Arab Gulf J. Scient. Res., **15** (1), pp. 187-205 (1996)

Records of Free-living Ciliates in Saudi Arabia. II. Freshwater Benthic Ciliates of Al-Hassa Oasis, Eastern Region*

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ABSTRACT. Benthos samples were collected from the submerged topmost 1-3 cm of sediments in freshwater ponds in Al-Hassa Oasis, Eastern Region, Saudi Arabia for the identification and recording of free-living benthic ciliates of the Oasis. A total of 37 species belonging to 25 genera in 21 families was identified, 21 of which are known to be typical marine species. All represent new records to the fauna of Saudi Arabia. The distribution of each species within the Oasis was recorded.

Free-living protozoa are important members of food webs of any aquatic environment (Fenchel 1987). Some freshwater protozoa, such as those inhabiting waste water treatment plants, are of great economic significance (Curds 1969). Many are used as biological indicators of pollution levels (Bick 1972). Hence, a lot of studies have been undertaken worldwide on the distribution of benthic ciliates in ponds, streams, lakes and rivers (Goulder 1971a, Gray 1976, Finlay 1978, 1982, Finlay *et al.* 1979, Taylor and Berger 1980, Baldock *et al.* 1983, Baldock and Sleigh 1988, Beaver and Crisman 1989, Salvado and Garcia 1991 and Bereczky and Nosek 1994). However, with the exception of the work of AL-Rasheid (1996) in the current series, all previous protozoological studies in Saudi Arabia have concentrated on parasitic protozoa, together with few surveys on the foraminifera (Bokhary 1987). Freeliving ciliates are yet to be investigated in detail, not only in Saudi Arabia, but also throughout the Arabian Gulf States. Hence, a research program has been established to survey those ciliates and their distribution in slected sites on the

*Part of a research project supported by the National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia.

Arabian Gulf coastline of Saudi Arabia, its offshore islands and inland freshwater ponds.

The present paper is the second in a series of surveys of the free living ciliate fauna of Saudi Arabia; it records the freshwater ciliate species of Al-Hassa Oasis in the Eastern Region of the country. The paper is not a quantitative study, but it is intended to provide qualitative background information for future ecological studies.

Materials and Methods

Samples of benthos were collected from the bottom of freshwater ponds from six localities in Al-Hassa Oasis, Eastern Region of Saudi Arabia, between August 1994 and July 1995 (Fig. 1). Al-Hassa is one of the largest oases of the world. It is situated some 50 km inland from the Arabian Gulf coast, west of the vast sand desert of Al-Jafurah. The general nature of the Oasis is an inland sabkhah with some similarities of the coastal sabkhahs of the Arabian Gulf (Johnson *et al.* 1978). There are numerous wells and artesian springs with abundant fresh water which makes it an important producer of dates and other agricultural products. The ground water level of the Oasis is particularly shallow. This causes the mixing of fresh water with the salty sediments of the Oasis, forming scattered ponds of various salinity levels. Most of the salinity of the ponds may be due to solution of salts from sabkhah surfaces (Al-Taher, pers. com.) and decreases southwards, where numbers of springy wells increase, along with increasing vegetation. The water of Site 1 (Al 'Uyun) has the highest salinity (18‰) followed by Ash Shu'bah (Site 2), 13‰. The rest of the sites are within a range of 4-11 ‰. The mean water temperature is 16 °C during January, the coldest month and 37 °C during July, the hottest month of the year.

Samples were obtained undisturbed from the submerged topmost 1-3 cm of sediments of freshwater ponds by the sediment core method of Fenchel (1987), as the ciliates are known to concentrate in the superficial topmost few centimeters of benthic environments (Goulder 1971b). The cores were then transferred undisturbed to slightly larger plastic containers as suggested by Carey and Maeda (1985). Subsamples were also taken from the cores and placed into 50 mm deep petri dishes and briefly subcultured for not more than 48 h, with the addition of rice grains and boiled wheat grains as a bacterial food source. Small volumes of sediment was also pipetted into a watch-glasses containing millipore-filtered (0.22 µm) pond water collected from the same site for the extraction of the benthic ciliates. Then the sediment particles were dispered with a faine needle, and, with the aid of micropipettes, live individual ciliates were isolated for identification by high power,

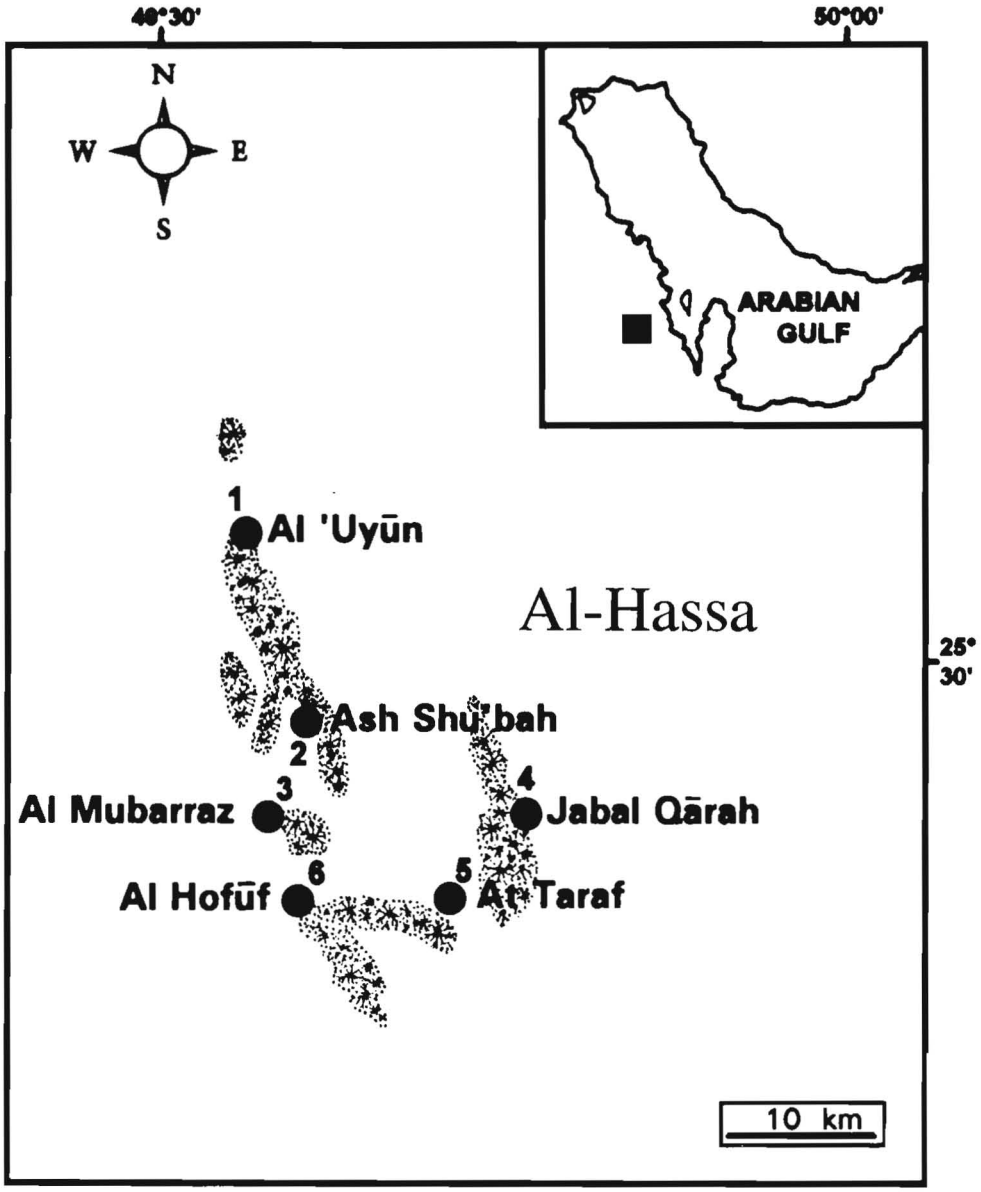

Fig. 1. Map of the Al-Hassa Oasis showing the sampling sites 1-6.

bright-field and phase-contrast light microscopy, then microphotographed. On several occasions, the ciliates were mounted onto microscope slides with glycerin albumin, fixed in Champy's fluid, and stained with Protargol stains (Lynn 1992). The description of each organism is compared to that of Kahl (1930-5), Corliss (1979), Curds (1982), Small and Lynn (1985), Carey (1992) and Patterson and Hedley (1992). Observations and identifications were usually completed within 48 hours of collection.

Results and Discussion

The present study is the first of its kind conducted in Saudi Arabia. It has revealed the presence of 37 taxa all of which are new records of free-living benthic ciliates in the fauna of Saudi Arabia. The following is a checklist of the recorded species arranged according to Corliss (1979), each followed by a brief description according to Curds (1969, 1982) and to Carey (1992). The distribution of each species in the study area is presented in Table. 1. Photomicrographs of each species are shown in Figs. 2-4.

Phylum: Ciliophora Doflein 1901
Class: Kinetofragminophorea de Puytorac *et al.* 1974
Subclass: Gymnostomatida Bütschli 1889
Order: Prostomatida Schewiakoff 1896
Suborder: Prostomatina Schewiakoff 1896
Family: Metacystidae Kahl 1926

1. *Metacystis tesselata* Kahl 1926 (Fig. 2a)

Cylindrical, almost ovoid, 50 μm in length, deeply annulated. Transverse rings around anterior half of body. Cytopharynx vase-shaped, equipped with concentric rows of prebuccal cilia. Single large terminal vacuole and terminal cilium present. Contractile vacuole central. Macronucleus central, micronuclei many. Secrets membranous lorica.

Suborder: Prorodontina Corliss 1974
Family: Prorodontidae Kent 1880-2

2. *Prorodon ovum* (Ehrenberg 1831), Kahl 1930 (Fig. 2b)

Holophrya ovum Ehrenberg 1831
Prorodon rigidus Bürger 1908

Ovoid, ca. 80-100 μm in length. Cytopharyngeal basket elongated. Macronucleus oval. Contractile vacuole terminal.

Family: Colepidae Ehrenberg 1838

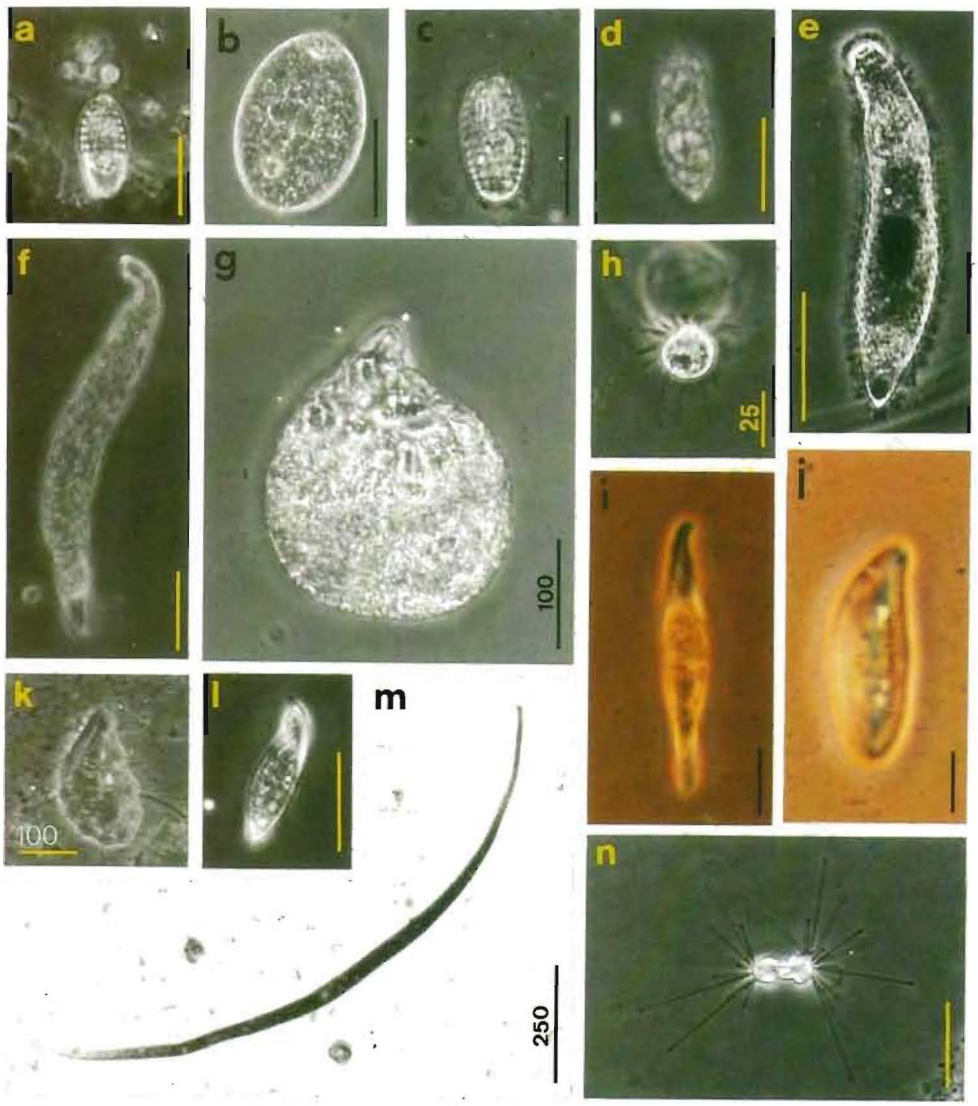

Fig. 2. Phase-contrast photomicrographs (unless otherwise stated) of live ciliate species reported from Al-Hassa Oasis. a) *Metacystis tesselata;* b) *Prorodon ovum;* c) *AColeps bicuspis;* d) *Tiarina fusus; e) Lacrymaria caudata;* f) *Protospathidium* sp.; g) *Trachelius ovum;* h) *Mesodinium pulex;* i) *Litonotus dusarti;* j) *Loxophyllum kahli;* k) *Loxophyllum meleagris;* l) *Loxophyllum uninucleatum;* m) *Trachelraphis aragoi,* bright-field photomicrograph; n) *Acineta cuspidata.* All bars = 50 μm unless otherwise indicated.

3. *Coleps bicuspis* Noland 1925 (Fig. 2c)

Barrel-shaped, 60 µm in length, covered with regularly arranged ectoplasmic calcium carbonate plates. Posterior spines 2, equatorial cleft present, caudal cilium absent. Macronucleus ovoid.

4. *Tiarina fusu* (Claparède and Lachmann 1858), Kahl 1930 (Fig. 2d)

Coleps fusus Claparède and Lachmann 1858

Spindle-shaped, 80 µm in length. Caudal region poined, with many caudal spines. Contractile vacuole single, large. Macronucleus ovoid.

Suborder: Haptorina Corliss 1974

Family: Enchelyidae Ehrenberg 1838

5. *Lacrymaria caudata* (Kahl 1933) Dragesco 1960 (Fig. 2e)

Lacrymaria caudata var. *lemani* Dragesco 1960

Spindle-shaped, 140 µm in length (contracted). Tail pointed. Snout region equipped with nematodesmata. Macronucleus ovoid, contractile vacuole terminal.

Family: Spathidiidae Kahl in Doflein and Reichenow 1929

6. *Protospathidium* sp. Drageso and Dragesco-Kerneis 1979 (Fig. 2f)

Elongated, 200-250 µm in length. Posterior bluntly rounded, apical ending in very short unciliated ridge. Contractile vacuole single, terminal. Macronuclei several, distributed throughout body.

Family: Tracheliidae Ehrenberg 1838

7. *Trachelius ovum* Ehrenberg 1833 (Fig. 2g)

Ovoid, slightly convex, 275 µm in length. Snout region long. Contractile vacuoles distributed throughout body. Rhabdos basket contains nematodesmata. Macronucleus in two parts.

Family: Didiniidae Ehrenberg 1838

8. *Mesodinium pulex* (Claparède and Lachmann 1858), Kahl 1930 (Fig. 2h)

Halteria pulex Claparède and Lachmann 1858

Small, 25 µm long, conical anteriorly, globose posteriorly. Nematodesmata extend beyond cytopharynx, forked at the tip. Cilia long, extending radially.

Order: Pleurostomatida Schewiakoff 1896

Family: Amphileptidae Bütschli 1889

9. *Litonotus dusarti* Dragesco 1960 (Fig. 2i)

Elongate, neck long, curving, tail pointed, 200 µm in length. Mid-body region

enlarged. Neck lined with trichocysts. Contractile vacuole single. Macronuclei 2, micronucleus intercalated.

10. ***Loxophyllum kahli*** Dragesco 1960 (Fig. 2j)

Small, 150-200 µm long, very broad, almost ovoid in shape, flattened laterally. A flattened band, striated transversely by trichocysts, runs around periphery of body. Papillae present in buccal area. Contractile vacuoles small, dorsally located. Macronucleus moniliform.

11. ***Loxophyllum meleagris*** Dujardin 1841 (Fig. 2k)

Large, broad, 250-400 µm in length, edges sinuous, bluntly pointed at both ends. Trichocyst warts dorsally located. Contractile vacuole posteriorly placed with collecting canals along dorsal edge. Macronucleus moniliform.

12. ***Loxophyllum uninucleatum*** Kahl 1928 (Fig. 2-1)

Small, elongated, 75 µm in length. Anterior truncated when extended obliquely. Upper surface domed, lower surface pleated. Flattened band present on both sides of body. Oral region equipped with long trichocysts. Contractile vacuole single, terminal. Macronucleus single, ovoid.

Order: Karyorelictida Corliss 1974

Family: Trachelocercidae Kent 1880-1882

13. ***Tracheloraphis aragoi*** (Dragesco 1953), Dragesco 1960 (Fig. 2m)

Trachelocerca aragoi Dragesco 1953

Vermiform, thread-like, 1.3-1.5 mm long, head expanded, tail pointed. Cytostome simple as terminal cleft. Small bumps present; carry large trichocysts or mucocysts. Macronuclei six.

Subclass: Suctoria Claparède and Lachmann 1858

Order: Suctorida Claparède and Lachmann 1858

Suborder: Endogenina Collin 1912

Family: Acinetidae Stein 1859

14. ***Acineta cuspidata*** Stokes 1888 (Fig. 2n)

Inverted, conical, within cup-like lorica, 30-40 µm in length. Lorica mounted on very short stalk. Capitate tentacles arranged in two distinct fascicles. Contractile vacuole single. Macronucleus round, centrally located.

Class: Oligohymenophorea de Puytorac *et al.* 1974

Subclass: Hymenostomatida Delage and Hérouard 1896

Order: Hymenostomatida Delage and Hérouard 1896

Suborder: Peniculina Fauré-Fremiet in Corliss 1956

Family: Parameciidae Dujardin 1840

15. *Paramecium aurelia* (Ehrenberg 1838), Dujardin 1841 (Fig. 3a)

Ovoid to enlongate, 175 μm long, anterior and posterior rounded. Oral groove wide. Contractile vacuoles 2. Macronucleus ovoid, micronuclei 2. Tuft of caudal cilia present.

16. *Paramecium caudatum* Ehrenberg 1838 (Fig. 3b)

Elongate, 190 μm in length, anterior and posterior rounded. Oral grove thin, long. Contractile vacuoles 2. Macronucleus ovoid, micronucleus single. Tuft of caudal cilia present.

Family: Frontoniidae Kahl 1926

17. *Frontonia fusca* Quennerstedt 1869 (Fig. 3c)

Frontonia elliptica Beardsley 1902

Elongate, 145 μm in length, anterior slightly wider than posterior. Oral aperture small. Trichocysts small. Contractile vacuoles 2, located anteriorly and posteriorly. Macronucleus single, micronucleus single, large.

18. *Frontonia leucas* (Ehrenberg 1833), Ehrenberg 1838 (Fig. 3d)

Elongate, 400 μm long. Anterior not wider than posterior. Oral aperture small. Macronucleus large, micronuclei 3. Contractile vacuole single, with many long radiating canals. Trichocysts numerous, fine.

19. *Frontonia macrostoma* Dragesco 1960 (Fig. 3e)

Ovoid, 175 μm in length. Oral aperture large, well-defined. Contractile vacuole large, posteriorly located. Macronucleus large, micronucleus single. Trichocysts numerous.

Subclass: Peritricha Stein 1859

Order: Peritrichida Stein 1859

Suborder: Sessilina Kahl 1933

Family: Vorticellidae Ehrenberg 1838

20. *Vorticella communis* de Fromentel 1874 (Fig. 3f)

Rotund, almost spherical in shape, 30-40 μm long. Contracted unbranched stalk, many food vacuoles. Contractile vacuole single.

Family: Epistylididae Kahl 1933

21. *Epistylis plicatilis* Ehrenberg 1838 (Fig. 3g)

Trumpet-shaped, widest at peristome, 90-100 μm in length. Annulated at base

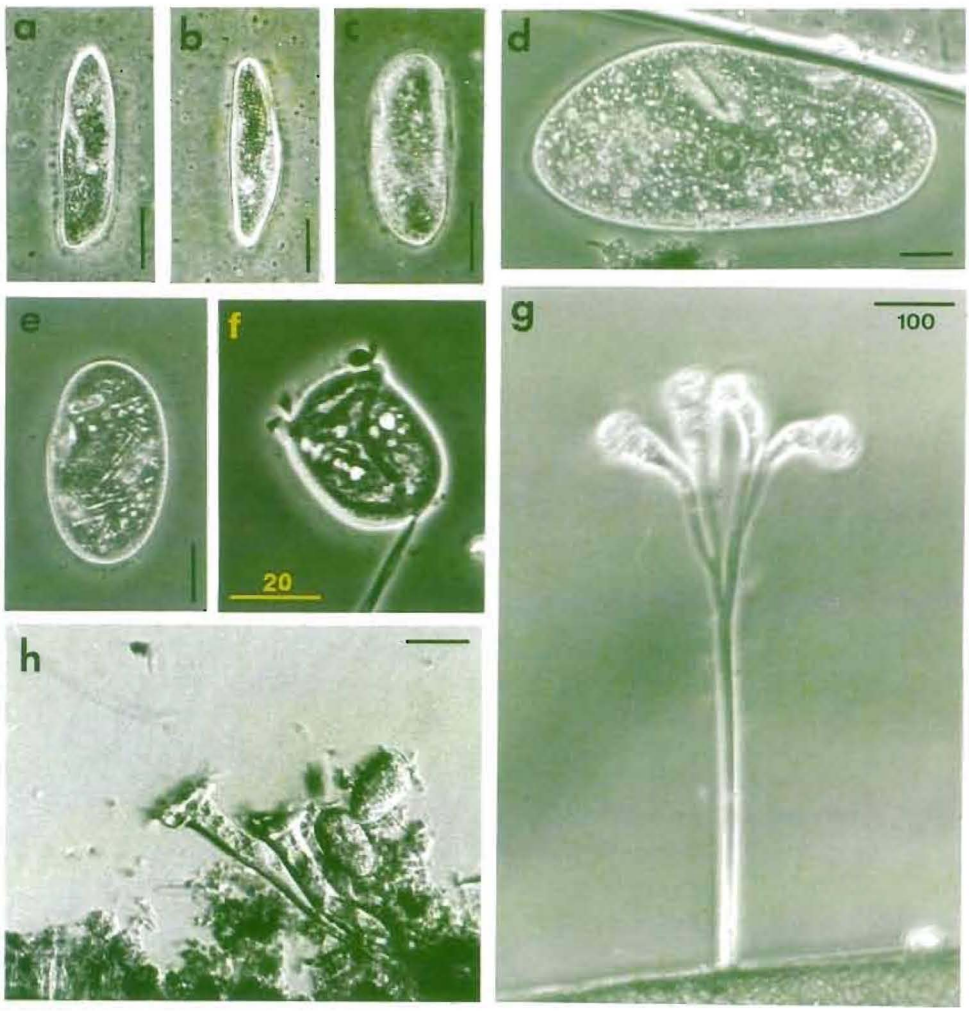

Fig. 3. Phase-contrast photomicrographs (unless otherwise stated) of live ciliate species reported from Al-Hassa Oasis. a) *Paramecium aurelia;* b) *Paramecium caudatum;* c) *Frontonia fusca;* d) *Frontonia leucas;* e) *Frontonia macrostoma;* f) *Vorticella communis;* g) *Epistylis plicatilis;* h) *Vaginicola crystallina,* differential interference contrast photomicrograph. All bars = 50 μm unless otherwise indicated.

of body. Stalk noncontractile, nonsegmented, striated, branched. Macronucleus C-shaped.

Family: Vaginicolidae de Fromentel 1874

22. *Vaginicola crystallina* Ehrenberg 1830 (Fig. 3h)

Elongate, cylindrical two trumpet-shaped zooids protrude from single lorica, 120-140 μm in length. One zooid shorter than the other. Symmetrically tapering lorica from mouth to base. Macronucleus single, elongate, worm-like, longitudinal to body axis.

Class: Polyhymenophorea Jankowski 1967
Subclass: Spirotrichia Bütschli 1889
Order: Heterotrichida Stein 1859
Suborder: Heterotrichina Stein 1859
Family: Condylostomatidae Kahl in Doflein and Reichenow 1927-1929

23. *Condylostoma kahli* Dragesco 1960 (Fig. 4a)

Ovoid to elongate, 250-300 μm in length. Peristome very wide, tail small, blunt. Macronuclei 5, ovoid, large. Contractile vacuole absent. Abundant mucocysts in pellicle.

24. *Condylostoma magnum* Spiegel 1926 (Fig. 4b)

Elongate, 1 mm in length (ca. 600 μm contracted), spatulate anteriorly, broad, tapering to long tail. Peristome deep, wide, macronucleus moniliform. Contractile vacuole present with long canal running forward to equatorial region.

25. *Condylostoma tenuis* Fauré-Fremiet 1958 (Fig. 4c)

Elongate, broad, with spatulate anterior, expanding to mid-body, terminating in sharp pointed tail, 300-350 μm long. Peristome wide, deep. Macronucleus moniliform. Cytoplasm with many non-contractile vacuoles.

Family: Stentoriidae Carus 1863

26. *Stentor roeseli* Ehrenberg 1835 (Fig. 4d)

Attenuate, ca. 700 μm in length (ca. 300 μm contracted). Non-pigmented. Peristome widely expanded. Macronucleus moniliform.

Order: Oligotrichida Bütschli 1887
Suborder: Oligotrichina Bütschli 1887
Family: Strombidiidae Fauré-Fremiet 1970

27. *Strombidium oculatum* Gruber 1888 (Fig. 4e)

Conical to pyriform, 60-70 μm in length. Posterior bluntly pointed, anterior with

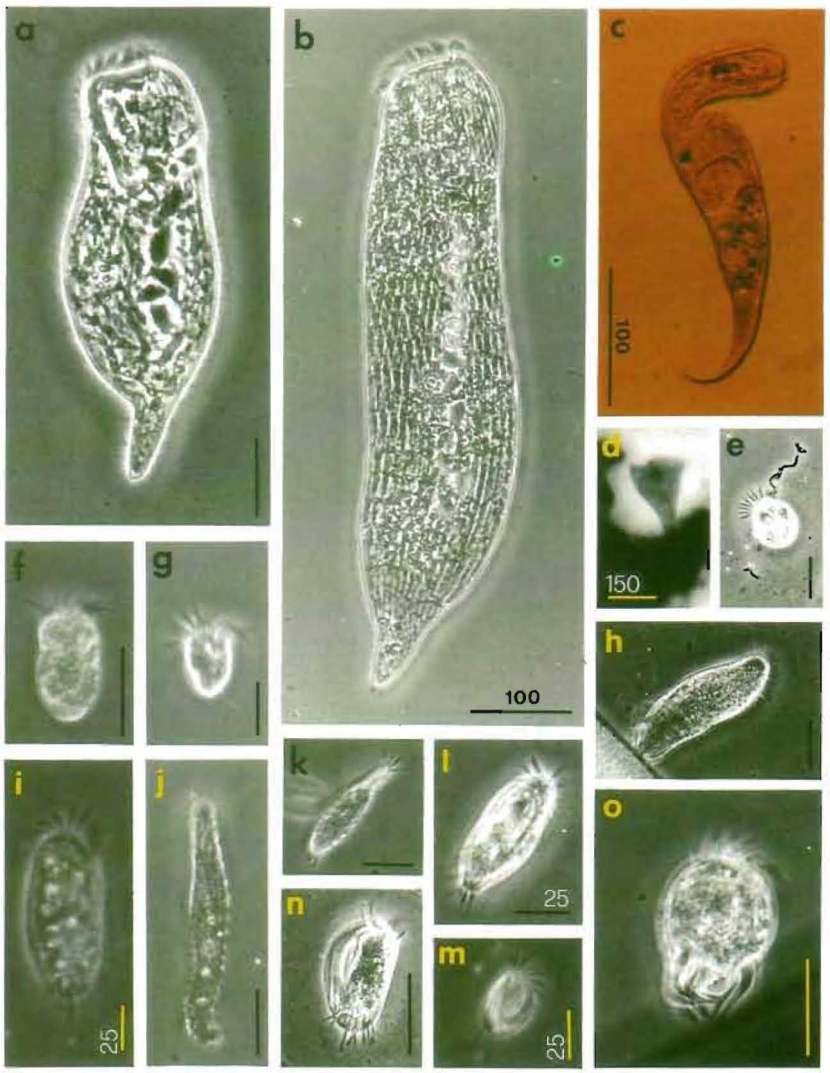

Fig. 4. Phase-contrast photomicrographs (unless otherwise stated) of live ciliate species reported from Al-Hassa Oasis. a) *Condylostoma kahli;* b) *Condylostoma magnum;* c) *Condylostoma tenuis,* differential interference contrast photomicrograph; d) *Stentor roeseli,* bright-field photomicrograph; e) *Strombidium oculatum;* f) *Strombidium sulcatum;* g) *Strombidium viridae;* h) *Holosticha kessleri;* i) *Holosticha simplicis;* j) *Holosticha violacea;* k) *Stichochaeta mereschkowski;* l) *Oxytricha ovalis;* m) *Euplotes affinis;* n) *Euplotes elegans;* o) *Uronychia setigera.* All bars = 50 µm unless otherwise indicated.

small peristomial collar. Trichites funnel-shaped, equatorially arranged. Posterior half of body covered with polygonal cortical platelets. Equatorial ventral cleft present.

28. *Strombidium sulcatum* Claparède and Lachmann 1858 (Fig. 4f)

Ovoid, 60 µm in length. Bluntly pointed anterior, rounded posterior. Cortical platelets starting at equatorial cleft, with a band of trichites. Ventral cleft and perilemma present.

29. *Strombidium viridae* Stein 1867 (Fig. 4g)

Strombidium nasutum Smith 1897

Conical, with well-developed peristomial collar, 65 µm in length. Posterior rounded, covered with polygonal cortical platelets. Equatorial cleft present, with band of trichites. Macronucleus vermiform.

Order: Hypotrichida Stein 1859

Suborder: Stichotrichina Fauré-Fremiet 1961

Family: Holostichidae Fauré-Fremiet 1961

30. *Holosticha kessleri* (Wrzesnioski 1877) Kahl 1930-5 (Fig. 4h)

Holosticha gibba (Stein 1859) Kahl 1930-5

Oxytricha kessleri Wrzesnioski 1877

Elongate, rounded anteriorly, transversely truncate posteriorly, 155 µm in length. Adoral zone of membranelles (AZM) occupies quarter of body. Cirri arranged in rows of right and left marginals. Macronuclei 2 groups.

31. *Holosticha simplicis* Wang and Nie 1932 (Fig. 4i)

Elongate, rounded anteriorly and posteriorly, 80 µm in length. AZM occupies third of body. Cirri arranged in rows of right and left marginals. Macronuclei 2, ovoid.

32. *Holosticha violacea* Kahl 1928 (Fig. 4j)

Vermiform to cylindrical, 200-230 µm in length, AZM occupies quarter of body. Cirri arranged in rows of right and left marginals. Macronuclei 2, ovoid.

33. *Stichochaeta mereschkowski* Andrussowa 1866 (Fig. 4k)

Stichotricha mereschkowski Andrussowa 1866

Elongate, 120 µm in length. Neck distinct, AZM occupies left margin of neck. Cirri, frontal 5, ventral 6 rows, 1 transverse row, no marginals. Macronuclei 2, ovoid.

Suborder: Sporadotrichina Fauré-Fremiet 1961

Family: Oxytrichidae Ehrenberg 1838

34. *Oxytricha ovalis* Kahl 1930-5 (Fig. 4-l)

Ovoid, 65 μm in length, AZM confined to anterior region. Transverse cirri long. Macronuclei 2, ovoid.

Family: Euplotidae Ehrenberg 1838

35. *Euplotes affinis* (Dujardin 1841), Kahl 1930-5 (Fig. 4m)

Elongate, 40-50 μm in length with long AZM. Dorsal surface ornamented with 5 longitudinal ridges. Ventral surface sculptured with 4 prominent ridges. Caudal cirri 3; one of which long, stiff. Macronucleus 3-shaped.

36. *Euplotes elegans* Kahl 1930-5 (Fig. 4n)

Euplotes elegans var. *littoralis* Kahl 1930-5

Ovoid to enlongated, 70 μm in length, not ornamented. AZM extends three-quarter of body length. Frontoventral cirri 9, transverse 5, caudal 4. Macronucleus C-shaped.

37. *Uronychia setigera* Calkins 1902 (Fig. 4-o)

Ovoid, 70 μm long. Peristome large, occupying over half body, with 2-3 flagella-like cirri and 2 paroral membranes. Wide undulating membranes. Transverse cirri 4-5, marginal cirri 2, large, right caudal cirri, 2, curved, dorsally attached, satellite cirrus thin, long. Dorsal ridges 3-4. Macronucleus single, spherical.

As shown in Table 1, 21 out of the 37 species recorded are typical marine species (Patterson *et al.* 1989). However, this is not unusual, as many marine species can acclimate to salinity stress and many species of *Euplotes, Cyclidium* and *Lacrymaria* occur in freshwater and marine habitats. The marine benthic ciliates are mainly concentrated at the first two sites, which may be related to the somewhat higher salinity of those habitats. Many species of marine fishes were observed in several freshwater ponds of the Oasis (Ross 1985). Furthermore, Webb (1956) reported three of the species found during the present study from brackish waters nearly with similar salinity to the present study sites. Similar observations were also made from low salinity lagoons of the Caspian Sea (Agamaliev 1986).

Table 1. Distribution of the recorded species of benthic ciliates in Al-Hassa Oasis. Typical marine Species are in boldface

Species	Sampling sites*					
	1	2	3	4	5	6
1. *Metacystis tesselata*	–	+	–	–	–	–
2. *Prorodon ovum*	+	–	–	–	–	–
3. *Coleps bicuspis*	+	+	+	+	+	–
4. *Tiarina fusus*	–	–	+	+	–	–
5. *Lacrymaria caudata*	+	–	–	+	+	–
6. *Protospathidium* sp.	–	+	–	–	–	–
7. *Trachelius ovum*	+	–	–	–	–	–
8. *Mesodinium pulex*	–	–	–	+	+	–
9. *Litonotus dusarti*	+	–	–	–	–	–
10. *Loxophyllum kahli*	+	–	+	+	–	–
11. *Loxophyllum meleagris*	–	–	–	+	+	–
12. *Loxophyllum uninucleatum*	–	+	–	–	–	–
13. *Trachelraphis aragoi*	+	–	–	+	–	–
14. *Acineta cuspidata*	–	+	–	–	–	–
15. ***Paramecium aurelia***	–	–	+	+	–	+
16. *Paramecium caudatum*	+	–	+	+	+	+
17. *Frontonia fusca*	–	+	–	–	–	–
18. *Frontonia leucas*	+	–	–	–	–	–
19. *Frontonia macrostoma*	+	–	–	–	–	–
20. *Vorticella communis*	+	+	–	–	–	–
21. *Epistylis plicatilis*	–	–	+	–	–	–
22. *Vaginicola crystallina*	+	–	–	–	–	–
23. *Condylostoma kahli*	+	–	–	–	–	–
24. *Condylostoma magnum*	+	–	–	–	–	–
25. *Condylostoma tenuis*	+	+	–	–	–	–
26. *Stentor roeseli*	+	–	–	–	–	–
27. *Strombidium oculatum*	+	+	+	–	–	–
28. *Strombidium sulcatum*	+	–	+	–	+	–
29. *Strombidium viridae*	+	+	+	–	+	+
30. *Holosticha kessleri*	–	+	–	–	–	–
31. *Holosticha simplicis*	–	–	+	–	–	+
32. *Holosticha violacea*	+	–	–	–	–	–
33. *Stichochaeta mereschkowski*	–	–	+	–	–	–
34. *Oxytricha ovalis*	–	–	+	–	–	+
36. *Euplotes affnis*	–	–	+	–	–	+
36. *Euplotes elegans*	+	+	–	–	–	–
37. *Uronychia setigera*	+	+	+	+	+	+
Totals	22	13	14	10	8	7

*Shown in Fig. 1.

Acknowledgements

The author wishes to thank Prof. Hussein Hussein of our Department for suggestions and critical reading of the manuscript. Thanks are also due to Prof. Abdullah Al-Taher, Geography Department, King Saud University for help with the geographical background of the study area.

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(Received 24/09/1995;
in revised form 13/04/1996)

سجل الأوليات الهدبية حرة المعيشة في المملكة العربية السعودية
٢- هدبيات المياه العذبة القاعية في واحة الأحساء بالمنطقة الشرقية

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تعتبر الأوليات وخاصة الهدبيات من أدق المقاييس الحيوية لمستوى التلوث في البيئات المائية . فإن لإختفاء الهدبيات من مجاميع الأوليات في مدى زمني معين يعتبر مؤشراً حساساً لمستوى تراكم الملوثات السامة في البيئة المائية ، لهذا فلقد أجريت دراسات في أماكن عديدة من العالم لتحديد أنواع الهدبيات القاعية والطافية في المسطحات المائية المختلفة واستخدمت كمؤشرات حيوية لنسبة تركز أو خلو الماء من الملوثات .

أما في المملكة العربية السعودية فلقد كان التركيز في أبحاث الأوليات منصباً على الأوليات الطفيلية مع بعض المسح الذي تم على المثقبات من الأوليات ولم تجر حتى الآن أي دراسة لا في المملكة العربية السعودية ولا في أي من دول الخليج بصورة عامة على التواجد الحيواني للهدبيات حرة المعيشة ، رغم الأهمية الكبرى للهدبيات حرة المعيشة كمقياس حيوي حساس لمستوى التلوث المائي . وعليه فلقد تم تخطيط برنامج بحثي متكامل لتحديد أنواع الهدبيات حرة المعيشة ضمن التواجد الحيواني للمملكة العربية السعودية .

والبحث الحالي هو الجزء الثاني من ذلك البرنامج ويحدد أنواع الهدبيات القاعية في واحة الأحساء بالمنطقة الشرقية .

لقد تم في الدراسة الحالية جمع ووصف ٣٧ نوعاً من هدبيات المياه العذبة القاعية من البرك والمجاري المائية بواحة الأحساء وتنتمي إلى ٢٥ جنساً في ٢١ فصيلة من فصائل الهدبيات ، وهي تسجل لأول مرة كأنواع ضمن التواجد الحيواني لبيئات المياه العذبة بالمملكة العربية السعودية . كما أوضحت الدراسة التوزيع الجغرافي لكل نوع من الأنواع الموصوفة من الواحة .