

Seaweed Species Profile

Ecklonia radiata



© Luis Henriquez

Luis Henriquez has done credit to the beauty of *Ecklonia radiata* in its natural habitat. This seaweed is probably more familiar to people as the spiky lumps of seaweed that wash up on our temperate shores after a storm. It is important that those who can't get to appreciate the beauty of seaweeds do, to grow the appreciation and use of them. So ISAP2014 has launched its website and a **PHOTOGRAPHY COMPETITION** where the winners will be announced at the conference in 2014. So start getting your entries online and you can change your entry over the course of the next 18 months as your photos improve.

Ecklonia radiata is a dominant habitat forming species. Luis is part of a research team in Tasmania that will look at this among other species from an ecological perspective (see inside), however it is also of interest for its food and health potential. The bioactivities of *E. radiata* metabolites might include the unique polysaccharides and/or polyphenols for applications such as management of metabolic disorders (Iwai 2008).

Seaweeds Australia

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Australia Technology Park, Sydney, Sunday 22 – Friday 27 June 2014

www.isap2014.com



Already at the end of a busy year for all, but with success in the growing participation in Australian seaweed research and development, production technologies and products on the market. Although Australian seaweed products are still in their infancy—they are making a big mark on the world. Ashmores wakame product made from *Undaria* growing in Tasmania was recently served to Royalty, the Prince of Wales and the Duchess of Cornwall, by Simon Bryant on their tour of Adelaide. Similarly, Jared Ingersoll of Dank St Depot and author of the book “Sharing Plates”, has been cooking up a seaweed storm at the Arthur Boyd Bundanon Trust Future Food Feast (featured in this newsletter). Last but not least, a new Australian seaweed cosmetic product using Tasmanian fucoïdan (also featured in this newsletter) has landed on the face of Keira Knightly in an American beauty magazine. So Australian seaweed industries may be small but they are certainly making their mark. I hope that this has set the pace for more emerging commercial seaweed success stories in 2013 and onwards.

As previewed in the last newsletter, Adelaide played host to the Asia-Pacific Conference of Algal Biotechnology. The conveners put on a great event and Flinders University researchers Wei Zhang, Raymond Tham and their team hosted a delegation of hundreds from many nations throughout the Asia Pacific and beyond. Macroalgal research was well represented from a strong international contingent of delegates, especially from our neigh-

boring countries where the cultivation of seaweed is already at scale. From my point of view there is much to be gained from collaboration with our Asia-Pacific neighbours in terms of strengthening their existing seaweed industries, but also in realizing the new opportunities for improved production, new and improved species and value adding to the biomass. Although the potential for seaweeds to contribute to the future of food security, sustainable primary production and new valuable products remains strong, this can only be realised with a good track record of research and industry development that builds on strong collaboration across disciplines, sectors and nations—therefore I encourage any members of Seaweeds Australia to contribute to further newsletters in profiling their work both within Australia but also with collaborations abroad.

Other 2012 events included international visitors that are interested in the developments of seaweed research and industry in Australia including Thierry Chopin from the University of New Brunswick, Canada, and Professor Jiang Zengjie from the Yellow Seas Fisheries Research Institute in China (featured inside). So after a busy year, I can imagine that 2013 will be even busier. Personally the planning is well underway for an exciting conference in Sydney for 2014 (see last page) and abstract deadlines for the International Seaweed Symposium in Bali is on January 31—so get writing this summer and I hope to see you in Bali in 2013.

Seasons Greeting
Pia Winberg

Theme: Cultivation - James Cook University biofuels project

Researchers at James Cook University (JCU) have received a \$5 million grant to research, develop and demonstrate Australia's first freshwater and marine macro-algae to biofuels project. A \$15 million Advanced Biofuels Investment Readiness (ABIR) Program has also been set up, designed to support the investment case of scalable, pre-commercial advanced biofuels demonstration projects in Australia.

MBD Energy Ltd is a commercial partner of this projects and Managing Director, Andrew Lawson, said macroalgae offer exceptional opportunities for the supply of biomass feedstock for the production of bio crude likely to be well suited to refining a comprehensive range of conventional transport fuels. Both marine and freshwater macroalgae are produced using non-arable land, and therefore this process does not compete at any level for food production.

"Advanced biofuels have the poten-

tial to play a role in diversifying our liquid fuel sources while reducing carbon emissions," the Minister for Resources and Energy, Martin Ferguson, said when he visited the MBD Energy pilot facility at JCU.

The first stage of the project is to look at optimised biomass productivity and critically, biomass organic yields for biocrude production. A second stage of the program could demonstrate commercial scale production and processing of macro algal biomass.

"Advanced biofuels have the potential to play a role in diversifying our liquid fuel sources while reducing carbon emissions"

Funding for these projects is provided through the Government's \$20 million Australian Biofuels Research Institute. A final project report will be submitted to the Commonwealth De-

partment of Resources, Energy & Tourism at the end of September 2014.

James Cook University researchers involved in this project include Project Leaders Prof Rocky de Nys and Dr Nicholas Paul; Research Fellows Dr Leonardo Mata, Dr Andrew Cole, Dr Rebecca Lawton, Dr David Roberts, Dr Marie Magnusson and several Post-Graduate students.

See regular project updates at: www.jcu.edu.au/macroalgae. See also ATSE Focus 171 at: www.atse.org.au



Theme: Food & Nutrition - Bundanon Food Feast

Recently the Bundanon Trust, Arthur Boyd's natural legacy to the nation, hosted its annual Siteworks Event

(<http://bundanon.com.au/siteworks>).

This year the theme was "Future Food Feast" and chef Jared Ingersoll, founder of Dank St. Depot in Sydney, was the innovative chef taking on the challenge of cooking with foods of the future. Jared created four separate sittings areas for different food types, one including the local sea and featuring seaweed. To this end, members of Seaweeds Australia sourced local cultivated biomass, wild harvest and imported seaweeds to create a unique and colourful seaweed salad atop locally caught fish (Luderick – also a grazer of seaweed).



health and cultivation properties. In this way the full spectrum of stages of development of seaweed food products was demonstrated; commercial production, trial culture and wild species of interest.

Some of these seaweeds had also recently been used in an Australian entry to the International Algae Competition Food section, and were placed in the top 17 finalists internationally. All of the finalists in this competition can be seen at:

www.algaecompetition.com.

The dish was a hit and 120 sittings had people fascinated by the form, taste and texture of the seaweeds. Although many people are familiar with the *Porphyra* seaweeds used in sushi, few understand the diversity of seaweed food opportunities that exist. The seaweeds presented at the Future Food Feast represented an international *Chondrus* seaweed product with established commercial production and markets, an emerging commercial species of *Ulva* that is under pilot trial cultivation at the Shoalhaven Marine & Freshwater Centre at the University of Wollongong, and the brown *Hormosira banksii*, a candidate local Australian brown seaweed that is being investigated for



Theme: Natural Resource Management - Integrated Multi-Trophic Aquaculture

Integrated Multi Trophic Aquaculture (IMTA) As An Environmental Sustainability Strategy: Threat or Opportunity?

It is well recognised that coastal zones in developed areas can be subject to increased nutrient inputs through waste water systems, and urban and agricultural runoff. Commonly known as eutrophication such shifts in the nutrient balance can contribute to algal blooms and changes in trophic dynamics. However, nutrients such as nitrogen can also be seen as a wasted resource that could be utilised in a more positive way.

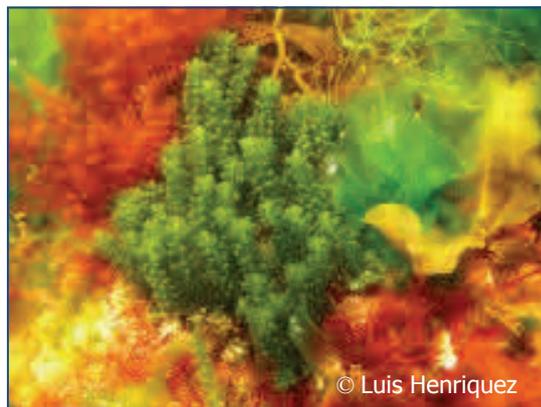
Tasmania is the largest producer of farmed salmon in Australia, with a significant proportion of the production focused in the Huon Estuary and D'Entrecasteaux Channel in SE Tasmania. The fate of the excess nutrients from salmon farming has been the subject of several studies. In 2008, the CSIRO released a report in which modelling suggested that the nutrient status of this system could be markedly affected by salmon farming during summer when natural nutrient inputs are low. This resulted in a nutrient cap being established, to manage the industry expansion. Additional monitoring and research is underway to improve our understanding of the potential impacts of excess nutrients. A key area of research is the investigation of possible effects on local seaweeds and reef systems. A team of researchers, led by Dr. Catriona MacLeod at the

University of Tasmania's Institute for Marine & Antarctic Studies (IMAS) and Dr Karen Wild-Allen at CSIRO are looking at whether seaweed cultivation could be an opportunity to both improve the environment and create a new seafood industry for Tasmania.

Although IMTA or polyculture has a long history in extensive aquaculture in Asia and is growing in interest in Canada (see Thierry Chopin article in the previous newsletter), this method of farming has had limited application and scientific validation in Australian systems. Some of the results from the many small-scale commercial trials that

trients. Scott's research will evaluate scenarios associated with three different seaweed culture objectives – i) for profit, ii) for nutrient remediation and iii) as a conservation strategy. The second student, Luis Henriquez, is measuring the response of different seaweeds in rocky reef systems using field based controlled nutrient enhancement experiments.

It is anticipated that the findings and outputs of this research will have benefits far beyond the localised study environment and will provide important management information for both industry based and regulatory environmental managers. This research is especially important, as IMTA aquaculture is increasingly being flagged as a promising approach for ensuring sustainable aquaculture practices.



have been undertaken so far have not been well tested at larger "real-world" scales, where the preferred nutrient form and uptakes rates may vary with location and seaweed species. Two PhD projects underpin this research effort. Scott Hadley is developing a model to test the potential for cultured macroalgae to effectively utilise the increased nu-



International visitor from China

Associate Professor Jiang Zengjie from the Yellow Seas Fisheries Research Institute

recently visited the Shoalhaven Marine & Freshwater Centre and the Victorian Marine Science Centre through the Group of Eight Australia-China Young Researchers Exchange Program. Jiang has undertaken extensive research on the nutrient and carbon dynamics in and around integrated aquaculture systems to evaluate the impacts and potential benefits of different aquaculture systems. Recent research by Assoc. Prof. Jiang

has included quantifying the seaweed and shellfish biomass and ratios that can deliver net positive uptake of carbon dioxide from the atmosphere above IMTA systems. This research has been recently published in "Carbon dioxide fixation by the seaweed

Gracilaria lemaneiformis in integrated multi-trophic aquaculture with the scallop *Chlamys farreri* in Sanggou Bay, China", Aquaculture International (DOI: 10.1007/s10499-012-9610-9).

Researchers pictured here with Assoc. Prof. Jiang at the Shoalhaven Marine and Freshwater Centre include Clare McKenzie (MSc candidate), Honours students Claire Taylor and Andrew Wakefield, and Dr. Lisa Kirkendale. Jiang also visited UOW PhD candidate Will Mulvaney who is based with Fisheries Victoria in Queenscliff where the local abalone industry are collaborating towards sea-based cultivation systems of abalone and testing seaweeds as a feed.



Theme: Biotechnology - Seaweed and skin

Modern research has uncovered many of nature's compounds that are effective in the treatment of illnesses, and seaweeds are increasingly being explored for bioactive properties. A niche area of research is the application of seaweed extracts for skin care. The research in this field provides evidence of efficacy from topical skin cancer treatments (Higashi-Okai et al. 1999) to wound healing (Chadby et al. 2007, Yanagibayashi 2012) and to preventative skin care health in the form of cosmeceuticals. Similarly to other health applications for seaweed extracts, the challenge is to deliver marketable products from the early and emerging evidence from randomised control and clinical trials—and to build on the evidence of those trials for investment into the future scope for seaweed bioactive properties, something that takes a lot of time and investment and is of little interest to gov-

ernment funding bodies under pressure to fund competitive research in mainstream applications.

Therefore in order to progress the unrealised opportunities of seaweed extracts and their applications, it is important that companies that are willing to develop and deliver marketable products within the existing legislation and degrees of evidence for functionality and claims, while investing in the research and development needed to deliver effective and consistent biologically active products for the future. [Applebox Cosmetics](#) are doing just that having recently launched its new Australian range of skin care products which contain selected key seaweed components that are recognised for beneficial skin properties. This includes the 100% organic fucoidan sourced from the pristine waters off the coast of Tasmania and which is one of the promising extracts with skin

applications. Fucoidan has both soothing and restorative effects on skin. In clinical trials Fucoidan has shown that it inhibits enzymes such as elastase and collagenase, the enzymes that break-down elastin and collagen of the skin, and is therefore highly effective in reducing inflammation, tissue damage and enhancing what dermatologists call "dermal condition".

These Australian products are emerging for the high end market and with the high standards of organic sources, no testing on animals and with the ambition to expand on the evidence and scope for application into the future. This Australian product was recently presented to Prime Minister Julia Gillard as a new innovative Australian product and was featured in the make-up of a feature image of Keira Knightly.



International Events— below plus [International Marine Biotechnology Conference](#)



21st International Seaweed Symposium
 Seaweed Science for Sustainable Prosperity
 April 21 - 26, 2013, Bali - Indonesia

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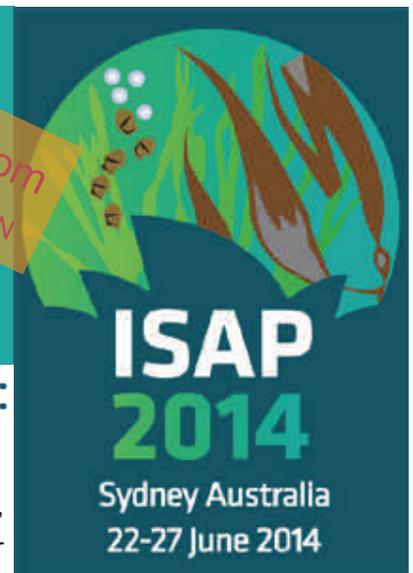
Strengthening algal industries for the future: key knowledge and skills gaps

As President of the International Society for Applied Phycology and Convenor of the conference, we are delighted to invite you to ISAP 2014 - the 5th Congress of the International Society for Applied Phycology - in Sydney, Australia.

Historically, Australia has been a leader in algal applications and currently there are many exciting research and industrial developments in algal applications happening in Australia. International interest in algal applications in Australia is strong due to our unique algal biodiversity, landscape and biogeography that lend itself to algal industry development. ISAP 2014 in Sydney will give researchers and industry representatives a wonderful opportunity to learn more of Australia's algal potential as well as to share the global achievements and future directions in this vibrant frontier at this inspiring global venue.

Susan Blackburn & Pia Winberg
 President & Convenor of ISAP 2014

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