

## NOTES ON MEDITERRANEAN ALCYONIUM SPECIES (COELENTERATA: OCTOCORALLIA)

by

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In this paper I will try to solve the controversial points still existing in respect to the species *Alcyonium palmatum* Pallas, *Alcyonium acaule* Marion and *Alcyonium brioniense* Kükenthal. I found that *A. brioniense* has to be regarded a synonym of *A. acaule*, and that *A. palmatum adriaticum* Kükenthal, 1907, (= *A. adriaticum* of Kükenthal, 1909) can neither be considered a geographical race nor a valid species.

I wish to express my sincere thanks to Dr. L. D. Brongersma, director, and Drs. W. Vervoort and L. B. Holthuis, curators, of the Rijksmuseum van Natuurlijke Historie at Leiden, to Prof. Dr. H. Engel, director, and Dr. J. H. Stock, curator, of the Zoölogisch Museum at Amsterdam, for placing material of their respective museums at my disposal and for their kind assistance. My thanks are also due to my colleagues Mr. W. ter Spill, who revised my English, and Mr. G. J. Vrijmoeth, who performed for me the difficult task of making the photographs.

### OUTLINE OF THE LITERATURE CONCERNING ALCYONIUM ACAULE MARION AND A. BRIONIENSE KÜKENTHAL

In 1878 Marion distinguished between two types of *Alcyonium*, occurring in the Bay of Marseilles. The first type he called „les Alcyons des fonds vaseux”, evidently since it is found on a muddy bottom. This type was characterized as follows: (a) the colony has a long sterile stalk (Marion, 1878, pl. 6 fig. 1); (b) the length of the colony is 23 cm and more; (c) usually the colour is palish, though sometimes it may be a dirty light-yellow, brown-red or bright vermillion; (d) the tegument is transparent and nearly colourless; (e) usually the zooids are colourless or slightly white or yellow, sometimes their spicules are reddish; (f) in the sterile stalk there are short, thick spicules with some warts, low cones or knobs, and crosses (Marion, 1878, pl. 9 fig. 10,  $\delta'''$ ,  $\delta''''$  and fig. 11,  $\delta''$ - $\delta'''$ ; cf. my figs. 4g-j and 6f-i). The colonies of this type were referred by Marion to *A. palmatum* Pallas.

The colonies of the other type, “les Alcyons (sessiles) des fonds coralligènes” are found on fragments of corals, rocky bottom or on calcareous algae. They show the following characters: (a) the sterile part is very short, and passes into an encrusting base; immediately above this sterile part the

lobes arise; (b) the colonies are 10-12 cm high; (c) usually they are dark wine-red, sometimes chamois-reddish; (d) the cortical layer is very rough and resistant, the spicules in the cortex, coenenchyma, tentacles and the base of the zooids are much more numerous than in *A. palmatum*, and are coloured; (e) in the sterile part the short, thick, knobby spicules and the crosses are absent. These differences are striking enough, and Marion proposed to call this species *A. acaule*.

It is remarkable that according to Marion's figure 9  $\delta'$  in *A. acaule* the cortex contains clubs; I shall return to this below.

Four years later Marion (1882, p. 408) mentioned *A. palmatum* var. *acaule*. Apparently Marion then considered *A. acaule* a variety of *A. palmatum*, but he stated that "this form ... will be considered by some zoologists a true species". "It is characterized by its incrusting base furnished with zooids, and by its dense tissues closely packed with strong spicules".

Von Koch (1891, pp. 663-667) was provisionally willing to follow Marion in separating *A. acaule* from *A. palmatum*. He considered the former a separate species, which is characterized by the following: "Stamm kürzer, breit aufsitzend, weniger reich verzweigt. Gewebe fester. Polypen größer, 12 mm lang bis zur Mundscheibe und bis 3 mm dick, Spicula des Cönosarks plumper". I may point to the club-shaped spicule figured by Von Koch in his fig. 17.

Unlike Von Koch, Roule (1900, p. 125) held the view that *A. acaule* has to be abandoned as a separate species. Roule had often examined specimens of *Alcyonium* from the coasts of Languedoc, and found many intermediate forms between the *palmatum* and *acaule* types; according to him the ecological conditions determine the different characters. He found, however, that in the specimens agreeing with the *acaule* type the coenenchymal spicules are slightly longer.

In 1907 Kükenthal described the new species *A. brioniense*. In this publication he incidentally mentioned *A. acaule* Marion (p. 64), but instead of citing the original publication he quoted the diagnosis of this species given by Von Koch (1891). He did not give his opinion about the validity of *A. acaule*. For the following reasons I suppose that Kükenthal had not seen Marion's original paper on *A. acaule*: (1) Kükenthal did not mention either title, journal or year of publication of Marion's paper, he only cited Von Koch; (2) if Kükenthal had seen Marion's paper he would no doubt have compared his *A. brioniense* with Marion's *A. acaule*. I am convinced that in that case he would have hesitated to establish his new species.

Lüttschwager (1914, p. 25) considered Roule correct in doubting the validity of *A. acaule*.

Roxas (1933, p. 357), Frenzel (1937), Pax & Frenzel (1938) and Pax & Müller (1954-55, 1955 b) considered *A. brioniense* a valid species. Pax & Müller (1954-55, sep. p. 31) took *A. acaule* for an ecological modification ("Standortsmodifikation") of *A. palmatum*.

Broch (1953, p. 6) found specimens of *A. palmatum*, in which "the spicula of the eight teeth representing the rudimentary calyx, are colourless or, in a few colonies, bright orange, lending a fascinating appearance to the colony, especially when the polyps are withdrawn. The colonies in this case decidedly recall the description of *Alcyonium brioniense* of Kükenthal". This comparison is incorrect as Kükenthal (1907, p. 68) stated: "Die Farbe der gesamten Kolonie ist dunkel-purpurrot, nur die Tentakel samt oberstem Polypenteil sind hellgelb". So in *A. brioniense* the calyx is dark-red. As to the validity of this species Broch (1953, p. 7) supposed "that it at present seems most correct to look on them (viz., *A. palmatum* and *A. brioniense*) as different species".

The first investigator who, after Von Koch, recognized *A. acaule* as a valid species is A. Béranguier (1954). She compared both species *A. palmatum* and *A. acaule*, and she paid special attention to the spiculation. It is, however, to be regretted that her drawings of the spicules are so poor. Béranguier referred to Kükenthal (1909), and supposed that *A. adriaticum* is not different from *A. palmatum* from the Bay of Marseilles, and that *A. brioniense* (misspelled *A. brionense*) is the same as *A. acaule*. As we shall see below I quite agree with Béranguier in this respect.

It struck me that the French investigator Béranguier did not mention Kükenthal's paper of 1907, in which *A. brioniense* was described for the first time, and that German authors such as Von Koch, Kükenthal, Frenzel and Pax & Müller nowhere record the title, the name of the journal or the date of Marion's first publication of 1878.

### ***Alcyonium acaule* Marion, 1878**

Amsterdam Museum

Banyuls, south-east coast of France, dépt. Pyrénées orientales; on rocky bottom near the pier, depth about 12 m; collected by Dr. J. H. Stock, 29 August 1960, many specimens.

Diagnosis. — Colony low, rigid, entirely opaque; sterile part short; lobes digitate, upright, unbranched or with short side-branches, uniformly covered with autozooids; anthocodial armature: crown spicules in about twenty-five rows, superposed by numerous spindles arranged en chevron; tentacles with eight pairs of pinnules; in coenenchyma spindles, in the cortical layer numerous clubs; colour dark-red, sometimes light-red.

Description. — The maximum heights of the colonies (pl. XI) vary from 33 to 60 mm, the maximum breadth may be 48 mm. The lobes arise from a common basal part, of which the undermost part is sterile. The height of this sterile part is usually less than 10 mm, but in some cases the undermost zooids are to be found at a distance of 15 to 20 mm from the often expanded base of attachment.

In many cases the lobes stand in one row, up to four in number, and close to each other like the fingers of a stretched hand. In other colonies they are more irregularly arranged. These lobes are up to 33 mm in length, mostly 6 to 8 mm in breadth, and 4 to 5 mm in thickness, so they are usually flattened; the tips are rounded. In a few cases the lobes are wider, in one colony (pl. XI fig. 2) the basal part of a lobe measured as much as 18 mm in width. Most of the lobes have short side-branches, which are only slightly narrower than the lobes themselves. The whole colony is always very rigid.

The uppermost part of the common basal part and the lobes are uniformly covered with zooids. The anthocodiae are usually retracted within low, vulcano-shaped calyces. The distance between the centres of the calyces is 1.25 to 2.00 mm. In other colonies, however, the distal part of the anthocodia rises just above the rim of the calyx, revealing the anthocodial crown and points. Fortunately there is one colony (pl. XI fig. 5) which does have fully extended zooids, which reach a length of 3 to 4 mm; the wide open calyx then has a diameter of about 1.5 mm. In these zooids the thin body wall just above the calyx (= anthostele) may be swollen, reaching up to 2 mm in diameter. Unfortunately the tentacles are nearly always strongly contracted; in a few cases, however, the number of the small, rounded pinnules could be counted: eight on each side of the tentacle.

The spicules. — In the colony with extended zooids it was possible to examine the distribution, the shape and the dimensions of the anthocodial spicules: (a) the anthostele is thickly filled with irregularly arranged spicules, 0.09 to 0.15 mm long; they are spindles or slightly club-shaped, red or colourless, and provided with girdles of blunt cones or warts; (b) in the long neck zone the spindles are much less numerous, their length increases, and gradually they pass into (c) the numerous, more densely packed and transversely arranged spindles forming the crown, which consists of up to about twenty-five rows. These narrow spindles are 0.20 to 0.30 mm long and have low cones; (d) distally the crown passes into the points; at first there are numerous, almost needle-shaped spicules arranged en chevron; they are very closely packed, their length is 0.30 to 0.45 mm, their width 0.011 to 0.025 mm, they bear the same low cones; upwards these slender spindles gradually show a longitudinal arrangement; (e) in the tentacles the spicules diverge

featherwise; at first they still have a length of about 0.23 mm but in the tips of the tentacles their length is 0.15 mm; they are often club-shaped, the thickened end pointing outwards.

In the rigid cortical layer of the lobes, about 0.12 to 0.15 mm thick, clubs and rods are met with, very closely packed and standing at right angles to the surface of the lobe, the clubs with their heads turned outwards (text-fig. 1a-e). Most of them measure 0.07 to 0.10 mm in length. In my opinion these clubs (text-fig. 1a, c) are characteristic of *A. acaule*.

Just under this outer layer and in the thick coenenchymal canal-walls numerous spindles and needles occur, measuring 0.25 to 0.56 mm in length and 0.014 to 0.022 mm in width; they bear spines, sometimes split at the tip (text-fig. 2a-c).

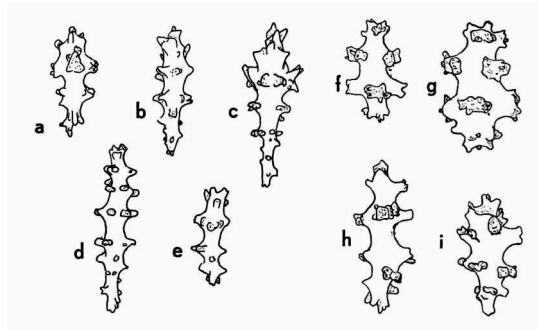


Fig. 1. *Alcyonium acaule* Marion, cortical spicules. a-e, from the lobes; f-i, from the sterile basal part of the stalk.  $\times 180$ .

The cortical layer of the basalmost, sterile part of the stalk has closely packed spicules of the following types: (a) small capstans, capstan-like rods and clubs, 0.06 to 0.10 mm long, the waist of the capstans is 0.014 to 0.030 mm wide (text-fig. 1f, i); (b) slightly larger, cylindrical or barrel-shaped bodies, about 0.12 mm long and 0.04 mm wide, and provided with more irregularly placed warts (text-fig. 1g, h).

These cortical spicules are not arranged at right angles to the surface.

In the interior of the sterile part the coenenchyma is thickly filled with spindles varying in length from 0.15 to 0.33 mm (rarely longer, up to 0.38 mm). Their width varies from 0.015 to 0.035 mm. They have high warts, sometimes arranged in girdles (text-fig. 2d-g). Besides, some more or less irregularly shaped spicules or capstans may be met with (text-fig. 2h-k). Crosses are scarce, both in cortex and in coenenchyma (text-fig. 2l). The colour varies from colourless to red.

The canal system shows the ordinary scheme of *Alcyonium*. The gastric

cavities of many zooids extend as far as the base of the colony, those of other zooids are shorter. Many solenia connect the coelentera. In the whole colony there is a superficial network of solenia, which are about 0.04 to 0.10 mm wide.

Colour. — In most colonies the colour is dark wine-red owing to the red

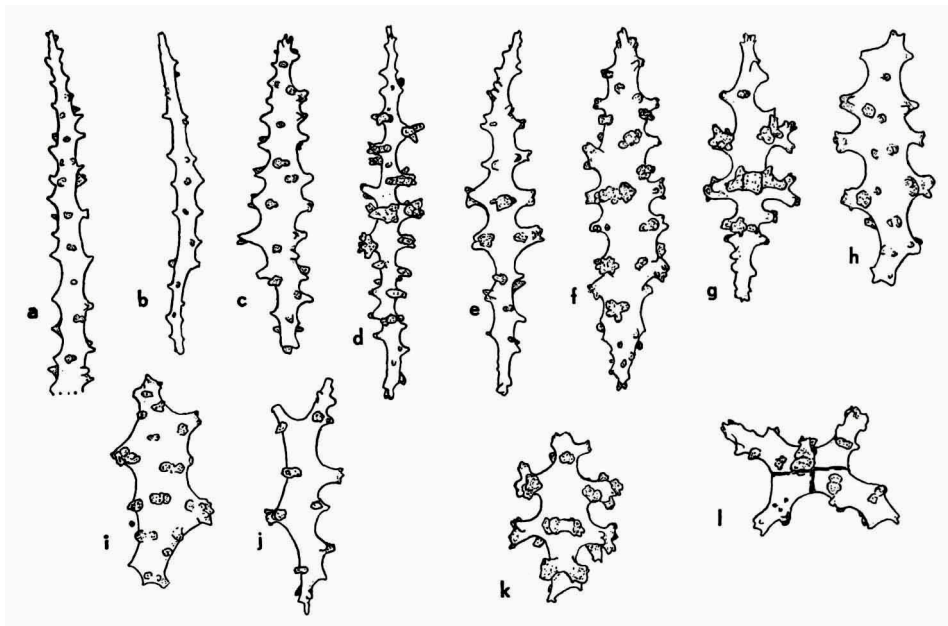


Fig. 2. *Alcyonium acaule* Marion, coenenchymal spicules. a-c, from the lobes (a is just half of a spicule); d-l, from the sterile basal part of the stalk,  $\times 180$ .

spicules in the cortex. In the coenenchyma of the lobes the spindles are also red, in the stalk the colour varies from colourless to red. One colony (that with extended zooids) is light-red (pl. XI fig. 5), the bulk of the cortical spicules being colourless.

When in the dark-red colonies the zooids are not fully retracted they are visible as yellow dots (cf. Kükenthal, 1907, pl. 4). This is caused by the yellow point spicules and by the yellow colour of the tissues in the tentacles and of the tentacle spicules. In some colonies, however, the point spicules are dark-red, but at the same time the tentacles are yellow. In the light-red colony nearly all crown and point spicules are yellow, but now the spicules in the tentacles are red. So there exists some variability in the colour of the anthocodial spicules.

Comparison with Marion's (1878) description of *Alcyonium acaule*. — According to Marion the height of the contracted colonies may be up to 100 or 120 mm, but in our material the specimens are up to 60 mm in height. Compared with the colony figured in Marion's figure VIII the lobes of our colonies are narrower and shorter, they seem to be more contracted. Further I found small crosses in the basal part of the colonies, though in a very small number, but in my opinion this is of no importance. For the rest I could not establish any clear difference.

Comparison with *Alcyonium brioniense* Kükenthal, 1907. — In looking at Kükenthal's plate 4 (1907) it struck me that the colony figured there is rather like the colonies of *A. acaule* placed at my disposal. In my colonies the lobes usually stand more upright, and generally they are narrower, but for the rest there is no clear difference to be found. Just as in some of my colonies the slightly projecting zooids are conspicuous by their yellow colour.

Kükenthal estimated the length of the extended polyps at half of those in *A. palmatum*. In the latter they are 8 mm long on an average (Von Koch, 1891; Kükenthal, 1907, p. 68), so in *A. brioniense* they would have to be 4 mm long, which is in accordance with the length of the extended zooids in one of my colonies. In other respects I found only few, unimportant differences. Kükenthal records, e.g., that in the coenenchyma the spicules are up to 0.25 mm in length (according to the enlargement the spicule in his fig. 5 is 0.35 mm long). I found, however, that in the lobes the coenenchymal spicules are longer, up to 0.56 mm, but in the basal part of the colony they are shorter, up to 0.30 mm. For the rest I could not find any difference, and I am, therefore, of the opinion that *A. brioniense* is the same as *A. acaule*. Consequently the name *A. brioniense* must be abandoned in favour of the older name *A. acaule*, which species should be regarded as a valid one.

#### THE PROBLEMS CONCERNING ALCYONIUM PALMATUM PALLAS, 1766

In 1907 Kükenthal noted that the specimens of *A. palmatum* found in the Adriatic Sea differ in some respects from those collected near Naples. From his description and figures it appears that his *A. palmatum* forma *adriatica* is characterized by the following: (1) the branching is in one plane, the so-called "pinnate branching" of Broch (1953); (2) the spicules in the cortex of the lobes are shorter and wider, and have stronger spines; (3) in the cortex and in the interior of the stalk there are wide, flat spicules ("Platten"), 0.12 mm long and 0.06 mm wide; in *A. palmatum* forma *typica* the canal-wall spicules are usually much more slender and rod-like, and they are provided with high warts ("gezackte Warzen").

Two years later Kükenthal (1909, p. 323) considered the Adriatic form as a true species, and named it *A. adriaticum*.

Frenzel (1937) stated that the differences between the spicules of both forms as established by Kükenthal do not exist. He considered the Adriatic form as a geographical race, differing solely in the shape of the colony.

Broch (1953) reunited the Adriatic form with the typical form. According to him the different mode of branching is due to ecological conditions.

Pax & Müller (1954/55, 1955a, b), however, preferred to keep the two races separate.

In 1937 A. Durivault again examined the spiculation of *A. palmatum*. In my opinion her investigation is of great importance, as she has shown that in the different parts of the colony, viz., the base and the middle of the stalk, the basal part of the main stem and the lobes, the spicules vary considerably in size and shape. Especially the spicules in the interior of the extreme basal part of the stalk are quite unlike those in the middle of it. Those in the extreme basal part are short, broad, knobby spicules such as shown in text-fig. 6g, h. They strongly resemble those figured by Kükenthal (1907, figs. 10, 11). It is to be regretted that Durivault did not record the locality of her specimen(s). For, as I will show below, such cumbrous spicules are abundant in the "Adriatic" specimens.

At any rate it appears that the shape of the spicules varies in the different parts of the stalk. That Kükenthal only found slender spicules in the interior of the stalk of the one specimen from Naples that he examined is probably due to the fact that he did not extend his examination to all parts of the stalk. In the extreme basal part of it he would probably have found quite different types.

### **Alcyonium palmatum** Pallas, 1766

#### Leiden Museum

Split, coast of Yugoslavia; dredged off Trogir, depth about 40 m, 23-24 August 1960; 9 specimens.

Bay of Cadaqués, N.E. Spain; brought to land by inshore fishermen, 5-19 August 1954; leg. Dr. L. B. Holthuis, nr. 144; 2 specimens.

Locality unknown, 1 specimen.

#### Amsterdam Museum

Cape Béar, south-east coast of France, dépt. Pyrénées orientales; depth 50-60 m, 27 June 1956; 6 specimens.

#### Verseveldt collection

Naples; 1937; 1 specimen.

It is not my intention to describe this species completely, as many details are sufficiently known from the descriptions of previous authors.



Suffice it to mention a few points.

I. The shape of the colonies in connection with their localities.

The smallest of the nine specimens dredged near Split in the Adriatic Sea is 70 mm high, the largest is 150 mm high. The undivided stalk, of which only the basal part is sterile, varies considerably in length. In the largest colony it measures 70 mm in length, in most colonies it is 30 to 40 mm long, in one colony the stalk is only 10 mm long, whereas the whole colony measures 80 mm in height. The habitus of this colony strongly suggests that of *A. acaule*. I shall return to this specimen below (point IIIB).

Most of the colonies show a ramification in one plane. In one colony the primary branches actually arise in one plane, but they have many side-

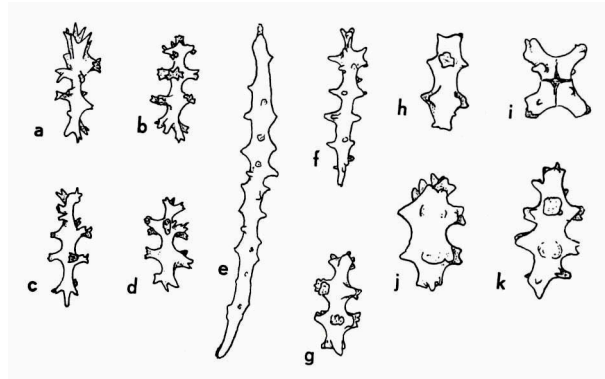


Fig. 3. *Alcyonium palmatum* Pallas, specimen from Naples, cortical spicules. a-f, from main stem and lobes; g, from the middle of the stalk; h-k, from the base of the stalk.  $\times 180$ .

branches curved in all directions. In another colony the branches arise in all directions, showing the typical *palmatum* mode of branching. Broch (1953, p. 7), too, has found a few colonies of this type in the Adriatic Sea.

One of the colonies from the Bay of Cadaqués and four specimens from Cape Béar are young ones; they are unbranched, or they have knob-like prominences or a few very short branches. Two of these colonies from Cape Béar are very small, measuring 20 and 25 mm in total height, of which 5 mm goes to the white, sterile base. They are flexible, not rigid, the colour is nearly white and light brown; the anthocodial spicules composing crown and points are brownish red. Had the colour of the base and the stem been dark red, one would have felt tempted to refer them to *A. acaule*. But the spicules, especially those in the outer layer of the stem, agree with those of *A. palmatum* (see below, point III).

The other colony from the Bay of Cadaqués (pl. XII fig. 1) and two of the colonies from Cape Béar (pl. XII figs. 2, 3) show a typical *adriaticum* mode of branching. These "adriatic" forms have been dredged near the coast of N. E. Spain and S. E. France, far away from the Adriatic Sea. From this it follows that colonies of *A. palmatum* showing a branching in one plane cannot be considered as a geographical race as, e.g., Frenzel (1937, p. 5) suggests. According to him the area of distribution of this "race" is confined to the northern part of the Adriatic Sea; up to the date of his publication (1937) no localities of the "adriatic" form were known outside this area. But this is no longer true.

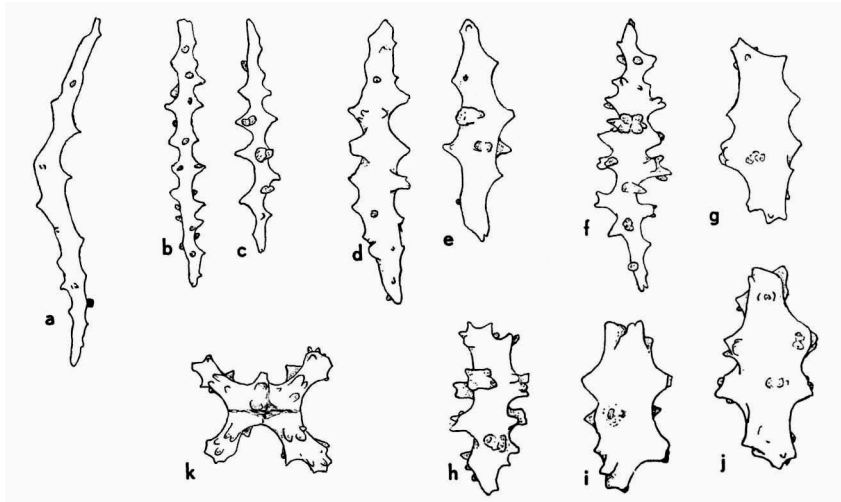


Fig. 4. *Alcyonium palmatum* Pallas, specimen from Naples, coenenchymal spicules. a, from the lobes; b-c, from the uppermost, fertile part of the stalk; d-e, from the middle of the stalk; f-j, from the base of the stalk.  $\times 180$ .

The colony from an unknown locality, pinnate though it is, does not play a part in this question.

The specimen from Naples (pl. XII fig. 4) is branched in a typical *palmatum* manner. It is excellently preserved and has beautifully extended zooids.

## II. The anthocodiae.

The extended zooids of the specimen from Naples have a length of up to 8 mm. Only the spicules forming crown and points are red, the other anthocodial spicules are colourless. In respect to the number of rows composing the crown there is an important difference between the zooids of this colony. In some of them there is hardly any question of a crown: there are only some irregularly arranged spicules. In other zooids the spindles are

more transversely arranged, forming rows to the number of four or more, up to about twenty.

The same applies to the specimens from Split and Cadaqués. In most zooids the number of rows varies from one to ten.

### III. The spicules.

I have already mentioned that Frenzel (1937) denied the differences in spiculation between the two "races" of *A. palmatum* suggested by Kükenthal (1907, 1909). I examined the spicules in my material with the following results.

#### A. The specimen from Naples.

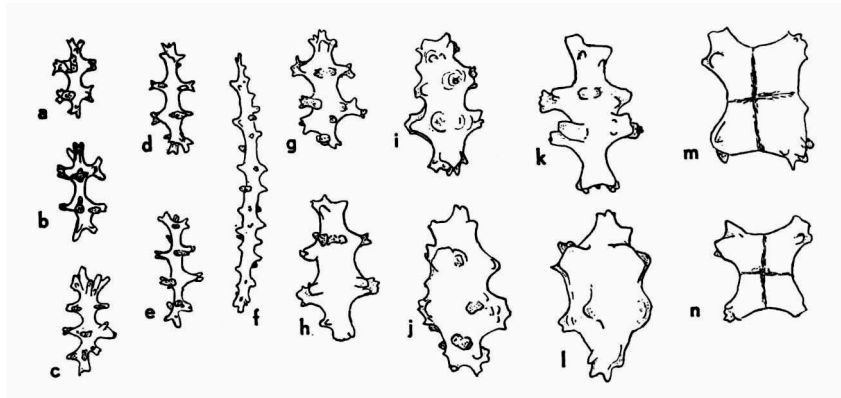


Fig. 5. *Alcyonium palmatum* Pallas, specimen from Split, cortical spicules. a-f, from main stem and lobes; g-h, from the uppermost, fertile part of the stalk (here also types as in a and c); i-j, from the middle of the stalk (here also types as in a, c, g, h); k-n, from the base of the stalk.  $\times 180$ .

In the thin, translucent outer layer of the main stem and the lobes, the bulk of the spicules consists of small capstan-like rods with often two whorls of high, wart-like prominences, and a tuft of usually more spiny processes at the ends (text-fig. 3a-d). A common type, which is characteristic of *A. palmatum*, is represented in text-fig. 3a: at one end the spines are larger and more densely packed; owing to this the spicule seems to imitate a club (cf. Von Koch, 1891, fig. 16 below right; Kükenthal, 1907, fig. 6, left spicule). They are 0.05 to 0.10 mm long and 0.005 to 0.010 mm wide. Besides these there are long, narrow needles provided with spines or cones; they measure 0.15 to 0.30 mm in length (text-fig. 3e, f). These "cortical" spicules are not closely packed, they lie parallel to the surface.

I found that in the outermost, thin layer of the stalk the spicules differ from those occurring slightly deeper. I therefore chipped off a very thin sliver with a razor. This very thin layer I call outer layer or cortical layer.

From Frenzel's figures it appears that this author, on the contrary, applied the term cortical spicule also to those spicules lying slightly deeper in the stalk. The spicules figured by Frenzel resemble very closely those occurring in the canal-walls of the stalk.

In the uppermost (fertile) part of the stalk the outer layer has the same small capstans as those occurring in stem and lobes, but their waist is slightly wider, measuring 0.010 to 0.014 mm (text-fig. 3g). In addition to these, we

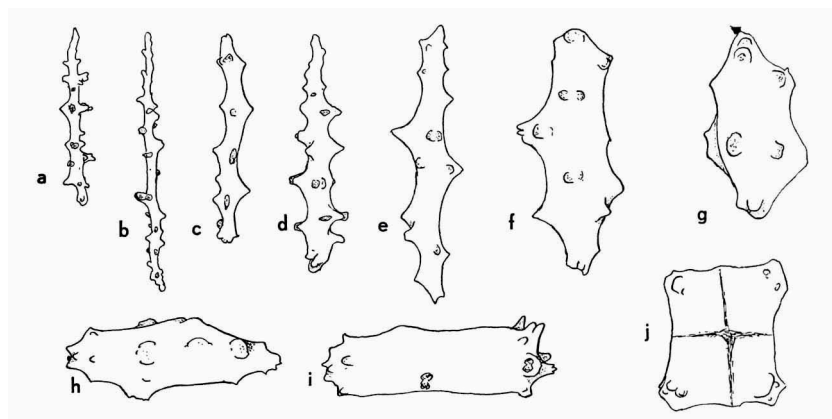


Fig. 6. *Alcyonium palmatum* Pallas, specimen from Split, coenenchymal spicules. a-b, from the lobes; c-d, from the uppermost, fertile part of the stalk (here also types as in a and b); e-f, from the middle of the stalk; g-j, from the base of the stalk.  $\times 180$ .

still find narrow needles, 0.18 to 0.23 mm long, but in the middle of the stalk these needles have disappeared, and the capstans gradually become wider. In the basal expansion the latter are 0.014 to 0.028 mm wide, and have bigger prominences (text-fig. 3h, j, k). A few small crosses are met with (text-fig. 3i).

In the interior of stem and lobes the spicules are scarce. They are knobby or spiny, sometimes irregularly curved spindles, up to 0.30 mm long (text-fig. 4a).

Just as the cortical stalk spicules change, so the spicules in the interior of the stalk change in shape towards the base. In the uppermost part there are still slender spindles or rods, varying in length from 0.07 to 0.30 mm; they are 0.008 to 0.014 mm wide (text-fig. 4b, c). In the middle of the stalk many spindles are wider, viz., 0.020 to 0.035 mm (text-fig. 4d, e). In the extreme basal part there are: (a) a few spindles like that in text-fig. 4d, up to 0.20 mm long, spiny or slightly warty, and red-coloured; (b) wider spindles, up to 0.21 mm long, provided with warts (text-fig. 4f); (c) numerous short, wide

bodies, about 0.15 mm long and 0.035 to 0.050 mm wide, provided with warts or coarse, cone-shaped or flattened knobs; this type is the most common one (text-fig. 4g-j).

Everywhere in the stalk crosses are met with (text-fig. 4k).

B. The specimens from Split and from Cape Béar.

The spicules of one of the colonies from Split are represented in the text-figs. 5 and 6. I found that in the outer layer of the main stem and the lobes the same capstan-like spicules and needles occur (text-fig. 5a-f), lying parallel to the surface. With respect to the spicules in the outer layer of the stalk

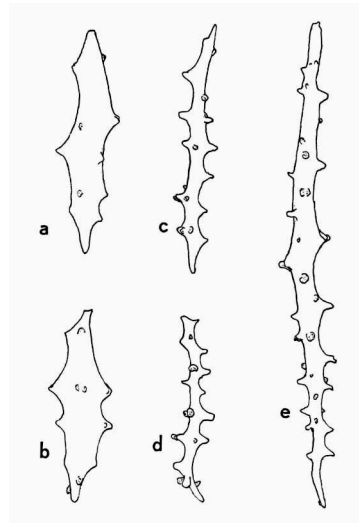


Fig. 7. *Alcyonium palmatum* Pallas, specimen with very short stalk from Split, coenenchymal spicules from the base of the stalk.  $\times 180$ .

there is considerable variability in the colonies. In one colony capstans such as figured in text-fig. 5a-e occur abundantly. In another specimen these spicules are less numerous and replaced by wide, warty or knobby ovals as represented in text-fig. 5i-l.

A similar variability occurs in the spicules in the interior of the stalk. In the majority of the colonies the extreme basal part of the stalk has knobby ovals or nearly smooth cylinders, 0.13 to 0.17 mm long and 0.035 to 0.060 mm wide (text-fig. 6f-i; cf. Kükenthal, 1907, figs. 10, 11; Durivault, 1937, fig. 1 B, C; Frenzel, 1937, fig. 11). One of the colonies, however, is a remarkable one. It shows pinnate branching, and it is dirty-grey in colour. It measures 80 mm in total height, but it has a remarkably short stalk, only 10 mm in height. In this respect it resembles *A. acaule*. But the spicules in the interior

of the base of the stalk are spindles with low cones. Their length is 0.12 to 0.16 mm, the width is 0.015 to 0.025 mm (text-fig. 7a, b). Besides, there are slender spindles, about 0.014 mm wide and usually 0.10 to 0.20 mm long, while a few are much longer, up to 0.38 mm (text-fig. 7c-e). So the warty spindles characteristic of *A. acaule* are absent.

In the young colonies from Cape Béar, which as regards their habitus, resemble *A. acaule* (cf. point I), the spicules in the interior of the base differ from each other in certain respects. In one colony there are few spindles such as shown in text-fig. 7 a, b, but many needles (text-fig. 7c, d). In another specimen these spindles are numerous and much larger and wider, viz., 0.20 to 0.30 mm long and 0.055 mm wide. In a third the spicules are more like the blunt bodies as figured in text-fig. 6f, h. But in all these specimens, too, the warty spindles of *A. acaule* are absent.

From this variability in the spiculation I conclude that in my opinion Frenzel (1937) and Broch (1953) are right in stating that "it is on the basis of the spicula impossible to distinguish a special form, *adriatica*, from the typical *palmatum* group as proposed by Kükenthal" (Broch, 1953, p. 7).

C. The specimens from Cadaqués and from an unknown locality.

The spicules in these colonies agree entirely with those occurring in most specimens from Split, as figured in text-figs. 5 and 6.

IV. Comparison between *Alcyonium acaule* and *A. palmatum*.

#### *A. acaule*

Colony small, less than 10 cm high.

Stalk always short.

Lobes short, and very rigid.

Anthocodiae about 4 mm long.

Crown spicules: 0 to 20 rows.

Pinnules: 11 to 13 on each side.

Outer layer of stem and lobes thick, rigid, not translucent; its spicules being few capstans, many typical clubs, densely packed, at right angles to the surface.

In the interior of stem and lobes: numerous spindles, up to 0.56 mm long.

In the interior of the base of the stalk: warty spindles, 0.15 to 0.33

#### *A. palmatum*

Colony may be much larger.

Stalk usually long.

Lobes long, and flexible.

Anthocodiae about 8 mm long.

Crown spicules: about 25 rows.

Pinnules: 8 on each side.

Outer layer of stem and lobes thin, translucent; its spicules being mainly capstans, not densely packed, lying parallel to the surface.

In the interior of stem and lobes: spindles less numerous, up to 0.30 mm long.

In the interior of the base of the stalk: knobby, not warty ovals or

mm long, and few, irregularly shaped, warty bodies.	cylinders, 0.15 mm long, and few slender spindles, 0.10 to 0.25 mm long.
Colony usually dark wine-red.	Colony usually light in colour.

Concluding I may remark that *A. acaule* has to be regarded a valid species that differs in many respects from *A. palmatum*.

## LITERATURE

- BÉRENGUIER, A., 1954. Contribution à l'étude des Octocoralliaires de Méditerranée occidentale. Rec. Trav. Stat. marit. Endoume, no. 12 bull. 7.
- BROCH, HJ., 1953. Octocorals and stony Corals of the high Adriatic trawling grounds. Ribarstveno-biološka ekspedicija m/b "Hvar", Izvješća-Rep. Inst. oceanogr. Ribarstvo-Split, vol. 6 no. 2.
- DURIVAUT, A., 1937. Forme et mode de répartition des spicules chez *Alcyonium palmatum* Pall., Bull. Mus. Nat. Hist. Nat. Paris, vol. 9.
- FRENZEL, G., 1937. Die systematische Stellung des adriatischen *Alcyonium*. Note Istituto Italo-Germanico Biol. marina Rovigno d'Istria, vol. 2 no. 6.
- KOCH, G. VON, 1891. Die Alcyonacea des Golfes von Neapel. Mitth. Zool. Stat. Neapel, vol. 9 pt. 4.
- KÜKENTHAL, W., 1907. *Alcyonium brioniense* n. sp.; ein neues *Alcyonium* des Mittelmeeres. Jenaische Zeitschr. Naturwiss., vol. 42 (= n. ser. vol. 35).
- , 1909. Beobachtungen an einigen Korallentieren des Adriatischen Meeres. Aus der Natur, vol. 5 pt. 11.
- LÜTTSCHWAGER, J., 1914. Beiträge zu einer Revision der Familie Alcyoniidae. Arch. Naturgesch., vol. 80 sect. A pt. 10.
- MARION, A. F., 1878. Deux jours de Dragages dans le golfe d'Alger. Rev. Sci. Nat., vol. 7 no. 1.
- , 1882. The Alcyonaria of the Bay of Marseilles. Ann. Mag. Nat. Hist., ser. 5 vol. 9.
- PAX, F., & FRENZEL, G., 1938. Adriatische Korallentiere im Aquarium. Aus der Natur, vol. 19 pt. 7.
- PAX, F. & I. MÜLLER, 1954-'55. Die Korallentiere der Adria. Die Aquar. Terr. Zeitschr. (DATZ), vol. 7 (1954), vol. 8 (1955).
- & —, 1955a. Gli Antozoi del Golfo di Trieste. Atti Mus. Civ. Stor. Nat. Trieste, vol. 20 pt. 2 no. 6.
- & —, 1955b. Gli Antozoi del Museo Civico di Storia Naturale di Trieste. Parte I. Atti Mus. Civ. Stor. Nat. Trieste, vol. 20 pt. 3 no. 7-8.
- ROULE, L., 1900. Notice sur les Anthozoaires des côtes de la Corse. Bull. Soc. Zool. France, vol. 25.
- ROXAS, H. A., 1933. Philippine Alcyonaria, II. The Families Alcyoniidae and Nephthyidae. Philipp. Journ. Sci., vol. 50 no. 4.

## PLATE XI

*Alcyonium acaule* Marion. Six colonies from Banyuls. Natural size.

## PLATE XII

*Alcyonium palmatum* Pallas. 1, colony from Cadaqués; 2, 3, colonies from Cape Béar; 4, colony from Naples. 1,  $\times 1.1$ ; 2-4,  $\times 3/4$ .

