FIGURES OF SOME AQUATIC SPECIMENS

Fig. 1 : Ceratophyllum demersum : Few plants occurring under shallow water. X 1/6

Fig. 2 : Polygonum pulchrum : Showing emergent habit. X 1/6

Fig. 3 : Utricularia exoleta : Showing habit of plants, with flowers (photographed taking outside of water).

Fig. 4 : U. stellaris : Few plants occurring under shallow water, and with emergent "floats' and flowers. X 1/6

Fig. 5 : Limnophyton obtusifolium : Showing habit of plants, with flowers. X 1/6
Fig. 6: *Aponogeton undulatus*: Showing submerged habit of plants, with floating leaves. X 1/6

Fig. 7: *Potamogeton nodosus*: Plants with inflorescences, floating at surface of water. X 1/6

Fig. 8: *Hymenachne acutigluma*: Showing habit of plants with inflorescences. X 1/6

Fig. 9: *Monochoria hastata*: Plants with inflorescences. X 1/6
FIGURES OF SEEDS
(Taxon marked with asterisk [*] indicate the occurrence of inseparable fruit wall from seed)

Fig. 10 : *Nelumbo nucifera* : Seed surface punctate, or with minute pores. LM X 128

Fig. 11 : *Euryale ferox* : Seed surface wrinkle or scabrate. LM X128

Fig. 12 : *Nymphaea nouchali* : Seeds broadly ellipsoid or subglobose; surface with parallel ridges and furrows; each furrow traversed by transverse striations. LM X 320

Fig. 13 : *Nymphaea pubescens* : Seed broadly ellipsoid or subglobose; surface with parallel ridges and furrows; each furrow traversed by striations. LM X 320
Fig. 14: *Ceratophyllum demersum*: Seed compressed ellipsoid with three marginal spines; surface scabrate, traversed by polygonal reticulations. LM X 128

Fig. 15: *Ranunculus sceleratus*: Seed broadly obovate; surface rough due to raised and shallow markings. LM X 320

Fig. 16: *Alternanthera sessilis*: Seeds circular or lenticular with edge narrowed into a thin rim; surface smooth. LM X 320
Fig. 17: *Polygonum barbatum* var. *barbatum*: Seeds trigonous, apiculate, oval, surface glossy, smooth or faintly granular. LM X 320

Fig. 18: *P. barbatum* var. *barbatum*: Seed surface appearing uneven and granular. LM X 1600

Fig. 19: *P. barbatum* var. *gracile*: Seeds trigonous, subspheroidal, apiculate; surface glossy or faintly granular. LM X 320

Fig. 20: *P. barbatum* var. *gracile*: Seed surface granular and uneven. LM X 1600
Fig. 21: *Polygonum glabrum*: Seed surface glossy, and granular. LM X 320

Fig. 22: *P. glabrum*: Seed surface granular and uneven. LM X 1600

Fig. 23: *P. hydropiper var. hydropiper*: Seed trigonous, apiculate; surface glossy and smooth. LM X 320

Fig. 24: *P. pulchrum*: Seeds spheroidal, biconvex; surface glossy, smooth or faintly granular. LM X 320

Fig. 25: *P. pulchrum*: Seed surface granular and uneven. LM X 1600
Fig. 26: *Elatine triandra*: Seeds curved-oblong, surface with transverse striations. LM X 800

Fig. 27: *E. triandra*: Seed surface appearing as polygonal cells arranged in longitudinal rows. LM X 1600

Fig. 28: *Bergia ammamioides*: Seeds ovoid to ellipsoid; surface smooth, glossy. LM X 800

Fig. 29: *B. capensis*: Curved-oblong; surface provided with longitudinal ridges and furrows, each furrow traversed by areoles. LM X 800

Fig. 30: *Neptunia oleracea*: Seed compressed obovoid; surface smooth, with raised dehiscence loop. LM X 128
Fig. 31: *Aeschynomene aspera*: Seed sub-reniform; surface smooth. LM X 128

Fig. 32: *A. indica*: Seeds slightly sub-reniform; with basal hilum; surface smooth. LM X 128

Fig. 33: *Myriophyllum oliganthum*: Seeds compressed ligulate; surface minutely scabrate. LM X 320

Fig. 34: *M. tetrandrum*: Seeds subglobose; surface rough, with tubercles. LM X 320

Fig. 35: *M. tuberculatum*: Seed broadly oblong; surface rough, with minute warts and long spiny projections. LM X 320
Fig. 36 : *Rotala indica* : Seeds oblong, surface with inconspicuous longitudinal ridges and furrows. LM X 800

Fig. 37 : *R. mexicana* : Seeds obovoid; surface uneven and rough. LM X 1600

Fig. 38 : *R. rosea* : Seeds ovoid; surface granular. LM X 800

Fig. 39 : *Trapa natans* var. *bispinosa* : Seed angular cordate, with two ± equal thorns; surface rough, uneven. X2.5

Fig. 40 : *T. natans* var. *quadrispinosa* : Seed triangular with four thorns. X2.5
Fig. 41: _Ludwigia perennis_: Seeds ellipsoid, with a narrow raphae, surrounded by heart-shaped corky material; surface smooth. LM X 320

Fig. 42: _L. perennis_: Seed surface cells elongated transversely and striped in rows to the length. LM X 1600

Fig. 43: _Ipomoea aquatica_: Ovoid, surface rough, composed of tomentose silky, or velvety hairs. LM X 128

Fig. 44: _Nymphoides hydrophylla_: Seeds discoid, biconvex; surface granular, prickly, prickles in clusters. LM X 320

Fig. 45: _N. indica_: Seeds discoid, biconvex; surface minutely granular. LM X 320
Fig. 46 : *Hydrolea zeylanica* : Seeds oblong, ellipsoid; surface provided with inconspicuous longitudinal ridges and furrows. LM X 800

Fig. 47 : *Bacopa monnieri* : Seeds ellipsoid; surface with narrow ridges and broad furrows. LM X 800

Fig. 48 : *Dopatrium junceum* : Seeds broadly fusiform or ellipsoid; surface traversed by depressed cavities and polygonal ridges. LM X 800

Fig. 49 : *Glossostigma diandrum* : Seeds oblong or obliquely oblong; surface slightly scabrous, with inconspicuous longitudinal ridges and furrows. LM X 800

Fig. 50 : *Limnophila aquatica* : Seed oblong-quadrangular; surface rough, glossy, exhibiting reticulation. LM X 1600

Fig. 51 : *L. heterophylla* : Seeds oblong-quadrangular; surface glossy, exhibiting reticulation. LM X 800
Fig. 52: *Limnophila indica*: Seed oblong-quadrangular; surface glossy, exhibiting reticulations. LM X 1600

Fig. 53: *L. micrantha*: Seeds ellipsoid-oblong; surface glossy, with inconspicuous reticulations. LM X 800

Fig. 54: *L. repens*: Seeds oblong-cylindrical or oblong-quadrangular; surface glossy, showing inconspicuous reticulation. LM X 800

Fig. 55: *Hygrophila auriculata*: Seed ligulate, biconvex; surface scabrous. LM X 320

Fig. 56: *H. difformis*: Seeds pyriform or obovoid; surface granular. LM X 800
Fig. 57 : *Hygrophila polysperma* : Seeds compressed, ovoid; surface granular, rough. LM X 800

Fig. 58 : *Utricularia aurea* : Seeds lenticular with polygonal outline; surface rough, with marginal ridges, flat surface showing reticulations. LM X 320

Fig. 59 : *U. exoleta* : Seeds lenticular, winged, edges irregularly lobed; surface granular or scabrate. LM X 320

Fig. 60 : *U. stellaris* : Seeds lenticular, bluntly polygonal in outline; surface rough, showing faint reticulation. LM X 320

Fig. 61 : *Sphenoclea zeylanica* : Seeds compressed, narrow oblong; surface with narrow ridges and broad furrows. LM X 1600
Fig. 62: *Caesulia axillaris*: Seed flat, obovate; surface cells polygonal forming reticulation. LM X 320

Fig. 63: *Ephydra fluctuans*: Seed flattish, conical; surface rough, striped with fine longitudinal lines. LM X 320

Fig. 64: *Butomopsis latifolia*: Seeds compressed subglobose; surface smooth, glossy. LM X 800
Fig. 65: *Alisma plantago-aquatica*: Seeds oblong; surface uneven, scabrate. LM X 320

Fig. 66: *Caldesia oligococca*: Seeds subspherical; surface scabrate, with raised ridges. LM X 128

Fig. 67: *Limnophyton obtusifolium*: Seed obovoid or subglobose; surface reticulate. LM X 128

Fig. 68: *Sagittaria guayanensis*: Seeds compressed, discoid, surrounded by blunt, spiny wings. LM X 128

Fig. 69: *S. trifolia*: Seed obliquely ovate, compressed; surface scabrate. LM X 320
Fig. 70: *Blyxa octandra*: Seed ellipsoid or fusiform; surface provided with blunt spines. LM X 320

Fig. 71: *Hydrilla verticillata*: Seeds oblong-cylindrical; surface rough, reticulate. LM X 320

Fig. 72: *Nechamandra alternifolia*: Seeds oblong-ellipsoid; surface glossy with areolae in rows. LM X 800

Fig. 73: *Ottelia alismoides*: Seeds fusiform, or narrow-oval; surface covered with loose rough hairs. LM X 320

Fig. 74: *Vallisneria natans*: Seeds oblong-ellipsoid; surface with longitudinal narrow ridges and interrupted furrows. LM X 800
Fig. 75: *Aponogeton natans*: Seeds oblong cylindric; surface with uneven raised longitudinal ridges and unequal wide furrows, traversed by reticulation. LM X 320

Fig. 76: *A. undulatus*: Seeds compressed, oblong or ligulate; surface granular. LM X 320

Fig. 77: *Potamogeton crispus*: Seed compressed ovoid; surface scabrate. LM X 256

Fig. 78: *P. nodosus*: Seed obliquely obovoid; surface scabrate and wrinkle. LM X 320
Fig. 79: *Potamogeton pectinatus*: Seeds obovoid; surface scabrate, wrinkle. LM X 128

Fig. 80: *Ruppia maritima*: Seed oblique, ovoid; surface rough, wrinkle. LM X 320

Fig. 81: *Najas graminea*: Seed fusiform; surface with longitudinal ridges and furrows. LM X 800

Fig. 82: *N. indica*: Seeds fusiform; surface with longitudinal ridges and furrows. LM X 320
Fig. 83 : *Najas minor* : Seeds fusiform; surface provided with longitudinal ridges and furrows. LM X 320

Fig. 84 : *Zannichellia palustris* : Seeds flattish with undulate margin; surface granular or scabrate. LM X 320

Fig. 85 : *Cryptocoryne ciliata* : Obliquely oblong; surface finely granular. LM X 128

Fig. 86 : *Pistia stratiotes* : Oblong or barrel-shaped; surface coarsely reticulate. LM X 320
Fig. 87: *Lemna perpusilla*: Seeds oblong or ovate; surface with longitudinal ridges and furrows. LM X 800

Fig. 88: *Amischophacelus axillaris*: Seed oblong or subcylindric; surface uneven, striato-reticulate. LM X 320

Fig. 89: *Commelina diffusa*: Seed broadly oblong; surface composed of polygonal areas. LM X 320

Fig. 90: *C. longifolia*: Seed subcylindric; surface granular or scabrate. LM X 256

Fig. 91: *Eriocaulon cinereum*: Seeds ovoid-oblong; surface glossy with transverse interrupted striations. LM X 800
Fig. 92: *Eleocharis acutangula*: Seeds compressed, ovoid, surrounded by bristles; surface striped in longitudinal rows, forming reticulation. LM X 320

Fig. 93: *E. dulcis*: Seed compressed, ovoid, surrounded by bristles; surface apparently granular but provided with reticulate ornamentation. LM X 320

Fig. 94: *E. geniculata*: Seed obovoid, surrounded by bristles; surface smooth, or minutely granular. LM X 800
Fig. 95: *Schoenoplectus articulatus*: Seed obliquely ovoid; surface wrinkled or corrugated, glossy. LM X 320

Fig. 96: *Hygroryza aristata*: Seeds cylindrical or ellipsoidal; surface with parallel ridges and furrows. LM X 128

Fig. 97: *H. aristata*: Seed surface with longitudinal ridges and furrows. LM X 800

Fig. 98: *Hymenachne acutigluma*: Seeds oblong, or oblong-elliptic; surface glossy. LM X 320
Fig. 99: *Paspalidium geminatum*: Seeds ellipsoidal, with marginal rim; surface with longitudinal fine stripes. LM X 128

Fig. 100: *Sacciolepis interrupta*: Seed ellipsoidal; surface smooth, with fine longitudinal stripes. LM X 320

Fig. 101: *Typha angustata*: Seeds fusiform or cylindrical; surface longitudinally striped. LM X 800
Fig. 102: *Typha elephantina*: Seeds fusiform, or cylindrical; surface almost smooth and faintly striped. LM X 800

Fig. 103: *Eichhornia crassipes*: Seeds oblong, cylindrical; surface longitudinally striped (ridged). LM X 320

Fig. 104: *Monochoria hastata*: Seeds oblong; surface longitudinally striped (ridges). LM X 320

Fig. 105: *M. vaginalis*: Seeds oblong; surface longitudinally striped (ridged), and with transverse bands in between stripes. LM X 800
Fig. 106: *Nelumbo nucifera*: Seed surface traversed by pore and papillate appendages; each pore composed of cells in tiers. SEM X 200

Fig. 107: *Euryale ferox*: Seed surface cells appearing polygonal. SEM X 400

Fig. 108: *Nymphaea nouchali*: Seed surface with ridges and furrows; each ridge composed of loose tentacle-like appendages and each furrow interwined by basal part of tentacles. SEM X 400

Fig. 109: *N. pubescens*: Seed surface with ridges and furrows; each ridge composed of raised, compact, bent, appressed appendages under rectangular cells, and each furrow interwined. SEM X 200

Fig. 110: *Ranunculatus sceleratus*: Seed broadly obovate, surface reticulate. SEM X 100

Fig. 111: *Alternanthera sessilis*: Seed surface minutely scabrate. SEM X 300
Fig. 112: *Bergia annmannioides*: Seed-surface showing beaded ornamentation within reticulation. SEM X 500

Fig. 113: *Neptunia oleracea*: Seed surface showing transversely elongated dehiscence lines over the flattish surface. SEM X 200

Fig. 114: *Aeschynomene aspera*: Seed-surface densely forming network with polygonal elevated cells. SEM X 4000

Fig. 115: *Aeschynomene indica*: Seed-surface showing densely forming a network with rectangular elevated cells. SEM X 4000

Fig. 116: *Myriophyllum oliganthum*: Seed-surface provided with loose elongated hyphae. SEM X 500

Fig. 117: *M. tetrandrum*: Seed-surface with tubercles; each tubercle connected by dense microfibrils. SEM X 80
Fig. 118: *Ammannia baccifera*: Seed-surface cells rectangular or polygonal in shape. SEM X 800

Fig. 119: *Rotala indica*: Seed-surface traversed by coiled hairs with rounded heads. SEM X 1500

Fig. 120: *R. mexicana*: Seed-surface covered by longitudinal beaded ridges and furrows; each furrow traversed by minute processes. SEM X 600

Fig. 121: *R. rosea*: Seed surface composed of rectangular or polygonal cells. SEM X 150

Fig. 122: *Ludwigia adscendens*: Seed oblong; surface minutely reticulate. SEM X 30

Fig. 123: *Nymphoides indica*: Seed surface showing faint cellular composition. SEM X 80
Fig. 124: *Hydrolea zeylanica*: Seed surface provided with ridges and furrows, both traversed by jointed or interrupted beads. SEM X 1000

Fig. 125: *Bacopa monnieri*: Seed surface with ridges and furrows; each furrow composed of rectangular cells. SEM X 300

Fig. 126: *Limnophila aquatica*: Seed surface cells polygonal, mostly hexagonal, and raised cells. SEM X 800

Fig. 127: *L. heterophylla*: Seed surface appearing warty through reticulation. SEM X 300

Fig. 128: *L. indica*: Seed surface reticulations composed of elongated network. SEM X 1000

Fig. 129: *L. micrantha*: Seed surface reticulation composed of stout fibrillar threads traversed by minute complicated projections. SEM X 400
Fig. 130: *Limnophila repens*: Seed surface showing distinct reticulation. SEM X 200

Fig. 131: *Hygrophila auriculata*: Seed surface composed of compact ridges and furrows; each ridge traversed by annular rings. SEM X 2000

Fig. 132: *H. difformis*: Seed surface striato-reticulate. SEM X 150

Fig. 133: *H. polysperma*: Seed surface composed of rod-like elements and lumina forming hollow depression. SEM X 3000

Fig. 134: *Butomopsis latifolia*: Seed surface traversed by parallel ridges and sunken warts. SEM X 2000

Fig. 135: *Alisma plantago-aquatica*: Seed surface composed of long rectangular cells being traversed by small circular bodies. SEM X 600
Fig. 136: *Limnophyton obtusifolium*: Seed surface cells polygonal. SEM X 400

Fig. 137: *Sagittaria trifolia*: Seed surface showing polygonal cells arranged obliquely. SEM X 500

Fig. 138: *Blyxa echinosperma*: Seed ellipsoid or fusiform, surface with irregular, distinct, spiny ridges. SEM X 30

Fig. 139: *B. octandra*: Seed surface cells rectangular. SEM X 200

Fig. 140: *Hydrilla verticillata*: Seed surface cells polygonal. SEM X 800

Fig. 141: *Nechamandra alternifolia*: Seed surface cells polygonal, being traversed by microfibrillar threads. SEM X 300
Fig. 142: *Vallisneria natans*: Seed surface cells rectangular, arranged in longitudinal rows. SEM X 200

Fig. 143: *Pistia stratiotes*: Seed surface reticulate traversed by microreticulate fibres. SEM X 100

Fig. 144: *Lemma perpusilla*: Seed surface with longitudinal ridges and furrows; each furrow traversed by parallel transverse bands. SEM X 600

Fig. 145: *Commelina diffusa*: Seed surface composed of polygonal areas, each of which enclosing network; further composed of polygonal cells inside. SEM X 400

Fig. 146: *Hygroryza aristata*: Seed surface cells rectangular, or polygonal forming network. SEM X 400

Fig. 147: *Hymenachne acutigluma*: Seed surface striato-reticulate. SEM X 150
Fig. 148: *Typha angustata*: Seed surface cells rectangular. SEM X 600

Fig. 149: *T. elephantina*: Seed surface cells mostly quadrangular. SEM X 1000

Fig. 150: *Eichhornia crassipes*: Seed surface forming fine network in between wide stripes. SEM X 400

Fig. 151: *Monochoria hastata*: Seed surface showing ridges (at two extreme corner of photograph) joined transversely by straight rod-like parallel elements. SEM X 500
FIGURES OF SEEDLINGS

(Showing different stages of development)

Fig. 152 : Nymphaea nouchali
Fig. 153 : N. pubescens
Fig. 154 : Ceratophyllum demersum
Fig. 155 : Polygonum barbatum var. barbatum X2
Fig. 156 : P. orientale
Fig. 157 : P. pulchrum
Fig. 158 : *Neptunia oleracea*
Fig. 159 : *Aeschynomene aspera*
Fig. 160 : *A. indica*
Fig. 161 : *Myriophyllum oliganthum*
Fig. 162 : *M. tuberculatum*
Fig. 163: *Trapa natans* var. *quadrispinosa* X2½

Fig. 164: *Ipomoea aquatica*

Fig. 165: *Nymphoides hydrophylla*

Fig. 166: *Bacopa monnieri*
Fig. 167: *Glossostigma diandrum*

Fig. 168: *Utricularia aurea*: A seedling with eight paracotyledonoides

Fig. 169: *Caesulia axillaris* X2

Fig. 170: *Enydra fluctuans*
Fig. 171 : *Bumatopsis latifolia* X2\(\frac{1}{2}\)

Fig. 172 : *Sagittaria guayanensis*

Fig. 173 : *S. trifolia*

Fig. 174 : *Hydrilla verticillata*

Fig. 175 : *Nechamandra alternifolia*

Fig. 176 : *Ottelia alismoides*
Fig. 177 : Vallisneria natans
Fig. 178 : Najas graminea
Fig. 179 : Zannichellia palustris
Fig. 180 : Pistia stratiotes X5
Fig. 181 : Amischophacelus axillaris
Fig. 182 : Eleocharis acutangula
Fig. 183 : Hygroryza aristata X1
Fig. 184 : Hymenachne acutigluma X1
Fig. 185 : Sacciolepis interrupta
Fig. 186 : Eichhornia crassipes
Fig. 187 : Monochoria hastata X1½
Fig. 188 : M. vaginalis