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MARINE ALGAE OF ST MARTIN'S ISLAND, BANGLADESH. XI. RED ALGAE (RHODOPHYCEAE)

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Abstract

Falkenbergia hillebrandii (Bornet) Falkenberg, *Gelidiella tenera* (J. Ag.) Schmitz, *Halymenia floridana* J. Ag., *Liagora harveyiana* Zeh and *Polysiphonia harveyi* Bailey of Rhodophyceae have been recorded and described for the first time from the St Martin's Island, Cox's Bazar, Bangladesh.

Introduction

A total of 200 marine algal taxa (seaweeds) have been reported so far, from Bangladesh (Ahmed *et al.* 2008, 2009, Aziz and Islam 2009, Aziz *et al.* 2010, Islam *et al.* 2010) of which 98 taxa under 53 genera are reds. The present work is an attempt to study the taxonomy of some preserved marine algae collected from the St Martin's Island, Cox's Bazar.

Materials and Methods

Marine algae collected on 06 January 1986 by Professor Sayed Hadiuzzaman and Professor Abdul Aziz, Department of Botany, University of Dhaka on 01 March, 1995 from the St. Martin's Island (20°34´28˝ - 20°38´14˝ N and 92°18´51˝ - 92°20´25˝ E), Cox's Bazar, Bangladesh were considered. The materials were preserved in marine water with 4% formalin, some were made into herbaria and have been stored in the first author's algal herbarium, Department of Botany, University of Dhaka.

Results and Discussion

In the present investigation a total of 5 taxa of Rhodophyceae have been worked out, illustrated and discussed.

Order: Nemaliales, Family: Nemaliaceae

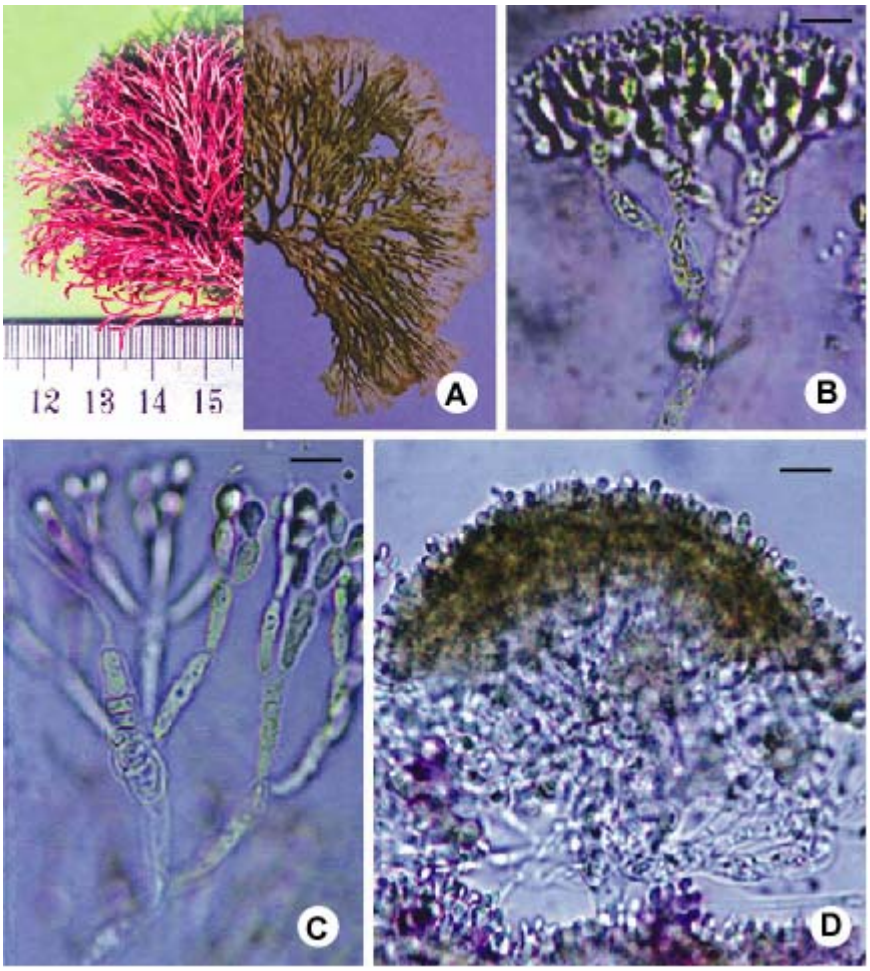
1. **Liagora harveyiana** Zeh **(Figs 1A-D)**

(Womersley 1965, Pl. 7, Fig. 1)

Habit: Plants very bushy, dichotomously branched, calcified.

Vegetative structure: Thalli strongly calcified, becoming rigid, usually 3 - 7 cm high with one to several main branches arising from a discoid holdfast, dichotomously branched after every 2 - 4 (-8) mm distance, forming a very dense rounded tuft; lower part of the thallus about 1 mm thick, branches narrowing gradually to about 0.5 mm below apices. Color pinkish-red with whitish crust (especially on lower parts). Basal cells of assimilatory filament cylindrical, 50.8 - 63.5 µm long and 10.00 - 11.50 µm broad; cells next to the basal cell cylindrical to slightly inflated in the middle, while distal cells are more inflated appearing ellipsoidal to balloon-like highly granulated; assimilatory cells with one pyrenoid in each; branching of as similatory filaments dichotomous proximally but trichotomous distally giving as bushy appearance. Terminal cells up to 10.16 µm long, 6.35 µm broad and may develop short or long flask shaped structure. Some tip cells cut off very small spherical structures appearing spermatangia.

Reproductive structure: Plants dioecious. Spermatangia produced at apex of egg shaped assimilatory filaments up to a maximum of 3 µm long and 2 µm broad, stalked. Carpogonial branch 4 - 6 celled, develops laterally on a cell in the median portion of assimilatory filament; basal cell of the carpogonial branch usually large and hemispherical followed by gradually smaller cells in series bearing cylindrical carpogonium proper with trichogyne at the apex. Cystocarps hemispherical, 130 µm long and 450 µm broad.



Figs 1A-D. *Liagora harveyiana*: A. A living (left) and herbarium (right) parts of the thallus. B. Assimilatory filament of a male plant showing spermatangia from peripheral cells. C. Assimilatory filament of a female plant showing carpogonial branch (note the cylindrical carpogonium). D. A hemispherical cystocarp. Bars: A, in cm; B-D = 30 µm.

Discussion: Islam (1976) reported *L. ceranoids* Lamx. and mentioned the probable presence of five or six spp. in the St. Martin's Island. The present species is an addition to the list of the taxa.

Habitat and local distribution: Grows on boulders, in the west coast of St Martin's Island at intertidal zone; collection no. 255, 01 March, 1995; very common.

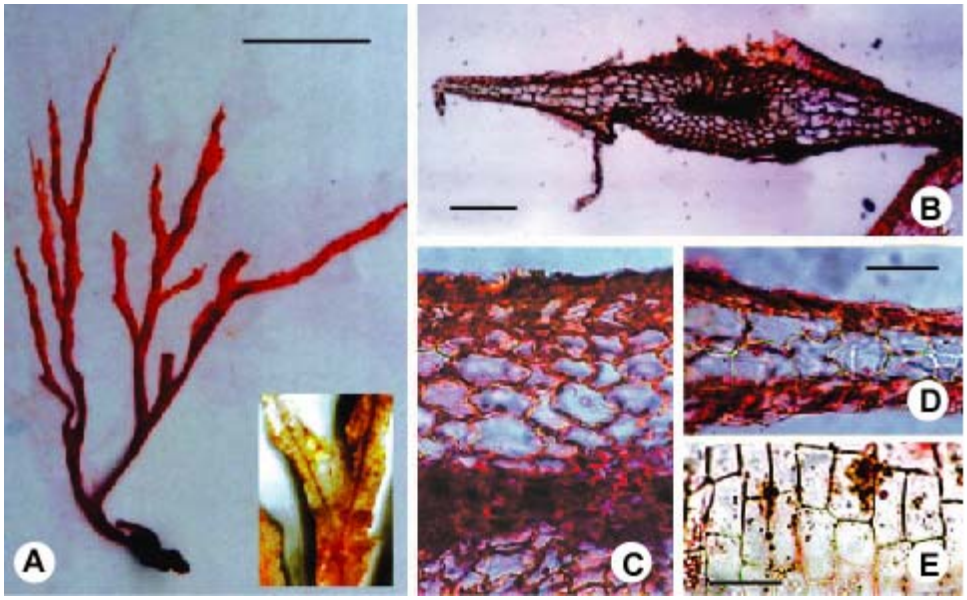
Order: Gelidiales, Family: Gelidiaceae

2. **Gelidiella tenera** (J. Ag.) Schmitz **(Figs 2A-E)**

(Nora 1972, 277, Pl. 15, Fig. 64)

Habit: Thalli dichotomously branched, erect.

Vegetative structure: Plants erect, up to 10 cm tall, cartilaginous; the base producing short thick haptera-like attachment organ. Stipe broadly rounded in cross section, dichotomously branched distally. Branches elliptical in cross section basally but as they grow upwardly, flanges develop on both sides with midrib which diminishes near the apex, apices gradually narrowed into a filiform tip. Stipe 2 mm thick; branches up to 0.44 mm thick and 2.75 mm broad in the median region. Epidermal cells rectangular in surface view, varying sizes; cortical cells moderately thick walled, nearly rectangular but heavily thick wavy walled, compactly arranged in a bundle without intercellular spaces, cells in flanges elongated. Cells of conducting tissue are in the axial region, dorsiventrally flattened much smaller than cortical cells and narrowed lumen with dense cytoplasm forming midrib, 0.36 mm broad and 77.6 µm thick. Only epidermal cells were found to contain several nearly spherical plastids. Reproductive structures not observed.



Figs 2A-E. *Gelidiella tenera*: A. A preserved whole plant with haptera at the base (stained with saffranin); inset shows a part of the dichotomy enlarged to show a midrib. B. A cross section of the axis showing thickened central region of conducting tissue and flanges on both the sides. C. Midrib portion partly enlarged showing details of conducting tissue (ct), cortex (c) and epidermis (ed). D. A portion of the flange enlarged. E. A peeled off epidermis in surface view. Bars: A = 2 cm, B = 300 µm, C-E = 60 µm

Discussion: Islam (1976) reported *G. tenuissima* Feldm. *et* Hamel from the St Martin's Island, attached to shells and corals or entangled with other algae.

Habitat and local distribution: Plant was attached to soft substratum, along with other algae in the intertidal pools on the west coast of St. Martin's Island; collection no. 254, 06 Jan. 1986; common.

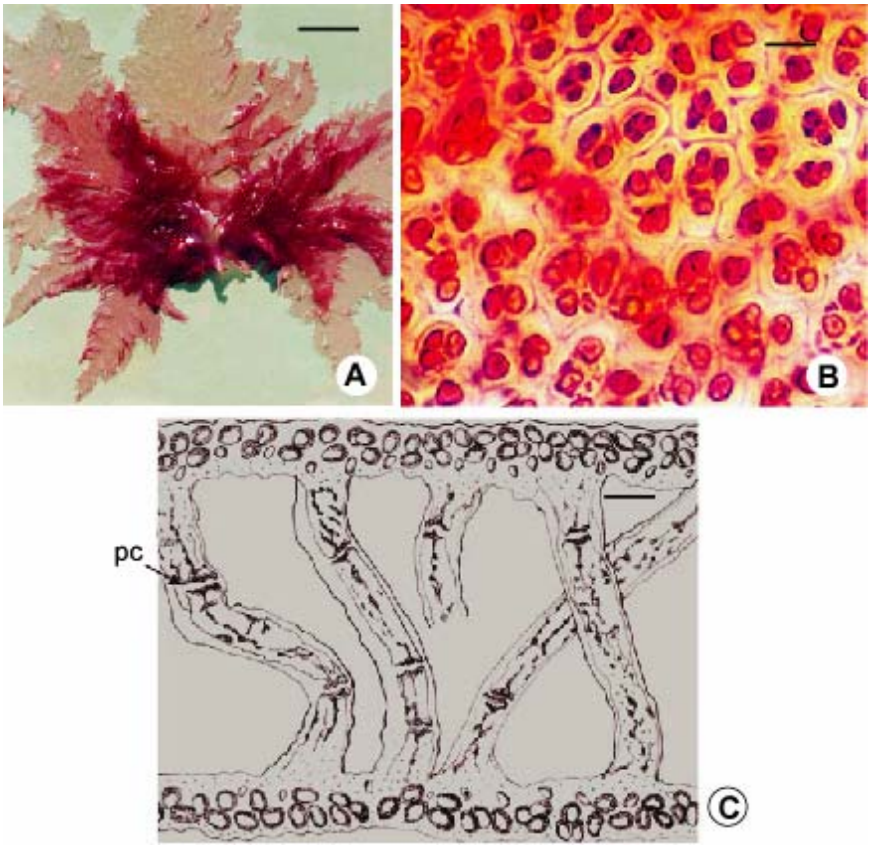
Order: Cryptonemiales, Family: Grateloupiaceae

3. **Halymenia floridana** J. Ag. **(Figs 3 A-D)**

(Taylor 1960, 420, Pl. 53, Fig. 2)

Synonym: Halymenia bermudensis F. S. Collin & M. A. Howe *H. gelinaria* F. S. Collin & M. A. Howe

Habit: Plants of moderate to considerable size, foliaceous, generally of a gelatinous consistency.



Figs 3 A-C. *Halymenia floridana*: A. A living plant spread apart. B. Surface view of the thallus showing epidermal cells which appeared to be grouped in a layer within the common parent wall. C. A camera lucida drawing of tranverse section of the thallus showing epidermis, narrow cortex and wide medulla with prominent hyphae (pc = pit connections). (A. Natural colour; B. Stained with saffranin). Bars : A = 1.2 cm, B - C = 20 µm.

Vegetative structure: Plants foliaceous, incised, texture membranaceous with gelatinous consistency, rose or purplish; blades 5 - 10 cm tall, 4 - 10 cm wide, borne on a slender very short (few millimeters long) stipe; at first ovate and entire, but later forming numerous lobes, which are cuneate below and taper toward the apices, finally becoming laciniate, somewhat palmatifid; blades 152 µm thick. Epidermis appeared single layered, vertically divided producing a group of epidermal cells usually of fairly uniform diameter (10.16 - 15.24 µm) surrounded by common parent cell; cortex narrow, 1 - 2 celled thick; medulla wide, traversed by many irregularly

branched hyphae of various sizes, 48.1 - 50.8 µm long, 8.89 - 11.25 µm broad, frequently anastomosing and almost at right angle to the thallus surface. Surface jelly of the thallus conspicuous, easily dispersed from dried specimens. Cystocarps and tetraspores not found.

Discussion: So far *H. duchassaigne, H. floresia, H. dilata* and *H. maculata* have been reported from the St Martin's Island. (Aziz *et al.* 2002, Islam and Aziz 1987).

Habitat and local distribution: The plant was collected as a drifted form from the west coast of St. Martin's Island, during low tide; collection no. 258, 01 March, 1995; common.

Order: Ceramiales, Family: Rhodomelaceae

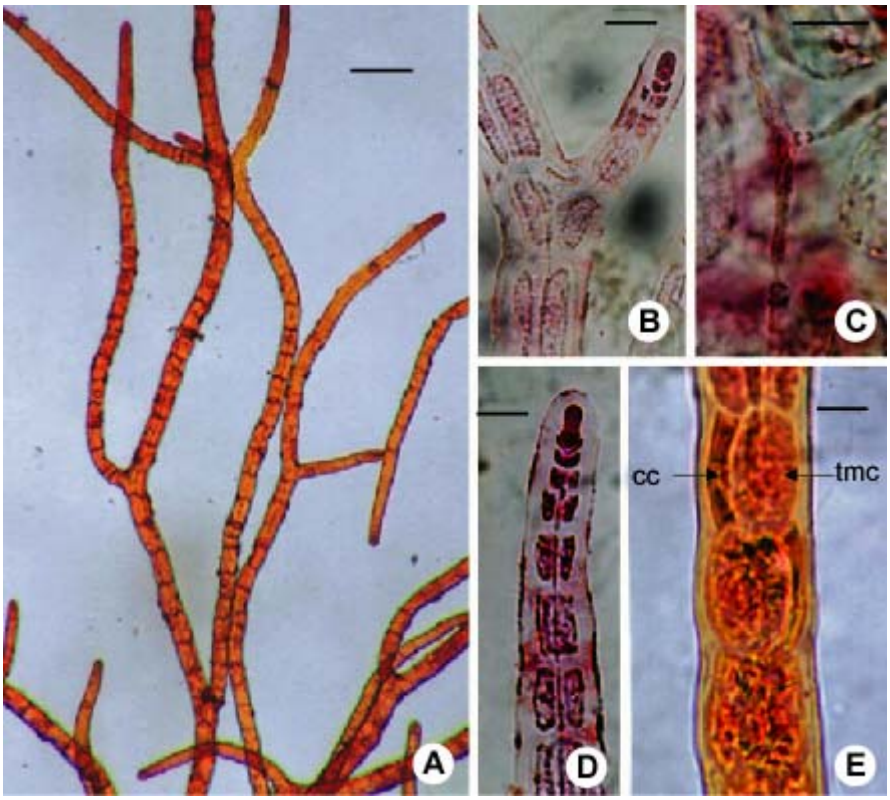
Genus: *Falkenbergia* Schmitz

4. **Falkenbergia hillebrandii** (Bornet) Falkenberg **(Figs 4 A-E)**

(Taylor 1960, 571-572, Pl. 72, Fig. 8)

Synonym: Asparagopsis taxiformis (Delile) Trevisande Saint-Leon

Habit: Plants small, soft, filamentous and profusely branched.



Figs 4 A-F. *Falkenbergia hillebrandii* (Bornet) Falkenberg: A. A portion of the upper part of a plant showing branching pattern. B. Branch development from the middle of a segment of the plant. C. The branched portion of fig. B enlarged showing the axial cell and its branching from its middle; note also the pit connection at the middle of the axial cell. D. Terminal part of the filament showing the typical apical cell. E. A branch showing tetrasporangial mother cell (tmc) and a cover cell (cc). Bars: A = 100 µm, B, D-E = 10 µm, C = 5 µm.

Vegetative structure: Plants more than 2 cm long, no rhizoidal structures are found along the whole length of the filament. Branching irregular develop almost at right angle from the middle of a segment (Fig. 4A-B), an axial cell also produce branch from its middle (Fig. 4C). Pericentral cells large, 3 in number around a very narrow (2.00 µm) axial cell. Pericentral cells up to a maximum of 25.4 µm broad and 76.2 µm long. Main axis up to 33.0 µm broad. Apical cells large, dumbell shaped up to 15.24 µm long and 7.62 µm broad.

Reproductive structure: Distinct reproductive structures were not found. In rare cases distal part of ultimate branches was found to produce tetraspore mother- cell like structure where one of the three pericentral cell narrowed to produce cover cell of the tetrasporangia (Fig. 4E).

Discussion: As per description of the genus the holdfast develops at the very base of a thallus but in the present materials multicellular branched holdfast was not found even in the proximal part of 2 cm long thallus.

Habitat and local distribution: The alga grows on *Liagora harveyiana* Zeh; which was found to be growing on boulders; collection no. 255, 01 March, 1995; common.

Genus: *Polysiphonia* Greville

5. **Polysiphonia harveyi** Bailey **(Figs 5A-G)**

(Taylor 1957, 332, Pl. 56, Fig. 8)

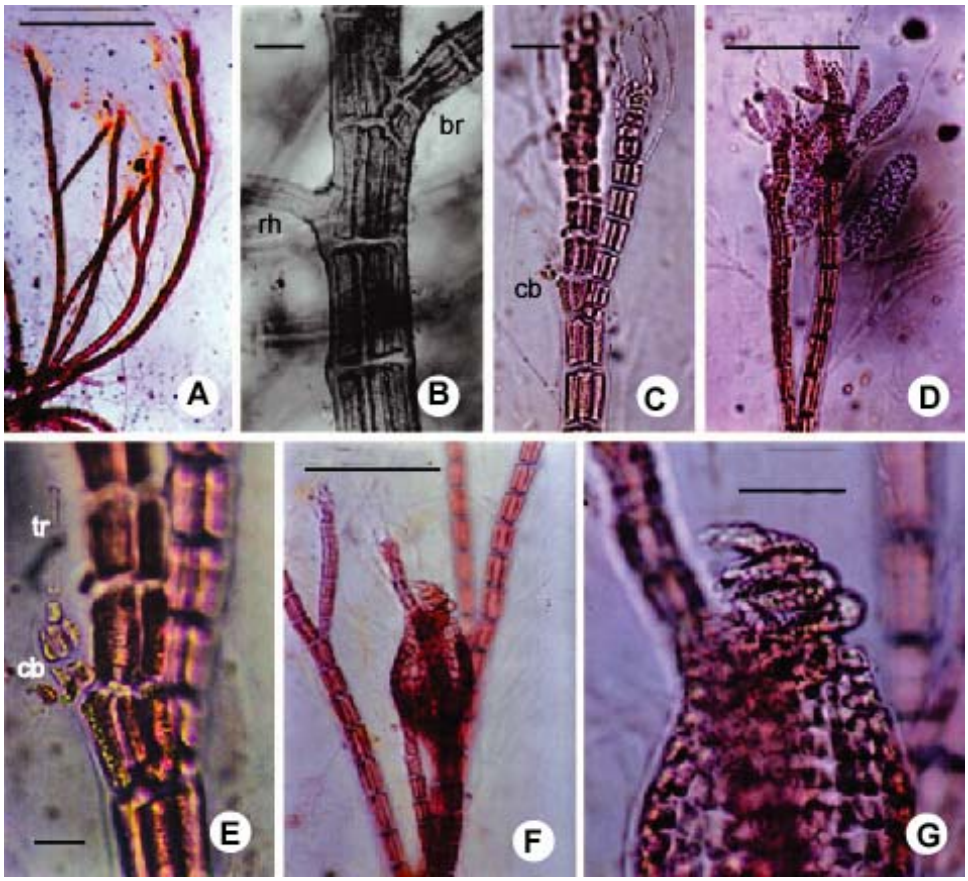
Habit: Plants erect, usually laterally branched.

Vegetative structure: Plants branched, 3.44 mm tall, basally attached by rhizoids developed from underside of creeping axis; texture soft to rather stiff, slender, color pinkish when young, later light-brown to blackish; irregularly and laterally branched, usually once from upper part of the axis; erect main axes up to 3.45 mm long and 46.5 - 62.7 µm broad, prostate creeping part 67.2 - 113.7 µm broad. Length of basal segments up to 93.1 µm and 51.1 µm broad. Near the tip, segments 25.9 µm long and 62.0 µm broad, with 4 pericentral cells, up to 36.19 µm broad. Pericentral cells of prostate part up to 93.1 µm long and 23.27 µm broad. Rhizoids unicellular developed from the base of a pericentral cell, while polysiphonous branches develop from the upper part of a tire of pericentral cells. Trichoblasts numerous at the distal end, dichotomously branched consisting of long narrow cells, almost colorless appearing as hairs, up to 414 µm long.

Reproductive structure: Spermatangial branches cylindrical mostly developed on the tip of a basal cell of a trichoblast, up to 170.6 µm long and 56.9 µm broad at the base while 49.1 µm broad near the tip. Young developing spermatangial branches are lanceolate in shape. Cystocarp broadly ovoid, 196.5 µm long and 134.4 µm broad. Carpogonium develops from a segment situated near the base of a branch; trichogyne short, cylindrical (Fig. 5E), 38.78 µm long, 3.10 µm broad. Carpospores fusiform, broader end rounded, 51.7 µm long and 15.51 - 18.10 µm broad at the rounded end.

Discussion: Islam (1976) reported *P. denudata* (Dill.) Kütz. and *P. mollis* Kooh et Harv. from the St Martin's Island. The later species was found to be growing epiphytically on *Liagora* sp., like the present species.

Habitat and local distribution: Plants were collected from the base of *Liagora harveyiana* Zeh which was found on the west coast of St Martin's Island; collection no. 252, 06 Jan. 1986; common.



Figs 5A-G. *Polysiphonia harveyi:* A. An aggregate of thalli showing habit of plants. B. A part of creeping axis with a rhizoid (rh) and a branch (br)on the right. C. Distal end of an axis with trichoblasts, note the carpogonial branch (cb) near the dichotomy. D. Distal end of the plant with spermatangial clusters of various ages. E. An axis with carpogonial branch (cb) developed from the upper side of a segment with short trichogyne (tr). F. A cystocarp near the axil of a branch. G. Carpospores oozing out of the cystocarp. Bars: A = 1mm, B, G = 50 µm, C = 25 µm, D, F = 200 µm.

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