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THE TINTINNOINEA FROM THE SEA OF OKHOTSK
AND ITS NEIGHBORHOOD

By

Yoshine HADA

The Akkeshi Marine Biological Station of the Hokkaido Imperial University,
Akkeshi, Hokkaido, Japan.

(With 23 Figures)

INTRODUCTION

Previous notes on this common group of the pelagic ciliates in
Japanese waters have been reported by OKAMURA (1907) on the
plankton from the warm water current, the so-called “Kuroshio,”
and by HADA (1932) on two neritic species found in northern waters
of Japan. The present investigation is based on the plankton in the
Sea of Okhotsk and neighboring waters of Kamchatka generally tri­
bulary to the cold currents.

The materials dealt with in this work were collected with a
plankton tow net from the upper layer of the sea-water by myself
in July, 1929 at two stations in Taraika Bay, and by the Steamer
“Oshoro-Maru” of the Fishery College of the Hokkaido Imperial
University during July-August, 1930 at seventeen stations distrib­
uted in the above mentioned regions.

The following 23 species are here reported, including 7 which
are new.

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1) Contribution No. 31 from the Zoological Institute, Faculty of Science, the Hokkaido
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The detection of comparatively many species of the genus *Parafavella* certainly suggests the cold-temperate character of the sea where collection was made, and the frequent occurrence of the species in the genus *Tintinnopsis* indicates the neritic character of the plankton.
My hearty thanks are due to Professor Dr. C. A. KOFORD and Dr. A. S. CAMPBELL for their kind aid rendered me and for their verification of my identification of the species reported in this paper. It also gives me a great pleasure to record my indebtedness to Mr. K. OGAKI, Captain of the Steamer "Oshoro-Maru" for the collection of the materials.

### Table of Stations at Which Materials Were Obtained.

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CHART OF THE SEA WHERE COLLECTION WAS MADE.
SYSTEMATIC TREATMENT

Class CILIATA PERTY, 1852.
Order HETEROTRICHIDA STEIN, 1867.
Suborder TINTINNOINEA KOFOID and CAMPBELL, 1929.
Family TINTINNIDIDAE KOFOID and CAMPBELL, 1929.
Genus LEPROTINTINNUS JÖRGENSEN, 1899.

1. Leprotintinnus pellucidus (CLEVE) JÖRGENSEN.

Figure 1.

Tintinnus pellucidus CLEVE, 1899, p. 21, pl. 1, fig. 4; MEUNIER, 1910, p. 134, pl. 11, figs. 1-10.
Leprotintinnus bottnicus, JÖRGENSEN, 1899, p. 10; 1900, pl. 2, fig. 13.
Leprotintinnus pellucidus, JÖRGENSEN, 1901, p. 18; 1927, p. 8 fig. 8; KOFOID and CAMPBELL, 1929, p. 17, fig. 12.
Tintinnopsis pellucida, BRANDT, 1906, pl. 23, figs. 8, 14, 15; 1907, p. 127; MERKLE, 1909, p. 156, pl. 2, fig. 22.

Lorica elongate, tubular, 5.5 oral diameters in length; both apertural rims irregular; shaft slightly conical (2°-3°) towards the aboral end, constricted a little above the posterior end; aboral end flaring, 0.85 of the oral diameter in aboral diameter; wall thin, with a sparse agglomeration, numerous spiral turns usually appearing in the anterior part.
Length, 220 μ; oral diameter, 40 μ.
Stations, 8, 14.

Fig. 1.

Differs from Leprotintinnus bottnicus (NORDQVIST) in more widened aboral region and from L. simplex SCHMIDT in having posterior constriction.

Family CODONELLIDAE KENT, 1882.
Genus TINTINNOPSIS STEIN, 1867.

2. Tintinnopsis beroidea STEIN.

Figure 2.

Tintinnopsis beroidea STEIN, 1867; JÖRGENSEN, 1899, p. 23, pl. 1, fig. 5; ENTZ.

* Indicates literature which I have not examined.
Jr. (part), 1909, pl. 8, fig. 11, pl. 20, figs. 27, 45, pl. 21, fig. 8; MERKLE, 1909, pp. 149, 177, pl. 2, fig. 30; MEUNIER, 1910, p. 140, pl. 12, figs. 14–18; JÖRGENSEN, 1927, pp. 6, 7, fig. 5; KOFOID and CAMPBELL, 1929, p. 28, fig. 26.

Codonella beroidea (part), ENTZ, Sr., 1884, p. 411, pl. 24, figs. 2–9.

Tintinnopsis beroidea var. acuminata (part), DADAY, 1887, p. 547, pl. 19, figs. 4, 5.

Lorica bullet-shaped, usually cylindrical in the anterior 0.6–0.7 of the total length, aborally conical (75°–85°), its length 1.5–2.1 oral diameters; oral rim ragged; aboral end bluntly pointed; wall rather coarse, 0.03–0.04 oral diameters in thickness, without spiral structure.

Length, 48 (43–51) μ; oral diameter, 27 (26–30) μ.

Stations, A, B, 10.

Differs from Tintinnopsis acuminata DADAY in stouter proportions and in the subacute aboral end, from Tps. parvula JÖRGENSEN in absence of an aboral expansion below the anterior subcylindrical region, and from Tps. strigosa MEUNIER in the aboral end.

3. Tintinnopsis urnula MEUNIER.

Figure 3.

Tintinnopsis sp. (T. campanula var. ?) OKAMURA, 1907, p. 139, pl. 6, fig. 63.

Tintinnopsis urnula MEUNIER, 1910, p. 145, pl. 13, figs. 21–25; KOFOID and CAMPBELL, 1929, p. 50, fig. 20.

Lorica campanulate, 1.5 oral diameters in length; oral rim ragged; bowl constricted at the suboral 0.3 of the total length, its narrowest transdiameter 0.8 oral diameters, sides concave in the anterior 0.6 of the lorica; aboral region an inverted cone of 78°; aboral end subacute; wall more or less coarse, with very slight spiral organization in the suboral part.
Length, 54–60 μ; oral diameter, 37–40 μ.
Station, 7.

- Differs from *Tintinnopsis beroidea* STEIN and *Tps. lata* MEUNIER in the presence of the suboral constriction, and from *Tps. compressa* DADAY in the widened oral aperture and in the tapering aboral end.

4. *Tintinnopsis strigosa* MEUNIER.

Figures 4.

*Tintinnopsis strigosa* MEUNIER, *1919*; KOFOLD and CAMPBELL, 1929, p. 47, fig. 31.

Lorica stout bullet-shaped, 1.9 oral diameters in length; oral rim entire; bowl cylindrical, contracting posteriorly, changing from 80° in the aboral region to 38° in the distal end looking like an aboral horn; wall rather thin, with several faint spiral turns in the anterior half of the lorica.

Length, 55 μ; oral diameter, 29 μ.
Station, 1.

- Differs from *Tintinnopsis acuminata* DADAY in stouter proportions and from *Tps. beroidea* STEIN in having the more tapering aboral end.

5. *Tintinnopsis tubulosoides* MEUNIER.

Figure 5.

*Tintinnopsis karajacensis*, BRANDT, (part), 1906, pl. 19, fig. 11; 1907, p. 162.
*Tintinnopsis tubulosa* (part), BRANDT, 1906, pl. 24, figs. 8, 10; 1907, p. 167.
*Tintinnopsis tubulosoides* MEUNIER, 1910, p. 139, pl. 12, figs. 10, 11; KOFOLD and CAMPBELL, 1929, p. 49, fig. 74.

Lorica elongate bullet-shaped, 2.0–3.3 oral diameters in length; oral rim more or less
smooth; no collar; bowl cylindrical in the anterior 0.75 of the total length; aboral region contracting gradually, conical (58°–73°); aboral end generally acute, sometimes pointed bluntly; wall comparatively thin, with a few faint spiral turns in the suboral region, agglomerated particles somewhat sparse.

Length, 85 (71–110) μ; oral diameter 35 (34–37) μ.
Stations, 8, 10, 11.

Differs from *Tintinnopsis beroidea* STEIN in having spiral structure and in the long cylindrical bowl, from *Tps. strigosa* MEUNIER in its more slender lorica, and from *Tps. tubulosa* LEVANDER in the absence of the enlarged aboral region.

6. *Tintinnopsis kofoidi* HADA.

Figure 6.

*Fig. 6.*

*Tintinnopsis kofoidi* HADA. x450.

*Tintinnopsis kofoidi* HADA, 1932, p. 210, figs. 2, 3.

Length, 171 (156–188) μ; oral diameter, 38 (32–43) μ.
Stations, A, B, 10.

Family CODONELLOPSIDAE KOFOID and CAMPBELL, 1929.
Genus STENOSEMELLA JÖRGENSEN, 1924.

7. *Stenosemella ventricosa* (CLAPAREDE and LACHMANN) JÖRGENSEN.

Figure 7.

*Tintinnus ventricosus* CLAPAREDE and LACHMANN, 1858; KENT, 1882, p. 609, pl. 31, fig. 31.

*Codonella ventricosa*, JÖRGENSEN, 1899, p. 26; CLEVE, 1902, p. 22; 1908, p. 31.

*Fig. 7.*

*Stenosemella ventricosa* (CLAPAREDE and LACHMANN) JÖRGENSEN. x550.
Tintinnopsis ventricosa, Cleve, 1900a, p. 17; 1900b, p. 19; Brandt (part), 1906, pl. 17, fig. 9; 1907, p. 154; Entz, Jr. 1909, pl. 8, figs. 7, 10, pl. 9, fig. 19, pl. 20, fig. 48; Merkle, 1909, pp. 146, 176, pl. 2, figs. 26, 28, pl. 3, fig. 70; Merkle, 1909, pp. 146, 176, pl. 2, figs. 26, 28, pl. 3, fig. 70.

Tintinnopsis ventricosoides Meunier, 1910, p. 143, pl. 13, figs. 1-8.

Stenosemella ventricosa, Jorgensen, 1927, p. 8, fig. 6; Kofoed and Campbell, 1929, p. 71, fig. 142.

Lorica ovate, 1.7–2.0 oral diameters in length; collar very low, hyaline, without windows; shoulder sloping outwardly; bowl ovoidal, aborally convex conical (95°–110°), its greatest transdiameter 1.5–1.7 oral diameter; aboral end more or less blunt; wall coarsely agglomerated.

Length, 84 (80-86) μ; oral diameter, 46 (42-49) μ; transdiameter of the bowl, 72 (71-75) μ.

Station, 7.

Differs from Stenosemella steini (Jorgensen) in its lower collar and in the structure of the shoulder which is square in S. steini, but in this species sloping smoothly with rounded edges.

Genus Codonellopsis Jorgensen, 1924.

8. Codonellopsis frigida n. sp.

Figure 8.

Lorica stout top-shaped, 2.16 oral diameters in length, consisting of a subspherical bowl and a tubular collar separated from the former by the distinct conjunction; collar subcylindrical, usually with 5 spiral turns, 0.36 of the total length in length, constricted slightly below its oral flare; bowl globose, widest near the upper one-third of its length, 1.46–1.58 oral diameters in greatest transdiameter, provided with the comparatively smooth surface; aboral end hemispherical; wall of the bowl rather uniform in thickness, generally without agglomerated particles.

Length, 56 μ; oral diameter, 26 μ; greatest transdiameter of the bowl, 38–41 μ.

Stations, 6, 13.
Differs from *Codonellopsis contracta* KOFOID and CAMPBELL in the subcylindrical collar without posterior flaring region and in lack of fenestration on the basal part of the collar.

Family COXLIELLIDAE KOFOID and CAMPBELL, 1929.
Genus HELICOSTOMELLA JÖRGENSEN, 1924.

9. **Helicostomella fusiformis** (MEUNIER) JÖRGENSEN.

*Figure 9.*

*Amphorella subulata*, MEUNIER, 1910, p. 131, pl. 10, figs. 14, 15.

*Amphorella fusiformis* MEUNIER, *1919.

*Helicostomella fusiformis*, JÖRGENSEN, 1927, p. 10 fig. 15.

*Helicostomella fusiformis*, KOFOID and CAMPBELL, 1929, p. 105, fig. 207.

Lorica elongated fusiform, 6.4–7.8 oral diameters in length; oral rim somewhat flaring, dentate with about 24 short teeth; bowl cylindrical with 10–22 suboral turns in the anterior one-third of the lorica, dilated slightly in the posterior half of the bowl, widest near the middle of the total length, its greatest transdiameter 1.00–1.13 oral diameters; aboral region convex conical (25°–38°), sometimes with a few, irregularly curved striae running into an aboral horn 0.12–0.17 of the total length in length.

Length, 160 (148–180) μ; oral diameter, 23 μ.

Station, 10.

Differs from *Helicostomella subulata* (EHRENBERG) in its shorter lorica and in an aboral bulge.

10. **Helicostomella subulata** (EHRENBERG) JÖRGENSEN.

*Figure 10.*

*Tintinnus subulatus* EHRENBERG, *1833; KENT, 1882, p. 605, pl. 31, fig. 5; BRANDT, 1896, p. 52; LAACKMANN, 1906, p. 17, pl. 3, fig. 47; BRANDT. (part), 1906, pl. 65, figs. 1–4; 1907, p. 398.
The Tintinnoinea from the Sea of Okhotsk and its Neighborhood

*Tintinnus Ussowi* MERESCHKOWSKY, 1879, p. 160, pl. 10, fig. 40; KENT, 1882, p. 609, pl. 31, fig. 4.

*Amphorella subulata*, DADAY, 1887, p. 534, 536, pl. 18, fig. 7; CLEVE, 1900b, p. 18; 1902, p. 21; 1903, p. 31.

*Helicostomella subulata*, JÖRGENSEN, 1927, p. 10, fig. 14; KOFOID and CAMPBELL, 1929, p. 107, fig. 209; KOFOID, 1930, fig. 17 (No. 209).

Lorica elongated, slender pipette-shaped, 9.1–11.3 oral diameters in length; oral rim more or less flaring, denticulate with about 30 short teeth; bowl cylindrical in the anterior half of the lorica; aboral region conical (15°–20°), tapering distally into a long, somewhat oblique aboral horn with a pointed tip; sub-oral bands 10–20 in number, denticular, fading posteriorly, but most prominent on some one of the more anterior bands.

Length, 238 (210–260) μ; oral diameter, 23–24 μ.

Stations, A, 13.

Differs from *Helicostomella edentata* (FAURÉ-FREMIE) in presence of dentation of the oral margin and from *H. kiliensis* (LAACKMANN) in more gradually contraction of the aboral region.

**Fig. 10.**

*Helicostomella subulata* (EHRENBERG) JÖRGENSEN. ×500.

Family CYTTAROCYLDAE KOFOID and CAMPBELL, 1929.

Subfamily FAVELLINEAE KOFOID and CAMPBELL, 1929.

Genus FAVELLA JÖRGENSEN, 1924.

11. **Favella taraikaensis** n. sp.

Figure 11.

Lorica tall goblet-shaped, 3.2–3.7 oral diameters in length; oral rim entire, but not quite smooth; oral region a low funnel of 20°–35°
with 1–2 spiral turns, its length 0.11 of the oral diameter; bowl bell-shaped, slightly expanding below the nuchal constriction, widest near the posterior 0.4 of the bowl, contracting aborally into a conical aboral end of 60°–75°; aboral horn nearly circular in cross section, more or less longitudinally rugose on the surface, conical (7°–13°), 0.24–0.30 of the total length in length, tip bluntly pointed; wall finely prismatic, more in the oral region than in the bowl.

Length, 283 (260–314) μ; oral diameter, 83 (80–86) μ.

Stations, A, B.

Differs from *Favella ehrenbergii* (CLAPAREDE and LACHMANN) in lack of fins appendicular to the aboral horn, from *P. franciscana* KOFOID and CAMPBELL in having the entire oral rim instead of oral denticulation, and from *F. panamensis* KOFOID and CAMPBELL in size, in proportions, and in absence of wings of the aboral horn.

**Genus Parafavella** KOFOID and CAMPBELL, 1929.

12. *Parafavella jørgenseni* n. sp.

*Figure 12.*

*Cyttarocystis denticulata* var. *calycina* forma *acuta* (part) JÖRGENSEN, 1901, pp. 7, 10, pl. 1, fig. 5.

*Cyttarocystis hemifusus* (part) MEUNIER, 1910, p. 117, pl. 8, fig. 19.

*Parafavella acuta* (part), KOFOID and CAMPBELL, 1929, p. 158.

Lorica tall bell-shaped, 2.1–2.4 oral diameters in length; oral margin denticulated with 38 (32–42) short triangular teeth; bowl subcylindrical aboral end conical (40°–55°), without an aboral horn.

Length, 105 (91–125) μ; oral diameter, 45 (43–47) μ.
Stations, 7, 9–11, 13.

Differs from Parafavella acuta (Jørgensen) in stouter proportions, from P. greenlandica Kofoed and Campbell in the longer lorica and in the pointed aboral end instead of a blunt tip, from P. parumdentata (Brandt) in having no aboral horn, and from P. obtunsangula (Ostenfeld) in the contour of the aboral region which is not so much abruptly contracted in this species as in the last.

13. Parafavella pacifica n. sp.

Figure 13.

Lorica elongated goblet-shaped, 2.1–3.0 oral diameters in length; oral rim flaring very slightly, denticulated with about 25 teeth 0.013–0.034 of the total length in length; bowl almost dilated near the middle of the bowl, its greatest trans-diameter 1.04–1.17 oral diameters, gradually contracting aborally and merging distally into a convex conical (80°–120°) aboral region; aboral horn short, conical (17°–34°), 0.08–0.12 of the total length in length, tip pointed.

Length, 123 (105–150) μ; oral diameter 46 (43–50) μ.

Stations, 15–17.

Differs from Parafavella obtunsangula (Ostenfeld) and from P. parumdentata (Brandt) in the more broadly conical postmedian region, in fewer teeth of the oral rim, and in the more rotund lateral contour.

14. Parafavella parumdentata (Brandt) Kofoed and Campbell.

Figure 14.

Cyttarocylis edentata var. parumdentata Brandt, 1906, pl. 37, figs. 6–8, 7a, 8a; 1907, pp. 231, 232; Merkle, 1909, p. 158; Busch, 1920, p. 756, fig. 1.
Parafavella parumdentata, KOFOID and CAMP­
bell, 1929, p. 168, fig. 306.

Lorica elongate goblet-shaped, 3 oral
diameters in length; oral rim somewhat
flaring, denticulate with about 35 teeth;
bowl subcylindrical and subconical (5°) in
suboral part, tapering aborally (50°); ab­
oral horn conical (10°), 0.15 of the total
length in length, with an acute tip.

Length, 50 μ; oral diameter, 50 μ.
Station, 10.

Differs from Parafavella pacifica n. sp.
in the more tapering aboral end and from
P. obtunsangula (OSTENFELD) in possesing
the more differentiated aboral horn.

15. Parafavella dentiulata (EHRENBERG) KOFOID and CAMPBELL.

Figure 15.

Tintinnus denticulatus EHRENBERG, *1840; KENT, 1882 p. 607, pl. 31, figs. 18, 19.
Cyttarocylis denticulata, DADAY, 1887, pp. 575, 583; BRANDT, 1896, pp. 60, 62;
JÖRGENSEN (part), 1899, p. 31; 1901, p. 4; CLEVE, 1899, p. 21; 1900a, p. 15;
1900b, p. 18; 1902, p. 22; 1903, p. 31; BRANDT (part), 1907, p. 220; MERKLE,
1909, pp. 157 (part), 179, pl. 3, figs. 39-61.
Cyttarocylis denticulata var. a typica JÖRGENSEN (part), 1899, p. 31, pl. 2, figs. 13,
15.
Cyttarocylis denticulata var. typica, JÖRGENSEN, 1901, pp. 8, 9, 12; BRANDT
(part), 1906, pl. 37, figs. 9, 10, 15–17; 1907, pp. 220 (part), 232; MERKLE, 1909,
pp. 158, 168, pl. 2, fig. 27, pl. 3, figs. 31–38, 68, 72, 73.
Favella denticulata, JÖRGENSEN 1927, pp. 10, 11.
Parafavella denticulata, KOFOID and CAMPBELL, 1929, p. 163, fig. 310.

Lorica elongated bell-shaped, 33–37 oral diameters in length;
oral rim denticulated with 50–60 teeth 0.095 of the total length in
length; bowl cylindrical, 1.08 oral diameters in the widest trans-
diameter; aboral region contracting gradually (50°–67°); aboral
horn usually straight and conical (14°–20°), occasionally curved, 0.13–0.16 of the total length in length, its tip pointed.

Length, 226 (208–234) μ; oral diameter, 63 (62–64) μ.

Stations, 1, 3.

Differs from *Parafavella gigantea* (BRANDT) in size and dimensions of the lorica and in the shorter aboral horn.

16. **Parafavella gigantea** (BRANDT)

KOFOID and CAMPBELL.

Figure 16.

*Cyttarocylis gigantea* (part) BRANDT, 1896, p. 63, pl. 3, figs. 21, 24; MEUNIER, 1910, p. 109, pl. 8, figs. 1, 3–5, 8–11.

*Cyttarocylis denticulata* var. *gigantea*, JÖRGENSEN, 1899, p. 35, pl. 3, figs. 26–28.

*Cyttarocylis denticulata* var. *gigantea*, CLEVE, 1899, p. 21; JÖRGENSEN, 1901, pp. 9, 14, pl. 2, fig. 21; BRANDT (part), 1906, pl. 38, figs. 3, 8, 8a, 9; 1907, p. 233.

*Cyttarocylis denticulata* var. *elongata* JÖRGENSEN, 1901, pp. 8, 14, pl. 3, figs. 23, 24.

*Cyttarocylis cuspidata* (part) MEUNIER, 1910, p. 113, pl. 10, figs. 8, 9.

*Parafavella gigantea*, KOFOID and CAMPBELL, 1929, p. 165, fig. 311.

Lorica elongated tubular, 5.3–8.1 oral diameters in length; oral margin denticulated with about 45 teeth as long as 0.013–0.018 of the length in length; bowl nearly cylindrical, somewhat expanding in the suboral part, its greatest transdiameter 1.02–1.11 oral diameters, constricted slightly at the middle; aboral region convex conical (45°–60°), tapering into a long slender horn; aboral horn straight or more or less curved, 0.25–0.33 of the total length in length, with a pointed tip.

Length, 445 (340–576) μ; oral diameter 66 (63–71) μ.

Stations, 1–4, 8, 10.
Differs from *Parafavella denticulata* (Ehrenberg) in larger size and in elongation of the aboral horn and from *P. robusta* (Jörgensen) in the more slender contour of the lorica.

17. *Parafavella brandti* n. sp.

*Figure 17.*

*Cyttarocylis gigantea* (part) Brandt, 1896, p. 63, pl. 3, figs. 22, 23.
*Cyttarocylis denticulata var. gigantea* (part), Brandt, 1906, pl. 38, figs. 2, 2a; 1907, p. 233.
*Parafavella subedentata*, Kofoid and Campbell (part), 1929, p. 170.
Lorica elongated goblet-shaped, 5.2–7.0 oral diameters in length; oral rim entire without dentation; bowl subcylindrical, widened slightly in the suboral region; aboral region an inverted cone of 50°–58°; aboral horn long, sometime more or less curved, 0.26–0.28 of the total length in length.

Length, 360–437 μ; oral diameter, 63–68 μ.
Station, 7.

Differs from *Parafavella edentata* (BRANDT) and *P. subedentata* (JÖRGENSEN) in the longer bowl and in the elongate aboral horn, and from *P. gigantea* (BRANDT) in absence of oral teeth on the oral margin.

18. *Parafavella promissa* n. sp.

Figure 18.

Lorica elongate, consisting of a tubular bowl and a very long aboral horn, its length 7.3 oral diameters; oral rim slightly flaring, denticulated with about 22 long teeth strongly curved outwardly; bowl nearly cylindrical, more or less expanding at the anterior 0.12 and at the posterior 0.31 of the bowl, contracting aborally, (45°); aboral horn much elongated, slender, somewhat curved irregularly, 0.46 of the total length, in length, provided with a discoidal appendage at the tip.

Length, 334μ; oral diameter, 46μ.
Station, 16.

Differs from *Parafavella denticulata* (EHRENBERG) and *P. gigantea* (BRANDT) in long curved teeth of the oral rim and in its remarkable elongated aboral horn.
19. **Parafavella subrotundata** (JORGENSEN) KOFOID and CAMPBELL.

Figure 19.

*Cyttarocylis denticulata* var. *subrotundata* JORGENSEN, 1899, p. 34, pl. 2, figs. 20, 21.

*Cyttarocylis denticulata* var. *subrotundata* JORGENSEN, 1901, pp. 8, 13; MERKLE, 1909, p. 159.

*Parafavella subrotundata*, KOFOID and CAMPBELL, 1929, p. 170, fig. 316.

Loricæ elongate, tubular, 3.0–4.3 oral diameters in length; oral rim denticulated with about 50 teeth; bowl cylindrical, slightly conical (65°–7°) towards the aboral end, its widest transdiameter 1.03–1.05 oral diameters; more or less abruptly contracting aborally (65°–85°); aboral horn short, 0.05–0.11 of the total length in length, conical (20°–35°).

Length, 223 (191–271) μ; oral diameter 63 (63–65) μ.

Stations, 3, 13.

Differs from *Parafavella cylindrica* (JORGENSEN) in smaller size and in the slightly conical bowl, from *P. denticulata* (EHRENBERG) in the short horn, and from *P. dilatata* (JORGENSEN) in less conical feature of the lorica.

20. **Parafavella subcylindrica** n. sp.

Figure 20.

Loricæ short finger-shaped, 2.7 oral diameters in length; oral margin denticulate with many small triangular teeth (about 60); bowl subcylindrical, dilated slightly in the suboral 0.16 of the total length, gradually contracting aborally, convex conical (8°) in the posterior 0.3 of the lorica; aboral end nearly hemispherical, somewhat subacute, without an aboral horn.
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Length, 169 μ; oral diameter, 63 μ.
Station, 9.

Differs from Parafavella digitalis KOFOID and CAMPBELL in having the denticulate oral rim, from *P. hemifusus* (MEUNIER) in numerous oral teeth and in the rounded aboral end, and from *P. rotundata* (JÖRGENSEN) in smaller size and in stouter proportions.

Family PTYCHOCYLIDAE KOFOID and CAMPBELL, 1929.
Genus PTYCHOCYLIS BRANDT, 1896.

21. Ptychocylis obtusa BRANDT.

Figure 21.

*Ptychocylis obtusa* BRANDT, 1896, p. 59, pl. 3, fig. 15; CLEVE (part), 1899, p. 23, 1903, p. 32; BRANDT, 1906, pl. 57, fig. 8; 1907, p. 311; KOFOID and CAMPBELL, 1929, p. 188, fig. 349.

*Fig. 20.* Parafavella subcylindrica n. sp. ×250.

*Ptychocylis urnula* var. *obtusa*, JÖRGENSEN, 1901, p. 18, pl. 3, fig. 32.

*Ptychocylis urnula* var. *digitalis* (part) JÖRGENSEN, 1901, p. 17, pl. 2, figs. 29.

*Ptychocylis obtusa* var. *drygatskyi* (part), BRANDT, 1906, pl. 56, fig. 4; 1907, p. 312.

*Ptychocylis Drygalskii*, MEUNIER, 1910, p. 126, pl. 8, figs. 23, 26, 29-31, pl. 9, figs. 8-10, 12-14.

*Ptychocylis media* MEUNIER, 1910, p. 127, pl. 9, fig. 11, pl. 10 fig. 4.

*Ptychocylis ampla* MEUNIER, 1910, p. 127, pl. 12, fig. 36.

*Ptychocylis glacialis* (part), MEUNIER, 1910, p. 124, pl. 8, fig. 27, pl. 10, fig. 6.

*Ptychocylis* sp. MEUNIER, 1910, p. 123, pl. 8, fig. 28.

*Ptychocylis duplicata* MEUNIER, 1910, p. 126, pl. 10, figs. 2, 5.
Lorica stout bell-shaped, 1.50–1.85 oral diameters in length; oral rim denticulate; bowl contracting very slightly towards the aboral end, with two anterior expansions and a very weakly developed aboral dilation; posterior region abruptly conical (90°–102°), with an inverted truncated cone (27°–40°) as long as 0.15–0.20 of the total length in length; wall rugged in the aboral end, 0.045 oral diameters in thickness.

Length, 108(91–120) μ; oral diameter 63(60–71) μ.

Stations, 5, 7, 10, 11, 13.

Differs from Ptychocylis acuta Brandt in stouter proportions and in the broadly rounded aboral end and from P. drygalskii Brandt in the shape of the aboral region having a definite aboral cone.

Family PetaIotrichidae Kofoid and Campbell, 1929.
Subfamily Craterellinae Kofoid and Campbell, 1929.

Genus Acanthostomella Jørgensen, 1927.

22. Acanthostomella norvegica (Daday) Jørgensen.

Figure 22.

Tintinnus sp., Kent, 1882, pl. 31, fig. 17.
Amphorella norvegica Day, 1887, p. 543; Cleve, 1902, p. 21; Mønner (part), 1910, p. 131, pl. 10, figs. 20–26.
Tintinnus norvegicus Brandt, 1896, p. 54; 1907, pp. 401, 405; Merkle, 1909, p. 164, pl. 2, fig. 15.
Tintinnus norvegicus var b minutus Brandt, 1906, pl. 62, fig. 6.
Cyttarocylis norvegica, Jørgensen, 1899, p. 28, pl. 1, fig. 10.
Cyttarocylis norvegica var. minuta, Jørgensen, 1901, p. 15, pl. 2, fig. 27.
Acanthostomella norvegica, Jørgensen, 1927, p. 13, fig. 23; Kofoid and Campbell, 1929, p. 198, fig. 363.

Lorica stout bell-shaped, 1.3–1.6 oral diameters in length, inner collar high; outer collar
flaring, 1.17-1.23 oral diameters in transdiameter, denticulated with about 25 low triangular teeth; bowl conical (15°-20°) in the anterior half, widened gradually towards the middle part of the total length, its greatest transdiameter 1.13-1.24 oral diameters; aboral region hemispherical, provided with a short aboral spine tip sharply pointed.

Length, 40 (36-43) \( \mu \); inner oral diameter, 26 (25-27) \( \mu \).

Stations, 5-7, 10, 14.

Differs from *Acanthostomella gracilis* (BRANDT) in having an aboral expansion and the acute aboral end.

Family **TINTINNIDAE CLAPAREDE and LACHMANN, 1858.**

Subfamily **TINTINNINEAE KOFOID and CAMPBELL, 1929.**

Genus **TINTINNUS SCHRANK, 1803.**

23. **Tintinnus rectus** WAILES.

Figure 23.

*Tintinnus lusus-undae* var. *rectus* WAILES, 1925.


Lorica tubular, subcylindrical with a very slight median dilation, its length 4.5-5.0 oral diameters; anterior end a low, inverted, truncated cone of 27°-40°, with 44-50 sharp triangular teeth 0.023 of the total length in length; posterior region very slightly flaring, aboral diameter 0.75-0.85 oral diameters.

Length, 235 (223-254) \( \mu \); oral diameter, 50 (49-54) \( \mu \).

Station, 10.

Differs from *Tintinnus rugosus* KOFOID and CAMPBELL in the smooth instead of the rugose surface.
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