

Epizoic Algal Communities of Al-Hassa, Saudi Arabia

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ABSTRACT. Ten algal species are reported for the first time from Saudi Arabia (5 Cyanophyta, 5 Chlorophyta) growing epizoically. The algae were discovered on the surfaces of 3 species of snail, 1 species of turtle and 1 species of frog. Snails were covered mostly by the green algae *Cladophora glomerata* and *Enteromorpha intestinalis*. The green alga *Basiacladia chelonum* (newly recorded for Saudi Arabia) and the blue-green alga *Microcystis robusta* were the most common algae on turtles. Frogs were dominated by a species of the green alga *Chlorella*.

Algal communities growing on the surface of living animals have been infrequently studied. Both marine and freshwater animals have been observed to have algae on their surfaces with no host specificity (see Round 1981). Green and blue-green algae are the most common epizoic algae reported (Edgren *et al.* 1953, Ducker 1958, Cribb 1969, Anjum *et al.* 1980, Hussain and Anjum 1982, Anjum and Hussain 1984). Turtles and snails were the animals mentioned in most of these studies. Islam and Hameed (1982) and Hinton and Maulood (1983) have described epizoic algae from Iraq but none have been reported from Saudi Arabia. The present paper deals with the algae growing epizoically in the Al-Hassa area, Saudi Arabia. Al-Hassa is located in the Eastern part of Saudi Arabia. The area is characterized by having large irrigation and drainage system (for description see Hofuf Agricultural Research Centre 1977, 1973, Khatib 1974).

Materials and Methods

Living Animals (11 snails, 2 turtles and 3 frogs) covered by conspicuous algal growth were collected from different parts of Al-Hassa area during March-May,

1989. Snails were found around the edges of a natural spring named Ain Al-Khudoud. Three species of snails were observed, *Lymnaea aeuminata* (Lamarck), *Lymnaea pinguis* (Dohrn) and *Melania striatella tuberculata* (Muller) (identification of snails was by Dr. A. Chaudary). Turtles (*Mauremys caspica* Gmelin, identified by Dr. A. Al-Johany) and frogs (*Rana ridibunda* Pallas, identified by Dr. H. Al-Kahem) were collected from irrigation and drainage canals and pools. Temperature, pH and conductivity of the water were determined in the field for each site collection. The animals were washed gently with tap water to remove phytoplankton. The algae were then scraped off, preserved in 3% (v/v) formalin (pH5) and identified. The green alga *Cladophora glomerata* (L.) Kuetzing was decalcified by treating with 0.125 N HCL for five min. so as to better reveal of taxonomic features not clearly seen due to the presence of heavy incrustation. Some snails were left in a Chu 10 enrichment medium (Nichols 1973) to protect the epizoic algal vegetation from dessication. The rest of the material was preserved in 3% (v/v) formalin. Epidermis of frog was scraped and cut to investigate the algal vegetation. Photographs were taken by means of a Wild photomicroscope model MPS-51.

Results

Systematic Enumeration

Division : Cyanopyta
Order : Chroococcales
Family : Chroococcaceae

Merismopedia glauca (Ehrenb.) Naegeli
Desikachary 1959, p. 155, Pl.29, fig. 5.

Colony a flat plate of limited cells 20 to 80 in number, light blue-green or pale blue-green in colour. Cells oval or hemispherical, 3 to 6 μm in size; mostly regularly arranged in a definite and quadrangular colony (Fig. 1).

Host: Frog.

Forming a thin film along with other unidentifiable coccoid forms of algae on the epidermis.

Locality: In a ca. 30 cm deep pool in an agricultural farm, muddy bottom, temperature 21°C, pH 8.2, conductivity 2150 μScm^{-1} .

Microcystis robusta (Clark) Nygaard

Desikachary 1959, p. 85, Pl. 17, figs. 7-10; Geitler 1932, p. 135, fig. 58

Colonies irregular, rarely clathrate, cells 6 to 9 μm broad, without pseudovacuoles.

Host: Turtle.

Densely colonises the carapace.

Locality: Irrigation canal, about 0.75 m deep, muddy bottom, temperature 23°C, pH 8, conductivity 1750 μScm^{-1} .

Order: Oscillatoriales

Family: Oscillatoriaceae

Lyngbya epiphytica Hieron

Desikachary 1959, p. 284, Pl. 53, fig. 7.

Filaments solitary, growing epiphytically on *Lyngbya majuscula*; curved or spiralled; loosely or tightly fashioned. The apical end usually free and straight. Trichomes gray green, not attenuated, 2 to 3 μm in diameter. Sheath thin; firm and partially transparent (Fig. 2.).

Host: *L. Majuscula* grown on turtle.

Locality: Drainage canal, about 0.5 m deep, muddy bottom, temperature 22°C, pH 7.8, conductivity 3250 μScm^{-1}

Lyngbya majuscula Harv.

Desikachary 1959, p. 113, Pl. 48, fig. 7, Pl. 49, figs. 21 & Pl. 52, fig. 10.

Thallus brush-like, expanded, attached to the carapace and tail of turtle. Filaments 3 cm long, rarely up to 4 cm, dull blue-green to brownish, sheath 10 to 15 μm thick, lamellated.

Trichome 60 to 80 μm broad, without calyptra, end cell rounded (Figs. 3&4).

Host: Turtle.

Locality: Drainage canal.

Schizothrix lardacea (Ces.) Gomont

Desikachary 1959, p. 327, Geitler 1932, p. 1085, fig. 693 d-e.

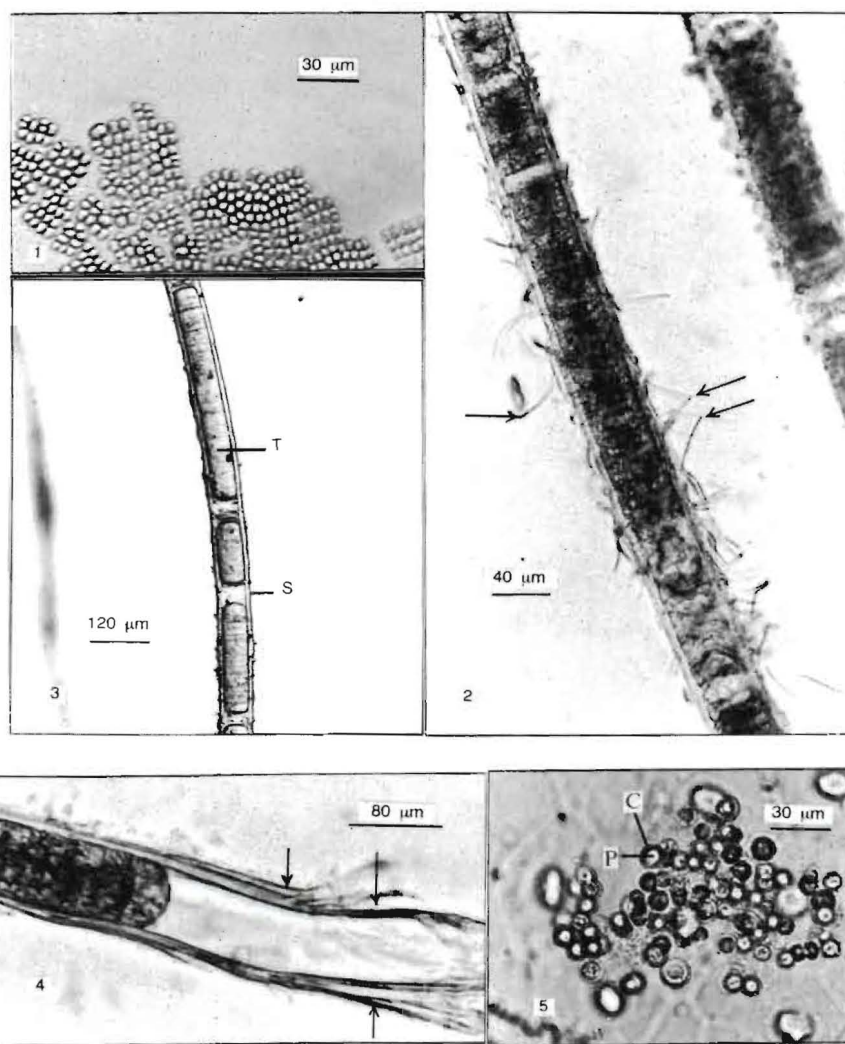


Fig. 1. *Merismopedia glauca*, showing part of the regularly arranged colony established luxuriantly over the mucilaginous secretion of the epidermis of frog.

Fig. 2. *Lyngbya epiphytica* (arrows), growing epiphytically on *Lyngbya majuscula*.

Fig. 3&4. *Lyngbya majuscula*. Fig. 3. Showing trichomes (T) within the distinct sheath (S). Fig. 4. Enlarge portion of filament showing details of laminated sheath (arrows).

Fig. 5. *Chlorella* sp., showing aggregated cells over the scraped epidermal film of frog. C = chloroplast, P = pyrenoid.

Thallus expanded, up to 2 cm high, rarely branched, trichomes 1 to 2 μm broad. The granulated cross-walls not constricted.

Host: Snail shell.

Intermingled with other algae and form a hard substratum.

Locality: Ain Al-Khudoud, natural spring, temperature 24°C, pH 7.9, conductivity 825 μScm^{-1} .

Division : Chlorophyta
Order : Chlorococcales
Family : Oocystaceae

Chlorella sp.

Cells spherical, unicellular and mostly gregarious, forming irregular clumps on epidermal tissues, 6 to 9 μm in diameter. Chloroplast with or without pyrenoids (Fig. 5).

Host: Frog.

Locality: Pool in an agricultural farm, temperature 22°C, pH 7.8, conductivity 2400 μScm^{-1} .

Order : Ulvales
Family : Ulvaceae

Enteromorpha intestinalis (L.) Grev.

Prescott 1978, p. 125, fig. 235.

Thallus 4 to 20 cm high, 200 to 400 μm broad, initially uniseriate, later becoming parenchymatous, broadening distally, usually cylindrical or intestine-form; branched thallus not frequent (Fig. 6). Chloroplast parietal, outer cell wall thin.

Host: Snail shell.

Growing luxuriantly on shells of snails and on other hard substrata.

Locality : Ain Al-Khudoud.

Order : Chaetophorales
Family : Chaetophoraceae

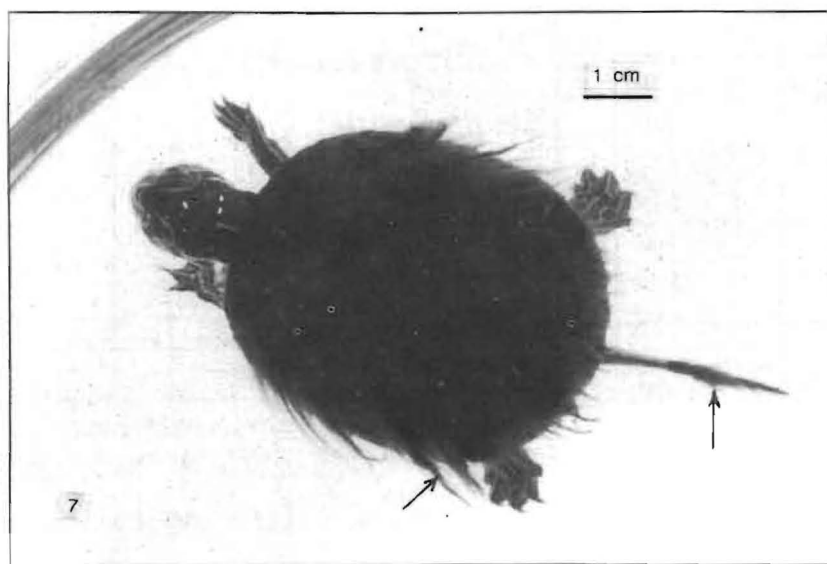
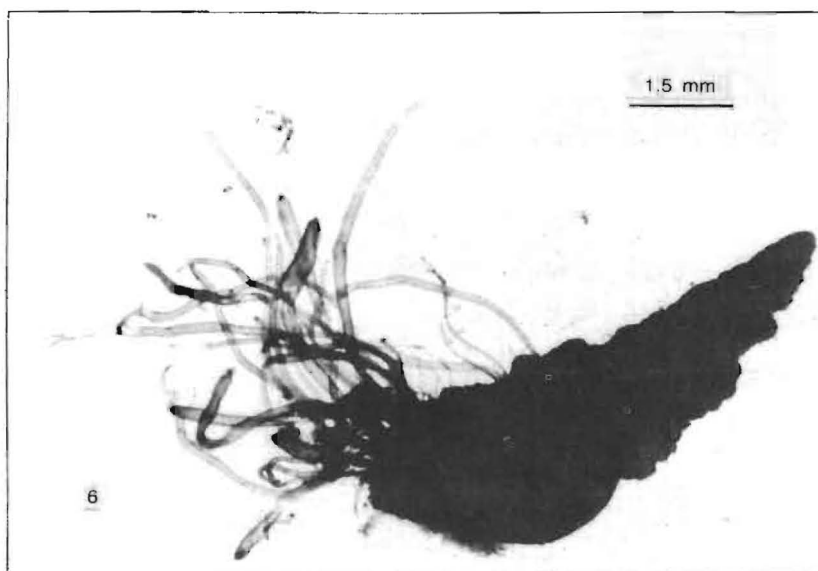


Fig. 6. *Enteromorpha intestinalis*, bunch of unbranched thalli colonizing the distal end of the shell of *Melania striatella tuberculata*.

Fig. 7. *Basicladia chelonum*, growing densely on the carapace and tail (arrows) of the turtle *Mauremys caspica*.

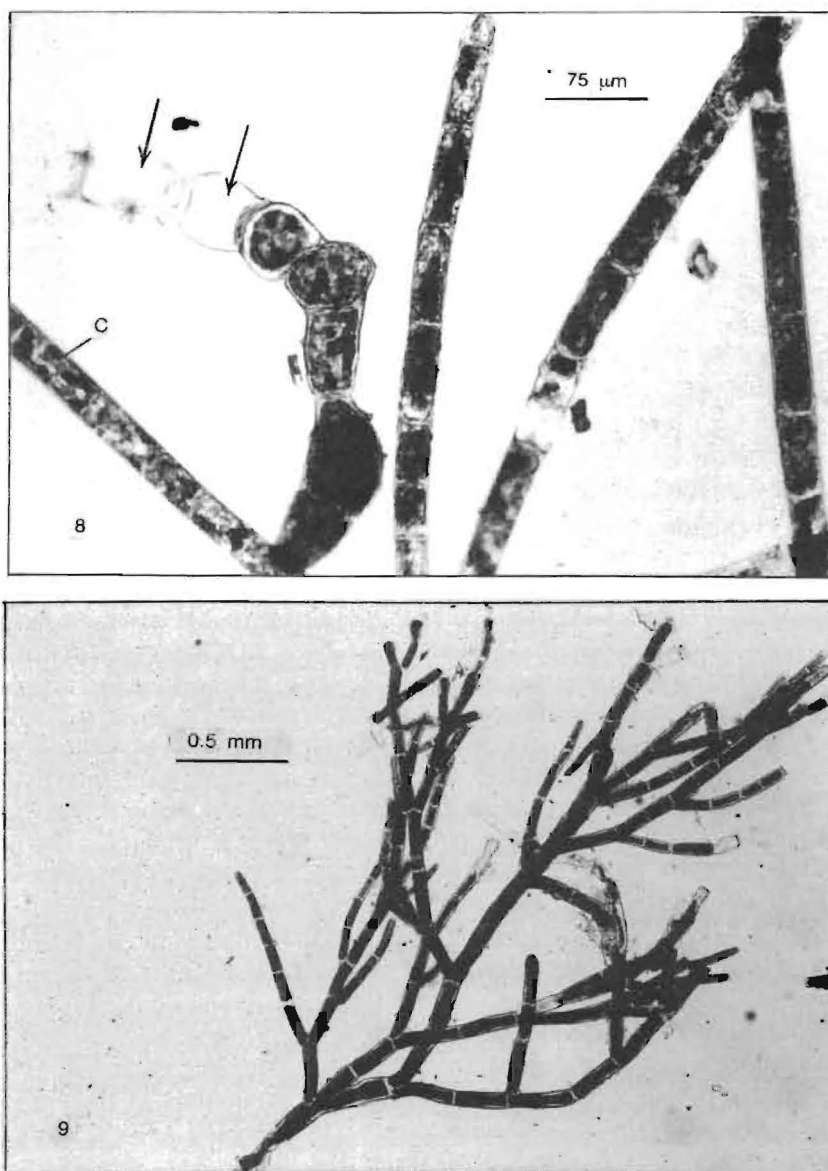


Fig. 8. Sporangia bearing filament and three young filaments of *Basicaladia chelonum* showing pores in sporangia (arrows) and reticulate form of chloroplast (C).

Fig. 9. *Cladophora glomerata*, an acid treated plant showing the dichotomous branching of the upright branches.

Gongrosira Debaryana Rabenhorst

Prescott 1962, p. 132 & 133, Pl. 19, fig. 3.

Thallus densely packed, short filaments of 2 to 5 cells arising from prostrate filaments, forms a cushion-like hard green stratum; a few upright filaments terminate in sporangia. Cells cylindrical or claviform 20 to 30 μm broad, 40 to 60 μm long. Chloroplast parietal and not properly defined with one centrally located pyrenoid.

Host: Snail shell.

Locality : Ain Al-Khudoud.

Order : Siphonocladales

Family : Cladophoraceae

Basycladia chelonum (Colins) Hoffman & Tilden

Prescott 1962, p. 143, Pl. 23, figs. 8-12

Thallus erect, attached by rhizoids, branching sparsely, only from the basal part of the filament. Cell cylindrical several times longer than broad, 30 to 35 μm in diameter. Chloroplast compact reticulate, with plentiful pyrenoids. Sporangia present at the upper part of the filament and few lateral spores were present on the lamellated cell wall. New record for Saudi Arabia (Figs. 7&8).

Host: Turtle

Locality: Irrigation canal.

Cladophora glomerata (L.) Kuetzing

Prescott 1962, p. 138, Pl. 20, figs. 8&9.

Robust plant, highly incrustated, up to 4 to 5 cm. high. Filaments mostly unilaterally and dichotomously branched. Upper part of the thallus is usually crowded, apical cells with attenuated tips. Main thallus 100 to 120 μm broad (Fig. 9).

Host: Snail shell.

Locality: Ain Al-Khudoud.

Of the algae growing on snails *Cladophora glomerata* was the most abundant species. Nine snails of different species showed the occurrence of this alga dominating over the other algal vegetation. *Enteromorpha intestinalis* was second

clonizing 6 of the snails followed by *Shizothrix lardacea* (3 snails) and *Gongrosira debaryana* (2 snails). The two turtles examined were dominated by *Basicladia chelonum*. *Microcystis robusta* was frequently noticed on both turtles but *Lyngbya majuscula* and *L. epiphytica* were less frequent appearing only on one turtle. A species of *Chlorella* was the most abundant alga on frogs. All three frogs showed the presence of this species on the epidermis. *Merismopedia glauca* was occasionally observed on two frogs.

Discussion

The results indicate that the epizoic algal species of Al-Hassa belong to two groups, the blue-green algae and the green algae. Such conclusion was also reached by Islam and Hameed (1982) who described 7 epizoic algae from Southern Iraq 5 of which were greens and 2 were blue-greens. However, epizoic algae from other algal groups have been reported. For example 9 diatoms and 1 yellow alga were found growing on snail shells from Pakistan (Anjum and Hussain 1984). The absence of other algal groups from the animals of Al-Hassa could be attributed to unfavorable environmental conditions. Two of the species (*Basicladia chelonum* and *Cladophora glomerata*) described by Islam and Hameed (1982) from southern Iraq were found at Al-Hassa. *Basicladia chelonum* was growing on the same species of turtles as that of Iraq while *C. glomerata* colonized different snail species. A third epizoic algal species was also found in both regions, Hinton and Maulood (1983) reported *Enteromorpha intestinalis* growing epizoically on animal shells from inland waters of Iraq.

This is the first report of epizoic algae from Saudi Arabia. *Basicladia chelonum* is a new record to the area. Some of the species, e.g. *Lyngbya majuscula* and *Cladophora glomerata* have been previously reported from fresh water streams in Makkah (Al-Amoudi 1988) and in Asir Mountains (Whitton *et al.* 1986) but they have not been observed before to grow epizoically.

The colonization of snails, turtles and frogs by different algal species at Al-Hassa doesn't indicate host specificity. Epizoic algae are known to grow on various animal species or hard surfaces (Prescott 1969).

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مجتمعات الطحالب النامية على حيوانات في الاحساء بالمملكة العربية السعودية

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يصف هذا البحث عشرة أنواع من الطحالب النامية على حيوانات للمرة الأولى في المملكة العربية السعودية (خمسة طحالب خضراء مزرققة، وخمسة طحالب خضراء)، كانت الطحالب نامية على سطح ثلاثة أنواع من القواقع *Lymnaea aeuminata*, *Lymnaea pinguis*, *Melania strialtella tuberculata* ونوع واحد من السلاحف *Mauremys caspica* ونوع واحد من الضفادع *Rana ridibunda*. جمعت القواقع من عين الحدود بالاحساء بينما جمعت الضفادع والسلاحف من برك في أراضي زراعية ومن قناتي ري وصرف، قدرت درجة الحرارة والتوصيل الكهربائي والرقم الهيدروجيني لكل موقع في الحقل. غسلت الحيوانات بعد ذلك بالماء برفق لإزالة العوالق النباتية ثم ازيلت الطحالب من سطح الحيوانات وحفظت في محلول من الفورمالين (٣ ٪) لتعريفها. بعض الطحالب عوملت بمحلول من حمض الهيدروكلوريك المخفف (١٢٥، ٠٠ ع) للتخلص من الترسبات الجيرية عليها. غطيت القواقع غالباً بالطحالبين الاخضرين *Enteromorpha intestinalis*, *Cladophora glomerata*. الطحلب الاخضر *Basidiadia chelonum* (يسجل لأول مرة في المملكة العربية السعودية) والطحلب الاخضر المزرق *Microcystis robusta* كانا الاكثر وجوداً على السلاحف، ساد على الضفادع الطحلب الاخضر *Chlorella sp.*

لا يمثل اختلاف أنواع الطحالب النامية على الحيوانات في هذه الدراسة أن تلك الطحالب مختصة بها حيث من المعروف أن تلك الطحالب قد تنمو على سطح حيوانات أخرى كما قد تنمو على بعض السطوح الصلبة .