THE DANISH
INGOLF-EXPEDITION.

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CONTENTS:

HJALMAR BROCH: HYDROIDA. (I.)

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THE DANISH INGOLF-EXPEDITION.

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HYDROIDA.

(PART I.)

BY

HJALMAR BROCH.

WITH 2 PLATES AND 20 FIGURES IN THE TEXT.

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CONTENTS

Preface.

The investigation of the large Danish collections of hydroids from the Faroe Islands, Iceland, and Greenland, and the researches into the interesting material brought home from the Ingolf Expedition, have realised great results. In fact, several points of dispute as to the classification of northern species have been settled. In the first place, the Danish collections contain original specimens of some species which have been described as new several times after being originally recorded. In other cases, the large number of specimens tend to bridge the division between species which have hitherto been looked upon as "good" ones. It is, indeed, a matter of regret that deficiencies of diagnosis and inaccuracy of design have frequently put obstacles to the recognition of species previously recorded, and that the literature has, consequently, been encumbered with synonyms which we should rather have done without. This inconvenience, in fact, enforces the necessity of giving full and exhaustive accounts of every single species. The American investigators, indeed, on the pattern of Nutting have long tried to give brief diagnoses and drawings of all American species. But it must be observed that, because of the impressionist way of drawing, the illustrations are, as a general rule, somewhat wanting in accuracy, and to the brief diagnoses there is the objection that they are often too summary to give exhaustive account of the distinguishing features. On the whole such weak points as appear in the last works of Allman, have gone down to his epigones. Great difficulties, indeed, are in this way given to students of the geographical distribution of the hydroids. No doubt, more species than those which are at present pointed out by literature, are common to the European and the American seas. But in general it proves impossible to form, on the ground of the brief diagnoses, a well-founded opinion as to the virtual qualities of many species. As far as the European species are concerned, we are fortunate in possessing the classic work of Hincks, A History of the British Zoophytes. However, since the appearance of that work, plenty of fresh subjects have been added by descriptions of several species and genera which can hardly all be maintained, and publications have of late appeared in such abundance that it proves difficult to students of this group of animals to find their way through the crowded matter.

These are the reasons why I have tried to give new and detailed diagnoses of every single species in question. The diagnoses are essentially founded on the copious material occurring in the Danish collections. Of synonyms I have only selected those of absolute necessity. Detailed accounts of synonymy are found — as far as earlier literature is concerned — in the excellent treatises of Bedot,

Matériaux pour servir à l'histoire des Hydroïdes, and — regarding recent literature on northern hydroids — in the groupings framed by Jäderholm (1909), Broch (1909), and Kramp (1914). As far as possible, the various species are accompanied by maps illustrative of the geographical data in the northern Atlantic. Besides the collections the recent literature has served as basis. In this respect the groupings occurring in the works of Bonnevie (1899), Jäderholm (1909), Broch (1909), Sæmundsson (1911), and Kramp (1914), have proved particularly available.

I have made it a point to define precisely the limits of genera and families by full diagnoses, and at the same time I have tried to account for the leading principles I hold to for the purpose of division and classification. The various authors have maintained various opinions as to the systematic principles of classification; many of them have disregarded phylogeny and allowed biological considerations to play a predominant part; consequently the circumscription of genera has been practised in most various ways. To leave no opening for misunderstanding I have thought it necessary to give a detailed account of each species in question, even if the work should be delayed and grow a little broader than I wanted. However, I hope that in this way the extensive and methodical Danish collections will tell better and to fuller advantage than otherwise.

Trondhjem the 22nd August 1915.

I. Introductory Notes.

Scarcely in any other part of the animal world greater difficulties are thrown in the way of the systematist than those occasioned by the lowest Coelenterata, impeding the attempts to establish a natural grouping of the hydroids and their attendants, the hydromedusæ. This is due not only to the actual deficiencies of our knowledge of these low organisms, but also to the fact — as pointed out by Kühn in his excellent summary (1913) — that the groups present partly a confused series of adaptations and phenomena of convergency, partly the occurrence of medusæ of widely divergent development as companions of closely allied hydroids or, vice versa, closely allied medusæ accompanying hydroid polyps divergently developed. It is a striking fact that in certain species, for instance the *Codonidæ*, the phylogenetic development and differentiation of form of the medusæ have been comparatively stunted, whereas the polyps (*Corynidæ, Pennariidæ, Tubulariidæ*) have developed heterogeneously so as to present a large series of various forms. The exact reverse is represented by the homogeneous polyps of the family *Bougainvilliidæ* forming the nurse generation of the heterogeneously developed hydromedusæ of the families *Margelidæ* and *Tiaridæ*. The possibility of constructing a safe system common to medusæ and hydroid polyps, indeed, appears remote. For in the first place the two "generations", on account of their excessive abundance of species, have had to be treated separately, each generation by specialists of its own, and moreover, we are in fact still in the dark as to which of the two generations is to be regarded as the primitive or the phylogenetically older.

When looked upon as a whole the group of Zoophytes must be characterized as a very low group of animals. In the nurse generation as well as in the free-swimming medusæ the structure of the individual is very simple, though the medusæ after all must be said to be a little higher organised than the polyps. In addition to the two primary layers of cells, the endoderm and the ectoderm, occurs in the medusæ a "mesoglœa", whose descent from one or the other of the primary layers is not yet definitely ascertained as far as all species are concerned. However, a mesoglœa also occurs with some hydroids, for instance the "parenchyma" of the *Tubulariidæ*, which is a typical endodermal formation.

To students of the hydroids it very soon becomes obvious that the leading systematic characters have been derived from such criteria as urge themselves on a superficial view of the animals, while, contrarily to the method practised in investigating most other groups of animals, the inner anatomy is all but entirely left out of account. This is due to the generally accepted view that the

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structure of the hydropolyps is throughout quite homogeneous and accordingly affords no holds of use to the systematist. A careful study, however, of the slight information occurring in the literature as to the structure of the polyps, will show that the old view is wrong. In this connection it will be sufficient to refer to the excellent passage written by K ü h n (1913), Die Ausbildung des Polypenkörpers, in which are mentioned several examples of the heterogeneous structure of the polyps in the various groups of hydroids.

Nevertheless K ü h n himself (1913), in constructing his system of the hydroids, has, according to the old practice, left this fact almost wholly out of account. I will afterwards come back to the subject and point out how unreasonable it is to set aside this part of systematics even though a thorough investigation of the anatomy of the polyps may seem almost impracticable because of the state of preservation in which the hydroids generally occur in the materials of the great expeditions and collections. In fact, it is confirmed that L e v i n s e n (1893) is right, emphasizing that the systematist in treating of hydroids should rather lay stress on all about the nourishing individuals than on the varying development and organisation of the generative individuals.

a. The Hydroid Gonophores bearing on classification.

Our knowledge of the hydroids has advanced a vast stride ahead owing to the thorough researches of K ü h n into the development and the organisation of the gonophores (1910). As to the importance of the gonophores to systematics, it has lately (1913) been asserted by the same author that no weight whatever can be given to the various gonophoral development, but that particular stress should be laid on the structure of the full-grown gonophores. On account of difference of structure he distinguishes between four types of sessile gonophores: eumedusoids, cryptomedusoids, heteromedusoids, and, finally, the simple gonophores, called styloids (B o n n e v i e 1898). The eumedusoid gonophores, indeed, retain the structure of the medusa throughout, and occasionally breaking away (*Campanularia integra* Mc. Gillivr. — *Agastra mira* H a r t l a u b) occur like defective medusæ. The structure of the crypto-medusoid gonophores is more reduced. Certainly they keep their endocodon and their umbrellary cavity, but have a single-layered umbrellary endoderm; however, also of cryptomedusoids occur exceptional instances breaking away, as in *Pachycordyle Weismanni* H a r g i t t. The heteromedusoids are entirely wanting the umbrellary endoderm, and the inner umbrellary ectoderm is formed by delamination, not by invagination of the outer ectoderm (endocodon). The simplest gonophores, finally, are without any trace of medusoid organisation. These four types of sessil gonophores K ü h n (1913) regards as characters important to the systematist for the division of hydroids into genera.

S t e c h o w (1913) in his important work on Japanese hydroids occupies another standpoint, attaching more importance to the conditions of the gonophores. Thus he draws nearer to earlier principles of classification, but at the same time he tries to make his systematic division more manageable by drawing out characters from the outward morphology of the colonies, thus effecting the transition to the American school. The Americans, headed by N u t t i n g, look on classification only as "a matter of convenience", and accordingly in their groupings, as a matter of fact, relinquish the idea of constructing a natural system aiming at summing up and drawing by critical sifting of the characters a skeletonlike picture of the phylogenetic affinities of the group of animals in question. Con-

sequently the system brought about by the American investigators, picking up heterogeneous characters, is indeed, as I have shown in an earlier treatise (1909), to a great extent one of arbitrariness, placing the species now in one, now in another genus, according to the character it is thought desirable to emphasize at the moment. The system has, in this way, become a matter of chance.

Before proceeding to the special explanation of the several species of hydroids and their occurrence in the seas of the northern Atlantic, we, therefore, must try to realize, from a systematic and phylogenetic point of view, the value of each single character. In the first instance the question must be answered what part the gonophores play as to the phylogeny of the hydroids or, in other words, what importance has to be attached to the gonophores and their conditions for the purpose of classification.

The application of the characters of the gonophores as distinguishing marks of higher systematic unities, of families, or of subfamilies, has been abandoned by all modern investigators of the hydroids. On the other hand, it is held by several investigators that they are of importance as to the limitation of genera. The last significant publications maintaining this view, are those of Kühn (1913) and Stechow (1913). Kühn, however, applies the characters of the gonophores with much caution and discretion, while Stechow, as a glance at his tables (1913, p. 36 and the following pages) suffices to show, undiscerningly recurs to the principle of laying the main stress on the "medusa" as contrasted with the "sporosac". In fact, as long as the limits between these designations are not more precisely defined, they will be subject to much arbitrariness. An interesting instance is afforded by the point in dispute, where the limits are to be drawn between the genera *Coryne* and *Syncoryne*. The old criterion, accepted by Allman and other investigators, was the free medusa as contrasted with the fixed gonophore or sporosac, and, to all appearance, it is the same limitation Stechow tries to maintain in his table. Indeed, this principle of limitation was only supportable on the ground of the deficient knowledge of the organisation and development of the hydroid gonophores attained to in Allman's days. Kühn, therefore, (1913, p. 229) is seen to take quite another departure, defining the *Syncoryne* as including all species having "medusæ", while the *Coryne* is distinguished by styloid gonophores. It is evident from Kühn's previous argument (l. c. p. 174) that under "medusæ" he also includes the eumedusoids which normally do not break loose, and that accordingly *Coryne*, in his opinion, exclusively embraces species having styloid gonophores.

Parallel to these genera Stechow also treats of *Podocoryne* (with medusæ) and of *Hydractinia* (with "sporosacs"). Kühn (1913, p. 227) groups them in the following vague way:

Podocoryne ⎫
           ⎬ Medusen (Margelinen), Eumedusoide, Cryptomedusoide, Styloide.
Hydractinia ⎭

From his premises (l. c. p. 226) it appears that he agrees with most modern investigators, thinking it right that the two old genera should be merged into one, *Hydractinia*; for he states that in fact we have here before us a series of closely allied forms, in which "zwischen Arten mit Vollmedusen und einfachen Medusoiden die verschiedensten Übergänge bestehen". Thus Kühn, elsewhere considering the characters of the gonophores as significant generic criteria, in this place actually reduces them to mere specific characters.

In another connection Kühn (1913 p. 197) gives an instance of the fact that the sexes in

one and the same species can be distinguished by different types of gonophores; thus the female gonophore of *Laomedea flexuosa* Hincks is heteromedusoid, while the male gonophore is styloid. This strongly defined sexual dimorphism is most interesting, and the question is obvious whether the case is a solitary one, or if in other species other types of gonophores, of those stated by Kühn, might perhaps be found united in one and the same species. On that account I have (1915) more closely examined the development of the gonophores of, among others, the *Tubularia indivisa* Lin. and the *Tubularia regalis* Boeck, two species in which a marked sexual dimorphism is found pronounced in the external characters of the gonophores. The examinations resulted in the startling result that the female gonophores of both species are eumedusoid, though not equally high in medusoid organisation, whereas the male gonophores of both species are heteromedusoid and of entirely the same organisation and development as the gonophores of the genus *Lampra* Bonnevie (1898) (comp. Broch 1915). It is owing to the gonophores that *Lampra* is separated from *Corymorpha*, the latter genus producing free medusæ or having gonophores eumedusoid. Acting on this principle of division, as far as the species of the genus *Tubularia* are concerned, we should have to separate the male *Tubularia indivisa* and *Tubularia regalis* as a new genus, while the female individuals belonging to the same species would retain their places[1].

The outcome of the searching studies of the last years shows, indeed, that in proportion as a greater number of species have been examined, the more evidently the characters of the gonophores appear as criteria of species. The increasing knowledge of the gonophores makes ever clearer that the gonophores alone cannot form the base of any division of genera, but at most serve as secondarily corroborative.

The free medusæ show throughout a greater abundance of forms developed than the polyps, which are more conservative. No doubt, the medusæ present a series of phenomena of adaptation and, accordingly, display several characters of convergency, to which the systematists are inclined to attach a greater phylogenetic value than is their virtual due. Nowhere, I dare say, the adaptations to habits of life and the accommodations to varying physical conditions play such a part as with the pelagic organisms, to which the slightest variation of salinity and of temperature causes great changes of viscosity of the surrounding water, decisive of the adaptation of their suspension organs. Therefore, the hydroid systematist should not lay too much stress on the statements of the medusoid specialist as to the systematic grouping of the free-swimming generation; phylogenetically the characters of the nurse generation are of the greatest interest. A similar state of things urges itself with the sessile gonophores. It is a circumstance of vital importance to the maintainance of the species, that the generative individuals are able to accommodate themselves quickly to the peculiar conditions of life to which the species is subjected. What I observed in my treatise on the *Stylasteridæ* (1914), is fully applicable (or even more so) to the case under consideration: "Owing to their conservatism in development the polyps are of the most important phylogenetic interest. The gonophores, the generative individuals, on the other hand, might almost be said to be a playball in the hands of chance biological conditions and thus phylogenetically have much less interest".

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[1] The possibility of a fusion of four species is precluded, as in *Tubularia indivisa* and in *Tubularia regalis* ♂ and ♀ occur in the same colony.

On account of their dependence on outward conditions and their power of plastic accommodation to biological influences, the gonophores are unsuitable for basis of division into genera. On the other hand, the genera, owing to the conditions of the gonophores, often fall into a series of biological groups (or subgenera). The systematists who lay the main stress on the gonophores in establishing the system, in fact apply biological conditions as fundamentum divisionis, and let phylogeny, the properly governing principle of systematic inquiry, recede into the shade.

b. The comparative anatomy of the nourishing individuals, and the system of the athecate hydroids.

An exact review of the researches of the last years makes ever clearer, as also appears from the statements above, the correctness of Levinsen's view (1893), maintaining that in the great classification of the hydroids the main stress must be laid on the peculiar conditions of the nourishing polyps, and reducing at the same time the modifications of growth and the conditions of the gonophores as characters of subordinate importance. Later investigators[1] have, indeed, attached ever more importance to the conditions of the polyps. But in so doing they have almost exclusively taken into consideration such morphologic criteria as urge themselves on a superficial view of the polyps. The inner anatomy, on the contrary, has been disregarded. Kühn (1913) certainly by the way points out that the inner anatomy can be different in the different groups. He treats (l. c. p. 50) at some length of the peculiar structure of the polyps of the *Tubulariidæ*, and points out the multifarious development of the *thecaphores*. But in drawing the bases of his system he makes no attempt to turn these features to further account.

As a result of searching inquiries, the structure of the polyps in the different genera and families has turned out not to be quite so homogeneous as it has been generally held. Both in the construction of the ectoderm and in that of the endoderm differentiations occur, which may be characteristic of greater or smaller groups of species and give us several holds for judging the systems drawn up for hydroids in the course of time.

Therefore, it will here be appropriate to give a brief synopsis of the more important peculiarities of anatomy distinguishing the various groups of athecate hydroids, in order to apply them afterwards to drawing up the system of the group.

The *ectoderm*, deciding by the disposition of its elements whether the tentacles have to be claviform or not, has, to some extent, been turned to account as fundamentum divisionis. The claviform shape is particularly due to the accumulation of the stinging cells on the tips of the tentacles, while the tentacles are filiform when the nematocysts are more equably distributed. A third type of tentacles, which, as far as is known, is found with all thecaphore hydroids, occurs in the *Eudendriidæ*;

[1] Works like that of Poche 1914) I leave out of account. That sort of "zoology" which is based not on study of the organisms themselves, but only on what may be beaten up from books, here debouches in the construction of airy castles of complicated systematics, which does not advance zoological science by a hairbreadth, but only contributes to increasing the systematic confusion. Between "regnum" and "family" are inserted 34 — thirty four — degrees. It is a matter of regret that we do not learn how many osculant categories must be placed between "family" and "individual" to give a "full" picture of nature. But this will suffice to illustrate the scientific value of the work.

here the stinging cells are arranged in dense transverse belts round the tentacles so as to give these, when distended, a peculiar transversely striped appearance.

On the ground of filiform and claviform tentacles Kühn (1913) divides the athecate hydroids into the two principal groups of *Filifera* and *Capitata*. However, we find in the latter group also instances of filiform tentacles; in the *Pennariidæ* filiform tentacles occur together with claviform ones; in the *Tubulariidæ*, on the contrary, the claviform tentacles have disappeared, at any rate in the polyps fully developed. Kühn (l. c. p. 228), therefore, also makes the reservation that the tentacles are "dauernd oder in der Jugend geknöpft". Embryological studies on *Corymorpha* have, in fact, shown that the actinula has claviform tentacles (Torrey 1907, Hartlaub 1907). However, this state of things cannot be generalized as a matter of course to embrace the *Tubularia*; on the contrary the figures of Allman (1872) show quite distinctly that the actinula in *Tubularia larynx* and *Tubularia indivisa* have filiform tentacles, and inquiries into the *Tubularia regalis* in the Trondhjem Fjord have shown no trace of capitate tentacles during the development of the actinula. Nor do here claviform tentacles occur in full-grown polyps.

But even though the definition of Kühn must be characterized as erroneous so far, there is another criterion showing that his division of groups is correct. A searching study of the very nematocysts, shows, as a matter of fact, that the athecate hydroids fall into two large principal groups, corresponding to the *Capitata* and the *Filifera* stated by Kühn.

In the hydroids occur two characteristic principal forms of nematocysts (Pl. I, figs 1—7). In all the *Capitata* we find large oviform or almost wholly spherical nematocysts of the same principal type as is often mentioned in the *Hydra*. These large nematocysts are always accumulated on the tips of the claviform tentacles, as in the *Coryne*, while on the filiform tentacles of the *Tubularia* they are more equably distributed all over the ectoderm of the tentacles. However, these stinging capsules are also found elsewhere in the ectoderm of polyps, as is the case with *Monocoryne* and *Myriothela*. In the last mentioned form the nematocysts, like those of *Millepora*, have developed dimorphicly; besides the typical oviform nematocysts we find here a larger and more slender oval form; in general the latter nematocysts are outnumbered by the oviform ones, but still they amount to a large percentage of the total stock of stinging capsules occurring in the animal. In the *Millepora* this type of nematocysts, judging from the figures in hand, is rather broad.

The rest of the hydroids are distinguished by quite a different type of nematocysts. The predominant type is a very small, all but rod-shaped nematocyst, particularly occurring in the tentacles, generally accumulated in belts, vertically on the tentacle axis, giving the tentacles, when wholly stretched out, a peculiar transversely striped appearance, like that of the tentacles of the *Eudendrium* recorded. Concurrently with this typical small nematocyst distinguishing all *Filifera* sometimes occurs, finally, a somewhat larger form, as in the *Eudendrium* and the *Stylasteridæ*. In the *Eudendrium Wrighti* we find in the tentacles only small rod-shaped stinging capsules; on the contrary in the basal whorl of stinging cells of the polyp body of the species in question the capsules are much larger, though keeping a slenderly oval appearance. It is strange that this large type of the *Eudendrium* and the *Stylasteridæ* should appear almost entirely consistent with the aberrant slenderly oval nematocyst with the *Myriothela*. The simultaneous occurrence of the type in so different and so highly

organised forms suggests, indeed, that we have before us phenomena of convergency, the cause of which is at the moment quite inexplicable.

However, not only the ectoderm itself and its elements are of interest to comparative anatomy. The derivates of the ectoderm are of great importance. In the same way as the ectoderm of the stem secretes a periderm, we find that with all thecaphore hydroids a chitinous hydrotheca is secerned by the ectoderm of the polyp. Remarkably enough, a parallel is found also in a single genus of the athecate hydroids, the *Perigonimus*. In this genus the ectoderm of the polyp secretes a "pseudohydrotheca", a hydrotheca-like, folding periderm case of a jellied substance surrounding the basal portion of the polyp up to the tentacle whorl. The first inquiries as to the pseudohydrotheca have been made by Hadži (1913 and 1914). The pseudohydrotheca is distinguished from the real hydrotheca in having no free margin, but being distally firmly connected with the ectoderm of the polyp so as to be indistinguishable, on a superficial view, when the polyp is wholly distended. On the contrary, when the polyp is contracted, the pseudohydrotheca is, in general, easily discerned, forming a richly folded cover round the basal portion. The pseudohydrotheca bears some resemblance to the genuine hydrotheca by the way in which the polyp is attached to it, the supporting lammella of the polyp being basally connected with the pseudohydrotheca by a whorl of small chitinous prominences. Similar chitinous prominences are also seen, for instance in *Eudendrium*, connecting the soft parts of the stem with the periderm cover; systematically, however, no particular interest can be attached to them.

Also in the endoderm diversities of great interest are found. The simplest, most homogeneous shape is represented by the gastric endoderm of *Clava* (Broch 1911), forming a homogeneous epithelium for absorbing the nourishment, from the orifice of the mouth to the passage of the polyp into the stem; almost all of the cells of the gastric endoderm are filled with larger or smaller grains showing a strong affinity to Delafield's hæmatoxyline ("nutritive cells" and "albumen cells", comp. Schneider 1902). As to *Coryne*, the state of things is quite different; here the endoderm in the portion nearest to the mouth is extremely rich in mucous gland cells, while the digestive cells are comparatively few in number. In *Coryne* we must consequently distinguish between the oral portion secerning mucus and the part of the endoderm of the polyp which is the proper gastric or digestive portion. The difference between these two endodermal zones appears still more distinctly in *Myriothela*; the glandular cells are here densely concentrated on a small portion near to the mouth, strongly conspicuous by its clear blueing after being treated with Delafield's hæmatoxyline; the other endodermal cellular forms have almost wholly disappeared in the glandular zone with *Myriothela*. In *Tubularia*, on the contrary, the glandular zone has disappeared, so that the endoderm here by its homogeneous appearance all over the polyp strongly recalls the case of *Clava*.

A rather different state of things is found in the *Bougainvilliidæ*. Here, indeed, mucous cells, occur in the oral endoderm of the polyp. But the bulk of the cellular elements in the oral portion as far as the whorl of the tentacles, is constituted by cells which appear indifferent to the nutritive elements. All the cells here have small nuclei strongly concentrated, while in the gastric endoderm taking the nourishment, from the whorl of tentacles and downwards, the nuclei are large, with open chromatine net-work. This condition of things is still more pronounced in *Eudendrium*, the mucous cells of
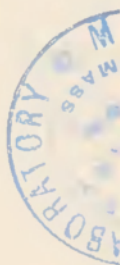
which, however, are most frequently concentrated in the proboscis, closely to the basis of the tentacles, where the entrance to the proper gastric cave is found.

Thus there is throughout a typical difference between the *Capitata* and the *Filifera* as to endodermal matters, though the *Clava* apparently presents an intermediate form or a form of departure from which the other types are derivable. Simultaneously the *Filifera*, as far as can be judged from the data in hand, bear a typical resemblance to the thecaphore hydroids, and here the parallel between the *Eudendrium* and the *Campanulariidæ* is particularly obvious. Whether this is owing to a closer affinity or it must be explained only as a phenomenon of convergency, we must at present leave unanswered, because of our deficient knowledge of the group.

A single family, the *Tubulariidæ*, shows an anatomic peculiarity, as with the species of this family there occurs a peculiar m'esogloeal formation. At the basis of the large tentacles the endoderm has developed a thick supporting cushion formed as a ring of mesoglœal tissue of large cells round the polyp. This leans inwardly on the supporting lamella, and is bounded against the axial endoderm of the tentacles by a delicate membrane, which in some cases it is rather difficult to point out.

Hollow tentacles occur in two ways. In their original shape they are, as is the case with *Hydra*, openly communicating with the gastric cave of the polyp. This state of things, however, has ceased with most hydroids and cannot be found in any of our northern species. In these, on the other hand, occasionally occurs, as in *Clava multicornis* and in *Myriothela* a central cavity in the tentacles, at any rate in their basal part. This cavity, however, does not communicate with the gastric cave of the polyp, but is basally bounded by the unbroken supporting lamella. This central cavity of the tentacles, as it is represented by well-developed *Clava multicornis*, might be looked upon as a primitive condition of things. However, in forms so highly organised as *Myriothela*, it must sooner be considered as a secondary phenomenon, which cannot have any direct correspondence with the primitive condition of things in *Hydra*.

In *Myriothela* the tentacles' show a peculiar structure, elsewhere unknown in the hydroids. The matter is more precisely described by Jäderholm (1905). The supporting lamella is in the thickened distal part of the tentacle transformed into a cushion constructed by delicate radially placed fibres, showing no cellular structure and densely crowded. They seem to be intended for strongly stiffening the distal portion of the tentacles and for making the armed outmost portion of the tentacles larger and more powerful of resistance.

On the ground of the anatomical features stated, and of morphological characters hitherto turned to account in systematics, is brought about a system which, as far as the athecate hydroid families are concerned, can be summed up in the following key of determination:

A. No formation of gonophores. Eggs and sperms, developed in the wall of the polyp. The tentacles — if such ones occur — hollow, openly communicating with the gastric cave (Sectio **Simplicia** nov.) Fam. *Hydridæ*.

B. The generative cells developed in special gonophores.
    I. The polyps with large, broadly oval or spherical nematocysts (Sectio **Capitata** Kühn).
        a. The tentacles of the polyp wholly or in part claviform.

1) The polyp having only one kind of nematocysts. The claviform tentacles of simple structure, having no central cavity and no particularly developed supporting lamella.

    a. All tentacles claviform. Fam. *Corynidæ*.

    β. The distal tentacles claviform; proximally a whorl of filiform tentacles. Fam. *Pennariidæ*.

2) The polyps, besides having oviform or spherical nematocysts, also provided with slenderly oval or nearly cylindrical stinging capsules.

    a. Without calcareous skeleton. The claviform tentacles having a central cavity, greatly widened distally, but not openly communicating with the gastric cavity of the polyp. The supporting lamella, in the outer portion of the tentacles, developed into a thick radial fibrous supporting tissue. Fam. *Myriothelidæ*.

    β. Colonies with calcareous skeleton. The tentacles of simple structure, having no central cavity. Fam. *Milleporidæ*.

b. All the tentacles of the polyp filiform, arranged in two main circles:

    1) The proximal (basal) whorl of tentacles leaning against a well-developed mesoglœal cushion. The polyps of radial symmetrical structure. Fam. *Tubulariidæ*.

    2) The mesoglœal formation at the basis of the proximal whorl of tentacles almost wanting, owing to radial canals. The structure of the polyps bilaterally symmetric. Fam. *Branchioceerianthidæ*.

II. The nematocysts always only slender, the small ones quite rod-shaped. (Sectio **Filifera** Kühn).

a. Colonies without calcareous skeleton.

    1) The tentacles irregularly spread all over the polyp, or reducible to a single large tentacle. The endoderm not differentiated into oral endoderm and gastric endoderm. Fam. *Clavidæ*.

    2) The tentacles forming a main circle round the polyp. The endoderm differentiated into an oral endoderm and a gastric endoderm.

        a. The polyps fusiform with conically pointed proboscis. Fam. *Bougainvilliidæ*.

        β. The broad body of the polyp well defined from the stem, and provided with a claviform proboscis placed with a narrow basis on the whorl of the tentacles. Often two kinds of nematocysts, large ones and small ones. Fam. *Eudendriidæ*.

b. Colonies with calcareous skeleton and with two kinds of nematocysts, the large ones being slenderly oval or nearly cylindric, frequently slightly curved. Fam. *Stylasteridæ*.

II. Athecate Hydroids of the Northern Atlantic.

Section Capitata Kühn.

Family Corynidae.

"Hydroids with fusiform or more cylindric polypes, whose oral portion is conically pointed. The stinging capsules are large, oviform, or almost globular. All the tentacles of the polype are capitate with the stinging cells mainly concentrated on the thickened distal portion. The structure

2*

of the tentacles is simple, with no central cavity, and with a thin supporting lamella without any particular thickening. In the endoderm we must distinguish between an oral portion, abounding in mucous gland cells, and the gastral portion proper. The colonies develop no calcareous skeleton".

It is questionable, as is also pointed out by Kühn (1913), whether it is justifiable to maintain the *Corynidae* and the *Pennariidae* as two distinct families. Stechow (1913) states that "das gleichzeitige Vorkommen geknöpfter und fadenförmiger Tentakel ein vorzügliches Merkmal für das Bestimmen ist"; simultaneously, however, he ranks the genera *Acaulis* and *Clavatella* with the *Corynidae*, though, having tentacles both capitate and filiform, they should, from this main characteristic, be reckoned among the *Pennariidae*. Also as compared with the *Tubulariidae*, the limitation of the *Pennariidae* makes some difficulty. Thus Bonnevie (1899) e. g. classes *Heterostephanus* among the *Tubulariidae* in spite of the fact that the species is provided with capitate distal tentacles. Stechow (1913), on the other hand, as well as Broch (1911), ranks this genus with the *Pennariidae*. I regret that I am in lack of material for a more thorough inquiry into the *Pennariidae*; it is not unlikely that the anatomical structure of the polypes might afford safer holds for the judging of this group of hydroids than the merely outward morphological characters.

The *Corynidae* form a very central group, with which all the other groups of the section of *Capitata*, stated by Kühn, are likely to have originated. — At the first glance it may appear as if one of the genera *Monocoryne* has got nematocysts heterogeneously developed, so as to show, besides oviform or globular capsules, partly also long, narrowly oval ones. That this is not the case, is ascertained by a careful study of material of *Monocoryne gigantea* (Bonnevie) collected in the Trondhjemsfjord. Partly all the nematocysts of this shape are discharged, and partly developmental stages of other nematocysts than oviform ones are not traceable. It is, therefore, obvious that, in being discharged, the oviform nematocysts assume a narrowly oval shape. The apparent dimorphism of the nematocysts would otherwise have been greatly interesting as a connecting link with *Myriothela*, and would have been likely to support the supposition of Bonnevie (1899) of the derivation of the last-mentioned genus from the *Corynidae* through *Monocoryne*. But as a matter of fact, the large *Monocoryne gigantea* shows the anatomical structure of the true *Corynidae*. Swenander (1903) mentions that its tentacles are coalesced at the basis; this statement, however, only holds good for the ectoderm, which in several places appears to be stratified; the endoderm, as far as the single tentacles are concerned, continues, wholly surrounded by the ectoderm, to the supporting lamella. *Monocoryne gigantea* presents another peculiarity which the inquirers have hitherto obviously failed to notice; the individuals are hermaphrodite, in a most peculiar way. Not only we find in a single individual sheer female and sheer male gonophores; but among these also occur several gonophores containing, besides large ova, also sperms and spermatocytes of all stages. The gonophores of this species are reduced to cryptomedusoids.

In the internal structure of the polype of the *Corynidae* our attention is fixed on a great accumulation of mucous gland cells in the endoderm next to the orifice. Here are densely accumulated a lot of cells, whose affinity with Delafield's haematoxyline make them very conspicuous on material well preserved. This concentrated glandular zone is found still more strongly marked in the *Myrio-*

thelidae, whereas in the *Tubulariidae* it has disappeared. It forms a striking contrast to the proboscis of the *Eudendriidae*, the outer oral portion of which is more abounding in indifferent endodermal cells and more nearly approaching the state of things in the *Bougainvilliidae*, in which, however, also the indifferent endodermal cells appear in larger numbers. As is mentioned before, this oral zone is wanting both in the *Clavidae* and the *Stylasteridae*.

The *Corynidae*, like their near relations the *Myriothelidae*, are distinguished by a vigorously developed polype musculation, and in connection with this show an astonishing power of changing appearance and volume. It is easy for them to swallow a comparatively large copepode, and in my material I have found several shapeless-looking *Coryne*-polypes which were digesting rather large crustaceans. Thus they are very greedy animals, frequently feeding on organisms larger than the polype of normal size. Series of sections show how the food half dissolved also is led direct into the gonophores and is absorbed by their endodermal spadix. The endodermal cells of the spadix then are filled with some granulous contents, which are greedily absorbing and tenaciously keeping the haematoxyline of Delafield, while they are rather indifferent to both the haematoxyline of Bohmer and to eosine. However, the cells also contain several eosinophile grains.

Gen. **Coryne** Gaertner.

"*Corynidae* forming colonies, with solitary capitate tentacles spread all over the hydranth. The colony is formed by the ramification of an upright hydrocaulus, whose tubes do not communicate through secondary canals. The gonophores are developed on the proximal portion of the polypes".

Many investigators place the species productive of medusae in a separate genus, *Syncoryne*. This criterion, however, is of merely biological nature, and thus of less importance to systematists. And apart from this, it is evident that some species of *Coryne* produce more strongly reduced eumedusoids which are only quite exceptionally detached from the mother colony. The species have not yet been sufficiently examined. Therefore, it is obvious that, for instance, the species *Coryne Loveni* (M. Sars) must have been several times confounded with *Coryne Sarsi* (Lovén). In the medusoid gonophores of the former species the tentacles are wholly reduced, while *Coryne Sarsi* has complete medusoid gonophores with tentacles. The opinion maintained by L. Agassiz (1860) and Hincks (1868), based on the observations of L. Agassiz (l. c.) and Clark (1865), that some species of *Coryne* at one time of their lives produce free-swimming medusae, at other times, on the contrary, sessile eumedusoids, has not yet been refuted, but, quite the contrary, been strengthened by the observation of a parallel condition of things in species of *Campanularia* (Giard 1899, Behner 1914). It is not impossible that *Coryne Sarsi* should be one of these species of *Coryne*. In *Coryne Loveni* the eumedusoid gonophore has lost its tentacles, and at the same time the development of the generative cells shows us that the gonophores are not here normally disengaged from the colony. Other species, such as *Coryne Hincksi* Bonnevie and *Coryne brevicornis* Bonnevie, seem to have gonophores somewhat more reduced, still, however, keeping the medusoid structure strongly defined. These species, then, exhibit stages forming the transition to *Coryne pusilla* Gärtner with its strongly reduced styloid gonophores.

If we, therefore, like Kühn (1913) and Stechow (1913), separate *Syncoryne* as a genus of its own, there will be insurmountable difficulties about drawing the limits. If, as is done by Stechow, the limit is drawn by the production of free-swimming medusae, *Coryne Loveni* must normally be omitted from the genus *Syncoryne*, and a species such as *Coryne Sarsi* will probably have to be reckoned sometimes among the *Syncoryne*, at other times, on the contrary, among the *Coryne*. If, on the other hand, we follow Kühn and draw the limits of genera between species with eumedusoid gonophores and species having gonophores more strongly reduced, it may be greatly questionable where, for instance, *Coryne Hincksi* and *Coryne brevicornis* ought in fact to be placed. In this case as in others, the more species we learn to know more exactly, the more impossible it proves to draw the limits of genera on the ground of gonophoral conditions. To this must be added that in all the species of *Coryne* or *Syncoryne* the colonies and the polypes are so uniform as to their appearance, that they cannot with certainty be identified to species or included under one or the other of the two "genera", if the gonophores are wanting or only little developed. It is, therefore, absurd to insist on drawing an artificial and arbitrary line of distinction, founding on merely biological phenomena of adaption.

Coryne Sarsii (Lovén) Johnston.

1835 *Syncoryna Sarsii*, Lovén, Bidrag til Kännedomen af Slägterna *Campanularia* och *Syncoryna* p. 275, pl. 8, fig. 1—6.

1847 *Coryne Sarsii*, Johnston. A History of the British Zoophytes, p. 43.

?1911 *Syncoryne Sarsii*, Sæmundsson, Bidrag til Kundskaben om de islandske Hydroider II, p. 72.

"The delicately constructed colonies attain to a height of up to 30 mm. The hydrocaulus is wholly irregularly ramified with no distinct main stem; the branches form acute angles with the stem or the main branch whence they proceed; both the stems and the branches are almost entirely smooth with no rings nor wrinkles. The strongly contractile polype, when extended, attains to a length of up to 1.5 mm., and is then almost wholly filiform; when contracted, it is oviform or nearly globular. The numerous capitate tentacles are irregularly distributed over the polype.

The gonophores develop into medusae, which are likely to break away during the greater part of the generative period of the polype; the medusa bud developes four tentacles. One or two, more rarely three, gonophores occur simultaneously on the polype".

Material:

    Iceland, Reykjavik.   Shallow water (associated with small *Mytilus*).

In all probability, Sæmundsson (1902, 1911) is right in including these very delicately constructed colonies under *Coryne Sarsii*. The occurrence of the species is boreal. But the possibility that the species is frequently confused with forms nearly related, as yet precludes certain decision as to its distribution. *Coryne Sarsii* is recorded from the coasts of Norway, Bohuslän, Denmark, Helgoland, Great Britain, Iceland, and Northern France. Hartlaub (1905 a) and Jäderholm (1903), though with some doubt, refer some colonies from Tierra del Fuego and from Patagonia to the same species.

Coryne Loveni (M. Sars) Bonnevie.

1835 *Syncoryna ramosa*, Lovén, Bidrag til Kännedomen af Slägterna *Campanularia* och *Syncoryna*, p. 275, pl. 8, figs. 7—10.

1846   —   *Loveni*, M. Sars, Fauna littoralis Norvegiae, p. 2, footnote.

1899 *Coryne Loveni*, Bonnevie, Norske Nordhavs-Expedition, p. 14.

"The colonies are rather coarsely constructed and attain a height of up to 30 mm. The hydrocaulus is wholly irregularly ramified and shows no distinct main stem. The branches proceed almost rectangularly from the stem or the mother branch, but at once curve upwards, forming a very acute angle or even a parallel with it. The hydrocaulus and the branches are almost entirely smooth, having only here and there wrinkles slightly indicated. The strongly contractile polype, when extended,

.... 200 m.   — — — — — 600 m.   .—.—.—.—.1000 m.   ...—...—...—... 2000 m.
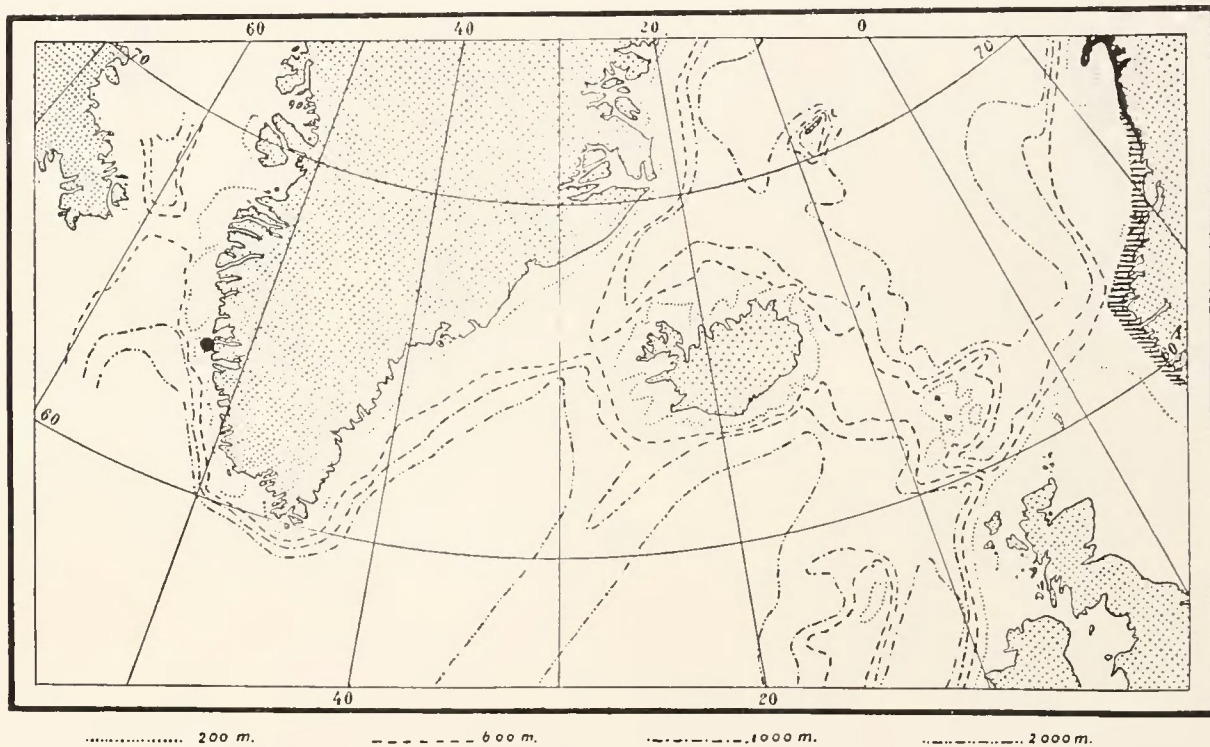
Text-fig. A. The occurence of *Coryne Loveni* in the Northern Atlantic (the hatched coastal Region denotes a scattered occurence, the totally black parts indicate a common occurence)

attains to a length of nearly 2 mm., and then is slenderly fusiform or nearly cylindric; when contracted it is oviform, oval, or almost globular. The numerous capitate tentacles are irregularly distributed all over the polype.

The gonophores develop into eumedusoids, 1.5 mm. long, with no tentacles, normally not breaking away; they have four well-developed radial canals and a circular canal. Up to three gonophores occur on the polype near its base".

Material:

       Greenland, Godthaab   litoral (on *Ascophyllum*)

       Norway, Bjarköi, Lofoten   litoral (on *Fucoideae*)

Hartlaub (1907) informs us that in his aquaria he has observed a *Syncoryne*, whose gonophores are not set free, though being full-grown medusae with four tentacles well developed; the generative products are developed in the sessile medusa, which is reduced after having performed her generative task. Hartlaub refers this form to *Coryne (Syncoryne) Loveni* M. Sars. This identification however, cannot be right; most likely we have here rather in hand individuals of the *Coryne Sarsii* during the part of the generative period when the medusae are not detached. Through Mr. C. Dons, conservator at Tromsö, I received a very copious material of *Coryne Loveni* from Bjarköi, where the species occurs in abundance on the *Fucoidea* in the tidal water region. The large number of individuals examined have most frequently two, more rarely three gonophores, which are developed into a complete medusa without any tentacles. The four radial canals end in a small enlargement, which is the only indication of tentacles traceable. The species, accordingly, cannot be identical with the form recorded by Hartlaub, but agrees very well with the description and the illustration given by Lovén.

Coryne Loveni is earlier known only from the west coast of Scandinavia[1]. Jäderholm (1909, taf. 1, fig. 7) gives an excellent drawing of the species collected from Bohuslän; elsewhere it is recorded from the coast of Norway from Bergen as far as Lofoten, where its occurrence in the northern part of its habitat is most numerous. Some colonies from Godthaab show us that *Coryne Loveni* must also be added to the fauna of Greenland. The species is native to the boreal tidal water zone and attains to its most luxuriant development in the passage to the regions of the Artic Ocean.

Coryne pusilla Gärtner.

1774 *Coryne pusilla*, Gärtner, in Pallas: Spicilegia zoologica vol. 1, fasc. 10, pag. 40; pl. 4, fig. 8.
1893 *Syncoryne mirabilis* Levinsen, Meduser, Ctenophorer og Hydroider fra Grönlands Vestkyst, p. 150.
1902 *Coryne vermicularis*, *C. fruticosa*, *Syncoryne eximia*, Sæmundsson, Bidrag til Kundskaben om de islandske Hydroider, p. 50.

"The colonies are coarsely constructed, attaining a height of up to 40 mm. The hydrocaulus is wholly irregularly branched, showing no distinct main stem; the irregularly curved branches are everywhere densely wrinkled and form almost right angles with the hydrocaulus or with the mother branch. The strongly contractile polyp, when extended, attains to a length of 2.5 mm., and is then slender and narrowly fusiform or almost wholly cylindrical; when contracted, it is oviform or oval. The numerous capitate tentacles are irregularly distributed over the polyp.

The gonophores are globose, showing a styloid structure. There occur 4—8 gonophores, irregularly distributed over the proximal (basal) half of the polyp".

Material:

The Faroe Islands.

Iceland: Grindavik.   On littoral algae (labelled *Coryne pusilla* and *C. fruticosa*).

Reykjavik.   On littoral algae (labelled *Syncoryne eximia* and *Coryne vermicularis*).

Greenland (labelled *Syncoryne mirabilis*).

[1] Dr. P. L. Kramp kindly informs me, that *Coryne Loveni* is abundant in the Little Belt.

A closer investigation of the living polyps and of their conditions very soon shows us that the appearance of the polyp is varying very strongly according to its state of contraction. Now it is stretched at length, assuming approximately the shape of a thin worm, now it is again contracted to a short, thick lump, very nearly approaching the globular shape. Sometimes the polyp is at the widest at the base; sometimes it is contracted in this part, so that the largest width appears farther out. The study of the live polyps thus, in this case as in many others, shows us that many characters which have been turned to account as criteria of species with the Coelenterata, may be of most doubtful value or even of no importance whatever to classification. In the first place, of course, this is applicable to the various states of contraction, which, in *Coryne pusilla*, have even led to subdivision into several species. Jäderholm (1909) thus, on account of difference of shape of the polyp, still distinguishes *Coryne pusilla* and *Coryne vermicularis* Hincks; as, however, all other characters wholly
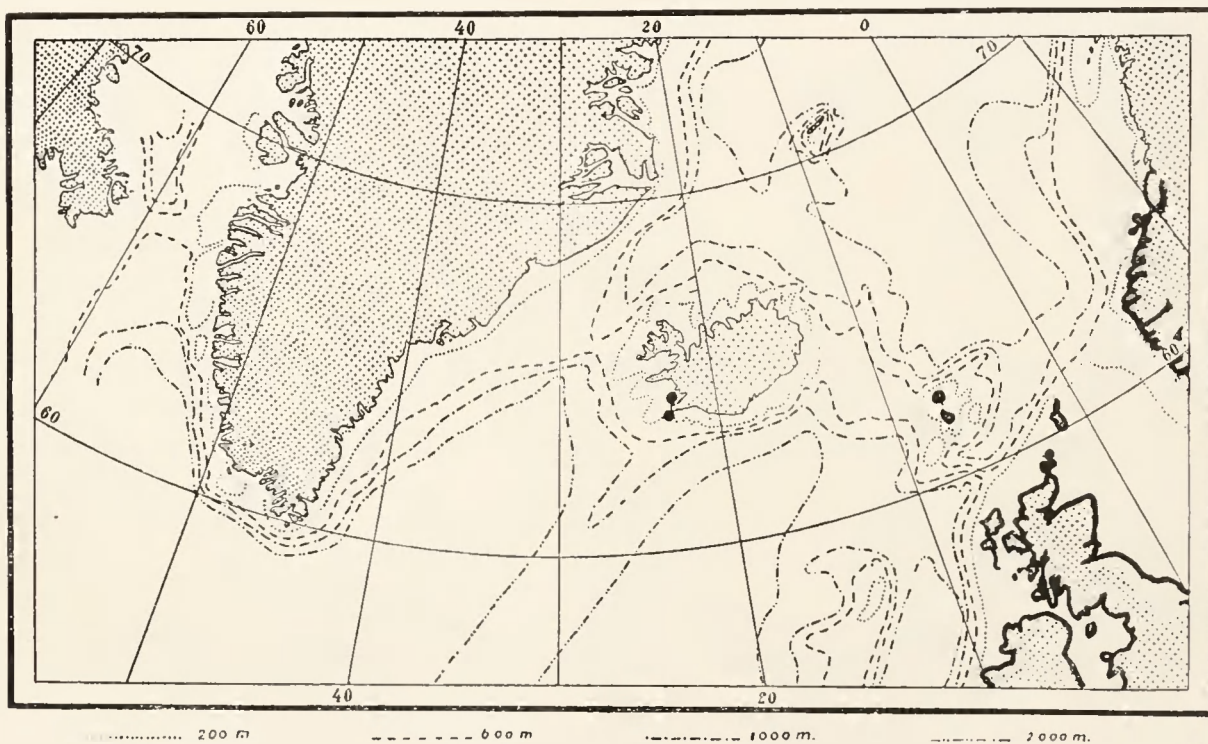
Text-fig. B. The distribution of *Coryne pusilla* in the Northern Atlantic.

agree, and the differences put to account as specific characters fall far within the limits of the polyp movements described above from observation of living individuals, the separation into species cannot be recognized; *Coryne vermicularis* forms a synonym of *Coryne pusilla* and, in fact, only represents a phase of the movement of the polyps.

Coryne pusilla has previously been recorded from the north of France, from Great Britain and Ireland, from Helgoland, from Denmark, from Bohuslän, from the west coast of Norway, from the Faroe Islands, and from Iceland (Reykjavik). In my material there also occurs a colony marked "Greenland?", wrongly determined as *Syncoryne mirabilis* Agass; the species thus seems to belong to the fauna of Greenland, but particulars are still missing. The rather numerous Icelandic colonies of the species are all derived from the south-western point of the island. The species, accordingly, must

be characterized as southern boreal; it mainly occurs along the coasts of the North Sea and round the British Isles; how far it advances to the north on the coast of Norway, we do not as yet know with certainty; but a any rate it does not push forward as far as into the Arctic seas.

Coryne sp. aff. Hincksi Bonnevie.

Material:

"Ingolf" St. 44. 61°42′ Lat. N., 9°36′ Long. W., 545 met. 4.8°.

A small colony of young individuals of a species of Coryne is attached to the stalk of a Tubularia sp. The hydrocaulus is irregularly wrinkled and attains a height of up to 6 mm. with polyps 1—2 mm. long. There occur 4—8 small, apparently medusoid, gonophores at the base of the polyp closely below the tentacles. The tentacles are short. The stolon of the colony is reptant, the stalks of the polyp are unbranched. On account of the bad state of preservation it is impossible to furnish a proper design of the individuals.

It is possible that the individuals belong to the species Coryne Hincksi Bonnevie, which has previously been recorded only from a depth of 100 fathoms near Hammerfest (Bonnevie 1899).

Family Myriothelidae.

"Large solitary hydroid polyps with stratified ectoderm, in which occur two kinds of nematocysts. Besides the typical oviform nematocysts of Capitata are found in somewhat smaller numbers narrowly oval or nearly cylindrical, rather large nematocysts which are especially frequently occurring in the ectoderm of the gonophores. The tentacles are capitate with a central cavity which does not communicate with the gastral cavity of the polyp, and which is distally broader. The vigorously developed distal portion of the tentacles is shored up by a particularly developed portion of the supporting lamella, here showing a fibrillary structure with fibres radiarily arranged. The supporting lamella is vigorously developed in the wall of the polyp and provided with bilamellae. The endoderm exhibits a dense circle of mucous glands at the mouth of the animal. No calcareous skeleton is developed".

The Myriothelidae seem to be nearly related to the Corynidae, and also to the Milleporidae, which latter form calcareous skeletons. The last mentioned family presents in its dimorphically developed nematocysts a strong resemblance to the Myriothelidae. However, only a character as the peculiarly developed supporting lamella in the thickened distal portion of the tentacles, as well as the dimorphic development of the nematocysts, justifies the distinction of the Myriothelidae as a particular family beside the Corynidae. Already Bonnevie (1899) has pointed out the near relation between Myriothelidae and Corynidae and the bridge between them suggested by the species Monocoryne gigantea (Bonnevie). The arrangement by groups of the tentacles and the attachment of the gonophores to these groups are very likely to form the base of the development of the blastostyles of Myriothela. But on account of the peculiar direction in which the structure of the tentacles

of the *Myriothelidae* has developed, we cannot subscribe to the view of Kühn (1913), reducing the two families into one. The anatomical structure of the polyps of the two groups differs too much, and to this difference must be attached a greater importance than the investigators have hitherto been inclined to do; anatomically the difference between the groups is too great to allow their amalgamation, in spite of the agreement of the two families as to the endodermal mucous gland portion near the orifice of the polyp.

Hitherto only one genus has been recorded of *Myriothelidae*.

Gen. Myriothela M. Sars.

"The large solitary polyps have only exceptionally slight indications of hydrocaulus; in general the base of the polyp is truncate or pointed and provided with rhizoids or filaments of adhesion, which are in fact transformed tentacles. Both the ectoderm and the endoderm are stratified. The tentacles are capitate and are irregularly distributed over the polyp and the blastostyles. The gonophores are developed on small polyp-like blastostyles attached to the inferior half of the polyp; the blastostyles bear tentacles on their distal portion".

The genus *Myriothela* is recorded from the northern seas and from the Antarctic Ocean. The spread and rare occurrence of the individuals prevents us from deciding whether the genus is in fact bipolar, as the finds hitherto recorded seem to indicate.

Myriothela phrygia (Fabricius) M. Sars.

1780 *Lucernaria phrygia* Fabricius, Fauna Groenlandica, Nr. 333, p. 343.
1851 *Myriothela arctica* M. Sars, Beretning om en zoologisk Reise, p. 134.
1873 — *phrygia* G. O. Sars, Bidrag til Kundskab om Norges Hydroider, p. 130.

"The capitate or almost cylindrical polyp extended reaches a length of about 400 mm. The inferior termination of the polyp is truncate, and it is attached to the substratum by tentacle-like filaments of adhesion. Above the portion wearing blastostyles it is studded with strong capitate tentacles; on the other hand tentacles are wanting on the surface of the polyp between the blastostyles.

The cryptomedusoid gonophores are developed on small polyp-like blastostyles, attached to the inferior portion of the polyp and wearing capitate tentacles on their outward parts. The female blastostyle has only one or two fully-developed gonophores at the same time, while the male blastostyles wear numerous gonophores".

Material:

"Ingolf" St. 117. 69°13′ N., 8°23′ W., depth 1003 fathoms, ÷ 1° C.
— St. 125. 68°08′ N., 16°08′ W., — 729 — ÷ 0.8° C.

Myriothela phrygia has an enormous faculty for extension and contraction, and it is likely to share this faculty with its nearest relatives. A specimen I had the opportunity of observing when it was brought up by the trawl in the Trondhjemfjord, had stretched its distal portion wearing tentacles so strongly that the animal was as thin as a thread and measured up to 30 cm. in length; but as

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soon as it was irritated by the preservation fluid, it contracted to a length of only 9 cm., and simultanously the diameter of the distal portion of the polyp increased to the measure of 2—3 mm. This observation shows how little importance is, in fact, to be attached to the absolute measures of the polyp in the limitation of the species of *Myriothela*. While the individuals from st. 117 wholly agree with the earlier descriptions and drawings of the species, the defective specimen from st. 125 (tab. I, fig. 8) at the first glance differs greatly. The broad, longitudinally strongly contracted basal portion is studded with blastostyles in a narrow belt, above which the polyp tapers rapidly so as to assume a conical appearance fairly reminding of the drawing by Bonnevie of *Myriothela mitra* (1899, tab. IV, fig. 3). However, a closer examination shows that the distal portion of the polyp has been torn off,
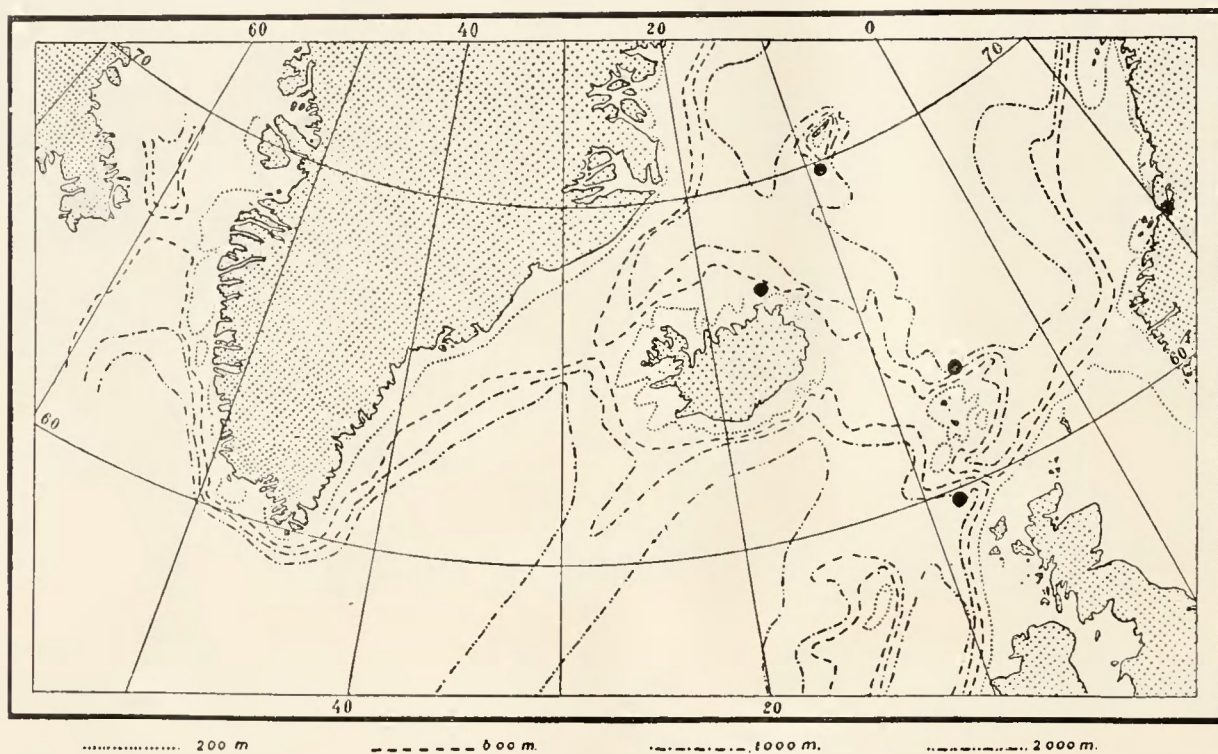
Text-fig. C. Localities of *Myriothela phrygia* in the Northern Atlantic.

and as its trunk above the blastostyles is studded with capitate tentacles, while the polyps of the species mentioned have no tentacles at all, a mistake of identity is out of the question.

Myriothela phrygia is an arctic deep-sea form, mainly occurring in the icy water at the bottom of the northern seas. It is recorded from Taimyr (Jäderholm 1908), from the north of Norway, and from the depths of the ocean between Spitzbergen and Greenland (Bonnevie 1899), besides from the localities laid down in the map subjoined (Text-fig. C). The original description has been given on specimens from Greenland, from where, however, we still lack particulars as to localities. "Ingolf" now adds two new finds in the waters of the Arctic Sea between Iceland and Jan Mayen. On the whole, the occurrence of the species is scattered; most of the finds are situated in high-arctic regions, and here the species is seen to occur even at so small a depth as between 12.8 and 14.6 m (Jäderholm 1908). Therefore, two localities are, indeed, apt to give surprise. One of these localities is recorded

from the "Michael Sars" 1902, when the species was found in the warm Atlantic waters to the south of the Wyville-Thomson-Ridge (Broch 1903). There is in this case a possibility that the animal has been carried with Arctic currents from northern regions; if so, the currents have conveyed the animal at an early period of life to the new locality, where it has been able to subsist and develop further. The other locality, in the Trondhjemfjord was previously recorded, and the Trondhjem Museum was in possession of a defective specimen which was said to have been taken in the fjord; but particulars were wanting till the researches of the fjord in 1911 brought to light, from the depth of 200 m., near Tautra, and thus in the midst of the Atlantic water layers of the fjord, a well developed female polyp. This find gives the more surprise, because there is left no opening for the possibility that the specimen should have been carried to this place from Arctic water layers. Like other Arctic hydroids, such as *Tubularia regalis* Boeck, *Corymorpha groenlandica* (Allman), and *Stegopoma plicatile* (G. O. Sars), *Myriothela phrygia* thus thrives very well in the region of the Trondhjemfjord which is otherwise characterized by Atlantic *Lophohelia*-reefs. This cannot, however, be turned to account as a proof against the Arctic character of the species; in the Trondhjemfjord all these species must be looked on as Arctic relics.

Family **Tubulariidae.**

"Hydroids forming colonies, or solitary, with large oviform or globose nematocysts in the ectoderm. The tentacles of the full-grown polyp are filiform and simply constructed with no central cavity; they are arranged in two main circles, a proximal whorl round the broad basal portion of the polyp and a distal whorl round the mouth. The basal whorl of tentacles is supported by a ring-shaped mesogloeal cushion round the basal portion of the polyp. The polyps are radially symmetrical. The supporting lamella shows a very simple structure".

Most authors refer to this family also *Branchiocerianthus*, which I reckon as the type of a family of its own, the *Branchiocerianthidae*. This family is distinguished from the *Tubulariidae* partly by bilaterally symmetrical polyps, partly by the peculiar anatomical structure of the polyps. In fact, the structure of the polyps of the *Branchiocerianthidae* differs greatly from that of all other hydroids (comp. Stechow 1909). There occurs a supporting lamella of complicated structure, and the polyp is provided with numerous, prominent radial canals. They are distinguished from the *Tubulariidae* also in their inner anatomy by almost lacking any trace of mesogloeal tissue at the base of the proximal whorl of tentacles, owing to the radial canals. These points of difference are, indeed, of such importance that they fully justify the separation of *Branchiocerianthus* into a family of its own, the *Branchiocerianthidae* beside the *Tubulariidae*.

Kühn (1913) divides the *Tubulariidae* into two subfamilies, *Tubulariinae* and *Corymorphinae*. The former he defines by the characters "Koloniebildend, Periderm gut entwickelt", while the latter is defined as "Solitär, Periderm häutig oder rückgebildet, Wurzelhaare". To this is to be observed that a species as *Tubularia cornucopia* Bonnevie is a typical *Tubularia* in spite of its forming no colonies. The filamentary appendages of *Corymorpha* must be compared with similar phenomena in *Myriothela*, some species of which have rhizoids, while others such as *Myriothela Cocksi* (Vigurs), attach themselves by a plateformed perisarc; when this is considered as nothing else or no more than a criterion

of species with *Myriothela*, there tells indeed little in favour of raising it to a distinguishing mark between two subfamilies of the *Tubulariidae*. As far as finally the development of the periderm is concerned, this is a gradual character showing many transitions, to which no importance can be attached as a distinguishing mark between two subfamilies.

Gen. Tubularia Linné.

"Hydroids most frequently forming colonies, the hydrocaulus being surrounded by a stiff and chitinous perisarc. The polyps are radially symmetrical, having two main circles of tentacles, a proximal (basal) whorl of long tentacles leaning on a mesogloeal ring in the trunk of the polyp, and a distal whorl with short tentacles round the mouth. The tentacles are also in the actinula filiform.[1] The gonophores are generally borne on blastostyles; the gonangia spring from the trunk of the polyp between the two whorls of the tentacles".

The gonophores are, in this genus as in most other genera, sometimes medusoid, sometimes more or less reduced. The species producing free medusae have been grouped by many authors as a genus of their own, *Hybocodon*. In this case as in others, the question then arises where the line is to be drawn. While in species as *Tubularia pulcher* (Sæmundsson) the medusa breaks away, the fully developed medusoid gonophore in *Tubularia regalis* Boeck, as far as is known to us, never voluntarily relinquishes its sessile existence. If we follow Kühn (1913), as might seem right, we get into a dilemma, having to refer the female of *Tubularia regalis* to *Hybocodon*, while the male, having crypto-medusoid gonophores (Broch 1915), must remain in the genus *Tubularia*. Only this should be sufficient to show the error of turning the organisation of the gonophores to account as fundamentum divisionis. No doubt, it is wrong to set up *Hybocodon* as a particular genus of hydroids, and the same is certainly the case with the genus *Auliscus* set up by Sæmundsson (1899), the medusae of which as we are going to see, are scarcely particularly distinguished as compared to the other *Hybocodon*-medusae.

Tubularia pulcher (Sæmundsson).

1899 *Auliscus pulcher* Sæmundsson, Zoologiske Meddelelser fra Island, p. 425, Tab. IV.

"Colonies, the hydrocauli of which are up to 50 mm. long, unbranched, and separated down to the reptant hydrorhiza. The stalk is covered with a brown perisarc, which is thick at the base, but upwards against the polyp narrowing periodically and at distinct intervals, so that the stalk gets an appearance approximately articulate; the spaces between the transverse striae, brought about in this way, attain their greatest length in the middle part of the stalk, being here 13 mm. long. The upper portion of the stalk is provided with a thin perisarc, widening funnel-shapedly into a thin collar under the polyp. The polyp is fitted out with a basal circle of 24—30 tentacles, about 5 mm. long; the distal tentacles, about 30, are placed, densely crowded, in a narrow belt, consisting of several rows, round the orifice, and attain a length of a little more than 1 mm.

The gonophores develop into free *Hybocodon*-medusae with gemmation on the bulb of the

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[1] The tentacles of the actinula may be swollen at their tips (comp. Allman 1872) but never show the dense accumulation of stinging cells here, which is so characteristic in the truly capitate tentacles of the section *Capitata*.

large tentacle; there are four radial canals. The bell exhibits five exumbrellary stinging cell stripes. The gonophores are developed on eight blastostyles faintly branched, a little more than 1 mm. long".

Material:

    Iceland, Reykjavik.   Near the shore (1 specimen).

The specimen in hand is one of the original specimens investigated by Sæmundsson (1899). It is an individual with hydrocaulus 30 mm. high. The polyp is fitted out with 25 proximal tentacles, 5 mm. long, and 8 blastostyles a little branched, about 1 mm. long. A closer inquiry of the gonophores gives a picture somewhat different from that drawn from the explanation of Sæmundsson. In the first place the umbrella of the medusa is not quite symmetrical, but somewhat oblique, as in *Hybocodon prolifer* L. Agassiz. At first only one tentacle, not two, is developed on the large tentacle bulb (Tab. II, fig. 16); the "corpora acuminata et duo ovata", mentioned by Sæmundsson as springing from the tentacle bulb, are all gems of medusae; none of them can be made out as "initium tentaculorum novorum" belonging to the original medusa. Wherever at the first glance two tentacles seem to occur on the bulb, a closer research will show that one of them in fact belongs to the bud of a new medusa on the bulb of the gonophore. Therefore, we have to concur in the opinion of Hartlaub (1907) and subscribe to his explanation of the apparent occurrence of two tentacles with *Hybocodon prolifer* as satisfactory for the species in hand, that "bei der Knospung von Hybocodon der Tentakel in der Entwickelung stark voraneilt und schon fertig sein kann, wenn der dazu gehörige Medusenkörper noch nicht deutlich in die Erscheinung getreten ist".

The conditions of gonophores described show a much nearer relationship to *Tubularia* (*Hybocodon*) *Christinae* Hartlaub (= *Tubularia prolifer* Bonnevie 1899). Hartlaub's drawing of *Hybocodon Christinae* (1907, fig. 98) is, according to the statements cited, easily reconcilable to the figure a little more skeletonlike given by Sæmundsson (1899, tab. IV, fig. 3). Nor is the difference between the polyps very great; Bonnevie (1899) states for her specimen 14 proximal tentacles, about 10 mm. long, while the species stated by Sæmundsson is said to have 24—30. It is a matter of regret that we only know the length of the proximal tentacles of the specimen in hand. But on account of the great contractility of the tentacles, no particular systematical importance can be attached to their length, and as far as the difference of numbers of the proximal tentacles is concerned, we see in other *Tubulariidae* within easy reach such a variety that the difference quoted by itself cannot justify any separation of species. When *Tubularia Christinae* is nevertheless maintained as a separate species beside *Tubularia pulcher*, it is in the first place owing to the express declaration of Bonnevie (1899) that her specimen has no collar under the hydranth; such a collar is, on the other hand, strongly developed in *Tubularia pulcher*, though at the first glance it may seem very little distinctive on material preserved.[1]

Hartlaub (1907) holds that the medusa is identical with the medusa drawn by Steenstrup (1842), *Coryne fritillaria*, and much is speaking in favour of the correctness of this supposition. On the other hand, the polyp described by Steenstrup, in the same place and by the same name, cannot be identified. It may be that it really is a *Coryne*; some features are even suggestive of *Coryne Loveni* M. Sars; but the only thing the drawing shows us with full certainty, is that the polyp is no

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[1] The original specimen of Bonnevies *Tubularia prolifer* was wanting in the museum of the Kristiania university.

Tubularia, and that its medusoid gonophores, if they are rightly perceived, cannot develop into medusae of the *Hybocodon* type.

The only locality from which *Tubularia pulcher* is recorded with certainty, is the shore near Reykjavik, Iceland, where it has been found only once.

Tubularia indivisa Linné.

1758 *Tubularia indivisa* Linné, Systema Naturae, Ed. 10, p. 803.
1899   —   *obliqua* + *T. indivisa* Bonnevie, Norske Nordhavs-Expedition, p. 24.

"Colonies, whose long dark brown-coloured hydrocauli are, in the lower part, twisted together. The stems are covered with a vigorous perisarc, but show no rings nor wrinkles. No collar is formed below the polyp. The polyp has a basal whorl of 20 to 30 tentacles up to 20 mm. long; the distal tentacles are up to 3 mm. long and densely crowded round the orifice in a whorl consisting of several rows.

The female gonophores are eumedusoid with four rudimentary radial canals, one of which (the shortest) is often slightly indicated even in the gonophore fully developed. The gonophore has, near the apex, a tentacle-like bulging, obliquely situated. The male gonophores are crypto-medusoid and almost wholly globular, not oval. The gonophores are born upon up to 10 blasto-styles, which attain a length of 10 mm. The actinula-larvae, when set free, wear filiform tentacles".

Material:

"Ingolf" St. 31, 66°35' N., 55°54' W.; depth 88 metres 1,6° C. (Davis's Straits).
—   St. 87, 65°02'₃ N., 23°56'₂ W.; depth 110 metres (West-Iceland).
Greenland: Davis's Strait (without further data).
—   Egede's Minde (—   —   —).
Iceland: Brede Bugt 65°12' N., 23°28' W., depth 36 fathoms.
—   Grindavik   littoral.
—   Skagestrand   depth 60 fathoms.
—   Vestmannö   littoral.
The Faroe Islands (without further data).
The North Sea: the West side of large Fishing bank 57°7' N., 2°40' E., depth 37 fathoms.

Swenander (1903) has pointed out that *Tubularia obliqua* Bonnevie (1899) is based on female individuals of *Tubularia indivisa;* thus in the very external characters of the gonophores this species presents a peculiar sexual dimorphism, and inquiries into the conditions of the gonophores (Broch 1915) have made good that this sexual dimorphism is a radical one, the female gonophores being eumedusoid, the male ones on the contrary cryptomedusoid. — *Tubularia indivisa* is very easily confounded with the following species, *Tubularia regalis*, particularly when only male individuals are in hand for examination. In this case only the somewhat different shape of the gonophores makes it possible to refer with certainty the individuals to one species or the other, the male gonophore of

Tubularia indivisa being globular, and accordingly broadly rounded in the distal part, while that of *Tubularia regalis* is oval and showing an attempt to be pointed in the distal part.

Tubularia indivisa has a very wide distribution. Its main occurrence in the boreal seas is bound to the middle and deeper parts of the littoral region and to the upper part of the deep sea region. From the cold area we find the species but once recorded, by Grieg (1914). After the examination of his specimens I cannot confirm this record; the specimens consisting only of hydrocauli without polyps, more probably belong to another species of *Tubularia* inhabiting the deep sea.

To judge from literature, *Tubularia indivisa* penetrates rather far into the shallower parts of the Arctic regions, where it is recorded even from the New Siberia Islands (Jäderholm 1908). However, as appears from what is stated above, there is a possibility that some of the Arctic individuals
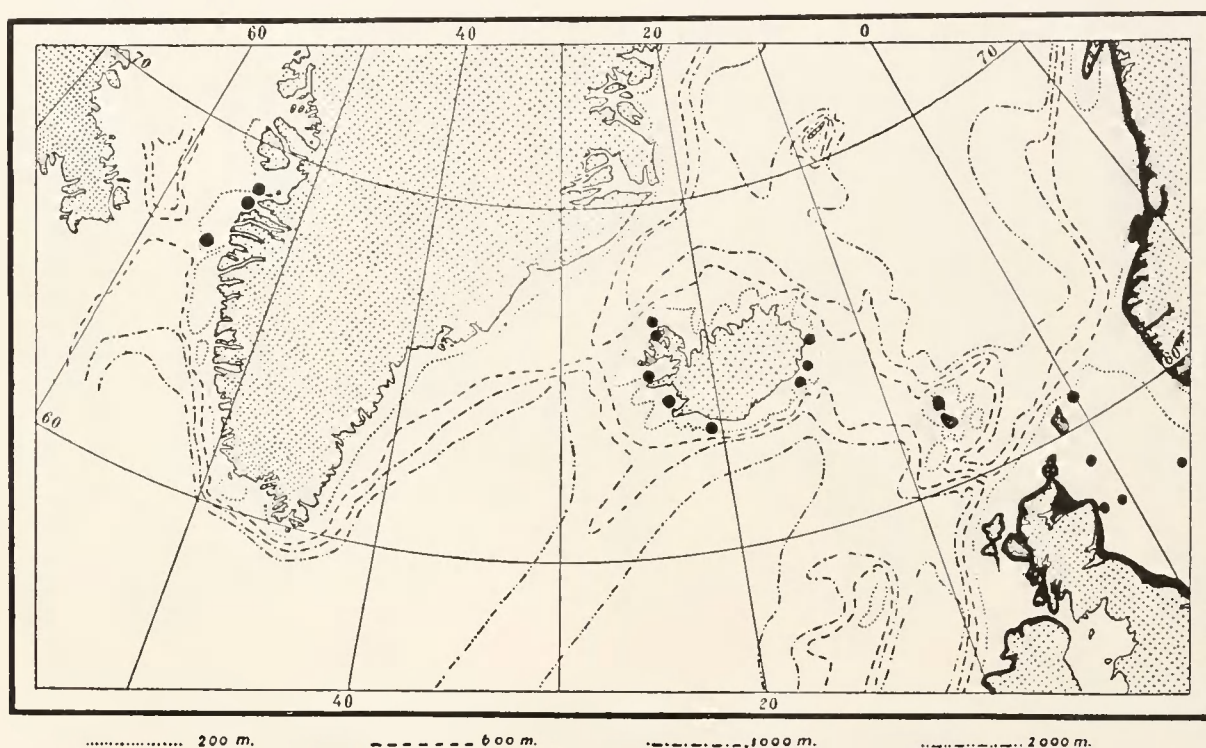
Text-fig. D. The distribution of *Tubularia indivisa* in the Northern Atlantic.

are in fact to be referred to *Tubularia regalis*. — The species also penetrates far towards the south. It is recorded by Fewkes (1881) even from the Caribbean Sea, by Allman (1877) from between Cuba and Florida, and by Billard (1906) from the west coast of Africa. As *Tubularia indivisa* is recorded at the same time both from the East and the West coast of North America, it must be characterized as a circumpolar or rather "circumboreal" (Nordgaard 1912) species.

Tubularia regalis Boeck.

1860 *Tubularia regalis* Boeck, Videnskabsselskabets Forhandlinger for 1859.
1899 — — + *T. variabilis* Bonnevie, Norske Nordhavs-Expedition, p. 24.

Colonies whose long, dark-brown-coloured hydrocauli are in the lower parts twisted together. The stem is covered with a vigorous periderm, but shows no rings nor wrinkles. No collar is formed

below the polyp. The polyp wears a basal whorl of 20—35 tentacles up to 40 mm. long; the distal tentacles, up to 3 mm. long, are densely crowded round the orifice in a whorl consisting of several rows.

The female gonophores are eumedusoid with 3—6 external longitudinal ribs and as many corresponding radial canals. The male gonophores are cryptomedusoid and oval, often with an attempt to be pointed in the distal part. The gonophores are born upon up to 20 blastostyles, which attain a length of 35 mm. The actinula larvae, when deliberated, wear filiform tentacles.

Material:

Between the Faroe Islands and the Shetlands, depth 505 fathoms.

Tubularia regalis presents so many points of resemblance to *Tubularia indivisa* that the risk of confounding the two species is very easily incurred. As a general rule, the full-grown polyps of *Tu-*
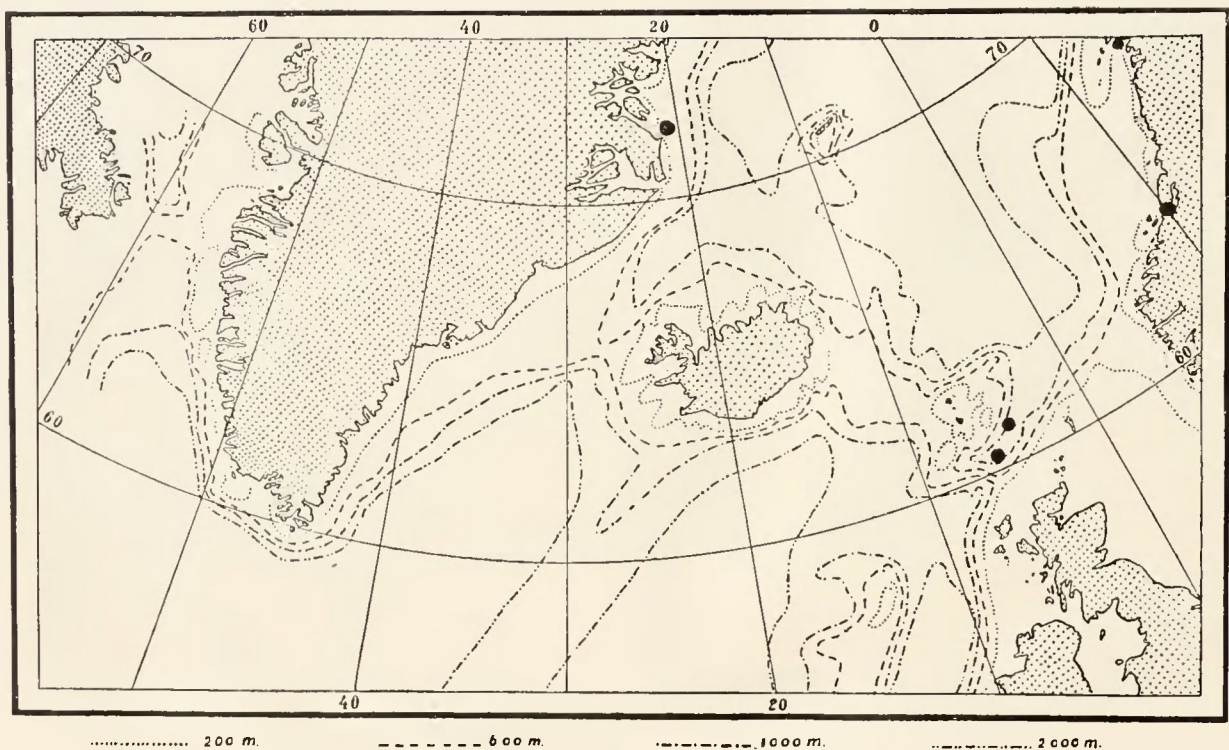
Text-fig. E. The occurence of *Tubularia regalis* in the Northern Atlantic.

bularia regalis are larger than those of *Tubularia indivisa*. But this is not the case in younger individuals of *Tubularia regalis*, in which consequently the only certain distinguishing marks are presented by the gonophores. The gonophores, indeed, are typical enough in the female individuals, but are not very conspicuous in the male ones, especially at earlier stages. The male gonophores of *Tubularia regalis* are oval, while those of *Tubularia indivisa* are globular. It is evident from the diagnosis of the species, that also *Tubularia regalis* presents a strong sexual dimorphism. The first who got aware of this fact, was Swenander (1903), who accordingly pointed out that the female had been described as a different species *Tubularia variabilis* Bonnevie.

Tubularia regalis is a form of true Arctic character, particularly occurring in the deeper parts of the cold area. In the seas far towards the north it rises to shallower parts, and it is, for instance,

recorded from Spitzbergen at the depth of only 38 m. (Broch 1909). Evidence of its occurrence in the Kara Sea is still wanting. From this locality a specimen is in hand, determined by Bergh (1887) as *Tubularia regalis*. As a matter of fact, the specimen is a *Corymorpha*, probably a *Corymorpha glacialis* M. Sars. — A remarkable exception to the habitat stated is formed by the frequent occurrence of the species in the Trondhjem Fjord, where it is found in abundance on the *Lophohelia*-reefs. In spite of the luxuriant development which it attains in the Trondhjem Fjord, it must probably, like *Corymorpha groenlandica* (Allman), *Myriothela phrygia* (Fabricius), and *Stegopoma plicatile* (G. O. Sars), be accounted for as an arctic relict in this locality.

Tubularia larynx Ellis et Solander.

1786 *Tubularia larynx*, Ellis et Solander, The Natural History of Many Curious and Uncommon Zoophytes, p. 31.
1864   — *humilis*, Allman, Notes on Hydroida, p. 57 and 60.

Colonies whose long polyp stems, generally unbranched and irregularly curved, are separated quite down to the tangled network of basal tubes. The stems are covered with a fairly vigorous, but colourless perisarc, which is irregularly wrinkled or more rarely quite smooth. The polyp wears a basal whorl of up to 25 tentacles, attaining a length of 8 mm.; the numerous distal tentacles, 2 or 3 mm. long, are densely crowded round the orifice in a whorl consisting of several rows.

The gonophores are eumedusoid, without radial canals, but with a rudimentary circular canal; they are most frequently provided with three rudimentary tentacles. The gonophores are supported by 6—12 short blastostyles, which may be erect or hanging. The actinula larvae, when deliberated, show filiform tentacles.

Material:

Iceland: Reykjavik.

		depth	4	fath.
Gustsey		depth	4	fath.
Keflavik		—	15—16	—
Faxebugt three miles N 37 E Keflavik		—	19,5	—
Off Havnefjord		—	25	—
Stykkisholm		—	20—30	—
Skagi		—	40	m.
Vestman Islands		—	28	fath.
The Faroe Islands: Andefjord		—	16—23	—
The North Sea 60°35′ N., 1°50′ W.		—	50	—

The synonymy of the varying species has been thoroughly accounted for by Fenchel (1905). He points out that, as is also maintained by Bonnevie (1899) and by Swenander (1903), *Tubularia coronata* Abildgaard must be subsumed under *Tubularia larynx*. On the other hand, it is not plainly seen whether he regards *Tubularia humilis* Allman to be a peculiar species. On a closer examination, indeed, the characters pointed out by Bonnevie (1899) as distinguishing marks, prove to be of no particular systematic importance. The wrinkling of the stem is strongly varying from

4*

one individual to another in a larger colony, and individuals with quite smooth stems are not seldom observed in colonies which are otherwise typical *Tubularia larynx*. The dimensions of *Tubularia humilis* wholly agree with those of young colonies of *Tubularia larynx*, and the numbers stated as characteristics stand far within the range of variability known in this species. Then only remains the condition of the blastostyles, which should be erect in *Tubularia humilis*, but hanging in *Tubularia larynx*. An examination, however, of living material will show that only in rare cases the blastostyles of *Tubularia larynx* can be described as hanging (comp. Broch 1911); on the contrary they are generally borne in a rather erect position, particularly when not yet very large. Thus also this criterion proves to fail, and consequently we are forced to consider *Tubularia humilis* as a synonyme of *Tubularia larynx*.

Tubularia larynx is an entirely boreal species, which has its main occurrence in the zone of the
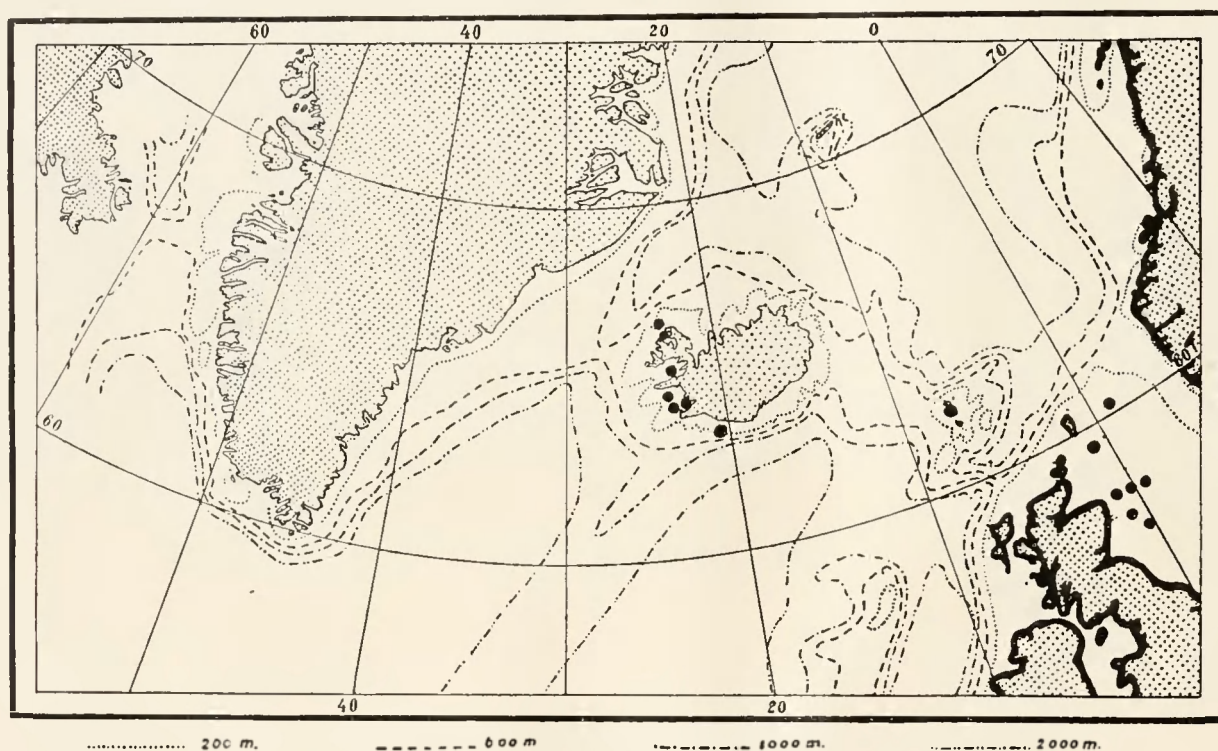
Text-fig. F. The distribution of *Tubularia larynx* in the Northern Atlantic.

laminaria and the red algae. Towards the south it enters into the Mediterranean, and towards the north it penetrates as far as Nova Zembla, and seems still to occur at Spitzbergen. On the south-western coasts of Iceland it is very frequent, and it is also found on the east coast of North America. It is to be wondered that the species has not yet been met with at Greenland.

Tubularia sp. indet.

Stems of *Tubularia* of the type *indivisa-regalis* are in hand from the following localities:

"Ingolf" St.   8.   63°56′ N., 24°40′ W., depth 136 fathoms, + 6°0 C.
   —   -   35.   65°16′ -   55°05′ -   —   362   —   + 3°6 -
   —   -   36.   61°50′ -   56°21′ -   —   1435   —   + 1°5 -

"Ingolf" St. 40. 62°00′ N., 21°36′ W., depth 845 fathoms, + 3°3 C.

—   - 86.   65°03′6 - 23°47′6 -   —   76   —   ?

—   - 87.   65°03′2 - 23°56′2 -   —   110   —   ?

—   - 106.   65°34′ - 8°54′ -   —   447   —   ÷ 0°6 C.

—   - 127.   66°33′ - 20°05′ -   —   44   —   + 5°6 -

—   - 143.   62°58′ - 7°09′ -   —   388   —   ÷ 0°4 -

Of a type like that of *Tubularia cornucopia* Bonnevie from the localities:

"Ingolf" St. 11.   64°34′ N., 31°12′ W., depth 1300 fathoms, + 1°6 C.

—   - 18.   61°44′ - 30°29′ -   —   1135   —   + 3°0 -

Gen. **Corymorpha** M. Sars.

Solitary hydroids, whose contractile hydrocaulus is surrounded by a flexible, thin, and membran-
aceous perisarc. The hydrocaulus is attached to the substratum by numerous rhizoids. The structure
of the polyp is radially symmetrical with two main whorls of tentacles, a proximal or basal whorl
of long tentacles supported by a mesogloeal ring in the polyp body, and a distal whorl of short ten-
tacles round the orifice. In the full-grown polyp all the tentacles are filiform; in the actinula
larva at any rate the distal (oral) tentacles may be capitate. The gonophores are generally supported
by blastostyles; the gonangia arise from the body of the polyp between the tentacle whorls.

As early as 1909 I stated this limitation of the genus, grouping at the same time the species,
on the ground of gonophoral matters, in four subgenera. However, I suggested that, as to the rela-
tions between the two subgenera *Monocaulus* and *Lampra*, a closer inquiry was wanting. As a matter
of fact, one of the species stated by Allman (1876) *Monocaulus groenlandica* really proves to be
identical with two of the species of *Lampra* stated by Bonnevie (1899). Also the other northern spe-
cies of *Monocaulus* has met a peculiar fate, being first ranked by Allman (1872) within his genus as
Monocaulus glacialis (M. Sars), and afterwards (1876), after the examination of some specimens from
the museum of Copenhagen, described as a new species, *Amalthaea islandica* Allman.

These matters, indeed, throw a glaring light on the unmaintainability of the subdivision into
so-called "genera" to which *Corymorpha* has been the subject. At the first glance it is a matter of sur-
prise that Stechow (1913) still tries to maintain the old genera. Indeed, in zoology more considera-
tion must be given to the observations made on living individuals than has hitherto been done. Thus
the two main criteria turned to account by Stechow (1912) for the purpose of distinguishing *Cory-
morpha Sarsii* Steenstrup (1854) and *Corymorpha vardöcnsis* Loman (1889) testify to the fact that
matters of contraction are still allowed to play a prominent part as to the limitation of species. By
the observation of a living *Corymorpha* it will soon be ascertained that, by extension and contraction
of the lower parts of the polyp and of the upper sections of the stem, the same polyp will show now
a more emphatic distinction from its stem, now a smoother transition into it. The points of difference de-
lineated by Stechow (1912, Taf. 12, Fig. 2 and 3) are, in this respect, not so great as those which
may be observed in a single individual while alive. The other main character, that the spadix of the

gonophore of *Corymorpha Sarsii* is "fast immer" projecting from the umbrellar cavity, while this is "fast nie" the case with *Corymorpha vardöensis*, is in the first place very vague, and secondly dependent partly on the various contraction of the umbrella, partly on the sex and the degree of maturity of the gonophore. On the whole there can be no doubt that the description of *Corymorpha vardöensis* is based on an individual of *Corymorpha Sarsii*.

I have entered on this subject because S t e c h o w (1912, 1913) puts together the species mentioned into a genus of their own, *Amalthaea*. The genus was first established by O. S c h m i d t (1854) for the species *Amalthaea uvifera* O. S c h m i d t, which is likely to be identical with *Corymorpha Sarsii*. It embraces the species of *Corymorpha* whose gonophores develop into complete medusae, but, after all, not breaking away, whereas the species whose medusae are normally breaking away, are gathered in the genus more narrowly limited, *Corymorpha*. It is evident, however, that the medusa of *Amalthaea* exceptionally breaks away and then leads a wretched life, unfit as it is for free existence on account of possessing a too small umbrella, the greater part of which is, into the bargain, occupied by the enormous spadix with mature generative cells. The medusa strongly reduced, further, shows so near a relationship to the medusa of *Corymorpha nutans* M. S a r s that a systematist of medusae so skilful and discerning as H a r t l a u b (1907) decides on only placing it in a subgenus of the medusoid genus *Corymorpha*. The classification afterwards maintained by M a y e r (1910), who distinguishes the two groups of medusae as peculiar genera and even places them in quite different places in his synopsis, as *Amalthaea* and *Steenstrupia*, only proves that he has failed to notice the excellent drawing by M. S a r s (1877), which shows us in fact, that the female gonophore, when fully developed, is often an entirely typical *Steenstrupia*, though one of the main tentacles is not quite so large as in *Corymorpha nutans*. The figures delineated by S a r s wholly agree with the facts observed in living individuals, and make good the correctness of H a r t l a u b's view of division, giving the right place to affinity and biology. But where is then the fundamentum divisionis adaptable for the purpose of classifying the *Corymórpha*-like species of polyps into separate genera?

From *Amalthaea* to *Monocaulus glacialis* there is, indeed, a very short step; all the difference, as a matter of fact, is to be found in the gonophore, also here eumedusoid, being even somewhat more reduced, as the tentacles, the special organs of the umbrellar margin, are entirely wanting. The conformity of the polyps is obvious; the gonophores of both species are eumedusoid and normally sessile; the difference is accordingly too little for a separation of genera.

Then only remains the group of *Lampra*, whose gonophores are cryptomedusoid. A generic separation between, for instance, the species of *Lampra* and *Corymorpha* (*Monocaulus*) *glacialis*, will, as I have recently pointed out (1915), correspond to a generic separation between ♂ and ♀ in *Tubularia indivisa* L i n n é or *Tubularia regalis* B o e c k. A particular argumentation of the unnaturalness of this limitation is hardly required. But then it is obvious, as a matter of course, that a generic separation of the species of *Lampra* and the other species of *Corymorpha* cannot be maintained. Also the species of *Lampra* must be ranked within the genus *Corymorpha*.

Corymorpha nutans M. Sars.

1835 *Corymorpha nutans*, M. Sars, Beskrivelser og Iagttagelser ...... p. 7, Pl. 1, Fig. 3.

The hydrocaulus, when extended, attains a height of 100 mm. It is broad at the basis, attached to the substratum by numerous rhizoids, and tapering upwards till it reaches its least breadth closely below the polyp. The basis of the polyp is broad and surrounded by a proximal whorl consisting of up to 50 tentacles, which, when extended, attain a length of 30 mm. The distal tentacles are small and placed round the orifice in a main whorl composed of several irregular circles quite closely set.

The gonophores are developed into free medusae with four radial canals, one well-developed tentacle and three rudimentary ones. The gonophores are developed on 15—20 blastostyles, arising

.... 200 m.   _ _ _ _ _ _600 m.   ._._._.._ 1000 m.   ._._.__._..2000 m.
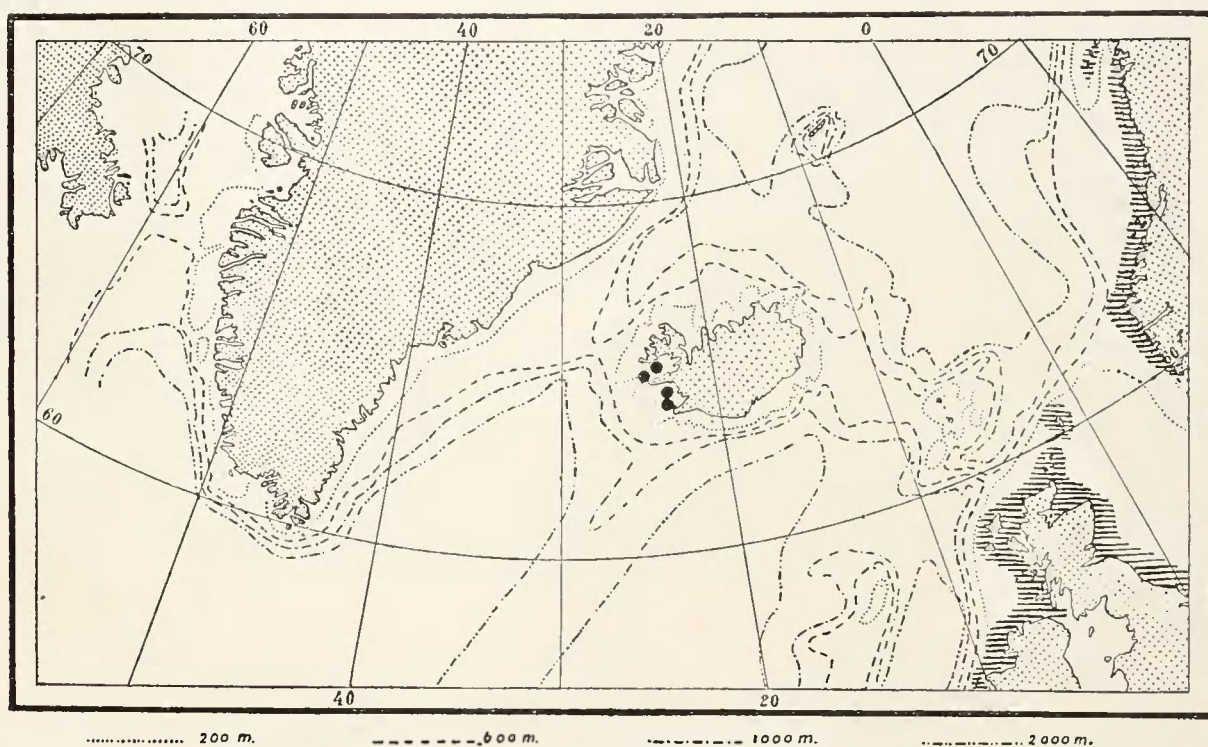
Text-fig. G. The habitat of *Corymorpha nutans* in the Northern Atlantic.
(In the hatched regions the litterature denotes a scattered, allthough common occurence).

closely above the proximal whorl of tentacles. The blastostyles bear small alternating branches, each provided with a large number of gonophores.

Material:

Iceland, 16 minutes N. W. Akranes, depth 26—30 fathoms (a couple of young polyps).

The occurrence of the species is typically boreal. It is indigenous to the middle parts of the littoral region. Towards the north it goes along the coast of Norway as far as Lofoten and towards the south it penetrates to the northern parts of France. The species is recorded by J ä d e r h o l m (1909) from Matotschkin Schar (Nova Zembla) at the depth of between 2 and 5 fathoms. This find is most peculiar and mysterious. *Corymorpha nutans* occurs not rarely in the North Sea, and I think H a r t - l a u b (1907) is right in supposing the specimen from the North Sea recorded by me (1905) as a *Cory-*

morpha, to be in fact a young colony of *Corymorpha mutans*. Remarkably enough, the species has not yet been met with at the Faroe Islands; but it has been found several times on the west side of Iceland. At Greenland it is not likely to occur; nor has the species as yet been recorded from this locality.

Corymorpha glacialis M. Sars.

1859 *Corymorpha glacialis*, M. Sars, Om Ammeskægten Corymorpha.

1872 *Monocaulus glacialis*, Allman, A Monograph of the Gymnoblastic or Tubularian Hydroids, p. 396.

1876 *Amalthæa islandica*, Allman, Diagnoses of new Genera and Species of Hydroida, p. 256, Pl. IX Fig. 5—6.

? 1887 *Tubularia regalis*, Bergh, Goplepolyper fra Kara-Havet.

Nec 1893 *Amalthæa islandica*, Levinsen, Meduser, Ctenophorer og Hydroider fra Gronlands Vestkyst, p. 151.

The hydrocaulus, when extended, attains a height of 100 mm. It is wide at the base, where it is attached to the substratum by numerous rhizoids, and is gradually tapering upwards till closely below the polyp where its width reaches its minimum. The polyp has a broad base, surrounded by a whorl of up to 50 tentacles, which, when extended, attain a length of 30 mm. The distal tentacles are small and numerous, placed round the orifice in a main whorl formed by several irregular and closely set circles.

The gonophores are eumedusoid, with four radial canals, but without rudiments of tentacles. They are sessile. The gonophores are scattered all over the surface of 30—35 unbranched blastostyles, the oldest and most developed ones at the apex of the blastostyle.

Material:

Iceland, Ofjord (without particular data). Original specimen of *Amalthaca islandica*.

? The Kara Sea ("Dijmphna". Particular data are wanting). Labelled *Tubularia regalis*.

The original specimen in hand of *Amalthaca islandica* Allman (1876) proves as clearly as desirable that this species is wholly identical with *Corymorpha glacialis*. Allman, certainly, states that the gonophores of the species are provided with four short tentacles, which are also, in his rather skeletonlike drawings, delineated as rather considerable formations. But in the original specimen can only in some straggling gonophores be pointed out some accidental wrinkles, which, when acting in good will, we may consider as the origin of the rudimentary tentacles stated. Other divergencies from the typical *Corymorpha glacialis* are, on the whole, not traceable.

A specimen from the Kara Sea has been identified by Bergh (1887) as *Tubularia regalis* Boeck. The specimen is an unquestionable *Corymorpha* and no *Tubularia*; indeed, everything suggests that it is a *Corymorpha glacialis*, but the state of preservation impedes a safe identification.

According to the particulars in hand *Corymorpha glacialis* is indigenous mainly to Arctic waters. It has been recorded from the Varanger fjord (M. Sars 1859), from Nova Zembla (Marenzeller 1877), and from Spitzbergen (Broch 1909). But the species also penetrates into warmer water

layers, as is seen (Text-fig. H) from the finds to the north east of the Faroe Islands and on the south east coast of Iceland (Broch 1903). As new localities must be added Northern Iceland (Ofjord). On the other hand, the specimens from Davis Strait, recorded by Levinsen (1893) as *Amallhaca islandica*, prove to belong to *Corymorpha groenlandica* (Allman).

Corymorpha groenlandica (Allman) Broch.

1876. *Monocaulus groenlandica*, Allman, Diagnoses of new Genera and Species of Hydroida, p. 257, Pl. IX, Fig. 7—8.

1893. *Amalthæa islandica* + *Monocaulus groenlandica*, Levinsen, Meduser, Ctenophorer og Hydroider fra Gronlands Vestkyst, p. 151.

200 m. ------ 600 m. ·—··—··—·· 1000 m. ··—··—··—·· 2000 m.
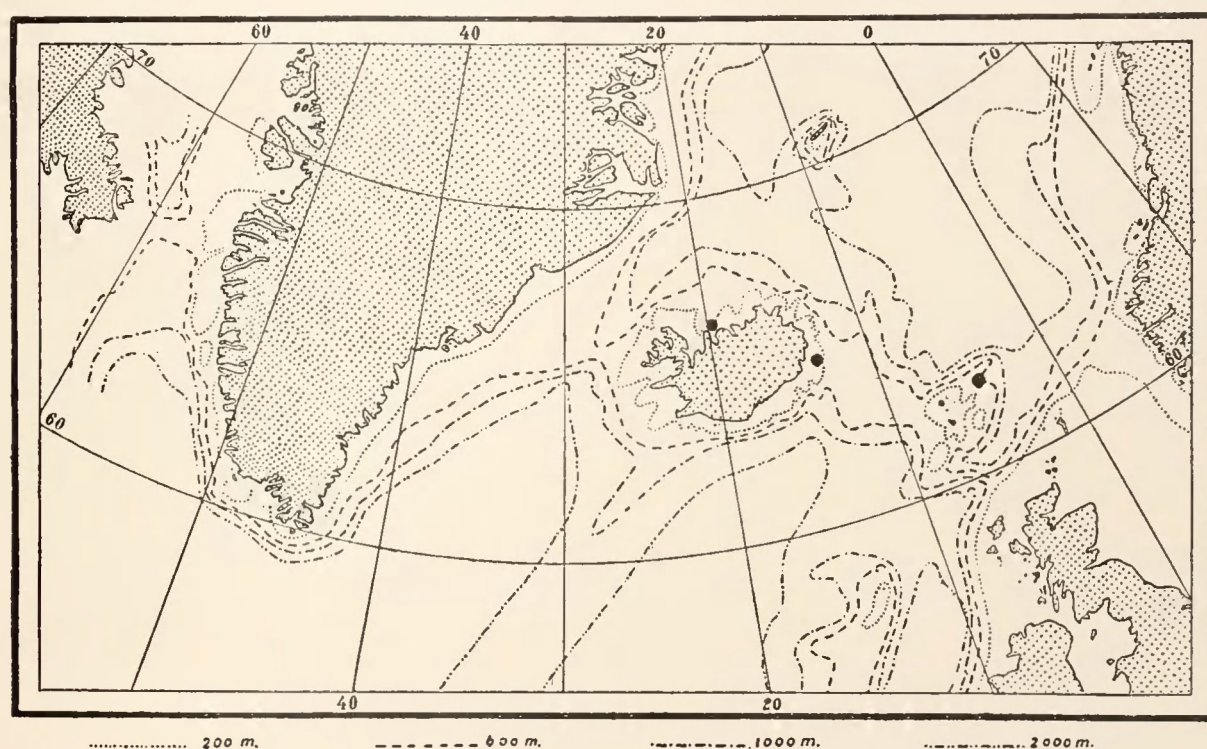
Text-fig. II. Finds of *Corymorpha glacialis* in the Northern Atlantic.

1899 *Lampra atlantica* + *Lampra purpurea*, Bonnevie, Norske Nordhavs-Expedition, p. 20, Tab. II Fig. 4, Tab. III Fig. 1.

1903 — *socia*, Swenander, Über die athecaten Hydroiden des Drontheimsfjordes, p. 6, Taf. Fig. 1—3.

1909 — *arctica*, Jäderholm, Hydroiden, p. 41, Taf. I Fig. 9—10.

1909 *Corymorpha spitzbergensis*, Broch, Die Hydroiden der arktischen Meere, p. 140.

1915 — *groenlandica*, Broch, Hydroiduntersuchungen IV, p. 11.

The hydrocaulus, when extended, attains a height of 100 mm; it is widest at the base, where it is attached to the substratum by numerous rhizoids, and is gradually tapering upwards till close below the polyp where the width reaches its minimum. The polyp has a wide base, surrounded by

a basal whorl of up to 37 tentacles, which, when extended, attain a length of 40 mm. The distal tentacles, when extended, attain a length of 9 mm; they are placed in large numbers round the mouth in a main whorl formed by two or more irregular and closely set circles.

The gonophores are cryptomedusoid and globular ($♀$) or sub-oval ($♂$), often somewhat tapering distally, but without any rudiments of tentacles. The gonophores are supported by unbranched and strongly contractile blastostyles, which, when extended, attain a length of 40 mm. The gonophores first ripen at the apex of the blastostyle. As many as 32 blastostyles may occur, but, in general, the number is much smaller; the blastostyles arise close above the basal whorl of tentacles.

Material:

"Ingolf" St. 102. 66°23' N., 10°26' W., depth 750 fathoms, ÷ 0°9 C.
      -   107. 65°33' - 10°28' -   —   492   —   ÷ 0°3 -
      -   139. 63°36' - 7°30' -   —   702   —   ÷ 0°6 -

Greenland: Godthaab (no particulars) [Allman's original specimen of *Monocaulus groenlandica*].

Davis Strait, depth 100 fathoms [labelled *Amalthaea islandica*].

Iceland: 66°02' N., 11°05' W.

5 miles east of Seydisfjord; depth 435 fathoms.

The fairly well preserved specimens of the material recently collected show the following characters (all the measurements are given in mm).

Nr.	Finds	Height of Hydro-caulus	Blastostyles		Proximal Tentacles		Distal Tentacles		Observations
			Number	Length	Number	Length	Arrangement	Length	
1	"Ingolf" St. 139	90	14	5	?	?	in several close circles	2	Hydrocaulus strongly extended
2	"Ingolf" St. 139	60	15	1—3	?	?	in several close circles	2	Blastostyles very strongly contracted
3	"Ingolf" St. 107	57	13	3.5	26	25	in a double circle formed by alternating displacement	1.5	
4	"Ingolf" St. 102	45	10	5	23	up to 24	in several close circles	1.5	
5	"Ingolf" St. 102	41	8	5	25	24	in a double row formed by alternating displacement	2	
6	Davis Strait	40	20	7	24	25	in several close circles	5	
7	"Ingolf" St. 107	?	10	6—13	21	30	in three irregular rows formed by alternating displacement	1.5	Hydrocaulus more than 50 mm high
8	"Ingolf" St. 102	?	9	4	28	up to 23	in several close circles	2	
9	"Ingolf" St. 107	?	16	3—4	24	22	in a double row formed by alternating displacement	2.5	
10	66°2'N. 11°05'W.	?	28	5—18	22	25—30	?	?	Blastostyles placed alternatingly; attempt at forming two rows
11	"Ingolf" St. 107	?	14	4	18	18	in three irregular rows formed by alternating displacement	2	

The species, which is widely distributed in the deeper parts of the cold area, has been found by several expeditions, and has formed the base of the genus *Lampra* stated by Bonnevie (1898, 1899). I have already in works earlier published pointed out that, for several reasons, this genus cannot be maintained. In the first place, the name of *Lampra* had already been applied to a subgenus of the beetle family *Buprestidae*, and should, therefore, disappear among the hydroids, according to the rules of nomenclature internationally adopted. Secondly the characters distinguishing *Lampra* from *Corymorpha* are not sufficient to justify a separation of genera.

A closer examination of the numerous northern species of *Lampra* described will show their unmaintainability. A survey of the figures forming distinguishing characters is obtained by grouping the criteria stated as follows:

| Nomenclature | Height of Hydrocaulus | Blastostyles | | Tentacles | | | | Gonophores |
| | | Number | Length | Proximal | | Distal | | |
				Number	Length	Arrangement	Length	
Monocaulus groenlandica Allman 1876 .	1 inch	7—8	?	ca. 20	"Moderately long"	"numerous"	short	no tentacles
Lampra arctica Jäderholm 1909	45 mm	22	5—8 mm	25	25 mm	5-6 close circles	?	globular, broadly oval with rounded apex
Corymorpha spitzbergensis Broch 1909 .	60 mm	12	5 mm	25	20 mm	4-5 close circles	2 mm	oviform or globular without tentacles
Lampra atlantica Bonnevie 1899 ...	80 mm	10	4—6 mm	10	10-20 mm	several close-set circle	?	without tentacles
Lampra purpurea Bonnevie 1899	100 mm	10	30-40 mm	30	30-40 mm	two circles	?	without tentacles
Lampra socia Swenander 1903.......	45 mm	18—32 till 25 mm		29—37	35 mm	numerous close-set circles	up to 9 mm	♀ more rounded, ♂ sub-oval, without tentacles

The original discription given by Allman (1876) is founded on a series of young individuals from Godthaab, in which it may be observed how the number of proximal tentacles increases by new tentacles being established and growing out among the old ones. How far the number of tentacles may increase in this way, cannot be settled. But no definite rule of the increase being traceable, we here face one of the reasons of the great varying of the numbers of tentacles. In these young individuals it is also interesting to observe that the distal tentacles are established quite irregularly Tab. II Fig. 14), and that the blastostyles arise as simple fingerformed bulges of the polyp wall. The gonophores only appear at a rather late stage of development.

The skeletonlike figures and rather deficient diagnosis of the species given by Allman long impeded its recognition, and, therefore, only a couple of specimens occurring in the museum of Copenhagen have later on been correctly referred to his species *Monocaulus groenlandica*. Bonnevie (1899) accordingly describes two new, closely related species, *Lampra atlantica* and *Lampra purpurea*. The former species is distinguished from the latter mainly by its small number of tentacles, having only ten proximal ones. However, even though this difference must be regarded as very large, as far as in the single specimen of *Lampra purpurea* as many as thirty proximal tentacles have been observed, we cannot acknowledge it as a sufficient specifical distinguishing character after the examination of a larger material of the species. The rather numerous specimens found in the Trondhjem fjord present

so great a range of variability that the number stated in *Lampra atlantica* must only be considered as an extreme variation. The variation of the individuals found in the Trondhjem fjord is even larger than stated by Swenander (1903); individuals have been found with only 15 tentacles in the proximal whorl. The difference in the shape of the gonophores, being either subglobular or oval with attempts at tapering, is of little importance. Swenander points out that the female gonophores are more globose, the male more oval. In a specimen picked up north east of the Seydisfjord (Iceland) the gonophores are partly globular, partly oval, with the same attempt at tapering towards the distal end as is shown in the figure of Bonnevie (1899, Tab. III, Fig. 1 a). However, one criterion is still left, the distal tentacles of *Lampra purpurea* being arranged in two separate circles, while in other species they are placed in several irregular and close-set circles. From the comments of Bonnevie it appears that the description has mainly been based on the drawings of G. O. Sars, which were executed on board ship. In these drawings the double whorl is not peculiarly clearly rendered; nor can, from the remnants of the original specimen kept, the character be ascertained any longer. From the table set up of the specimens from the Danish collections, however, it appears that, from individuals with a distal whorl consisting of two rows to individuals with a distal tentacle whorl of several rows, every transition may be pointed out. Thus neither this table nor the criteria stated in the other table may be turned to account for the purpose of attaching any peculiar systematical importance to this character. *Lampra atlantica* and *Lampra purpurea*, therefore, cannot be recognized as two separate species, and are moreover identical with *Corymorpha groenlandica*.

For a thorough examination of the species we are indebted to Swenander (1903), who considered the *Lampra* of the Trondhjem fjord as a peculiar species, *Lampra socia*. From what I have stated above, the shape of the gonophores, applied by Swenander as a main character distinguishing the species from *Lampra purpurea* Bonnevie, cannot be maintained as a criterion. The number of the blastostyles then remains; Bonnevie, for both the species mentioned, states 10 blastostyles; Swenander, for *Lampra socia*, 18—32. Still Swenander has not found the minimum for the individuals of the Trondhjem fjord; as a matter of fact, specimens with only 15 blastostyles are now in hand. In the Danish material collected from the northern Atlantic the number is throughout lower, varying from 10 to 28, thus bridging the difference between *Lampra socia* and the species stated by Bonnevie. Also the other distinguishing characters, the emphatic demarkation of the hydrocaulus from the polyp, or its gradual transition into the latter, and the colour of the animals, are varying from one individual to the other, forming no strongly defined limits. The demarkation of the stem from the polyp more or less emphatic, is, in living individuals, varying according to the state of contraction, as in other species of *Corymorpha*. Therefore, also *Lampra socia* must be considered as a synonym of *Corymorpha groenlandica*.

Jäderholm (1909) and Broch (1909) describe two new species, respectively *Lampra arctica* and *Corymorpha spitzbergensis*. The table at once shows that they come within the range of variation of *Corymorpha groenlandica*. As to *Lampra arctica* the short and thick blastostyles, maintained by Jäderholm (1909) as a good criterion, are in fact to be looked upon as a mere phenomenon of contraction which may be partly observed even in preserved material, where in the same individual some blastostyles may be short and thick, while others are thin and strongly extended. Illustrative in this

respect is the individual nr. 10 of the first table, the length of the blastostyles varying from 5 to 18 mm., and the thickness being inversely proportional to the length. The rest of the distinguishing characters fall under what has been earlier stated.

Corymorpha groenlandica is a typical form characteristic of the great deep of the cold area. It proves to be widely distributed, from Spitzbergen to the Faroe Islands, and from Norway to Greenland. It has also been recorded from Davis Strait. In the seas far to the north it rises to more shallow waters. Thus it has been recorded near Spitzbergen at the depth of only 45 metres (Broch 1909). A remarkable geographical exception is formed by the occurrence of the species in the deeper Atlantic

.... 200 m.   _ _ _ _ _ 600 m.   .—.—.—.— 1000 m.   ._._..—.—. 2000 m.
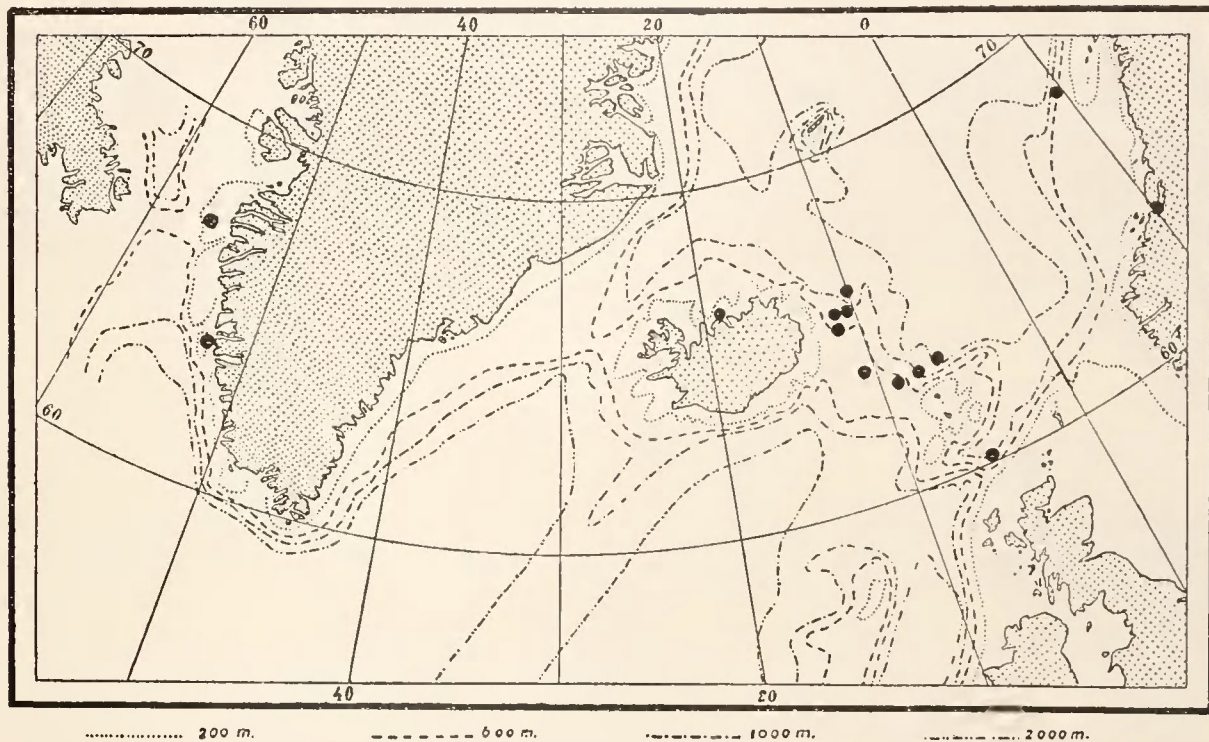
Text-fig. I. Localities of *Corymorpha groenlandica* in the Northern Atlantic.

strata of the Trondhjem fjord. At present the occurrence of the species in this locality cannot be accounted for. But a great deal may be said in favour of the notion that we have here in hand a relict form, which has been able to accommodate itself to the altered circumstances in the same way as *Tubularia regalis* Boeck and *Stegopoma plicatile* (M. Sars) which are rather frequently occurring on or at the *Lophohelia* reefs of the fjord.

Corymorpha sp. indet.

Indeterminable remnants of species of *Corymorpha* occur from the following localities:

"Ingolf" St. 28, 65°14′ N., 55°42′ W., depth 420 fath., + 3°5 C., attached to the tube of a *Pectinaria*.

—   - 124, 67°40′ - 15°40′ -   —   495 —   ÷ 0°6 -

Section Filifera Kühn.
Family **Clavidae.**

Hydroids forming colonies, with polyps fusiform or capitate, the distal part of which is coni-
cally tapering. The stinging cells are small and rodformed. The tentacles are filiform, irregularly dis-
tributed over the body of the polyp, now and then showing a heterogeneous development or even
reduced to a single large tentacle. The endoderm forms a homogeneous gastral cell-layer through
the whole of the polyp. The colonies have no calcareous skeleton.

The family *Clavidae*, as it is here defined, includes the genus much in dispute *Monobrachium*,
which has been distinguished by most investigators as the representative of a family of its own, *Mo-
nobrachiidae*. This family is maintained even by Kühn (1913), who has obviously failed to notice
the significant pointing out by Vanhöffen (1909) of the heterogeneous development of the tentacles
of *Campaniclava clionis* Vanhöffen, forming an obvious link between *Monobrachium* and the other *Cla-
vidae*. Vanhöffen, therefore, does away with the family *Monobrachiidae* and refers *Monobrachium*
to *Clavidae*. In this he is rightly followed by Stechow (1913).

Gen. **Clava** Gmelin.

The reptant colonies have polyps capitate or subfusiform with filiform tentacles irregularly
distributed over the polyp. The proboscis is conically pointed. The hydrocauli are not surrounded
by any distinct stiff perisarc. The gonophores are clustered on the polyp below the portion bearing
tentacles, or seated on the reptant stolons either solitary or in clusters.

According to· this diagnosis also the genus *Rhizogeton* must be included under *Clava*. The two
genera have hitherto generally been distinguished on the ground that in *Rhizogeton* the gonophores
are seated on the stolons, while in *Clava* they are borne by the polyp itself. This criterion, however,
is too insignificant to justify a division of genera, and it is also suggested by Stechow (1913) that
very likely the two genera have to be united. In his key of genera, indeed, Stechow puts down
Rhizogeton in a parenthesis under *Clava*.

Clava multicornis (Forskål) Gmelin.

1775 *Hydra multicornis*, Forskål, Descriptiones animalium, p. 131.
1776   —   *squamata*, Müller, Zoologia Danicæ Prodromus, p. 230.
1788 *Clava parasitica*, Gmelin, in Linné: Systema natura Ed. 13, vol. I, p. 3131.

On the reptant stolons the capitate or almost fusiform polyps are placed in close or opener
clusters. The stem of the polyp is without perisarc. The filiform tentacles are irregularly distributed
over the distal parts of the polyp.

The gonophores are cryptomedusoid, and placed in larger or smaller groups like clusters of
grapes closely below the portion of the polyp bearing the tentacles.

The species may be divided into two forms:

Forma *genuina*, growing, in colonies more openly constructed, on stones and shells (*Mytilus*); it is delicately built and bluish or rose-coloured.

Forma *squamata* forming clusters of polyps more brick-coloured or yellowish-red on the leaves of *Fucoideae*; its polyps are large and robustly built.

Material:

Iceland: Reykjavik   depth 3—4 fathoms.

           Vestmanney   on the shore (on *Fucoideae*)

The Faroe Islands: Sundelaget

               north of Kvalvik   on the shore (on *Fucoideae*)

               (There also occur specimens marked "Faerö" without particular data).

Clava multicornis and *Clava squamata* are recorded by most investigators of hydroids as two separate species; the distinguishing characters, however, are rather vague, being made out by the closer or opener occurrence of the polyps in the colony or by the colour of the colonies. A copious material from various localities, in fact, presents all transitions possible, and it is virtually impossible to draw any certain limit between the species. A closer inquiry soon makes clear to us that the points of difference must be of biological nature, and the two species, therefore, have to be regarded only as biologically determined "forms" of a single species, which I, accordingly, denominate forma *genuina* and forma *squmata*. The occurrence of typical colonies of the forma *genuina*, which are, in

.... 200 m.   — — — — — — 600 m.   —..—.—.—..1000 m.   —..—..—..—2000 m.
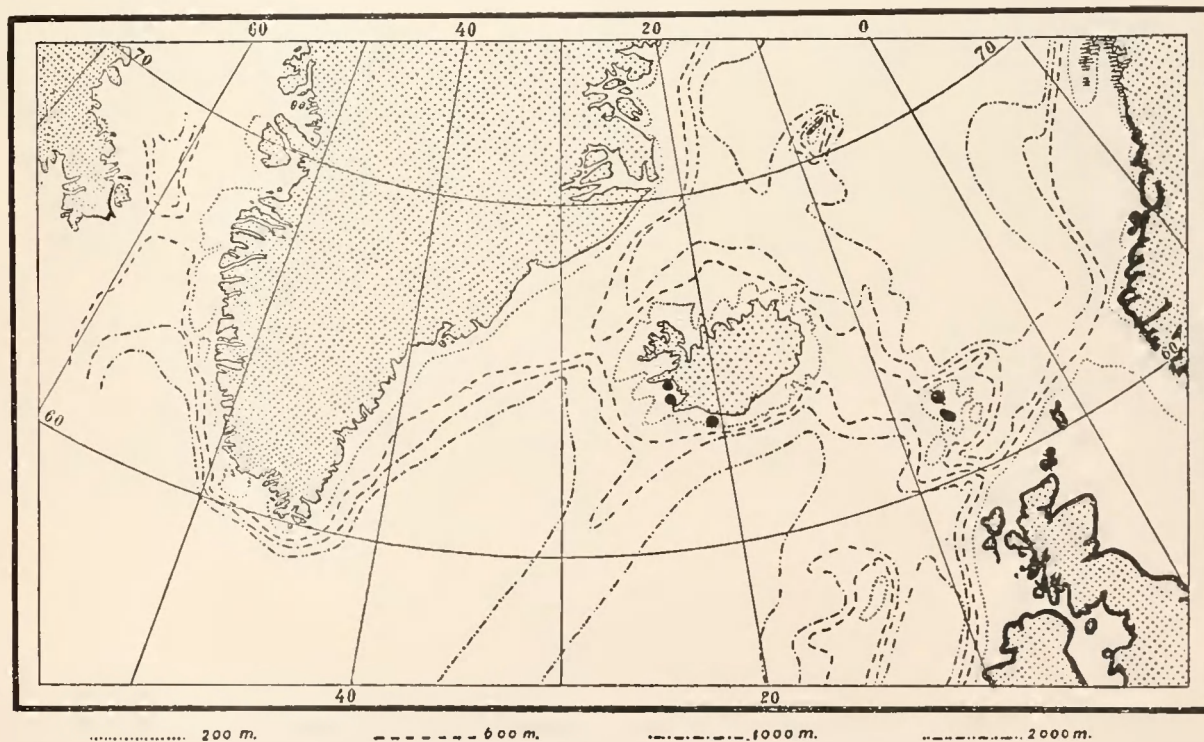
Text-fig. K. The distribution of *Clava multicornis* in the Northern Atlantic.
(In the hatched part of the Norwegian coastal region the occurrence is rather scarce).

fact, rather rare and scattered, is bound to substrata of stones, which may be, at a pinch, replaced by the shell of a *Mytilus*, while the colonies luxuriantly developed of the forma *squamata* are resident on the leaves of the *Fucoideae*, where certainly the supply of food is much more copious.

The description of Forskål (1775) being older than that of O. F. Müller (1876), we have according to the rules of nomenclature in force, to drop the specific name employed by the latter, *Clava squamata* and to maintain the denomination bestowed on the species by Forskål, *Clava multicornis*. Its limitation from the American species *Clava leptostyla* L. Agassiz, has not as yet been ascertained, and it seems on the whole questionable if the two species are really to be distinguished.

Clava multicornis is a boreal species, which seems, nevertheless, to be able to penetrate far into the Mediterranean (Babić 1904). It is a littoral form, and forma *squamata* has been found only in the tidal zone; forma *genuina*, on the other hand, at rare intervals, has been met with a little beneath the tidal zone in places with rather small salinity. Fabricius (1780) records the occurrence of the species at Greenland without particular statement of locality; however, it has not afterwards been observed in this place. On the other hand, the species seems to occur not unfrequently on the south west coast of Iceland. It is frequently met with at the Faroe Islands, and is found everywhere round the British Isles and on all coasts round the North Sea. Its occurrence at the northern parts of the coast of Norway is not sufficiently accounted for, but does not seem to be particularly frequent.

Gen. **Merona** Normann.

From the reptant stolons arise unbranched, chitinous polyp stems. In the upper part of the stem the perisarc is so wide that the polyp can be retracted into it, though developement of a hydrotheca is not indicated. The filiform tentacles are irregularly spread over the polyp. The gonophores are borne upon reduced polyps (blastostyles) arising from the reptant stolons.

With great hesitation I set up *Merona* as a genus of its own. It is distinguished from *Corydendrium* van Beneden (1844) only in mere trifles of no great importance. Thus its polyp stems are unbranched, while the hydrocaulus of *Corydendrium* is richly branched. Another distinguishing character may perhaps be sought in the quality presented by *Merona* in its wide perisarc, into which the polyps are retractile. But none of these criteria can be said to be of properly generic value. When, nevertheless, *Merona* is provisionally maintained, it is due to the fact that only an exceedingly scarce material of a single species is in hand, and that the state of preservation of this material allows of no closer inquiry into the polyps.

Merona cornucopiae Norman.

1864 *Tubiclava cornucopiae*, Norman, On undescribed British Hydrozoa, Actinozoa and Polyzoa, p. 357.
1865 *Merona*   —   Norman, On Merona, an undescribed genus of British Hydrozoa, p. 262.

The hydrocauli are unbranched and attain a height of about 5 mm.; the stems are narrowest at the base and increase gradually in diameter till they attain their greatest width closely below the

extended polyp; they are without rings; at most there is some faint and irregular wrinkling here and there. The polyp is fusiform with the tentacles irregularly distributed all over the surface; the polyp may be retracted into the broader distal portion of the hydrocaulus.

The structure of the gonophores seems to be strongly reduced. They are developed at the upper part of blastostyles without tentacles, at most 1 mm. high.

Material:

The Faroe Islands: 13 miles West to South of Munken, depth 150 fath. (on *Cardium* sp.).
- — — 9 — East South East of Bispen, — 70 — (- — -).

.... 200 m.   _ _ _ _ _ _ 600 m.   .—.—.—.—.1000 m.   .....—.....—..... 2000 m.
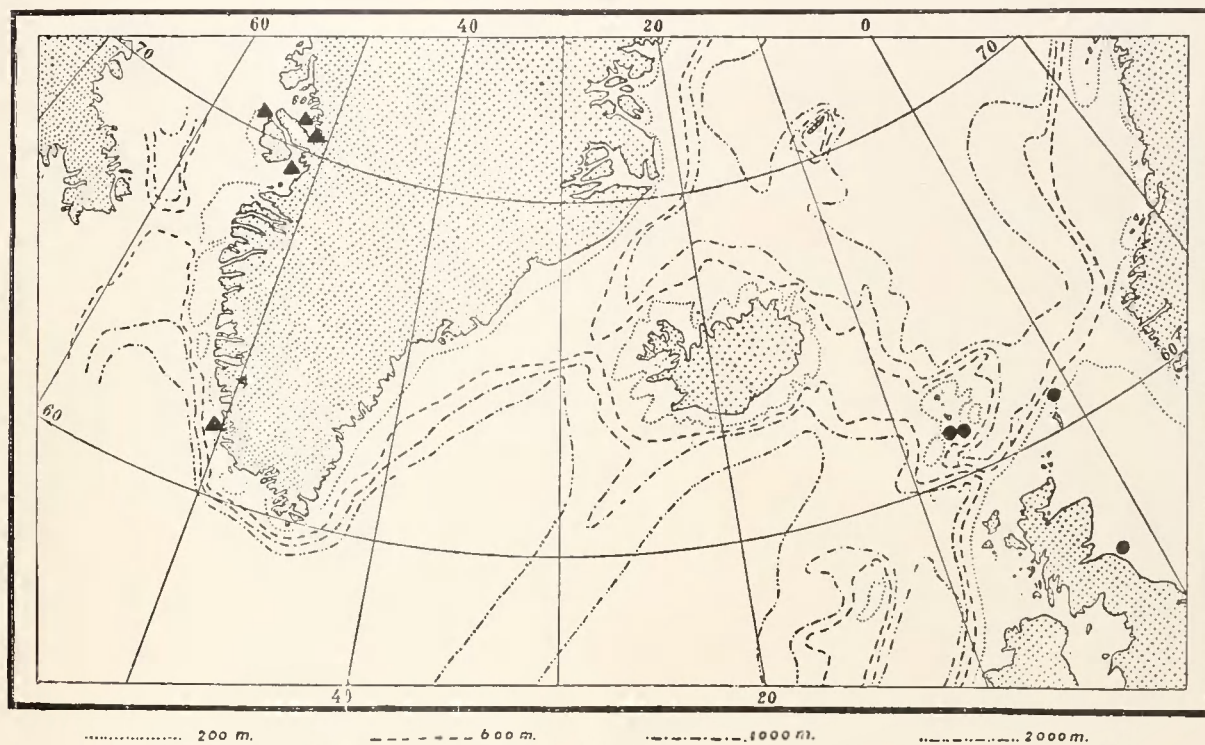
Text-fig. L. Localities of *Merona cornucopiae* ● and *Monobrachium parasitum* ▲ in the Northern Atlantic.

Merona cornucopiae was first described as a *Tubiclava* by N o r m a n (1864). But as the latter genus is characterized by the gonophores being borne on the polyps, he thought he had better set up a new genus *Merona* (1865) for the species in hand, bearing its gonophores on polyps strongly reduced or on blastostyles. This criterion, however, is of subordinate importance and would by no means justify the separation of two genera. However, from the drawings occurring in literature, a much essential point of difference urges itself. The perisarc of the species of *Tubiclava* is not so wide that the polyp can be retracted into it, while this is the case with *Merona*. The division, therefore, seems well founded. But at any rate a renewed examination of the two genera is needed.

Merona cornucopiae seems only to occur attached to shells of living mollusks, and has been found on species of the genera *Cardium, Astarte*, and *Dentalium*. The species does not seem to be very frequent; it has previously been recorded from the sea to the north of the Shetlands at the depth of 80—100 fathoms, and from the coast of Northumberland. To these localities are now to be

added the seas to the south of the Faroe Islands at the depth of 70—150 fathoms. All the finds are thus situated in the boreal area, on the border of the warmer Atlantic regions (Text-fig. L).

Gen. Monobrachium Mereschkowsky.

Reptant colonies, whose cylindric polyps are provided with a solitary large tentacle. Besides the nourishing individuals bearing tentacles, also machozooids with no mouth and no tentacles occur. The polyps have no distinct stem and are not covered with perisarc. The gonophores are eumedusoid and attached to the stolons.

The very peculiar Arctic genus of hydroids first described by Mereschkowsky (1877) has been more closely investigated by Wagner (1890) and Bonnevie (1899). In the only species known of this genus the eumedusoid gonophores have a rudimentary spadix, and the germ cells are accordingly developed along the radials canals. On this ground Bonnevie maintains that the species is closely related to the *Leptomedusae*, and that the genus has to be placed proximately between atheeate and thecaphore hydroids. Kühn (1913), on the other hand, holds that the organisation of the gonophore cannot be considered as any certain proof justifying such a supposition, and points out that the transition of the gonophore from independent free existence into sessile mode of life can effect a secondary displacement of the gonads in many different ways without any necessity that this should be indicative of nearer or remoter relationship. Apart from this, however, there is an additional reason against the supposition of Bonnevie. As is pointed out by Vanhöffen (1909), we have in hand a medusaform obviously nearly related, *Catablema*, which, when somewhat damaged, is very easily mistaken for a *Leptomedusa*, but which is, in fact, a genuine *Tiaride*. Vanhöffen even presumes that *Catablema* really is the medusoid generation of *Monobrachium*. But in that case it remains to show that the gonophores of *Monobrachium* are not sessile as they have hitherto generally been supposed to be.

The explanations of Vanhöffen (1909) and Kühn (1913) make good that *Monobrachium* takes no intermediate place between athecate and thecaphore hydroids. But the place of the genus among the athecate hydroids would still be equally uncertain if the peculiar species *Campaniclava clionis* Vanhöffen (1909) had not shown us, by its heterogeneous development of the tentacles, the unquestionable link between *Monobrachium* and the normal-looking forms of *Clava*. Therefore there is no reason any longer to regard the genus as the representative of a peculiar family; as pointed out by Vanhöffen, it ought to be classed with the *Clavidae*.

Monobrachium parasitum Mereschkowsky.

1877 *Monobrachium parasitum*, Mereschkowsky, On a new Genus of Hydroids, p. 225, pl. 5 fig. 1—6 pl. 6 fig. 7—14.

1899   —   *parasiticum* Bonnevie, Norske Nordhavs Expedition, p. 51.

Reptant colonies, whose polyps are dimorphically developed; beside cylindric polyps with orifice and a vigorous tentacle, also machozooids without mouth or tentacles occur. The nourishing

polyps are provided with a ring of stinging cells above the base of the tentacle. The stolons form a network of anastomosing tubes.

The gonophores are eumedusoid with a rudimentary spadix and with the generative cells placed along the four radial canals. The colonies are bisexual.

Material:

Greenland: Egedesminde (on *Tellina calcarea*).

The Kara Sea ("Dijmphna").

Monobrachium parasitum is indigenous to the middle parts of the litoral region far to the north. It is recorded from Spitzbergen, the Kara Sea, the White Sea, and the west coast of Greenland (Text-fig. L).

Family Bougainvilliidae.

Hydroids forming colonies with polyps fusiform or capitate, whose oral portion is conically pointed. The stinging cells are small and rodshaped. The tentacles, which are filiform, are placed in a main whorl round the polyp; the stinging cells are equally distributed all over the surface of the polyps or in less distinct transverse belts round them. The polyps are quite naked or surrounded by a jellied, lithe, and pliable pseudohydrotheca below the tentacle whorl. The endoderm is differentiated into an oral portion, consisting of indifferent small-nucleated cells between which occur a large number of mucous gland cells, and the proper gastral portion; the limit is formed by the tentacle whorl. The colonies have no calcareous skeleton.

The diagnosis states for the family the same range as was practically already given by Bonnevie (1899), whom the later authors have generally followed. Kühn (1913) divides the family into three subfamilies, two of which, *Hydractiniinae* and *Atractylinae*, are represented in our northern seas. The main distinguishing mark stated by Kühn is that *Hydractiniinae* are stated to have a vigorous, crustformed skeleton, while *Atractylinae*, on the other hand, have hydrocauli covered with periderm. However, this character does not seem to be of the importance Kühn attached to it. In young colonies the stolons have not coalesced into a crust, and the development of the skeleton is not particularly vigorous. There is even every probability that several species of *Stylactis* do not at all assume such crustformed skeleton-formations, even when advanced in life. On the other hand, we also know species of *Hydractiniinae*, in which the hydrocaulus covered with periderm has been reduced to a mere minimum. The character, therefore, must be characterized as a merely gradual one, and can hardly be turned to account as fundamentum divisionis for higher groups.

A very different interest is attached to the peculiar occurrence of pseudohydrothecae met with in the *Bougainvilliidae*. I set aside the socalled pseudohydrothecae of *Clathrozoon* (the subfamily *Hydroceratininae*, stated by Kühn 1913); in fact, this group is not yet so well known that we are able to judge of it entirely, and its "pseudohydrothecae" do not seem to form such a parallel with the formations of the thecaphores as those found in certain other *Bougainvilliidae*, namely in *Perigonimus*. In this species the ectoderm of the polyp has secerned a jellied pseudohydrotheca, which has coalesced with the polyp along its distal margin, and to which the basal portion of the supporting

lamella of the polyp is attached by small chitinous bodies similar to those found in several thecaphores. This pseudohydrotheca is but little visible, or, with intact polyps, when they are extended, almost untraceable, while in contracted polyps it lies round the basal portion of the polyp like a cup richly folded. It might be obvious to regard it as the precursor of the real hydrotheca. Perhaps it might be regarded as a character sufficiently important for the purpose of distinguishing a subfamily: However, the matter has, as yet, been too little examined as to allow the forming of a reasonable opinion; we have, provisionally, to regard it as a generic character.

Gen. **Hydractinia** van Beneden.

The stolons of the reptant colonies, when young, will generally form an open meshwork which afterwards most frequently changes into a continuous chitinous crust. The crust is commonly carrying spines of various appearance, or may grow out into branched formations of colonies. The polyps are cylindrical or capitate with conically pointed oral portion. The tentacles are placed in a whorl below the mouth. There is no erect hydrocaulus covered with perisarc. The polyps are heterogeneously developed into larger nourishing individuals bearing tentacles and into spiralzooids bearing no tentacles; the latter occur at the extremities of the colonies. — The gonophores are supported by polyps more or less transformed (blastostyles) or arise directly from the stolons.

According to this diagnosis, also *Podocoryne*, *Oorhiza* and *Stylactis*, earlier set up as genera are included under *Hydractinia*. The only reason of distinguishing between *Hydractinia* and *Podocoryne* has been sought in the power of the last-mentioned genus of producing free-swimming medusae. However, Bonnevie (1899) has described a couple of species, *Hydractinia Allmani* and *Hydractinia ornata*, having medusoid gonophores less strongly reduced with radial canals, and from Africa has been recorded a species, *Hydractinia Michaelseni* Broch (1914), whose male gonophores are perfect medusae, which, however, do not seem to break away normally. Also Kühn (1913) seems to incline to the opinion that the separation of the two genera is questionable. The intermediate forms of gonophores mentioned, in fact, forbid the drawing of a certain limit between the genera, and, therefore, the proper thing to be done, is, indeed, to draw in *Podocoryne* under *Hydractinia*.

The genus *Oorhiza* is based on the fact that the gonophores are seated, not, as in *Hydractinia*, on blastostyles, but, on the contrary, on a short stem rising directly from the stolons. A review of our northern species of *Hydractinia*, however, shows that, in fact, this criterion is of no vital importance. In *Hydractinia humilis* Bonnevie and *Hydractinia Sarsii* Steenstrup the gonophores are borne on polyps fully developed of the same size as the sterile nourishing individuals; in *Hydractinia carnea* M. Sars the polyps bearing gonophores are, certainly, fully developed individuals, provided with tentacles; but they have a smaller number of tentacles, and are smaller than the sterile nourishing polyps. In *Hydractinia Allmani* Bonnevie, *Hydractinia ornata* Bonnevie, and *Hydractinia echinata* (Fleming) the reduction is carried still further, the tentacles being reduced or wholly disappearing, so that the bearers of the gonophores are here typical blastostyles. In *Hydractinia carica* Bergh, finally, the polyp has been reduced to a stem, round the apex of which the gonophores are

placed in a whorl. In fact, between this condition of things and a solitary gonophore seated terminally on a polyp wholly reduced to a stalk, there is no great gap, and at any rate the criterion is not essential enough to be turned to account as fundamentum divisionis. Also *Oorhiza* has, accordingly, to be included as a synonym under *Hydractinia*.

Stylactis is yet left to be mentioned, being distinguished by the stolons forming an open mesh-work and no continuous chitinous crust. In his excellent elucidation of *Hydractinia* and *Podocoryne*, Hincks (1868) calls attention to the fact that, in the species then known, the stolons at first form an open mesh-work and do not till later on coalesce into a continuous crust. Young colonies of *Hydractinia carnea*, which are in our Norwegian seas very commonly observed on living specimens of *Nassa reticulata*, in most cases show this open mesh-work of stolons and, therefore, easily run the risk of being undiscerningly characterized as *Stylactis*. In the African species, *Hydractinia Michaelseni* Broch and *Hydractinia fallax* Broch, large colonies show a mixture of characters of *Stylactis* and of *Hydractinia*, and, accordingly, there is no reason to maintain the two groups as distinct genera. They communicate with each other by intermediate forms. It is probable that several species of *Stylactis* have been based on young colonies of typical species of *Hydractinia*. This probability, indeed, cannot be contested even by the occurrence of gonophores, because, in young colonies of *Hydractinia carnea*, where the stolons have not yet coalesced into a crust, gonophores are frequently observed. A species as *Stylactis arctica* Jäderholm (1902) has obviously to be judged summarily as such a young *Hydractinia*. Also *Stylactis*, therefore, has to be included among the synonyms of *Hydractinia*.

Hydractinia Sarsii (Steenstrup) Bonnevie.

1846 *Podocoryna carnea*, M. Sars, Fauna littoralis Norvegiæ, Heft 1, p. 7.

1850 *Podocoryne Sarsii*, Steenstrup, in: Lütken, Nogle Bemærkninger om Medusernes systematiske Inddeling, p. 33.

1872 *Stylactis* — Allman, Monograph of the Gymnoblastic or Tubularian Hydroids, p. 303.

1892 *Podocoryne carnea*, Levinsen, Meduser, Ctenophorer og Hydroider fra Grönlands Vestkyst, p. 11.

1899 — — pars, Sæmundsson, Bidrag til Kundskaben om de islandske Hydroider, p. 50.

1899 *Hydractinia sarsii*, Bonnevie, Norske Nordhavs Expedition, p. 45.

The reptant stolons are covered by a continuous chitinous coenosarc, whose surface is studded with small spines, among which are found, often by groups, large, vigorous thorns, up to 0.5 mm. high, of irregular conical shape with closed apex abruptly cut off. The polyps attain a length of 2.5 mm. and have 10 or 20 tentacles in a dense, proximately double, whorl, below the oral portion. Spiral-zooids have not yet been pointed out.

The gonophores are cryptomedusoid and placed, to the number of three or six, round fully developed polyps of the same size as the sterile nourishing individuals.

Material:

      Greenland, the harbour of Godthaab . . . depth 12 fath. (on *Hyas araneus*).

      Iceland, Seydisfjord   (on *Carcinus maenas*).

The well developed colony in hand has been wrongly determined as *Podocoryne carnea*. It is hardly intelligible that Bedot, in his "Matériaux pour servir à l'histoire des Hydroides", should have followed Allman (1872) and referred this species to *Stylactis;* it is one of the few species of *Hydractinia* which, even at the extremities of small colonies, show no indication of the open network of stolons for which *Stylactis* should be distinguished.

The species seems to be a boreal one, but it has hitherto been recorded only from very few localities, as it has probably been mistaken for *Hydractinia carnea* also by investigators subsequent to M. Sars (1846). It has previously been recorded only from the coast of Norway near Bergen. In the Danish collections is found a well developed, though sterile, colony from Iceland (Seydisfjord), seated on the claw of a strand-crab. It seems to be the same species which is recorded, by the name

Text-fig. M. Finds of *Hydractinia Sarsi* ● end *Hydractinia carica* ▲ in the Northern Atlantic.
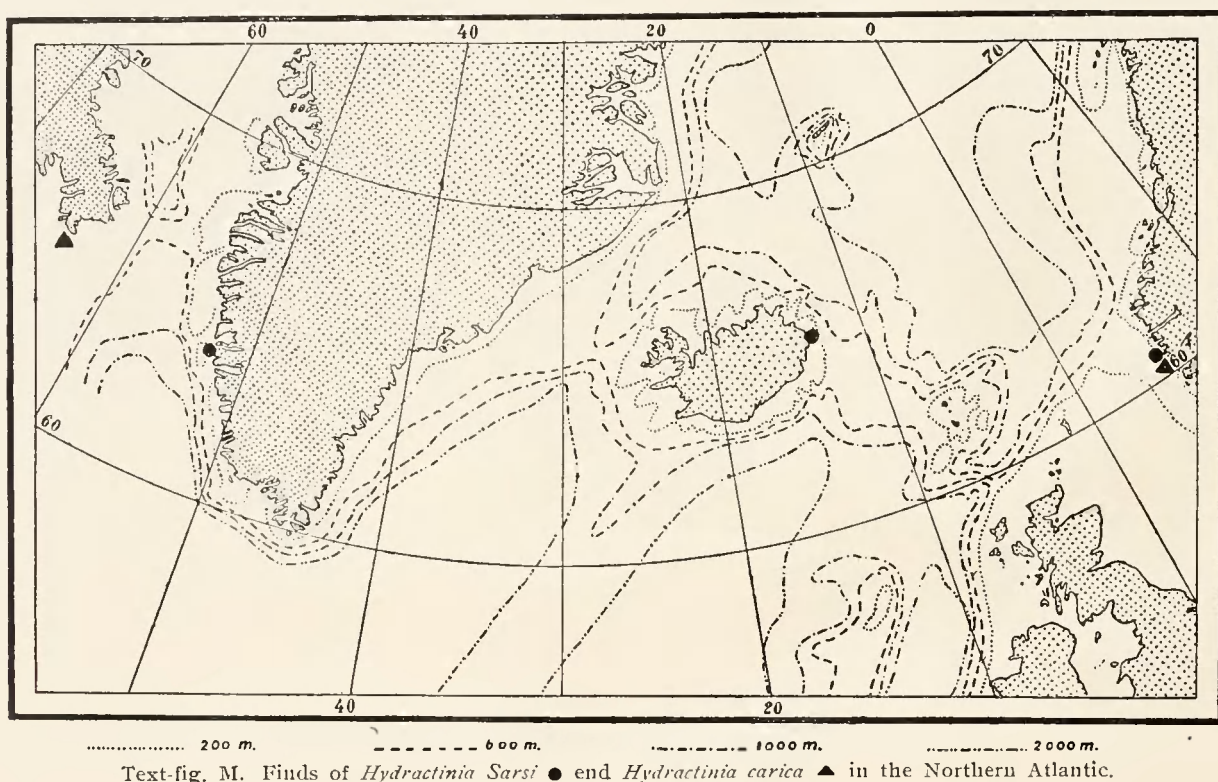
of *Podocoryne carnea*, from the north of Iceland, on the operculum of a *Balanus Hammeri* (Sæmundsson 1902, 1911); here is only found the chitinous crust; but it differs considerably from the crust found in *Hydractinia carnea*, and, on the contrary, wholly agrees with *Hydractinia Sarsii* (Tab. I Fig. 12). Finally also West Greenland (Godthaab) has to be added to the localities where the species has been found (Text-fig. M).

Hydractinia echinata (Fleming) van Beneden.

1828 *Alcyonium echinatum*, Fleming, A History of British Animals, p. 517.

1841 *Hydractinie*, van Beneden, Recherches sur la structure de l'oeuf dans un nouveau . . . genre de Polype (genre Hydractinie), p. 89.

1909 *Hydractinia monocarpa* pars, Broch, Die Hydroiden der arktischen Meere, p. 199.

The reptant stolons are covered by a continuous chitinous coenosarc, whose surface is studded with small prickles, among which occur larger chitinous spines about 1.5 mm. high, provided with longitudinal rows of more or less regular small teeth. The large spines now and then show a tendency to divide at the apex. The polyps are up to 4 mm. long, whitish or faintly reddish, with 20—30 tentacles in a dense whorl below the oral portion. The tentacles form a belt which appears double because of alternating displacement. Spiralzooids without tentacles occur along the margin of the colony.

The gonophores are cryptomedusoid, placed, to a number of 3 or 6, round reduced polyps with rudimentary tentacles.

Material:

Greenland: Upernivik, depth 80—90 fathoms without particular data, from a cod's stomach.

Skagerrak: the channel near Vinga (Bohuslän), depth 50 fath.

Hydractinia echinata in its large chitinous skeleton-spines (Tab. I Fig. 9 and 10) has a very typical armour impeding a confusion with other northern species. It is an Atlantic-boreal species, showing a great power of enduring both high and low temperatures. It occurs very frequently in the North Sea, along the coasts of Great Britain and Ireland, goes to the south as far as into the Mediterranean, and is also found on the east coast of North America. The species belongs to the litoral region and almost always goes together with *Eupagurus Bernhardus*, on whose house it settles. When we consider the distribution of the species along both sides of the northern Atlantic, we must wonder that it has not yet been observed at the Faroe Islands, and that only a single specimen has been met

.... 200 m.   ─ ─ ─ ─ ─ 600 m.   .─..─..─.. 1000 m.   ..─..─..─.. 2000 m.
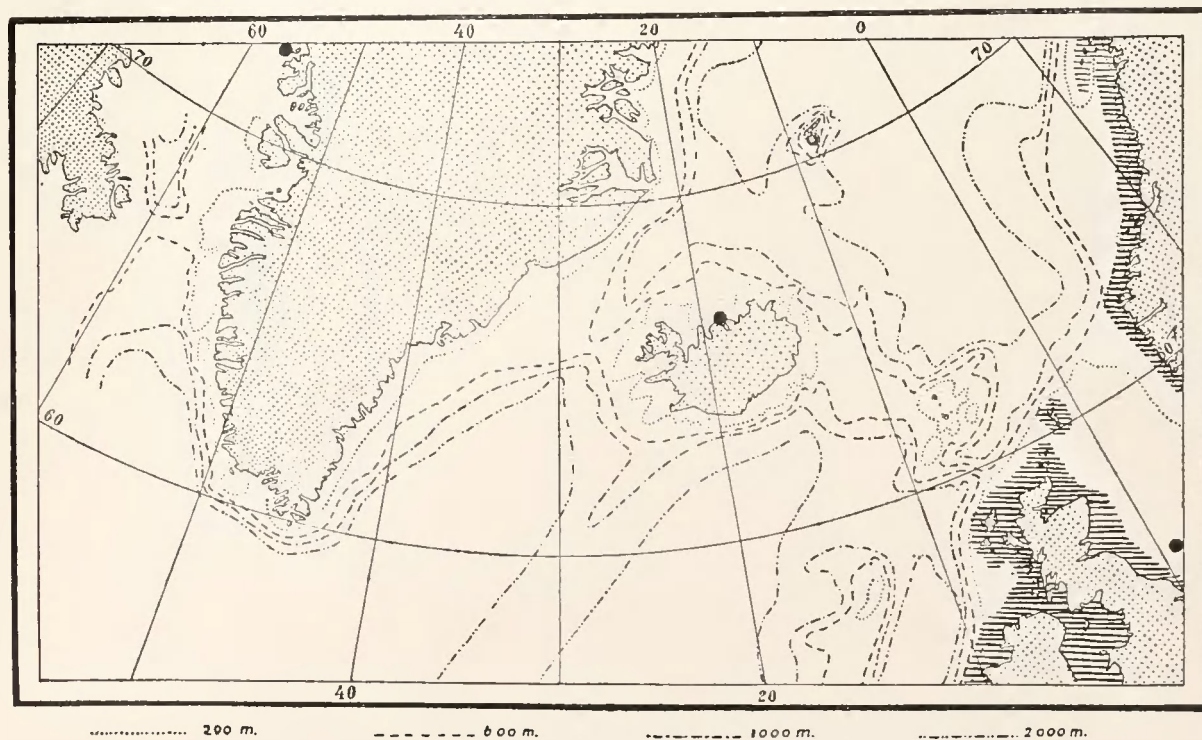
Text-fig. N. The occurrence of *Hydractinia echinata* in the Northern Atlantic.
(The hatched parties denote according to litterature a scattered allthough common occurence).

with at Iceland. This specimen which was found on the north side of the island, was originally recorded by Winther (1880), and has afterwards been revised by Sæmundsson (1902). It is a peculiarity of the specimen that it is seated on the operculum of a *Balanus Hammeri*, and not on the house of the Bernhardus crab. The species has been recorded once in the Arctic water-layers near Jan Mayen (v. Lorenz 1886). In a previous work (1909) I gave utterance to the supposition that the variety recorded by Levinsen (1892) had probably to be referred to the high-arctic species *Hydractinia monocarpa* Allman. An examination of the specimens mentioned, however, shows that this supposition is wrong. The specimens are unquestionable *Hydractinia echinata* with skeleton strongly developed. One of the specimens is distinguished by being attached to the shell of a living *Buccinum hydrophanum*. The species, thus, proves able to occur now and then under wholly high-arctic conditions.

Hydractinia carica Bergh.

1887 *Hydractinia carica*, Bergh, Goplepolyper fra Karahavet, p. 3, Taf. 28, Fig. 1.
1899 — *minuta*, Bonnevie, Norske Nordhavs-Expedition, p. 48, Tab. I, Fig. 3.

The reptant stolons are covered by a chitinous layer of coenosarc, without small pricles, but bearing here and there vigorous spines, singly placed and up to 0.5 mm. high, conical with rounded apex. The polyps attain a length of 2 mm., and have 10—14 rather vigorous tentacles placed in a single whorl below the oral portion. Spiralzooids are not traceable.

The gonophores are cryptomedusoid, placed, to a number of 3—6, round polyps almost wholly atrophied, forming, if anything, only a short stalk, or showing rudiments of tentacles slightly indicated.

Material:

The Kara Sea: Petuchoffskoi Schar depth 7 fath. (the original specimen described by Bergh 1887).

An examination of the original specimen, determined by Bergh, shows with full certainty that it is the same species that has afterwards been described by Bonnevie (1899) by the name of *Hydractinia minuta*. The diagnoses, however, when compared, will show some points of difference. Bonnevie does not mention the skeleton-formations at all while on the other hand, the statements of Bergh convey the impression of a greater resemblance to *Hydractinia echinata* than it really bears. *Hydractinia carica* lacks the small prickles found in the species last mentioned, and more vigorous spines also occur rather scarcely; the latter (Tab. I, Fig. 11) are smooth and more conically tapering than those of *Hydractinia Sarsi*. The main difference, however, between the diagnosis of Bonnevie and that of Bergh is implied in the mention of the blastostyles. Bergh states in his diagnosis "Sporosacs borne on very short, rudimentary hydrants, without or with very few (1—4) tentacles", while in the diagnosis of Bonnevie we find "Fixed gonophores without radial canals, from 3 to 5 in circle round the inconspicuous blastostyles", and in her short comment Bonnevie further states that the species is distinguished for "the complete atrophy of the gonophore-bearing hydranths". The specimens determined by Bergh show a great varying as to the development of the fertile polyp; it may, as he tells us, have 1—4 tentacles; but they are a great deal more reduced than is apparent from his pictures, and agree better with the drawings published by Jäderholm (1909, Pl. 2, Fig. 10—11). However,

there are in the colonies also numerous blastostyles, which are wholly devoid of rudiments of tentacles, and accordingly only forming a stalk in the same way as is indicated by the diagnosis of Bonnevie. But there always occurs a small polyp, and a "complete atrophy" of the polyp is in no case demonstrable; nor is it obvious from the imperfect figure of Bonnevie (1899, Tab. I, Fig. 3). — The great variation of the blastostyles of the original specimens determined by Bergh, shows us that the species stated by Bonnevie may be founded on a colony where the blastostyles carrying tentacles were reduced to a minimum in number. But this does not give sufficient reason for maintaining it as a peculiar species beside *Hydractinia carica*.

Hydractinia carica is an Arctic litoral species, which, in boreal waters, proves able to penetrate along the West coast of Norway as far as Bergen (Text-fig. M). It has been found elsewhere only in high arctic regions, in the Kara Sea, in the Murman Sea, and at Spitzbergen. It has also been recorded by Jäderholm (1909) from Davis Strait.

Gen. Bougainvillia Lesson.

Upright colonies with branched hydrocauli clothed with a perisarc. The polyps are fusiform with the tentacles placed in a whorl below the conically pointed oral portion. The polyps are naked without the slightest attempt at formation of pseudohydrotheca round their proximal portion. The gonophores are placed on the stems of polyps fully developed or reduced (blastostyles). In the latter case, the unbranched polyp stem will sometimes rise from the hydrorhiza instead of from the hydrocaulus.

A closer inquiry into the distinguishing characters and their systematic value, shows us that there is no reason to distribute the species of *Bougainvillia* on the three genera *Bougainvillia*, *Dicoryne*, and *Heterocordyle*. Sufficient cause for distinguishing between *Bougainvillia* and the two other genera is not at all given by the fact that the former has medusoid gonophores, while the two other genera have styloid gonophores. In mentioning the genera earlier treated, I have sufficiently explained the insignificance of this criterion as to classification. Then remains the other distinguishing mark that the gonophores of *Bougainvillia* develop on the stems of some fullgrown polyps, while in *Dicoryne* and *Heterocordyle* they are developed on the stems of reduced polyps (blastostyles). The genus *Hydractinia* shows us a full parallel to this condition of things. But because of the many and close connecting links between one extreme and the other, it has been agreed that the stronger and weaker specializing into nourishing polyps and blastostyles cannot be employed as a generic character. When, on the other hand, this has been done with *Bougainvillia* and *Dicoryne* and *Heterocordyle*, the only reason must be that, between the few species known of these genera, most of the links occurring in *Hydractinia* are wanting. This lack, in fact, is not a sufficient reason to elevate, in one case, the character to an importance which is denied in another case, even within the same family. It is not right to base the genera *Bougainvillia*, *Dicoryne* and *Heterocordyle* on characters that must be used with discretion as specific characters in *Hydractinia*. Further, as to the distinguishing mark between *Dicoryne* and *Heterocordyle*, it is still more diminutive. *Heterocordyle conybeari* Allman, the only species known of the genus, is so like

Dicoryne conferta (Alder) as to confusion, and the two species have probably more than once been mistaken for one another. Both the species have styloid gonophores; but in *Heterocordyle* they are sessile, while in *Dicoryne*, when ripening, they assume cilia all over, develop two tentacles, and break away. This is, unquestionably, a phenomenon of mere biological adaptation and cannot be recognized as sufficient for distinction of genera as long as it is not accompanied by a thorough change of the organization of the sterile parts of the colony. It is evident that *Dicoryne* and *Heterocordyle* must be drawn together into one genus, and moreover that this genus must be united with *Bougainvillia*.
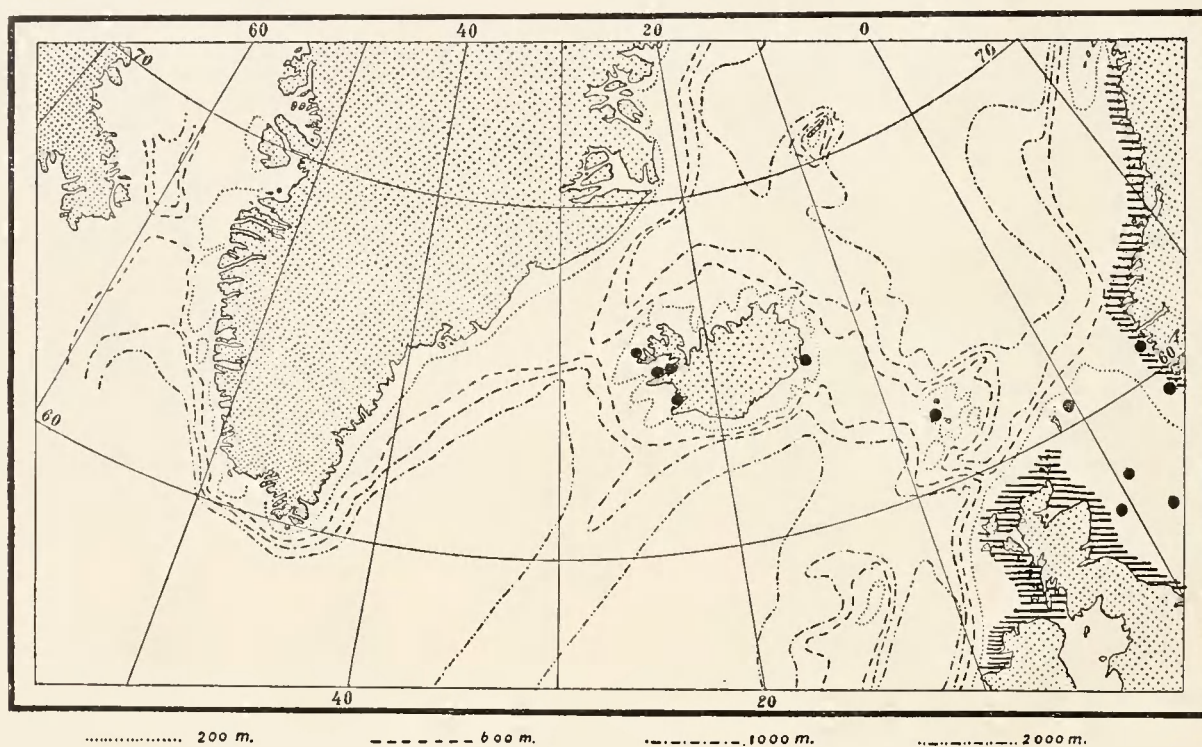
Text-fig. O. The habitat of *Bougainvillia conferta* in the Northern Atlantic.
(In the hatched regions the litterature denotes the occurence of the species without strict localities).

Bougainvillia conferta (Alder).

1856 *Eudendrium confertum*, Alder, A Notice of Some New Genera and Species of British Hydroid
Zoophytes, p. 354, pl. 12, fig. 5—8.

The colonies attain a height of up to 15 mm., and exhibit a rigid appearance. They have a distinct main stem with short side-branches. The perisarc is vigorously developed and dark brown-coloured. The small fusiform polyp attains a length of about 0.5 mm.; it wears about 16 tentacles in a single whorl below the oral conically pointed portion.

The gonophores are styloid and break away. When ripening, they assume a peculiar oviform shape, develop two filiform tentacles, and put on a complete suit of cilia all over. The gonophores are seated, gathered in a belt, somewhat below the apex of blastostyles, which arise from the hydrocaulus or, in smaller numbers, from the hydrorhiza. The blastostyles show no indication of tentacles.

Material:

Iceland: Talknafjord (without particular data).

Reydarfjord, depth 163 metres.

The Faroe Islands (without particular data).

Bougainvillia conferta is a southern-boreal species penetrating as far as into the Mediterranean; towards the north it goes, along the coast of Norway, only as far as Lofoten. It has been recorded several times from Iceland, in the warmer water-layers along the west- and south-coasts of the island, but it has not yet been pointed out at Greenland. As a new locality must be added the Faroe Islands. The species is indigenous to the litoral region.

Gen. Perigonimus M. Sars.

The hydranth stems rise immediately from the reptant stolons, or there are formed upright rhizocaulomes bearing the polyps. The polyp stems are sometimes divided into a couple of branches; still hydrocaulus, properly speaking, cannot be recorded. The polyps are fusiform, with the tentacles placed in a whorl below the conically pointed oral portion; below the tentacle whorl they are surrounded by delicate pseudohydrothecae, superiorly connected with the ectoderm of the hydranth, and inferiorly passing into the chitinous perisarc of the stem. The stinging cells show attempts at being arranged in transverse belts on the tentacles. The gonophores are placed singly on the stolons or on the hydranth stems, most frequently attached to the latter by a short stalk.

The distinguishing marks between *Perigonimus* and *Bougainvillia,* indeed, seem to be so insignificant that the conclusion might be obvious that both genera should be united into one. The *Perigonimus* polyp, when wholly extended, is very easily mistaken for a *Bougainvillia*. However, there is an essential difference between the two genera which necessitates a separation. Their medusae even belong to different families, the *Bougainvillia*-medusae being typical *Margelidae*, while *Perigonimus* gives rise to *Tiaridae* (see Hartlaub 1913). As far as the nurse polyp is concerned, we must notice the difference existing between the wholly naked *Bougainvillia*-polyp and the hydranth covered with pseudohydrotheca of the *Perigonimus*-polyp. The pseudohydrotheca has been pointed out by several authors and has been emphasized as generic character particularly by Broch (1911). A closer inquiry into this formation has been made by Hadži (1913, 1914), who has studied it most thoroughly in the Adriatic species, *Perigonimus Corii* Hadži and *Perigonimus Georginae* Hadži; the latter species is very nearly related to *Perigonimus repens* (Wright). Hadži points out that *Perigonimus* is provided with a sort of hydrotheca, the essential substance of which is jellied and accordingly not entirely parallel with the hydrotheca of the thecaphore hydroids. For this jellied polyp case, which is, in its outer margin, connected with the ectoderm of the polyp, I, therefore, employ the denomination of "pseudohydrotheca", earlier employed for the chitinous false hydrothecae of *Clathrozoon*. In the case of *Chlathrozoon*, however, the formation seems to be quite different, and the denomination, on that account, rather misleading; indeed, we had better employ the term of "false hydrothecae". Hadži

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calls our attention to the interesting fact that the polyps are basally attached to the pseudohydrotheca by a whorl of small chitinous bodies similar to that met with in *Haleciidae, Plumulariidae, Lafoëidae*, and *Campanulariidae;* they actually attach the supporting lamella to the polyp case. Systematically, however, hardly any particular importance can be attached to this character. The chitinous bodies occur on the passage from the pseudohydrotheca to the hard periderm of the stem. Also the periderm of the stem has, in most species of *Perigonimus* a jellied cover, to which a lot of foreign bodies fasten themselves so as to give the colony a foul appearance.

The stinging cells in the tentacles of the *Perigonimus*-species show attempts at an arrangement by belts. But it is not here so pronounced as in the *Eudendriidae* and the thecaphore hydroids. This criterion, together with the pseudohydrotheca, suggests that *Perigonimus* must be more nearly related to the thecaphore hydroids than most other athecate hydroids.

Perigonimus repens (Wright) Allman.

1857 *Eudendrium repens*, Wright, Observations on British Zoophytes, p. 84, pl. 82, fig. 8—9.
1864 *Perigonimus* — , Allman, On the Construction and Limitation of Genera among the Hydroida, p. 365.
nec 1911 — — , Broch, Fauna droebachiensis, p. 14.

From the reptant stolons proceed thin polyp stems, up to 5 mm. long, more rarely dichotomically divided so as to bear two polyps. The polyps are about 0.5 mm. long, broadly fusiform, with 4—12 tentacles placed in a whorl, and surrounded below the tentacles by a thin jellied pseudohydrotheca, which is sometimes hardly observable. The polyp stems are wholly without rings, and all but without wrinkles, and provided with a dark-coloured, but thin perisarc, which, on account of bottom particles appendant, convey the impression of being granulous.

The gonophores are developed into free medusae; when breaking away, they have two tentacles and a well-developed, solid umbrella. The gonophores are borne individually on stems 0.2—0.3 mm. long, proceeding from the hydranth stems; on one hydranth stem is generally developed one gonophore at a time, sometimes a couple of gonophores simultaneously.

Material:

The Faroe Islands, Sörvaag.   Depth 14—16$^1/_2$ fath. (on *Nucula nucleus*).

Certainly it is not this species that is delineated and described by the name of *Perigonimus repens* in Fauna Droebachiensis (Broch 1911). A comparison with the excellent drawings of the species with Jäderholm (1909, Taf. I, Fig. 15—16), at once shows us the difference. The species described and delineated from the Kristianiafjord has a stiff and robust structure; its perisarc is solid and the colonies are open rhizocaulome formations; most probably the specimens in question should have been referred to *Perigonimus muscoides* M. Sars. *Perigonimus repens*, on the other hand, has thin closely set, irregularly curved polyp stems. Besides, the colonies from the Kristianiafjord bear on the hydranth stems numerous gonophores without stalks, while the few gonophores of *Perigonimus repens* are borne on distinct small stalks covered with perisarc.

Perigonimus repens is a southern species which penetrates into our seas. It has been recorded from the Mediterranean and the west coast of France, and occurs frequently in the sea round Great Britain and Ireland. Already in the North Sea its occurrence is more straggling. In the Danish waters and along the coast of Bohuslän it is still rather frequent. On the coast of Norway it is not unfrequently met with in the Trondhjemfjord, where the fauna, on the whole, bears a southern character. But only once it has been found farther to the north, at Lofoten. Sæmundsson (1911) records several questionable specimens from the west and the north of Iceland. But these localities have to be confirmed. As a new locality must now be added the Faroe Islands. The species belongs to the litoral region.
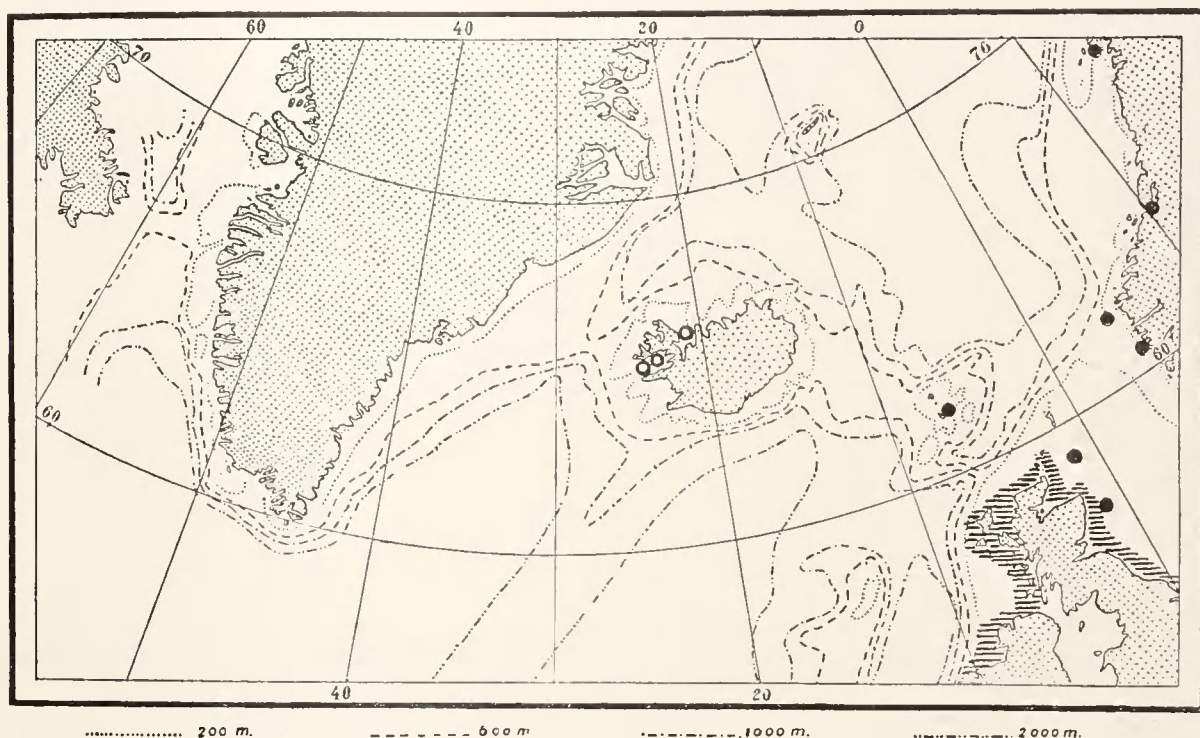
Text-fig. P. The distribution of *Perigonimus repens* in the Northern Atlantic (o localities needing further confirmation. — In the hatched region the litterature denotes a scattered although common occurence of the species).

Perigonimus abyssi G. O. Sars.

1874 *Perigonimus abyssi*, G. O. Sars, Bidrag til Kundskaben om Norges Hydroider, p. 96, pl. 5, Fig. 27—30.
1911   —   sp., Kramp, Danmarks-Ekspeditionen til Grönlands Nordöstkyst, p. 363.

From the reptant stolons proceed unbranched polyp stems, which attain a length of 1.5 mm. The polyps are about 0.5 mm. long, broadly fusiform, bearing 5—8, usually 7 tentacles in a whorl. Below the tentacles the polyp is surrounded by a rather vigorous, wide, jellied pseudohydrotheca, which is, however, often hardly visible on the polyp wholly extended. The polyp stems are irregularly and strongly wrinkled, and have a dark-coloured, vigorous perisarc.

The gonophores are developed into free medusae, having, when deliberated, a vigorously developed umbrella and four tentacles. The gonophores are developed on the polyp stems, to which they are attached by a very short stalk. On the polyp stem arise one or two gonophores.

Material:

   Greenland, Egedesminde (on *Lepeta cocca*).

   The species has been found chiefly along the west coast of Scandinavia. It is likely to occur much more frequently than might be believed from the scattered data. On account of its small dimensions, and as, besides, it prefers settling on living, smaller molluscs, it too often escapes the attention of the investigators of hydroids. *Perigonimus abyssi* has been found at Bohuslän and on the west coast of Norway, from Stavanger as far as the Trondhjemfjord, at the depth of 100 —600 metres. On the north side of Beeren Island it has been met with at the depth of 165
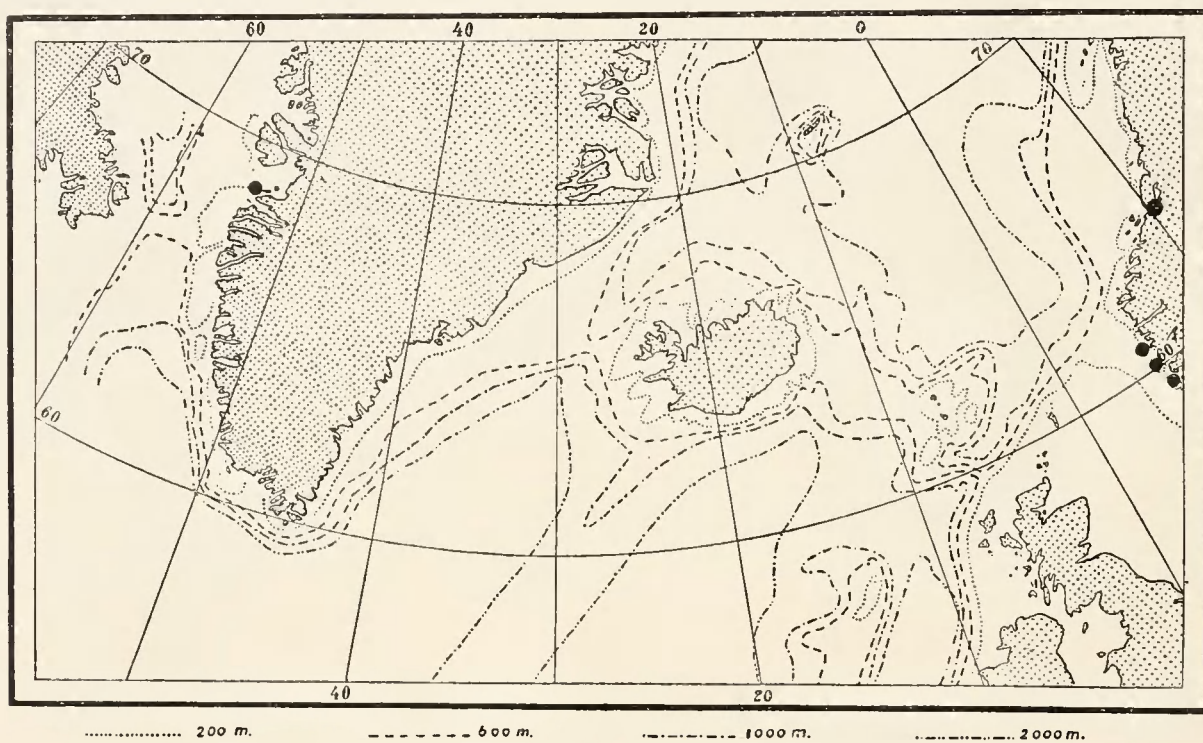
Text-fig. Q   The finds of *Perigonimus abyssi* in the Northern Atlantic.

metres (Bonnevie 1899). In Arctic regions it may occur in considerably shallower waters. Thus the German expedition to Spitzbergen in 1898 found the species in the Storfjord at the depth of between 0 and 10 metres (Broch 1909), and certainly it is the same species that is recorded by Kramp (1911), by the name of *Perigonimus* sp., from the depth of 20—40 metres at a couple of stations of the "Danmark" Expedition. To the localities previously recorded must now also be added the west coast of Greenland near Egedesminde. — According to the data in hand, the species must be characterized as Arctic and boreal (Text-fig. Q).

Perigonimus roseus (M. Sars) Bonnevie.

1874 *Rhizoragium roseum*, M. Sars in: G. O. Sars, Bidrag til Kundskaben om Norges Hydroider, p. 96.
1892 *Garveia groenlandica*, Levinsen, Meduser, Ctenophorer og Hydroider fra Grönlands Vestkyst, p. 13.
1898 *Perigonimus roseus*, Bonnevie, Neue norwegische Hydroiden.
1911 *Garveia groenlandica*, Kramp, Danmark-Ekspeditionen til Grönlands Nordöstkyst, p. 363, pl. XXV, fig. 6.

From the reptant stolons proceed polyp stems up to 12 mm. long, generally unbranched; more rarely 2—4 polyp stems proceed from a common trunk, 1—2 mm. high. The polyps attain a length of 0.7 mm., and are fusiform, with 6—12 tentacles placed in a whorl. Below the tentacles the polyp is surrounded by a pseudohydrotheca, which it is very difficult to observe on the polyp when wholly extended. In general it is jellied and vigorously developed. The polyp stems are, particularly in their proximal part, irregularly wrinkled.

The very large gonophores show no medusoid structure; they are attached to the reptant stolons by a short stem.

Material:

Greenland (Lille Hellefiskebanke) (the original specimen of *Garvcia groenlandica* L e v i n s e n).

An examination of the original specimen of *Garvcia groenlandica* shows no difference at all from Norwegian specimens of *Perigonimus roseus*. The species are no doubt identical. If we compare K r a m p's drawing of *Garvcia groenlandica* (1911, pl. XXV, fig. 6) with J ä d e r h o l m's figure of *Perigonimus roseus* (1909, Taf. III, Fig. 7), there may, at the first glance, seem to be some points of difference. Thus the stems of the specimen mentioned by K r a m p are much shorter. But this character proves of little significance if we compare the specimen with a larger colony, where, as a matter of fact, the length of the polyp stems varies greatly. A greater stress might, on the other hand, be laid on the apparently great difference between the pseudohydrothecae as represented in the two figures. However, much depends on the contraction of the polyps and on the state of preservation, as is plainly to be seen by an inquiry into a larger material. I have several times had the opportunity of observ-

.... 200 m.   _ _ _ _ _ _ _ 600 m.   ._._._._. 1000 m.   .._.._.._.. 2000 m.
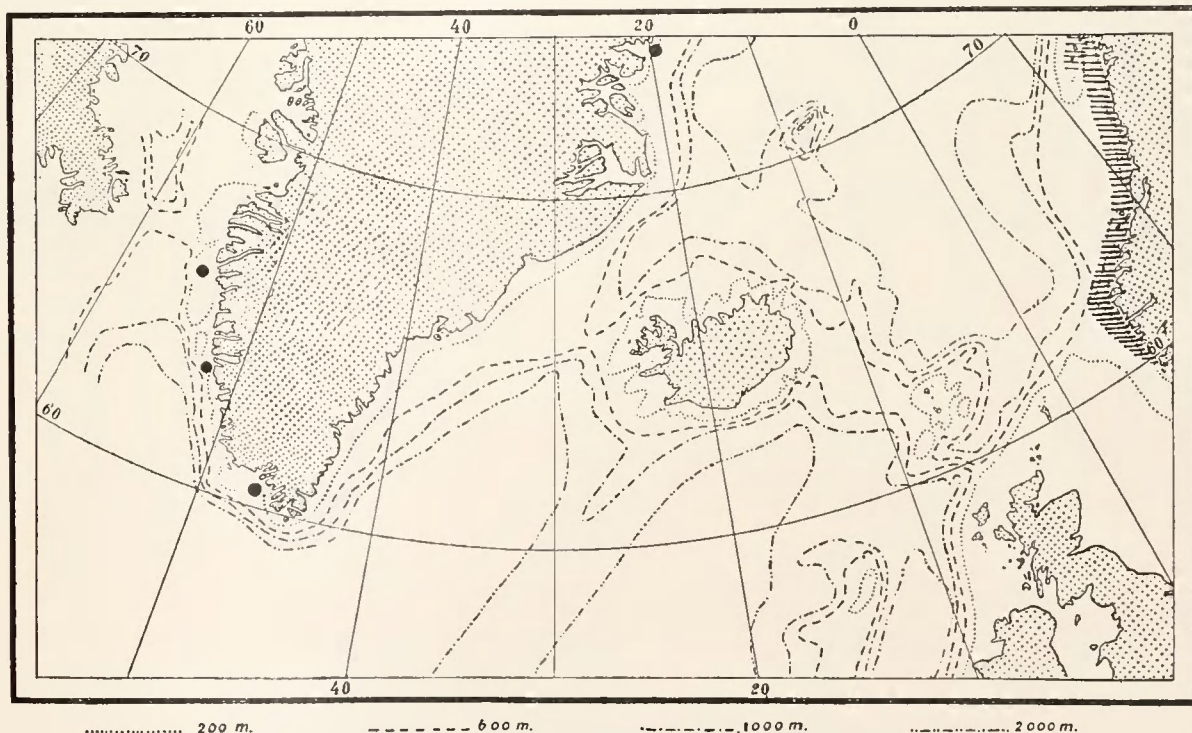
Text-fig. R. The occurence of *Perigonimus roseus* in the Northern Atlantic.
(In the hatched region the occurence according to the litterature is common allthough scattered).

ing, in larger colonies of *Perigonimus*, individuals with pseudohydrothecae bulging even more loosely round the shrunken and contracted polyps than that rendered in Kramp's drawing, while, at the same time, in extended polyps in the same colony, a superficial view fails to notice the presence of this formation (Broch 1911, fig. 12). The intermediate state represented by Jäderholm is the commonest observed in preserved colonies. Still one point of difference might seem to remain, the chitinous cup in which the gonophore, in *Garveia groenlandica*, is resting when it is about to empty its ripe contents. This cup, or rather this remnant of the flayed-off external periderm cover of the gonophore, is, however, frequently observed also in the female gonophores of typical *Perigonimus roseus*, in which hitherto no particular importance has been attached to this character. Accordingly, we have to include *Garveia groenlandica* as a synonyme under *Perigonimus roseus*.

The chief occurrence of the species is attached to the middle and the lower parts of the litoral region of the boreal waters. It occurs rather frequently from Bohuslän as far as Lofoten, generally attached to stalks of *Tubularia indivisa*. However the species also penetrates far into Arctic waters, and has been recorded from the White Sea and as far to the north as Nova Zembla. It has previously been recorded from Greenland (Jäderholm 1909), where now also Lille Hellefiskebanke, Fiskenes (West Greenland), and Danmarks Havn (East Greenland) have to be added to its localities (Text-fig. R).

Family **Eudendriidae.**

Hydroids forming colonies, the polyps of which are provided with a single whorl of filiform tentacles. The proboscis is capitate, placed with a narrow base on the broad polyp body above the tentacle whorl; the stinging cells of the tentacles are small and rodshaped. Also larger stinging cells, narrowly oval, occur, particularly in the specific stinging organs of the polyp. The stinging cells of the tentacles are arranged in very distinctive transverse belts. The polyps are wholly naked. The endoderm of the polyp is differentiated into two portions, an oral portion, consisting of small-nucleated, indifferent cells, among which occur some mucous gland cells, and the proper gastral portion. The limit is formed by the tentacle whorl. The tentacles lack a central cavity. The colonies have no calcareous skeleton.

Nearly all investigators of hydroids have distinguished the *Eudendriidae* as a family of their own. To this Levinsen (1892) forms an exception, considering the arrangement of the tentacles in a single whorl round the polyp as indicative of so near a relationship to the *Bougainvilliidae* that he unites the two families into one. However, the *Eudendriidae*, in their structure of the polyps, show, as compared to other athecate hydroids, such peculiarities that we are forced to distinguish them as a family of their own. In the first place are obvious the broad structure of the polyp body and the capitate proboscis, placed with a narrow base above the well defined tentacle portion. In this character the polyps bear a strongly marked resemblance to the thecaphore *Campanulariidae*. This likeness is the more interesting because, in the more delicate structure of the polyp of the *Eudendriidae*, several points of resemblance to the thecaphore hydroids are demonstrable. Thus the stinging cells of the tentacles of *Eudendriidae*, as well as those of the thecaphore hydroids, are arranged in well defined

transverse belts. This peculiarity we find slightly indicated even in some *Bougainvilliidae*. But only in the *Eudendriidae* it has become a character plainly distinctive. Further, the endoderm in the well defined hypostome shows the same structure as in the thecaphore hydroids, and is more strongly differentiated than in the *Bougainvilliidae*, the indifferent cells having gained the ascendency, and the number of the mucous gland cells having been reduced to a minimum. Whether these peculiarities are indicative of a nearer relationship between the *Eudendriidae* and the thecaphore hydroids, is a question which it would here be out of place to enlarge upon.

The *Eudendriidae*, with their frequently dimorphic development of the stinging cells, also present a parallel to the *Stylasteridae*. Besides the small rodformed stinging cells characteristic of all *Filifera*, we also find in several species larger narrowly oval ones, bearing a strong resemblance to those of the *Stylasteridae*. The latter are large, but of the same shape as the small stinging cells of *Myriothela*. We probably here face a phenomenon of convergency, the reason of which, however, at the present stage of our knowledge of the biology of the Coelenterata, we cannot account for with any certainty. Wherever the larger stinging cells occur in the *Eudendriidae* they are accumulated in particular stinging organs.

Eudendrium Ehrenberg.

Upright colonies with branched hydrocaulus. The polyps are broad and distinctly set off from the stem, which is covered with a vigorous chitinous perisarc. The polyp has a single whorl of filiform tentacles. Above the tentacle whorl the polyp is suddenly tapering and ends into a capitate or trumpetshaped proboscis, which is seated, with a narrow base, above the tentacle whorl. The gonophores are developed on normal or reduced polyps, or placed singly on the branches.

Kühn (1913, p. 48) states that the polyp tentacles of *Eudendrium* "nach einander vorsprossen und dadurch sich als Angehörige verschiedener Wirtel zu erkennen geben". Later on (l. c. p. 247) he again mentions this peculiarity as a refutatory argument against the adoption of a nearer relationship to the thecaphore hydroids; in the passage last quoted he apparently bases his opinion essentially on Allman (1872). A closer inquiry, on new material, gave no hold to the statement of Allman and Kühn that the tentacles should appear successively. In the numerous colonies examined of *Eudendrium rameum* (Pallas) and *Eudendrium Wrighti* Hartlaub it could be ascertained that all the tentacles appear simultaneously. This suggests that the observations of Allman may rather depend on accidental circumstances, and that no special importance must be attached to them as reminiscences of manyrowed tentacle-whorls of the ancestors or as proofs of a nearer or remoter relationship to the *Bougainvilliidae* or to the thecaphore hydroids.

Eudendrium rameum (Pallas) Thompson.

1766 *Tubularia ramea*, Pallas, Elenchus zoophytorum, p. 83.
1844 *Eudendrium rameum*, Thompson, Report on the Fauna of Ireland, p. 283.
1887 — *ramosum*, Bergh, Karahavets goplepolyper, p. 332.

1908 *Eudendrium caricum*, Jäderholm, Die Hydroiden des Sibirischen Eismeeres, p. 5, Taf. I, Fig. 4,
Taf. II, Fig. 1.
1911   —   *rigidum?* + *Eudendrium ramosum*, Sæmundsson, Bidrag til Kundskaben om de is-
landske Hydroider, p. 74—75.

The strongly and irregularly branched colonies have a fascicled main stem, and attain a height
of 200 mm. The small branches are annulated immediately above their rise from the mother branch,
but are elsewhere smooth. The polyps have about 20 tentacles. There is no particularly developed
ring of stinging cells round the tentacles or the polyp body. The colonies have no particular sting-
ing organs.

The gonophores are styloid. The male gonophores have 2—4 chambers and are seated round
the base of fully developed polyps. The female gonophores are pear-shaped, and are borne on the
bodies or the hydrocauli of polyps that may either be fully developed, or somewhat smaller than the
sterile polyps, or entirely reduced. The spadix is unbranched.

Material:

"Ingolf" St. 21.	58°01′ N. lat.	44°45′ long W.	Depth 1330 fath.	2°4 C.	
— - 31.	66°35′ - -	55°54′ — -	— 88	1°6 -	
— - 44.	61°42′ - -	9°36′ — -	— 545	4°8 -	
Greenland: Davis Strait			Depth 80—100 fath.		
Henry Land, East Greenland			—	20	—
Cape Tobin			—	57	—
Iceland: 6 miles west of Iceland..................................			—	22	—
Stykkisholm			—	20—30	—
Faxebugt, 16 miles N.E. of Akranes ("*Eudendrium ramosum*")			—	26—30	—
Vestman Islands ("*Eudendrium rigidum?*")			—	30	—
The Faroe Islands: Stokken 2 engl. miles S 22 E.			—	55	—
"Thor" .... 61°15′ N. lat. 9°35′ W. long.			—	872 m.	
"Diana" .... 61°40′ - - 7°40′ - —			—	135 fath.	
Store Fiskebanke (Large fishing-bank) 57°7′ - - 2°40′ E. —			—	37	—

The Kara Sea, "Djimphna".

This common northern species has, no doubt, frequently been confused with the southern spe-
cies *Eudendrium ramosum* (Lin.), which, in fact, is rather rare in our northern seas. Assuredly enough,
nearly all the statements of the occurrence of the last-mentioned species in Arctic waters, are to be
regarded as referring to specimens of *Eudendrium rameum*, the appearance of which varies greatly
indeed. It has already been pointed out by Kramp (1911) that the species *Eudendrium caricum* from
the Russian polar expedition, described by Jäderholm (1908), is, in fact, founded on specimens of
Eudendrium rameum. Surely enough, it is the same species which is recorded by Bergh (1887) now
as *Eudendrium rameum* and *Eudendrium ramosum*, now as *Eudendrium* sp.

The species has a circumpolar distribution, and appears, from the statements of literature, to be a
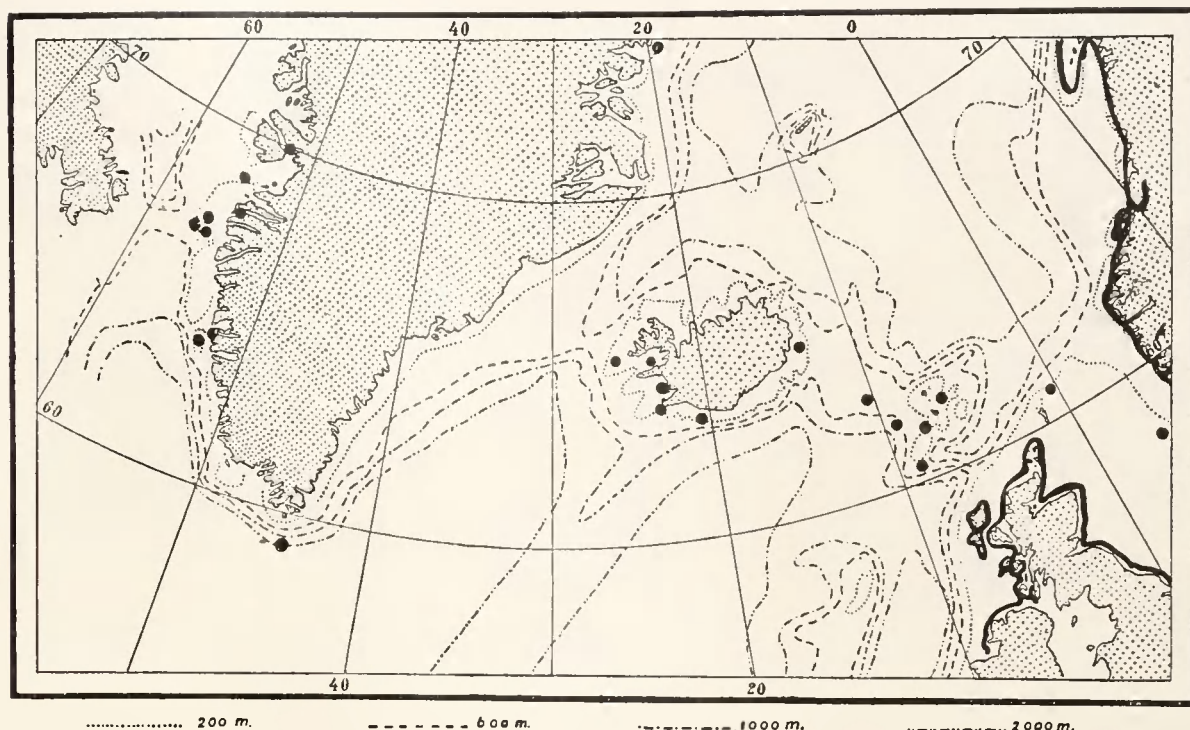
Text-fig. S. The habitat of *Eudendrium rameum* in the Northern Atlantic.

perfect cosmopolite. It occurs frequently everywhere in the middle and deeper parts of the litoral region of the northern seas (Text-fig. S), and may, exceptionally, as in the "Ingolf" st. 21, also penetrate far down into the abyssal region.

Eudendrium ramosum (Linné) Ehrenberg.

1758 *Tubularia ramosa*, Linné, Systema naturæ, ed. X, p. 804.

1834 *Eudendrium ramosum*, Ehrenberg, Beiträge zur physiologischen Kenntnisse der Corallenthiere, p. 296.

nec 1887   —   —   , Bergh, Karahavets Goplepolyper, p. 332.

nec 1911   —   —   , Sæmundsson, Bidrag til Kundskaben om de islandske Hydroider, p. 74.

The strongly branched colonies show an almost quite regular, alternating arrangement of the small branches. The main stem is fascicled. The small branches are annulated above their rise from the mother branch, but are elsewhere quite smooth. The polyps have about 20 tentacles. The stinging cells are not accumulated in any particular main ring round the tentacles or the polyp body. The colony has no particular stinging organs.

The gonophores are styloid. The male gonophores have 2—3 chambers and are seated round entirely atrophied polyps with short hydrocauli. The female gonophores are pear-shaped and borne on the bodies or on the stems of polyps which are either fully developed or somewhat reduced as compared to the sterile polyps. The spadix is unbranched.

Material:

Southeastern Iceland: (Hörring) 1898. — Depth 52—49 fath.

8*

The species *Eudendrium ramosum* (P a l l a s), *Eudendrium rameum* (P a l l a s), and *Eudendrium race-mosum* (C a v o l i n i) are very nearly related to each other, and sterile colonies of the three species are often hardly distinguished with certainty. While in *Eudendrium rameum* the male gonophores are borne on polyps fully developed, they are seated, in *Eudendrium ramosum* and *Eudendrium racemosum* round polyps wholly reduced. This conformity of the two last-mentioned species, the homogeneous structure of their colonies, and several other features common to them, which struck me during my inquiry into the Adriatic hydroids (1912), really led me to consider, though with some doubt, *Eudendrium racemosum* as a synonyme of *Eudendrium ramosum*. This supposition, however, is hardly right. By the liberality of Dr. C. L e h n h o - f e r at Innsbruck I have afterwards had the opportunity of examining more closely unquestionable colonies of *Eudendrium racemosum* from Triest, and of recognizing in these the characteristic criteria distinguishing this species from *Eudendrium ramosum*. Occasionally are found developed in the polyp of *Eudendrium racemosum* peculiar organs which are not traceable in other species of the genus, and which, like analogous organs in other hydroids, have to be designated as "nematophores" (cp. W e i s m a n n 1882). Elsewhere the presence or the absence of these formations is looked upon as a generic character among the hydroids. But this view is here hardly justifiable, as in *Eudendrium racemosum* the nematophores occur quite irregularly and are rather rare; in some colonies they are even entirely wanting, and such colonies, when sterile, or when only male individuals occur, cannot be distinguished with certainty from *Eudendrium ramosum*. — The other distinguishing mark between the two species is the spadix of the female gonophores. While, according to the descriptions in hand, the spadix of *Eudendrium ramosum* is unbranched, that of *Eudendrium racemosum* is, on the contrary, bifurcate or divided into three branches, embracing the ovum like a claw (s. B r o c h 1914 Stylasteridae p. 24, Text-fig. I) I regret that I have not succeeded in getting hold of fertile female colonies of *Eudendrium ramosum*, so as to be unable to give a drawing, from new material, of the female gonophore of this species.

From the statements above it is clear that *Eudendrium ramosum* has most probably been several times confused with *Eudendrium racemosum*. On the other hand, as I have earlier pointed out, a confusion with *Eudendrium rameum*, particularly from the northern seas has also often taken place, and the geographical data presently in hand as to *Eudendrium ramosum* are, therefore, of most questionable value. A closer inquiry into the colonies from Faxebugt (Iceland) recorded by S æ m u n d s - s o n (1911) as *Eudendrium ramosum*, shows that we here really face typical *Eudendrium rameum*. However, the single specimen of the species which is in hand, shows us that in warmer layers of the Atlantic it may occur as far to the north as Iceland. The occurrence of the species in the northern Atlantic regions, however, has yet to be more closely accounted for.

Eudendrium Wrighti H a r t l a u b.

1859 *Eudendrium arbuscula*, Wright, Observations on British Zoophytes, p. 113, pl. 9, fig. 5—6.
1905   —   *Wrighti*, Hartlaub, Die Hydroiden der magalhaensischen Region, p. 547.

The strongly and irregularly branched colonies have a fascicled main stem, and attain a height of 60 mm. The small branches are annulated above their rise from the mother branch, but are elsewhere smooth. The polyps have a large number of tentacles. The tentacles have no particularly

distinct main ring of nematocysts. On the other hand, there is round the polyp body, at its base, a distinctive girdle of large stinging cells. Otherwise, the colony has no particular stinging organs.

The gonophores are styloid. The male gonophores have two chambers with a well marked accumulation of stinging cells distally, and are densely clustered on short stems perpendicularly placed on the trunk. Female gonophores are unknown.

Material:

The Faroe Islands: Trangisvaag, on roots of *Laminaria*.

The species was first described by Wright (1859) by the name of *Eudendrium arbuscula* from the Firth of Forth. However, another *Eudendrium* had been previously described by d'Orbigny
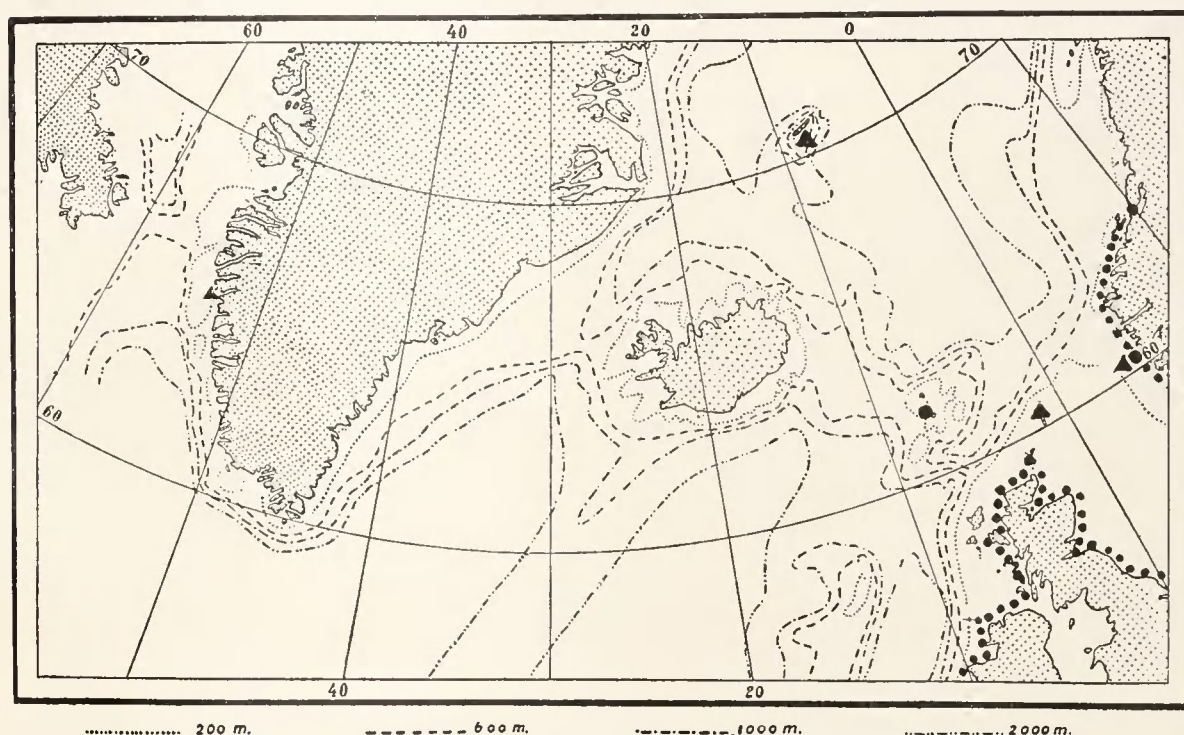
Text-fig. T. The occurence of *Eudendrium Wrighti* ● and *Eudendrium annulatum* ▲ in the Northern Atlantic. (The vothed coastal parties denote a scattered occurence of *Eudentium Wrighti* according to the litterature).

(1839) by the name of *Tubularia arbuscula* from Patagonia, and even though it will be questionable whether the species of d'Orbigny can be reidentified, we are no doubt right to follow Hartlaub (1905) and abandon the name of *arbuscula* for the northern species. Here we, therefore, adopt the denomination of Hartlaub, *Eudendrium Wrighti*.

Eudendrium Wrighti is an absolutely littoral species, the occurence of which seems to be restricted to the zone of the Laminaria. It occurs quite frequently from Bohuslän as far as towards the Trondhjemfjord, and it is peculiar, therefore, that its female gonophores have not yet been pointed out. The species is quite common at the British Isles (s. the Text-fig. T), and it has also been recorded from the Mediterranean. *Eudendrium Wrighti* is, therefore, likely to be characterized as an Atlantic species of southern character, which is able to penetrate into the northern seas as far as the Trondhjemfjord. The Faroe Islands have now to be added to the localities where the species has been found.

Eudendrium annulatum Normann.

1864 *Eudendrium annulatum*, Norman, On undescribed British Hydrozoa, Actinozoa, and Polyzoa, p. 83, pl. 9, fig. 1—3.

The strongly and irregularly branched colonies have a fascicled main stem, and attain a height of 100 mm. All the smaller branches are densely annulated everywhere. The polyps have 16—20 tentacles. There are no particular accumulations of stinging cells on the tentacles or on the polyp body, and the colony has no particular stinging organs.

The gonophores are styloid. The male gonophores have one chamber with an accumulation of stinging cells distally, and are densely grouped on short stalks perpendicularly placed on the stem. The female gonophores have an unbranched spadix and form grape-like clusters round polyps entirely atrophied.

Material:

Greenland: Sukkertoppen (without particular data).

Iceland: Vestman Island, on the stems of *Tubularia indivisa*.

Eudendrium annulatum seems to occur rather sparsely, but apparently on the whole prefers the littoral parts of the boreal seas. However, among the localities of the species are also recorded the Cape Verde Islands (Quelch 1885), and with some doubt Cape Town (Ritchie 1907). On the west coasts of Scandinavia the species has been met with here and there from Bohuslän as far as Vadsö, and it even occurs in the Murman Sea. It has been found near Jan Mayen and the Shetlands, and specimens occur from the south of Iceland and from West Greenland.

Eudendrium capillare Alder.

1856 *Eudendrium capillare*, Alder, A notice of some new Genera and Species of British Hydroid Zoophytes, p. 355, pl. 12, fig. 9—12.

The strongly and irregularly branched colonies have a simple unfascicled main stem, and attain a height of 30 mm. The branches show a few rings immediately above their rise. But elsewhere they are smooth. The polyps have 20—30 tentacles. There are no particular accumulations of stinging cells on the tentacles or on the polyps. The colonies have no particular stinging organs.

The gonophores are styloid. The male gonophores have two chambers with an accumulation of stinging cells distally, and are placed in a whorl round entirely atrophied polyps or, more rarely, round strongly reduced polyps, the stems of which rise from the hydrocaulus or the hydrorhiza. The female gonophores occur in the same manner; they are pear-shaped with unbranched spadix.
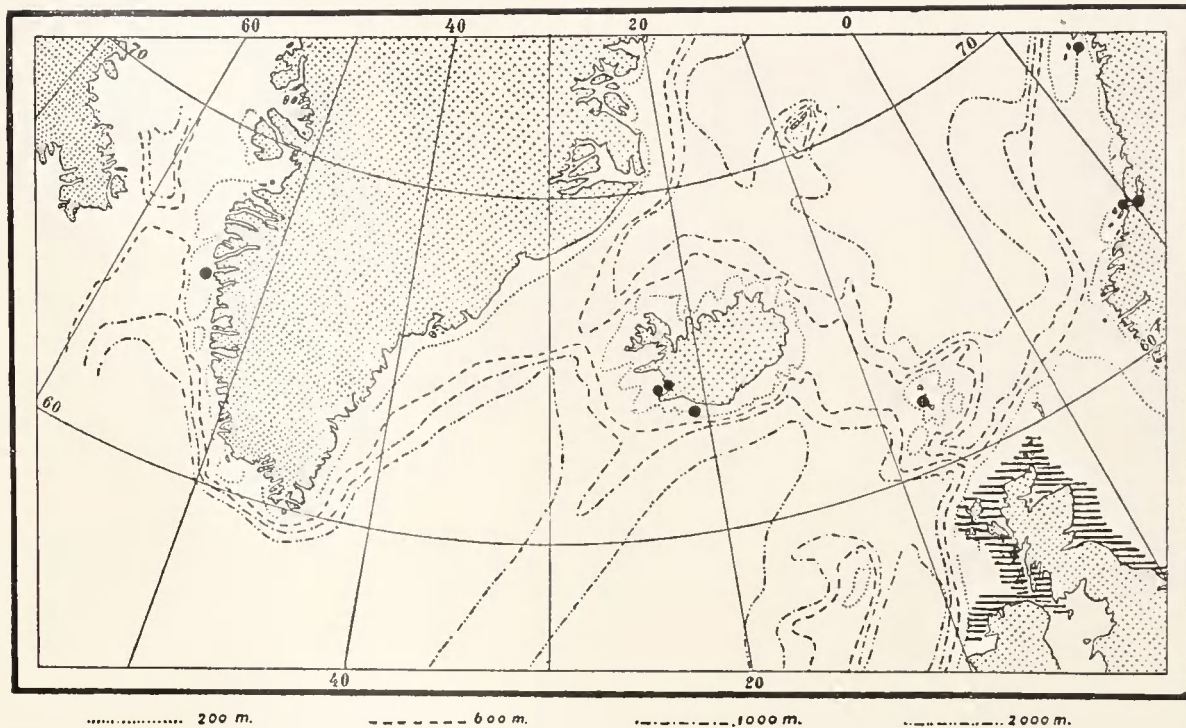
Material:

Greenland: Store Hellefiskebanke . . . Depth 28 fath.

Iceland: Stykkisholm . . . Depth 30 fath.

The Faroe Islands: between Nolsö and Østnæs . . . Depth 100 fath.

The specimens from the "Store Hellefiskebanke" offer a great interest, the male gonophores

.... 200 m.   _ _ _ _ _ _ _ 600 m.   .—.—.—.—.—.1000 m.   .—.—.—.—.—.. 2000 m.

Text-fig. U. The distribution of *Eudendrium capillare* in the Northern Atlantic.
(The hatched coastal region indicates a scattered occurence according to the litterature).

being borne by diminutive polyps. It accordingly appears that the fertile polyps of the species are not always wholly atrophied, as has hitherto been generally supposed.

The distribution of *Eudendrium capillare* is extremely wide, almost quite cosmopolitan. It very frequently occurs in the northern seas (Text-fig. U); however, already in the Norwegian Sea and along the west coast of Norway its occurence becomes less frequent, and it does not penetrate very far into the Arctic regions. The species belongs to the middle parts of the littoral region.

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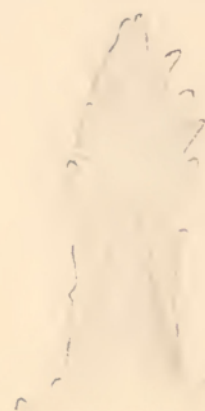
Plate I.

Plate I.

Fig. 1. Nematocyst from the tentacle of *Monocoryne gigantca*. Delafields haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 2. Nematocyst from the tentacle of *Coryne Lovéni*. Boehmers haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 3. Nematocysts from the tentacle of *Myriothela phrygia,* a: of the general, ovoid type, b: of the rarer, narrow type. Delafields haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 4. Nematocyst from the tentacle of *Tubularia indivisa*. Delafields haematoxyline — van Giesson. $^{1750}/_1$.

— 5. · Nematocyst from the tentacle of *Clava multicornis*. Delafields haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 6. Nematocyst from the tentacle of *Bougainvillia ramosa*. Delafields haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 7. Nematocysts from *Eudendrium Wrighti*, a: small type from the tentacles, b: larger type from the belt of stinging cells at the base of the polyp body. Delafields haematoxyline — Iron ammonium sulfate. $^{1750}/_1$.

— 8. *Myriothela phrygia;* mutilated specimen from the "Ingolf" st. 125. $^2/_1$.

— 9. *Hydractinia cchinata;* spines from the Greenland specimen. $^{60}/_1$.

— 10.   —   —   specimen from Greenland with extraordinarily large spines. $^2/_1$.

— 11. *Hydractinia carica;* spines from the type specimen. $^{60}/_1$.

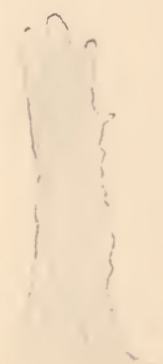— 12. *Hydractinia Sarsii;* spines from a specimen from Godthaab harbour, wrongly labelled "*Podocoryne carnea*". $^{60}/_1$.

Plate II.

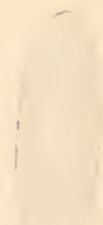# Plate II.
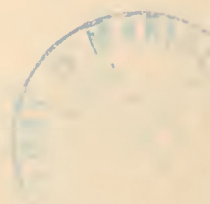
Fig. 13. *Coryne Loveni;* specimen from Bjarköy, Northern Norway. $^{20}/_1$.

— 14. *Corymorpha groenlandica;* one of Allmans type specimens of *Monocaulus groenlandica* showing the young blastostyles as mere sacs without any trace of the single gonophores. $^{30}/_1$.

— 15. *Corymorpha groenlandica* from the Davis street, wrongly labelled *"Amalthæa islandica"*. Nat. size.

— 16. *Tubularia pulcher.* Gonophore of one of the type specimens of *"Auliscus pulcher"*. $^{60}/_1$.

— 17. *Merona cornucopiæ* on *Cardium* sp. from the Faroe-islands. $^{30}/_1$.

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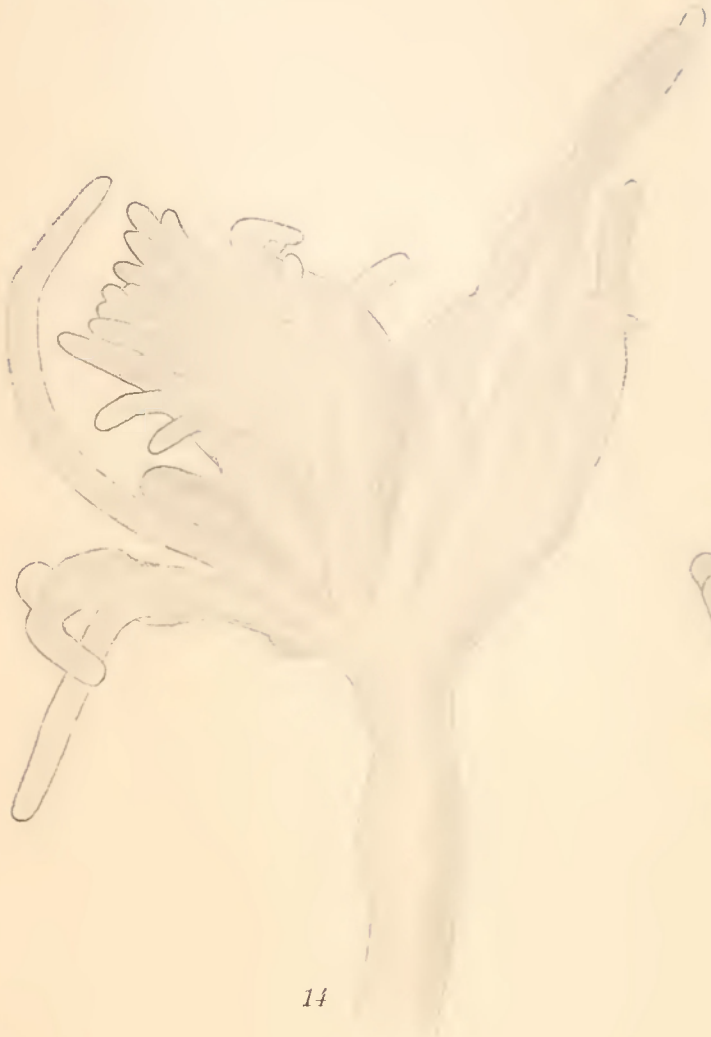
THE INGOLF-EXPEDITION

1895—1896.

THE LOCALITIES, DEPTHS, AND BOTTOMTEMPERATURES OF THE STATIONS

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
1	62° 30'	8° 21'	132	7°2	24	63° 06'	56° 00'	1199	2°4	45	61° 32	9° 43'	643	4°17
2	63° 04'	9° 22'	262	5°3	25	63° 30'	54° 25'	582	3°3	46	61° 32'	11° 36'	720	2°40
3	63° 35'	10° 24'	272	0°5		63° 51'	53° 03'	136		47	61° 32'	13° 40'	950	3°23
4	64° 07'	11° 12'	237	2°5	26	63° 57'	52° 41'	34	0°6	48	61° 32'	15° 11'	1150	3°17
5	64° 40'	12° 09'	155			64° 37'	54° 24'	109		49	62° 07'	15° 07'	1120	2°91
6	63° 43'	14° 34'	90	7°0	27	64° 54'	55° 10'	393	3°8	50	62° 43'	15° 07'	1020	3°13
7	63° 13'	15° 41'	600	4°5	28	65° 14'	55° 42'	420	3°5	51	64° 15'	14° 22'	68	7°32
8	63° 56'	24° 40'	136	6°0	29	65° 34'	54° 31'	68	0°2	52	63° 57'	13° 32'	420	7°87
9	64° 18'	27° 00'	295	5°8	30	66° 50'	54° 28'	22	1°05	53	63° 15'	15° 07'	795	3°08
10	64° 24'	28° 50'	788	3°5	31	66° 35'	55° 54'	88	1°6	54	63° 08'	15° 40'	691	3°9
11	64° 34'	31° 12'	1300	1°6	32	66° 35'	56° 38'	318	3°9	55	63° 33'	15° 02'	316	5°9
12	64° 38'	32° 37'	1040	0°3	33	67° 57'	55° 30'	35	0°8	56	64° 00'	15° 09'	68	7°57
13	64° 47'	34° 33'	622	3°0	34	65° 17'	54° 17'	55		57	63° 37'	13° 02'	350	3°4
14	64° 45'	35° 05'	176	4°4	35	65° 16'	55° 05'	362	3°6	58	64° 25'	12° 09'	211	0°8
15	66° 18'	25° 59'	330	−0°75	36	61° 50'	56° 21'	1435	1°5	59	65° 00'	11° 16'	310	0°1
16	65° 43'	26° 58'	250	6°1	37	60° 17'	54° 05'	1715	1°4	60	65° 09'	12° 27'	124	0°9
17	62° 49'	26° 55'	745	3°4	38	59° 12'	51° 05'	1870	1°3	61	65° 03'	13° 06'	55	0°4
18	61° 44'	30° 29'	1135	3°0	39	62° 00'	22° 38'	865	2°9	62	63° 18'	19° 12'	72	7°92
19	60° 29'	34° 14'	1566	2°4	40	62° 00'	21° 36'	845	3°3	63	62° 40'	19° 05'	800	4°0
20	58° 20'	40° 48'	1695	1°5	41	61° 39'	17° 10	1245	2°0	64	62° 06'	19° 00'	1041	3°1
21	58° 01'	44° 45'	1330	2°4	42	61° 41'	10° 17'	625	0°4	65	61° 33'	19° 00'	1089	3°0
22	58° 10'	48° 25'	1845	1°4	43	61° 42'	10° 11'	645	0°05	66	61° 33'	20° 43'	1128	3°3
23	60° 43'	56° 00'	Only the Plankton-Net used		44	61° 42'	9° 36'	545	4°8	67	61° 30'	22° 30'	975	3°0

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
68	62° 06′	22° 30′	843	3°4	92	64° 44′	32° 52′	976	1°4	118	68° 27′	8° 20′	1060	—1°0
69	62° 40′	22° 17′	589	3°9	93	64° 24′	35° 14′	767	1°46	119	67° 53′	10° 19′	1010	—1°0
70	63° 09′	22° 05′	134	7°0	94	64° 56′	36° 19′	204	4°1	120	67° 29′	11° 32′	885	—1°0
71	63° 46′	22° 03′	46			65° 31′	30° 45′	213		121	66° 59′	13° 11′	529	—0°7
72	63° 12′	23° 04′	197	6°7	95	65° 14′	30° 39′	752	2°1	122	66° 42′	14° 44′	115	1°8
73	62° 58′	23° 28′	486	5°5	96	65° 24′	29° 00′	735	1°2	123	66° 52′	15° 40′	145	2°0
74	62° 17′	24° 36′	695	4°2	97	65° 28′	27° 39′	450	5°5	124	67° 40′	15° 40′	495	—0°6
	61° 57′	25° 35′	761		98	65° 38′	26° 27′	138	5°9	125	68° 08′	16° 02′	729	—0°8
	61° 28′	25° 06′	829		99	66° 13′	25° 53′	187	6°1	126	67° 19′	15° 52′	293	—0°5
75	61° 28′	26° 25′	780	4°3	100	66° 23′	14° 02′	59	0°4	127	66° 33′	20° 05′	44	5°6
76	60° 50′	26° 50′	806	4°1	101	66° 23′	12° 05′	537	—0°7	128	66° 50′	20° 02′	194	0°6
77	60° 10′	26° 59′	951	3°6	102	66° 23′	10° 26′	750	—0°9	129	66° 35′	23° 47′	117	6°5
78	60° 37′	27° 52′	799	4°5	103	66° 23′	8° 52′	579	—0°6	130	63° 00′	20° 40′	338	6°55
79	60° 52′	28° 58′	653	4°4	104	66° 23′	7° 25′	957	—1°1	131	63° 00′	19° 09′	698	4°7
80	61° 02′	29° 32′	935	4°0	105	65° 34′	7° 31′	762	—0°8	132	63° 00′	17° 04′	747	4°6
81	61° 44′	27° 00′	485	6°1	106	65° 34′	8° 54′	447	—0°6	133	63° 14′	11° 24′	230	2°2
82	61° 55′	27° 28′	824	4°1		65° 29′	8° 40′	466		134	62° 34′	10° 26′	299	4°1
83	62° 25′	28° 30′	912	3°5	107	65° 33′	10° 28′	492	—0°3	135	62° 48′	9° 48′	270	0°4
	62° 36′	26° 01′	472		108	65° 30′	12° 00′	97	1°1	136	63° 01′	9° 11′	256	4°8
	62° 36′	25° 30′	401		109	65° 29′	13° 25′	38	1°5	137	63° 14′	8° 31′	297	—0°6
84	62° 58′	25° 24′	633	4°8	110	66° 44′	11° 33′	781	0°8	138	63° 26′	7° 56′	471	—0°6
85	63° 21′	25° 21′	170		111	67° 14′	8° 48′	860	—0°9	139	63° 36′	7° 30′	702	—0°6
86	65° 03′6	23° 47′6	76		112	67° 57′	6° 44′	1267	—1°1	140	63° 29′	6° 57′	780	—0°9
87	65° 02′3	23° 56′2	110		113	69° 31′	7° 06′	1309	—1°0	141	63° 22′	6° 58′	679	—0°6
88	64° 58′	24° 25′	76	6°9	114	70° 36′	7° 29′	773	—1°0	142	63° 07′	7° 05′	587	—0°6
89	64° 45′	27° 20′	310	8°4	115	70° 50′	8° 29′	86	0°1	143	62° 58′	7° 09′	388	—0°4
90	64° 45′	29° 06′	568	4°4	116	70° 05′	8° 26′	371	—0°4	144	62° 49′	7° 12′	276	1°6
91	64° 44′	31° 00′	1236	3°1	117	69° 13′	8° 23′	1003	—1°0					

Jan Mayen

Faröerne

ISLAND

Reykjavik

GRÖNLAND

Danmarks Strede

Davis Strede

Godthaab
Egedesminde
Holstenborg
Sukkertoppen
Godthaab
Frederikshaab
Julianehaab
C. Farvel

Ujunaysulik

30° V f Greenwich

0	100 danske Favn (danish fathoms)
100	300
300	600
600	700
700	1000
over	1000

----- Grænselinie mellem koldt og varmt Bundvand
(limit between cold and warm water at the bottom)

THE DANISH INGOLF-EXPEDITION.

HITHERTO PUBLISHED: