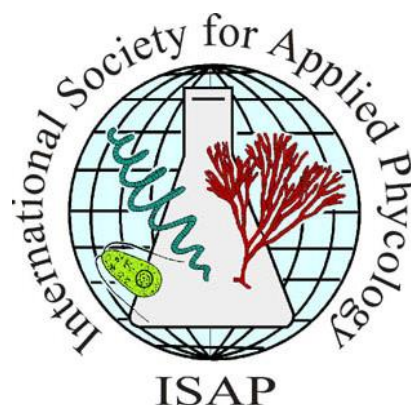


International Society for

Applied Phycology

NEWSLETTER



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Message from the 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 2020.

With the postponement of the conference, most elected members of the EC have generously volunteered to continue in their role for an additional year. I wish to thank them for their dedication and support to our society. In the last few months, the EC members have been preparing our society for the next triennium to sustain and grow its activities after our ISAP2021 Conference. I would like to thank, in particular, our new communication coordinator, **Fiona Moejes** and our training workshop coordinator, **Roberto De Philippis** for their remarkable efforts in restructuring these primordial activities for our society. I would like to also express gratitude our editor-in-chief, **Sasi Nayar** for preparing another issue of the Newsletter and hope you will enjoy reading this during this vacation!

We have all spent 2020 connecting online, and I wish to acknowledge the great effort of the Japanese Local Organizing Committee for reorganising the ISAP conference under a virtual format. The conference will stream from the **14th May 2021** and will then become available 'on demand' until the **13th August 2021**. You will find detailed information and the latest updates to the programme and events under the ISAP2021 conference [webpage](#), [Facebook](#) and [Instagram](#) pages.

Registered delegates will be able to access all content of the conference, such as oral sessions, poster (or short presentation) sessions, special sessions, panel discussions, special lectures and keynote sessions. Various networking programs such as B2B meeting, exhibition booth, and student & young researchers' forum will be organised to accelerate interaction among participants. We would like to invite you to go on our webpage and register. The abstract submission is now closed but you can still submit a **special session** until **December 31st, 2020**. The call can be found on the ISAP2021 conference [webpage](#). Further, thanks to the support of **ISAP, EABA, GlobalSeaweedSTAR and AIIC**, the ISAP2021 Organising Committee has secured **three grants** that will become available to finance your participation in ISAP2021. You will find information on the eligibility conditions, deadlines and the process to apply on the conference [webpage](#).

With the start of the New Year, I will request you to ensure that your ISAP membership is still current. The membership fees are critical in ensuring the activities of the society. Membership fees support maintenance of the website, funding workshops and training programs in algal biotechnology as well as sponsoring student travel grants. You can also contribute with a donation. For further details please consult our webpage or contact the ISAP Secretary/Treasurer Valeria Montalescot.

Finally, I would like to emphasize that ISAP operates solely on the volunteer work of its executive members and members. This means that all members can participate in the activities of the society. We would appreciate your ideas, feedback on ISAP, news, and announcements of interest for ISAP members. **We would also be delighted to receive articles for our forthcoming issues of the newsletter due in May 2021.** For further details, please contact either the Editor of the newsletter (Sasi Nayar), or the ISAP Secretary/Treasurer (Valeria Montalescot) whose contact details can be found at the end of the newsletter.

ISAP looks forward to a brighter 2021 for the algae community and on behalf of the Executive committee I am wishing you and yours a safe, healthy, and prosperous new year!

Céline Rebours

President, International Society for Applied Phycology

Message from the Editor, Sasi Nayar

Dear Colleagues,

At the outset, let me wish you and your family happy holidays and a healthy, happy and prosperous new year 2021. When we compiled the last issue of the newsletter in 2019, little did we anticipate on what lay ahead in 2020! One would not have thought that our much-anticipated congress would be a casualty of the pandemic. In the face of adversity, we came up with some very novel tools to go about with our business and a new format for our congress! As we compile this issue many countries in Europe, Asia, South and North America are doing it tough in containing the virus. Our thoughts are with them hoping that the vaccine will hopefully end this pandemic.

With all that is going on and the challenges we faced, the Editorial Committee is pleased to bring out the final issue of the newsletter for 2020. I must thank our colleagues who contributed articles without which this issue would not have been a reality. I would also like to thank Celine, Fiona and the editorial review committee for their assistance in compiling this issue.

This issue of the newsletter has two articles and a post-event report on ISAP funded training course and workshop. The first article in this issue by Kraan on a biorefinery approach to valorise marine macroalgal (seaweeds) biomass. The article refers to a sustainable approach of fractionation into a wide spectrum of valuable products using multistage cascade processes. Rather than a conventional solvent based approach, the article recommends green chemistry and refers to a recently published book titled '*Sustainable Seaweed Technologies*' in the book series *Advances in Green Sustainable Chemistry*.

The second article by Zittelli et al., is a summary of recommendations from a group of experts from the European Algal Biomass Association (EABA) on candidate species of microalgae and seaweeds as novel food ingredients. EABA undertook this exercise to facilitate approvals from regulatory agencies in the EU. The metrics used by the experts were based on access to scientific information in the published literature as well as the economic potential of the species.

The final article is a post-event report by Olguin on the ISAP funded training course and workshop titled 'Challenges and applications in microalgal biotechnology' held from the 17 – 21st February 2020 in Veracruz, Mexico. This training course and workshop saw participation by 29 researchers from México, Colombia, Cuba, India, The Netherlands and Chile.

We hope you find this issue of the newsletter informative. As always, please do not hesitate to contact one of us from the editorial team if you have any ideas of contributing an article in the next issue of the newsletter. As you can appreciate, we are always looking for articles to complete a newsletter issue. You will find the guidelines at the end of the newsletter.

As we sign off, we the editorial team, wish you and your families the very best in the new year.

Sasi Nayar,
Editor of the ISAP Newsletter

Unlocking the blue biorefinery: Macroalgae as versatile biomass

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It is well known that seaweeds (macroalgae) or their constituents have great potential as products in food, feed, cosmetics and biomaterials and the functional food markets. Other novel products based on macroalgae have truly entered the market in recent years and starting to become accepted. Many studies have shown that marine macroalgae are unrivalled sources of bioactive molecules with the potential to maintain and improve health through inclusion in other foods or feed. Seaweeds offers a wide range of interesting bioactives, and with over 10,000 species identified globally it is of interest to be able to extract these compounds. Hence, seaweed fractionation into a wide spectrum of valuable products using multistage cascade processes offers a sustainable approach of exploitation of this resource (Figure 1). This “blue” biorefinery processing approach should be adapted to local conditions, to maximize the biomass utilization and to lower the waste fractions or preventing any waste materials, re-enforcing the circular economy. On top of this, macroalgae also have high potential to advance sustainability through many diverse applications from chemicals and solvents to bioplastics. However, recently more and more emphasis are placed on the sustainability and green technologies of the biomass resource itself and the extraction and application techniques, hence our blue and green technologies becomes a turquoise biorefinery.

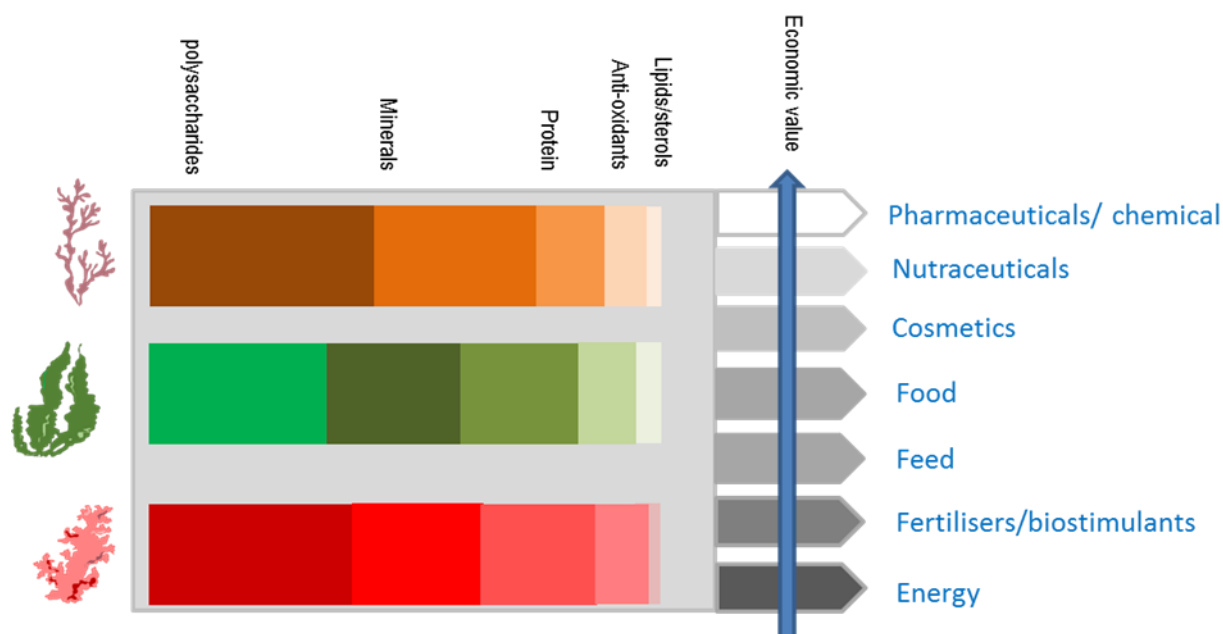


Figure 1: Showing major constituents and their application and value in brown, red and green algae (Taken from Torres et al. 2019 with permission)

Over the last decades an increasing global issue takes place i.e., proliferations of green, brown and red seaweeds, caused most probably by eutrophication in combination with climate change. Examples are green tides (Normandy in France, Yellow Sea in China, Indian River, Florida, and Sargassum in the Caribbean basin being estimated at 20 million tonnes alone, Wang et al., 2019). Nowadays a common phenomenon and often a nuisance becoming an economic threat, nevertheless it also might present an opportunity (Figure 2).

As a raw material, cultivated seaweeds offer important advantages in terms of sustainability, as:

- i) cultivation in the sea does not require arable land and freshwater inputs and requires minimal human intervention,
- ii) fertilizers are not needed since nutrients are absorbed from the surrounding water,
- iii) seaweed present a rapid reproduction growth rate and offer high biomass yield,
- iv) the fast growth rate helps to reduce atmospheric greenhouse carbon indirectly through photosynthesis and supply oxygen to the sea acting as a short-term carbon sink and help to alleviate ocean acidification (Kraan, 2013).

Seaweed cultivation, harvest, and reuse of excess nutrients from the aquatic environment is a promising approach for sustainable resource nutrient cycling in a regenerative economy while significantly reducing eutrophication (Seghetta et al., 2016).



Figure 2: Local green tide in Ireland

This year a book was published to address this subject and it is called *Sustainable Seaweed Technologies* in the book series *Advances in Green Sustainable Chemistry*. It deals mainly with sustainable cultivation and resources, green biorefinery and its applications (Torres, Kraan and Dominquez, 2020).

A diverse range of subjects are addressed ranging from the sustainability of the seaweed biomass, the concept of green biorefinery and the opportunities, to the bioactive components, properties, and applications in part 1. Part 2 and 3 deals with storage, conditioning, modification, extraction and emerging extraction technologies. Part 4 explores green purification technologies while part 5 looks at biofuels and catalytic conversion. Part 6 looks at the applications of seaweed as biomaterials. Part 7 and

8 deals with the diverse range of applications to improve sustainability of processes and use to finish with a life cycle assessment of macroalgal industrial systems

Looking ahead and taking the UN Sustainability Development Goals into account together with the Global Societal Challenges, seaweed might very well be one of the main key drivers for inclusive economies with the ability to restore natural ecosystem services (Thomsen and Zhang, 2020).

Conclusions

The future of the seaweed industry in Europe will start to shift, basically meaning that industrial wild harvesting of furoid and kelp forests will be phased out over the next 10-15 years, while making allowances for small cottage/SME's to still sustainably hand harvest. The nuisance algae tides (green; *Ulva* sp., red; *Soliera chordalis* and brown; *Sargassum* sp.) can still be harvested commercially and used as biomass feed stock. In general production will move to cultivation of seaweeds (predominantly kelp and a few red seaweeds) to fuel the current industries and allowing for new emerging technologies and industries to develop. Europe is entering seaweed version 2.0 but the update will take a bit of time.

References

- Kraan, S. 2013. Mass-cultivation of carbohydrate rich macroalgae, a possible solution for sustainable biofuel production. *Mitigation and Adaptation Strategies for Global* 18: 86-98.
- Seghetta, M., Tørring, D., Bruhn, A. and Thomsen, M. 2016. Bioextraction potential of seaweed in Denmark - An instrument for circular nutrient management. *Science of the Total Environment* 563: 513-529.
- Thomsen, M. and Zhang, X 2020. Life cycle assessment of macroalgal ecoindustrial systems. In: *Sustainable seaweed technologies: cultivation, biorefinery, and applications. Advances in Green and Sustainable Chemistry.* 663-708 pp. Torres, M.D., Kraan, S. and Dominguez, H. (Eds.). Elsevier, Amsterdam, Netherlands.
- Torres, M.D., Kraan, S. and Dominguez, H. 2019. Seaweed Biorefinery. *Reviews in Environmental Science and Bio/Technology* 18: pages335–388.
- Torres, M.D. Kraan, S. and Dominguez, H. 2020 *Sustainable Seaweed Technologies; Advances in Green and Sustainable Chemistry.* Elsevier, Dordrecht, The Netherlands. 330 pp
- Wang, M., Chuanmin H., Barnes, B.B., Mitchum, G., Lapointe, B. and Montoya, J.P. 2019. The great Atlantic Sargassum belt. *Science* 365 (6448): 83-87.

EABA: Novel Food Priority List 2020

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Abstract

This article details the recommendations of a group of experts from the European Algae Biomass Association (EABA) on a list of microalgae and macroalgae (seaweeds) candidate species to facilitate approvals from regulatory bodies as novel food. These recommendations have been developed based on a few metrics such as information in the published domain and the commercial significance of the taxa.

Disclaimer

The documents: "Algae as Novel Food in Europe - EABA Information Paper", (2020 November 25)" and "EABA Novel Food Priority List", (2020 Nov. 26) have been drafted by Dr. Graziella Chini Zittelli (IBE-CNR), Dr. Carlos Unamunzaga (Fitoplancton Marino), Dr. Silvio Mangini (Archimede Ricerche), Dr Vitor Verdelho and Dr Jean-Paul Cadoret on behalf of EABA. The information and conclusions in this report should not be treated as binding on the individuals, companies and organisations involved. The information and conclusions listed hereafter should not be treated as binding on the individuals, companies and organisations involved. No liability is assumed for the use which may be made of the information contained herein. The individuals concerned have offered their views in a personal capacity.

Methodology

0. The algae biomass sector has a relevant need for new Novel Food approvals to stimulate the growth of the sector, requiring a list of promising candidate species.
 1. This list of macroalgae (seaweed) and microalgae candidates was proposed along the last two years by EABA members and experts in the algae biomass sector.
 2. The two criteria for the algae for the next Novel Food candidates was (1) the available scientific information and the (2) economic potential
 3. Without a relevant scientific ‘body of knowledge’ is extremely complex the process and chances of presenting a proper file request for Novel Food approval
 4. The subjectivity of the two criteria requires a quantitative metrics that can be based in Google Scholar and Google Patents with number of references in documents
 5. The proposed metrics aims to bring to the curation, quantitative data to support the decision making, for the potential ranking of promising “species” for “food”
- GS is the number of documents with the reference to "species" using Google Scholar; this is a good tool for large numbers
 - GP is the number of documents with the reference to "species" using Google Patents; this is a good tool for large numbers
 - GS+food is about the references in GS that include GS + the word “food”; this will provide a direction where the reference food is along the “species” in scientific documents

- The ratio GS+food / GS shows the relevance of food in the number of references in Google Scholar; when $\times 100 = \%$ of food related references (not the number of documents)
- the higher S the higher food relevance for the “species”
- the higher P the higher business relevance considering that some food related patents exist if there are commercial applications
- S x P is an index that combines the relevance of food related publications with reference to "species" with the relevance of references of "species" and food in Patents documents.

Microalgae in the Food Catalog (and Union List)	Food that was consumed “significantly” prior to May 1997 is not considered to be a novel food						
Not novel (5+2)	Google		S=	Google		P=	
Species	Scholar (GS)	GS+food	GS+food/GS	Patents (GP)	GP+food	GP+food/GP	S x P
<i>Arthrospira platensis</i> (formerly <i>Spirulina platensis</i>)	67 300	38 800	0,58	10 430	7 363	1,42	0,71
<i>Aphanizomenon flos-aquae</i>	12 000	5 950	0,50	1 459	813	1,79	0,56
<i>Chlorella vulgaris</i>	92 700	43 200	0,47	13 144	8 453	1,55	0,64
<i>Auxenochlorella pyrenoidosa</i> (formerly <i>Chlorella pyrenoidosa</i>)	29 000	15 000	0,52	5 224	3 601	1,45	0,69
<i>Jaagichlorella luteoviridis</i> (formerly <i>Chlorella luteoviridis</i>)	342	182	0,53	1 387	1 316	1,05	0,95
<i>Tetraselmis chuii</i> (approved as Novel Food since March 2014)	3 520	2 510	0,71	475	0,00	0,00	0,00
<i>Odontella aurita</i> (approved since December 2002)	2 140	1 190	0,56	0	0,00	0,00	0,00
Under some approval (not ranked)							
<i>Phaeodactylum tricornutum</i> (application pending for extract and oil from <i>Phaeodactylum</i>)	30 300	17 500	0,58	6 608	4 948	0,75	0,43
<i>Euglena gracilis</i> (application pending for biomass is under EFSA evaluation)	39 900	12 000	0,30	8 476	6 235	0,74	0,22
<i>Galdieria sulphuraria</i> (under approval for phycocyanin extraction)	2 920	1 360	0,47	454	3,00	0,00	0,00
<i>Haematococcus pluvialis</i> (astaxanthin oleoresin approved)	18 100	13 100	0,72	9 178	7 388,00	0,80	0,58
Candidates for Novel Food (not ranked)							
<i>Arthrospira maxima</i>	13 700	9 860	0,72	3 755	2 680,00	0,71	0,51
<i>Graesiella emersonii</i> (formerly <i>Chlorella emersonii</i>)	2 040	1 170	0,57	1 677	1 469	0,88	0,50
<i>Mychonastes homosphaera</i> (formerly <i>Chlorella minutissima</i>)	4 140	2 860	0,69	2 271	2 012	0,89	0,61
<i>Auxenochlorella protothecoides</i> (formerly <i>Chlorella protothecoides</i>)	8 330	6 000	0,72	3 534	3 114	0,88	0,63
<i>Chromochloris zofingiensis</i> (formerly <i>Chlorella zofingiensis</i>)	3 490	2 720	0,78	1 274	1 150	0,90	0,70
<i>Chlorella sorokiniana</i>	12 500	7 440	0,60	3 339	2 680,00	0,80	0,48
<i>Parachlorella kessleri</i>	1 550	942	0,61	1 313	0,00	0,00	0,00
<i>Dunaliella salina</i> (formerly <i>Dunaliella bardawil</i>)	29 830	17 730	0,58	9 535	7 164	0,74	0,43
<i>Microchloropsis gaditana</i> (formerly <i>Nannochloropsis gaditana</i>)	5 670	3 720	0,66	1 589	722	0,45	0,30
<i>Nannochloropsis oceanica</i>	3 320	2 300	0,69	845	0	0	0
<i>Nannochloropsis oculata</i>	12 200	8 820	0,72	2 241	2	0	0
<i>Nostoc commune</i>	8 920	4 190	0,47	2 484	1 302	0,52	0,25
<i>Nostoc sphaeroides</i>	850	525	0,62	237	186	0,78	0,48
<i>Haematococcus lacustris</i> (formerly <i>Haematococcus pluvialis</i>)	17 800	12 800	0,72	9 000	7 272	0,81	0,58
<i>Isochrysis galbana</i>	20 900	15 200	0,73	5 176	3 905	0,75	0,55
<i>Tisochrysis lutea</i> (T-iso) (formerly <i>Isochrysis affinis galbana</i> T-iso)	4 480	3 620	0,80	322	210	0,65	0,52
<i>Tetrademus obliquus</i> (Scenedesmus obliquus)	29 500	15 800	0,54	2 792	1 691	0,61	0,32
<i>Skeletonema costatum</i>	26 200	14 900	0,57	1 750	865	0,49	0,28
<i>Porphyridium purpureum</i> (formerly <i>Porphyridium cruentum</i>)	10 300	5 710	0,55	2 967	2 172	0,73	0,41
<i>Cryptocodinium cohnii</i>	6 020	4 130	0,69	5 916	5 428	0,92	0,63
<i>Ettlia oleabundans</i> (formerly <i>Neochloris oleabundans</i>)	4 740	3 420	0,72	1 897	1 296	0,68	0,49
<i>Diacronema lutheri</i> (formerly <i>Pavlova lutheri</i>)	5 300	3 790	0,72	1 390	1 241	0,89	0,64
<i>Lobosphaera incisa</i> (formerly <i>Parietochloris incisa</i>)	1 607	1 130	0,70	157	133	0,85	0,60
<i>Cylindrotheca fusiformis</i>	3 360	1 760	0,52	599	403	0,67	0,35
<i>Chlamydomonas reinhardtii</i>	99 800	28 000	0,28	15 943	9 681,00	0,61	0,17

Comments

1. The changes of names in recent years must be considered as they introduce a higher complexity in this process, but the quantitative changes are minor.
2. The list of candidates proposed below addresses biomass of microalgae species that cannot be placed in the market because they are not in the NF Catalog, Union List or under an application process (e.g. *P. tricornutum* is under approval application for extract and oil but not as whole biomass).

Macroalgae in the Food Catalog	Food that was consumed "significantly" prior to May 1997 is not considered to be a novel food.						
Not novel (20)	Google		S=	Google		P=	
Species	Scholar (GS)	GS+food	GS+food/GS	Patents (GP)	GP+food	GP+food/GP	S x P
<i>Fucus vesiculosus</i>	24 600	14 500	0,59	4 486	2 621	1,71	1,01
<i>Fucus serratus</i>	10 800	5 300	0,49	776	498	0,64	0,31
<i>Fucus spiralis</i>	5 130	2 590	0,50	288	207	0,72	0,36
<i>Ascophyllum nodosum</i>	21 900	13 700	0,63	6 284	3 923	1,60	1,00
<i>Saccharina japonica</i> (<i>Laminaria japonica</i>)	24 120	17 300	0,72	5 426	3 912	0,72	0,52
<i>Saccharina latissima</i>	4 750	3 540	0,75	229	182	1,26	0,94
<i>Chondrus crispus</i> [pioca]	15 500	8 320	0,54	6 967	4 420	0,63	0,34
<i>Ulva intestinalis</i> (<i>Enteromorpha intestinalis</i>) [aonori]	11 650	6 050	0,52	510	307	0,60	0,31
<i>Ulva lactuca</i> [sea lettuce]	26 000	16 200	0,62	2 007	1 386	0,69	0,43
<i>Undaria pinnatifida</i> [wakame]	19 500	14 100	0,72	4 417	3 408	1,30	0,94
<i>Laminaria digitata</i> [kombu]	15 400	6 070	0,39	5 272	3 005	1,75	0,69
<i>Laminaria longicruris</i>	1 810	1 090	0,60	190	150	1,27	0,76
<i>Gracilariopsis longissima</i> (formerly <i>Gracilaria verrucosa</i>)	8 170	4 240	0,52	914	687	0,75	0,39
<i>Palmaria palmata</i> (<i>Rhodomenia palmata</i>) [dulse]	7 070	4 850	0,69	1 536	1 039	0,68	0,46
<i>Eisenia bicyclis</i>	4 870	3 630	0,75	1 213	834	1,45	1,08
<i>Pyropia tenera</i> (formerly <i>Porphyra tenera</i>)	4 670	3 020	0,65	760	600	1,27	0,82
<i>Himanthalia elongata</i> [sea spargetti]	2 590	1 760	0,68	424	299	0,71	0,48
<i>Sargassum fusiforme</i> (formerly <i>Hizikia fusiforme</i>)	2 740	2 340	0,85	888	740	1,20	1,02
<i>Alaria esculenta</i> [atlantic wakame]	3 620	2 250	0,62	644	375	0,58	0,36
<i>Phymatolithon calcareum</i> (<i>Lithothamnion calcareum</i>)	1 010	446	0,44	174	155	0,89	0,39
Candidates for Novel Food (not ranked)							
<i>Saccharina japonica</i> (formerly <i>Laminaria japonica</i>)	19 200	13 900	0,72	5 000	3 628	0,73	0,53
<i>Laminaria hyperborea</i>	7 720	4 770	0,62	1 984	1 252	0,63	0,39
<i>Laminaria palmata</i>	1 690	917	0,54	8	8	1,00	0,54
<i>Macrocystis pyrifera</i>	17 800	1 110	0,06	4 986	2 853	0,57	0,04
<i>Ulva rigida</i>	10 400	5 740	0,55	378	1	0,00	0,00
<i>Neopyropia yezoensis</i> (formerly <i>Porphyra yezoensis</i>)	9 770	5 570	0,57	1 715	1 127	0,66	0,37
<i>Sargassum muticum</i>	9 650	5 850	0,61	409	235	0,57	0,35
<i>Sargassum fusiforme</i>	4 080	3 060	0,75	1 712	1 323	0,77	0,58
<i>Sargassum vulgare</i>	3 100	1 890	0,61	157	101	0,64	0,39
<i>Sargassum fulvellum</i>	1 980	1 520	0,77	682	494	0,72	0,56
<i>Porphyra umbilicalis</i>	5 180	2 420	0,47	846	495	0,59	0,27
<i>Codium fragile</i>	9 000	5 330	0,59	1 036	620	0,60	0,35
<i>Codium tomentosum</i>	1 600	781	0,49	689	306	0,44	0,22
<i>Caulerpa taxifolia</i>	7 470	3 800	0,51	245	135	0,55	0,28
<i>Ectocarpus siliculosus</i>	6 320	2 380	0,38	375	239	0,64	0,24
<i>Hypnea musciformis</i>	5 910	3 460	0,59	374	199	0,53	0,31
<i>Porphyra umbilicalis</i>	5 180	2 420	0,47	846	495	0,59	0,27
<i>Eisenia bicyclis</i>	4 860	3 630	0,75	1 213	834	0,69	0,51
<i>Neopyropia tenera</i> (formerly <i>Porphyra tenera</i>) [nori]	4 670	3 020	0,65	843	600	0,71	0,46
<i>Ulva compressa</i> (formerly <i>Enteromorpha compressa</i>)	3 940	1 900	0,48	1 039	590	0,57	0,27
<i>Gelidium comeum</i> (formerly <i>Gelidium sesquipedale</i>)	2 050	1 711	0,57	319	215	0,57	0,47
<i>Gelidium amansii</i>	3 720	2 480	0,67	1 164	889	0,76	0,51
<i>Gelidium comeum</i>	1 200	681	0,57	158	90	0,57	0,32
<i>Porphyra purpurea</i>	2 940	1 090	0,37	1 117	778	0,70	0,26
<i>Gracilaria gracilis</i>	2 740	1 630	0,59	168	120	0,71	0,42
<i>Asparagopsis taxiformis</i>	2 520	1 330	0,53	144	97	0,67	0,36
<i>Euclima denticulatum</i> (formerly <i>Euclima spinosum</i>)	2 470	1 500	0,61	928	734	0,79	0,48
<i>Mastocarpus stellatus</i>	2 420	1 610	0,67	436	289	0,66	0,44
<i>Osmundea pinnatifida</i> (formerly <i>Laurencia pinnatifida</i>)	1 832	778	0,42	8	6	0,75	0,32

Comments

1. The changes of names in recent years must be considered as they introduce a higher complexity in this process, but the quantitative changes are minor.
2. A first priority group should include a set of *Laminaria*, *Macrocystis*, *Ecklonia*, *Porphyra* (*Porphyra dioica*, *Porphyra purpurea*, *Porphyra leucosticta*, *Porphyra linearia*), a set of *Sargassum* a set of *Codium* and *Caulerpa*.

3. A second priority group should include a set of *Gelidium* (approved in France), a set of *Gracilaria* (approved in France, including *Gracilaria vermiculophylla*), a set of *Porphyra* (approved in France), *Eucheuma* (approved in France).

Conclusions

Under EU regulations, any food that was not consumed “significantly” prior to May 1997 is considered to be a novel food. The category covers new foods, food from new sources, new substances used in food as well as new ways and technologies for producing food. Examples include oil rich in omega-3 fatty acids from krill as a new source of food, phytosterols or plant sterols as a new substance or nanotechnology as a new way of producing food. Traditional Novel Food is a subset of novel foods and refers to food that is traditionally consumed anywhere outside Europe. After the new EU regulation on novel food came into effect in January 2018, the process for scientific risk assessment of a novel food application has been centralised. EFSA performs risk assessments on the safety of a novel food upon request by the European Commission. www.efsa.europa.eu/en/topics/topic/novel-food

TRAINING COURSE & WORKSHOP REPORT: Challenges and applications in microalgal biotechnology, Mexico, 17th -21st February 2020

EUGENIA J. OLGUÍN

Manejo Biotecnológico de Recursos, Institute of Ecology INECOL, Veracruz, Mexico

Corresponding author: eugenia.olguin@inecol.mx

The training course aimed at disseminating current information about microalgal biotechnology (from basic knowledge to knowledge related to massive cultivation and integration of bioprocesses within microalgae-based biorefineries) among young students from both, graduate and postgraduate Programs, as well as entrepreneurs interested in commercial applications such as biomass and pigment production within a biorefinery at pilot plant level.

The course had a high demand resulting in twenty-nine attendees from various countries: México, Colombia, Cuba, India, The Netherlands and Chile. They included undergraduate and postgraduate students, professionals from industry and researchers.



Group photo of the workshop participants

Details of the training course and workshop are as below:

Venue: Institute of Ecology (INECOL), Xalapa, Veracruz, México

Sponsors:

- International Society for Applied Phycology
- Institute of Ecology,
- Latin-American Society of Environmental and algal Biotechnology (SOLABIAA).

- Sponsor of the workshop “High value products from microalgae”: British Council organized by Prof. Roberto Lovitt and Prof. Eugenia J. Olguín.

Organizing committee:

- Chair: Eugenia J. Olguín
- Budget Administrator - Gloria Sánchez
- Outreach and logistics - Erik González and Nancy Mancilla

Training course lecturers:

- Giuseppe Torzillo
- Gabriel Acién
- Guillermo Quijano
- María Edith Ponce
- Roberto De Philippis
- Germán Buitrón
- Luis Fernández Linares
- Hugo Moreira Soares

Workshop facilitators:

- Alla Silkina
- Claudio Fuentes-Grunewald
- Eugenia J. Olguín
- Giuseppe Torzillo
- Saul Purton
- Roberto De Philippis
- John McDonald
- Joe McDonald
- Carole Llewellyn
- Eduardo Rodríguez Verdú

The lecture topics included:

1. What are algae? Generalities, where they live, importance, location and taxonomy
2. Photosynthesis: basic principles to optimize growth of microalgae culture outdoors
3. Kinetic characterization of microalgal cultures
4. Preparation of inoculum for raceways in flat plate bioreactors (180L) (Experimental work)
5. Identification of Microalgae (theoretical part)
6. Dual purpose systems for the production of microalgae and treatment of wastewater
7. Microalgal-bacterial aggregates for wastewater treatment
8. Heavy metal bio-removal with exopolysaccharide-producing cyanobacteria
9. Observation and identification of microalgae (Experimental work)
10. Preparation of permanent and semi-permanent preparations of microalgae
11. Obtaining hydrogen and methane from microalgal biomass
12. Microalgae-based biorefineries using agro-industrial wastewater and aquatic plants
13. Various types of microalgae cultures and bioproducts
14. Cleaning and assembly of diatoms
15. Cultivation of *A. maxima* in raceways (2,000 L) (Experimental work)
16. Trends and Tendencies in Bioprocess Engineering Applied to the Environment
17. ROUND TABLE- The future of Microalgae Biotechnology

Workshop of the “High value products from microalgae”

Talks

- Phycopigments project (UK)

- Cultivation of *A. maxima* and production of phycocyanin (México)
- Purification of phycocyanin from *Arthrospira platensis* biomass using hydrophobic interaction membrane chromatography
- Algae-UK network
- Exopolysaccharides of industrial interest from cyanobacteria
- Algaecytes (UK)
- PBR Varicon (UK)
- Circular economy, ALG-AD (UK)

Demonstrations

- Demonstration of culture systems and separation-INECOL
- Harvesting of biomass for *Spirulina* culture- (UK)
- Phycocyanin separation demo (UK)
- Roundtable on identification of good product systems for Mexico and routes to market



Practical laboratory sessions



Experimental work at the Pilot-plant scale facility demonstrating the use of equipment for the cultivation of Spirulina



Experimental work at Pilot-plant scale facility demonstrating the use of equipment for the extraction / purification of phyco-pigments

News and Views



The 7th International Society for Applied Phycology conference has been rescheduled to be held VIRTUALLY.

ISAP2021 will be streamed online from

14th May to 13th August 2021

Important deadlines

Special session proposal deadline:	31 December 2020
Registration deadline (early-bird):	1 March 2021
Registration deadline (standard):	2 March to 13 August 2021
Exhibition booth deadline (early-bird):	1 March 2021
Exhibition booth deadline (standard):	2 March to 30 April 2021
Sponsor deadlines:	30 April 2021

Due to the COVID-19 pandemic, the ISAP Executive Committee and Local Organising Committee made the decision to move the 7th ISAP conference (ISAP2021) online. All the participants will have access to all the sessions and will have the opportunity to interact with other participants virtually. The first virtual congress of the ISAP will give the participants an exciting experience of presenting, learning, encountering, and interacting, in a safe and healthy environment. Please visit the official [ISAP2021](http://www.appliedphycologysoc.org/) website for updates.

Organized by:



Conferences and Events

The 12th International Phycological Congress (IPC2021), March 22nd – 26th 2021, Puerto Varas (Chile)

IPC 2021 will be a 5-day Congress and it will include a mid-Congress break to visit the natural attractions surrounding Puerto Varas. The event is intended for scientists and professional organizations with an interest in phycology. Aim is to elaborate a solid and innovative scientific program that will include invited speakers, oral presentations, and posters.

Further information: <https://ipc2021.com/>

Aquaculture Europe 2020: the Blue and the Green, April 12th – 15th 2021 in Cork (Ireland)

Aquaculture can take the lead in the BlueGreen BioEconomy and is well placed to lead by example with new technologies such as land-based marine aquaponics, large-scale recirculating marine farms and innovative, integrated freshwater initiatives on brown field sites. This conference will bring together stakeholders from many diverse disciplines to discuss and debate cross cutting issues such as new circular economies, life-long health, and environmentally sustainable production.

Further information: <https://www.aquaeas.eu/>

Algae-UK and Interreg2Seas joint event: developing the roadmap for industrial applications of algae for food and novel food ingredients in the UK, October (TBA) 2020 in TBA

This event is being hosted jointly by Algae-UK and a team from the Interreg2Seas funded project, Valorizing Algae for Taste, and will bring together all interested stakeholders, to discuss the latest developments and UK requirements for increasing the use of algae for food and food ingredients.

Further information: <https://www.algae-uk.org.uk/events/developing-the-roadmap-for-industrial-applications-of-algae-for-food-and-novel-food-ingredients-in-the-uk/>

The 19th International Conference on the Cell and Molecular Biology of Chlamydomonas (Chlamy2021), May 18th – 23rd 2021 in Six-Fours-les-Plages (France)

Every two years, the international research community working on the unicellular green alga *Chlamydomonas reinhardtii* and its close multicellular relatives, meets to share their most exciting results. Do not miss this opportunity to expose your research and develop collaborations with the best specialists in your field!

Further information: <https://chlamy2020.sciencesconf.org/>

The 10th International CeBiTec Research Conference – prospects and challenges for the development of algal biotechnology, September 13th – 15th 2021 in Bielefeld (Germany)

The 2021 International CeBiTec Research Conference Bielefeld aims at giving a complete overview of the challenges facing the exploitation of microalgae and cyanobacteria for industrial biotechnology, from biofuels to high value proteins and chemicals.

Further information: <https://www.cebitec.uni-bielefeld.de/events/conferences/575-algal-biotech-202>

The 24th International Seaweed Symposium (ISS2022) February 13th – 18th 2022, Hobart, Tasmania (Australia)

The International Seaweed Association (ISA) is an international organisation 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, organisations and industries and in all countries. The 2022 Symposium is being hosted by the University of Tasmania's Institute for Marine and Antarctic Studies on behalf of ISA.

Further information: <https://www.iss2022.net/>



The ISAP and European Algal Biomass Association (EABA) are offering financial support for students or early-stage researchers who are attending ISAP2021 to present their research work in sustainable macro- or micro-algal aquaculture

Candidate Eligibility:

1. preference to PhD students or post docs
2. preference to people coming from Developing Countries for the ISAP2021
3. the applicant must send a contribution (poster or oral) that they must present at the Congress

How to apply:

Please send the following documents:

1. the application form (can be downloaded from [here](#))
2. for PhD students: a declaration from the tutor stating the position of the applicant
3. for Post-docs: a declaration from the Scientific Responsible stating the position of the applicant

Please send the above documents as an email attachment to kusuda.emi@tsukuba.ac.jp with the subject "APPLY_FELLOWSHIP_ISAP2021"

Please note:

1. Grant payments will be made only if attendance to the congress is confirmed, and by bank transfer only
2. the application deadline had been extended in accordance with postponement of the conference.

Application deadline is 15 January 2021

For more information: <https://isap2020-phycology.org/fellows.html>



GlobalSeaweedSTAR is providing travel grants to attend ISAP2021 for applicants from the UK and DAC-listed countries

Travel Grants are available through the [GlobalSeaweedSTAR programme](#) – a four year, multidisciplinary programme with a vision to grow the research and innovation capacity of [DAC-list countries](#) engaged in seaweed farming.

This programme is supported by [UK Research and Innovation – Global Challenge Research Fund](#) and directly addresses key [UN Sustainable Development Goals \(SDGs\)](#).

Application deadline: 12 February 2021

For more information: <https://www.globalseaweed.org/>



**Algae Industry
Incubation
Consortium
JAPAN**

Algae Industry Incubation Consortium Japan (AIIC) is honoured to invite young people from Asian and developing countries to participate in the ISAP2021, with the wish to provide the young generations who will lead the next generation in the field of applied phycology valuable opportunities of learning, presenting and networking by attending the conference.

Candidate Eligibility:

1. Residents in Asian countries and DAC listed countries.
2. Young generation whose research/work field or has interest is in the applied phycology.
3. Who hasn't registered yet for ISAP 2021.

How to apply:

1. Fill out Application form and submit by email: isap2021_secretariat@algae-consortium.jp
2. Important: Do not register before result is announced

Application deadline: 15 February 2021

For more information: https://isap2020-phycology.org/aiic_grant.html

Please note that most countries may also have national conference attendance and grants – please look at national institutions in your respective countries for these opportunities

Promote YOUR COMPANY with the International Society of Applied Phycology

The International Society of Applied Phycology would like offer your company/organization the opportunity to conduct public relation activities with us. We are pleased to announce that there are a wide variety of the sponsorship options available to meet your needs.

We would also like to invite you to **participate in our triennial international conference** that attracts over 500 of the world's leading phycological researchers from world-renowned universities, research institutes and companies!



Contact Valeria.Montalescot@sams.ac.uk for more information

CALL FOR ARTICLES

The ISAP Newsletter team is looking for YOUR INPUT for the next edition of the newsletter (June 2021)! We are interested in technical articles pertaining to applied phycology from any type of ecosystem as well as news clips or announcements you wish to share with the ISAP community.

We would like to especially invite PhD STUDENTS and EARLY-STAGE RESEARCHERS to submit!

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.

Please e-mail Sasi Nayar (Sasi.Nayar@sa.gov.au) to express your interest in submitting an article. First drafts should be ready for submission by 30 April 2021.

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. Thomas¹, K. R. Roman² and A. R. Camello^{3*}

¹Affiliation of first author with institutional address

²Affiliation of second author with institutional address

³Affiliation 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 title.

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 sasi.nayar@sa.gov.au. 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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