The 5th Congress of the International Society for Applied Phycology: strengthening algal industries for the future. (Sydney, Australia)

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Hosted for the first time in Australia, Sydney welcomed 285 delegates from 34 countries to the 5th Congress of the International Society for Applied Phycology. Australia has maintained a strong representation within ISAP membership as well as on the executive committee; most notably with two presidents, Prof Michael Borowitzka a past president, and Dr. Susan Blackburn, the current president. By hosting the Congress in Australia ISAP was able to actively engage more of the Australian phycological research activities into the community of applied phycologists; in order to grow the society in its role to increase and disseminate the knowledge of algae and its applications. In Australia, as elsewhere, there are many phycologists who do not regard their work as applied. However the term “applied” could effectively be considered a metaphor for multidisciplinary research where basic phycological disciplines such as taxonomy, biology and photophysiology cross into environmental management, climatic processes, animal and plant biochemistry, bioremediation and cultivation. In this way it is hoped that the Society can continue to cross fertilise knowledge across continents and fields of research through its triennial congresses, that progress applied phycology to real world outcomes.

Previous ISAP Congresses represent a trajectory of development towards increasing the role of applied algal biotechnology in a commercial, remedial or regulatory context; starting in 2002 with the theme of “A Sea of Opportunity”. The scope at this Congress was to appreciate the phycological

diversity and an abundance of potential applications. This was further developed towards the third congress with the agenda for novel applications of algae in 2008, while in 2011 in Halifax the challenges of taking the ideas from the beaker to the world were addressed as the challenges of scaling. In 2014, the theme of ISAP was chosen to reflect on the actual successes of algae applications. We are no longer talking about the potential for algae to be applied in relevant ways for a future of sustainable biotechnologies, but that algal applications already represent a sustainable and relevant field of biotechnology with successful industry development. However there remain gaps that block the specific adoption or potential strength of algal industries and regulatory applications.

Thanks to the global community of ISAP on the Executive Committee as well as local recruitment to the Local Organising Committee, ISAP2014 featured a record 189 presentations and 123 posters across twelve themes; ten of these themes are represented in this volume of the Journal of Applied Phycology (Fig. 1). Just by chance it turns out that these publications are equally represented across both microalgal and macroalgal articles (Fig. 1); representative of a shift that has seen the common ground emerge for applications of both macroalgae and microalgae under the banner of the ISAP. There had been somewhat of an historical divide in the research across these two classifications, but ISAP provides a unique framework where both of these fields of research can exchange ideas and learn from each other. Indeed the promotion of both microalgal and macroalgal applications has a bigger voice than each on their own; microalgae being smaller in production biomass but bigger on research effort in recent years, while macroalgae are a significant global crop in both biomass and value.

Diverse algal applications were well represented across the fields of research and endeavour of the four eminent keynote speakers. To open the event, Prof Paul Falkowski of Rutgers

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Fig. 1 The representation of algal taxa and the distribution across applications as published in this special volume of the Journal of Applied Phycology for the 5th Congress of the International Society for Applied Phycology

University, USA, a biological oceanographer, presented a grounding summary on the difficulty in realising algal biofuels from the perspective of global carbon budgets and nutrient efficiencies. In contrast Dr. Anicia Hurtado from the Southeast Asian Fisheries Development Center, Tigbauan, Philippines, provided a summary of the staggering rise of the red macroalgal production in the Asia-Pacific, and the historical journey of this realised, and large, algal industry which is of great socio-economic importance in Asian-Pacific nations. The convener of the 2008 ISAP Congress in Ireland, Dr. Stefan Kraan, has since left his academic posting and pursues commercial opportunities that are emerging from increasing scientific evidence of the importance of seaweeds in human and animal nutrition and health in his role as Scientific Director of Ocean Harvest Technology, Ireland. Dr. Kraan presented a through overview of this evidence and an increasing sophistication of seaweed products. Finally and locally, Prof. Peter Steinberg from the University of New South Wales and the Sydney Institute of Marine Science, highlighted the latest knowledge from the chemical and microbial ecology worlds in which macroalgae exist - the cryptic signalling molecules - and the extent of relevance of this knowledge from understanding the effects of climate change stressors on seaweeds, to restoring seaweed habitat and the commercialisation of macroalgal metabolites.

An addition to the Congress program were two public outreach events that served to demonstrate to phycologists and the public alike just how relevant algae are to society. ISAP2014 opened with the Algae Gastronomy Cocktail Event – *Science meets the Chefs* - where algae supplied by Acadian Seaplants Limited, ALGAPLUS (Portugal), allma and a4f (Portugal), Earthrise (USA), Kai Ho Tasmanian Sea Vegetables, Marinova and Venus Shell Systems (Australia) were served in canapés selected from a collection of recipes by 18 prominent Australian chefs especially created for the event

and published in the book ‘Coastal Chef’ (Tinellis 2014). This follows a study at the 2011 ISAP Conference in Halifax, Canada, that identified a surprisingly low consumption of algae as a regular dietary practice (Edwards et al 2012). Two nutritionally focused experts, Dr. Prannie Rhatigan from Ireland and Dr. Rosemary Stanton from Australia, also presented their perspectives on the role of algae in addressing chronic nutritional deficiencies in modern diets.

In the second event, the often controversial world of algae for biofuels was debated in a public forum, sponsored by James Cook University College of Marine and Environmental Sciences, with a panel of well-respected experts from diverse fields: Assoc. Prof. John Benemann (University of California Berkeley, USA), Prof. Michael Borowitzka (Algae R&D Centre, Murdoch University, Australia) Prof. Paul Falkowski (Rutgers University, USA), Assoc. Prof. Kirsten Heimann (James Cook University, Australia), Dr Deborah O’Connell (CSIRO Energy Flagship Sustainable Biomass Production research team, Australia), and Prof. Susan Pond (Chair of the Australian Initiative for Sustainable Aviation Fuels). The facilitator was Adam Spencer, a prominent Australian science personality in radio and television. This event was open to the public and a poll was held for the audience entering and then again upon leaving the debate event on their view on the future of algal biofuels. The results of this poll were enlightening about the hope for sustainable biofuels from algae, contrasted with the more sobering challenges that we face to realise such a future.

Finally, the BioMarine think tank provided a discussion forum on the commercialisation challenges for phycopolymers in health and medicine, and the CSIRO hosted a workshop group at the Sydney Institute of Marine Science to discuss the role of culture collections in supporting the knowledge and applications of algae.

Three eminent scientists were recognised by the Society at the conference dinner for their continuous and outstanding

contributions to the field of Applied Phycology. They were Dr Ahma Belay of Earthrise Nutritionals LLC, USA; Prof. Sammy Boussiba of the Ben Gurion University, Israel, and Prof Mario Tredici of the University of Florence, Italy.

The following awards were also made:

Best Oral Presentation - Patricia Matanjun (Malaysia)

P. Matanjun¹, S. Mohamed², N.M. Mustapha², K. Muhamad², P.T. Chan¹.

¹Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia; ²Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Chemical composition, antioxidant and hypolipidaemic properties of Malaysian tropical seaweeds powder.

Best Poster Presentation - Asterio Sánchez-Mirón (Spain)

A. Sánchez-Mirón, L.L. Rosales, J.J. Gallardo Rodríguez, F. García Camacho, E. Molina Grima.

University of Almería, Almería, Spain

CFD-based assessment of the fragility of toxic dinoflagellates microalgae in a contractional flow device.

Best Student Oral (Microalgae) - Vidhyasri Subramaniyam (Australia)

V. Subramaniyam¹, S.R. Subashchandrabose^{1,2}, T. Palanisami^{1,2}, M. Megharaj^{1,2}, Z. Chen^{1,2}, R. Naidu^{1,2}.

¹Centre for Environmental Risk Assessment and Remediation, University of South Australia, Adelaide, Australia; ²CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia

Chlorococcum sp. MM11- a novel phyconanofactory for the synthesis of iron nanoparticles.

Best Student Oral (Macroalgae) - Yao Xian Chin, (Malaysia)

Y.X. Chin^{1,2}, P.E. Lim^{1,2}, C.A. Maggs³, S.M. Phang^{1,2}, Y. Sharifuddin^{1,2}, B.D. Green⁴.

¹Institute of Ocean and Earth Sciences, University of Malaya, Kuala Lumpur, Malaysia; ²Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia; ³School of Biological Sciences, Queen's University Belfast, Belfast, United Kingdom; ⁴Institute for Global Food Security, School of Biological Sciences, Queen's University Belfast, Belfast, United Kingdom

Malaysian seaweed species with potential antidiabetic activity.

Best Student Poster (Microalgae) - Priscilla Rajakumar (United Kingdom)

P.D. Rajakumar, S. Purton.

Institute of Structural and Molecular Biology, University College London

An oral vaccine candidate for infectious bronchitis virus through chloroplast engineering of *Chlamydomonas reinhardtii*.

Best Student Poster (Macroalgae) - Oh Jae-Young (Republic of Korea)

O. Jae-Young, H.S. Kim, E.A. Kim, Y.J. Jeon.

Department of Marine Life Sciences, Jeju National University, Jeju, Republic of Korea

Zebrafish as a model for high glucose-stimulated oxidative stress associated with diabetes and the antioxidative effect of phlorotannins, marine algal polyphenols.

We also thank the sponsors and Industry partners for their support which helped make ISAP2014 a reality and an experience; Aquation Pty Ltd, Bioline Pty. Ltd., Blue Biotech Shoalhaven, CSIRO, Fresh By Design, James Cook University, Muradel Pty Ltd, NSW Trade and Investment, the Rural Industries R&D Corporation, Springer Science + Business Media (who also sponsor the ongoing access to the Journal of Applied Phycology for ISAP members), and Walz Australia Pty. Ltd.

As the Chair of ISAP2014, it is with great thanks to the 2014 ISAP Local Organising Committee, comprising Dr. Susan Blackburn, Prof. Michael Borowitzka, Dr. Helen Fitton, Assoc. Prof. David Lewis and Dr. Sasi Nayar that the groundwork was laid and a fairly and democratically planned ISAP Congress was achieved. The International Advisory Committee comprising the ISAP Executive as well as ISAP members totalling 31 individuals from 16 nations was invaluable in selecting the session topics, recruiting high quality presenters as well as chairing the sessions. The next ISAP Congress for 2017 will be hosted by France in Nantes; I look forward to the continuing development of applied phycology.

Reference

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- Tinellis C (ed) (2014) Coastal Chef. Harbour Publishing House, Ulladulla, p 258