Other events that have happened recently include the .......

Yes, seaweed is increasingly on the minds of foodies around the world. Attending this event were chef/scientists from the Nordic Food Lab who have published work on the flavour of seaweeds and the all important umami flavour (Mouritsen et al. 2012, Flavour 1:4). The Nordic Food Lab (NFL) team have an international reputation for the development of new and non-conventional taste sensations. For example they presented fermented grasshoppers and bee bread, so seaweed seemed to be tame on the list of tastes. However the NFL recognises that seaweed is very important in bringing back the taste of umami to Westerners. Umami molecules are based on glutamate which is rich in seafood but especially seaweeds. It is important for neurological function and identifying nutritionally important foods. The NFL describe the Japanese "dashi" as "the mother of umami" and have described extraction processes and combinations of seaweed with other foods that will maximise the flavour of umami. In this newsletter we highlight the growth of an Australian processor of seaweed for food, and continue with examples of effort in others areas of seaweed initiatives in Australia …

Hope to see you in Bali.

Pia Winberg
Executive Officer Seaweeds Australia
There are a number of projects in Australia now that are investigating the bioremediation of waste water from aquaculture using seaweeds (see last newsletter). It is encouraging that such integrated multi-trophic aquaculture approaches are spreading across Australian states from Queensland to south Australia and Tasmania. Of importance however is how much such cultivated seaweed can contribute to reducing the feed coasts of the species under cultivation. For example in Mexico the cultivation of Ulva and Prawns provides feed for the prawns, and in South Africa and Hawaii the co-cultivation of seaweeds and abalone has been shown to be successful.

Although some work has been done in Australia on the growth rates of nursery stage abalone and algae, little has been done with the weaned juveniles that are typically fed a formulated feed based mostly on land crops. University of Wollongong PhD student Will Mulvaney has recently published a paper on the outcomes of his research in collaboration with AbTas and the University of Tasmania in the Journal of Applied Phycology (DOI 10.1007/s10811-013-9998-2).

The cultivation of abalone is primarily a land-based growth industry in Australia and Will’s study compared the growth of abalone in the weaning stage from the nursery to outdoor tanks. He tested six single and mixed seaweed diets compared to two commercial formulated feeds and found that both the growth rates, health and condition of the abalone increased on the seaweed diets. The abalone tissue from seaweed diets also had high carbohydrate content, lower lipids and higher ash content (trace elements and minerals).

These findings suggest that there may be a double gain from the cultivation of seaweeds in abalone aquaculture: improved environmental standards from bioremediation as well as improved growth rates and condition of the final product. However more remains to be done to see if this trend is consistent into adulthood of the abalone. Will is continuing his research in this way at the University of Wollongong and in collaboration with Fisheries Victoria, the Victorian abalone industry and the Rural Industries Research & Development Corporation.

Seaweeds provide a superb source of bioactive extracts suited to applications in dietary and therapeutic areas. The successful Australian marine biotechnology company Marinova Pty Ltd specialises in the development and manufacture of fucoidan fractions from brown seaweeds. These sulphated fucose polysaccharides have considerable activity as immune modulators, viral inhibitors and enzyme inhibitors.

Carefully controlled sources of seaweed together with modern extraction and characterization methods mean that Marinova is able to create reproducibly defined products. Some fucoidan fractions can be produced to standards suitable as ingredients in medical devices and even cross the threshold into drug development route. There is increasing potential for seaweed derived in complementary medicine and topical applications.

One area of interest for seaweed and fucoidan extracts is the dietary control of type 2 diabetes and prediabetes. Seaweed extracts including fucoidan have shown potential in the control of blood glucose in animal models. The biological mechanism appears to centre on the inhibition of digestive enzymes and inhibition of glucose transport in the gut. In house studies at Marinova have shown that fucoidan causes marked decrease in non enzymatic glycosylation of proteins, which generates non functional proteins in poorly controlled diabetes. Increasing numbers of people are affected by these conditions and the market potential for these ingredients is growing.

Fucoidan extracts in particular have a known antiviral activity. Recent research has demonstrated a profound inhibitory activity in mouse models of the Influenza A virus. Fucoidan appears to both inhibit the direct entry of the virus to cells in vitro, and modulate immune responses when given orally in mouse models to help clear the virus. This modulation of response to the virus could provide a useful adjunct to conventional therapies.

Recent published clinical trials with fucoidan have illustrated possible utility in control of the human viral conditions HTLV1 and chronic Hepatitis C in addition to the reduction of chemotherapy toxicity. The next few years offers exciting possibilities for fucoidan as bench research progresses into more clinical trials. If you would like to find out more about Marinova and the therapeutic potential of fucoidans please visit www.marinova.com.au
Theme: Natural Resource Management

In the inaugural Seaweeds Australia newsletter in 2011, we reported that the Shoalhaven City Council was tackling the challenge of managing a mass seaweed bloom in Jervis Bay, NSW. The unique green seaweed, *Microdictyon umbilicatum*, likens a green tissue on first impression; however on closer examination it has an intricate green lattice structure. Due to this fine and flat structure, the seaweed packs tightly and is slow to decompose when washed up in large volumes on the beaches. Thus local residents were affected by a year of deep volumes of seaweed that even smothered mangrove pneumatophores (aerial roots). The trigger for the bloom was not known and the only option was to investigate the possible harvesting of biomass from the beaches and to determine if it was a safe and suitable species to use as a soil or compost conditioner.

Now the results of this intervention and compost application on native species will be published in the journal of Compost Science and Utilisation (DOI:10.1080/1065657X.2013.785220), and further findings of applications on edible crops will be presented at the XXIst International Seaweed Symposium in Bali this month. There has previously been no published information on the use of *Microdictyon umbilicatum* as a compost component or soil conditioner for plants, and the outcomes here confirmed that *M. umbilicatum* was a safe organic additive to Australian Standards (AS4454: Soil Conditioner & Fine Mulch Analysis). This grade allows for unrestricted use on home gardens, public spaces, urban landscaping, agriculture, forestry, soil and silo rehabilitation, landfill disposal or surface land disposal.

The findings demonstrate that the *Microdictyon umbilicatum* bloom biomass can be effectively composted with terrestrial green waste to provide a soil conditioner with a useful macro-nutrient and trace element profile. In addition it is of benefit to the growth and stress tolerance of native species and edible crops respectively. As expected with an unwashed marine algal source, the sodium concentrations were elevated at high doses and 5% volume of seaweed biomass content in compost, assuming an addition ratio to soil or potting mix of 1:1, is recommended.

Native plant growth responses to *Microdictyon umbilicatum* enhanced compost were significantly increased by 157% and 73% for Saltbush (*Rhagodia candoleana*) and Coastal Banksia (*Banksia integrifolia*) respectively. In addition the numbers of leaves for Salt Bush were significantly greater with 5% seaweed biomass volume compared to controls. Both plant species maintained good growth rates at higher seaweed compost additions up to 20%, but there was no significant benefit. This optimal range of seaweed biomass in compost is a bell curve response that might reflect plant sensitivity to sodium salts at higher seaweed content. Prewashing the salt from the seaweed biomass may extend the range of beneficial seaweed content, but this would require further testing for confirmation.

These outcomes confirm not only that the utilisation of this algae bloom biomass is safe, but that there are significant benefits for native Australia coastal species of plants and crop plants. This is of importance where early and fast establishment of seedling is vital to the success of coastal revegetation programs. Thus what was perceived as a local amenity problem can now be seen as an opportunity and an effective and valuable use of a marine resource.

Theme: Food & Nutrition - Booming business for Tasmanian based seaweed food processing company

**SEA VEGETABLES TASMANIA**

The Hobart based partnership between Ashmore Foods and Craig Sanderson is entering its third year of production this season: 2013. Markets for *Undaria* products: Wakame and Mekabu have been established in Perth, Adelaide, Hobart, Melbourne, Sydney, Brisbane and Cairns. To mark the success and promise of the venture so far, a new business entity is being established: Sea Vegetables Tasmania. This company is stand alone and will manage seaweed product procurement, processing and distribution.

Sea Vegetables Tasmania is aiming to be the premier company for production and distribution of seaweed food products in and for Australia. Seaweeds will be sourced from pristine waters including around Tasmania with the aim of achieving organic status for all products.

Currently Wakame and Mekabu will continue to be marketed fresh, blanched and frozen by Sea Vegetables Tasmania in 500g, 200g and bulk 3kg quantities. This year however, further variations on *Undaria*, will be trialled including fresh, dried and smoked. At least two other seaweed species (local to Tasmania) and a seaweed salad will also be tested.

Sea Vegetables Tasmania recognises that the hardest step in getting a seaweed food based business up and running is establishing distribution networks (along with identifying and formulating products). Sea Vegetables Tasmania is willing to consider being the distribution outlet for other seaweed products from other startup companies and more established companies. Please contact us.

Information can be found on current *Undaria* products at the Ashmore Foods site: [www.ashmorefoods.com.au](http://www.ashmorefoods.com.au). Look out for the new site for Sea Vegetables Tasmania which will be established before the start of this years harvest season (June 2013). We can be contacted through either james@ashmorefoods.com.au or craig.sanderson@iinet.net.au.
The fulfilment of an assignment to collect, preserve and identify seaweeds from the coast of Tasmania, a small part of a university course in Applied Algology 30 years ago, sparked an interest which has developed into a lifetime passion for seaweeds. The seaweeds were pressed onto cards for identification. During this process a lot was learnt about those specific components of seaweeds which differ so greatly from terrestrial plants. Twenty years working in Europe after this did not stop our fascination for seaweeds. In contrast, we expanded our knowledge about their uses and preservation particularly on the coasts of France and Ireland.

Returning to Australia in 2008, it was disappointing to find that for most people here still regard seaweeds as only a smelly mass on our beautiful beaches. We have therefore, made it our goal to promote the awareness of seaweeds in our community. We took part in an exhibition organised by the Eden Killer Whale Museum. Although our cards were very popular, larger displays were also requested. We developed a new technique of mounting seaweed on rice paper and laminated these sheets to create large posters.

The Sapphire Coast Marine Discovery Centre in Eden, NSW, was very interested in displaying the laminated seaweed sheets. Coming out of a family with a background in the lighting industry, the next step of displaying them as lights soon evolved. Until now, two types of lights have been created, one utilising polycarbonate tube inside an oval shaped light-shade and an upward facing light and the other with the laminated sheets over a wooden frame with internal LED lighting strips.

These are lights with a mission (light up your life with seaweed) to promote seaweeds as the valuable resource with enormous potential for our lives.

International Events

The Fourth Latin-American Congress in Algal Biotechnology, Brazil

The 5th Congress of the International Society for Applied Phycology 2014

Strengthening algal industries for the future: key knowledge and skills gaps