

This seaweed citizen science pilot pack is to provide information to both those curious about seaweeds and to society which is grappling with how to protect this amazing wealth of species and habitats. **It is suitable for individual, family and school use and adaptable from primary to forming part of secondary school biology and geography field study modules.** Use during the Coastwatch autumn survey or on shore visits during the year where you see a range of seaweeds in situ and washed up.



In view of rising seaweed harvest and aquaculture interest, one urgent concern is how to ensure that

sufficient high value sites are protected and that harvesting is sustainable for the marine ecosystems which depend on those seaweeds. That requires more information, especially about our brown seaweed forests and the animals which live there or need them at key times such as laying eggs. The guide also touches on climate change and how this may be effecting different seaweeds so we jointly keep an eye open for changes in seaweed cover and species.

A small number of relatively easy to identify macro algae are included with simple sketches. We recommend you look them up on line or invest in Prannie Rhatigan's identification booklet for kitchen use seaweeds <http://irishseaweedkitchen.ie/>

This is a pilot pack and we would love your feedback on how it might be improved. To return information you can use the Seaweed results input programme on www.coastwatch.org.

CONTENT Select the pull out sheets relevant to you.

Survey Forms	Content	Where to Use	Page
A - A first impression of seaweeds on this shore.	Seaweed treasure hunt Questions about seaweeds on your shore - growing and swept up	On shore ideally an hour before spring low tide , so you work your way down the shore.	1 Leave back blank for sketches and notes
B Egg wrack <i>Ascophyllum</i> as Intertidal forest: high intertidal biomass (& largest volume harvested)	Check - how long egg wrack grows, estimate biomass, sensitivity and who lives with and on it	A shore where egg wrack grows. - up to 2 hours either side of low tide	1 page with questions, back blank
C Kelps: Swept up from Underwater forest. (Diver's C version in prep)	Measure lengths - where are the tallest??? Estimate biomass and check for signs of life on kelp 'trees' .	Use along tide marks up to an hour either side of full tide. In spring tides calm weather a low water check	1 page with questions, back has kelp ID notes
D Invasive Alien seaweed Table made out for <i>Sargassum muticum</i> as most widespread.	Seaweed part has notes and questions on Sargassum, Insert other species if found – eg Japanese kelp	Use when you suspect you found some growing or washed up.	1 page with questions,
E - The litter menace	Seaweeds examined for evidence of litter and micro litter. Questions and app	Seaweed growing (low tide) & washed up. Also suitable for harvesters.	1 page, plus micro litter app.



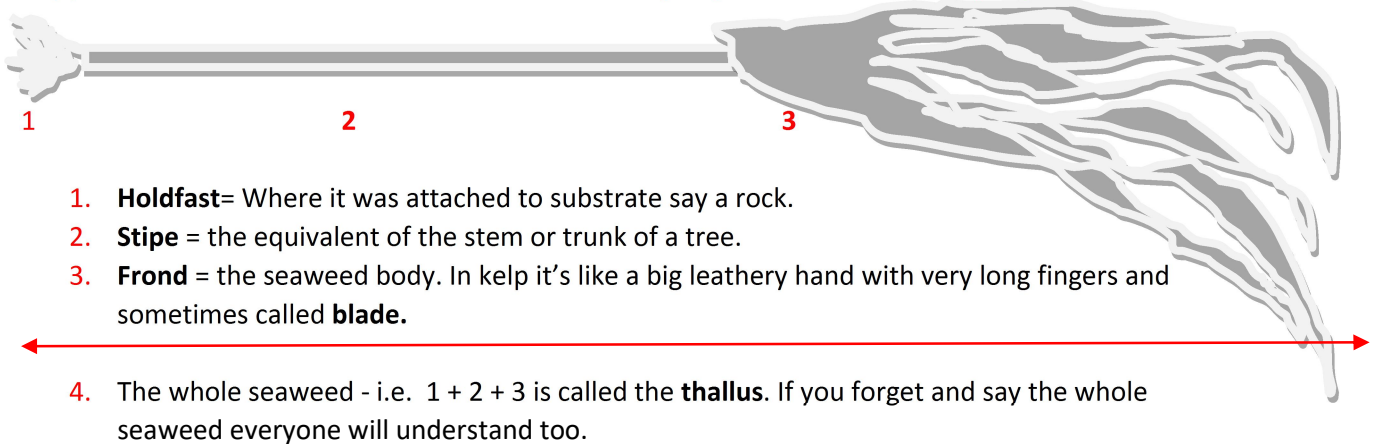
Seaweeds around the island of Ireland

Ireland has over 500 species of seaweed due to its range of rocky and intertidal mudflat and boulder habitats, range of exposure, water transparency and temperatures. Our seaweed diversity is greater, or terrestrial diversity poorer than most other EU countries.

Terminology,

Seaweeds are either **macro algae** which generally grow attached to a hard surface attachment, or **planktonic** - only visible under the microscope or indirectly by masses of tiny phytoplankton clumping together in water during a bloom so the water may be discolored and turbid.

Key parts of a seaweed as illustrated on sketch of a big kelp which has been swept up



1. **Holdfast**= Where it was attached to substrate say a rock.
2. **Stipe** = the equivalent of the stem or trunk of a tree.
3. **Frond** = the seaweed body. In kelp it's like a big leathery hand with very long fingers and sometimes called **blade**.
4. The whole seaweed - i.e. 1 + 2 + 3 is called the **thallus**. If you forget and say the whole seaweed everyone will understand too.

Growth

Seaweeds need light for photosynthesis like plants on land. Some seaweeds are annual and some live many years (perennial).

The point where they grow – the **meristem** – is in different locations in different species. It's essential to know where that is if you want to harvest part of the seaweed without killing it. Examples: **Egg wrack** grows longer by adding extra length at the tip of the frond and an annual extra 'egg' airbladder to keep that new extension afloat. In **kelps** like **Oarweed** *Laminaria digitata* sketched above, growth cells are located where the stipe and frond meet. As the seaweed gets worn and eaten at the frond tips, new tissue is produced lower down. The stipe gets longer and the frond size increases until the seaweed ages after a few years. In winter growth slows down or even halts, but the tips are still being worn by the waves and munched by hungry animals so the frond may get worn shorter. Special ways to keep the frond up to catch light have evolved in different species. Many have **air bladders**, some a **strong stipe** and some a **ridged calcium** reinforced structure like *Corallina*.

Seaweeds have different ways of reproducing but many have **reproductive structures (receptacles)** In **Bladder wrack** these form at the tips of the fronds, like yellowish strawberries with jelly inside. In **Egg wrack** the receptacles grow out of the stipe on stalks like wild cherries on a tree.

Seaweed Monitoring

There are over 100 coastal and transitional water sites around Ireland where scientists from the EPA and NI Heritage services monitor seaweed species diversity and presence/absence of indicator seaweeds as part of the water framework directive (wfd) implementation. Elevated levels of opportunistic macro algae (seaweeds) are a negative sign and can be enough to downgrade the quality report for an estuary. – e.g. the Moy estuary is deemed 'moderate' rather than 'good' now, because of the amount of green seaweeds observed at the monitoring sites.

In the Coastwatch autumn survey question D3 on 'green algae - whether present as 'thin line or patch or carpets on mudflats' picks out that element of the WFD quality indicators. This part of the citizen science data is also useful, especially where nitrate tests (see Coastwatch autumn survey Question B2) have highlighted nutrient enrichment from small inflows or there is a known sewage



Photo: Coastwatch Seaweed monitoring training trial in Bantry Bay Co Cork.

treatment deficit. Citizens information may not be as comprehensive but still valuable information on set species and habitats and areas where there are data gaps. – e.g. there are no official wfd seaweed monitoring sites in Bantry Bay, Co Cork where a mechanical kelp harvest license for over 750 ha has been granted and trial harvesting is about to start.

Climate change

About 100 kilometres of kelp forests off the western coast of Australia were wiped out by a marine heatwave where sea temperature rose by 2 degrees between 2010 and 2013 <http://science.sciencemag.org/content/353/6295/169> . About 90% of the forests that make up the north-western tip of the Great Southern Reef disappeared over the period and with it the majority of fish and lobster which dependent on it. So far they are not re-establishing.

Warmer sea temperature is not the only stress, as there are also changes in water transparency, when plankton blooms are prolonged with high nutrient loads. So less light reaches the sublittoral seaweeds like kelp forests who need it for photosynthesis. On the other hand the hot dry weather patches with baking sun appear to be causing more bleaching of some red coral seaweeds around low tide and rock pools.

A greater storm frequency is likely to cause more seaweed hold fasts coming off or moving stones which challenges especially the taller seaweeds. Also more shifting sediments can bury and then expose rocks more often. Much of this is poorly understood and requires more research.

Invasive Alien Seaweeds introduced to Ireland, like the very fast growing Sargassum (held by two volunteers in this picture) come from warmer pacific seas and do better as our sea temperature increases. Especially if the native seaweeds are stressed by changing weather patterns or high temperatures, or gaps to settle in open up by over harvesting.



Seaweeds are likely to be impacted in different ways by climate change. We know very little about their resilience to adapt. Additionally to any new citizen science work we are also keen to get feedback from people who have lived by the sea most of their life and might have noticed changes or cycles in seaweed growth. So if there is a spot where you knew a long lived kelp bed could you find it now? Or have you noticed other seaweed changes?

Protection

Most of the over 500 seaweed species identified as growing around Ireland are not protected. Only 2 seaweeds have been selected for special protection under the habitats directive. These are red seaweeds which create coral like structures called Maërl. Examples of it include the Kenmare river estuary and Blacksod Bay. Both are designated as Special Area of Conservation (SAC) under the Habitats Directive with stated goals to 'Conserve the high quality of the Maërl-dominated community, subject to natural processes' <https://www.npws.ie/protected-sites/sac/002158>

In Northern Ireland and the UK, the list of protected seaweed species is a little longer. Apart from those which must be protected under the Habitats Directive, government selected 'priority species' for special protection - see <http://www.habitas.org.uk/priority/intro.html> . The long brown **Egg wrack**, also known as **Knotted wrack** and lately **Asco** after its Latin name **Ascophyllum nodosum** is the only one on the short list of priority species seaweeds which most people would be familiar with). The NI work on priority species also includes seeking public participation – see extract in box below:

There is a role for individuals, community groups, landowners and companies within the conservation of Priority Species through for example, practical conservation work or species recording. The individual species pages suggest ways to get involved and organisations to contact.

In some areas of Northern Ireland there are Local Biodiversity Action Plan (LBAP) Officers who co-ordinate biodiversity conservation action. To contact these officers to discuss opportunities to get involved in your local area see the link below:

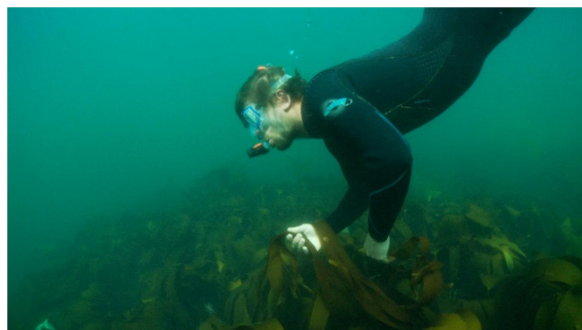
[Biodiversity NI](#)

Text written by Biodiversity Unit, Northern Ireland Environment Agency.

Potential for special seaweed sites to be protected

Apart from sites already protected under the Habitats or Birds Directives which may list seaweed or reefs with seaweed cover as features of conservation interest, there are sensitive fisheries areas under Fisheries law and OSPAR MPAs which can include seaweeds.

Another avenue to designate sites is the 'Marine Strategy Framework Directive' (MSFD). Marine Protected Areas have been identified and designated over the past few years under the MSFD in most countries with public participation. In NI two sites were proposed by members of the public and then accepted and added by government. As the large seaweeds like Egg wrack and the kelps have a keystone biodiversity or ecosystem role on the shore –'a coherent network of marine protected sites' should contain sufficient high diversity and quality seaweed areas to adequately protect such seaweed ecosystems and the ecosystem services they deliver.



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