

Red Alga

(*Grateloupia doryphora*)



Family name: Halymeniaceae

Common name/s: Red Alga



Red Alga (*Grateloupia doryphora*) is a large, invasive marine species. In Ireland, it poses a risk to coastal ecosystems by outcompeting native algae and altering marine habitats.

The plant spreads primarily through spores and vegetative fragments, often facilitated by human activities.

Management strategies include mechanical removal, preventive measures to avoid spreading, and monitoring high-risk areas. Without control, *Grateloupia doryphora* can significantly impact biodiversity, aquaculture, and the overall health of marine ecosystems.

Description - *Grateloupia doryphora* is a large, fleshy red alga known for its broad, flattened fronds and distinctive red to reddish-brown colour. It has spread to many other regions, including Europe, North America, and Australia, where it is considered an invasive species. The alga's ability to thrive in a variety of marine environments and its rapid growth can significantly impact local ecosystems by displacing native seaweed species.

Key characteristics include:

Size: Can grow to lengths of 20-50 cm, although larger specimens up to 1 metre have been recorded in optimal conditions.



Fronds: The fronds are broad, flat, and strap-like, with a gelatinous and slippery texture.

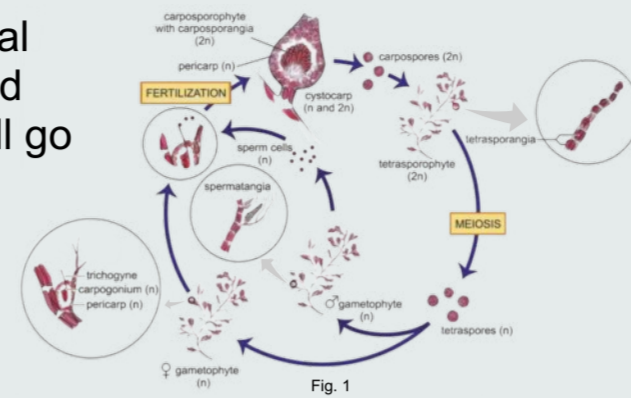
They can be irregularly branched, with edges that are often wavy or ruffled.

The fronds are typically reddish-brown to dark red but can appear pinkish or purple in certain conditions.

Stipe: The alga has a short stipe (stem-like structure) that attaches to a substrate via a holdfast, which anchors the plant to rocks or other surfaces.

Reproductive Structures: Reproduces via spores produced in specialized areas on the fronds. The sexual reproduction of red algae is a complicated process. Depending on the number of copies of chromosomes, the life cycle of red algae can be divided into two parts.

Small Polysiphonia thalli with the normal amount of chromosomes (2n) are called tetrasporophytes. A tetrasporophyte will go through meiosis to produce four tetraspores, which have only half the number of chromosomes (n). These spores can grow into male and female algae (called gametophytes, also n).

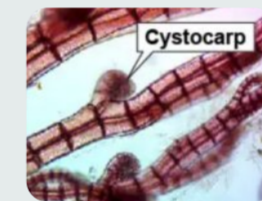


Tetrasporophytes and gametophytes may look identical, apart from their reproductive organs. On the top of male gametophytes' branches, there are male reproductive organs, called spermatangia, which produce sperm cells (spermata).

However, red algae's sperm cells don't have flagella, making them not capable to swim. If these spermata are luckily carried by water currents to the female reproductive organ, the carpogonium, the sperm will fertilize the egg.

The fertilization (spermata and egg cells) brings the two half parts of chromosomes together, generating a zygote (2n).

The zygote will develop into a cystocarp. In the cystocarp (like a sac), carpospores are formed (with 2n chromosomes), which can escape through a hole at the top and can grow into a new tetrasporophyte. Later, it will start a new cycle, again.



Habitat - *Grateloupia doryphora* is native to the northwest Pacific Ocean, including regions around Japan, China, and Korea. It has been introduced to various coastal areas worldwide, where it thrives in:

- **Rocky Intertidal Zones:** Commonly found in shallow, rocky coastal areas, where it attaches to hard substrates.
- **Subtidal Habitats:** Can grow in subtidal zones, often down to depths of 20 metres or more.
- **Marinas and Harbours:** Frequently found in harbours, marinas, and other sheltered coastal environments, where it can attach to artificial structures like piers and boat hulls.

The alga prefers temperate to warm waters and can tolerate a range of light conditions, from full sunlight in shallow waters to low light levels in deeper subtidal zones.

Status in Ireland - In Ireland, *Grateloupia doryphora* is considered an invasive species, particularly in coastal regions and sheltered bays, where it can establish rapidly and outcompete native algae.

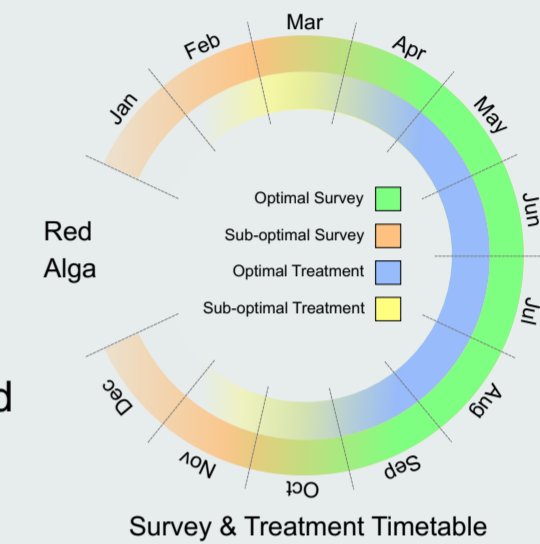
The spread of this species is often associated with the movement of boats and aquaculture equipment, which can facilitate its dispersal.

Reproduction and Spread - *Grateloupia doryphora* primarily spreads through spore dispersal, but it can also spread vegetatively:

- **Spore Production:** The alga produces spores that are released into the water, allowing it to colonise new areas. These spores can settle on hard substrates and develop into new plants.
- **Fragmentation:** Fragments of the alga can regenerate into new individuals, making it easy for the species to spread through human activities, such as boat movement or aquaculture operations.

Management and Control - Controlling *Grateloupia doryphora* is challenging due to its rapid growth and ability to regenerate from fragments. Management strategies include:

- **Mechanical Removal:** Manual removal of fronds and holdfasts can help reduce the biomass, but it must be done carefully to avoid leaving fragments behind that could regrow.



Repeated efforts are often needed for effective control.

- **Preventative Measures:** Cleaning boats, aquaculture equipment, and other marine gear before moving between different coastal areas can help prevent the spread.

Monitoring high-risk areas, such as harbours and marinas, can also help with early detection.

- **Biological Control and Chemical Methods:** There are currently no widely accepted biological or chemical control methods for this species.

Ecological Impact - *Grateloupia doryphora* can have significant ecological impacts, especially in areas where it becomes invasive:

- **Competition with Native Species:** Forms dense stands that can outcompete native algae, leading to a reduction in biodiversity and changes in habitat structure.
- **Habitat Alteration:** The dense growth can alter the physical and chemical environment, affecting other marine life, including invertebrates and fish that rely on native seaweeds for habitat.
- **Impact on Aquaculture:** The alga can foul aquaculture equipment and structures, potentially impacting the productivity of shellfish and other marine farming operations.

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