

NOTES ON THREE NEW SPECIES OF FRESH-WATER TINTINNOINEA

DASHU NIE

The following account consists of descriptions of three new species of Tintinnoinea recently discovered from the fresh-water of Nanking. It may be stated at the outset that the individuals of each of these species varies exceedingly both in form and in size, and when two individuals of the same species representing two extremes of the variation are observed simultaneously, they might be wrongly considered as different species. After a large number of loricae have been carefully studied and compared, the fact of belonging to a single species may be proved by gradually deviations within a wide range of the size or form. The details of the variation for two of these species are also represented in the following pages in addition to the description.

In the present study, observations were chiefly made on prepared specimens. Loricae were put on clean slides for drying, dehydrated in absolute alcohol, cleared in xylol and mounted in Canada balsam. All the figures were outlined with the aid of a camera lucida and magnified in the same proportion. The writer is very much indebted to Dr. C. C. Wang (王家楫博士) who had been so kind in giving him suggestion to prepare this paper.

Tintinnopsis wangi sp. nov.

Occurrence: This species was first noticed on December 25th, 1932 accompanied with *Tps. subpistillum* in the water samples collected from a pond near the 5th dormitory of the National Central university (國立中央大學學生第五宿舍) Nanking. The water of the pond is intensely green in colour, and almost filled up with large number of the species of *Euglena*, *Chilomon-*

as, *Chlamydomonas* and *Trachelomonas*. The individuals of the present species also occurred in great abundance during that time, as there were at least three or four individuals present in every drop of water taken from this particular pond. Since then, their number became gradually decreased and finally they disappeared altogether from the surface of the pond after January 15, 1933.

Tps. wangi was also found from Ho-hu (後湖) and other small ponds located near by the Biological Laboratory of the Science Society in the early part of February. Examination of the water samples collected from these localities during the months of March and April, however, failed to reveal any individual of this species.

Diagnosis (fig. 1): Lorica with collar and bowl distinctly represented, stout, flask-shaped, 1.7 oral diameter in length. Oral rim more or less irregular. Collar region nearly cylindrical, about 0.5 of the total length, distinctly provided with 4-6 subequal spiral annulations, each annulation probably representing a new cycle of growth. Bowl globular or rounded in form, 1.2 oral diameter in transdiameter at the posterior 0.3 of the total length. Wall thin and homogeneous, with coarse primary alveoli only, no foreign particles; the alveoli of the bowl much larger than those found in collar region. Colour orange brown.

Length of lorica 51.6μ in average.

This new species is characterized by the presence of distinct spiral annulations at the anterior portion of the lorica. The absence of secondary structures together with the attached foreign particles and the demarcation of the collar from bowl of the lorica are the important characteristics to differ the animal from other known species of this genus.

The living animal is companulate in form, and attached to the middle of the bottom of the lorica simply by the posterior prolongation of the body. The peristome is well developed and bordered by a thick and slightly elevated peristomial lip. The membranelles are rather long and prominent. Due to the opaque-

ness of the lorica, the structures of the body cilia, striations, and number of nuclei have not been especially studied.

The movements of *Tps. wangi* was observed under a binocular microscope in the petri dish with a sufficient quantity of water. The animal swims up and down very swiftly almost in a straight direction. When the animal intends to change its course of locomotion, it becomes at first, temporary motionless, either attaching to the substratum by its lorica or suspending quietly in water with its membranelles radiating out along the oral rim of the lorica. Sooner or latter, the animal begins to move again and a new direction is finally followed. *Tps. wangi* appears as a psychophilic species, as the individuals were usually observed to die off at the temperature 13° C. to 15° C., when the collected samples were kept in the laboratory for a short period of twenty four hours. Binary fission of the animal was found in one occasion and the process of the formation of new lorica was thus observed. At first, greenish yellow mucilagenous particles are seen to be given off between the living animal and its lorica in the form of an irregular mass. The mass gradually becomes larger and larger and more uniform in appearance until a rounded new lorica is performed. One of the daughter animals then entirely separates from its sister cell, leaves the old shell, and fits itself to the newly formed lorica. Finally the oral rim of the new lorica also becomes separated from the old one and both of the daughter animals begin to swim independently. The newly formed lorica is much shorter and pot-shaped provided with one annulation only. The wall appears thinner than in the old lorica and greenish yellow in colour.

Variation: As shown in 'figs. 4-12 the animal varies greatly in size, form, and number of annulations. These variations of the individuals were recorded not only from the different localities but also from the same one. Measurements of length and width were made on 100 individuals of the same locality from the prepared slides. The data are represented in graphs A, B, and C.

Graph A. shows that the length of the lorica varies from 35 μ to 61.1 μ . Most of the loricae of the animals are, however,

measured 51.6μ , which may be taken as an average length of the lorica of the animal. The shortest ones are probably young specimens just produced after binary divisions, while the longest may be either considered as variants or inherited from a taller race.

The ratio of the length to the width taken from these individuals is shown in graph B. It varies from 1.1 to 1.9, while 1.4 and 1.5 were recorded for the majority of the loricae of the animals.

Graph C. gives the variation of the number of annulations for the same 100 individuals. It ranges from 1 to 7, although 4 to 6 are rather common for the most individuals. Specimens possessing less than 4 annulations may be considered as young forms, since, as described above, each annulation probably represents a new cycle of growth.

The form of the bowl also tends to vary very greatly. They may be, however, grouped into two types; the one is globular or rounded in form (figs. 1 & 4-6), while the other is more or less conical (figs. 7-12).

This new species is named in honour of Professor C. C. Wang of the Biological Laboratory of the Science Society of China, Nanking, from whom I have received my first impetus towards the study of protozoological science.

Tintinnopsis sinensis sp. nov.

Occurrence: This species was first found during the early part of February 1933 from a small river, Chen-chu-ho, (珍珠河) nearby the Biological Laboratory of the Science Society of China. It was present in great abundance in association with few end-of-the-season stragglers of *Tps. wangi* in the latter part of this month, and it entirely disappeared in the middle part of March.

Diagnosis (fig. 2): Lorica elongate, 2.0 to 2.2 oral diameter in length, cylindrical anteriorly, slight expanded posteriorly. Oral rim ragged. Suboral region straight or slightly oblique, laid with several spiral turns, which is distinct in the region

just beneath the oral rim and gradually indistinct as it approaches to the middle portion of the lorica. Aboral region slightly enlarged, about 1.1 oral diameter in transdiameter; aboral end broadly rounded. Wall nearly uniform in thickness throughout the lorica, composed of a fine and less conspicuous alveolar structure, attached with many small rounded granules and some large and irregular foreign particles. Colour orange-brown.

Length of lorica 68.8μ in average.

Tps. sinensis is differed from *Tps. wangi* by (1) its large size of lorica, (2) the illegible demarcation of the color from the bowl, (3) less distinction of the form and number of spiral annulations and (4) the presence of heavily agglomerated foreign particles.

This species seems to be closely related with *Tps. tubulosoides* Meunier from Barents sea. In the latter species, the oral rim is rather flare and distinctly furnished with adherent spicules, and its aboral region does not extend like what has been observed in the present species.

The structure and habitat of the living animals are identical with those of the preceding species.

Variation (figs. 13-21): Individuals of this species tends to vary greatly as in the case of the preceding species. Measurements of length and width were made on 100 individuals from the same locality on prepared slides. The data are given in the graphs D and E.

Graph D. shows that the length of the lorica varies from 60.2μ to 86.0μ , while the highest presentage of the specimens is registered at 68.8μ . The ratio of the length to the width (Graph E) ranges from 1.6 to 2.1, with most of the individuals recorded at 1.8 and 1.9.

The variation in form of the lorica appears much greater than that of the preceding species. Different individuals may be, however, grouped in four types, and all of them represent a series of gradual deviations. In group 1 (figs. 13-15) the oral diameter of the lorica is rather narrow, the suboral region is

somewhat trapezoid, and the aboral end is globular. The lorica of group 2 (figs. 2, & 16-17) appears slightly differentiated into a cylindrical anterior portion and a feebly expanded aboral extremity, which is usually from round to broad-conical in form. In group 3 (fig. 18) the entire lorica is tubular with the diameter of the oral region somewhat equaling that of the aboral. The aboral end is either conical or subhemispherical. In contrast with the first group, the oral diameter of the lorica of the fourth group (figs. 19-21) is rather large. In addition to this, the oral rim is somewhat flare and the aboral region is usually rounded or conical.

***Tintinnopsis subpistillum* sp. nov.**

Occurrence: This species was found in company with *Tps. wangi* in the pond near the 5th dormitory of the National Central University, Nanking. The occurrence of this animal was rather rare as compared with *Tps. wangi* and *Tps. sinensis*. Only one lorica with living animal and two empty loricae have been thus far observed, and, therefore, no opportunity was afforded to study the variation of the species.

Diagnosis (fig. 3): Lorica pestle-shaped, 2.7 to 2.9 times oral diameter in length, oral rim irregularly ragged; suboral region cylindrical and slight narrowing at the region a little below the middle portion of the lorica, about 0.55 to 0.6 the total length. Aboral region slightly enlarged, convex, about 1.1 to 1.2 oral diameter in transdiameter; aboral end subspherical or rounded; wall thin, uniform in thickness, laid of many small rounded particles and some large and irregularly shaped fragments in addition to the fine and less conspicuous primary alveoli. Colour yellowish brown.

Length of lorica 96.9 μ to 98.9 μ .

This new species seems to be very closely related to *Tps. undella* Meunier, a marine species of Kara sea. However, it differs from the latter not only in the different habitats, but also in its larger size and longer proportion of the cylindrical suboral region. *Tps. subpistillum* also differs from *Tps. wangi* and *Tps. sinensis* in lack of spiral annulations.

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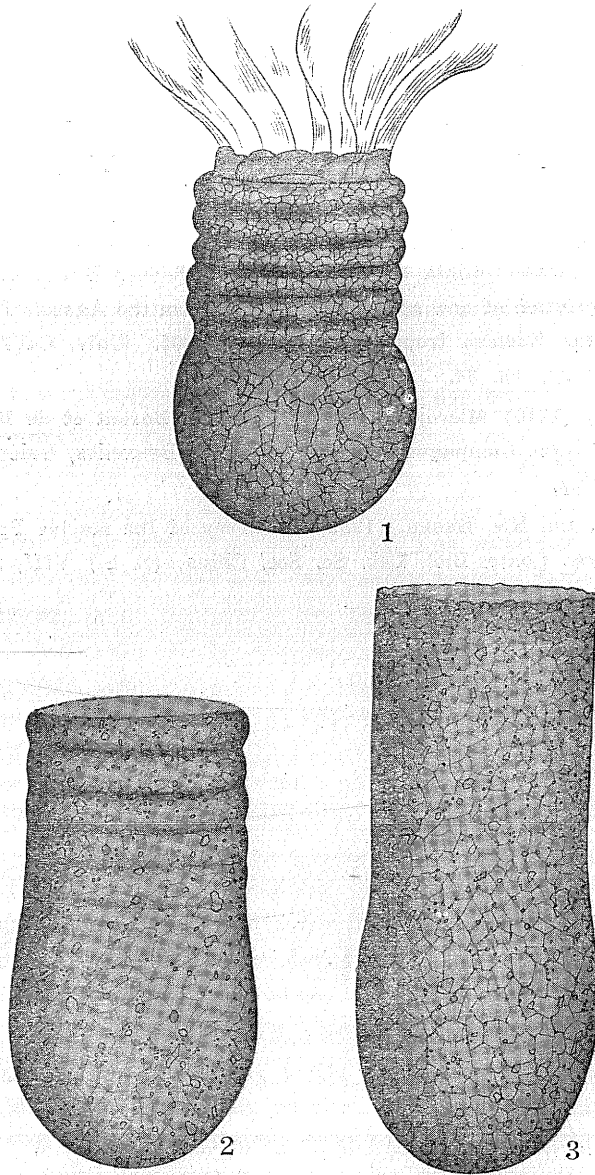


Plate I.

- Fig. 1 *Tintinnopsis wangi* sp. nov.
Fig. 2 *Tintinnopsis sinensis* sp. nov.
Fig. 3 *Tintinnopsis subpistillum* sp. nov.

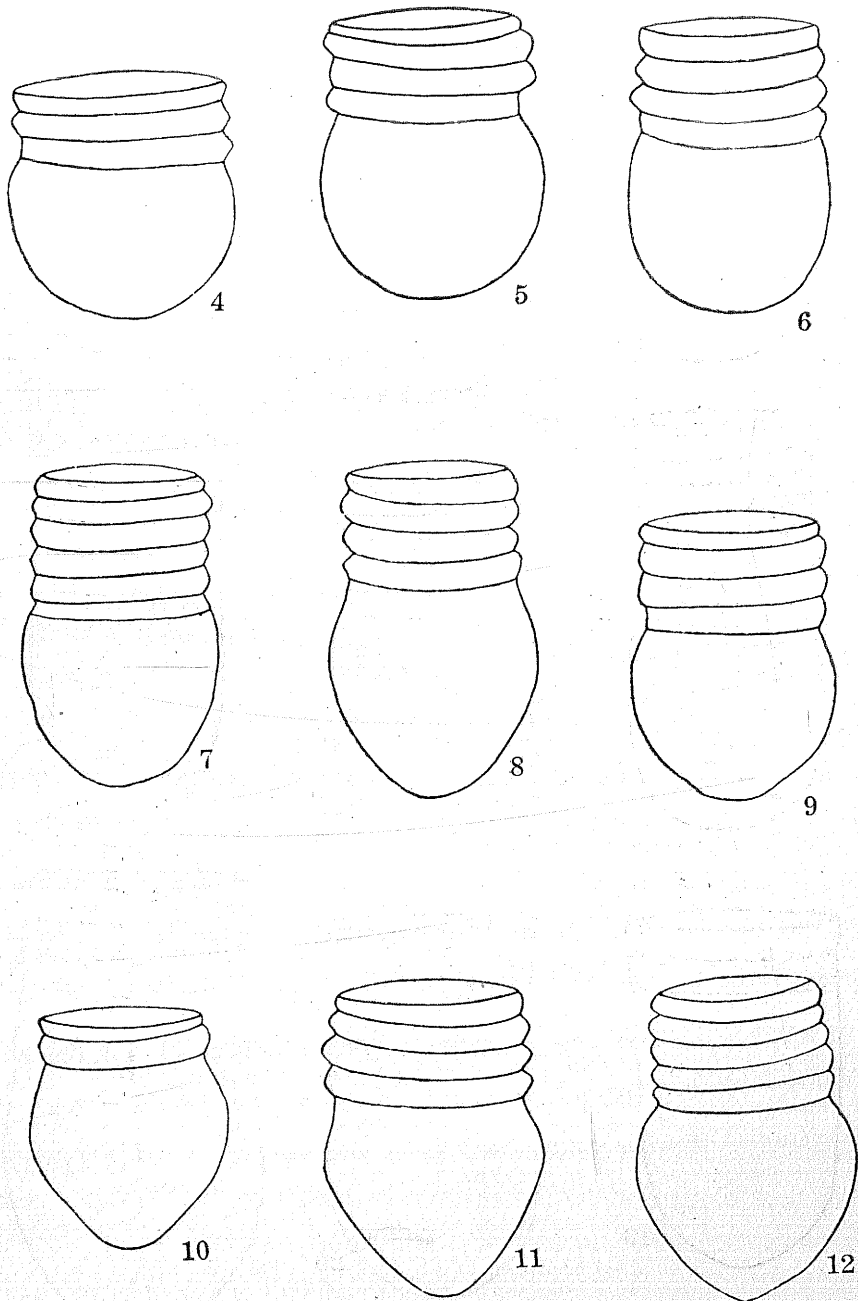


Plate II.

Figs. 4-12 *Tintinnopsis wangi*, showing its variation in size, form and number of annulations.

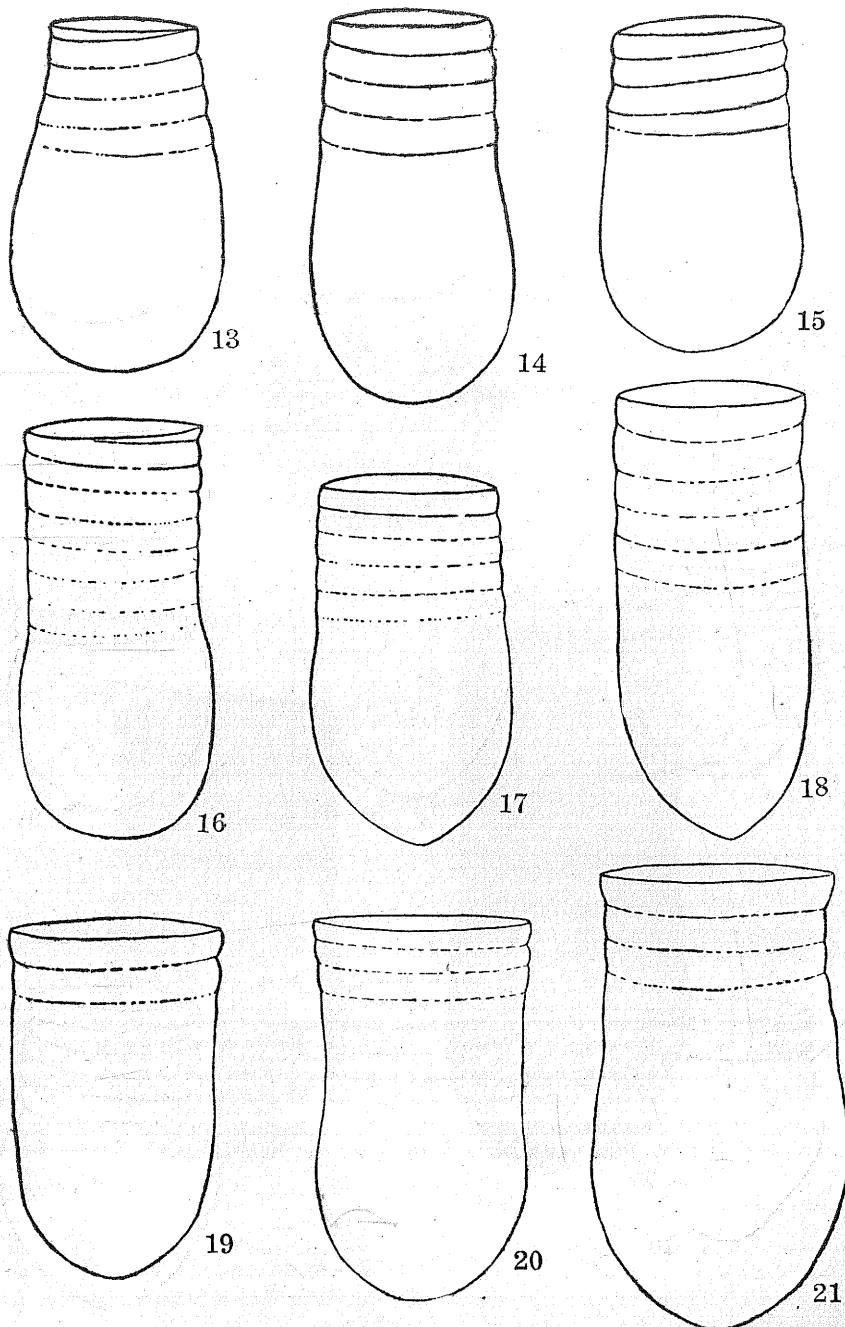


Plate III.

Figs. 13-21 *Tintinnopsis sinensis*, showing its variation in size, form and illegible spiral annulations.

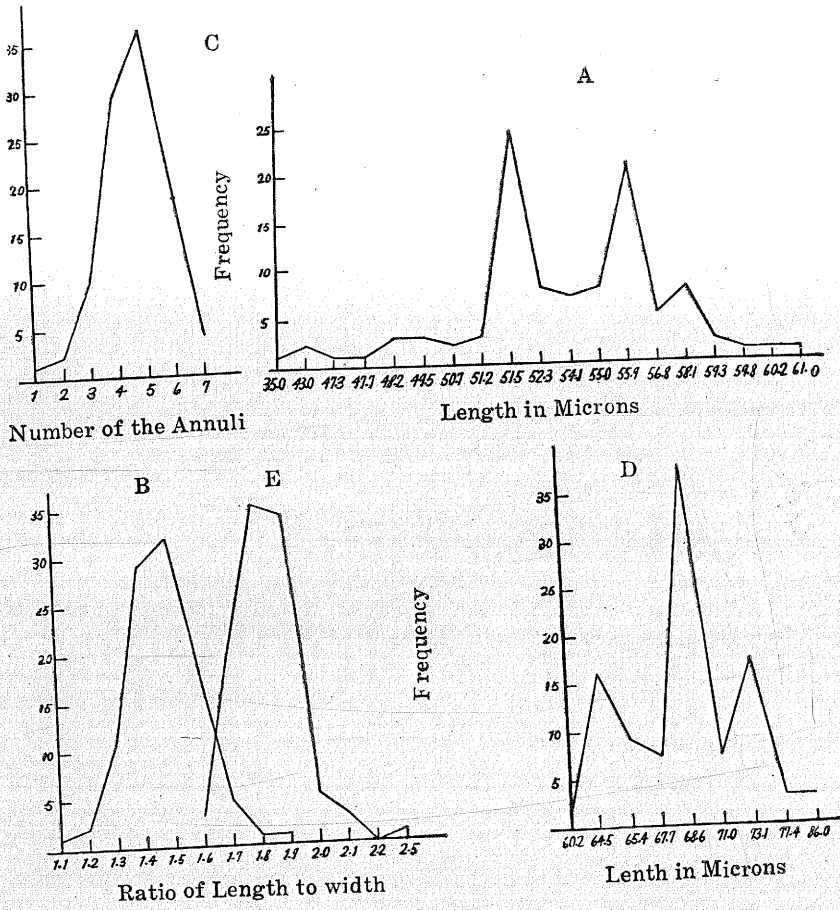


Plate IV.

- Graph A. showing the variation of the length of 100 loricae of *Tintinnopsis wangi*.
- Graph B & E. showing the ratio of length to the width of 100 loricae of *Tintinnopsis wangi* and *Tintinnopsis sinensis*.
- Graph C. showing the variation of the number of annulations of 100 loricae of *Tintinnopsis wangi*.
- Graph D. showing the variation of the length of 100 loricae of *Tintinnopsis sinensis*.