Records of Marine Interstitial Hymenostomatid Ciliates from the Jubail Marine Wildlife Sanctuary, Saudi Arabia(*)

By
Khaled A. S. Al-Rasheid
Department of Zoology, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia

Hymenostomatida : ~)~WI ~

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ABSTRACT

Sediment samples were collected at low tide from various localities of Jubail Marine Wildlife Sanctuary in the Arabian Gulf during 1996-1997 for the study of the marine interstitial ciliate fauna of the Sanctuary. Eleven species belonging to the genus Frontonia (Order: Hymenostomatida) were identified, 7 of which represent new records of the fauna of the Arabian Gulf and of Saudi Arabia. The distribution of each species was compared to those in similar habitats worldwide.

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INTRODUCTION

An environmental rehabilitation plan that has led to the establishment of the Jubail Marine Wildlife Sanctuary (JMWS) north of Jubail city on the Saudi Arabian Gulf shore was proposed by concerned agencies in Saudi Arabia, in conjunction with a Task Force from the European Union, just after the 1991 Gulf War [1]. One of the aims of the project, besides assessing ecological effects of oil spills, is to assess and document biological diversity of various fauna and flora in order to generate baseline information of species and species assemblages, and to monitor the rehabilitation of coastal and marine habitats [2].

The establishment of JMWS has provided an excellent opportunity to further the studies on the ciliate fauna of Saudi Arabia started by AL-Rasheid [3-6]. The present paper deals with the ciliates of the genus *Frontonia*, order: Hymenostomatida.

MATERIALS AND METHODS

Samples were collected during 1996 and 1997 from coastlines of Jubail Marine Wildlife Sanctuary (JMWS) - (see AL-Rasheid [6] for description of the study area). Undisturbed sediment samples were collected from the topmost 1-3 cm of submerged areas of the Sanctuary, between high and low tide marks and transferred to the laboratory in thermal containers. In the laboratory, ciliate samples were detached from the sand grains as described by Faure-Fremiet [7], studied in vivo in hanging drops over depression slides, and under cover slips supported by Vaseline rings. Intravital and specific stains were employed to observe the structure of organisms [8]. The infraciliature was revealed by Wilbert's method of protargol impregnation [9]. Stained cells were studied, measured and photomicrographed with a Nikon® Photomicrographic System attached to Nikon Alphaphot® microscope. The characteristics of each organism were then compared to descriptions and keys in Carey [10], Bullington [11], Kahl [12] and to some previous worldwide interstitial records extracted from the literature.

RESULTS AND DISCUSSION

The present study revealed the presence of 11 species of *Frontonia* Ehrenberg 1838, belonging to the Order: Hymenostomatida. Seven of these are new to the fauna of Saudi Arabia and to that of the Arabian Gulf at large. Specimens as slides of protargol impregnated cells of each species have been deposited in the Museum of Zoology Department, College of Science, King Saud University, Riyadh, Saudi Arabia. The following is a checklist of the recorded species arranged systematically according to Corliss [13]. Each species is followed by a brief description. Micrographs of each species are presented in Figs. 1-11.

**Phylum:** Ciliophora Doflein, 1901  
**Class:** Oligohymenophorea de Puytorac et al., 1974  
**Subclass:** Hymenostomatida Delage and Herouard, 1896  
**Order:** Hymenostomatida Delage and Herouard, 1896  
**Suborder:** Peniculina Faure-Fremiet in Corliss, 1956  
**Family:** Frontoniidae Kahl, 1926  
**Genus:** *Frontonia* Ehrenberg, 1838

1. *Frontonia aberrans* Dragesco, 1960 (Fig. 1)  

**Distribution:** Cape Cod in USA [7], Bermuda [14].

2. *Frontonia caneti* Dragesco, 1960 (Fig. 2)  
Ovoid, elongate, 150 μm in length. Oral aperture, trichocysts small. Macronucleus and contractile vacuole posteriorly located. Dark pigmented area at posterior.

**Distribution:** French Atlantic coast [15].

3. *Frontonia leucas* (Ehrenberg, 1833) Ehrenberg, 1838  
(Fig. 3)
52. Bursaria leucas Ehrenberg, 1833
53. Frontonia vernalis Ehrenberg, 1838
54. Ophryoglena magna Maupas, 1883
55. Plagiopyla hatchi Stokes, 1891
56. Ophryoglena vorax Smith, 1897


**Distribution:** Woods Hole in USA [16], French Atlantic coast [15], Norwegian Sea [17], Mediterranean Po Delta [18], Caspian Sea [19], Hamburg Harbour in Germany [20], Brackish water in Al-Hassa Oasis in Saudi Arabia [4].

4. **Frontonia macrostoma** Dragesco, 1960 (Fig. 4)


**Distribution:** French Atlantic coast [15], White Sea [21], Caspian Sea [19], Brackish water in Al-Hassa Oasis in Saudi Arabia [4].

5. **Frontonia marina** Fabre-Domergue, 1891 (Fig. 5)

**Frontonia leucas** var. marina Florentin, 1899


**Distribution:** Dee Estuary in UK [22], Mediterranean Gulf of Napoli [23], Baltic Sea [24–27], French Atlantic Coast [15], Gulf of Mexico and Eastern Coast of the USA [28, 29], Plymouth in the U.K. [30], Japan Sea at Ussuri [31] and at Posjet Gulf [32], Black Sea [33, 34], Brazilian Coast [35], New Hampshire coast in USA [36], Island of Sylt in Germany [37], Louisiana salt marshes [38], Norfolk salt marshes in UK [39], Bermuda [14], Red Sea [40], East African Coast of Somalia [41], Caspian Sea [42], British Isles and North Sea [43], Saudi Arabian Gulf Islands of Al-Batinah, Abu Ali and Tarut [3, 5].

6. **Frontonia maris-albi** Burkovsky, 1970 (Fig. 6)


**Distribution:** White Sea [21].

7. **Frontonia microstoma** Kahl, 1931 (Fig. 7)


**Distribution:** Baltic Sea [24, 25], Gulf of Mexico [28], Aligator Harbor in USA [29], White Sea [21], New Hampshire coast in USA [44], Louisiana salt marshes [38], Caspian Sea [19], Mediterranean Sea [45].

8. **Frontonia nigracans** Penard, 1922 (Fig. 8)


**Distribution:** Baltic Sea [12].

9. **Frontonia pallida** Czapik, 1979 (Fig. 9)


**Distribution:** Baltic Sea [46], Atlantic west African coasts [47].

10. **Frontonia salmastra** Dragesco and Dragesco-Kernéis, 1986 (Fig. 10)

Ovoid, elongate, ca 150 μm in length. Oral aperture triangular. Macronucleus ovoid, contractile vacuole centrally located.

**Distribution:** Atlantic west African coasts [47].

11. **Frontonia vacuolata** Dragesco, 1960 (Fig. 11)

Ovoid, 150–160 μm long. Oral aperture small, well-
defined. Macronucleus large, irregularly-shaped, contractile vacuole terminal. Trichocysts numerous, fine.

**Distribution:** French Atlantic coast [15], Chichester Harbor in UK [48], Saudi Arabian Gulf Island of Tarut [5].

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Frontonia of the Arabian Gulf


Legends of Figures

Figs. 1-7. Micrographs of protargol stained ciliate species found in the Jubail Marine Wildlife Sanctuary. 1) Frontonia aberrans; 2) Frontonia caneti; 3) Frontonia leucas; 4) Frontonia macrostoma; 5) Frontonia marina; 6) Frontonia maris-albi; 7) Frontonia microstoma. Ma, macronucleus; Oa, oral apparatus; T, trichocysts. Bars = 50 μm.
Figs. 8-11. Micrographs of protargol stained ciliate species found in the Jubail Marine Wildlife Sanctuary. 8) Frontonia nigroacans; 9) Frontonia pallida; 10) Frontonia salmastra; 11) Frontonia vacuolata. Ma, macronucleus; Oa, oral apparatus; Sa, anterior suture; Sp, posterior suture; T, trichocysts. Bars = 25 μm