

Studies on Planktonic Blue-green Algae 7.
Anabaena pseudocompacta sp. nov. from Eutrophic
Lakes in Central Japan

By

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Abstract A new species from eutrophic lakes in central Japan, *Anabaena pseudocompacta* M. Watanabe, is described. The alga is characterized by regularly twisted and closely contracted trichomes, and is superficially most similar to *A. compacta* (Nygaard) Hickel but has longer akinetes and larger vegetative cells.

The present alga was originally recorded from Lake Kasumigaura as *Anabaena spiroides* Klebahn f. *spiroides* by Watanabe and Chihara in 1980. In a previous paper, because of the lack of morphological information, especially on akinetes in natural samples, observations were based on cultures which enabled observations of akinetes. During the taxonomical studies of bloom-forming cyanophytes in Chiba Prefecture, central Japan, the author found the same alga forming akinetes in some natural samples collected from two eutrophic lakes, Lake Teganuma and Lake Inbanuma. Through detailed observations, the alga was confirmed to be different from *A. spiroides* and any other related taxa and thus declared to be a new species.

Materials and Methods

The first sample was collected from Lake Teganuma in September 1989 by Dr. M. F. Watanabe of the Tokyo Metropolitan Research Laboratory of Public Health. Further samples containing the same alga were collected several times in the summer of 1995 from Lake Teganuma and Lake Inbanuma by the author. All samples were fixed with formalin and preserved in the herbarium of the National Science Museum, Tokyo (TNS).

Specimens examined: 53621 September 12th, 1989, M. F. Watanabe, Lake Teganuma; 53704 July 29th, 1995, M. Watanabe, Lake Teganuma; 53705 July 29th, 1995, M. Watanabe, Lake Teganuma; 53711 September 23rd, 1995, M. Watanabe, Lake Inbanuma.

Results and Discussions

The species under study, *Anabaena* sp. was found in most of the specimens collected during the summer from Lake Teganuma and Lake Inbanuma. The alga is characterized by regularly twisted and closely contracted trichomes as well as by elliptical and slightly curved akinetes. It is superficially most similar to *Anabaena compacta* (Nygaard) Hickel (Basionym *Anabaena spiroides* var. *minima* f. *compacta* Nygaard), whose akinetes show smaller length/width ratios and cells have smaller dimensions than those of the present alga. The length/width ratios of akinetes in the alga are 1.8–2.6 and those in *A. compacta* are 1.2–1.4. *Anabaena reniformis* Lemmermann is another similar looking alga; however it differs in producing reniform cells and spherical akinetes. *Anabaena* sp. is similar to the common species *A. spiroides* (Komárek 1958, Komárková-Legnerová & Eloranta 1992, etc.) in shape of vegetative cells and in akinete morphology but differs in diameter of trichome coils. Though *A. spiroides* var. *spiroides* is one of the most widely recorded species, many of these records do not mention akinete morphology. For the Japanese cases, at least, the author believes that many *Anabaena spiroides* in previous papers might be identified as *A. compacta* (Nygaard) Hickel, *A. crassa* (Lemmermann) Komárková-Legnerová & Cronberg, *A. oumiana* M. Watanabe, *A. ucrainica* (Schkorbátov) M. Watanabe, etc. (Watanabe 1996). Klebahn (1895) described *Anabaena spiroides* and its variety *contracta*. This variety is also comparable with the present alga in smaller coil diameter; however the morphology of the akinetes of this variety is still largely unknown. The mature akinetes of this variety are known to be wider than $14\text{ }\mu\text{m}$ at least and are discontinuously wider than those of the present alga. *Anabaena longicellularis* (Pankow) Komárková-Legnerová & Eloranta is also similar to the present alga, but its vegetative cells are cylindrical and longer than those of the present alga. As shown above and in Table 1, *Anabaena* sp. differs from any of the known *Anabaena*, thus the author proposes to designate it as a new species.

***Anabaena pseudocompacta* M. Watanabe, sp. nov.**

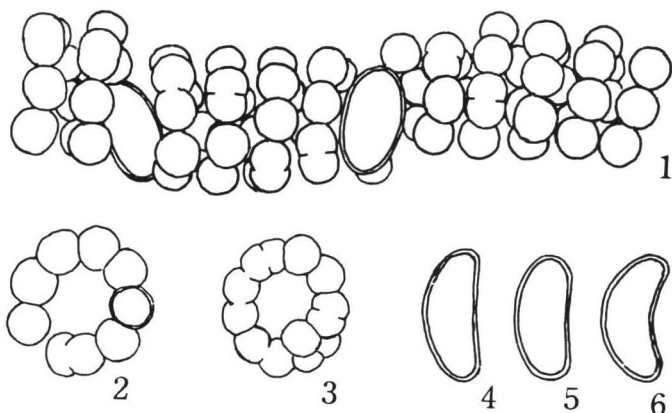
Trichomata libere natantia, solitaria, regulariter circinata, sine vaginis mucosis. Cellulae vacuolis gaseosis includentes, sphaeroideae vel cupiformes, $5.2\text{--}7\text{ }\mu\text{m}$ latae, $3\text{--}6.8\text{ }\mu\text{m}$ longae. Heterocytae sphaericae, $5.5\text{--}7.5\text{ }\mu\text{m}$ latae. Akineta ellipsoidea, interdum leviter curvata aut asymmetricè curvata (paene stricta ad latus interius), $7.5\text{--}11.3\text{ }\mu\text{m}$ lata, $16.8\text{--}21.3\text{ }\mu\text{m}$ longa, 1.8–2.6 plo longiora quam latiora, ab heterocytis remota. Spirae regulares, generaliter arte contractae, $18\text{--}24\text{ }\mu\text{m}$ latae, $50\text{--}250\text{ }\mu\text{m}$ longae.

Iconotypus: Figurae 1–6.

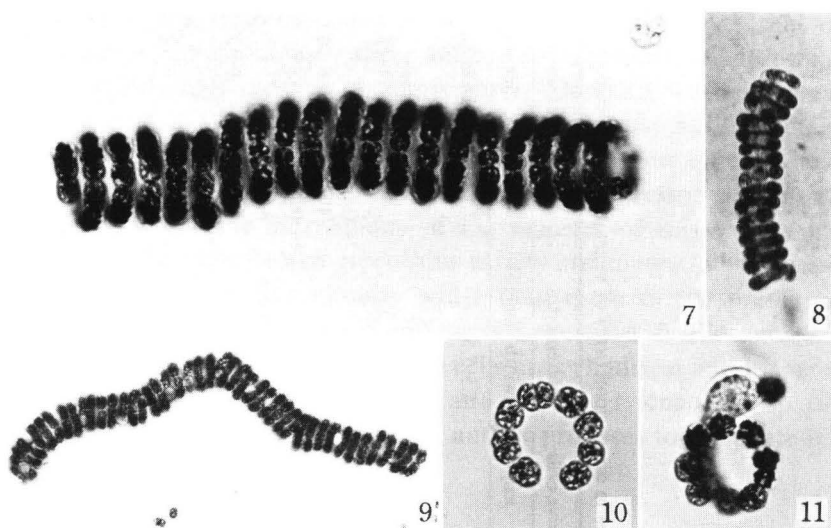
Locus typicus: in lacu Teganuma, Chiba, Japoniae.

Table 1. Differences in dimensions (μm) of vegetative cells, heterocytes, akinetes and coils among the related taxa.

Species	Vegetative cells		Heterocytes		Akinetes			Coils		Source of data
	width	length	width	length	width	length	l/w ratios	width	distance	
<i>Anabaena pseudocompacta</i> nov. sp.	5.5–6.8		5.5–7.5		7.5–11.3	16.8–21.3	1.8–2.6	18–20	7	Watanabe & Chihara 1981, p. 86
	5.2–7	3–6.8						18–24	5.8–7.5(–20)	(L. Teganuma, no. 53621)
<i>A. compacta</i>	4–5		5.5–6		8–10.5	11–12.5	1.2–1.4	11–16	4–12	Nygaard 1949, p. 204
<i>A. spiroides</i> v. <i>spiroides</i>	6.5–8		7		14 (immature)		?	45–54	40–50	Klebahn 1895, p. 268
	6–8(–9)	4–8	6.5–10		10–14	17.6–20.8	(1.4–1.8)			Komárek 1958, p. 139
v. <i>contracta</i>	7–8		7		14 (immature)		?	20–25	10–15	Nygaard 1949, p. 206
<i>A. reniformis</i>	4–5.5	6–8	4.2–7	4.2–8	8.5–11		(± 1)	12–23	10–12	Elenkin 1938, p. 766
<i>A. longicellularis</i>	5–6	6–10(–16)	5–6		8–11	9–12	1–1.5	20–28	8–12	Pankow 1965, p. 164



Figs. 1–6. *Anabaena pseudocompacta* sp. nov. 1. A trichome with akinetes. 2, 3. Two helices of trichomes. 4–6. Akinetes. All: $\times 1000$ (all from Lake Teganuma, September 12th, 1989).



Figs. 7–11. *Anabaena pseudocompacta* sp. nov. 7–9. Trichomes. 8. A trichome treated with ink shows absence of thick mucous sheath. 10. A helix of a trichome. 11. A helix of a trichome with an akinete. 7, 10, 11: $\times 600$, 8, 9: $\times 300$ (all from Lake Teganuma, September 12th, 1989).

Trichomes free-floating, solitary, regularly twisted (Figs 1, 7–9), without mucilaginous sheath (Fig. 8). Cells with gas vesicles, spherical or barrel-shaped (Figs 2, 3, 10), $5.2\text{--}7\text{ }\mu\text{m}$ wide, $3\text{--}6.8\text{ }\mu\text{m}$ long. Heterocytes spherical, $5.5\text{--}7.5\text{ }\mu\text{m}$ wide. Akinetes ellipsoidal, sometimes slightly curved or asymmetrically curved (nearly straight at the inner side), $7.5\text{--}11.3\text{ }\mu\text{m}$ wide, $16.8\text{--}21.3\text{ }\mu\text{m}$ long, $1.8\text{--}2.6$

times longer than wide (Figs. 4–6, 11), remote from heterocytes. Coils regularly twisted, generally closely contracted, 18–24 μm wide, 50–250 μm long.

Table 1 shows dimensions of vegetative cells, heterocytes, akinetes and coils among the taxa similar to the new species.

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