

## The Genus *Laurencia* (Rhodomelaceae, Rhodophyta) in the Canary Islands

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1 Figure

The genus *Laurencia* LAMOUROUX is a group of medium-sized, erect, fleshy or cartilaginous, red algae distributed from temperate to tropical waters.

During the last few years several collections along the coasts of the Canary Islands have shown the important role of the *Laurencia* species in the intertidal communities; however, it is rather problematic to identify many of the taxa observed, and it seems necessary to make a biosystematic review of this genus in the Macaronesian Region.

LAMOUROUX in 1813 established the genus with 8 species, but he didn't mention a type species. Critical systematic studies have been made by several authors, C. AGARDH (1823, 1824), J. AGARDH (1842, 1851, 1880), DE TONI (1903, 1924), YAMADA (1931), after reviewing many type specimens from different American and European Herbaria. TSENG (1943) studied the Hong-Kong species, DAWSON (1944, 1963) reported on the Pacific Mexican species, CRIBB (1958) on the Australian species (Southeastern Queensland), DURIRATNAM (1963) on species from Sri Lanka and HOLLENBERG & ABBOTT (1965) on the Californian species.

More recently, the extensive works of SAITO (1964, 1966, 1967, 1969a, 1969b & 1985), SAITO & WOMERSLEY (1974), CHANG & BANGNEI (1980, 1983) and NAM & KANG (1984) have made a great contribution to the knowledge of this genus in the Pacific Basin.

In the Atlantic Coasts, SAITO (1982) made a short review of three typical European species: *L. obtusa* (HUDSON) LAMOUROUX, *L. pinnatifida* (HUDSON) LAMOUROUX and *L. hybrida* (DC.) LENORMAND. Other researches carried out in this troublesome genus in the Atlantic Ocean were made by TAYLOR (1960) in Eastern Tropical and Subtropical Coasts of America, OLIVEIRA-FILHO (1969) in Brazil, MAGNE (1980) in the French Atlantic Coasts, LAWSON & JOHN (1982) in the West Coast of Africa, RODRIGUEZ DE RIOS (1981), RODRIGUEZ DE RIOS & SAITO (1982, 1985) and RODRIGUEZ DE RIOS & LOBO (1984) in Venezuela.

### Material and methods

The morphology of the species were studied using the herbarium sheets deposited in the La Laguna University Herbarium (TFC Phyc.) as well as with fresh samples from the Canary Islands; the taxonomical characters were observed with binocular lens and optical microscope. The fresh samples were studied before and after fixation in 4% formalin in seawater, kept in a dark place and a part were included in the TFC Phyc.

The taxonomical characters used for the systematic of the genus over the specific level are:

- 1) Secondary pit-connections between adjacent superficial cortical cells: presence (Fig. 1a) versus absence (Fig. 1b).
- 2) Origin of tetrasporangia: adaxial (Fig. 1c) or abaxial (Fig. 1d).
- 3) Disposition of tetrasporangia in the stichidial branches: parallel type (Fig. 1e) or right-angle type (Fig. 1f).
- 4) Shape and disposition of spermatangial receptacles: cup-like (Fig. 1g) or pocket-like (Fig. 1h); determinate (ending branch growth) or indeterminate (not ending branch growth).

Besides, other characters were used to identify the species.

### Results

In the Canarian Area, only records and chorological data of some taxa are known.

The first species from the Canarian area was described by BORY ST. VICENT (1804) as *Fucus perforatus* BORY [= *Laurencia perforata* (BORY) MONTAGNE]. Until the recent studies of VIERA-RODRIGUEZ et al. (1987) the following species have been reported:

- 1) *Laurencia brongniartii* J. AGARDH (VIERA-RODRIGUEZ 1985; PRUD'HOMME VAN REINE com. pers.)
- 2) *Laurencia hybrida* (DC.) LENORMAND (PICCONE 1884; BOERGESEN 1930; LEVRING 1974; GIL-RODRIGUEZ & AFONSO-CARRILLO 1980; AUDIFFRED & WEISSCHER 1984; JORGE et al. 1986; PRUD'HOMME VAN REINE com. pers.)  
Syn.: *Laurencia canariensis* MONTAGNE in litt. (KUTZING 1849, 1865), *Laurencia caespitosa* LAMOUROUX (HARVEY 1846-1851; AGARDH 1851)
- 3) *Laurencia obtusa* (HUDSON) LAMOUROUX (MONTAGNE 1839-1841; PICCONE 1884; BOERGESEN 1930; GIL-RODRIGUEZ & AFONSO-CARRILLO 1980; LOPEZ-HERNANDEZ & GIL-RODRIGUEZ 1982; RIBERA et al. 1984; AUDIFFRED & WEISSCHER 1984; AUDIFFRED 1985; VIERA-RODRIGUEZ 1985; JORGE et al. 1986; GONZALEZ 1986; VIERA-RODRIGUEZ et al. 1987; PRUD'HOMME VAN REINE com. pers.)
- 4) *Laurencia paniculata* (C. AGARDH) J. AGARDH (AUDIFFRED 1985; GONZALEZ 1986).
- 5) *Laurencia papillosa* (FORSKAAL) GREVILLE (PICCONE 1884; GIL-RODRIGUEZ & AFONSO-CARRILLO 1980; RIBERA et al. 1984; JORGE et al. 1986).
- 6) *Laurencia perforata* (BORY) MONTAGNE (BORY ST. VICENT 1804; BOERGESEN 1930; LEVRING 1974; GIL-RODRIGUEZ & AFONSO-CARRILLO 1980; LOPEZ-HERNANDEZ & GIL-RODRIGUEZ 1982; AUDIFFRED & WEISSCHER 1984; AUDIFFRED 1985; VIERA-RODRIGUEZ 1985; JORGE et al. 1986; GONZALEZ 1986; VIERA-RODRIGUEZ et al. 1987; PRUD'HOMME VAN REINE com. pers.)
- 7) *Laurencia pinnatifida* (HUDSON) LAMOUROUX (MONTAGNE 1839-1941; PICCONE 1884; BOERGESEN 1930; LEVRING 1974; GIL-RODRIGUEZ & AFONSO-CARRILLO 1980; LOPEZ-HERNANDEZ & GIL-RODRIGUEZ 1982; RIBERA et al. 1984; GIL-RODRIGUEZ et al. 1985; JORGE et al. 1986; GONZALEZ 1986; PRUD'HOMME VAN REINE com. pers.)
- 8) *Laurencia tenera* TSENG (PRUD'HOMME VAN REINE com. pers.)

Since 1987 we could not only collect all the above-mentioned species but also 4 identified other species and a number of which still remains unidentified. It is our intention to continue this investigation.

### Records of species new to the Canary Islands

- 1) *Laurencia corallopsis* (MONTAGNE) HOWE (TAYLOR 1928 & 1960; YAMADA 1931; RODRIGUEZ DE RIOS & SAITO 1982)
- 2) *Laurencia flexilis* SETCHELL (SETCHELL 1926; YAMADA 1931; BOERGESEN (1945)
- 3) *Laurencia majuscula* (HARVEY) LUCAS (SAITO 1969b; SAITO & WOMERSLEY 1974; LAWSON & JOHN 1982)
- 4) *Laurencia platycephala* KÜTZING (MAGNE 1980)
- 5) *Laurencia* sp. 1 (section *Laurencia* SAITO)

### Provisional key of the genus *Laurencia* in the Canary Islands

- 1 With secondary pit-connections between cortical cells . . . . . 2  
(Subg. *Laurencia* SAITO)
- 1\* Without secondary pit-connections between cortical cells . . . . . 3
- 2 Branches terete or subterete. Radial branching pattern . . . . . Sect. *Laurencia* SAITO  
(*L. majuscula*, *L. obtusa*, *L. tenera* & *L. sp. 1*)
- 2\* Branches compressed. Complanate branching pattern . . . . . Sect. *Planae* SAITO & WOMERSLEY  
(*L. brogniartii*)
- 3 Tetrasporangia-initials of abaxial cutting-off. Spermatangial receptacle of determinate position, cup-like type and with clear central axis . . . . . 4
- 3\* Tetrasporangia-initials of adaxial cutting-off. Spermatangial receptacle of determinate position, cup-like and/or pocket-like type and without clear central axis. Tetrasporangia parallel type . . . . . Subg. nov. *Pinnatifida*  
(*L. hybrida* & *L. pinnatifida*)
- 4 Tetrasporangia right angle type . . . . . 5  
(Subg. *Chondrophycus* TOKIDA & SAITO)
- 4\* Tetrasporangia parallel type . . . . . group *Platycephala*  
(*L. platycephala*)
- 5 Cortical cells elongate and palisade-like, thallus drying cartilaginous . . Sect. *Palisadae* YAMADA  
(*L. corallopsis*, *L. paniculata*, *L. papillosa* & *L. perforata*)
- 5\* Cortical cells not elongate and not palisade-like, thallus not drying cartilaginous . . . . . Sect. *Chondrophycus* SAITO  
(*L. flexilis*)

### Conclusions

In this first contribution to the study of the genus *Laurencia* in the Canarian Archipelago, the number

of species have increased from eight to thirteen. The new records are: *Laurencia corallopsis*, *L. flexilis*, *L. majuscula*, *L. platycephala* and *Laurencia* sp. 1.

However, other taxa have been collected, although their taxonomic position needs more detailed research.

We have made a provisional systematic key to the subgenus and sections of *Laurencia* studied in our area.

Thirteen species have been identified. Eleven have been included in the subgenus *Laurencia* (sections *Laurencia* and *Planae*) and in the subgenus *Chondrophycus* (sections *Chondrophycus*, *Palisadae* and a new group "*Platycephala*"). Two species, *L. pinnatifida* and *L. hybrida* have been included in the new subgenus "*Pinnatifida*".

We propose a third subgenus, *Pinnatifida* subgenus nov.: Longitudinal secondary pit-connections among the cortical cells are absent; the tetrasporangial arrangements are a parallel type and have adaxial cut-offs; the spermatangial receptacles are cup-like and/or pocket-like; cortical cells are not radially elongated and not palisade-like.

*L. platycephala* has not been included in section level, it remains as the "*Platycephala*" group, in the subgenus *Chondrophycus*. Its systematic position should be reviewed together with other complanate species of the Subtropical Atlantic Area.

#### Differences between the subgenus and sections of the genus *Laurencia*

##### I. Subgenus *Laurencia* SAITO

Longitudinal secondary pit-connections among the cortical cells are present; the tetrasporangia arrangements are parallel and abaxial; the spermatangial receptacles are cup-like; they are neither radially elongated nor arranged like cells when seen in a trans-section.

Section *Laurencia* SAITO: the fronds are teretes or subteretes; lenticular thickenings are absent among the medullary cells.

Section *Planae* SAITO & WOMERSLEY: the fronds are clearly compressed; lenticular thickenings are present among medullary cells.

##### II. Subgenus *Chondrophycus* TOKIDA & SAITO

Longitudinal secondary pit-connections among the cortical cells are absent; the tetrasporangia are of a right angle or parallel type and abaxial; the spermatangial receptacles are cup-like.

Section *Chondrophycus* SAITO: tetrasporangia right angle type; the cortical cells are not radially elongated and not palisade-like.

Section *Palisadeae* YAMADA: tetrasporangia right angle type; the cortical cells are radially elongated and palisade-like.

Group "*Platycephala*" GIL-RODRIGUEZ & HAROUN: tetrasporangia parallel type; the cortical cells are not radially elongated and not palisade-like.

##### III. Subgenus *Pinnatifida* GIL-RODRIGUEZ & HAROUN

Longitudinal secondary pit-connection among the cortical cells are absent; the tetrasporangia parallel type and adaxial; the spermatangial receptacles are cup-like and/or pocket-like; cortical cells are not radially elongated and not palisade-like.

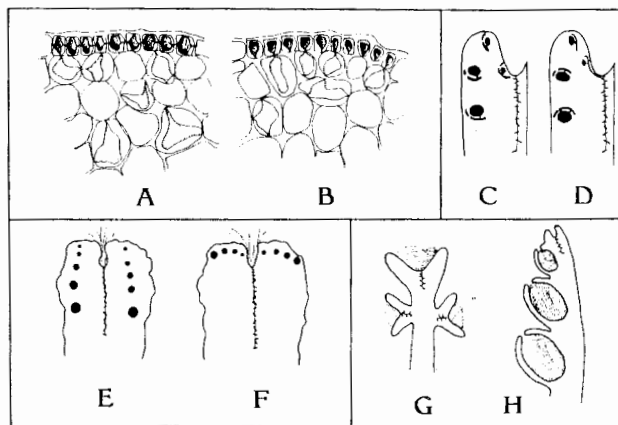


Fig. 1. The taxonomical characters used of the genus *Laurencia* LAMOUROUX. - Secondary pit-connections between cortical cells: A = presence; B = absence. - Origin of tetrasporangia: C = adaxial; D = abaxial. - Disposition of tetrasporangia; E = parallel type; F = right-angle type. - Shape and disposition of spermatangial receptacle: G = cup-like; H = pocket-like.

#### Summary

Up to now, only eight species of *Laurencia* have been reported on the Canarian Coasts. However, a revision of La Laguna University Herbarium (TFC Phyc.) and with fresh collections made from 1987 to 1989 in several locations along the Canarian Coasts, have allowed us to add five new records to the Canarian Flora.

As a result of our morphological studies of thirteen Canarian species of *Laurencia*, we propose to establish a new subgenus "*Pinnatifida*" in the genus *Laurencia*. Besides, in the subgenus *Chondrophycus* another new group "*Platycephala*" is also proposed here.

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