum. Ropes hanging on the wharf, stones.

Remarks. *C. pallasiana* is a typical fouling species. And is newly found for the first time from the Jeju Island (Chae *et al.*, 2016). This species is many found attached to shells (oyster shell, bivalve shell) and ropes from the East Sea. The colony varies from orange to pinkish orange in color, and the depth of color will be changed by the salinity of the seawater, even being white in brackish water (Gordon, 1989). One of the more ubiquitous fouling bryozoans in New Zealand, occurring at every port. Also widespread around the world, particularly in port, harbours, and estuarine situations (Gordon and Mawatari, 1992). In Korea, this species is usually found to port.

Distribution. Korea (East Sea, South Sea, and Jeju Island), Japan, Pacific Ocean (California to Mexico, Chile, New Zealand), Indian Ocean

(Red Sea, Port Phillip), Atlantic Ocean (Woods Hole, North Carolina, Florida, Brazil, European Seas, Norway to the Black Sea, Mauritania, Madeira, South Africa), Arctic Ocean, Cosmopolitan.

Family Cheiloporinidae Bassler, 1936 입술구멍이끼벌레과

Genus *Cheiloporina* Canu and Bassler, 1923 입술구멍이끼벌레속

94. *Cheiloporina haddoni* (Harmer, 1902) 하돈입술구멍이끼벌레

Lepralia haddoni Harmer, 1902: 266, pl. 7, figs. 38, 39.

Cheiloporina haddoni: Harmer, 1957: 978, pl. 71, figs. 27, 28; Canu and Bassler, 1923: 169, text-fig. 31, A, B; Rho and Seo, 1986: 35; Seo, 1992: 150; 2005: 438, pl. 168.

Smittina perforata Okada, 1923: 228, fig. 26.

Material examined. Seongsanpo, 31 Mar. 2011 (B.S. Min, and H.J. Yang).

Substratum. Unknown.

Remarks. Colonies encrusts sponges, other bryozoans and worm tubes. This species is found only from the Jeju Island.

Distribution. Korea (Jeju Island), Pacific Ocean (Torres Strait, Australia), North America (fossil).

Family Microporellidae Hincks, 1879 소공이끼벌레과

Genus *Fenestrulina* Jullien, 1888 방사이끼벌레속

95. *Fenestrulina malusii* (Audouin, 1826) 방사이끼벌레

Cellepora malusii Audouin, 1826: 239.

Lepralia malusii: Busk, 1854: 83, pl. 103, figs. 1-4; Waters, 1879a: 33.

Microporella malusi: Robertson, 1908: 282, pl. 18, figs. 35, 36; Thornely,

1924: 11; Calvet, 1927: 14; Sakakura, 1935a: 24.

Microporella malusii: Waters, 1886: 54; 1887a: 188; 1904: 42, pl. 3, fig. 4a-d; 1909: 168; Busk, 1884: 137; Nordgaard, 1896: 20; Calvet, 1904: 22; Thornely, 1907: 188; 1911: 146; Marcus, 1920: 107, fig. 7; 1937a: 234; O'Donoghue and O'Donoghue, 1923: 174; Livingstone, 1927: 62; Canu and Bassler, 1928a: 38; Hastings, 1932: 427; Okada and Mawatari, 1938: 458; Androsova, 1959: 50, pl. 2, fig. 13; Kluge, 1975: 633, fig. 364.

Microporella (Fenestrulina) malusi: Borg, 1930: 88, fig. 101; 1933: 535.

Fenestrulina malusi: Jullien and Calvet, 1903: 49; Nordgaard, 1918: 60; Canu and Bassler, 1923: 115, pl. 36, figs. 2, 3; 1925: 38; 1928b: 112; Osburn, 1952: 387, pl. 45, fig. 3; Soule and Duff, 1957: 117; Vigeland, 1958: 10; Kataoka, 1960: 396; Soule, 1961: 28; Eggleston, 1975: 20; Banta, 1980: 386, fig. 24.73; Banta and Redden, 1990: 798; Pouyet and Moissette, 1992: 67, pl. 10, fig. 7.

Fenestrulina malusii: Norman, 1909: 297; O'Donoghue and O'Donoghue, 1926: 109; Livingstone, 1929: 89; Okada, 1929: 27, 30, text-fig. 12; Marcus, 1940: 260-261, fig. 133; 1950: 3; 1955: 300, fig. 62; Brown, 1952: 260, fig. 194; Lagaaij, 1952: 77, pl. 7, fig. 2; Mawatari, 1952c: 279, fig. 14; 1963: 9; Harmer, 1957: 966, pl. 62, figs. 32, 33; Powell, 1967b: 296, text-fig. 57; Gordon, 1967: 58, fig. 32; Cook, 1968a: 208; 1985: 191; Fey, 1971: 208; Hayward, 1971: 485; 1976a: 9; 1980a: 707, fig. 3E; Uttley and Bullivant, 1972: 47; Geraci, 1974: 48, pl. 6, fig. 32; Unsal, 1975: 43; Lopez Gappa, 1975: 437, pl. 1, figs. 4, 5; Kubanin, 1975: 126; D'Hondt, 1977a: 61; 1978a: 449; 1979c: 2; 1979g: 460; 1985d: 409; 1988b: 516; 1990a: 54; 1991b: 20; 1995: 13; Hayward and Ryland, 1979: 224, fig. 96; Moyano G., 1979: 389; Rho and Lee, 1980: 119; Rho and Kim, 1981: 65, pl. 5, figs.

1-3; Rho and Seo, 1984: 86; Song, 1985: 71, 74; Limousin, 1986: 504, fig. 176; Bergey and Denning, 1987: 433, fig. 21.8; Dick and Ross, 1988: 77, pl. 9F; Seo and Rho, 1989: 210; Bishop and Hayward, 1989: 24, figs. 92-94; Seo, 1992: 152; 1998a: 215; 2005: 440, pls. 169-171A; Gong and Seo, 2004: 15; Chae *et al.*, 2016: 561.

Fenestrulina (Microporella) malusii: Calvet, 1931: 88.

Material examined. Gimnyeong port, 17 Aug. 2009 (B.S. Min, and H.J. Yang); Jikgwido Island in Sangchujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang).

Substratum. Seaweeds.

Remarks. This species is a fouling bryozoan found from ropes hanging on the wharf (Seo, 2009).

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea), Japan, Pacific Ocean (Chatham Island to California, Galapagos Islands, Tahiti, Australia, New Zealand), Indian Ocean (India, Red Sea), Atlantic Ocean (Gulf of Mexico, Brazil to Patagonia, European Seas, Mediterranean Coast, West Africa), Arctic Ocean (Northern Sea of USSR), Antarctic, North America (fossil), Cosmopolitan.

96. *Fenestrulina mutabilis* (Hastings, 1932) 변이방사이끼벌레

Microporella mutabilis Hastings, 1932: 427, pl. 1, fig. D, Text-fig. 11; Harmer, 1957: 969, pl. 62, figs. 42, 43; D'Hondt, 1970: 257, pls. 1, 2; Rho and Seo, 1984: 86, pl. 6, figs. 3-5; 1986: 35; D'Hondt, 1986b: 703; Seo and Rho, 1989: 210; Seo, 1992: 152; 2005: 442, pls. 171B-173A; Je *et al.*, 1997: 49.

Distribution. Korea (South Sea, Jeju Island, Yellow Sea), Japan, Pacific ocean (Australia, Queensland, Great Barrier Reef, New Caledonia), Atlantic Ocean (Netherland).

Genus *Microporella* Hincks, 1877 소공이끼벌레속

97. *Microporella discors* Uttley and Bullivant, 1972 불협화소공이끼벌레

Microporella discors Uttley and Bullivant, 1972: 45, fig. 39; Gordon, 1984: 101, pl. 38, A, B; 1989: 59; Seo, 2005: 443, pls. 173B, 174; Chae *et al.*, 2016: 561.

Material examined. Beomseom Island, 8 Jan. 2009 (J.R. Lee).

Substratum. Unknown.

Remarks. This species is endemic to the New Zealand.

Distribution. Korea (East Sea, South Sea, Jeju Island), Pacific Ocean (Chatham Island, New Zealand).

Family Robertsonidridae Rosso, Sciuto and Sinagra, 2010 로버트슨이끼벌레과

Genus *Robertsonidra* Osburn, 1952 로버트슨이끼벌레속

98. *Robertsonidra argentea* (Hincks, 1881) 은부리이끼벌레

Schizoporella argentea Hincks, 1881: 158, pl. 9, figs. 6, 6a; Waters, 1909: 146, pl. 12, figs. 17, 18, pl. 13, figs. 16, 17.

Rhamphostomella argentea: Harmer, 1957: 1102, pl. 66, figs. 19-22, 24-29, text-fig. 116; Mawatari, 1963: 10; Seo and Rho, 1989: 208, pl. 2, figs. 1, 2.

Robertnisodra argentea: Powell, 1967a: 169, pl. 2, fig. 10; Winston, 1986:

27; Cuffey and Cox, 1987: 87; Scholz, 1991: 291, pl. 7, figs, 3, 4; Ryland and Hayward, 1992: 261, fig. 19b; D'Hondt, 1995: 13; Seo, 2005: 463, pls. 126, 127; Seo, 2005: 463, pl. 194.

Material examined. Seongsanpo, 1 Apr. 2011 (B.S. Min, and H.J. Yang).

Substratum. Unknown.

Remarks. Colonies loosely encrust the broad lobe of seaweed. In Korea, this species was found only on the southern part of Jeju Island so far. Worldwide subtropical and tropical species (Seo, 2011).

Distribution. Korea (Jeju Island), Japan, Pacific Ocean (Philippines, California, Galapagos Islands, Tahiti, Halmahera I, Ambon, Flores Sea, New Guinea, Great Barrier Reef, Polynesia), Indian Ocean (Mannar Gulf, Ceylon, Indonesia, Red Sea), Atlantic Ocean (Mediterranean Sea, Africa).

Family Calwellidae MacGillivray, 1887 칼웰이끼벌레과

Genus *Onchoporella* Busk, 1884 산호부치이끼벌레속

99. *Onchoporella selenoides* Ortmann, 1890 산호부치이끼벌레

Onchoporella selenoides Ortmann, 1890: 28, pl. 2, fig. 2; Okada, 1917b: 236; 1921: 28-29, text-fig. 5; Rho and Kim, 1981: 67, pl. 6, fig. 7; Rho and Seo, 1986: 36; 2005: 445, pls. 175, 176. ; Seo and Rho, 1989: 210.

Distribution. Korea (South Sea and Jeju Island), Japan.

Family Petraliellidae Harmer, 1957 바위이끼벌레과

Genus *Petraliella* Stach, 1936 바위이끼벌레속

100. *Petraliella magna* (d'Orbigny, 1852) 큰말바위이끼벌레

Semieschara magna D'Orbigny, 1852: 367.

Hippopetraliella magna: Harmer, 1957: 701, pl. 45, figs. 5, 6 ; Soule, 1961: 6; Mawatari, 1963: 9; Powell, 1967a: 167; Banta, 1980: 380, fig. 24.51; Rho and Kim, 1981: 63; Rho and Seo, 1984: 84, pl. 3, fig. 4; 1986: 35; Winston, 1986: 20; Hayward, 1988b: 296; Seo, 1992: 148; Song and Won, 1992: 124; Je *et al.*, 1997: 49; Seo, 2005: 447, pls. 177, 178A; Chae *et al.*, 2016: 562.

Material examined. Hwasun port, 15 Aug. 2008 (B.S. Min); Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 8 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 12 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang).

Substratum. Rocks, worm tubes, oyster shells and sponges.

Remarks. All the colonies were collected from Jeju Island except one locality (Mipo) from the South Sea.

Distribution. Korea (South Sea, Jeju Island), Japan, Pacific Ocean (China Sea, Philippines, Coast of California, Aru Island, Torres St., Australia), Indian Ocean (India, Ceylon, Red Sea, East Africa), Atlantic Ocean (Mauritania), Cosmopolitan.

101. *Petraliella globulata* Chae, Kil and Seo, 2016 둥근난실말발바위
이끼벌레

Petraliella globulata Chae *et al.*, 2016: 562, fig. 6.

Material examined. Munseom Island, 20 Apr. 2012.

Substratum. Worm tubes.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (Jeju Island)

Genus *Mucropetraliella* Stach, 1936 앞이깍리레속

102. *Mucropetraliella mucroaviculata* (Okada and Mawatari, 1938) 조두
체이끼벌레

Petraliella armata var. *mucroaviculata* Okada and Mawatari, 1938: 454,
pl. 24, figs. 4, 5, text-fig. 2; Mawatari, 1952c: 264.

Mucropetraliella mucroaviculata: Rho and Seo, 1986: 38, pl. 5, figs. 3, 4,
pl. 6, figs. 1, 2; Seo, 1992: 149; Seo, 2005: 448, pl. 179; Chae *et al.*, 2016:
563.

Material examined. Beomseom Island, 8 Jan. 2009 (J.R. Lee);
Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Haengwon, 4 Jun.
2015 (B.S. Min and K.J. Jung).

Substratum. Sponges, worm tubes and seaweeds stem (*Ecklonia cava*).

Remarks. This species is found only from the Jeju Island.

Distribution. Korea (Jeju Island) and Japan.

103. *Mucropetraliella philippinesis* (Canu and Bassler, 1929) 화산조
두체이끼벌레

Petraliella philippinensis Canu and Bassler, 1929: 261; Lu, 1991: 52.

Petraliella falcifera Canu and Bassler, 1929: 263.

Mucropetraliella philippinensis : Harmer, 1957: 710; Tilbrook, 2006: 200;
Chae *et al.*, 2016: 563, fig. 7.

Material examined. Beomseom Island, 27 Aug. 2009.

Remarks. This species is collected only from Jeju Island.

Distribution. Korea (South Sea and Jeju Island), Japan, Pacific Ocean (China, Philippines, Solomon Islands).

Genus *Sinupetraliella* Stach, 1936 굽은앞이끼벌레속

104. *Sinupetraliella gigantea* (Canu and Bassler, 1929) 큰굽은앞이끼벌레

Petraliella gigantea Canu and Bassler, 1929a: 258, pl. 23, figs. 10, 11.

Sinupetraliella gigantea: Harmer, 1957: 706, pl. 45, figs. 16, 17, text-fig 62, A, C; Seo, 1992: 149, pl. 4; Seo, 2005: 449, pl. 178B.

Distribution. Korea (South Sea, Jeju Island), Pacific Ocean (Philippines, Sulu Archipelago, Sibutu Island).

Family Crepidacanthidae Levinsen, 1909 채찍이끼벌레과

Genus *Crepidacantha* Levinsen, 1909 채찍이끼벌레속

105. *Crepidacantha poissonii* (Audouin, 1826) 맞채찍이끼벌레

Flustra poissonii Audouin, 1826: 240.

Lepralia poissonii: Hincks, 1885: 256; Waters, 1886: 59, pl. 8, fig. 37; Kirkpatrick, 1888a: 14; 1888b: 78, pl. 8, fig. 1; Thornely, 1907: 190; 1911: 150; Norman, 1909: 307, pl. 41, figs. 7, 8.

Crepidacantha poissonii: Canu and Bassler, 1927b: 37, pl. 8, fig. 7; 1928b: 136, pl. 34, fig. 3; 1930: 33, pl. 5, fig. 5; Livingstone, 1929: 93; Osburn, 1940: 451; 1952: 478, pl. 58, fig. 2; Brown, 1954: 246; Harmer, 1957: 981, pl. 67, fig. 22; Balavoine, 1959: 276, pl. 5, fig. 2; Soule, 1961: 48; Banta, 1980: 394, fig. 24.96; D'Hondt, 1985d: 409; 1995: 13; Winston, 1986: 16;

Cuffey and Cox, 1987: 87; Banta and Redden, 1990: 798; Seo, 2000: 214, fig. 1A, B; 2005: 451, pl. 180; Chae *et al.*, 2016: 563.

Material examined. Beomseom Island, 8 Jan. 2009 (J.R. Lee); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang).

Substratum. Oyster shells.

Remarks. This species is newly collected from the Jeju Island (Chae *et al.*, 2016).

Distribution. Korea (South Sea, Jeju Island and Yellow Sea), Japan, Pacific Ocean (China Sea, Philippines, Gulf of California to Galapagos Islands, Hawaii, Tahiti, Torres St., Australia, New Zealand), Indian Ocean (Ceylon, Red Sea, Sumbawa, Port Phillip, Bass Strait), Atlantic Ocean (Gulf of Mexico, Caribbean Sea, Jamaica, Bahamas, Porto Rico, Mediterranean Sea, Egypt, Madeira, Mauritania), Cosmopolitan.

Family Lacernidae Jullien, 1888 망토이끼벌레과

Genus *Woosukia* n. gen.

Type species. *Schizoporella subhexagona* Ortmann, 1890.

Diagnosis. Colony encrusting, unilaminar. Zooids contiguous, with pseudoporous frontal shields and dimorphic orifices. Autozooidal orifice with sinus and condyles. No oral spines, no avicularia. Female zooids and orifices of different form; ooecium very large, ectooecium membranous, endooecium densely perforated by variably shaped pseudopores, peripheral ones tending to radially linear; orifice cleithral, very broad with shallow sinus. Maternal zooid with frontal shield like that of autozooid.

****106. *Woosukia subhexagona* (Ortmann, 1890) (Figure 10)**

Schizoporella subhexagona Ortmann, 1890: 51, pl. 4, fig. 3.

Schizobrachiella subhexagona: Harmer, 1957: 1026 (part); Hirose 2010: 128, pl. 219A - E.

Material examined. Udo Island, 21 Dec. 2015, 20 - 25 m (H.J. Yang and B.S. Min.)

Description. Colony encrusting, unilaminar, up to 30 mm or more in diameter. Zooids (560 - 703 μm long, 393 - 521 μm wide) subhexagonal, arranged in regular quincunx, rounded distally, truncate or with a convex margin proximally. Frontal wall dimpled by numerous evenly distributed simple pseudopores that continue as a double or triple row around the orifice; frontal-shield pseudopores in zone of astogenetic repetition 78 - 102 (average 93). Orifice (184 - 221 μm long, 191 - 223 μm wide) nearly circular, or a little wider than long, the large anter curving on both sides towards obliquely sloping 'shoulders' on which are set long narrow condyles with a slightly sinuous profile; sinus shallow and rounded, occupying about a third of the width of the proximal orificial margin. No oral spines. No avicularia. Ovicell (347 - 423 μm long, 390 - 490 μm wide) large, generally as wide as and longer than an autozoid, occupying a considerable part of the distal zooid; the maternal orifice much wider, and a little longer, than autozooidal orifices. Female zooid about as wide and as long as an autozoid but with a shorter frontal shield suborally owing to the large orifice (144 - 201 μm long, 269 - 325 μm wide), the shield perforated as in autozooids. Ooecial skeletal surface endooecial, densely and variably perforated by generally irregularly shaped pseudopores, these a little larger toward to ooecial periphery, where the

boundary is marked by a thin line where the membranous ectooecium attaches. Ancestrula not seen.

Remarks. At least two other species have been confused with *Woosukia subhexagona*, but which are certainly congeneric. Harmer (1957) illustrated Indonesian material from Sumbawa, Lesser Sunda Islands. If his illustrations are accurate, then this material is clearly a different species, having far fewer frontal-shield pseudopores (c. 60) and, as also mentioned in the description, a central imperforate area. Harmer noted that Ortmann (1890) illustrated pores all over the frontal shield of Sagami Bay specimens and this is certainly the case in lectotype material illustrated by Hirose (2010) from Döderlein's collection. The Indonesian material also differs in the porosity of the ooecium, having radial slit-like pores arranged around the periphery. Since he mentioned other Indonesian material that showed an intermediate or mixed expression of ooecial pores, perhaps the radial slits are found in older ooecia or maybe yet another species is involved. In an encyclopedia of Japanese fauna, Mawatari (1965) depicted an ooecium like that in Indonesian material, but his stylized drawing looks like it may have been adapted from Harmer (1957). Wass and Yoo (1983) illustrated a similar type of ooecium in material from the southern Australian continental shelf. Although having similar radial slits, the ooecium has a broad frontal band of smooth ectooecium. The autozooidal frontal shield has only about 40 pseudopores as well as a centrally imperforate area. Given the morphological differences among these forms and the unlikelihood of the same species, which is non-invasive, being distributed from Honshu to southern Australia, it seems that at least three species are involved.

Distribution. Korea (Jeju Island), Japan (Sagami Bay and Sagami Sea; 20 - 270 m on hard substrata).

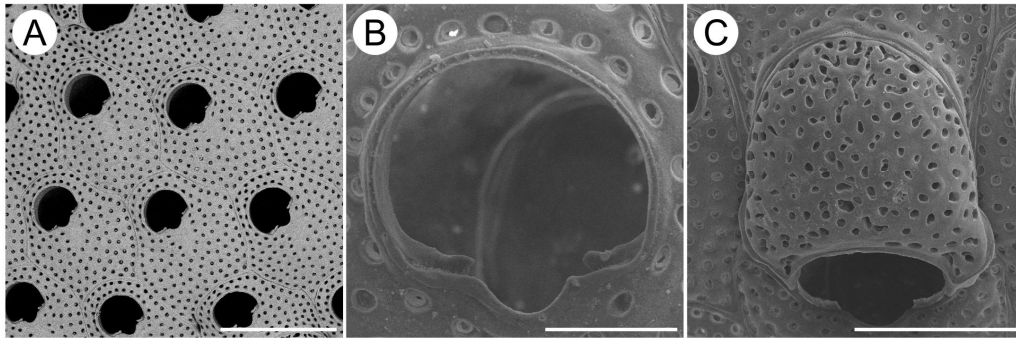


Figure 10. *Woosukia subhexagona* A, colony; B, orifice; C, ovicell. Scale bars. A = 500 μm , B = 100 μm , C = 300 μm .

Genus *Arthropoma* Levinsen, 1909 관절이끼벌레속

***107. *Arthropoma* n. sp. (Figure 11)

Arthropoma ceciliai: Okada and Mawatari 1936: 62; Rho and Seo 1986: 39, pl. 8; Seo 2005: 452, pls 181, 182A; Seo 2011: 77, fig. 36, pl. 27.

Arthropoma n. sp.: Hirose 2010: 111, pl. 190A - C.

Material examined. Yechori at Hachujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Jeju port, 6 Jan. 2011 (J.E. Seo, B.S. Min and H.J. Yang).

Substratum. Seaweeds.

Description. Colony encrusting, unilaminar, up to 20 mm diameter. Zooids (480 - 636 μm long, 287 - 403 μm wide) regularly quincuncial, the distal margin rounded or angular, the lateral margins more or less parallel-sided in many zooids. Orifice (165 - 197 μm long, 134 - 175 μm wide) proportionately large, the anter high-arched, curving proximally to horizontal 'shoulders' that bear very thin condylar surfaces that project

slightly across the entrance to the small U-shaped sinus, constricting it. Operculum with jointed sinus tab. Frontal shield convex, perforated by c. 35 - 46 relatively large, round pseudopores that are distributed over the most of the surface in the majority of zooids, except for an irregular, smooth narrow area midfrontally. Additional pseudopores are distributed around the orifice in an arc of 10 - 19 pores in an inner series, sometimes with a few other pores in an incomplete second series. No oral spines. No avicularia. Ovicell (223 - 310 μm long, 295 - 371 μm wide) prominent, hyperstomial, apparently cleithral (subcleithral), able to close both the ooecial orifice and the lower zooidal orifice; ooecial orifice nearly at right angles to maternal zooidal orifice. Ectooecium wholly membranous except for a thin peripheral rim around the base; endooecium minutely and densely pitted and textured, the pits less obvious frontally.

Remarks. *Arthropoma* n. sp. most resembles its congener *Arthropoma cecilii* Audouin, 1826 in having a similar, For example, *A. cecilii* has more than twice the number of frontal-shield pseudopores (120 - 130), which are according smaller and denser than in *Arthropoma* n. sp. The ooecium of *A. cecilii* has a smoothly calcified rim around the orifice, with a mid-distal extension, and the sides of the ooecium taper more closely towards to proximal official rim than in *Arthropoma* n. sp. The above synonymy does not cite all records of *A. cecilii* in the region, only those that definitely or almost certainly refer to *Arthropoma* n. sp.

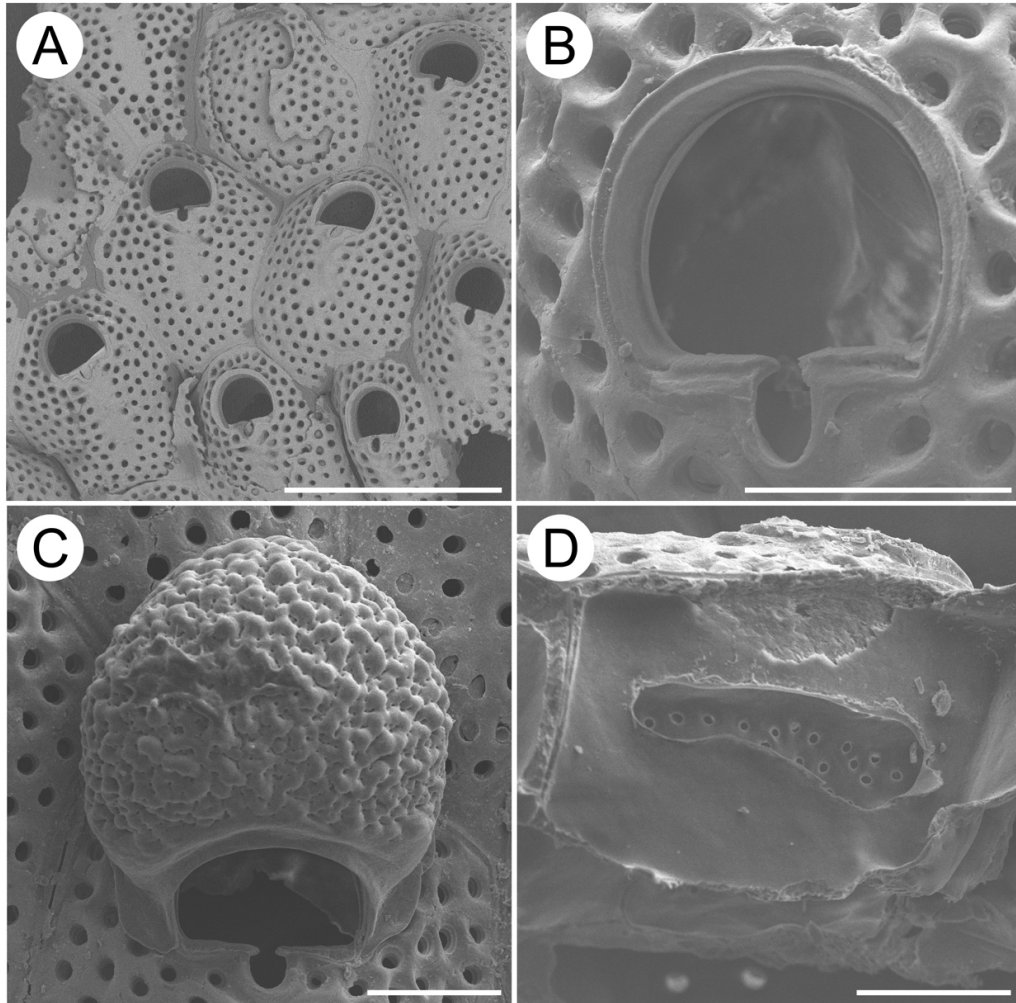


Figure 11. *Arthropoma* n. sp. A, Zooids; B, orifice; C, ovicell; D, communication pore. Scale bars. A = 500 μm , B-D = 100 μm .

Superfamily Celleporoidea Lamouroux, 1821 가지이끼벌레상과

Family Celleporidae Lamouroux, 1821 가지이끼벌레과

Genus *Buffonellaria* Canu and Bassler, 1917 두꺼비이끼벌레속

108. *Buffonellaria acutirostris* Seo and Gong, 2006 뽕족턱두꺼비이끼벌레

Buffonellaria acutirostris Seo and Gong, 2006: 13, fig. 2.; Seo and Min 2009: 38, fig. 12; Chae *et al.*, 2016: 564.

Material examined. Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Suryeongseom Island in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung).

Substratum. Rocks

Remarks. In Korea, it is found from the Jeju Island (Seogwipo, Munseom, Chujado) and East Sea (Ulleungdo). The previous data, all of collected from the fishing net.

Distribution. Korea (Jeju Island).

Genus *Celleporina* Gray, 1848 가지이끼벌레속

109. *Celleporina porosissima* Harmer, 1957 포로시씨마이끼벌레

Celleporina porosissima Harmer, 1957: 906, pl. 62, figs. 3, 16, 17; Rho and Lee, 1980: 119; Rho and Kim, 1981: 69, pl. 2, fig. 4, pl. 6, fig. 6; Song, 1985: 71, 74; Rho and Seo, 1986: 36; Seo and Rho, 1989: 212; Seo, 1992: 153; 1998a: 215; 1998b: 422; Seo, 2005: 455, pls. 182B-184; Gong and Seo, 2003: 13; Chae *et al.*, 2016: 564.

Material examined. Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Yechori at Hachujado Island, 5 Nov. 2009 (B.S. Min, and H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Jeju port, 9 Jul. 2011 (J.E. Seo, B.S. Min and H.J. Yang); Jeju port, 4 Jan. 2012 (Min and H.J. Yang).

Substratum. Seaweeds and oyster shells.

Remarks. This species is a fouling bryozoan found from fishing nets

mostly (Seo, 2005; 2009). This species inhabits shallow water and causes economical loss to the fishery industry as a fouling species (Seo, 2010). This species found from ropes hanging on the wharf, in intertidal zone attached to seaweeds.

Distribution. Korea (East Sea, South Sea, Jeju Island, Yellow Sea) and Japan.

110. *Celleporina rostellata* Harmer, 1957 부리조두체이끼벌레

Celleporina rostellata Harmer, 1957: 907, pl. 62, figs. 18, 19; Hayward and Ryland, 1995: 565, figs. 14F, 15A, B; Chae *et al.*, 2016: 564.

Material examined. Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang).

Substratum. Hydrozoans, rocks.

Remarks. This species is a fouling bryozoan found from fishing nets, and is newly added from the Jeju Island (Chae *et al.*, 2016).

Distribution. Korea (East Sea, South Sea and Jeju Island), Pacific Ocean.

Family Phidoloporidae Gabb and Horn, 1862 연구멍이끼벌레과

Genus *Iodictyum* Harmer, 1933 빨간망이끼벌레속

111. *Iodictyum axillare* (Ortmann, 1890) 빨간망이끼벌레

Retepora axillaris Ortmann, 1890: 36, pl. 2, fig. 25.

Iodictyum axillare: Harmer, 1934: 553, pl. 37, figs. 6-9; Okada, 1934b: 15, pl. 2, fig. 6; Okada and Mawatari, 1935: 139; Mawatari, 1952c: 265; Rho and Chung, 1975: 52, pl. 6, fig. 22, pl. 7, figs. 23, 24; Rho and Kim, 1981: 68; Rho and Seo, 1986: 36; D'Hondt, 1986b: 702; Seo and Rho,

1989: 211; Seo, 1992: 152; 2005: 457, pls. 185-187; Je *et al.*, 1997: 49; Chae *et al.*, 2016: 564.

Material examined. Seopseom Island, 7 Jan. 2009 (J.E. Seo, B.S. Min and H.J. Yang); Munseom Island, 5 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 13 Oct. 2009 (B.S. Min, and H.J. Yang); Suryeongseom Island in Sangchujado Island, 3 Nov. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. Min, and H.J. Yang); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks.

Remarks. The colony mostly encrusts rocks. *Iodictyum axillare* look lacy and beautiful as well as showings the most clear and luxurious color of all bryozoans (Seo, 2010). This species is easily recognizable with its red colony, and is remaining colored in alcohol.

Distribution. Korea (South Sea and Jeju Island), Japan, Pacific Ocean (New Caledonia).

Genus *Phidolopora* Gabb and Horn, 1862 연구멍이끼벌레속

112. *Phidolopora pacifica* (Robertson, 1908) 태양연구멍이끼벌레

Retepora pacifica Robertson, 1908: 310, pl. 24, figs. 81-84; Canu and Bassler, 1923: 154, pl. 39, figs. 1-7; O'Donoghue and O'Donoghue, 1925: 106; Osburn, 1952: 448, pl. 53, figs. 1-2; Androsova, 1959: 52, pl. 3, fig. 16; Soule et al., 1995: 277, pl. 106 A-E.

Iodictyum pacifica: Sakakura, 1935b: 114.

Phidolopora pacifica: Osburn, 1952: 448, pl. 53, figs. 1, 2; Seo and Rho,

1989: 212, pl. 7, figs. 1, 5; Seo, 1992: 152; 1998a: 215; 2005: 458, pls. 188–190A; Gong and Seo, 2003: 13.

Distribution. Korea (East Sea, South Sea and Jeju Island, Yellow Sea), Japan, Pacific Ocean (British Columbia to Peru, Galapagos Islands), Atlantic Ocean (United Kingdom, South Africa), North America (fossil).

*****113. *Phidolopora* n. sp. (Figure 12)**

Material examined. Munseom Island, 18 Apr. 2003; Seongsanpo, 5 Nov. 2000; Marado Island, 22 Feb. 2001; Gangjeong, 18 Apr. 2003; Munseom Island, 14 Dec. 2004.

Substratum. Rocks.

Description. Colony erect, dark orange in colour when alive. Fenestrulae irregularly rhombic in shape. Zooid hexagonal, rhombic, or oval, 383–401 μm long, 132–177 μm wide. Primary orifice long-semicircular, with beaded rim. Proximal margin straight, with shallow but distinct U-shaped sinus flanked by condylar shelves bearing low, blunt condyles. Two to four short, hollow, oral spines. Frontal avicularium long, with raised, beak-shaped rostrum, occupies central part of frontal wall. Cross-bar complete. Ovicell hyperstomial, spherical, smooth, often forming hood overhanging orifice. Dorsal surface of colony with outlines of kenozooids of irregular form. Kenozooids inflated, inflated, with a few sparse circular pore on surface. Dorsal avicularia randomly scattered on the kenozooids.

Remarks. *Phidolopora* n. sp. resembles *Phidolopora pacificoidea* in the shape of the orifice, the ovicell with a median denticle and frontal avicularia. However, this new species has more oral spines and sharper beak-shaped rostrum. And, the shape and location of dorsal avicularia

distinguish this new species from *P. elongata*, *pacifica* and *P. trisinuata*.

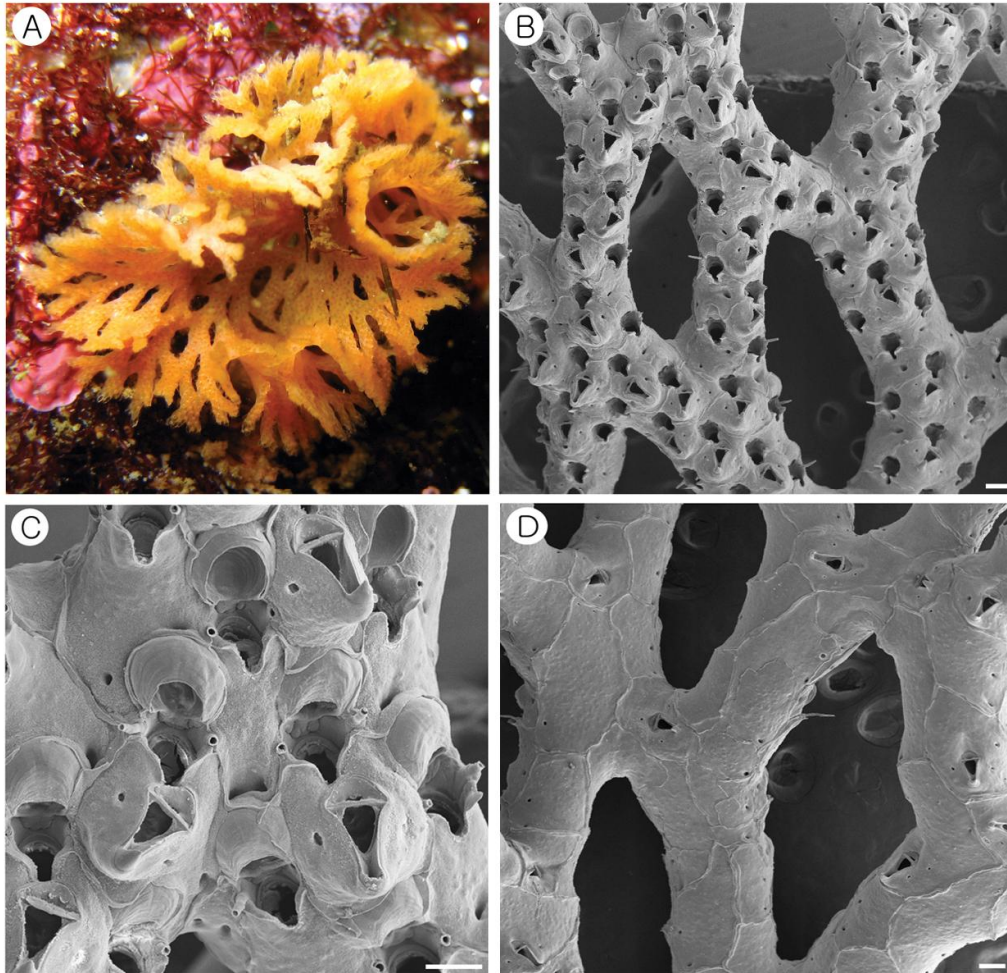


Figure 12. *Phidolopora* n. sp. A, colony; B, zooidal arrangement; C, ovicell; D, avicularia of basal surface. Scale bars = 100 μm (B-D).

Genus *Reteporellina* Harmer, 1933 망이끼벌레속

114. *Reteporellina denticulata* (Busk, 1884) 등색망이끼벌레

Retepora denticulata Busk, 1884: 109, pl. 26, fig. 1; Thornely, 1911: 147; Marcus, 1921b: 15.

Reteporellina denticulata: Harmer, 1934: 581; Okada, 1934b: 16, pl. 2, fig. 3; Okada and Mawatari, 1936: 72; 1938: 459; Silén, 1942b: 2; Mawatari, 1952c: 265; Rho and Kim, 1981: 68, pl. 1, fig. 3, pl. 6, fig. 8; Song, 1985: 71; Rho and Seo, 1986: 36; Winston, 1986: 24; D'Hondt, 1986b: 702; Seo and Rho, 1989: 212; Scholz, 1991: 323; Seo, 2005: 460, pls. 190B-192; Chae *et al.*, 2016: 564.

Material examined. Bukchon, 26 Aug. 2008 (J.R. Lee); Jeju port, 7 Jan. 2009 (B.S. Min, and H.J. Yang); Beomseom Island, 7 May 2009 (B.S. Min); Munseom Island, 6 Oct. 2009 (B.S. Min, and H.J. Yang); Seopseom Island, 20 Nov. 2009 (B.S. Min, and H.J. Yang); Munseom Island, 19 Jan. 2010 (B.S. Min, and H.J. Yang); Marado Island, 14 Nov. 2010 (J.E. Seo, B.S. and Min, H.J. Yang); Seongsanpo, 28 Nov. 2010 (B.S. Min, and H.J. Yang); Beomseom Island, 3 Jun. 2015 (B.S. Min and K.J. Jung); Haengwon, 4 Jun. 2015 (B.S. Min and K.J. Jung); Gapado Island, 5 Jun. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Marado Island, 4 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung); Gapado Island, 5 Jul. 2015 (B.S. Min, H.J. Yang, and K.J. Jung).

Substratum. Rocks.

Remarks. The colony of *Reteporellina denticulata* mostly encrusts rocks. This species is forming a typical lacy colony.

Distribution. Korea (East Sea, Jeju Island), Japan, Pacific Ocean (Philippines, Honolulu, Loyalty Island, Australia, Great Barrier Reef, New Caledonia), Indian Ocean (Ceylon, Indonesia, Red Sea, East Africa), Atlantic Ocean, Cosmopolitan.

Family Incertea sedis 소속불분명과

Genus *Hippomenella* Canu and Bassler, 1917 말달이끼벌레속

115. *Hippomenella avicularis* (Livingstone, 1926) 스푼이끼벌레

Lepralia tuberculata var. *avicularis* Livingstone, 1926: 93, pl. 5, figs. 1-3.

Hippomenella spatulata Harmer, 1957: 1095, pl. 72, figs. 27, 31; Rho and Seo, 1986: 40, pl. 9, figs.

1-3; D'Hondt, 1986: 704; Seo, 1992: 148; Seo, 2005: 462, pl. 193.

Hippomenella avicularis: Hayward and Cook, 1983: 81, fig. 19G; Seo, 2005: 462, pl. 193.

Material examined. Munseom Island, 7 Jan. 2011.

Distribution. Korea (Jeju Island), Pacific Ocean (Australia, Queensland, Torres Strait, Royalty Island, New Caledonia).

(*) indicate the species which were newly recorded from Jeju Island.

(**) indicate the species which were newly added to the Korean bryozoan fauna.

(***) indicate the species which were new to science.

제주도의 태형동물의 분류학적 연구를 통하여 5종의 한국미기록종[*Hornera lichenoides* (Linnaeus, 1758), *Scruparia ambigua* (d'Orbigny 1841), *Crassimarginatella kumatae* (Okada, 1923), *Pacificincola perforata* (Okada and Mawatari, 1937), *Woosukia subhexagona* (Ortmann, 1890)]과 4종의 신종(*Crisia* n. sp., *Primavelans* n. sp., *Arthropoma* n. sp. *Phidolopora* n. sp.)을 추가하였다. 그리고 제주도 해역에서 관찰할 수 없었던 5종 [*Membranipora serrilamella* Osburn, 1950 톱니막이끼벌레, *Bugula robusta* MacGillivray, 1869 떡갈이끼벌레, *Celleporaria aperta* (Hincks, 1882) 구멍섬유이끼벌레, *Celleporaria brunnea* (Hincks, 1884) 갈색섬유이끼벌레, *Parasmittina delicatula* (Busk, 1884) 고운입이끼벌레]을 추가하여 보고한다. 또한 기존에 잘 못 기재된 *Crassimarginatella crassimarginata* (Hincks, 1880) 연후이끼벌레, *Arthropoma cecillii* (Audouin, 1826) 관절이끼벌레는 동정의 오류로 판단되기 때문에 이번 연구에서 *C. kumatae* (Okada, 1923), *Arthropoma* n. sp. 로 보고한다. 본 연구를 통하여 얻은 제주도 해역의 태형동물은 총 2강 3목 46과 73속 115종이다.

그리고 다른 지역에 서식하지 않고, 제주도 해역에서만 서식하는 태형동물은 41종이다(Table 1). 그리고 제주도 해역에서 관찰할 수 있는 태형동물은 총 41종으로, 제주시 10종, 서귀포시 36종이다. 그리고 제주시와 서귀포시에 서 모두 관찰할 수 있는 태형동물은 *Tubulipora pulchra* 폴크라관이끼벌레, *Nolella stipata* 진흙이끼벌레, *Antropora granulifera* 공굴이끼벌레, *Amastigia xishaensis* 불룩이은이끼벌레, *Adeonella lichenoides* 넓적부리이끼벌레이다. 위에서 언급한 태형동물은 한국의 해역 중 제주 해역에서만 관찰할 수 있는 종으로 제주도를 대표하는 태형동물이다.

Table 1. Species collected only in Jeju Island.

학명	제주시	서귀포시	제주시 + 서귀포시
Class Stenolaemata			
Order Cyclostomata			
1. <i>Tubulipora pulchra</i>	○	○	○
2. <i>Crisia</i> n. sp.		○	
3. <i>Hornera lichenoides</i>		○	
Class Gymnolaemata			
Order Ctenostomata			
4. <i>Nolella stipata</i>	○	○	○
5. <i>Vesicularia harmeri</i>		○	
6. <i>Bantariella bocki</i>		○	
Order Cheilostomata			
7. <i>Crassimarginatella kumatae</i>		○	
8. <i>Antropora granulifera</i>	○	○	○
9. <i>Hiantopora intermedia</i>		○	
10. <i>Gregarinidra corbula</i>	○		
11. <i>Gregarinidra serrata</i>		○	
12. <i>Terminoflustra sagamiensis</i>	○		
13. <i>Bicellariella fragilis</i>		○	
14. <i>Dendrobeania longispinosa</i>	○		
15. <i>Beania magellanica</i>		○	
16. <i>Beania petiolata</i>		○	
17. <i>Amastigia xishaensis</i>	○	○	○
18. <i>Canda pecten</i>		○	
19. <i>Canda retiformis</i>		○	
20. <i>Tricellari adubia</i>		○	
21. <i>Labioporella bursaria</i>	○		
22. <i>Labioporella sinuosa</i>		○	
23. <i>Thalamoporella sibogae</i>		○	
24. <i>Brettia mollis</i>		○	

Table 1. Continued.

학명	제주시	서귀포시	제주시 + 서귀포시
25. <i>Adeona japonica</i>		○	
26. <i>Adeonella lichenoides</i>	○	○	○
27. <i>Celleporaria fusca</i>		○	
28. <i>Parasmittina areolata</i>		○	
29. <i>Parasmittina crosslandi</i>		○	
30. <i>Parasmittina serrula</i>		○	
31. <i>Pleurocodonellina signata</i>		○	
32. <i>Margaretta tenuis</i>		○	
33. <i>Hippopodina feegeensis</i>		○	
34. <i>Emballothea pacifica</i>		○	
35. <i>Cheiloporina haddoni</i>		○	
36. <i>Robertsonidra argentea</i>		○	
37. <i>Mucropetraliella mucroaviculata</i>		○	
38. <i>Mucropetraliella philippinesis</i>		○	
39. <i>Woosukia subhexagona</i>	○		
40. <i>Phidolopora</i> n. sp.		○	
41. <i>Hippomenella avicularis</i>		○	
	10종	36종	5종

2. 본 연구에서 미관찰 종 분석

제주도 해역에서 관찰된 태형동물은 115종으로 한국의 해산태형동물의 약 76% 이상이 포함된다. 그러나 기존에는 채집되었지만, 본 연구에서 채집할 수 없었던 태형동물에 대하여 조사하였다(Table 2). 제주도에서만 서식하는 41종 중, 이번 연구에서 관찰되지 않은 종은 12종이다. 이번 연구를 통하여 채집·관찰하지 못한 태형동물은 1강 2목 10과 11속 12종이다.

Table 2. Bryozoans not collected in study.

학명
Phylum Bryozoa Ehrenberg, 1831 태형동물문
Class Gymnolaemata Allman, 1856 나후강
Order Ctenostomata Busk, 1852 즐구목
1. <i>Vesicularia harmeri</i> Silén, 1942 주머니이끼벌레
Order Cheilostomata Busk, 1852 순구목
2. <i>Crassimarginatella kumatae</i> (Okada, 1923)
3. <i>Gregarinidra corbula</i> Seo, 1996 바구니이끼벌레
4. <i>Terminoflustra sagamiensis</i> (Okada, 1921) 끝꼬인이끼벌레
5. <i>Dendrobeania longispinosa</i> (Robertson, 1905) 긴극수지콩이끼벌레
6. <i>Beania magellanica</i> (Busk, 1852) 마젤라니카콩이끼벌레
7. <i>Beania petiolata</i> Harmer, 1926 엽병콩이끼벌레
8. <i>Tricellaria dubia</i> Silén, 1941 털세방가시이끼벌레
9. <i>Labioporella bursaria</i> (MacGillivray, 1887) 입술이끼벌레
10. <i>Adeona japonica</i> (Ortmann, 1890) 사슴뿔이끼벌레
11. <i>Celleporaria fusca</i> (Busk, 1854) 검은섬유이끼벌레
12. <i>Pleurocodonellina signata</i> (Waters, 1889) 길쭉중사춘이끼벌레

위의 종은 현재까지 보고된 문헌에는 기록되었지만 이번 연구를 통해서도 관찰하지 못하였다. 이번 연구를 통하여 관찰하지 못한 12종에 대하여 논문에 기재된 채집 방법과 관찰재료에 대한 내용을 분석하였고, 관찰하지 못한

대부분의 종은 1971년부터 1998년에 채집되었던 표본이다. 문헌의 관찰재료에 대한 내용을 보면, *Gregarinidra corbula* 바구니이끼벌레는 수심 100m의 어업활동을 하는 그물에 의해서 채집, *Dendrobeania longispinosa* 긴극수지콩이끼벌레는 수심 20m의 암반과 다른 태형동물에 부착한 것을 채집, *Labioporella bursaria* 입술이끼벌레는 수심 25m에서 SCUBA diving를 이용하여 채집하였다. 나머지 9종은 그물을 이용한 어업활동에 의해서 채집된 것이다. 군체의 특성상 *Vesicularia harmeri* 주머니이끼벌레는 굴껍질과 해조류에 부착하고, *Crassimarginatella kumatae* 는 다른 태형동물과 암반, *Terminoflustra sagamiensis* 끝꼬인이끼벌레는 조개껍데기, *Beania magellanica* 마젤라니카콩이끼벌레와 *Beania petiolata* 엽병콩이끼벌레는 다른 태형동물, *Pleurocodonellina signata* 길쭉종사촌이끼벌레는 굴껍질에 부착한 것을 확인하였고, *Tricellaria dubia* 털세방가시이끼벌레, *Adeona japonica* 사슴뿔이끼벌레, *Celleporaria fusca* 검은섬유이끼벌레는 어망에 걸려온 것이다. 그 이유는 채집지역이 모슬포, 서귀포, 위미리, 비양도, 추자도는 제주도에서도 어업활동이 활발히 이루어지는 지역이기 때문이다. *Labioporella bursaria* 입술이끼벌레는 관탈도에서 채집되었는데, 이번 연구에서는 관탈도를 조사하지 않았기 때문에 관찰할 수 없었다. 이번 연구에서 관찰할 수 없었던 대부분의 태형동물은 어업활동을 위해서 수심 100m부터 그물을 이용하여 어업활동을 했기 때문에 관찰할 수 없었다. 문헌을 분석한 결과, 대부분 수심이 깊은 곳으로부터 그물로 끌어올린 표본이 많다. 이번 연구에서 관찰한 종은 조간대와 항구 또는 조하대에서 채집하였는데, 조하대의 경우 직접 SCUBA diving을 이용한 관찰재료를 채집하였지만 가장 깊은 수심은 42m이다. *Dendrobeania longispinosa* 긴극수지콩이끼벌레와 *Labioporella bursaria* 입술이끼벌레를 제외한 10개의 종은 *Gregarinidra corbula* 바구니이끼벌레처럼 서식하는 수심이 50m 이하에서 서식하는 것으로 조사되었으며, 채집방법의 차이로 관찰할 수 없었다.

3. 항구와 조간대에 서식하는 태형동물 분석

제주도 태형동물의 채집지역인 항구와 조간대에서 채집한 해산 태형동물을 분석하였다. 제주도에는 크고 작은 항구가 많기 때문에, 부착동물인 태형동물이 어선, 배의 정박을 위해 설치한 밧줄, 선박 방지용 타이어, 그물, 양식장에서 사용하는 구조물 등 다양한 기질에 부착한다. 그리고 항구에 서식하는 종은 원산지로부터 그 분포를 확산시킬 수 있기 때문에 동물지리학적으로 매우 중요한 역할을 한다. 이와 같이 선박을 통한 외래종(introduced species)의 유입은 각 나라의 고유생태계를 교란시킬 수 있기 때문에 심각한 해양환경 문제를 유발한다.

조사지역 24개 중 4개의 항구(제주항, 김녕항, 서귀포항, 화순항)와 4개의 조간대(추자도의 예초리, 성산포, 위미리, 강정)에서 태형동물을 관찰할 수 있었으며, 일부 항구와 포구에서는 정비 사업으로 항구를 정리하였기 때문에 태형동물을 관찰할 수 없었다. 항구와 조간대에서 관찰한 태형동물은 2강 3목 26과 31속 39종이며, 종은 다음과 같다(Table 3).

Table 3. List of bryozoans collected from ports and intertidal zones.

학명	채집장소(항구, 조간대)
1. <i>Tubulipora pulchra</i> MacGillivray, 1885 폴크라관이끼벌레	제주항, 화순항
2. <i>Crisia eburneodenticulata</i> Smitt, 1865 흰수염이끼벌레	제주항
3. <i>Disporella novaehollandiae</i> (d'Orbigny, 1853) 노바접시이끼벌레	서귀포항, 종달두문포, 화순항
4. <i>Patinella radiata</i> (Audouin, 1826) 꽃접시이끼벌레	제주항, 김녕항
5. <i>Amathia distans</i> Busk, 1886 나선주머니이끼벌레	제주항, 서귀포항, 김녕항
6. <i>Aetea anguina</i> (Linné, 1758) 자루이끼벌레	서귀포항
7. <i>Biflustra perfragilis</i> MacGillivray, 1881 유연두겹막이끼벌레	서귀포항
8. <i>Membranipora serrilamella</i> Osburn, 1950 툽니막이끼벌레	화순항
9. <i>Membranipora tuberculata</i> (Bosc, 1802) 관막이끼벌레	용머리해안, 성산포 조간대 김녕항
10. <i>Bugula californica</i> Robertson, 1905 캘리포니아이끼벌레	제주항, 서귀포항
11. <i>Bugula neritina</i> Linné, 1758 큰다발이끼벌레	제주항, 서귀포항, 화순항
12. <i>Beania hexaceras</i> (Ortmann, 1890) 육콩이끼벌레	제주항, 화순항, 김녕항
13. <i>Beania mirabilis</i> Johnston, 1840 줄콩이끼벌레	화순항
14. <i>Scrupocellaria maderensis</i> Busk, 1860 모가시이끼벌레	제주항

Table 3. Continued.

학명	채집장소(항구, 조간대)
15. <i>Tricellaria occidentalis</i> (Trask, 1857) 세방가시이끼벌레	제주항, 서귀포항, 김녕항, 화순항
16. <i>Thalamoporella lioticha</i> (Ortmann, 1890) 미끈안방이끼벌레	화순항, 김녕항
17. <i>Cellaria punctata</i> (Busk, 1852) 마디이끼벌레	화순항
18. <i>Catenicella elegans</i> Busk, 1852 미끈이끼벌레	제주항, 서귀포항
19. <i>Adeonella lichenoides</i> (Lamarck, 1816) 넓적부리이끼벌레	김녕항, 화순항
20. <i>Celleporaria aperta</i> (Hincks, 1882) 구멍섬유이끼벌레	제주항, 서귀포항
21. <i>Celleporaria brunnea</i> (Hincks, 1884) 갈색섬유이끼벌레	제주항, 서귀포항, 화순항
22. <i>Celleporaria wakayamensis</i> (Okada and Mawatari, 1938) 섬유이끼벌레	제주항, 서귀포항, 화순항, 김녕항
23. <i>Escharoides excavata</i> (MacGillivray, 1860) 난로이끼벌레	김녕항
24. <i>Exochella tricuspis</i> (Hincks, 1881) 삼천파리이끼벌레	서귀포항
25. <i>Parasmittina areolata</i> (Canu and Bassler, 1927) 측입이끼벌레	화순항
26. <i>Parasmittina contraria</i> Seo, 1993 반향측입이끼벌레	김녕항
27. <i>Parasmittina triangularis</i> (Mawatari, 1952) 세모측입이끼벌레	화순항
28. <i>Smittoidea prolifica</i> Osburn, 1952 입이끼벌레	화순항

Table 3. Continued.

학명	채집장소(항구, 조간대)
29. <i>Metroporiella montferrandii</i> (Audouin, 1826) 철빛종이끼벌레	김녕항
30. <i>Watersipora subtorquata</i> (d'Orbigny, 1852) 자주빛이끼벌레	제주항, 서귀포항, 화순항
31. <i>Schizoporella unicornis</i> (Johnston, 1847) 한구멍이끼벌레	제주항, 서귀포항, 화순항
32. <i>Pacificincola perforata</i> (Okada & Mawatari, 1937) 숨은이끼벌레	서귀포항, 강정 조간대
33. <i>Cryptosula pallasiana</i> (Moll, 1803) 방사이끼벌레	위미리 조간대
34. <i>Fenestrulina malusii</i> (Audouin, 1826) 큰말바위이끼벌레	제주항, 서귀포항, 김녕항
35. <i>Petraliella magna</i> (d'Orbigny, 1852) 불협화소공이끼벌레	화순항
36. <i>Microporella discors</i> Uttley and Bullivant, 1972 관절이끼벌레	추자도 예초리 조간대
37. <i>Arthropoma cecillii</i> (Audouin, 1826) 관절이끼벌레	추자도 예초리 조간대
38. <i>Celleporina porosissima</i> Harmer, 1957 포로시씨마이끼벌레	제주항 추자도 예초리 조간대
39. <i>Reteporellina denticulata</i> (Busk, 1884) 등색망이끼벌레	제주항

제주도의 항구와 조간대에서 서식하는 해산 태형동물은 39종이다. 그 중 16종 (*Biflustra perfragilis* 유연두겹막이끼벌레, *Bugula californica* 캘리포니아이끼벌레, *Bugula neritina* 큰다발이끼벌레, *Tricellaria occidentalis* 세방가시이끼벌레, *Thalamoporella lioticha* 미끈안방이끼벌레, *Celleporaria aperta* 구멍섬유이끼벌레, *Celleporaria brunnea* 갈색섬유이끼벌레, *Escharoides excavata* 난로이끼벌레, *Parasmittina contraria* 반향측입이끼벌레, *Smittoidea prolifica* 입이끼벌레, *Watersipora subtorquata* 자주빛이끼벌레, *Schizoporella unicornis* 한구멍이끼벌레, *Cryptosula pallasiana* 숨은이끼벌레, *Fenestrulina malusii* 방사이끼벌레, *Microporella discors* 불협화소공이끼벌레, *Celleporina porosissima* 포로시씨마이끼벌레)은 오손태형동물로 알려져 있다. 그리고 *Bugula californica* 캘리포니아이끼벌레, *Bugula neritina* 큰다발이끼벌레, *Celleporaria brunnea* 갈색섬유이끼벌레, *Schizoporella unicornis* 한구멍이끼벌레는 제주도 채집지역 중 항구에서만 관찰할 수 있었다. 부착 오손태형동물은 항구에서 사용하는 부표나 수중의 구조물 또는 수중장비 등에 부착하여 부식을 촉진시키거나 장비의 기계적인 손상을 일으킨다. 또한 발전소의 용수관을 막아 물의 흐름을 방해하며, 양식장에서는 양식 생물의 성장을 저해하고 시설물을 파괴 또는 노화의 원인이 되기도 한다 (Ryland, 1970; Je *et al.*, 1988). 그리고 태형동물의 군체는 선박의 밑바닥에 부착하여 자라기 때문에 선박의 속도를 저하시켜서 연료의 소비량이 증가하기도 한다. 선박의 바닥에 부착하는 오손 태형동물은 전 세계적으로 선박을 통한 교류가 활발하므로 원산지로부터 그 분포를 확산시킬 수 있기 때문에 동물지리학적으로 매우 중요한 역할을 한다(Seo, 2005).

이번 연구를 통하여 제주도 해역에서 직접 채집한 관찰 재료 74종 중 39종(52%)이 제주도의 항구와 조간대에서 채집하였다. 대부분 항구에서 채집한 반면 조간대에서 채집한 종은 7종(노바접시이끼벌레 *Disporella novaehollandiae*, 관막이끼벌레 *Membranipora tuberculata* *Pacificincola perforata*, 숨은이끼벌레 *Cryptosula pallasiana*, 불협화소공이끼벌레

Microporella discors, 관절이끼벌레 *Arthropoma cecillii*, 포로시씨마이끼벌레 *Celleporina porosissima*)으로 항구보다 적게 관찰되었다. 조간대에서 관찰할 수 있는 종보다 항구에서 서식하는 태형동물이 많은 이유는, 태형동물이 부착할 수 있는 기질이 조간대 보다 항구가 다양하기 때문이다.

4. 수심과 수온에 따른 태형동물의 분석

제주도는 다양한 채집지역(항구, 조간대 그리고 조하대)을 가지고 있다. 이번 연구를 통하여 24개의 채집지역 중 태형동물의 종 다양성이 높은 지역은 서귀포 남쪽의 숲섬, 문섬, 범섬, 가파도이다. 그 중 문섬은 42종의 태형동물이 조사되어, 제주도의 24개 지역 중에서 태형동물을 가장 많이 관찰할 수 있는 곳이다. 문섬은 제주도 본섬과의 거리가 가깝고 연중 수온이 12℃ 이하로 내려가지 않기 때문에 따뜻한 수온을 유지하며, SCUBA diving을 할 수 있는 다양한 장소가 많다(Figure 13). 태형동물을 가장 많이 관찰할 수 있는 문섬의 종 목록을 작성하였다(Table 4). 그리고 수심과 수온을 표로 작성하였으며, 부착기질도 함께 정리하였다(Table 5).



Figure 13. Map of research sites at Munseom island.

Table 4. List of bryozoans in Munseom Island.

학명	
Phylum Bryozoa Ehrenberg, 1831	태형동물문
Class Stenolaemata Borg, 1926	협후강
Order Cyclostomata Busk, 1852	원구목
1. <i>Tubulipora pulchra</i> MacGillivray, 1885	폴크라관이끼벌레
2. <i>Crisia eburneodenticulata</i> Smitt, 1865	흰수염이끼벌레
Class Gymnolaemata Allman, 1856	나후강
Order Ctenostomata Busk, 1852	즐구목
3. <i>Amathia distans</i> Busk, 1886	나선주머니이끼벌레
4. <i>Bantariella bocki</i> (Silen, 1942)	보키반타이끼벌레
Order Cheilostomata Busk, 1852	순구목
5. <i>Aetea anguina</i> (Linné, 1758)	자루이끼벌레
6. <i>Biflustra crenulata</i> (Okada, 1923)	두겹막이끼벌레
7. <i>Biflustra perfragilis</i> MacGillivray, 1881	유연두겹막이끼벌레
8. <i>Membranipora tuberculata</i> (Bosc, 1802)	관막이끼벌레
9. <i>Bicellariella fragilis</i> Seo, 2009	
10. <i>Bugula dentata</i> (Lamouroux, 1816)	치상이끼벌레
11. <i>Bugula robusta</i> MacGillivray, 1869	떡갈이끼벌레
12. <i>Bugula subglobosa</i> Harmer, 1926	꽃다발이끼벌레
13. <i>Beania discodermiae</i> (Ortmann, 1890)	두겹질콩이끼벌레
14. <i>Beania hexaceras</i> (Ortmann, 1890)	육콩이끼벌레
15. <i>Amastigia rudis</i> (Busk, 1852)	막대이은이끼벌레
16. <i>Amastigia xishaensis</i> Liu, 1984	볼록이은이끼벌레
17. <i>Caberea boryi</i> (Audouin, 1826)	보리이끼벌레
18. <i>Caberea lata</i> Busk, 1852	라타이끼벌레
19. <i>Canda retiformis</i> Pourtales, 1867	거물칸다이끼벌레
20. <i>Scrupocellaria diadema</i> Busk, 1852	가시이끼벌레
21. <i>Scrupocellaria maderensis</i> Busk, 1860	모가시이끼벌레
22. <i>Tricellaria occidentalis</i> (Trask, 1857)	세방가시이끼벌레
23. <i>Cellaria punctata</i> (Busk, 1852)	마디이끼벌레
24. <i>Brettia mollis</i> Harmer, 1926	곤봉이끼벌레
25. <i>Catenicella elegans</i> Busk, 1852	미끈이끼벌레
26. <i>Adeona japonica</i> (Ortmann, 1890)	사슴뿔이끼벌레

Table 4. Continued.

학명
27. <i>Adeonella lichenoides</i> (Lamarck, 1816) 넓적부리이끼벌레
28. <i>Celleporaria wakayamensis</i> (Okada and Mawatari, 1938) 섬유이끼벌레
29. <i>Parasmittina areolata</i> (Canu and Bassler, 1927) 측입이끼벌레
30. <i>Parasmittina contraria</i> Seo, 1993 반향측입이끼벌레
31. <i>Parasmittina serrula</i> Soule and Soule, 1973 톱니조두체입이끼벌레
32. <i>Smittoidea pacifica</i> Soule and Soule, 1973 태양입이끼벌레
33. <i>Smittoidea prolifica</i> Osburn, 1952 입이끼벌레
34. <i>Metroperiella montferrandii</i> (Audouin, 1826) 철빛종이끼벌레
34. <i>Metroperiella montferrandii</i> (Audouin, 1826) 철빛종이끼벌레
36. <i>Emballothea pacifica</i> Harmer, 1957 태양못이끼벌레
37. <i>Petralliella magna</i> (d'Orbigny, 1852) 큰말바위이끼벌레
38. <i>Buffonellaria acutirostris</i> Seo & Gong, 2006 뽕족턱두꺼비이끼벌레
39. <i>Celleporina porosissima</i> Harmer, 1957 포로시씨마이끼벌레
40. <i>Celleporina rostellata</i> Harmer, 1957 부리조두체가지이끼벌레
41. <i>Iodictyum axillare</i> (Ortmann, 1890) 빨간망이끼벌레
42. <i>Reteporellina denticulata</i> (Busk, 1884) 등색망이끼벌레

Table 5. Depth, temperature and substrata of bryozoans in Munseom Island.

Species	5m	10m	15m	20m	25m	30m	35m	40m	Depth	Temperature	Substratum								Total			
											Rocks	Plastics	Algae	Sponges	Corals	Tubes of polychaetes	Shells	Tunicates		Bryozoans		
1. <i>Tubulipora pulchra</i> MacGillivray, 1885									1-10m	17-23°C	○		○							2		
2. <i>Crisia eburneodenticulata</i> Smitt, 1865									25-30m	17-23°C	○			○	○	○			○	5		
3. <i>Amathia distans</i> Busk, 1886									1-10m	23°C			○			○				2		
4. <i>Bantariella bocki</i> (Silen, 1942)									20-25m	17-25°C					○					1		
5. <i>Aetea anquina</i> (Linné, 1758)									1-10m	25°C			○		○					2		
6. <i>Biflustra crenulata</i> (Okada, 1923)									15-35m	17-23°C	○									1		
7. <i>Biflustra perfragilis</i> MacGillivray, 1881									20-25m	17-25°C	○									1		
8. <i>Jellyella tuberculata</i> (Bosc, 1802)									10-25m	17-23°C			○	○						2		
9. <i>Bicellariella fragilis</i> Seo, 2009									15-30m	17-23°C	○									1		
10. <i>Bugula mollis</i> Harmer, 1926									20-25m	17°C					○					1		
11. <i>Bugula robusta</i> MacGillivray, 1869									20-35m	21°C	○									1		
12. <i>Bugula subglobosa</i> Harmer, 1926									20-35m	17-25°C	○					○				2		
13. <i>Virididentula dentata</i> (Lamouroux, 1816)									15-25m	17°C	○					○				2		
14. <i>Beania discodermae</i> (Ortmann, 1890)									1-10m	17-18°C									○	1		
15. <i>Beania hexaceras</i> (Ortmann, 1890)									1-10m	17-25°C			○				○			2		
16. <i>Amastigia rudis</i> (Busk, 1852)									25-30m	17°C	○			○	○	○				4		
17. <i>Amastigia xishaensis</i> Liu, 1984									25-30m	17-23°C	○		○	○		○	○	○		6		
18. <i>Caberea boryi</i> (Audouin, 1826)									15-30m	15-21°C	○		○	○	○		○		○	6		
19. <i>Caberea lata</i> Busk, 1852									25-30m	17-25°C	○					○				2		
20. <i>Canda retiformis</i> Pourtales, 1867									15-20m	15-20°C			○							1		
21. <i>Licornia diadema</i> (Busk, 1852)									25-30m	17-25°C	○		○	○	○	○				5		
22. <i>Scrupocaberea maderensis</i> (Busk, 1860)									20-25m	17-20°C		○							○	2		
23. <i>Tricellaria occidentalis</i> (Trask, 1857)									1-5m	17-26°C			○	○			○			3		
24. <i>Cellaria punctata</i> (Busk, 1852)									15-30m	15-25°C	○			○						2		
25. <i>Catenicella elegans</i> Busk, 1852									15-25m	17-23°C	○	○		○		○				4		
26. <i>Adeona japonica</i> (Ortmann, 1890)									unknown	unknown	○						○			2		
27. <i>Adeonella lichenoides</i> (Lamarck, 1816)									18-27m	17-24°C	○	○		○	○	○				5		
28. <i>Celleporaria wakayamensis</i> (Okada and Mawatari, 1938)									20-30m	23-25°C	○				○		○			3		
29. <i>Parasmittina areolata</i> (Canu and Bassler, 1927)									20-25m	15-25°C	○									1		
30. <i>Parasmittina contraria</i> Seo, 1993									15-30m	15-24°C				○			○			2		
31. <i>Parasmittina serrula</i> Soule and Soule, 1973									25-30m	22°C			○				○			2		
32. <i>Smittoidea pacifica</i> Soule and Soule, 1973									10-20m	15-20°C	○									1		
33. <i>Smittoidea prolifica</i> Osburn, 1952									10-25m	15-20°C	○				○					2		
34. <i>Metropieriella montferandii</i> (Audouin, 1826)									18-30m	17-23°C	○			○	○	○	○	○		6		
35. <i>Calypotrothea wasinensis</i> (Waters, 1913)									23-30m	17-23°C			○							1		
36. <i>Emballothea pacifica</i> Harmer, 1957									25-30m	23°C	○				○		○			3		
37. <i>Petraliella magna</i> (d'Orbigny, 1852)									15-20m	17-23°C	○			○		○	○			4		
38. <i>Buffonellaria acutirostris</i> Seo and Gong, 2006									20-25m	17-23°C	○		○							2		
39. <i>Celleporina porosissima</i> Harmer, 1957									1-10m	17-23°C			○				○			2		
40. <i>Celleporina rostellata</i> Harmer, 1957									1-10m	17-23°C	○		○		○					3		
41. <i>Iodictyum axillare</i> (Ortmann, 1890)									30-36m	23°C	○									1		
42. <i>Reteporellina denticulata</i> (Busk, 1884)									30-35m	17-23°C	○									1		
Total	8			31				2					28	4	15	12	13	12	12	2	4	
%	21.4%			73.8%				4.8%				27.5%	3.9%	14.7%	11.8%	12.7%	11.8%	11.8%	2.0%	3.9%		

제주도의 문섬에 서식하는 해산 태형동물은 24종이다(Seo, 2005). 이번 연구를 통하여 18종이 추가되어, 문섬에 서식하는 태형동물은 2강 3목 20과 31속 42종이다. 우리나라에서 가장 태형동물을 많이 관찰할 수 있는 문섬에서 태형동물이 서식하는 수심과 수온 및 부착기질에 따른 태형동물의 서식 환경에 대한 특징을 확인하였다(Table 5). 수심 10m 이내에서 관찰한 태형동물은 8종(*Tubulipora pulchra*, *Amathia distans*, *Aetea anguina*, *Beania discodermiae*, *Beania hexaceras*, *Tricellaria occidentalis*, *Celleporina porosissima*, *Celleporina rostellata*), 수심 15-30m에서 관찰한 태형동물은 31종(*Crisia eburneodenticulata*, *Bantariella bocki*, *Biflustra crenulata*, *Biflustra perfragilis*, *Membranipora tuberculata*, *Bicellariella fragilis*, *Brettia mollis*, *Bugula robusta*, *Bugula subglobosa*, *Virididentula dentata*, *Amastigia rudis*, *Amastigia xishaensis*, *Caberea boryi*, *Caberea lata*, *Canda retiformis*, *Scrupocaberea diadema*, *Scrupocaberea maderensis*, *Cellaria punctata*, *Catenicella elegans*, *Aeonella lichenoides*, *Celleporaria wakayamensis*, *Parasmittina areolata*, *Parasmittina contraria*, *Parasmittina serrula*, *Smittoidea pacifica*, *Smittoidea prolifica*, *Metroperiella montferrandii*, *Calyptotheca wasinensis*, *Emballothea pacifica*, *Petralliella magna*, *Buffonellaria acutirostris*). 수심 30-40m에서 관찰한 태형동물은 2종(*Iodictyum axillare*, *Reteporellina denticulata*)이다. 그리고 *Adeona japonica* 사슴뿔이끼벌레에 대한 수심 정보는 없다. 수심별로 보면 태형동물은 수심 15-30m에서 안정적으로 분포하는 것으로 알 수 있다.

수온에 대한 특이성을 나타내는 태형동물은 적은 것으로 나타났다. 대부분의 태형동물은 수온 17-23℃ 채집하였으나, 일부 태형동물 중 *Bantariella bocki*, *Amastigia rudis*, *Brettia mollis*는 수온 14-17℃에서 채집하였다. *Bantariella bocki*는 대부분 11월에서 3월에만 출현하는 종으로 계절적인 영

향을 받고, 태형동물 중 큰 군체를 형성하는 *Adeonella lichenoides*와 *Reteporellina denticulata*는 계절과 수온에 상관없이 항상 관찰할 수 있었다.

부착기질에 따른 선호를 알 수 있다. 28종 (27.5%)은 암반, 15종 (14.7%)은 해조류, 13종 (12.7%)은 산호충류, 12종 (11.8%)은 해면동물, 12종 (11.8%)은 환형동물, 12종 (11.8%)은 연체동물의 패각, 4종 (3.9%)은 플라스틱, 4종 (3.9%)은 다른 태형동물 그리고 2종 (2.0%)은 명게류에 부착하였다 (Table). 막이끼벌레류(Membraniporids)는 해중림(kelp forest)을 형성하는 중요 갈조류인 감태(*Ecklonia cava*)의 잎이나 줄기를 하얗게 피복하는 것이 특징이다(Seo, 2005; 2010). 그리고 일부 태형동물(*Tubulipora pulchra*, *Amathia distans*, *Aetea anguina*, *Membranipora tuberculata*, *Beania hexaceras*, *Celleporina porosissima*)은 감태에 부착하는 것을 선호하고, *Bantariella bocki* and *Calyptotheca wasinensis*는 주로 산호충류에 부착하며, *Iodictyum axillare*와 *Reteporellina denticulata*는 수심 30m 이하의 암반에서만 관찰할 수 있었다. 이런 결과는 일부 태형동물이 그들의 유생시기에 기층을 선택하는 데 있어 선호도를 보여 주는 결과를 보여준다.

5. 부착기질에 대한 연구

태형동물은 해양생물 중 대표적인 부착동물이다. 유생이 부착하는 주요 기질은 바위, 연체동물과 갑각류의 패각, 해조류, 해면동물, 자포동물인 산호충류와 히드로충류, 갯지렁이서관, 태형동물, 어망 등 매우 다양하며 대부분 딱딱한 기질을 비롯한 여러 종류의 기질에 부착한다(Ryland, 1970; 1973; Uttley and Bullivant, 1971; Banta, 1980; Hayward, 1985; Song, 1985; Hageman, 2000; Kuklinski et al., 2005; Seo, 2005). 그리고, 일부 태형동물의 유생은 기층을 선택하는 데 있어 선호성을 가지고 있는데, 예를 들면 막이끼벌레류(*Membranipora*)는 조하대에 서식하는 감태 등의 갈조류를 주로 피복하고, 복족류 패각을 선호하는 *Antropora tincta*와 아조간대 해조류와 바닷말 등을 선호하는 *Alcyonidium*과 *Flustrellidra* 등이 알려져 있다(Ryland, 1970). 이러한 강한 부착력에 때문에 태형동물은 대표적인 오손동물(fouling animal)로 잘 알려져 있다. 오손동물은 인간이 만든 구조물을 기층으로 이용함으로써 인간에게 여러 가지 피해를 끼치는 동물로 알려져 있다. 또한 선박의 바닥에 부착하는 오손 태형동물은 전 세계적으로 선박을 통한 교류가 활발한 현대 사회에서는 선박에 부착하는 오손동물이 원산지로 부터 그 분포를 확산시킬 수 있기 때문에 동물지리학적으로 매우 중요한 역할을 한다.

부착기질에 대한 연구를 통하여 태형동물과 여러 부착기질과의 관계에 대한 연구를 통하여 선호도의 특성을 밝히기 위하여 제주도 연안 24개 지점(Figure 1)의 항구, 조간대 그리고 조하대에서 채집한 재료(2강 3목 31과 47속 71종)를 관찰·분석하였다(Table 8).

1) 부착기질별 부착종

기질에 부착하여 서식하는 태형동물 2강 3목 31과 47속 71종을 대상으로 부착한 기질을 분석한 결과, 11개의 기질로 구분되었으며, 종류별로 분석한 결과는 다음과 같다.

기질의 종류는 11가지로 기질은 무생물성 기질과 생물성 기질로 구분하였다. 무생물성 기질 3가지와 생물성 기질 8가지로 구분되었고, 무생물성 기질 (27%), 생물성 기질 (73%)의 분포를 나타냈다(Table 6, Figure 14).

(1) 무생물성 기질 종류

관찰한 무생물성 기질을 재질별로 분류하면 총 3가지의 기질이 관찰되었다. 종류는 돌성분(23.7%), 플라스틱(7.1%), 그리고 고무(0.6%)이다(Table 6). 3가지의 기질 중에서 돌로 구성된 성분에는 암반, 돌맹이, 수중암반구조물이 포함되었다. 플라스틱의 세부기질은 낚시줄, 어망, 로프, 포대자루가 포함되어있다. 피복하거나 기립하면서 성장하는 태형동물의 생활특성을 고려했을 무생물성 기질인 돌과 플라스틱 기질은 다양한 종이 서식하기에 적합한 기질로 생각한다. 고무의 경우 24개 채집지역의 환경을 고려할 때 특정 지역인 항구에서만 관찰할 수 있었다. 무생물성 기질은 항구와 조간대 조하대에서 다양하게 확인할 수 있었으며, 돌로 구성된 기질을 제외한 플라스틱과 고무는 대부분 항구에서 관찰하였다.

(2) 생물성의 기질 종류

관찰한 생물성 기질을 분류군별로 나누면, 총 8개의 기질을 관찰하였다. 해조류 (13.5%), 해면동물류(12.2%), 패각류(11.5%), 갯지렁이류(7.1%), 산호충류(5.1%), 다른 태형동물류(4.5%), 히드라류(3.8%), 멍게류(1.3%) 이었다 (Table 6). 8가지의 기질 중에서 면적이 넓은 해조류와 해면동물류에서 부착된 경우가 가장 많았으며 다음으로 딱딱한 패각, 갯지렁이류, 산호류, 다

른 태형동물, 히드라류, 명게류 순서로 나타났다. 생물성 기질은 대부분 조하대에서 확인하였다.

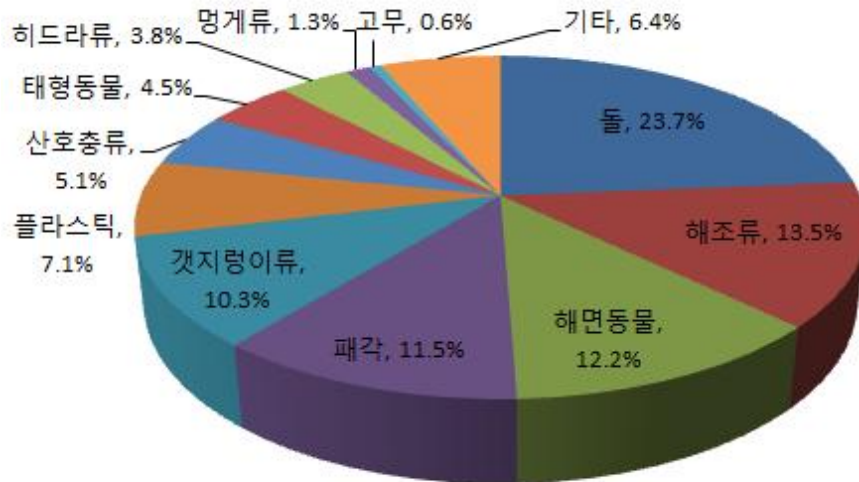


Figure 14. Comparison of substrata of bryozoans.

Table 6. Comparison of substrata of bryozoans.

종류	무생물성 기질 (27%)			생물성 기질 (73%)									합계
	돌	플라스틱	고무	해조류	해면동물	패각	갯지렁이류	산호충류	태형동물	히드라류	명게	기타	
%	23.7	7.1	0.6	13.5	12.2	11.5	10.3	5.1	4.5	3.8	1.3	6.4	100

(3) 기질별 부착종

① 돌

부착기질이 돌은 암반, 돌맹이, 그리고 수중 암반구조물을 포함하였다. 돌에 부착되어 관찰한 종은 2강 3목 22과 29속 37종으로 폴크라관이끼벌레 (*Tubulipora pulchra*), 흰수염이끼벌레 (*Crisia eburneodenticulata*), 노바접시이끼벌레 (*Disporella novaehollandiae*), 두겹막이끼벌레 (*Biflustra crenulata*),

유연두겹막이끼벌레(*Biflustra perfragilis*), *Bicellariella fragilis* Seo, 치상이끼벌레(*Bugula dentata*), 큰다발이끼벌레(*Bugula neritina*), 꽃다발이끼벌레(*Bugula subglobosa*), 줄콩이끼벌레(*Beania mirabilis*), 막대이은이끼벌레(*Amastigia rudis*), 볼록이은이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 라타이끼벌레(*Caberea lata*), 가시이끼벌레(*Scrupocellaria diadema*), 큰단추이끼벌레(*Steginoporella magnilabris*), 미끈안방이끼벌레(*Thalamoporella lioticha*), 마디이끼벌레(*Cellaria punctata*), 미끈이이끼벌레(*Catenicella elegans*), 넓적부리이끼벌레(*Adeonella lichenoides*), 섬유이끼벌레(*Celleporaria wakayamensis*), 측입이끼벌레(*Parasmittina areolata*), 세모측입이끼벌레(*Parasmittina triangularis*), 태양입이끼벌레(*Smittoidea pacifica*), 입이끼벌레(*Smittoidea prolifica*), 철빛종이끼벌레(*Metroperiella montferrandii*), 뽕죽작은구멍이끼벌레(*Schizomavella acuta*), 큰입이끼벌레(*Watersipora platypora*), 자주빛이끼벌레(*Watersipora subtorquata*), 한구멍이끼벌레(*Schizoporella unicornis*), 말발이끼벌레(*Hippopodina feegeensis*), 태양못이끼벌레(*Emballothea pacifica*), 큰말바위이끼벌레(*Hippopetraliella magna*), 뽕죽턱두꺼비이끼벌레(*Buffonellaria acutirostris*), 부리조두체가지이끼벌레(*Celleporina rostellata*), 빨간망이끼벌레(*Iodictyum axillare*), 등색망이끼벌레(*Reteporellina denticulata*)이다.

돌 성분의 기질에서 관찰된 재료는 전체 관찰재료 중 23.7% (37종)로 가장 높게 나타났다. 이 같은 결과가 나온 이유는 대부분 수중 암반에서 채집을 하였고, 대부분의 태형동물이 암반처럼 단단한 기질을 선호하기 때문으로 생각한다. 또한 암반의 기질의 종류로는 조간대와 조하대의 돌맹이, 바위 그리고 수중 암반구조물(방파제, 인공구조물 등)을 포함하고 있기 때문에 다양한 태형동물이 부착한 결과라고 할 수 있다.

② 플라스틱

부착기질이 플라스틱은 낚시줄, 어망, 로프, 그리고 포대자루를 포함하였다. 플라스틱에 부착되어 관찰한 종은 1강 1목 8과 9속 11종으로 캘리포니아이끼벌레(*Bugula californica*), 큰다발이끼벌레(*Bugula neritina*), 모가시이끼벌레(*Scrupocellaria maderensis*), 세방가시이끼벌레(*Tricellaria occidentalis*), 미끈이이끼벌레(*Catenicella elegans*), 넓적부리이끼벌레(*Adeonella lichenoides*), 갈색섬유이끼벌레(*Celleporaria brunnea*), 철빛종이이끼벌레(*Metroperiella montferrandii*), 큰입이끼벌레(*Watersipora platypora*), 자주빛이끼벌레(*Watersipora subtorquata*), 숨은이끼벌레(*Cryptosula pallasiana*)이다.

플라스틱의 기질에서 관찰된 재료는 전체 관찰재료 중 7.1% (11종)로 나타났다. 플라스틱 기질은 조간대와 조하대 보다는 항구에서 대부분 채집되었다. 플라스틱은 낚시줄, 어망, 로프 (스티로폼, 어선, 부표) 등의 세부기질로 이루어져 있다. 플라스틱은 태형동물이 부착하기 좋은 재료(Gordon, 1967)이며, 이전의 오손태형동물 연구결과(Gong and Seo, 2004)에서 플라스틱은 많은 종들이 관찰되었다는 기록이 있었으나, 제주도의 관찰결과는 다르게 나타났다. 항구가 발달한 동해와 남해의 항구보다 제주도의 항구의 시설물이 깨끗하였기 때문에 플라스틱 기질에 부착한 태형동물이 적게 관찰되었다. 캘리포니아이끼벌레(*Bugula californica*), 모가시이끼벌레(*Scrupocellaria maderensis*) 그리고 숨은이끼벌레(*Cryptosula pallasiana*)는 오직 항구에 있는 플라스틱 기질의 로프와 포대자루에서만 부착한 것을 확인하였다.

③ 고무

고무에 부착되어 관찰한 종은 1강 1목 1과 1속 1종으로 갈색섬유이끼벌레(*Celleporaria brunnea*)이다.

고무의 기질에서 관찰된 재료는 전체 관찰재료 중 0.6% (1종)로 가장 낮

게 나타났다. 고무는 항구에서만 관찰할 수 있다. 주로 선착장에 배의 정박을 위한 방지 시설로 설치되어 있다. 수면 아래보다는 수면 위쪽에 설치되어 있기 때문에 태형동물이 부착하기 적합하지 않다. 그러나 일부 고무의 기질 중 수중에 설치된 시설물에서 외래종인 갈색섬유이끼벌레(*Celleporaria brunnea*)만 유일하게 관찰되었다. 고무의 부착기질에는 태형동물을 제외한 다른 동물로는 절지동물인 따개비와 연체동물인 굴이 고무의 대부분을 부착하였다. 따개비와 굴이 고무에 가입하지 않았다면, 더 많은 종류의 태형동물이 부착했을 것으로 생각한다. 고무의 기질은 항구를 제외한 조간대와 조하대에서는 관찰하기 어려운 기질이기 때문에 태형동물의 비율이 낮게 나타났다.

④ 해조류

해조류에 부착되어 관찰한 종은 2강 3목 16과 19속 21종으로 폴크라관이끼벌레(*Tubulipora pulchra*), 흰수염이끼벌레(*Crisia eburneodenticulata*), 노바접시이끼벌레(*Disporella novaehollandiae*), 나선주머니이끼벌레(*Amathia distans*), 자루이끼벌레(*Aetea anguina*), 톱니막이끼벌레(*Membranipora serrilamella*), 관막이끼벌레(*Membranipora tuberculata*), 큰다발이끼벌레(*Bugula neritina*), 육콩이끼벌레(*Beania hexaceras*), 볼록이은이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 가시이끼벌레(*Scrupocellaria diadema*), 세방가시이끼벌레(*Tricellaria occidentalis*), 시보가안방이끼벌레(*Thalamoporella sibogae*), 세모측입이끼벌레(*Parasmittina triangularis*), 은협이끼벌레(*Calypotheca wasinensis*), 방사이끼벌레(*Fenestrulina malusii*), 조두체이끼벌레(*Mucropetralliella mucroaviculata*), 관절이끼벌레(*Arthropoma cecillii*), 포로시씨마이끼벌레(*Celleporina porosissima*), 부리조두체가지이끼벌레(*Celleporina rostellata*)이다.

해조류의 기질에서 관찰된 재료는 전체 관찰재료 중 13.5% (21종)로 생물

성 기질 중 가장 높게 나타났다. 해조류는 대부분 조하대에서 다양하게 채집할 수 있으며, 일부 조간대와 항구의 암반에서도 쉽게 관찰할 수 있다. 이런 이유로 태형동물이 부착한 해조류를 쉽게 채집할 수 있다. 폴크라관이끼벌레(*Tubulipora pulchra*), 톱니막이끼벌레(*Membranipora serrilamella*), 관막이끼벌레(*Membranipora tuberculata*), 방사이끼벌레(*Fenestrulina malusii*), 관절이끼벌레(*Arthropoma cecillii*)는 주로 해조류에 부착한 종으로, 부착하는 위치는 종마다 다르다. 폴크라관이끼벌레(*Tubulipora pulchra*), 톱니막이끼벌레(*Membranipora serrilamella*), 방사이끼벌레(*Fenestrulina malusii*) 그리고 관절이끼벌레(*Arthropoma cecillii*)의 경우 해조류의 엽상체와 같은 넓은 면에 부착하였고, 관막이끼벌레(*Membranipora tuberculata*)는 해조류의 모든 부위를 피복하였다. 톱니막이끼벌레(*Membranipora serrilamella*)는 해조의 기질을 선호하는 연구(Canu and Bassler, 1923; Ryland, 1970; Ryland and Hayward, 1977; Zaala and Maluquner, 1988; Seo, 2005)결과와 일치하였다. 해조류는 얇고 넓은 엽체와 두껍고 단단한 부착기를 갖는 특성 때문에 다양한 태형동물이 부착하였다.

⑤ 해면동물

해면동물에 부착되어 관찰한 종은 2강 2목 13과 16속 19종으로 흰수염이끼벌레(*Crisia eburneodenticulata*), 관막이끼벌레(*Membranipora tuberculata*), 떡갈이끼벌레(*Bugula robusta*), 막대이은이끼벌레(*Amastigia rudis*), 볼록이은이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 가시이끼벌레(*Scrupocellaria diadema*), 미끈안방이끼벌레(*Thalamoporella lioticha*), 마디이끼벌레(*Cellaria punctata*), 미끈이이끼벌레(*Catenicella elegans*), 넓적부리이끼벌레(*Adeonella lichenoides*), 반향측입이끼벌레(*Parasmittina contraria*), 세모측입이끼벌레(*Parasmittina triangularis*), 철빛종이끼벌레(*Metroperiella montferrandii*), 큰입이끼벌레

(*Watersipora platypora*), 자주빛이끼벌레(*Watersipora subtorquata*), 말발이끼벌레(*Hippopodina feegeensis*), 큰말바위이끼벌레(*Hippopetraliella magna*), 조두체이끼벌레(*Mucropetraliella mucroaviculata*)이다.

해면동물의 기질에서 관찰된 재료는 전체 관찰재료 중 12.2% (19종)로 생물성 기질 중 두 번째로 높게 나타났으며 동물성 기질에서는 가장 높게 나타났다. 해면동물은 일부 조간대와 항구의 부착구조물에서도 관찰되었지만, 태형동물이 부착한 해면동물은 대부분 수심 10m 이하의 조하대에 서식하였다. 해면동물의 형태에 따라서 부착한 태형동물의 차이를 보였다. 덩어리 형태의 해면동물에는 주로 피복형태 태형동물인 관막이끼벌레(*Membranipora tuberculata*), 철빛종이끼벌레(*Metroperiella montferrandii*) 그리고 큰입이끼벌레(*Watersipora platypora*)가 가장 많이 관찰되었고, 줄기형태의 해면동물에는 피복형과 덩어리형태의 미끈안방이끼벌레(*Thalamoporella lioticha*), 넓적부리이끼벌레(*Adeonella lichenoides*), 반향측입이끼벌레(*Parasmittina contraria*), 세모측입이끼벌레(*Parasmittina triangularis*), 자주빛이끼벌레(*Watersipora subtorquata*), 말발이끼벌레(*Hippopodina feegeensis*), 큰말바위이끼벌레(*Hippopetraliella magna*), 조두체이끼벌레(*Mucropetraliella mucroaviculata*)를 관찰하였다. 일부 가지형태의 태형동물인 흰수염이끼벌레(*Crisia eburneodenticulata*), 떡갈이끼벌레(*Bugula robusta*), 막대이은이끼벌레(*Amastigia rudis*), 볼록이은이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 가시이끼벌레(*Scrupocellaria diadema*), 미끈안방이끼벌레(*Thalamoporella lioticha*), 마디이끼벌레(*Cellaria punctata*)는 가근으로 부착하는 가지형태의 기립형으로 덩어리형태와 항아리형태의 해면동물에 부착하였다. 해면동물을 선호하는 특이성을 보이는 태형동물은 없다(Gordon, 1967)는 연구결과와 다른 결과를 나타내고 있다. 그 이유는 Gordon(1967)은 항구에서 주로 채집을 하였고, 제주도에서 채집한 해면동물은 조하대에서 채집하였기 때문에 서식환경의 차이 때문이다.

⑥ 패각

부착기질이 패각은 연체동물의 패각과 절지동물의 갑각을 포함하였다. 패각에 부착되어 관찰한 종은 1강 1목 11과 15속 18종으로 육콩이끼벌레(*Beania hexaceras*), 볼록이은이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 세방가시이끼벌레(*Tricellaria occidentalis*), 갈색섬유이끼벌레(*Celleporaria brunnea*), 섬유이끼벌레(*Celleporaria wakayamensis*), 반향측입이끼벌레(*Parasmittina contraria*), 톱니조두체입이끼벌레(*Parasmittina serrula*), 철빛종이끼벌레(*Metroperiella montferrandii*), 뽕족작은구멍이끼벌레(*Schizomavella acuta*), 큰입이끼벌레(*Watersipora platypora*), 자주빛이끼벌레(*Watersipora subtorquata*), 한구멍이끼벌레(*Schizoporella unicornis*), 상칭은협이끼벌레(*Calyptotheca symmetrica*), 태양못이끼벌레(*Emballotheca pacifica*), 큰말바위이끼벌레(*Hippopetraliella magna*), 맞채찍이끼벌레(*Crepidacantha poissonii*), 포로시씨마이끼벌레(*Celleporina porosissima*)이다.

패각의 기질에서 관찰된 재료는 전체 관찰재료 중 11.5% (18종)로 나타났다. 패각은 조하대에서 쉽게 관찰할 수 있으며, 패각의 종류로는 연체동물의 이매패류 또는 복족류의 패각이 대부분이다. 조간대와 항구의 암반 및 선박방지 구조물에서도 이매패류에 부착한 태형동물을 쉽게 관찰할 수 있다. 패각의 거친 표면과 홈은 태형동물이 부착하기에 적합하고 다양한 형태의 종들이 관찰되었다. 그러나 조하대와 항구에서 채집된 종에는 차이를 나타냈다. 항구에서 채집된 종은 세방가시이끼벌레(*Tricellaria occidentalis*), 갈색섬유이끼벌레(*Celleporaria brunnea*), 자주빛이끼벌레(*Watersipora subtorquata*), 한구멍이끼벌레(*Schizoporella unicornis*), 포로시씨마이끼벌레(*Celleporina porosissima*)이며 수심이 깊은 조하대보다는 항구에서 쉽게 관찰할 수 있었다. 조하대와 조간대 및 항구에서 채집된 종이 결과가 다른 이

유는 태형동물이 서식할 수 있는 수심과 부착기질에 대한 연관성이 있다고 생각한다. 복족류의 패각에서만 부착하는 것으로 알려진 (Osburn, 1950; Seo, 2005; Seo and Min, 2009) 분홍이끼벌레(*Antropora tincta*)는 이번 연구에서도 결과가 일치하였다. 그리고 분홍이끼벌레는 제주도에서는 처음으로 관찰된 종이다.

⑦ 갯지렁이류

갯지렁이에 부착되어 관찰한 종은 2강 3목 11과 14속 16종으로 흰수염이끼벌레(*Crisia eburneodenticulata*), 진흙이끼벌레(*Nolella stipata*), 나선주머니이끼벌레(*Amathia distans*), 자루이끼벌레(*Aetea anguina*), 치상이끼벌레(*Bugula dentata*), 꽃다발이끼벌레(*Bugula subglobosa*), 막대이은이끼벌레(*Amastigia rudis*), 볼록이은이끼벌레(*Amastigia xishaensis*), 라타이끼벌레(*Caberea lata*), 가시이끼벌레(*Scrupocellaria diadema*), 미끈이이끼벌레(*Catenicella elegans*), 넓적부리이끼벌레(*Adeonella lichenoides*), 철빛종이끼벌레(*Metroperiella montferrandii*), 상칭은협이끼벌레(*Calypsotheca symmetrica*), 큰말바위이끼벌레(*Hippopetraliella magna*), 조두체이끼벌레(*Mucropetraliella mucroaviculata*)이다.

갯지렁이의 기질에서 관찰된 재료는 전체 관찰재료 중 10.3% (16종)로 나타났다. 갯지렁이의 기질은 모두 조하대에서 다양하게 채집하였다. 태형동물의 군체 형태에 따라서 태형동물의 종류가 다양하게 부착한 것을 확인할 수 있었다. 가지형태의 태형동물은 흰수염이끼벌레(*Crisia eburneodenticulata*), 나선주머니이끼벌레(*Amathia distans*), 치상이끼벌레(*Bugula dentata*), 꽃다발이끼벌레(*Bugula subglobosa*), 막대이은이끼벌레(*Amastigia rudis*), 볼록이은이끼벌레(*Amastigia xishaensis*), 라타이끼벌레(*Caberea lata*), 가시이끼벌레(*Scrupocellaria diadema*), 미끈이이끼벌레(*Catenicella elegans*)로 주로 꽃갯지렁이류에 부착하고 있다. 그리고 피복형 태형동물인 진흙이끼벌레

(*Nolella stipata*), 철빛종이끼벌레(*Metroperiella montferrandii*), 상칭은협이끼벌레(*Calypsotheca symmetrica*), 큰말바위이끼벌레(*Hippopetraliella magna*), 조두체이끼벌레(*Mucropetraliella mucroaviculata*)는 석회질 성분의 갯지렁이 서관에 부착한 것을 확인하였다. 갯지렁이의 서관은 튜브 모양으로 표면에는 단단한 모래 또는 석회성분의 관으로 되어있기 때문에 다양한 태형동물이 부착하였다.

⑧ 산호충류

산호충류에 부착되어 관찰한 종은 2강 3목 8과 8속 8종으로 흰수염이끼벌레(*Crisia eburneodenticulata*), 보키반타이끼벌레(*Bantariella bocki*), 보리이끼벌레(*Caberea boryi*), 넓적부리이끼벌레(*Adeonella lichenoides*), 섬유이끼벌레(*Celleporaria wakayamensis*), 철빛종이끼벌레(*Metroperiella montferrandii*), 큰입이끼벌레(*Watersipora platypora*), 은협이끼벌레(*Calypsotheca wasinensis*)이다.

산호충류의 기질에서 관찰된 재료는 전체 관찰재료 중 5.1% (8종)로 나타났다. 산호충류는 모두 조하대에서 채집하였다. 산호충류를 선호하는 태형동물로는 보키반타이끼벌레(*Bantariella bocki*)와 은협이끼벌레(*Calypsotheca wasinensis*)이다. 보키반타이끼벌레(*Bantariella bocki*)는 제주도 서귀포 해역에서 서식하는 종으로 산호충류(*Antipathes japonica* and *Antipathes lata*, and sea fans)에 부착하여 피해를 주는 것으로 알려져 있다(Seo, Suh and Min, 2009). 산호충류의 기질을 선호하는 보키반타이끼벌레(*Bantariella bocki*)는 제주도의 남쪽해역인 서귀포 인근에서만 채집되었다.

⑨ 다른 태형동물

다른 태형동물에 부착되어 관찰한 종은 1강 1목 6과 7속 7종으로 자루이끼벌레(*Aetea anguina*), 두껍질콩이끼벌레(*Beania discodermiae*), 보리이끼

벌레(*Caberea boryi*), 가시이끼벌레(*Scrupocellaria diadema*), 시보가안방이끼벌레(*Thalamoporella sibogae*), 미끈이이끼벌레(*Catenicella elegans*), 큰입이끼벌레(*Watersipora platypora*)이다.

태형동물의 기질에서 관찰된 재료는 전체 관찰재료 중 4.5% (7종)로 나타났다. 기질로 관찰한 태형동물은 흰수염이끼벌레(*Crisia eburneodenticulata*), 불록이은이끼벌레(*Amastigia xishaensis*), 미끈안방이끼벌레(*Thalamoporella lioticha*), 넓적부리이끼벌레(*Adeonella lichenoides*), 방사이끼벌레(*Fenestrulina malusii*)로 모두 조하대에서 채집하였다. 일부 조간대와 항구의 암반에서도 태형동물은 쉽게 관찰할 수 있지만 다른 부착생물에게 서식처를 제공하는 태형동물은 모두 조하대에만 서식하였다. 두껍질콩이끼벌레(*Beania discodermiae*)는 다른 기질에서는 관찰되지 않았지만 흰수염이끼벌레(*Crisia eburneodenticulata*)에만 부착된 것을 확인하였다. Gordon (1967)의 연구에 의하면 태형동물(*Watersipora*)은 다른 태형동물과 고착성 동물들에게 서식처를 제공하는 것으로 알려져 있고, 이번 연구에서도 일부 태형동물은 다른 태형동물에게 부착할 수 있는 기질을 제공하였다.

⑩ 히드라충류

히드라충류에 부착되어 관찰한 종은 2강 2목 5과 6속 6종으로 흰수염이끼벌레(*Crisia eburneodenticulata*), 자루이끼벌레(*Aetea anguina*), 막대이은이끼벌레(*Amastigia rudis*), 가시이끼벌레(*Scrupocellaria diadema*), 입이끼벌레(*Smittoidea prolifica*), 부리조두체가지이끼벌레(*Celleporina rostellata*)이다.

히드라충류의 기질에서 관찰된 재료는 전체 관찰재료 중 3.8% (6종)로 나타났다. 기질로 관찰한 히드라충류는 산호불이히드라류(*Solanderia*)로 모두 조하대에서 채집하였다.

⑪ 멧게류

멧게류에 부착되어 관찰한 종은 1강 1목 2과 2속 2종 이었다. 관찰한 종은 볼록이은이끼벌레(*Amastigia xishaensis*)와 철빛종이끼벌레(*Metroperiella montferrandii*)이다.

멧게류의 기질에서 관찰된 재료는 전체 관찰재료 중 1.3% (2종)로 생물성 기질 중 가장 낮게 나타났다. 멧게류는 모두 조하대에서 채집하였다. 태형동물에게 기질을 제공하는 멧게의 바깥은 딱딱한 껍데기를 가지고 있지만 생물성 기질 중 가장 낮게 나타났다.

⑫ 기타

부착정보를 알 수 없는 기타는 2강 2목 9과 9속 10종 이었다. 모두 조하대에서 채집하였고, 목록은 다음과 같다. 꽃집시이끼벌레(*Patinella radiata*), 바늘이끼벌레(*Chaperia acanthina*), 거물칸다이끼벌레(*Canda retiformis*), 굽은입술이끼벌레(*Labioporella sinuosa*), 곤봉이끼벌레(*Brettia mollis*), 구멍섬유이끼벌레(*Celleporaria aperta*), 삼천파리이끼벌레(*Exochella tricuspsis*), 술촉입이끼벌레(*Parasmittina crosslandi*), 고운입이끼벌레(*Parasmittina delicatula*), 불협화소공이끼벌레(*Microporella discors*)이다.

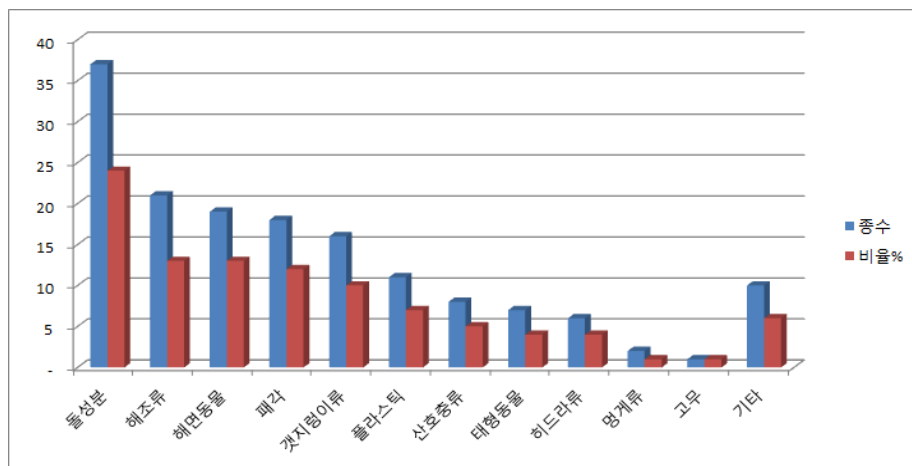


Figure 15. Comparison of living and nonliving substrata.

(4) 기질별 종 부착 빈도

11가지의 기질 중에서 가장 많은 종이 관찰된 기질은 돌 37종(23.7%), 해조류 21종(13.5%), 해면동물 19종(12.2%), 패각 18종(11.5%), 갯지렁이류 16종(10.3%), 플라스틱 11종(7.1%), 산호류 8종(5.1%), 다른태형동물 7종(4.5%), 히드라류 6종(3.8%), 멍게류 2종(1.3%), 고무 1종(0.6%) 으로 나타났다(Figure 15). 11가지의 기질 중 플라스틱(낙시줄, 어망, 로프, 포대자루 포함)과 고무(타이어)는 항구의 구조물에서 채집된 것으로 오손태형동물로 판단한다. 가장 적게 관찰된 부착기질은 멍게류와 고무이다. 멍게류의 경우에는 화학물질을 분비하여 자신을 보호하는 착생저해물질 때문에 표피에 태형동물을 비롯한 다른 생물이 부착하는 것을 방해한 것으로 생각한다. 항구에서 선박의 파손을 방지하기 위한 고무(타이어)의 경우 고정적이고 한정된 지역에만 설치되어 있기 때문에 관찰할 수 있는 타이어의 개수가 적어서 낮게 관찰되었다. 태형동물이 가장 많이 부착한 기질은 암반, 해면동물류, 해조류, 패각, 갯지렁이류, 플라스틱으로 모두 10종이상이 부착하였고, 산호류, 태형동물, 히드라류는 10종 미만이 관찰되었다. 두 분류의 차이는 기질의 경도 차이로 단단한 기질과 부드러운 기질이라고 생각되며 또한 흠의 유무에 큰 차이가 나타났다. 또한 생물기질 보다는 무생물기질을 선호하며, 대부분의 태형동물은 단단한 기질과 흠이 많은 곳을 선호한다(Grischenko, 2007). 부착 빈도가 낮은 고무(타이어)의 경우에는 기질이 부드럽고 흠이 많지 않았기 때문에 적은 종이 관찰되었다. 그러므로 대부분의 태형동물은 부드러운 기질보다는 단단한 기질을 선호한다.

2) 종의 부착기질

71종의 태형동물이 몇 가지 기질에 부착하였는지 분석하였다. 철빛종이끼벌레(*Metropariella montferrandii*)가 11가지의 기질 중 7가지의 기질에서 관찰하였고 다음으로 흰수염이끼벌레(*Crisia eburneodenticulata*), 볼록이은

이끼벌레(*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 큰입이끼벌레(*Watersipora platypora*)가 6가지 기질에서 관찰할 수 있었다. 태형동물 중 대부분의 기질에 부착하는 종은 자주빛이끼벌레(*Watersipora subtorquata*), 큰다발이끼벌레(*Bugula neritina*), 세방가시이끼벌레(*Tricellaria occidentalis*)로 알려져 있다(Gordon, 1967). 그러나 이 연구에서는 철빛종이끼벌레(*Metroperiella montferrandii*) 7회, 볼록이은이끼벌레(*Amastigia xishaensis*) 7회, 흰수염이끼벌레(*Crisia eburneodenticulata*), 보리이끼벌레(*Caberea boryi*), 큰입이끼벌레(*Watersipora platypora*) 6회로 나타났다. 이종들은 모두 조하대에 서식하는 종이다. 그러나 대부분의 기질에 부착하는 자주빛이끼벌레(*Watersipora subtorquata*), 큰다발이끼벌레(*Bugula neritina*), 세방가시이끼벌레(*Tricellaria occidentalis*)는 조하대에서는 관찰할 없었지만 조간대와 항구에서는 관찰하였다. 조하대와 조간대의 서식환경의 차이 때문이다.

11가지 기질 중 무생물성 기질에서만 관찰되어 종 특이적 부착 선호도를 가진 종은 두겹막이끼벌레(*Biflustra crenulata*), 유연두겹막이끼벌레(*Biflustra perfragilis*), *Bicellariella fragilis*, 캘리포니아이끼벌레(*Bugula californica*), 줄콩이끼벌레(*Beania mirabilis*), 모가시이끼벌레(*Scrupocellaria maderensis*), 큰단추이끼벌레(*Steginoporella magnilabris*), 측입이끼벌레(*Parasmittina areolata*), 태양입이끼벌레(*Smittoidea pacifica*), 숨은이끼벌레(*Cryptosula pallasiana*), 빨간망이끼벌레(*Iodictyum axillare*), 등색망이끼벌레(*Reteporellina denticulata*) 12종이었다. 12종 중 7종은 암반 기질에서만 발견되는 특이성을 갖는 종으로 두겹막이끼벌레(*Biflustra crenulata*), 유연두겹막이끼벌레(*Biflustra perfragilis*), *Bicellariella fragilis*, 줄콩이끼벌레(*Beania mirabilis*), 큰단추이끼벌레(*Steginoporella magnilabris*), 측입이끼벌레(*Parasmittina areolata*), 태양입이끼벌레(*Smittoidea pacifica*), 빨간망이끼벌레(*Iodictyum axillare*), 등색망이끼벌레(*Reteporellina denticulata*), 플

라스틱에서만 발견한 종은 캘리포니아이끼벌레(*Bugula californica*), 모가시
이끼벌레(*Scrupocellaria maderensis*), 숨은이끼벌레(*Cryptosula pallasiana*)
는 플라스틱 기질에서만 발견되는 특이성을 보였다.

생물성 기질(해조류, 해면동물류, 패각류, 갯지렁이류, 산호류, 다른 태형
동물류, 히드라류, 멍게류)에서만 관찰되는 특이적인 부착선호를 가진 종은
진흙이끼벌레(*Nolella stipata*), 나선주머니이끼벌레(*Amathia distans*), 보키
반타이끼벌레(*Bantariella bocki*), 자루이끼벌레(*Aetea anguina*), 톱니막이끼
벌레(*Membranipora serrilamella*), 관막이끼벌레(*Membranipora
tuberculata*), 떡갈이끼벌레(*Bugula robusta*), 두껍질콩이끼벌레(*Beania
discodermiae*), 육콩이끼벌레(*Beania hexaceras*), 반향촉입이끼벌레
(*Parasmittina contraria*), 톱니조두체입이끼벌레(*Parasmittina serrula*), 상
칭은협이끼벌레(*Calyptotheca symmetrica*), 은협이끼벌레(*Calyptotheca
wasinensis*), 방사이끼벌레(*Fenestrulina malusii*), 조두체이끼벌레
(*Mucropetraliella mucroaviculata*), 맞채찍이끼벌레(*Crepidacantha
poissoni*), 관절이끼벌레(*Arthropoma cecilli*), 포로시씨마이끼벌레
(*Celleporina porosissima*), 18종이다. 생물성 기질에서만 관찰되는 18종 중
볼록이은이끼벌레 (*Amastigia xishaensis*), 보리이끼벌레(*Caberea boryi*), 가
시이끼벌레(*Scrupocellaria diadema*), 철빛종이끼벌레(*Metroperiella
montferrandii*)는 8가지 생물성 기질 중 5가지 기질에서 관찰하였으며 가장
높은 생물성 기질에 부착하는 것으로 나타났다. 또한 산호류에서만 관찰되
는 보키반타이끼벌레(*Bantariella bocki*)는 이번 연구에서도 생물성 기질인
산호류에서만 관찰되는 동일한 연구결과(Seo, Suh and Min, 2009)를 나타
냈다. 17종 중 단일 기질에서 부착되는 것으로 관찰되는 태형동물은 9종이
다(Table 7).

Table 7. Bryozoans observed on single substratum.

기질	관찰종	
해조류	<i>Membranipora serrilamella</i>	3종
	<i>Fenestrulina malusii</i>	
	<i>Arthropoma cecilli</i>	
패각	<i>Antropora tinctoria</i>	3종
	<i>Parasmittina serrula</i>	
	<i>Crepidacantha poissonii</i>	
산호류	<i>Bantariella bocki</i>	1종
갯지렁이류	<i>Nolella stipata</i>	1종
다른 태형동물류	<i>Beania discodermiae</i>	1종

Table 8. Comparison of substrata of each species.

학명	무생물 기질			생물 기질								기타	부착 기질수
	돌	플라스틱	고무	해조류	해면동물	히드라류	산호류	갯지렁이류	패각	멍게류	다른 태형동물		
<i>Tubulipora pulchra</i>	○			○									2
<i>Crisia eburneodenticulata</i>	○			○	○	○	○	○					6
<i>Dispirella novaehollandiae</i>	○			○									2
<i>Patinella radiata</i>												○	1
<i>Nolella stipata</i>								○					1
<i>Amathia distans</i>				○				○					2
<i>Bantariella bocki</i>							○						1
<i>Aetea anguina</i>				○		○		○			○		4
<i>Biflustra crenulata</i>	○												1
<i>Biflustra perfragilis</i>	○												1
<i>Membranipora serrilamella</i>				○									1
<i>Membranipora tuberculata</i>				○	○								2
<i>Antropora tinctoria</i>									○				1
<i>Chaperia acanthina</i>												○	1
<i>Bicellariella fragilis</i>	○												1
<i>Bugula californica</i>		○											1
<i>Bugula dentata</i>	○							○					2
<i>Bugula neritina</i>	○	○		○									3
<i>Bugula robusta</i>					○								1
<i>Bugula subglobosa</i>	○							○					2

Table 8. Continued.

학명	무생물 기질			생물 기질								기타	부착 기질수
	돌	플라크 립	고무	해조류	해면동물	히드라류	산호류	갯지렁이류	패각	멍게류	다른 태형동물		
<i>Beania discodermiae</i>											○		1
<i>Beania hexaceras</i>				○					○				2
<i>Beania mirabilis</i>	○												1
<i>Amastigia rudis</i>	○				○	○		○					4
<i>Amastigia xishaensis</i>	○			○	○			○	○	○			6
<i>Caberea boryi</i>	○			○	○		○		○		○		6
<i>Caberea lata</i>	○							○					2
<i>Canda retiformis</i>												○	1
<i>Scrupocellaria diadema</i>	○			○	○	○		○			○		6
<i>Scrupocellaria maderensis</i>		○											1
<i>Tricellaria occidentalis</i>		○		○					○				3
<i>Labioporella sinuosa</i>												○	1
<i>Steginoporella magnilabris</i>	○												1
<i>Thalamoporella lioticha</i>	○				○								2
<i>Thalamoporella asibogae</i>				○							○		2
<i>Cellaria punctata</i>	○				○								2
<i>Brettia mollis</i>												○	1
<i>Catenicella elegans</i>	○	○			○			○			○		5
<i>Adeonella lichenoides</i>	○	○			○		○	○					5
<i>Celleporaria aperta</i>												○	1

Table 8. Continued.

학명	무생물 기질			생물 기질								기타	부착 기질수
	돌	플라스틱	고무	해조류	해면동물	히드라류	산호류	갯지렁이류	패각	멍게류	다른 태형동물		
<i>Celleporaria brunnea</i>		○	○						○				3
<i>Celleporaria wakayamensis</i>	○						○		○				3
<i>Exochella tricuspis</i>												○	1
<i>Parasmittina areolata</i>	○												1
<i>Parasmittina contraria</i>					○				○				2
<i>Parasmittina crosslandi</i>												○	1
<i>Parasmittina delicatula</i>												○	1
<i>Parasmittina serrula</i>									○				1
<i>Parasmittina triangularis</i>	○			○	○								3
<i>Smittoidea pacifica</i>	○												1
<i>Smittoidea prolifica</i>	○					○							2
<i>Metroperiella montferrandii</i>	○	○			○		○	○	○	○			7
<i>Schizomavella acuta</i>	○								○				2
<i>Watersipora platypora</i>	○	○			○		○		○		○		6
<i>Watersipora subtorquata</i>	○	○			○				○				4
<i>Schizoporella unicornis</i>	○								○				2
<i>Hippopodina feegeensis</i>	○				○								2
<i>Calyptotheca symmetrica</i>								○	○				2
<i>Calyptotheca wasinensis</i>				○			○						2
<i>Emballothea pacifica</i>	○								○				2

Table 8. Continued.

학명	무생물 기질			생물 기질								기타	부착 기질수
	돌	플라스틱	고무	해조류	해면동물	히드라류	산호류	갯지렁이류	패각	멍게류	다른 대형동물		
<i>Cryptosula pallasiana</i>		○											1
<i>Fenestrulina malusii</i>				○									1
<i>Microporella discors</i>												○	1
<i>Hippopetraliella magna</i>	○				○			○	○				4
<i>Mucropetraliella mucroaviculata</i>				○	○			○					3
<i>Crepidacantha poissonii</i>									○				1
<i>Arthropoma cecillii</i>				○									1
<i>Buffonellaria acutirostris</i>	○												1
<i>Celleporina porosissima</i>				○					○				2
<i>Celleporina rostellata</i>	○			○		○							3
<i>Iodictyum axillare</i>	○												1
<i>Reteporellina denticulata</i>	○												1
기질 부착종	37	11	1	21	19	6	8	16	18	2	7	10	

IV. 결론 및 고찰

제주도의 태형동물의 분류학적 연구를 통하여 태형동물이 부착하는 기질의 형태와 특성에 대한 연구와 제주도 태형동물의 서식 환경에 대하여 연구를 수행하였다. 본 연구에서는 2008년 8월부터 2015년 12월 까지 제주도의 24개 지점에서 해산 태형동물을 채집하였으며, 5종의 한국미기록종 [*Hornera lichenoides* (Linnaeus, 1758), *Scruparia ambigua* (d'Orbigny 1841), *Crassimarginatella kumatae* (Okada, 1923), *Pacificincola perforata* (Okada and Mawatari, 1937), *Woosukia subhexagona* (Ortmann, 1890)]과 4종의 신종 (*Crisia* n. sp., *Primavelans* n. sp., *Arthropoma* n. sp. *Phidolopora* n. sp.)을 추가하였다. 그리고 제주도 해역에서 관찰할 수 없었던 5종 [*Membranipora serrilamella* Osburn, 1950 톱니막이끼벌레, *Bugula robusta* MacGillivray, 1869 떡갈이끼벌레, *Celleporaria aperta* (Hincks, 1882) 구멍섬유이끼벌레, *Celleporaria brunnea* (Hincks, 1884) 갈색섬유이끼벌레, *Parasmittina delicatula* (Busk, 1884) 고운입이끼벌레]을 추가하여 보고한다. 또한 *Crassimarginatella crassimarginata* (Hincks, 1880) 연후이끼벌레, *Arthropoma cecillii* (Audouin, 1826) 관절이끼벌레는 오동정으로 판단되어 *C. kumatae* (Okada, 1923), *Arthropoma* n. sp.로 새로 보고한다. 본 연구 결과 한국산 태형동물 중 제주도 해역에서 서식하는 태형동물은 총 2강 3목 46과 73속 115종이 된다.

태형동물의 분류학적 연구를 통하여 제주도의 과거에 채집되어진 종과 비교하고, 태형동물의 서식하는 적합한 환경을 확인한 결과, 제주도 해역에서만 서식하는 태형동물은 41종이며 제주시에서 10종, 서귀포시 36종이 확인되었다. 그리고 제주시와 서귀포시에서 모두 관찰할 수 있는 태형동물은 *Tubulipora pulchra* 폴크라관이끼벌레, *Nolella stipata* 진흙이끼벌레, *Antropora granulifera* 공굴이끼벌레, *Amastigia xishaensis* 볼록이은이끼벌

레, *Adeonella lichenoides* 넓적부리이끼벌레 5종이다. 특히, 제주도 지역에만 서식하는 태형동물 41종은 해류의 영향과 수온의 증가를 통하여 서식 지역의 북상 등 기후변화를 추정하는 종으로 사용될 수 있을 것으로 판단된다.

본 연구에서 미관찰된 12종에 대하여는 기존의 문헌을 분석한 결과 현재 관찰할 수 없었던 종은 대부분 그물을 이용한 어업활동에 의해서 채집하였기 때문으로 판단된다. 제주도 인근 지역은 수심이 보통 50m 보다 깊기 때문에, SCUBA diving을 이용하여 채집하는데 한계가 있다. 더 깊은 지역에 서식하는 태형동물은 어선의 그물을 이용하여 조사해야 될 것으로 생각한다.

항구와 조간대에서 채집한 종을 분석하였다. 조사지역 24개 중 4개의 항구(제주항, 김녕항, 서귀포항, 화순항)와 4개의 조간대(추자도의 예초리, 성산포, 위미리, 강정)에서 채집한 결과 39종의 태형동물을 채집할 수 있었다. 조간대에서 채집한 태형동물은 7종(*Disporella novaehollandiae* 노바접시이끼벌레, *Membranipora tuberculata* 관막이끼벌레, *Pacificincola perforata*, *Cryptosula pallasiana* 숨은이끼벌레, *Microporella discors* 불협화소공이끼벌레, *Arthropoma cecillii*관절이끼벌레, *Celleporina porosissima* 포로시씨마이끼벌레)이며 항구에서 채집한 종보다 적은 결과가 나타났다. 항구에서 서식하는 태형동물이 많은 것으로 확인되었는데, 그 이유는 항구는 인간의 활동에 의해서 태형동물이 부착할 수 있는 기질(어선, 밧줄, 타이어, 그물, 양식장 구조물 등)이 조간대 보다 다양하기 때문이다. 특히, 항구에 서식하는 오손태형동물은 선박의 평형수와 선박의 바닥에 부착하여 원산지로부터 그 분포를 확산시킬 수 있다. 그러므로 오손태형동물은 동물지리학적으로 매우 중요하기 때문에 항구의 서식하는 태형동물의 목록을 작성하고 관리하는 것은 매우 중요하다.

태형동물이 가장 많이 서식하는 문점의 수심에 따른 종 목록을 표로 작성

하고 수온과 기질을 함께 조사한 결과 2장 3목 20과 31속 42종이 확인되었으며, 이 중 31종이 수심 15-30m에서 안정적으로 분포하는 것으로 나타났다. 또한 수온에 대한 특이성으로는 *Amastigia rudis* 막대이은이끼벌레, *Brettia mollis* 곤봉이끼벌레로 수온 14-17℃에서만 채집할 수 있었다. 그리고 *Bantariella bocki* 보키반타이끼벌레는 대부분 11월에서 3월에만 출현하는 종으로 계절적인 영향과 밀접한 관련이 있다는 것으로 나타났다.

부착기질에 대하여 분석한 결과, 태형동물이 부착한 기질은 11가지로 무생물성 기질인 돌성분, 플라스틱, 고무 3가지(27%)이며, 생물성 기질인 해조류, 해면동물, 패각, 갯지렁이류, 산호충류, 다른 태형동물, 히드라류, 멍게류 8가지(73%)로 나타났다. 생물성 기질에서 관찰된 종은 49종, 무생물성 기질에서 관찰된 종은 42종으로 무생물성 기질보다 생물성 기질에서 태형동물이 더 많이 부착한다. 기질별 부착종은 돌 37종 (23.7%), 해조류 21종 (13.5%), 해면동물 19종 (12.2%), 패각 18종 (11.5%), 갯지렁이류 16종 (10.3%), 플라스틱 11종 (7.1%), 산호류 8종 (5.1%), 다른태형동물 7종 (4.5%), 히드라류 6종 (3.8%), 멍게류 2종 (1.3%), 고무 1종 (0.6%), 기타 10종 (6.4%) 순으로 나타났다. 부드러운 기질인 고무를 제외한 대부분의 기질 재료는 경성기질이며, 인공적인 구조물, 고무와 플라스틱을 제외하고 다른 기질은 대부분 자연적 성분의 기질로 나타났다. 대부분의 태형동물은 두껍고 단단한 기질에 많은 종이 부착하는 것으로 나타났다. 그리고 한 가지 기질에서만 관찰되는 종은 8종으로 해조류에서 3종, 패각에서 2종, 산호류, 갯지렁이류, 다른 태형동물에서 각각 1종씩 관찰하였다. 우리나라에서 가장 많이 관찰되는 *Watersipora subtorquata* 자주빛이끼벌레와 *Tricellaria occidentalis* 세방가시이끼벌레는 다양한 기질에서 부착하는 것으로 알려져 있지만 (Ryland 1970; Gordon and Mawatari 1992; Gong and Seo 2003, 2004; Seo, 2005) 제주도에서는 3개와 4개의 부착기질에서만 관찰할 수 있었다. 그리고 가장 많이 부착하는 태형동물은 철빛종이끼벌레(*Metroperiella*

montferrandii)로 7개의 부착기질에서 서식하는 것을 확인하였다. 기질 중에서 무생물성 기질에서만 관찰된 종은 12종이었고, 생물성 기질에서만 부착되어 관찰되는 종은 18종을 확인하였고, 관찰재료 중에서 생물성 기질은 무생물성 기질보다 7종이 높게 관찰되었다. 제주도의 태형동물은 무생물성 기질보다 생물성 기질에 더 많은 종이 부착하는 것으로 나타났다.

태형동물이 제주도 해역에서 다양성이 높은 이유는 해양생물의 먹이원과 유충을 전달하는 해류의 영향, 태형동물이 다양하게 부착할 수 있는 기질이 많기 때문이다. 태형동물의 조사는 제주도의 남부지역인 서귀포지역에서 많이 수행되었고, 깊은 수심에 서식하는 태형동물을 관찰하는데 한계가 있다. 추후에 다양한 조하대 채집과 심해에 서식하는 태형동물을 연구한다면 더욱 많은 종이 추가될 것으로 예상된다.

V. 참고문헌

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ABSTRACT

A Taxonomic Study on Bryozoans from Jeju Island, South Korea

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The purpose of this study is to search the diversity of bryozoans on Jeju islands of South Korea. The Jeju Bryozoans contains over about 76% of the Korea marine bryozoans (135 species) from South Korea. Furthermore, most of the Jeju bryozoans are in the Pacific coast. In Korean waters, bryozoan species are abundant at depths of 20–40 m coast of Jeju Island, and form general bryozoans in subtidal communities. And most species require a hard substratum such as rocks or shells on which to attach. In the present study, systematic studies on the taxonomy, kind of attachments substratum diversity of bryozoans, and habitat study on only living Jeju Island such as water temperature, depth of water, particular substratum of Jeju bryozoans were performed.

This study, Taxonomic study on bryozoans from Jeju Island. As a result of the present study, a total of 71 species were found from 24 sites of Jeju Island from 2008 to 2015. The bryozoan species from Jeju Island were turned out to be 115 species, 73 genera, 46 families, three orders and two classes. And four new species *Crisia* n. sp., *Primavelans* n. sp., *Arthropoma* n. sp. *Phidolopora* n. sp. from Korea, and five

species *Hornera lichenoides* (Linnaeus, 1758), *Scruparia ambigua* (d'Orbigny 1841), *Crassimarginatella kumatae* (Okada, 1923), *Pacificincola perforata* (Okada and Mawatari, 1937), *Woosukia subhexagona* (Ortmann, 1890) are newly added to Korean fauna. The bryozoans are endemic to the intertidal and subtidal zones at Jeju-do Island and are distributed on the hard substratum between 10-30 m deep. Add, habitat study on the Jeju bryozoan, habitat study such as water temperature, depth of water, particular substratum etc. The subtidal bryozoan has the diverse more than intertidal bryozoan in Jeju islands. However, whereas some particular species from intertidal sites, ports. Most of the subtidal bryozoans are distributed on the hard substratum between 15-30 m deep. Some species(*Amathia distans*) preferences warm temperatures, whereas some species(*Bantariella bocki*) cold temperatures. And some species(*Adeonella lichenoides*, *Iodictyum axillare*, *Reteporellina denticulata*) relationless in and out of season. Furthermore, bryozoan Colony spaces provide a habitat for other benthic invertebrates, mainly small isopod, amphipod, crustaceans skeleton shrimp, starfish, and polychaetes. Study on the attachment substrates of Jeju Island bryozoan. For this study, the materials have been collected in Jeju Island of South Korea during the period from 2008 to 2015. A total of 71 specimens which were used were classified into eleven kinds, such as rock, algae, sponge, shell, polychaete tube, plastic, coral, bryozoan, hydroid, tunicate and rubber. As a result of 37 species 23.7% attached to the rocks, 21 species 13.5% attached to the algae, 19 species 12.2% attached to the sponge, 18 species 11.5% attached to the shell, 16 species 10.3% attached to the tubeworm, 11 species 7.1% attached to the plastic, 8 species 5.1%

attached to the anthozoan, 7 species 4.5% attached to the bryozoan, 6 species 3.8% attached to the hydrozoan, 2 species 1.3% attached to the tunicates, 1 species 0.6% attached to the rubber, 10 species 6.4% attached to the unknown, The most species require a hard substratum such as rocks, algae, shells or worm tubes.