

# SEAWEED CULTIVATION

The origins of intensive seaweed cultivation date back to 17th century Japan when the supply of the popular Nori (a flat blade-like red seaweed) could not meet rising demand. Nori, *Porphyra yezoensis*, has been in use in Japan for over 2,000 years as a staple food source and many other species were used in medical treatments. Demand for the farmed seaweed increased and with the development of new cultivation techniques following World War II Nori cultivation now represents the largest marine aquaculture industry in Japan. A total of 350,000 wet tonnes are farmed each year with a retail value of US\$ 1.5 billion.

In China the cultivation of seaweeds was established in the 1950's. The first species to be cultivated was the ribbon weed, *Laminaria japonica*, and production has risen from some 62 tonnes in 1952 to a current harvest of in excess of 3.5 million tonnes. Industrial-scale seaweed aquaculture is currently limited to Asian countries. Cultivated seaweeds are predominantly grown for the food market although in the Philippines, Taiwan and some African countries seaweed is intensively farmed for carrageen and crude agar production. The cultivated species of global importance to the food industry include Nori (Purple sea vegetable or laver) and some of the different types of kelp (*Laminaria* sp. and *Undaria*).

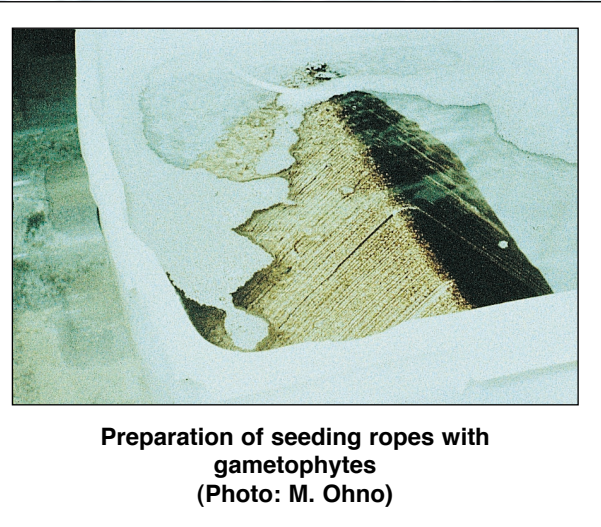
A wide range of techniques are used to cultivate seaweed, depending on the species being farmed, the life cycle and biogeographical factors. In general, fragments of adult plants, juvenile plants, sporelings or spores are seeded onto either ropes or other substrata in nurseries and the plants are on-grown to maturity at sea. Because of the complex life cycles of many seaweeds a detailed knowledge of both the biology and life history of the plants is critical, particularly at nursery/ hatchery stages. A comprehensive harvesting programme is also in place around many of Ireland's bays and inlets, which sustains a processing sector currently comprising at least 18 companies. In the first poster of the series "Ireland's Seaweed Resources" a detailed description of the main types of seaweed found around the Irish coast is given along with a description of their commercial uses and their geographic distribution.



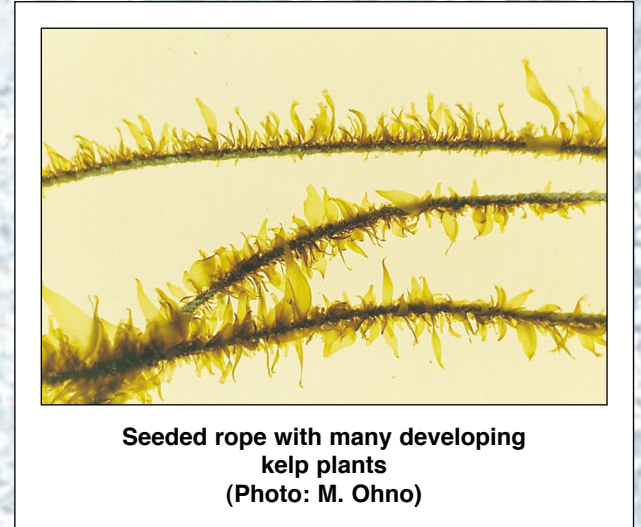
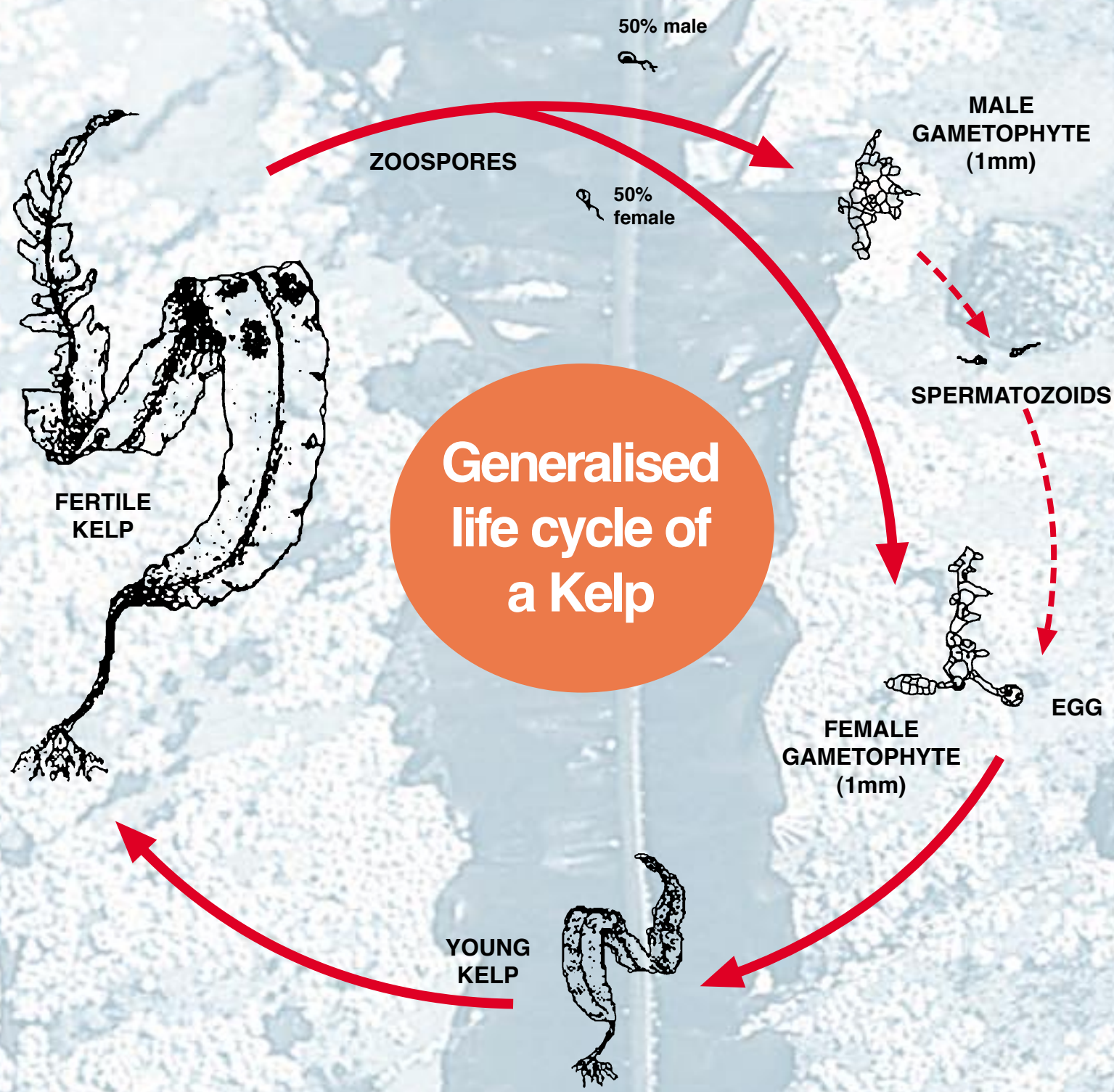
A Nori farm in Japan. Nets with seeded Nori are placed between a bamboo pole system (Photo: M. Ohno)



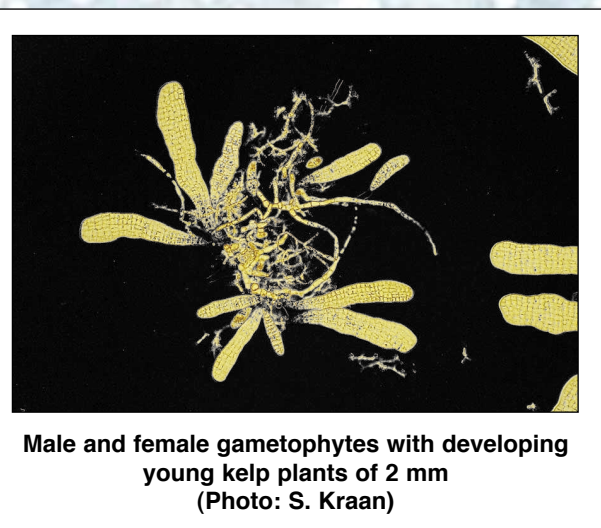
Nori harvesting cutting cultivation nets by boat (Photo: M. Ohno)



Preparation of seeding ropes with gametophytes (Photo: M. Ohno)



Seeded rope with many developing kelp plants (Photo: M. Ohno)



Male and female gametophytes with developing young kelp plants of 2 mm (Photo: S. Kraan)



Harvesting of *Laminaria japonica* (Kombu) in Japan from long lines by boat (Photo: M. Ohno)

Kelp is a generic name for large brown algae of the order Laminariales. Under the right temperature and light conditions (in Ireland in Spring and Autumn), the kelp blades form dark patches on the surface which produce zoospores. The zoospores attach to the substrate and grow in to tiny filamentous male and female plants, the gametophytes. The female gametophyte produces eggs, which are fertilised by spermatozooids produced in the male gametophytes. The fertilised egg develops to form young kelp plants.

## SEAWEED CULTIVATION IN IRELAND

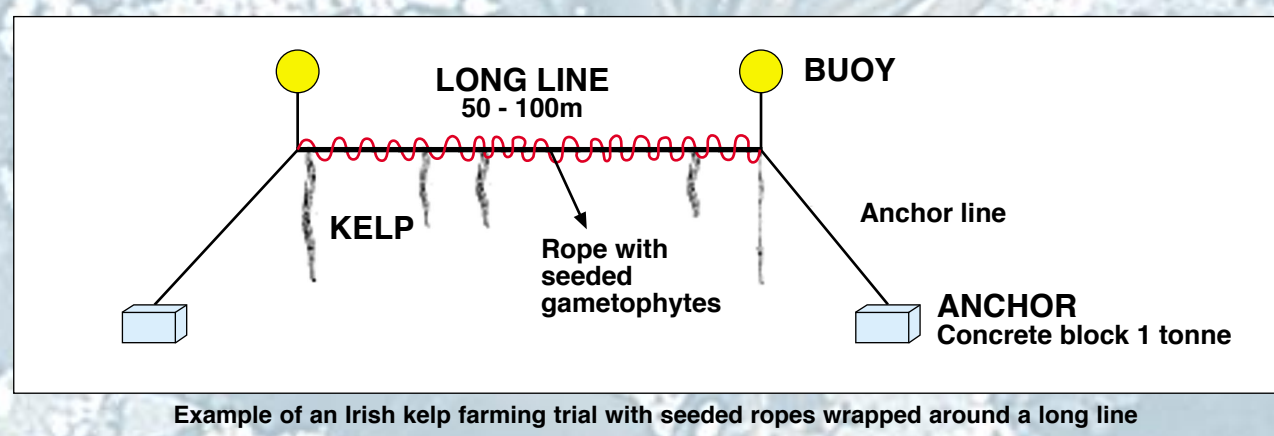
Although still in its infancy, the development of seaweed aquaculture in Ireland is a further step in the enhancement of Ireland's aquaculture industry. BIM, The Martin Ryan Marine Science Institute together with the Irish Seaweed Industry Organisation are currently preparing the groundwork for the introduction of seaweed aquaculture in Ireland. Seaweed will be farmed as a subsidiary food (value added sea-vegetables), as a source for chemical and medical substances and as a food source for cultivated abalone and sea urchins.

To date successful trials of the cultivation of both *Alaria esculenta* and *Laminaria* spp. have been run in conjunction with BIM and the NUI, Galway for use as a food source for farmed stocks of European and Japanese abalone. The red seaweed *Asparagopsis armata* is commercially grown in the west of Ireland in an Údarás na Gaeltachta supported project for its chemical contents. In addition, many trials with different species of sea-vegetables for the food market are taking place.

Sea-vegetables are nutritious and tasty dietary supplements that have a high concentration of readily available vitamins, proteins and trace elements. The species of potential importance for Irish sea-vegetable aquaculture are *Palmaria palmata* (Dulse or dillisk), *Alaria esculenta* (Ribbon weed or Atlantic Wakame), and *Porphyra linearis* (purple sea vegetable or laver).



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