

## **SOME RARELY REPORTED ATHECATE DINOFLAGELLATES FROM NORTH ARABIAN SEA**

**SADAF GUL\* AND S. M. SAIFULLAH**

*Department of Botany,  
University of Karachi, Karachi, Pakistan.*

### **Abstract**

The present paper reports 5 species of the dinoflagellate genera *Pyrocystis* Murray and *Dissodinium* Pascher from the North Arabian Sea shelf of Pakistan.

### **Introduction**

The phytoplankton occurring in the north Arabian sea shelf of Pakistan have been described earlier (Anonymous, 1978; Chaghtai & Saifullah, 1988; Gul & Saifullah, 2007; Saifullah *et al.*, 2008) but the list is not complete and there remain still many taxa to be described, especially those of athecate dinoflagellates. Taylor (1976) reported the dinoflagellates from Northwest Arabian Sea but not particularly from the shelf. Similarly Kuzmenko (1975) described phytoplankton species from the entire Arabian Sea and did not mention particularly if they had sampled the Pakistan's shelf water. Beside their observation were sporadic consisting of a very few samples from the area. The present study is based on very intensive sampling carried out on the shelf during 6 months Dr. Fridtjof Nansen cruise from January 1977-June 1977. *Pyrocystis* and *Dissodinium* were not described from the area. Kuzmenko (1975) reported some of the species from Arabian Sea but not from the shelf again. The present paper describes 4 species of *Pyrocystis* and one of *Dissodinium*.

### **Materials and Methods**

The method of sampling and the location of species have already been described by Chaghtai & Saifullah (1988), Saifullah *et al.*, (2002), Gul & Saifullah (2007), Saifullah *et al.*, (2008) and therefore, the reader is referred to these papers for reference.

### **Results**

Dinophyta

Dinophyceae G.S. West and Fritsch, (1927)

Pyrocystales Apstein, (1909)

Pyrocystaceae (Schütt, 1896) Lemmermann, (1899)

### ***Dissodinium* Pascher**

An armoured heterotrophic dinoflagellate, parasitic on copepod eggs; life cycle showing alternation of three stages, two vegetative (primary and secondary cysts and one reproductive (motile planospore) (Elbrachter & Drebes, 1978); the primary cyst being spherical in shape and the secondary lunar; the secondary cyst produce planospores which attach to copepod eggs and later develop into primary cyst. Not bioluminescent.

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\*Corresponding author E-mail: sadafgpk@yahoo.com

***Dissodinium elegans* (Pavillard) Matzenauer****Fig. 1**

Matzenauer, (1933), p. 441; Taylor, (1976), p. 175, pl. 38, fig. 458, 459; Licea *et al.*, (2004). p. 425.

Syn: *Pyrocystis elegans* Pavillard, 1931, p. 38, t. 1, fig. 21A, B; Schiller, 1937, p. 493, fig. 569; Silva, (1956a), p. 70, t. 12, fig.6; Bouquaheux, (1972), p. 4, fig. 2A-F.

Cell large, body lunate with tapering ends; protoplast peripheral in strands; spherical cysts formed.

Length: 377µm. Width: 100 µm

***Pyrocystis* Murray**

An unarmored photoautotrophic dinoflagellate; life cycle showing alternation of two stages, one vegetative coccoid phase and the other transitive reproductive stage (Elbrachter & Drebes 1978) which is mostly motile; reproduction asexual; bioluminescent.

***Pyrocystis fusiformis* f. *fusiformis* (W. Thomson) Murray****Fig. 2**

Murray, (1885), p. 937, fig. 338; Wood, (1954). p. 318, fig. 256a-b; Silva, (1956a), p. 70, t. 12, fig.5; Steidinger & Williams, (1970). p. 62, t. 39, fig. 142; Taylor, (1976); p. 178, pl. 39, fig. 466.

Naked, flattened and fusiformis, central portion wider, ends rounded or acute, narrow. Protoplasmic strands marginal.

Length: 768-841 µm. Width: 174-232 µm

***Pyrocystis hamulus* var. *hamulus* Cleve****Fig. 3a, b**

Cleve, (1900), p. 19, pl. f, fig. 259a-b; Wood, (1968); p.126, fig.259a; Taylor, (1976); p. 180, pl. 38, fig. 450; Licea *et al.*, (2004), p. 425.

Body large, central part swollen, two elongated arms, narrow, ends pointed.

Two cells joined by arms and produce a ring this is characteristic feature of *P. hamulus* var. *hamulus*.

Length: 200-300µm. Width: 30-45 µm

***Pyrocystis obtusa* Pavillard****Fig. 4**

Pavillard, (1931), p. 38; Schiller, (1931), p. 38, Wood, (1968), p. 126, fig. 394; Licea *et al.*, (2004), p. 425.

Cell large, crescent shaped, middle part slightly had swollen end points slightly acute. Protoplasmic material aggregated in middle part.

Length: 320-377µm. Width: 100 µm

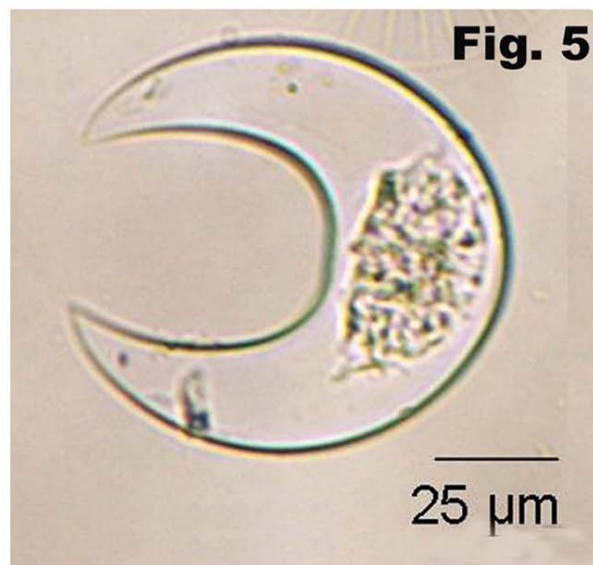
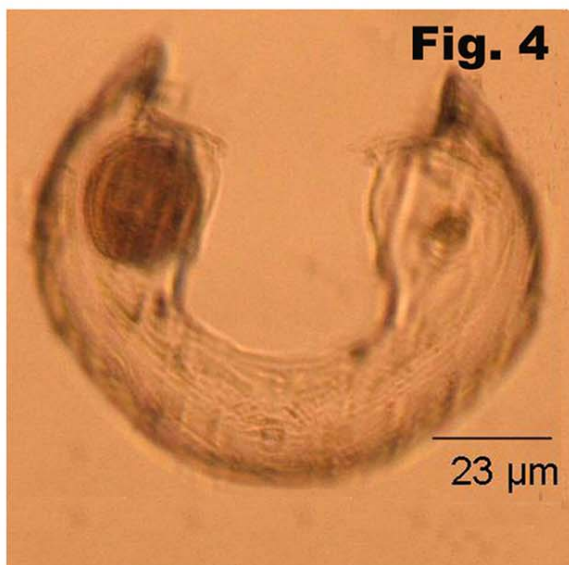
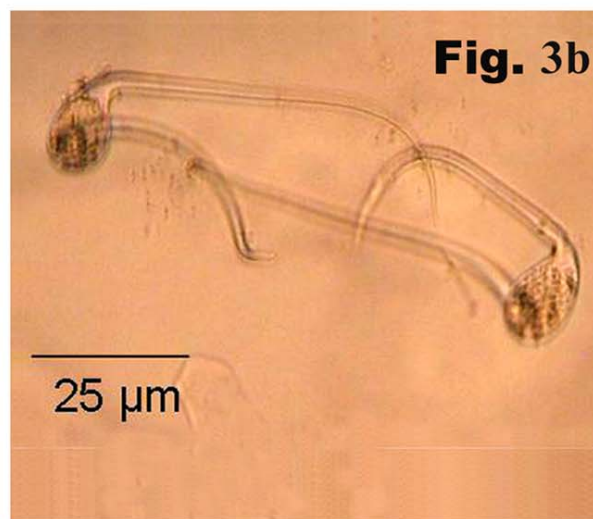
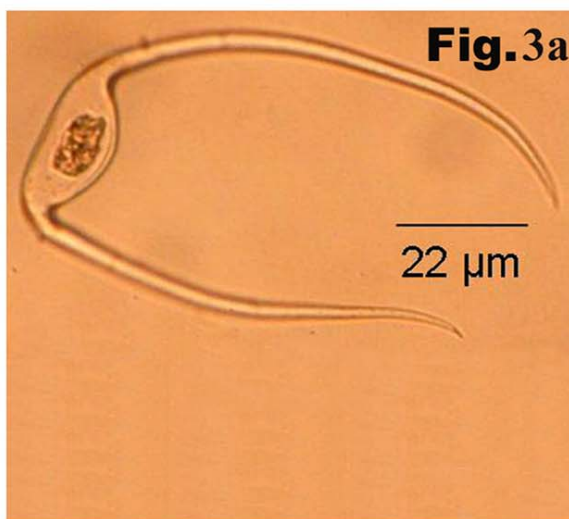
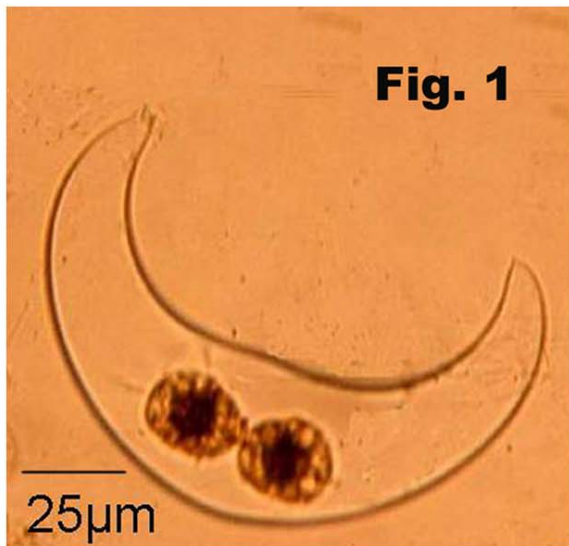


Fig. 1. *Dissodinium elegans*.  
Fig. 2. *Pyrocystis fusiformis* f. *fusiformis*  
Fig. 3a, b. *Pyrocystis hamulus* var. *hamulus*  
Fig. 4. *Pyrocystis obtusa*.  
Fig. 5. *Pyrocystis robusta*.

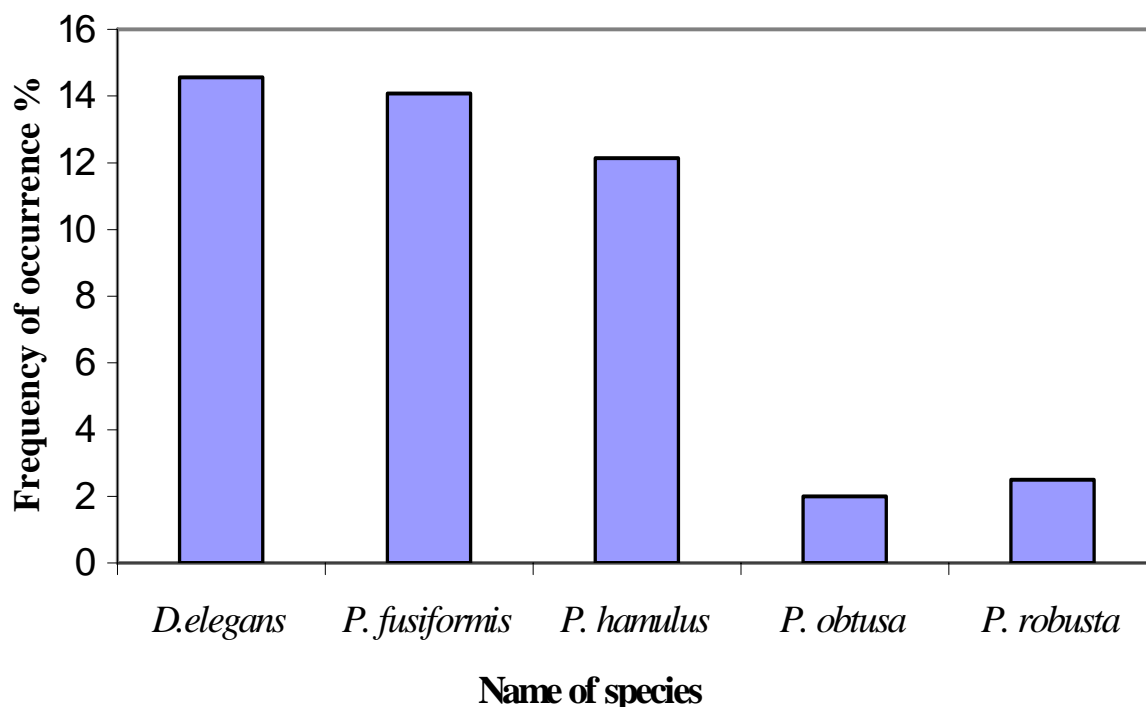


Fig. 6. Relative abundance of different species.

### *Pyrocystis robusta* Kofoid

#### Fig. 5

Kofoid, (1907b), p. 167, pl.1, fig. 5; Schiller, (1937), p. 492, fig. 568; Wood, (1968), p.127, fig.396; Taylor, (1976); p. 181, pl. 38, fig. 460; Licea *et al.*, (2004), p. 425.

Body almost circular, swollen in the middle, two arms near to each other, some times fused or not, end points narrow, pointed; cytoplasmic strands marginal.

Length: 130  $\mu\text{m}$ . Width: 58  $\mu\text{m}$

### Discussion

Many studies of dinoflagellates from the Pakistan's Shelf deal mainly with armoured or thecate dinoflaellates and the athecate forms remained neglected except for *Noctiluca scintillans* (Saifullah & Chaghtai, 1999) and *Amphidinium carterae* (Baig *et al.*, 2006). The present study is another effort in this direction.

All the species of *Pyrocystis* and *Disodinium* occurred poorly on Pakistan's Shelf except *Pyrocystis obtusa* and *P. robusta* (Figs. 4 & 5) which occurred rarely. (Table 1). In general all the species occurred preferably on the Indus Delta shelf, however, *Disodinium elegans* (Fig. 1) occurred overwhelmingly. This indicates that they favour low salinity and nutrient rich waters. *D. elegans* and *P. fusiformis* were the most frequent species occupying 14% of all stations and the remaining species were rare with a frequency of occurrence of less than 12% (Fig. 6).

The present study was carried out during two seasons only, namely the N-E monsoon season (January-March) and the transition period (April - June). *P. obtusa* and *P. robusta* occurred mostly during February and March indicating preference for lower temperature. The other species were eurythermal occurring in a wide range of temperature (Table 1). As regards the salinity tolerance it appears that all the species were stenohaline because the salinity value showed very little variation during the period of studies (35.91-36.67 PSU).

**Table 1. Temperature, salinity ranges and frequency of occurrence of different species.**

No.	Name of species	Temperature ranges °C	Salinity range PSU	Frequency of occurrence (%)
1.	<i>Dissodinium elegans</i>	21.36-29.19	35.91-36.63	14.56
2.	<i>Pyrocystis fusiformis</i>	22.97-29.19	36.03-36.65	14.07
3.	<i>Pyrocystis hamulus</i>	21.36-29.19	35.91-36.67	12.135
4.	<i>Pyrocystis obtusa</i>	24.14-29.19	36.32-36.63	2.00
5.	<i>Pyrocystis robusta</i>	24.14-29.19	36.32-36.63	2.5

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