

ON THE TYPE MATERIAL OF *DICTYONEMA NORVEGICUM* KJERULF

By

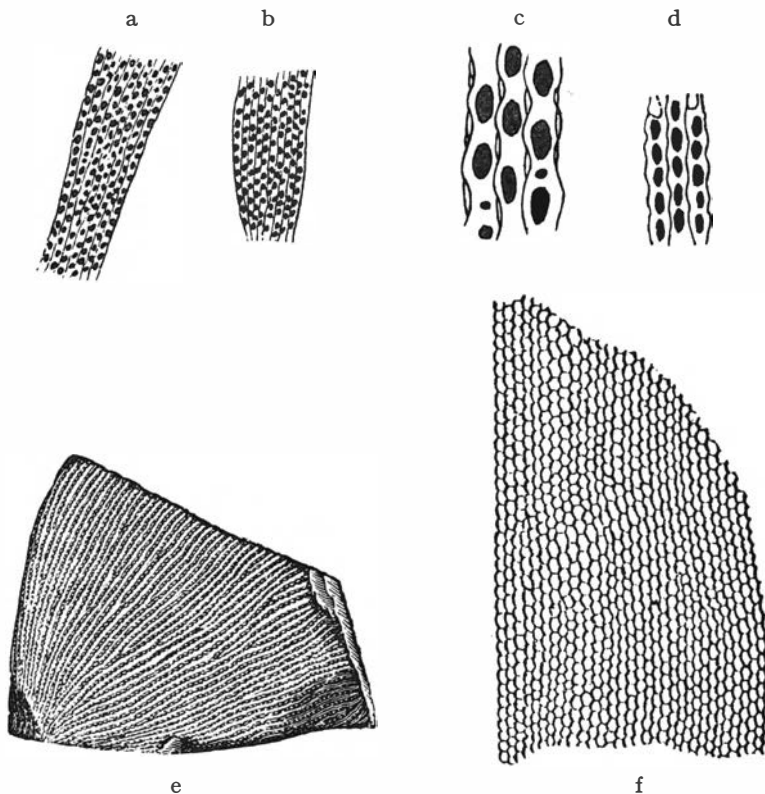
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Abstract. Syntypes of *Dictyonema norvegicum*, which may include the counterpart of one of Kjerulf's original Figures, are redescribed and compared with the syntypes of *Gorgonia flabelliformis* Eichwald.

Introduction

Dictyonema norvegicum, until recently recognized as a subspecies of *Dictyonema flabelliforme* (EICHWALD), was named and illustrated by KJERULF in 1865, and the selection of a type for this gains an added importance from the uncertainty which now exists regarding the synonymy of *D. flabelliforme* and *D. norvegicum*. Among the material preserved in the Palaeontological Museum in Oslo are four specimens which can with all probability be regarded as syntypes and may include the originals of Kjerulf's Figures. Of these, two (PMO nos. 20006 and 20007) bear the labels '*Dictyonema norvegicum* Tøyen. Th. Kj. legit' [= coll.] and two others (PMO nos. 261 and 74214) are labelled in the same handwriting '*Dictyonema norvegicum* Hulberget [= Holberget, Hardangervidda] T. Dahll legit [18] 59'. Kjerulf's Figures of *D. norvegicum* from Tøyen (1865, Fig. 1 a, b, A, B), here reproduced as Text-fig. 1 a-d, are so diagrammatic that it would be impossible to identify the original with certainty, but these specimens are undoubted topotypes and there is considerable probability that they are also syntypes, from which it would be legitimate to select a lectotype for the species. KJERULF's Fig. 2 (1865) bears the caption 'Hulberget Tellef Dahll legit'; here again, positive identification of the original would be difficult owing to the diagrammatic nature of the



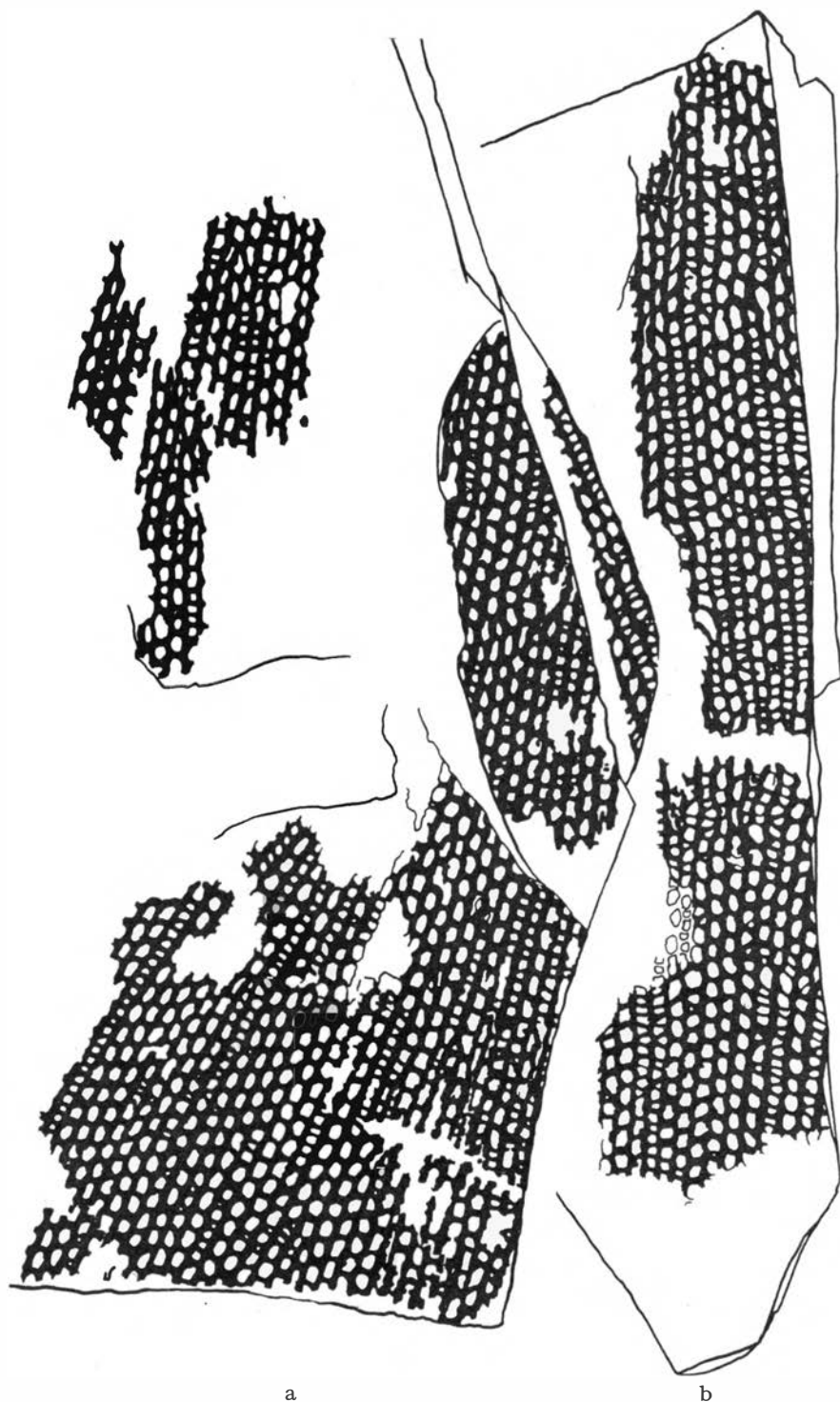
Text-fig. 1. *a-d*, *Dictyonema norvegicum* KJERULF. Tøyen, Oslo.

a and *b*, natural size; *c* and *d*, enlarged. Copies of KJERULF, 1865, Figs. 1 *a*, *b*, *A*, *B*.

e, *Dictyonema norvegicum* KJERULF. Holberget, Hardangervidda, $\times 1/2$. Copy of KJERULF, 1865, Fig. 2.

f, *Gorgonia flabelliformis* EICHWALD. Estonia. Copy of EICHWALD, 1842, Pl. 1, fig. 6 (magnification not stated).

Figure, but Fig. 2 strongly resembles part of specimen 261 in reverse (compare Pl. 2, fig. 2 with KJERULF's Fig. 2, 1865, here reproduced as Text-fig. 1 *e*). The original of Kjerulf's *D. graptolithinum*, Fig. 4*a*, which can be identified with certainty (PMO no. 73088), proves that Kjerulf's Figures are not reversed (as is so often the case with engravings and lithographs in old publications); it would accordingly appear that specimen 261 could at most be the counterpart of the



Text-fig. 2. *Dictyonema norvegicum* KJERULF. Portions of rhabdosome illustrating mesh characters of the species, $\times 2$. *a*, PMO no. 20006, Tøyen, Kjerulf coll.; cf. Pl. 1, fig. 2. *b*, PMO no. 20007, Tøyen, Kjerulf coll.; cf. Pl. 1, fig. 1.

figured specimen of *norvegicum*. But there is good if not conclusive evidence that these also are syntypes. Dahll's specimens are badly distorted (as can be seen immediately on comparing the two rhabdosomes orientated almost at right angles on specimen 261, Pl. 2, fig. 2). The Tøyen specimens from Kjerulf's own collection, however, are well preserved, though flattened. There are numerous fragmentary specimens on all bedding-planes, and were it necessary, the rhabdosome shown in the lower part of specimen 20006, Text-fig. 2a and Pl. 1, fig. 2, could appropriately be designated as the lectotype for *Dictyonema norvegicum*.

Description of syntypes

- 1) *Holberget*: Pl. 2, figs. 1, 2; KJERULF, 1865, Figs. 2, 3.

The specimens collected by Dahll from Holberget are completely flattened and so seriously distorted that measurements of mesh characters are of little value. In one direction (specimen 261), the stipes number 8–9 per cm and have a width of about 0.6 mm, separated by interspaces of comparable magnitude; the coarse dissepiments number only 4 per cm, with meshes 2–2.5 mm long. In a rhabdosome orientated almost at right angles, the stipes rarely exceed 5 or 6 per cm, are 1 mm broad and separated by interspaces of comparable or slightly greater magnitude; dissepiments appear relatively slender and number about 7 per cm. In the second specimen (74214), the stipes are 5–7 per cm, with a breadth of 0.8–0.9 mm and interspaces slightly wider; the dissepiments number 5–7 per cm and are again relatively slender. It is difficult to pronounce upon the regularity or otherwise of the mesh. Both specimens indicate relatively wide-angled cones, length/breadth ratio about 1:1; STÖRMER (1940, p. 164) records Holberget specimens with a length of 15 cm and even greater breadth. The mesh could be interpreted as comparable with that of the Tøyen specimens, but distorted; they will not, however, be considered further in the re-description of *D. norvegicum*.

- 2) *Tøyen*: Text-fig. 2; Pl. 1, figs. 1, 2; KJERULF, 1865, Figs. 1 a, b, A, B.

In these specimens, the stipes number 8–10 in 10 mm; the lower value is rare and the usual number is 9–10. They are slightly sinuous, and measured perpendicular to the stipe direction have a breadth of

0.45–0.55 mm. The character of the mesh makes it almost impossible to give a meaningful value to the width of the interspaces (see below). Faint markings on the back of the stipes in better-preserved examples undoubtedly represent stolothecal and other thecal tubes, though they cannot be interpreted in detail, and these suffice to demonstrate that the sinuosity of the stipes is real and cannot be attributed entirely to the expanded bases of alternating dissepiments (which could, of course, produce a comparable effect on the outline).

The dissepiments are of two kinds and produce two differing types of mesh. In the coarse-meshed areas, dissepiments are regularly spaced and alternate on the two sides of a given stipe; they number 7 in 10 mm (very rarely 6 or 8), with a width of 0.25–0.6 mm at the slender central 'waist'. The spaces of the mesh are irregularly ovoid, with maximum and minimum axes 1.1–1.2 mm and 0.7–0.8 mm. In the fine-meshed areas, dissepiments number 13–14 in 10 mm, generally 0.2–0.3 mm wide; they are fairly regularly spaced and commonly more or less at right angles to the stipes, which in these areas tend to be straight. Completely irregular dissepiments are rare. As will be seen from the Figures, the closely-spaced dissepiments sometimes occur over a short length of a single interspace between more normal widely-spaced dissepiments; more commonly, they occur over relatively long (1–2 cm) distances of interspace; and sometimes two or three adjacent interspaces are involved in this type of mesh.

On the basis of such few *Dictyonema* species as are known in detail, KOZŁOWSKI (1949, p. 91) was able to state that dissepiments are entirely extrathecal in origin and composed of cortical tissue. Although cortical tissue generally presents a finely laminated structure, it may in some cases acquire a pseudo-fusellar aspect (op. cit., p. 42), and the dissepiments of *Dictyonema wysoczkanum* (op. cit., Pl. iv, fig. 6) comprise a core of such tissue which has grown from adjacent branches to meet and fuse centrally, later becoming encased in normally laminated cortical tissue. A similar structure and origin may be postulated for the dissepiments of *D. norvegicum*. In the fine type of *norvegicum* mesh, adjacent dissepiments are not infrequently connected by a web (presumably of laminated cortical tissue) on one side, leaving on the other a small foramen, and sometimes appear to be completely fused in this manner to produce a single dissepiment 0.6–0.7 mm broad; but the normal broad dissepiments of the coarse mesh are clearly not

the result of such fusion, though their expanded bases may well represent additional deposition of laminated cortical tissue.

There are indications of autothecae with elongate denticles numbering 13–14 per cm at two points on the reverse side of specimen 20006, and clearly the two types of mesh would result from dissepiments produced at the level of every autotheca (or bitheca) or alternate autothecae (or bithecae). This correspondence is probably significant though its explanation is not obvious. It may be that the positioning of a dissepiment results from the fact that the apertural region of a bitheca forms a lateral projection on the branch and the outgrowth of extra-thecal tissue is localized at such points, where adjacent stipes are closest together. The coarse mesh (dissepiments alternating on the two sides of a stipe and situated at the level of every second theca) and the fine mesh (opposite on the two sides of each stipe and at the level of every theca) would then reflect the arrangement of bithecae along adjacent branches.

The combination of widely-spaced broad dissepiments, more closely-spaced narrower dissepiments, and closely-spaced and fused dissepiments, together with slight fluctuations in spacing (which, following thecal number, is rarely precisely constant) serves to produce all varieties of mesh represented.

Complete rhabdosomes of *D. norvegicum* are exceedingly rare, but the length/breadth ratio would seem to be 1 : 1 or even less; in addition to the example from Holberget already mentioned (STÖRMER 1940), WESTERGÅRD (1909, p. 60) records a rhabdosome from Öland with the dimensions: length 11.5 cm, breadth 13 cm. For the sake of completeness, a ¹/₂ Figure is included here (Text-fig. 3) of one of the few



Text-fig. 3. *Dictyonema norvegicum* KJERULF. Proximal end of a specimen from Grönhögen, Öland. Geol.-Paleontol. Inst., Lund, LO 4143. $\times 2$.

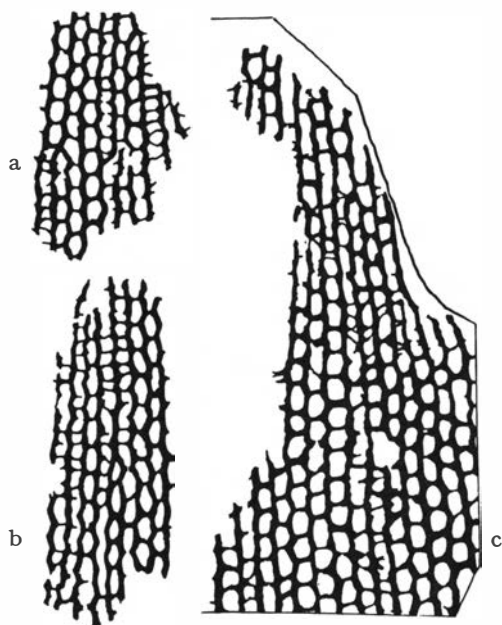
known specimens retaining the sicula. Preservation is poor, but so far as can be determined from this and another small rhabdosome on the same piece of shale, there were only the normal three 'primary' branches. Subsequent stipe division, however, is unusually rapid, and zones of branching occur at approximately 1, 2.25, 5, and 11 mm; the specimen is somewhat compressed as shown by the close spacing of dissepiments (approximately 16 per cm).

Relation of Kjerulf's *norvegicum* to Eichwald's *flabelliformis*

In 1953, OBUT reported the recognition of a number of specimens in the Museum of the Institute of Historical Geology at Leningrad which appeared to be the syntypes of Eichwald's *Gorgonia flabelliformis*. He claimed that these were identical with Kjerulf's *Dictyonema norvegicum*, and that what is currently termed *Dictyonema flabelliforme* should consequently be referred to *Dictyonema graptolithinum*, under which name it was described by KJERULF in 1865. This identity has been accepted by some writers and doubted by others, and the main purpose of this note has been to examine the basis for the claim as a preliminary to settling the synonymy of *D. flabelliforme*.

Eichwald's original Figure, like Kjerulf's, was schematic and presents comparable difficulty in identifying the type specimen. Obut has selected as lectotype specimen 1/28/a₂ of the Leningrad Museum (OBUT 1953, Pl. 1, figs. 2, 2a, here reproduced as Text-fig. 4c). It may be noted that this specimen, together with the other apparent syntypes, was labelled in Eichwald's handwriting '*Rhabdinopora flabelliformis*, Obolensandstein, Reval' (= Tallinn). Reval is not, in fact, a locality mentioned by EICHWALD in his original description (1840, p. 207); the only localities there cited were Baltischport (= Paldiski), Odinsholm (= Osmussaar) and Pulkowka near Zarskoje (25 km south of Leningrad). In 1842, when the first Figure (Pl. 1, fig. 6) was published, only the general locality 'Esthland' was cited, together with Ostgotland (east of Motala); and it was not till 1854 (p. 6) that Reval (Tallinn) appears by name.

Obut stresses in particular the character referred to by EICHWALD in 1842 (p. 45) and 1860 (p. 369), but not in 1840 (p. 207), of sinuosity of the stipes, resulting in ovoid-quadrangular meshes. This feature is undoubtedly absent in *D. flabelliforme* as currently interpreted, but



Text-fig. 4. *Dictyonema flabelliforme* (EICHWALD). Portions of rhabdosome illustrating mesh characters of the species, $\times 2$. Copies of Obut, 1953; *a*, *b*, two fragments from specimen 135/70, Schmidt coll., Paldiski, Obut Pl. 3, fig. 3 and Pl. 4, fig. 3a; *c*, specimen 1/28/a₂, Eichwald coll., Tallinn, selected by Obut as lectotype and figured Pl. 1, fig. 2a.

has been shown above to occur in *D. norvegicum*. The principal differences seem to be that both dissepiments and stipes are more slender in Eichwald's Estonian material, so that the whole mesh has a more 'open' appearance than in the Norwegian material.

Obut gives the figures 8–9 stipes in 10 mm and 7–8 dissepiments in 10 mm for the lectotype (and for most of the other fragments mentioned), but gives no figure for the stipe width. This is difficult to obtain from his plates, but would appear not to exceed 0.5 mm and to be commonly 0.4 mm. Estonian material of the commonly accepted *D. flabelliforme* type is preserved in slight relief, and if this *norvegicum* type is similarly preserved, the difference between Eichwald's and Kjerulf's specimens in this respect could be largely attributed to the greater flattening of the Norwegian material. Such an explanation

would not account for the appreciably more slender dissepiments in the Estonian material, since the dissepiments are now known to be solid.

Greater importance should perhaps be attached to the occurrence of patches of closely-spaced dissepiments. These are seen (poorly represented) in portions of three interspaces in Obut's lectotype (Text-fig. 4c) and rather better in two other fragments here figured as Text-fig. 4a, b. If these two types of mesh are kept distinct, the figures for number of dissepiments should (judging from Obut's plates) be corrected to 7 per cm for the coarse-mesh and 13–14 for the fine-mesh areas, which agrees very closely with the Tøyen material (and is presumably related to a comparable thecal number). There is no doubt that in addition the positioning of the dissepiments (regularly alternating on the two sides of a stipe in the coarse-mesh areas), the expanded dissepimental bases, and the sinuosity of the stipes themselves, producing alternating ovoid meshes, serve to establish a good case for identity.

I am therefore disposed to agree with Obut that Kjerulf's *Dictyonema norvegicum* should be accepted as synonymous with Eichwald's *Gorgonia flabelliformis*. The geographical distribution of *D. norvegicum*, however, is far more restricted than that of *D. flabelliforme* (= *D. graptolithinum* of Kjerulf), which is a stratigraphical index-fossil of great importance internationally and of long-standing usage; and in view of the confusion that would result from a strict application of the Rule of Priority in this case, an application is being submitted to the International Commission for Zoological Nomenclature for the conservation (under plenary powers of the Commission) of the name *Dictyonema flabelliforme* EICHWALD by designation of a neotype.

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PLATES

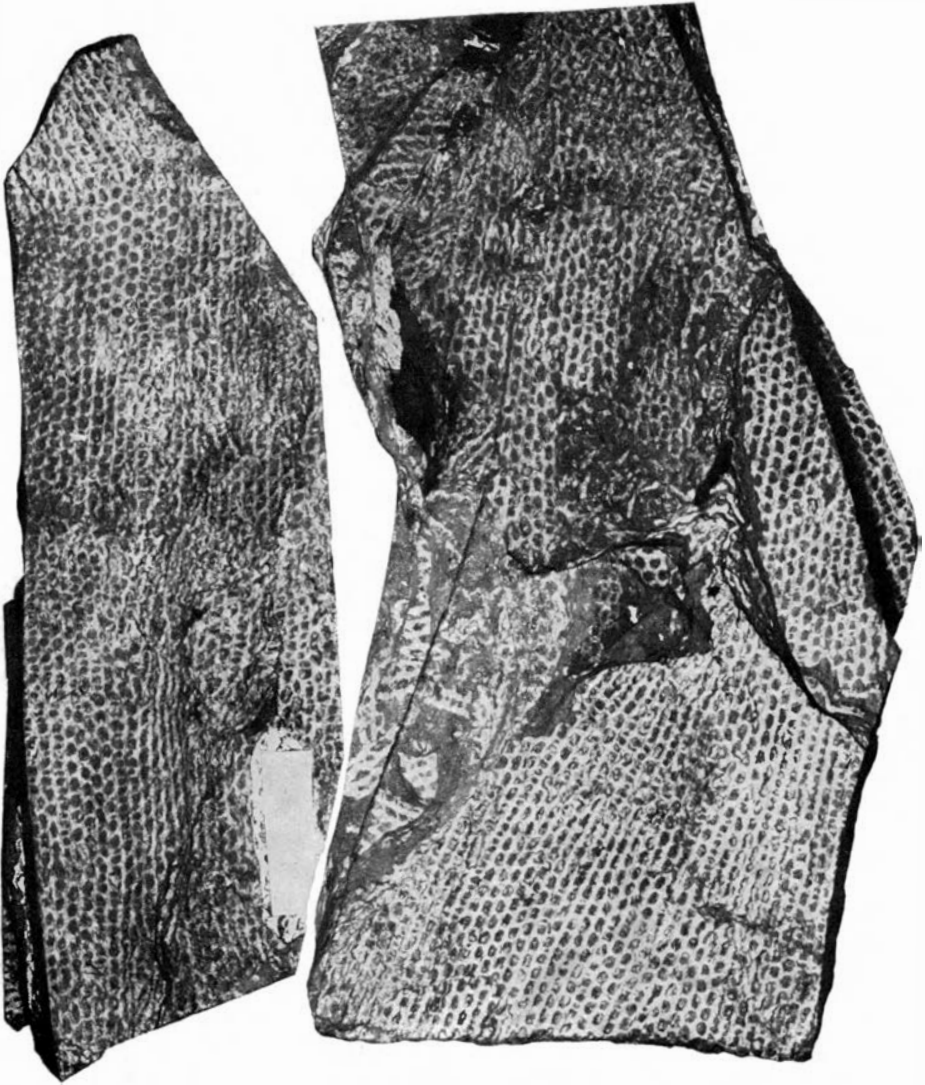
PLATE 1

Dictyonema norvegicum KJERULF; Tøyen, Oslo. Kjerulf oölk.

Fig. 1. PMO no. 20007, $\times 1\frac{1}{2}$; cf. Text-fig. 2b.

Fig. 2. PMO no. 20006, $\times 1\frac{1}{2}$; cf. Text-fig. 2a.

PLATE 1



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PLATE 2

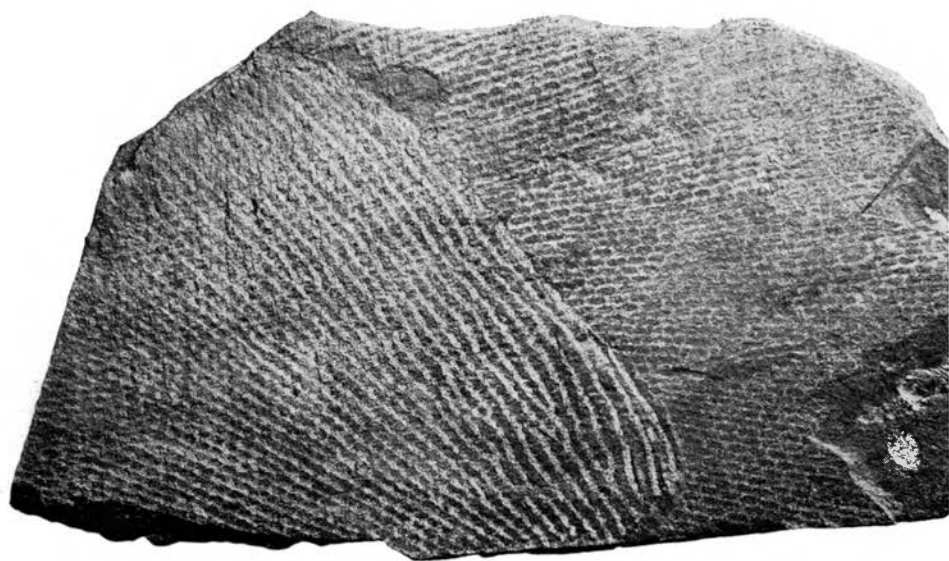
Dictyonema norvegicum KJERULF; Holberget, Hardangervidda. T. Dahll coll.

Fig. 1. PMO no. 74214, $\times 1$.

Fig. 2. PMO no. 261, $\times 1$. Two rhabdosomes nearly at right angles showing extent of deformation. The rhabdosome on the left of the Figure may represent the counterpart of KJERULF, 1865, Fig. 2.

PLATE 2

1



2