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ON SOME LITHOTHAMNIA

BY

M. FOSLIE.

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M. FOSLIE

1801.
LITHOAMNIA (LITHOAMNIA)

Several botanists have been kind enough to send me even large collections of calcareous algæ for examination, for which I also here express my sincere thanks. Having recently examined a part of these interesting collections I got acquainted with some formerly but little known species and met with several forms that appear to have been undescribed. As I intend, however, later to give some contributions towards a monograph of the algæ referred to *Lithothamnion* and *Lithophyllum* I, here only want to give, some preliminary communications about a number of the named species.

L. expansum (Phil.)

Lithophyllum expansum Phil in Wieg. Arch. 1837, p. 389.

f. *genuina* Fosl. mscr.

Lithophyllum expansum Hauck, Meeresalg. p. 268, t. 4, fig. 1.

f. *foliacea* Fosl. mscr.

Lithophyllum expansum β agariciforme Hauck l. c. t. 4, fig. 2; excl. syn.

f. *repens* Fosl. mscr.

f. *exigua* Fosl. mscr.

Syn. *Pocillopora agariciformis* Ehrenb. Beitr. p. 353.

Millepora " Lam. An. s. vert. 2, p. 312; ex parte.

Melobesia expansa Endl. Gen. plant. suppl. 3, p. 49.

" *stictaeformis* Aresch. in J. Ag. Spec. Alg. 2, p. 517.

" *agariciformis* Aresch. l. c.; ex parte.

Lithophyllum agariciformis Falkenb. Meeresalg. in Mitth. Zool. St. Neapel
I. p. 263.

There can be some doubt whether the name *agariciforme* ought not, perhaps, to be adopted for the species in question. Thus *Pocillopora agariciformis* Ehrenb. l. c. probably only includes this species, and Hauck adopts the name for a variety of the species; but as the same denomination formerly given by Pallas is considered to have been applied on another species, I keep that of Philippi for the present one, as made by Hauck and other recent authors. Therefore, the form described by Hauck l. c. as β *agariciforme* must be given another name, for which I propose f. *foliacea*. This form is rather varying. I have seen specimens in which the lamels formed a nearly rosaceous bundle.

The form *repens* is a rather characteristic one. However, I have seen but a sterile and fragmentary specimen from the Mediterranean Sea about 10 cm. long and 6 cm. broad in the broadest part (Flahault, coll. no. 261), and some smaller fragments from the Gulf of Naples. It appears to be nearly related to f. *genuina*, but it is thinner and it creeps rather closely over the substratum, so that the shape of the crust partly is caused by that of the latter, although being but here and there loosely fastened. It differs much in colour from the last named, being orange-rufous or tawny which, however, probably is caused by local circumstances. The crust is rather uneven, somewhat irregularly concentric plicate, often forming deep furrows and ridges, and towards the margin, which is wanting, it is provided with feeble concentric striæ and here and there with wart-like, hollow excrescences. A very small proliferation occurs showing that this form probably develops itself nearly in the same manner as f. *genuina*.

The form *exigua* in some respects corresponds with *L. lichenoides* f. *epiphytica*¹⁾ and rather resembling certain forms of this. I have seen a solitary Mediterranean specimen (Prof. De-

1) I give this name to the epiphytical form of *L. lichenoides*, which in many respects rather differs from the coarse and often vigorously developed form fastened to stones or other hard objects. The latter I propose to name f. *rupicola*, and it sometimes even approaches certain forms of *L. expansum* in habit.

bray, coll. no. 5) only about 2 cm. long and 1 cm. broad and fastened by the lower side to a thin axis of a coral, *Gorgonia*, and here at length by new formations surrounding the host. It is composed of two small lamels, one in part covering the other and partly somewhat bent and undulate. The specimen has been taken at Alger in the former half of May, and it bears conceptacles of antheridia which agree with those in f. *genuina*.

L. agariciforme (Pall.)

Millepora agariciformis Pall. Elench. p. 263.

f. *decussata* (Ell. et Sol.)

Millepora decussata Ell. et Soland. Zooph. p. 131, t. 23, fig. 9.

f. *hibernica* Fosl. mscr.

Nullipora agariciformis Johnst. Brit. Spong. and Lithoph. p. 241, woodcut no. 23.

Syn. Favagini de Aristotele, specie prima, Gin. Op. I, p. 38, t. 44?

Millepora agariciformis Lam. An. s. vert. 2, p. 312; ex parte.

Nullipora „ Blainv. Actin. p. 605.

Lithophyllum decussatum Phil. in Wieg. Arch. 1837. p. 389?

Melobesia decussata Endl. Gen. plant. suppl. 3, p. 49.

Spongites „ Kütz. Spec. Alg. p. 698?

Melobesia agariciformis Harv. Phyc. Brit. pl. 73.

Spongites „ Kütz. Spec. Alg. p. 698; excl. syn. plur.

Melobesia „ Aresch. in J. Ag. Spec. Alg. 2, p. 516; ex parte fide syn.

„ *decussata* Aresch. l. c.; saltem ex parte.

It scarcely admits of any doubt as regards the identity of *Millepora decussata* Ell. et Soland. l. c. described from specimens found on the coast of Portugal and, as the authors remark „supposed to be a variety of the following (*M. lichenoides*)“ . Through the kindness of Prof. Flahault I got well developed Mediterranean specimens (coll. no. 277) provided with reproductive organs which show that the plant in fact is more nearly related to *L. lichenoides* than to *L. expansum*, although on the one hand apparently often approaching f. *foliacea* of the latter, but on the other *L. lichenoides* f. *rupicola* in habit.

The alga described by Johnston as well as Harvey l. c. under the species-name *agariciforme* probably belongs to the same

series of forms. I have seen two Irish specimens kindly sent me by Prof. Johnson for examination (coll. no. 76 and 57^{II}), and these coincide well with Johnston's description and figure l. c., but not fully agreeing with the figure by Harvey l. c. They have been collected by M'Calla in Roundstone Bay, or the same locality from which Johnston and Harvey got the specimens that underly their description. These specimens are sterile; but a small one that I got from Mr. Batters and collected at the Isle of Man, as I consider, belongs to the same form, and this carry a couple of not well developed conceptacles, probably those of antheridia, which coincide with those in the Mediterranean form, only a little larger or nearly 600 μ in diameter. This form differs from the Mediterranean especially therein, that it is more delicate and the lamels smaller, nearly always vertical and most often fastigate, and they are „either sinuated, or bent into semicircular forms, imbricating on each other, or curled round into little cups, or trumpet-mouthed siphons“. In the Mediterranean form the lamels are slightly thicker, frequently larger, sometimes nearly double the size, and not so breakable, often of the same shape as those in the Irish, but mutually more irregular and not seldom more or less horizontal, and thereby partly approaching *L. expansum* f. *foliacea* partly certain forms of *L. lichenooides* in habit. For the present I regard, therefore, both the named forms as being of one and the same species, *L. agariciforme*.

With reference to the species-name adopted there has been a great confusion, and in most cases two different species have been described under this name. It is difficult to know with certainty what underlies the description by Pallas l. c. Johnston as well as Harvey l. c. considers it identic with the plant described by them under the same species-name (otherwise partly setting aside their list of synonymes), by other authors on the other hand either applied to *L. expansum* Phil., or including both. Pallas refers to *Mosco petroso* Imp. Hist. Nat. p. 840 (734). Dr. E. Levier in Firenze kindly showed me the favour to send me a tracing of the figure in the quoted work. This rather reminds one of the above f. *decussata* in habit, but I am most inclined to suppose

the original specimen to have been a true coral. On the other hand Pallas' description partly somewhat agrees with *L. expansum* Phil. partly and perhaps most nearly with the species in question, and Johnston l. c. even apprehends it in every respect coinciding with his *agariciforme*. Therefore, I also adopt this name. In the sense taken by Areschoug l. c. it probably includes both the named species. And the plant described by Philippi as *L. decussatum* most probably either belongs to the above f. *decussata*, to which he refers, or not unlikely being *L. expansum* f. *foliacea*, as this form appears to be common in the same places from which Philippi got *L. expansum* and probably considered by him to be a separate species.

The conceptacles of sporangia in f. *depressa* nearly correspond with those in *L. lichenoides*, only in most cases smaller, 700—800 μ in diameter, somewhat prominent and rather flattened, intersected with about 100 muciferous canals. Other conceptacles, of which I have seen but a couple supposed to be those of antheridia and not yet more nearly examined, are conical but rather low, about 500 μ in diameter.

L. Philippii nov. nom.

L. decussatum Solms, Corall. Monogr p. 14.

” ” Hanck, Meeresalg. p. 270, t. 1, fig. 7.

I have not yet seen any authentic specimen of *L. decussatum* Solms, but specimens from the Gulf of Naples and other parts of the Mediterranean Sea agree well with the description l. c. as well as with that of Hauck. It is a species quite different from *L. expansum* and *L. agariciforme*, and in some respects rather more corresponding with *L. lichenoides* f. *rupicola*, although it cannot be confounded with any form of the latter. As mentioned above under *L. agariciforme* I consider *L. decussatum* Phil. identical with this or *L. expansum* f. *foliacea*. It cannot, therefore, be identified with *L. decussatum* Solms, which easily may be seen by comparing the figure by Hauck l. c. and that by Ellis et Solander l. c. Cp. *Spongites decussata* Kütz Spec. Alg. p. 698 which is described after specimens in Philippi's collection.

Consequently a new name must be given, for which I propose the above. The limits of the species are not yet well known.

L. fasciculatum (Lam.) Aresch.

in J. Ag. Spec. Alg. 2, p. 522; ex parte. *Millepora fasciculata* Lam. An. s. vert. 2, p. 203 (ed. 2, p. 311).

f. *incrassata* Fosl. mscr.

Melobesia fasciculata Harv. Phyc. Brit. pl. 74, fig.

f. *gyrosa* Fosl. mscr.

Melobesia fasciculata Harv. l. c. fig. 2.

f. *dilatata* Fosl. mscr.

f. *subtilis* Fosl. mscr.

Syn. *Nullipora fasciculata* Blainv. Actin. p. 605.

„ „ Jonhst. Brit. Spong. and Lithoph. p. 240, pl. 24, fig. 6, pl. 25, fig. 4.

„ *polymorpha* Johnst. l. c. pl. 24, fig. 1, 3?

As regards the different apprehension of *L. fasciculatum* (Lam.) I refer to Lith. p. 64. I there considered this as well as the alga described by Harvey under the same name to be referrible to *L. crassum*. However, the latter is to be given another limitation than l. c. Among a large collection of Irish Lithothamnina that I got from Prof. Johnson for examination I found several specimens agreeing well with Harvey's description and figures l. c. Some of these were collected in Roundstone Bay by M'Calla, from whom also Harvey got his specimens. I examined them very carefully, but I was not able to find any trace of reproductive organs. Although often extremely nearly related to *L. crassum* I make now no doubt that it is to be regarded a separate species, but the limits are very difficult to draw since only sterile specimens are known.

I for the present only want to call attention to this fact and will by a later occasion give a set of figures of this interesting and curious alga. There can be but little doubt that f. *gyrosa* belongs to the same series of forms as f. *incrassata*, which perhaps is the typical form of the species, and f. *subtilis* differs from the latter chiefly by much thinner branches, frequently 1—1.5 mm.,

and in all being smaller. Fig. 2 by Harvey l. c. gives a tolerably good idea of f. *gyrosa*. Here the tips of the branches are more or less expanded and oblong, or irregularly plicate and now and then grown together. In the form that I have named f. *dilatata* partly such expanded tips as in the preceding are to be found partly and most often the tips of the branches are dilated into irregular or semicircular, flattened or convex horizontal lamels up to 1.5 cm. in diameter, which often anastomose, or such lamels are formed over each other, here and there replaced by a branch resembling those in f. *incrassata*, or carrying small wart like or larger, angular excrescences. Sometimes two lamels trumpling each other become vertical, irregularly folded, or the one grips over the other, or sometimes even reminding one of those in *L. dentatum*. Although this form partly shows almost fully transition to f. *gyrosa* it partly differs so much, that it in the sense here taken perhaps even includes another species, which, however, cannot be decided before the reproductive organs in the supposed typical form of the species, f. *incrassata*, are known. In one of the most extreme specimens that I have seen of the form *dilatata* from Cape Finisterre (Sauvageau) I found conceptacles of sporangia which are nearly related to those in *L. incrustans* as well as *L. crassum*, by the latter lately found in specimens from the Mediterranean Sea.

L. calcareum (Pall.)

Millepora calcarea Pall. Elench. p. 265; ex parte,

f. *attenuata* Fosl. mscr.

Melobesia calcarea Harv. Phyc. Brit. pl. 291.

f. *uncinata* Fosl. mscr.

L. uncinatum Fosl. Lith. p. 126, t. 19, fig. 11—14.

f. *compressa* (M'Calla).

Melobesia compressa M'Calla sec. Harv. Man. 2, p. 108.

Syn. Corallium pumilum Ell. Corall. p. 83, t. 27, fig. C. no. 1.

Millepora polymorpha Ell. et Soland. Zooph. pr. 130; ex parte.

Nullipora calcarea Johnst. Brit. Spong. and Lithoph. p. 240, t. 24, fig 4—5.

„ fragilis M'Calla sec. Harv. Phyc. Brit. l. c.

Millepora calcarea Lam. An. s. vert. ed. 2, vol. 2, p. 312.

Spongites calcarea Kütz. Spec. Alg. p. 699.

Lithothamnion calcareum Aresch. in J. Ag. Spec. Alg. 2 p. 523; ex parte.

Also the present species is one of those which have been very differently understood by different authors. In Lith. p. 119 I considered it perhaps being identic partly with *L. tophiforme* partly with *L. flabellatum*. Afterwards I have seen a great number of Irish specimens, nearly all of them, however, fragmentary. Some of these specimens proved no doubt to be identic with the above species as described by Harvey l. c. Although I examined every one even of the smallest fragments very carefully I was but able to find some few scars after emptied conceptacles. I am now, however, not in doubt that also this alga is to be considered an independent species, but it is extremely varying and approaches partly one partly another of other known species. Besides specimens considered to be the form figured by Harvey, the above f. *attenuata*, characterized by its coarse and often clumsy main axis and much attenuating, often nearly subulate branches, frequently more or less angular and thereby reminding one of *L. elegans*, I found specimens which much resemble partly *L. tophiforme* partly *L. flabellatum* in habit, and others so closely approaching *L. divergens* in habit that I at first considered them identic with that. On the other hand several fragmentary specimens so nearly approaches the only specimen known of *L. uncinatum* Fosl. l. c. and besides showing transitions to f. *attenuata*, that I cannot consider the last named species to be anything more than a form of *L. calcareum*. I have even seen British specimens, not unlikely belonging to the same series of forms, which in habit rather resemble certain forms of *L. glaciale*! However, the limits of the species cannot be drawn before better materials and especially a number of entire and well developed specimens are known. The fragments sometimes are but parts of the main axis sometimes pieces of the outermost branch-systems, and these seem often to continue their growth and thereby apparently very differing forms appear.

In a specimen from Cape Finisterre (Prof. Debray, coll. no.

12), most probably belonging to f. *attenuata*, I found a solitary and not well developed conceptacle of sporangium about 400 μ in diameter and some scars after emptied ones. It comes near to *L. glaciale* in its development as well as appearance, as the central portions also here get decorticated leaving an annular border about 100 μ broad, and traversed by about 60 muciferous canals.

Nearly the same form of the species also appears to occur on the coast of Denmark, but also here only sterile specimens have been found (Kolderup Rosenvinge); and some curious specimens lately seen from Mandal on the Norwegian coast (Wille) I expect also belong to this species, and this makes it rather probable that the species formerly has been more widely dispersed to the north than for the present, as the specimens not unlikely are to be considered as relicts.

About the form *compressa* it is mentioned by Harvey l. c., that „it differs from *M. calcarea* in having a compressed frond, with flat branches broader towards the tips, and is probably as good a species as any other of these variable forms“. A fragmentary specimen collected on the Isle of Man by Mr. Harvey Gibson and kindly sent me for examination by Mr. Batters I suppose to be a form of the present species and corresponding with the above f. *compressa*, supposing the words „broader towards the tips“ depend thereon that the branches in the specimen seen by Harvey have been broadest a little above the divisions, or on the point of dividing and, therefore, looking increasing in thickness upwards. However, in the present and evidently stunted, fragmentary specimen, only 2—3 cm. in diameter, the rather compressed and short, more or less anastomosed branches partly are but very little partly rather attenuated with rounded ends.

With regard to the synonyme of this species I am still of opinion, that *Millepora calcarea* Ell. et Soland. l. c., referred to by most authors as the type of *L. calcareum*, is not any *Lithothamnion*. Cp. Lith. p. 124. On the contrary as mentioned l. c. I think *L. polymorphum* Ell. et Soland in part is identic with the present species. It includes *Corallium pumilum* Ellis which I l. c. considered merely a form of *L. Battersii*. Cp. New or

crit. Lith. p. 2. Among the above quoted Irish fragments I met with some which on the one side much approach *L. Battersii* in habit but on the other by closer examination appear to be nothing more than broken parts of the main axis or branches of *L. calcareum* continuing their growth and assuming an often peculiar appearance. However, *M. polymorpha* Ell. et Soland. not unlikely also includes fragmentary and dead masses of *L. fasciculatum* like that figured by Johnston l. c. t. 25, fig. 4. The first binary name given to the species in question is *M. calcarea* Pall. l. c., but here certainly including *L. lichenoides* (Ellis) as a crust-like form of his species, as afterwards pointed out by Ellis himself¹⁾.

L. byssoides (Lam.) Phil.

f. *major* Fosl. Lith. p. 119.

After having seen a typical specimen of *L. byssoides* in a collection from Greece, kindly sent me by Prof. S. Miliarakis, the above f. *major* is to strike as a form of that species. I am unable at present to decide what it may be, as I only know stunted and fragmentary specimens, thence supposed referrible to the named species.

L. moluccense Fosl. mscr.

Prof. M. Möbius had the kindness to send me a *Lithothamnion* for examination, collected at the Moluccas by Prof. Kükenthal. So far as I can judge at present it forms the type of an undescribed species. The specimen has the appearance of a small bush about 2.5 cm. high, the longest diameter 4.5 cm. It has been fastened to some harder object by a small convex-concave crust about 1 cm. in diameter and 1 mm. in thickness (however fragmentary), the form of which being caused by the shape of the substratum. From this issue rather densely crowded, subdichotomously, sometimes nearly cervine-divided, more or less

1) Extract of a Letter from John Ellis, Esquire, F. R. S. to Dr. Linnæus of Upsal, F. R. S. on the *Animal Nature of the Genus of Zoophytes, called Corallina*. Philosophical Transactions (Royal Society). Vol. 57, 1767. London 1768. Pag. 404.

fan-shaped branch-systems, which frequently are ordered in rather regular rows. The comprehend axes of up to 4 orders, which are downwards subcylindrical but upwards compressed. Just above the first branching point the branches are about 3 mm. broad, but upwards only 1—1.5 mm. and often nearly subulate.

The conceptacles, the nature of which I do not yet know, are rather densely scattered almost everywhere in the branches, hemispherical or low conical, 200—300 μ in diameter at the base and not sharply defined.

Occurrence. The Moluccas (Kükenthal).

L. affine Fosl. mscr.

f. *tuberosa* Fosl. mscr.

f. *complanata* Fosl. mscr.

This species is nearly related on the one side to *L. crassum* and on the other to *L. pallescens*, or in habit nearly approaching certain forms of *L. fruticosum*. If fastened to smaller stones it at length forms roundish or somewhat lobed balls on the bottom, 3—5 cm. in diameter, but I do not know whether it at any time loosens itself or develops freely on the bottom. It apparently often grows on corals, and then it seems never to loosen itself, but often surrounding the branches of the host and forming more or less roundish or irregular masses. In the form that I have named f. *tuberosa* the branches are radiating, rather fastigate and densely crowded, about 1.5 mm thick, subcylindrical, or slightly thickened, rounded or sometimes nearly truncate ends, often provided with small wart-like processes. The form *complanata* is more irregular and less branched, the branch-systems not radiating but often more or less fan-shaped and much compressed, or the thin and irregular crust bears scantily divided, attenuating or sometimes nearly subulate branches of the same thickness as in f. *tuberosa*.

The conceptacles of sporangia are nearly related to those in *L. crassum*, but smaller and the visible part of the roof itself less depressed. However, I have been in doubt whether it ought to be considered more than a delicate form of the named species,

but as occurring in its recognizable forms in different places and separated from the latter in some particulars it appears to be an independent species. It on the other side shows relation to *L. pallescens*, the limits of which, however, are not yet well known, as but fragmentary specimens hitherto have been found.

Occurrence. The Red Sea, at Massanah (Levander), and the coast of Greece, on the island of Nisyro (Miliarakis).

L. proboscideum Fosl. mscr.

The species at first forms a thin crust on harder objects. From this issue frequently somewhat dispersed or here and there rather crowded scantily and subdichotomously divided, about 3 mm. thick, sometimes compressed, especially in the lower parts often anastomosing branches, which commonly increase in thickness upwards, or with roundish thickened, or more often truncate tips not seldom depressed in the centre. The plant is extremely attacked by animals, in the specimens that I have seen the lower parts are dead, traversed by numerous animals and covered with Bryozoa, or forming a clumsy mortar of calcareous masses, perforated dead branches together with numerous tubes of *Serpula*, shells of muscles, and other animals. Upon this new crust-like and irregular expansions are formed, or over and between or sometimes surrounding parts of old branches, and from here issue more or less confluent wart-like excrescences or branches like above quoted, up to 2 cm. high. The branches sometimes are rather straight sometimes and more often irregularly bent, here and there subfastigiate, in part grown together, and frequently provided with rather numerous wart-like processes.

I have seen specimens both from America and Africa. Although a little differing they most probably belong to one and the same species but unfortunately being sterile. The largest is about 12 cm. in diameter. The species apparently is most nearly related to *L. crassum*.

Occurrence. California, dredged at Monterey (Prof. W. A. Setchell, coll. no. 1084 A); and Africa, at Cap Verd (Prof. J. A. Henriques, coll. no. 23).

L. ponderosum Fosl. mscr.

The solitary specimen that I have seen forms a rather subhemispherical mass about 8 cm. in diameter which has been fastened to any hard object. From the but small fastening point issue in different directions nearly obpyramidal or somewhat compressed, coarse and thick, upwards fully or almost fully confluent lobes, which at least in part are composed of anastomosing branches. These lobes carry simple, short and wart-like or longer and branch-like processes. The latter are 5—10 mm. high by a diameter of 3—7 mm., angular or compressed, seldom subcylindrical with rounded ends. The specimen is rich in holes after boring muscles and in passages produced by worms. It seems to have been dead when collected and the shape of the branches apparently in part to be caused by the influence of rapid tides. However, it is so characteristic and different from other Lithothamnia known, that it must be considered an independent species.

Occurrence. Africa, at St. Thomas (Prof. J. A. Henriques, coll. no. 28).

L. retusum Fosl. mscr.

This species seems sometimes to lie free on the bottom, but frequently fastened to harder objects by a thin and small crust. From this issue radiating, repeatedly subdichotomously divided branch-systems, with axes of at least three orders. The branch-systems are sometimes rather flattened sometimes obpyramidal, 2,5—3 cm. high. They are nearly always much anastomosing even to the apex. The branches are more or less fastigiate and rather straight, about 2 mm. thick, frequently enlarged towards the tip, with the ends most often truncate and depressed in the centre. Seen from above the plant rather reminds one of *L. incrustans* f. *Harveyi* in habit. Otherwise it seems to be nearly connected with *L. Darwini* (Harv.) Aresch. in J. Ag. Spec. Alg. 2, p. 523, a species that I only know from the description l. c.

Occurrence. Africa, at St. Thomas (Prof. J. A. Henriques, coll. no. 24).

L. grumosum Fosl. mscr.

This characteristic species forms crusts on other hard objects, often quite surrounding stones up to 10 cm. in diameter, or covering other crust-like Lithothamnia. The crust is up to 2 mm. thick, plainly decreasing towards the margin, and the latter lobed or irregularly crenate, in young individuals with feeble concentric striae. It is especially in the older parts densely covered with coarse wart-like excrescences 4—8 mm in diameter which here and there are rather confluent. The conceptacles (not yet examined and the nature of which I do not exactly know) are densely crowded especially in the excrescences, slightly convex and not sharply defined, 200—300 μ in diameter.

Occurrence. California, in tide pools at Pacific Grov and at San Pedro (Prof. Setchell, coll. no 1594 and 1497 A).

L. macroblastum Fosl. mscr.

A solitary specimen forming the type of an undescribed species was found among a collection that I got from the Gulf of Naples through the kindness of Prof. Dohrn. The species forms a somewhat irregular crust 4—5 cm. in diameter and about 1 cm. thick, and appears to have been fastened to some hard object. New crusts are developed upon the primary almost in the same manner as in *L. Philippii*, and in all being nearly related to the latter. However, it is provided with numerous, in part confluent wart-like excrescences frequently about 2 mm. in diameter and, therefore, it in habit rather reminds one of *L. papillosum* seen from above. The conceptacles of sporangia are densely crowded principally in the excrescences, often confluent and thereby angular, hemispherical or nearly hemispherical, with a smaller or larger central portion rather deeply depressed (decorticated?) and sharply defined, and then often nearly crater-shaped, 550—700 μ in diameter. This portion is intersected with about 20 muciferous canals. Other conceptacles supposed to be those of antheridia are conical, low but rather acute, about 400 μ in diameter, and appear in small number.

I have been in doubt whether this is to be considered more than a form of *L. Philippii* (*L. decussatum* Solms), as the latter apparently is a rather varying species, the limits of which are not yet well known. Mad. A. Weber van Bosse kindly sent me for examination a couple of authentic Adriatic and Mediterranean specimens of *L. Philippii* from Hauck's herbarium. Here the conceptacles of sporangia are larger though far less prominent than in the present, and the greatest part of the roof much flattened, now and then slightly depressed but not sharply marked. Similar specimens I have seen from other parts of the Mediterranean Sea (Debray, coll. no. 7). On the other hand I am not sure whether the roof of the conceptacles is not somewhat differing in the different states of development as in several other species, although the present species also in other respects differs from *L. Philippii*. The structure is not yet examined.

Occurrence. The Gulf of Naples, picked up from a depth of 15—25 fathoms.

L. adplicitum Fosl. mscr.

Among some Lithothamnia that I got from Mr. Batters for examination I found a solitary specimen, collected at Bognor in October, which cannot be identified with any known species of *Lithothamnion*. It is very nearly related to *L. foecundum*, but differs especially as regards the conceptacles of cystocarps as well as the structure. It is fastened to a shell of a muscle, *Pholas*, partly growing over another *Lithothamnion*, probably *L. Lenormandi*, partly Bryozoa or other smaller animals, here end there but loosely fastened to the substratum, forming a somewhat uneven crust in part bent over the edge of the shell and a little extended on the other side. about 2—3 cm. in diameter and 0.3—0.6 mm. thick, gradually decreasing in thickness towards the margin, with some few very small, wart-like or irregular excrescences. The unevenness, however, is partly caused by its growing over extraneous objects. It is here and there feebly zonate towards the margin, and the latter irregularly crenate, without or with a very feeble whitish brim

The not yet examined conceptacles probably are those of cystocarps, the only reproductive organs found, convex or nearly hemispherical, or sometimes approaching a low conical shape, 550—650 μ in diameter at the base, with a single orifice. They appear as a rule densely crowded except in the peripheral portions and often so densely that they become angular. At maturity the greater part of the roof falls away, leaving a shallow scar with most often somewhat elevated edges, the rest of the roof. Some of the conceptacles are to be found overgrown, but this probably does not take place if the whole roof falls away or only a small part left, as they are superficial or nearly superficial.

Occurrence. Britain, at Bognor (Batters).

L. Setchellii Fosl. msr

Of this characteristic alga I have seen but a solitary specimen, forming a somewhat lobed, roundish ball about 7 cm. in diameter. It is — probably throughout — composed of small, suborbiculate lamellae 1—3 mm. in diameter, loosely growing over each other, or at least in the upper layers often more or less confluent. Seen from the surface the plant looks densely rugged, which partly is caused by small wart-like and sometimes confluent papillae partly and principally on account of the numerous conical, high conceptacles of cystocarps, 800—1200 μ in diameter at the base and of about the same height including a somewhat elongated tip, which easily falls away, traversed by a single canal.

The species is plainly separated from any other species known. The conceptacles rather approach those in *L. Hauckii* but otherwise quite distinct from that species and probably most nearly connected with *L. squamulosum*.

Occurrence. California, in tide pools at San Pedro (Prof. W. A. Setchell, coll no. 1496).

L. prototypum Fosl. msr.

This alga has been found on shells of a muscle, *Pinna*, forming smaller crusts up to 300 μ thick in the central portions and

plainly decreasing towards the margin. It clings closely but in an older stage rather loosely adherent to the substratum. The crusts are when freely developed suborbiculate but soon becoming confluent they form somewhat extended crust-complexes of indefinite shape. Upon the primary numerous small, scaly, suborbiculate lamels are formed especially in the central portions, which again become confluent, forming a new formation upon the primary crust or a part of it, and so on, so that at length the whole looks more or less imbricated with the lamels always closely clinging to the subjacent. Sometimes more crust-complexes stumbling each other form small and slightly elevated ridges. The margin is thin, with very feeble, concentric striæ, lobed or irregularly crenate.

The conceptacles of cystocarps are irregularly scattered over the whole frond except the peripheral portions, buckler-shaped or depressed conical, 450—550 μ in diameter. A part of the conceptacles not seldom become covered by new-formed lamels before the spores are ripe.

In a young state this species rather resembles younger individuals of *Melobesia farinosa*, but older is quite different and nearly related to *L. Lenormandi*, from which, however, it is separated by essential characteristics.

Occurrence. West India, at St. Croix (Börgesen).

L. myriocarpum Fosl. mscr.

Among some Lithothamnia from the Red Sea that I got for examination from the University of Helsingfors through the kindness of Prof. F. Elfving is a specimen growing on a bucky (*Murex*) which stands very near to *L. tenue* (Kjellm.), but on the other side must be considered a separate species. It differs especially with reference to the conceptacles and the structure, and forms more extended and rather irregular crusts. The crust is but 100—200 μ in thickness, and it clings closely and firmly to its substratum. The margin is thin, with feeble concentric striæ, and the conceptacles not ordered in more or less regular concentric rows, but irregularly crowded everywhere almost close to

the margin. The conceptacles of cystocarps are conical, most often low, with a rather coarse summit, 400—600 μ in diameter at the base. The conceptacles of antheridia occur in greater number than the former and are of about half the size.

Occurrence. Massanah in the Red Sea (Levander).

L. decipiens Fosl. mscr.

The present alga is in habit nearly connected with *L. scabriusculum*. It forms an up to nearly 200 μ thick crust of indefinite shape on a stone, composed of smaller confluent crusts, here and there with the limits visible as indistinct ridges. It clings closely and firmly to its substratum. The conceptacles of sporangia are convex, about 200 μ in diameter seen from above, and the roof intersected with 15—20 muciferous canals. Those of cystocarps or antheridia are conical, low and about 100 μ in diameter at the base.

Occurrence. California (Prof. W. A. Setchell, coll. no. 1482).