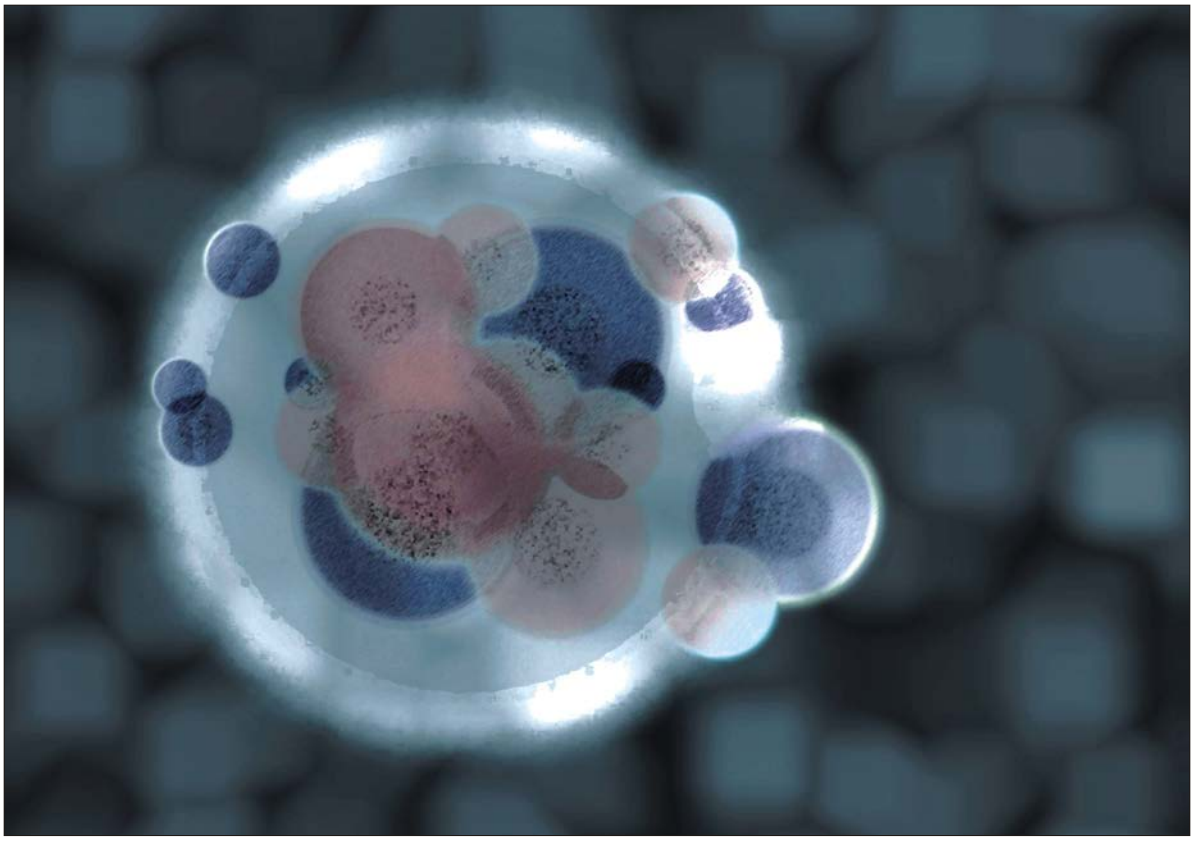

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Fresh Water Algae of Sindh, VI. Charales (Charophyta) from Fresh and Brackish Water of Sindh, Pakistan

[1]Sultan Mahmood Leghari and [2]Anders Langangen
[1]Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro, 76080, Sindh Pakistan, [2]Hallager Bakken 82, B-1256, Oslo, Norway

Abstract: Fifteen Taxa representing 7 species of the *Chara*, 2 species of *Ntella,* and 1 species of *lamprothaminum succinctum* and *Nitellopsis obtusa* have been identified and described from fresh water lakes and ponds. It was noted that the species of chara are indicator of the presence of fish. These species were observed within pH 7.8 to 8.5 and total dissolved solids 260-580 mg/l. *Chara globularis* f.*connivens* R.D.W was present in kinjhar lake, while *Nitellopsis obtusa* was commonly found in kinjhar lake (Distt. Thatta) and Bakar lake (Distt Sanghar) at the depth of 3 - 20 feet.

Key words: Charophytes of Sindh

Introduction

The members of the Characeae (Charophyta) family usually inhabit in submerged conditions of slow running and standing water over muddy and sandy bottom, but they can also grow at the various depth in lakes. Their distribution commonly occur in ponds, lakes, ditches rice fields, shallow undisturbed streams, River Indus shallow pools and even brackish water. In Pakistan Charales (Charophyta) have been found to grow in the Punjab, Northern areas, N.W.F.P. (Faridi, 1955, 1956; Sarim, 1991). Aisha and Shameel (1995) described *Chara vulgaris* L. f. *atrovirens* (Low) *H. et* Groves and *Chara vulgaris calveraensis* R.D Wood from maritime region of Baluchistan (Pakistan).

The present work is an attempt to add more information about Characeae from Sindh, Pakistan.

Materials and Methods

The Charophycean material were collected from the fresh water and Bakar lake (Distt. Sanghar), Kinjhar (Distt. Dadu) also ponds, pools, drain, Nain bran beds, stagnant water, Rice fields . The samples were collected from brakish water (lake pateji and Karoghanghro district Badin). Collection were made by hand picking also with help of grapnei at the various depth from the lakes. Specimen were studied after preserving in 3-4% formaline. The dust and other organic material (grit) were removed by washing the sample 2-3% aceitic acid and to clear the specimen drawing were made with the hlep of a camera lucida at the magnification of 8x x 10 & 8x x 5 under the stero/light microscope and specimen were identified and conformed after the reference Pal *et al*. (1962) and Wood and Imahori (1964).

Results

Distribution of Charales (Charaphyta) from Sindh-I

Species Name	Distribution with location
Chara canescens Desv. & lois	Jati pond srinwari (District Sanghar)
Chara globularis f. connivens R.D.W. (*Chara connivens*) salzm. (A.Br.)	Kinjhar lake at 5-20 feet depth
Chara vulgaris F. contraria (A. Br.) R.D.W.	Kinjhar, Sonda (Distt. Thatta) Nai Baran.
(*Chara contraria* A. Br. es. kutz)	Kotri, Jamshoro (Distt: Dadu) Tando Mohammad Khan, Seri (Distt: Hyderabad). Jati, Tando Mitha khan, Khimbhro (Distt: Sanghar). Rice fields & ponds (Distt. Shikarpur & Jacobabad)
Chara corallina Klein ex. wild.	Pharagmites pond near Bakar lake (Distt. Sanghar)
Chara corallina var. wallichi (Chara wallichi. A. Br.)	Chalgari pond and River water Petaro (Distt. Hyderabad).
Chara fibrosa Ag. es. Broz: em (Chara gymnopitys A.Br)	Kinjhar lake (Distt. Thatta), Award Pond (Distt: Sanghar) Karo ghanghro lakes (Distt. Badin)
Chara globularis Thuiff: em.	Kinjhar lake ponds (Distt. Thatta)
Chara setosa Khen es. willd. em (C.brachypus A. Br.)	Kotri pond (Distt. Dadu).
Chara vulgaris L. em.	Lake Manjosa (Kashmir). Tando Mitha Khan (Distt. Sanghar)
C*hara zeylanica* Willdenow	Bakar, Award (Distt. Sanghar) KJaro ghanghro, sonda, Kinjhar (Distt. Thatta) pond, (Distt. Badin) Manchar, Kotri, Jamshoro (Distt. Dadu) Hostri, Syedpur Takur (Distt. Hyderabad) Hub-Dam (Karachi).
Chara zeylanica f. *elegans* (A. Br. ex.T.F.A.) H & J Gr.	Drain water (Distt. Sanghar)
Lamprothaminium succinctum (A.Br). R.D.W.	Karo ghanghro, Pateji (Distt. Badin), Thando Bola Khan (Distt: Dadu) & Alam Rajar ponds (Distt. Sanghar), Syed pur Takur (Distt. Hyderabad). (Chara succineta A. Br.)
Nitella hyalina (D.C) Ag.	Nai Baran, Kotri (Distt. Dadu) Sonda, Kinjhar lake (Distt. Thatta) Drain Karo ghanghro (Distt. Badin) Chalgari River Indus (Distt. Hyderabad) Khori pond, Nara Canal Bakar (Distt. Sanghar) Hub-Dam (Karachi)
Nitella dictyosperma H & J. Gr.	Bank pond of Nara cannal near Bakar lake (Distt. Sanghar)
Nitellopsis obtusa J.Gr.	Bakar lake (Distt. Sanghar) Kinjhar lake (Distt: Thattat)

Systematic Accounts

Chara canescens Desv. & lois.

Faridi, 1955:77; Pal *et al*. 1962:101; Wood and Imahori, 1964:45. (Fig. 1). Dioecious, stem moderately stout, internodes 2-4 times in length of the branchlets, spine cells persistant, whorls of 8-9 branchlets. stupulodes in two series developed long apex accuminate. Branchlets 6-8 segmented, upper most segment ecort. Bract cells 5-6 longer than Oogonium. Bractlet small. Oogonium solitary ellipsoid 600-700 μm long, 375-550 μm broad, spiral cells showing 13-15 convolutions. Oospore ellipsoid black 500-600 μ long, 350-450 μm broad. Anthridium 300-350 μm in diameter.

This species reported from colder region of the world also reported from Peshawar (N.W.F.P), Rawalpindi (Punjab), Quetta (Baluchistan), Faridi (1955). In our observation this species grown colder season in Jati pond Distt: Sanghar in

Sindh Province.

Chara globularis f. ***connivens*** (Salzm ex. A. Br) R.D.W.(*Chara connivens* salzam ex. A. Br.) Pal *et al*., 1962:114; Wood & Imahori, 1964:54 (Fig. 2).
Plant dioecious brittle, stem-slender, branchlets 6-10 in whorl. Male plant consisting 6-13 segment of which upper 1-2 ecorticate, bract cells 7, bracteoles & bractlet elongated 300-380 μm long, but shorter than Oognia. Antheridia or Ooginia solitary at the lowest nodes. Antheridia 550-600 μm in diameter. Oogonia 650-700 μm long (including coronula); 450-500 μm broad. Spiral cell showing 13-14 convolution, Coronula 110-150 μm wide 200-210 μm high. Oospore black 500-550 μm long, 350-400 μm wide.
Distribution: This species occur at the depth of (3-10 feet) in Kinjhar lake Distt: Thatta and Bakar Lake Distt: Sanghar.

Chara vulgaris **f. *contraria*** R.D.W. **(*Chara contraria*** A. Br.). Faridi, 1955:78; Pal *et al*. 1962:103 ; Wood and Imahori, 1964:7 (Fig. 3-4).
Plant monoecious 20-30 cm high stem short, internodes 2-4 times as long as the branchlets, cortex diplostichous 2-3 cort, spine cell solitary 350-400 μm long, 75-95 μm wide at the base. Stipulodes 2 in tiers, 2 per branchlet, upper 180-225 μm long, 65-75 μm wide at the base lower 90-120 μm long, 45 μm wide. Branchlets 7-10 in whorl upto 1-1.5 cm long segments 4-5, terminal 2-3 ecrot & basal 2 cort. end cell conical, accuminate, Bractcell 4-5 various in lenght.
Bracteoles long exceding Ooginia. Oogonia solitary on corticate segments of the branch lets ellipsoid, cylindrical 650-700 μm long, 450-500 μm broad with 13-15 convolutions. Coronula 150-200 μm high, 200-250 μm broad; Anthridum 275-350 μm in diameter.
Habit: In shallow water, pools, ponds, rice fields on the margin of the lake.
Locality: Kinjhar lake, sonda pond (Distt: Thatta), Kotri pond Nain Bran, S.U. campus ponds. (Distt. Dadu). Jati , Khori, Khimbro Pond (Distt: Sanghar), rice fields ponds (Distt. Jacobabad & Shikarpur).

Chara corallina Klein ex willd, em
Faridi, 1955:75; Pal *et al*. 1962:87; Wood and Imahori, 1964:111 (Fig. 5-6).
Plant monocious, stem stout, internodes long, ecorticate stipulides rudimentary in young parts of the plant elongated acute. Whorl 7-8 branchlets each branchlets 4-5 segments, the upper segment small conical accute. Bract cell 3-4 long accute. Gametangia at the base of the whorls also on the branchlets. Oogonia with stalk ovate, oblong 800-1036 μm long (including coronula) and 500-770 μm broad with 8-10 convolutions, coronula 85-120 μm high, 165-225μm broad. Antheridium about 465-520 μm in diameter. Oospore ovate, oblong black 500-700 long, 320-500 μm broad with 7-8 ridges outer membrane light yellow granulated.
This species occur in the slow running clean seepage water coming from the *Phargmites communis* beds in association with *Hydrilla verticilita* and *Compsopogan coeruleus* near Bakar lake.

Chara corallina var. ***wallichii*** (A. Br.) R.D.W. (***Chara wallichii*** Brown)
Faridi, 1955:75; Pal *et al*. 1962:86; Wood and Imahori; 1964:118 (Fig. 7-8).
Male and Female plants similar (dioecious), stem stout, ecorticate, stipulodes in series rudimentary. Whorl 3-5 branchlets, branchlets stright longer than the bract cell. Bract cell 2-4 times long, thick accute, bracteoles as long as Ooginia. Gametangia at the base of whorls also at the branchlet nodes. oogonia inside & out side the branchlets also at the base of the whorls, 1-2 at the nodes, broadly ellipsoidal 650-750 μm long, 450-550 μm broad, spiral cell showing 7-8 convoultion. Coronula 100-125 μm in high, 150-200 μm broad. Oospore ellipsoid brown black 500-650 μm broad. Antheridia clustered at the base of the whorls, 1-2 at the lower internodes of the branchlets 450-500 μm in diameter.
Habit: This species grow in the fresh water on the Bank of the River Indus along with other species commonly November-March.

Chara fibrosa Ag. ex. Bruz; em. (***Chara gymnopitys*** A. Br.).
Pal *et al*., 1962:95; Wood and Imahori, 1964:125; Islam and Sarama, 1968;366 (Fig. 9-10).
Plant monoecious, 10-35cm high, moderately stout internodes 1-4 times in the length of the branchlets, whorls 10-11 branchlets, spine cell single accute 800μm long, 70-80μm broad at the base, branchlets 5 segments, ecorticated, stipules developed in single row cortex diplostichous, primary series more prominent than the secondary series, bract-cell 6-8μm in length usually exceding the bracteols similar to bract cells. Gametangin usually at the two lowest, occasionally at the third node. Anheridium 250-300 μm in diameter. Oogonia 600 μm long, 400-450 μm broad, coronula 75-100 μm high, 130-140 μm broad at the base. Oospore 350-380 μm long, 250-300 broad black.
Habit: Awad ponds (4-5-98, Distt: Sanghar) Kinjhar lake (Distt. Thatta), Saline lake Karoganghro (Distt: Badin).

Chara vulgaris L., em. Wood and Imahori, 1964:2
Pal *et al*., 1962:102, Faridi, 1955:78 (Fig. 11)
Plant monocious, 18-30 cm high, incrusted. Cortex 2-corticated, spine cell solitary stipulates in 2 tiers, 2 sets per branchlets. Branchlets 8 in whorls, Bract cell 3-4 unilateral. Bracteoles 2-4 times as long as Oogonium.Oogonia 500-550 μm long (including coronula), 250-300μm wide, convulations 12-13, coronula 100-120 μm high, 130-200 μm broad.Oospore black 350 μm long, 160-200 μm wide. Striae 12-13 ridges. Antheridia 200-350 μm in diameter.
Habit: Ponds, Tando Mitha Khan Pond (Distt: Sanghar) 28-12-97

Chara setosa Klein ex. Willd., em. (***C. brachypus*** A. Br)
Wood and Imahori, 1964:88.
Plant monoecious 30-40 cm high. Axes selender stout, internodes 2-3x branchlets length, 8-10cm long, cortex 3-cort. Spine cell 70-125 μm long, 55-75 μm wide at the base stipulods in 2 tiers 2 sets each branchlets upper larger 350-500 μm long, 100-150 μm wide, lower apex conical 150-200 μm long, 120-145 μ wide at the base
Branchlets 8-10 in whorls, 2.5-4 cm long, with 8-10 segments, 4-7 cort and 1-3 distal ecort. Bractcell 6-8 anterior well developed and posteriors rudimentary. Oogonia 700-850 μm long (including coronula) 550-600 μm

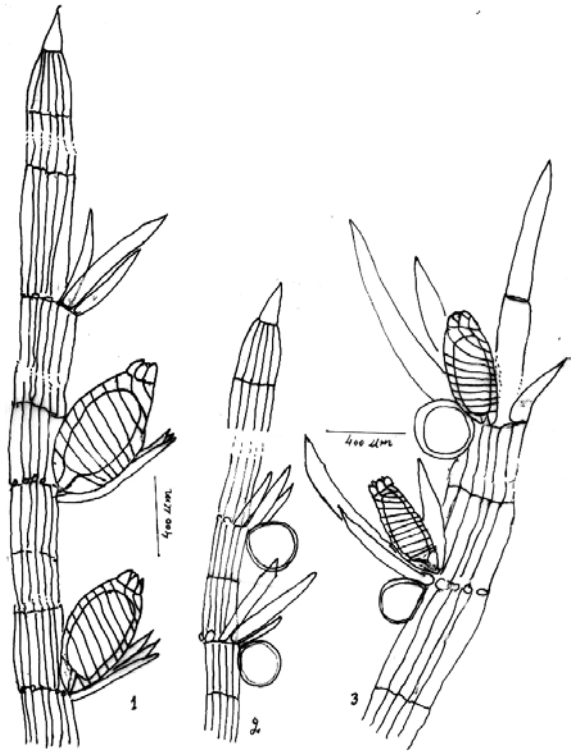

Fig. (1-3):
1. Chara canescens Desv. & Lois.
2. Chara globularis f. connivens Slazm ex A. Br (Chara connivens Salzm ex.A.Br).
3. Chara vulgaris f. contraria (A. Br. ex Kutz) R.D. Wood Chara contraria A. Br. Kutz..

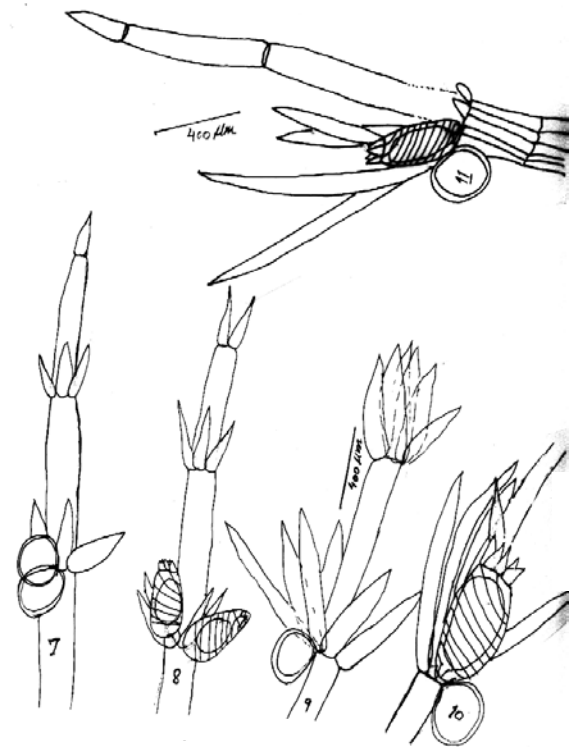

Fig. (7-11):
7-8 Chara corallina var. wallichii (A.Br) R.D.W. (Chara Wallichi A. Br.)
9-10 Chara fibrosa Ag. ex. Bruz. em (Chara gymnopitys A. Br).
11. Chara vulgaris L. em Wood & Imahori.

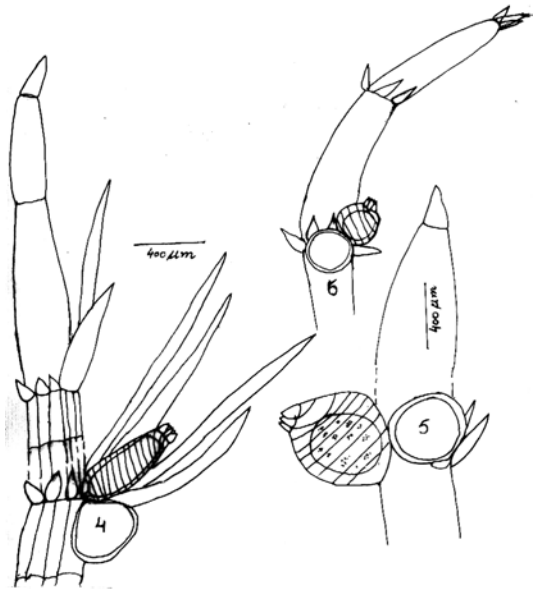

Fig. (4-6):
4. Chara vulgaris f. contraria (A. Br. ex Kutz). R.D.W. (Chara contraria A. Br.)
5-6. Chara corallina Klein ex-Willd.

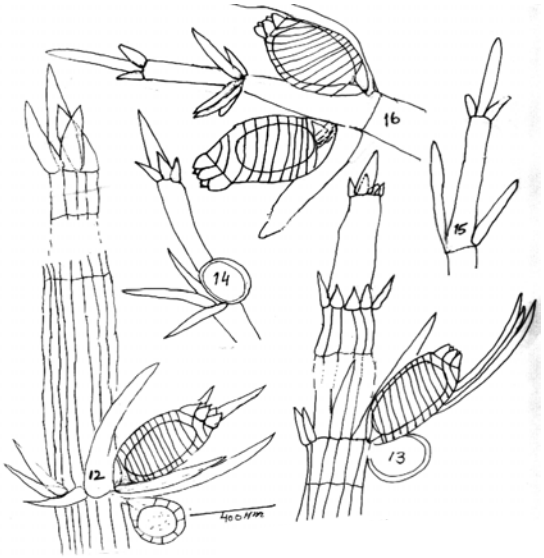

Fig. (12-16):
12. Chara zeylanica Willdnow
13. Chara zylanica f. elegans (A. Br. ex. T.F.A) (Chara gymnopus var. elengan A. Br.)
14-16. Lamprothaminum succinctum (A. Br) R.D.W. (Chara succineta. A . Br. A.).

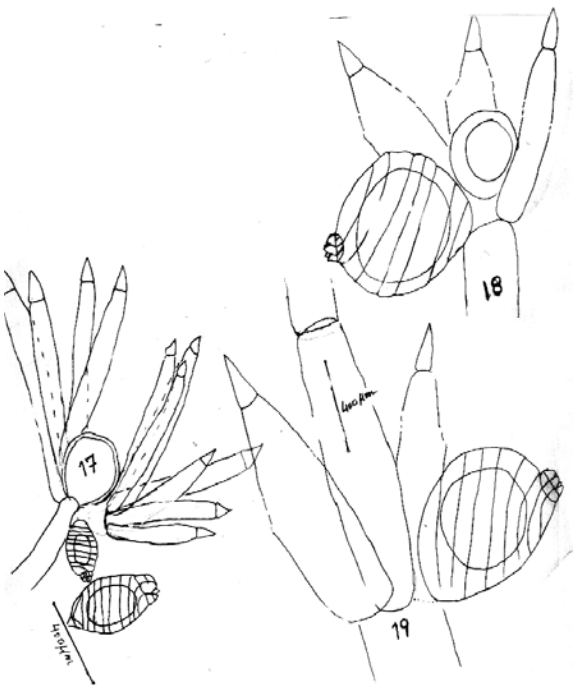

Fig. (17-19):
17. Nitella hyalina (D.C) Ag.
18-19. Nitella dictyosperma H & J. G.r.

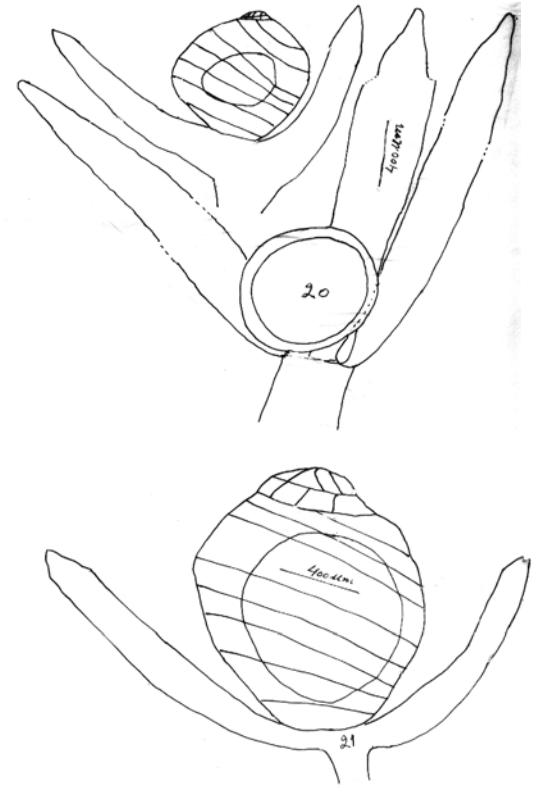

Fig. (20-21):
Nitellopsis obtusa (Desv.) Groves.

wide subglobose convulations 12-13, coronula 125-175 μm high 200-250 μm wide . Oospore black 650-750 μm long 450-500 μm wide, with 9-10 ridges.
Antheridia 250-350 μm in diameter.

Habit: Kotri & Nain Baran pond (Distt: Dadu), Date: 20-1-1998

Chara zeylanica Willdnow. Pal *et al*. (1962:105) (Fig. 12).
Plant monocious, stem stout, internodes 1-3 times the length of the branchlets, stipulodes acute into two series, spine accute elongated, whorls of 11-12 stout spreading branchlets, branchlets of 9-11 segments, the lowest segment very short and ecortet terminal segment short hardly exceeding the bracts, bract cell 7-8, bracteoles 3-4 times the length of the bract cell exceeding the fruit length. Gamentongia produced 2-5 branchlet nodes, Oogonia 750-800 μm long, 280-350 μm broad, spiral cell showing 12-14 convulations, coronula slightly spreading 120-150 μm high and 170-200 μm broad at the base. Oospore 450-500 μm long, 250-300 μm broad, Antheridium 350-400 μm in diameter.
This is very common species commonly occur in brackish water Pateji & Karo ghanghro lakes (Distt: Badin), Kinjhar lake, saline ponds, also found in rice field through out Sindh Province.
Lutijanus lutijanus (Park) Dandio, Bigeye snapper (Karo ghanghro lake), Cyprinus ticteto (Manchar lake) feeds on the branchlets, stipulodes & spines.

Chara zeylanica* f. *elegans (A. Br. ex T.F.A) H&J. Gr. (***Chara gymnopus*** var. ***elegans*** A. Br. ex. T.F.A). Wood and Imahroi; 1964:94 (Fig. 13).
Plant monoecious upto 15-20cm high, incrusted. Axes 500-650μm in diameter, inter nodes 2-4 times in lenght of the branch-lets, whorls usually 2-4 branchlets in three series one above the other, below the primary branchlets, primary branchlets thicker, and longer 2-3 frucate. Primary rays about 1/2-3/4 of the total length of the branchlets. Secondary rays 7-10 of which 2-3 simple tertiary rays 4-7 with quarternary rays ultimate rays 2 celled, the lower cell tapering gradually to the apical cell, the apical cell small conical, pointed , accessary branchlets once furcate into 4-5 rays.
Oogonia & anthersidia developed on the primary branchlets at second, third, fourth forkings. Oogonia 1-2, 270-350 μm broad, 450-500 μm long including coronula, spiral cells showing 8-9 convulation, coronula 50-75 μm high, 75-100 μm broad. Oospore flatend brown black 250-350 μm broad, 350-400 μm long. Antheridia 250-300 μm in diameter.
Habit: In a drain near Sanghar city (Distt. Sanghar) 20-5-1998

Lamprothamnium succinctum (A. Br.) R.D.W. (***Chara succineta*** A. Br.)
Pal *et al*, 1962:89; Wood and Imahori, 1964:161 (Fig. 14-16).
Plant monocious, without cortex, transparent 10-30 cm, stem stendler. Internode 1/3-1/2 length of the branchlets stipulodes in single whorl small accute, numerous branchlets 7-8, 2-4 cm long with 4-5 segment bract cells 5-6 at lowest node.
Antheridia & Oogonia not together at the base of the brachlet whorl at the lowest branchlet nodes only antheridia are found solitary or two Oogonia may present. Antheridia 350-400 μm in diameter. Oogonia 700-75 μm long (including coronula) 450-550 μm wide, corona 100-150 μm high, 125-150 μm broad, spiral cell showing 11-13 convulations. Oospore brown black 500-550 μm long, 350-450 μm wide.
This species commonly occur in saline water Alam Rajer pond

& other lakes on the edge of Thar desert (Distt: Sanghar), Brackish water lake Karo ghangharo (Distt: Badin), in the bed of Nain Bran at the Dawo Dam near Thano Bola Khan (Distt. Dadu).
Faridi (1955) reported from the bed consisting of coarse sand, Lyaree river, Karachi.

Nitella hyalina (D.C) Agardh
Faridi, 1955:72; Pal *et al*., 1962:72; Wood and Imahori, 1964:34 (Fig. 17)
Plant monocious stem 20-25cm long selender, ecorter inter nodes 2-4 times in length of the branchlets, whorls usually 24 branchlets in three series one above the other, below the primary branchlets, primary branchlets thicker, and longer 2-3 times frucate. Primary rays about 1/2-3/4 of the total length of the branchlets. Secondary rays 7-10 of which 2-3 simple tertiary rays 4-7 with quarternary rays ultimate rays 2 celled, the lower cell tapering gradually to the apical cell, the apical cell small conical, pointed, accessary branchlets once furcate into 4-5 rays. Oogonia & anthersidia developed on the primary branchlets at second, third & forth for kings.
Oogonia 1-2, 270-350 μm broad, 75-100 μm broad. Oospore flatend brown black 250-350 μm broad, 350-400 μm long. Antheridia 250-300 μm in diameter. This species are very common through out Sindh , in ponds, Kanjhar lake up 1-4 feet depth, also in the bed Nai Baran, below the bridge of supper high way and in winter season growth occur in the bed of River Indus forming pools.

Nitella dictyosperma H. & J.Gr.
Faridi, 1955:71; Pal *et al*., 1962:64 ; Wood and Imahori, 1964:227 (Fig. 18-19).
Plant monocious, stem stout, internodes twice of the length of the branchlets, whorls 5-7 branchlets. Branchlets fertile 2-3 times furcate primary rays little less than half the total length of the branchlets, secondary 3-5 rays tertiary ray 3-4, quaternary 3-4 ultimate rays 2 celled. Low cell usually rounded at the apex, ultimate cells very short and narrow, conical ending point. Oogonia and antheridia produced at frucation. Oogonia 350-375 μm long, 280 μm broad, coronula 30-50 μm high, 50-60 μm broad with 7 convulations. Oosopore granulated Brown Black 220-250 μm in diameter. Antheridia 170-200 μm in diameter.
Habit: This species grow in clean water with Typha domingensis in pond on the Bank of Nara Canal near Bakar lake (Distt: Sanghar).

Nitellopis obtusa (Desv.) Grovs
Pal *et al*., 1962:80; Wood and Imahori 1964 (Fig. 20-21).
Diecious large, grayish green in colour, selender stout stem nodes star shaped, internodes as long as the branchlets length, cortex absent, branchlets 5-7 in whorl, almost stright, segments 2-3 and segment with one celled, cylendrical, apex accuminate. Bract cell 1-2.
Male and female gametes 1-2 together, oogonia 1000-1100 μm long; 800-950 μm broad. Convulations 8-9, coronula 100-150 μm high, 150-200 μm wide at the base. Oospore brown 450-700 μm in dimater. Antheridia redish in colour 750-1000 μm in diameter.
This species grow in Bakar and in Kinjhar lakes alongwith *Chara connivens* salzam at the depth of 3-15 feet.

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