

## A New Species of *Peridinium* and New Records of Dinoflagellates and Silica-Scaled Chrysophytes from Belize

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**Abstract.**—Phytoplankton samples from five freshwater ponds in Belize were examined for dinoflagellates and silica-scaled chrysophytes using light and electron microscopy. Twelve species of Synurophyceae were observed: *Mallomonas acaroides*, *M. annulata*, *M. gratis*, *M. guttata*, *M. multisetigera*, scales of three unidentified *Mallomonas* taxa, *Synura echinulata*, *S. petersenii*, *S. spinosa* and *Chrysodidymus synuroideus*, and one species of Chrysophyceae: *Paraphysomonas vestita*. Five species of dinoflagellates were observed: *Thompsodinium intermedium*, *Peridinium belizensis* new species, *P. centenniale*, *P. gatunense*, and *Sphaerodinium polonicum*. All species are new records for Belize.

### INTRODUCTION

The freshwater algal flora of Belize is relatively unknown. Aside from the red algal studies of Sheath et al. (1993a-b, 1994) and Vis et al. (1992), the only freshwater phytoplankton study is by Carty (2000). Vørs' (1993) marine phytoplankton study included chrysophyte taxa frequently observed in freshwater environments.

Freshwater dinoflagellates have been reported throughout the Caribbean and Central America, particularly from Mexico (Ortega, 1984) and Cuba (Popovsky, 1970). Freshwater phytoplankton chrysophyte studies from nearby countries include Costa Rica (Wujek, 1984; Wujek et al., 1998), Panama (Wujek, 1986), Mexico (Kristiansen and Tong, 1995), and Colombia (Vigna and Escobar, 1999). Other contributions from tropical and subtropical areas, including other South American countries, are reviewed in Siver and Wujek (1999), Vigna and Escobar (1999), Wujek (2000) and Wujek and Elsner (2000).

### MATERIALS AND METHODS

Plankton net collections were made on March 10, 1996 and from March 6-10, 1998 (Table 1). Chrysophyte preparations for transmission electron microscopy and data analyses follow (Wujek, 2000; Wujek and

Elsner, 2000), except that the observations were made with a Philips CM-10 microscope. For chrysophyte scanning electron microscopy observations, subsamples were air-dried on aluminum stubs, gold coated, and examined with a JEOL 840A. Dinoflagellates were photographed using an Olympus BH2 and a Hitachi S2700 SEM.

### RESULTS AND DISCUSSION

Eighteen taxa representing seven genera were observed (Table 2). Chrysophytes include eight *Mallomonas* taxa, three *Synura* taxa, and one taxon each of *Paraphysomonas* and *Chrysodidymus*. Dinoflagellates include *Thompsodinium intermedium*, *Peridinium belizensis*, *P. centenniale*, *P. gatunense*, and *Sphaerodinium polonicum*. Most of the species found are common and widely distributed; all are new records for Belize.

*Myriophyllum* pond had the greatest chrysophyte diversity (six species), followed by the alligator pond site with four species. All of our collecting locations contained at least one taxon; this is in sharp contrast to two other tropical sites: Cronberg (1996) found chrysophytes in 20 % of her Botswana samples while Wujek and Ogundipe (in press) found chrysophytes in 40 % of their Nigerian study sites.

Of the three unidentified *Mallomonas* taxa

TABLE 1. Belize collecting sites, March 10, 1996 and March 6-10, 1998.

Sample/name	Location
March 6-10, 1998	
1. Airstrip pond	north of airstrip between Placencia and Seine Bight
2. <i>Myriophyllum</i> pond	near the 86 km mark on east side of the Southern Highway
3. Alligator pond	just north of site 2, but on west side of highway
4. Highway pond	23 km north of Punta Gorda on the Southern Highway
March 10, 1996	
5. Bladen	Bladen Nature Reserve, March 10, 1996.

(Figs. 6-8), species 2 and 3 come closest to being identifiable. Our *M. sp. 2* specimen (Fig. 7) has large pores in the proximal end of the scale which are absent in the similar *M. perenoides*. *Mallomonas sp. 3* (Fig. 8) most closely resembles *M. grata*.

*Peridinium belizensis* sp. nov. Carty

*Dinoflagellatum aquae dulcis*, 12-16 $\mu$ m longum, 10-13 $\mu$ m latum, chromatophoris flavus,

TABLE 2. Scaled chrysophytes and dinoflagellates observed in the Belize collections. See Table 1 for locations.

Taxon	Location	Figure
Synurophyceae		
<i>Mallomonas</i> Perty		
<i>M. acaroides</i> Perty em. Ivanov	4	1
<i>M. annulata</i> Harris	3	2
<i>M. guttata</i> Wujek	2	4
<i>M. multisetigera</i> Dürschmidt	2	5
<i>M. grata</i> Takahashi	2	3
<i>M. sp. 1</i>	2	6
<i>M. sp. 2</i>	4	7
<i>M. sp. 3</i>	3	8
<i>Synura</i> Ehrenberg		
<i>S. echinulata</i> Korshikov	2, 3	9
<i>S. petersenii</i> Korshikov	4	10
<i>S. spinosa</i> Korshikov	1	11
<i>Chrysodidymus</i> Prowse		
<i>C. synuroideus</i> Prowse	2	12
Chrysophyceae		
<i>Paraphysomonas</i> de Saedeleer		
<i>P. vestita</i> (Stokes) de Saedeleer	3	13
Dinophyceae		
<i>Peridinium</i> Ehrenberg		
<i>P. belizensis</i> Carty	3	14-16
<i>P. centenniale</i> (Playfair) Lefèvre	2	17
<i>P. gatunense</i> Nygaard	5	
<i>Sphaerodinium</i> Wołoszyńska		
<i>S. polonicum</i> Wołoszyńska	4	18
<i>Thompsodinium</i> Bourrelly		
<i>T. intermedium</i> (Thompson)		
Bourrelly	1	19, 20

*theca tenue, ordinatione tabulari* Po, 4', 2a, 7'', 5''', 2''''', *Globus Umbonatus*, 3' et 4'' remotum, sulcus non antapi tubula antapex non impar.

Freshwater dinoflagellate, 12-16 $\mu$ m long, 10-13  $\mu$ m wide, chromatophores yellow, theca thin, plate formula Po, 4', 2a, 7'', 5''', 2''''', Group Umbonatum, 3' and 4'' remotum, sulcus not to antapex, and antapical plates unequal. Holotype Figure 14.

Type locality: Alligator Pond, Southern Highway, Belize.

*Peridinium belizensis* n. sp. has two characteristics that distinguish it from other species in the Umbonatum Group, a sulcus that does not reach the antapex and antapical plates greatly different in size. The 1'''' plate is small and the 2'''' plate is large and bordered dorsally with small spines. The cingulum is broad with a T transition plate before C-1; the sulcus includes Sa, Sp and Sd plates. The two common species in the Umbonatum Group, *P. umbonatum* Stein and *P. inconspicuum* Lemmermann have widely spreading sulci that reach the antapex and equal sized antapical plates (see Lefèvre, 1932).

It is impossible from this short list to make phytogeographic considerations about the Belizean freshwater plankton. More investigations are needed, especially from different seasons of the year. As Hansen (1996) has stated, "many unresolved questions remain regarding biogeography and ecology of the silica-scaled Chrysophyceae and Synurophyceae in the tropics." This certainly holds true for the dinoflagellates as well.

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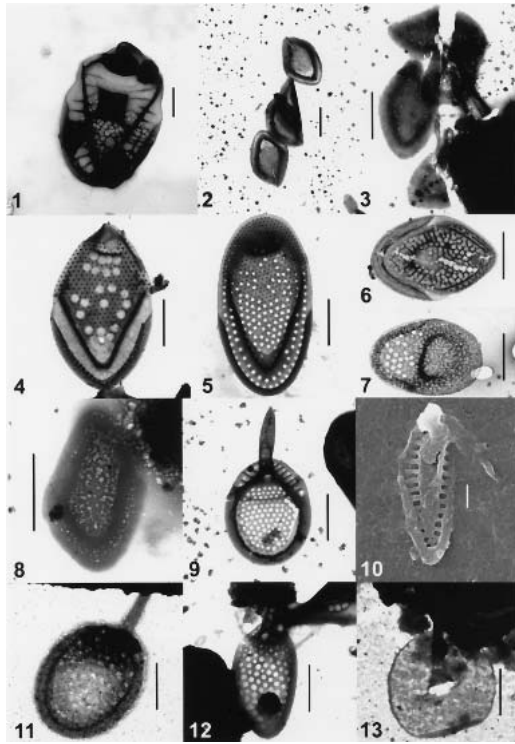


FIG. 1. Figures 1-8. Scales of *Mallomonas*. 1. *M. acaroides*. 2. *M. annulata*. 3. *M. grata*. 4. *M. guttata*. 5. *M. multisetigera*. 6. *M. sp. 1*. 7. *M. sp. 2*. 8. *M. sp. 3*. Figs. 9-10. Scales of *Synura*. 9. *S. echinulata*. 10. *S. petersenii*. Fig. 11. *S. spinosa*. Fig. 12. Scale of *Chrysodidymus synuroideus*. Fig. 13. Scale of *Paraphysomonas vestita*. Scale bar = 1  $\mu\text{m}$ .

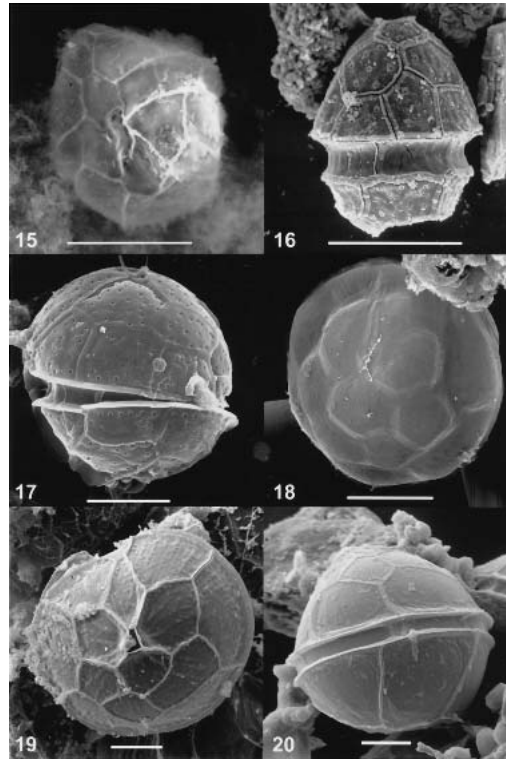


FIG. 15. Figures 15-16. *Peridinium belizensis*. 15. Ventral view, note sulcus not reaching antapex, small 1'''' plate, small spines on dorsal margin of 2''' plate. 16. Dorsal view, note 3' and 4'' remotum, wide cingulum. Fig. 17. *P. centennale*, dorsal view. Fig. 18. *Sphaerodinium polonicum*, apical view. Figs. 19-20. *Thompsodinium intermedium*. 19. Apical view. 20. Dorsal view. Scale bar = 10  $\mu\text{m}$ .

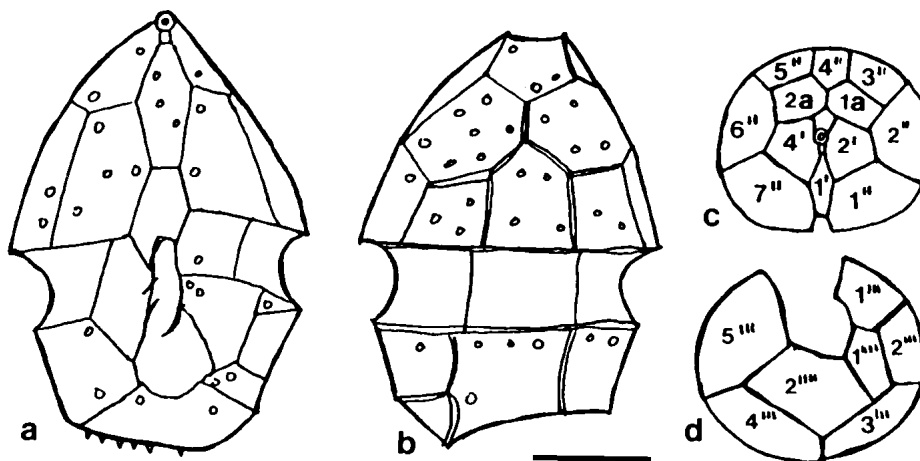


FIG. 14. Figure 14. *Peridinium belizensis*. Holotype. a. ventral view, b. dorsal view, c. apical view with plates labeled, d. antapical view with plates labeled. Scale bar = 10  $\mu\text{m}$ .

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