New or critical Lithothamnia.

By

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(With 1 Plate.)

Among an interesting collection of British Lithothamnia that Mr. E. A. L. Batters of Wormley had the kindness to send me for comparison with the species found along the coast of Norway, recorded in „The Norwegian Forms of Lithothamnion"[1]) are some specimens of an undescribed and characteristic species not met with on the Norwegian coast, which here I want to describe. After a part of the named paper was printed I also got some specimens of different Lithothamnia from Mr. P. Hariot of Paris, gathered on the coast of California, and one specimen from the straits of Magellan. Three of these specimens constitute new species, that I have at least not seen previously described, and together with these I also want to record the other specimens belonging to formerly known species, as they are of interest with regard to the apprehension and geographical distribution of this rather little known group of algæ.

Lithothamnion Battersii Fosl. mscr.

L. fronde libera in fundo jacente, simplice vel subsimplice, curvata vel flexuosa, 1.3—2 cm. longa, 2—3 mm. crassa, ramulis

[1]) Det kgl. norske Videnskabers Selskabs Skrifter 1894. Trondhjem 1895.

brevibus vel verrucæformibus tenuioribus plus minusve dense instructa, apicibus rotundatis vel obtusis; conceptaculis sporangiferis convexiusculis vel plano-convexis, parum prominentibus, a superficie visis diametro 250—300 μ, demum innatis; sporangiis binas sporas foventibus, 90—120 μ longis, 35—45 μ latis. Fig. 1—5.

Syn. Corallium pumilum Ellis, Corall. p. 83, p. 27, fig. C., No. 1?

Description of the species. Of this plant I have seen six specimens, five of which are represented fig. 1—5. The frond is simple or nearly simple, curved or angularly bent, its longest diameter 1.3—2 cm. by a thickness of 2—3 mm. It appears frequently to be more or less densely furnished with short branchlets or wart-like processes, which are rather varying in thickness, 0.5—1.5 mm. The ends are rounded or obtuse, and the surface is either smooth or, more frequently, provided with scaly thickenings.

With reference to structure the cells of the outer layers of tissue are, in a median longitudinal section of the axis, nearly square or rectangular, about 7—10 μ long and 6—8 μ thick. The more or less cup-shaped layers in the peripherical portions partly are pretty regular partly the stratification rather disturbed by burried conceptacles. The central portion in the specimen examined are much destroyed by numerous perforating algæ.

I have seen but some few conceptacles of sporangia. These organs appear to be scattered over the whole frond, now and then two or three confluent or nearly confluent, convex but very little prominent and not distinctly marked, at least towards maturity rather flattened, 250—300 μ in diameter seen from the surface. The roof is rather thick, and the muciferous canals first visible in a rather late stage. I have numbered about 30 of the latter. All the sporangia that I have seen in superficial as well as overgrown conceptacles were bisporic, in the former apparently mature, and about 90—120 μ long and 35—45 μ broad.

A couple of other conceptacles with a small central portion of the roof dissolved, probably are those of cystocarps. They appear to have been conical, very low, and are about 300 μ in diameter at the base. Some rather deep scars with slightly elevated edges, not unlikely, are from these organs.

The species belongs to the section *Innatæ*. Overgrown conceptacles of sporangia are numerous in the peripherical portions of the specimen examined, some of them, however, filled with local formations of tissue, which are again covered with a new thickening layer of the frond. The cystocarpic conceptacles quite likely, at least now and then, also grow down into the frond, or are filled with local formations, and the latter covered with a new thickening layer of the frond.

Remark on the synonomy. I quoted in Lithoth. p. 123 (151), that the plant recorded by Ellis l. c. from Falmouth and the Isle of Man as *„Corallium pumilum album, fere lapideum, ramosum"* on one hand somewhat reminds one of certain forms of *L. tophiforme* but on the other rather approaches the present species in habit. It not unlikely is a form of the latter, although apparently more branched.

Relation to other species. This plant is quite different from any other species that I know, perhaps most nearly allied with *L. flabellatum* f. *Granii* Fosl. Lithoth. p. 70 (98), from which, however, it differs both in development and other essential characteristics.

Habitat. The species has been taken on a depth of about 7 fathom. Specimens collected in August are scantily provided with reproductive organs.

Occurrence. Hitherto with certainty only met with at Cumbrae on the western coast of Scotland (Batters).

Lithothamnion crassum Phil.

in Wiegm. Arch. p. 388; Hauck, Meeresalg. p. 273.

f. *typica* Fosl.

Lithoth. p. 31 (59); Hauck l. c. t. I, fig. 1, 3; tab. nostr. fig. 14.

Remark on the species. Coll. Hariot No. 4. This plant appears to be widely dispersed especially in southern waters. By comparing the specimen fig. 14 with those delineated by Hauck l. c. it will be seen, that they agree well with each other, and this specimen, gathered on the coast of California, must be referred to the typical form of the above species. I certainly have not found

conceptacles of sporangia, but some holes probably after these organs, with the whole roof dissolved after the death of the plant, are nearly 300 μ in diameter, thus apparently a little smaller in this form than in f. *capitellata*. Cp. Fosl. l. c. The specimen is much bleached, probably found cast on shore, and the branches here and there rather rubbed.

Locality. California, according to Mr. P. Hariot.

Lithothamnion pallescens Fosl. mscr.

L. fronde subglobosa, irregulariter subdichotome ramosa; ramis cylindricis vel interdum subcompressis, plus minusve coalitis, circa 2 mm. crassis, subfastigiatis, apicibus obtusis; conceptaculis cystocarpiferis convexiusculis, parum prominentibus, a superficie visis diametro 250—300 μ. Fig. 11—13.

Syn. L. racemus auct., ex parte?

Description of the species. Coll. Hariot No. 5. I have seen but a fragmentary specimen and two smaller fragments not unlikely from the former. Cp. fig. 11—13. The longest diameter of the largest of these is about 3.5 cm. Most of the ultimate branches are broken. The plant forms subspherical balls that apparently develop freely on the bottom. The colour appears to be much faded, yellowish brown, but that of the living plant is unknown. The frond is repeatedly branched in a more or less irregular subdichotomous manner, and the branches are short, terete, cylindrical or now and then slightly compressed, seldom very slightly enlarged towards the tip, subfastigiate, with obtuse ends. Especially in the lower or central portions they are more or less anastomosing. The surface is smooth or nearly smooth.

The structure seems to be coarser than for inst. in *L. fruticulosum*. The inner cells of the cup-shaped layers of tissue are, in a longitudinal section of a branch, rectangular with rather thin walls, up to about 20 μ long and 10 μ broad, or occasionally a little more.

The organs that I suppose to be conceptacles of cystocarps are irregularly scattered or somewhat crowded at or below the tip

of the branches. They are convex but little prominent and frequently not distinctly marked, seen from the surface 250—300 μ in diameter, with a single orifice. I have not seen the carpospores. Some other conceptacles resembling the former in shape but smaller probably are those of antheridia.

The conceptacles of sporangia are unknown. In the solitary fragment of a branch examined I found a couple of overgrown conceptacles, which probably are the latter, as those of cystocarps seem not to grow down into the frond.

Remark on the synonomy. In Lithoth. p. 35 (63) I remarked that *L. racemus* auct. appears to be impossible to identify, but that I suppose it to be referrible partly to *L. fruticulosum* partly to *L. crassum.* It may be that it in fact also includes the present species.

Relation to other species. This plant is closely related on one side to *L. fruticulosum* and on the other to *L. crassum.* It differs from the former especially as regards the conceptacles of cystocarps and its coarser structure, but sterile specimens seem to be very difficult to separate. From the latter it distinguishes itself by its not or now and then, but very little, roundish thickened ends as well as the shape of the named reproductive organs, which rather resemble those in *L. depressum* f. *Harveyi.*

Locality. California, according to Mr. P. Hariot.

Lithothamnion dentatum (Kütz.) Aresch.

in J. Ag. Spec. Alg. 2, p. 525; Spongites dentata Kütz. Polyp. calcif. p. 33. *Descr.* et *Fig.* Lithothamnion dentatum Hauck, Meeresalg. p. 273. t. II, fig. 2 et t. V, fig. 2; tab. nostr. fig. 15.

Remark on the species. Coll. Hariot No 3. I have not seen any authentic specimen of this alga, but that from California represented fig. 15 so closely coincides with Hauck's description and the figure t. II, fig. 2, that it, no doubt, belongs to the same series of forms. The specimen is nearly 4 cm. in diameter. It is sterile, and the organs of propagation appear to be unknown in this species, which apparently comprehends more than one form.

Locality. California, according to Mr. P. Hariot.

Lithothamnion elegans Fosl. mscr.

L. fronde libera in fundo jacente, roseo-purpurea vel roseo-flavescente, decomposito-ramosa, diametro usque ad 4 cm.; ramis e centro undique egredientibus, squarrosis, compressis vel subcompresso-angulatis, 1.5—2.5 mm. crassis, extremis vel dilatatis, complanato-palmatis vel subulatis, unum alterumve ramulum spinescentem vel subulatum emittentibus; conceptaculis cystocarpiferis convexiusculis, vix prominentibus, a superficie visis diametro 220—280 μ, demum innatis; carposporis elongato-obovatis, 50—70 μ longis, 25—35 μ latis.

f. *angulata* Fosl. mscr.

f. ramis compressis vel subcompresso-angulatis, extremis plerumque subulatis. Fig. 9.

f. *complanata* Fosl. mscr.

f. ramis inferioribus compressis vel subcompresso-angulatis, extremis sæpe dilatatis, complanato-palmatis, usque 10 mm. latis, 1 mm. crassis, dentatis, fere spinescentibus vel subulatis, vel apicibus interdum truncatis. Fig. 10.

Description of the form of the species. Coll. Hariot No. 2. I have seen but two specimens, and some of the branches are broken. They are nearly related to one another but on the other hand ought to be specially mentioned. The one that I have named f. *angulata,* not unlikely, constitutes the typical form of the species. This form is branched from the centre of the frond in a rather irregular manner, its longest diameter about 4 cm., the branches much spreading and more or less curved, in the lower part somewhat anastomosing, either compressed or subcompressed-angular, about 1.5—2.5 mm. thick and frequently rather attenuating upwards. The upper branches are nearly always angular or subcompressed-angular, often subulate, seldom with a tendency to divide themselves in a subpalmate manner. They here and there bear one or two spinescent or subulate branchlet. Cp. fig. 9. The surface is smooth, here and there even feebly shining.

The form *complanata* is closely connected with the former and of about the same size. It differs by its lower branches fre-

quently being more compressed, but especially by most of the upper ones being more or less dilated, complanate-palmate, upwards up to 10 mm. broad or more, by a thickness of about 1 mm., partly rather shallowly dentate with the apices nearly spinescent, partly deeply cleft, subulate, or now and then with the apices truncate or nearly truncate. Cp. fig. 10.

The colour of both the forms is a feebly pink with a purplish tinge, or yellowish pink.

In a longitudinal median section of the upper part of a branch the inner cells of the cup-shaped layers of tissue are nearly square or rectangular, about 9—12 μ long and 7—8 μ thick.

Some cystocarpic conceptacles appear in one of the branches of both forms. They are scattered, slightly convex, or highest in the centre and approaching a depressed-conical shape, but most often scarcely perceptibly raised above the surface of the frond, distinctly marked, seen from the surface 220—280 μ in diameter, with a single and small orifice. At maturity a part or nearly the whole roof gets dissolved, the surrounding parts continue their growth, and the conceptacles become overgrown. In a vertical median section they are about 90—100 μ high and 200—230 μ in diameter. The carpospores are elongated-obovate, 50—70 μ long and 25—35 μ broad.

Two other conceptacles appearing together with the former most probably are those of antheridia. They apparently are fully developed, resemble the named organs in shape but are only about 100 μ in diameter seen from the surface. Also these probably grow down into the frond. I, however, have not seen the spermatia.

Overgrown conceptacles were scarce in the solitary piece of a branch examined. The conceptacles of sporangia are unknown.

Relation to other species. This species shows a rather great affinity to *L. coralloides,* from which, however, it distinguishes itself particularly by the shape of the branches and conceptacles of cystocarps.

Occurrence. The coast of California, according to Mr. P. Hariot.

Lithothamnion coralloides Cr.

Fl. Finist. p. 151; Fosl. Lithoth. p. 62 (90).

f. *australis* Fosl.

l. c.

Descr. et *Fig.* Lithothamnion coralloides f. australis Fosl. l. c. et t. 16, fig. 24—31; tab. nostr. fig. 6—7.

Remark on the species. Coll. Hariot No. 1. Two specimens, one of which is fragmentary, agree well with the above form of this species. Cp. fig. 6—7. As quoted l. c. reproductive organs were unknown in the three southern forms. In one of the present specimens I found a solitary conceptacle that fully coincides in shape with those in f. *norvegica* supposed to be cystocarpic and antheridian conceptacles, conical, low and about 250 μ in diameter at the base. It appears not to be fully developed, and I do not know whether it is of the former or the last named organs.

Locality. California, according to Mr. P. Hariot.

Lithothamnion magellanicum Fosl. mscr.

L. fronde crustacea, usque ad circa 300 μ crassa, scabriuscula, limbo lævi; conceptaculis sporangiferis superficialibus, nunquam innatis, crebris, disciformibus, parum prominentibus, diametro 300—400 μ; sporangiis quaternas sporas foventibus, 120—130 μ longis, 40—60 μ latis. Fig. 8.

Description of the species. Coll. Hariot No. 6. I have seen but a solitary specimen which is represented fig. 12. It forms a thin crust, covering a shell, scarcely up to 300 μ thick in the thickest parts, frequently apparently less. It is but slightly thinner in the peripherical than in the central portions, here and there, however, somewhat uneven in thickness. The surface is finely rugged, partly nearly smooth, and the unevenness principally is caused by growing over or covering up small extraneous objects, but also thereby that the scars after emptied conceptacles are not regularly effaced. It is not provided with scaly thickenings, nor have I seen local formations effacing the named scars. The brim is smooth or nearly smooth, not concentric zonate, feebly shining, and the

margin here and there shallowly crenate. The colour is yellowish brown, probably much faded.

I have not examined the structure and, therefore, I am not quite sure whether the species belongs to the subgenus *Eulithothamnion* or to *Lithophyllum,* quite likely, however, the former, and of this the section *Evanidæ.*

The conceptacles of sporangia are rather crowded over the whole frond without any order, here and there even close to the margin. They are superficial, never growing down into the frond, disc-shaped but little prominent and 300—400 μ in diameter. The roof is intersected with 70—90 muciferous canals. At maturity the whole roof falls away leaving a shallow hole with not or very slightly elevated edges. In two conceptacles examined I found mature or nearly mature sporangia, four-parted and 120—130 μ long, by 40—60 μ broad.

Relation to other species. This plant appears to be most nearly connected with *L. Strömfeltii* Fosl. Lithoth. p. 145 (173). It differs especially by its more uneven and not concentric zonated surface and disc-shaped conceptacles. On the other hand it in some respects shows greater affinity to *L. scabriusculum* Fosl. Lithoth. p. 142 (170).

Occurrence. The straits of Magellan, according to Mr. P. Hariot.

Explanation of the Plate.

The figures are reproduced in nearly the natural size

L. Battersii.

Fig. 1—5. Habit-figures of the plant.

L. coralloides f. *australis.*

„ 6—7. Habit-figure of a complete and a fragmentary specimen.

L. magellanicum.

„ 8. Habit-figure.

L. elegans f. *angulata.*

„ 9. Habit-figure. Some of the branches are broken.

L. elegans f. *complanata.*

„ 10. Habit-figure. Several branches are broken.

L. pallescens.

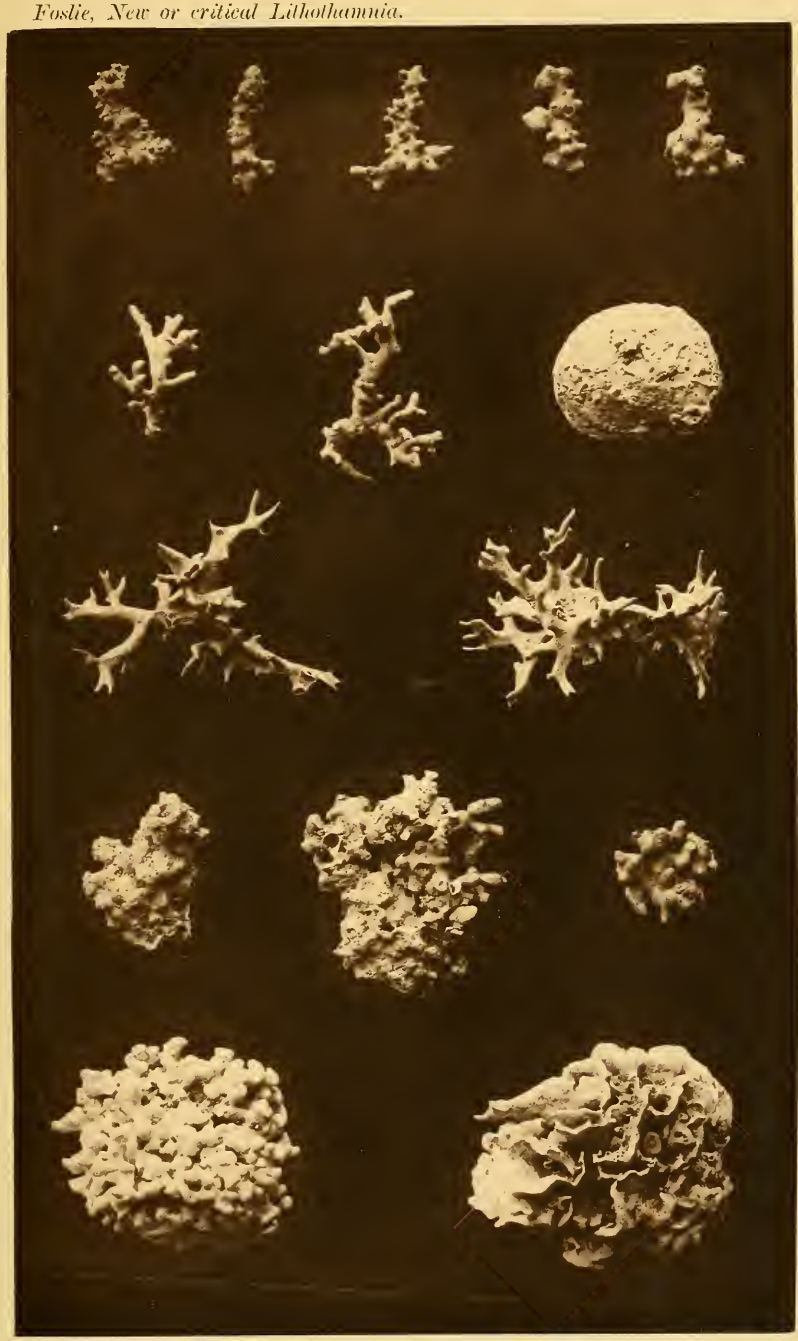
„ 11—13. Habit-figures. The small fragments fig. 11 and 13 are not unlikely from the fragmentary specimen fig. 12. Most of the ultimate branches are broken.

L. crassum f. *typica.*

„ 14. Habit-figure of a nearly complete specimen.

L. dentatum.

„ 15. Habit-figure.



1—5. L. Battersii. 6—7. L. coralloides f. australis. 8. L. magellanicum. 9. L. elegans f. angulata. 10. L. elegans f. complanata. 11—13. L. pallescens. 14. L. crassum f. typica. 15. L. dentatum.