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A Brief Report of Five Newly Recorded Korean Modern Benthic Foraminiferal Species

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Abstract: The present study describes five newly recorded modern benthic foraminiferal species from the subtidal zone near Jeju Island and East China Sea (Korea). The newly recorded species (*Karrerulina conversa*, *Rotaliammina trumbulli*, *Vertebralina striata*, *Pegidia dubia* and *Amphistegina radiata*) belong to five families (Prolixoplectidae, Trochamminidae, Fischerinidae, Pegidiidae and Amphisteginidae), three orders (Lituolida, Miliolida and Rotaliida) and two classes (Globothalamea and Tubothalamea). All these five genera (*Karrerulina*, *Rotaliammina*, *Vertebralina*, *Pegidia* and *Amphistegina*) were also reported for the first time from Korean waters. Most of the examined specimens were highly consistent morphologically with previous records from southern China and Japan. Additionally, *Amphistegina* is one of the symbiont-bearing larger benthic foraminifera, known to be mainly distributed in tropical to warm subtropical waters. This study contributes to the expansion of data on the recent foraminiferal species diversity in Korean waters.

Keywords: foraminifera; protists; unrecorded species; East China Sea; Jeju Island

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1. Introduction

Foraminifera are unicellular eukaryotes that mainly inhabit marine environments. They commonly form granuloreticulopodia and secrete a test (shell) composed of calcite or have an arenaceous or proteinaceous test (shell). The test can fossilize, and the group represents one of the most studied microfossils with a record from the early Cambrian to present day [1]. Modern foraminifera are one of the most dominant meiobenthic organisms and occupy an important position in the marine food web because of their wide feeding strategies [2]. Particularly, some species called 'Large Benthic Foraminifera (LBF)', mostly distributed in the warm oligotrophic waters of temperate to subtropical zones, have symbiotic relationships with microalgal symbionts [3].

Overall, 48,506 species of foraminifera have been reported worldwide, of which 8912 species are extant [4]. In Korea, 1197 species including fossil and modern species have been recorded [5]. However, taxonomic descriptions or voucher specimens for most of the records are missing, and the research areas were mainly limited to some coastal areas. After the year 2010, taxonomic and diversity studies on benthic foraminifera have been conducted for 10 years in areas not previously investigated before, such as East Sea (Japan Sea) and East China Sea in the southern Jeju Island, and in line with it, several newly recorded species (218 species) or new species (1 species) have been reported [6–10].

The purpose of this study is to describe an additional five newly recorded recent benthic foraminiferal species from around Jeju Island and East China Sea (Korea).

2. Materials and Methods

Sediment sampling was conducted between 2016 and 2021 in the subtidal zone near Jeju Island, Chuja Island and East China Sea (Figure 1 and Table 1). Sediment samples

were collected using an acrylic corer via SCUBA diving or grab samplers (van Veen Grab, Smith-McIntyre Grab). Sediments from the acrylic corer were sieved through 63 μm mesh screen with tap water and fixed with 99% ethanol. In the case of the sediment collected by grab samplers, the top 0–1 cm of sediment was sieved through 125 μm mesh screen using natural sea water, and then stored in 250 mL bottles with filtered sea water and continuously aerated using a portable aerator while transported to the laboratory.

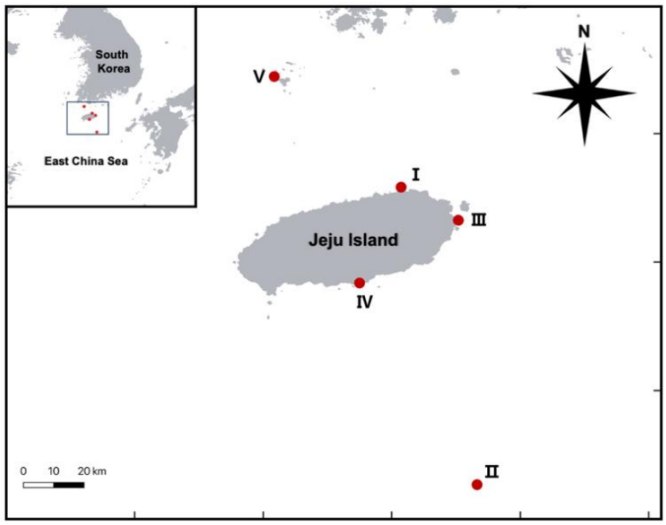

Figure 1. Map of sampling sites around Jeju Island. This map is made with QGIS software v.3.16.

Table 1. Information on the sample collection sites.

No	Locality	Date	Latitude (N)	Longitude (E)	Depth	Method
I	National Marine Ecosystem Monitoring st. J08	30 April 2016	33°34′26.461″	126°44′6.121″	35 m	Van Veen Grab
II	R/V Saedongbaek (Chonnam National University) cruise st. EC10	8 August 2019	32°30′	127°00′	118 m	Smith-McIntyre Grab
III	Sungsan Seom-yeo diving point, Jeju	2 August 2020	33°27′21.54″	126°56′3.06″	18.3 m	SCUBA diving
IV	Seopseom, Kaldong-gul diving point, Jeju	3 August 2020	33°14′12.10″	126°35′19.34″	23.1 m	SCUBA diving
V	Chuja Island st.3	9 September 2021	33°57′31.8″	126°17′18.3″	16.5 m	SCUBA diving

In the laboratory, samples were examined using a stereomicroscope (Leica S8AP0; Olympus SZ40, Wetzlar, Germany) and foraminiferal specimens were isolated by using fine brushes and kept in micropaleontology slide. Photomicrographs were taken at multiple focal points using digital cameras (Olympus PEN Lite E-PL3, Canon EOS 90D, Tokyo, Japan) attached to a stereomicroscope (Olympus SZX12, Tokyo, Japan), and the images were stacked using Helicon Focus 7.6.4 software (Helicon Soft). Specimens for scanning electron microscopy (SEM) were mounted on a stub attached with carbon tape, and coated with Au under 4 mA, for 220 s, in a vacuum ion coater, COXEM SPT-20. Coated samples were examined using a tabletop SEM (COXEM EM-30, Daejeon, Korea) in biodiversity laboratory (Hanyang University). All examined specimens were determined to be autochthonous based on the cytoplasmic traces which were observed as colors on the test, and the good test conservation status with almost no damages. Species identification was conducted based on the original descriptions in Ellis and Messina [11] and other related references including Cheng and Zheng [12], Zheng [13,14], Loeblich and Tappan [15,16], Hatta and Ujiié [17,18] and Jones [19]. Systematic classification of species, genera and higher level

were mainly referred to Loeblich and Tappan [15], Kaminski [20] and World Register of Marine Species (WoRMS) [21]. Voucher specimens were preserved on micropaleontology slides or SEM stubs, and deposited to National Marine Biodiversity Institute of Korea (MABIK) and National Institute of Biological Resources of Korea (NIBR).

3. Results and Discussions

3.1. Systematics

Phylum Foraminifera d'Orbigny, 1826
Class Globothalamea Pawlowski, Holzmann and Tyszka, 2013
Order Lituolida Lankester, 1885
Family Prolixoplectidae Loeblich and Tappan, 1985
Genus *Karrerulina* Finlay, 1940

***Karrerulina conversa* (Grzybowski, 1901) (**Figure 2. **1a–c**)

Gaudryina conversa Grzybowski, 1901 [22], p. 285, pl. 7, figs. 15, 16.

Gaudryina apicularis Cushman, 1911 [23], p. 69; text fig. 110a,b; [24], p. 151, pl. 29, fig. 7; [25], p. 72, pl. 8, fig. 4.

Karrerulina apicularis: Loeblich and Tappan [15], p. 130, pl. 139, Figures. Zheng and Fu [26], p. 464, pl. 69, figs. 3–8.

Karrerulina conversa: Jones [19], p. 51, pl. 46, figs. 17–19; Hayward et al. [27], p. 145, pl. 6, figs. 6 and 7.

Material examined. Three specimens; Korea, off southern coast of Jeju, R/V Saedongbaek (Chonnam National University) cruise st. EC10, 32°30′00″ N, 127°00′00″ E, 8 August 2019, by Smith-McIntyre grab, depth 118 m, collected by Nayeon Park and Somin Lee. Voucher specimens—MABIK ID: MABIK PR00043299, MABIK PR00043300, NIBR ID: NIBRPR0000111046.

Diagnosis. Test elongate, triserial in the early stage then biserial chambers added obliquely to previous chamber, with subparallel or lobulate outline. Chambers increase in size rapidly and sutures slightly indistinct in the early triserial portion. Chambers merely increase in size, and sutures become distinct, depressed in the later biserial portion. Aperture terminal at the end of slightly produced neck. Wall agglutinated with fine to coarse grains, color grey to brown, surface rough. Test length about 1.38 mm.

Remarks. According to Holbourn and Henderson [28], *Karrerulina conversa* is the type species of genus *Karrerulina* by synonymy with *Karrerulina apicularis.* Currently, there are two modern *Karrerulina* species: *K. conversa* and *K. pupiformis.* According to the original description of *Karrerulina pupiformis* in Ellis and Messina [11], it differs from *K. conversa* in having less distinct sutures, no inflated chambers, and a finely agglutinated test wall with a neat surface rather than rough. *Karrerulina conversa* have been reported mainly from deep waters: 49–7225 m [26] and present Korean specimens are collected at a relatively shallow depth compared to the previous records [26,27].

Distribution. Korea, China, Japan, New Zealand, Mauritania, United States, Cuba, Caribbean Sea.

Class Globothalamea Pawlowski, Holzmann and Tyszka, 2013
Order Lituolida Lankester, 1885
Family Trochamminidae Schwager, 1877
Genus *Rotaliammina* Cushman, 1924

***Rotaliammina trumbulli* (Seiglie, 1977) (**Figure 2**. 2a–d)**

Rotaliammina trumbulli Seiglie and Bermudez, 1977 [29], p. 301, pl. 3, figs. 1–3; Poag and Tresslar [30], p. 56, pl. 12, figs. 2, 3.

Material examined. Three specimens; Korea: Daeseo-ri, Chuja-myeon, Jeju-si, Chuja Island st.3, 33°57′31.8″ N, 126°17′18.3″ E, 9 September 2021, by SCUBA diving, depth 16.5 m, collected by Byung-Jin Lim and Cheol Yoo, Voucher specimens—MABIK ID: MABIKPR00043306, MABIKPR00043307, NIBR ID: NIBRPR0000111045.

Diagnosis. Test small, compressed, low trochospiral, attached by concave umbilical side. Spiral side slightly convex, composed with about three whorls, eight chambers in the final whorl. Spiral side, chambers crescentic, sutures curved and slightly depressed. On umbilical side, chambers have mushroom-like outline with prominent bulb shaped lobules towards umbilicus. Test wall thin, agglutinated, slightly rough on spiral side, smooth on umbilical side. Test diameter about 314 μm.

Remarks. This species can be distinguished from other congeneric species by the prominent lobules of each chamber in the umbilical side. This species is close to *R. chitinosa,* particularly of the specimen reported by Zheng [13] (p. 117, pl. 2, Figure 10a–c) by having chambers with lobules produced toward umbilicus. However, the shape of lobule is more rounded, bulb-like in *R. trumbulli,* and the number of chambers on the final whorl in *R. trumbulli* is higher than that of *R. chitinosa,* which is five to six. Present Korean specimens are nearly identical to the specimens reported by Poag and Tresslar [30] from West Flower Garden Bank, northernmost coral reef in Gulf of Mexico and the holotype and paratype specimens reported in Seiglie and Bermudez [29] from Puerto Rico. This is the first report of genus *Rotaliammina* in Korean waters.

Distribution. Korea, United States, Puerto Rico.

Class Tubothalamea Pawlowski, Holzmann and Tyszka, 2013
Order Miliolida Delage and Hérouard, 1896
Family Fischerinidae Millett, 1898
Genus *Vertebralina* d'Orbigny, 1826

***Vertebralina striata* (d'Orbigny, 1826)** (Figure 2**. 3a–f)**

Vertebralina striata d'Orbigny, 1826 [31], p. 283; Cushman [32], p. 38, pl. 22, figs. 3, 4; [24], p. 414; [33], p. 96, pl. 22, fig. 6a,b; Cheng and Zheng [12], p. 172, pl. 14, fig. 4a–c; Hatta and Ujiié [17], p. 62, pl. 4, fig. 6a,b; Hottinger et al. [34], p. 43, pl. 23, figs. 8–15; Jones [19], p. 28, pl. 12, figs. 14–16; Loeblich and Tappan [16], p. 39, pl. 60, figs. 1–7; Parker [35], p. 379, fig. 274a–h; Debenay [36], p. 139.

Material examined. Four specimens; Korea: Seongsan-eup, Seogwipo-si, Jeju Island, Seom-yeo diving point, 33°27′21.54″ N, 126°56′3.06″ E, 2 August 2020, by SCUBA diving, depth 18.3 m, collected by Heerin Kim, Jisu Yeom, Nayeon Park and Wonchoel Lee. MABIK ID: MABIKPR00043301, MABIKPR00043302, MABIKPR00043303, NIBR ID: NIBRPR0000111044.

Diagnosis. Test strongly compressed, early stage weakly trochospiral, later tends to uncoil and become uniserial. Periphery rounded and lobulate. Chambers crescentic, rapidly increase in size as added. Sutures distinct, slightly depressed, and curved. Surface ornamented by numerous striae. Aperture terminal elongated, somewhat more opened toward umbilical side due to narrower flap on ventral side and bordered by a thickened lip. Wall calcareous, porcelaneous imperforate. Test length about 1 mm.

Remarks. This species is well known in the Mediterranean and Indo-Pacific warm and shallow waters [17,37]. In waters close to Korea, this species has been reported from Ruykyu Island Arc, southern Japan [17] and Xisha islands, southern China [12]. The striae on the test surface appear to vary from almost smooth to heavily striated or costate. In case of specimens with a markedly developed aperture, which are thought to be in the gerontic stage, such as figures by Cushman [33], Hottinger [34] and Parker [35], the aperture may appear to be somewhat flaring. Present Korean specimens are most similar with the specimens from Ruykyu Islands [17], Xisha Islands [12] and Timor Sea [16]. *Vertebralina striata* is mostly similar to *V. substriata*, however the latter has a subcircular contour, rather than the arcuate test of *V. striata.* Additionally, *V. striata* differs from *V. substriata* in the larger size, indented rather than flush sutures, and less broad apertural flap [16]. This is the first record of the genus *Vertebralina* in Korea.

Distribution. Korea, China, Japan, Malaysia, Australia, New Caledonia, Maldives, Micronesia, Moorea, Italy, Turkey, Spain, Saudi Arabia, Kuwait, Tanzania, Mozambique.

Class Globothalamea Pawlowski, Holzmann and Tyszka, 2013

Order Rotaliida Delage and Hérouard, 1896
Family Amphisteginidae Cushman, 1927
Genus *Amphistegina* d'Orbigny, 1826

***Amphistegina radiata* (Fichtel andMoll, 1798) (**Figure 2**. 4a–g)**

Nautilus radiatus Fichtel and Moll, 1798 [38], p. 58, pl. 8, fig. a–d.

Amphistegina quoii d'Orbigny, 1826 [31], p. 304, pl. 17, fig. 1–4.

Amphistegina radiata: Larsen [39], p. 7, pl. 5, figs. 1–4; pl. 6, figs. 1, 2; pl. 7, fig. 5; pl. 8, fig. 5; Cheng and Zheng [12], p. 231, pl. 29, figs. 12–14; Zheng [14], p. 170, pl. 5, fig. 9; Loeblich and Tappan [15], p. 609, pI. 677, figs. 1, 2; Hatta and Ujiié [18], p. 196, pl. 42, fig. 5a,b; Loeblich and Tappan [16], p. 157, pl. 339, Figures 8–11; pl. 341, figs. 8–10; Parker [35], p. 499, fig. 356a–j; Debenay [36], p. 216; Förderer and Langer [40], p. 126, pl. 51, figs. 1–3.

Amphistegina sp.: Förderer and Langer [40], p. 126, pl. 51, figs. 12–16.

Material examined. Four specimens; Korea: Bomok-dong, Seogwipo-si, Jeju Island, Seop-seom Kaldong-gul diving point, 33°14′12.10″ N, 126°35′19.34″ E, 3 August 2020, by SCUBA diving, depth 23.1 m, collected by Heerin Kim, Jisu Yeom, Nayeon Park and Wonchoel Lee. Voucher specimens—MABIK ID: MABIKPR00043308, MABIKPR00043309, MABIKPR00043310, NIBR ID: NIBRPR0000111042.

Diagnosis. Test low trochospiral, compressed lenticular in lateral, circular in outline, with central transparent, imperforate plug. Sutures unclear due to scattered papillae and hemiseptulum [41] or interseptae [39], except peripheral region, where sutures strongly curved back covering most of the peripheral part of previous chamber. On the spiral side, the sutures are relatively more distinct than on the umbilical side. About two or more rows of papillae and hemiseptula are arranged between sutures. The umbilical side is more complex and almost entirely occupied by supplementary chambers. Papillae and hemiseptula of the umbilical side scattered throughout except in the marginal region, where the supplementary chambers alternate with the umbilical parts of the main chambers. Aperture opened at the periphery slightly toward umbilical side, surrounded by a small field of papillae along the peripheral margin. Test dimension about 780 to 950 μm.

Remarks. *Amphistegina radiata* and *A. papillosa* are morphologically very close to each other, and it is often difficult to distinguish between the two species because they both have a somewhat compressed test, a complex umbilical side almost completely covered by supplementary chambers with hemiseptulum (or interseptae) of broken appearance and dotted lines of papillae. Commonly, *A. radiata* can be differentiated from *A. papillosa* by its smooth surface without profuse papillae, however sometimes, *A. radiata*, especially from deep water depth can have papillate test, and this case, it is difficult to distinguish it from *A. papillosa.* According to Larsen [39], these species differ in spiral side and aperture details. In *A. radiata*, sutures of spiral side are rather clear in overall length, the hemiseptulum (or interseptae) are linear and arranged in a single line between sutures. Whereas in *A. papillosa*, sutures become clear only near the periphery, and hemiseptulum (or interseptae) are irregularly arranged in multiple lines between sutures. *Amphistegina radiata* is smaller and more compressed and exhibits a higher number but has narrower chambers than *A. lessonii* and *A. lobifera* [35]. Additionally, the tuberculated area around the aperture is more restricted in *A. papillosa.* The distribution depths differ from each other; *A. papillosa* seems to distribute mainly at deeper (>30 m) depth than *A. radiata* [42–44].

Present specimens are smaller than 1 mm in size, and the surface of the test are slightly papillate, which makes the intersepta/hemiseptula appear short and dotted, showing characteristics very similar to *A. papillosa.* However, as it can be seen from the scanning electron micrograph, the present specimens do not have profuse papillae like most reported *A. papillosa*, and the periphery is not as sharp as *A. papillosa* but rather blunt, and the tubercles around the aperture are slightly extended along this region. Furthermore, the collection depth of present specimens (23.1 m) is consistent with general distribution depth of *A. radiata* (<30 m) rather than *A. papillosa* (>30 m) [42–44]. As mentioned above, since there are some unclear points in the species distinction between those two species,

detailed molecular phylogenetic morphological and ecological study is necessary for a clear species identification.

This is the first record of *Amphistegina* in Korea. *Amphistegina* is one of the symbiont-bearing foraminifera (Larger Benthic Foraminifera) and is known to be distributed in normally tropical to warm subtropical regions, where the surface water temperature in winter is higher than 14 °C [3,39]. The occurrence of Amphistegina in southern Jeju may relate to the northward geographic range shifts of tropical marine species due to ocean warming, which has also been reported from Jeju Island [45–48]. Actually, the region has been considered as one of the hot spots where the rapid rise in sea water temperature occurs [49], and over the last century, water temperature around Jeju has increased by 1.6 to 2.1 °C [50]. However, further interdisciplinary studies such as long-term environmental monitoring with quantitative analysis and biological, phylogenetical studies with larger numbers of live specimens are required to provide concrete evidence of such an ecosystem shift.

Distribution. Korea, Japan, China, Philippines, Palau, Indonesia, Papua New Guinea, Micronesia, Marshall Islands, Solomon Islands, Timor Sea, Australia, New Zealand, New Caledonia, India, Saudi Arabia, Gulf of Aqaba, Kenya, Mozambique.

Family Pegidiidae Heron-Allen and Earland, 1928
Genus *Pegidia* Heron-Allen and Earland, 1928

***Pegidiadubia*(d'Orbigny in Fornasini, 1908)**(Figure 2**. 5a–e)**

Rotalia dubia d'Orbigny in Fornasini, 1908 [51], p. 46, pl. 1, fig. 14.

Pegidia dubia: Heron-Allen and Earland, 1928 [52], p. 290—291, pl. 1, figs. 8–15; Zheng [13], p. 179, pl. 22, figs. 5–12; Loeblich and Tappan [15], p. 556, pl. 602, figs. 7–9; [16], p. 137, pl. 275, figs. 1–6; Hatta and Ujiié [18], p. 181, pl. 31, fig. 2a–c, 3; Debenay [36], p. 245.

Material examined. Three specimens; Korea: Guja-eup, Jeju-si, Jeju Island, National Marine Ecosystem Monitoring st. J08, 33° 34′ 26.461″ N, 126° 44′ 6.121″ E, 30 April 2016, by van Veen Grab, depth 35 m, collected by Somin Lee and Hyunsoo Yoo. Voucher specimen—MABIK ID: MABIKPR00043304; Bomok-dong, Seogwipo-si, Jeju Island, Seop-seom Kaldong-gul diving point, 33° 14′ 12.10″ N, 126° 35′ 19.34″ E, 3 Aug 2020, by SCUBA diving, depth 23.1 m, collected by Heerin Kim, Jisu Yeom, Nayeon Park and Wonchoel Lee. Voucher specimens—MABIK ID: MABIKPR00043305, NIBR ID: NIBRPR0000111043.

Diagnosis. Test unequally biconvex to planoconvex, and irregular in shape ranging from oval to rounded quadrate in outline. Chambers arranged in a reduced trochospiral of two chambers per whorl. Chambers rapidly increase in size as added, so the last two chambers occupy almost the entire test. Dorsal side domed, surface ornamented tubercles, sutures indistinct due to ornamentation. Ventral side flattened, smooth with thick, somewhat rounded peripheral keel. Test calcareous, hyaline, and perforated. Aperture multiple, consisting of terminal openings of branching tubular canals along the sutures on ventral side. Test diameter about 800 μm.

Remarks. This species was originally reported from Mauritius and is known to be widely distributed in the Indo-Paicific region [52]. In the Norhwest Pacific, close to Korea, it has been reported from Ryukyu Island, Japan, in the East China Sea [18], and from Xisha Islands, China, in the South China Sea [13]. *Pegidia dubia* is mostly similar to *P. lacunata* among other congeneric species, however the latter one has wrinkle-like striae at the center of the ventral side, and a more involute dorsal side showing no evidence of organization, and surface presents an interlacing, open, minute network connecting tufts of minute vertical tubes [53].

Distribution. Korea, Japan, China, Papua New Guinea, Sahul Shelf, New Caledonia, Micronesia.

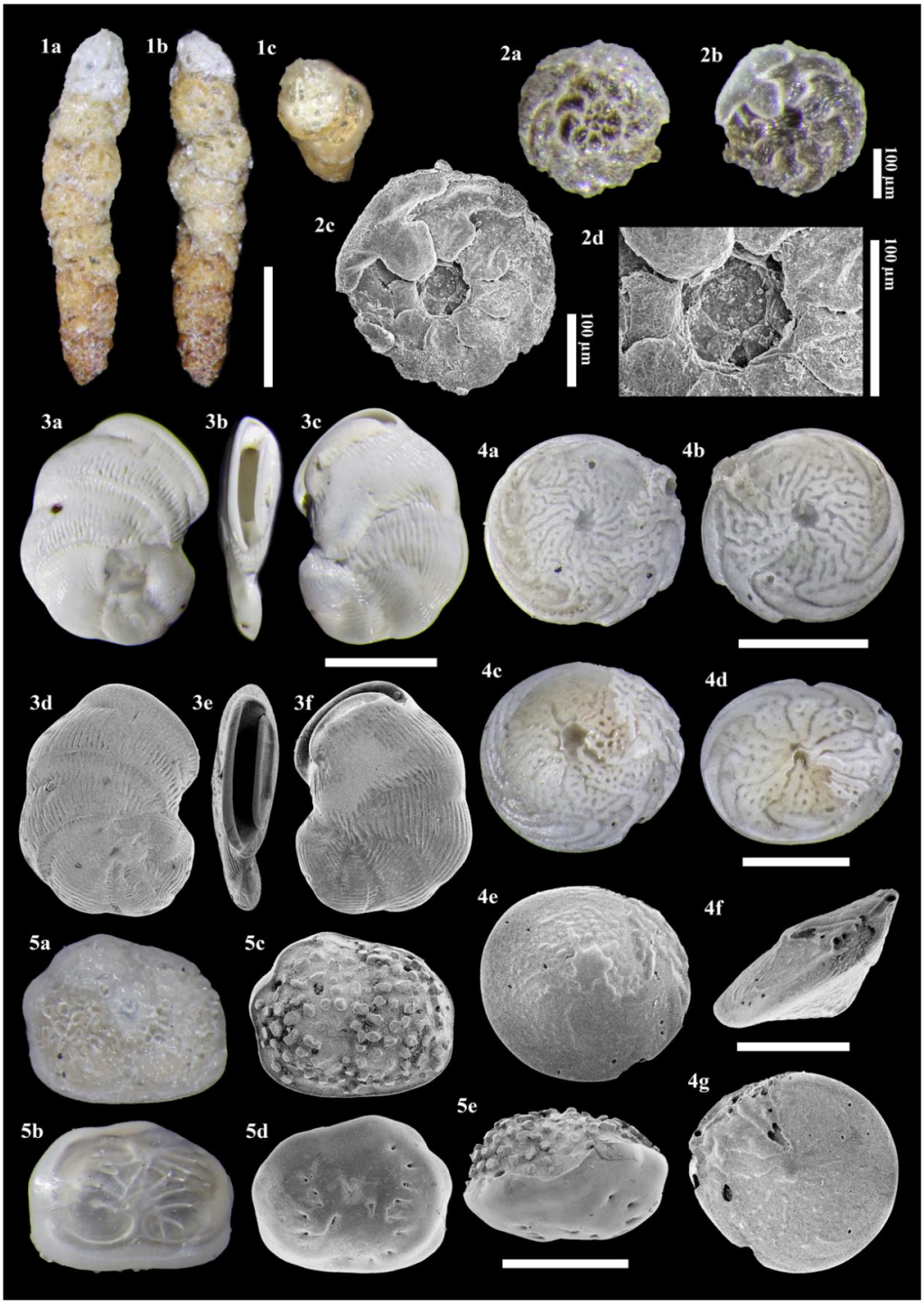

Figure 2. Photomicrograph and SEM image of the five newly recorded species. All scales are 500 µm unless otherwise noted. 1. (**a**–**c**) *Karrerulina conversa* (Grzybowski, 1901); 1**a**, 1**b**. Side view; 1**c**. Apertural side view. 2. (**a**–**d**) *Rotaliammina trumbulli* Seiglie, 1977; 2**a**. Spiral side view; 2**b**. Umbilical side view; 2**c**. Umbilical side view, SEM image; 2**d**. Close-up of umbilical region. scales: 100 µm. 3. (**a**–**f**) *Vertebralina striata* d'Orbigny, 1826; 3**a**. Spiral side view; 3**b**. Apertural side view; 3**c**. Umbilical side view; 3**d**. Spiral side view, SEM image; 3**e**. Apertural side view, SEM image; 3**f**. Umbilical side view, SEM image. 4. (**a**–**g**) *Amphistegina radiata* (Fichtel and Moll, 1798); 4**a**. Umbilical side view; 4**b**. Spiral side view; 4**c**. Umbilical side view; 4**d**. Spiral side view; 4**e**. Umbilical side view, SEM image; 4**f**. Apertural side view, SEM image; 4**g**. Spiral side view, SEM image. 5. (**a**–**e**) *Pegidia dubia* (d'Orbigny in Fornasini, 1908); 5**a**. Spiral side view; 5**b**. Umbilical side view; 5**c**. Spiral side view, SEM image; 5**d**. Umbilical side view, SEM image; 5**e**. Lateral side view, SEM image.

4. Conclusions

Five newly recorded recent benthic foraminiferal species belonging to five genera (*Amphistegina, Karrerulina, Pegidia, Rotaliammina, Vertebralina*), five families (Amphisteginidae, Fischerinidae, Pegidiidae, Prolixoplectidae, Trochamminidae), and three orders (Lituolida, Miliolida and Rotaliida) were discovered in the waters around Jeju Island, and East China Sea, Korea. Most of these species have been previously reported in the East China Sea or South China Sea, geographically close in the Pacific. All five genera are recorded for the first time in Korea, and in particular, *Amphistegina* is a symbiont-bearing tropical to subtropical larger benthic foraminifera. Although further studies are needed, its appearance in Jeju Island may be related to the northward expansion of tropical marine species due to the surface water temperature increase. The present study contributes to improving our knowledge of recent benthic foraminiferal species diversity in Korea.

Author Contributions: Conceptualization; methodology; writing—original draft preparation, S.L.; writing—review and editing, F.F.; supervision, F.F., W.L.; project administration, W.L.; funding acquisition, W.L. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement: The voucher specimens of the species examined in the present study were deposited to National Marine Biodiversity Institute of Korea (MABIK) and National Institute of Biological Resources of Korea (NIBR).

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Conflicts of Interest: The authors declare no conflict of interest.

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