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COSCINODISCUS WAILESII: CENTRIC DIATOM REPORTED FROM THE OIL AFFECTED AREA OF NORTHERN ARABIAN SEA AFTER TASMAN SPIRIT OIL SPILL

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ABSTRACT: In this study presence of large centric diatom *Coscinodiscus wailesii* was observed in phytoplankton samples collected just after Tasman Spirit Oil Spill (TSOS) and after 1.5 year of spill in Bio-remedial project (BP).Occurrence of *Coscinodiscus wailesii* in both the study periods showed resistance against spilled oil after an incident of Tasman Spirit Oil Spill which might be due to mucilage secretion on its surface. Moreover Light and Scanning Electron Microscopic illustrations are described in this report.

KEYWORDS: Bioremedial, phytoplankton, Seaview, Karachi.

INTRODUCTION

A discoid genus *Coscinodiscus* which is an important component of phytoplankton community structure was established by Ehrenberg in 1839 (Sar *et al*., 2010). By the establishment of detailed microscopic findings many of its species were later on transferred to other genera (Hasle and Syvertsen, 1997; Sar *et al.,* 2010). A great many scientists worked on *Coscinodiscus* on different aspects including observation of auxospore formation (Holmes, 1967), morphological characters (Ferrario and Eugenia, 1994; Lee, 1989; Lee *et al.*, 1992; Sar *et al.,* 2008), taxonomy (Hernandez-Becerril, 2000), sediment analysis (Sancetta, 1987), effects of ultra violet radiations on their pigment system (Yogamoorthi, 2007) and its distribution (Fernandes *et al.,* 2001; Gomez and Souissi, 2010). Bloom condition of *Coscinodiscus* var. *centralis* were also recorded from Indian coastal waters during specific study period (Sanilkumar *et al.,* 2009). *Coscinodiscus wailesii* a widely distributed species was first described by Gran and Angst in 1930 (Lee *et al.,* 1992). It was also reported from North Arabian Sea bordering Pakistan by Ghazala *et al.,* (2006); In this study light as well as scanning electron microscopic structure of *C. wailesii* is presented which was isolated during TSOS & BP. Moreover, morphometric data has also been compared with other reports (Table 2).

MATERIALS & METHODS

In this paper area of study comprised of sea view Clifton Karachi in which a total of 21 phytoplankton samples were studied from sampling sites (Fig. 1) during Tasman Spirit Oil Spill (TSOS) and Bioremedial Project (BP) respectively. Moreover materials and methods including light and Scanning Electron Microscopic protocol were same which have been described in earlier reports (Tabassum *et al.,* 2010 and Tabassum *et al.,* 2011).

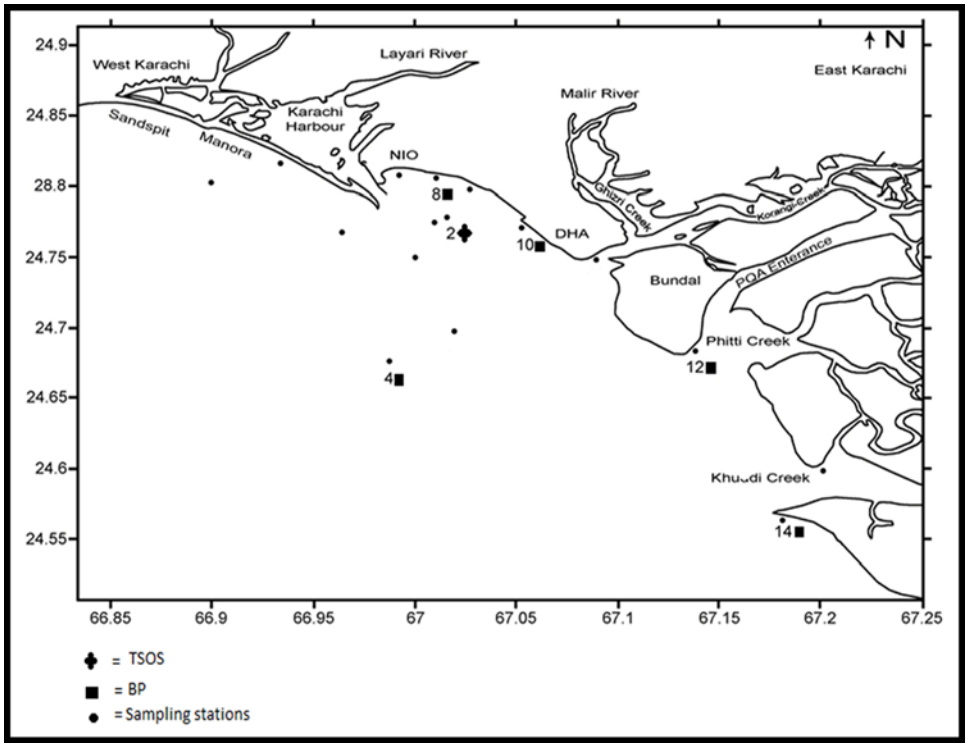

Fig. 1 Map showing occurrence of *Coscinodiscus wailesii* during TSOS & BP.

Table 1. Sampling date and site of *Coscinodiscus wailesii* Gran & Angst during TSOS.

S. No.	Date	Site	Latitude	Longitude
1	19/11/03	Station 2	24°80’816 N	66°99’215 E
2	21/04/05	Station 4	24.6758	66.9872
3	18/04/05	Station 8	24.8077	67.0108
4	16/04/05	Station 10	24.7719	67.0544
5	21/04/05	Station 12	24.5992	67.2009
6	21/04/05	Station 14	24.5665	67.1814

Observations and results:

***Coscinodiscus wailesii* Gran and Angst (Plate 5, Figs. 10a & 10b):**

Cupp, 1943, p. 58 & 59, Fig. 23 (p. 59); Lee et al., 1992, p. 56-60, Figs. 7-12 (p. 57 & 59); Hasle and Syvertsen, 1997, p. 106, Plate 16 (p. 100); Hernandez-Becerril, 2000, p. 16, Figs. 31-37 (p. 15); Fernandez et al., 2001, p. 90 & 91, Figs. 2 - 20 (p. 91- 94); Gomez and Souissi, 2010, p. 1427, Figs. 4D - F, (p. 1428),

Morphometric data:

Apical axis: 180 µm - 204 µm

Valves circular, flat, discoid with concentric depression, mantle high, steeped, hyaline area centrally located, areolae irregular in shape, variable in size, radiating larger to smaller from center to the peripheral region, cribra present, presence of two marginal rings of processes, chromatophores numerous, discoid plastids.

Table 2. Comparison of morphometric data of *Coscinodiscus wailesii* recorded from different location.

	Cupp, 1943 (Pacific Ocean)	Moazzam, 1973 (North Arabian Sea)	Hasle and Syvertsen, 1997	Gomez & Souissi, 2010 (English Channel)	Fernandes *et al.*, 2001 (Brazilian waters)	Present study (North Arabian Sea)
Apical axis	230 µm - 350 µm	228 µm - 359 µm	280 µm - 500 µm	180 µm - 450 µm	268 µm - 306 µm	114 µm -204 µm

It was commonly found at station 2 of TSOS and stations 4, 8, 10, 12 and 14 of Bioremedial Project (Table 1). The species individually reported from research ares, Cupp, 1943: West Coast of North America, Lee *et al.*, 1992: Korean Coastal Waters; Hernandez-Becerril, 2000: Pacific Ocean; Hallfors, 2004: Baltic Sea; Liu, 2008: Chinese Seas; Fernandez *et al.*, 2001: Brazilian Waters; Gomez and Souissi, 2010: Strait of Dover, Between English Channel and North Sea; Pham *et al.*, 2011: Singapore; Mather *et al.*, 2010: Canadian Coastal Waters.

DISCUSSION

Valve morphology of commonly bloom forming species *C. wailesii* has been discussed in earlier records from different oceanic environments (Cupp, 1943; Hasle and Syvertsen, 1997; Gomez and Souissi, 2010). In this report morphological characters of *C. wailesii* studied isolated from a stressed environmental condition after TSOS. Its Light and Scanning Electron Microscopic study showed similar features mentioned in earlier documents including flat, circular and discoid valve surface with concentric depression. Mantle was recorded as high and steeped. Presence of centrally located well developed

hyaline area. Valve surface had irregular shaped areolae of variable size. Areolae were radiating from center to the peripheral region in larger to smaller in size with cribral pores. Moreover, two distinct marginal rings of processes were also visible. Morphometric measurements of this species taken in the present study were also more or less parallel with other reports of researchers from their specific regions (Table 1).

Studies of various investigators after oil spill in different areas of the world showed adverse effects of crude oil on phytoplankton (Adekunle, *et al.,* 2010; Hallare *et al.,* 2011). Present study showed that *C. wailesii* was found in samples of both the study periods i.e. TSOS and BP. It was also observed that this species occurred only at one station during TSOS and occurred in 5 stations during BP study.

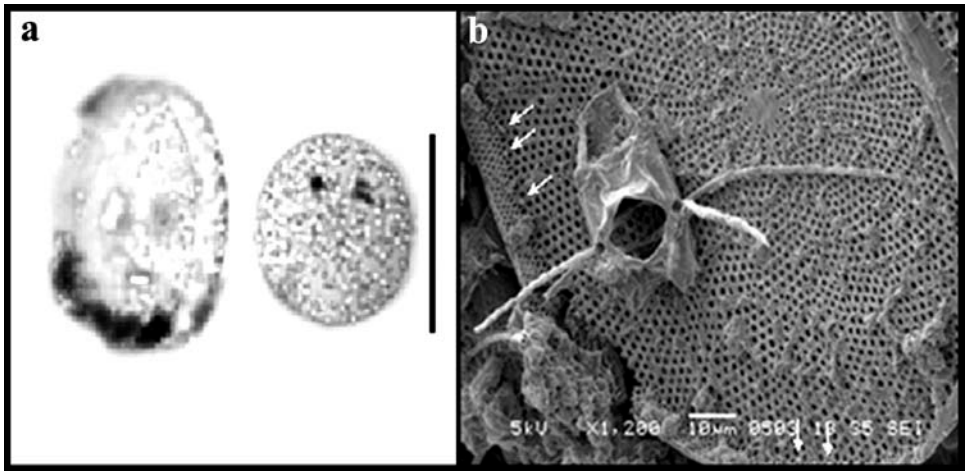

Fig. 2. a, *Coscinodiscus wailesii*: Light Microscopic girdle view & valve view. Scale Bar = 180 µm; b, *Coscinodiscus wailesii.* Scanning Electron Microscopic valve view showing absence of central rossete andpresence of central hyaline area. Arrow shows marginal rimportulae. Scale Bar = 114 µm.

It was also reported earlier that *C. wailesii* has an ability to produce large amount of mucilage during its bloom condition (Edwards et al., 2001). The character of producing mucilage by this species might be the reason of showing tolerance against environmental disturbances hence continued to be present in both the study periods in TSOS and BP.

REFERENCES

Adekunle, I.M., M.R. Ajijo, C.O. Adeofun and I.T. Omoniyi. 2010. Response of four phytoplankton species found in some sectors of Nigerian coastal waters to crude oil in controlled ecosystem. *Int. J. Environ. Res.* 4(1): 65-74.

Cupp, E.E. 1943. Marine Plankton diatoms of the West Coast of North America, *Bull. Scripps. inst. Oceanogr.* 5: 1-238.

Edwards, M., A.W.G. John, D.G. Johns and P.C. Reid. 2001. Case history and persistence of the non-indigenous diatom *Coscinodiscus wailesii* in the north-east Atlantic. *J. Mar. Biol. Ass.* 81: 207-211.

Fernandes, L.F., L. Zehnder-Alves and J.C. Bassfeld. 2001. The recently established diatom *Coscinodiscus wailesii* (Coscinodiscales, Bacillariophyta) in Brazilian waters. I: Remarks on morphology and distribution. *Phycol. Res*. 49: 89-96.

Ferrario, M.E. and E.A. Sar. 1994. Valve morphology of *Coscinodiscus janischii* Schmidt (Bacillariophyceae). *Mem. Calif. Acad. Sci.*; Lugar: USA; Ano: 17:63-68.

Ghazala, B., R. Ormond and F. Hanna. 2006. Phytoplankton communities of Pakistan. I. Dinophyta and Bacillariophyta from the coast of Sindh. *Int. J. Phycol. Phycochem.* 2: 183-196.

Gomez, F. and S. Souiss., 2010. The Diatoms *Odontella sinensis, Coscinodiscus wailesii* and *Thalassiosira punctigera* in the European Atlantic: recent introductions or overlooked in the past? *Fresenius Environ. Bull.* 19(8): 1424-1433.

Hallare, A.V., K.J.A. Lasafin and J.R. Magallanes. 2011. Shift in Phytoplankton community structure in a tropical marine reserve before and after a major oil spill event. *Int. J. Environ. Res.* 5(3): 651-660.

Hallfors, G. (2004). Checklist of Baltic Sea Phytoplankton species (including some heterotrophic protistan groups). *Baltic Sea Environ. Proc.*, No. 95: 1-208.

Hasle, G.R. and E.E. Syvertsens. 1997. Marine Diatoms (5-386). In: *Identifying Marine Phytoplankton*. (Ed): C.R. Tomas. Academic Press, San Diego, California, pp. 1-385.

Hernandez-Becerril, D.U. 2000. Morfologia y taxonomia de algunas species de diatomeas del genero *Coscinodiscus* de las costas del Pacifico mexicano. *Rev. Biol. Trop.* 48(1): 7-18.

Holmes, R.W. 1967. Auxospore formation in two marine clones of the Diatom Genus *Coscinodiscus. Amer. J. Bot.* 54(2): 163-168.

Lee, J.H. 1989. The Diatom Genus *Coscinodiscus* Ehrenberg: *C. Jonesianus* (Ehrenberg) Ostenfeld. *Korean J. Phycol.* 4(2): 69-78.

Lee, J.H., Y.H. Jung and C.I.I. Choi. 1992. The Diatom Genus *Coscinodiscus* Ehrenberg: *C. wailesii* Gran & Angst. *Korean J. Phycol.* 7(1): 55-62.

Liu R. (J.Y., Liu) (Ed.). 2008. Checklist of biota of Chinese Seas. pp. 1-1267. Beijing: Science Press, Academia Sinica.

Mather, L., K. MacIntosh, I. Kaczmarska, G. Klein and J.L. Martin. 2010. A checklist of diatom species reported (and presumed native) from Canadian Coastal Waters. Canadian Technical Report of Fisheries and Aquatic Sciences. 2881: 1-78.

Pham, M.N., H.T.W. Tan, S. Mitrovic and H.H.T. Yeo. 2011. A checklist of the algae of Singapore. pp. 1-100: Singapore: Raffles Museum of Biodiversity Research, National University of Singapore.

Sancetta C. 1987. Three species of *Coscinodiscus* Ehrenberg from North Pacific Sediments Examined in the light and Scanning Electron Microscopes. *Micropaleont.* 33(3): 230-241.

Sanilkumar M.G., K.B. Padmakumar, N.R. Menon, K.J. Joseph, V.N. Sanjeevan and A.V. Saramma. 2009. Algal blooms along the coastal waters of southwest India during 2005-08. *J. Mar. Biol. Ass. Ind.* 51(1): 69-74.

Sar, EA., I. Sunesen and F. Hinz. 2008. Fine morphology of *Coscinodiscus jonesianus* and *Coscinodiscus cummutatus* and their Transfer to *Coscinodiscopsis* Gen. Nov. *Diatom. Res.* 23(2): 401-421.

Sar, E.A., I. Sunesen and R. Jahn. 2010. *Coscinodiscus perforatus* revisited and compared with *Coscinodiscus radiatus* (Bacillariophyceae). *Phycologia* 49(6): 514-524.

Tabassum, A., S.H. Baig and R. Aliya. 2010. First Scanning Electron Microscopic report of *Chaetoceros pseudocurvisetus* (Bacillariophyceae) isolated from North Arabian Sea during Tasman Spirit Oil Spill. *Pak. J. Mar. Sci.* 19(1&2): 1-5.

Tabassum, A., S.H. Baig and R. Aliya. 2011. *Bellerochea malleus* (Brightwell) Van Heurk: A new record from North Arabian Sea after Tasman Spirit Oil Spill. *Pak. J. Mar. Sci.* 20(1&2): 87-91.

Yogamoorthi, A. 2007. Artificial UV-B induced changesin pigmentation of marine diatom *Coscinodiscus gigas. J. Environ. Biol.*, 28(2): 327-330.