



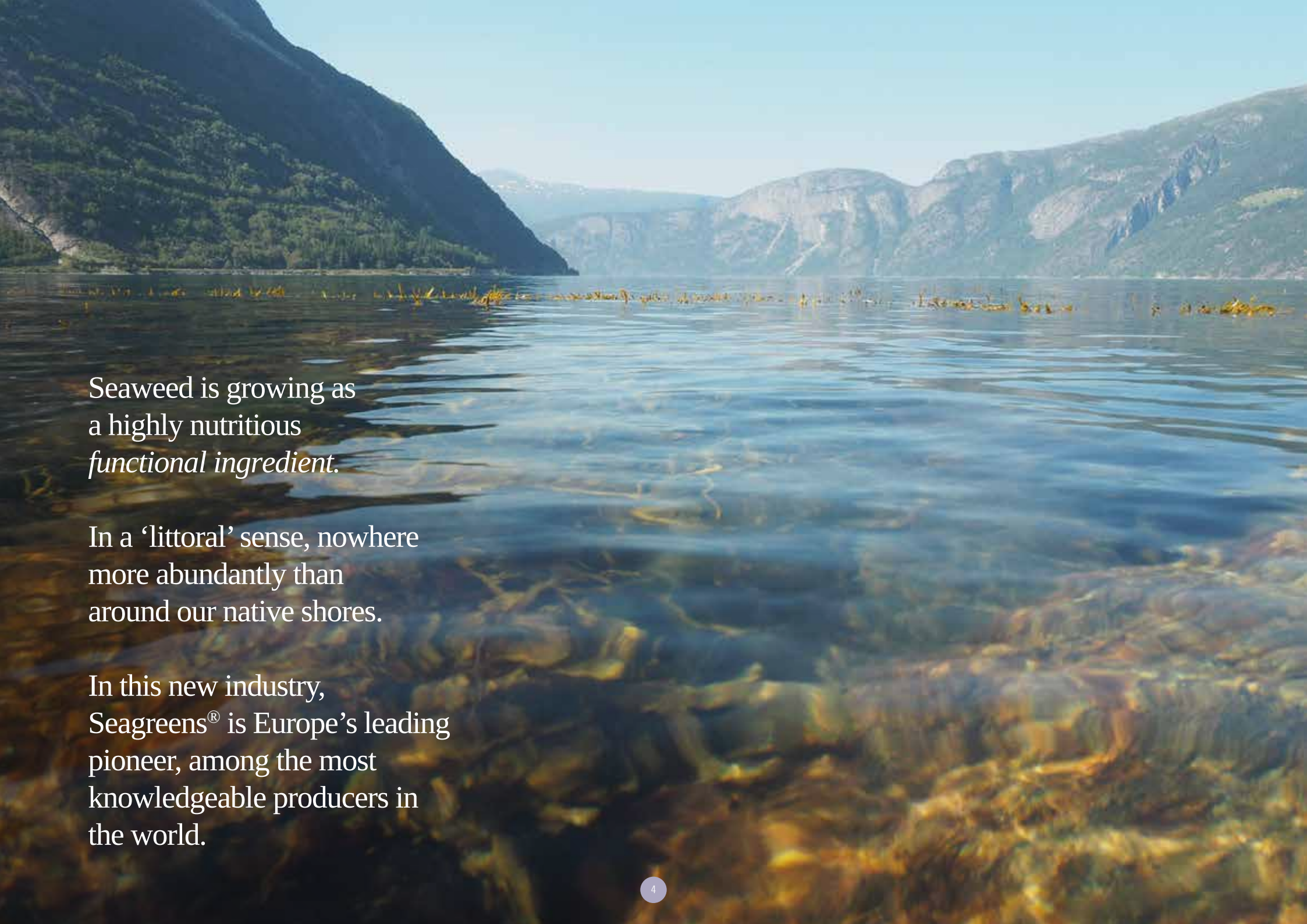
Seagreens®

The rising tide of seaweed ingredients

Part 1

An industry in the making





Seaweed is growing as
a highly nutritious
functional ingredient.

In a 'littoral' sense, nowhere
more abundantly than
around our native shores.

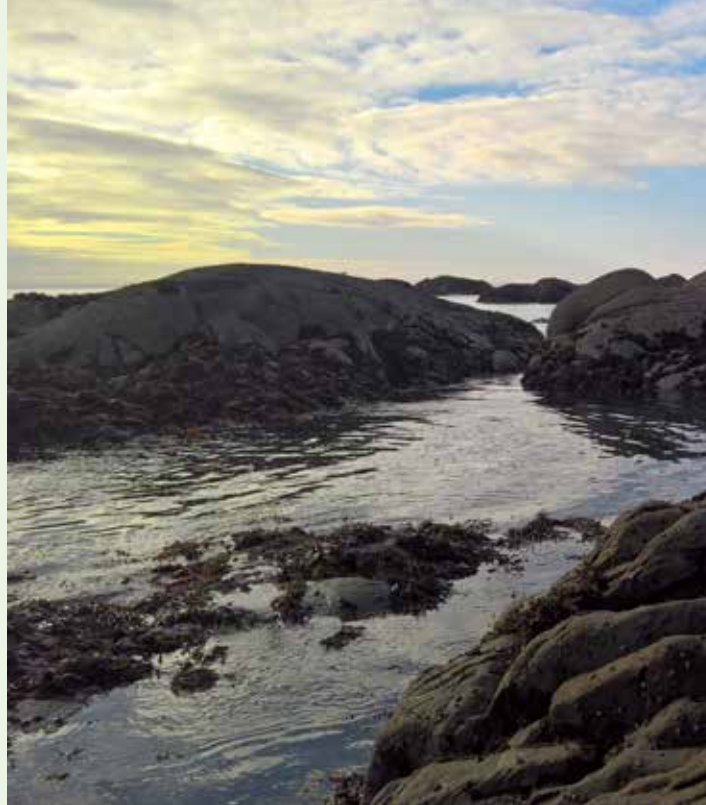
In this new industry,
Seagreens[®] is Europe's leading
pioneer, among the most
knowledgeable producers in
the world.

As in any industry, raw material is the key to quality, and the best seaweeds are found in different locations.

Seagreens has developed harvesting at five locations in the British Isles and Nordic region.

The selection, collection, and drying of each batch is carefully supervised.

A unique system of production combines traditional methods and innovative technologies, with *final processing and ingredient production in the UK.*



Seagreens' business model, with international distribution and technical support, has evolved through a consortium of independent partners.

Partners and customers benefit from *20 years of innovation and scientific data*, and strong brand values.

Seagreens has produced nutritious native wild seaweeds solely for human consumption, in Iceland, Ireland, Norway and Scotland.



Seagreens® Ascophyllum

Very Fine, Fine, Medium, and Large Granules



Ascophyllum nodosum: Knotted wrack

There are red, green, and brown seaweeds, brown overall being the most nutritious.

Ascophyllum is a native brown species, the most prolific of the ‘Wrack’ family.

It is adding *nutrient density and health benefits* to an ever-increasing range of nutrition and food products.



Seagreens® Fucus

Very Fine, Fine, and Medium Granules, and Large Pieces



Fucus vesiculosus: Bladder wrack

The ancient Greeks called all seaweed *Phycos*.

Which is why until recently, all the Wrack species were called *Fucus*, because they are so *closely related*.

Bladder wrack is the highest in *antioxidants*. *Fucus Serratus* and *Fucus Spiralis* have similar organoleptic and nutritonal properties.



Seagreens® Pelvetia

Fine and Medium Granules, and Large Pieces



Pelvetia canaliculata: Channel wrack

Pelvetia is short, mild flavoured, and comparatively rare, but has distinct advantages.

Low in iodine, higher in Omega 3, 6, and 9 long-chain polyunsaturated fatty acids, it is useful in formulating nutrient profiles and in blends for specific applications.

It finds its way into condiments and pasta toppings as well as mueslis and tonics.

All Seagreens® wrack seaweeds are effective prebiotics.



Seagreens® Dulse

Very Fine and Fine Granules, Medium Flakes, and Chopped Pieces



Palmaria palmata: Dulse

Traditionally prized for its flavour, variously described as salty and smokey, it has a well balanced nutritional profile, *with very low iodine*.

Scientifically, it has low *umami*, but a ‘high roasted’, bitter taste and aroma.

‘Ruby Rich Dulse’, chopped and sold in sachets in Waitrose stores, is Seagreens® *Palmaria* from the western shores of Ireland and Scotland.



Seagreens® Winged Kelp

Very Fine and Fine Granules, Medium Flakes, and Chopped Pieces



Alaria esculenta: Winged kelp, Dabberlocks

Similar to Japanese *Wakame* but a different species, Winged kelp has outstanding *umami* flavour, and moderate iodine.

Unlike Dulse it has a *distinctly sweet, clean taste and aroma*, highly suitable for tea blends, fruit juices, and nutritious smoothies.



Seagreens® Triblend Fine and Medium Granules

Ascophyllum, Fucus, Pelvetia:
Knotted, Bladder, and Channel wrack

Species can be blended to meet *nutritional and regulatory requirements, flavours, aromas and textures.*

A blend can add uniqueness to a high quality supplement or food formula, or help achieve desired nutrition and health claims.

Most blends are made for a customer requirement, but some well proven blends are available from stock.



Seagreens® Wrack Blend

Fine and Medium Granules

Ascophyllum and *Fucus*:
Knotted and Bladder wrack

This blend combines the benefits of *Fucus* high antioxidant profile and lower iodine, with *Ascophyllum* thyroid research and high polyphenols, and the *functional and health claims for both species*.



Seagreens® Salt & Seaweed Blend Medium Granules

Ascophyllum: Knotted wrack.
Natural sea salt from the
British Isles

This standard 50/50
blend of *Ascophyllum*
and natural sea salt
cuts salt intake by
half with more
flavour, lowers the
statistical risk of
cancer and cardio-
vascular diseases,
and is *an effective
antidote to excess
sodium chloride.*

Seagreens® Mineralizing Meal Large Granules

Ascophyllum nodosum: Knotted wrack

Any Seagreens® seaweed can be included in animal health or feed products, but this highly palatable ground meal is specially produced *at lower cost for domestic animals and livestock.*

The same quality assurance and data applies to all Seagreens® products. *We already produce to higher standards than feed producers, so why not give animals the benefit too?*

Mineralizing Meal is available on special terms to biodynamic and organic farms and certain institutions.





Laminaria digitata:
Oarweed, Kombu
(Japanese)

Vertebrata lonosa:
Seaweed Truffle

Himanthalia elongata:
Thongweed,
Sea spaghetti

Further seaweeds are under development to our uniquely high standards.

These ‘kelp’ and other species have different flavours, including strong *umami*.

Their individual nutritional profiles are increasing the variety of health and food applications available to our customers.

Ingredient Summary

Seagreens[®] wild wrack species provide nutrient dense, mineral rich, natural whole food ingredients, which in the daily diet, can deliver iodine sufficiency with no adverse effect on thyroid function¹, reduce the glycaemic response to carbohydrate load², assist in the digestion

of fats³, reduce hunger via lowered gastric emptying with a positive effect on nutrition⁴ and potentially in diabetes⁵, in the digestion are effective prebiotics⁶ and help protect the gut lining⁷, and are high antioxidant free-radical scavengers². They are a comprehensive source

of nutrition which may help to ameliorate numerous risk factors associated with diabetes, obesity, endothelial dysfunction, hypertension, cardiovascular disease⁸ and human cognitive disorders including dementia, depression and bipolar diseases⁹.

References



- ¹ *Combet E, et al. British Journal of Nutrition, 9:1-9, 2014.*
- ² *Wheater H, and Kent Z, PhD studies, Newcastle University, 2012.*
- ³ *Chater PI, et al. Journal of Applied Phycology, 28:1303-1313, 2016.*
- ⁴ *Hall AC, et al. Journal of Appetite, 58:379-386, 2012.*
- ⁵ *Nwosu F, et al. Food Chemistry, 126:1006-1012, 2011.*
- ⁶ *O'Sullivan L, et al. (2010). Marine Drugs, 8:2038-2064, 2010.*
- ⁷ *Pearson J, et al, Critical Reviews in Food Science and Nutrition, Newcastle University Inst. for Cell & Molecular Biosc., 2006.*
- ⁸ *Cornish ML, et al. Phycologia, 54(6): 649-666, 2015.*
- ⁹ *Cornish ML, et al. Journal of Applied Phycology, 2017.*

Part 2

How we support NPD & QA



Nutrition & health claims

Assisted by a retail consortium convened by the British Government, nutrition studies on Seagreens[®] began in 2008 at the Centre for Food Innovation at Sheffield Hallam University.



Seagreens® proved to be an *effective natural preservative* able to replace or reduce salt in manufactured foods, antibacterial and highly nutritious.

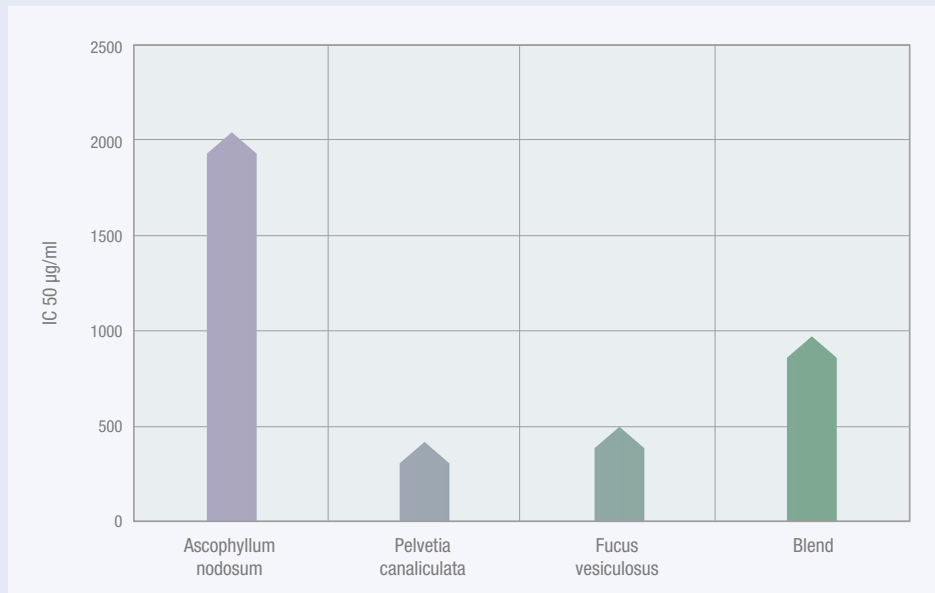
A series of studies was then undertaken to explore its benefits to population health.

Award-winning studies in obesity led to a range of findings with profound implications for digestion, detoxification, diabetes, cardiovascular and other non-communicable chronic and degenerative diseases.

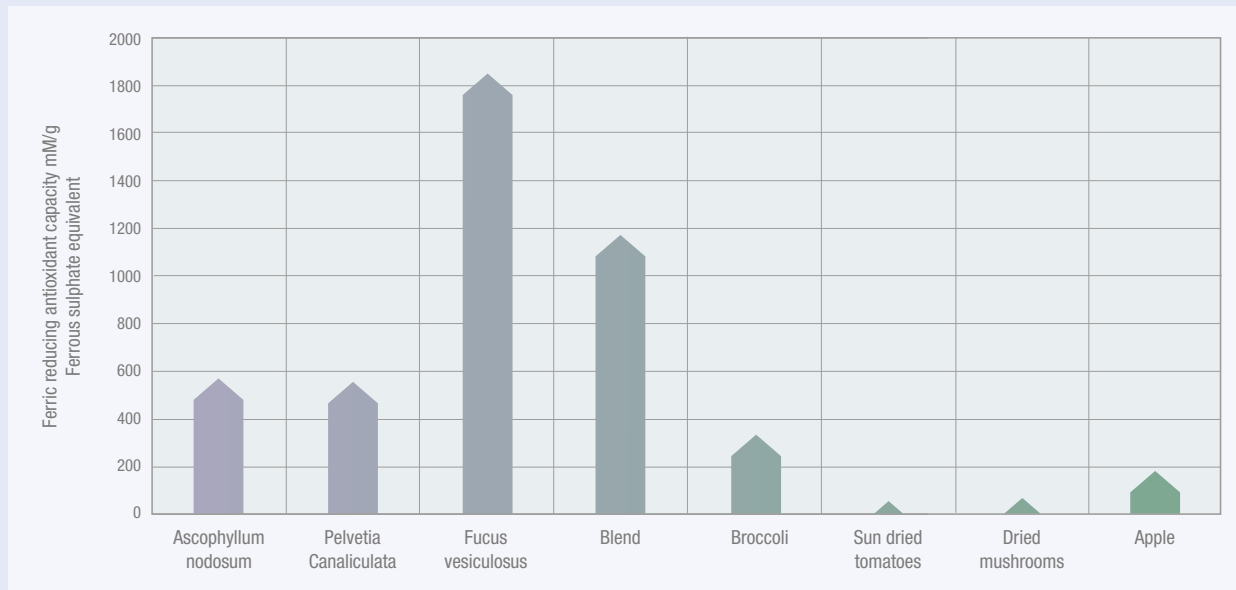
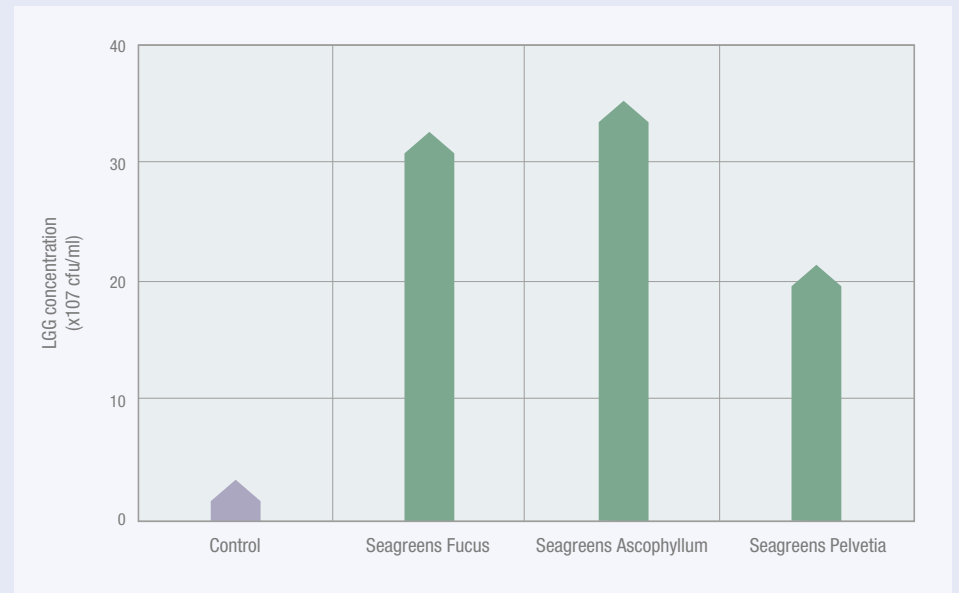
Big
IDEAS
FOR THE
FUTURE

UK Research Councils

Sugar digestion is slowed especially by Seagreens® *Ascophyllum*, useful in the treatment of obesity and diabetes.



Effective prebiotics, Seagreens® Wrack seaweeds help gut bacteria stay in balance.



Seagreens® *Fucus* has very high antioxidants which help protect the gut lining.

- Seagreens® research at Glasgow, Newcastle, Sheffield Hallam, and Teesside universities, 2009-13

Significant Seagreens® nutrient groups have also been studied, including iodine, robust antioxidants, and essential fatty acids. Population iodine deficiency, and thyroid interaction, inspired a customer-led

study at Glasgow University, published in the *British Journal of Nutrition* in 2014. Seagreens® *Ascophyllum* demonstrated more stable and prolonged iodine uptake than potassium iodide, the most

widely used conventional supplement. It had *no adverse effect on thyroid function*, and normalised production of Thyroid Stimulating Hormone.



British Journal of Nutrition, page 1 of 9
© The Authors 2014

doi:10.1017/S0007114514001573

Low-level seaweed supplementation improves iodine status in iodine-insufficient women

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(Submitted 4 March 2014 – Final revision received 23 May 2014 – Accepted 27 May 2014)

Abstract

Iodine insufficiency is now a prominent issue in the UK and other European countries due to low intakes of dairy products and seafood (especially where iodine fortification is not in place). In the present study, we tested a commercially available encapsulated edible seaweed (Napiers Hebridean Seagreens® *Ascophyllum nodosum* species) for its acceptability to consumers and iodine bioavailability and investigated the impact of a 2-week daily seaweed supplementation on iodine concentrations and thyroid function. Healthy non-pregnant women of childbearing age, self-reporting low dairy product and seafood consumption, with no history of thyroid or gastrointestinal disease were supplemented ($n=22$) with 1 g seaweed (712 µg iodine) daily for 2 weeks. After supplement ingestion (2 weeks, 0.5 g seaweed) iodine concentrations of thyroid-

Allowable claims for Seagreens[®] supported by published independent research

A good source of iodine contributing to normal thyroid, nervous system and cognitive function, energy-yielding metabolism, normal skin, and normal growth in children ^(A).

A natural prebiotic, supporting digestion, gastrointestinal health and bowel function ^(P).

Valuable in free-from, raw, vegan, kosher, halal, and other restricted and special diets for all age groups ^(P).

Decreases fat absorption ^(P).

With other dietetic measures, contributes to weight loss and weight management ^(P).

Reduces the glycemic index in bread and other carbohydrate foods ^(A).

Non allergenic ^(A).

Antibacterial effects such as to prolong food shelf life, or fight infection ^(A).

Nutrition claims allowed if portion contains >15% of Reference Intake.

“Breakfasting on a slice of bread with ground up seaweed rather than salt, could help burn more calories than half an hour on a treadmill”

– Daily Telegraph, 2012

^A EU approved list

^P EU pending list

Application areas supported by seaweed nutrition research

Ageing and degenerative health conditions, including loss of appetite and salivation (dry mouth) the latter aided by *umami* receptors.

Human cognitive disorders including dementia, depression and bipolar diseases.

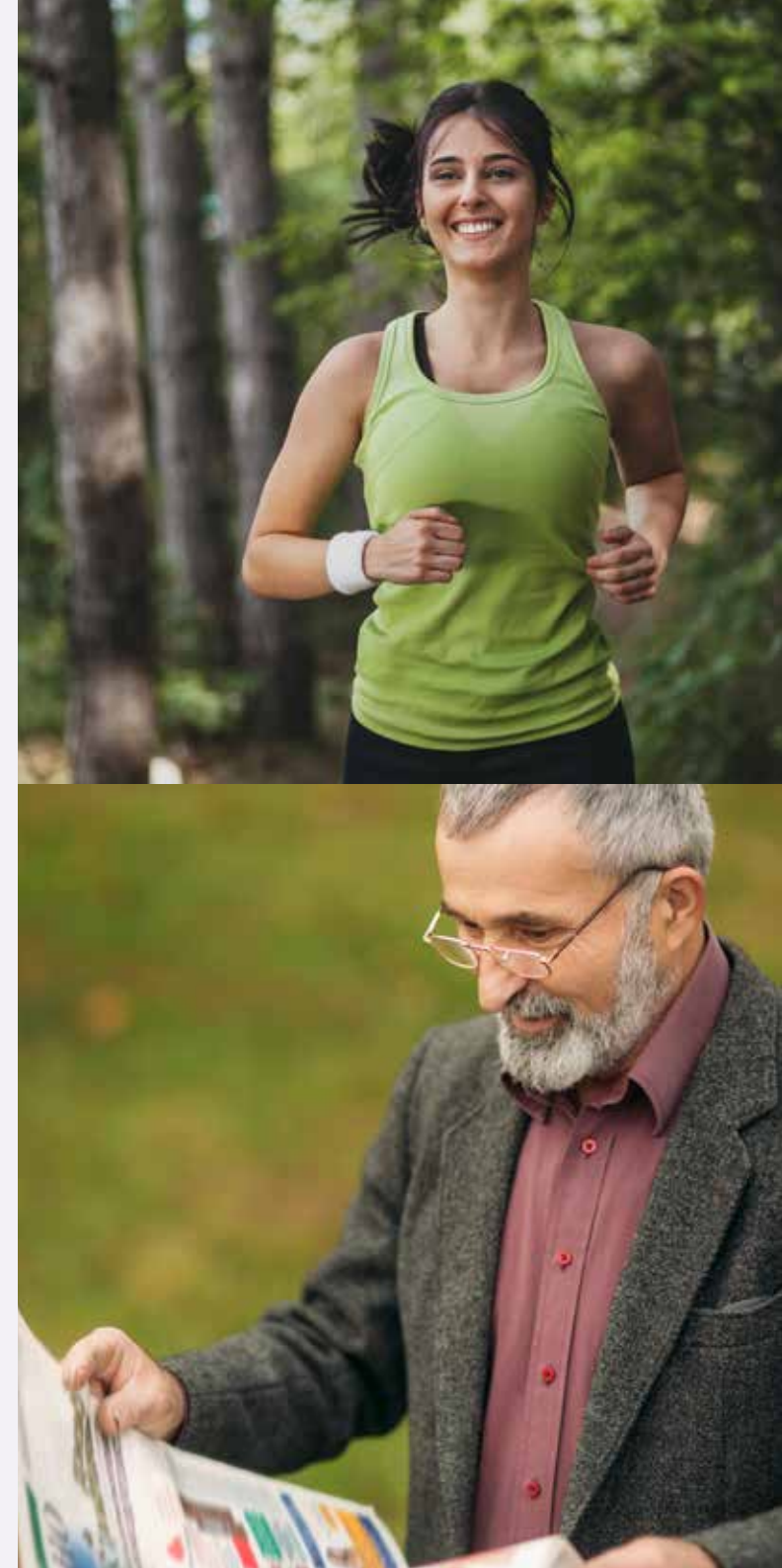
Cardiovascular diseases including endothelial dysfunction and hypertension.


Oral health and hygiene.

Sports functional foods and supplementation.

Everyday supplementation of the population diet via food ingredients.

Comprehensive source of minerals, antioxidants, polyphenols, soluble fibre, PUFAs, Omega 3, 6, 9 ratio, amino acids and vitamins.





“Neurodegenerative diseases are on the rise and poor nutritional regimes are leading to serious health pathologies triggered by widespread and chronic risk factors such as obesity, diabetes, inflammation, and hypertension. Seaweeds produced under controlled conditions offer boundless opportunities to satisfy the known requirement for brain health and could readily play important roles in improving overall human health and well-being.”

– Cornish ML, Critchley AT, Mouritsen OG* .
Consumption of seaweeds and the human brain.
Journal of Applied Phycology, 2017.

**Professor Ole Mouritsen is an Advisory Group member of Seagreens Health Foundation*



We know NPD cycles can take months or years.
Customers need a partner with staying power.

Together, we have the resources to respond to all of your regulatory, production, marketing and consumer issues.

We work with customers' NPD management, formulators, QA, test kitchens, and third party consultants - sometimes for years before a product is ready to launch.

Issues often reflect consumer concerns around *allergens*, *contaminants*, *provenance*, *purity*. We provide reliable dietary information *and seaweed compositional data*.

In 1999 Seagreens was the first seaweed ingredient producer to introduce a microfine particle size with no dust. It removed the need for flowing agents in blending and encapsulation, improved homogeneity and ease of handling.

Calcium

Seagreens Ascophyllum 13.5mg/g

Seagreens Fucus 10.9mg/g

Seagreens Pelvetia 11.4mg/g

Spirulina 7mg/g

Chlorella 3mg/g

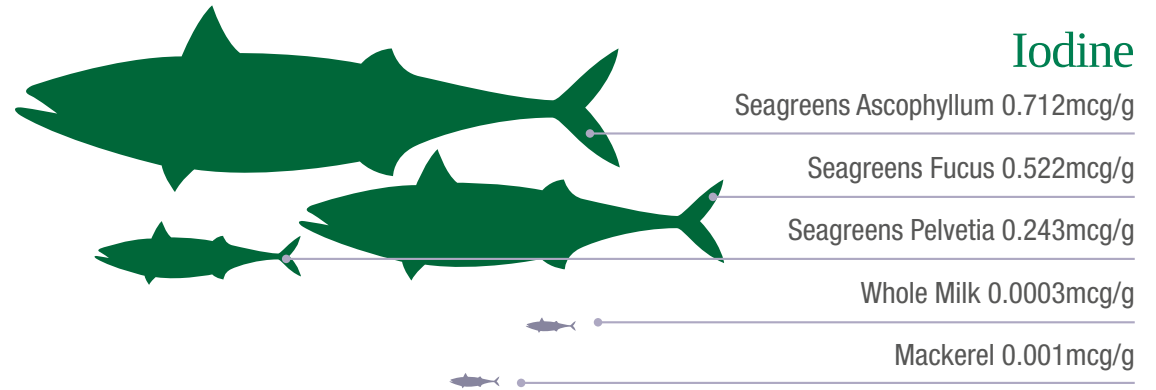
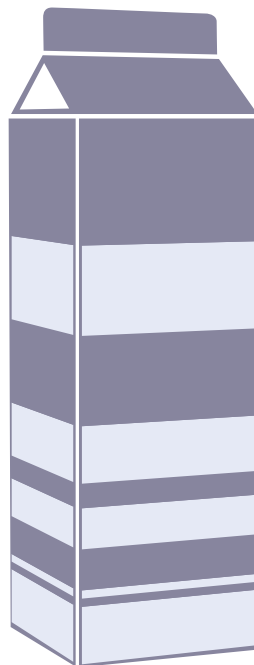
Barley Grass 5.2mg/g

Wheat Grass 5.2mg/g

Brown Rice 1.1mg/g

Whole Milk 1.15mg/g

Cheddar Cheese 7.2mg/g



In 2012 a comparative study was undertaken to establish the *nutritional basis for a customer's range of green superfood drinks*.

Potassium

Seagreens Ascophyllum 18mg/g

Seagreens Fucus 19mg/g

Seagreens Pelvetia 22mg/g

Spirulina 14mg/g

Chlorella 8mg/g



Seagreens® Ingredient Specification is the highest in the seaweed industry.

Independent analysis of every harvested batch, against a range of nutritional and contaminant markers, enables continuous improvement in production quality.

An innovation when developed in 2012, the data comprises *the most comprehensive compositional studies ever undertaken on native European seaweeds.*



GB-ORG-06
Great Britain





**Nutritious
Food Seaweed**

BDA CERTIFICATION

Seagreens Ltd was Britain's first certified Organic seaweed food producer in 1998.

Today, Seagreens[®] are produced in the British Isles and the Nordic region to British Retail Consortium and Nutritious Food Seaweed standard.

Free from harmful allergens, contaminants, and pesticides.

With Seagreens[®], you know what you are using.

Part 3

The Tools of Support





Seagreens provides support every step of the way, with advice, trial samples, and technical data.

This information booklet for your customers, and *a specific quality assurance presentation for technical staff*, are available on request.

Seagreens® Design Guidelines provide helpful guidance concerning the appropriate naming and description of seaweed ingredients.

Our seaweed photographic library and marketing information are valuable resources for NPD, PR and promotional activities.



Seagreens publishes periodical technical papers, inspired by new research and applications, keeping customers informed on important issues.

- Weight management and regulation
- Iodine, levels and formulation
- Health and nutrition claims

Wachstum von Seetangwirkstoffen (aktuelle Daten)

Die Anwendung von bekannten, belegbaren Daten als Beitrag für die Formulierung und Regulierung dieser Wirkstoffe

2. Das JOD

Wir haben immer wieder die Möglichkeit, unseren Partnern und Kunden Informationen und Forschungsergebnisse mitzuteilen, um ein besseres Verständnis der Meeresalgen zu erreichen und auf ihre Nutzung in der Entwicklung und Herstellung von neuen Lebensmittelprodukten und Getränken, zu berichten.

Vor kurzem wurde in den Medien oft über den Mangel an Jod in vielen Ländern berichtet. Wild geerntetes Seetang ist die reichhaltigste Quelle von bioverfügbarem Jod. Im Kulturboden dagegen ist es kaum vorhanden. Vorteile für die Gesundheit sind möglich mit nur 59 mg von Seagreens® *Ascophyllum*, oder 106 mg von Seagreens® *Fucus* Meerestang. Sie finden wichtige neue Daten in dieser Schrift über den Jodgehalt von den fünf nährstoffreichsten Arten von Seetang.

Seit zwanzig Jahren hat Seagreens an fünf

deren Beleg als Gesundheitsvorteile bei der EU beantragt werden können (1, 2).

Vor einigen Jahren haben wir eine Diskussionsschrift über den Arsengehalt von Seetang herausgebracht in der Zeit wo dies auch unter dem prüfenden Blick der Behörden gestanden hat. Mit unseren Daten haben wir zeigen können, daß die Art des Vorkommens viel wichtiger ist als der Gesamtgehalt von Arsen. Es ist jetzt allgemein anerkannt, daß nur dann eine Gefahr besteht, wenn das Arsen aus inorganischer Herkunft stammt.



Diese Diskussionsschrift ist nur zur Darstellung von wissenschaftlicher Auskunft und Bildungsinformation gedacht. Es ist nicht als Werbung dieser produkte gedacht oder sie zum Verkauf anzubieten. Die beschriebenen Angaben sind von 34 zuständigen Lebensmittelüberwachungs- und nicht ausgewertet.

Current data and the growth of seaweed ingredients

The use of known, verifiable data to assist formulation and regulatory compliance

2. IODINE

We are pleased to provide customers with information which may be helpful in using seaweed in the products in nutrition, food applications.

Insufficiency has been found in many countries. Wild seaweed is the richest source of iodine, while iodine is one of the most nutritious minerals in our diet. Health Claims are possible with the inclusion of only 59 mg of Seagreens® *Ascophyllum*, or 106 mg of Seagreens® *Fucus* seaweed. This paper presents new data on iodine levels in seaweed.

Harvested and produced in the British Isles and consumed for the past 20 years. It has

specialised in the production of brown Wrack seaweeds with comprehensively documented compositional profiles, officially defined as 'a good source of iodine' for which EU Health Claims may be made (1, 2).

A few years ago we issued a white paper on arsenic levels in seaweed, which was also under regulatory scrutiny. We presented data showing that the form of arsenic is more important than the total level. It is now generally accepted that only the level of inorganic arsenic is of regulatory concern.



This paper is intended to provide scientific and educational information. It is not intended to promote or sell any product. The statements herein have not been evaluated by the Food and Drug Administration. The ingredients discussed are not intended to diagnose, treat, cure, or prevent any disease.
16th July 2018

- Safety and some research studies 2
- about the amounts of iodine in seaweed? 2
- Balance on natural variances 4
- 4



Pricing

A global price list means that the price per kilo of a Seagreens® ingredient is the same wherever purchased, vital for international production and marketing.

Prices range from £12 to £100 per kilo depending on the ingredient species and order volume. *Brand Partner* customers, identifying the Seagreens® ingredient on pack or elsewhere, receive special privileges.

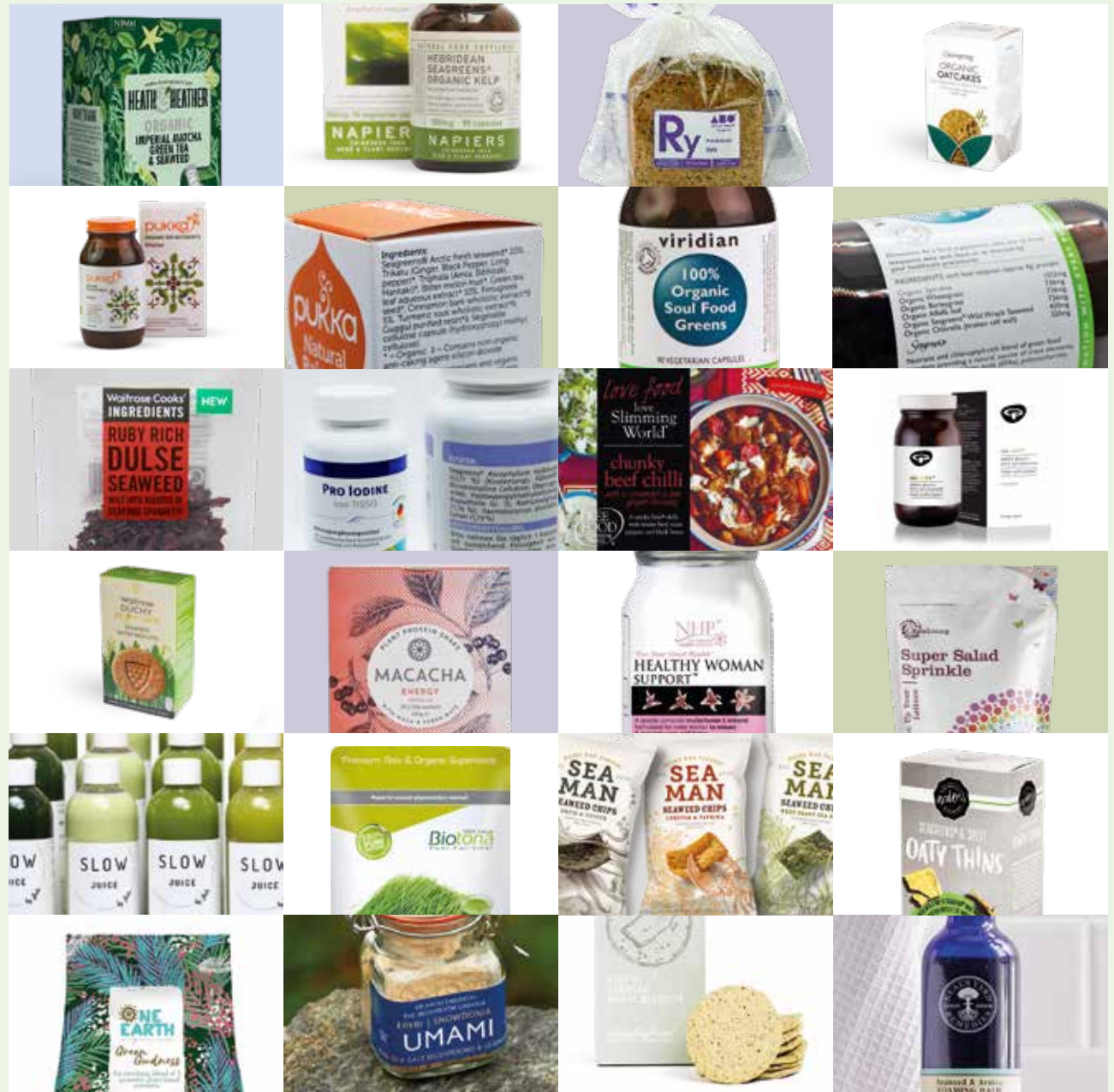
Whether sold or simply transferred, to uphold brand integrity *Seagreens conditions of sale and quality assurance apply to the entire chain of custody.*

Brand partnership

Most customers choose to identify the Seagreens® ingredient in their product, *on pack or elsewhere*, as Seagreens®.

They benefit from unique scientific data and reputational assurance, of special value in dealing with regulatory matters and the media.

The nutritional profile of Seagreens® ingredients is published for consumers and healthcare practitioners.



Stockholding

Seagreens reserves adequate stock for Intermediary Partners and their manufacturing customers.

In 20 years we have never been unable to fulfil an order.

15 different ingredient forms are now available from stock across 5 different seaweed species, *the largest stock of nutritious food seaweed in Europe.*

Corporate summary

- 20 years in production specifically for human consumption
- 12 years original nutrition research and compositional data
- Awarded for sustainable production, products and research
- 15 ingredient products from 5 different seaweed species
- 1kg to 5,000kg available from stock with global distribution
- Price consistency and equivalence in worldwide markets
- Respected international brand name for use by customers
- First British seaweed producer certified Organic in 1998
- First producer certified to Nutritious Food Seaweed 2016



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*Administered in the
interests of our Partners
and Customers by
Seagreens Trust.*