

List of tintinnids (Protozoa: Ciliata) in Uranouchi Inlet, Kochi, Japan

Miwa NAKAMACHI¹ and Nozomu IWASAKI²

¹ *Laboratory of Aquatic Ecology, Faculty of Agriculture, Tohoku University, Aoba-ku, Sendai, Miyagi 981-8555, Japan*

² *Usa Marine Biological Institute, Kochi University, Usa-cho, Tosa, Kochi 781-1164, Japan*

Abstract: Tintinnid fauna in Uranouchi Inlet, Kochi, was investigated during the period from January 1995 to May 1997 by taking samples at 3 stations from several depths at ten days or monthly intervals. As a result, 31 species belonging to 14 genera were identified, and 13 species out of them are new records from Uranouchi Inlet.

Key words: Tintinnids, Uranouchi Inlet, planktonic ciliates

INTRODUCTION

Uranouchi Inlet is a semi-enclosed eutrophic inlet and open to Tosa Bay only through a narrow and shallow mouth. Several plankton studies have been done, mainly on the seasonal variation of planktonic fauna and flora, diel vertical migration of microplankton and the red tide (Ueta, 1949, 1975, 1976; Ohno *et al.*, 1971, 1984; Hirota *et al.*, 1994; Matsumura *et al.*, 1995; Ueda *et al.*, 1998; Akizawa *et al.*, 1998). Some authors have reported tintinnid fauna (Ueta, 1949, 1976). Since the tintinnids play an important role in the aquatic food chain, a qualitative and quantitative investigation on tintinnids is further required. We investigated seasonal occurrence and vertical distribution of tintinnids in Uranouchi Inlet during January 1995 to May 1997. During this period, variability of lorica morphology of dominant species was observed. In this paper, a list of tintinnids which summarizes recent taxonomy of this taxon is given along with microphotographs of all species found.

MATERIALS AND METHODS

Sampling was carried out at three stations (Stn 1, 33°26.15'N 130°25.5'E; Stn 2, 33°26.19'N 130°23.41'E; Stn 3, 33°24.18'N 130°22.12'E) in Uranouchi Inlet during the period from January 1995 to May 1997. In the first year, January 1995 to January 1996, samples were collected at six depths (0 m, 2 m, 5 m, 10 m, 15 m and 1 m above the bottom) at three stations monthly. In the latter half, from May 1996 to May 1997, samples were collected every tenth day from the surface to the bottom at 2 m intervals at Stn 2. Water samples were taken with a Niskin water sampler and preserved in 1% neutralized formalin on board. The fixed samples were brought to land laboratory and concentrated by settling before microscopic examinations. Species identification and photographing were made either by normal or inverted microscope. Length, oral and aboral diameters of lorica were measured with an image analysis system (Olympus Flovel video micrometer model VM-30). Although several different ways of classifying tintinnids have been proposed, the systematic classification of Taniguchi (1997) has been adopted here as it is the most recent in this field.

LIST

Class Polyhymenophora
 Subclass Spirotrichia
 Order Oligotrichida
 Suborder Tintinnina
 Family Tintinnididae
 Genus *Tintinnidium*

1. *Tintinnidium mucicola* (Claparède & Lachmann) (Pl. 1, Fig. 1)
 Length 80-139 μm , oral diameter 31-51 μm .
 This is the first record from Uranouchi Inlet.

Genus *Leprotintinnus*

2. *Leprotintinnus nordqvisti* (Brandt) (Pl. 1, Fig. 2)
 Length 108-223 μm , oral diameter 33-44 μm , aboral diameter 56-95 μm .

Family Codonellidae
 Genus *Tintinnopsis*

3. *Tintinnopsis aperta* Brandt (Pl. 1, Fig. 3)
 Length 92-118 μm , oral diameter 16-26 μm .
 Ueta (1976) reported this species under the name of *T. sperta*.

4. *Tintinnopsis beroidea* Stein (Pl. 1, Figs 4 and 5)

T. beroidea is a highly variable species as shown in Figs 4 and 5. Many forms of this species have been described under different names which are now considered to be synonymous to this species. For example, the form shown in Pl. 1, Fig. 5 used to be identified as *T. nana*, but has been synonymized with *T. beroidea* by Bakker and Phaff (1976). The length and oral diameters of this form were shorter than those of the typical form as follows.

Typical form (Pl. 1, Fig. 4) - length 67-98 μm , oral diameter 21-27 μm ; variety form (Pl. 1, Fig. 5) - length 18-28 μm , oral diameter 10-14 μm .

T. angustior reported by Ueta (1976) was synonymized with this species by Taniguchi (1997).

5. *Tintinnopsis campanula* (Ehrenberg) (Pl. 1, Figs 6, 7 and 8)

T. campanula is also a variable species as shown in Figs 6, 7 and 8. Although one of the form shown in Pl. 1, Fig. 7 had been identified as *T. butschlii*, which was synonymized to *T. campanula* by Bakker and Phaff (1976). The characteristics of the form shown in Pl. 1, Fig. 7 are a widely flared oral rim and the absence of an aboral horn. Another form shown in Pl. 1, Fig. 8 used to be classified by the name of *T. elongata*, which has been synonymized with *T. campanula* by Bakker and Phaff (1976). The characteristics of the latter are thickly agglutinated particles and gradually narrowing aboral part.

Typical form (Pl. 1, Fig. 6) - length 116-161 μm , oral diameter 61-73 μm , aboral horn 31-47 μm ; variety form 1 (Pl. 1, Fig. 7) - length 64-93 μm , oral diameter 76-95 μm ; variety form 2 (Pl. 1, Fig. 8) - length 120 μm , oral diameter 35 μm .

6. *Tintinnopsis corniger* Hada (Pl. 1, Fig. 9)

Length 115-191 μm , oral diameter 28-34 μm , aboral horn 25-70 μm .

7. *Tintinnopsis cylindrica* Daday (Pl. 1, Fig. 10)
Length 106–155 μm , oral diameter 30–45 μm .
8. *Tintinnopsis dadayi* Kofoid (Pl. 1, Fig. 11)
Length 86–112 μm , oral diameter 36–61 μm .
T. directa reported by Ueta (1976) is a synonym of this species (Taniguchi, 1997).
9. *Tintinnopsis kofoidi* Hada (Pl. 1, Fig. 12)
Length 156–225 μm , oral diameter 33–45 μm , aboral horn 29–41 μm .
10. *Tintinnopsis lobiancoi* Daday (Pl. 2, Fig. 1)
Length 174 μm , oral diameter 40 μm .
T. subacuta reported by Ueta (1976) is synonym of this species (Halme and Lukkarinen, 1960).
11. *Tintinnopsis lohmanni* Lachmann (Pl. 2, Fig. 2)
Length 130 μm , oral diameter 60 μm .
This is the first record from Uranouchi Inlet.
12. *Tintinnopsis radix* (Imhof) (Pl. 2, Fig. 3)
Length 151–293 μm , oral diameter 31–49 μm .

Family Codonellopsidae

Genus *Stenosemella*

13. *Stenosemella nivalis* (Meunier) (Pl. 2, Fig. 4)
Length 34–39 μm .
This is the first record from Uranouchi Inlet.

Genus *Codonellopsis*

14. *Codonellopsis morchella* (Cleve) (Pl. 2, Fig. 5)
Length 94 μm , oral diameter 40 μm , length of the collar 22 μm .
15. *Codonellopsis nipponica* Hada (Pl. 2, Fig. 6)
Length 126–145 μm , oral diameter 56–65 μm , length of the collar 30–63 μm .
This is the first record from Uranouchi Inlet.
16. *Codonellopsis ostensfeldi* (Schmidt) (Pl. 2, Fig. 7)
Length 116 μm , oral diameter 30 μm , length of the collar 43 μm .

Family Metacylidae

Genus *Metacylis*

17. *Metacylis* sp. (Pl. 2, Fig. 8)
Length 85–95 μm , oral diameter 56–62 μm .
Although this specimen can be identified as *M. corbula* in general morphology, its size is very large, beyond reported range of size variation.
This is the first record of species of *Metacylis* from Uranouchi Inlet.

Genus *Helicostomella*18. *Helicostomella subulata* (Ehrenberg) (Pl. 2, Figs 9 and 10)

H. subulata is known as a polymorphous species as seen in Pl. 2, Figs 9 and 10, and used to be classified into several different species. The form shown in Pl. 2, Fig. 10 had been referred to *H. longa*, which is one of the synonymies of *H. subulata* (Margalef and Duran, 1953). The length of this form is shorter than typical form, but almost the same in oral diameter. In this form no triangular teeth are observed on the oral rim.

Typical form (Pl. 2, Fig. 9) - length 151-241 μm , oral diameter, 19-21 μm ; variety form (Pl. 2, Fig. 10) - length 71-82 μm , oral diameter 18-21 μm .

Ueta (1976) reported this species under the name of *H. longer*.

Family Dictyocystidae

Genus *Luminella*19. *Luminella parvicollis* (Marshall) (Pl. 2, Fig. 11)

Length 74-83 μm , oral diameter 27-42 μm , length of the collar 8-14 μm .

Stenosemella parvicollis reported by Ueta (1976) is a synonym of this species.

Family Ptychocylididae

Genus *Favella*20. *Favella ehrenbergii* (Claparède & Lachmann) (Pl. 2, Fig. 12)

Length 165-258 μm , oral diameter 63-95 μm , aboral horn 22-48 μm . Some specimens lack the aboral horn.

21. *Favella taraikaensis* Hada (Pl. 3, Figs 1 and 2)

Length 197-241 μm , oral diameter 68-74 μm , aboral horn 31-63 μm . Some specimens lack the aboral horn.

Morphological variation of *Favella* is sometimes unusually large. For example, the form shown in Pl. 3, Fig. 2 used to be classified as a species of Genus *Coxiella*. However, Laval-Peuto (1981) found that this form is a phenotype of *Favella* by laboratory culture experiments. Main characteristic of this coxliella form is the appearance of a spiral ring round the whole lorica.

Family Tintinnidae

Subfamily Tintinnae

Genus *Amphorides*22. *Amphorides quadrilineata* (Claparède & Lachmann) (Pl. 3, Fig. 3)

Length 152 μm , oral diameter 50 μm .

This is the first record from Uranouchi Inlet.

Genus *Amphorellopsis*23. *Amphorellopsis acuta* (Schmidt) (Pl. 3, Fig. 4)

Length 109-156 μm , oral diameter 36-42 μm .

Genus *Dadayiella*24. *Dadayiella ganymedes* (Entz, Sr.) (Pl. 3, Fig. 5)

Length 120 μm , oral diameter 30 μm .

This is the first record from Uranouchi Inlet.

Subfamily Salpingellinae

Genus *Eutintinnus*

25. *Eutintinnus apertus* (Kofoid & Campbell) (Pl. 3, Fig. 6)
Length 100 μm , oral diameter 32 μm , aboral diameter 11 μm .
This is the first record from Uranouchi Inlet.
26. *Eutintinnus fraknoi* (Daday) (Pl. 3, Fig. 7)
Length 170 μm , oral diameter 34 μm , aboral diameter 18 μm .
This is the first record from Uranouchi Inlet.
27. *Eutintinnus lususundae* (Entz, Sr.) (Pl. 3, Fig. 8)
Length 164-274 μm , oral diameter 37-58 μm , aboral diameter 25-37 μm .
28. *Eutintinnus rectus* (Wailes) (Pl. 3, Fig. 9)
Length 170-193 μm , oral diameter 37-51 μm , aboral diameter 28-42 μm .
This is the first record from Uranouchi Inlet.
29. *Eutintinnus tubulosus* (Ostenfeld) (Pl. 3, Fig. 10)
Length 45-116 μm , oral diameter 12-21 μm , aboral diameter 9-16 μm .

Genus *Salpingella*

30. *Salpingella faurei* Kofoid & Campbell (Pl. 3, Fig. 11)
Length 83-105 μm , oral diameter 15-18 μm .
This is the first record from Uranouchi Inlet.

Genus *Salpingacantha*

31. *Salpingacantha ampla* Kofoid & Campbell (Pl. 3, Fig. 12)
Length 246 μm , oral diameter 20 μm .
This is the first record from Uranouchi Inlet.

ACKNOWLEDGMENTS

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Plate 1

Fig. 1. *Tintinnidium mucicola* (Claparède & Lachmann).

Fig. 2. *Leprotintinnus nordqvisti* (Brandt).

Fig. 3. *Tintinnopsis aperta* Brandt.

Fig. 4. *Tintinnopsis beroidea* Stein, typical form.

Fig. 5. *Tintinnopsis beroidea* Stein, variety form.

Fig. 6. *Tintinnopsis campanula* (Ehrenberg), typical form.

Fig. 7. *Tintinnopsis campanula* (Ehrenberg), variety form 1.

Fig. 8. *Tintinnopsis campanula* (Ehrenberg), variety form 2.

Fig. 9. *Tintinnopsis corniger* Hada.

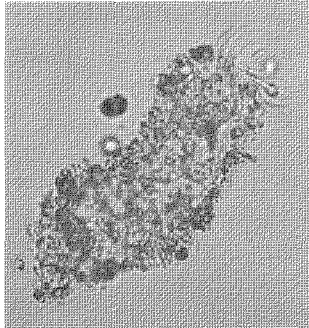
Fig. 10. *Tintinnopsis cylindrica* Daday.

Fig. 11. *Tintinnopsis dadayi* Kofoid.

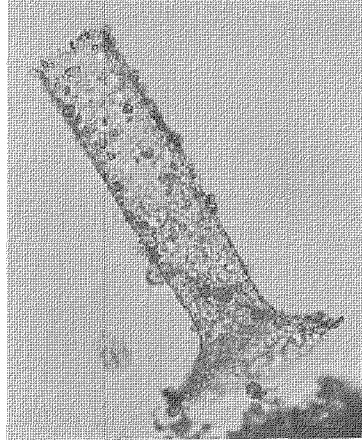
Fig. 12. *Tintinnopsis kofoidi* Hada.

Scale = 10 μ m.

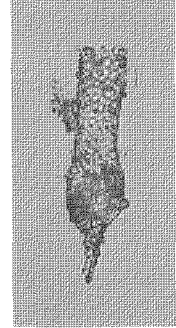
Plate 1



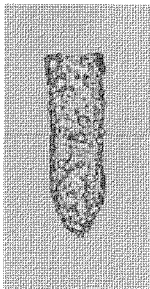
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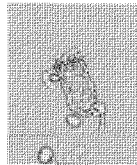
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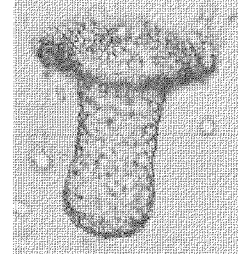
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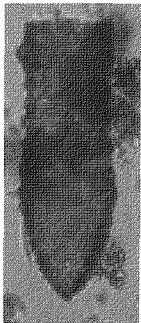
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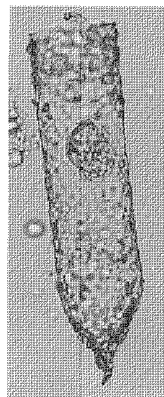
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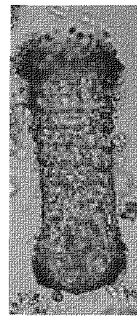
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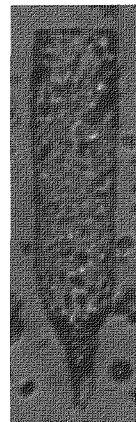
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Plate 2

Fig. 1. *Tintinnopsis lobiancoi* Daday.

Fig. 2. *Tintinnopsis lohmanni* Lachmann.

Fig. 3. *Tintinnopsis radix* (Imhof).

Fig. 4. *Stenosemella nivalis* (Meunier).

Fig. 5. *Codonellopsis morchella* (Cleve).

Fig. 6. *Codonellopsis nipponica* Hada.

Fig. 7. *Codonellopsis ostenfeldi* (Schmidt).

Fig. 8. *Metacylis* sp.

Fig. 9. *Helicostomella subulata* (Ehrenberg), typical form.

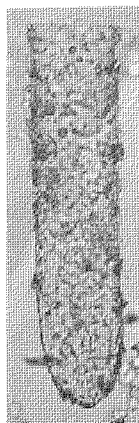
Fig. 10. *Helicostomella subulata* (Ehrenberg), variety form.

Fig. 11. *Luminella parvicollis* (Marshall).

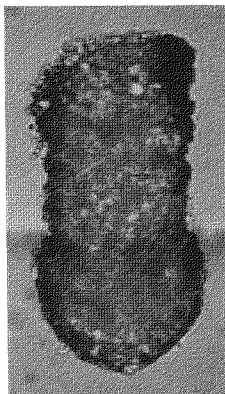
Fig. 12. *Favella ehrenbergii* (Claparède & Lachmann).

Scales = 10 μ m.

Plate 2



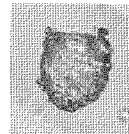
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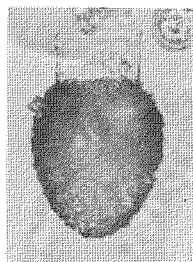


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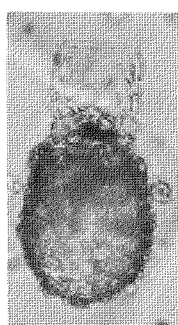
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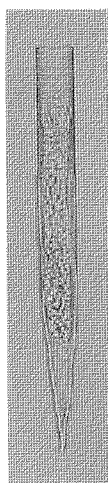
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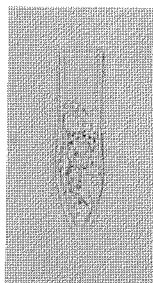
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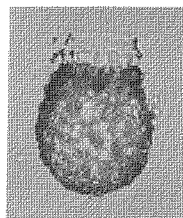
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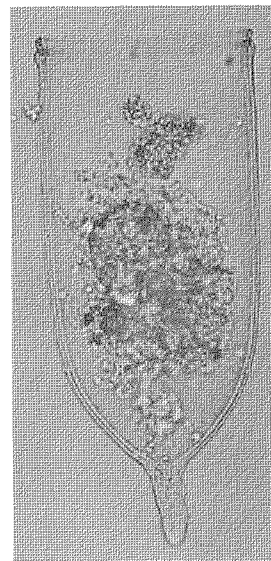
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Plate 3

Fig. 1. *Favella taraikaensis* Hada.

Fig. 2. *Favella* sp., coxliella form.

Fig. 3. *Amphorides quadrilineata* (Claparède & Lachmann).

Fig. 4. *Amphorellopsis acuta* (Schmidt).

Fig. 5. *Dadayiella ganymedes* (Entz, Sr.).

Fig. 6. *Eutintinnus apertus* (Kofoid & Campbell).

Fig. 7. *Eutintinnus fraknoii* (Daday).

Fig. 8. *Eutintinnus lususundae* (Entz, Sr.).

Fig. 9. *Eutintinnus rectus* (Wailes).

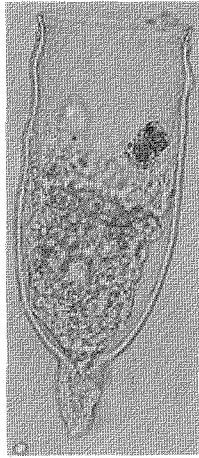
Fig. 10. *Eutintinnus tubulosus* (Ostenfeld).

Fig. 11. *Salpingella faurei* Kofoid & Campbell.

Fig. 12. *Salpingacantha ampla* Kofoid & Campbell.

Scale = 10 μ m.

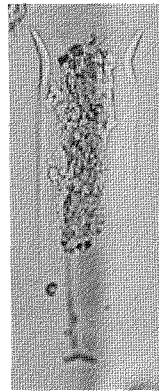
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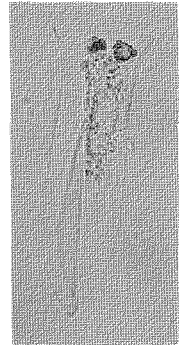
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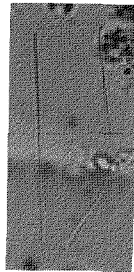
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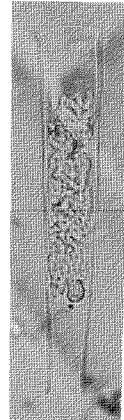
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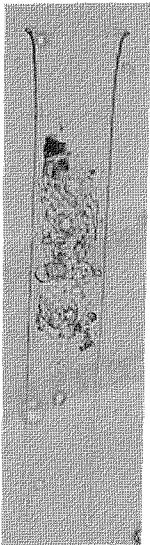
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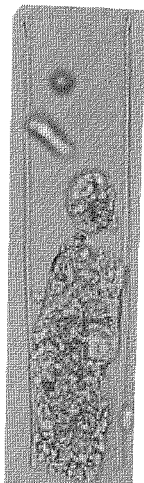
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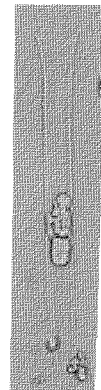
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