SOS Jersey

Save Our Shoreline Jersey

Jersey's Sea Lettuce Problem

Where we are and what next

In Brief

St Aubin's Bay on the south coast is blighted by sea lettuce, and the problem is spreading. Locals and tourists are being affected and businesses are being hit. So far, little has been done to sort out the problem.

Three years ago, Save Our Shoreline Jersey (SOSJ), along with Jersey Sea Farms, first approached States departments with an inexpensive eco-friendly idea using Jersey native oysters that may well have helped stopped the blooms of sea lettuce. It would also have benefitted Jersey's economy and substantially improved water quality in St Aubin's Bay.

The idea has not been seriously considered by States Departments, who have already stated that there is no solution to the problem. Instead they are about to purchase a huge and extremely expensive machine in an attempt to scrape the sea lettuce off the beach.

The States refuse to trial an inexpensive, innovative and potentially hugely advantageous possible solution to stop the sea lettuce blooming at source.

In this report we relate the background and history of the problem, our suggested solution, what has happened in the last three years and where we are now.

Our statements on the position of the States are accurate at time of publication.

Contents

What is sea lettuce?

The sea lettuce in question is *Ulva lactuca* ('lactuca' is Latin for lettuce). It is very common on rocks and on other algae in the littoral and sublittoral on shores all around the British Isles, the coast of France, the Low Countries, and Jersey. It is particularly prolific in areas where nutrients are abundant.

Sea lettuce is a flat, thin (two cells thick), green seaweed that resembles slimy lettuce leaves. Young leaves are bright green and older ones a deeper green.

The fronds, attached without a stipe to rocks, other seaweeds and other substrates, can grow up to 45cm long and 30cm across. The sea lettuce can be easily torn from the substratum and can accumulate in large, drifting masses.

Dried sea lettuce can be black or, as is common in Jersey, almost white.

Uses for sea lettuce

Ulva lactuca is relatively nutritious and can be eaten, but it must be freshly harvested, washed up fronds from non-polluted waters. Once washed, it can be chopped up raw to use in salads, or added to soups and stews.

Sea lettuce can also be dried on a very low, slow heat in the oven or sun. When dried, it can be stored and, when required, crushed and sprinkled into any hot meals.

Sea lettuce is sometimes used as a crop fertiliser, but needs to be used with care because of the gases it produces. It is used for this purpose in Brazil, for example, but not commercially in Jersey.

We are not sure whether:

- Jersey's farmers would wish to use the sea lettuce as fertiliser
- Viable markets exist for such practices
- The administrative costs attached to running such a business will result in a positive contribution to the capital and annual running costs

The problem is, however, so big in Jersey that such projects would not solve our problem.

Why is sea lettuce a problem?

People who have an aquarium or refugium find sea lettuce is very easy to keep as it tolerates a wide range of lighting and temperature conditions. The same tolerance is shown in the sea around the southern part of Jersey which, a generation ago, was not a problem because the seaweed did not grow so prolifically then.

Now the sea lettuce is becoming a huge problem environmentally, for Islanders and for tourists. Keith Beecham, CEO of Visit Jersey, was recently quoted in the Jersey Evening Post as saying that the sea lettuce was not an issue for tourists, but we say how can it not be when the majority of tourists arrive from the airport via the Avenue and see (and smell) the rotting sea lettuce before reaching their hotels? Likewise, on their departure, it could diminish the tourists' desire to return or to recommend Jersey to others if it is their last memory of the Island.

What has changed? Nitrate levels in the sea in the main, and possibly other factors such higher sea temperatures – more on this later.

What is the problem? Blooms in the sea can also hamper swimmers, foul fishing gear, become entangled in propellers of boats. It is unsightly, hard to walk on and gives off strong, sulphurous smells which even waft up to The Esplanade and Victoria Avenue. Local businesses, including sea-sports companies and beach cafés, are affected.

The Bosdet Foundation, an organisation which started to run summer water sports in the then newly-refurbished West Park Marine Lake walked away after a couple of years because the huge amounts of the sea lettuce hampered all efforts to make the scheme work.

In addition, Jersey sportsman Gordon Burgis said last year the sea lettuce was getting into the rudders of the Hobie Cats, affecting their sailing ability. He commented to the Jersey Evening Post, 'We were looking at holding a world championship racing event in Jersey, but this wouldn't be possible under the current conditions.'

But it is not just locals and tourists and the Island's economy that is suffering. In the longer term we are seeing an ongoing destruction of the limited, but extremely precious, resource that is the marine environment.

While sea lettuce provides a habitat to some small invertebrates such as amphipods, large amounts prevent sunlight reaching plant life below; when the plants cannot photosynthesise, they die. Bacteria feeding on decomposing dead sea lettuce use up a lot of oxygen in the water, depriving other species of oxygen, which also die or move elsewhere.

Currently, when the tide is low, the States move the piles of sea lettuce to the low water mark using diggers. The machinery damages the sand structure and disrupts sand-living organisms. The States are now considering using a costly sea lettuce harvesting machine (shown on p9) which, by their own admission, say will not be a solution; we fear there will be even more sand damage and disruption to habitats.

In addition, when large quantities of *Ulva lactuca* are washed up on beaches, they are not washed out again except during very high spring tides and/or stormy weather: even then, the *Ulva* soon returns. Instead of being washed away, the sea lettuce on the top of the piles dries to form a crust; underneath that layer it decays and produces methane, hydrogen sulphide and other gases.

Methane gas in high concentrations, especially in confined spaces, can displace the oxygen need for respiration. Hydrogen sulphide is a toxic gas which inhibits cytochrome oxidase, which in turn inhibits cellular respiration and results in critical cellular hypoxia – that is, the cells/body become starved of oxygen.

Are these gases that dangerous? Yes. For example, in July 2009, near Saint-Michel-en-Grève in Brittany, a truck driver died close to his vehicle after hauling three truckloads of sea lettuce without protective gear during the annual clean-up. On the same beach in August 2009, a horse rider lost consciousness and his horse died after riding through decomposed sea lettuce; an autopsy found the horse had died from cardiac arrest resulting from pulmonary oedema, which is an indication of possible hydrogen sulphide poisoning, so it is very likely the horse died from the fumes from the decomposing sea lettuce.

Dead animals found on the algae-clogged beaches in the area (including 31 wild boars in July 2011) were also thought to be linked to toxic fumes. French ministers warn visitors to avoid areas covered with excess sea lettuce; they also tell workers to wear gas monitors: if the monitors sound an alert, the workers must leave the area right away.

What has caused Jersey's sea lettuce problem?

Blooms of sea lettuce are a good indicator of nitrate pollution, and the problem is seen worldwide. The problems in Brittany are blamed on runoff from fertilisers and excreta from pig and poultry farms. In Jersey, we also see high levels of nitrates in St Aubin's Bay; coupled with warm water and sunshine, we get perfect conditions for a sea lettuce bloom.

The level of nitrates in St Aubin's Bay has increased substantially

It's like fire: we need fuel, warmth and oxygen to get those flames – and if one factor is missing, the fire won't start or will go out. With sea lettuce blooms we need the confluence of nitrates, warm water and sunshine: currently this is what we get every summer.

There are many people who remember there being a strip of sea lettuce along the water line through which one had to wade before reaching the clearer water in St Aubin's Bay.

The strip was a few centimetres up to a metre or so wide and was never seen as a problem; the beach itself was gloriously sandy and was a place favoured by many for its wide expanse of sand, shallow waters, few currents and relatively warm water.

We had the warm water and sunshine in those days, so what has changed? The level of nitrates has: levels have increased enough to reach the tipping point needed for sea lettuce blooms. There are a number of possible reasons for this and it is most probably a combination of factors such as:

- Nitrate runoff from human sewage (this is increasing as our population increases) and from agriculture
- The washing in of nitrates from France which produces substantial amounts
- A decline in certain shellfish and other organisms which help filter nitrates
- The building of the reclamation and/or La Collette sites, which have altered the flow of water in the Bay to make it more circular

With respect to that last point, studies we have seen show the circulation of the waters in St Aubin's Bay on most tides is just that – circular. Drogues released at the end of the Bellozanne outflow either 'returned to base', or went east into St Clement's Bay; this means extending the Bellozanne outfall, as is often suggested, would not be the answer. It would also be hugely expensive.

UK consultants were brought in to help with the sea lettuce problem; they went out looking for the 'mother lode', believing that it was possible that the lettuce was coming from elsewhere. This is not so: *Ulva* cells are present in the water column constantly and can be quickly triggered into bloom when conditions are right.

As one sees in our reservoirs when an algae bloom occurs, the same principle applies to St Aubin's Bay; a combination of slack tides, hot weather and high nitrates in the water will suddenly trigger the growth of the *Ulva* which is not washed away due to the circulation of the bay in normal summer conditions.

On 28 Oct 2014 three members of SOSJ attended a Transport and Technical Services (TTS[1]) presentation on the sea lettuce problem. TTS had invited Dr Kieran Conlan from the UK to speak, and we looked forward to hearing some real science and seeing helpful study data. We were disappointed[2].

Apart from the estimated tonnage lying stranded in the bay being approximately 9,000 tonnes, with between 10-30 tonnes arriving on each tide, there was nothing in the information that we heard that was new. The presentation was as we might expect from a year 9 or early year 10 GCSE student; it was poorly presented, pictures were not from Jersey and the only slide with any data on was blurred. SOSJ don't know how much this cost to commission and run, but we do know we could have given a much better and more informative presentation… and would not have charged any money to do so.

[1] TTS have now been renamed as the Dept of Infrastructure

[2] We do, however, recognise the valuable work that was carried out on the drogue release study in St Aubin's Bay which looked at the flow of the water in the area.

Pictures

There are more photos at sosjersey.co.uk/sea-lettuce-problem-in-jersey-continues, but these give an indication of the problems Jersey faces with sea lettuce.


©SOS Jersey - sosjersey.co.uk

Possible solutions

This is a world-wide problem and all countries involved are looking at possible solutions. In Jersey, the approach is piecemeal at best. We currently have a sticking plaster approach whereby the sea lettuce is collected and pushed out to sea: the beach is cleared until the next incoming tide, when the sea lettuce is washed back up. This is not only expensive, but it disrupts organisms' habitats.

Here is a brief overview of what else is on offer:

1. Harvesting machine

As mentioned earlier, the States of Jersey are currently looking at a harvesting machine, perhaps with a view to using the lettuce as biofuel. This machine is very expensive and its efficacy has not been proven: we believe that the area is so huge and the tonnage of lettuce so great that only token areas can be cleaned, and it will not work on areas such as the Victoria Pool or near Elizabeth Castle.

We feel it is more a case as being seen to be doing something due to mounting public pressure. The purchase of a sea lettuce harvester is effectively short termism, which means the Council of Ministers (COM) will be passing this problem on to others.

2. New sewage treatment facilities

As a quick fix, it would be better to rent the harvester for two years while installing new treatment facilities at Bellozanne and trialling a Jersey native oyster programme. The COM must put costed alternatives before the States: it is that important.

The States should introduce water treatment facilities which extract nitrates *before* the water runs out into the Bay, but current plans mean this will not happen for many years. The cost of *not* doing this earlier will potentially be much greater in both economic and environmental terms, but these costs have not been factored into any plans we have seen.

3. Changing farming practices

Additional projects include collaboration with Jersey farmers to return to more environmentally sound practices, particularly with regard to gradually using less of the currently preferred commercial NPK fertilisers[3].

Even if all farmers were to use 'organic' methods, however, the sea lettuce problem would not be solved as we have too much sewage produced.

[3] NPK fertiliser is primarily composed of three main elements: Nitrogen (N), Phosphorus (P), and Potassium (K), each of these being essential in plant nutrition.

4. Jersey native oysters

There is, however, another potential solution. As we outline this, bear in mind we do not need to get rid of all nitrates, just enough that the sea lettuce does not bloom every summer.

Three years ago, SOSJ and aquaculture farmer Tony Legg of Jersey Sea Farms approached the then TTS with a low cost, ecologically-friendly potential solution to the problem.

The idea is straight forward and low cost: Create a sustainable population of Jersey native oysters (*Ostrea edulis* – see right) in St Aubin's Bay.

It's that simple.

We have been asked:

- Why oysters?
- Why Jersey native oysters in particular?
- Won't the oyster beds get in the way?
- How would it work?
- …and more questions along those lines

Oysters filter sea water and take up nitrates; Jersey native oysters, not only a natural part of Jersey's coastal ecosystem, are particularly effective at extracting nitrates from the water. A successful modest-scale project has generated new techniques and equipment and we know the oyster beds will not impede boats.

The results have already lead to a significant Irish project, led by Tony Legg, to rejuvenate the famous Galway/Clarinbridge and Clew Bay beds[4], and there are hatcheries and nurseries in Scotland and Denmark.

Most significantly, a large scale project has been started in Milford Haven in Pembrokeshire in Wales. That area has similar issues to St Aubin's Bay with high nitrate levels generated from the population and the potato industry, and the ecosystem services of large scale oyster beds have been recognised as a system worth support. A project involving a number of Stirling University Aquaculture Faculty Masters students investigating the system, is starting this autumn.

[4] See tinyurl.com/sosjtlgrant

How would it have worked?

The Jersey native oyster system involved is *unlike* the Grouville Bay beds (pictured right) where the oysters grow in netted bags secured to rows of raised trestles.

Instead, this project would use low, modular units of oysters held below the low water line, but ones that still intercept the high nitrate boundary flow[5].

The oysters filter nitrates from the water; these nitrates are used to make proteins which the oysters use, amongst other things, to grow.

In addition, the oyster beds generate populations of denitrifying bacteria in the sand around them. This allows significant quantities of nitrates to be released into the atmosphere as harmless nitrogen gas[6].

Once more, we stress this project would not be a total solution, but a good, probably necessary, part of it: if we use the oysters to remove some of the excess quantities of nitrates from the runoff and outfalls into the bay *in conjunction with* an improved sewage system *and* reductions of agricultural NPK fertiliser use, then the risk of triggering the seaweed 'explosions' will be massively reduced.

By growing juvenile Jersey native oysters below low water level in self-contained 'micro-reefs', the nitrate load could have been reduced by 25% by year three by extracting 35-40 tonnes of nitrates.

This means, rather than these regular nuisance and toxic blooms of sea lettuce, the phenomenon would become progressively infrequent – more like we saw in the past.

The oysters would be below the low water line and can be commercially harvested so would be of economic benefit to the Island.

If necessary, the oysters can be filtered in existing tanks as the Pacific oysters mainly grown in Grouville sometimes have to be, so there should be no issue with contamination from bacteria. If the oysters should not turn out fit for consumption because of the bay's water quality, for instance, the project would still be a cheap one for the States to fund.

[5] You can see more details here: tinyurl.com/sosjjno

[6] The complete denitrification process can be expressed as a redox reaction:
$2NO_3^- + 10e^- + 12H^+ \rightarrow N_2 + 6H_2O$

Jersey's lost opportunity

The idea of using Jersey native Oysters to help control the sea lettuce problem was initially listened to with interest by Officers and Minsters of both relevant Departments. However, with a change in government ministers, suddenly it was deemed not worthy of attention.

We are now three years on since SOS Jersey first approached the Departments with our suggested solution to the sea lettuce problem. This is the period in which we could have discovered if this low-cost, ecological friendly project would have helped control the sea lettuce problem. By now the effects could have already been felt and the sea lettuce volumes substantially reduced.

What can we say? We tried.

Why wouldn't the authorities let us try?

For some years, SOSJ and their scientific advisers have worked both independently and with Jersey Sea Farms on this innovative solution. Despite the project entailing virtually no cost to the taxpayer, being unobtrusive and potentially a sustainable source of export revenue for Jersey's struggling economy, we have been met with little enthusiasm by the relevant Departments and the Ministers involved.

Last summer, Dr Tim du Feu, Director of Environmental Protection, advised the Council of Ministers that there was no solution to the sea lettuce problem; specifically, he stated the reintroduction of the native oyster would not work.

More recently, the Environment Minister Steve Luce publicly and erroneously declared that if the scheme went ahead, St Aubin's Bay would be covered by trestles and invaded by tractors. This is nonsense: the low level cages would be on the sea bed out of sight, harvesting would be annually, and servicing would take place infrequently from the sea.

Nonetheless, if harvesting were to be a problem, then that practice would stop: this is, after all about preventing sea lettuce blooms, and the investment in building a self-sustaining population of Jersey native oysters is a mere nothing compared to the costs of buying a sea lettuce harvester. We would have hoped that the Minister would have embraced this project and follow up on the offers to discuss it in detail.

SOSJ met last year with John Rogers, CEO of TTS, and his officers to request the use of a disused sea water reservoir at La Collette to 'grow on' juvenile seed oysters until they were ready to be put in the sea at a predetermined 5-hectare site behind St Aubin's Fort. TTS turned us down, citing worries about frequent visits and security.

In fact, the reservoir would only need to be visited monthly to refresh the water and these visit would not affect TTS's landscaping or security concerns. We think that had the political will been there our request would have been granted, as John Rogers seemed supportive. Maybe, as is often the case in Jersey politics, there may be undisclosed reasons for the lack of interest?

Where will the 'native' now be used?

SOSJ consider Jersey has lost a golden opportunity to at least try this exciting potential solution to a perennial problem which is blighting our tourist industry and annoying so many residents.

It seems inconceivable that the protectionist instincts and attitudes of some Departments ('We didn't suggest it, so it's no good') and Ministers ('We only take advice from our officers and expensive off-Island consultants') could be the cause of this loss to our Island, but we can think of no other reason.

Our qualified advisers are probably more experienced that theirs on this issue, and they have the benefit of local knowledge, but are just not asked.

What next?

After three years – a period of time in which we could have seen if the project would have helped to the degree needed – SOS Jersey and Mr Legg have decided reluctantly to stop pushing the idea of the project, though Mr Legg will continue to farm native oysters in his current area behind Green Island.

SOS Jersey members are all volunteers, working on various Island projects in their own time and at their own expense, so cannot just waste time speaking to deaf ears. Mr Legg has been approached from outside Jersey by authorities who recognise the importance of what he is offering, and will be working with them.

Last year (2015) SOSJ met with Environment Director Dr Tim Du Feu and officers to ask questions relating to water quality in St Aubin's Bay and to discuss the sea lettuce. We asked about nitrates in the water at the Bellozanne outflow; we were astonished and perturbed to hear the water there is *not* tested[7].

As a result, earlier this year SOSJ approached the Howard Davis Farm Trust to request a grant so we could assist the Environment Department by independently testing and correlating data over several months or more in order to gain a better understanding of the trigger point at which the sea lettuce blooms.

SOSJ will carry out testing even if the Environment Department won't

Why? Our feeling is more information needs to be gathered about the nutrients and outflows in St Aubin's Bay, and the specific conditions where blooms are triggered as we believe the nitrate levels need only be lowered by just a small amount to prevent the bloom.

[7] This policy may have changed, but we have not been informed if it has. Apart from keeping SOSJ apprised, we feel the relevant departments could do much more about letting the public know exactly what's going on.

On our grant application, SOSJ made it clear we need to retain our independence and integrity in order to be able to conduct our work, but that we would be happy to share our data with the department on completion. We were told we would need to work together with the Department if we were to secure the grant.

It is our belief that working with the Department would not achieve an independent report, which is, after all, the point of the project. Much as Scrutiny must work independently from the States, so must we from the Departments on this particular issue. The departments will not even countenance supporting our suggested sea lettuce solution, so how can they be impartial?

As such, we are hoping we can find funding from other sources in order to carry out this important testing independently. If not, we will do what we can with the limited funds we have and hope that the public will support our endeavours to safeguard the health of our marine environment.

If we don't do the testing that Environment won't, who will?

So what now? SOSJ are carrying out water quality testing of outflows around the south and east coasts in order to build up a clearer picture of the nitrate loads and other chemicals that impact upon our marine environment and which cause the sea lettuce blooms.

Although in an early stage, our preliminary testing is throwing up some 'interesting' data. We will continue to work on the testing throughout the coming months and will publish updates in due course.

If we don't do the testing that Environment won't, then who will?

Support SOS Jersey

SOS Jersey is a self-funded, voluntary organisation.

Should you wish to help, we welcome donations of any amount.

Our 'ways to help' page can be found here: sosjersey.co.uk/ways-to-help.

Thank you for reading this report. Please share this and also ask your Deputies and Ministers why they are not listening.

Best wishes,

Save Our Shoreline Jersey

Further information

Picture attributions:

- Screen shots from the Jersey Evening Post and the States of Jersey Twitter feed
- Chris Brookes, aerial photographer
- Local resident Mandy Neilson Snook
- asc-aqua.org
- Wikipedia Commons

Local links:

- SOSJ: sosjersey.co.uk/category/concern/pollution/sea-lettuce/
- SOSJ Facebook: facebook.com/sosjersey/
- Help SOSJ: sosjersey.co.uk/ways-to-help
- Jersey Evening Post on sea lettuce: jerseyeveningpost.com/search/sea+lettuce/
- States of Jersey, environment links: gov.je/Environment/
- States of Jersey on sea lettuce: gov.je/News/2015/pages/sealettuceinformation.aspx
- Sea water monitoring, Jersey beach results: gov.je/Environment/ProtectingEnvironment/SeaCoast/Pages/SeawaterMonitoring.aspx
- Sea water monitoring, La Haule results: gov.je/SiteCollectionDocuments/Environment%20and%20greener%20living/ID%20La%20Haule%20Internet%20Profile%2020160525%20CLeM.pdf

Recommended reading:

fish2fork.com/en_GB/news/news/native-oyster-farmer-planning-huge-boost-to-british-production (See Tony Legg's oyster farming in action)
slideshare.net/SAGB_Conference/sagb2013-tony-legg-jersey-sea-farms
seagrant.uconn.edu/whatwedo/aquaculture/pdf/nrac105-environeff.pdf
edc.uri.edu/restoration/html/gallery/plants/sea.htm
en.wikipedia.org/wiki/Ulva_lactuca
boprc.govt.nz/media/362724/research-directed-towards-the-management-of-sea-lettuce-in-bay-of-plenty-coastal-waters-by-niwar-september-1992.pdf
ncbi.nlm.nih.gov/pmc/articles/PMC4333771/
elkhornslough.org/sloughlife/plants/sea_lettuce.htm
spo.nmfs.noaa.gov/mfr674/mfr6741.pdf
sciencedirect.com/science/article/pii/S1568988308001066 & pii/S1568988308001078
sciencedirect.com/science/article/pii/0044848674900209 & pii/S0956053X13002948

Contact SOSJ

SOS Jersey, Helm's Deep, 8 Le Clos de Maitland, La Rue du Presbytere, St. Clement, JE2 6RA
Web: sosjersey.co.uk
Email: info@sosjersey.co.uk
Tel: 07797 733 613

Facebook: facebook.com/sosjersey/