Fresh Water Algae from Chontra, District Karak


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Abstract - Thirty-six species of fresh water algae were taxonomically identified. The samples were collected from rain-fed streams (Algaadha) in Shamshoki, District Karak during March to May, 2011. Algae was collected, identified and described from this area for the first time. These specimens belong to 36 species, 25 genera, 17 families, 15 orders, 7 classes and 5 divisions of Cyanophyta, Chlorophyta, Chrysophyta, Bacillariophyta and Ochrophyta including Oscillatoria (1 spp), Lyngbya (1 spp), Chroococcus (2 spp), Synechocystis (1 spp) Spirogyra (3 spp), Ulothrix (2 spp) Cosmarium (2 spp) Oedogonium (1 spp) Rhizoclonium (1 spp) Fragilaria (1 spp), Synedra (1 spp), Diatoma (1 spp), Pinnularia (2 spp), Amphora (1 spp), Cymbella (2 spp), Surirella (1 spp), Cocconeis (1 spp), Achnanthes (1 spp), Nitzchia (2 spp), Navicula(2 sp) had one Stauroneis (3 spp) and Vaucharia, Epithamia, Mastogloia, Frustulia.

GJSFR-C Classification : FOR Code: 060204

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Abstract - Thirty-six species of fresh water algae were taxonomically identified. The samples were collected from rain-fed streams (Algaadha) in Shamshoki, District Karak during March to May, 2011. Algae was collected, identified and described from this area for the first time. These specimens belongs to 36 species, 25 genera, 17 families, 15 orders, 7 classes and 5 divisions of Cyanophyta, Chlorophyta, Chrysophyta, Bacillariophyta and Ochrophyta including Oscillatoria (1 spp), Lyngbya (1 spp), Chroococcus (2 spp), Synechocystis (1 spp) Spirogyra (3 spp), Ulothrix (2 spp), Cosmarium (2 spp), Oedogonium (1 spp), Rhizoclonium (1 spp), Fragilaria (1 spp), Synedra (1 spp), Diatoma (1 spp), Pinnularia (2 spp), Amphora (1 spp), Cymbella (2 spp), Surirella (1 spp), Cocconeis (1 spp), Achnanthes (1 spp), Nitzchia (2 spp), Navicula (2 sp), Vaucheria, Epithemia, Mastogloia, Frustulia.

I. INTRODUCTION

Algae is present in all biologically active ecosystems (John et al., 2002). There is approximately 19 divisions with 26,900 species of algae which has been described till today in the world (Wilson, 1988). It has been studied worldwide and in Pakistan phycologist has reported algae from various habitats. Hussain et al. (1984), Anjum & Hussain (1984), Leghari et al. (2002), Sarim (2005), Zaman and Hussain (2005), Ali et al. (2008) reported algae from various fresh water habitat of Pakistan. Freshwater diatoms of Sindh (Leghari, 2001; Leghari et al., 2001, 2002, 2004), Punjab, KPK and Azad-Kashmir (Leghari et al., 2003, 2004, Tariq et al., 2005, 2006a, b, c, d, 2007, 2008; Bashir et al. 2008; Sarim et al., 2008; Ghazala et al., 2009; Ali et al., 2010; Ghazala & Habib, 2011) have all been worked out. Diatoms from coastal waters of Pakistan were reported by Ghazala (2006, 2007). Aliya et al. (2009) demonstrated fresh water algae of Karachi.

In this continuation the present study is an attempt to report some fresh water and soil algae from the hilly area, Shamshoki of District Karak.

II. MATERIALS AND METHODS

Collection was made from rain fed fresh water stream and moist soil by hand picking, squeezing the algal masses and scraping stones and other submerged objects. The collected specimens were kept in glass bottles and preserved by adding 3% formalin solution. The preserved specimens were then examined under microscope and identified with help of key used after Tiffany and Britton 1952, Prescott, 1962, Cleve (1893), Ramanathan (1964), Desikachary (1959) and Transeau (1951).

III. RESULT AND DISCUSSION

The present study revealed that the 36 algal specimens belong to 5 Divisions. Out of it 5 species belongs to 4 genera, 3 families, 2 orders, and 2 classes of division Cyanophyta. 9 species belongs to 5 genera, 5 families, 4 orders, and 2 classes of division Chlorophyta. 18 species belongs to 12 genera, 7 families, 7 orders, and 1 class of division Bacillariophyta. 1 species belongs to 1 genus, 1 family, 1 order, and 1 class of division Chrysophyta. 3 species belongs to 3 genera, 1 family, 1 order, 1 class of division Ochrophyta.

PHYLUM CYANOPHYTA
CLASS CYANOPHYCEAE
ORDER OSCILLATORIALES
FAMILY OSCILLATORIACEAE

1. Oscillatoria laetevirens: (Crowan) Gomonl.

References: P 212 plate 39, fig 2 Desikachary.

General Characters: Cells nearly as long as broad 2.5-5 micrometer long sometimes granulated at the cross walls; end cells not capitates more or less obtuse or less obtuse or conical without calyptras.


Remarks: The species was collected in vegetative form. Fig. 26.

2. Lyngbya spiralis, Geitler.

References: p 288 plate 48, fig 1, Desikachary.

General Characters: cells mostly 1/3 seldom up to ½ as long as broad, 1.2-2.5 micrometer long; end cell broadly rounded without a thickened outer wall, calyptras absent.


Remarks: it was collected in vegetative form, Fig.27.

ORDER CHROOCOCALES
FAMILY CHROOCOCCACEAE

3. Chroococcus turgidus (Kuetz.) Naegeli 1849.

References: P 129 plate 26, fig 6 Desikachary.

General Characters: Cells bright blue green, contents sometimes coarsely granular, enclosed by individual sheath, 8-32 u in diameter without sheath, 15-50 micrometer wide including sheath.

Locality: Village Hakim Khel, April 2011.

Remarks: the species was collected in vegetative form. Fig.24.

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4. *Chroococcus minutus* (Kuetz.)Naegeli.1849

**Reference:** p 122 plate 4 Desikachary.

**General Characters:** Cells contents blue green either homogenous or finely granular, cells 5-7-(10) micrometer in diameter without sheaths.

**Locality:** Village Hakim Khel , April 2011.

**Remarks:** the species was collected in vegetative form.

Fig.23.

Key to species

1 Cells 2-2.5µm in diameter ----------------------------------------*C. turgidus.*

2 Cells 5-7µm in diameter ----------------------------------------*C. minutes.*

5. *Synechocystis aquisiliis* Sauv

**References:** p 126, plate 25, fig 9, Desikachary.

**General Characters:** Cells spherical, single or in taws, 5-6u broad, pale blue green. Planktonic in stagnant waters.

**Locality:** Collected from the green colored material deposited inside the water hose.

**Remarks:** it was collected in vegetative form Fig.25.

**Phylum:** Chlorophyceae

**Class:** Zygmatophyceae

**Order:** Zegnematales

**Family:** Zegnemataceae

6. *Spirogyra tetraplan* Transeaua

**References:** Pg 159, plate 49, fig 517, Tiffany.

**General Characters:** Vegetative cells 30-40 X 100-250 u, with replicate end walls; 1 or 2 Chromatophores making 2 to 8 turns in the cell; conjugation scalariform; tubes formed by both gametangia; fertile cells fusiform or cylindrically inflated to 29-36 / t; zygospores Ovoid, 25-32/1 x 41-58/1; median wall densely punctate, yellow.

**Locality:** Shamshoki, April, 2011.

**Remarks:** Vegetative form. Fig.28.

**Key to the species**

1 Vegetative cells 30-40µm in diameter ------------------------*S. tetralpa.*

2 otherwise-------------------------------------------------------------------*

2 chromatophores making 4-5 turns------------------------*S. corrugate.*

2 chromatophores making 1.5-5 turns------------------------*S. puncitula.*

Family: Desmidiceae

9. *Cosmarium nitidulum* De Notaris.

**References:** Pg 174, plate 53, fig572, Tiffany.

**General Characters:** Cells 23-33X 30-41u and 16.0-22.5u thick (isthmus 8-10u wide), a little longer than wide, deeply constricted, sinus narrowly linear ,the apex slightly dialated; semicells truncate - subsemicircular, basal angles broadly rounded, sides convex and converging upward, upper angles slightly rounded, apex small, truncate- convex, straight or slightly retuse; cell-wall minutely and often obscurely punctuate; chromatophore axial ,1 in each semicell; pyrenoid single, central.

**Locality:** VILLAGE Khakim khel, April 2011.

**Remarks:** The specimen collected in vegetative form, Fig.33.

10. *C. pachydermum* Lundell var. aethiopian W. and G. S. West

**References:** pg 174, plate 53, fig 581,Tiffany.

**General Characters:** Cells 61-80X 69-107u and 40-45 u thick (isthmus 28-33u wide), longer than wide, broadly elliptic, deeply constricted, lower part of sides somewhat straight, basal angles broadly rounded, apices broad; cell wall thin, finely scrobiculate and minutely punctuate between the scrobiculations; chromatophore axial ,1 in each chromatophore.

**Locality:** Village KHakim khel, April 2011.

**Remarks:** Collected in vegetative form, Fig. 34.

**Key to species**

Vegetative cells 23-33µm in diameter -------*C. nitidulum*

Vegetative cells 61-80µm in diameter -------*C. pachydermum.*

**Order** Ulotrichales

**Class** Chlorophyceae

**Order** Odegoniales

**Family** Odegoniaceae.

11. *Odegonium bohemicus* Hirn

**Reference:** p.84 169 Pl. 22, Fig.204, Tiffany.

**General Characters:** monoecious; oogonium one, globose, operculate, division superior; oospore globose,
filling oogonium, spore walls smooth; Vegetative cells capitate, 10-16X 21-66u; oogonium 42-45X46-49u; oospore 40-43X40-43 u; antheridium 9-19X 5-7 u. 

**Locality:** Shamshoki stream, April 2011. 
**Remarks:** The species was collected in reproductive form. Fig.19. 
*Family Ulotrichaceae.*

12. **Ulothrix subtilissima** (Rabenhorst 1868). 
**References:** p. 672 plate6, fig 3 Prescott. 
**General Characters:** Cells very slightly inflated and constricted at the cross walls. Chloroplast extending the entire length of the cell, with one pyrenoid. Cells 4.5-6 micrometer in diameter, 11-14.8 micrometer long. 
**Locality:** Shamshoki stream, April, 2011. 
**Remarks:** The specimen was collected in vegetative form. Fig.20. 

13. **U. variabilis** Kuetzing 1849 
**References:** p. 672 plate 6, fig13, Prescott. 
**General Characters:** Cell cylindrical, without constrictions at the cross walls. Chloroplast a folded, parietal plate, 1/2 to 2/3 the length of the cell with one pyrenoid. Cells 4.5-6 micrometer in diameter and up to 15 micrometer long. 
**Locality:** Shamshoki stream, April, 2011. 
**Remarks:** The specimen was collected in vegetative form. Fig.21. 

Key to the species 
Cells 5-6 µm in diameter ****************************************************************** U. viribilis 
Cells 4-5µm in diameter------------------------------------------U. subtilissima 

Order **Chladoraphales** 
Family **Chladoraphaceae**

14. **Rhizoclonium hieroglyphicum** (Agardh)Kuetzing 
**References:** P 46, plate.13, fig. 91 Tiffany. 
**General Characters:** vegetative cells 10-35 x 10-115 u, with thin walls, cylindrically or slightly constricted at cross wall; filamentous straight, without rhizoidal cells. 
**Locality:** Shamshoki Stream, April, 2011. 
**Remarks:** Vegetative form, Fig.22. 

**PHYLUM** **OCHROPHYTA** 
**CLASS** **COSCINIDISCOPHYCEAE** 
**ORDER:** **FRAGILARIALES** 
**FAMILY** **FRAGILARIAEACE**

15. **Fragiliria capucina** Desmazieren 
**References:** p 232 plate-62, fig- 698, Tiffany 
**General Characters.** Cells 2-5X 25-100 u, united into long chain; valves linear with pseudoraphe and rectangular to elliptical central area; transverse striation fine, about 15 in 10u. 
**Locality:** Shamshoki Stream, April, 2011. 
**Remarks:** Specimen collected in Vegetative form. Fig.2. 

16. **Synedra acus** Kuetzing 
**References:** P 234, Plate 63, fig 720, Tiffany. 

**General Characters:** Cells 5-6 x100-300 u, solitary; valves linear- lanceolate, becoming needle-like toward the scarcely rounded poles,about 1.5 u in diameter; transverse striations 12-14 in 10u, pseudoraphae narrow, linear with central area usually present, rectangular. 

17. **Diatoa hiemals** (Lyngbye) Hleiberg 
**References:** P. 228,Plate-61, Fig-684, Tiffany. 
**General Characters:** Cells 7-13x 30-100u, united into closed chains, with numerous intercalary bands; valves linear – lanceolate only slightly narrowed toward the rounded poles; costae prominent, 2-4 in 10 u. Transverse striations 18-20 in 10 u. 
**Locality:** Shamshoki Stream, April, 2011. Fig.7. 
**CLASS** **BASCILARIOPHYCEAE** 
**ORDER** **NAVICULARIAS** 
**FAMILY** **NAVICULACEAE** 
**SUB FAMILY:** **Tabellariaceae**

18. **Pinnularia gibba** (Van Heurck) Boyer 
**References:** p 259, plate 69, fig 801, Tiffany. 
**General Characters:** Cells 7-13x50-140 u; valves Linear-lanceolate with lightly convex sides diminishing towards broad capitates to cuneate poles, with varying wide axial area and an elliptically banded central area; transverse striations radial in the middle, parallel toward the poles and convergent at the poles,9-11 in 10 u. 
**Locality:** Shamshoki Stream. 
**Remarks:** It was collected in vegetative form. Fig.05. 

19. **P. nobilis** Ehrenberg 
**References:** p. 258, plate 69, fig 806, Tiffany. 
**General Characters:** Cells 34-50x200-350 u; valves linear, a little wider at the rounded poles; axial area about a third of the cell diameter, with rounded central area; raphe complex, undulate; transverse striation, medianly radial, polarly convergent, 4-5 in 10u, crossed by a wide longitudinal band. 
**Locality:** Shamshoki Stream, April, 2011. 
**Remarks:** The species was collected in vegetative form. Fig.6. 

1 Key to species 
1 Cells with subcapitate end-------------------------------------P. gibba 
1 Cells with rounded ends--------------------------------------P. nobilis 

20. **Navicula cuspidate** Kuetzing 
**References:** P 252, plate68, fig 789, Tiffany. 
**General Characters:** Cells 17-37x50-170 u. Valves rhombo-lanceolate, tapering sharply to rounded ends, transvers striations, evidently punctate,11-19 in 10 u; longitudinal striations about 25 in 10u and parallel to narrow axial area. 
**Locality:** Shamshoki Stream, April, 2011. 
**Remarks:** The specimen was collected in vegetative form, Fig.10. 

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21. **Navicula oblonga** Kuetzing

**Reference:** p 251, Plate 67, fig. 787, Tiffany.

**General Characters:** Cells 13-24x70-220 μ; valves linear-lanceolate with broadly rounded ends; transverse striations in polar and subpolar area bent, generally radial, 6-8 in 10 μ; central area large, round.

**Locality:** Shamshoki Stream, April 2011.

**Remarks:** Collected in vegetative form. Fig. 3.

**Key to species of Cymbella**

1. Stria 9-14 in 10μm

2. Cymbella cuspidate. Kuetzing

22. **Frustulia viridula.** (Brebisso)De Toni

**References:** P. 247, Plate 66, fig. 755, Tiffany.

**General Characters:** Cells 13-20x100-110 μ, in gelatinous tubes; valves elliptic-lanceolate, with transverse striations 28-30 in 10 μ.

**Locality:** Shamshoki Stream, April 2011.

**Remarks:** It was collected in vegetative form. Fig. 16.

23. **Mastogloia smithii** Thwaites

**References:** P. 252, Plate 68, fig. 793, Tiffany.

**General Characters:** Cells 8-16x20-65 μ; valves elliptic-lanceolate, with transverse striations fine, 18-20 in 10 μ, slightly radial, axial area narrow and linear, raphe straight; rectangular to quadrate chambers of internal septa 6-8 in 10 μ.

**Locality:** Collected from Shamshoki Stream, April 2011, Fig. 11.

**ORDER:** CYMBELLALES
**FAMILY:** CYMBELLAACEAE

24. **Amphora desipiens** Cl. N. Sp.

**References:** Plate IV, Fig. 16, Diatom Part II.

**General Characters:** Frustule nearly rectangular about 3 times as long as broad. L.0.055, B.0.02 mm; zone with distant rows(6 in 0.01 mm) of puctae (about 11 in 0.01mm). V. gibbous in the middle of the ventral side, at some distance from the median line, Ventral side striate, striae 12 in 0, 01 mm, not distinctly punctuate. Striae crossed by an obtuse longitudinal band.

**Locality:** Shamshoki Stream, April 2011, Fig. 30.

**ORDER:** CYMBALES
**FAMILY:** CYMBELLAACEAE

25. **Cymbella cuspidate.** Kuetzing

**Reference:** p. 277 plate 74, fig.863 Tiffany.

**General Characters:** Cells 14-28X 40-100u; Valves broad, somewhat asymmetrically linear lanceolate, with slight constriction below the somewhat capitates poles; Raphe exentric, nearly straight; axial area narrow; central area large and circular; transverse striation radiate 9-14 in 10u indistinctly cross-tired.

**Locality:** Shamshoki Stream, April 2011.

26. **C. prostrate.** (Berkeley) Cleve

**References:** p 276 plate 74, fig 859, Tiffany.

**General Characters:** Cells 10-30x20-100u, valves quite asymmetric, semi-elliptic, dorsally convex, ventrally straight with median expansion, poles broadly rounded, raphe straight with polar deviation, axial like area narrow; content area small ,round without isolated dots; transversely striations 7-10 in 10u ,radiate to parallel, with cross lines-about 20 in 10u.

**Locality:** Shamshoki Stream, April 2011.

**Remarks:** Collected in vegetative form. Fig. 3.

**Key to species of Cymbella**

1 Stria 7-10 in 10μm

2 C. prostrate

27. **Surirella linearis** Wm. Smith

**References:** P 292, Plate. 79, fig.920, Tiffany.

**General Characters:** Cells isopolar, 9-25x10-125, valves linear with parallel or slightly convex sides and bluntly rounded nearly cuneate poles, costae 2-5 in 10 μ.

**Locality:** Shamshoki Stream, April 2011, Fig.15.

**ORDER:** ACHNANTHALAES
**FAMILY:** ACHNANTHALACEAE

28. **Cocconeis placentula** EHRENBerg

**References:** P 239, Plate. 64, fig.736, Tiffany.

**General Characters:** Cells 8-40X 11-70 μ, flat or slightly curved; valves elliptic, striae in both longitudinal and transverse series, with isolated punctae and hyaline areas appearing towards margins.

**Locality:** Shamshoki Stream.April 2011, Fig. 8.

29. **Achnanthes lanceolata** (Brebisson) Grunow.

**Reference:** p.239, plate 64, fig.724, Tiffany.

**General Characters:** Cells 4-10 x 8-40 μ; valves elliptic-lanceolate, with transverse striations 13-17 in 10 μ; hypo-valve with pronounced thread like raphe, with central broad, somewhat rectangular ,hypo-valve with slender pseudoraphe, and with a u-shaped spot on one side.

**Locality:** Shamshoki Stream, April 2011, Fig.36.

**ORDER:** NITZCHIALES
**FAMILY:** NITZCHIACEAE

30. **Nitzchia sigmaeoida.** (Nitzsch)wWm.Smith.

**References:** P 284, plate 76, fig 895, Tiffany.

**General Characters:** Cells 8-14 x160-500 μ, somewhat sigmoid in girdle view, almost linear with parallel sides. Valves naviculoid with cuneate, acute somewhat recurved poles. Keel slightly excentric with punctae 5-7 in 10 μ, striations 23-26 in 10 μ.

**Locality:** Shamshoki Stream, April, 2011, Fig.4.

31. **N. linearis.** (Agardh)Wm. Smith

**References:** P 284, plate 76, fig.892, Tiffany

**General Characters:** Cells 5-6 x70-80 μ, rectangular, linear, valve linear and generally with parallel sides and smaller capitates poles. Striations 28-30 in 10 μ, keel punctae 8-13 bin 10 μ.
Locality: Shamshoki Stream, April 2011, Fig.32

Key to species
1 Valve naviculoid, with some what recurved poles------------------------------------------N. sigmoidea
1 Valve linear, with capitate poles----------------------------------------------------------N. linearis

ORDER RHOPALODIALES
FAMILY RHOPALODIACAE

32. Epithemia zebra. (Ehrenberg) Kuetzing

References: P 283 Plate-76, Fig-882, Tiffany.
General Characters: Cells 7-14×30-150µm; valves lanceolate, gently curved with nearly parallel sides, gradually attenuated to rounded poles; costae radial, 2-4 in 10µ, alternating with 4-8 rows of striations, 12-14 in 10µ.
Locality: Shamshoki Stream, April 2011, Fig.14.

ORDER NAVICULALES
FAMILY STAUROEIDACAE

33. Stauroneis acuta. Wm. Smith

References: p.267, plate 72 fig 829, Tiffany
General Characters: cells 15-100×80-166 µ, joined all their valves into short filamentous ,valves rhombo-lanceolate, sometimes with a slight median inflation, rounded poles, raphe straight moderately wide, axial area linear, broad stauros wider at the margins, polar septum extending inward a considerable distance, transverse striation, radial ,12-16 in 10 micrometer, evidently punctuate.
Locality: Shamshoki Stream, April, 2011, Fig.17

34. S. phyllode Ehrenberg

References: p.265, plate-71, fig-821, Tiffany
General Characters: Cells 25-50 X100 -250 µ, solitary; valves broadly lanceolate, with rostrate ends; raphe straight, wide; axial area linear, broad; stauros generally an elliptically elongate band; transverse striation radial throughout,10-14 in 10 µ, evidently punctuate.
Locality: Shamshoki Stream, April ,2011,Fig.13

Key
Cells 15-100µm in diameter-------------------------------------S. acuta
Cells 25-50µm in diameter---------------------------------------S. phyllode

PHYLUM CHRYSOPHYTA
CLASS XANTHOPHYCEAE
ORDER HETEROSIPHONALES
FAMILY VAUCHARIACEAE

35. Vaucharia sisselis (Vaucher) De Candolle.

References; p 110, plate-36, fig.378, Tiffany.
General Characters: Fillaments 50-130µ in diameter; oogonia usually 2, sometimes single, sessisile or on very short stalks ,ovoid or oblong-ovoid,70-85 x 75-100 µ,more or less oblique, with short beak, anthridium between the two oogonia or besides the single oogonium, on a short pedicel, straight, hooked or circinate; mature oospor e dark-spotted, with triple membrane, filling oogonium ;zoosporangium ovoid-clavate , terminal ,producing a single zoospore,77-154 x 82-176 µ.
Remarks: Collected from moist soil in Chountra, December, 2011.

**References**


16. Leghari, S. M. 2001. Some fresh water Green Filamentous Algae (Chlorophyta) and *Dinobryon...*


