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Message from the Vice-President, Dr. Céline Rebours

Dear ISAP Members,

After a year full of challenges, it is now my pleasure to announce the publication of the second issue of ISAP Newsletter for 2021.

The ISAP 2021 Conference has been streaming for 3 months during which all presentations, the opening ceremony, special sessions, panel discussions, student & young researchers' week and the plenary lectures including associated Q&A sessions were made available 'on demand'. While the theme of ISAP2021 conference was chosen to reflect changes in our society and explore the benefits of algae for all humankind, the virtual format was designed to answer the challenges posed by the restrictions resulting from the Covid-19 pandemic. This virtual conference however managed to attract participants from over 46 countries! On Behalf of the ISAP foundation, I wish to warmly thank The Local Organising Committee and in particular Professor **Makoto M Watanabe**, **Emi Kusuda**, **Mieko Noguchi** and **Kohei Atsuji** for their intense work and dedication to the success of the 7th ISAP congress.

Further, the ISAP General Assembly was successfully held online for the first time on June 15th. The ISAP Executive committee presented the work undertaken over the past 4 years and the transformation of the governance of the society. We warmly thank the subscribers who dedicated time to participate in this meeting and in the process of voucher the transformation. The summary of the GA results was already published in our previous newsletter edition. If you wish to know more about the new structure and governance, may I invite you to consult the ISAP guidelines.

As one of my last actions as the ISAP President and first as Vice-President, we successfully organised a workshop on "Revealing algae biotechnological potentials to contribute to sustainable blue growth in Mediterranean". All ISAP subscribers can still view the course content and all the video presentations in the subscriber portal.

With the start of the new triennium of the Society and on behalf of the 2017-2021 EC members, I would like to welcome the new Executive committee! You can find more about the team elected in July 2021 on our webpage. This great team will run the affair of the foundation until our next congress in 2024 in held in Porto, Portugal from June 18th to June 22nd, 2024. Professor Vitor Vasconcelos from CIIMAR at the University of Porto will be serving as the chair of local organizing committee. More information about the ISAP2024 will be provided in the next issue of ISAP Newsletter and on our webpages. Please stay tune!

During the first half of 2021, the EC members continued to prepare our society for the next triennium to sustain and grow its activities after our triennial conference. Some of the 2017-2021 EC members continue today to support our new 2021-2024 EC members in ensuring a smooth transition to ensure business continuity of the society. I would like to specifically thank our communication coordinator **Fiona Moejes,** our training workshop coordinator, **Roberto De Philippis**, our Sponsor and Promotion coordinator, **Qiang Hu** and our Dutch representative **Job Schipper**, for their remarkable efforts in streamlining these primordial activities for our society. I would also like to express my deepest gratitude to **Sasi Nayar** for preparing this last issue of the Newsletter of his term as editor-in-chief and hope you will enjoy reading this edition!

I would like to remind you to ensure that your ISAP subscription is still current. As a subscriber your support is critical in ensuring the activities of the society. Subscriber fees support the maintenance of the website, funding workshops and training programs in algal biotechnology as well as sponsoring student travel grants. We would also appreciate receiving a donation were possible. For further details please consult our webpage or contact our new ISAP Treasurer **Jonalyn Mateo**.

Finally, I would like to emphasize that ISAP operates solely on the volunteer work of its executive members and subscribers. This means that all subscribers can participate in various activities of the society. We would appreciate receiving your ideas, feedback on ISAP, news, and announcements of interest for ISAP subscribers. **We would also be delighted to receive articles for our 2022 issues of the newsletter.** The deadline for submission is March 30th, 2022. For further details, please contact either the ISAP Assistant President or I (details can be found at the end of the newsletter).

On behalf of the 2017-2022 Executive committee, I wish the 2021-2024 EC and all the ISAP subscribers, a safe, healthy, and prosperous new year!

Kind regards,

Céline Rebours
Vice-President, International Society for Applied Phycology

Message from the Editor, Sasi Nayar

Dear Colleagues,

There are mixed emotions as I pen this final editorial as the outgoing Editor of the newsletter. Since joining the Editorial committee in 2014, it has been a steep learning curve and a keen desire to improve the newsletter. What made the process easier for me was all the mentoring support I received as I assumed the role of the Editor in 2018. Noteworthy achievements of our team include:

- registering the newsletter with the National Libraries of Australia and obtaining an ISSN number,
- regularising the publication of the newsletter by bringing out two issues a year,
- developing the guidelines for article submission by authors and,
- published 8 issues from 2018 – 2021

We hope the new committee can take on from where we leave and improve it even further.

There are many individuals to thank, especially those that contributed articles to the newsletter as well as fellow committee members viz., Amha Belay, Stephen O'Leary, Roberto De Philippis, Céline Rebours, Qian Hu, Sammy Boussiba, Alexandra Busnel and Nghiem Xuan. I would also like to acknowledge Dr Pia Winberg who introduced me to the ISAP family as we hosted the 5th ISAP Congress in Sydney, Australia in 2014.

This issue was made possible with the kind assistance of Fiona Moejes, Céline Rebours and the editorial review team and I thank them for their help. The first article by Duan et al., highlights the development of a novel Spirulina production system, the Smart Cyano Glucosylglycerol Polygeneration (SCGP, for co-production of glucosylglycerol. The authors report Glucosylglycerol has wide ranging applications in cosmeceutical, nutraceutical, and pharmaceutical industries. The second article by der Schueren et al., is a summary of an EU funded project called 'Herewear', where bio-based textiles will be developed from biomass sidestreams, an output of the seaweed biorefinery process. The proposed technology will not only valorise the cellulose-rich side-streams but is likely to replace polyester and cotton fibres that are regarded to be environmentally unsustainable. This is followed by the third article by Ventura et al., who provides an insight into the fledgling seaweed industry in Brazil. The article also delves into how their research group collaborates with industry groups in developing a new industry in the province of Santa Catarina in Brazil. The final article is a report on the 7th Annual Conference of the Microalgae Branch of the China Algae Industry Association (CAIA) held from the 29 April to 1 May 2021 at Wuhan in China.

Lastly, I take this opportunity in wishing the new EC and the Editorial Committee the very best.

Thanking you all

Sasi Nayar, Outgoing Editor of the ISAP Newsletter

Technology development of Spirulina cultivation for production of glucosylglycerol

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Summary

Conventionally, *Spirulina* is harvested after cultivation and processed into *Spirulina* powder, which is further refined into end products for consumers. Glucosylglycerol (GG) is a conjugated molecule of glucose and glycerol, which is critical for the growth of cyanobacteria under stress conditions. GG has many excellent properties and is widely used in the field of cosmetics and health care products. We first developed a *Spirulin*a cultivation technology that can efficiently synthesize GG. Through special cultivation conditions, the originally dormant GG biosynthesis pathway in Spirulina cells is activated. High-quality GG can be produced continuously and stably under industrial production conditions. High-value GG production would not affect the yield and property of Spirulina biomass, and therefore increase the gross profit of Spirulina industry significantly.

Introduction

Spirulina is one of the few microalgae that can be cultivated outdoors at scale. It is a rich source of protein, carotenes, chlorophyll, and phycocyanobilin. Spirulina strains have been certified Generally Recognized as Safe (GRAS) by the United States Food and Drug Administration. Traditionally, Spirulina biomass post-harvesting is processed into powder and further refined into flakes or capsules for nutritional supplements (Lafarga et al., 2020). Glucosylglycerol (GG) is a heteroside consisting of a glucose and a glycerol linked by a glycosidic bond. GG plays an important role in cyanobacterial adaptation to stress conditions (Klahn and Hagemann, 2011). As a biologically active compound, GG exhibits potentially promising properties such as moisturizing effects and non-carcinogenicity (Schrader et al., 2012). Therefore, GG is widely used in the field of cosmetics and health care products. Among the various configurations of GG, 2-α is a natural stable configuration with multiple physiological activities (Takenaka et al., 2000). At present, chemical and enzymatic synthesis are the mainstream technologies for GG production. The chemical synthesis of GG has some disadvantages, such as long reaction time, low synthesis efficiency, high cost, and low stereoselectivity. Enzymatic synthesis of GG creates a mixture of by-products, the separation of which is cost intensive (Takenaka and Uchiyama, 2000). Therefore, innovative technologies are required to improve GG production (Tan et al., 2016).

GG production through SCGP technology

We took the lead in developing an innovative technology called Smart Cyano Glucosylglycerol Polygeneration (SCGP) that enabled GG production by Spirulina during cultivation. In conventional culture of Spirulina, GG is not synthesized. However, with SCGP technology, high-value GG can be produced under certain conditions. SCGP technology has significant economic advantages over conventional technology as outlined below:

1. High-value GG accounts for 15-20% of the dry weight of Spirulina powder with consistent yield and biochemical properties (protein content ~ 65%),
2. The physical extraction of GG does not use organic solvents and is regarded to be environmentally friendly, and,
3. The high-purity GG product (>99.7%) has a single natural 2-α configuration.

So far, GG production from laboratory proof-of-concept to large-scale mass production trials have been completed (Figure 1). Two Spirulina production facilities are currently operational in Qingdao and Yancheng in China. Furthermore, a Good Manufacturing Practice (GMP) certified workshop with a footprint of 1,000 m2 for product refining is also operational in Qingdao in China (Figure 2). GG products with single 2-α configuration and high purity is now commercially available.

Figure 1: GG production from laboratory proof-of-concept scale to large-scale mass production

Figure 2: The GMP certified GG refining workshop

Conclusions

Compared to traditional Spirulina products, GG has higher value and a larger market. GG production could increase profitability of the Spirulina industry and play a pivotal role in modernising the traditional Spirulina cultivation sector. The development of SCGP technology will not only promote the Spirulina industry but also commercialization of GG.

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HEREWEAR: Empowering local, bio-based textiles and circular economy

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The use of bio-based materials as well as reuse and recycling are emerging practices in the textile sector. The EU funded HEREWEAR project aims at the creation of a European ecosystem for locally produced textiles and clothing made from bio-based resources and contribute to the circular economy. Cellulose fibres will be developed from locally sourced bio-based residues such as those obtained from processing seaweed.

Large quantity of affordable clothing manufactured in developing countries these days are far connected from the brands that create them under appalling labour conditions and with limited concern for the environment. Vast majority of clothing is made of two types of fibres - polyester and cotton. These fibres, however, have considerable disadvantages and shortcomings. Polyester is oil-based and mainly sourced from the Middle East, whilst cotton is mostly grown in countries such as India. Growing cotton has a large environmental impact due to intensive use of pesticides and high-water consumption. Moreover, small fibre fragments are released from the garments made of polyester fibres during washing and wearing. These microplastics end up and accumulate in soil and water, contributing to the well-known "plastic soup". The textile sector is regarded to be the second largest contributor of microplastics.

The HEREWEAR project aims to create an EU-based circular bioeconomy for locally manufactured textiles and clothing made from bio-based resources. This will be realised by a holistic approach covering all manufacturing steps as can be seen in Figure 1.

Bio-based polyester yarns will be developed based on the melt spinning of biopolyester blends. To replace cotton, cellulosic material will be extracted from one of the many biowaste sources such as straw, manure and seaweed. This cellulosic material will be processed by wet spinning to textile filaments. Three representative commercially relevant seaweeds from Rhodophyceae, Phaeophyceae and Chlorophyceae will be chosen for the trials. We aim to valorise the left-over cellulose-rich residues after extraction of valuable components for pharmaceutical, food and feed applications. The seaweed biorefinery concept is based on extraction of seaweed hydrocolloids, with co-production of cellulose to be developed further. This will be achieved by evaluating the effects of hydrocolloid extraction on the yield, purity and properties of the residual cellulosic material and by further optimising the process to meet cellulose quality requirements for wet spinning.

Further, emerging sustainable technologies for yarn and fabric production and for bio-based coating and colouring will be developed and piloted at semi-industrial scale. We also aim to significantly reduce the microfibre release via measures along the textile manufacturing process. In addition, we will maximize the sustainability and circularity of our clothing by connecting regional micro-factories through provision of platform-support and networked production resources. Guidelines will be provided to support the design of fashion goods; with focus on bio-based materials and reuse/recycling. Garment prototypes for streetwear and corporate clothing, made from the bio-polyester and cellulose yarns, will demonstrate the HEREWEAR concept.

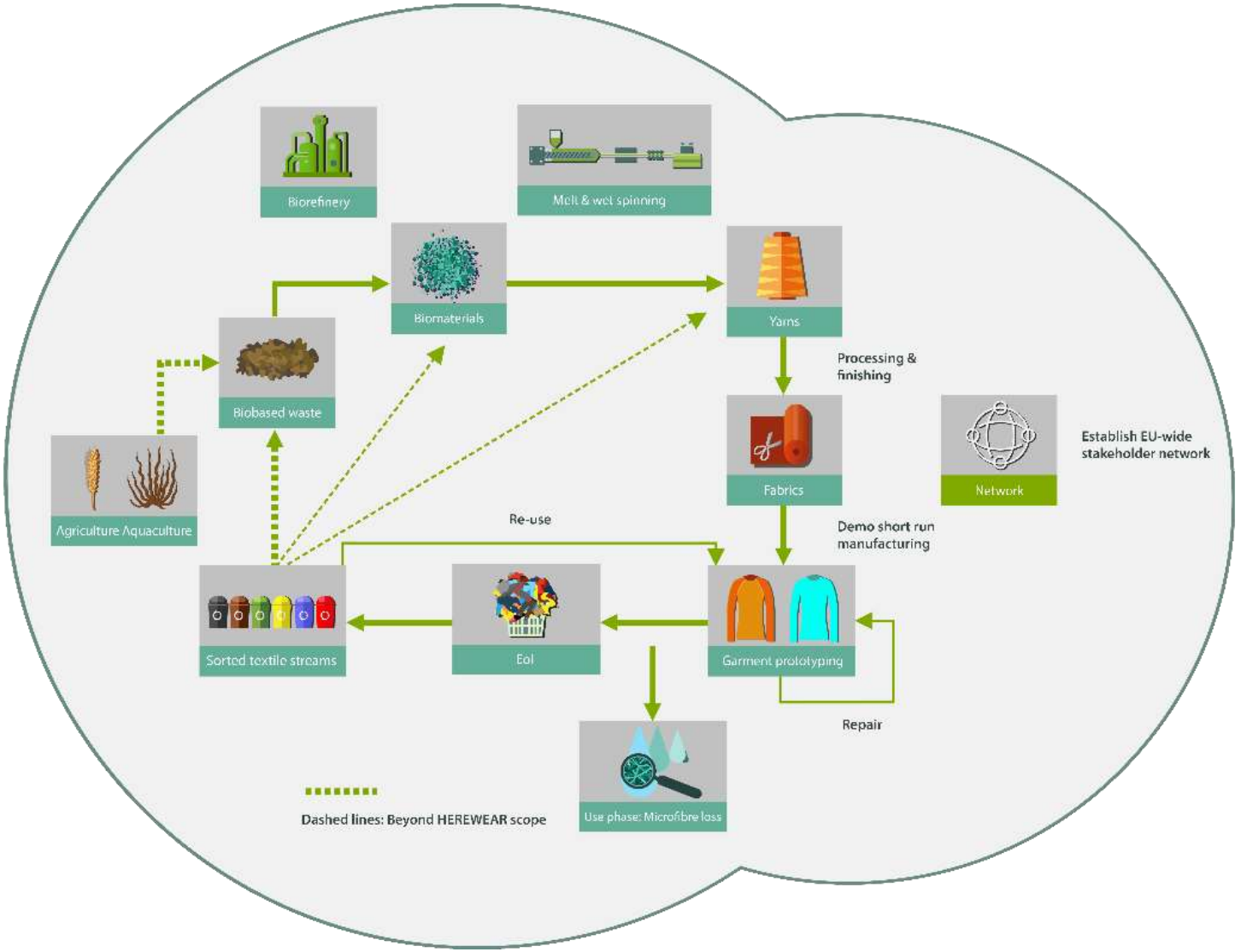

Figure 1: Circular value chain of HEREWEAR

The HEREWEAR consortium is strongly SME driven, that includes 8 SMEs and a large enterprise. The consortium is further supported by 6 research organizations. The collaborative approach adopted by HEREWEAR brings together the expertise and infrastructure from academic, applied research and industry based in 9 different EU countries. This is further complemented with the support of a US SME. HEREWEAR is a Horizon 2020 project that commenced on the 1st of October 2020. This 48-month project is being co-funded by the European Union. It is coordinated by Centexbel, the Belgian research centre for textiles and plastics. TNO will be responsible for the biorefinery aspect.

Conclusions

The HEREWEAR project aims to develop local, circular and bio-based clothing. Seaweed is seen is one of the promising bio-based sources for the development of cellulosic textile materials.
For further information about the HEREWEAR project, please visit https://herewear.eu/

Acknowledgement

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Developing seaweed cultivation in Santa Catarina, Brazil

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The Brazilian coastline extends over 7,367 km and offers wide climatic diversity. These include the tropical waters extending to subtropical waters, that provides a habitat for over 850 native species in fifteen Brazilian coastal states. Whilst many of these species show potential for aquaculture, further research is required.

Worldwide, several seaweed species are used in food and agriculture, mainly as biofertilizers, mineral sources, animal feed, biomass, bioethanol, and even as a source of phytohormones. However, in Brazil, the primary use of seaweeds is for phycocolloids used as texturing, gelling and thickening agents. These phycocolloids are also reported to exhibit antiviral, antibiotic, and antimycotic properties, and is therefore used in pharmacological and cosmetic industries. Currently, no industrial production of phycocolloid exists in Brazil, as the result the country imports phycocolloids to meet market demands.

In the 1970s, pioneering seaweed research involved the identification of various seaweed taxa and gained insight into their life history (Oliveira Filho, 1977). Despite the diversity of species and efforts to develop their farming, the cultivation of native seaweeds was not fully developed. Over time, research focused on the utilisation of seaweeds and new products that could be derived from both native and introduced species. The warm water mass in the Brazilian Northeast appeared appropriate for the cultivation of *Gracilaria* spp. At the same time, researchers focussed on developing cultivation technology for other species such as *Sargassum* spp., *Hypnea* spp., and notably *Ulva* spp. In the South and Southeast regions, lower water temperatures coupled with extensive effort on strain selection facilitated the responsible introduction of *Kappaphycus alvarezii* and its cultivation at sea (Bulboa & Paula, 2005; Hayashi et al, 2010).

The State of Santa Catarina is Brazil's largest mariculture producer, with a production of 13,000 tons of molluscs including mussels, oysters, and scallops valued at over US $15 million in 2019 (Giehl et al., 2020). Additionally, this is the only state where aquaculture zones are regulated. Because of this, seaweed cultivation has been carefully planned by institutions such as the Seaweed Laboratory of the Marine Shrimp Laboratory (LCM Macroalgas) in Federal University of Santa Catarina (UFSC) and Santa Catarina Agricultural Research and Rural Extension Enterprise (EPAGRI). Both institutions proactively support the development of mariculture by actively working with regional producers through research and extension.

Since 2008, UFSC and EPAGRI formed a partnership to implement the cultivation of *K. alvarezii* in the region (Figure 1). For over a decade, both institutions have produced research and scientific publications that validate the social, economic, and environmental safety record of the development activity. Alongside these institutions, AMASI - Associação de Maricultores do Sul da Ilha (Mariculture Producers Association of Southern Florianopolis) has supported the request to legalize these species.

Figure 1: Longline cultivation of Kappaphycus alvarezii in Sambaqui Beach, Florianopolis

In January 2020, the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) authorized commercial cultivation of *K. alvarezii* in the State of Santa Catarina. This offers significant potential for the cultivation of *K. alvarezii* in the state, if undertaken to complement the local, well-established, artisanal, shellfish mariculture industry (Santos, 2014). When integrated with shellfish, it will provide a complementary source of income to producers who are unable to harvest during periods of toxic microalgae blooms. *K. alvarezii* is cultivated from spring to autumn, providing 3-5 annual production cycles, with growth rates of up to 5.12% day^{-1} (Santos, 2014).

In the past 11 years, LCM Macroalgas has concentrated their efforts in establishing cultivation technologies for *K. alvarezii*, and more recently for *Ulva* spp. This work involves in vitro and tank cultivation, supplementation of inorganic carbon, ploidy of strains, IMTA (Integrated Multi-trophic Aquaculture), mechanization, besides the use of seaweed extracts as bio-stimulant for commercial crops and additive for animal feed (Table 1).

Table 1: Research developed by LCM Macroalgas, with collaboration of other institutions.

Species	Research topics	Experiments	References
Kappaphycus alvarezii	In vitro cultivation	• Acclimation methods and nutrient regime • Inorganic carbon supplementation	Hayashi *et al.*, 2010; Ventura *et al.*, 2020.
	Ploidy identification and polyploid strain	• Standardization of methods for ploidy analysis with flow cytometer • Ontogenesis and ploidy determination of tetraesporophytic strain • The use of phytoregulators in micropropagation	Zitta *et al.*, 2012a; Zitta *et al.*, 2012b.
	Fertilization with shrimp effluents (BFT)	• Density and nutrient regime for cultivation in biofloc effluents • Characterizationof carrageenan and other bioactive compounds from seaweed cultivated in biofloc effluent	Pires *et al.*, 2021; Pedra *et al*., 2017.
	Cultivation in 'at-sea' farms	• Evaluation of the commercial cultivation in Santa Catarina State • Effects of biofloc effluent nutrient pulse-fed as a strategy prior cultivation at the sea	Hayashi *et al*., 2010; Martino *et al*., 2021.
Species	**Research topics**	**Experiments**	**References**
	Animal feed additive	• Effects of carrageenan on growth and white spot virus resistance in white-legged shrimp (*Litopenaeus vannamei*)	Mariot *et al.*, 2021.
Ulva spp.	Integrated Multi-trophic Aquaculture (IMTA)	• Cultivation of *U. fasciata* integrated to white-legged shrimp (*L. vannamei*) and mullet (*Mugil liza*) • Bioremediation of biofloc effluent using *U. lactuca*	Legarda *et al*., 2021a; Martins *et al.*, 2020.
	Animal feed additive	• Incorporation of *U. fasciata* in feed for yellowtail jack (*Seriola dornalis*) • Evaluation of *U. lactuca* as a feed ingredient for white-legged shrimp (*L. vannamei*)	Legarda *et al.*, 2021b.
Other species	Animal feed additive	• The use of *Ascophyllum nodosum*, *S. filipendula* and *Undaria pinnatifida* as feed additive and probiotic for white-legged shrimp (*L. vannamei*)	Schleder *et al.*, 2020.

Among the native taxa, *Ulva* spp., popularly known as sea lettuce, presents wide ranging commercial opportunities. In the nutritional field, *Ulva* spp. stands out for having a diverse range of nutrients and bioactive compounds such as essential minerals, antioxidants, amino acids, and fatty acids (Roleda et al., 2021; Kazir et al., 2019), that make it attractive for human consumption and as a feed. Besides, one of the highlighted compounds of *Ulva* spp. is the polysaccharide Ulvan. This polysaccharide has attracted the attention of the pharmaceutical industry for its anti-inflammatory, antioxidant, anticancer, bactericidal, antiviral, and anticoagulant properties, among others (Kidgel et al., 2019). *Ulva* spp. is regarded to be an excellent candidate for bioremediation, IMTA systems, and for biofuel production as it is an efficient nutrient scrubber is fast-growing (Shpigel et al., 2019; Gao et al., 2018).

The current global focus is to undertake sustainable farming of seaweeds. These is published literature on the application of *U. lactuca*, *U. fasciata*, and *U. ohnoi*, in IMTA and biofloc systems (BFT) (Legarda et al., 2021a, b; Martins et al., 2020). The research focus on seaweed domestication, scaling up mass cultures from the laboratory large tanks and ponds, improving productivity, and the remediation potential of the culture media when co-cultivated with marine shrimps and fishes (Figure 2). The inclusion of these seaweeds in fish and shrimp feed have also been evaluated.

Figure 2: Experimental cultivation of Ulva spp. at the LCM Macroalgas undertaken in 2019.

Conclusions

The state of Santa Catarina offers significant potential for the development of seaweed farming due its favorable natural conditions and a well stablished local mariculture industry. This manuscript highlights the significance of collaboration between various researchers, farmers, members of the public and industry groups in advancing this industry in Brazil.

Acknowledgments

This is a collaborative work between undergraduate and graduate students encouraged by our professor and mentor Dr. Leila Hayashi who keeps us united and strong as a team during the COVID-19 pandemic. We thank the UFSC for providing high-quality public education, and EPAGRI as a partner in our tasks.

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Post congress report: The 7th International Society for Applied Phycology Conference: Algae for all humankind!

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As the global population grow, so does the demand for resources. New approaches to mitigate the effects of climate change and anthropogenic impacts are urgently needed to avoid further depletion and sustain a healthy planet. The 2015 Paris Climate Agreement identified the transition to sustainable development as a major priority for the global community. The harnessing of marine resources for a resource-efficient and sustainable bioeconomy is a crucial in meeting the growing demand.

Algae are an underutilized marine resource that offers significant promise in addressing many of the challenges faced by our society today. Unlocking the true potential of algae will require innovative approaches to support the economy, generation of new business models and establish start-ups. There is a need to proactively work towards the demands of existing and new markets for all our products, seeking new alliances in international trade and consumer support. Meanwhile, the challenges of climate change and scarcity of natural resources are urgent and require our full attention in respect to and appreciation of our ecosystems. Previous Congresses of the International Society for Applied Phycology (ISAP) have explored the applications of algae, development of new algal biotechnological advances as well as the potential development of innovative products in a commercial, remedial or regulatory context. In 2017, the theme of ISAP was chosen to reflect the change in our society and offer an event to explore the *benefit of algae for all humankind*.

ISAP Congresses offer a platform for researchers and industry with a focus in applied phycology to meet every three years. However, 2020 took an unexpected turn due to the COVID-19 global pandemic. After much consideration and deliberations, the ISAP Executive Committee together with the Local Organizing Committee in Japan decided to postpone the 7th ISAP Congress to the following year and hold it as a virtual conference. This decision ensured the continuity of our activities whilst keeping the health and wellbeing of those who would have attended the Congress in mind.

The 7th ISAP may therefore have been one of the toughest congresses ever to be organized. The preparation for the congress commenced in 2017 with the website launched in early 2019. Calls for registration and abstracts opened the following August. At that time, there was absolutely no doubt to welcome all the participants to Japan in April, together with the Olympics. Unfortunately, that was not to be as the pandemic spread widely in Asia towards the end of 2019. By February 2020, the LOC had to decide on whether to organize the conference as scheduled at the venue, or to cancel or postpone further. We decided on postponing the congress to May 2021 and change the venue to from Chiba to Tsukuba. By February the situation worldwide was not severe. However, by April 2020 many countries around the world went into lock down with limited opportunity to travel. This situation persisted longer than expected. By September 2020, there was little hope of the situation improving. The Local organizing committee and the ISAP Executive Committee had to make the tough decision of organizing this congress in a fully virtual format - first in the history of ISAP. The 7th ISAP Conference was therefore re-scheduled to May 14 to August 13, 2021.

The next challenge was to organize the virtual conference, unfamiliar to most. There was also a requirement to maintain the program from the physical format unchanged, whilst adding more online-specific content. A decision was made to hold it in a hybrid format comprising both live and on-demand content. To encourage better interaction among the participants, 44 live Q&A sessions were added to the program that enabled all the oral session panelists the opportunity to discuss their work with the virtual audience. One significant benefit of this format was, what would have been a 5-day physical meeting format being extended to over 3 months, providing all participants the opportunity to view the online content or participate in all the live sessions, pre-recorded presentations on demand, Q&A sessions at their leisure.

ISAP2021 conference included a panel discussion, 12 plenary lectures, 9 special sessions, 2 workshops dedicated to early-career researchers, and over 230 oral and e-poster presentations. ISAP 2021 also featured a virtual exhibition hall, where vendors and media partners had a dedicated place online to present their products, links to their website and have a chat-box to interact with attendees and set up business-to-business (B2B) meetings. Virtual tour of Japanese seaweed and microalgae facilities were also organized. E-posters could also be reviewed directly with the authors through a chat system. Exchange of emails and the organization of one-to-one virtual meetings were also encouraged.

Finally, the organizers would like to take this opportunity to acknowledge all sponsors and donors (https://isap2020-phycology.org/sponsors.html). We would specially like to acknowledge European Algal Biomass Association (EABA), Global Seaweed Star Grant and Springer and AIIC that supported the early-career researchers' activities and in doing reached out to the next generation of researchers that we hope will continue to advance the field of applied phycology.

At the end of the congress, we established participation by 362 attendees from 46 countries that included 97 students. Our thanks are due to all participants who patiently put up with the challenges posted by a virtual congress. Last but not the least, we would like to acknowledge the ISAP EC members and LOC members, who worked tirelessly to host the first ever ISAP online conference!

We sincerely hope that this conference met the expectations besides contributing to learning and new friendships. We hope that you stay safe and that we will all see you in person, in Porto, Portugal from June 18th to June-22nd, 2024.

Conference report: The 7th Annual Conference of the Microalgae Branch of the China Algae Industry Association (CAIA), 29 April – 1 May, Wuhan, China

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The 7th Annual Conference of the China Algae Industry Association (CAIA) jointly organized by the Microalgae Branch and Jianghan University. It took place at Jianghan University from 28 April to 1 May 2021 in Wuhan, China. Since the COVID-19 pandemic is still prevalent in the country, the conference was held in a hybrid format comprising both online and in-person attendance. The theme of this conference was transforming new knowledge in phycology and microalgal biotechnology into advanced green technology to create a greener, sustainable, microalgae based bio-economy. The participants had extensive and in-depth exchanges on the following three topics:
1) the research on microalgae bio-economic development strategy,
2) the "jam neck" technology and new technology applications, and,
3) the microalgae industry development strategy as part of the "Fourteenth National Five-Year" Plan.

In addition to the parallel sessions, a special session on microalgae-based protein substitutes and new markets and opportunities for microalgae was held in the evening on 29 April. A roundtable discussion between entrepreneurs and scientists focusing on technical standards and industry-academia interactions and collaboration, as well as policy and regulatory requirements of microalgae-based products was held in the evening on the 30 April. The Conference had a total of 45 oral and 50 poster presentations.

News and Views

A warm acknowledgement to all participants of the 7th International Society of Applied Phycology Congress (ISAP2021)

ISAP2021 was a HUGE success thanks to the outstanding contribution from all the participants, presenters and organisers!

Organized and sponsor by:

ISAP2021 in a snapshot

Participants Ordinary/Student Corporation/Academic & Government	362 265/97 243/119
Countries	46
Platform Access (14 May - 27 July)	6996
Live Session Participants	944
Social Media Followers Twitter Facebook Instagram	 161 423 234

Conferences and Events

EABA technical Webinar: Innovative Start-up, February 2022, online

EABA workshop are promoting mutual interchange and cooperation in the field of biomass production and use, including biofuels uses and all other utilizations.

Further information: https://algaeworkshops.org/

Europe Algae Summit 2022, 27 – 28 April 2022, Reykjavik, Iceland

The conference will bring together key players within the algae industry including leaders from food, feed, nutraceuticals, pharmaceuticals and cosmetics across the globe to gain a deeper understanding of recent industry developments and economically viable applications and benefit from excellent live networking opportunities. This edition will focus on improving production methods, both from an efficiency and a sustainable perspective, with case studies from key players of each segment bringing forward their experience. The conference will also take an in-depth look into the most recently developed technologies, the potential of algae as biomaterials, as well as the way to get algae to the next level, on a standards, awareness and marketing levels. The various conference topics will be discussed through case studies sessions and interactive panel discussions, to ensure a positive exchange with all industry actors involved.

Further information: https://www.wplgroup.com/aci/event/european-algae-industry-summit/

Seagriculture 2022, 29 – 30 June 2022, Bremerhaven, Germany

The Seagriculture conference gathers top speakers, who will share their know-how within seaweed for feed, food, offshore cultivation, biorefinery of seaweed and much more. Don't miss this unique opportunity to network with colleagues from all over Europe within industry and research.

Further information: https://seagriculture.eu/

UN Ocean Conference 2022, 27 June – 01 July 2022, Lisbon, Portugal

The Ocean Conference, co-hosted by the Governments of Kenya and Portugal, comes at a critical time as the world is seeking to address the many of the deep-rooted problems of our societies laid bare by the COVID-19 pandemic and which will require major structural transformations and common shared solutions that are anchored in the SDGs. To mobilize action, the Conference will seek to propel much needed science-based innovative solutions aimed at starting a new chapter of global ocean action.

Further information: https://www.un.org/en/conferences/ocean2022

Aqua Nor, 22 – 25 August 2022, Trondheim, Norway

Since 1979, Aqua Nor has been an important international meeting place for the aquaculture industry, and it is today the world's largest aquaculture technology exhibition. During Aqua Nor, numerous seminars, mini-conferences, lectures, debates and presentations are held. During the exhibition, visitors and exhibitors alike can participate in various social events both during the day and in the evening. The conditions are perfect for meeting old friends as well as new contacts and customers in an informal setting.

Further information: https://aquanor.no/en/

Aquaculture Europe 2022, 27 – 30 October 2022, Remini, Italy

Climate change, depletion of natural resources, loss of biodiversity, food security and safety, environmental pollution and waste represent important sustainability challenges for further expansion of European aquaculture and the ambition of the European Green Deal and the Farm to Fork Strategy. It will be necessary for the sector to address these externalities, but also focus on the way in which we chose, use and re-use resources, as we move towards a circular Blue economy. How aquaculture is facing these challenges, and the solutions put in place to develop a sustainable, responsible and productive and climate neutral European aquaculture sector for key marine and freshwater fish, shellfish and algal species are the main themes for AE2022 event in Rimini.

Further information: https://www.aquaeas.org/Meeting/AE2021

The 24th International Seaweed Symposium (ISS2023) February 19th – 23th 2023, Hobart, Tasmania (Australia)

The International Seaweed Association (ISA) is an international organization dedicated to the encouragement of research and development of seaweed and seaweed products. Their mission is to promote applied phycology on a global basis, and to stimulate interactions among researchers, industrialists and government representatives in all relevant institutions, organizations and industries and in all countries. The 2023 Symposium is being hosted by the University of Tasmania's Institute for Marine and Antarctic Studies on behalf of ISA.

Further information: https://www.iss2023.net/

Available online to all ISAP subscribers: click here
To become an ISAP subscribers click here

International Society for Applied Phycology (ISAP) Newsletter Article Submission Guidelines

Contributing an article to the ISAP newsletter

Members or non-members of ISAP are welcome to contribute articles, news clips or announcements to the newsletter. We do particularly encourage undergraduate and graduate students to contribute.

Past issues of the newsletter

Archives of the newsletter can be accessed on our website:
https://www.appliedphycologysoc.org/newsletters

Frequency of publication

Biannual.

The audience

The newsletter is read by about 600 members of the ISAP who are applied phycologists from universities, research institutes, industry, policy makers and other algae enthusiasts. It is also read by those who frequent our Facebook and LinkedIn in page where the newsletter is uploaded. The newsletter can also be accessed through National Library of Australia (NLA), as part of the agreement for the issue of the ISSN number.

Type of articles

We solicit and publish technical articles pertaining to applied phycology from any type of ecosystem. Each issue typically comprises two articles, one on microalgae and the other on macroalgae.

Other types of contributions may include announcements pertaining to conferences, workshops, symposia, training courses and events, project updates, book reviews as well as review of technology and services.

Article formatting

All submissions should be in **MS word (.doc or .docx) format typically of 250 – 2500 words**. Word files should be named with the surname (family name) of the corresponding author e.g., Camello.docx.

Please format your article in plain font ideally using **Times New Roman, font size 11**. Please bold titles and italicize sub-titles. Use appropriate symbol font for units. Please avoid the use of excessive space between characters or words. ISAP newsletter adopts metric unit of measurement. Scientific names should be in full, with genus and species in italics.

The manuscript should be organized as follows

- Title
- Author list with affiliation and corresponding author
- Summary or Abstract
- Main body of the manuscript
- Conclusions and/or recommendations
- Acknowledgments (optional)
- References
- Tables (optional)
- Figures (optional)
- Figure captions (optional)

Title
Typically **100 characters**, in bold.

Authors and affiliation
Each article should list all authors with their first name and middle name abbreviated. Superscripts may be used to indicate the institutional affiliation of the authors. An asterisk symbol is used to highlight the corresponding author and their contact email ID. For e.g.,

N.V. Thomas[1], K. R. Roman[2] and A. R. Camello[3*]
[1]Affliation of first author with institutional address
[2]Affliation of second author with institutional address
[3]Affiliation of third author with institutional address

*Corresponding author: camello.a@aad.gov.au

Summary or Abstract
A summary or abstract, typically **100-150 words** should summarize what the article is about and the salient findings.

Main body of the manuscript
The articles must be written in plain English with the broad objective of conveying technical information that can be understood by non-specialists and members of the public. Technical jargon should be avoided. Figures and tables may be cited in the main body of the manuscript but must not be embedded. Similarly, in-text citation of references must be adopted. In-text citations should follow the author-year format. For e.g., (Roberts and Emilio, 2003).

Conclusions / Recommendations
No more than 50 – 100 words with closing opinion with recommendations for further work.

References
Citations need not be extensive and may be restricted to pertinent reviews or those applicable to the subject matter. Only literature cited in the main body of the manuscript should appear in the reference list. The citations should be listed **alphabetically and chronologically**. The format adopted by the newsletter is as below:

Journal article
Thomas, P.A. and Oscar, M.A. 2005. Culture of *Nannochloropsis gaditana* in bubble column reactor. Journal of Applied Phycology 134: 31-38.

Book
Whatman, C.F. 2008. Pond water quality. CRC Press, Boca Raton, FL, USA. 455p.

Book chapter
Michaelis, M. 2008. Bacterioplankton in aquaculture ponds. 48 -52pp In: Pond water quality, Whatman, C.F. (Ed.). CRC Press, Boca Raton, FL, USA.

Report
Roman, H.G. and Pete, G.S. 2012. Seaweed cultivation in ponds. Report no. RD12/0208-1. Environmental Protection Authority, Canberra, ACT, Australia. 80p.

Tables
Small, concise tables that complement the data in the text are encouraged. Tables may be created using the word table tool. Tables must **be submitted separate to the main manuscript** and must contain the tile.

Photos / Figures / Images / Line art
Photos or image files should be of high resolution (typically >300dpi), in colour or Black and white (B&W) and should be supplied in **.jpg** or **.tiff** or **.png** format. Up to 15 figures or images can be included with each article. Image or photo files should be labelled with the surname (family name) of the corresponding author followed by the Figure number for e.g., **McTierFigure1.jpg**

Figures or photographs used in the manuscript should have in-text citation. Please do not embed photos or images into the main body of the manuscript. Figure legends or captions should be in word format with the description of each of the figure used. The photographs or figures used must be original and must have been taken by one of the co-authors. If not, the owner, the source of the photograph or figure must be acknowledged.

Copyrights and ownership

All materials submitted must belong to the authors. If not, contribution from other parties must be clearly acknowledged in the article. The corresponding author takes all responsibility pertaining to compliance with copyrights and permission to publish the material, when an article is submitted to the newsletter for publication.

Submitting an article

If the complete submission, that includes the manuscript, tables and figures, are <10Mb we encourage the corresponding author to attach the manuscript and the supporting files to an email message and email to the Editor at celine.rebours@moreforsking.no. If the files are too large to be communicated over email, please let the Editor know. We will then create a secure folder on OneDrive and share it with you for the files to be dropped and shared with the Editorial team.

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