

Central Marine Fisheries Research Unit, University Campus, Madras 5, India

**On *Ruttnera pringsheimii* sp. nov. (Chrysophyceae)
from the Coastal Waters of India***

By

R. SUBRAHMANYAN

With 12 Figures in the Text

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The alga which forms the subject of this account occurs in the coastal waters of India and has been observed in the plankton collection during the last eleven years. On one occasion, in March 1955, there was a bloom of this alga in the sea off Calicut on the west coast, discolouring the water yellowish-green. Unlike in several other instances (SUBRAHMANYAN 1959, pp. 159—160), in this instance, no deleterious effect was noticed on other marine organisms during the intense bloom of this alga.

The material was studied principally in the living state, but was also fixed in ALLEN's modification of BOULIN's fluid (PFA₃) and stained in HEIDENHAIN's iron-alum hematoxylin.

Description

The mature thallus consists of a mucilaginous amorphous globular mass, sometimes out of shape, attaining a size of 1.5—2 mm across. To the bare eye, the colonies appear as tiny white specks. The mucilage is not tough or striated as in some of the other palmelloid *Chrysophyceae*. Within this mucilage hundreds of cells are found embedded (Figs. 1, 2 and 3).

Individual cells are globular (3μ in diameter) to broadly ellipsoidal/rectangular with rounded corners ($4.5 \mu \times 3 \mu$), at times drawn in at the middle (beginning of a division? Figs. 1, 2, 4, 5 and 7). Each cell possesses two chromatophores, yellowish-green in colour, more or less bean-shaped, parietally placed. Adpressed to the chromatophore, a strongly refractive body, stained intensely by iron-alum hematoxylin, is seen often, probably a pyrenoid (Fig. 5p, and in Fig. 8). Some glistening globules and a nucleus could also be made out, former in living specimens and latter in stained preparations (Fig. 8b). Two or three tiny vacuoles (not contractile) are present in the cytoplasm.

The cells multiply within the mucilaginous environment by successive divisions (Fig. 8a), the divisions taking place in the middle, in the vertical or longitudinal plane confirmed during divisions concerned with

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swarmer formation. The chromatophores have been observed divided prior to division of the cell as well as to divide after division of cell had taken place (Fig.4) and eventually orient themselves parietally in the daughter cells.

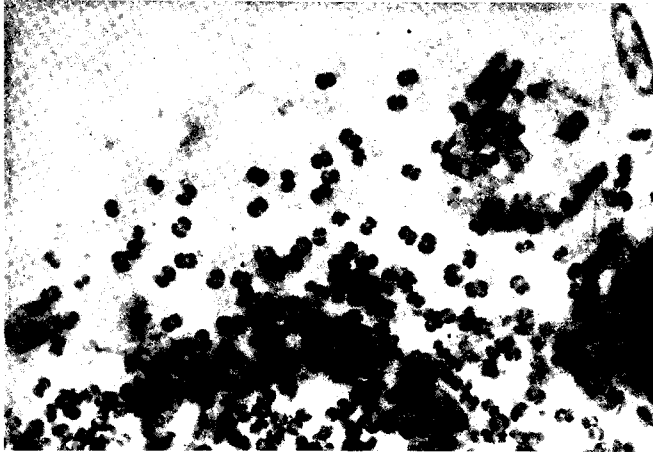


Fig. 1

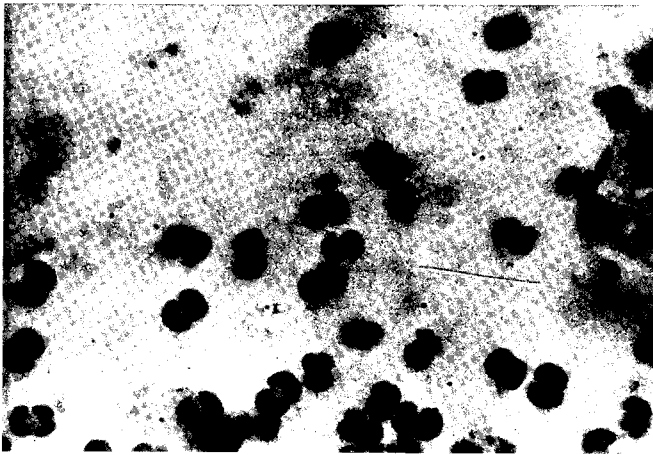
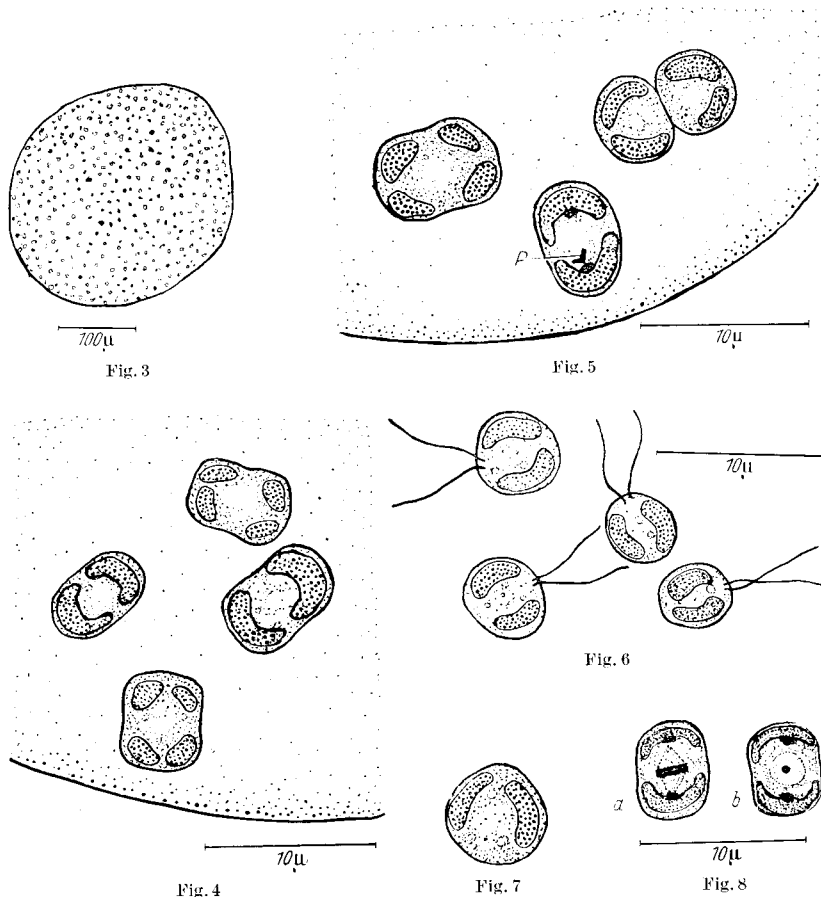


Fig. 2

Figs. 1 and 2. *Rutilera pringsheimii* spec. nov. Photomicrograph of adult colony (portion) showing characteristic cells. Material fixed in PFA₃ and stained in Heidenhain's iron-alum hematoxylin. In Fig. 1, some diatoms (*Fragilaria oceanica*) may be seen sticking to the colony. Fig. 1, \times approx. 600; Fig. 2, \times approx. 1,500

Swarmer formation appears to take place only in the large old colonies. This was observed in May 1952 and again in July 1953. In this instance, division of cell occurs as during vegetative multiplication described above, but, in addition, each daughter cell develops two flagella which are equal in length (Figs. 5 and 6). The chromatophores change

their orientation to lie at the sides in the body of the swarmer (cf. Figs. 5 and 6). The swarmers are almost round, show slight metaboly. No contractile vacuoles or stigma (eye spot) could be noticed. The mother cells

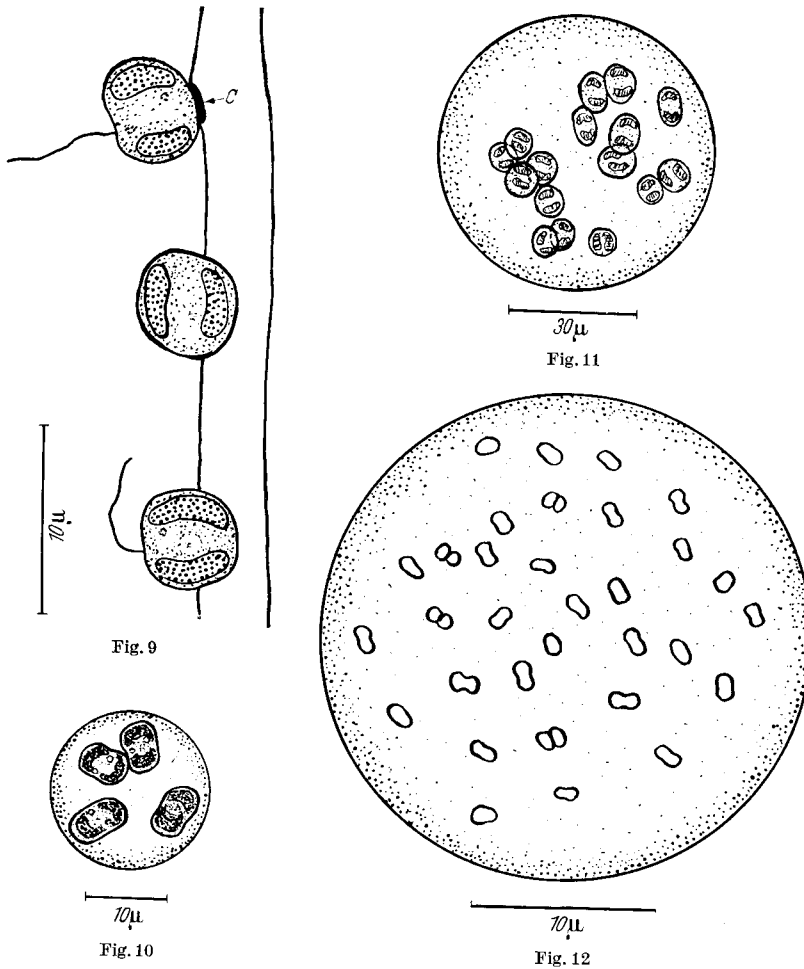


Figs. 3—8. Fig. 3. An old colony. — Fig. 4. Cells within colony, two of them showing chromatophores divided prior to vegetative division. — Fig. 5. Cells within an old colony showing division prior to swarmer formation; note pyrenoid-like body "p" on chromatophore. — Fig. 6. Swarmers. — Fig. 7. A vegetative cell, globose. — Fig. 8. Cells stained in iron-alum hematoxylin showing nucleus, chromatophore with pyrenoid-like body *b*, and nucleus in metaphase or early anaphase of nuclear division *a*

dividing to give rise to the swarmers are slightly larger than the vegetative cells and the swarmers are about 6μ in diameter.

The swarmers escape out of the mucilage envelope and swim about and have been noticed to settle by their posterior end, in most instances, on the setae of *Chaetoceros lorenzianus* or *Ch. curvisetus* (Fig. 9) and sometimes on that of *Bacteriastrium varians*. Soon after settling, one flagellum

is lost, the remaining one persists for a short while. At the place of attachment to the setae, in some instances, a small disc-like structure could be noticed, which presumably aids in securing a fast hold on the



Figs. 9—12. Fig. 9. Swimmers settled on setae of *Chaetoceros*. — Fig. 10. Four-celled colony. — Fig. 11. 16-celled colony. — Fig. 12. 32-celled colony, some cells may be seen divided

setae (Fig. 9c). A globular mucilage envelope is seen next formed around the cell within which it divides into two, and the daughter cells repeat the divisions to give rise to 4-, 8-, 16-, 32-, and so on-celled colonies (Figs. 10, 11 and 12), the colony increasing in size proportionately. During all these stages, up to about the 256-celled stage, the colony is globose and attached, but later it gets detached and becomes free-floating. Once

again, when the colony attains a large size, at a certain state swarmer formation is repeated and the life-cycle goes on.

Discussion

The alga described here shows an apparent resemblance, in the early stages of colony formation, under low magnifications, to *Chryso-capsa* of PASCHER (1925, p. 548) and to *Chryso-capsella* of BOURRELLY (1957, p. 222), but the vegetative cells differ in their structure as also the swarmers in their flagellation too. In the present alga, the presence of two equal flagella is a constant feature.

The old colonies show a resemblance to *Phaeocystis* Lagerheim (refer FRITSCH 1935; BOURRELLY *op. cit.*), but in this instance also, the vegetative cells differ in their structure as well as orientation in the mucilage. In *Phaeocystis*, the cells are distributed at the periphery unlike in the present alga, where the cells are more or less embedded uniformly throughout the thallus. Further, the colony is never lobed in the present alga as in *Phaeocystis* however much it may develop. In *Phaeocystis*, the swarmers have two unequal flagella (refer FRITSCH 1935, p. 542; BOURRELLY 1957, p. 223—24) and sometimes a third short one also (“*un appendice flagelliforme*” BOURRELLY, *op. cit.*, p. 373; KORNMAN 1955), which latter character indicates an affinity for *Phaeocystis* with the *Isochrysidales* and may have to be placed there (BOURRELLY, *op. cit.*).

Therefore, in view of the closer resemblance particularly to the characters of the genus *Ruttnera* GETTLER (1942, 1943) except for the homogeneity of the mucilage¹, which might be considered as an additional distinguishing specific character for the present alga, the writer is inclined to place this alga in the genus *Ruttnera* under: according to FRITSCH (1935, p. 555—56; also refer PASCHER 1925), in the Order *Chrysomonadales*, Sub-order *Chryso-capsineae*, Family *Chryso-capsaceae*; according to BOURRELLY (1957), Order *Ochromonadales*, Family *Phaeocystaceae*, instead of creating a new genus to receive the same.

The present alga differs from the two species of the genus *Ruttnera* known so far — *R. spectabilis* (GETTLER 1942, 1943) and *R. chadefaudii* Bourrelly et Magne (1953; MAGNE 1954; BOURRELLY 1957) — in the absence of stratification of the mucilage, habit of the colony (epiphytic on planktonic diatoms to begin with and then becoming free-floating)

¹ In his modification of the diagnosis of the genus *Ruttnera* Gettler to include *R. chadefaudii* Bourrelly et Magne, BOURRELLY (1957, p. 221) also states that the mucilage is often stratified (“*souvent stratifiée*”). Hence, this character is not to be considered as a constant one; and, in the key to the genera, he states (*op. cit.*, p. 220) “*gelée ferme, gloeocystoïde, thallus sans forme définie*” for *Ruttnera*. In the writer’s opinion, the stress on the nature of the mucilage may be eliminated as a diagnostic character of a genus in this family concerned.

and in the swarmers being globose and possessing two equal flagella as a constant feature. Hence, it is considered a new species of *Ruttnera* GETTLER and named *Ruttnera pringsheimii*¹.

Diagnosis

Ruttnera pringsheimii spec. nov.

Pertinet ad algas Chrysophyceas coloniales; cellulae circumdatae mucilagine amorphae. Coloniae juveniles globulares, adhaerentes setis Diatomacearum — *Chaetoceri lorenziano*, *C. curviseto*, raro *Bacteriastro varianti*; maturae vero et largiores coloniae libre natantes, ad 2 mm diam. Cellulae parvae, globosae (diametentes $3\ \mu$) vel late ellipsoideae ($4.5 \times 3\ \mu$). Chromatophori luteo-virides, bini, \pm fabaeformes, parietales. Nonnulli globuli nitentes et nucleus minutus adsunt. Reproductio per divisionem vegetativam et per formationem zoosporarum in coloniis maturioribus. Zoosporae fere rotundae, duplici chromatophore luteo-viridi, globulis nonnullis nitentibus et flagello duplici aequali praeditae; nec stigma nec vacuola in eis notata; parte posteriore insident setis Diatomacearum, atque exsudent integumentum mucosum intusque cellula multiplicatur per divisionem.

In planktone marino lectus ad oras maritimas occidentales indicas ad Calicut, die 15 mensis Iulii anni 1953 et servatus in auctoris collectione sub numero 104; etiam in planktone marino ad oras maritimas Madras-patanas lectus die 19 mensis Iulii anni 1961 et servatus in auctoris collectione sub numero 121.

Summary

A new species of *Chrysophyceae*, *Ruttnera pringsheimii*, occurring in the coastal waters of India, is described in detail. The alga forms large colonies with cells embedded in amorphous mucilage. Vegetative cells globose or ellipsoid with two chromatophores and a nucleus and a few unidentified glistening globules. Reproduction by vegetative division and swarmer formation. The latter are globose, have the same structure as the vegetative cells and in addition possess two equal flagella. The swarmers settle down on the setae of some diatoms and develop into colonies. The alga, at times, discolours the water yellow when in bloom.

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¹ I have great pleasure in naming this species after Prof. E. G. PRINGSHEIM, to whom, on the occasion of his 80th birthday, this paper is dedicated.

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Dr. R. SUBRAHMANYAN, M. Sc., Ph. D., F. A. Sc.
52 Choolai High Road, Madras 7, India