

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

By

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سجل الهدبيات البحرية البين رملية التابعة لرتبة : Hymenostomatida

من محمية الجبيل البحرية بالمملكة العربية السعودية

خالد عبد الله سليمان الرشيد

لقد تم في الدراسة الحالية جمع عينات من الرمال البحرية من منطقة ما بين المد والجزر من مواقع مختارة من شواطئ محمية الجبيل البحرية في الخليج العربي . وتم تصنيف الهدبيات القاطنة في شواطئ المحمية ووصف ١١ نوعاً من الهدبيات البين رملية البحرية (المتعلقة بالرمال القاعية) التابعة لجنس *Frontonia* من رتبة Hymenostomatida ؛ ٧ منها تسجل لأول مرة كأنواع ضمن التواجد الحيواني لكل من الخليج العربي والمملكة العربية السعودية . هذا وقد تم مقارنة توزيع كل نوع من الأنواع الموصوفة ضمن المحمية ومقارنته بالتوزيع العالمي له .

**Key Words:** Interstitial, Hymenostomatida, *Frontonia*, Ciliates, Jubail Marine Wildlife Sanctuary, Arabian Gulf .

## 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 top-most 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 Fauré-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 Fauré-Fremiet in Corliss, 1956

Family: Frontoniidae Kahl, 1926

Genus: *Frontonia* Ehrenberg, 1838

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

Elongate, 300-400 µm in length. Oral aperture large, oral structures well defined. Mucocysts plentiful, trichocysts absent. Macronucleus dumb-bell-shaped. Micronuclei 3.

**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)

*Bursaria leucas* Ehrenberg, 1833

*Frontonia vemalis* Ehrenberg, 1838

*Ophryoglena magna* Maupas, 1883

*Plagiopyla hatchi* Stokes, 1891

*Ophryoglena vorax* Smith, 1897

Elongate, 350-600 µm in length. Anterior end not wider than posterior. Oral aperture small with well-defined pre- and postoral sutures. Macronucleus large with three micronuclei. Single contractile vacuole with long, distinctive radiating canals. Trichocysts many, fine.

**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)

Ovoid, 100-200 µm long. Oral aperture very large, sutures well-defined. Macronucleus large, micronucleus single. Contractile vacuole large, lies posteriorly. Trichocysts numerous. Interkinetal striations in pellicle.

**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

Elongate, 300-350 µm long. Anterior wider than posterior, dorso-ventrally flattened. Oral aperture small. Macronucleus large, two micronuclei. Single, small, centrally located contractile vacuole. Trichocysts numerous, fine.

**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)

Reniform, 100-140 µm long. Buccal cavity small. Oral sutures distinctive. Macronucleus large, micronuclei four. Contractile vacuole centrally placed.

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

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

Elongate, anterior wider than posterior, 200-300 µm in length. Oral aperture small, elongated. Preoral suture very distinctive. Macronucleus elongated, micronucleus single. Contractile vacuole large, with associated canals.

**Distribution:** Baltic Sea [24, 25], Gulf of Mexico [28], Alligator Harbor in USA [29], White Sea [21], New Hampshire coast in USA [36], Mobile Bay in USA [44], Louisiana salt marshes [38], Caspian Sea [19], Mediterranean Sea [45].

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

Oval-elongate, 250 µm in length. Posterior larger than anterior. Macronucleus large, ovoid. Heavily darkly pigmented.

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

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

Elongate, 100 µm long. Posterior wider than anterior. Oral area small, extends deep into center of cell in tube-like extension. Oral sutures distinctive. Macronucleus large, elongate. Contractile vacuole centrally placed.

**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 Harbour in UK [48], Saudi Arabian Gulf Island of Tarut [5].

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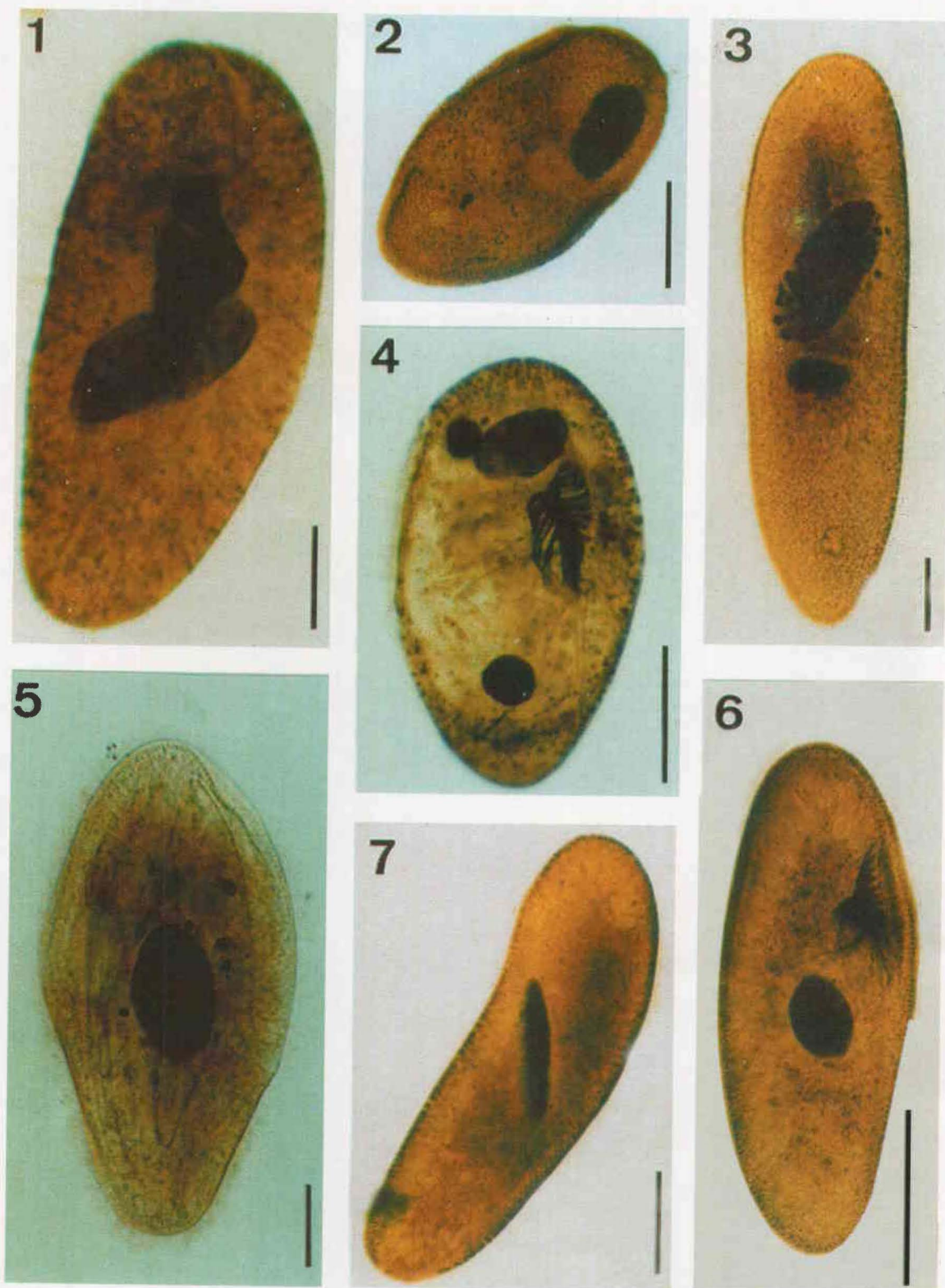
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**Legends of Figures**

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  $\mu$ m.

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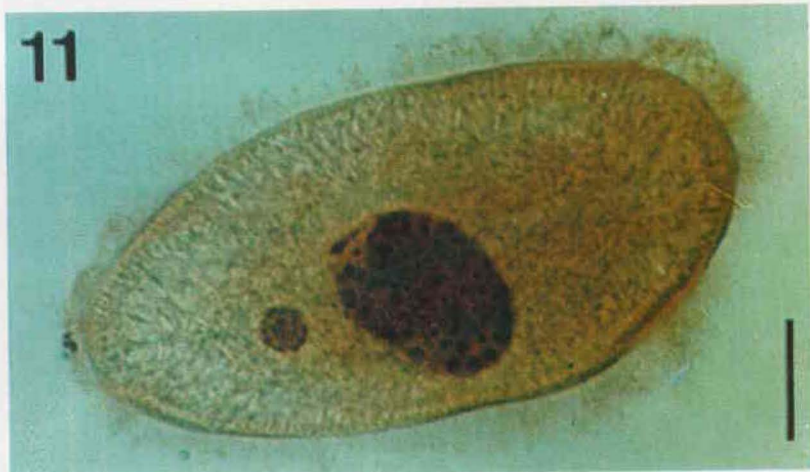
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Figs. 8-11. Micrographs of protargol stained ciliate species found in the Jubail Marine Wildlife Sanctuary. 8) *Frontonia nig-racans*; 9) *Frontonia pallida*; 10) *Frontonia salmastra*; 11) *Frontonia vacuolata*. Ma, macronucleus; Oa, oral apparatus; Sa, anterior suture; Sp, posterior suture; T, trichocysts. Bars = 25  $\mu$ m