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Editorial: Marine Biotechnology and Bioproducts session of the 13th Asia-Pacific Marine Biotechnology Conference (13th APMBC) and 5th Australia New Zealand Marine Biotechnology Society Conference (5th ANZMBS)

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Editorial on the Research Topic

Marine Biotechnology and Bioproducts session of the 13th Asia-Pacific Marine Biotechnology Conference (13th APMBC) and 5th Australia New Zealand Marine Biotechnology Society Conference (5th ANZMBS)

This issue of Frontiers in Marine Science is a Research Topic arising from the combined 13thAsia-Pacific Marine Biotechnology Conference (13thAPMBC) and 5thAustralia New Zealand Marine Biotechnology Society Conference (5thANZMBS). This joint meeting took place in Adelaide on October 2-6 of 2023 with 271 participants, hosted by Flinders University Centre for Marine Bioproducts Development (Figure 1). There were 12 plenary speakers, 39 keynote presentations, and 30 sessions covering a broad range of Marine Biotechnology themes.

The Australia New Zealand Marine Biotechnology Society (ANZMBS) advocates for all aspects of marine biotechnology in Australia and New Zealand. It was founded in 2014 and is active and growing with ~218 members currently, focusing on promoting collaborations in the field of marine biotechnology. The APMBC is a large international conference held every two years and this 13th meeting was the first time it was held in Australasia.

A key feature of the joint conference was the balance of academic and industry participants, engaging marine biotechnologists, industry, investors, and policymakers with an aim to align industry needs and government priorities with productive collaborations and research and development essential for achieving marine biotechnology industry's full potential in the Asia-Pacific region.

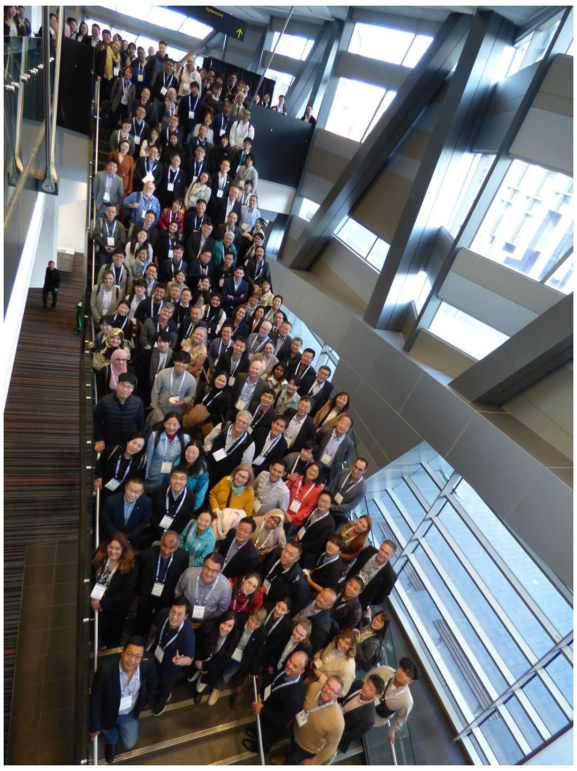

FIGURE 1
Conference Delegates of the joint 13th Asia-Pacific Marine Biotechnology Conference (13th APMBC) and 5th Australia New Zealand Marine Biotechnology Society Conference (5th ANZMBS), Adeliade, October 2023.

In this Research Topic, Guo et al. describe that specific trait loci and alleles responsible for coloration have yet to be identified in the industrially significant and economically valuable *Pyropia/Porphyra* group of marine macroalgae. Mutations in pigmentation-related genes can be very useful for distinguishing between different chimeric sections of thalli that can aid in efficient breeding and genetic analysis of the stock. By constructing a double haploid *Pyropia haitanensis* population consisting of 480 homozygous offspring lines, they were able to show that offspring had only wild type and orange sectors in a circa 1:1 ratio, indicating that a single nuclear gene controlled the orange coloration. They then used a quantitative trail locus (QTL) mapping technique, bulk segregant analysis, to identify a 0.5 Mb genomic region on chromosome 2 for this trait of interest. Subsequent sequencing detected an A to G single nucleotide polymorphism in a phycocyanin-associated rod linker protein, *PhcpcC*. This indicates that *PhcpcC* may be the gene associated with the orange coloration of *P. haitanensis*. The development of such molecular markers can allow the use of pigmentation for breeding and genetic analysis in this species.

Yu et al. employed two new approaches, dielectrophoresis (DEP) and fluorescent D-amino acids (FDAA), to aid in marine bacteria isolation from complex environmental samples. Many techniques used previously for targeting specific bacterial features are still limited by reliance on conventional direct cultivation and sometimes the targeting approaches render samples non-viable. In this work, the authors successfully attained clean bacterial fractions applicable to downstream processing, including cultivation, using these new approaches. They showed that these techniques could target bacteria based on their characteristics and features. It was then shown using 16S rRNA sequencing that the diversity of bacteria attained by both new approaches was greater than that obtained by the standard differential centrifugation method. The new methods have utility for isolating novel and potentially useful bacteria from complex environmental samples.

Ashworth et al. provide a mini-review of seaweed drying approaches and the utility of freeze drying and lyophilization. The review examines the freeze-drying process and discusses its applicability and advantages in preparing macroalgae for various value chains. The combination of freezing material and low temperature, using a vacuum 'locks in' and/or stabilises many of the higher value benefits such as nutritional characteristics, compared with other techniques. It is a more intensive and expensive process than other traditional techniques, such as air drying, but is becoming more cost-effective and useful for certain scales of production and processing for many products. The article also describes the diverse uses of macroalgae, from culinary applications to pharmaceuticals, and highlights the potential of freeze-drying in these different applications and uses.

Battershill provides nutritional profiles of several selected macroalgae from Aotearoa New Zealand, determining crude protein, total lipids, carbohydrates, fibre, amino acids, mineral profiles, heavy metals and antioxidant capacity (Oxygen Radical Absorbance Capacity, ORAC). Samples were collected from the wild (*Pyropia plicata* from Tauranga and Kaikōura), or from commercial wild harvest suppliers (*Macrocystis pyrifera* and *Undaria pinnatifida*), and were compared to *Ulva* species (*Ulva ralfsii* and *Ulva stenophylloides*) produced in a land-based cultivation system. The two cultivated *Ulva* spp. specimens had the highest crude protein content of the six seaweed samples analysed and the highest total, essential, and branched chain amino acid levels. Though the two *Ulva* species were grown under the same cultivation parameters, they differed in carbohydrate and total fibre content, with the *U. stenophylloides* sample having considerably higher levels. *Pyropia plicata* collected in Kaikōura had the highest carbohydrate levels overall though not the highest total fibre, and both *Pyropia* samples had the highest trace mineral levels. None of the seaweeds contained lipophilic antioxidants though the two Phaeophyceae samples, *Macrocystis pyrifera* and *Undaria pinnatifida*, had the highest hydrophilic antioxidant content. This article provides a preliminary indication of the relative nutritional attributes of a range of potential New Zealand seaweed aquaculture target species benchmarked against sea lettuce.

Similarly, in this Research Topic, Purcell et al. examine nutritional characteristics and effects of growth parameters on in developing giant kelp sporophytes.

Here four cultivation treatments combining temperatures ranging between 12 and 18 °C and varying day lengths with warmer temperatures and longer day lengths, representing a more stressful environment for developing *Macrocystis* sporophytes were used. This was confirmed through growth rate and biomass accumulation measurements, which were lower in the warmer and longer day treatments. Protein content, total fatty acid and total

polysaccharides analysis were performed on each of the four groups, scoring highest in the least stressed growth condition at 12°C and with a 12:12 L:D diurnal cycle. Protein levels across all treatments ranged from 16-22.48% DW, total polysaccharide content ranged from 9.6-16.2% DW and the highest polyunsaturated fatty acid level was 60.4%. This study demonstrates that temperature and photoperiod impact juvenile sporophyte growth, biomass accumulation and biochemical composition.

Author contributions

MP: Writing – original draft, Writing – review & editing. JQ: Writing – original draft, Writing – review & editing. MC: Writing – original draft, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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