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Title	On the Frequent Occurrence of Fresh-water Medusae in Japan (With 2 Text-figures)
Author(s)	UCHIDA, Tohru
Citation	北海道大學理學部紀要, 10(2), 157-160
Issue Date	1951-03
Doc URL	https://hdl.handle.net/2115/27090
Type	departmental bulletin paper
File Information	10(2)_P157-160.pdf



On the Frequent Occurrence of Fresh-water Medusae in Japan¹⁾

By

Tohru Uchida

(Zoological Institute, Faculty of Science, Hokkaido University)

(With 2 Text-figures)

During these several years there has been reported on rather frequent occurrence of fresh-water medusae in several localities in Japan as follows :

1) Many fresh-water medusae were discovered in a pool near the Tama River in Tokyo on Sept. 2, 1946 (*vide* Komai, 1947).

2) From 200 to 300 fresh-water medusae were collected in a concrete tank in the Seian Girls' School in the city of Kyoto in September, 1946. The tank is connected with the water reservoir and contained at that time slight amount of the water plant *Elodea* and several green algae. Many polyps were found attached to miscellaneous objects submerged in the water (*vide* Komai, 1947). Since then the fresh-water medusae are found from summer to autumn every year.

3) Many fresh-water medusae were obtained by Mr. M. Okamoto from a concrete tank in the environs of the city of Yokohama in the autumn, 1947. The specimens were intrusted to the writer by Mr. H. Ishizuka of the Niigata University.

4) Numerous fresh-water medusae were found in a concrete tank in the town Yanagawa, Daté District, Fukushima Pref. at the end of July, 1949. The tank constructed three years ago is 5 m × 6 m and 2 m in depth, and when the medusae were found, it contained a few fishes and copepods. The water of the tank was 5.4-5.8 in pH and was led by the iron tube from the reservoir, 150 m apart, in which no medusa was found. The medusae gradually decreased in size and number in September. The note on the medusae and medusan specimens were sent to the writer by Mr. S. Anzai of the Yasuhara High School and then through the kindness of Miss H. Ban of the Ochanomizu University another note of the medusa by Miss S. Shishido was secured.

5) Many fresh-water medusae were discovered in two localities in the city of Toyama in August, 1949. They were found together with the water-plants, *Spirogyra* and *Chlorella*, in an elliptical concrete tank, 18 m in circumference and 80 cm in depth, which was constructed a few years ago. The pH of the water was 7.6. The medusae appeared in August-September, 1950. A short note on the medusae was presented to the writer by Prof. T. Ueki of the Toyama University.

1) Contribution No. 248 from the Zoological Institute, Faculty of Science, Hokkaido University.

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 10, 1951.

6) Numerous fresh-water medusae were found in a pond and the reservoir near the Fishery Laboratory in the vicinity of Nagasaki City in November, 1949. Several photographs and specimens of the medusae were sent by Mr. M. Oka to the writer.

As shown in the reports above given the fresh-water medusae have been found in several localities of Honshu and Kyushu, especially in these several years after the war. It is noticeable that the medusae were at first discovered in concrete tanks recently made in the cities of busy traffic as Tokyo and Yokohama. They seem to be liberated in summer from the polyp and disappear before the end of autumn. The medusae so far examined by the writer seem to be all identified with *Craspedacusta sowerbii* Lankester which is widely distributed in Europe, China and North America. Concerning the fresh-water medusae in Japan A. Oka and M. Hara (1922) were the first to record a new species, *Craspedacusta iseana* from an old well in the town Tsu, Ise. Several years later Amemiya (1929) reported from his laboratory the medusa, *C. sowerbii* accidentally appeared in an aquarium rearing tropical fishes. Recently T. Komai (1947) reported the occurrence of *C. sowerbii* in the vicinity of Tokyo and in the city of Kyoto both in September, 1946 as in the records above given. He compared the specimens from these localities with a single preserved specimen of *C. iseana* and came to the conclusion that the two species must be separated mainly due to the form-difference of statocysts and tentacles.

At the present time, the fresh water medusae belonging to the genus, in spite of veritable complexity of synonymies and so wide distribution, have been reduced to the single species *C. sowerbii* except with the Japanese species by Oka and Hara. The differences of the two species enumerated by the previous authors and Komai (1947) can be summarized as follows :

<i>C. sowerbii</i>	<i>C. iseana</i>
1. The statocysts are tubular, and extend within the tissue of the velum nearly to the margin ;	The statocysts are globular like those in ordinary Leptomedusae ;
2. The nematocysts on tentacles are crowded on papilla-like processes.	The nematocysts on tentacles are scattered.

Among the Hydromedusae the statocysts of *C. sowerbii* are unique in form in sending the centrifugal canals within the mesogloea of velum, while the statocysts of *C. iseana* so far described are globular and in general similar to those of the Olindiadae. In this point the two medusae are markedly separated. So far as the writer's observations go, the statocysts of *C. sowerbii* are clearly observable in preserved specimens ; some of them nearly straight but some undulating, and some extending to the free margin of velum while some very short (Fig. 1). The writer examined a single preserved specimen of *C. iseana*, of which the velum was very obscure and the marginal portion was exceedingly folded as is indicated in the figure by Oka and Hara. On careful examination he could not ascertain the presence of the centrifugal canals. Therefore, the present writer (1929) described the

medusa under the name of *C. iseana*. It is highly probable that Komai reexamined the very specimen, in which he also failed to see the velar canals in the medusa. As to the state of nematocysts of tentacles, whether clustered on papilla-like processes or scattered on the whole shaft, the writer is of opinion that the distribution of nematocysts is different in places in one tentacle. The nematocysts are in general thickly set near the tip of the tentacle but sparsely scattered near the base as shown in Fig. 2 drawn from *C. sowerbii* from Fukushima Pref. Moreover, the distribution of the nematocysts is seemingly different in tentacles by the state of contraction even in tentacles in one individual. The similar fact can be seen, more or less, in most of Hydromedusae. Komai further pointed out difference between *C. sowerbii* and *C. iseana* in regard to the correlation of tentacle-number and bell-diameter, but in medusae so easily contractile as *Craspedacusta* and *Gonionema* the correlation cannot be precisely measured. At any rate, Oka and Hara's specimens were not in full-grown stage, though gonads were already developed. In the present state we can as yet unite *C. iseana* to *C. sowerbii*, but to verify the separation of the Japanese species further examination of more specimens, especially of living ones, seems to be necessary.

Reasons of the frequent occurrence. For the reasons why the fresh-water medusa suddenly appeared so frequently and in different localities in Japan, the following surmise seems to be possible. The species was probably imported after the war by some of Japanese so many returned from the drainage-basin of the Yangtsu River or by some of American soldiers of the occupatory army came from the drainage-basin of the Kentucky River. In the two large rivers and their tributaries the fresh-water medusa is found all the

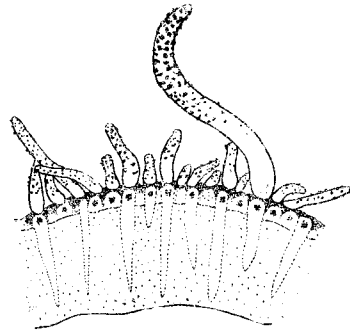


Fig. 1. A part of the velar margin of *Craspedacusta sowerbii* from Fukushima Pref., showing tentacles, statocysts and centrifugal canals.

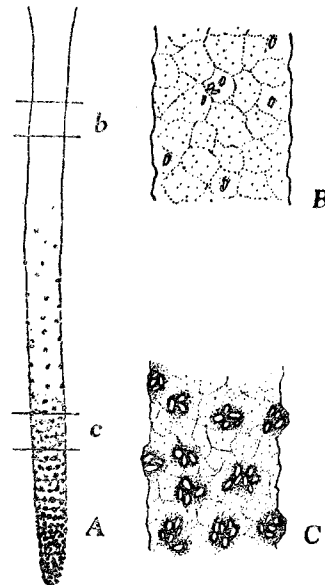


Fig. 2. A. A tentacle moderately contracted, the parts b and c each corresponding to Figs. B and C respectively. C and B highly magnified.

year round. The import of the medusa is not always caused to be carried together with water-plants or fishes. It can be further supposed that the medusa has been transported in the state of some dried form as is seen in rotifers, nematodes, tardigrads and Protozoa. Besides in some fresh-water immigrants of marine animals, the peculiar adaptation to dried condition is known as in the statoblast in the fresh-water Bryozoa and the gemmule in the fresh-water sponges. For the fresh-water polyps and medusae the similar case is also probable. Besides, it is often observed that the fresh-water polyp, *Hydra vulgaris* appears every spring in some pools which are always dried up in summer. The fresh-water coelenterates have possibly a peculiar adaptation to aridity. The dried form of them, when met with the water of favourable conditions, probably becomes active and grows to a polyp which gives rise to medusae later on.

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