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Rediscovery of *Coryne fucicola* (de Filippi, 1866) (Cnidaria: Hydrozoa)

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Abstract: *Coryne fucicola* (de Filippi, 1866) has been considered a somewhat problematic species of unknown origin and whose last records date back more than a century. However, a living colony was recently rediscovered at Roscoff and the species is redescribed in this report. It is evidently a valid species and clearly distinct from other similar species like *Coryne pusilla* and *C. muscoides*. This was also confirmed using 16S sequence data. The relationship to the similarly problematic *C. vermicularis* Hincks, 1866 is discussed and the status of the latter re-evaluated by an examination of the type material. *Coryne vermicularis* appears distinct from *C. fucicola*, but its relationship to *C. pusilla* remains unclear. Pending a detailed comparison of living material, it is advised not to synonymize *C. vermicularis* and *C. pusilla*.

Résumé : *Redécouverte de* Coryne fucicola *(de Filippi, 1866) (Cnidaria: Hydrozoa). Coryne fucicola* (de Filippi, 1866) a été considérée comme une espèce problématique d'origine inconnue et elle n'a plus été repérée depuis plus de cent ans. Néanmoins, elle a été redécouverte à Roscoff et l'espèce est re-décrite dans cette publication. Il s'agit clairement d'une espèce valide et nettement distincte des espèces proches comme C*oryne pusilla* et *C. muscoides.* Ce fait est confirmé par une analyse des séquences 16S. La relation avec l'espèce également problématique *Coryne vermicularis* Hincks, 1866 est discutée et son statut évalué par un examen du matériel type. *Coryne vermicularis* semble être distincte de *C. fucicola* mais la relation avec *C. pusilla* reste confuse. Avant qu'un examen détaillé du matériel vivant soit possible, il est préférable de ne pas considérer *C. vermicularis* et *C. pusilla* comme synonymes.

KeyWords: Cnidaria, Hydrozoa, *Coryne fucicola*, Rediscovery, Roscoff.

Introduction

The European Corynidae are relatively well known (Schuchert, 2001), and it was therefore quite surprising when a corynid hydroid was found at Roscoff (Brittany, France) that was obviously distinct from all other species known from that region. A comparison with the older literature revealed that it must belong to a somewhat doubtful species that has not been seen for more than 100 years, namely *Coryne fucicola* described by de Filippi in 1866.

The eminent Italian zoologist Filippo de Filippi had his laboratory in Turin, where he also kept seawater aquaria with coralline algae and other bottom concrements. Several hydroids developed in this aquarium, among them a so far unknown corynid hydroid which he described in 1866 as *Halybotrys fucicola*, a species today placed in the genus *Coryne*. The most conspicuous feature that distinguished this species was the size of its hydranths, which were up to three times larger than in any other corynid known at that time.

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Coryne fucicola was subsequently found in nature by Du Plessis (1888) who reported its presence in the Ligurian Sea and Roscoff. After this, the species was not reported anymore and in his review of the family Corynidae, Schuchert (2001) doubted somewhat its validity. Earlier, Brinckmann-Voss (1970) had already thought that it might not be recognizable and its size might have been a culture artefact.

In the same year when de Filippi published his account on *C. fucicola*, Hincks (1866) made a preliminary report on a new *Coryne* species from the Shetland Islands. He named it *C. vermicularis* and like *C. fucicola* it was described as having unusually large, wormlike hydranths. Albeit the differences in tentacle numbers and colony size, Du Plessis (1888) synonymized both species, a proposition rejected by Brinckmann-Voss (1970). Only few naturalists claimed to have seen *Coryne vermicularis* and the records are all more or less problematic. Garstang (1894) hesitatingly attributed an infertile colony found at Plymouth to this species. Saemundsson (1902) allocated a colony beached near Reykjavìk to *C. vermicularis*. Jäderholm (1909) reported it from the west coast of Sweden, but he based his identification on the shape of the hydranths and not their size. Finally, Fraser (1931) thought to have it found at the Canadian coast. However, Fraser's material had hydranths of a size more typical for *C. pusilla* (comp. Fraser, 1944: fig. 9). The validity of *C. vermicularis*, despite its characteristically big hydranths, was already doubted by Allman (1872) and Bétencourt (1888), but it was Broch (1916) who finally claimed that *C. vermicularis* is nothing but a "phase of movement of *C. pusilla*". Broch's conclusion remained uncontested by later authors and also Schuchert (2001) listed it as a synonym of *C. pusilla*.

In the following, *C. fucicola* is redescribed and the status of *C. vermicularis* is re-assessed.

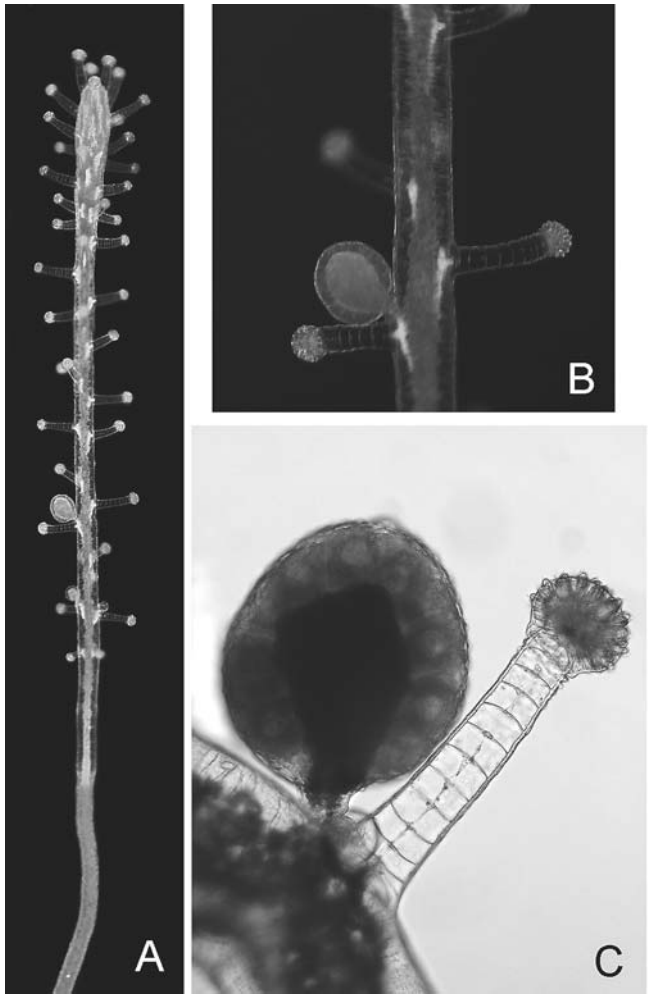

Figure 1. *Coryne fucicola*. Photographs of living hydranths from cultures (for dimensions see text). **A.** Fully expanded hydranth with sporosac. **B.** Close up of young female sporosac, note the elongated white pigment spots at the tentacle bases. **C.** Mature female sporosac.

Figure 1. *Coryne fucicola*. Photographies d'un hydranthe vivant (pour les dimensions, consulter le texte). **A.** Hydranthe complètement épanoui portant un sporosac. **B.** Gros plan d'un jeune sporosac femelle, notez les tâches blanches allongées à la base des tentacules. **C.** Sporosac femelle mature.

Material & Methods

One small colony of *Coryne fucicola* was found west of the "Île Verte" (near the marine biological station of Roscoff, Brittany, France) on 14 September 2004. It grew on the holdfast of the laminarian alga *Saccorhiza polyschides* (Lightfoot) Batters at a depth corresponding to zero datum. The colony consisted in three infertile hydranths. After a first examination it was immediately recognized as differing from all other *Coryne* of the region (concomitantly also living *C. muscoides* (Linnaeus, 1761), *C. pusilla* Gaertner, 1774, *C. pintneri* Schneider, 1898, and *C. eximia* Allman, 1859 from the same region could be obtained and used for comparisons). The colony was detached from the substratum, tied onto a microscopic slide with a cotton thread and kept in a 35 l tank at 13-14°C. The polyps were fed twice a week with *Artemia* nauplii hatched from dry cysts. The nauplii were 2-3 days old and had previously been nutritionally enriched by letting them feed 6-12 hours on a suspension of spray-dried unicellular marine algae (PhytoPlan™, Two little Fishies, Miami, USA). As an additional food source served harpacticoid copepods that were abundantly present in the tank. The colony started to develop further hydranths with an identical morphology and colour as the initial ones and after four weeks sporosacs developed. The sporosacs matured and the gametes were shed, but later no more sporosacs developed. The temperature was then lowered to 8°C, which was well supported by the colony, but the hydranth remained shorter (3-4 mm).

One hydranth was used to extract DNA and determine the 16S gene sequence as described by Schuchert (2005). The sequence has been deposited under the accession number (AM084259) in the EMBL database. A phylogenetic analysis using Maximum Parsimony was made as described in Schuchert (2005). Only *Coryne* species present in the European seas were used for the analysis, with *Dipurena halterata* (Forbes, 1846) and *Sarsia tubulosa* (M. Sars, 1835) as outgroup taxons. The EMBL accession numbers of the sequences used are as follows: AJ580934, AJ878689, AJ878690, AJ878693, AJ878697, AJ878700, AJ878702, AJ878704, AJ878708, AJ878712, AJ878713, AJ878715, AJ878716, AJ878717, AJ878718, AJ878720, AY787874. In addition to these sequences, two new Corynidae sequences could be used: *Coryne pintneri* Schneider, 1898 from Roscoff (AM084260) and *Dipurena halterata* (Forbes, 1846) from Villefranche-sur-Mer (AM084261, voucher MHNG INVE 31741).

Several fertile hydranths were preserved in 4% formaldehyde and deposited in the natural history museum of Geneva under the accession number INVE36328.

For comparisons, material of *Coryne vermicularis* (Natural History Museum London, accession number 1899.5.1.131, loc. Shetland, ex Hincks collection) was examined. The specimen is labelled as type material, but a question mark has been added. As the colony was part of Hincks' collection and its origin corresponds to the type locality, it is almost certainly the type specimen. Type material of *C. fucicola* could not be located.

Nematocysts were examined and measured using living material as described in Schuchert (1996).

Taxonomy

Phylum CNIDARIA
Class HYDROZOA
Subclass Leptolinae Haeckel, 1879
Order Anthomedusae Haeckel, 1879
Suborder Capitata Kühn, 1913
Family Corynidae Johnston, 1836
Genus Coryne Gaertner 1774

Coryne fucicola (de Filippi, 1866)

Figs 1-2

Halybotrys fucicola (de Filippi, 1866: 383, pl. 2). *Coryne fucicola* (Du Plessis, 1888: 533). *Coryne fucicola* (Brinckmann-Voss 1970: 53, fig. 58). *Coryne fucicola* (Schuchert, 2001: 85).

Diagnosis

Coryne species with stolonal or erect, branching colonies; hydranths very slender and long, tentacles numerous, gastrodermis at tentacle origin with spot of white pigment; without filiform tentacles; gonophores in upper axils of tentacles, sessile sporosacs without radial or circular canals.

Description

Hydoid attached to substratum by thin, ramified stolons, producing either stolonal or erect, branched shoots with several terminal hydranths (up to 4 cm high after de Filippi, 1866). Branches are long, diameter 0.18 mm, perisarc relatively thin, mostly smooth, some few annulated stretches present. Hydranths very elongate, 2-4 mm long when taken from the sea, 4-7 mm in fully extended cultivated animals, basal diameter 0.2 mm when fully extended, distal region swollen to give a club-like shape, diameter 0.3 mm in thickest part, hypostome conical, distinct, about 0.2 mm high; four oral tentacles, held oblique, below oral tentacles up to 25-28 scattered tentacles (in culture up to 37), these tentacles relatively widely spaced and held horizontally, becoming gradually shorter towards proximal. At each tentacle base a conspicuous spot of white pigment granules in gastrodermis of hydranth body. Trunk of oral tentacles 0.4-0.5 mm, slightly tapering, 13-18 gastrodermal cells, capitulum diameter 0.15 mm. Filiform tentacles always absent, proximal 1/6 of hydranth free of tentacles, in middle of this basal tentacle free zone a very inconspicuous annular epidermal thickening, gastrodermal cells of basal region large and vacuolated. Gonophores sessile sporosacs without radial- or circular canals, developing in axils of lower tentacles, 1-2 per tentacle, initially spherical, later ovoid, length 0.4-0.5 mm, diameter 0.3-0.4 mm, spadix voluminous; female sporosacs initially containing a large number of oocytes that is reduced during maturation to about 25. Colours: Hydranth epidermis transparent; gastrodermal lumen lined with orange-brown pigment, white spots at tentacle bases; tentacles with transparent trunk and whitish capitulum; branches and stolons orange-brown. Nematocysts: only stenoteles, three size classes, (14-16)x(7-8) µm, r = 2.0; (17.5-19.5)x(9-10.5) µm, r = 1.9; (24.5-26)x(14-15.5) µm, r = 1.7. Behaviour: the movements of the hydranth appear worm-like, the basal tentacle-free zone is muscular and used to pivot and coil the upper part of the hydranth in search for prey.

Distribution

Ligurian Sea (Mediterranean), Roscoff (English Channel). No localities were given by de Filippi (1866), there is thus no type locality specified for *C. fucicola*.

Biology

In the English Channel, it was found in shallow water growing on holdfasts of laminarians (this study); in the Mediterranean, Du Plessis (1888) found it growing on algae like *Chaetomorpha* sp. and Rhodophytae at the end of winter.

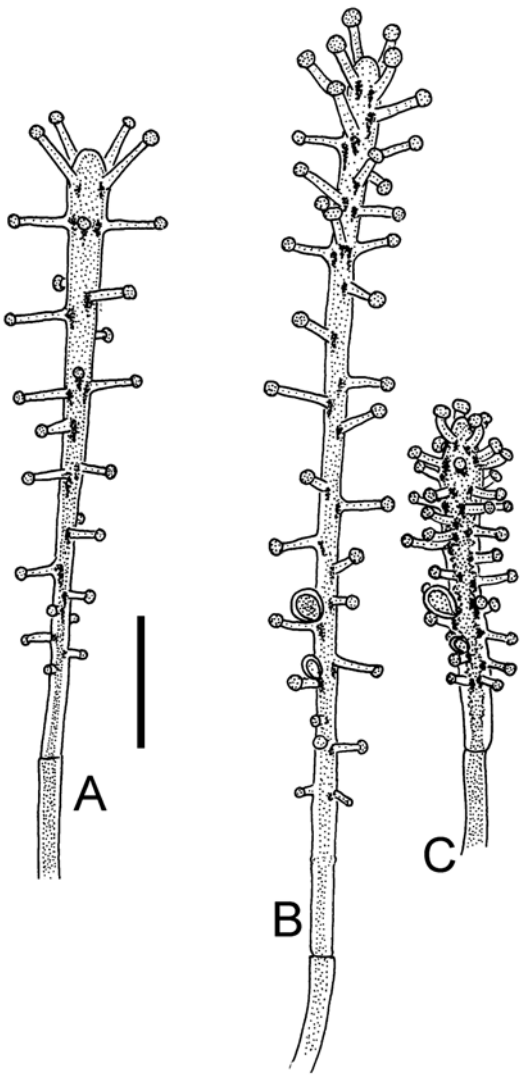

Figure 2. *Coryne fucicola*. Drawings of living hydranths. **A.** After collection from the sea. **B.** After cultivation and development of sporosacs, fully extended. **C.** Same as B, but contracted. Scale bar = 1 mm.

Figure 2. *Coryne fucicola*. Dessins des hydranthes vivants. **A.** Après la récolte dans la nature. **B.** Après mise en culture et développement des sporosacs, complètement épanoui. **C.** Même hydranthe, contracté. Echelle = 1 mm.

Remarks

The white pigment at the tentacle bases was regularly present, this in the hydranths from the sea and in the cultivated ones as well (fig. 1B). However, it disappears rapidly in formaldehyde preserved material.

16 Sequence data

The partial sequence of the large mitochondrial RNA gene of *C. fucicola* is distinct from all other known *Coryne* sequences (comp. Collins et al., 2005; Schuchert, 2005). The phylogenetic analysis placed *C. fucicola* near *C. pusilla* and *C. muscoides* (Fig. 3).

Discussion

De Filippi's (1866) account on *C. fucicola* is quite precise and the corynid from Roscoff can easily be allocated to this species. The size and form of the hydranths, the tentacle numbers, type of sporosacs, and the colony form match exactly de Filippi's (1866) description and figures. A further distinctive trait is the presence of the white spots at the tentacle bases. These pigmented spots were, however, not mentioned explicitly by de Filippi (1866). He only stated that the tentacles and their bases appear white in reflective light. Perhaps he was referring by this to the same white spots as observed here, or he just described his general impression. It might also well be that not all populations have them. Colours as a taxonomic trait in hydrozoans is somewhat problematic (comp. Edwards, 1978; Brinckmann-Voss, 1980; Schuchert, 2001) as it may be depend on food items, but in the material examined here it seems to be clearly genetically based because also the newly formed, cultivated hydranths continued to develop these white spots. These white spots alone, however, are not a diagnostic trait, as also some other *Coryne* species may have them (e. g. *Coryne epizoica* Stechow, 1921; own unpublished observations).

The long, slender hydranths and the high number of tentacles are characteristic for *C. fucicola*, but it appears that the very long hydranths observed in cultivated animals are partially due to the artificial environment. Only well fed colonies develop hydranths that measure up to 5-7 mm in height, while in colonies from the sea and starved ones in culture they remain much shorter (2-4 mm). Neither *Coryne pusilla* nor *C. muscoides* form such drastically elongated hydranths when cultivated (pers. obs.). Even when they came directly from the sea, the hydranths of *C. fucicola* were conspicuously longer than in any other *Coryne* without filiform tentacles. *Coryne pusilla* hydranths, which are somewhat longer than those of most other *Coryne* species, measure only 1 to 2.5 mm. The results of the analysis of the 16S sequences (Fig. 3) additionally prove that *C. fucicola* is not just a form of *C. pusilla*.

There is one other nominal *Coryne* species that has reportedly similarly long hydranths, namely *Coryne vermicularis* Hincks, 1866. Unfortunately, no living material of this species has ever been described, but the presumed type material of *Coryne vermicularis* is still existent and it was examined for this study. It is a 15 mm high, dense, shrubby colony with an irregularly annulated perisarc that is in no way distinguishable from *Coryne pusilla*, except for the size of a minority of its hydranths. While the majori-

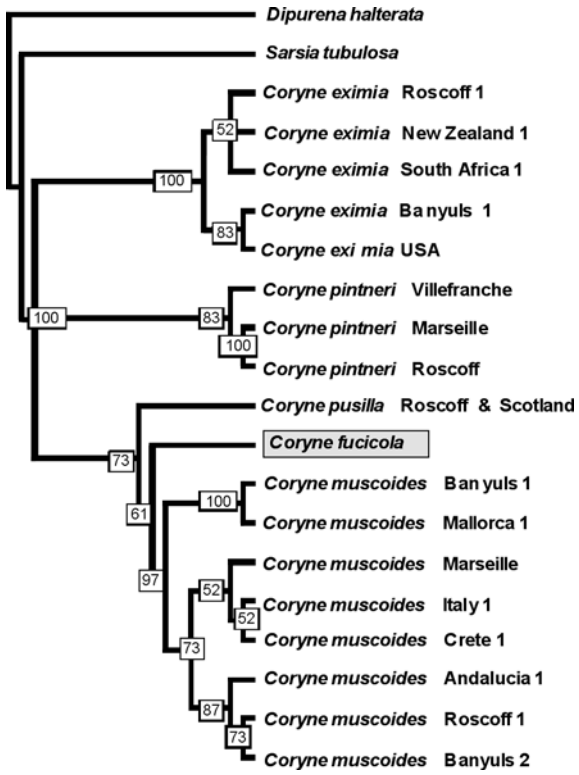

Figure 3. *Coryne fucicola*. Phylogenetic relationships of 16S sequences shown as 50% majority consensus cladogram obtained from 1000 bootstrap replicates of a Maximum Parsimony Analysis, gaps scored as fifth state, and *Dipurena halterata* as outgroup. The numbers in boxes indicate the percentage of bootstrap support for this node, values above 70% are considered as sufficient support. Following the species name is the locality where the sample came from and an isolate number (for more details see Schuchert, 2005). Note that for the European *C. pusilla* no intraspecific variation could be found so far.

Figure 3. *Coryne fucicola*. Arbre phylogénétique (consensus majoritaire à 50%) obtenu à partir de 1000 réplications de bootstrap en Maximum de Parcimonie, avec les indels pris comme 5ème état de caractère et *Dipurena halterata* comme groupe extérieur. Les nombres encadrés indiquent les valeurs de bootstrap au noeud correspondant, les valeurs supérieures à 70% étant considérées comme un support robuste. L'origine géographique de l'échantillon et son numéro de prélèvement sont indiqués après le nom de l'espèce (pour plus de détail, voir Schuchert, 2005). On peut noter l'absence de variation intra-spécifique pour les échantillons européens de *C. pusilla*.

ty of the fertile hydranths are up to 2 mm – thus matching values typically found in *C. pusilla* (see Schuchert, 2001) – there is a minority of much larger hydranths that reach 3.5 mm in height. The tentacle numbers are 16-20 in normally sized hydranths, and up to 20-24 in the larger ones. In the larger hydranths, the tentacles are unusually widely spaced, but mostly only in the distal half, thus giving the impression of an artificial stretching (fixation artefact ?). Contrary to the figure given in Hincks (1868), most hydranths are fusiform and not different from other *Coryne* species. There is only a minority of hydranths with a proximal thickening as shown in his figure (Hincks, 1868: pl. 8, fig. 2). Although for a more definitive conclusion living material from the type locality must be examined, I think that *C. vermifomis* resembles more a *C. pusilla* with a few exceptionally large hydranths. It appears also unlikely that *C. vermicularis* is conspecific with *C. fucicola* as the colony and hydranth form appear quite distinct. The colony forms should, however, only compared with caution, as branched *C. fucicola* are only known from cultivated colonies. Colony forms of cultivated corynid hydroids can sometimes differ significantly from the form found in nature (pers. observ.).

As already said, for a reliable discussion on the status of *C. vermicularis* living material from near the type locality must be examined. Until this has been done, *C. vermicularis* should not be synonymized with neither *C. pusilla* nor *C. fucicola*. Because the reportedly cosmopolitan *C. pusilla* is actually a complex of indistinguishable sibling species (Schuchert, 2005), and in view of its occurrence in deep waters, it might well be that also *C. vermicularis* is a separate biological species.

The intertidal region of Roscoff is quite well investigated for hydroids (Teissier, 1965) and it is therefore surprising that *Coryne fucicola* has never been found since Du Plessis (1888). Although rarity is a trait of quite a number of hydrozoans (Boero, 1994), it is intriguing to ask whether the reappearance of *C. fucicola* reflects some recent environmental changes. With just a single record, an answer is not yet possible and it will be necessary to maintain a continued observation program to detect a possible spreading and multiplication of this species.

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