OBSERVATIONS

1) *Chara globularis* Thuill., em.

Wood Imahori 1965 p. 164 Icon: 49, 50

Plants monoecious or dioecious, tiny to large, 9 – 45 cm high, slightly to heavily incrusted, branchlets uniform, very rarely dimorphic, with fertile ones crowded into terminal "foxtails". Axes moderately slender or stout, 225 - 1000 μm in diameter; internodes ¼ - 4 (- 6) times longer than the branchlets, 1 - 5 (- 8) cm long, rarely reduced between fertile axes; cortex regularly 3 - corticate, occasionally irregular due to complete overlapping of secondaries with resulting (1-) 2 - 3 (- 4) - corticate axes in some strains, isostichous or tylocanthous; spine-cells varying, generally obscure, rudimentary; in some forms well developed, solitary, 1 - 3 times as long as the axis diameter, uncommonly in fascicles of 2 - 3 (- 5), occasionally abundant and well developed, (0 -) 1- 3 times longer than axis diameter, in 2 tires, 2 sets per branchlet, but only uppers developed in some strains. Branchlets (5-) 6 -11 in a whorl, 0.8 - 3 (- 5) cm long, straight to sharply incurved; segments (2-) 5 - 9 (-11) of which all are 2 (- 3) - corticate except the 1 - 2 (- 4) - celled end segment, but partly irregularly, or completely ecorticate in some strains. Bract- cells 4 - 6 (- 8), unilateral, occasionally verticillate; anteriors short to elongate, ½ - 4 (- more) times as long as the branchlet diameter, to 0.6 cm. long (var. *kokeilii*); posterior generally obscure, occasionally somewhat enlarged to conical, rarely elongate and slightly shorter than anterior bract - cells. Bracteoles 2, similar to the anterior bract- cells, ½ - 8 times as long as branchlet diameter, ½ - 4 times as long as mature oogonium. Bractlet 1, in dioecious strains, similar to bracteole, may be longer or shorter than bracteole. Gametangia conjoined (rarely sejoined) or on separate plants; conjoined at 1 - 3 (- 5) lowest branchlet nodes, very rarely at base of whorl (var. *tenuispina*). Oogonia 530 to 1100 μm long (excl. coronula), 300 - 700 μm wide; convolutions rarely colored (var. *stachymorpha* and var. *krausii*), 10 - 15; coronula 75 - 240 μm high, 120 - 270 μm wide; connivent to slightly spreading. Oospores dark black, rarely yellow or orange (especially when immature or in limeshell), 400 - 780 μm long, 250 - 460 μm wide, ovoid to cylindrical and truncate; striae of (8 -) 10 - 13 (-16) low to

prominent ridges, often terminating in basal claws (rarely cage); fossa 40 - 66 μm across; membrane smooth or finely granulate or papillate. Antheridia 225 - 575 μm (monoecious strains), 550 - 1100 μm (dioecious strains) in diameter; octoscutate. Bulbils uncommon, whitish, in clusters, to 0.15 cm. in diameter.

This species of charophyte was collected from Rashiwade (budruk).

Synopsis of the varieties of *Chara globularis*. Thuill., em.

1a. Axial cortex regularly 3- corticate; spine- cells obscure.
   2a. Appendages (i.e., stipulodes, spine- cells and bract- cells) obscure .....var. *globularis*
   2b. One tier of stipulodes developed, the lowers obscure.....var. *virgata*
   2c. Both tiers of stipulodes developed.....var. *leptosperma*

1b. Axial cortex regularly 3- corticate; spine- cells developed.
   3a. Spine-cells small to large, often fasciculate.....var. *aspera*
   3b. Spine-cells solitary, extremely elongate.....var. *tenuispina*
   3c. Spine-cells solitary, normal size; branchlets naked.....var. *kokeilii*

1c. Axial cortex irregular 1-2-3-corticate.
   4a. Axial cortex 2 -3 corticate; branchlets uniform.....var. *krausii*
   4b Axial cortex 1-2-3- corticate; branchlets dimorphic, fertile ones crowded into "foxtails".....var. *stachymorpha*

Chara globularis var. *leptosperma* (A.Br.) R.D.W., em
Wood Imahori 1965 p. 190 Icon: 67, 68, 69

Plants monoecious or dioecious, 10 - 20 cm. high, slightly to heavily incrusted. Axes moderately slender to stout, 300 - 850 (-1000) μm in diameter; internodes ¾ -2 (-5) times as long as the branchlets, to 8 cm. long; cortex (2 -) 3-corticate, isostichous to slightly tylacanthous (rarely aulacanthous); spine - cells obscure, solitary to well developed and becoming 1 - 2 times longer than axis

diameter (f. *abnormiformis*), to 700 µm long. Stipulodes in 2 tiers, 2 sets per branchlet 6 - 11 in a whorl to 3 cm. long; segments (4-) 5 - 9 (-11) of which 0 - 7 are 2- corticate, sometimes irregularly corticate, occasionally entirely gymnophyllous, end segment 1 - 5 celled, naked; basal segment sometimes shortened. Bract - cells 4 - 8, verticillate to somewhat unilateral, fewer at more distal nodes; anteriors longer, 1- 2 ½ times longer than oogonium; posteriors ½ - 4 times as long as branchlet diameter rarely obscure (f. *schroederi*). Bracteoles 2 (- 4), similar to the anterior bract cells, ½ - 3 times as long as the mature oogonium. Bractlet, where known (only on dioecious strains) resembles bracteoles. Gametangia conjoined (rarely sejoined) at the 1 - 4 (-5) lowest branchlet nodes, or on separate plants (dioecious); in sejoined strains the oogonia occur at the 1 - 2 (-3) lowest branchlet nodes, and the antheridia occur at the more distal nodes. Oogonia 675 - 800 µm long (excl. coronula), 270 - 555 µm wide; convolutions 13 - 15; coronula 90 - 150 µm high, 190 - 225 µm wide, erect or slightly spreading. Oospores golden brown, dirty brown or black, 540 - 600 µm long, 270 - 480 µm wide; striae of (9 -) 11-15 low ridges occasionally terminating in short basal claws or cage; fossa 45 - 53 µm across; membrane poorly known, smooth to granulate. Antheridia 250 - 600 µm in diameter; (tetra -?) octoscute.

Characteristics of the forms of variety *leptosperma.*

1a. With corticate branchlets and well- developed stipulodes (in 2 tiers) and bract-cells.....f.1. *leptosperma*

1b. Branchlets ecorticate (resembling *C. zeylanica* var. *diaphana*).....f.2. *handae*

1c. Bract-cells verticillate; branchlet end segment 1-3 celled, naked...f.3. *tangyglochis*

1d. Branchlets (and often axes) only poorly corticated; 1-2 branchlet segments corticated; nittelloid in habit.....f.4. *schroederi*

1e. Branchlets with numerous segments (8-11); bracteoles elongate (2 – 3 × times oogonium); axial cortex (2-) 3- corticate.....f.5. *poopoensis*

1f. Similar to 1e. but spine-cells elongate (to 2 times axis diameter) and dense on upper internodes.....f.6. *abnormiformis*

Chara globularis var. *leptosperma* f. *leptosperma* (A.Br.) R.D.W., em Wood Imahori 1965 p. 192 Icon: 67, 68, 69

Plants monoecious or dioecious, to 15 (- more?) cm. high, slightly incrusted. Axes moderately slender, 300 - 540 μm in diameter; internodes 1- 2 times as long as the branchlets, to 3 cm long cortex 3 - corticate, isostichous; spine - cells absent or obscure, globular to small conical (120 μm × 75 μm). Stipulodes in 2 tiers, 2 sets per branchlet, ½ -1 times as long as axis diameter; upper 300 - 530 μm long, to 80 μm wide. Branchlets 6 - 9 (-11) in a whorl, 1 - 1.5 cm long, spreading; segments 6 - 9 of which all are 2- corticate except the end cell; end segment 1- celled, reduced. Bract-cells 4 - 6 (- 8), unilateral to verticillate; anteriors 1 - 2 ½ times longer than the oogonium; posteriors shorter, ½ - 2 times as long as branchlet diameter. Bracteoles 2, similar to anterior bract - cells. Bractlet not observable on dioecious specimens studied. Gametangia conjoined at 3 - 4 lowest branchlet nodes, or on separate plants (dioecious). Oogonia 830 - 850 μm long (incl. coronula), 350 - 360 μm wide; coronula 180 - 190 μm high, 180 - 190 μm wide. Oospores golden brown (immature?), 540 - 600 μm long, 300 - 480 μm wide; striae of 11 - 12 low ridges. Antheridia 250 μm (320 - 600 μm in dioecious strains) in diameter octoscutate.

Chara globularis var. *leptosperma* f. *leptosperma* (A.Br.) R.D.W., em

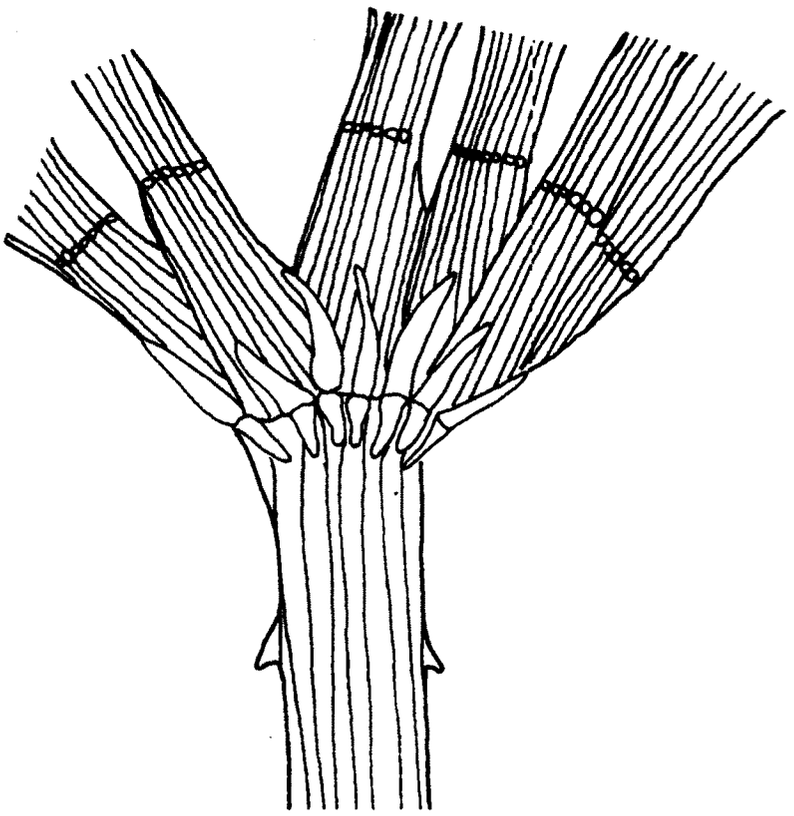
Plate No. 7 Fig. 1- 6

Plants monoecious rarely dioecious, tiny to large, generally 4 - 8 cm high slightly incrusted. Axes moderately slender to stout, 293 - 308 μm in diameter; internodes 0.6 - 2 cm long, ½ to 2 times longer than the branches. Cortex regularly 3 corticate, isostichous; spine cells rudimentary globular to 63 μm long. Stipulodes in 2 tires, upper well developed or 2 times longer than lower; upper 386 μm long, lower 83 μm wide. Branchlets 9 in a whorl to 2 cm long straight to incurved; segments 5 – 8; cortication present. Nodes commonly darkened most commonly constricted; end segment 1 - 6 celled. Bract cells 1- 2, bracteoles 1 longer than oogonium. Gametangia

conjoined at 1 - 2 lowest branchlet nodes. Oogonia 366 - 341 µm long (excl. coronula). 263 - 395 µm wide; convolutions 9-11; coronula 59 - 117 µm high, 29 - 44 µm wide. Oospores black in color 293 - 367 µm long and 190 - 250 µm wide; stria of 10 - 11 fairly prominent ridges; fossa 14 - 30 µm across; membrane granulate. Antheridia 205 - 249 µm in diameter.

Location - Rashiwade.

PLATE NO. - 7 *Chara globularis* v. and f. *leptosperma* (A.Br.) R.D.W., em
Location: Rashiwade



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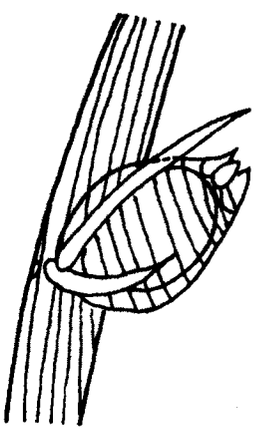

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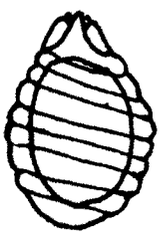

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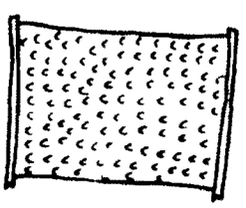

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1. Axial node, stipulodes in 2 tiers with spine cells X 30
2. Single branchlet X 30
3. Branchlet node showing oogonium with 1 bract- cell and 1 bracteole X 30
4. Oogonium X 30
5. Oospore X 30
6. Oospore membrane X 200

Table No. 1 Comparative account of,

Chara globularis var. *leptosperma* f. *leptosperma.* (A.Br.) R.D.W., em.

Sr. no	Characters	Wood, Imahori, 1964	Rashiwade specimen
1	**Habit/ Height**	Monoecious 15 (- more ?) cm high	Monoecious 4 - 8 cm high
2	**Axis diameter**	300 – 540 µm	293 – 308 µm
3	**Internodes**	3 cm	0.6 – 2 cm
4	**Cortex**	Regular 3 corticate	Regular 3 corticate
5	**Spine Cells**	absent or obscure, globular to small conical 120 µm long	rudimentary globular to 63 µm long
6	**Stipulodes**	2 tiers, 2 sets per branchlet	2 tiers, 2 sets per branchlet
7	**Branchlet–**		
	Number	9 – 11	9
	Length	2.5 cm	2 cm
	Segment	3 – 5	5 – 8
8	**Bract Cells**	3 – 5	1 – 2
9	**Bracteoles**	2	1
10	**Gametangia**	Conjoined	Conjoined
11	**Oogonia–**		
	Length	525 - 600 µm long	366 - 341 µm long
	Width/Breadth	345 – 400 µm wide	263 - 395 µm wide
12	**Coronula–**		
	Height	120 - 135 µm	59 - 117 µm
	Width	170 - 195 µm	29 - 44 µm
13	**Oospore–**		
	Length	440 - 480 µm	293 - 367 µm
	Breadth	280 - 320 µm	190 - 250 µm
	Color	Bright Brown or Yellow	Black
	Membrane	Smooth to granulate	Granulate
	Ridges	11 - 13 µm	10 – 11
	Fossa	37 µm	14 - 30 µm
14	**Antheridium**	250 - 275 µm	205 - 249 µm

2) *Chara vulgaris* L., em

Wood Imahori 1965 p. 73-76 Icon: 2-9, 12-34, 75

Pal et al p.102 Fig 235 - 238

Plants monoecious or dioecious, (3-) 5 - 60 (-100) cm. high, moderately to heavily incrusted, rarely without lime. Axes moderately slender to stout, 200-1100 μm in diameter; internodes shorter or longer (¾ - 3 (-20) times longer) than the branchlets, to 10 cm. long; cortex (1-) 2 (-3)- corticate, but basically 2 corticate, occasionally diaphanous, rarely secondaries overlapping a short distance causing localized 3- corticate condition, aulacanthous, isostichous to strongly tylacanthous; spine-cells variable, generally solitary occasionally geminate (very rarely 1-3 fasciculate), rudimentary to elongate, occasionally as long as the axis diameter, rarely longer (to 1300 μm), generally ovoid or allantoid, rarely tapered. Stipulodes essentially in 2 tiers, rarely appearing 1 tier if the lowers do not develop, 2 sets per branchlet, contiguous or separated , variable in size from small and obscure to as long as the axis diameter, rarely 1600 μm long and exceeding the basal branchlet segment; uppers occasionally longer than lowers, globular, ovoid or allantoid, occasionally tapered, blunt, rarely acute. Branchlets (5-) 6 – 10 (-12) in a whorl. (0.5 -) 1 - 3 (- 6) cm. long, spreading or incurved, occasionally reflexed, corticate or ecorticate, occasionally both naked and corticate ones in the same whorl; segments (1-) 2 – 5 (- 8) of which (0-) 1 – 3 (- 7) are (1-) 2- corticate and 1 -3 (- 7) are naked; cortex occasionally diaphanous, rarely imperfect or rudimentary (var. *denudata*); end segment 1 – 3 (- 5) - celled, lowest cell occasionally enlarged; end cell variable, allantoid to tapered or conical, blunt to sharp- pointed, often reduced, mucroniform; nodes rarely swollen. Bract-cells 3 - 6 (- 8), rarely obscure or absent, unilateral, rarely verticillate; anteriors shorter than oogonium to elongate, occasionally as long as the branchlet segment, to 2500 μm long; posteriors generally rudimentary, globose, occasionally as long as the axis diameter, occasionally inflated blunt apiculate or occasionally sharp - tipped; rarely bifid. Bracteoles 2, longer (occasionally shorter) than the anterior bract - cells, to 3000 μm long usually exceeding the mature oogonium; rarely bifid. Bractlet only in dioecious and sejoined examples, usually

similar to or smaller than the bracteoles. Gametangia conjoined or sejoined at the 1 - 3 (- 4) lowest branchlet nodes, occasionally on separate plants (dioecious); solitary frequently geminate; commonly incrusted forming limeshells. Oogonia rarely vertically geminate (var. *oedophylla*), 500 - 1100 (- 1275) μm long (excl. coronula), (280 -) 335 – 525 - (660) μm wide, commonly with limeshell; convolutions (9 -) 11 - 15 (- 18); coronula (60 -) 90 – 200 (- 225) μm high (125-) 180 – 230 (- 460) μm wide, cells ovoid, spreading, occasionally erect or connivent, rarely deciduous. Oospores black or dark brown (rarely reddish or golden brown), (360 -) 425 – 660 (- 780) μm long, (225 -) 250 – 420 (- 530) μm wide, often incrusted; striae of (7 -) 9 - 13 (-17) faint to prominent ridges generally prolonged into basal claws or cage; fossa 41-57 μm across; membrane obscurely to clearly granulate to tuberculate, rarely diffusely spotted. Antheridia (210 -) 270 – 610 (- 800) μm in diameter, generally larger in dioecious strains; octoscutate. Bulbils rare, spheroid.

Synopsis of the varieties of *Chara vulgaris* L., em

1a. Axial cortex normal (occasionally irregular) and present; branchlet cortex (if present) normal.

2a. Branchlets 1/3 -1 times as long as the axial internode; bracteoles not especially inflated; gametangia at nodes adjacent to corticated segments .....var. *vulgaris*

2b Branchlets ecorticate (rarely with1-2 corticated segments); gametangia at nodes not adjacent to corticated segment .....var. *gymnophylla*

2c Branchlets very short, 1/20 - 1/10 as long as the axial internodes, whorls often obscure.....var. *krighisorum*

2d Branchlets normal, but bracteoles inflated; oogonia often vertically geminate .....var. *oedophylla*

[2e. Branchlet cortication variable, partly imperfect, commonly consisting of a few isolated cells .....var. *inconnexa*]

1b. Axial cortex 2-3 corticate; ecorticated segments of branchlets elongate, corticated segments (1 - 3) abbreviated.....var. *nitelloides*

1c. Axial cortex not normal, 1-2- corticate; branchlets cortex normal imperfect.

3a Axial cortex variable, perfect to imperfectly (1-) 2- corticate .....var. *inconnexa*

3b Axial cortex rudimentary, but secondary cells occur wherever primary cells are developed.....var. *denudate*

3c Axial cortex 1- corticate, without any traces of secondary cells .....var. *imperfecta*

Chara vulgaris var. *vulgaris* L., em

Wood Imahori 1965 p. 78 – 81 Icon: 2- 9, 12 – 15, 75

Plants monoecious, 5 – 60 (-100) cm. high, moderately or sometimes times heavily incrusted, rarely unincrusted; occasionally resembling *C. globularis* in habit, Axes moderately slender to stout, 200 - 1100 μm in diameter, internodes (¾ -) 1- 3 (- 5) times as long as the branchlet, to 4 (-10) cm. long; but occasionally overlapping of secondaries is irregular resulting in some localized cells which are 1 - or 3 - corticate; spine-cells solitary, rarely geminate, variable rudimentary and globose to well developed (to 1300 μm long) and spreading but characteristically ovoid, blunt. Stipulodes in 2 tiers, 2 sets per branchlet, typically contiguous but often separated, variable in size from obscure to nearly 2 times as long as the axis diameter, to 1600 μm long, exceeding branchlet segment, but characteristically ovoid and regular, uppers frequently longer than lowers. Branchlets 6 -10 (- 12) in a whorl, 0.8 -5 cm. long, straight. incurved, or rarely reflexed, occasionally one or all branchlets of a whorl totally ecorticate; segments 4 – 6 (- 8) of which (0 -) 3 – 6 (- 7) are 2- corticate and 1-2 (- 6) are naked; cortex rarely diaphanous; end segment 2 – 3 (- 5) -celled, basal 1-2 occasionally enlarged; end – cell allantoid or conical, blunt to pointed, occasionally mucroniform; node rarely swollen. Bract- cells 3 - 6 (-8) unilateral, occasionally verticillate, rarely bifid; anteriors variable, 300 - 2400 μm long, ½ as long as branchlet diameter, to 3 times as long as oogonia, acuminate blunt or apiculate; posteriors generally rudimentary, globular or ovoid, occasionally conical, rarely similar to the anteriors. Bracteoles 2, larger (rarely smaller) than the

anterior bract- cells, shorter to 4 times longer than oogonium, 300 - 3000 μm long, acuminate to obtuse, occasionally inflated, rarely bifid. Bractlet rare, shorter than oogonium. Gametangia conjoined or sejoined at lowest 1-3 or at all branchlet nodes (adjacent to corticated segment), solitary or geminate, commonly incrusted. Oogonia 500 – 800 (-1275) μm long (excl. coronula), 345 - 524 (-660) μm wide; convolutions (10-) 12-16 (-18); coronula (60-) 75-175 (-225) μm high, (120-) 200-325 (-450) μm wide, cells spreading or rarely erect or connivent, blunt or with divergent tips, occasionally deciduous. Oospores dark reddish (rarely golden) brown to black, 425 - 765 μm long, 225 - 420 (- 525) μm wide, often incrusted; striae of (9 -) 10 - 15 (- 17) low to prominent ridges often prolonged into basal claws or cage; fossa 41 - 53 μm across; membrane obscurely to clearly granulate papillate or diffusely spotted. Antheridia 255 - 500 μm in diameter; octoscutate. Bulbils are spheroid.

Characters of the forms of Variety *Vulgaris* L., em

1a. As described, and without unusual features.....f. 1. ***vulgaris***

1b. Gametangia mostly sejoined; branchlets irregularly corticate.....f. 2. ***rabenhorstii***

1c. Bract- cells verticillate; spine-cells robust.....f. 3. ***boevana***

1d. Similar to 1a, but young parts resembling *C. globularis*.....f. 4. ***strumosa***

1e. Axial cortex irregular (1- 3 - cortiate), isostichous to strongly tylacanthous; spine-cells occasionally geminate; bract- cells occasionally bifid.....f. 5. ***kineri***

1f. Resembles 1a, but branchlets reflexed and anterior bract- cells large (to 2500 μm long).....f. 6. ***crispa***

1g. Unincrusted; dark green; bract- cells swollen .....f. 7. ***atrovirens***

1h. Branchlets irregularly corticate; spine-cells occasionally geminate .....f. 8. ***pistianensis***

1i. Similar to 1a, but with cortex very regular throughout, tylacanthous; spine-cells papillate or ovoid .....f. 9. ***contraria***

1j. Branchlets numerous (8 -12); whorls with occasionally ecorticate branchlets; cortex diaphanous .....f. 10. ***tenera***

1k. Similar to 1a, but cortex nearly isostichous; resembling *C. globularis* in habit

.....f.11. *schaffneri*

11. Similar to 1a, but strongly tylacanthous with primaries nearly obscuring the secondaries.....f.12. *muscosa*

1m. Similar to 1a, but with elongate spine-cells; (10 1300 μm long).....f.13. *hispida*

1n. Similar to 1a, but with short (0.4 - 1 cm.) branchlets and stout axis (to 1500 μm).....f. 14. *crassicaulis*

1o. Resembling C. hispida var. major f. *baltica*; spine-cells often in fascicles of 1-3... .....f.15. *andina*

1p. Resembling 1a, upper whorls compacted into terminal clump.....f.16. *papillosa*

1q. Stipulodes elongate (to 1600 μm long) and irregular.....f. 17. *calaverensis*

1r. Resembling 1a, but with elongate spine-cells, bract- cells and bracteoles (longer than segment).....f. 18. *excelsa*

1s. Resembling 1a, but with elongate posterior bract- cells (1 - 4 times longer than wide).....f.19. *intumescens*

Chara vulgaris var. *vulgaris* f. *vulgaris* L., em
R.D.W. 1965 p. 84 Icon: 2
Pal et al. p. 102 fig 235 - 238

Plants monoecious, 9-30 cm. high, incrusted. Axes moderately slender, c. 500 μm in diameter; internodes 1 - 3 times as long as the branchlets, to 4 cm. long; cortex 2- corticate, aulacanthous or tylacanthous; spine-cells solitary, common to ¼ as long as axis diameter ovoid, adpressed in furrow of cortication. Stipulodes in 2 tiers, 2 sets per branchlet, regular and equally developed, to ¼ as long as axis diameter, contiguous, ovoid adpressed. Branchlets 7 - 9 in whorl, c. 1 cm. long, spreading; segments 4 - 5 of which 3 - 4 are 2 - corticate and 1 (- 2) are naked; end segment 2 - 3 celled; end- cell acute. Bract- cells 4 - 6, unilateral, blunt or acute; anteriors exceeding oogonia; posteriors globular. Bracteoles 2, 2 - 4 times as long as the mature oogonium, blunt or acute, to 3000 μm long. Gametangia conjoined at each node (3 - 4) (adjacent to corticated segment). Oogonia 500 - 800 μm long (excl. coronula), 350

- 475 µm wide; convolutions 14 -16; coronula 75 - 125 µm high, 200 - 325 µm wide, spreading. Oospores dark brown (to black), 425 - 675 µm long, 225 - 400 µm wide; striae of 12 -15 thin low ridges often prolonged into a cage; membrane granulate. Antheridia 325 - 500 µm in diameter; octoscutate.

Chara vulgaris var. *vulgaris* f. *vulgaris* L., em

Plate no 8aFig. 1- 6.

Plants monoecious rarely dioecious 25 - 52 cm high, middle sized; moderately and heavily incrusted, rarely without lime. Axes moderately slender to stout 322 - 513 µm in diameter; internodes longer than branchlet to 4 cm long; cortex 2 - 3 corticate. Spine cells absent. Stipulodes essentially 2 tire, upper longer than lower occasionally tapered. Branchlets 4 - 8 in a whorl 0.3 - 0.6 cm in length at 1-3 lowest branchlet node; segment 4 - 5. Bract- cells 2 - 4. Bracteoles (1-) 2 - 3 (- 4). Gametangia conjoined. Oogonia 395 - 586 µm long (excl. coronula) and 307 - 445 µm wide. Convolutions 11 - 13; coronula 151 - 205 µm high and 58 - 102 µm wide spreading. Oospores dark brown in color. 380 - 512 µm long and 175 - 310 µm wide; stria of 10 - 13 prominent ridges. Fossa 43 - 73 µm across; membrane granulate Antheridia 270 - 610 µm in diameter.
Location 1: Kalamba Talav

Chara vulgaris var. *vulgaris* f. *vulgaris* L., em

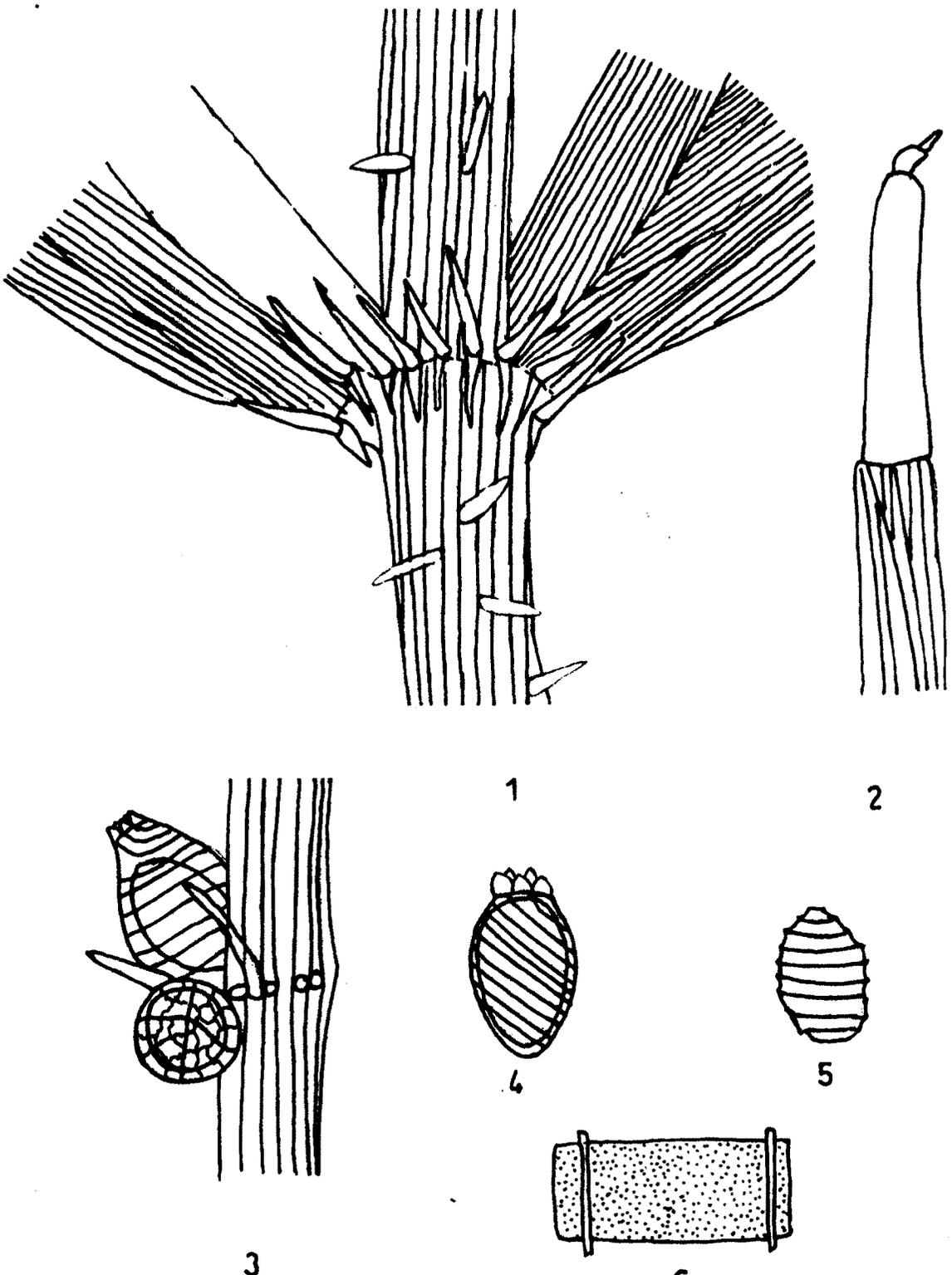
Plate no 8bFig. 1- 6

Plants monoecious rarely dioecious 26 - 42 cm high, middle sized moderately incrusted. Axes moderately slender to stout 223 - 336 µm in diameter; internodes longer to twice as long as branchlet to 4 cm long. Cortex 2 - 3 corticate anisostichous. Spine cells present. Stipulodes essentially 2 tires. Upper longer to 205 µm long lower shorter to 92 µm long. Branchlets 7-10 in a whorl 1.4 - 3 cm long, spreading; segments 3 - 5. Bract cells 2 - 4. Bracteoles 1 - 4. Gametangia conjoined. Oogonia

146 - 352 µm long (excl. coronula) and 160 - 239 µm wide and. Coronula 146 - 205 µm high and 43 - 102 µm wide Oospores deep orange to orange red in color, 129 - 175 µm long and 87 - 159 µm wide. Stria of 8 - 9 prominent ridges. Fossa 14 - 29 µm across; membrane granulate Antheridia 190 -510 µm in diameter.

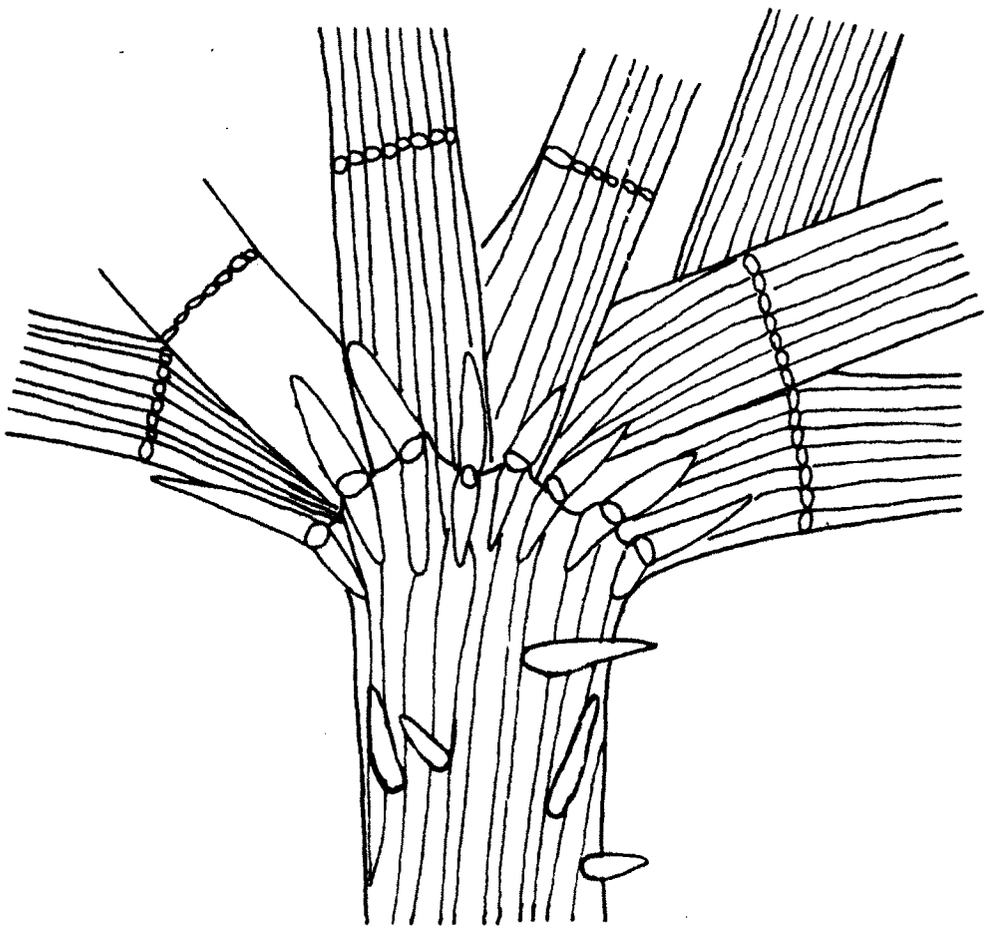
Location 2: Rajaram Lake

PLATE NO. - 8[a] *Chara vulgaris* var and f *vulgaris* L., em
Location: Kalamba Lake, Kolhapur



1. Axial node with 2 corticated cortex, stipulodes in 2 tiers and spine cells X 30
2. Apical part of branchlet showing 3- celled end segment X 30
3. Branchlet node showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Oospore X 30
6. Oospore membrane X 100

PLATE NO. - 8b *Chara vulgaris* var and f *vulgaris* L., em
Location: Rajaram Lake, Kolhapur



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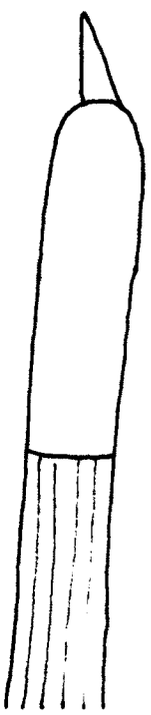

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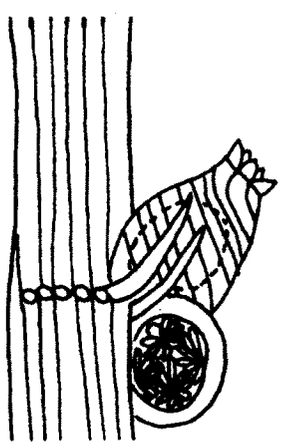

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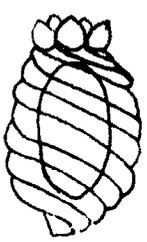

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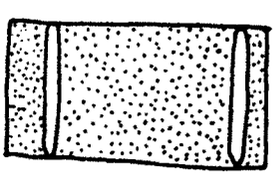


6

1. Axial node with 2 corticated cortex, stipulodes in 2 tiers and spine cells X 30
2. Apical part of branchlet showing 3- celled end segment X 30
3. Branchlet node showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Oospore X 30
6. Oospore membrane X 100

Table No.2 Comparative account of Chara *vulgaris* var. *vulgaris* f. *vulgaris* L., em

Sr. no	Characters	Wood, Imahori, 1964	Kalamba Lake	Rajaram Lake
1	**Habit/ Height**	Monoecious/ 9-30 cm.	Monoecious/25-52 cm high	Monoecious/26 – 42 cm
2	**Axis Diameter**	500 µm	322 - 513 µm	223 - 336 µm
3	**Internodes**	4 cm.	4 cm.	4 cm.
4	**Cortex**	2 - corticate	2 -3 corticate	2 -3 corticate
5	**Spine Cells**	Present	Absent	Present
6	**Stipulodes**	2 tire	2 tire	2 tire
7	**Branchlet–**			
	Number	7-9	4-8	7-10
	Length	1 cm	0.3 - 0.6 cm	1.4 - 3 cm
	Segment	4 - 5	4 - 5	3 - 5.
8	**Bract Cells**	4 - 6	2 - 4	2 – 4
9	**Bracteoles**	2	(1-) 2 - 3 (-4)	(1-) 2 – 3 (-4)
10	**Gametangia**	Conjoined	Conjoined	Conjoined
11	**Oogonia–**			
	Length	500 - 800 µm	395 - 586 µm	146 - 352 µm
	Breadth	350 - 475 µm	307 - 445 µm	160 - 239 µm
12	**Coronula–**			
	Height	75 - 125 µm	151 - 205 µm	146 - 205 µm
	Width	200 - 325 µm	58 - 102 µm	43 - 102 µm
13	**Oospore–**			
	Length	425 - 675 µm	380 - 512 µm	129 - 175 µm
	Breadth	225 - 400 µm	175 - 310 µm	87 - 159 µm
	Color	dark brown to black	dark brown	deep orange to orange red
	Membrane	granulate	granulate	granulate
	Ridges	12 - 15	10 - 13	8 - 9
	Fossa	Not mentioned	43 - 73 µm	14 - 29 µm
14	**Antheridium**	325 - 500 µm	270 - 610 µm	190 - 510 µm

2) *Chara setosa* Klein ex Willd., em

Wood Imahori 1965 p. 214 - 216 Icon: 88 - 90

Plants dioecious dimorphic in having fertile whorls crowded into "foxtails." Axes with cortex (1-) 2 (-3) - corticate; internodes shortened between fertile whorls; spine-cells rudimentary. Stipulodes doubtless essentially in 2 tiers, only 1 tier (upper?) developed, lower rudimentary. Branchlets dimorphic; fertile, 7 in a whorl, short compacted into " foxtails"; segments 3 - 5 of which 2 - 4 are corticate; end segment 1(-2) - celled, cuspidate; sterile, 7 in a whorl, elongate and isolated; segments 3 - 8 of which 2 - 7 are corticate; end segment 1 – 2 - celled, naked. Bract - cells unilateral, variable, developed at fertile, often rudimentary at sterile nodes; posteriors usually rudimentary at sterile nodes; posteriors usually rudimentary. Bractlet similar to bracteole. Gametangia on separate plants. Oogonia somewhat colored; convolutions dark brown; coronula connivent to slightly spreading. Oospores black, truncate above, sub - cylindrical, tapering from middle to base, 600 - 700 μm long, 275 - 375 μm wide. Antheridia c. 600 μm in diameter. Bulbils occasionally, clustered.

Characteristics of the forms of *Chara setosa* Klein ex Willd., em

1a. Spine-cells frequent; branchlet cortication 2-3 corticate; coronular lobes generally erect or convergent.....f.1. *setosa*

1b. Axes devoid of spine-cells; (coronula slightly spreading).....f.2. *inermis*

1c. Branchlets 2-corticate .....f.3. *pseudobrachypus*

1d. Coronula lobes strongly divergent; branchlet cortication variable within whorl.....f.4. *tanganyikae*

Chara setosa f. *setosa* Klein ex Willd., em

Wood Imahori 1965 p. 216, 217 Icon: 88

Plants monoecious, to 30 cm. high, slightly incrusted, commonly protandrous. Axes moderately slender, to 800 μm in diameter; internodes 1-3 times longer than the branchlets; cortex regular, isostichous; spine-cells rather frequent, solitary short conical to 90 μm long; stipulodes in 2 tiers, 2 sets per branchlet, uppers more developed, to 600 μm long; lowers to 225 μm long. Branchlets (8-) 9 - 12 in a whorl, to 2 (- 4) cm. long, spreading; segments 5 - 8 of which all but the distal 1 - 2 segments naked; basal segment abbreviated, cortex discolored or colorless, often obscured behind the stipulodes; end segment short, rarely 2- celled, penultimate segment occasionally elongate; branchlets often constricted at the nodes. Bract- cells 6-8, unilateral; anteriors to 500 μm long; posteriors rudimentary or papillate. Bracteoles 2, similar to anterior bract- cells, shorter to longer than mature oogonium, to 1000 μm long. Gametangia conjoined at 2-3 lowest branchlet nodes. Oogonia 675 (-795?) μm long (excl. coronula), 600 - 675 μm wide; convolutions 12 - 15; coronula 105 - 125 μm high, 195 - 225 μm wide. Oospores black, 560 - 760 μm long, 435 - 595 μm wide; striae of 9 - 13 rather prominent ridges; fossa c. 73 μm across; membrane dark, smooth. Antheridia 255 - 390 μm in diameter.

Chara setosa f. *setosa* Klein ex Willd., em

Plate no. 9 a Fig. 1-5

Plants monoecious, large in size 30-52 cm high, slightly incrusted. Axes moderately slender, 61 - 102 μm wide in diameter; internodes longer than branchlet; cortex 2 corticate, spine - cells frequent. Stipulodes in 2 tires, upper longer 586 μm long and lower 210 μm long. Branchlets 7 - 9 in a whorl to 1.5 cm long; segments 5 - 7 of which all but the distal 1-2 segments are naked. Bract cells 2-3, bract cells occasionally absent at sterile nodes. Bracteoles 2, similar to anterior bract cell Gametangia conjoint at 2-4 lowest branchlet nodes. Oogonia 747 - 981 μm long (excl. coronula) and 586 - 791 μm wide. Convolutions 10 -12; coronula 102 - 235 μm high

and 146 - 380 µm wide. Oospores dark green to black 600 - 776 µm long and 424 - 571 µm wide; stria 8 - 10 ridges; fossa 43 - 74 µm across. Antheridia 219 - 351 µm in diameter.

Location 1- Kalamba Lake, Kolhapur

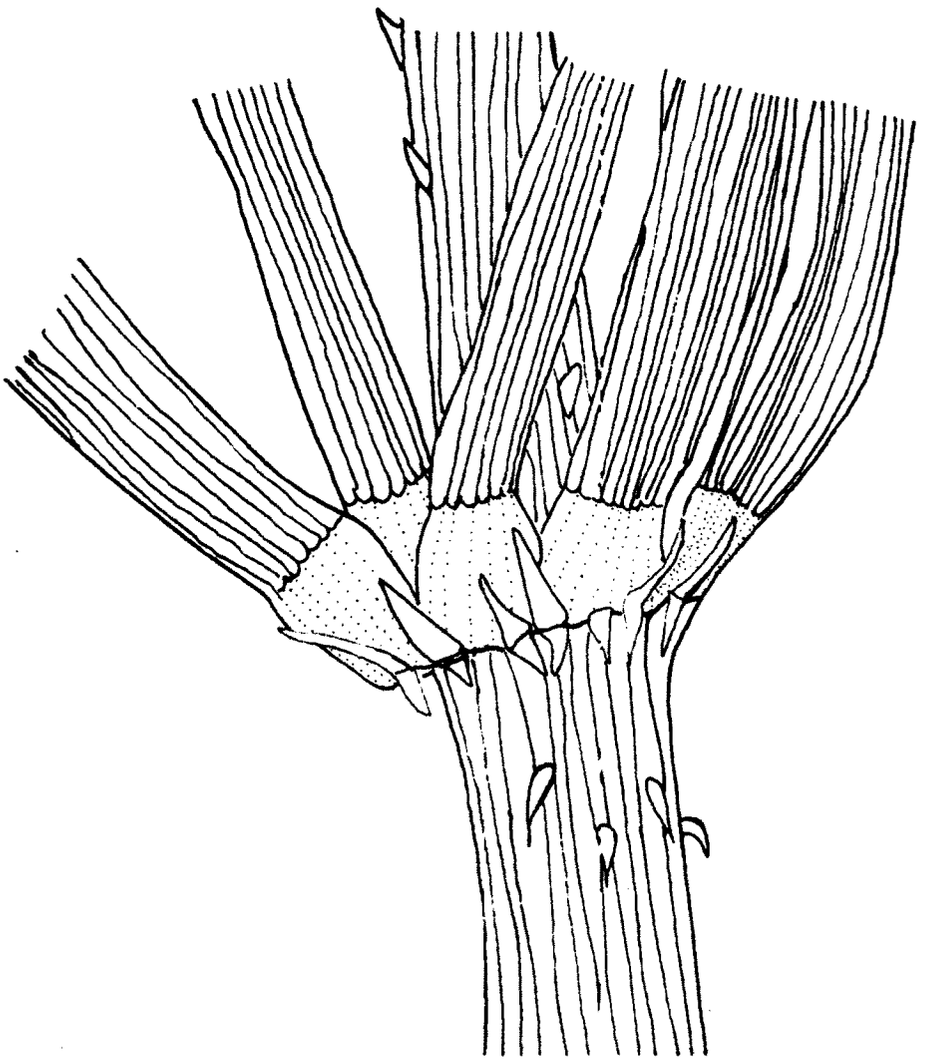
Chara setosa f. *setosa* Klein ex Willd., em

Plate no. 9b Fig. 1- 6

Plants monoecious, large in size 36 - 44 cm high, incrusted. Axes moderately slender, 278 - 293 µm in diameter. Internodes longer than branchlet; cortex 2 corticate, spine cells frequent, small to 483 µm long and 51 µm wide. Stipulodes 2 tire, upper longer 532 µm long than lower 200 µm long. Branchlet 8 -9 in a whorl to 5 cm long. Segments 5 -7 of which all but the distal 1- 2 segments are naked. Bract cells 1 - 3, bract cells occasionally absent at sterile nodes. Bracteoles 1 - 2. Gametangia conjoint at 1 - 3 at lowest branchlet node. Oogonia 278 - 351 µm long (excl. coronula) and 234 - 278 µm wide; convolutions 9 -11; coronula 87 -131 µm high 146 - 191 µm wide. Oospores orange to dark brown. 263 - 337 µm long and 190 - 279 µm wide; stria 7 - 8; fossa 29 - 44 µm across. Antheridia 161- 219 µm wide

Location 2- Ichalkaranji

PLATE NO. - 9 a *Chara setosa* f. *setosa* Klein ex Willd.
Location: Kalamba Lake, Kolhapur



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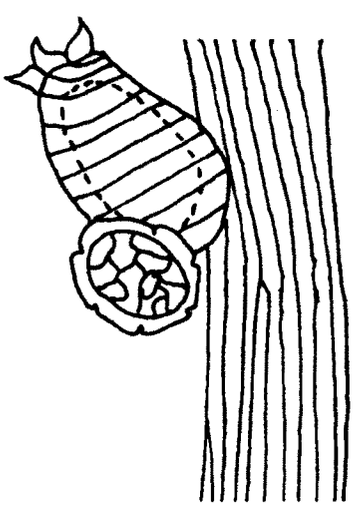

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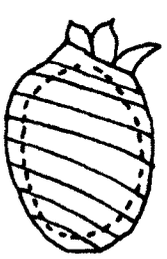

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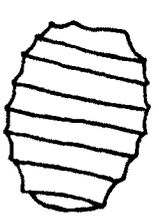

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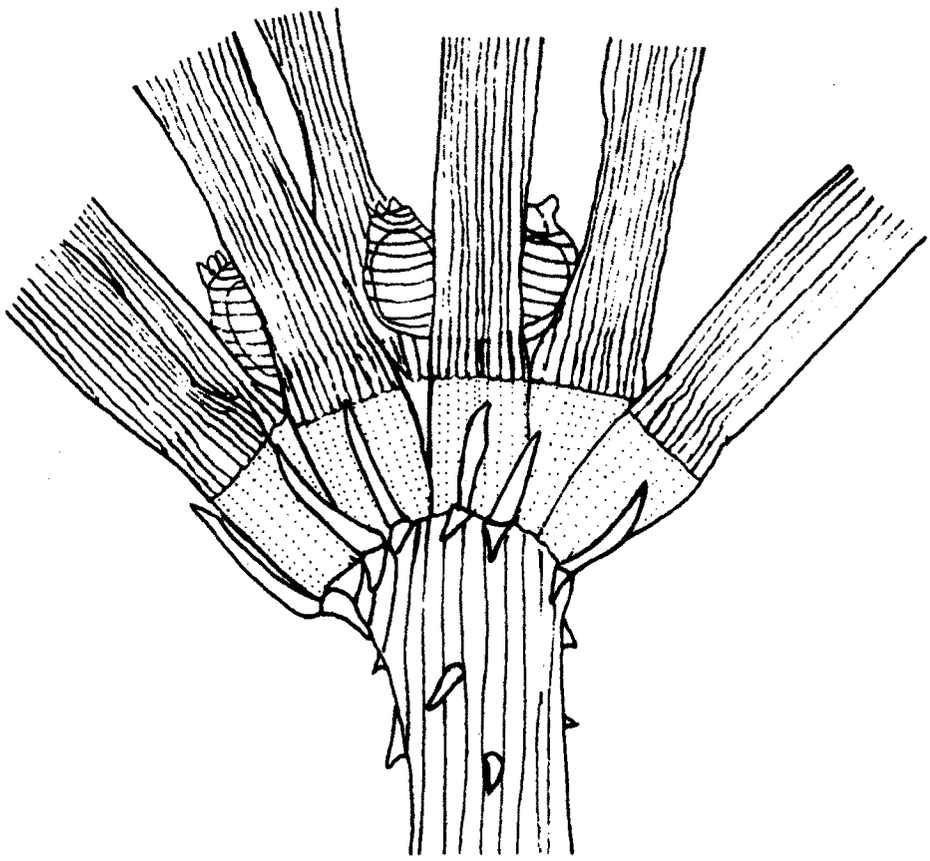
1. Axial node with 2 corticated cortex, and stipulodes in 2 tiers X 30
2. Apical part of branchlet showing 1- celled end segment X 30
3. Branchlet nodes showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Oospore X 30

PLATE NO. - 9b *Chara setosa* f. *setosa* Klein ex Willd.
Location: Ichalkaranji



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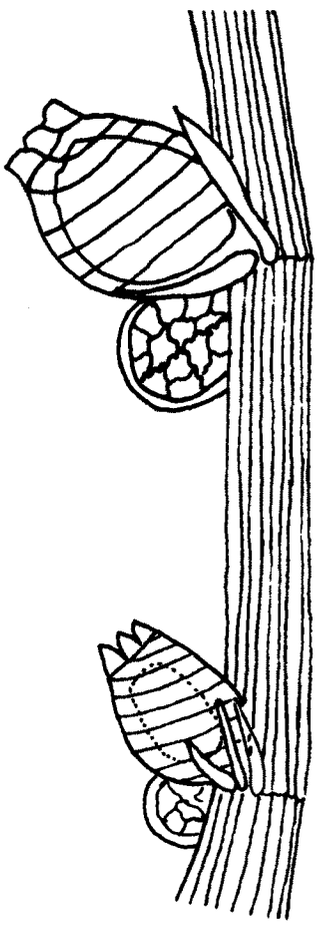

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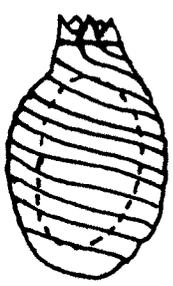

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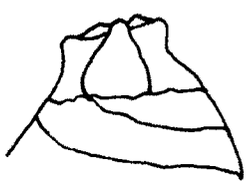

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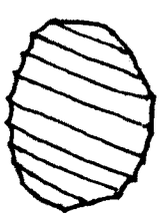


6

1. Axial node with 2 corticated cortex, and stipulodes in 2 tiers X 30
2. Apical part of branchlet showing 1- celled end segment X 30
3. Branchlet nodes showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Coronula erect X 30
6. Oospore X 30

Table No.3 Comparative account of Chara *setosa* f. *setosa* Klein ex Willd.

No.	Characters	Wood	Kalamba Lake	Ichalkaranji
1	**Habit/ Height**	Monoecious 30 cm.	Monoecious 30 - 52 cm.	Monoecious 36 - 44 cm
2	**Axis Diameter**	800 µm	61- 102 µm	278 - 293 µm
3	**Internodes**	1 - 3 times longer than the branchlets	Internodes longer than branchlet	Internodes longer than branchlet
4	**Cortex**	2 corticate	2 corticate	2 corticate
5	**Spine Cells**	Present	Present	Present
6	**Stipulodes**	2 tiers	2 tiers	2 tiers
7	**Branchlet–**			
	Number	9 - 12	7 - 9	8 - 9
	Length	2 - 4 cm	1.5	5
	Segment	5 -8	5 -7	5 -7
8	**Bract Cells**	6 - 8	2 - 3	1 - 3
9	**Bracteoles**	2	2	1 - 2
10	**Gametangia**	Conjoined	Conjoined	Conjoined
11	**Oogonia–**			
	Length	675 -795 µm	747 - 981 µm	278 - 351 µm
	Breadth	600 - 675 µm	586 - 791 µm	234 - 278 µm
12	**Coronula–**			
	Height	105 - 125 µm	102 - 235 µm	87 - 131 µm
	Width	195 - 225 µm	146 - 380 µm	146 - 191µm
13	**Oospore–**			
	Length	560 - 760 µm	600 - 776 µm	263 - 337 µm
	Breadth	435 - 595 µm	424 - 571 µm	190 - 279 µm
	Color	black	dark green to black	orange to dark brown
	Membrane	smooth	Not observed	Not observed
	Ridges	9 - 13	8 -10 µm	7 - 8 µm
	Fossa	73 µm	43 - 74 µm	29 - 44 µm
14	**Antheridium**	255 - 390 µm	219 - 351 µm	161- 219 µm

4) *Chara zeylanica* Klein ex Willd., em

Wood Imahori 1965 p. 220 - 222 Icon: 91 – 108

Pal et al. 1962 p. 105 Fig.253 - 255

Plants monoecious or dioecious, small to large 8 - 60 cm high, slightly (occasionally annular) incrusted; with or without cortication. Axes moderately slender, 400 – 1400 μm in diameter; internodes longer or shorter than branchlets, to 6 cm. long; cortex essentially 3 corticate, in some forms the secondaries do not regularly overlap leaving cortex partly 2 corticate, isostichous to slightly tylacanthous, rarely entirely absent (var. *brittoni*); spine - cells solitary, variable, rudimentary to elongate, reaching 2 - 3 times as long as long as axes diameter, 1600 (- 2700 in f. kenoyeri) μm long, occasionally occurring in transverse rows, often sparse or absent or lower axial internodes. Stipulodes in 2 tires, well developed, ¼ - 2 times as long as axis diameter, to 1700 μm long; uppers 1 - 4 times longer than lowers; 2 sets per branchlet, sometimes irregular in placement and possibly in number. Branchlets (- 6) 8 - 13 (-15) in antheridium whorl. 0.6 - 3.8 cm. long, straight or slightly incurved, spreading or ascending; segments (2) – 5 - 15 (-16) of which the basal and terminal ones are invariably ecorticate and of which more or less of the intercalary ones are 2 - 3 corticate, rarely branchlet entirely naked; basal segment frequently different from second, often abbreviated, ¾ - 4 time longer than wide, often obscured behind the stipulodes (in which case its presence is indicated if the lowest obvious (i.e., the second segment has a central ring which cortication meets); end segment 1(rarely at 2 - more cells); naked distal segments 1 - 4 (- 6), although occasionally 1-more branchlets partly to completely naked. Bract - cells 5 - 8, unilateral to verticillate; anteriors equal to or longer than posteriors, to 1300 (- 3500) μm long; posteriors varying obscure to elongate (to 1300 (-3500) μm long), spreading ascending or adpressed; bract - cells often reduced or absent at sterile nodes, and occasionally modified at the lowest node, swollen (ventricose). Bracteoles 2, shorter to longer than mature oogonium, ¼ - 2 times longer than oogonium. Bractlet below solitary oogonia of dioecious strains and often on sejoined strains, similar to but

shorter than bracteoles. Gametangia conjoined, sejoined or on separate plants (dioecious), at 2 - 7 lowest branchlet nodes, sometimes absent from lowest node; in sejoined strains oogonia at 2 - 4 lowest nodes and antheridia at more distal ones. Oogonia (400-) 630 - 1000 (-1400) μm long (excl. coronula), 360 - 770 μm wide, often incrusted (i.e., limeshell); convolutions (10-) 11 - 15 (-17); coronula 70 - 250 μm high, 140 – 320 μm wide, connivent, erect or divergent occasionally with divergent distal lobes. Oospores dark brown to black, (405 -) 480 - 900 μm long, (270 -) 350 - 570 (to 600) μm wide; striae of (8 -) 11-13 (-16) low to prominent ridges, rarely terminating in basal claws; fossa 41-73 μm across; membrane smooth to granulate or tuberculate, occasionally mottled. Antheridia (240 -) 270 - 470 (- 690) μm in diameter, larger in dioecious strains; tetra (occasionally octo-) scutate.

Synopsis of the varieties of *Chara zeylanica* Klein ex Willd., em

1a. Axes and branches corticated.

2a. Branchlets uniformly corticated, 4 - more corticated branchlet segments.

3a. Medium to large specimens, axes (400-) 800 -1400 μm in diameter; gametangia predominantly conjoined.....var. *zeylanica* (see also f. *armata* of var. *diaphana*).

3b.Small slender forms, axes 250 – 700 (-1100) μm in diameter; gametangia predominantly sejoined or plants dioecious.....var. *sejuncta*

2b Branchlets irregularly corticated, (0 -) 1 – 4 (rarely more)- corticated branchlet segments.....var. *diaphana*

1b. Axes and branchlets entirely without cortication.....var. *brittoni*

Chara zeylanica var. *zeylanica* ex Willd., em

Wood Imahori1965 p. 225 - 227 Icon: 91, 93 - 98

Plants monoecious or dioecious, medium to large, (6 -) 25 – 40 (-60) cm. high, slightly (occasionally annularly) to heavily incrusted. Axes slender to moderately stout, (400-) 800 - 1400 μm in diameter; internodes varying, usually 1 - 2 (-3) times longer than branchlets; cortex essentially 3 corticate, occasionally irregular, to nearly 2 - corticate, isostichous or slightly tylacanthous; spine-cells solitary, varying widely from absent or obscure to abundant or elongate, to 1600 (-2700) μm long. Stipulodes in 2 tires, 2 sets per branchlet, ¼ - 2 times as long as axis diameter, to 1700 μm long; uppers equal to or longer than lowers; lowers sometimes reduced. Branchlets (6 -) 8 -13 in a whorl 1 - 2.5 (- 3.8) cm. long, nearly straight, spreading or ascending; segments (6 -) 7 - 15 (-16) of which the basal and terminal are invariably ecorticate and of the remaining all but 1 - 2 (- 4) segments are 2 - 3 corticate (i.e., 5 - 14 are corticate with 1 - 2 (- 4) distal ones naked); basal segments variable, (¾ -) 1 - 3 (- 4) times longer than wide, rarely swollen, often obscured by the stipulodes. Bract - cells 5 - 8 variable, unilateral to verticillate, obscure to large; anteriors shorter to longer than oogonia; posteriors obscure and rudimentary to 1300 (- 3500) μm long; often reduced at sterile nodes; those at the lowest node sometimes differing from others, ventricose and one-sided. Bracteoles 2, shorter or longer than mature oogonium. Bractlet uncommon, regular or dioecious ♀, occasional with ♀of sejoined specimens, similar to but shorter than bracteoles. Gametangia conjoined, sejoined or on separate plants (dioecious strains), usually at lowest 2 - 7 branchlet nodes ♀ on lower ones. Oogonia 700 -1000 (- 1400?) μm long (excl. coronula), 400 - 750 μm wide, frequently lime-crusted; convolutions 11-15 (- 17); coronula 70 - 143 μm high, 140 - 180 μm wide, erect to connivent to slightly divergent, sometimes early deciduous. Oospores black, occasionally dark brown, (450 -) 600 - 900 μm long (285 -) 350 - 440 (- 560) μm wide; striae of (8 -) 11 - 13 (to 16) low to prominent ridges; fossa 46 - 56 μm across; membrane smooth, obscurely dotted or granulate. Antheridia (240-) 350 - 470 (to 690) μm in diameter, larger in dioecious ♂; tetra - (octo-) scutate.

Characters of the forms of Variety *Zeylanica* ex Willd., em

1a. Moderately developed structures; bract- cells to 1 times as long as branchlet diameter; basal Branchlet node occasionally fertile; oospore striae 11-13; branchlet segments 10 -13; spine - cells, bract- cells and stipulodes hardly visible to naked eye .....f. 1. *zeylanica*

1b. Bract- cells greatly reduced, posteriors and those at sterile nodes obscure; basal node sterile; Bracteoles shorter than oogonia; oospore striae 12- 16 .....f. 2. *michauxii*

1c. As in 1b, but bracteole as long as oogonia; bract- cells at lowest node ventricose; oospore striae few (8-10).....f.3. *berteroi*

1d. As in 1a, but spine-cells slender, elongate (to 3000 μ long); oospore striae 13-15 .....f.4. *trichacantha*

1e As in 1a, but branchlet segments few (6-7); bract- cells short usually adpressed .....f.5. *humboldtiana*

1f As in 1a, but elongate bract-cells (to 1500 μm); spine-cells (to 1600 μm) and stipulodes obvious to naked eye; lowest node fertile; gametangia conjoined; branchlets to 1.8 cm long.....f.6. *elegans*

1g As in 1a, but axis slender (to 600 μm); lowest branchlet node fertile .....f.7. *filicaulis*

1h As in 1f, but bract- cells (to 3500 μm), spine-cells (to 2700 μm), and stipulodes huge; branchlets elongate (to 3.8cm.); dioecious.....f.8. *kenoyeri*

Chara zeylanica var. *zeylanica* f. *elegans* (A. Br. ex T.F.A)

Wood Imahori 1965 p. 235, 236 Icon: 94, 95, 96

Plants 15 - 25 (- 60) cm. high, rather rigid. Axes moderately slender, 600 - 900 μm in diameter; internodes variable, often shorter than branchlets; cortex (2 -) 3 -corticate; spine - cells variable, 600 - 1600 μm long, other verticillate. Stipulodes exceeding basal branchlet segments. Branchlets (7-) 9 - 12 in a whorl, to 1.8 (- 3) cm. long; segments 7 – 9 (-10) of which 6 - 9 are 3 corticate; basal segment 1 - 2 times longer than wide; 1 – 2 (- 4) end segments naked. Bract- cells 5 - 6, verticillate (rarely slightly unilateral), 500 - 1300 μm, posteriors 300 - 1000 μm long. Bracteoles 2, longer than mature oogonium. Bractlet absent (peculiar isolated bract or bractlet at lowest node in spec. b). Gametangia conjoined at 3 - 4 lowest branchlet nodes. Oogonia 600 - 850 μm long (excl. coronula), 400 - 500 μm wide; convolutions c. 15; coronula 105 -150 μm high and 240 - 285 μm wide at apex, spreading. Oospores black, 500 - 675 (- 800?) μm long, 285 – 375 (-500?) μm wide; striae of 11 - 14 (- 15?) low ridges; fossa 46 - 50 μm across; membrane smooth, finely granulate or obscurely dotted. Antheridia 255 - 390 μm in diameter; tetrascutate.

Chara zeylanica var. *zeylanica* f. *elegans* (A. Br. ex T.F.A)

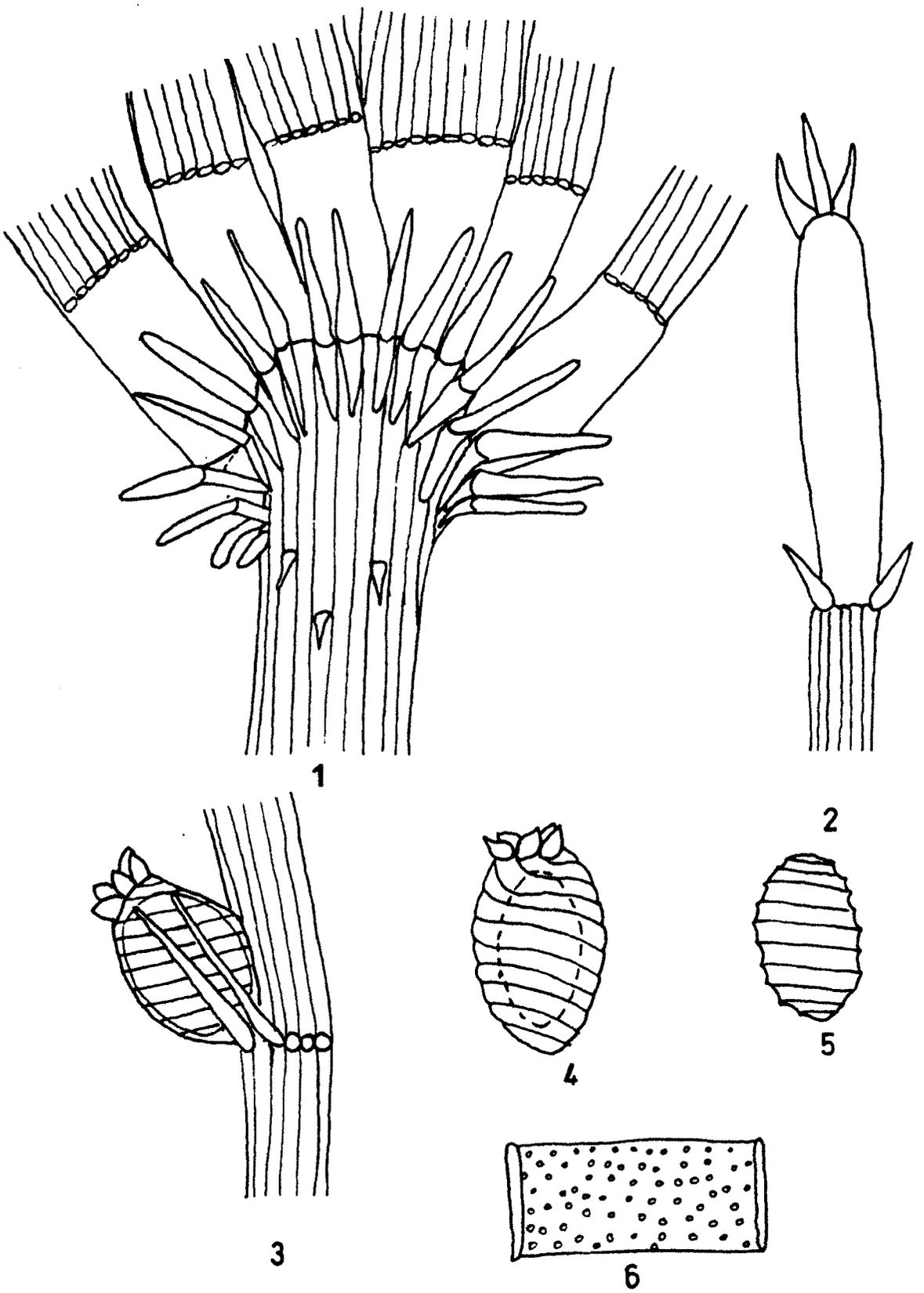
Plate no 10 Fig. 1- 6

Plants monoecious 8 -13 cm high; rather rigid. Axes moderately slender 780 - 900 μm in diameter, internode variable often shorter than branchlet. Cortex 3 corticate, isostichous. Spine cells variable 400 - 1200 μm long Stipulodes in 2 tires. Branchlets 9 - 10 in a whorl to 1.8 cm in length. Segments 7 - 8. Bract- cells 3 -5, verticillate (rarely unilateral). Bracteoles 2 longer than mature Oogonium. Bractlet absent. Gametangia conjoined. Oogonia 766 - 780 μm long (excl. coronula) and 437 - 501 μm wide, convolutions 11 - 14. coronula 15 - 34 μm high and 22 - 36 μm wide. Oospore black 234 - 498 μm long and 322 - 527 μm wide. Stria of 13 prominent

ridges. Fossa 60 μm across; membrane obscurely dotted. Antheridia 280 - 320 μm in diameter.

Location- Kurundwad.

PLATE NO. - 10 *Chara zeylanica* var. *zeylanica* f. *elegans* Klein ex Willd., em.
Location: Kurundwad



1. Axial node, well developed stipulodes and basal part of branchlets X 30
2. Apical part of branchlet showing 1- 2 celled end segment X 30
3. Branchlet nodes showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Oospore X 30
6. Oospore membrane X 200

Table No. 4 Comparative account of,

Chara *zeylanica* var. *zeylanica* f. *elegans*. Klein ex Willd., em.

No	Characters	Wood, Imahori, 1964	Kurundwad
1	**Habit/ Height**	Monoecious 15 – 25 (-60) cm	Monoecious 8 - 13 cm
2	**Axis Diameter**	600 - 900 µm	780 - 900 µm
3	**Internodes**	variable, often shorter than branchlets	variable, often shorter than branchlets
4	**Cortex**	2 - 3	3
5	**Spine Cells**	600 -1600 µm	400 - 1200 µm
6	**Stipulodes**		2 tire
7	**Branchlet--**		
	Number.	9 - 12	9 -10
	Length.	1.8 - 3 cm	1 - 1.8 cm
	Segment.	7 - 9 (-10)	7 - 8
8	**Bract Cells**	5 - 6	3 - 5
9	**Bracteoles**	2 longer than mature oogonium	2 longer than mature oogonium
10	**Gametangia**	conjoined	conjoined
11	**Oogonia--**		
	Length	600 - 850 µm long	766 - 780 µm long
	Width/Breadth	400 - 500 µm wide	437 - 501 µm wide
12	**Coronula--**		
	Height	105 - 150 µm high	15 - 34 µm high
	Width	240 - 285 µm	22 - 36 µm wide
13	**Oospore--**		
	Length	500 - 675 µm long	234 - 498 µm long
	Breadth	285 - 375 µm wide	322 - 527 µm wide
	Color	black	black
	Membrane	Smooth, granulate	Obscurely dotted
	Ridges	11 - 14	13
	Fossa	46 - 50 µm across	60 µm across
14	**Antheridium**	255 - 390 µm diameter	280 - 320 µm diameter

5) *Chara zeylanica* Klein ex Willd., em.

Wood Imahori1965 p. 237 Icon: 98

Pal et al 1963 p.105 Fig. 253-255

Chara zeylanica var. *zeylanica* f. *filicaulis* (Rob.) Wood.

R.D.W. 1965 p. 237 Icon: 98

Pal et al 1963 p.105 Fig. 253-255

Plants monoecious, to 50 cm. high, Axes moderately slender, to 600 μm in diameter; internodes elongate, 2 - 3 times branchlet length; cortex essentially 3 corticate, except occasionally 2 - 3 corticate in younger internodes; spine-cells well developed above. Stipulodes exceeding basal branchlet segment. Branchlet 7 - 8 in a whorl, to 1.8 cm. long; segments 9 - 10 of which 5 - 7 are 3 - corticate; basal segment 1 - 1 ½ times longer than wide. Gametangia conjoined at 3 - 4 lowest branchlet nodes. Oogonia 900 -1000 μm long (excl. coronula), 450 - 510 μm wide, slightly incrusted; convolutions 16 -17; coronula 70 - 90 μm high 130 - 165 μm wide; striae of (12?) 14 - 15 faint ridges; fossa c. 50 μm across; membrane unfigured. Antheridia 370 - 420 μm in diameter; tetrascutate.

Chara zeylanica var. *zeylanica* f. *filicaulis* (Rob.) Wood.

Plate no11a Fig. 1-5

Plants monoecious to 51 cm high. Axes moderately slender to 410 μm in diameter; internodes elongate 1.2 - 5.6 cm long 2 - 3 times branchlet length. Cortex 2 - 3 corticate. Spine - cells well developed Stipulodes 2 tire exceeding basal branchlet segment, upper 175 - 410 μm long and lower 73 - 322 μm long. Branchlets 9 in a whorl to 3.1 cm long; segments 8 - 9. Bract- cells 1-3. Bracteoles 2. Gametangia conjoint at 3 - 4 lowest branchlet node. Oogonia 278 - 425 μm long (excl. coronula) and 123 - 218 μm wide and convolutions 9 -10; coronula 43 - 117 μm long and 43 - 263 μm wide, slightly spreading. Oospores dark green in color, 146 - 308 μm long

and 175 - 264 µm wide; strie 8 - 9 ridges; fossa 29 -36 µm across. Antheridia 131 - 322 µm in diameter

Location- Kalamba Lake, Kolhapur

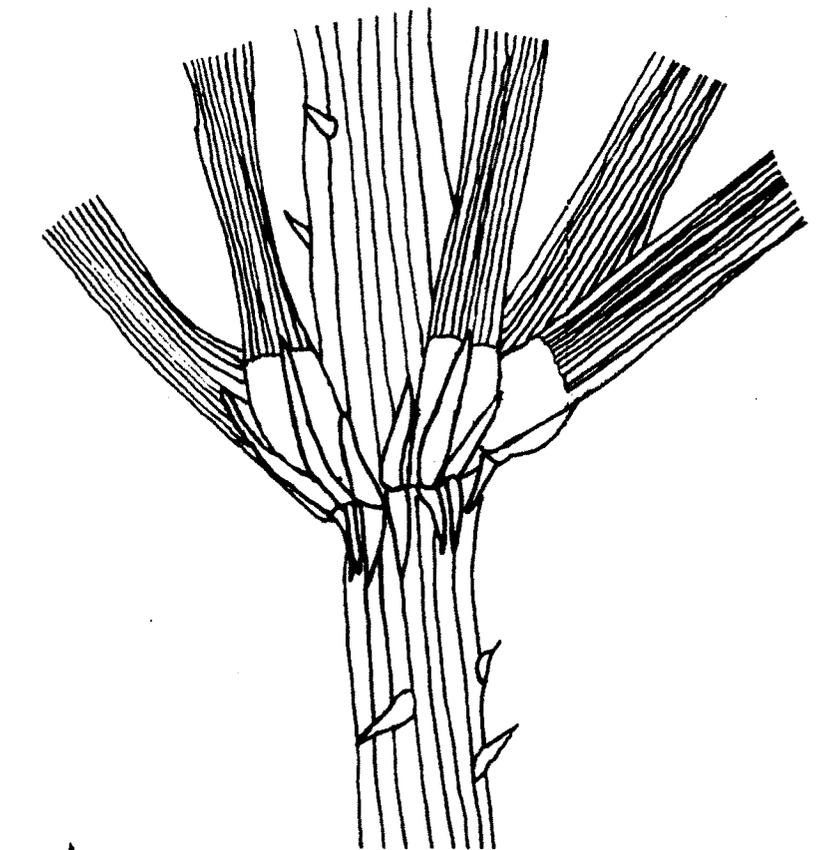
Chara zeylanica var. *zeylanica* f. *filicaulis* (Rob.) Wood.

Plate nc11bFig. 1-5

Plants monoecious to 52 cm high. Axes moderately slender to 777 µm in diameter; internodes elongate; 1.4-3.5 cm long, 2 - 3 times branchlet length; cortex essentially 3 corticate, except occasionally 2 - 3 corticate in younger internodes; spine cells well developed. Stipulodes 2 tire exceeding basal branchlet segment. Branchlets 7 - 9 in a whorl to 1.6 cm long; segments 9 - 10. Gametangia conjoint at 3 - 4 lowest branchlet node. Oogonia 717 - 1025 µm long (excl. coronula), 439 - 615 µm wide, slightly incrusted; convolutions 10 - 12 coronula 175 - 249 µm high and 58 - 147 µm wide, slightly spreading. Oospores dark green to black, 629 - 791 µm long and 307 - 439 µm wide; stria 11 - 15 ridges; fossa 59 µm across. Antheridia 307 - 439 µm in diameter.

Location- Jaisingh Lake, Kagal, Kolhapur

PLATE NO. - 11 a *Chara zeylanica* var. *zeylanica* f. *filicaulis* Klein ex Willd., em.
Location: Kalamba Lake, Kolhapur



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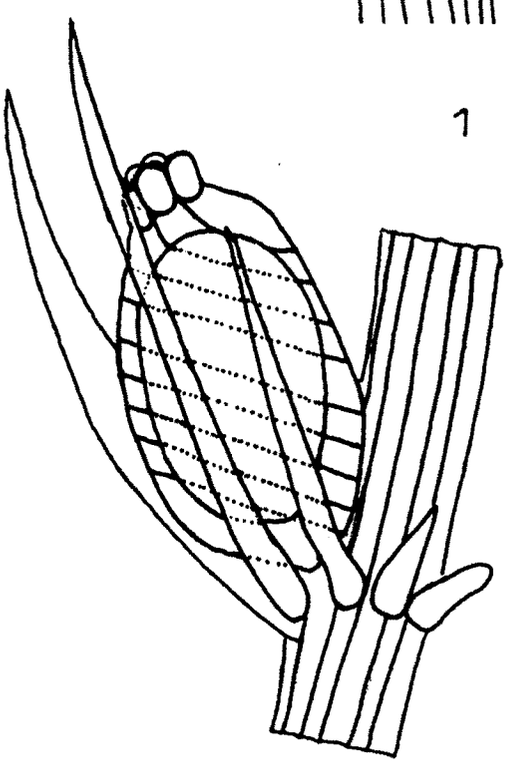

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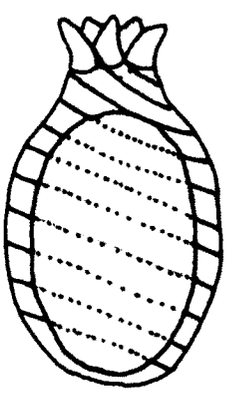

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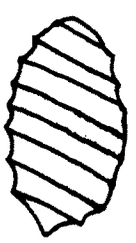
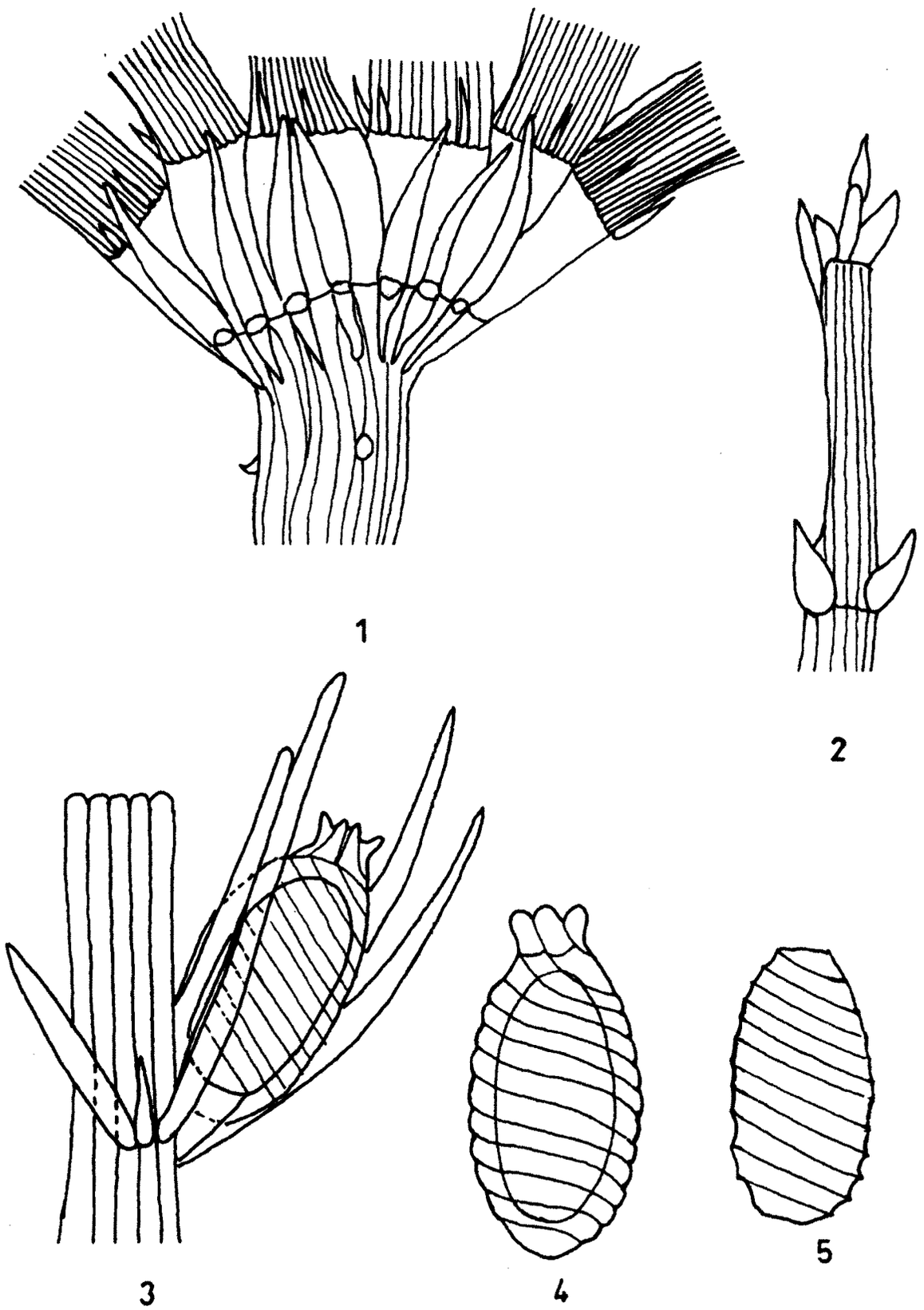


5

1. Axial node with 2 corticated cortex, stipulcdes in 2 tiers and spine cells X 30
2. Apical part of branchlet showing 3- celled end segment X 30
3. Branchlet node showing oogonium with 1 bract and one bracteole X 30
4. Oogonium X 30
5. Oospore X 30

PLATE NO. - 11 b *Chara zeylanica* var. *zeylanica* f. *filicaulis* Klein ex Willd., em.
Location: Jaisingh Lake, Kagal



1. Axial node with stipulodes in 2 tiers, bases of branchlets and spine cells X 30
2. Branchlet X 30
3. Branchlet node with gametangia, unilateral bract-cells and bracteoles X 30
4. Oogonium X 30
5. Oospore X 30

Table No. 5 Comparative account of,

Chara zeylanica var. *zeylanica* f. *filicaulis* Klein ex Willd., em.

No	Characters	Wood,	Kalamba Lake	Jaisingh Lake
1	**Habit/ Height**	Monoecious 50 cm	Monoecious 51cm	Monoecious 52 cm
2	**Axis Diameter**	600 µm	410 µm	777 µm
3	**Internodes**	Elongate 2 - 3 times branchlet length	Elongate 1.2 -5.6 cm long 2 - 3 times branchlet length	Elongate 1.4 - 3.5 cm long, 2 - 3 times branchlet length
4	**Cortex**	2 -3 corticate	2 -3	2 -3
5	**Spine Cells**	600 - 1600 µm	Well developed	well developed
6	**Stipulodes**	2 tiers	2 tiers	2 tiers
7	**Branchlet--**			
	Number	7 - 8	9	7 - 9
	Length	To 1.8 cm	To 3.1 cm	1.6 cm
	Segment	9 - 10	8 - 9	9 - 10
8	**Bract Cells**	5 - 6	1 - 3	2 - 4
9	**Bracteoles**	2, longer than mature oogonium	2	3-5
10	**Gametangia**	Conjoined	Conjoined	Conjoined
11	**Oogonia--**			
	Length	900 -1000 µm long	278 - 425 µm	717 - 1025 µm
	Breadth	450 - 510 µm wide	123 - 218 µm	439 - 615 µm
12	**Coronula--**			
	Height	70 - 90 µm high	43 - 117 µm	175 - 249 µm
	Width	130 - 165µm	43 - 263 µm	58 - 147 µm
13	**Oospore--**			
	Length	630 - 675 µm long	146 - 308 µm	629 - 791 µm
	Breadth	300 - 375	175 - 264 µm	307 - 439 µm
	Color	black	dark green	dark green to black
	Membrane	Not figured	Not observed	Not observed
	Ridges	14 - 15	8 - 9	11 - 15
	Fossa	50 µm across	29 -36 µm across	59 µm across
14	**Antheridium**	370 - 420 µm	131 - 322 µm	307 - 439 µm

6) *Chara zeylanica.* Klein ex Willd., em

R.D.W. 1965 p. 246 Icon: 104, 105

Pal et al p.105 Fig 253 - 255

Chara zeylanica var. *diaphana* (Meyen) R.D.W., em.

Wood Imahori 1965 p. 243, 244 Icon: 104, 105, 106, 107

Plants monoecious small to medium large, 4.5 - 40 cm. high, occasionally incrusted. Axes moderately stout, 400 - 1100 μm in diameter; internodes ¾ - 4 time as long as branchlets, to 6cm. long; cortex regularly or irregularly 3 - corticate, occasionally slightly tylacanthous; spine - cells solitary, variable, very small to large, usually about as long as axis diameter. Stipulodes in 2 tiers 2 sets per branchlet; uppers often longer than lowers, occasionally as long as basal branchlet segment; lowers occasionally reduced, rarely rudimentary (f. *vandalurensis*). Branchlets (8-) 9 - 11 (- 12) in a whorl, to 2.8 cm. long; segments (2 - 3-) 5 - 7 of which 0 - 6 are 2 - 3 – corticate; basal segment always naked, generally different from other segments, ½ -10 times as long as 2nd segment; end segment 1- celled (rarely 2 – 3 - celled, f. *vandalurensis*, in which case end cell is mucronate), generally forming a terminal cluster with the bract – cells. Bract- cells 5 – 6 (- 7), verticillate or unilateral, ½ - 2 (- 3) times as long as branchlet diameter, often fewer and smaller on sterile and distal nodes, absent from septa of segments (f. *vandalurensis*). Bracteoles 2, shorter or longer than mature oogonia. Gametangia conjoined at 2-3 lowest branchlet nodes, occasionally absent from 1st node, solitary. Oogonia 630 - 900 μm long (excl. coronula) 360 - 522 μm wide; convolutions 13 - 15; coronula 93 - 150 μm high, 143 - 240 μm wide; divergent or erect. Oospores dark brown to black, (420-) 480 - 680 μm long, 270 - 450 μm wide; striae of 11 - 12 (-14) low to fairly prominent ridges, occasionally terminating in short basal claws; fossa 44 - 60 μm across; membrane smooth, finely granular to minutely papillate. Antheridia 322 - 358 μm in diameter; tetra- (octo?-) scutate.

Synopsis of forms of variety *diaphana* (Meyen) R.D.W., em.

1a. 4 or more corticate segments per branchlet.....f.5. *armata*

1b. 0-3 corticate branchlet segments.

2a.. Tiny (to 6 cm. high), with reduced branchlets (to 0.4cm. long) .....f.4. *depauperata*

2b. Normal form.

3a. Branchlets totally ecorticate ("*C. handae*" may key out here, see *C. globularis* var. *leptosperma* f. *handae*).

4a. Bract- cells absent from distal 2 - 3 branchlet cross walls; segments 3 - 4 .....f.7. *vandalurensis*

4b. Bract- cells present at all cross walls, also subtending the end cell; segments 5 - 7.....f.6. *guatemalensis*

3b. Some branchlets with some corticated segments

5a. Robust, to 40 cm. high, axes 1100 µm in diameter .....f.3. *cubensis* .....

5b. Small to medium, to 29 cm. high, axes to 750 µm in diameter.

6a. Lowest branchlet node fertile.....f. 1. *diaphana*

6b. Lowest branchlet node usually sterile.....f.2. *oerstediana*

Chara zeylanica var. *diaphana* f. *oerstediana* (Meyen) R. D. W., em

Wood Imahori 1965 p. 246,247 Icon: 104, 105

Pal et al p.105 Fig 253-255

Plants 4.5 - 15 (-29) cm. high. Axes 351 - 750 µm in diameter; cortex regularly or irregularly 3 - corticate; spine-cells 70 - 800 µm long, acute. Stipulodes to 607 µm long, uppers longer then lowers, uppers not exceeding basal branchlet segment. Branchlets (8 -) 9 -11 (-12) in a whorl, to 1.5 cm. long; segments 5 - 7 of which 0 – 1 (- 4) are (2 -) 3 corticate; basal segment 4 - 8 times longer than wide. Bract- cells 5 - 6, unilateral or verticillate, varying in size, c. 2 times as long as axis

diameter, to 1200 µm long (often resembling those of *C. fibrosa*). Bracteoles 2, generally longer than oogonium. Gametangia conjoined or solitary at (1^{st}-) 2^{nd} and 3^{rd} lowest branchlet nodes. Oogonia 645 - 750 µm high, 90 - 120 µm wide; convolutions 14 - 15; coronula 45 - 75 µm high, 90 - 120 µm wide. Oospore dark brown to black, 480 - 680 µm long, 360 - 400 µm wide; striae of 11 - 13 (-14) moderately prominent ridges occasionally terminating in short claws; fossa 44 - 59 µm across; membrane smooth or weakly granulate. Antheridia 250 -358 µm in diameter; tetrascutate.

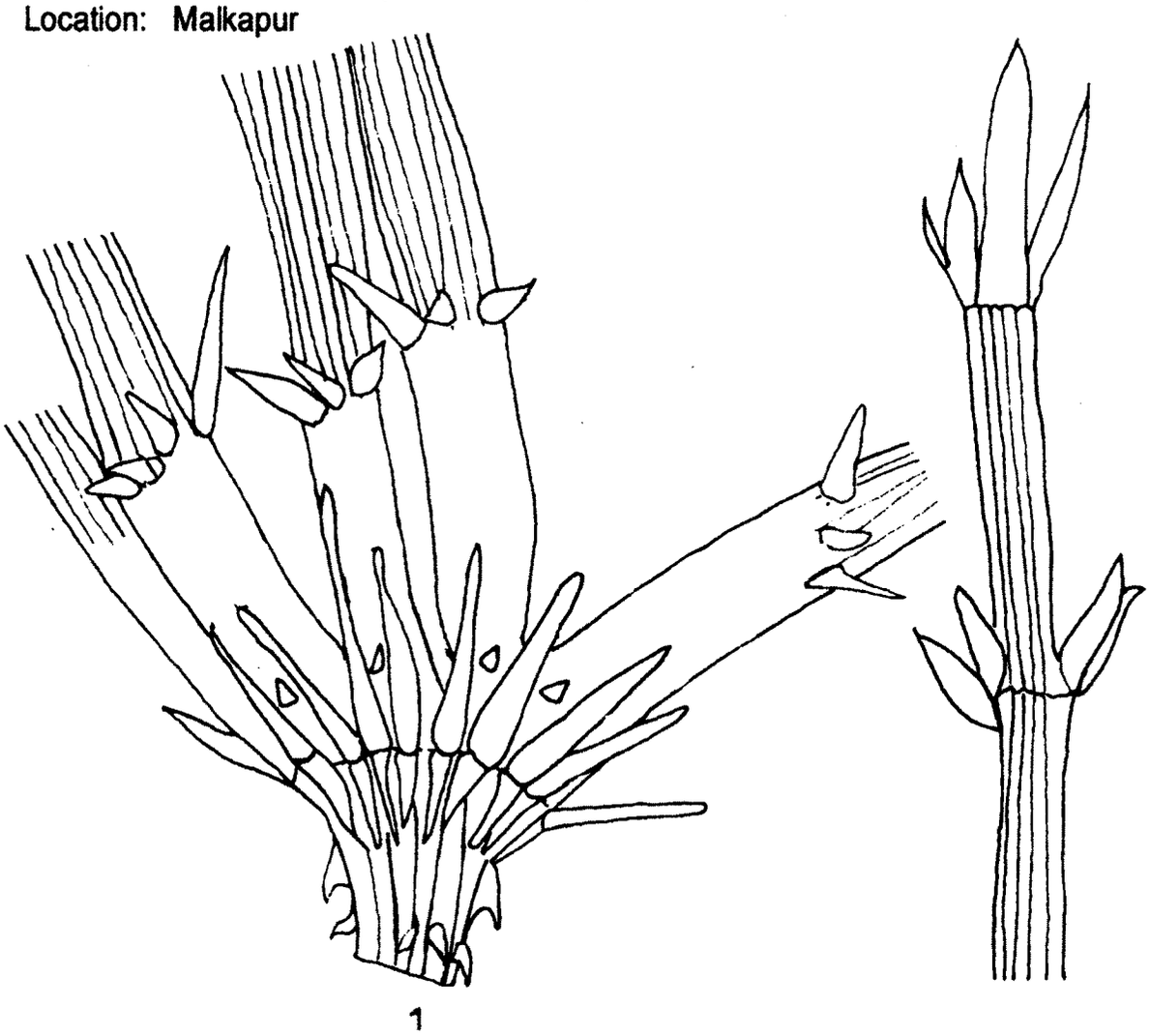
Chara zeylanica var. *diaphana* f. *oerstediana* (Meyen) R. D. W., em

Plate no. 12 Fig. 1-6

Plants monoecious 12 - 27 cm high. Axes 249 - 336 µm in diameter; cortex regularly or irregularly 3 corticate; spine cells present. Stipulodes in 2 tire, upper 146 -278 µm long and lower 87 - 161 µm long. Branchlets 9 in a whorl to 2.7 cm long, lower segment naked and somewhat longer than the above segments; segments 5 - 7 all are 3 corticate; bract cells 1 - 2 unilateral, varying in size 2 times as long as axis diameter to 717 µm long. Bracteoles 1 - 2. Gametangia conjoined. Oogonia 351 - 439 µm long (excl. coronula) and 219 - 336 µm wide, convolutions 10 - 12; coronula 43 - 102 µm high and 73 - 107 µm wide. Oospores dark green to black 263 - 293 µm long and 146 - 263 µm wide; striae of 8 - 9 prominent ridges; fossa 29 - 44 µm across. Antheridia 146 - 191 µm in diameter.

Location- Malkapur.

PLATE NO. - 12 *Chara zeylanica* var. *diaphana* f. *oerstediana* Klein ex Willd., em.
Location: Malkapur



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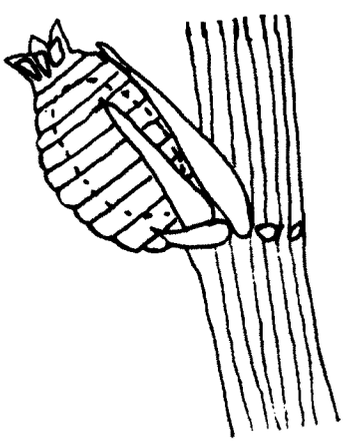

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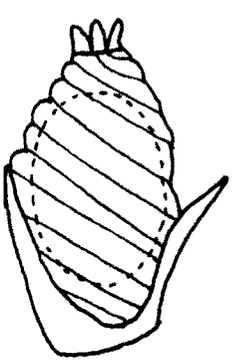

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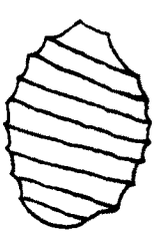

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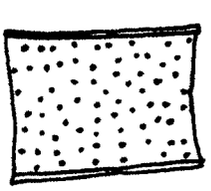


6

1. Axial nodes with stipulodes in 2 tiers, basal part of branchlets, 2 corticated axis and spine cells X 30 .
2. Branchlet X 30
3. Branchlet node with mature oogonium 2 bract- cells and 1 bracteoles X 30
4. Oogonium X 30
5. Oospore X 30
6. Oospore membrane X 100

Table No. 6 Comparative account of,

Chara zeylanica var. *diaphana* f. *oerstediana* Klein ex Willd., em.

No.	Characters	Wood, Imahori, 1964	Malkapur
1	**Habit/ Height**	Monoecious. 4.5 -15 (- 29) cm	Monoecious 12 - 27 cm
2	**Axis Diameter**	351 - 750 µm	249 - 336 µm
3	**Internodes**	to 6 cm	0.8 - 4.7 cm
4	**Cortex**	3 corticate	3 corticate
5	**Spine Cells**	Present	Present
6	**Stipulodes**	2 tiers to 607 µm long, uppers longer then lowers	2 tier, upper 146 - 278 µm long and lower 87 - 161 µm long
7	**Branchlet--**		
	Number	9 - 11	9
	Length	To 1.5 cm	To 2.7 cm
	Segment	5 - 7	5 - 7
8	**Bract Cells**	5 - 6, unilateral, verticillate	1 - 2 unilateral
9	**Bracteoles**	2	2
10	**Gametangia**	Conjoined	Conjoined
11	**Oogonia--**		
	Length	645 - 750 µm high	351 - 439 µm high
	Width/Breadth	90 - 120 µm wide	219 - 336 µm wide
12	**Coronula--**		
	Height	45 - 75 µm	43 - 102 µm
	Width	90 - 120 µm	73 - 107 µm
13	**Oospore--**		
	Length	480 - 680 µm	263 - 293 µm
	Breadth	360 - 400 µm	146 - 263 µm
	Color	dark brown to black	dark green to black
	Membrane	Smooth, finely granular to minutely papillate	----
	Ridges	11 - 13	8 - 9
	Fossa	44 - 59 µm	29 - 44 µm
14	**Antheridium**	250 - 358 µm	146 - 191 µm

7) *Chara socotrensis* Nordst. in Kuhn, em.

Wood Imahori 1965 p. 279, 280 Icon: 119 – 121

Pal et al. 1962 p.92 Fig.204, 205

Plants monoecious or dioecious, 5 - 16 (- 30) cm high. Axes moderately stout, 200 - 1000 μm in diameter; internodes 1 - 4 times as long as branchlets. Stipulodes small, often rudimentary to absent, 1 - 2 times as numerous as the branchlets, opposite or alternate. Branchlets (4 -) 10 - 12 in a whorl, to 2 cm long; segments 2 - 7, terminal segment 1 - 4 celled, end cell small, often mucronate, rarely subtended by bract - cells. Bract cells small, unilateral or verticillate, to as long as the branchlet diameter, absent from branchlet septa except nodes, occasionally rudimentary or absent. Bracteoles 1, to as long as oogonia, occasionally rudimentary. Gametangia conjoined or on separate plants, solitary or geminate at lowest 1 - 3 branchlet nodes. Oogonia 450 - 830 μm long (excl. coronula), 330 - 525 μm wide; convolutions 8 - 14; coronula 60 -150 μm high, 105-195 μm wide. Oospores dark brown to black, 420 - 450 (-more) μm long, 270 - 350 μm wide; striae of 8 - 9 (-12) ridges; fossa 53 - 65 μm across; membrane minutely granulate to papillate. Antheridia 180 - 345 μm in diameter; octascuate.

Key to species of *Chara socotrensis* Nordst. In Kuhn, em.

Stipulodes absent or obscure even under the dissecting lens.

Cortication totally absent.

Bract cells well developed.

Bract cells peculiarly interested, depressed or adepressed

Bract cells small.....*C. socotrensis*

Characters of the forms of *Chara socotrensis* Nordst. in Kuhn, em

- Bract- cells unilateral, stipulodes evident and alternate, gametangia conjoined, solitary.....f. *socotrensis*
- Bract- cells verticillate, may occur to all nodes, stipulodes obscure, dioecious

.....f. *fulgens*

- Bract- cells equilateral, depressed, stipulodes absent, gametangia geminate or aggregate at branchlet nodes, monoecious.....f. *pashanii*
- Bract- cells unilateral, stipulodes evident, alternate, branchlets with 1-2 nodes .....f. *nuda*

Out of the above four forma, we could collect only one forma, viz. f. *nuda*

Chara socotrensis. f. *nuda*. (Pal) R. D.W.

Wood Imahori 1965 p. 282 Icon: 119

Pal et al. 1962 p.92 Fig.204, 205

Chara socotrensis is ecorticate and monoecious species; it has stipulodes in one tier and are rudimentary. Bracts and bracteoles are also present in f. *nuda* though it is totally ecorticate species.

Chara socotrensis f *nuda* was found at only in one locality i.e., at Rashiwade (budruk) in Radhanagri tehsil.

Chara socotrensis f *nuda* (Pal) R. D.W.

Wood Imahori 1965 p. 282 Icon: 119

Pal et al. 1962 p.92 Fig.204, 205

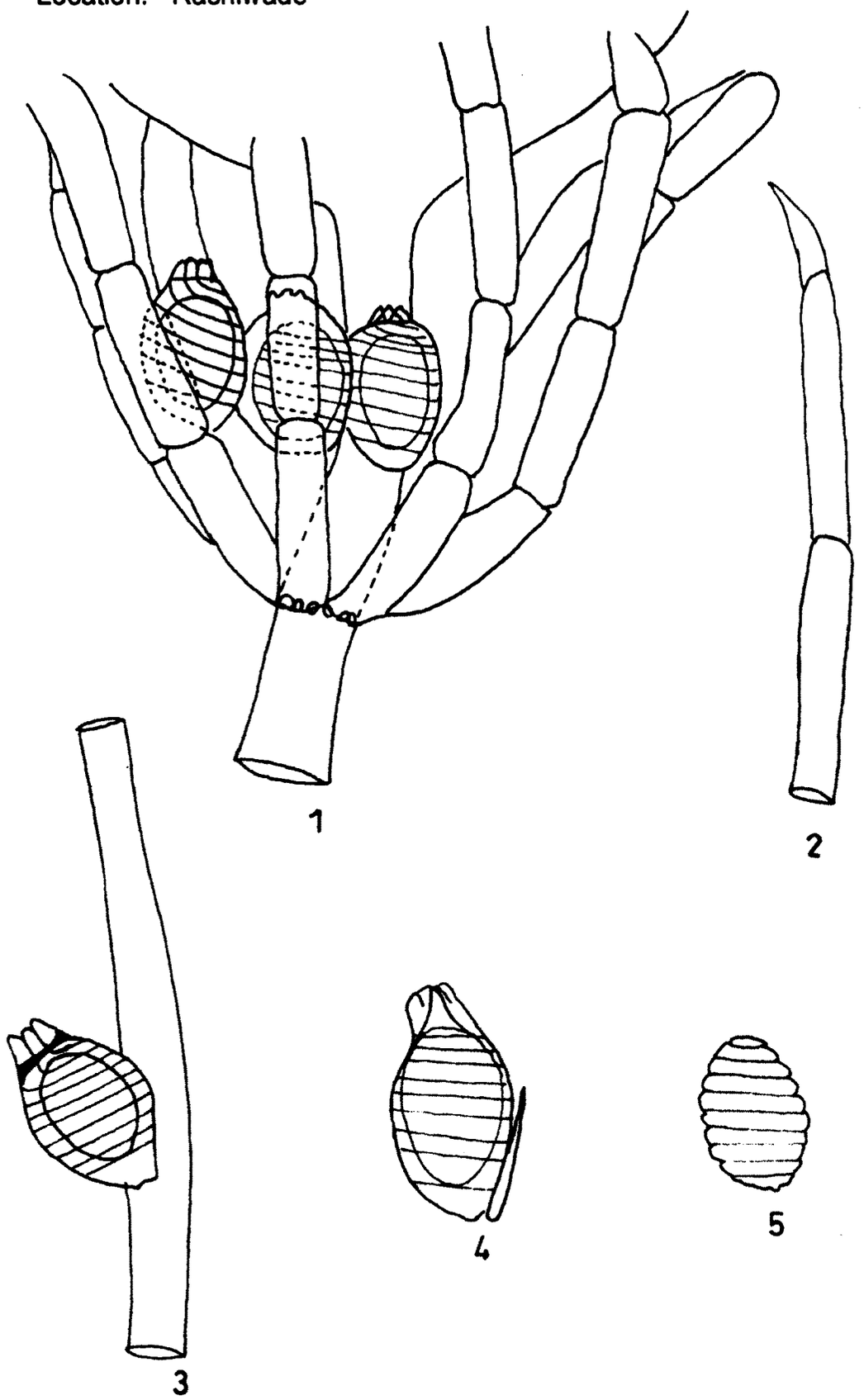
Plants monoecious, c. 5.2 cm high. Axes 350 μm in diameter. Stipulodes in 1 tier, usually rudimentary. Branchlets 7 - 8 in a whorl, 0.8 cm long; segments 2 - 3, end segment 3 - 4 celled. Ecorticate, gametangia conjoined at 2 lowest branchlet nodes. Oogonia solitary 730 (- 800?) μm long (excl. coronula), 525 μm wide; convolutions 14; coronula c. 70 μm high and 190 μm wide, connivent .Oospores black, 450 μm long, 330 μm wide striae of 12 ridges; fossa 53 - 65 across extending into short basal claws. Antheridia c. 230 μm in diameter; octoscutate

Chara socotrensis f *nuda* (Pal) R. D.W

Plate no. 13 Fig. 1-5

Plants monoecious 7 - 9 cm high. Axes 456 - 610 μm in diameter. Stipulodes in 1 tier usually rudimentary. Internodes 1 - 3.2 cm long Branchlets 9- 10 in a whorl to 3 cm long. Segments 3 - 4, spine cells absent, ecorticate. Spine-cells absent, Bract cells 2 - 3, Bracteoles 1 - 2 in number. Gametangia conjoined at lowest branchlet nodes. Oogonia solitary 710 - 858 μm long and 476 - 495 μm wide. Oospore dark brown to black in color with 520 - 600 μm long and 330 - 378 μm wide; striae of 10 - 11 prominent ridges; fossa 50 μm wide. Antheridia 293 - 350 μm in diameter.
Location - Rashiwade.

PLATE NO. - 13 *Chara socotrensis* f. *nuda* Nordst. in Kuhn, em.
Location: Rashiwade



1. Branchlet whorl with 1 tier rudimentary stipulode X 30
2. Branchlet X 30
3. Branchlet node with mature oogonium X 30
4. Oogonium with a single bract- cells X 30
5. Oospore X 60

Table No. 7 Comparative account of *Chara socotrensis* f. *nuda* Nordst. in Kuhn, em.

No	Characters	Wood, Imahori, 1964	Rashiwade
1	**Habit/ Height**	Monoecious 5.2 cm high	Monoecious 7 - 9 cm high
2	**Axis Diameter**	350 µm	456 - 610 µm
3	**Internodes**	Not mentioned	1 - 3.2 cm
4	**Cortex**	Absent	Absent
5	**Spine Cells**	Absent	Absent
6	**Stipulodes**	1 tire	1 tire
7	**Branchlet–**		
	Number	7 - 8	9 – 10
	Length	0.8 cm	3 cm
	Segment	2 - 3	3 – 4
8	**Bract Cells**	Not mentioned	2 – 3
9	**Bracteoles**	2	1 – 2
10	**Gametangia**	Conjoined/monoecious	Conjoined/monoecious
11	**Oogonia–**	Solitary	Solitary
	Length	730 - 800 µm	710 - 858 µm
	Width/Breadth	525 µm	476 - 495 µm
12	**Coronula–**		
	Height	70 µm	95 µm
	Width	190 µm	193 µm
13	**Oospore–**		
	Length	450 µm	520 - 600 µm
	Breadth	330 µm	330 - 378 µm
	Color	Black	Dark Brown to Black
	Membrane	Minutely granulate to papillate	Not observed
	Ridges	12	10 – 11
	Fossa	53 - 65 µm	50 µm
14	**Antheridium**	230 µm	293 - 350 µm

8) *Nitella stuartii* A.Br.

R.D.W. 1965 p. 436 Icon: 209, 210

Pal et al p.74. Fig 143 -144

Plants monoecious, 8 - 10 cm. high, upper fertile whorls heteroclemous, occasionally incrusted. Axes moderately stout, 450 - 950 μm in diameter; internodes shorter or longer (to 2 times) than branchlets, Branchlets, fertile varying in number, usually 5 - 6 in a whorl, to 2 cm. long, 2 - furcate, primary ray c. ⅓ of branchlet length, secondaries 4 - 6, often short, tertiaries 3 - 4; accessory branchlets 2 - 6 below the fertile branchlets, 0.1 - 0.2 cm. long, 1- 2 - furcate, usually sterile 5 - 7 in a whorl, to 2 cm. long, (1-) 2 - furcate, primary ray ½ - ⅔ of branchlet length, secondaries 4 - 6, tertiaries 2 - 3 (-6). Dactyls 2- 4 (- 6), 1 celled, acute or obtuse. Heads not formed; fertile whorls with accessory branchlets occasionally suggesting heads, and these are 0.4 - 1 cm. in diameter. Gametangia conjoined or sejoined at fertile branchlets. Oogonia aggregate, (1 -) 2 – 4 (- 6) at a node, 330 - 360 μm long (excl. coronula), 220 - 270 μm wide; convolutions 8 - 9, occasionally elongated distally; coronula 38 - 49 μm high, 50 - 60 μm wide, persistent. Oospores light golden chestnut or dark brown, 200 - 270 μm long, 175 - 245 μm wide, 90 - 100 μm thick; striae of 5 – 6 (- 7) thin and occasionally prominent flanged ridges; fossa 42 - 45 μm across; membrane reticulate, 8 - 13 meshes across a fossa, each c. 3 μm in diameter; Antheridia 195 - 225 μm in diameter.

Nitella stuartii A.Br.

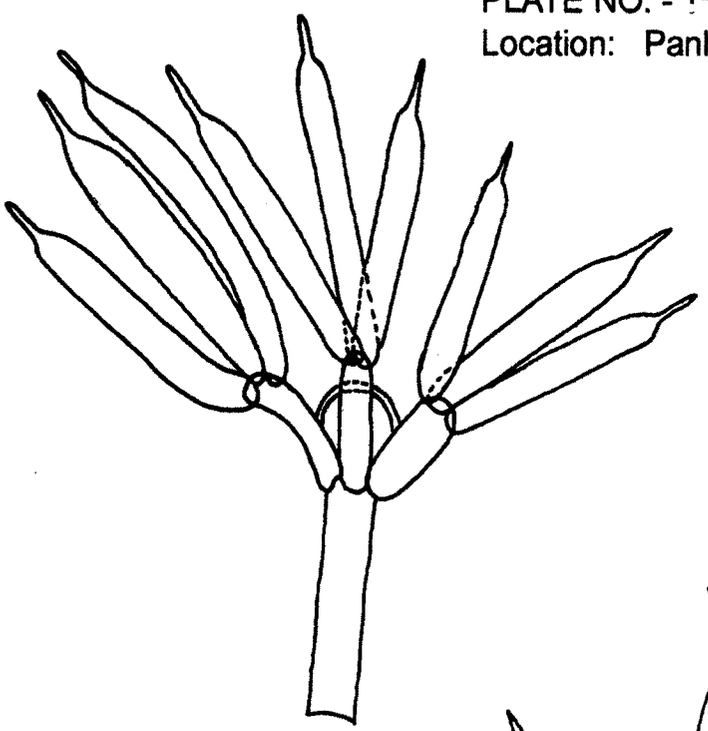
Plate no 14 Fig. 1-7

Plants monoecious, 7 - 9 cm high. Upper fertile whorls heteroclemous. Not incrusted. Axis slender to moderately stout 420 - 639 μm in diameter. Internodes shorter or longer than branchlets 1 - 3.1 cm long. Branchlets fertile varying in number, usually 4 - 6 in a whorl with 2 - 3 cm long and 2 furcate. Primary ray 1.33 μm long, secondary 4 - 6 μm and tertiary 2 - 4 μm long, accessory branchlets 2 - 4 below the fertile branchlets. Sterile branchlets 4 - 5 in no to 2 cm long. Dactyls 2 - 3

celled. Heads not formed; fertile whorls with accessory branchlets occasionally suggesting heads, and these are 0.5 - 1.2 cm in diameter. Fertile whorls with accessory branchlets 2 - 4 in number. Gametangia conjoined at fertile branchlet nodes. Oogonia not aggregate 319 - 326 µm long and 220 -239 µm wide (excl. coronula). Coronula 36 - 38 µm high and 52 - 58 µm wide, persistent. Oospores dark brown in color 200 - 217 µm long and 172 - 179 µm wide; stria 6 - 7, occasionally prominent flanged ridges; fossa 40 - 43 µm across, membrane reticulate, 9 -10 meshes across fossa. Antheridia 195 - 211 µm in diameter.

Location- Panhala

PLATE NO. - 14 *Nitella stuartii* A.Br.
Location: Panhala



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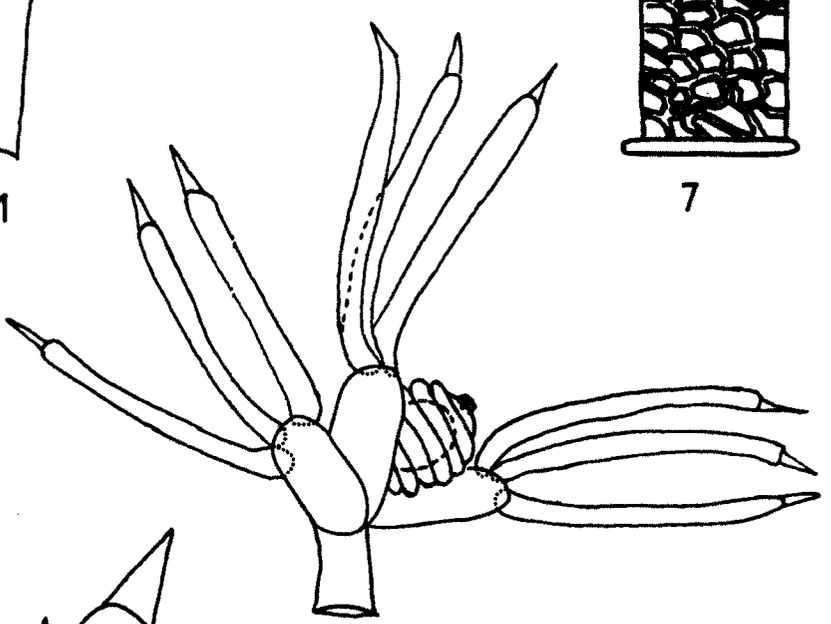

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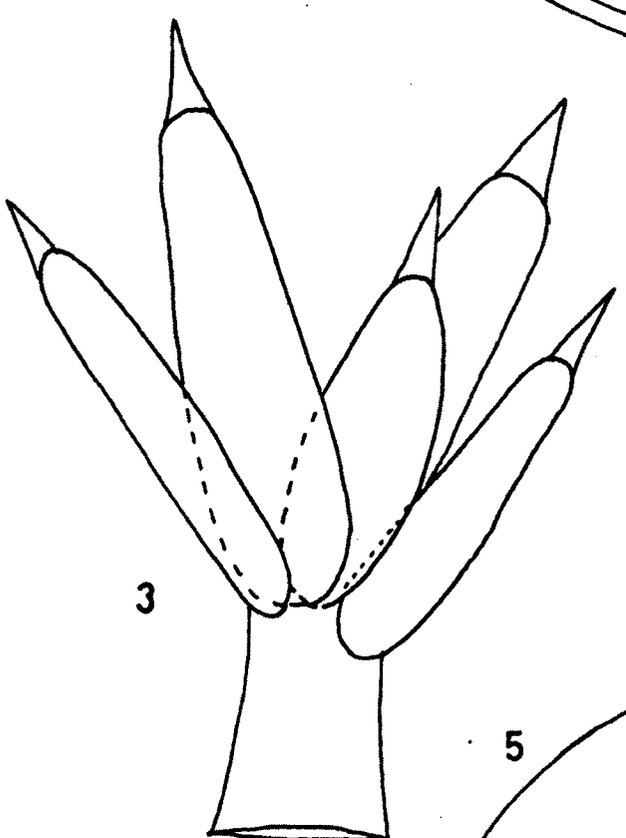

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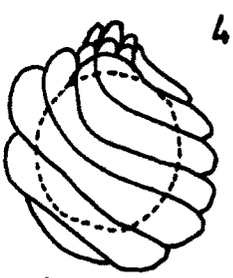

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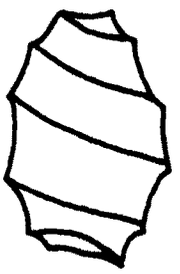

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7

1. Apical portion of branchlet showing male reproductive structure with 9 sterile branchlets X 60
2. Apical portion of branchlet showing female reproductive structure with 12 sterile branchlets X 60
3. Sterile whorl X 120
4. Oogonium X 120
5. Coronula X 270
6. Oospore X 120
7. Oospore membrane X 450

Table No. 8 Comparative account of *Nitella stuartii* A.Br.

Sr. no	Characters	Wood	Amboli
1	**Habit/ Height**	Monoecious, 8 - 10 cm	Monoecious, 7 - 9 cm
2	**Axis Diameter**	450 - 950 µm	420 - 639 µm
3	**Internodes**	To 4 cm	1 - 3.1 cm
4	**Branchlet–**		
	a.) Fertile		
	Number	5 - 6	4 – 6
	Length.	2 cm	2-3 cm
5	**b.) Sterile**		
	Number	5 - 7	4 – 5
	Length	2 cm	2 cm
6	**Dactyls**	2 - 4	2 – 3
7	**Heads**	Not formed	Not formed
8	**Gametangia**	conjoined or sejoined	Conjoined
9	**Oogonia–**		
	Length	330 - 360 µm	319 - 326 µm
	Width/Breadth	220 - 270 µm	220 - 239 µm
10	**Coronula–**		
	Height	38 - 49 µm	36 - 38 µm
	Width	50 - 60 µm	52 - 58 µm
11	**Oospore**		
	Length	200 - 270 µm	200 - 217 µm
	Breadth	175 - 245 µm	172 - 179 µm
	Color	light golden chestnut or dark brown	dark brown
	Membrane	reticulate,	reticulate,
	Ridges	5 - 6	6 – 7
	Fossa	8 - 13 meshes	9 - 10 meshes
12	**Antheridium**	195 - 225 µm	195 - 211 µm

9) *Nitella dualis* Nordst. in T.F.A., em.

Wood Imahori 1965 p. 446 Icon: 212

Pal et al. 1962 p. 49 Fig. 1- 9

Plants monoecious or dioecious, (6 -) 15 - 30 cm. high, bright to brownish green, fertile portions enveloped with mucus. Axes slender to moderately stout, (280 -) 450 - 850 μm in diameter; internodes ½ - 5 times as long as the branchlets, 1- 4 (- 7.5) cm. long. Branchlets, fertile 5 - 9 in a whorl, commonly congested into heads 0.1 (-2 ?) cm. long, (1-) 2 - 3 (- 4?) - furcate, primary ray ¼ - ⅔ of branchlet length, occasionally very stout, secondaries 5 – 7 (- 8), tertiaries 3 – 5 (- 6) of which one (- more) may be again furcate into 3 - 4 quaternaries and rarely 2 - 3 quinaries; sterile 5 - 10 in a whorl, 0.7 - 3.8 cm. long, (1-) 2 - 3 (- 4)- furcate, primary rays 2/5 - 4/5 of branchlet length, secondaries 5 - 8, tertiaries 3 - 5, quaternaries (were present) 3 - 4, and occasionally 3 - 4 quinaries; sterile and fertile whorls in some strains are quite similar. Dactyls 2 - 4, (1-) 2 – 3 - celled, end cell allantoid, abruptly pointed, apiculate or very rarely acuminate; rarely bifid. Heads variable, occasionally not formed, commonly congested, 1 - 1.5 cm. in diameter, with thick mucus. Gametangia on separate plants or conjoined or sejoined at branchlet nodes but commonly absent at lowest furcation. Oogonia solitary, 300 - 500 μm long (excl. coronula), 240 – 375 (- 400) μm wide; convolutions 8 - 10, occasionally swollen distally; coronula 31- 54 μm high, 49 - 65 μm wide, upper cells equal to or slightly longer than lowers. Oospores (light) chestnut brown to almost black, 180 - 320 μm long, 160 – 230 (-270) μm wide; striae of 6 - 8 low or prominent ridges; fossa 32 - 35 μm across; membrane strongly or irregularly reticulate, 6 -15 meshes across fossa. Antheridia 195-450 μm diameter, with or without long stipe which commonly is 200 - 650 μm long and sometimes swollen.

Synopsis of the varieties of *Nitella dualis* Nordst. in T.F.A., em.

1a. Fertile branchlets reduced, 0.1- 0.2 cm. long, forming compact heads to 1cm. in diameter; dactyls 2-celled; dioecious; oospore reticulate, c. 15 meshes per

fossa.....var. *dualis*

1b. Fertile branchlets variable, heads loose or compact; dactyls (1-) 2 (- 4) - celled; monoecious; oospore reticulate, c. 6 meshes per fossa.....var. *pulchella*

Nitella dualis var. *pulchella* (T.F.A.) R.D.W., em.
Wood Imahori 1965 p. 447 Icon: 213 – 217

Plants monoecious (or dioecious?), (6-) 15 - 30 cm, bright to brownish green, younger upper whorls enveloped in dense mucus. Axes slender to moderately stout, (280-) 450 - 850 μm in diameter; internodes ½ - 5 times as long as the branchlets, to 4 (-7.5) cm. long. Branchlets fertile 5 - 9 in a whorl, commonly congested into globular heads, 0.2 (-2) cm. long, (1-) 2 -3 (-4?)- furcate, primary ray ¼ - 2/3 of branchlet length, occasionally very stout, secondaries 5 - 7 (-8), tertiaries 3 - 5 (-6) of which 1- more may be again furcate into 3 - 4 quaternaries and rarely 2 - 3 quinaries; sterile 5 - 10 in a whorl, 0.7 - 3.8 cm. long,, (1-) 2 - 3 (-4)- furcate, primary rays 2/5 - 4/5 of branchlet length, commonly very stout, secondaries 5 - 7 (-8), tertiaries 3 - 5 (-6) of which 1- more may be again furcate into 3 - 4 quaternaries and rarely to 2 - 3 quinaries; sterile 5 - 10 in a whorl, 0.7 – 3.8 cm. long, (1-) 2 - 3 (-4)- furcate, primary ray 2/5 – 4/5 of branchlet length, commonly very stout, secondaries 5 - 8, tertiaries 3 - 5, quaternaries (where present) 3 - 4 and occasionally 3 - 4 quinaries; often sterile and fertile branchlets similar. Dactyls 2 - 4 (-5), (1-) 2 – 3 - celled, end cell allantoid, abruptly pointed, acute or rarely acuminate. Heads few, loose or compact, 0.2 – 0.8 cm. in diameter, enveloped in mucus; generally young terminal whorls rather than true heads. Gametangia conjoined or sejoined at all fertile branchlet nodes, commonly absent from the lowest branchlet node. Oogonia solitary, 300 - 500 μm long (excl. coronula), 240 – 375 (- 400) μm wide; convolutions 8 -10, occasionally swelling distally; coronula 31 - 54 μm high, 49 - 65 μm wide, upper cells occasionally slightly longer than lowers. 160 – 230 (- 270) μm wide; striae of (6 -) 7 - 8 low or prominent ridges; fossa 32 - 35 μm across; membrane strongly or irregularly reticulate, 6 - 7 meshes which commonly is 200 - 650 μm long and sometimes swollen

Characteristics of the forms of variety *pulchella* Nordst. in T.F.A., em.

1a. Dactyls generally 3- celled [(1-) 3 (-4)]; primary ray often exaggerated, with subsequent rays reduced.....f.1. *pulchella*

1b. Dactyls generally 3- celled; primary ray not exaggerated.

2a. Dactyls 1 -2 (-3) - celled .....f.2. *superba*

2b. Dactyls uniformly 2- celled.....f.3. *blowiana*

Nitella dualis var. *pulchella f. pulchella* Nordst. in T.F.A., em.

Wood Imahori 1965 p. 449, 450 Icon: 213,214

Pal et al p. 49

Plants monoecious (or dioecious?), 6 - 30 cm. high, bright to brownish green, fertile whorl with mucus. Axes moderately stout to slender, (280-) 400 - 850 μm in diameter; internodes 2-3 (- 4) times as long as the branchlets, to 4 (- 7.5) – cm. long. Branchlets, fertile 8-9 in a whorl, to 0.2 cm. long, congested into globular heads, (1 -) 2 (-3) - furcate, primary ray very stout, ¼ - 2/3 of branchlet length, secondaries 5 – 7 (- 8), tertiaries 3 - 5 (- 6) of which 1 - 2 frequently again furcate into 3 - 4 quaternaries; sterile (6 -) 8 - 10 in a whorl, (0.7 -) 1.2 - 3.8 cm. long, (1-) 2 - 3 (- 4) - furcate, primary ray stout and elongate, 3/5 – 4/5 of branchlet length, secondaries 6-8, tertiaries (3 -) 4 - 5 most of which are again furcate into 3 - 4 quinaries. Dactyls, fertile 2 - 3, (1-) 2 – 3 - celled, end cell allantoid variable, abruptly pointed. Heads few, loose or dense, 0.2 - 0.8 cm. in diameter, with dense mucus. Gametangia conjoined or sejoined, at 2nd or 3rd lowest branchlet node, rarely at 1st. Oogonia solitary, 300 - 500 μm long (incl. coronula), 240 -340 (- 400) μm wide; convolutions 8 - 10, occasionally swelling distally; coronula 31 - 45 μm high, 49 - 60 μm wide at base, upper cells slightly longer than lowers. Oospores dark or chestnut brown to almost black, 230 - 320 μm long, 195 - 230 (- 270) μm wide; striae of (6 -) 7 - 8 rather prominent ridges; fossa c. 35 μm across; membrane strongly reticulate, c. 6

meshes across fossa. Antheridia 195 - 250 (- 370) μm in diameter, long stipulate, stalk 200 - 650 μm long, 35 - 60 μm wide and often somewhat swollen.

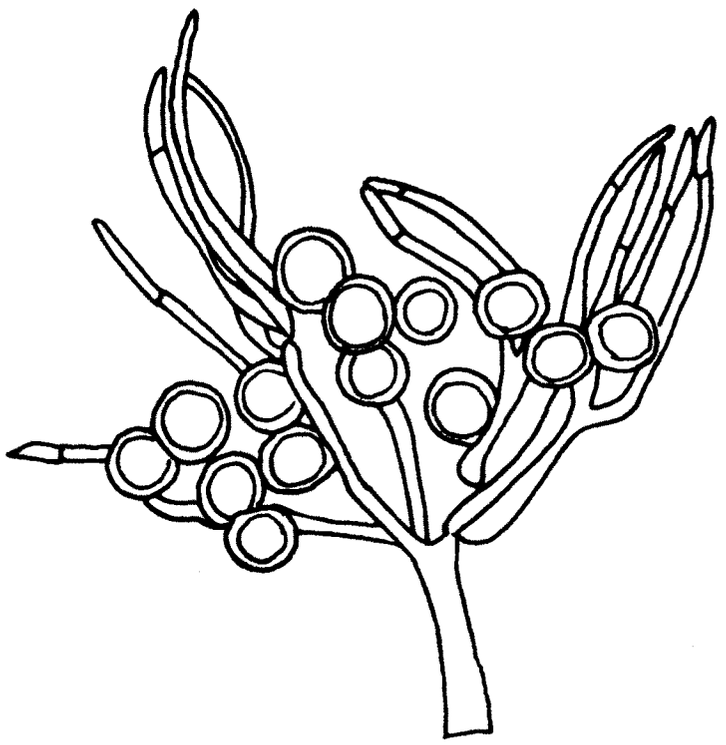
Nitella dualis var. *pulchella f. pulchella* Nordst. in T.F.A., em.

Plate no 15 Fig. 1-7

Plants dioecious 53 - 63 cm high. Light to dark green, fertile portions covered with mucus. Axis slender 161 - 250 μm in diameter; internodes 1 - 8.1 cm long. Branchlets fertile 4 -13 in a whorl, 0.1- 0.15 cm long in length commonly congested into heads, 2 - 3 furcate; primary ray 102.55 μm in length, secondary 43 - 88 μm, tertiary 14 - 20; sterile 5 - 10 in a whorl, 0.6 - 2 cm long, dactyls 2 - 3 celled. Heads densely compacted, spheroid, to 1cm. in diameter, enveloped with mucus Gametangia dioecious on separate plants, conjoined or sejoined at branchlet nodes. Oogonia solitary 131 - 161 μm long (excl. coronula), 117 - 132 μm wide. Convolutions 7 - 8, coronula 14 - 44 μm high and 43 - 74 μm wide. Oospore chestnut brown to almost black 146 -161 μm long and 117 - 132 μm wide; stria 6 - 7 of low ridges; fossa 29 - 30 μm across. Antheridia 146 - 176 μm in diameter.

Location- Amboli

PLATE NO. - 15 *Nitella dualis* var. and f. *pulchella* Nordst. in T.F.A., em.
Location: Amboli



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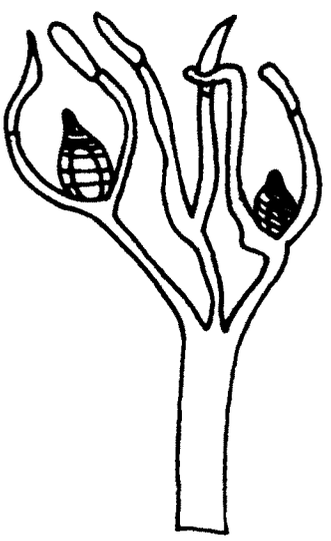

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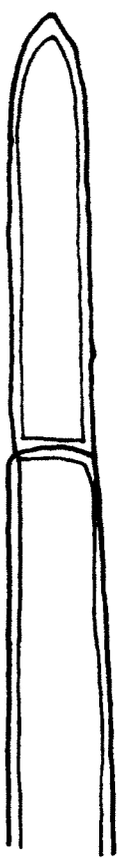

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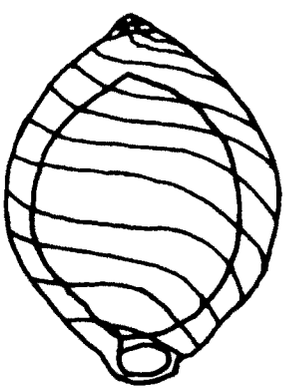

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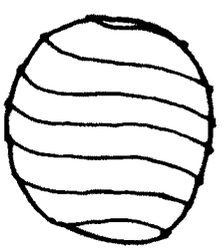

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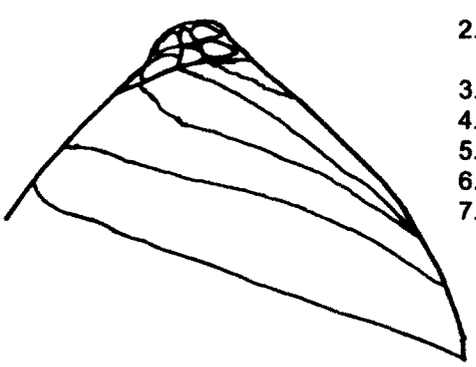

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1. Portion of branchlet showing bunch of male reproductive structure (Male plant) X 60
2. Portion of branchlet showing female reproductive structure (Female plant) X 30
3. Apex of dactyl X 100
4. Branchlet tip X 100
5. Oogonium X 100
6. Coronula X 200
7. Oospore X 100

Table No. 9 Comparative account of,

Nitella dualis var. and f. *pulchella* Nordst. in T.F.A., em.

Sr. no	Characters	Wood	Amboli
1	**Habit/ Height**	Dioecious 6 -30 cm.	Dioecious 53 - 63
2	**Axis Diameter**	161 - 250 µm	161 - 250 µm
3	**Internodes**	4 cm	1 - 8.1cm long
4	**Branchlet--**		
	a.) Fertile		
	No.	5 - 9	4 – 13
	Length.	0.2 - 2 cm	0.1 - 0.15 cm
5	**b.) Sterile**		
	No.	5 -10	5 -10
	Length	0.7 - 3.8 cm	0.6 - 2 cm
7	**Dactyls**	2 - 3	2 – 3
8	**Heads**	0.2 - 0.8 cm	1 cm
9	**Gametangia**	Sejoined	Sejoined
10	**Oogonia--**	Solitary	Solitary
	Length	300 - 500 µm	131 -161 µm
	Width/Breadth	240 - 340 µm	117 - 132 µm
11	**Coronula--**		
	Height	31 - 45 µm	14 - 44 µm
	Width	49 - 60 µm	43 - 74 µm
12	**Oospore**		
	Length	230 - 320 µm	146 - 161 µm
	Breadth	195 - 230 µm	117 - 132 µm
	Color	chestnut brown to black	chestnut brown to black
	Membrane	strongly reticulate	Not observed
	Ridges	7 - 8 µm	6 - 7 µm
	Fossa	35 µm	29 - 30 µm
13	**Antheridium**	195 - 250 µm	146 - 176 µm

10) *Nitella heteroteles* J. Gr. and Steph

Wood Imahori 1965 p. 451, 452 Icon: 366

Plants monoecious, apparently of medium size, resembling *N. furcate* subsp. *Mucronate*. Axes moderately stout; internodes? Branchlets 6 - 8 in a whorl, 2 - 3-furcate, primaries less than ½ of branchlets length, secondaries 4, tertiaries 3; sterile and fertile probably similar. Dactyls 3, (1-) 2 - 3- celled, penultimate cell rounded at apex, end cell extremely variable (from minute mucro to elongate allantoid cell with acute tip). Heads apparently not formed; young whorls without mucus. Gametangia conjoined [?] or sejoined, solitary or geminate, without mucus. Oogonia 1 - 2 at 2nd and 3rd lowest branchlet nodes, c.500 µm long (excl. coronula), 375 µm wide, convolutions c. 9; coronula c. 30 µm high, 50 µm wide, persistent. Oospores dark brown, 300 µm wide, c. 200 thick; striae of c. 8 flanged ridges terminating in a marked crest; membrane finely regularly reticulate, c. 15 meshes across fossa. Antheridia at 1 - 2 lowest branchlet node, c. 375 µm in diameter.

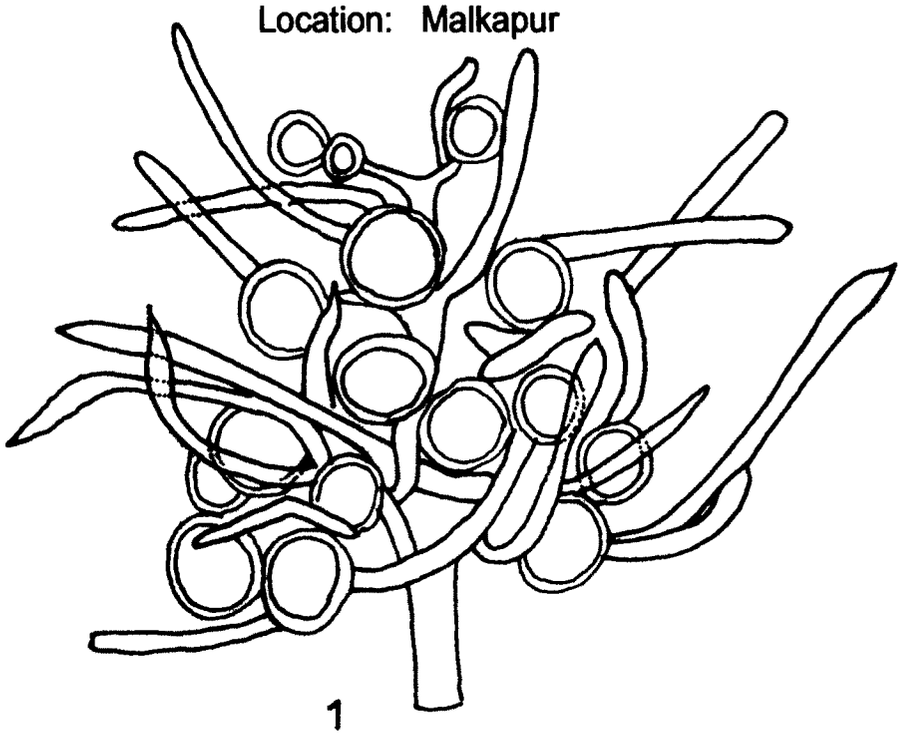
Nitella heteroteles J. Gr. and Steph

Plate no. 16 Fig. 1- 7

Plants monoecious of medium size, 11 - 30 cm long, axes moderately stout; branchlets 5 - 8 in a whorl, 2 furcate, primaries 0.1mm long, secondary 3 – 4 mm long, tertiary 3, sterile and fertile probably similar. Fertile 1 - 3 in number with 0.2 - 3.2 cm long and sterile equally same. Dactyls 3, to 3 celled. Heads apparently not formed. Young whorls without mucus. Gametangia conjoined or sejoined. Oogonia 205 µm long and 176 µm wide. Convolutions 6 - 7; coronula 43 µm high and 52 µm wide. Oospore dark brown to black 161 - 293 µm long and 187 - 293 µm wide. Stria 6 - 7. Fossa 29 - 30 µm across. Antheridia 418 µm in diameter

Location- Malkapur

PLATE NO. -16 *Nitella heteroteles* J.Gr. & Steph.
Location: Malkapur



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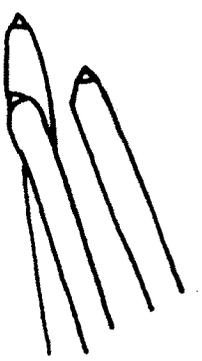

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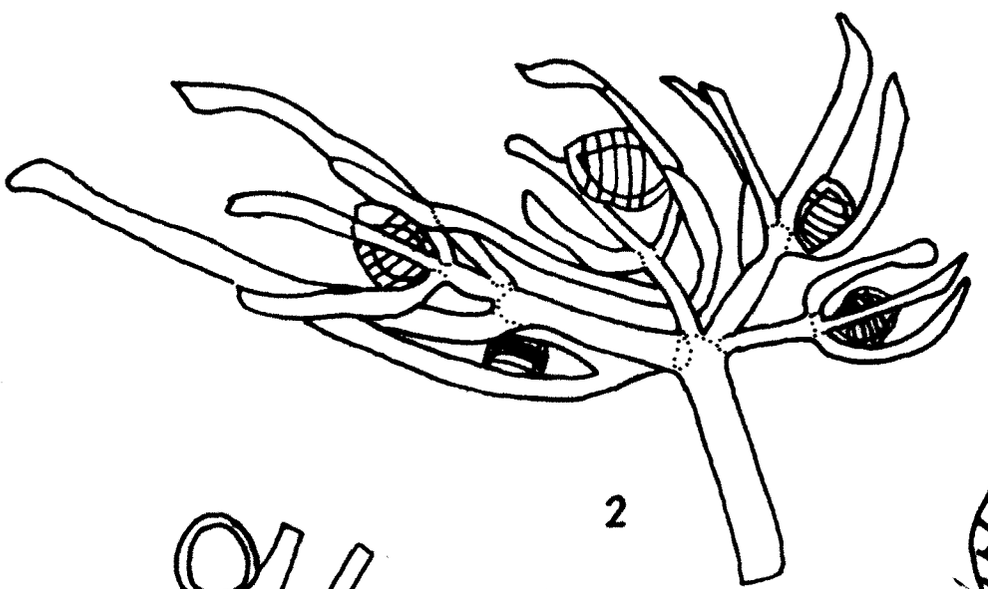

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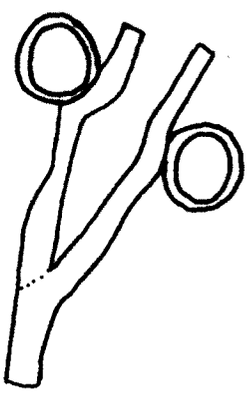

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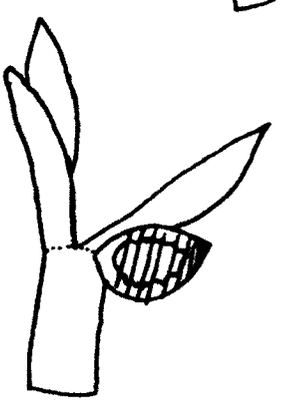

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1. Portion of branchlet showing bunch of male reproductive structure X 30
2. Portion of branchlet showing female reproductive structure X 30
3. Apex of dactyl X 60
4. Part of Branchlet showing 2 antheridia X 60
5. Part of Branchlet showing 1 Oogonium X 60
6. Oogonium X 100
7. Oospore X 100

Table No. 10 Comparative account of *Nitella heteroteles* J. Gr. & Steph.

Sr. no	Characters	Wood	Amboli
1	**Habit/ Height**	Monoecious 15 - 30 cm	Monoecious 11 - 30 cm
2	**Axis Diameter**	Moderately stout	506 - 584 µm
3	**Internodes**	Not mentioned	1.2-5.3 cm
4	**Branchlet--**		
	a.) Fertile		
	No.	6 - 8	1 - 3
	Length.	Not mentioned	0.2 - 3.2
5	**b.) Sterile**		
	No.	6 - 8	1 - 3
	Length	Not mentioned	0.2 - 3.2
6	**Dactyls**	3	3
7	**Heads**	not formed	not formed
8	**Gametangia**	Conjoined or sejoined	Conjoined
9	**Oogonia--**		
	Length	500 µm	205 µm
	Width/Breadth	375 µm	176 µm
10	**Coronula--**		
	Height	30 µm	43 µm
	Width	50 µm	52 µm
12	**Oospore**		
	Length	300 µm	161 - 293 um
	Breadth	200 µm	187 - 293 µm
	Color	dark brown	dark brown to black
	Membrane	regularly reticulate	Not observed
	Ridges	8	6 - 7
	Fossa	15 µm	29 - 30 µm
13	**Antheridium**	375 µm	418 µm

11) *Nitella capillata* A.Br

Wood Imahori 1965 p. 454, 455 Icon: 219, 302

Plants are monoecious, 14 - 25 cm. high, fertile whorl in dense spheroid to spicate heads with dense mucus. Axes moderately stout, 500 - 1000 µm in diameter; internodes abbreviated in the heads, otherwise 1 - 2 times as long as the branchlets, to 4.6 cm. long. Branchlets, fertile 5 - 8 in a whorl, 0.1- 2 cm. long, (2 -) 3 (- 4)- furcate, primary ray c. ⅓ of branchlet length, secondaries 5 -7, tertiaries 3 - 5, quaternaries 3 - 4, quinaries (where present) 2 - 3; sterile 6 (- 8) in a whorl, 2 - 4 cm. long, 3 - 4 furcate, primaries c. ½ of branchlet length, secondaries 6 - 7 one of which is frequently central (percurrent) and stouter than others, tertiaries 4 - 5 (- 6), quaternaries 3 - 5, quinaries 3 - 5. Dactyls, fertile 2 - 3, (2 -) 3 – celled, allantoid, reduced gradually towards apex, end cell allantoid or acute; sterile 3-4, (2-) 3 (- 5) - celled, cells allantoid, reduced distally, end cell obtuse to acute, rarely acuminate. Heads few, 3 - 4 per shoot, terminal or occasionally axillary, generally stipitate, 0.3 - 0.4 cm. in diameter, but occasionally confluent into spikes or clusters, with dense mucus. Gametangia conjoined or sejoined at the nodes of the fertile branchlets. Oogonia solitary, 250 - 285 µm long (excl. coronula), 250 - 285 µm wide; convolutions 8 - 10; coronula 30 - 35 µm high, 47 - 51 µm wide at base, persistent, cells of upper tier c.2 times longer than lowers. Oospores dark brown, 220 - 255 µm long, 200 - 255 µm wide; striae of 8 - 9 prominent ridges; fossa c. 35 µm across; membrane coarsely and occasionally irregularly reticulate, 3 - 5 meshes across fossa. Antheridia 195 - 225 (- 318) µm in diameter, long stipitate, stalk180 - 270 µm long.

Nitella capillata A.Br

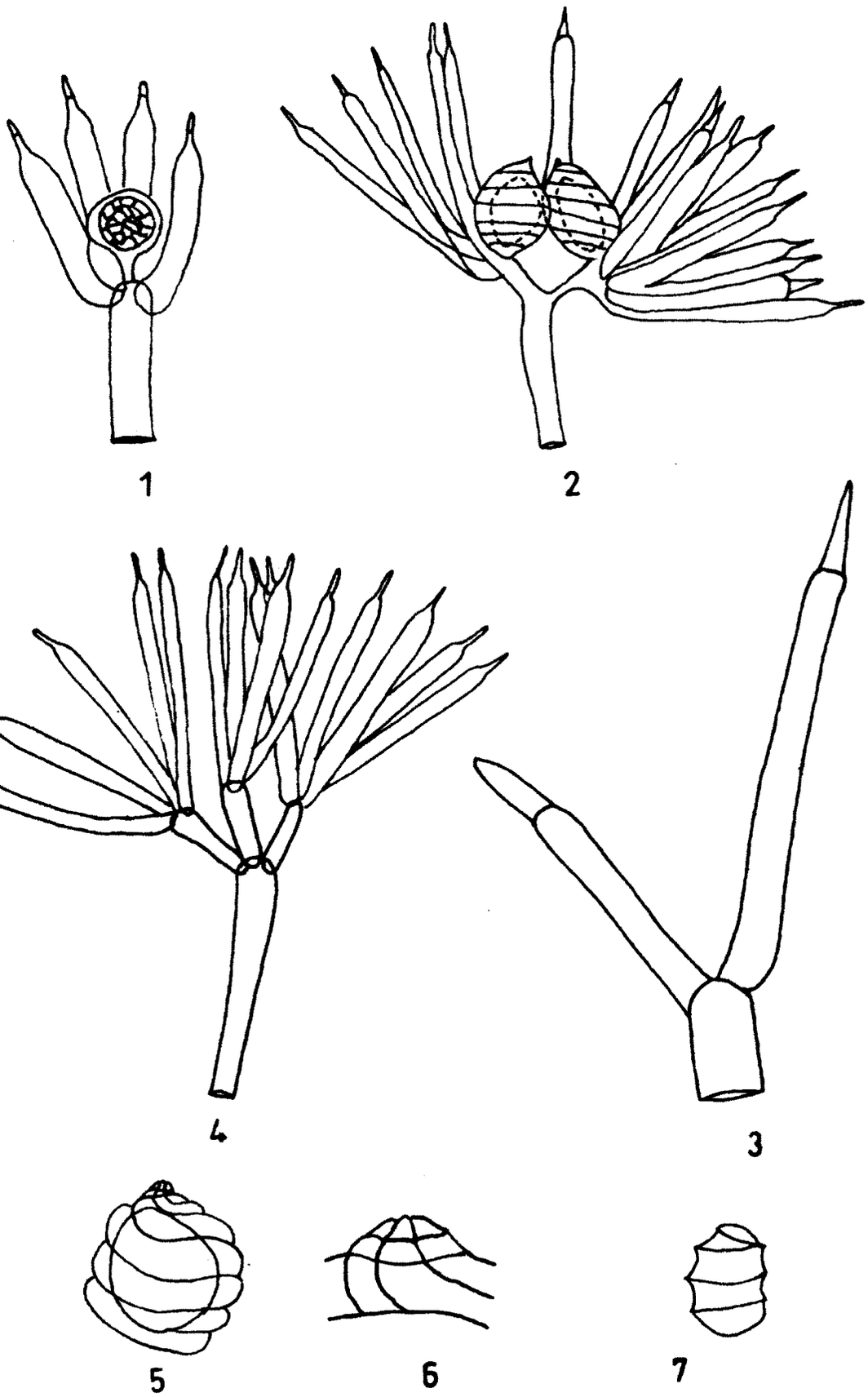
Plate no. 1 7 Fig. 1-7

Plants monoecious 8 - 15 cm high. Whorls in dense spheroid to spicate heads with mucus. Axes moderately stout, 482 - 650 µm in diameter; internodes 2 - 10 cm long abbreviated in heads, otherwise 1 - 2 times as long as the branchlets, primary ray 1 - 3 mm long; secondaries 5 - 7 mm; tertiaries 3 - 5 mm long, Branchlets 0.2 - 0.5

cm long, Fertile 4 - 6 in whorl, sterile 5 - 6 in whorl 2 - 4 cm long 2 - 3 furcate. Dactyls fertile 2 - 3 (2-) 3 celled. Allantoid, reduced gradually towards apex, end cell allantoid or acute. Sterile 5 - 6, 3 celled, cells allantoid, reduced distally, end cell obtuse to acute, rarely acuminate. Heads few, 3 - 4 per shoot, terminal or occasionally axillary, generally stipitate, 0.3 - 0.4 cm. in diameter, but occasionally confluent into spikes or clusters, with dense mucus. Gametangia conjoined at the nodes of fertile branchlets. Oogonia solitary 250 - 283 µm long (excl. coronula), 253 - 285 µm in diameter. Convolutions 6-7, coronula 30 - 35 µm high and 47 - 52 µm wide, wide at base. persistent, cells of upper tier 2 times longer than lowers. Oospore dark brown to black in color length 240 - 255 µm long 241 - 255 µm wide; stria 6 - 7; fossa 10 - 20 µm across. Antheridia 195 - 225 µm in diameter, long stipitate, stalk 180 - 270 µm long.

Location- Gadhinglaj

PLATE NO. - 17 *Nitella capillata* A.Br.
Location: Gadhinglaj



1. Apical portion of branchlet showing male reproductive structure with 4 sterile branchlets X 30
2. Apical portion of branchlet showing female reproductive structure with 17 sterile branchlets X 30
3. Sterile branchlet tip X 120
4. Whorl of sterile branchlets X 30
5. Oogonium X 120
6. Coronula X 270
7. Oospore X 120

Table No. 11 Comparative account of *Nitella capillata* A.Br.

Sr. no	Characters	Wood	Amboli
1	**Habit/ Height**	Monoecious 14 - 25 cm	Monoecious 8 - 15 cm
2	**Axis Diameter**	500 - 1000 µm	482 - 650 µm
3	**Internodes**	4.6 cm.	2 – 10
4	**Branchlet–**		
	a.) Fertile		
	No.	5 - 8	4 – 6
	Length.	0.1 - 2 cm	0.1 - 0.5 cm
5	**b.) Sterile**		
	Number	6 - 8	5 – 6
	Length	2 - 4 cm	2 - 4 cm
7	**Dactyls**	2 - 3,	2 – 3
8	**Heads**	3 - 4 per shoot 0.3 - 0.4 cm	3 - 4 per shoot 0.3 - 0.4 cm
9	**Gametangia**	Conjoined	Conjoined
10	**Oogonia–**		
	Length	250 - 285 µm	250 - 283 µm
	Width/Breadth	250 - 285 µm	253 - 285 µm
11	**Coronula–**		
	Height	30 - 35 µm	30 - 35 µm
	Width	47 - 51 µm	47 - 52 µm
12	**Oospore**		
	Length	220 - 255 µm	240 - 255 µm
	Breadth	200 - 255 µm	241 - 255 µm
	Color	dark brown	dark brown to black
	Membrane	irregularly reticulate	
	Ridges	8 - 9	6 – 7
	Fossa	35 µm	10 - 20 µm
14	**Antheridium**	195 - 225 µm	195 - 225 µm