

TINTINNOINEA OF THE HAINAN REGION\*

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Introduction

The present study is based upon the marine-plankton materials collected from Haikow (海口), Ching-lan-kong (清瀾港), Shin tsuen-kong (新村港), San-yah-kong (三亞港) and Ya-shian (崖縣) of Hainan Island, during the two successive years of 1933-1934. As shown in the following sections, fifty one species are reported; most of them have, so far, not been recorded from the coastal region of this country. The genus *Marshallia* and ten species and one variety belonging to various genera are described as new to science. All the figures are sketched with the help of a camera lucida.

*Tintinnopsis beroidea* Stein

Fig. 1

*Tintinnopsis beroidea* Stein, 1867, pp. 154-156; Bütschli, 1889, pp. 1735-1736, pl. 69, fig. 0, pl. 70, figs. 2, 2a; Jörgensen, 1899, pp. 5, 23-24, 42, pl. 1, fig. 5; 1924, pp. 66-68, 100, 107, figs. 72a, b; 1927, p. 7, fig. 5; Wright, 1907, pp. 11, 18, pl. 4, fig. 17; Faure-Fremiet, 1908, p. 234, fig. 19; Entz, Jr., *partim*, 1908, pp. 10-135, pl. 1, fig. 11, pl. 13, figs. 27-45; Merkle, 1909, pp. 334, 346, pl. 2, fig. 36; Meunier, 1910, p. 140, pl. 12, fig. 14-18; 1919, p. 27, pl. 22, figs. 28-30; Leegaard, 1920, p. 27, fig. 26; Lepsi, 1926b, pp. 79, 99, pl. 11, fig. 383; Kofoid and Campbell, 1929, p. 28, fig. 26; Hada, 1932, p. 41, fig. 2; 1937, p. 156, fig. 9; 1938, p. 93, fig. 4; Wang, 1936, p. 353, fig. 1.

*Codonella beroidea*, *partim*, Entz, Sr., 1884, pp. 296, 411-412, pl. 24, figs. 2-9.

*Tintinnopsis acuminata*, Meunier, 1919, pp. 22-23, figs. 19, 20.

\*An abstract under this title had been read before 20th annual Conference of the Science Society of China held at Nanning, 1935.

Lorica bullet-shaped, 2.0-2.08 oral diameters in length; oral rim more or less irregular, never flaring; bowl tubular or cylindrical, of the oral diameter in transtiameter; aboral region more less conical; aboral end tapered and bluntly pointed; wall without spiral structure and with scattered coarse agglomerations.



Fig. 1. *Tintinnopsis beroides* Stein.

Length: 54-60 $\mu$

Oral diameter: 26-28 $\mu$

Occurrence: San-yah, common.

Distribution: This is one of the cosmopolitan species widely distributed in warm and temperate neritic waters of the world.

### *Tintinnopsis tubulosa* Levander

Fig. 2

*Tintinnopsis tubulosa* forma a Levander, 1900a, p. 18 fig. 4.

*Tintinnopsis tubulosa*, partim, Brandt, 1907, pp. 167-171, 444, 481; Merkle, 1909, pp. 142, 144, 153, pl. 2, figs. 5, 8; Kofoid & Campbell, 1929, p. 48, fig. 39; Hofker, 1931, p. 338, figs. 18, 18a; Hada, 1937, p. 167, fig. 19.

Lorica stout finger-shaped, 2.14-2.50 oral diameters in length; oral rim rough; bowl cylindrical in the upper half of the lorica, somewhat dilated just below the middle, its greatest transdiameter 1.05-1.13 oral diameters; aboral region usually conical (75°-90°) to an acute distal end, sometimes rounded with a blunt end; wall agglomerated with coarse particles, no spiral structure.

Length: 90-100 $\mu$

Oral diameter: 40-42 $\mu$

Occurrence: San-yah and Shin-tsuen, Rare.

Distribution: Gulf of Finland; North Sea; Zuider Zee and Akkeshi Bay.

Comparison: this species differs from *T. gracilis* Kofoid and Campbell in its stout size of the lorica and from *T. subacuta* Jörgensen and *T. tubulosoides* Meunier in the absence of an aboral point.

### *Tintinnopsis nana* Lohmann

Fig. 3

*Tintinnopsis nana*. Lohmann. 1908, p. 292, pl. 17, fig. 12; 1911, p. 29, pl. 1, fig. 5; Kofoid and Campbell, 1929, p. 41, fig. 15; Hofker, 1931, p. fig. 5; Kofoid and Campbell, 1929, p. 41, fig. 15; Hofker, 1931, p. 340, fig. 19; Hada, 1938, p. 93, fig. 5.

*Tintinnopsis minuta*, Kofoid and Campbell, 1929, p. 40, fig. 16.

Lorica small, short tubular, 1.6 oral diameters in length; oral rim ragged; bowl usually cylindrical; aboral end conical or rounded; wall with sparse agglomerations.

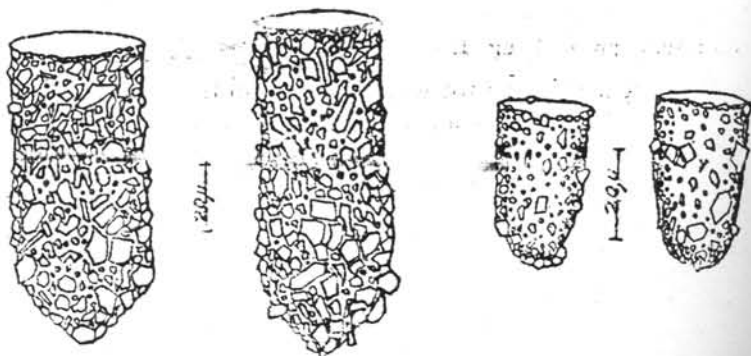


Fig. 2. *Tintinnopsis tubulosa*  
Levander.

Fig. 3. *Tintinnopsis nana*  
Lohmann.

Length: 35-38 $\mu$

Oral diameter: 20-23 $\mu$

Occurrence: San-yah, not very rare.

Distribution: Kiel Bay; North Sea; Zuider Zee; Straits of Georgia, British Columbia; Palao Island.

Comparison: this species differs from *T. beroidea* Stein and *T. acuminata* Daday in the smaller size and the shape of the aboral region.

#### *Tintinnopsis turgida* Kofoid & Campbell

*Tintinnopsis karajacensis* var. b Brandt, 1906, pp. 17, 19, pl. 19, figs. 9, pl. 26, fig. 9.

*Tintinnopsis turgida* Kofoid and Campbell, 1929, p. 49, fig. 65; Nie, 1934, p. 73, fig. 5.

Several individuals of the species were found in the samples collected from Jiangmen, Ya-Shian. It varies from 70 to 85 $\mu$  in length, from 25 to 27 $\mu$  in oral diameter. The present specimens appear slightly smaller in dimension than those recorded by Nie ('34) from Amoy.

#### *Tintinnopsis bütschlii* Daday

*Tintinnopsis Bütschlii* Daday, 1887b, p. 556, pl. 20, figs. 4, 5; Faure-Fremiet, 1924, pp. 93-97, fig. 30; Nie, 1934, p. 74, fig. 7; Wang, 1936, pp. 355-356.

*Tintinnopsis campanula* var. *bütschlii*, Jörgensen, 1924, pp. 67, 69, fig. 76a; 1927, pp. 6, 7, fig. 2.

Only five specimens were observed from the collections made at San-yah. The dimension of the lorica is 65 $\mu$  in average in length, 71 $\mu$  in oral diameter and 35 $\mu$  in the greatest transdiameter of the bowl.

#### *Tintinnopsis tocaninensis* Kofoid & Campbell

Fig. 4

*Tintinnopsis aperta* var. a Brandt, 1906, p. 19, pl. 25, figs. 2, 7; 1907, pp. 129, 177.

*Tintinnopsis tocaninensis* Kofoid and Campbell, 1929, p. 48, fig. 46; Wang and Nie, 1932, p. 343, fig. 51; Wang, 1936, p. 357, fig. 4.

*Tintinnopsis aperta* var. *tocaninensis*, Hada, 1938, p. 101, fig. 15.

This species was found in great abundance from all surveyed places of Hainan island. The specimens are from 77-140 $\mu$  in length and 20-25 $\mu$  in oral diameter, being more divergent than those recorded from Amoy by Wang and Nie.

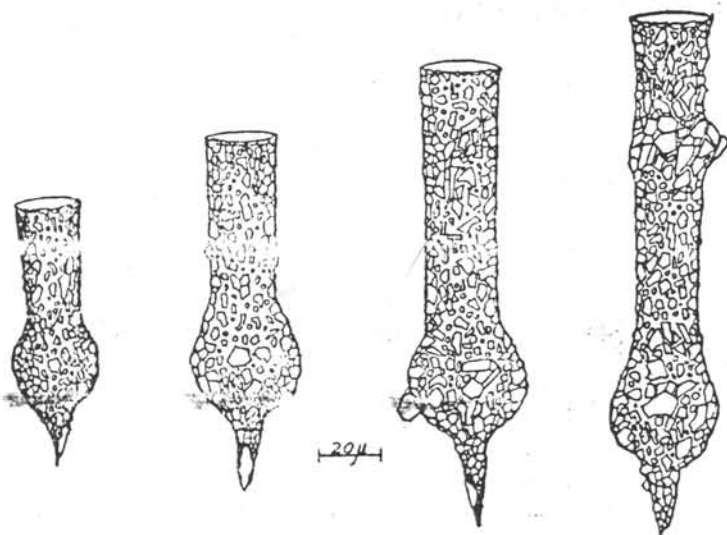


Fig. 4. *Tintinnopsis tocantinensis* Kofoid & Campbell.

#### *Tintinnopsis karajacensis* Brandt

*Tintinnopsis karajacensis* Brandt, 1896, pp. 55-57, 64-65, 69, pl. 3, fig. 5; Laackmann, 1906, pp. 21, 25, 36, pl. 1, figs. 12-14; Busch, 1925, pp. 186-187, figs. E, F; Kofoid and Campbell, 1929, p. 37, fig. 38; Hada, 1932, p. 558, fig. 6; 1938, p. 97, fig. 10; Nie, 1934, p. 75, fig. 10.

A common species found in the samples collected from Chin-lan and San-yah. They are slightly smaller in size as compared with those recorded from Amoy by Nie, averaging about 110-157 $\mu$  in length and 40-41 $\mu$  in oral diameter.

#### *Tintinnopsis nucula* (Fol) Brandt

Fig. 5

*Codonella nucula* Fol, 1884, p. 60, pl. 5, fig. 13.

*Tintinnopsis nucula*, Brandt, partim, 1906, p. 16, pl. 16, fig. 10, 12; Kofoid & Campbell, 1929, p. 41, fig. 47; Hada, 1938, p. 100, fig. 13.

*Tintinnopsis conglobata*, Hada, 1932, p. 555, fig. 2.

Lorica ovoidal, 2.75-3.50 oral diameters in length; oral rim rough; suboral region tubular or convex conical (45°); aboral

region ovoidal; aboral end broadly rounded or convex conical; wall laid up of irregular platelets of alveolar material with foreign inclusions.



Fig. 5. *Tintinnopsis nucula* (Fol) Brandt.

Length: 55-70 $\mu$

Oral diameter: 20-22 $\mu$

Occurrence: Ching-lan and San-yah, very common.

Distribution: Bombay, Kiel Bay, mouth of the Tocantins; Mutsu Baby; Lagoon of Yap.

Comparison: The species differs from *T. ovalis* Daday in habitat since the latter occurs in fresh water. It also differs from *T. amphora* in short proportion and much smaller size.

#### *Tintinnopsis directa* Hada

Fig. 6

*Tintinnopsis karajacensis* var. b Brandt, 1906, pl. 19, figs. 9, 19, pl. 26, fig. 9.

*Tintinnopsis* sp. Okamura, 1907, p. 139, pl. 6, fig. 64.

*Tintinnopsis directa* Hada, 1932, p. 557, fig. 4; 1938 p. 99, fig. 12.

Lorica tall campanulate, consisting of a oral flare (60-80 $\mu$ ), a subcylindrical median part and a globose bowl, 1.85-2.20 greatest transdiameters of the bowl in length; oral rim rough; median part cylindrical or slightly tapering, sometimes with several indistinct rings; aboral end hemispherical; wall coarse in appearance.

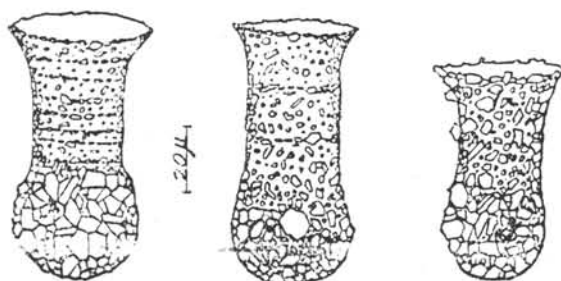


Fig. 6. *Tintinnopsis directa* Hada.

Length: 74-80 $\mu$ .

Oral diameter: 43-48 $\mu$ .

Greatest transdiameter of the bowl: 37-40 $\mu$ .

Occurrence: San-yah, common.

Distribution: Mouth of the Tocantins, Bombay; west coast of Borneo Kurosiwo; Mutsu Bay, Palao Islands and Yap.

Comparison: The species differs from *T. dadayi* Kofoid in having a tall lorica with feeble spiral annulations, and from *T. everta* Kofoid and Campbell and *T. cyathus* Daday in having a distinct globose posterior region.

*Tintinnopsis tentaculata* sp. nov.

Fig. 7

Lorica consisting of a low cylindrical collar and a stout ovoidal bowl, its length 1.40-1.82 oral diameters; oral rim more or less smooth; collar 0.083-0.1 of the total length in height, with 5-6 irregular tentacular-like processes of variable length and caliber, projecting out from its base; bowl broadly ovate, widest near the middle, its great diameter being equal to the length of the lorica or slightly broader; aboral region convex conical (95°-120°); aboral end usually acuminate into a nipple-like process, rarely rounded to a blunt end; wall of the bowl agglomerated with coarse foreign particles.

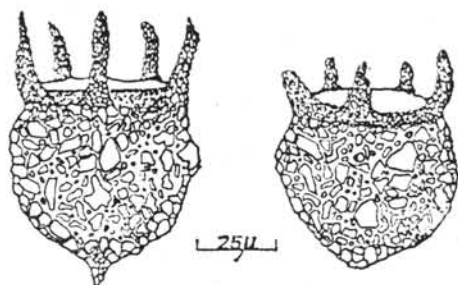


Fig. 7. *Tintinnopsis tentaculata*  
sp. nov.

Length: 52-63 $\mu$

Oral diameter: 35-40 $\mu$

Occurrence: Ching-lan frequent.

Comparison: The species differs from all the species of *Tintinnopsis* in the presence of five to six tentacular-like processes projecting out from the base of the collar.

#### *Tintinnopsis schotti* (Brandt) Kofoid & Campbell

Fig. 8

*Tintinnopsis dadayi* var. a *schotti* Brandt, 1906, p. 18, pl. 22, fig. 2; 1907, p. 145.

*Tintinnopsis schotti* Kofoid and Campbell, 1929, p. 46, fig. 56; Hada, 1938, p. 102, fig. 16.

Lorica consisting of a collar and a bowl, about 1.3 oral diameters in length; oral rim irregular; collar widely flaring to form an inverted truncated cone of 50°-60° with convex sides, about 0.23 of the total length; bowl ovoidal, usually broadest a little below its middle, about 0.85 of the oral diameter; aboral region broadly convex conical (110°) to a blunt distal end; wall of very coarse, irregular alveolar blocks.

Length: 130 $\mu$

Oral diameter: 97.5 $\mu$



Fig. 8. *Tintinnopsis schotti* (Brandt)  
Kofoid & Campbell.



Occurrence: San-Yah, very rare.

Distribution: West of Borneo; Western half of the Java sea.

Comparison: The species differs from *T. orientalia* Kofoid and Campbell in having a more flaring collar and a more distinct nuchal constriction and from *T. loricata* Brandt in possessing a stouter bowl.

### *Tintinnopsis amoyensis* Nie

*Tintinnopsis amoyensis* Nie, 1934, p. 75, fig. 9.

*Tintinnopsis baltica*, Hada, 1937, p. 176, fig. 25.

Only a single specimen was observed from the collections made at Jiang-men, Ya-shian. The dimension of the lorica is  $45\mu$  in length and  $25\mu$  in oral diameter.

Remarks: Hada, in 1937, identified this species as *T. baltica* Brandt. But he was able to point out the great difference between his specimens and *T. baltica* in the following words: "These Japanese specimens are different from those of the Baltic Sea in the presence of an aboral opening and the lack of or a weak development of the spiral structure which is characteristic of specimens in the Baltic Sea as shown in Brandt's figure in pl. 15, fig. 6 and pl. 16, fig. 4 (1906)". This is why Nie described it as a distinct species previous to Hada's observation.

### *Tintinnopsis chinglanensis* sp. nov.

Fig. 9

Lorica more or less flask-shaped, 2.2-3.2 oral diameters in length, cylindrical anteriorly, enlarged or bulging out aborally; oral rim slightly flaring, roughened with agglomerated materials; tubular part 0.59-0.68 of the total length in length, with a well defined constriction at the base, 0.85-0.90 oral diameter in trans-diameter, provided with several spiral turns, which are very distinct in the region above the enlarged part and gradually fade from sight as they approach upward to the oral rim; aboral region globular to conical, 1.36-1.40 oral diameters in trans-

diameter; aboral end hemispherical or convex conical; wall paved with irregular foreign particules.



Fig. 9. *Tintinnopsis clinglanensis* sp. nov.

Length: 81-112 $\mu$

Oral diameter: 31-35 $\mu$

Occurrence: Ching-lan, very abundant.

Variation: The length of the tubular part varies greatly in this new species. The shortest individual reaches only two third the length of the longest ones. The length of the bowl or aboral region, however, is generally constant. The shape of the bowl varies also very greatly; a series of different forms from globular to conical has been observed.

Comparison: This new species differs from *T. pestillum* Kofoid and Campbell in more distinctly separated tubular part and bulging bowl and in the absence of minute alveoles on the wall; from *T. subacuta* in the absence of an aboral point, and from *T. turgida* in the presence of spiral structure.

#### *Tintinnopsis major* Meunier

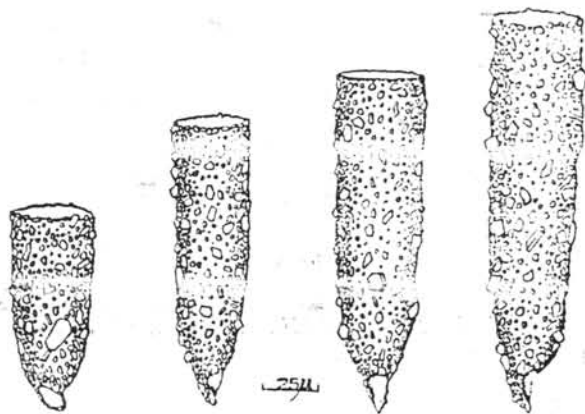
*Tintinnopsis major* Meunier, 1910, p. 138, pl. 12, fig. 1; Kofoid and Campbell, 1929, p. 39, fig. 18; Nie, 1934, p. 72, fig. 2.

This species is very rare in the samples collected from the Bay of San-yah. The dimension of the lorica is 55 $\mu$  in length, 42 $\mu$  in oral diameter and 55 $\mu$  in the great transdiameter of the bowl. The form of the lorica here reported is more like the type specimen than those found in Amoy.

*Tintinnopsis digita* sp. nov.

Fig. 10

Lorica finger-shaped, 2.53-4.30 oral diameters in length; oral rim either finely or greatly ragged; bowl cylindrical in the main part; aboral region usually conical (60°-70°); distal end pointed, usually with one side contracting rather abruptly; aboral opening present, often on the abruptly contracting side; wall moderately thick, composed of coarse agglomerated materials, spiral structure absent.

Fig. 10. *Tintinnopsis digita* sp. nov.

Length: 126 (81-160) $\mu$

Oral diameter: 37 (32-38) $\mu$

Occurrence: Shin-tzen, very common.

Variation: The considerable variations are seen in the length of lorica from 81-160 $\mu$ , while the oral diameter is constant throughout even in the shortest individual.

Comparison: The species differs from *T. gracilis* Kofoid and Campbell and *T. elongta* Daday in the presence of an aboral aperture and from *T. cylindrica* Daday in the absence of a long aboral horn.

**Tintinnopsis radix** (Imhof) Brandt

*Codonella radix* Imhof, 1886, p. 103.

*Tintinnopsis Davidoffii* Daday, 1887, p. 552, pl. 19, fig. 23.

*Tintinnopsis Davidoffii* var. *longicauda*, Daday, 1887, pp. 545, 553, pl. 19, fig. 26.

*Tintinnopsis curvicauda* Daday, 1887, pp. 554-555, pl. 19, fig. 33.

*Tintinnopsis radix*, Brandt, 1907, p. 20; Laackmann, 1913, pp. 17, 20-24, pl. 19, figs. 17-20, 27-28; Kofoid & Campbell, 1929, p. 45, fig. 93; Nie, 1934, p. 75, fig. 11; Hada, 1932b, p. 560, fig. 10; 1937, p. 166, fig. 18; 1938, p. 100, fig. 14; Marshall, 1934, p. 636, fig. 10; Wang, 1936, p. 359.

Remarks: The specimens of this species were found in the samples collected from Shin-tsun. The dimension of the lorica is comparatively smaller than those recorded by Nie ('34) from Amoy and Wang ('36) from Po-hai.

**Stenosemella nivalis** (Meunier) Kofoid & Campbell

Fig. 11

*Tintinnopsis nivalis* Meunier, 1910, p. 143, pl. 13, figs. 26, 27; Campbell, 1926, pp. 179-230, pls. 12-15.

*Tintinnopsis ventricosa*, Daday, 1887b, p. 559, pl. 20, figs. 19, 20.

*Tintinnopsis nitida* var. *ovalis* Jörgensen, 1905, pp. 53, 56, 143, pl. 18, fig. 115.

*Codonella ventricosa*, Entz, Sr., 1884, pp. 296, 413, pl. 24, fig. 24.

*Tintinnopsis glans* Meunier, 1919, pp. 29-30, pl. 13, figs. 35, 36.

*Stenosemella nucula*, *pratim*, Jörgensen, 1924, pp. 95-96, figs. 108a, b; 1927, pp. 8, 15, 17, 20, 21, fig. 7.

*Stenosemella nivalis*, Kofoid and Campbell, 1929, pp. 69-70, fig. 136; Hada, 1932c, p. 561, fig. 11; 1937, p. 178, fig. 26; 1938, p. 105, fig. 20; Marshall, 1934, p. 638.

Lorica ovate, about 2 oral diameters in length; collar low, without windows; bowl with prominent shoulder, widest at the anterior portion, 2 oral diameters in transdiameter; aboral region conical; aboral end bluntly pointed; wall of the bowl with coarse agglomerations.

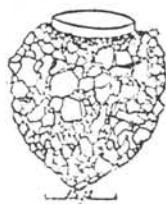


Fig. 11. *Stenosomella nitulii* (Meunier) Kofoid & Campbell.

Length:  $35\mu$

Oral diameter:  $17.5\mu$

Great transdiameter of the bowl:  $35\mu$

Occurrence: ~~San-yah~~, very rare.

Distribution: Cosmopolitically distributed in neritic waters.

Comparison: The species differs from *S. ventricosa* (Claparede & Laachmann) in smaller size and from *S. pacifica* Kofoid and Campbell in lacking of windows at the base of the collar.

#### *Codonellopsis ostenfeldi* (Schmidt) Kofoid & Campbell

Fig. 12

*Codonella ostenfeldi* Schmidt, 1901, p. 187, fig. 4; Brandt, 1906, pp. 15, 17, pl. 14, figs. 1, 2, pl. 15, fig. 2, pl. 20, fig. 10; Okamura, 1907, p. 137, pl. 6, figs. 53a, b.

*Codonella fenestrata* Cleve, 1901, p. 53, pl. 7, fig. 15.

*Codonella morchella* var. *ostenfeldi* Cleve, 1903, p. 350.

*Tintinnopsis ostenfeldi*, Brandt, 1907, pp. 123, 125.

*Codonellopsis ostenfeldi* Kofoid and Campbell, 1929, p. 84, fig. 160; Wang and Nie, 1932, p. 348, fig. 57; Hand, 1938, p. 111, fig. 27.

Lorica consisting of a cylindrical collar and an ellipsoidal bowl, 2.9-4.7 oral diameters in length, oral rim entire, slightly flaring; collar thin, hyline, 0.4-0.51 of the total length in length, with 2-5 spiral turns at the oral end and 5-10 rows of elliptical or round fenestrae throughout its remained portion; bowl ellipsoidal, usually longer than the wide, shoulder gently emergent, aboral end hemispherical; wall exceedingly thick, agglomerated particles often coarse.

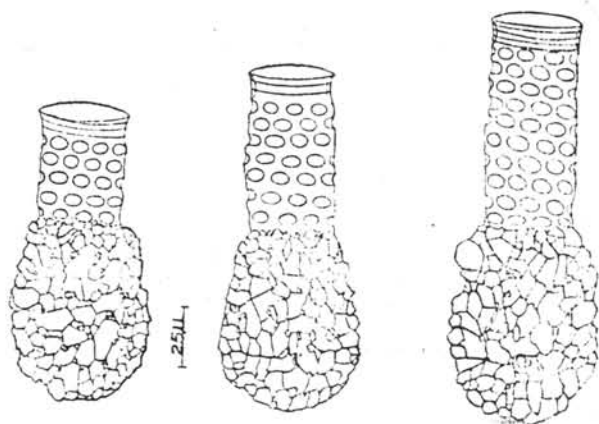


Fig. 12. *Codonellopsis ostenfeldi* (Schmidt) Kofoid & Campbell.

Length: 105-167.5 $\mu$

Oral diameter: 36-37.5 $\mu$

Length of the bowl: 62.5-82.5 $\mu$

Greatest transdiameter of the bowl: 57-61 $\mu$

Occurrence: San-yah, common.

Distribution: Kurosiwo; Gulf of Siam; Malay Archipelago; Arabia and Red Seas; Zanzibar; Palao Islands; Borneo and Sumatra; Java Sea; Strait of Sunda and Amoy.

Comparison: The species differs from other species of *Codonellopsis* in having 5-10 rows of fenestrations on the collar.

Variation: The size of the lorica varies very greatly from 105-167.5 $\mu$ , especially in the collar region. The collar of the longest individual has a length of 2 times the shortest one. The oral diameter and the greatest transdiameter of the bowl are, however, very constant.

### *Codonellopsis morchella* (Cleve) Jörgensen

Fig. 13

*Codonella morchella* Cleve, 1900, p. 969, fig. (2); Okamura, 1907, p. 173, pl. 6, figs. 54a, b.

*Codonellopsis morchella*, Jörgensen, 1924, p. 100, fig. 111; Kofoid & Campbell, 1929, p. 83, fig. 165; Hada, 1938, p. 107, fig. 22.

*Codonellopsis indica* Kofoid and Campbell, 1929, p. 80, fig. 158; Marshall, 1934, p. 639, fig. 12.

*Codonella morchella* var. *erythraensis* Brandt, 1906, p. 15, pl. 14, fig. 4.

*Codonellopsis erythraensis* Kofoid and Campbell, 1929, p. 79, fig. 151.

*Codonellopsis orientalis* Hada, 1932, p. 563, fig. 15.

Lorica tall top-shaped, 2.5-2.6 oral diameters in length; collar with a flaring rim, slightly bulging near the middle, usually lower than the bowl, its height 0.34-0.37 of the total length, composed of 9-10 spiral turns, increasing in width towards the bowl with one or two elliptical fenestrae; bowl generally ovate, longer than broad; aboral region convex conical; aboral end round or bluntly pointed; wall of the bowl rather thick, agglomerated with coarse particles.

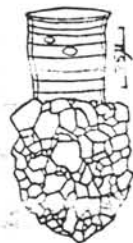


Fig. 13. *Codonellopsis morchella* (Cleve) Jörgensen.

Length: 83-95 $\mu$

Oral diameter: 33-35 $\mu$

Occurrence: San-yah, very rare.

Distribution: Occurs in heritic plankton of tropical and temperate regions of the world.

Comparison: The species differs from *C. Schabi* (Brandt) in having a shorter bowl and from *C. americana* in its lower collar.

#### *Codonellopsis hainanensis* sp. nov.

Fig. 14

Lorica somewhat like a common electric lamp, 2.5 oral diameters in length; oral margin slightly flaring; collar low,

bulging below the middle, 0.26 of the total length in length, composed of 6 spiral turns, fenestrae absent; bowl longer than wide, 0.74 of the total length in length, nearly cylindrical at anterior one third, globular in the posterior two third, its great transdiameter 1.7 oral diameters; wall of the bowl agglomerated with rather coarse foreign particles.

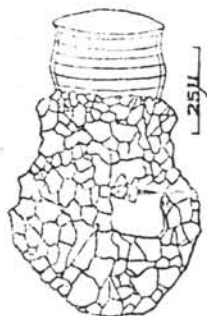


Fig. 14. *Codonellopsis hainanensis* sp. nov.

Length:  $85\mu$   
 Oral diameter:  $34\mu$   
 Length of collar:  $22\mu$   
 Greatest transdiameter:  $57\mu$

Occurrence: San-yah, very rare.

Comparison: The species differs from *C. morchella* (Cleve) in having a lower collar and in the shape of the bowl.

#### *Coxiella annulata* (Daday) Brandt

*Cyttarocyclus annulata* Daday, 1887, p. 582-583, pl. 21, fig. 6.

*Coxiella annulata*, Brandt, 1907, p. 42, 184, 187; Luackmann, 1913, p. 8, 32, 44, pl. 5, figs. 62-63; Jörgensen, 1924, pp. 73, 75, fig. 34; Nie, 1934, p. 77, fig. 13.

This species is commonly found in the samples collected from Shin-tsuen while comparatively rare from Ching-lan. It varies from  $130$  to  $220\mu$  in length and from  $75$ - $100\mu$  in oral diameter. The variation of size and shape of the lorica is much greater than those reported by Nie ('34) from Amoy.



*Helicostomella longa* (Brandt) Kofoid & Campbell

Fig. 15

*Tintinnus mediterraneus* var. *longa* Brandt, 1906, p. 31, pl. 65, figs. 6-8; Okamura, 1907, p. 140, pl. 6, fig. 66.

*Tintinnus patagonicus* Brandt, 1907, p. 401.

*Helicostomella longa* Kofoid and Campbell, 1929, p. 106, fig. 296; Hada, 1938, p. 115, fig. 32.

Lorica bullet-shaped, 3.5-4.0 oral diameters in length; oral rim entire, smooth; 7 (4-9) suboral turns, very fine, subequal in width, not everted orally; bowl expanding slightly, widest 0.8-1.0 oral diameter below the middle; aboral region conical ( $40^{\circ}$ - $42^{\circ}$ ); aboral end sharply pointed; wall thin and hyaline.



Fig. 15. *Helicostomella longa* (Brandt) Kofoid & Campbell.

Length 67 (65-70) $\mu$   
Oral diameter 17.5 (17-18) $\mu$

Occurrence: San-yah, very rare.

Distribution: Off the coast of Patagonia; Kurosiwo off Tosa; Palao Island and Yap.

Comparison: The species differs from other species of the genus in smaller size and smoother oral rim.

*Favella ehrenbergi* (Claparède & Lachmann) Jörgensen

Fig. 16

*Tintinnus Ehrenbergii* Claparède and Lachmann, 1858, p. 203, pl. 8, figs. 6, 7; Kent, 1882, p. 607, pl. 31, fig. 1.

*Cyttarocytilis ehrenbergi*, Brandt, 1906, p. 24, pl. 41, figs. 2-4.

*Favella ehrenbergi* forma *claparèdei*, Jörgensen, 1924, pp. 28-31, 66, fig. 32b.

*Favella ehrenbergi*, Jörgensen, 1924, pp. 8, 25, 26, 28, 30, 31, 74, 75, 107; Kofoid and Campbell, 1929, p. 152, fig. 280; Hada, 1937, p. 186, fig. 32.

Lorica campanulate, 2.54-2.94 oral diameters in length; oral rim slightly wavy; annular ring ~~absent~~; bowl cylindrical in its upper 0.55-0.63; aboral region conical ( $70^{\circ}$ - $80^{\circ}$ ); aboral horn 0.22-0.27 of the total length, provided with oblique fins, its tip blunt; wall comparatively coarse reticulated.

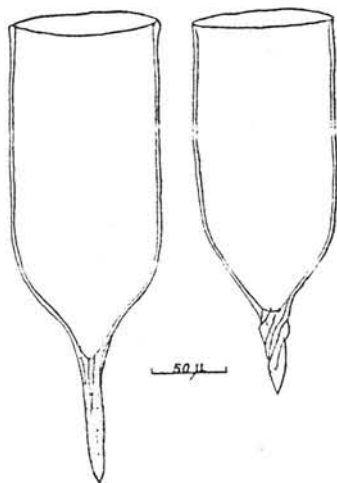


Fig. 16. *Favella ehrenbergi* (Claparede & Lachmann) Jörgensen.

Length: 239-294 $\mu$

Oral diameter: 94-100 $\mu$

Occurrence: Ching-lan and Shin-tsuen, not very common.

Distribution: Cosmopolitically distributed in neritic waters.

Comparison: The species differs from *F. franciscana* in lacking of an oral ring.

*Favella campanula* (Schmidt) Kofoid & Campbell

Fig. 17

*Undella campanula* Schmidt, 1901, p. 190, fig. 6.

*Favella azorica* var. *campanula*, Jörgensen, 1924, pp. 6-8, 24-27, 38, 72, 105, fig. 30.

*Favella campanula*, Kofoid & Campbell, 1929, p. 151, fig. 281; Hada, 1938, p. 121, fig. 38.

*Lorica Campanula*, 1.7-2.5 oral diameters in length; oral rim entire, sometimes slightly wavy, with usually one annular ring; bowl cylindrical in its upper 0.55-0.65; aboral region convex conical ( $65^{\circ}$ - $90^{\circ}$ ); aboral horn 0.17-0.25 oral diameter in length, having a few vertical striae on the surface, tapering to a bluntly pointed tip; wall almost layline with a hardly visible reticulation.

Length: 120-200 $\mu$

Oral diameter: 70-80 $\mu$ .

Occurrence: Shin-tsuen and Ching-lan, very abundant; San-yah, common.

Comparison: The species differs from *F. cylindrica* Wang in shorter but stouter proportion of the lorica and absence of longitudinal and irregular furrowings.

Remarks: The species is remarkably varying in shape, size, and caudal elongation, while the oral diameter is very constant.

*Favella franciscana* Kofoid & Campbell

Fig. 18

*Favella Serrata*, Campbell, 1927, pp. 429-452, pls. 21-22, text-figures A, 1, 3-5, 7, 8, B, C.

*Favella franciscana* Kofoid & Campbell, 1929, p. 154, fig. 285.

*Favella Panamensis* Kofoid & Campbell, 1929, p. 156, fig. 279; Wang Nie, 1932, p. 350, fig. 59.

*Favella Campanula* var. *palaoensis* Hada, 1938, p. 122, fig. 39.

Lorica elongate-campanulate or rather cylindrical chalice shaped, 2.7-3.5 oral diameters in length; oral rim minutely and irregularly serrated or sometimes wavy, with 1, rarely 2-4 rings; distinctly lipped below the rings; bowl cylindrical for 0.51-0.74 its length; aboral region tapering or convex conical; aboral horn 0.32-0.94 oral diameter in length, with or without oblique or vertical ridges, tip pointed.

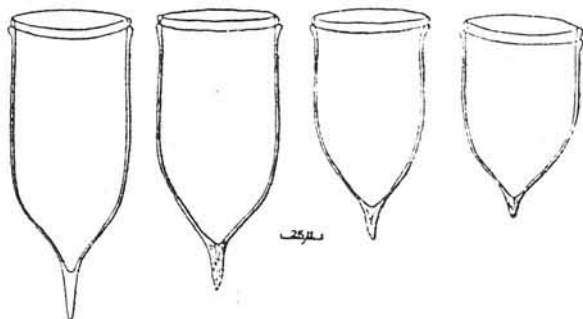


Fig. 17. *Favella campanula* (Schmidt) Kofoid & Campbell.

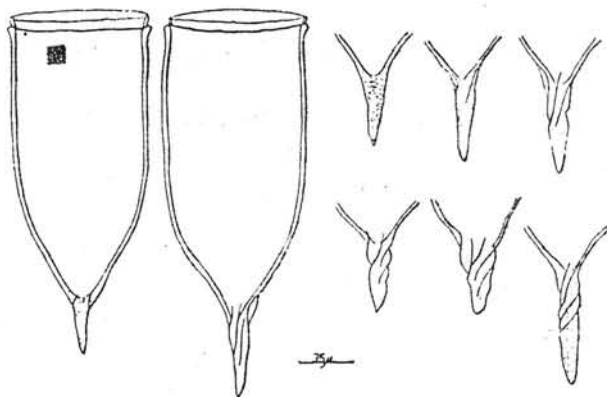


Fig. 18. *Favella franciscana* Kofoid & Campbell.

Length: 230-300 $\mu$

Oral diameter 90-100 $\mu$

Occurrence: Shin-tsuen and Ching-lan, very abundant;  
San-yah, common.

Distribution: San Francisco Bay; Pacific Coast from Vancouver; Panama; Mexican; Peruvian currents in the Pacific; North Sea off Holland; Amoy and Palao Island.

Comparison: The species differs from *F. serrata* (Möbius), in its less prominent denticulation and more cylindrical bowl.

*Favella hainanensis* sp. nov.

Fig. 19

Lorica very slender, cylindrical chalice-shaped, 3.1-3.5 oral diameters in length excluding the aboral horn; oral rim entire, with 4-8 annular rings, slightly lipped below the rings; bowl without nuchal constriction, cylindrical in the anterior 0.60-0.72 of the total length; aboral region contracting gradually to a cone of 64°-85°; aboral horn slender, straight, 0.34-0.45 oral diameter in length, tip pointed.

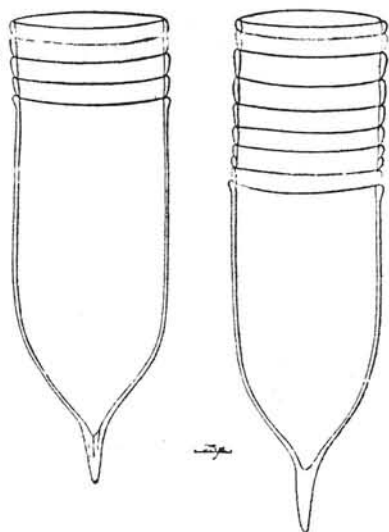


Fig. 19. *Favella hainanensis* sp. nov.

Length: 285-315 $\mu$   
Oral diameter: 90-97 $\mu$

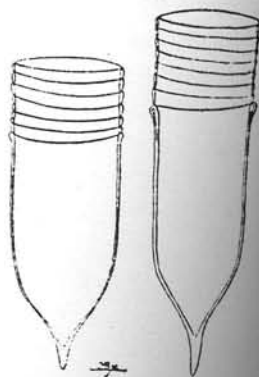


Fig. 20. *Favella hainanensis* var. *pava* var. nov.

Occurrence: Shin-tsuen and Ching-lan, Common.

Comparison: The species differs from *F. undulata* Wang & Nie in larger size, and from *F. franciscana* Kofoid and Campbell in having more annular rings.

*Favella hainanensis* var. *parva* var. nov.

Fig. 20

Lorica chalice-shaped, 2.2-2.7 oral diameters in length excluding the aboral horn; oral margin entire, followed by four to eight annular rings; bowl cylindrical in the anterior 0.60 (or more) of the total length; aboral region contracting gradually to a cone of 65°-70°; aboral horn short, 0.21-0.24 oral diameter in length, tip pointed.

Length: 170-222 $\mu$

Oral diameter: 70-75 $\mu$

Occurrence: Shin-tsuen and Ching-lan; Common.

Comparison: The variety differs from the typical form of *F. hainanensis* in smaller size and short aboral horn.

*Favella azorica* (Cleve) Jörgensen

Fig. 21

*Undella azorica*, Cleve 1900, p. 974, fig. (10).

*Favella azorica*, Jörgensen, 1924, pp. 6-8, 24-27, 37, 72, 105, fig. 28; Kofoid and Sampbell, 1929, p. 151, fig. 284; Non Hadu, 1933, p. 120, fig. 37.

Lorica simple, short goblet-shaped, 1.6 oral diameters in length; oral rim entire, without rings; bowl cylindrical in anterior two third, concave conical (80°) aborally tip pointed wall hyaline.



Fig. 21. *Favella azorica* (Cleve)  
Jörgensen.

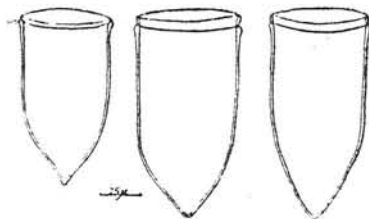


Fig. 22. *Favella shintsuensis*  
sp. nov.

Length:  $100\mu$   
Oral diameter:  $60\mu$

Occurrence: Bay of Shin-tsuen, very rare.

Distribution: Off the azores.

Comparison: The species differs from *F. composita* Jörgensen in more slender in porportion and lacking of a series of narrow rings.

*Favella shintsuenensis* sp. nov.

Fig. 22

*Favella azorica*, Hada, 1938, p. 120, fig. 37; Non Jörgensen, 1924, pp. 6-8, 24-27, 37, 72, 105, fig. 28.

Lorica inverted bell-shaped, 1.64-2.08 oral diameters in length: oral margin entire, with single annular ring; bowl cylindrical in the anterior half to two third of the lorica, posteriorly convex conical ( $60^{\circ}$ - $80^{\circ}$ ), tip bluntly pointed; aboral horn absent; wall hyaline.

Length: 195-125,  
Oral diameter:  $57-70\mu$

Occurrence: The Bay of Shin-tsuen, frequent; San-yah, rare.

Distribution: Palo Islands, Saipan, Tinian.

Comparison: The species differs from *F. azorica* in having an annular oral ring and convex conical instead of concave conical of the posterior end of the bowl.

*Epiplocylis constricta* Kofoid & Campbell

Fig. 23

*Ptychocylis undella* var. e Brandt, 1906, p. 29, pl. 59, fig. 2; 1907, p. 259.

*Epiplocylis constricta* Kofoid and Campbell, 1929, p. 177, fig. 333, Marshall, 1934, p. 643.

*Epiplocylis pacifica* Kofoid and Campbell, 1929, p. 184, fig. 335.

*Epiplocylis undella* var. *constricta* Hada, 1938, p. 124, fig. 41.

Lorica stout goblet-shaped, 1.78 oral diameters in length; bowl rotund, contracting orally, 1.32 oral diameters in length; fundus convex ( $83^\circ$ ); reticulated zone 0.45 oral diameter wide, free lines deflected, usually turned to right; aboral horn tapering to a pointed tip, 0.40 oral diameter in length; wall thickest at suboral region, thinning gradually posteriorly.

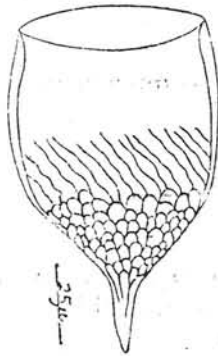


Fig. 23. *Epiplocypris constricta* Kofoid & Campbell.

Length:  $107\mu$

Oral diameter:  $55\mu$

Occurrence: San-yah, very rare.

Distribution: New Pomerania, warm waters of the East Pacific; Great Barrier Reef; Palao Island and Tinian.

Comparison: The species differs from *Epiplocypris undella* (Ostenfeld & Schmidt) in having a rotund bowl, contracting oral margin and deflected free lines of reticulation.

#### *Epiplocypris undella* var. *blanda* Jörgensen

Fig. 24

*Ptychocypris undella* var. b. Brandt, 1906, pl. 61, fig. 3; 1907, p. 294.

*Ptychocypris undella* var. m Brandt, 1906, pl. 59, fig. 5, pl. 61, fig. 8; 1907, p. 298.

*Ptychocypris undella* var. o Brandt, 1906, pl. 60, fig. 3; 1907, p. 299.

*Epiplocypris undella* var. *blanda* Jörgensen, 1924, p. 55, fig. 62; Hada, 1938, p. 125, fig. 42.



*Epiplocylis blanda* Kofoid and Campbell, 1929, p. 176, fig. 341, Marshall, 1934, p. 644, text-fig. 19.

*Epiplocylis mucronata* Kofoid and Campbell, 1929, p. 183, fig. 346.

*Epiplocylis obtusa* Kofoid and Campbell, 1929, p. 183, fig. 339.

Lorica tall chalice-shaped, 1.90-2.08 oral diameters in length; oral rim entire; bowl nearly cylindrical in anterior 0.6, conical (72°-90°) aborally; aboral horn conical (20°-25°), 0.35 oral-diameter in length; free zone about 0.3-0.5 total length in length; free line short, subvertical; reticulated zone subregular.

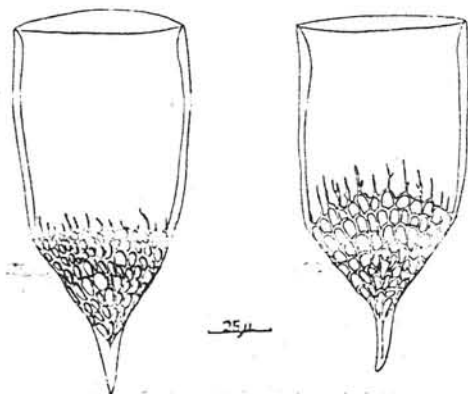


Fig. 24. *Epiplocylis undella* var. *blanda* Jörgensen.

Length: 135-150 $\mu$

Oral diameter: 67-71 $\mu$

Occurrence: San-yah, common.

Distribution: Mediterranean; Sargasso Sea; North Equatorial Stream of the Atlantic; New Pomerania; Great Barrier Reef and Tinian.

Comparison: The variety differs from the typical form of *E. undella* (Ostenfeld & Schmidt) in having a longer but narrower cylindrical bowl.

*Epiplocylis calyx* var. *labiosa* (Kofoid & Campbell) Hada

Fig. 25

*Ptychocylis calyx* var. *b.* Brandt, 1906, p. 29, pl. 58, figs. 13, 13a; 1907, p. 292.

*Epiplocytilis labiosa* Kofoid and Campbell, 1929, p. 182, fig. 338.

*Epiplocytilis calyx* var. *labiosa* Hada, 1938, p. 127, fig. 44.

Lorica stout, goblet-shaped, 1.7-1.8 oral diameters in length, suboral region abruptly thickened; bowl convex conical; aboral horn 0.39-0.44 oral diameter in length; reticulated zone sub-regular, absent on upper 0.22-0.26 of the bowl.

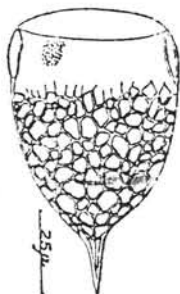


Fig. 25. *Epiplocytilis calyx* var. *labiosa* (Kofoid & Campbell) Hada.

Length: 78-82 $\mu$

Oral diameter: 45-48 $\mu$

Occurrence: San-yah, not very rare.

Distribution: South Equatorial Stream of the Atlantic; Guinea Stream and Tinian.

Comparison: The variety differs from the typical form of *E. calyx* (Brandt) in its less conical of the bowl.

#### *Epiplocyloides reticulata* (Ostenfeld and Schmidt) Hada

Fig. 26

*Cyttarocytilis reticulata* Ostenfeld and Schmidt, 1901, p. 180, fig. 23.

*Ptychocytilis reticulata* Brandt, 1906, p. 28, pl. 58, figs. 1, 4; 1907, p. 287; Laackmann, 1909, p. 457.

*Epiplocytilis reticulata* Jørgensen, 1924, p. 54; Kofoid and Campbell, 1929, p. 184, fig. 325.

*Epiplocytilis healdi* Kofoid and Campbell, 1929, p. 180, fig. 321.

*Epiplocytilis brandt* Kofoid and Campbell, 1929, p. 177, fig. 324.

*Epiplocyloides reticulata* Hada, 1938, p. 130, fig. 47.

Lorica campaniform, 1.44-1.50 oral diameters in length; outer oral margin flaring ( $63^{\circ}$ - $80^{\circ}$ ), 1.1-1.2 inner oral diameters; bowl subcylindrical in anterior 0.62, then contracting abruptly into an aboral horn of 0.14 oral diameter in length; wall uniformly reticulated on the lower half, with subvertical anastomosing lines on the remained part.

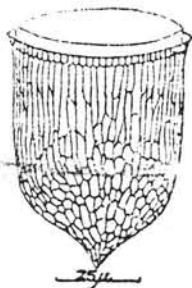


Fig. 26. *Epiplochyloides reticulata*  
(Ostenfeld & Schmidt) Hada.

Length: 70-72 $\mu$   
Oral diameter: 46-50 $\mu$

Occurrence: San-yah, rare.

Distribution: Red Sea; widely distributed in oceanic and coastal waters of the Pacific and Atlantic.

Comparison: The species differs from *E. valumensis* (Brandt) in the presence of linear striae on the surface of the upper part of the lorica.

*Metacylis oviformis* sp. nov.

Fig. 27

Lorica inverted bullet-shaped, 1.73 oral diameters in length; collar 0.11 total length, tapering to a slight nuchal constriction, with 3 annuli; bowl widest a little above the middle, convex conical ( $40^{\circ}$ ) aborally, aboral end rounded.

Length: 57 $\mu$   
Oral diameter 33 $\mu$



Fig. 27. *Metacylis oviformis*  
sp. nov.

Occurrence: San-yah, very rare.

Comparison: The new species differs from *M. conica* Kofoid & Campbell in larger size, lower collar and less conical of the bowl.

*Metacylis jørgensenii* (Cleve) Kofoid & Campbell

Fig. 28

*Codonella Jørgensenii* Cleve, 1902, p. 22, fig. 1.

*Tintinnus urceolatus*, Brandt, 1906, p. 30, pl. 62, fig. 3.

*Amphorella Jørgenseni* Faure-Fremiet, 1908, pp. 212, 235, 236, fig. 22, in explanation of figure as *A. Jørgensi*.

*Tintinnus Jørgensenii*, Ostenfeld, 1916, pp. 133-134, 176-177.

*Metacylis jørgensenii*, Kofoid & Campbell, 1929, p. 199, fig. 380.

Lorica chalice-shaped, 1.21-1.25 oral diameters in length; collar 0.13 total length, slightly flaring, with 2-3 spiral turns; bowl with a narrow sloping shoulder, widest at the shoulder region; aboral end pointed; wall hyaline, more thick in the collar region.

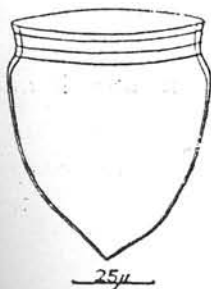


Fig. 28. *Metacylis jørgensenii* (Cleve) Kofoid & Campbell.



Fig. 29. *Metacylis sanyahensis* sp. nov.

Length: 68-70 $\mu$

Oral diameter: 56-58 $\mu$

Occurrence: San-yah, rare.

Distribution: North Sea; Mediterranean Sea.

Comparison: The species differs from *M. mereschkowskii*.

Kofoid and Campbell in taller and more flaring collar and pointed instead of rounded aboral end.

*Metacylis sanyahensis* sp. nov.

Fig. 29

*Metacylis corbula*, Hada, 1938, p. 135, fig. 52.

Non *Metacylis corbula* Kofoid & Campbell, 1929, p. 199, fig. 376.

*Metacylis corbula* var. *perspicax* Hada, 1938, p. 136, fig. 53.

Lorica subspherical, more or less becoming conical, 0.95-1.10 oral diameters in length; collar variable in height from 0.12-0.34 of the total length, conical ( $30^\circ$ ), with 2-5 annuli, differentiated from the bowl by a visible constriction; bowl broadest just below the nuchal constriction, its greatest transdiameter 1.09-1.22 of the total length; aboral end rounded or broadly convex conical with a minute point; wall hyaline.

Length: 38-42.5 $\mu$

Oral diameter: 38-40 $\mu$

Occurrence: San-yah, common.

Distribution: Lagoons of the Palao Islands.

Comparison: The new species differs from *Metacylis corbula* Kofoid & Campbell in smaller size and more globose in contour and from *M. mereschkowskii* Kofoid & Campbell in smaller size, taller collar and more broad bowl.

*Marshallia* gen. nov.

Lorica goblet-shaped, with single, abruptly flaring collar; oral trough not present; bowl cup-shaped; aboral end open; wall single-layered, hyaline.

Type species: *Marshallia aperta* (Marshall).

This new genus differs from *Graterella* Kofoid & Campbell in single collar and open aboral end. The species of this genus is allied to those of *Petalotricha* in general outline and the form of oral brim; it may, however, be easily discriminated from the latter on account of the absence of nuchal constriction, in-

ternal nuchal ledge and suboral and subnuchal fenestrae. It belongs to the subfamily Petalotrichineae, and the family Petalotrichidae.

### Marshallia aperta (Marshall)

Fig. 30

*Craterella aperta* Marshall, 1934, p. 645, fig. 21; Hada, 1933, p. 133, fig. 50.

Lorica goblet-shaped, 1.34 oral diameters in length; oral rim abruptly flaring to make a wide expansion, its diameter 1.16 oral diameters; bowl cylindrical in the anterior half, convex conical in the aboral region; aboral end truncated, its diameter 0.17 oral diameter; wall hyaline.

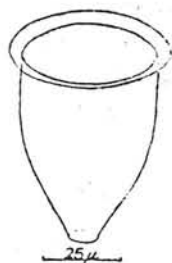


Fig. 30. *Marshallia aperta* (Marshall)

Length:  $55\mu$

Oral diameter:  $41\mu$

Occurrence: San-yah, very rare.

Distribution: Great Barrier Reef; Palao Island and Tinnan.

### *Proterhabdonella simplex* (Cleve) Jörgensen

Fig. 31

*Cyttarocylis simplex* Cleve, 1900, pp. 972-973, fig. (7).

*Rhabdonella amor* var. *simplex*, partim, Brandt, 1907, pp. 43, 315-331, 453; Laackmann, 1909, pp. 461-465, pl. 48, fig. 13, pl. 49, fig. 15.

*Proterhabdonella simplex* Jörgensen, 1924, p. 67, fig. 64; Kofoid & Campbell, 1929, p. 208, fig. 395; Hada, 1938, p. 138, fig. 55.

Lorica consisting of a short annulated collar and a fusiform bowl, 1.7-1.8 oral diameters in length; oral margin simple, entire; collar very low, slightly contracting, with 2 to 3 equal annular rings; bowl widest at 0.41 of total length below the oral rim, then contracting aborally in a cone of  $54^\circ$ ; wall hyaline, provided with 10 subvertical ribs and never branching.



Fig. 31. *Protorhabdonella simplice*  
(Cleve) Jörgensen.



Fig. 32. *Protorhabdonella curta*  
(Cleve) Jörgensen.

Length: 57-60 $\mu$

Oral diameter: 34 $\mu$

Occurrence: San-yah, rare.

Distribution: This species is widely distributed in warm waters of the world.

Comparison: The species differs from *P. ventricosa* (Schmidt) in the form of the bowl and from *P. curta* (Cleve) in having an annular collar and few striae.

#### *Protorhabdonella curta* (Cleve) Jörgensen

Fig. 32

*Cyttarecylis striata* forma B *curta* Cleve, 1901, p. 922, fig. (3b); Okamura, 1912, pp. 21, 35, pl. 5, fig. 100.

*Rhabdonella amor* var. *curta*, Brandt, 1907, pp. 315, 316, 328.

*Protorhabdonella curta*, Jörgensen, 1924, pp. 57, 58, fig. 65; Kofoid and Campbell, 1929, p. 207, fig. 393; Hada, 1937, p. 207, fig. 50; 1933, p. 139, fig. 56.

Lorica bullet-head-shaped, 1.67-1.76 oral diameters in length; oral rim entire, simple, slightly flaring; bowl widest at the middle, then contracting aborally in a cone of  $55^\circ$ ; aboral end pointed; surface ornamented with 28-32 ribs running slightly spirally through out the entire length of the lorica and sometimes branching.

Length: 42-46 $\mu$

Oral diameter: 25-28 $\mu$

Occurrence: Shin-tsuen, rare.

Distribution: South Atlantic; Indian Ocean; the Red and Mediterranean Seas; The Japanese Current, the Great Barrier Reef and Palao Islands.

Comparison: The species differs from *P. simplex* (Cleve) in its more simple oral rim and more numerous ribs of the bowl.

### *Rhabdonella conica* Kofoid & Campbell

Fig. 33

*Ptychocylis* (*Rhabdonella*) *spiralis*, Brandt, 1906, p. 27, pl. 52, figs. 4, 7-9, 9a.

*Rhabdonella spiralis* var. *elongata* Jørgensen, 1921, pp. 36, 60, 61-68, fig. 69.

*Rhabdonella spiralis* (var. *elongata*?) Jørgensen, 1924, p. 59, fig. 70d.

*Rhabdonella conica* Kofoid and Campbell, 1929, p. 214, fig. 418.

*Rhabdonella spiralis*, *partim*, Hasle, 1933, p. 440, fig. 58b.

Lorica very tall chalice-shaped, 5.7 oral diameters in length; outer oral rim flaring abruptly, gutter between the inner and outer oral rim conspicuous; bowl about 0.5 total length in length, slightly contracting at the middle, somewhat bulging out again at posterior portion, then contracting in a cone of 35°; pedicel very long, subcylindrical, tapering and deflecting distally; tip obscurely opened; ribs 26-30, with sinistral deflection; fenestrae distinct, widely distributed between ribs.

Length: 340-400 $\mu$

Outer oral diameter: 60-65 $\mu$

Occurrence: Jiang-men district of Yashian, very rare.

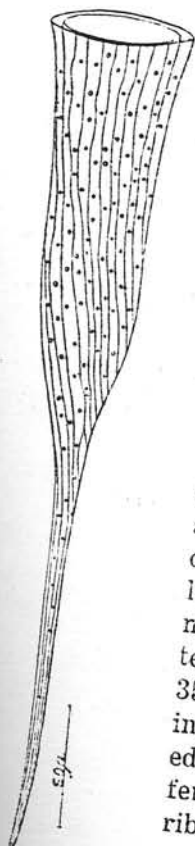


Fig. 33. *Rhabdonella conica* Kofoid & Campbell.



Distribution: This species has a wide distribution in warm waters.

Comparison: The species differs from *R. spiralis* in larger size and longer pedicel which is opened at the terminal end.

Remarks: Hada (1938) considered this species as a synonym of *R. spiralis*. However, he indicated that "from collections of the East Indies two distinguishable forms were observed; the short one is 264-320 $\mu$  long and has a pointed tip, usually appearing in neritic plankton, while the other elongate one is 432-460 $\mu$  long and provided with a long, slender pedicel perforated at the terminal, often occurring in open waters of the South China and Sulu Seas." It seems very reasonable that Kofoid and Campbell had raised it to the rank of species.

In the present study not a single specimen of *R. spiralis* was found both in neritic and pelagic planktons.

#### *Rhabdonella elegans* Jörgensen

Fig. 34

*Udella spiralis*, partim, Daday, 1887, pp. 565-566.

*Rhabdonella elegans* Jörgensen, 1924, p. 59, fig. 67; Kofoid & Campbell, 1929, p. 215, fig. 401; Hada, 1938, p. 142, fig. 59.

*Rhabdonella brandt* Kofoid and Campbell, p. 213, fig. 400, Marshall, 1934, p. 649, fig. 24.

*Rhabdonella inflata* Kofoid and Campbell, 1929, p. 217, fig. 403.

*Rhabdonella Quantula* Kofoid and Campbell, 1929, p. 218, fig.

*Rhabdonella valdestriata* Kofoid and Campbell, 1929, p. 220, fig. 410.

Lorica chalice-shaped, 3.1-3.4 outer oral diameters in length; outer oral rim flaring; bowl slightly conical (7°-15°) in its anterior part, then abruptly narrowing (50°-52°) in the aboral region; pedicel often gradually tapering to a pointed tip, sometimes with a minute or obscure opening; fenestrae distinct, 6-12 between ribs; ribs 20-30, subvertical, sometimes branching.

Length: 146-210 $\mu$

Outer oral diameter: 45-65 $\mu$

Occurrence: San-yah, common.

Distribution: Known from warm waters of the world.

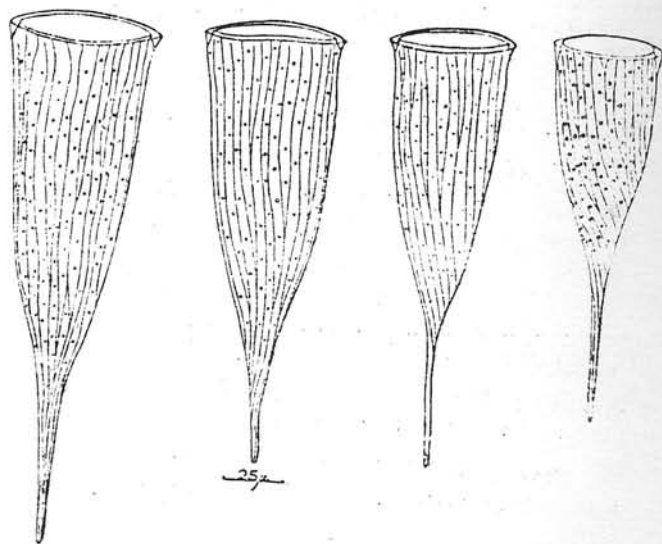


Fig. 34. *Rhabdonella elegans* Jörgensen.

Comparison: The species differs from *R. cornucopia* Kofoid and Campbell in larger size of the lorica.

Remarks: This species is exceedingly variable in size, form, number of the ribs and the shapes of the aboral region and pedicel.

*Rhabdonella sanyahensis* sp. nov. ✓

Fig. 35

Lorica inverted conical 2.7-3.1 outer oral diameters in length; inner oral rim low, 0.9 outer oral diameter in diameter; outer oral rim flaring; bowl convex conical, increasing from  $18^{\circ}$ - $23^{\circ}$  in the upper region to  $32^{\circ}$ - $35^{\circ}$  in the lower; pedicel feebly differentiated, about 0.5 oral diameter in length, ribs about 14-18, very distinct and slightly sinistral; wall hyaline; no fenestrae; alveoli visible.

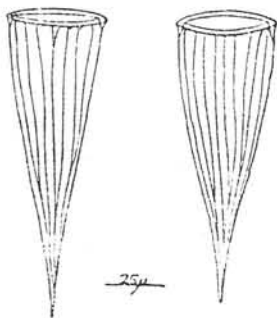


Fig. 35. *Rhabdonella sanyahensis*  
sp. nov.

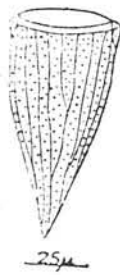


Fig. 36. *Rhabdonella amor* (Cleve)  
Brandt.

Length: 104-125 $\mu$   
Outer oral diameter: 38-42 $\mu$

Occurrence: San-yah, common.

Comparison: The species differs from *R. exillis* Kofoid and Campbell in larger size, less numerous ribs, and slender proportion, and from *R. cornucopia* Kofoid and Campbell in the absence of a knob-like process on the pedicel.

#### *Rhabdonella amor* (Cleve) Brandt

Fig. 36

*Cyttarocylis amor* Cleve, 1900, pp. 970-971, fig. [4].

*Ptychocylis (Rhabdonella) amor*, Brandt, 1906, p. 27, pl. 54, figs. 4-6, 12-15; 1907, p. 327.

*Rhabdonella amor* var. *simplex*, partim, Brandt, 1907, p. 331.

*Rhabdonella amor*, Entz, Jr., 1908, pp. 133, 215, pl. 9, fig. 15, pl. 12, fig. 2; Jørgensen, 1924, p. 58, fig. 66; Kofoid & Campbell, 1929, p. 212, fig. 398; Hada, 1938, p. 144, fig. 61.

Lorica short, convex conical, 1.8-1.9 outer oral diameters in length; inner oral rim higher than the outer, 0.8 outer oral diameter in diameter, its gutter deep; bowl gradually narrowing to the acute aboral end; aboral region forming an inverted cone of 35°-40°; without pedicel; wall bearing about 20 vertical ribs which are sometimes branched; fenestrae numerous.

Length: 79-91 $\mu$   
Outer oral diameter: 44-47.5 $\mu$

Occurrence: San-yah, frequent.

Distribution: Atlantic Ocean; Indian Ocean; Mediterranean Sea and Western Tropical Pacific.

Comparison: The species differs from *R. indica* Laackmann in larger size, less numerous but more distinct ribs, and in the presence of fenestrae.

*Proplectella globosa* (Brandt) Kofoid & Campbell

Fig. 37

*Undella claparedei* var. *e globosa* Brandt, 1906, pp. 30, 31, pl. 54, figs. 4, 10, 33, 34.

*Undella claparedei* var. *globosa*, Entz, Jr., 1908, p. 106.

*Undella claparedei* forma *fastigata*, partim, Jörgensen, 1924, p. 38.

*Proplectella globosa* Kofoid & Campbell, 1929, p. 278, fig. 541.

*Proplectella tenuis* Kofoid & Campbell, 1929, p. 283, fig. 536.

Lorica globose, 1.27-1.32 oral diameters in length, contracting orally; oral rim sharp, smooth; inner collar very distinct, its length 0.13-0.17 total length, its inner face straight, forming an inverted truncated cone of 20°-22°, its narrowest diameter 0.72 oral diameter; bowl expanding evenly below the collar, its greatest diameter (1.27-1.32 oral diameter) near the middle; aboral region hemispherical; aboral end rounded; wall thickest at throat, gradually thinning towards the aboral end.

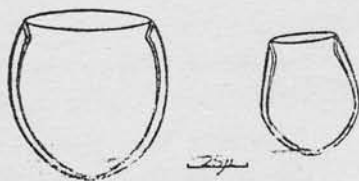


Fig. 37. *Proplectella globosa* (Brandt) Kofoid & Campbell.

Fig. 38. *Proplectella avata* (Jörgensen) Kofoid & Campbell.

Length: 62-65 $\mu$

Oral diameter: 47-51 $\mu$

Occurrence: San-yah, not very rare.

Distribution: Mediterranean Sea; Eastern Tropical Pacific; Sargasso Sea.

Comparison: The species differs from *P. claparedei* in its more globose bowl and from *P. fastigata* in its smaller size and less thick wall.

*Proplectella ovata* (Jørgensen) Kofoid & Campbell

Fig. 38

*Undella claparedei* var. g Brandt, 1906, p. 31, pl. 64, figs. 12, 35.

*Undella claparedei* forma *ovata* Jørgensen, 1924, pp. 38-39, fig. 42c.

*Proplectella ovata* Kofoid & Campbell, 1929, p. 280, fig. 529.

Lorica baggy, subangular, 1.70 oral diameters in length; oral margin sharp; inner collar distinct, its length 0.15-0.16 total length, its narrowest diameter 0.90 oral diameter; bowl expending from oral margin as a truncate cone of 35° with straight sides, basal diameter of 1.5 oral diameters at 0.62 total length from oral margin; aboral region hemispherical; no aboral projection.

Length: 46-48 $\mu$

Oral diameter: 27-28 $\mu$

Occurrence: Shih-tsuen, very rare.

Distribution: "Thor" off Barka, North Africa, in the Mediterranean.

Comparison: The species differs from *P. globosa* (Brandt) and *P. Perpusilla* Kofoid & Campbell in its more angular bowl.

Remarks: The specimens here reported are smaller than the type which is 63-70 $\mu$  in length.

*Amphorella brandti* (Jørgensen) Kofoid & Campbell

Fig. 39

*Tintinnus amphora*, Brandt, 1906, p. 33, pl. 69, fig. 6.

*Amphorella quadrilineata* var. *brandti* Jørgensen, 1924, p. 18.

*Amphorella brandti* Kofoid & Campbell, 1929, p. 309, fig. 588; Hada, 1938, p. 165, fig. 82.

Lorica 2.8-3.1 oral diameters in length; collar funnel-shaped, widely flaring ( $85^{\circ}$ - $90^{\circ}$ ), 0.2 oral diameter in height; bowl cylindrical in its anterior one third, becoming triangular aborally in cross section, owing to the development of three flat, blade fins which extend upward to the upper 0.3 of the total length of the lorica; narrowest (0.56-0.66) oral diameter below the collar; aboral end truncated, slightly concave inwardly; wall hyaline, separated in the upper part of the cylindrical portion and single-layered posteriorly.



Fig. 39. *Amphorella brandti* (Jørgensen) Kofoid & Campbell.

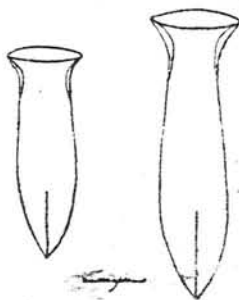


Fig. 40. *Amphorellopsis acuta* (Schmidt) Kofoid & Campbell.

Length: 115-120 $\mu$

Oral diameter: 37-41 $\mu$

Occurrence: San-yah, rare.

Distribution: North Equatorial Current of the Atlantic; Palao Islands; West coast of Borneo; Indian Ocean off the Strait of Sunda.

Comparison: The species differs from *A. Quadrilineata* (Claparede & Laackmann) in its widely flaring collar and longer bowl.

*Amphorellopsis acuta* (Schmidt) Kofoid & Campbell

Fig. 40

*Amphorella acuta* Schmidt, 1901, pp. 184, 185, figs. 2a-c; Jørgensen, 1924, p. 21.

*Tintinnus acutus*, Brandt, 1906, p. 33, pl. 70, figs. 6, 7.

*Amphorellopsis acuta* Kofoid & Campbell, 1929, p. 315, fig. 598; Nie, 1934, p. 78, fig. 14; Hada, 1938, p. 168, fig. 85.

Lorica fusiform, 2.4-2.9 oral diameters in length; oral rim entire, circular; collar funnel-shaped, widely flaring ( $80^\circ$ ), its length 0.09 of the total length; bowl cylindrical below the collar, becoming triangular posteriorly, aboral region contracting in a cone of  $50^\circ$ ; antapex acute.

Length: 85-115 $\mu$

Oral diameter: 35-40 $\mu$

Occurrence: Shin-tsuen, very common; San-yah, rare.

Distribution: Gulf of Siam; West coast of Africa; Palao Islands, Yap, Singapore, Batavia and Amoy.

Comparison: The species differs from *A. pentagona* Nie in its circular collar and from other species of the genus in having three ridges.

*Dadayiella ganymedes* (Entz) Kofoid & Campbell ✓

Fig. 41

*Tintinnus ganymedes* Entz, Sr. 1884, p. 409, pl. 24, figs. 17, 18.

*Amphorella ganymedes* Dalay, 1887, pp. 539, 540, pl. 18, fig. 18; Jørgensen, 1924, pp. 17, 22, 23, fig. 22a.

*Amphorella ganymedes* var. *a tenuicauda* form *obtusa* Jørgensen, 1924, fig. 22.

*Tintinnus ganymedes*, Brandt, 1906, p. 33, pl. 70, fig. 2.

*Dadayiella ganymedes*, Kofoid & Campbell, 1929, p. 321, fig. 610; Hada, 1938, p. 169, fig. 83.

Lorica elongated goblet-shaped, 3.25-3.33 oral diameters in length; collar slightly flaring, with 16 facets extending for 0.5 oral diameter below the oral rim, 8 of them being more-stouter and projected out from the oral rim to a length about half of the oral diameter; bowl inflated near the middle, 1.1 oral diameters in transdiameter; pedicel 0.20-0.25 total length in length, with or without a bulb; aboral tip pointed; wall hyaline.

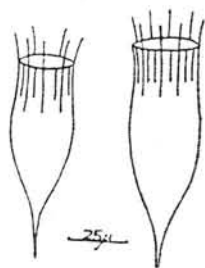


Fig. 41. *Dadayiella ganymedes*  
(Cleve) Kofoid & Campbell.



Fig. 42. *Tintinnus striatus* sp. nov.

Length: 80-100 $\mu$   
Oral diameter: 24-30 $\mu$

Occurrence: Shin-tsuen, common; San-yah, rare; Haikow, rare.

Distribution: This is one of the cosmopolitan species occurring widely in warm waters of the world.

Comparison: The species differs from *D. acuta* (Jørgensen) and *D. bulbosa* (Brandt) in having half of the oral facets projecting out from the oral rim.

#### *Tintinnus striatus* sp. nov.

Fig. 42

Lorica small, 3.6 oral diameters in length; oral funnel slightly flaring, without a brim; shaft tapering ( $10^\circ$ ), more or less concave; aboral end with a slight flare, 0.66 oral diameter in diameter; wall hyaline with fine longitudinal striations.

Length: 100-105 $\mu$   
Oral diameter: 27-29 $\mu$

Occurrence: San-yah, very rare.

Comparison: The species differs from all other species of *Tintinnus* in the presence of longitudinal striations on the wall of the lorica.



*Tintinnus lusus-undae* Entz, Sr.

Fig. 43

*Tintinnus lusus-undae* Entz, Sr., 1885, p. 202, pl. 14, fig. 12; Daday, *partim*, 1887, p. 527, pl. 18, fig. 3; Brandt, 1906, pl. 65, fig. 11; Jörgensen, 1924, p. 9, fig. 1; Kofoid & Campbell, 1929, p. 335, fig. 656; Hada, 1938, p. 173, fig. 88.

*Tintinnus fraknoi*, Okamura, *partim*, 1907, p. 140, pl. 6, fig. 67a.

*Tintinnus tenuis*, Nie, *partim*, 1934, p. 73, fig. 10.

Lorica stout, 3.7-4.6 oral diameters in length, consisting of an inverted and truncated cone of  $2^{\circ}$ - $4^{\circ}$ ; oral margin flaring with a brim; shaft nearly straight; aboral end without a flare, ~~0.63-0.71 oral diameter in diameter.~~



Fig. 43. *Tintinnus lusus-undae*  
Entz, Sr.

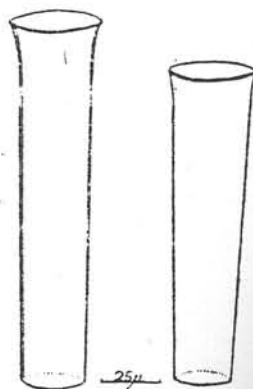


Fig. 44. *Tintinnus lusus-undae*  
var. *exigua* (Hada)

Length: 207-259 $\mu$   
Oral diameter: 52.5-56 $\mu$

Occurrence: San-yah, common; Shin-tsuen, very common.

Distribution: The species is widely distributed in warm waters of the world.

Comparison: the species differs from *T. fraknoi* Daday in the absence of an aboral flare and shorter but strouter lorica.

#### *Tintinnus lusus-undae* var. *exigua* (Hada)

Fig. 44

*Tintinnus exigua* Hada, 1932; Nie, 1934, p. 80, fig. 17.

Lorica of (*T.*) *lusus-undae* type except small in size, 3.7-4.5 oral diameters in length; oral margin flaring with an indistinct brim; sides nearly straight; aboral end 0.66-0.80 of the oral diameter in aboral diameter, without a flare.

Length: 127-178 $\mu$

Oral diameter: 37-39 $\mu$

Occurrence: San-yah, common; Shin-tuen, very common.

Distribution: Mutsu Bay and Amoy.

Comparison: The variety differs from the type in its smaller size and less distinct oral brim.

#### *Tintinnus fraknoi* Daday

Fig. 45

*Tintinnus fraknoi* Daday, 1887, p. 528, pl. 18, fig. 1; Brandt, 1906, p. 32, pl. 65, figs. 9, 13; Okamura, *partim*, 1907, p. 140, pl. 6, fig. 67b; Jørgensen, *partim*, 1924, pp. 9, 11, 105, 106, fig. 5a; Kofoid & Campbell, 1929, p. 334, fig. 638; Hada, 1938, p. 177, fig. 93.

*Tintinnus elongatus*, Kofoid & Campbell, 1929, p. 334, fig. 631.

Lorica very long and slender, 5.7-7.0 oral diameters in length; oral end a flaring funnel (36°); oral margin with a brim; shaft tapering 3°-6°; aboral end slightly flaring, without a brim, 0.49-0.54 oral diameter in diameter.

Length: 235-395 $\mu$

Oral diameter: 52-56 $\mu$

Occurrence: San-yah, not very common.

Distribution: It has a wide distribution in warm waters of the world.



Fig. 45. *Tintinnus fraknoi* Daday.

Comparison: The species differs from *T. lusus-undae* Entz in the presence of an aboral flare and from *T. maculatus* (Brandt) in the absence of the irregular patch-work on the shaft, a condition paralleling *Tintinnopsis*.

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