

By Tony Legg of Jersey Sea Farms

How, why and where the the sea lettuce (*ulva*) grows:

1. The point of *Ulva* growth is exactly the footprint of the seagrass.
2. On a descending tide the plume from the STW which contains above permit nutrients sits at that point.
3. This plume also drops physical deposits of nutrient rich material as sediment on this point, this would not be detected as N in the water column.
4. The Diffusive Benthic Boundary has a mechanism to release the N from this sediment in the form of NH_4 and NO_3 to increase the levels considerably above the ambient water column and even the STW discharge.
5. That high level nutrient soup sits in a shallow water column a couple of cm deep over the entire area, during the summer that is a perfect photobioreactor for all the stages of *Ulva*.
6. The main body of *Ulva* is generated at exactly this point as proven by Cascade and the Nurture Ecology sampling programme, it does not migrate in and slowly migrates out.
7. Only a small quantity of the entire biomass is in the surf zone (Cascade)
8. Increasing levels of N towards the Minquiers has no relationship with the de facto growth of *Ulva* in the nutrient enhanced photobioreactor zone it is merely background.
9. **The acid test: We suggest that Environment sample the water in the diffuse benthic boundary on a late low tide on a warm day!**

Re Cascade 2013 report :

Cascade appear to have not taken into account the, 'photobioreactor' effect of very shallow 1-2cm water that lays over most of the *Ulva* production zone for up to six hours on spring tides in summer. This zone incorporates the diffusive boundary layer of the benthic boundary layer and amplifies the nutrient concentrations in that non-turbulent condition. Those nutrients include all of the limiting factors Nitrogen, Phosphorous and an overlooked Carbon. This boundary warms substantially above ambient, is heavily illuminated by day and contains a mix of blades and spores. It is hard to design a better growing environment for all stages. It is suggested that this fluid layer is a mix of seawater and STW discharge at a much higher ratio than has been credited so far. It is also suggested that this constitutes the 'mother lode' that Cascade though might reside on some distant reef.

The control of this 'photobioreactor' environment is a principal effect envisioned in the furrowing exercise.

RE: Cascade's transects: (chlorophyll coming from France causes sea lettuce claim)

On page 30 (section Cascade concede that the Dissolved inorganic nitrogen (DIN) levels are constant to which we agree as our test concur. However, they go on to say that chlorophyll levels increase towards France they must be the culprit. That chlorophyll is in phytoplankton **not** macroalgae. Its like saying that because we can detect mackerel ten miles away we must have a source for our beached whales?????

We have large quantities of Ulva growing in a nutrient rich milieu, if it has a thinner solution above it that is irrelevant if it is a less thin solution at the Caux Buoy that is irrelevant .

The 'elephant in the room ' is that we have masses of Ulva in St.Aubins Bay that needs lots of nutrient, and here is the mechanism, it even fits with the N14 ratios. There are extremely localised effects that have not been looked at by the crude resolution sampling undertaken so far, listen to the *Ulva*, it knows where the excess nutrients are!

CONCLUSION

The Departments Consultants have looked at this as a two dimensional problem, samples have been taken in a single line single depth approach , the information derived from that sampling shows a gradual increase of nitrogen levels towards the Minquiers .

That is undoubtedly true but bears little relationship to the 'obvious' that we have a major problem of rapidly growing Ulva in St.Aubins Bay.

What should be looked at is the three dimensional micro-conditions that change with time as generated by

- the constant above permit discharge of sewage nutrients and sediment from the Bellozanne outfall,
- the effects of tidal concentration of those discharges creating a thin film of concentrate over a large area of the lower beach on a dropping tide, the known chemical concentration effects of the sand structure ,
- the retained water column a couple of cm thick that alongside the increasing nutrients, summer heat and sunshine has Ulva fronds and spores in a perfect photobioreactor,

The groundtruthing is that there is a major Ulva problem that needs resolving and this relates to the mix of conditions found here and now in St. Aubins Bay. To divert blame it on the French or 'mystical Pink Fairies' does nothing to solve the problem but does divert from political blame.