

## ON SOME TINTINNIDS (PROTOZOA : CILIATA) FROM THE STRAIT OF HORMOZ AND THE UNITED ARAB EMIRATES WATERS

By

GIBREEL M. SHARAF

Desert and Marine Environment Research Center, United Arab Emirates University, Al-Ain, UAE.

بعض الهوائيم البحرية من مضيق هرمز والمياه الساحلية لدولة الإمارات العربية المتحدة

جبريل شرف

أظهرت دراسة وصفية لعينات من الهوائيم البحرية تم جمعها من مضيق هرمز والمياه الساحلية لدولة الإمارات العربية المتحدة وجود ٣٨ نوعاً من الجرسيات (أوليات : هديات). وقد أوضحت الدراسة أن هذه الأنواع تنتمي إلى ١٠ عائلات و ١٦ جنس يعيش معظمها في المياه الدافئة والاستوائية والبعض الآخر إما واسع الانتشار أو يعيش في المياه الباردة ، كما تبين أيضاً سيادة جنس التنتوبوسس والعائلتين كودونيليدا وتنتيدا .

*Key Words* : Strait of Hormoz and UAE waters, Plankton, Taxonomy, Tintinnids.

### ABSTRACT

An examination of plankton samples collected from the oceanic waters of the Strait of Hormoz and the UAE inshore and offshore waters revealed the presence of a diverse community of planktonic Tintinnida (Protozoa). 38 tintinnid species belonging to 10 families and 16 different genera are described and illustrated in the present paper. Most of the species described are known from warm or tropical waters, however, some are cosmopolitan, while a few are cold water inhabitants.

### INTRODUCTION

Most previous plankton works done in the Arabian Gulf were focused on either the large-size portion of the plankton, mainly zooplankton that exceeds 200 µm [1 - 7] or on phytoplankton [8 - 11].

To the author's knowledge, no work has been done on the marine planktonic tintinnids of the Arabian Gulf or adjacent waters and most authors neglected even to mention their presence although no plankton sample collected in these waters was devoid of tintinnids. The present paper describes 38 species of the Order Tintinnida (Protozoa : Ciliata) collected from the Strait of Hormoz, inshore and offshore waters of the United Arab Emirates.

### MATERIALS AND METHODS

A Japanese research vessel cruising the Gulf waters during December 1993 collected plankton samples using a Norpac plankton net. About 25 samples were collected from different offshore stations in the Strait of Hormoz. The samples were forwarded to the UAE Ministry of Agriculture and Fisheries and finally were brought to the author for analysis and identification.

Plankton samples collected using a 55 µm net from the UAE waters were also examined. Samples from the mangrove creek waters of Ras Al-Khaimah and Umm Al-Quiwain were collected during November 1993 and from Abu Dhabi and Umm Al-Quiwain mangroves during January 1994. Offshore samples were collected from UAQ, RAK and Fugairah during March 1994, September 1994 and February 1995 respectively.

Tintinnids were frequently encountered in the samples mentioned above. Samples were examined under a research compound microscope, drawings were made using a drawing eyepiece (Camera lucida) and measurements were done by an ocular micrometer.

### Systematics

The classification and taxonomy used in the present paper follow the work of Kofoid and Campbell (12) which is based entirely on the shape of the lorica and its dimensions. Identification based only on the lorica was found not sufficient (13) because of the wide variations in its shape and structure. Marshall (14,15), however, considers the lorica as the only part of the animal available for identification. The author agrees with this approach .

RESULTS AND DISCUSSION

Sixteen genera and 10 families have reported in the present work. *Tintinnopsis* was the dominant genus while Codonellidae and Tintinnidae were the dominant families. All taxa were arranged alphabetically throughout.

Phylum : Protozoa  
 Class : Ciliata  
 Order : Tintinnida  
 Family : Codonellidae  
 Genus : *Tintinnopsis*

1 – *Tintinnopsis compressa* Daday, 1887  
 Pl. I, Fig. 1

A small species with a wide flaring collar (about twice as wide as the bowl) and a marked suboral constriction leading to a rounded aboral end. Bowl widens in the middle. Lorica's wall is coarsely agglomerated. According to (14) there is variability in form of the present species, the present specimen agrees with text-Fig. 8 of [14]. Length/Oral diameter ratio is about 4/5.

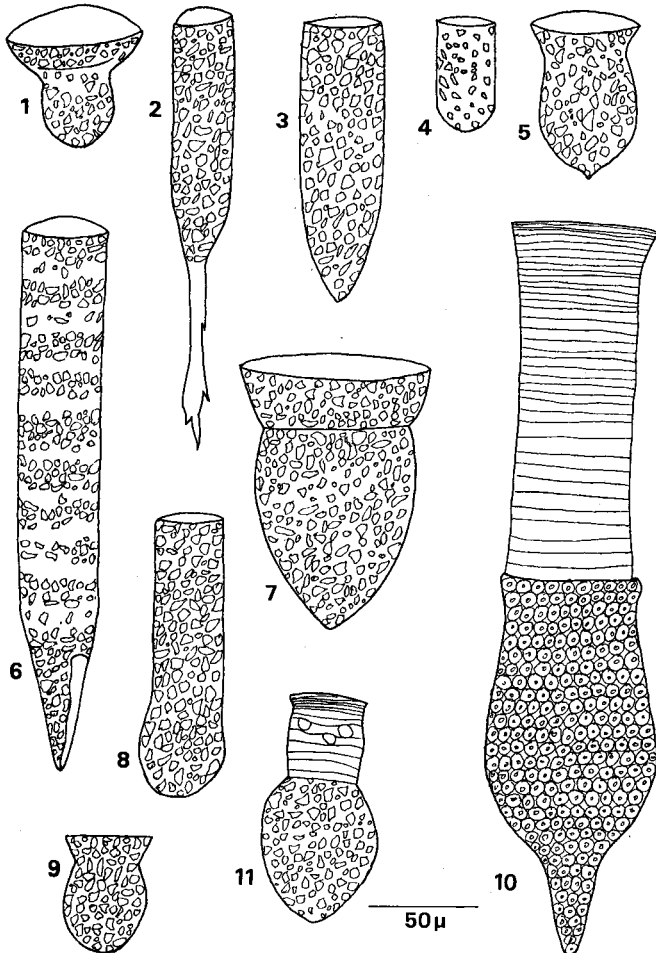


PLATE I

Dimensions : Length 59  $\mu$ m, oral diameter 73  $\mu$ m.  
 Occurrence : Hormoz Strait, In December.  
 Distribution : Great Barrier Reef [14], South Europe and West Atlantic [15].

2 – *Tintinnopsis corniger* Hada, 1964  
 Pl. I, Fig. 2

This species has a tubular not-flaring lorica covered with sand and foreign particles and a branched hyaline aboral horn or pedicel which is not covered by particles. The horn is more than 1/3 of the total length and has from 1–4 branches. Sometimes fine reticulation is visible on the horn. L/OD ratio is 5.4/6.9.

Dimensions : Length 166–200  $\mu$ m, oral diameter 29–31  $\mu$ m.  
 Occurrence : In Ras Al-Khaimah, In November, Mangrove Creek samples.  
 Distribution : Inland Sea of Japan [16].

3 – *Tintinnopsis gracilis* Kofoid & Campbell, 1929  
 Pl. I, Fig. 3

The finger-like lorica is cylindrical in the upper 2/3, then diameter decreases to give a conical bluntly pointed aboral end. Mouth is not flaring and has a smooth rim. Wall is coarse and covered by sand and foreign particles. L/OD ratio is about 33/10.

The present form has almost the same diameter from the mouth to the lower 1/3 of the lorica. According to [17], the posterior 1/3 of the bowl is sometimes slightly swollen.  
 Dimensions : Length 130  $\mu$ m, oral diameter 39  $\mu$ m.  
 Occurrence : In Abu Dhabi mangrove creek, in January.  
 Distribution : Western coast of Borneo [18], Great Barrier Reef [14], Singapore & Java Sea [17].

4 – *Tintinnopsis minuta* Wailes, 1925  
 Pl. I, Fig. 4

This is a very small and short species with tubular straight lorica. Oral rim is entire. Aboral end is rounded. Wall is thinly agglomerated. L/OD ratio is 2/1.  
 Dimensions : Length 52  $\mu$ m, oral diameter 26  $\mu$ m.  
 Occurrence : In Strait, of Hormoz in December.  
 Distribution : Strait of Georgia, British Columbia [19].

5 - *Tintinnopsis orientalis* Kofoid & Campbell, 1929

Pl. I, Fig. 5

This is a small species with a flaring oral region and a smooth nuchal constriction. The bowl is rounded with a minute point, it is widest just below its middle but less wide than the flaring collar. L/OD ratio is 1.3-1.4.

Dimensions : Length 70-73  $\mu\text{m}$ , oral diameter 25 $\mu\text{m}$ .

Occurrence : In Abu Dhabi Mangrove Creek, in January.

Distribution : Off Bombay in the Arabian Sea [12].

6 - *Tintinnopsis radix* Imhof, 1886

Pl. I, Fig. 6

Lorica of this species is tubular, elongate and slender with an entire or sometimes regular but not flaring oral rim. Aboral region narrows gradually in the lower 1/4 or 1/3 into a pedicel which usually has a laterally formed aboral opening. A spiral structure is clearly visible from the mouth down to the aboral cone. Agglomerated particles are more dense near the mouth and on the pedicel and fewer elsewhere. L/OD ratio is 6.4-6.7.

Dimensions : Length 250-262  $\mu\text{m}$ , oral diameter 39 $\mu\text{m}$ .

Occurrence : In Strait of Hormoz in December.

Distribution : Mutsu Bay [20], widely distributed along the coasts of the Mediterranean and the Atlantic, Indian & Pacific Oceans, Great Barrier Reef [14].

7 - *Tintinnopsis schotti* Brandt, 1906

Pl. I, Fig. 7

Lorica is campanulate (bell-shaped) with a suboral constriction in the upper 1/4 of the lorica. Collar is conical and widely flaring with convex sides. Oral rim sometimes is ragged. Bowl is ovate, widest in the middle and ends with a bluntly pointed distal end. Wall is thickly covered by large sand particles. L/OD ratio is about 6 - 5.

Dimensions : Length 112-117 $\mu\text{m}$ , oral diameter 83-91 $\mu\text{m}$ .

Occurrence : In Strait of Hormoz in December.

Distribution : West of Borneo [18] and Java Sea [17].

8 - *Tintinnopsis turgida* Kofoid & Campbell, 1929

Pl. I, Fig. 8

This species has a straight, elongate and tubular lorica. Oral rim is ragged and not flaring while the aboral end is slightly dilated and rounded. Wall is covered by sand and foreign particles. L/OD ratio is 3.7-4.3.

Dimensions : Length 147-157 $\mu\text{m}$ , oral diameter 34-42 $\mu\text{m}$ .

Occurrence : In Abu Dhabi Mangrove Creek samples, In January

Distribution : Off Borneo and Arabian Sea off Bombay [12].

9 - *Tintinnopsis urnula* Meunier, 1910

Pl. I, Fig. 9

This is a small species with an oval outline. Mouth is flaring above a suboral constriction. Aboral end is rounded. Wall is thickly covered by sand particles. L/OD ratio is about 1.2.

Dimensions : Length 52 $\mu\text{m}$ , oral diameter 42 $\mu\text{m}$ .

Occurrence : Abu Dhabi Mangrove Creek, January samples

Distribution : Mutsu Bay [20], Okhotsk Sea [21], Arctic Seas [15].

Family : Codone 11 opsidae

Genus : *Codonellopsis*10 - *Codonellopsis biedermani* (Brandt, 1906)

Pl. I, Fig. 10

This species has a long tubular collar (about 1/2 the total length) and an ovoid bowl. The collar has a flaring mouth and a slightly concave outline which is narrowest in the middle and getting wider towards the mouth and the bowl. About 33 spiral turns are present on the collar, more crowded towards the mouth. Bowl has a neck below the collar and a stout pedicel (about 1/7 total length). Bowl is covered with coccoliths. L/OD ratio is about 3.8.

Dimensions : Length 325 $\mu\text{m}$ , oral diameter 86 $\mu\text{m}$ .

Occurrence : In December, Fugairah off shore waters.

Distribution : Red Sea [22].

11 - *Codonellopsis orientalis* Hada, 1932

Pl. I, Fig. 11

Lorica is divided into a cylindrical collar and an oval bowl covered by sand and foreign particles. Collar is more than 1/3 of the total length, a little constricted below the slightly flaring mouth then dilated in the middle. About 12 spiral turns are present on the collar, crowded near the mouth and further apart towards the bowl. Few fenestrae are found in the middle of the collar. Bowl is wider in the middle and terminates with a blunt aboral end. L/OD ratio is 2.3-3.0.

Dimensions : Length 84-104 $\mu\text{m}$ , oral diameter 31-39 $\mu\text{m}$ , collar length 30-37 $\mu\text{m}$ .

Occurrence : In Strait of Hormoz, in December.  
 Distribution : Mutsu Bay (20).

12 – *Codonellopsis ostenfeldi* (Schmidt, 1901)  
 Pl. II, Fig. 1

The most obvious feature about this species is the presence of a more or less long collar, formed from spiral turns with fenestrae. Horizontal lines can be seen between the fenestrae rows. The collar varies considerably in length (1/3–2/3 of total length). The number of turns is also variable from 10–17 turns and from 4–13 fenestrated turns respectively. The cylindrical collar is slightly flared at the mouth and a little narrow at its base (especially when it is long). The upper turns just below the mouth are usually without fenestrae. The bowl is oval and is covered with large sand particles. L/OD ratio is 2.6–5.0.

Dimensions : Length 101–195 $\mu$ m, oral diameter 36–39 $\mu$ m.

Occurrence : In Strait of Hormoz, in December, and in November, Ras Al-Khaimah Mangrove Creek samples.

Distribution : Red Sea, Arabian Sea, Indian Ocean, Malay Archipelago, Gulf of Siam and Great Barrier Reef [14].

Genus : *Stenosemella*

13 – *Stenosemella nivalis* (Mcunier, 1910)  
 Pl. II, Fig. 2

A very small species with a very short collar (about 1/7 of the total length) and an oval bowl. The hyaline collar is narrowest at the mouth, expanding slightly towards the bowl. The bowl is widest just below the collar and has a rounded or bluntly pointed aboral end. Bowl is covered with coarse sand particles. L/OD ratio is about 2.0.

Dimensions : Length 37 $\mu$ m, oral diameter 18 $\mu$ m.

Occurrence : In Strait of Hormoz in December.

Distribution : Mutsu Bay [20], Mediterranean and coast of Europe (generally), Great Barrier Reef [14] and North Atlantic [23].

14 – *Stenpsemella parvicollis* (Marshall, 1934)  
 Pl. II, Fig. 3

This is a rather small species with a very short collar and an oval bowl which is thickly covered with agglomerated particles. The collar has only one row of 6 rectangular fenestrae. The bowl has projecting shoulders

where the collar and bowl meet. L/OD ratio is about 1.7.  
 Dimensions : Length 62 $\mu$ m, oral diameter 23 $\mu$ m, collar height 6 $\mu$ m.

Occurrence : In December, Hormoz Strait.  
 Distribution : Great Barrier Reef [14].

Family : Dictyocystidae  
 Genus : *Dictyocysta*

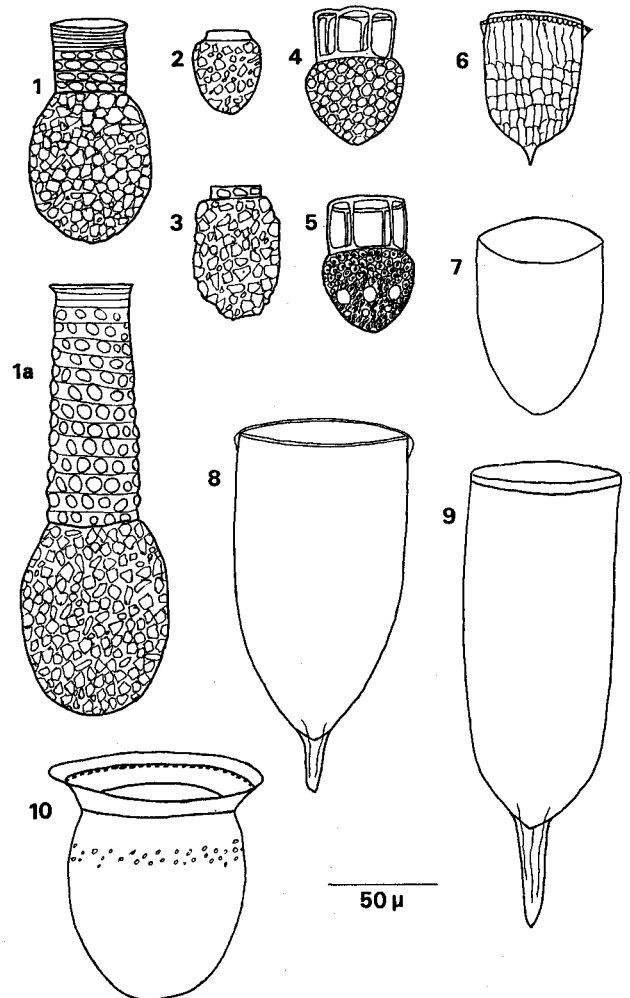


PLATE II

15 – *Dictyocysta polygonata* Kofoid and Campbell, 1929  
 Pl. II, Fig. 4

This species is characterized by cylindrical collar and ovoid bowl which is wider below the collar and slightly pointed aborally. Collar has one row of 6 large rectangular windows running almost 1/3 of the total length of the lorica. Bowl is without fenestrae, its wall is composed of a reticulation of a rather uniform polygonate meshes. L/OD ratio is about 1.6.

Dimensions : Length 62–68µm, oral diameter 39–42µm.

Occurrence : In strait of Hormoz, in December.

Distribution : California and Peruvian Currents, South Equatorial Stream, Galapagos Eddy and Panamic Area in Pacific [12] and Java Sea [17].

16 – *Dictyocysta reticulata* Kofoid and Campbell, 1929

Pl. II, Fig. 5

This species is almost similar to the previous one but differs in having fenestrae in the bowl. The reticulated bowl has 2 rows of fenestrae; the first running below the middle of the bowl formed of 6 large oval fenestrae, and the second running below the first and made of a few small fenestrae. L/OD ratio is about 1.5.

Dimensions : Length 60µm, oral diameter 39µm.

Occurrence : In Strait of Hormoz in December.

Distribution : Mediterranean [24], eastern tropical Pacific [12], Great Barrier Reef [14], Palao Islands and Java Sea [17].

Family : Epiplocyloidae

Genus : *Epiplocyloides*

17 – *Epiplocyloides reticulata*

(Ostenfeld & Schmidt, 1901)

Pl. II, Fig. 6

This is a small bell-shaped species with an almost cylindrical lorica that is more wider at the mouth. It has an upright hyaline collar surrounded by a slightly flaring lip and a narrow groove in between. Aboral end has a smooth conical outline and a short pointed pedicel. Coarse reticulation is found over most of the bowl with free lines running towards the lip. L/OD ratio is about 1.3. According to (17) this species is exceedingly variable in the elongation of the lorica, the shape of the aboral region, and the area of reticulation of the surface.

Dimensions : Length 65–68µm, oral diameter 52µm.

Occurrence : In Strait of Hormoz in December

Distribution : Red Sea [25], widely distributed in oceanic and coastal waters of the Pacific [12,14] and western tropical Pacific [17].

Family : Favellidae

Genus : *Favella*

18 – *Favella azorica* (Celve, 1900)

Pl. II, Fig. 7

The lorica is a hyaline bell-shaped and almost cylindrical in the upper half, then it narrows to a blunt

pointed aboral end. Oral rim is smooth and thin. This species may or may not have 1 or 2 annuli at the oral end [14], the present specimen is without any. L/OD ratio is 1.5–1.6.

Dimensions : Length 86–94µm, oral diameter 57µm.

Occurrence : Creek waters of Abu Dhabi mangrove, in January.

Distribution : The Azores [26], Mediterranean [27], Great Barrier Reef [14] and western tropical Pacific [17].

19 – *Favella campanula* (Schmidt, 1901)

Pl. II, Fig. 8

Similar to the previous species but differs in having a slightly flaring oral lip surrounding a collar that is barely higher than the lip. Aboral end is convex conical and tapering to form a pointed short pedicel. The pedicel is solid and has wings or vertical striae attaching it to the bowl. L/OD ratio is 1.5–2.0.

Dimensions : Length 109–164µm, oral diameter 68–88µm.

Occurrence : Found in Creek waters of Abu Dhabi and Umm Al-Quiwain mangroves in January.

Distribution : Gulf of Siam [28], western tropical Pacific [17] and Alexandria Coast, Egypt [29].

20 – *Favella ehrenbergii*

(Claparede & Lachmann, 1858)

Pl. II, Fig. 9

This is a longer and more slender species than the preceding species. It differs also in having a longer pedicel and flaring oral lip. Spiral turns are sometimes present suborally [15]. Pedicel is joined by wings to the bowl. L/OD ratio is 3.2.

Dimensions : Length 230µm, oral diameter 73µm.

Occurrence : Fujairah offshore waters, in February.

Distribution : North Sea, English Channel and Coasts of North & South Europe [15].

Family : Petalotrichidae

Genus : *Petalotricha*

21 – *Petalotricha major* Jorgensen, 1924

Pl. II, Fig. 10

A hyaline species with a globose bowl and a flaring collar separated from the bowl by a marked nuchal constriction. Collar is divided into 2 parts, a slightly flaring suboral cone and an outer lip. At the junction of

the 2 collar parts there is a row of small fenestrae. Bowl is widest in the middle and has a spherical contour. Small round fenestrae are present on the upper 1/2 of the bowl. L/OD ratio is 1.0.

Dimensions : Length 115µm, oral diameter 115µm.

Occurrence : Umm Al-Quiwain offshore waters, in March.

Distribution : Mediterranean Sea, Atlantic north to the Sargasso Sea and Indian Ocean [23].

Family : Rhabdonellidae

Genus : *Protorhabdonella*

22 – *Protorhabdonella curta* (Cleve, 1901)

Pl. III, Fig. 1

A small hyaline species with an oval outline. Oral rim is simple and not flaring. Lorica dilates in the upper 1/3 then narrows to a bluntly pointed aboral end. Lorica with numerous (about 16) slightly spiral ribs or lines running from left to right especially near the mouth then becoming more or less vertical. According to [12] and

[15], this species has a sharp pointed aboral end which is not the case in the present form. L/OD ratio is about 1.6.

Dimensions : Length 42µm, oral diameter 26µm.

Occurrence : In Strait of Hormoz in December.

Distribution : Red Sea, southern Atlantic, Indian Ocean, Mediterranean and Great Barrier Reef [14].

23 – *Protorhabdonella simplex* (Cleve, 1900)

Pl. III, Fig. 2

This is a slightly bigger species than the previous one. It differs from *P. curta* in having a more conical outline, a sharply pointed aboral end and fewer ribs.

About 8 vertical ribs are present. L/OD ratio is 1.4–2.0.

Dimensions : Length 47–63µm, oral diameter 31–34µm.

Occurrence : In Strait of Hormoz in December.

Distribution : Warm waters of the Atlantic, coast of Chile, Red Sea & Arabian Gulf, Gulf of Siam and Great Barrier Reef [14].

Genus : *Rhabdonella*

24 – *Rhabdonella poculum* (Ostenfeld & Schmidt, 1901)

Pl. III, Fig. 3

Lorica of this species has a wide cone that narrows gradually from the mouth then more sharply below the middle to a pointed aboral end or short pedicel. Oral rim is barely higher than the flaring lip. Numerous vertical ribs running throughout the length of the lorica. L/OD ratio is 1.6–2.0.

Dimensions : Length 84–96µm, oral diameter 47–52µm.

Occurrence : In Strait of Hormoz December .

Distribution : Red Sea [25], Great Barrier Reef [14] and western tropical Pacific [17] .

25 – *Rhabdonella quantula* Kofoid and Campbell, 1929

Pl. III, Fig. 4

This species is longer than *R. poculum* and has a longer pedicel. The tubular lorica narrows more smoothly in the middle leading to a conical aboral end that ends with the long pedicel (about 1/3 of total length). The aboral cone has straight outline, not concave as in *R. poculum* . Numerous vertical ribs or lines are present. L/OD ratio is about 3.4.

Dimensions : Length 133µm, oral diameter 39µm.

Occurrence : In Strait of Hormoz , in December.

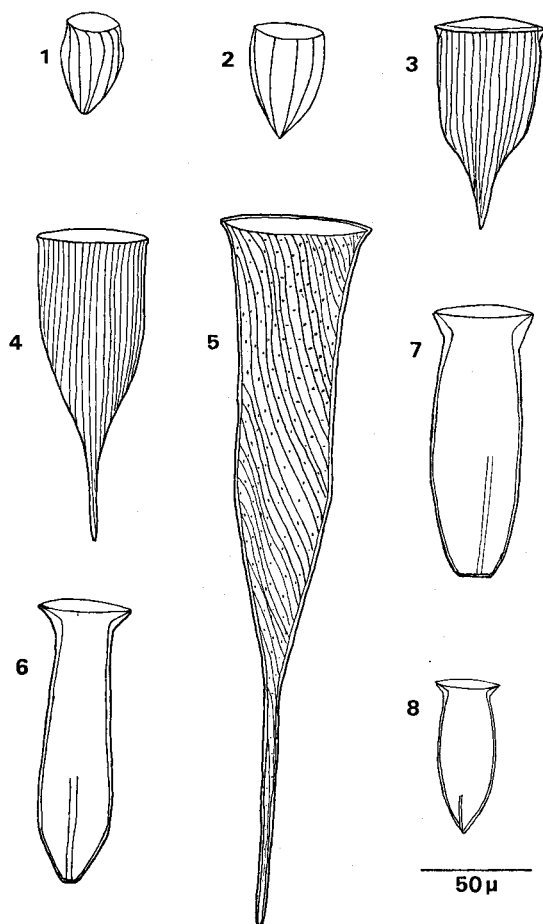


PLATE III

Distribution : Mexican, Californian, South Equatorial and Equatorial Counter, North Equatorial currents and Great Barrier Reef [14].

26 – *Rhabdonella spiralis* (Fol, 1881)

Pl. III, Fig. 5

This is a long species with a well marked oral flare. The upper 1/3 of the lorica is almost cylindrical in shape, then it tapers gradually to a long slender pedicel measuring almost 1/3 of the total length. Oral rim is not higher than lip. Numerous spiral ribs running from left to right and in between there are numerous, small, circular fenestrae. L/OD ratio is about 4.6.

Dimensions : Length 325µm, oral diameter 70µm.

Occurrence : In September, in Ras Al-Khaimah offshore waters.

Distribution : A cosmopolitan species, occurring in the Mediterranean, warmer regions of the Atlantic, Indian & Pacific Oceans and Great Barrier Reef [14].

Family : Tintinnidae

Genus : *Amphorella*

27 – *Amphorella brandti* (Jorgensen, 1924)

Pl. III, Fig. 6

This is a vase-shape species with a conical wide flaring collar and a tubular bowl. The lorica is narrowest just below the collar, widest in the lower 1/3 and ends with truncated closed aboral end. 3 longitudinal fins or ridges are running from the aboral tip to the lower third of the lorica. L/OD ratio is 2.5–2.9.

Dimensions : Length 117–127µm, oral diameter 44–47µm.

Occurrence : In December, Hormoz Strait; in January in Abu Dhabi Mangrove Creek.

Distribution : Mutsu Bay [20], Great Barrier Reef [14], western tropical Pacific [17].

28 – *Amphorella quadrilineata*  
(Claparede & Lachmann, 1858)

Pl. III, Fig. 7

This species is similar to *A. brandti* but differs in having a stouter lorica. Greatest width in the present form is at the middle of the bowl. According to (15), bowl may be wider above or below the middle. 3 fins on

the aboral region. L/OD ratio is about 2.6.

Dimensions : Length 122µm, oral diameter 47µm.

Occurrence : In Strait of Hormoz, in December.

Distribution : Widely distributed in northern temperate waters, Mediterranean and warm waters of the Atlantic, Indian & Pacific Oceans, Great Barrier Reef [14] and western tropical Pacific [17].

Genus : *Amphorellopsis*

29 – *Amphorellopsis acuta* (Schmidt, 1901)

Pl. III, Fig. 8

This species differs from *A. brandti* in being smaller in size and has a pointed aboral end. Three ridges are present on the lower half of the lorica. L/OD ratio is 2.2–3.0.

Dimensions : Length 68–94µm, oral diameter 31µm.

Occurrence : Ras Al-Khaimah Mangrove Creek in November.

Distribution : Gulf of Siam, West African Coast, Great Barrier Reef [14] and North Atlantic [23].

Genus : *Dadayiella*

30 – *Dadayiella bulbosa* (Brandt, 1906)

Pl. IV, Fig. 1

Hyaline species with tubular bowl. Oral region is slightly flaring with 9 primary and secondary ribs extending to the oral edge. Bowl with a slight constriction below mouth and a slight inflation in the middle, it ends with a short pedicel ending with a knob. L/OD ratio is 3.7.

Dimensions : Length 107–115µm, oral diameter 29–31µm.

Occurrence : In Strait of Hormoz in December.

Distribution : Canaries, Azores, Gulf Stream, Florida & Labrador Currents and Woods Hole region [15].

Genus : *Eutintinnus*

31 – *Eutintinnus exigua* Hada, 1932

Pl. IV, Fig. 2

A hyaline almost cylindrical species with straight sides which is open at both oral and aboral ends. Lorica is wider at the oral than the aboral end. Both ends are entire, oral only is slightly flaring and with a brim. L/OD ratio is about 3.4, aboral end is 0.7 of the oral diameter.

Dimensions : Length 151 $\mu$ m, oral diameter 44 $\mu$ m, aboral 32 $\mu$ m.

Occurrence : In Abu Dhabi Mangrove Creek, in January.

Distribution : Mutsu Bay [20].

Occurrence : In Abu Dhabi Mangrove Creek, In January.  
Distribution : Indian Ocean, Pacific Ocean, Mediterranean and warmer parts of the Atlantic [27], western tropical Pacific [17], North Atlantic between 20–50°N [23].

33 – *Eutintinnus lusus-undae* (Entz, 1885)

Pl. IV, Fig. 4

This species is similar to *E. exigua*, but it is longer and has a more marked flare ending with a brim. Aboral end with no flare. According to (14), two forms of this species are present : wide and slender forms. The present specimens fall in the slender group. Kofoid & Campbell, [12] put the present form under variety *tenuis* which is also a slender form of *T. lusus-undae*. L/OD ratio is 0.6–601 aboral is 0.6 of the oral diameter.

Dimensions : Length 256–283 $\mu$ m, OD 42–47 $\mu$ m, aboral 26–29 $\mu$ m.

Occurrence : Hormoz Strait, in December.

Distribution : Mediterranean Sea, Tropical Atlantic, Indo- Pacific region, Great Barrier Reef [14], western tropical Pacific [17] and North-East Atlantic between 35–42°N [23].

Genus : *Salpingella*

34 – *Salpingella attenuata* Jorgensen, 1924

Pl. IV, Fig. 5

A species with a long, slender lorica that resembles a long test-tube. The flaring collar is funnel-shaped, with a rim; while the bowl is long and tubular. Bowl becoming narrower in the lower quarter. Aboral end is truncated and open. 6 fins in the aboral region. L/OD ratio is 8.3–8.8.

Dimensions : Length 272–283 $\mu$ m, oral diameter 31–34 $\mu$ m.

Occurrence : In Strait of Hormoz in December.

Distribution : Mutsu Bay [20], Canaries, Azores and Gulf Stream [15].

35 – *Salpingella gracilis* Kofoid and Campbell, 1929

Pl. IV, Fig. 6

The species is similar to *S. attenuata* except that collar is slightly incurved and less flaring. 6–8 fins on the posterior end. L/OD ratio is about 8.5.

Dimensions : Length 262 $\mu$ m, oral diameter 31 $\mu$ m.

Occurrence : In Strait of Hormoz in December

Distribution : North Atlantic [23], Canaries, Azores,

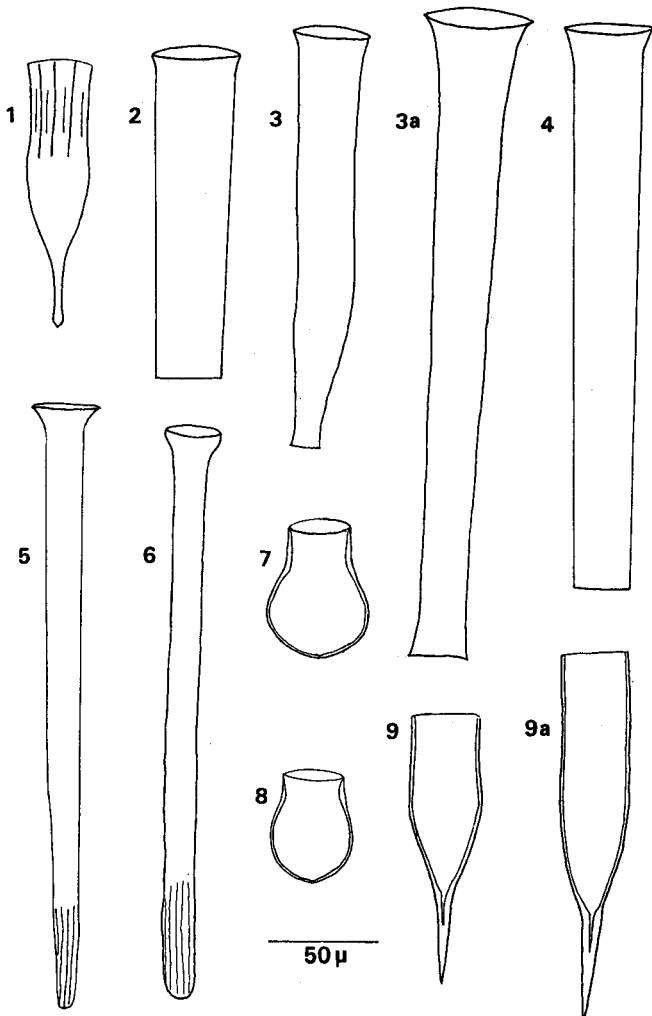


PLATE IV

32 – *Eutintinnus fraknoii* (Daday, 1887)

Pl. IV, Figs. 3 & 3a

The sides of the first form of this species are slightly curved especially in the lower third then narrows fast to a slightly flaring aboral end. Oral end has a well marked flare with a brim. The second form (Fig. 3a) is longer than the first and has an almost straight contour line ending with a sudden flare at the aboral end. L/OD ratio is 4.1–6.0. aboral end is 0.4 of the oral diameter.

Dimensions : Length 195–314 $\mu$ m, OD 47–52 $\mu$ m, aboral 18–21 $\mu$ m.



Gulf Stream, Florida & Labrador Currents, Woods Hole region [15].

Family : Undellidae

Genus : *Proplectella*

36 – *Proplectella expolita* Hada, 1932

Pl. IV, Fig.

A hyaline small species that resembles a round-bottom flask.

Collar is tubular thinning outwardly to a sharp, not flaring oral rim. Aboral region is widely rounded. Wall is more thicker at the end of the collar then it thins gradually towards the aboral end. L/OD ratio is 2.1–2.2.

Dimensions : Length 62–65 $\mu$ m, oral diameter 29–30 $\mu$ m.

Occurrence : Hormoz Strait, in December.

Distribution : Mutsu Bay [20].

37 – *Proplectella perpusilla* Kofoid and Campbell, 1929

Pl. IV, Fig. 8

Lorica of this species is pot-like. It is almost similar to the previous species except that collar is shorter, mouth is slightly flaring due to the thickening of the internal wall and the aboral end is more rounded. L/OD ratio is 1.5–1.9.

Dimensions : Length 45–52 $\mu$ m, oral diameter 27–31 $\mu$ m.

Occurrence : In Strait of Hormoz in December.

Distribution : Galapagos Eddy and widely in the Eastern Tropical Pacific [12], Great Barrier Reef [14].

Family : Xystonellidae

Genus : *Parundella*

38 – *Parundella longa* Jorgensen, 1924

Pl. IV, Figs. 9 & 9a

A hyaline species with a tubular lorica and an entire thin oral rim. The lorica contracts gradually in the lower half to form a conical aboral end that terminates with a somewhat long, slender pedicel. Lorica's wall is thicker in the pedicel. The lorica's cavity extends inside the pedicel forming a short hollow slender canal which is closed before the pointed tip of the pedicel. Another shorter form was also found which has a very slight expansion of the lower lorica. L/OD ratio is 3.5–5.5.

Dimensions : Length 109–169  $\mu$ m, oral diameter 31 $\mu$ m.

Occurrence : In Strait of Hormoz in December.

Distribution : Western basin of the Mediterranean off Spain [12], North Atlantic [23], South Europe, Canaries, Azores and Gulf Stream [15].

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