

Flora of Koh Chang.

Contributions to the knowledge of the vegetation in the
Gulf of Siam.

By

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Part II.

Corallinaceae

by M. Foslie — Trondhjem.

Along the coasts of Asia from the Indian Ocean, eastward to the North Pacific Ocean and farther up to the Bering Sea the tracts have been almost unknown as regards the anarticulated calcareous Algae, setting aside a few species of *Metobesia* attached to other Algae, although on the other hand the other groups of Corallinaceae do not seem to be considerably known. Some species are lately known from the Pacific coast of Japan, but otherwise as far as I know not a single species has been formerly quoted with any degree of certainty from the said extended coasts. Therefore, every contribution from these tracts may be of importance as regards the knowledge, of these up to late times rather neglected Algae and their geographic distribution.

During the Danish expedition to Siam 1899—1900 some calcareous Algae were collected in different places in the Gulf of Siam. The collection certainly comprehends but a small number of species which are to be recorded below, giving however some interesting facts as to the distribution of these Algae. The species not formerly described will be pictured on a subsequent occasion.

Mr. Th. Reinhold of Itzehoe has been kind enough to determine *Amphiroa* and *Corallina*.

Archaeolithothamnion (Rothpl.) Fosl.¹⁾

1. A. Schmidtii Fosl. msr.

Thallus forming crusts on Corals up to about 2 mm. thick, sending forth crowded wart-like excrescences or short, simple or subsimple branches about 2 mm. thick, occasionally up to 12 mm. long, in an advanced stage frequently knotty and rugged and in part rather anastomosing. Sporangia 50—65 μ long and 30—40 μ thick.

There are to be found two specimens of this characteristic species, attached to about 15 cm. long and 3—5 cm. thick, somewhat compressed pieces of dead Corals which it at length fully surrounds. The crust does not attain any considerable thickness, apparently not exceeding about 2 mm., frequently thinner. It produces in a rather young stage numerous small wartlike excrescences which little by little increase in size, becoming more and more crowded, frequently at length forming short, simple or subsimple branches 1.5—3 mm. thick, partly increasing in thickness upwards partly not, or with somewhat spherical thickened ends, occasionally almost truncate, and in an advanced stage nearly always knotty and rugged. The branches are up to 12 mm. long, but generally smaller, in part at length rather anastomosing. New crusts sometimes are formed upon the primary, or now and then stretched between the branches, or irregular. excrescences are formed by growing over extraneous objects. The surface is feebly shining. The colour was in a fresh state a brownish red, however almost discoloured in drying.

On a vertical section the hypothallic layer is shown to be rather feebly developed, composed of elongated cells which are up to about 20 μ long. It sends forth perithallic rows the cells of which frequently are 1½—2 times longer than broad, or 11—18 μ long and 7—10 μ broad, here and there alternating with very small square or roundish cells. Between the more or less densely crowded overgrown sporangia (or cavities after these) the cells are as a rule much elongated and narrow.

The sporangia are formed in more or less regular sori up to about 3 mm. in diameter. The sori are sometimes almost confluent, and appear especially in the excrescences or branches, being dissolved or nearly so in the middle of February. On a section the overgrown sporangia form rather regular layers over each other and parallel to the surface of the frond. They are cylindric-bean-shaped or oblong, 50—65 μ long and 30—40 μ thick, occasionally somewhat smaller and almost roundish-ovate.

The species reminds one in habit of *Lithothamnion rugosum* Fosl. Otherwise it stands nearest to *Archaeolithothamnion erythraeum* (Rothpl.) Fosl., from which, however, it separates itself by essential characteristics.

Picked up from a depth of about 5 fathoms off Koh Kahdat, apparently scarce.

¹⁾ With regard to the limit of the genera I refer to Revised Systematical Survey of the Melobesieae. Trondhjem 1900.

. **Lithothamnion** Phil. emend.

2. **L. fruticulosum** (Kütz.) Fosl.

List of Lith. p. 6 (non Norw. Lith.); *Spongites fruticulosa* Kütz. Polyp. calcif. p. 33, Tab. Phyc. 19, t. 99.

Syn. *L. ramulosum* Solms, Corall. Monogr. p. 19; ex parte¹⁾.

L. fasciculatum Solms l. c. p. 20; saltem ex parte.

L. fasciculatum β *fruticulosum* Hauck, Meeresalg. p. 274.

The limits of the above species are not yet well fixed. I have taken it in the same sense as *L. fasciculatum* β *fruticulosum* Hauck l. c. Whether it also includes the coarser form delineated by Hauck l. c., l. 5, fig. 3 is as yet not quite certain.

In the collection from Siam are some specimens certainly rather young and not well developed, but on the whole fully agreeing with Adriatic and Mediterranean specimens of the present species. They surround small stones and shells of Mollusks, forming a very thin crust which sends forth partly crowded partly scattered wart-like excrescences or short and thin branches up to 5 mm. long. The latter are frequently knotty and rugged, often with somewhat spherical thickened ends.

A couple of the specimens were scantily provided with conceptacles of sporangia in the beginning of February. The conceptacles were however almost dissolved except one. This was about 400 μ in diameter seen from above, with four-parted sporangia about 150 by 40—50 μ . A solitary, probably cystocarpic conceptacle of a conical shape measured about 600 μ at the base²⁾.

Between Koh Mesan and Cape Liant in 9 fathoms water.

Area: The Mediterranean, the Adriatic, and Mauritius.

3. **L. funafutiense** Fosl. msr.

Lithothamnion Philippii f. *funafutiensis* Fosl. Noles Lith. Funaf. p. 3; Calc. Alg. Funaf. p. 5.

1) Owing to a mistake I have in Rev. Syst. Surv. Melob. identified *L. ramulosum* Phil. with *L. fruticulosum* Kütz.

2) After this was in press, I have had the opportunity to examine authentic specimens from Hauck's herbarium. *L. fruticulosum* includes two forms, the one with 1—1.5 mm. thick branches as the above mentioned, which I propose to name f. *clavulata*. This form corresponds in the main with the quoted figure by Kützling l. c. as well as Hauck l. c., l. 5, fig. 5, the latter representing an old specimen. It sometimes assumes an almost globular shape with nearly fastigiate branches (specimens from the coast of Greece). The other form is rather coarse, in habit often much differing from the former and approaching *G. brassica-florida* (Harv.) Fosl., with the branches frequently 2—2.5 mm. thick. This form I name f. *crassiuscula*. On the other hand, the coarse form delineated by Hauck l. c., l. 5, fig. 3 seems to belong to another species.

f. purpurascens Fosl. msr.

Thallus forming up to 2 mm. thick crusts on Corals, frequently with wart-like excrescences 2—3 mm. in diameter. Conceptacles of sporangia subprominent, 550—700 μ in diameter. Conceptacles of cystocarps subconical, about 500 μ in diameter.

In the quoted papers I mentioned a calcareous Alga from Funafuti which I considered a form of *L. Philippii*. In the collection from Siam are a few mostly fragmentary specimens which certainly differ in habit from the Funafuti plant, but on the whole are closely related to this. On the other hand, also the latter form much approaches *L. Philippii*. However, as both show almost the same divergences in their relation to *L. Philippii*, it appears that they must be considered as forms of a separate species. Both cling more firmly to the substratum than *L. Philippii*, the latter even sometimes almost loosens itself and develops rhizoids in the lower part of the frond which occasionally at length form small fronds as in *Lithophyllum expansum*. The conceptacles are smaller than in the said species, although in this respect no true limit is to be drawn. Besides, as mentioned in the quoted papers, the hypothallus differs rather much from that in *L. Philippii*, being more feebly developed with more narrow and thin-walled cells than the generally thick-walled cells in the latter. I have seen but some few specimens of *L. Philippii*. It seems to be rather varying, and the limits are not yet fully known. Perhaps it even includes more than one species in the sense formerly taken. This cannot be decided till a larger material is procured than that I at present possess. I think however to be entitled to adopt the said forms as specifically distinct.

The form *purpurascens* sticks especially to divers Corals. It forms more or less extended crusts up to about 2 mm. thick, frequently however thinner. The crust is more or less uneven and feebly shining, generally with wart-like excrescences 2—3 mm. in diameter, or sometimes thinner, scattered and branch-like processes appear at least in part by covering up small extraneous objects or penetrating animals. A new crust occasionally is formed upon the primary.

With reference to structure the cells of the feebly developed hypothallic layer are elongated and up to about 20 μ long, with thin walls or rather so. The lower anticlites form a slow convergence towards matrix. The cells of the perithallic layer are much varying in shape and size, and often without any distinct order, partly but 4—5 by 5—6 μ in diameter, square or rounded, not seldom with the longest diameter in horizontal direction, or especially upwards square or more frequently vertically elongated, 7—12 μ long and 5—7 μ broad.

The reproductive organs in the present specimens of this form are very scanty and not well developed. I have seen but a few conceptacles of sporangia and cystocarps. The former are slightly convex but little prominent, 550—700 μ in diameter and intersected with a number of delicate muciferous canals. The sporangia are four-parted, judging from a solitary conceptacle examined 140—170 μ long and 60—70 μ broad, with apparently enduring interwalls. The conceptacles of cystocarps seem to be rather varying, although I have seen but a couple of almost fully

developed ones. They almost coincide in shape with those in *L. Philippii* and *L. lichenooides*, but are smaller, about $500\ \mu$ in diameter at the base, and apparently as a rule more acute. The central parts of the „conjugation cell“ bear a bundle of somewhat elongated paranemata.

The present form does not differ much from the Funafuti plant, which I provisionally name f. *genuina*. The latter has a rosy colour, sometimes with a feeble purplish shade, while f. *purpurascens* is darker or lighter purplish. The crust is frequently a little thicker and less irregular, but on the other hand generally with slightly smaller cells than in f. *genuina*. So also the conceptacles of sporangia being a little smaller, and in the few ones that I have seen not flattened in the central parts.

Between Koh Mesan and Cape Liant on a depth of 9 fathoms (not quite certain); 15 naut. miles E. of Koh Chuen, 10 fathoms; the north side of Koh Mesan, 10–15 fathoms; between Koh Mesan and Cape Liant, 5–8 fathoms; the north point of Koh Chang on Coral-reefs; and Koh Kahlat in 2 fathoms water.

Area: South Pacific Ocean: Funafuti (f. *genuina*).

4. *L. slamense* Fosl. msr.

Thallus forming delicate, light rosy, smooth crusts or nearly so on divers hard objects, $30\text{--}100\ \mu$ thick. Conceptacles of sporangia convex, rather prominent, $300\text{--}500\ \mu$ in diameter. Sporangia four-parted. Conceptacles of cystocarps conical, $350\text{--}600\ \mu$ in diameter.

f. *minuta* Fosl. msr.

The crust $30\text{--}60\ \mu$ thick. Conceptacles of sporangia $300\text{--}400\ \mu$ in diameter. Sporangia $60\text{--}70\ \mu$ long, $25\text{--}30\ \mu$ broad. Conceptacles of cystocarps $350\text{--}450\ \mu$ in diameter.

f. *simulans* Fosl. msr.

The crust $50\text{--}100\ \mu$ thick. Conceptacles of sporangia $400\text{--}500\ \mu$ in diameter. Sporangia $140\text{--}160\ \mu$ long and $60\text{--}80\ \mu$ thick. Conceptacles of cystocarps $500\text{--}600\ \mu$ in diameter.

This is one of the most delicate of the species of this genus attached to hard objects. It sticks especially to Corals, but is also met with on stones, shells of Mollusks or even attached to other calcareous Algae. The colour is in a dried state a light rosy, sometimes, however, with a greyish-green shade. The crust is at first almost orbicular, here and there with slightly crenulate margin. In an old state it becomes more irregular in outline, and more crusts founded near each other get fully confluent without any visible limit, at length forming an apparently solitary crust up to about 12 mm. in diameter, often, however, much smaller, or but 3 mm. in a fertile stage (f. *minuta*). But sometimes it almost covers small shells of Mollusks (f. *simulans*). It is smooth and not or very feebly shining. The smoothness of the crust depends however on that of the substratum, although it appears sometimes to become a little uneven in an old stage even on a plain substratum, partly by

covering up small extraneous objects partly by scars after emptied conceptacles being irregularly effaced, or the dropped conceptacles leaving small elevated edges not dissolved. The crust is in *f. minuta* frequently but 30—60 μ thick, in *f. simulans* up to about 100 μ thick.

A vertical section of the crust shows an almost coaxial development. The hypothallic cells are frequently rather elongated, up to about 25 μ long, sending forth a rather feebly developed perithallic layer. The cells of the latter are partly roundish partly square, 7—10 μ in diameter, however often with the longest diameter now in horizontal now and more frequently in vertical direction, in the latter case exceptionally up to 14 long and 7 μ broad.

The conceptacles of sporangia are scattered or somewhat crowded in any part of the crust except the peripheral portion, convex, in *f. minuta* less prominent than in *f. simulans*, towards maturity sometimes a little flattened in the central parts, in the former 300—400 μ and in the latter 400—500 μ in diameter seen from above. The roof is intersected with about 40 delicate muciferous canals. The sporangia are four-parted in both forms, in *f. minuta* 60—70 μ long and 25—30 μ broad, but in *f. simulans* 140—160 μ long and 60—80 μ broad. However, this is perhaps not to be considered the average size, as I have examined but a couple of conceptacles owing to the scanty material.

The conceptacles of cystocarps frequently appear in other individuals than those of sporangia. They are conical and, as in other species of this genus, abruptly passing into a very short and thin tip. Also these are smaller in *f. minuta* than in *f. simulans*, in the former 350—450 μ in diameter at the base and in the latter 500—600 μ .

Both forms are provided with the said organs in February, carpospores however more scarce than sporangia.

I have been in doubt whether *f. simulans* ought not perhaps to be considered as a separate species, but as I have seen only a solitary well developed specimen of this form I do not hesitate to keep it distinct, especially since the material also of *f. minuta* is scarce and some of the specimens no doubt are somewhat stunted. Nor have I been able to draw any true limit, setting aside the proportionally large reproductive organs in the former. But also in other species a great difference as regards the conceptacles sometimes is to be seen, for inst. in *Lithothamnion laeve*. The forms have been found under different conditions which not unlikely have had some influence on their development such as for instance in the said species as well as *L. Lenormandi*.

The present species stands nearest to *L. Lenormandi* and reminds one in habit of young specimens of *f. sublaevis*. It approaches this form also as regards the conceptacles of sporangia, while those of cystocarps are different.

11 naut. miles NW. of Koh Kam on a depth of 10 fathoms (*f. minuta*); between Koh Mesan and Cape Liant, 9 fathoms (*f. minuta*); 15 naut. miles E. of Koh Chuen, 10 fathoms (*f. minuta*?); between Koh Mesan and Koh Chuen, 15 fathoms (*f. minuta*); the north side of Koh Mesan in 10—15 fathoms water (*f. minuta*); and Koh Sarlak, on *Septifer bilocularis* L. in shallow water (*f. simulans*), — almost everywhere in solitary individuals.

Lithophyllum Phil. emend.

Subgen. **Eulithophyllum** Fosl.

5. **L. racemus** (Lam.) Fosl.

List of Lith. p. 9; *Millepora* (Nullipora) *racemosa* Lam. Hist. an. s. vertebr. 2, p. 203.

f. **crassa** (Phil.) Fosl.

l. c. *Lithothamnion crassum* Phil. in Wieg. Arch. 1837, p. 388.

Syn. *Lithothamnion racemus* Aresch. in J. Ag. Spec. Alg. 2, p. 521.

— *crassum* Hauck, Meeresalg. p. 273.

With some reservation I refer two specimens to the above form of this species. They are but 1—2 cm. in diameter, sterile and seem to have been dead when collected. Overgrown conceptacles are not to be found. The specimens agree however in habit with young ones of the said form. So also in the main with reference to structure.

Between Koh Mesan and Cape Liant on a depth of 9 fathoms.

Area: North Atlantic: South coast of England (only dead specimens known). Bahama; the Mediterranean and the Adriatic; the Red Sea; Indian Ocean; Mauritius, Rodríguez.

Subgen. **Lepidomorphum** Fosl.

6. **L. Yendoi** Fosl.

New or crit. calc. Alg. p. 25.

On the Pacific coast of Japan this rather easily recognisable species sticks to stones as far as hitherto known. In the Gulf of Siam it appears to be rather abundant on small *Conchis*, *Cerithia*, forming thin crusts little by little almost covering the host, and furnished with reproductive organs in the middle of March. The specimens from this place agree in the main both in habit and structure with the typical form of the species except that they are smaller.

Koh Sarlak on *Cerithium Morus* in shallow water (between tide-marks).

Area: North Pacific. Ocean: Pacific coast of middle Japan.

Melobesia Lamour. emend.

7. **M. farinosa** Lamour.

Polyp. flex. p. 315; Rosan. Melob. p. 59.

Also in the Gulf of Siam this widely dispersed species sticks to divers other Algæ. Well developed specimens have been found on *Halimeda macroloba* and *Padina*. On *Cystoseira latifrons* it grows together with Bryozoa, the one partly covering the other. The basal cells are on a section almost square and about $7\ \mu$ in diameter. It is provided with sporangia, antheridia and carpospores in the middle of February.

Koh Kahdat in about 2 fathoms water.

Area: Common almost everywhere except in the arctic and antarctic regions.

Dermatolithon Fosl.

8. **D. pustulatum** (Lamour.) Fosl.¹⁾

List of Lith. p. 11; *Melobesia pustulata* Lamour. Polyp. flex. p. 315, Rosan. Mélob. p. 72.

Koh Kahdat, in 1—2 fathoms water.

Area: Rather common almost everywhere except in the arctic and antarctic regions.

Amphiroa Lamour¹⁾.

9. **A. fragilissima** (L.) Lamour.

Polyp. flex. p. 298; *Corallina fragilissima* L. Syst. nat. ed. 12, vol. 1, p. 1305; Ell. et Sol. Zooph. p. 123.

Koh Lom and Koh Chick, on coral-reefs in shallow water.

Area: Common in all warmer seas.

Corallina (Tourmf.) Lamour¹⁾.

10. **C. (Jania) tenella** Kütz.

Tab. Phyc. vol. 8, p. 41, t. 85, II.

It is a question whether this species is not but a very thin form of the much varying *C. (Jania) rubens* which is common everywhere.

Koh Lom and Koh Chick, on coral-reefs in shallow water.

Area: The Mediterranean, Mexico, Samoa and Fidji Islds.

¹⁾ Auctore Th. Reinbold.