

World distribution of the genus *Antithamnion* NAEGELI (Rhodophyta, Ceramiaceae)

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The world distribution of 51 species belonging to the genus *Antithamnion* NAEGELI (Rhodophyta, Ceramiaceae) is presented. Of each species both the geographic distribution and the distribution-group to which it belongs are given. On the basis of this study the genus *Antithamnion* is shown to be characteristic of cold-temperate waters. A list of species to be considered as synonyms of other species of *Antithamnion* or transferred to other genera is given. Two new combinations are also proposed.

Key Index Words: Antithamnion—Ceramiaceae—distribution—phytogeography—Rhodophyceae.

Since its description (NAEGELI 1847), more than 100 species were referred to the genus *Antithamnion*. But, owing to Wollaston's redefinition of the genus (WOLLASTON 1968), based on the characters of the type species *A. cruciatum* NAEGELI, about 50 species were transferred to other genera. This redefinition of the genus resulting in a more precise taxonomic entity led us to analyze the world distribution of the genus in order to get an overview of its biogeography.

Materials and Methods

Numerous floras of different geographic regions were consulted (see References). All the species of *Antithamnion* there reported are listed in two tables. In Table 1, all the species reliably referable to this genus as well as two species (marked with ?), the taxonomic value of which was not possible to ascertain, are listed. In this table, to every species was attributed a number with which each of them is indicated in Fig. 1. In Table 2 are listed all the species previously referred to the genus *Antithamnion* that, however, on the basis of their characters, are now considered differently by a taxonomic point of view. In this table are also included two new combinations proposed

in this paper.

Results and Discussion

Of the species previously referred to the genus *Antithamnion*, 9 are conspecific with other species of the same genus and 55 were transferred to different genera (Table 2). As far as we can ascertain at the present time, the genus *Antithamnion* contains 51 species (Table 1).

Most of the species (34) have a restricted distribution or are reported only from the type locality. Moreover, none of the others (excepted *A. hubbsii*, *A. lherminieri*, *A. percurrentens* and *A. secundum*) has a Northern to Southern Hemisphere distribution via the tropical area, that represents a thermic barrier.

Only three species are widely distributed: *A. cruciatum* (the type species), distributed in the Mediterranean, along the boreal Atlantic coast (from N Africa to N Europe and from the Antilles to Canada) and in the Indian coast with var. *radicans* COLLINS et HERVEY; *A. antillanum* and *A. lherminieri* which can be considered as sub-cosmopolitan species. However, the distribution of the last two species is hardly definable because, since

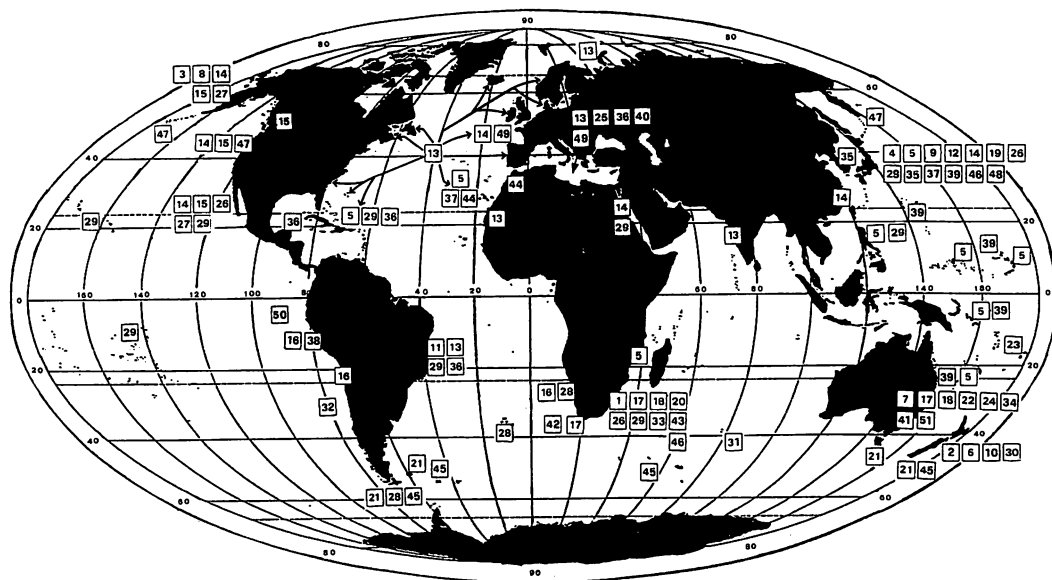


Fig. 1. World distribution of the species of the genus *Antithamnion* NAEGELI. The numbers refer to the species as listed in Table 1.

Table 1. Geographic distribution (with essential references) and distribution-group (according to CORMACI *et al.*, 1982) of the species of *Antithamnion* NAEGELI.

- 1 *A. adenocladellum* NORRIS INDIAN: Natal (NORRIS 1987). **Endemic**
- 2 *A. adnatum* (J. AGARDH) J. AGARDH PACIFIC: New Zealand (DE TONI 1903). **Endemic**
- 3 *A. alternans* GARDNER (1) PACIFIC: Alaska (DAWSON 1946). **Endemic**
- 4 *A. amamiense* ITONO PACIFIC: Japan (ITONO 1977). **Endemic**
- 5 *A. antillarum* BOERGESSEN ATLANTIC: Antilles, Canary Islands (BOERGESSEN 1930). INDIAN: Mozambique (WOLLASTON 1984). PACIFIC: Caroline Is. (TRONO 1968), Philippine Is. (SILVA *et al.*, 1987), Marshall Is., Japan (ITONO 1977), Solomon Is. (WOMERSLEY and BAILEY 1970), Australia (CRIBB 1983). **Sub-cosmopolitan**
- 6 *A. applicitum* (HARVEY) J. AGARDH (2) PACIFIC: New Zealand (SOUTH and ADAMS 1976). **Endemic**
- 7 *A. armatum* (J. AGARDH) DE TONI PACIFIC: Australia (WOLLASTON 1968). **Endemic**
- 8 *A. asymetricum* GARDNER PACIFIC: Alaska (GARDNER 1927). **Endemic**
- 9 *A. calloclados* ITONO PACIFIC: Japan (ITONO 1977). **Endemic**
- 10 *A. ? confusum* (J. AGARDH) LAING PACIFIC: New Zealand (DE TONI 1924). **Endemic**
- 11 *A. cristatum* (KUETZING) TAYLOR ATLANTIC: Brazil (TAYLOR 1960). **Endemic**
- 12 *A. cristirhizophorum* TOKIDA et INABA PACIFIC: Japan (YOSHIDA *et al.* 1985). **Endemic**
- 13 *A. cruciatum* (C. AGARDH) NAEGELI ATLANTIC: Coasts of Europe and North America, Antilles, Canary Is. (ARDRE 1970); New Zemlja? (DE TONI 1903); Senegal (PRICE *et al.* 1986). MEDITERRANEAN SEA (FELDMANN-MAZOYER 1940). INDIAN: India (DIXIT 1979, only var. *radicans* COLLINS et HERVEY). **Boreo-Atlantic**
- 14 *A. defectum* KYLIN (3) PACIFIC: Alaska to Baja California, Mexico, U.S.S.R., China, Sakhalin Is. (SCAGEL *et al.* 1986); Japan, Korea (KANG 1966). ATLANTIC: Brittany (L'HARDY-HALOS 1968). RED SEA (PAPENFUSS 1968a). **Boreo-Pacific**
- 15 *A. dendroideum* SMITH et HOLLENBERG PACIFIC: Alaska to California (SCAGEL *et al.* 1986); Guadalupe Is. (DAWSON 1962). **Boreo-Pacific**
- 16 *A. densum* (SUHR) HOWE ATLANTIC: South Africa (PAPENFUSS 1968b). PACIFIC: Northern Chile (LEVRING 1960). **Southern Atlanto-Pacific**
- 17 *A. diminutum* WOLLASTON ATLANTIC: Cape of Good Hope. INDIAN: Cape Agulhas, Natal (NORRIS 1987). PACIFIC: Australia (WOLLASTON 1968). **Southern Indo-Pacific**
- 18 *A. divergens* (J. AGARDH) J. AGARDH INDIAN: Natal (NORRIS 1987). PACIFIC: Australia (WOLLASTON 1968). **Southern Indo-Pacific**
- 19 *A. echigoense* NODA PACIFIC: Japan (YOSHIDA *et al.* 1985). **Endemic**
- 20 *A. eliseae* NORRIS INDIAN: Natal (NORRIS 1987). **Endemic**
- 21 *A. flaccidum* (HOOKER et HARVEY) DE TONI ATLANTIC: Cape Horn, Falkland (PUJALS 1963). PACIFIC:

- Australia (?), New Zealand (WOLLASTON 1968). **Antarctic**
- 22 *A. gracilentum* (HARVEY) J. AGARDH PACIFIC: Australia (WOLLASTON 1968). **Endemic**
- 23 *A. graeffei* (GRUNOW) DE TONI PACIFIC: Tonga Is. (DE TONI 1903). **Endemic**
- 24 *A. hanouvioides* (SONDER) DE TONI PACIFIC: Australia (DE TONI 1903; WOLLASTON 1968). **Endemic**
- 25 *A. heterocladum* FUNK MEDITERRANEAN (FUNK 1955; BOUDOURESQUE 1984; GALLARDO *et al.* 1985; GIACCONE *et al.* 1985; ATHANASIADIS 1987). **Endemic**
- 26 *A. hubbsii* DAWSON INDIAN: Natal (NORRIS 1987). PACIFIC: California, Guadalupe Is. (ABBOTT and HOLLENBERG 1976), Japan (ITONO 1969). **Indo-Pacific**
- 27 *A. kylinii* GARDNER PACIFIC: Alaska to Mexico (SCAGEL *et al.* 1986). **Boreo-Pacific**
- 28 *A. leptocladum* (MONTAGNE) WYNNE ATLANTIC: Strait of Magellan, Argentina, Tristan Da Cuña, South Africa (WYNNE 1986). **Southern Atlantic**
- 29 *A. lherminieri* NASR (4) ATLANTIC: Antilles, Brazil (UGADIM *et al.* 1986). PACIFIC: California, Polynesia, Japan (ITONO 1969), Philippines Is. (CORDERO 1977). INDIAN: Natal (NORRIS 1987). RED SEA (NASR 1941). **Sub-cosmopolitan**
- 30 *A. lindaueri* G. FELDMANN PACIFIC: New Zealand (HAY *et al.* 1985). **Endemic**
- 31 *A. ? microptilum* (GRUNOW) DE TONI (5) INDIAN: St. Paul Is. (DE TONI 1903). **Endemic**
- 32 *A. minutissimum* LEVRING PACIFIC: Is. Juan Fernandez (LEVRING 1941). **Endemic**
- 33 *A. nematocladellum* NORRIS INDIAN: Natal (NORRIS 1987). **Endemic**
- 34 *A. nigrescens* J. AGARDH (6) PACIFIC: Australia (WOLLASTON 1968). **Endemic**
- 35 *A. nipponicum* YAMADA et INAGAKI PACIFIC: Japan (YOSHIDA *et al.* 1985), Korea (KANG 1966). **Endemic**
- 36 *A. ogdeniae* ABBOTT (7) ATLANTIC: Antilles (ABBOTT 1979), Canary Is. (ATHANASIADIS 1985b), Brazil (UGADIM *et al.* 1986). MEDITERRANEAN SEA: Greece (ATHANASIADIS 1985b), Corsica (BOUDOURESQUE and VERLAQUE 1976). **Boreo-tropical Atlantic**
- 37 *A. okiense* KAJIMURA PACIFIC: Japan (KAJIMURA 1987). **Endemic**
- 38 *A. orbignianum* (MONTAGNE) DE TONI PACIFIC: Peru (DE TONI 1903; DAWSON *et al.* 1964), Chile (DE TONI 1903). **Endemic**
- 39 *A. percurrrens* DAWSON PACIFIC: Japan, Marshall Is. (ITONO 1969), Solomon Is. (WOMERSLEY and BAILEY 1970), Australia (CRIBB 1983). **Pacific**
- 40 *A. piliferum* CORMACI et FURNARI MEDITERRANEAN SEA: Sicily (CORMACI and FURNARI 1987a). **Endemic**
- 41 *A. pinnafolium* WOLLASTON (8) PACIFIC: Australia (WOLLASTON 1968). **Endemic**
- 42 *A. pseudoarmatum* STEGENGA ATLANTIC: South Africa (STEGENGA 1986). **Endemic**
- 43 *A. pterocladellum* NORRIS INDIAN: Natal (NORRIS 1987). **Endemic**
- 44 *A. pteroton* BORNET ATLANTIC: Canary Is., Tangier (BOERGESEN 1930). **Endemic**
- 45 *A. pilotum* (HOOKER et HARVEY) GIBSON-HARVEY R. J. ATLANTIC: Cape Horn, South Georgia (PUJALS 1963). INDIAN: Crozet Is. (DE TONI 1903). PACIFIC: New Zealand (DE TONI 1924). **Antarctic**
- 46 *A. secundum* ITONO INDIAN: Natal (NORRIS 1987). PACIFIC: Japan (ITONO 1977). **Indo-Pacific**
- 47 *A. shimamuranum* NAGAI PACIFIC: Washington, Aleutian Is., Kuril Is. (SCAGEL *et al.* 1986). **Boreo-Pacific**
- 48 *A. tanakae* ITONO PACIFIC: Japan (ITONO 1977). **Endemic**
- 49 *A. tenuissimum* (HAUCK) SCHIFFNER (9) MEDITERRANEAN SEA: (FELDMANN-MAZOYER 1940; BOUDOURESQUE 1984; GALLARDO *et al.* 1985; GIACCONE *et al.* 1985; ATHANASIADIS 1987). ATLANTIC: Brittany (L'HARDY-HALOS 1968). **Endemic**
- 50 *A. veleroae* TAYLOR (10) PACIFIC: Galapagos Is. (TAYLOR 1945). **Endemic**
- 51 *A. verticale* (HARVEY) J. AGARDH PACIFIC: Australia (WOLLASTON 1968). **Endemic**

- (1) On the basis of the description and iconography (GARDNER 1927: 377, Pl. 78, Figs. 1, 2), this species does not seem to belong to *Antithamnion*. The study of the type material could make its taxonomy clear.
- (2) This species should occur also in Chile, if the synonymy with *Callithamnion pectinatum* MONTAGNE proposed by BRAUNER (1982) was nomenclaturally validated.
- (3) The occurrence of the species in the Red Sea (PAPENFUSS 1968a as *A. pygmaeum*) seems due to a casual introduction, since this species and the taxa considered as its synonyms (*A. pygmaeum*, *A. setaceum*, *A. sparsum*) occur only in the Pacific Ocean. In a similar way, GUIRY and IRVINE (1974) explained the occurrence of this species in Brittany.
- (4) This species, according to ATHANASIADIS (1985b), is conspecific with *A. antillanum*.
- (5) This species, according to HUISMAN and KRAFT (1984), is probably to be referred to the genus *Balliella* ITONO et TANAKA.
- (6) This species, according to WOLLASTON (1968), is probably conspecific with *Platythamnion nodiferum* (J. AGARDH) WOLLASTON.
- (7) The reports of *A. antillanum* from Brazil and Corsica should be referred to *A. ogdeniae* on the basis of the study by ATHANASIADIS (1985b).
- (8) The reports of this species from S. Africa (NORRIS and AKEN 1985), have to be referred to *A. pterocladellum* (NORRIS 1987).
- (9) The occurrence of this species in Brittany could be a recent introduction.
- (10) On the basis of the description (TAYLOR 1945) it could be a synonym of *Antithamnionella glandulifera*. The study of the type material could make its taxonomy clear.

Table 2. List of the species conspecific with other species of *Antithamnion* or transferred to different genera.

- A. americanum* (HARVEY) FARLOW = *Scagelia pylaisaei* (MONTAGNE) WYNNE (WYNNE 1985).
A. antarcticum KYLIN = *Pterothamnion antarcticum* (KYLIN) MOE et SILVA (MOE and SILVA 1980).
A. applicitum YENDO = *Antithamnion nipponicum* YAMADA et INAGAKI (ITONO 1969).
A. atlanticum OLIVEIRA FILHO = *Antithamnionella atlantica* (OLIVEIRA FILHO) SCHNEIDER (SCHNEIDER 1984).
A. australe (J. AGARDH) DE TONI = *Shepleya australe* (J. AGARDH) GORDON (GORDON 1972).
A. barbatum (C. AGARDH) HOLMES et BATTERS = *Spermothamnion barbatum* (C. AGARDH) BORNET (1).
A. basisporum TOKIDA et INABA = *Antithamnionella basispora* (TOKIDA et INABA) CORMACI et FURNARI comb. nov. (2).
A. baylesiae GARDNER = *Hollenbergia subulata* (HARVEY) WOLLASTON (WOLLASTON 1971a).
A. boreale (GOBI) KJELLMAN = *Scagelia pylaisaei* (MONTAGNE) WYNNE (WYNNE 1985).
A. brevimosum DAWSON = *Antithamnionella elegans* (BERTHOLD) PRICE et JOHN v. *elegans* (CORMACI and FURNARI 1987b).
A. butleriae COLLINS = *Acrothamnion butleriae* (COLLINS) KYLIN (KYLIN 1956).
A. cladoderma (ZANARDINI) HAUCK = *Balliella cladoderma* (ZANARDINI) ATHANASIADIS (ATHANASIADIS 1987).
A. comosum (HARVEY) J. AGARDH = *Warrenia comosa* (HARVEY) KUETZING (WOLLASTON 1971b).
A. corallina (RUPRECHT) KJELLMAN = *Scagelia pylaisaei* (MONTAGNE) WYNNE (WYNNE 1985).
A. corticatum TOKIDA = *Tokidea corticata* (TOKIDA) YOSHIDA (YOSHIDA 1974).
A. crouanioides ITONO = *Balliella crouanioides* (ITONO) ITONO et TANAKA (ITONO and TANAKA 1973).
A.? *delicatulum* (HARVEY) DE TONI = *Antithamnion divergens* (J. AGARDH) DE TONI (WOLLASTON 1968).
A. densiusculum GARDNER = *Hollenbergia subulata* (HARVEY) WOLLASTON (WOLLASTON 1971a).
A. dispar (HARVEY) J. AGARDH = *Perithamnion dispar* (HARVEY) WOLLASTON (WOLLASTON 1968).
A. dumontii DAWSON = *Wrangelia dumontii* (DAWSON) ABBOTT (ABBOTT 1979).
A. elegans BERTHOLD = *Antithamnionella elegans* (BERTHOLD) PRICE et JOHN (PRICE et al. 1986).
A. flagellatum BOERGESEN = *Antithamnionella flagellata* (BOERGESEN) ABBOTT (ABBOTT 1979).
A. floccosum (MÜLLER) KLEEN = *Antithamnionella floccosa* (MÜLLER) WHITTICK (WHITTICK 1980).
A. floccosum f. *pacificum* (HARVEY) SETCHELL et GARDNER = *Antithamnionella pacifica* (HARVEY) WOLLASTON (WOLLASTON 1971a).
A. fragilissimum (ZANARDINI) DE TONI = *Antithamnion cruciatum* (C. AGARDH) NAEGELI f. *fragilissimum* (ZANARDINI) HAUCK (3).
A. gardneri DE TONI = *Antithamnionella spirographidis* (SCHIFFNER) WOLLASTON (WOLLASTON 1971a).
A. glanduliferum KYLIN = *Antithamnionella glandulifera* (KYLIN) WOLLASTON (WOLLASTON 1971a).
A. hannaforðii (HARVEY) J. AGARDH = *Ptilota hannaforðii* HARVEY (WOLLASTON 1971a).
A. horizontale (HARVEY) J. AGARDH = *Antithamnion verticale* (HARVEY) J. AGARDH (WOLLASTON 1968).
A. mcnaabii DAWSON = *Antithamnionella mcnaabii* (DAWSON) YOUNG (YOUNG 1981).
A. miharai TOKIDA = *Antithamnionella miharai* (TOKIDA) ITONO (YOSHIDA et al. 1985).
A. mucronatum (J. AGARDH) NAEGELI = *Macrothamnion pellucidum* (HARVEY) WOLLASTON (WOLLASTON 1968).
A. nigricans GARDNER = *Hollenbergia nigricans* (GARDNER) WOLLASTON (WOLLASTON 1971a).
A. nodiferum (J. AGARDH) J. AGARDH = *Platythamnion nodiferum* (J. AGARDH) WOLLASTON (WOLLASTON 1968).
A. occidentale KYLIN = *Scagelia pylaisaei* (MONTAGNE) WYNNE (WYNNE 1985).
A. pacificum (HARVEY) KYLIN = *Antithamnionella pacifica* (HARVEY) WOLLASTON (WOLLASTON 1971a).
A. palmlyrense DAWSON = *Antithamnion lherminieri* NASR (ABBOTT 1979).
A. plumula (ELLIS) THURET = *Pterothamnion plumula* (ELLIS) NAEGELI (MOE and SILVA 1980).
A. plumula v. *bebbii* (REINSCH) J. FELDMANN = *Pterothamnion plumula* v. *bebbii* (REINSCH) CORMACI et FURNARI (GIACCONE et al. 1985).
A. plumula v. *crispum* (DUCLUZEAU) HAUCK = *Pterothamnion crispum* (DUCLUZEAU) NAEGELI (ATHANASIADIS 1985a).
A.? *preissii* DE TONI = *Acrothamnion preissii* (SONDER) WOLLASTON (WOLLASTON 1977).
A. pseudocorticatum DAWSON = *Balliella pseudocorticata* (DAWSON) YOUNG (YOUNG 1981).
A. pulchellum GARDNER = *Antithamnionella spirographidis* (SCHIFFNER) WOLLASTON (WOLLASTON 1971a).
A. pusillum (RUPRECHT) KJELLMAN = *Antithamnion cruciatum* (C. AGARDH) NAEGELI? (DE TONI 1903).
A. pygmaeum GARDNER = *Antithamnion defectum* KYLIN (WOLLASTON 1971a).
A. pylaisaei (MONTAGNE) KJELLMAN = *Scagelia pylaisaei* (MONTAGNE) WYNNE (WYNNE 1985).
A. ramulosum (REINSCH) KYLIN = *Pterothamnion simile* (HOOKER et HARVEY) NAEGELI (WOLLASTON 1979).
A. sarniense (LYLE) G. FELDMANN = *Antithamnionella sarniense* LYLE (LYLE 1922).
A. scrippsianum DAWSON = *Antithamnionella glandulifera* (KYLIN) WOLLASTON (WOLLASTON 1971a).
A. secundatum GARDNER = *Antithamnion kyllinii* GARDNER (WOLLASTON 1971a).
A. setaceum GARDNER = *Antithamnion defectum* KYLIN (WOLLASTON 1971a).
A. simile (HOOKER et HARVEY) J. AGARDH = *Pterothamnion simile* (HOOKER & HARVEY) NAEGELI (WOLLASTON 1979).
A. simulans GARDNER = *Scagelia simulans* (GARDNER) CORMACI et FURNARI comb. nov. (4)
A. sparsum TOKIDA = *Antithamnion defectum* KYLIN (YOSHIDA 1981).
A. spirographidis SCHIFFNER = *Antithamnionella spirographidis* (SCHIFFNER) WOLLASTON (WOLLASTON 1968).
A. subcorticatum ITONO = *Balliella subcorticata* (ITONO) ITONO et TANAKA (ITONO and TANAKA 1973).
A. sublittorale SETCHELL et GARDNER = *Antithamnionella elegans* (BERTHOLD) PRICE et JOHN v. *sublittoralis* (SETCHELL et GARDNER) CORMACI et FURNARI (CORMACI and FURNARI 1987b).
A. subulatum (HARVEY) J. AGARDH = *Hollenbergia subulata* (HARVEY) WOLLASTON (WOLLASTON 1971a).

- A. tenuissimum* GARDNER = *Antithamnionella spirographidis* (SCHIFFNER) WOLLASTON (WOLLASTON 1971a).
A. terminale INAGAKI = *Acrothamnion preissii* (SONDER) WOLLASTON (IFONO 1969).
A. ternatum JOLY et CORDEIRO = *Antithamnionella elegans* (BERTHOLD) PRICE et JOHN v. *elegans* (CORMACI and FURNARI 1987b).
A. ternifolium (HOOKER et HARVEY) DE TONI = *Antithamnionella ternifolia* (HOOKER et HARVEY) LYLE (LYLE 1922).
A. ? thouarsii (MONTAGNE) DE TONI = *Mediothamnion lyallii* (HARVEY) GORDON (GORDON 1972).
A. tristicum JOLY et YAMAGUSHI = *Antithamnionella elegans* (BERTHOLD) PRICE et JOHN v. *elegans* (CORMACI and FURNARI 1987b).
A. uncinatum GARDNER = *Antithamnionella pacifica* (HARVEY) WOLLASTON v. *uncinata* (GARDNER) WOLLASTON (WOLLASTON 1971a).
A. ? verticillatum (SUHR) DE TONI = *Antithamnionella verticillata* (SUHR) LYLE (LYLE 1922).

- (1) *Antithamnion barbatum* is based on *Callithamnion barbatum* C. AGARDH transferred to the genus *Spermothamnion* by BORNET (1892).
(2) This species, reported from Japan (YOSHIDA *et al.* 1985) and from Vietnam (PHAM-HOANG 1969, p. 222, Fig. 2. 152), shows the typical characters of *Antithamnionella* LYLE. Therefore, formal transfer is proposed: *Antithamnionella basispora* (TOKIDA et INABA) CORMACI et FURNARI comb. nov., basionym: *Antithamnion basisporum* TOKIDA et INABA, 1950. *Pacif. Sci.* 4: 118, Figs. 1, 2.
(3) The taxonomic discussion on this taxon is reported in CORMACI and FURNARI (1987a).
(4) This species, reported from Alaska (GARDNER 1927; SCAGEL *et al.* 1986), shows the typical characters of *Scagelia* WOLLASTON. Therefore, formal transfer is proposed: *Scagelia simulans* (GARDNER) CORMACI et FURNARI comb. nov., basionym: *Antithamnion simulans* GARDNER, 1927. *Univ. of Calif. Publ. Bot.* 13(18): 376, Pl. 78 Fig. 3.

several authors consider them as conspecific, it is difficult to realize to which taxon the different reports have to be referred. Nevertheless, the presence in the different areas of the one or of the other taxon, is reported according to the epithet used in the floras examined.

Only 7 species are exclusively or prevalently distributed in the tropical area. But two of them, *A. densum* and *A. orbignianum*, cannot be considered typical of warm waters, since they are distributed along the Peruvian and Chilean coasts lapped by the cold Humboldt current.

The majority of species (38) occur in the Pacific Ocean. In this Ocean there are three areas having several endemic species: Japan, with 6 that are endemic out of a total of 13 species; Australia, with 6 out of a total of 10, and New Zealand, with 4 endemic species out of a total of 6 species.

Of the four non-endemic species occurring in Australia, two (*A. antillanum* and *A. percurrans*) are widely distributed from Australia to Japan, while the other two (*A. diminuatum* and *A. divergens*) also occur in South Africa. That suggests a floristic affinity between these two areas, which was previously pointed out by SILVA (1962) and by VAN DEN HOEK (1984). The two non-endemic species occurring in New Zealand (*A. ptilotum* and *A. flaccidum*)

have a disjunct distribution. *A. ptilotum* is reported from the Crozet Islands, Cape Horn and South Georgia; *A. flaccidum* from Cape Horn and the Falkland Islands. This pattern of distribution is probably linked to West Wind Drift and agrees with an Antarctic phytogeographic province.

Of the five non-endemic species occurring in Japan, two (*A. antillanum* and *A. percurrans*) are distributed, as mentioned above, from Japan to the Australian Great Barrier Reef through tropical islands; the other three (*A. defectum*, *A. hubbsii*, and *A. lherminieri*) have a wider distribution. In particular, their occurrence along the coast of California, strengthens the validity of the Japanese-Californian floristic pattern quoted by SILVA (1962).

Thirteen species are found in the Indian Ocean, where they show a distribution very restricted. In fact, 9 species (4 endemic) occur only in Natal, where they were firstly reported from in 1987 by NORRIS (1987); *A. microptilum* and *A. ptilotum* are distributed respectively at St. Paul Island and the Crozet Islands, along the boundaries with the Antarctic region; *A. cruciatum* var. *radicans* is found only in India (DIXIT 1979); *A. antillanum* only in Mozambique (WOLLASTON 1984).

Fourteen species are found in the Atlantic. Six of them are endemic in this Ocean: *A.*

cristatum, *A. pteroton* and *A. pseudoarmatum*, recorded respectively only from Brazil, the Canary Islands and South Africa; *A. cruciatum*, widely distributed in the boreal zone; *A. ogdeniae*, with a boreo-tropical distribution and *A. leptocladum*, occurring only in the South Atlantic. The pattern of distribution of the other species shows the close connection of the Atlantic with the Pacific, probably due to the communication between these two Oceans through Central America, that is known to have existed until Late Pliocene time.

Of the five species living in the Mediterranean, *A. cruciatum* and *A. ogdeniae* are distributed also in the Atlantic, while *A. heterocladum*, *A. piliferum* and *A. tenuissimum* are endemic. With reference to the distribution within the Mediterranean Sea, *A. cruciatum*, *A. heterocladum* and *A. tenuissimum* are widely distributed; *A. ogdeniae* and *A. piliferum* have a more restricted distribution: the former is reported only from Corsica (BOUDOURESQUE and VERLAQUE 1976 as *A. antillanum*, see CORMACI and FURNARI 1987a) and from the Aegean Sea (ATHANASIADIS 1985b); the latter only from the type locality (CORMACI and FURNARI 1987a).

In conclusion, although the type species of the genus is an Atlantic species, from this study it appears that the genus *Antithamnion* has a Pacific origin. Moreover, the patterns of distribution of the species strengthen the floristic affinities (between New Zealand and the southern part of South America; Australia and South Africa; Japan and California) pointed out by SILVA (1962) on the basis of the distribution of the genus *Codium* STACKHOUSE. Finally, both the scanty presence of species in the tropical regions and the very limited distribution in the Indian Ocean show the cold-temperate affinity of the genus *Antithamnion*.

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**Mario CORMACI · Giovanni FURNARI : 紅藻イギス科の
フタツガサネ属の世界における分布**

フタツガサネ属 (*Antithamnion*) に属する51種の世界における分布を示した。各々の種について、その地理的分布と分布グループを示した。この研究により、フタツガサネ属は冷温帯に特徴的に分布することが明らかになった。この属の他の種と synonym であると考えられる種、および他の属に移すべきであると考えられる種のリストを作成した。二つの新組合せを提案した。(Istituto e Orto Botanico dell'Università, Via A. Longo 19, 95125 Catania, Italy)