

Chondrus crispus

Chondrus crispus — commonly called **Irish moss** or **carrageen moss** (Irish *carraigín*, “little rock”) — is a species of red algae which grows abundantly along the rocky parts of the Atlantic coast of Europe and North America. In its fresh condition this protist is soft and cartilaginous, varying in color from a greenish-yellow, through red, to a dark purple or purplish-brown. The principal constituent is a mucilaginous body, made of the polysaccharide carrageenan, which constitutes 55% of its weight. The organism also consists of nearly 10% protein and about 15% mineral matter, and is rich in iodine and sulfur. When softened in water it has a sea-like odour and because of the abundant cell wall polysaccharides it will form a jelly when boiled, containing from 20 to 100 times its weight of water.

1 Description

Chondrus crispus is a relatively small red alga, reaching up to a little over than 20 cm in length. It grows from a discoid holdfast and branches four or five times in a dichotomous, fan-like manner. The morphology is highly variable, especially the broadness of the thalli. The branches are 2–15 mm broad, firm in texture and dark reddish brown in color bleaching to yellowish in sunlight. The gametophytes (see below) often show a blue iridescence and fertile sporophytes show a spotty pattern. *Mastocarpus stellatus* (Stackhouse) Guiry is a similar species which can be readily distinguished by its strongly channelled and often somewhat twisted thallus. The cystocarpic plants of *Mastocarpus* show reproductive papillae quite distinctively different from *Chondrus*.^[1] When washed and sun-dried for preservation, it has a yellowish, translucent, horn-like aspect and consistency.

2 Distribution

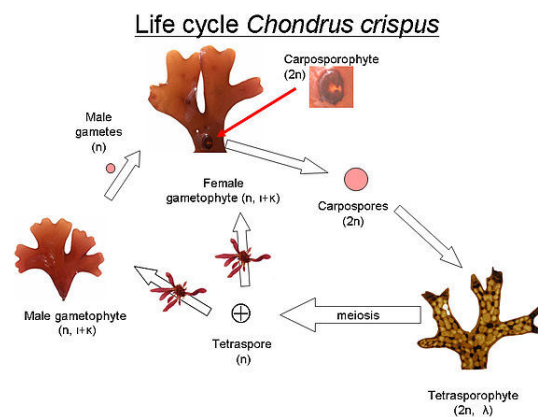
Chondrus crispus is common all around the shores of Ireland and Great Britain and can also be found along the coast of Europe including Iceland, the Faroe Islands^[2] western Baltic Sea to southern Spain.^[1] It is found on the Atlantic coasts of Canada^{[1][3]} and recorded from California in the United States to Japan.^[1] However, any distribution outside the Northern Atlantic needs to be verified. There are also other species of the same genus in the Pacific Ocean, for example, *C. ocellatus* Holmes, *C. nipponicus* Yendo, *C. yendoii* Yamada et Mikami, *C. pin-*

nulatus (Harvey) Okamura and *C. armatus* (Harvey) Yamada et Mikami.^[4]

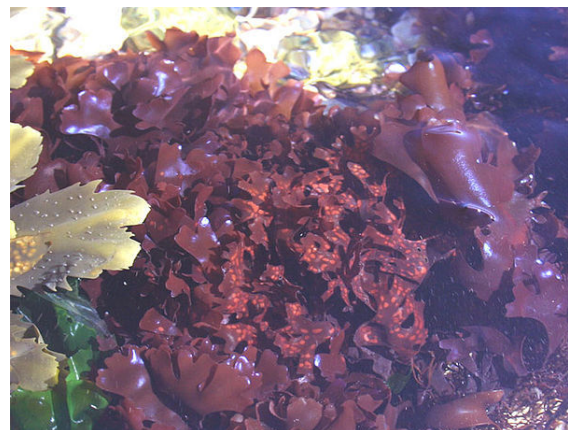
3 Ecology

Chondrus crispus is found growing on rock from the middle intertidal zone into the subtidal zone, all the way to the ocean floor.

4 Uses



The life cycle of *Chondrus crispus*. Below the life stage are indicated if the life stage is haploid(n) or diploid (2n) and the type of carrageenan present.



How the life cycles of *Chondrus crispus* might look in nature. The gametophytes show blue iridescence and the fertile sporophytes exhibit a spotty pattern.

Chondrus crispus is an industrial source of carrageenan, which is commonly used as a thickener and stabilizer^[5] in milk products such as ice cream^[6] and processed foods, including lunch meat. In Europe, it is indicated as E407 or E407b. It may also be used as a thickener in calico-printing and for fining beer or wine. Irish moss is frequently mixed with *Mastocarpus stellatus* (*Gigartina mamilliosa*), *Chondracanthus acicularis* (*G. acicularis*) and other seaweeds with which it is associated in growth. Carrageenan and agar-agar are also used in Asia for gelatin-like desserts, such as almond jelly. Presently, the major source of carrageenan is tropical seaweeds of the genera *Kappaphycus* and *Eucheuma*.^[7]

In parts of Scotland (where it is known as (*An*) *Cairgean* in Scottish Gaelic) and Ireland, it is boiled in milk and strained, before sugar and other flavourings such as vanilla, cinnamon, brandy or whisky are added.^[8] The end-product is a kind of jelly similar to pannacotta, tapioca, or blancmange.^[9] Similarly, in Jamaica and Trinidad and Tobago *Gracilaria* spp is boiled with cinnamon and milk to make a thick drink called Irish Moss that is believed to be an aphrodisiac.^[10] In Venezuela it has been used for generations as a home remedy for sore throat and chest congestion, boiled in milk and served with honey before bed.

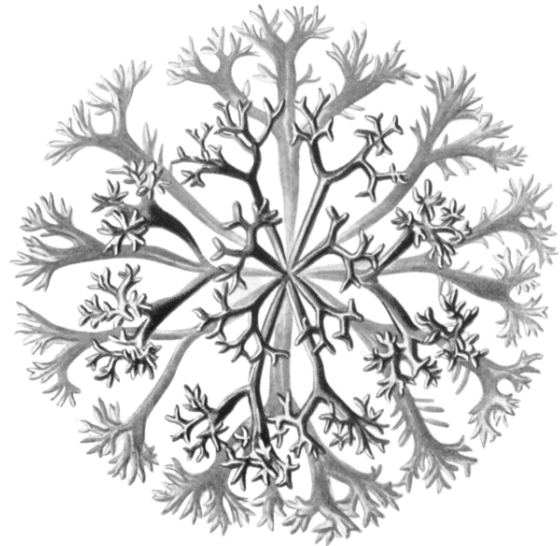
Irish moss is commonly used as a clarifying agent in the process of brewing (beer), particularly in homebrewing. A small amount is boiled with the wort, attracting proteins and other solids, which is then removed from the mixture after cooling.

5 Life history

Chondrus crispus undergoes an alternation of generation life cycle common in many species of algae (see figure below). There are two distinct stages: the sexual haploid gametophyte stage and the asexual diploid sporophyte stage. In addition, there is a third stage- the carposporophyte, which is formed on the female gametophyte after fertilization. The male and female gametophytes produce gametes which fuse to form a diploid carposporophyte, which forms carpospores, which develops into the sporophyte. The sporophyte then undergoes meiosis to produce haploid tetraspores (which can be male or female) that develop into gametophytes. The three stages (male, female and sporophyte) are difficult to distinguish when they are not fertile; however, the gametophytes often show a blue iridescence.

6 Scientific interest

Chondrus crispus is, compared to most other seaweeds, well-investigated scientifically. It has been used as a model species to study photosynthesis, carrageenan



The portion of the 65th plate of Ernst Haeckel's *Kunstformen der Natur* (1904), depicting Florideae *Chondrus crispus*, i.e. Irish moss.



When cultured in the laboratory *Chondrus* can have a morphology similar to the Haeckel plate; however, this is rarely seen in nature.

biosynthesis, and stress responses. The nuclear genome was sequenced in 2013.^[11] The genome size is 105 Mbp and is coding for 9,606 genes. It is characterised by relatively few genes with very few introns. The genes are clustered together, with normally short distances between genes and then large distances between groups of genes.

7 Names in various languages

8 See also

- Harvey, M.J. & McLachlan, J. 1973. *Chondrus crispus*. *Proc. Trans. Nova Scotian Inst. Sci.* **27** (Suppl.): 1 - 155.
- *Sagina subulata* - another plant referred to as “Irish Moss”

9 References

- [1] P. S. Dixon & L. M. Irvine (1977). *Seaweeds of the British Isles. Vol. 1 Rhodophyta Part I: Introduction, Nemaliales, Gigartinales*. British Museum (Natural History) London. ISBN 0-565-00781-5.
- [2] F. Börgesen (1903). “Marine Algae of the Faröes”. *Botany of the Faröes based upon Danish investigations Part II (Copenhagen Reprint 1970)*. p. 35. ISBN 90-6105-011-1.
- [3] W. R. Taylor (1972). *Marine Algae of the Northeastern Coast of North America*. University of Michigan Press, Ann Arbor. ISBN 0-472-04904-6.
- [4] Hu, Z., Critchley, A.T., Gao T, Zeng X, Morrell, S.L. and Delin, D. 2007 Delineation of *Chondrus* (Gigartinales, Florideophyceae) in China and the origin of *C. crispus* inferred from molecular data. *Marine Biology Research*, 3: 145-154
- [5] **Roeck-Holtzhauer, Y.de** 1991. Uses of seaweeds in Cosmetics. in Guiry, M.D. and Blunden, G. 1991 *Seaweed Resources in Europe: Uses and Potential*. John Wiley & Sons ISBN 0-471-92947-6
- [6] **Stegenga, H., Bolton, J.J., and Anderson, R.J.** 1997. *Seaweeds of the South African West Coast*. ed. Hall, A.V. Bolus Herbarium Number 18 Cape Town. ISBN 0-7992-1793-X
- [7] Bixler, H. J., & Porse, H. (2011). A decade of change in the seaweed hydrocolloids industry. *Journal of Applied Phycology*, 23 ,321-335
- [8] Feum à Feamainn (DVD, Scottish Gaelic), *Comhairle nan Eilean Siar*
- [9] **Lusan a' Chladaich** (Western Isles Council, Scottish Gaelic site)
- [10] Sylvia A Mitchell. The Jamaican root tonics: a botanical reference. Focus on Alternative and Complementary Therapies. Volume 16, Issue 4, pages 271–280, December 2011
- [11] Collén J, et al (2013) Genome structure and metabolic features in the red seaweed *Chondrus crispus* shed light on evolution of the Archaeplastida. *Proceedings of the National Academy of Sciences* doi:10.1073/pnas.1221259110.

- [12] Willén, T. & M. Waern, 1987. Alger med svenska namn. *Svensk botanisk tidskrift* 81: 281-288.

10 External links

- [AlgaeBase: Chondrus crispus](#)
- [Chondrus crispus Stackhouse](#) *Chondrus crispus*.
- [Marine Life Information Network](#)
- [Irish Moss industry on Prince Edward Island](#)

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