Crypt. Bot. 4, 50–59 (1993)

Cryptogamic Botany

Notes on some interesting marine algae new from the Canary Islands

Javier Reyes, Marta Sansón and Julio Afonso-Carrillo

Departamento de Biología Vegetal (Botánica), Universidad de La Laguna, 38271 La Laguna, Canary Islands, Spain

SUMMARY

Fifteen species of marine algae are reported from the Canary Islands for the first time: *Batophora oerstedii* J. Agardh, *Ulvella setchellii* Dangeard, *Compsonema microspongium* (Batters) Kuckuck, *Microcoryne ocellata* Strömfelt, *Myriactula chordae* (Areschoug) Levring, *Myriotrichia clavaeformis Harvey*, *Nemacystus flexuosus* (C. Agardh) Kylin, *Scytosiphon dotyi* Wynne, *Gracilaria longa* Gargiulo, De Masi et Tripodi, *Naccaria wiggii* (Turner) Endlicher, *Pterocladia melanoidea* (Bornet) Dawson, *Porphyra carolinensis* Coll et Cox, *Scinaia australis* (Setchell) Huisman, *Scinaia caribaea* (Taylor) Huisman and *Audouinella liagorae* (Børgesen) Woelkering. Data about the geographical distribution of each species, as well as their morphology, anatomy, phenology and ecological conditions are presented.

Introduction

In recent years, the knowledge of the Canary Islands marine algae has been greatly increased [4, 5, 6, 7, 10, 29, 49]. The main components of the vegetation are already known, but however they had not been reported. We know that most of the reported species exhibit a restricted geographical distribution and had been occasionally collected in the past. The present work includes the description of fifteen species of the Canary Islands marine flora.

Materials and Methods

Plants were collected between 1990 and 1992 at several localities of Tenerife and Gran Canaria. Specimens were studied while fresh or preserved in 4% formalin in sea water and deposited at TFC (Departamento de Biología Vegetal, Botánica, Universidad de La Laguna, Canary Islands). Anatomical studies were made using permanent slides prepared from the preserved fragments, sectioned by hand with a razor blade and mounted in 20% aqueous 'Karo' dextrose. Camera lucida drawings were obtained with a Zeiss microscope and photomicrographs with the aid of an Olympus Vanox microscope.

Results and Discussion

Chlorophyta

1. **Batophora oerstedii** J. Agardh (Fig. 1)

Batophora oerstedii (Dasycladales, Dasycladaceae) has only been reported from the Western tropical Atlantic [55, 61]. According to Taylor [55] two varieties are differentiated: var. *oerstedii*, a delicate plant of 10 cm tall growing in warm and quiet lagoons and brackish waters; and var. *occidentalis* (Harvey) Howe a smaller plant, up to 4 cm tall, growing in open waters with a normal marine salinity.

Sterile plants collected in the Canary Islands agree with previous accounts of the var. *occidentalis*. Plants are small up to 2 cm in height. The simple axes bear loosely whorled

0935-2147/93/0004-0050 $ 3.50/0

branchlets forming a very soft cylinder of 4 mm in diameter. The branchlets are succesively divided with hairlike terminal divisions (Fig. 1).

Batophora oerstedii was collected growing in a tide pool of El Médano (S Tenerife) [TFC (Phyc) 7331].

2. **Ulvella setchellii** Dangeard (Fig. 2)

Ulvella setchellii (Ulvellaceae, Ulotricales) has previously been reported from the Mediterranean Sea [19, 16, 57, 56, 9], the North Atlantic Ocean [42, 51] and Californian shores [3].

Plants collected in the Canary Islands are in good agreement with Coppejans [17]. Plants form a discoid thallus, of 1 mm in diameter, consisting of radially monostromatic filaments arising from a central polistromatic region in mature crusts. Filaments are several times bifurcated in the margin (Fig. 2). According to Dangeard's [19] original description, the marginal cells are rather long, up to 50 µm, containing 1 pirenoid.

Ulvella setchellii was collected growing on leaves of *Cymodocea nodosa* (Ucria) Ascherson. This species, together with other crustose algae, as *Fosliella* spp. (*Fosliella* A, B and C, according to Reyes [46]), *Pneophyllum lejolisii* (Rosanoff) Chamberlain and *Myrionema magnusii* (Sauvageau) Loiseaux, are the primary colonists of *Cymodocea*'s leaves. Plants have been observed all year around, on a meadow of this seagrass at El Médano (S Tenerife), at 2–5 m depth [TFC (Phyc) 7380].

Phaeophyta

3. **Compsonema microspongium** (Batters) Kuckuck (Fig. 3)

Compsonema microspongium (Myrionemataceae, Chordariales) has only been reported from the British Isles [51, 26]. So far, only the widely distributed species *Compsonema minutum* (C. Agardh) Kuckuck, has been recognized as present in the Canary Islands [34, see 45].

Canary Islands' specimens of *Compsonema microspongium* agree with Fletcher's description [26]. Plants form small solitary hemispherical cushions, having monostromatic net-like base composed of branched filaments giving rise to erect filaments. The erect filaments are loosely agregated and more often branched pseudodichotomously. Studied plants present oblong-lanceolated solitary plurilocular sporangia, sessile or with a 3-celled stalk, up to 80 µm long and 30 µm diameter (Fig. 3).

Compsonema microspongium was observed growing on the experimental artificial seagrass, installed on a meadow of *Cymodocea nodosa*, at El Médano (S Tenerife), at 5 m depth. However, this species has not been observed on leaves of this seagrass growing in its undisturbed natural environment [TFC (Phyc) 7385].

4. **Microcoryne ocellata** Strömfelt (Fig. 4)

Microcoryne ocellata (Corynophlaeaceae, Chordariales) was originally described based on specimens collected in Norway [53]. Later, this species have been reported from the British Isles [11, 12, 18, 41, 26], Denmark [47], Sweden [38], Norway [48] and The Netherlands [52]. According to South and Tittley [51] and Fletcher [26], the known southern limit of its geographical distribution was the British Isles.

Canarian specimens are in agreement with the previous descriptions. Plants are forming a small gelatinous cylindrical to clavate axes, simple or bifurcate, 2 mm long. The axes is composed of central filaments of elongated colourless cells; the cells measure more than 300 µm in length and up to 20 µm in diameter. They are loosely packed, becoming globose and progresively shorter to the periphery, terminating in pigmented paraphyses, plurilocular sporangia and hairs (Fig. 4). Plants studied present plurilocular sporangia, up to 50 µm long by 4–6 µm diameter.

Specimens of *Microcoryne ocellata* were collected growing on the experimental artifical seagrass installed on the meadow of *Cymodocea nodosa*, at El Médano (S Tenerife), 5 m in depth. Only few plants of this species were observed between March and June [TFC (Phyc) 7376]. No plants were observed on natural leaves of this seagrass.

5. **Myriactula chordae** (Areschoug) Levring (Fig. 5)

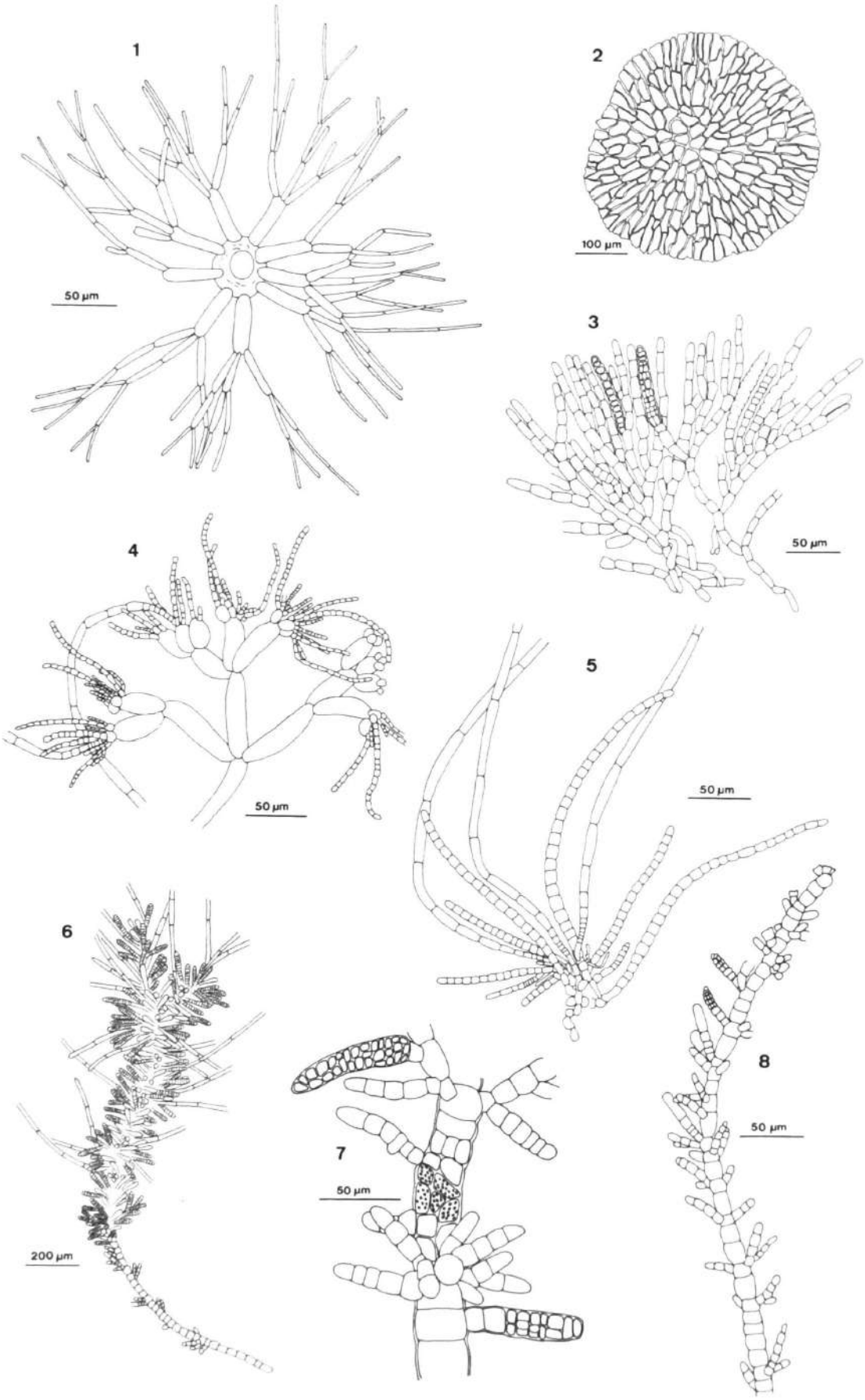
According to Fletcher [26], *Myriactula chordae* (Corynophlaeaceae, Chordariales) has been reported from the North Atlantic coasts (Norway, Sweden, Denmark and the British Isles) and the West Atlantic Ocean (USA). Nevertheless, South and Tittley [51] also reported it along the French Atlantic coast, the southern of its known distribution in the Eastern Atlantic Ocean.

Although the Canarian specimens were observed without sporangia, the vegetative morphology, structure and cells dimensions agree with the description of Fletcher's British plants [26]. Plants forming small hemispherical cushions, 1 mm in diameter, are composed of a pseudoparenchymatous base that give rise to erect paraphyses and hairs. Paraphyses are unbranched, elongate-clavate becoming elongate-cylindrical to the apex, with up to 26 cells and 600 µm long by 22 µm diameter. Hairs, with a basal meristem, borne at base of paraphyses (Fig. 5).

Myriactula chordae was collected growing on the experimental artificial seagrass installed on a meadow of *Cymodocea nodosa*, at El Médano (S Tenerife), at 5 m depth. Few plants of this species were observed in June [TFC (Phyc) 7377]. No plants were observed on *Cymodocea nodosa* leaves.

6. **Myriotrichia clavaeformis** Harvey (Figs 6–8)

Myriotrichia clavaeformis (Myriotrichiaceae, Dictyosiphonales) is widely distributed in cool-temperate European and Eastern North American coasts, the Mediterranean and Southern Australia [59]. Fletcher [26] also reported it as present in the Caribbean and Black Sea. Until now, only *Myriotrichia canariensis* Kützing, a species close to *Myriotrichia adriatica* Hauck [31, 44], has been reported from the Canary Islands [22, 35].



Figs 1–8: Fig. 1. *Batophora oerstedii* J. Agardh. Transverse section showing a whorl of branchlets. – Fig. 2. *Ulvella setchellii* Dangeard. Habit. – Fig. 3. *Compsonema microspongium* (Batters) Kuckuck. Erect filament with lateral plurilocular sporangia. – Fig. 4. *Microcoryne ocellata* Strömfelt. Terminal thallus portion showing paraphyses. – Fig. 5. *Myriactula chordae* (Areschoug) Levring. Portion of thallus showing paraphyses and hairs. – Figs 6–8. *Myriotrichia clavaeformis* Harvey. Fig. 6. Habit. Figs 7–8. Portions of erect filaments with plurilocular sporangia.

Plants collected in the Canary Islands agree with the descriptions reported previously. Plants are forming erect solitary tufts, attached by rhizoidal filaments. Erect branches are filiform, 3 mm long, commonly uniseriate to the base, multiseriate and parenchymatous to the apex. Axial cells give rise to lateral uniseriate branches, hairs with pigmented basal meristem, and plurilocular sporangia. The elongate-clavate morphology of the erect filaments results from the increasing number of axial cells to the apex (Fig. 6). Axial cells are cuadrate, cylindrical or barrel-shaped, with 30 μm in diameter, each with several discoidal plastids (Fig. 7). Plants studied shown plurilocular sporangia, often terminal but occasionally lateral on lateral branches, single or grouped at the apical region (Figs 7–8).

Myriotrichia clavaeformis was collected growing on leaves of *Cymodocea nodosa*. Up to now, only few specimens have been observed in May [TFC (Phyc) 7381], in spite of the fact that an exhaustive study of the epiphytes of this seagrass has been carried out along the year at El Médano (S Tenerife), at 2–5 m depth.

7. **Nemacystus flexuosus** (C. Agardh) Kylin (Fig. 9)

Nemacystus flexuosus (Spermatochnaceae, Chordariales), syn. *Nemacystus ramulosus* Derbès et Solier, has previously been considered as an endemic species of the Mediterranean Sea [8].

The Canarian material agrees with the description presented by Hamel [30], as *Nemacystus ramulosus*. Plants are yellow-brown in colour, soft and mucilaginous, 6 cm long and 2 mm broad. The assimilatory filaments are simple and curved, formed by cylindric cells of 7 μm in diameter. Phaeophycean hairs are numerous (Fig. 9). According to Kylin [37], *Nemacystus flexuosus* is next to *Nemacystus hispanicus* (Sauvageau) Kylin, an Atlantic species reported in the North coast of Spain, Madeira and the Canary Islands, usually as an epiphyte on *Sargassum vulgare* C. Agardh [40]. However, there are useful anatomical diagnostic differences in the cell morphology of assimilatory filaments, ovoid in *Nemacystus hispanicus* versus cylindrical in *Nemacystus flexuosus*.

Specimens of *Nemacystus flexuosus* were collected growing on leaves of *Cymodocea nodosa*, at El Médano (S Tenerife), at 2–5 m depth [TFC (Phyc) 7333].

8. **Scytosiphon dotyi** Wynne (Fig. 10)

Scytosiphon dotyi (Scytosiphonaceae, Scytosiphonales) was described by Wynne [60] of specimens at the Pacific coast of North America. In the Atlantic, this species has only been reported from the coast of Canada [50] and the British Isles [26].

Plants collected in the Canary Islands are in good agreement with previous accounts of the species. According to Wynne [60] and Fletcher [26], *Scytosiphon dotyi* (Fig. 10) differs from *Scytosiphon lomentaria* (Lyngbye) Link in its thallus relatively short and narrow, fairly rigid in texture, unconstricted intervals, with grouped hairs emerging from depressions and without ascocysts. Ecological differences also occur between them. *Scytosiphon dotyi* only grows in the littoral fringe whereas *Scytosiphon lomentaria* usually grows in littoral pools.

Scytosiphon dotyi was collected growing epilithically in the littoral fringe, in El Médano (S Tenerife) [TFC (Phyc) 7379].

Rhodophyta

9. **Gracilaria longa** Gargiulo, De Masi et Tripodi (Figs 11–12)

Gracilaria longa (Gracilariaceae, Gigartinales) has only been reported previously from the Eastern Mediterranean Sea [28]. According to Gargiulo *et al.* [28], this species was first considered to be a form of *Gracilaria verrucosa* (Hudson) Papenfuss, from which mainly differs in its branching pattern and axes dimensions. To date, five species of *Gracilaria* Greville have been reported from the Canary Islands [45]: *G. armata* (C. Agardh) J. Agardh, *G. dura* (C. Agardh) J. Agardh, *G. multipartita* (Clemente) Harvey, *G. rubra* (C. Agardh) J. Agardh and *G. verrucosa*. Among these, *Gracilaria verrucosa* seems to be the most common species, although some of these entities need to be reinvestigated.

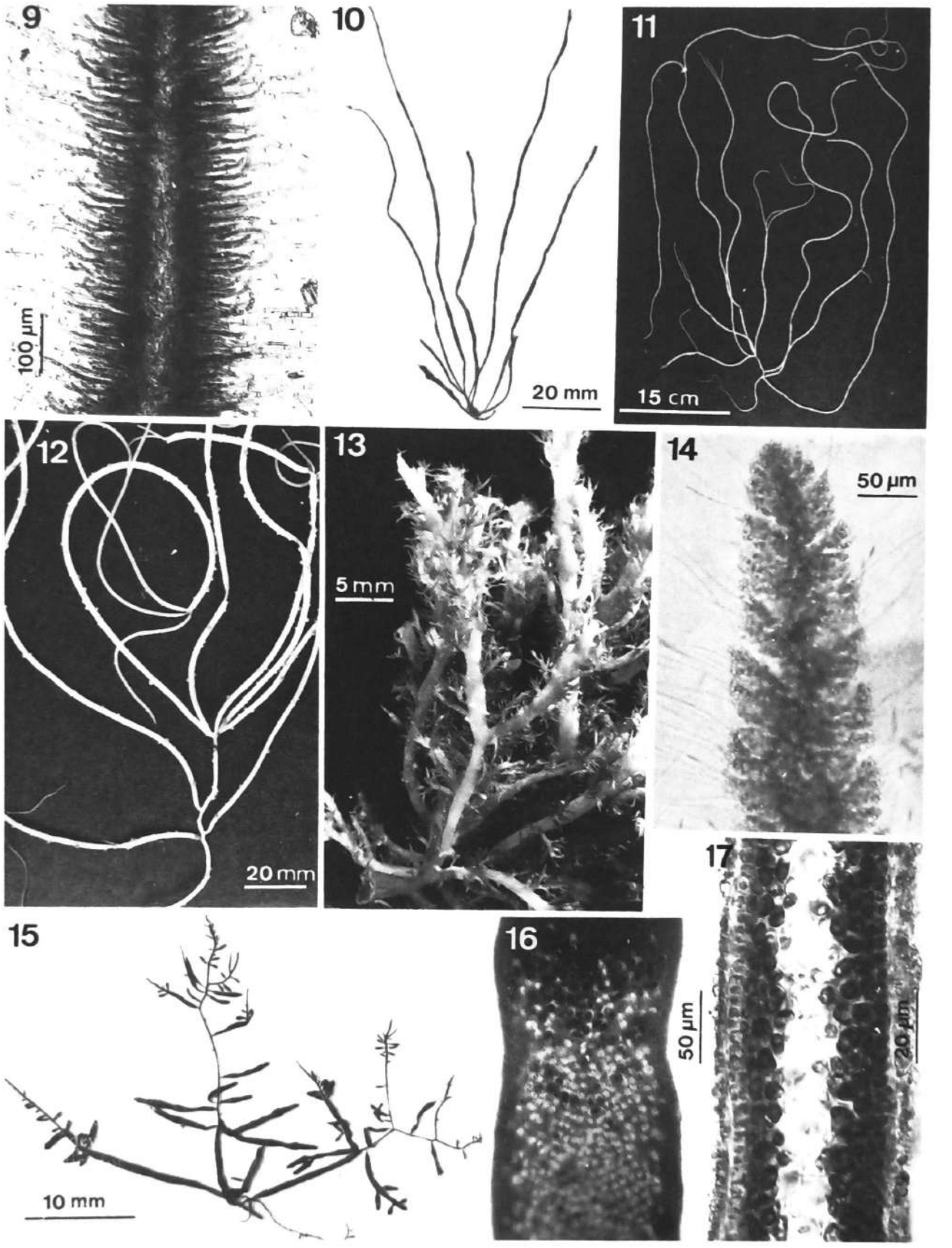
The Canarian specimens agree with Gargiulo *et al.* [28]. Plants are composed of brownish terete axes, up to 160 cm long and 2.5 mm diameter (Fig. 11), with few long lateral branches, mainly borne at the axes base, and constricted at its proximal end (Fig. 12). Slender branchlets are also formed along the axes, single or often grouped in branching points (Figs 11–12). Plants studied shown mature cystocarps scattered throughout the thallus (Fig. 12), 1200 μm long and 1650 μm diameter, greater than those described by Gargiulo *et al.* [28].

Gracilaria longa was collected growing on a sand bottom, attached to a rock covered by 20 cm of sediment, at El Médano (S Tenerife), at 1.5 m depth. Plants were not erected but lying upon the sand [TFC (Phyc) 7378].

10. **Naccaria wiggii** (Turner) Endlicher (Figs 13–14)

According to Abbott [2], only three species of *Naccaria* Endlicher (Naccariaceae, Nemaliales) have been reported from the Atlantic Ocean: *N. wiggii, N. antillana* Taylor and *N. corymbosa* J. Agardh. *Naccaria antillana* has been reported from the Lesser Antilles and Jamaica and *Naccaria corymbosa* from Florida, Bermuda and North Carolina (USA), both from the Western Atlantic Ocean. However, *Naccaria wiggii* has been reported in the Northeastern Atlantic Ocean (from the British Isles down to Northern Spain) [51] and in the Western Mediterranean Sea [2, 9].

Specimens of *Naccaria wiggii* collected in the Canary Islands correspond to previous descriptions [14, 41, 24]. Plants are pyramidal, bright red-rose to whitish, up to 20 cm long, lubricous and mucilaginous, attached to a small disc (Fig. 13). Axes present numerous lateral branches, cylindrical to slightly compressed, with a tendency to complanate arrangement. Although the branching pattern



Figs 9–17. Fig. 9. *Nemacystus flexuosus* (C. Agardh) Kylin. Surface view of thallus showing assimulatory filaments and hairs. – Fig. 10. *Scytosiphon dotyi* Wynne. Habit. – Figs 11–12. *Gracilaria longa* Gargiulo, De Masi et Tripodi. Fig. 11. Habit. Fig. 12. Detail of the habit showing lateral branches constricted on the branching points. – Figs 13–14. *Naccaria wiggii* (Turner) Endlicher. Fig. 13. Detail of habit. Fig. 14. Surface view of branchlet. – Figs 15–17. *Pterocladia melanoidea* (Bornet) Dawson. Fig. 15. Habit. Fig. 16. Surface view of fertile branch showing tetrasporangia in V-shaped rows. Fig. 17. Transverse section of thallus.

of the laterals is different to that stated by Kylin [36] and Dixon and Irvine [24], according to Abbott [2] this is a variable feature and not reliable for species distinction. Axial cells are invested by rhizoidal filaments forming a pseudoparenchymatous cortication. Lateral branches with numerous short flexuous branchlets, consisting of oval to bead-like cells, some with terminal hairs (Fig. 14). Branchlets bear subterminal swollen cystocarps, up to 1 mm in diameter, with a small sterile tip.

Only female gametangial plants of *Naccaria wiggii* were collected in April–May, growing on rocks anchored on sandy bottom, at El Médano (S Tenerife), at 1 m depth [TFC (Phyc) 7382] and in Las Galletas (S Tenerife), at 5 m depth [TFC (Phyc) 7386].

11. **Pterocladia melanoidea** (Bornet) Dawson (Figs 15–17)

Pterocladia melanoidea (Gelidiaceae, Gelidiales) has been reported to be found in the Mediterranean Sea, the Eastern Atlantic (Iberian Peninsula, Atlantic coasts of Morocco and Senegal) [27] and the Western Atlantic (Costa Rica) [21]. Dawson [21] transferred *Gelidium melanoideum* Bornet to *Pterocladia* J. Agardh on the basis of the arrangement of the tetrasporangia in decussate rows, according to Dawson "similar with several small species of *Pterocladia* in some of which cystocarps have been found". Recently, Fredriksen and Rueness [27] studied in culture the life cycle of this species and found gametangial plants with the typical unilocular cystocarps of *Pterocladia*.

Plants examined (Fig. 15) agree with previous accounts of the species [25, 27]. In the vegetative state, the species is easily confused with species of the *Gelidium pusillum* (Stackhouse) Le Jolis assemblage. The most distinctive characters of *Pterocladia melanoidea* are the simultaneous presence of regular arrangement of tetrasporangia in V-shaped rows (Fig. 16) together with internal rhizines (Fig. 17) and the unilocular cystocarps.

Pterocladia melanoidea was collected at Puerto de la Cruz and Punta del Hidalgo (N Tenerife) and El Médano (S Tenerife), growing epilithically in extensive caespitose communities in low light habitats of the eulittoral. Tetrasporangia and cystocarps were observed in March. This is the first reference of unilocular cystocarps on field conditions [TFC (Phyc) 5711, 6849, 7334].

12. **Porphyra carolinensis** Coll et Cox (Figs 18–20)

Porphyra carolinensis (Bangiaceae, Bangiales) was originally described by Coll and Cox [15] based on specimens collected in North Carolina (USA). Later, this species have been reported from the same region by Kapraun [33] and Wynne [61]. Until now, *Porphyra carolinensis* seems to be endemic to the Southeastern coasts of the Carolinas.

According to South and Tittley [51] and Wynne [61] there are sixteen species of *Porphyra* C. Agardh in the North and Western Atlantic Ocean. Only *Porphyra leucosticta* Thuret and *Porphyra umbilicalis* (Linnaeus) J. Agardh have previously been reported from the Canary Islands.

Observations on recently collected plants and herbarium specimens housed at TFC led us to confirm the presence of *Porphyra carolinensis* in the Canary Islands. Some of the herbarium specimens named as *Porphyra leucosticta* are missidentifications of *Porphyra carolinensis*.

The Canarian plants are in good agreement with the description given by Coll and Cox [15]. Plants are characterized by its several oval to irregular blades attached by a discoid base (Fig. 18), with marginal microscopic teeth (Fig. 19). Specimens examined shown the production of numerous monospores at the margin blades, forming rounded characteristic protuberances (Fig. 20). Spermatangial sori were observed near to the margin, composed of less than 32 spermatangia arranged in 2–4 rows. These features clearly distinguished *Porphyra carolinensis* from other known marginally dentate species, as *Porphyra pujalsii* Coll et Oliveira Filho from Uruguay and *Porphyra acanthophora* Oliveira Filho et Coll from Brazil [15].

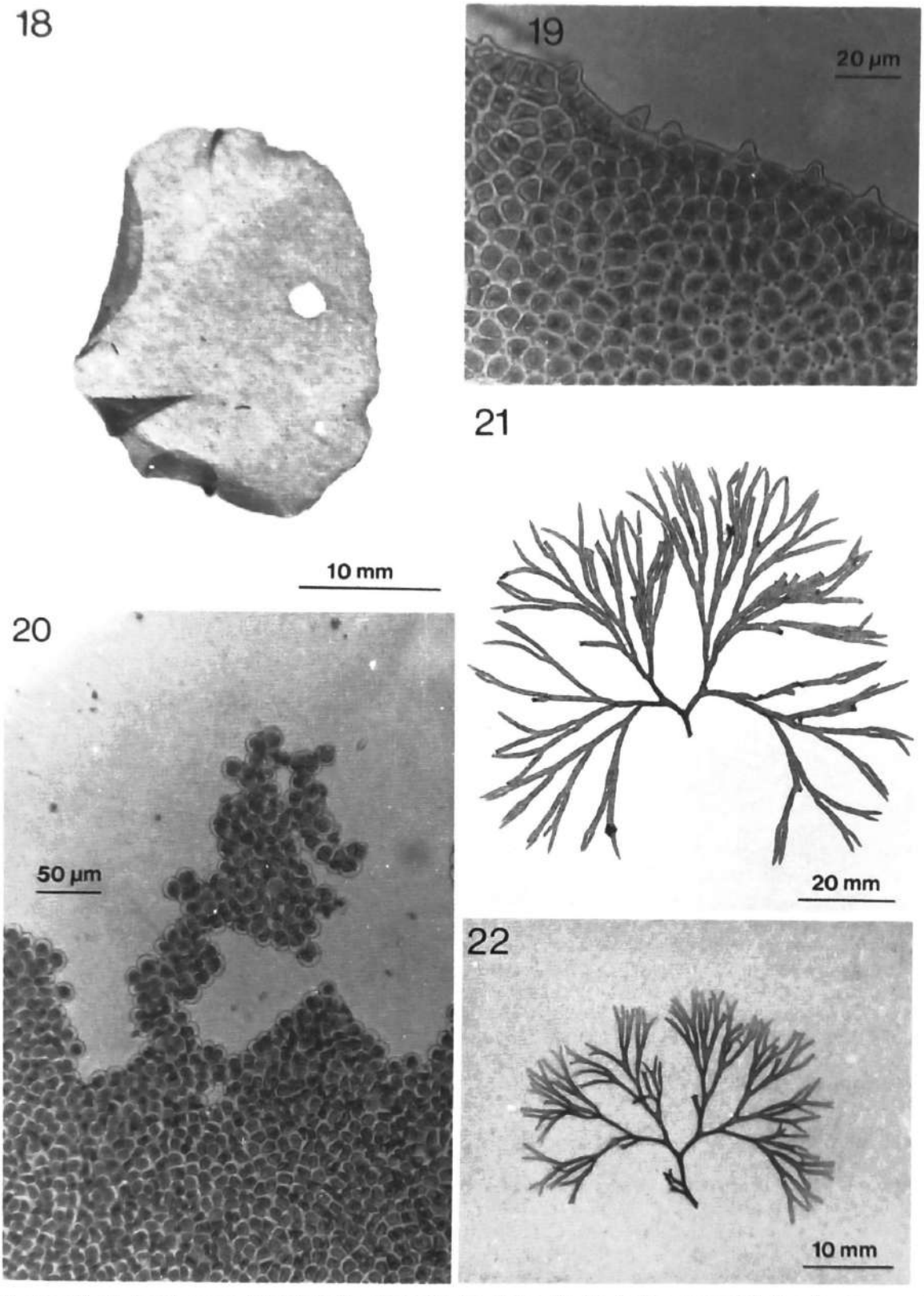
Porphyra carolinensis has been collected in several localities of Tenerife (Puerto de la Cruz, El Médano and Porís de Abona) and Gran Canaria (San Cristóbal). Plants were observed growing on rocks and epiphytic on other algae species, as *Fucus spiralis* Linnaeus, at the upper littoral. [TFC (Phyc) 1609, 1683, 1962, 2230, 4028, 5765, 7335].

13. **Scinaia australis** (Setchell) Huisman (Figs 21, 23–24)

Twenty-five species of *Scinaia* Bivona-Bernardi (Galaxauraceae, Nemaliales) are known world wide [32], with ten species previously reported from the Atlantic Ocean [39, 51, 61]. Of these, only two, *Scinaia complanata* (Collins) Cotton and *Scinaia pseudocrispa* (Clemente) Huisman (= *Scinaia forcellata* Bivona-Bernardi) have been reported up to date from the Canary Islands. Recently, another two species have been recognized in these islands, *Scinaia australis* and *Scinaia caribaea* (Taylor) Huisman. *Scinaia australis* has only been reported previously from South Australia (Tasmania, Victoria and New South Wales) [32].

According to Huisman [32] *Scinaia australis* is separated from other species of the genus by: (1) its large size, (2) the commonly large distance between furcations, (3) the comparatively small branch diameter, relatively constant along the axes, rarely reaching 2 mm and (4) the acutely pointed apices.

The specimen collected in the Canary Islands is to 75 mm high, with branches to 1.5 mm diameter, attached by a small basal disc. Axes pseudodichotomously divided, 9–11 times from base to apices, 3.5–25 mm between furcations and acute apices (Fig. 21). Superficially, the cortex is *Scinaia forcellata*-type [32], with numerous smaller utricles surrounding the larger ones (Fig. 23). In transverse section, the cortex is composed of pigmented hypodermal cells, 11–25 μm long and 6–10 μm diameter, supporting colourless utricles (Fig. 24). This specimen is a monoecious



Figs 18–22: Figs 18–20. *Porphyra carolinensis* Coll et Cox. Fig. 18. Habit. Fig. 19. Surface view of thallus showing marginal microscopic teeth. Fig. 20. Surface view of thallus showing monosporangia. – Fig. 21. *Scinaia australis* (Setchell) Huisman. Habit. – Fig. 22. *Scinaia caribaea* (Taylor) Huisman. Habit.

gametophyte, with abundant pyriform cystocarps and spermatangial sori throughout the axes.

Plant of *Scinaia australis* was collected in April, growing on a *Cymodocea nodosa* rhizome, at El Médano (S Tenerife), at 6 m depth. The small basal disc and the basal region of the plant were slightly sinked in sand. [TFC (Phyc) 7374].

14. **Scinaia caribaea** (Taylor) Huisman (Figs 22, 25–26)

Scinaia caribaea has been recorded from Haiti [54], Venezuela [23] and Lord Howe Island-Australia [32]. Nevertheless, according to Huisman [32], plants of *Scinaia caribaea* from Venezuela may be *Scinaia halliae* (Setchell) Huisman.

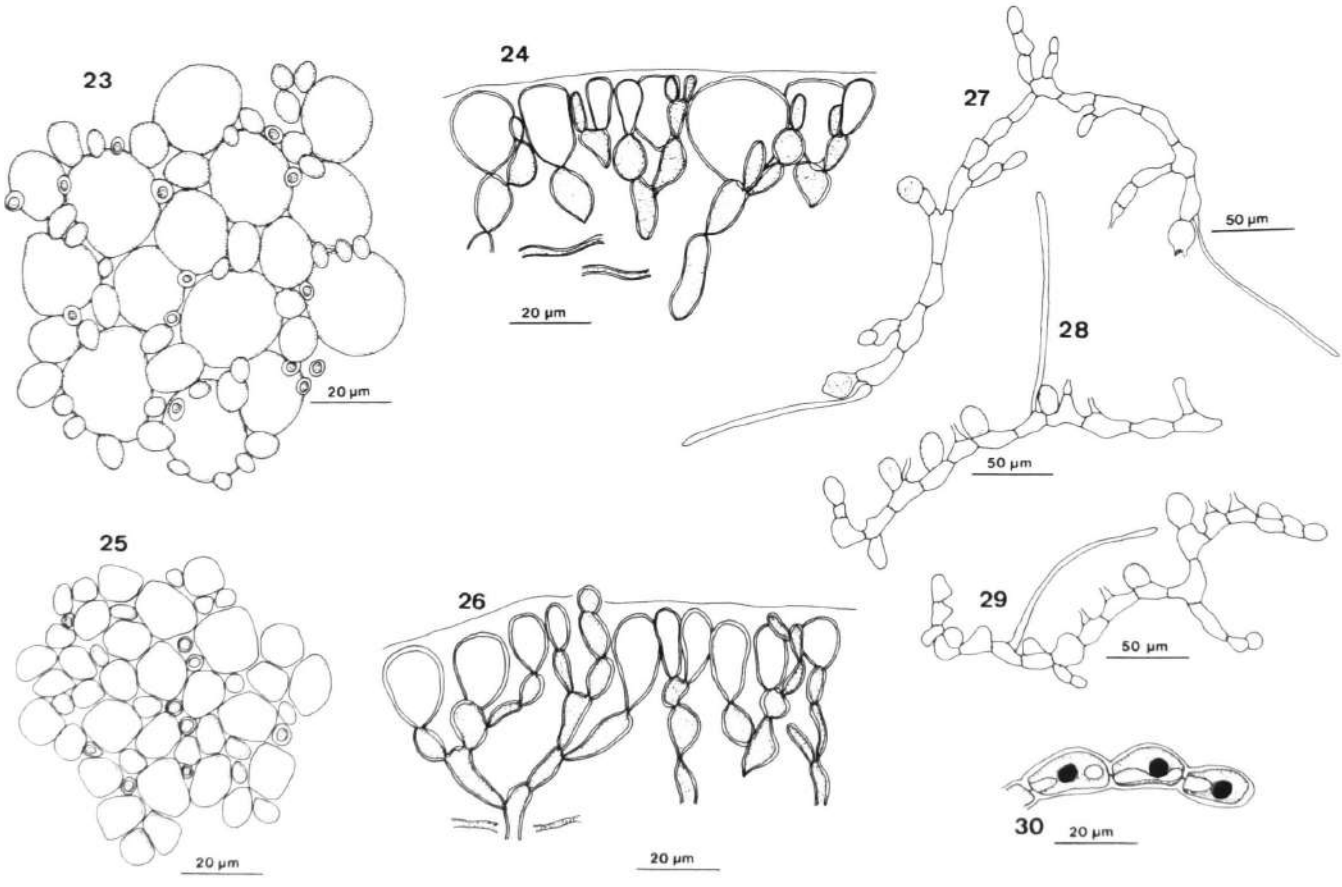
The Canarian specimens are 4 cm high, with narrow cartilaginous axes, attached by a small basal disc. Axes are pseudodichotomously divided, 7–10 times from base to apex, 2–4 mm between furcations. Axes diameter increase from 400 µm near the plant base to 900 µm near the apices (Fig. 22). Superficially, the cortex is *Scinaia forcellata*-type [32], with numerous pigmented or colourless smaller cells surrounding the larger utricles (Fig. 25). In transverse section, the cortex is composed of spherical to elongate hypodermal cells, to 20 µm long by 10 µm diameter, which produce the colourless utricles (Fig. 26).

Carposporangial plants of *Scinaia caribaea* were collected in November, growing on subtidal rocks, at 1.5 m depth, at El Médano (S Tenerife) [TFC (Phyc) 7330, 7375] and in tide pools at Puerto de la Cruz (N Tenerife) [TFC (Phyc) 5868] and Punta del Hidalgo (N Tenerife) [TFC (Phyc) 6838], in May and July, respectively.

15. **Audouinella liagorae** (Børgesen) Woelkerling (Figs 27–30)

Audouinella liagorae (Acrochaetiaceae, Nemaliales) was described by Børgesen [13] as *Acrochaetium liagorae* (and also by error as *Chantransia liagorae*) based on specimens growing endophytically among assimilatory filaments of *Liagora pinnata* Harvey from St. Croix (Virgin Islands, Western Atlantic). Papenfuss [43] transferred this species to *Kylinia* Rosenvinge and, later, Woelkerling [58] to *Audouinella* Bory.

Audouinella liagorae has also been reported as growing in the Caribbean [13, 55, 61], the Central Pacific [1],



Figs 23–30: Figs 23–24. *Scinaia australis* (Setchell) Huisman. Fig. 23. Surface view of thallus. Fig. 24. Section of cortex showing utricles and pigmented hypodermal cells. – Figs 25–26. *Scinaia caribaea* (Taylor) Huisman. Fig. 25. Surface view of thallus. Fig. 26. Section of cortex showing utricles and pigmented hypodermal cells. – Figs 27–30. *Audouinella liagorae* (Børgesen) Woelkerling. Figs 27–29. Creeping filaments bearing monosporangia and hairs. Fig. 30. Detail of cells showing parietal chromoplast with a well developed pyrenoid.

Philippines and the Southern Australian coasts [58]. Børgesen [13] only reported plants with monosporangia. Nevertheless, Woelkerling [58] studied sexual, carposporophyte and tetrasporangial stages. According to Woelkerling [58], *Audouinella liagorae* is apparently the only known endophytic species with the entire life cycle known under field conditions.

The Canarian material is in good agreement with the description given by Børgesen [13]. Plants consist of simple or little branched creeping filaments, bearing monosporangia and hyaline hairs (Figs 27–29). The cells have a single parietal chromoplast with a well developed pyrenoid (Fig. 30).

Audouinella liagorae was collected growing endophytically among the assimilatory filaments of *Liagora valida* Harvey and epiphytically on *Cymodocea nodosa* at El Médano (S Tenerife), at 1–5 m depth [TFC (Phyc) 7373].

Acknowledgements

This work was supported by grant P.I. n^0 35/08.03.90 from the Consejería de Eduación, Cultura y Deportes, Canary Islands Government. This paper contents data of J.R.'s Doctoral Thesis.

References

1 Abbott, I. A. (1962): Some *Liagora* – inhabiting species of *Acrochaetium*. Occas. Pap. Bernice P. Bishop Mus. *23*, 77–120.
2 Abbott, I. A. (1985): Vegetative and reproductive morphology in *Reticulocaulis* gen. nov. and *Naccaria hawaiiana* sp. nov. (Rhodophyta, Naccariaceae). J. Phycol. *21*, 554–561.
3 Abbott, I. A. and Hollenberg, G. J. (1976): Marine algae of California. Stanford University Press, Stanford.
4 Afonso-Carrillo, J. (1988): Structure and reproduction of *Spongites wildpretii* sp. nov. (Corallinaceae, Rhodophyta) from the Canary Islands, with observations and comments on *Spongites absimile* comb. nov. Br. phycol. J *23*, 89–102.
5 Afonso-Carrillo, J. (1989): Morphology, anatomy and vegetative reproduction of *Fosliella paschalis* (Corallinaceae, Rhodophyta). Phycologia *28*, 331–341.
6 Afonso-Carrillo, J. and Sansón, M. (1989): Clave ilustrada para la determinación de los macrófitos marinos bentónicos de las Islas Canarias. Dep. Biología Vegetal, Univ. de La Laguna, La Laguna.
7 Afonso-Carrillo, J., Pinedo, S. and Elejabeitia, Y. (1992): Notes on the benthic marine algae of the Canary Islands. Cryptogamie Algologie *13*, 281–290.
8 Athanasiadis, A. (1987): A survey of the seaweeds of the Aegean Sea with taxonomic studies on species of the tribe Antithamnieae (Rhodophyta). Thesis, Department of Marine Botany, Univ. of Gotenburg, Gotenburg.
9 Ballesteros, E. (1990): Checklist of benthic marine algae from Catalonia (North-Western Mediterranean). Treball's de l'Institut Botanic de Barcelona *13*, 5–52.
10 Ballesteros, E., Sansón, M., Reyes, J., Afonso-Carrillo, J. and Gil-Rodríguez, M. C. (1992): New records of benthic marine algae from the Canary Islands. Bot. Mar. *35*, 513–522.
11 Batters, E. A. L. (1892): New or critical British algae. Grevillea *21*, 49–53.
12 Batters, E. A. L. (1893): New or critical British algae. Grevillea *22*, 50–52.
13 Børgesen, F. (1915–1920): The marine algae of the Danish West Indies. III. Rhodophycean. Dansk. Bot. Ark. *3*, 1–498.
14 Bornet, E. and Thuret, E. (1876): Notes algologiques. Paris.
15 Coll, J. and Cox, J. (1977): The genus *Porphyra* C. Ag. (Rhodophyta, Bangiales) in the American North Atlantic. I. New Species from North Carolina. Bot. Mar. *20*, 155–159.
16 Coppejans, E. (1977): Bigdrage tot de studie van de Wierpopulaties (Chlorophyceae, Phaeophyceae, Rhodophyceae) van het fotofiel Infralittoraal in het noordwestelijk mediterraan bekken, 1–3. Thèse Sci. nat. Univ. Gent, Gent.
17 Coppejans, E. (1983): Iconographie des algues Méditerranéennes. Bibliotheca Phycologia. J. Cramer, Vaduz.
18 Cotton, A. D. (1912): Marine algae. In: Praeger, R. L.: A biological survey of Clare Island in the County of Mayo, Ireland and of the adjoining district. Proc. R. Ir. Acad. 31 Sect. *1* (15), 1–178.
19 Dangeard, P. (1931): L'*Ulvella lens* de Crouan et l'*Ulvella setchellii* sp. nov. Bull. Soc. Bot. Fr. *78*, 312–318.
20 Dangeard, P. (1969): Quelques Chlorophycées rares ou nouvelles. Botaniste Fr. *52*, 29–58.
21 Dawson, E. Y. (1962): Additions to the marine flora of Costa Rica and Nicaragua. Pacific Naturalist *3*, (13), 375–395.
22 De Toni, G. B. (1895): Sylloge algarum omnium hucusque cognitarum. III. Sylloge fucoidearum ... Patavii.
23 Díaz-Piferrer, M. (1970): Adiciones a la flora marina de Venezuela. Carib. J. Sci. *10*, 159–198.
24 Dixon, P. S. and Irvine, L. M. (1977): Seaweeds of the British Isles. I. Rhodophyta. Part. I. Introduction, Nemaliales and Gigartinales. British Museum (Natural History). London.
25 Feldmann, J. and Hamel, G. (1936): Floridées de France. VII. Gelidiales. Revue Algologique *9*, 85–140.
26 Fletcher, R. L. (1987): Seaweeds of the British Isles. Vol. III. Fucophyceae (Phaeophyceae). Part I. British Museum (Natural History). London.
27 Fredriksen, S. and Rueness, J. (1990): Culture studies on *Pterocladia melanoidea* (Schousboe ex Bornet) comb. nov. (Gelidiales, Rhodophyta). Phycologia *29*, 182–190.
28 Gargiulo, G. M., De Masi, F. and Tripodi, G. (1992): Morphology, reproduction and taxonomy of the Mediterranean species of *Gracilaria* (Gracilariales, Rhodophyta). Phycologia *31*, 53–80.
29 Gil-Rodríguez, M. C. and Haroun, R. (1992): *Laurencia viridis* sp. nov. (Ceramiales, Rhodomelaceae) from the Macaronesian Archipelagos. Bot. Mar. *35*, 227–237.
30 Hamel, G. (1931–1939): Phéophycées de France. Paris.
31 Hauck, F. (1885): Die meeresalgen Deutschlands und Oesterreichs. In: Rabenhorst, L.: Cryptogamen-Flora von Deutschland, Oesterreich und der Schweis 2. Leipzig.
32 Huisman, J. M. (1986): The red algal genus *Scinaia* (Galaxauraceae, Nemaliales) from Australia. Phycologia *25*, 271–296.
33 Kapraun, D. F. (1980): An illustrated guide to the benthic marine algae of coastal North Carolina. I. Rhodophyta. Univ. North Carolina. Chapel Hill.
34 Kuckuck, P. and Kornmann, P. (1953): Ectocarpaceen-Studien I *Hecatonema, Chilionema, Compsonema*. Helgoländer wiss. Meeresunters. *4*, 316–352.
35 Kützing, F. T. (1856): Tabulae Phycologicae oder Abbildungen der Tange. Bd. 6. Nordhausen.
36 Kylin, H. (1928): Entwicklungsgeschichtliche Florideenstudien. Lunds Univ. Arsskrift, Lund.
37 Kylin, H. (1940): Die Phaeophyceenordnung Chordariales. Acta Univ. Lund. N.F. Avd. 2, 36 (9), 1–67.

38 Kylin, H. (1974): Die Phaeophyceen der Schwedischen Westküste. Acta Univ. Lund. N.F. Avd. 2, *43* (4), 1–99.
39 Lawson, G. W. and John, D. M. (1982): The marine algae and coastal environment of tropical West Africa. J. Cramer, Braunschweig.
40 Levring, T. (1974): The marine algae of the Archipelago of Madeira. Bolm. Mus. Munic. Funchal *28*, 1–111.
41 Newton, L. (1931): A handbook of the British seaweeds. British Museum. London.
42 Nielsen, R. (1977): Culture studies on *Ulvella lens* and *Ulvella setchellii*. Br. phycol. J. *12*, 1–5.
43 Papenfuss, G. F. (1945): Further contributions toward an understanding of the *Acrochaetium-Rhodochorton* complex of the red algae. Univ. Calif. Publ. Bot. *18* (19), 433–447.
44 Price, J. H., John, D. M. and Lawson, G. W. (1978): Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. II. Phaeophyta. Bull. Br. Mus. Nat. Hist. (Bot.) 6 (2), 87–182.
45 Price, J. H., John, D. M. and Lawson, G. W. (1988): Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae). 2. Genera G. Bull. Br. Mus. Nat. Hist. (Bot.) *18* (3), 195–273.
46 Reyes, J. (1989): Contribución al estudio del epifitismo incrustante en las hojas de *Cymodocea nodosa* en la playa de El Médano (Tenerife). Univ. La Laguna. La Laguna.
47 Rosenvinge, L. K. and Lund, S. (1947): The marine algae of Denmark. Contributions to their natural history. Vol. II. Phaeophyceae. III. Encoeliaceae, Myriotrichiaceae, Giraudiaceae, Striariaceae, Dictyosiphonaceae, Chordaceae and Laminariaceae. Biol. Skr. *4*, 1–99.
48 Rueness, J. (1977): Norsk Algeflora. Scandinavian Univ. Books. Oslo, Bergen and Trondheim.
49 Sansón, M., Reyes, J. and Afonso-Carrillo, J. (1991): New records of Florideophyceae from the Canary Islands. Bot. Mar. *34*, 527–536.
50 South, G. R. (1984): A checklist of marine algae of Eastern Canada, second revision. Can. J. Bot. *64*, 680–704.
51 South, G. R. and Tittley, I. (1986): A checklist and distributional index of the benthic marine algae of the North Atlantic Ocean. Huntsman Marine Laboratory and British Museum (Natural History). St. Andrews and London.
52 Stegenga, H. and Mol, I. (1983): Flora van de'Nederlandse zeewieren. Nr 33. Koninklijke Nederlandse Natuurhistorische Vereniging. Bibliotheek. Uitgave.
53 Strömfelt, H. F. G. (1888): Algae novae quas ad litora Scandinaviae indagavit. Notarisia *3*, 381–384.
54 Taylor, W. R. (1942): Marine algae from Haiti collected by H. H. Bartlett in 1941. Pap. Mich. Acad. Sci. Arts Lett. *28*, 143–163.
55 Taylor, W. R. (1960): Marine algae of the eastern tropical and subtropical coasts of the Americas. Univ. of Michigan. Ann Harbor.
56 Verlaque, M. and Boudouresque, Ch. F. (1981): Vegetation marine de la Corse (Mediterranee). V. Documents pour la flore des algues. Biol. Ecol. Medit. *8*, 139–156.
57 Verlaque, M. and Tiné, J. (1981): Marine vegetation of Toulon (Var, France): algae and seagrasses. Thalassographica, Gr. *4*, 5–38.
58 Woelkerling, W. J. (1971): Morphology and taxonomy of the *Audouinella* complex (Rhodophyta) in Southern Australia. Aust. J. Bot. Suppl. Ser. *1*, 1–91.
59 Womersley, H. B. S. (1987): The marine benthic flora of Southern Australia. Part II. South Australia Government Printing Division. Adelaide.
60 Wynne, M. J. (1969): Life history and systematic studies of some Pacific North American Phaephyceae (brown algae). Univ. Calif. Publ. Bot. *50*, 1–88.
61 Wynne, M. J. (1986): A check-list of benthic marine algae of the tropical and subtropical western Atlantic. Can. J. Bot. *64*, 2239–2281.

Key words: New records, marine algae, Canary Islands

Javier Reyes, Departamento de Biología Vegetal (Botánica), Universidad de La Laguna, 38271 La Laguna, Canary Islands, Spain