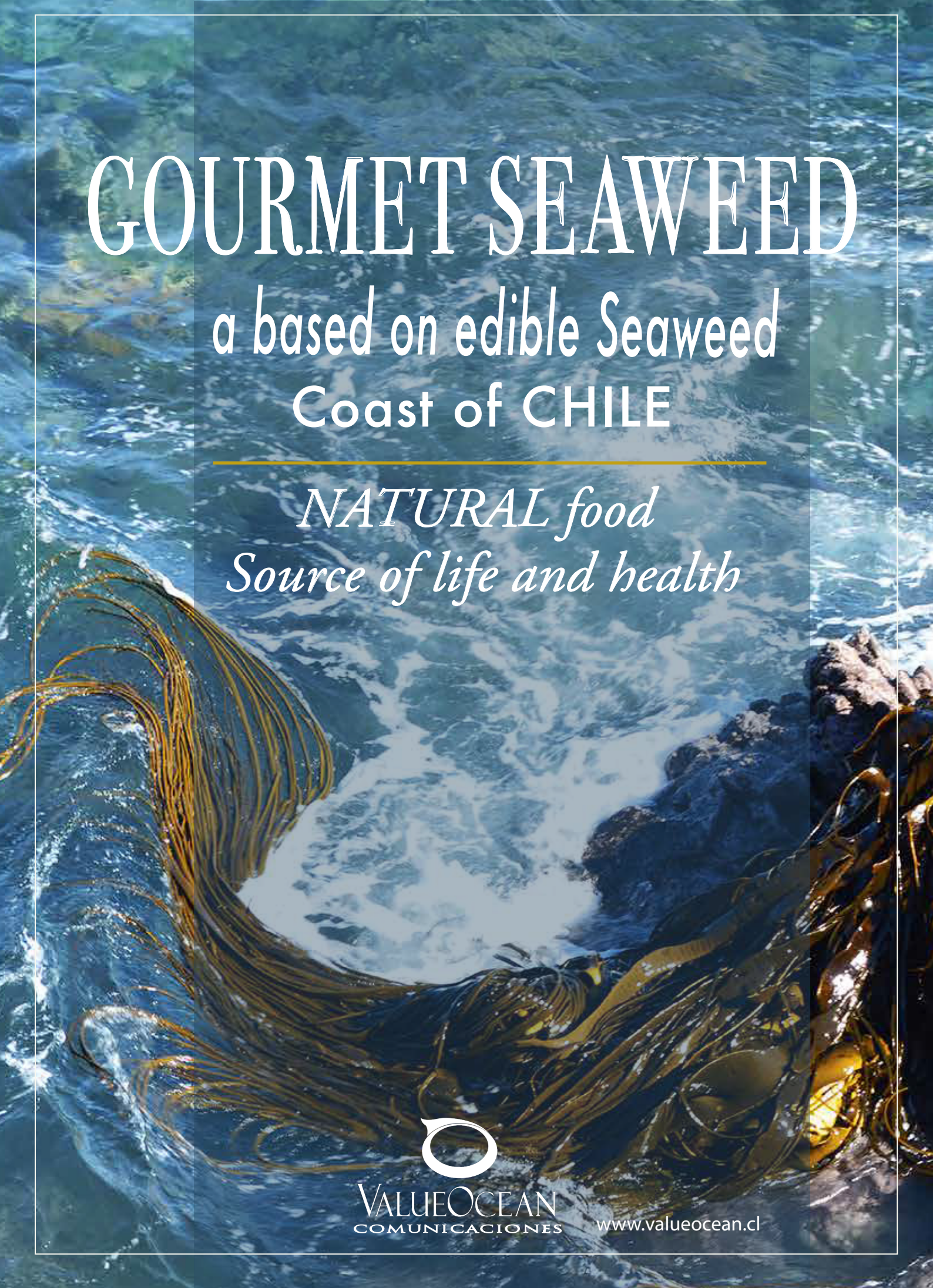
GOURMET SEAWEED
a based on edible Seaweed
Coast of CHILE
NATURAL food
Source of life and health
VALUEOCEAN
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Gourmet Seaweed

Edible Seaweed from Chilean Coast

Teresa Vergara G.
Foundress and Director
ValueOcean

In keeping with our mission of making more approachable the oceans and seas value and wealth for the planet and society, we present you the article "ALGAS GOURMET, en base a algas comestibles de la costa de Chile" (Gourmet Seaweed, based on edible seaweed from the Chilean coast). This is a magazine type article containing information and photographs of our coastal exploration, aimed at showing the beauty and wealth of seaweed from our Chilean shoreline.

Our purpose is to inform about the main edible algae and their value as healthy, nutritious food and also highlight the great work of the seamen and women who are committed to the sustainability of these resources through their controlled harvesting practices, avoiding the depletion of the kelp forest. A further purpose is to present a group of entrepreneurs from the food sector, committed to environment protection and their consumers' wellbeing, taking to their homes healthy products made from these valuable marine plants.

In order to tackle this publication and to have first-hand information, we visited the beautiful district of Navidad in the Sixth Region, where we explored its marine wealth and learned about the important work being carried out by the shore harvesters and the small-scale companies of this budding industry of seaweed-based food products.

After learning the value of these marine resources and becoming aware of the effort being made by the harvesters and the small-scale companies, we shall continue to support these ventures, seeking to contribute to promoting the consumption of these valuable marine plants, through this kind of publications.

Nowadays it is even more urgent to support this activity, given these difficult times of world crisis due to the pandemic (Covid -19) that has affected the entire production chain and commercialization of these products. In this scenario, every day families should eat food that are more natural and, thereby, support the small entrepreneurs who have been greatly affected on an economic level by this catastrophe.

We explore and discover the wonder the Oceans
Seaweed from the coast of Chile, sources of life and heath..

Seaweed

Marine plants of Value for the Planet and Society

There are many elements in the planet that are indispensable for life: the sun, water, and air being among the most well-known by society. The less known ones include ALGAE,which have existed on our planet for more than 4,000,000,000 years, long before most living beings and humans appeared on Earth. However, seaweed or macroalgae would have originated only 200 million years ago (Lin *et al,* 1986)

Scientific evidence indicates that algae are responsible for oxygenating earth given its capacity for carrying out photosynthesis, converting solar energy into chemical energy. Besides producing oxygen for our planet, they provide shelter for many marine species (fish, snails, sea urchins, crabs, among other). They are also a source of natural substances such as agar, carrageenan and alginate, used by the food, pharmaceutics and cosmetics industries. Said industries have identified the true potential of marine algae, exploiting the economic opportunities these resources provide, aligned with current new trends of sustainability of live resources of the planet.

These valuable marine plants have been used as food by humans since ancient times. At present, their value has increased because of awareness of their nutritional qualities, particularly their high protein, vitamin, amino acid and essential oil content.

Diverse algae species are currently being researched from an ecological and fishing standpoint, given the benefits they provide to the marine environment, and to the health and wellbeing of people worldwide.

Sources of life and food for the Planet and Society..

SEAWEED

The MARINE ALGAE can be divided according to size in two large groups; microalgae, which are part of plankton and are the base of the ocean trophic or food webs, and macroalgae or SEAWEED which are visible with the naked eye mainly on all shores around the world. The latter have been classified according to their pigmentation or color as follows:

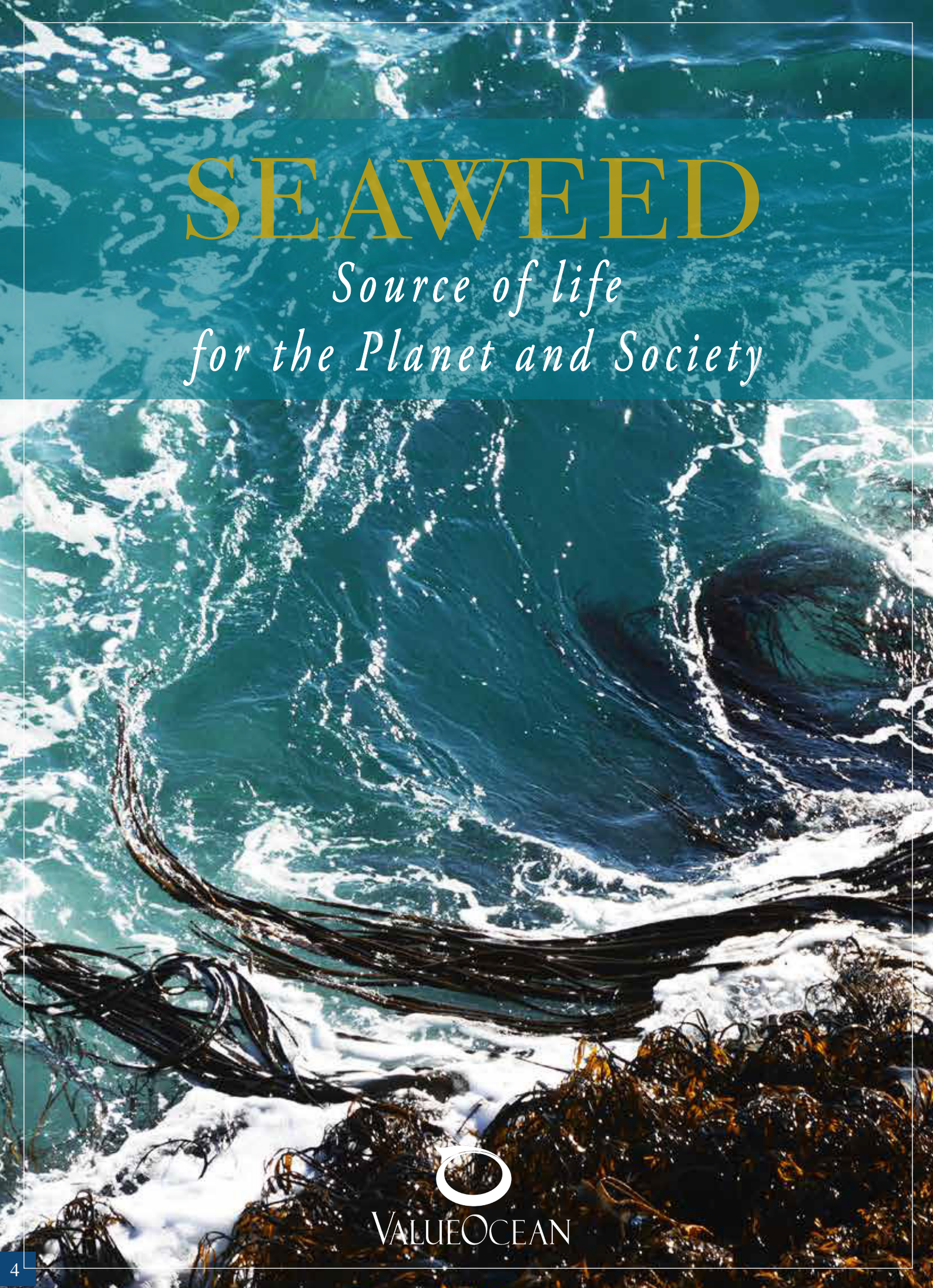
BROWN SEAWEED (Phaeophyta): The characteristic pigment, fucoxanthin (carotenoid pigment), gives them a greenish brown color. These are the largest among all algae species. They are fast growing and form relatively complex tissues. They live on rocks, in temperate and subpolar areas, in beach zones where the highest and lowest tide levels ("intertidal zone") are recorded. They produce alginate, which is used as thickener and gelling agents by the food industry. In Chile, BROWN SEAWEED diversity encompasses 179 species.

RED SEAWEED (Rhodophyta): This is the second major group of algae, whose characteristic pigment is phycoerythrin (a red protein pigment). Their habitat spans from intertidal zones to deeper areas of the subtidal coast, depending on water transparency. Some algae of this group are a source of important natural substances such as agar and carrageenin that, given their suspensory, emulsifying, stabilizing, and gelling properties, are utilized in modern industries to manufacture countless everyday products, including creams, jelly, toothpaste, pharmaceutical gels, ice cream, dry soup, cosmetics, among other. In Chile, RED SEAWEED diversity encompasses 479 species.

GREEN SEAWEED (Chlorophyta): Most of these algae live in freshwater habitats: only 10% live in seawater. These algae contain chlorophyll a and b.In Chile, GREEN SEAWEED diversity encompasses 152 species.

It is estimated that, worldwide, there are 19,200 species, 2,000 BROWN SEAWEED, 10,000 GREEN SEAWEED, and 7,000 RED SEAWEED. In Chile, meanwhile, it is estimated that there are 810 known species. All are potential food sources for mankind.

Generators of oxigen, shelter and food..


SEAWEED
Source of life
for the Planet and Society
ValueOcean

Edible Seaweed

Powerful marine plants in the Chilean coast..

The SEAWEED grow abundantly in all oceans of the world: some are edible and valuable for human consumption due to their high content of nutrients, essential forthe health and wellbeing of people.

These plants, also known as “SEA VEGETABLES”, have been the subject of scientific research. They have shown a series of nutritional benefits of an algae-based diet, constituted by a variety of antioxidants that protect from a myriad of diseases - hypothyroidism, vascular disease, and excess weight, among others considering consumption there of depending on a person’s health conditions.

The seawaters that wash the shores of Chile are known to be some of the most productive on earth, sustaining large populations of invertebrates, marine vertebrates (fish, birds, and mammals), and valuable species of algae.

In Chile, the main EDIBLE SEAWEED belong to the BROWN and RED SEAWEED group, which are increasingly being used in the Chilean cuisine.

SEAWEED GOURMET

edible Seaweed from the chilean coast

Among the 179 BROWN SEAWEED existing in Chile, we find COCHAYUYO (*Durvillaea antartica*) to be one of the main ones for human consumption, having high mineral salt and vitamin content.

This macroalga has been widely consumed as food among the coastal people since ancient times. Nowadays it is also used by the food industry and is becoming more prevalent in the Chilean cuisine. It is characterized by its large dimensions and its color ranging from brown to dark brown and being more golden when dry.

This group of BROWN SEAWEED also includes CALABACILLO (*Macrocystis pyrifera*). It is distinguished by its light brown to yellowish brown color and its pyriform structures called "floats" or "aerophores".

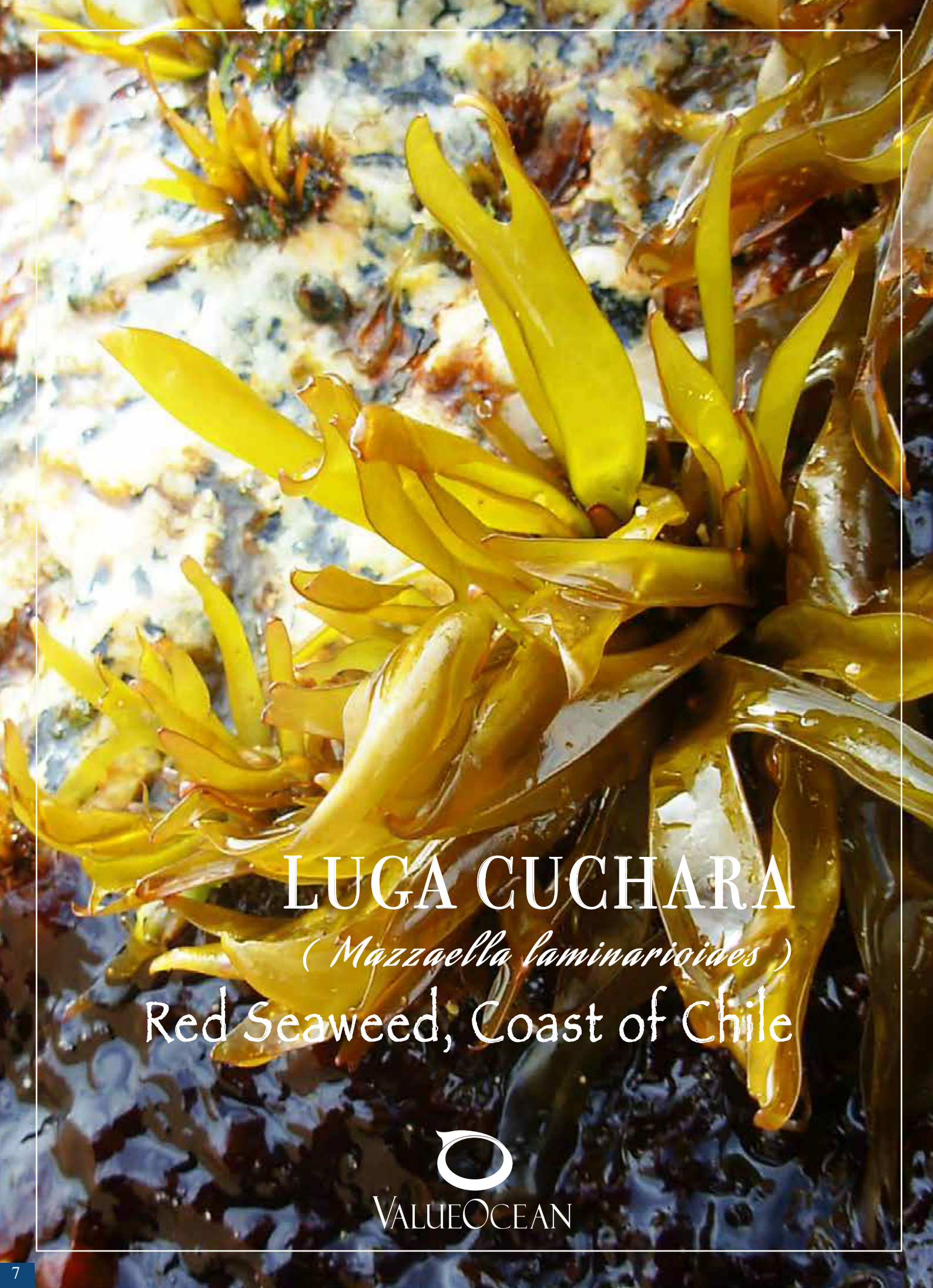
In addition, among the 479 RED SEAWEED existing in Chile we can find LUCHE (*Pyropia orbicularis*), also regarded as one of the main edible seaweed, which is used in Chile as a traditional food in the native cuisine.

Another of the RED SEAWEED that is being used for human consumption is LUGA CUCHARA (*Mazzaella laminarioides*), to fortify foods and as seasoning in the chilean cuisine.

These four edible algae possess important, valuable mineral salts and vitamins and are very fast growing.

Next, we shall describe in more detail these healthy seaweed for our nutrition and for that of future generations the fundamental reason for responsible extraction and consumption.

Brown and Red Seaweed, food sources for the gastronomy of Chile and the world..



LUGA CUCHARA

(Mazzaella laminarioides)

Red Seaweed, Coast of Chile

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LUGA CUCHARA

(*Mazzaella laminarioides*)

Clumps of Luga Cuchara attached to coastal rocks..

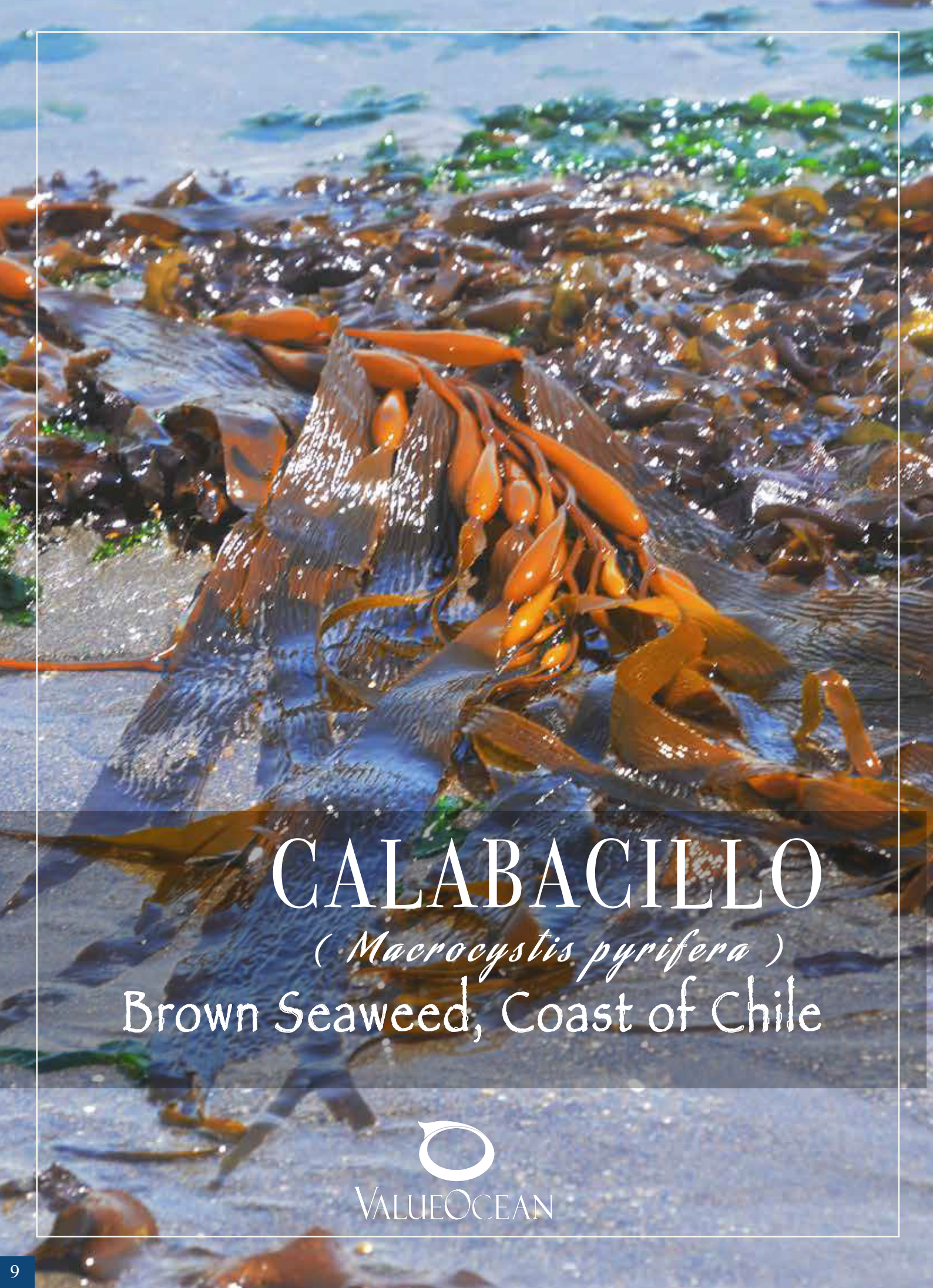
The LUGA CUCHARA belongs to the group of RED SEAWEED and is known by the scientific name *Mazzaella laminarioides* (Bory, 1829).

Scientists have described it as a plant formed by a varying number of up to 50 erect fronds or blades that originate in a holdfast having an irregular (sometimes hemispherical) shape. Its blades are brownish red, reddish brownor yellowish, and can measure up to 30 cm long and 5 cm wide. The blades are elongated, spear-point shaped, flat or with a concave-convex curve: hence its name in Spanish referencing a spoon (‘cuchara’) (Otaiza & Cáceres, 2015).

This alga grows attached to the rocky substratum. It can be found in puddles and in exposed and semi exposed rocks in the middle of the intertidal zone.

Along the Chilean coast it is present between Valparaíso and Tierra del Fuego. It has also been seen in the Peruvian coast and in the Kerguelen and Crozet Islands (French overseas territories) in the south of the Indian Ocean.

It is used as seasoning and dressing in the Chilean cuisine.



CALABACILLO

(Macrocystis pyrifera)

Brown Seaweed, Coast of Chile

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CALABACILLO

(*Macrocystis pyrifera*)

Eye catching AEROPHORES distinguish this brown macroalga..

The CALABACILLO or HUIRO FLOTADOR is a macroalga belonging to the BROWN ASEAWEED group, known by its scientific name *Macrocystis pyrifera* (Agardh, 1820).

This plant can grow to 45-50m in length. It has branched blades that stem from a cylindrical stipe extending from a small basal disk through which it attaches to the rocky substratum. It has long and narrow blades with a rough surface and serrated edges. At the base of the blades there are pear-shaped structures denominated “aerophores” or “pneumatophores”, which enable the blades to stay on the surface to receive the greatest amount of light possible. The Calabacillo is light brown to yellowish brown in color (Avila *et al*., 2019). Diverse chemical substances (10.2% proteins, 0.8% lipids, 20.4% fiber, 5.3% carbohydrates, and 29/100gcalories) have been identified within them (Toledo *et al,* 2009).

Said seaweed grows attached to the rocky substratum forming vast subtidal forests at 3-80 meter depths, in sectors that are protected or semi-protected from the waves. Just like other brown seaweed, scientists have considered this species to be “ecosystem engineers”. This implies that they constitute a shelter or refuge for marine benthic flora and fauna, which is characterized by living and feeding at the seabed.

It can be found in South America, along the northern coast of Peru, down to the southern Chilean Patagonia, and along the Atlantic coast of South America, in the Argentinian Patagonia. It can also be found in sub-Antarctic islands of South Africa, Australia, and New Zealand.

It is used as seasoning and dressing in the Chilean cuisine.

CALABACILLO

(Macrocystis pyrifera)

Basal disk

Small basal disk attached to a piece of rounded rock.

CALABACILLO

(Macrocystis pyrifera)

Aerophores

The blades of the CALABACILLO are distinguished by having at their base a ball shaped structure filled with air called “FLOATS” or “AEROPHORES”, of a vivid yellow color, which enable them to float on the surface. This makes it easier for them to obtain a greater amount of light, enhancing the process of photosynthesis and growth of these brown algae. This constitutes an ecological advantage for the CALABACILLO.

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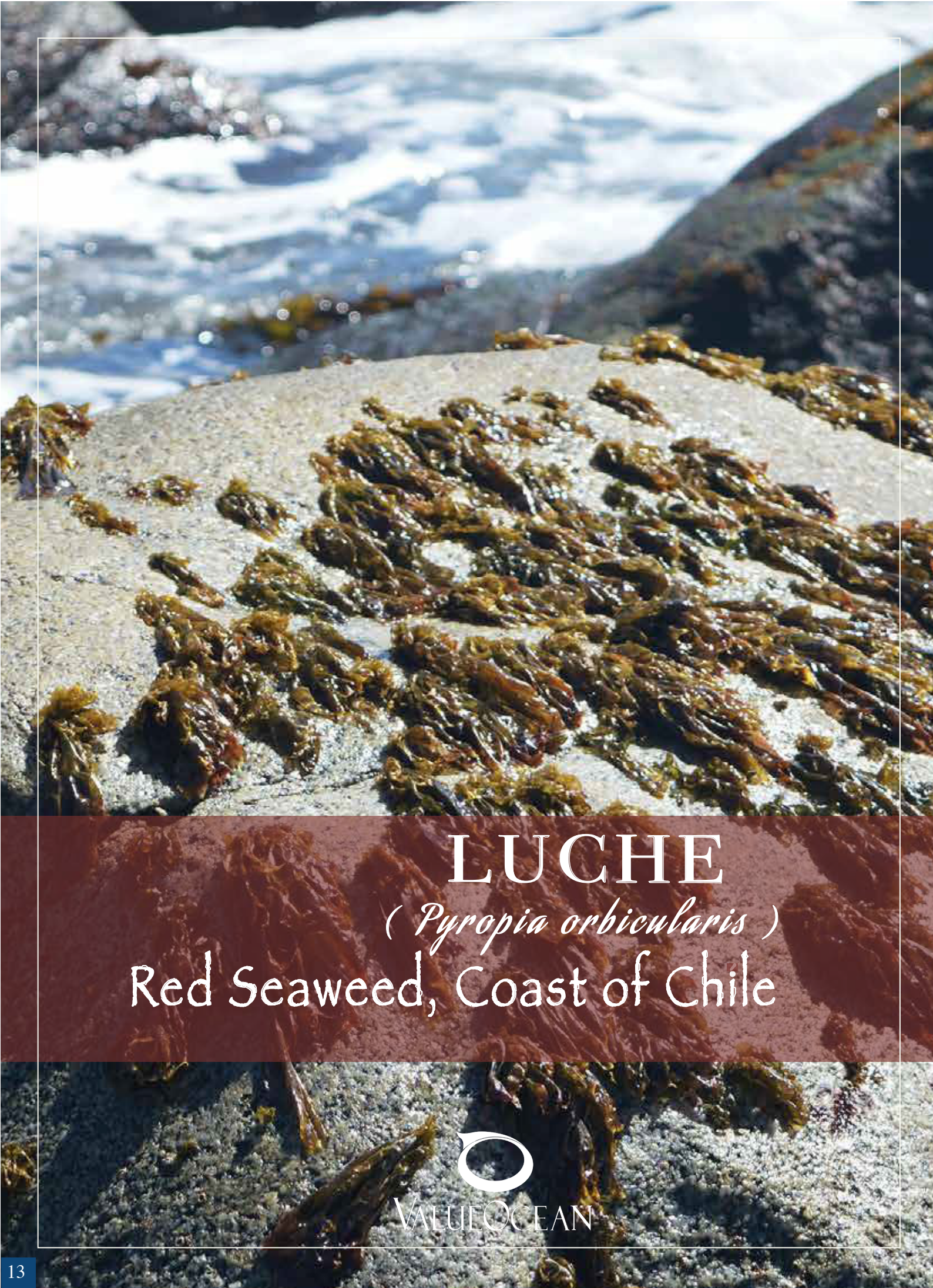

LUCHE

(Pyropia orbicularis)

Red Seaweed, Coast of Chile

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LUCHE

(*Pyropia orbicularis*)

Abundant clumps of LUCHE on coastal rocks..

The LUCHE is an edible RED SEAWEED whose scientific name is *Pyropia orbicularis,* previously denominated *Porphyra columbina* (Avila *et al*., 2019). It is also known as the “Chilean nori”.

Its blades, equivalent to the leaves of a plant, can measure up to 10 cm long, 5 cm wideand 0.15 mm thick. Its color ranges from brown, greenish red to green.It grows in different shapes: some are relatively flat, undulated, or have curled blades. To the touch they have a soft, very flexible and elastic texture, which is highly resistant to the beating of waves or to manual extraction. Its blades grow as stand alone or in clumps from a disk formed by rhizoids or by a cushion-shaped base.

The LUCHE inhabits rocks in the upper intertidal area, next to populations of small local barnacles called “picorocos” and some species of small snails.

It exists along the coast of Chile and Peru: in Chile, from Iquique to Tierra del Fuego; and in Peru, between Arequipa and Piura. It can also be found at the Campbell Islands and Auckland from New Zealand.

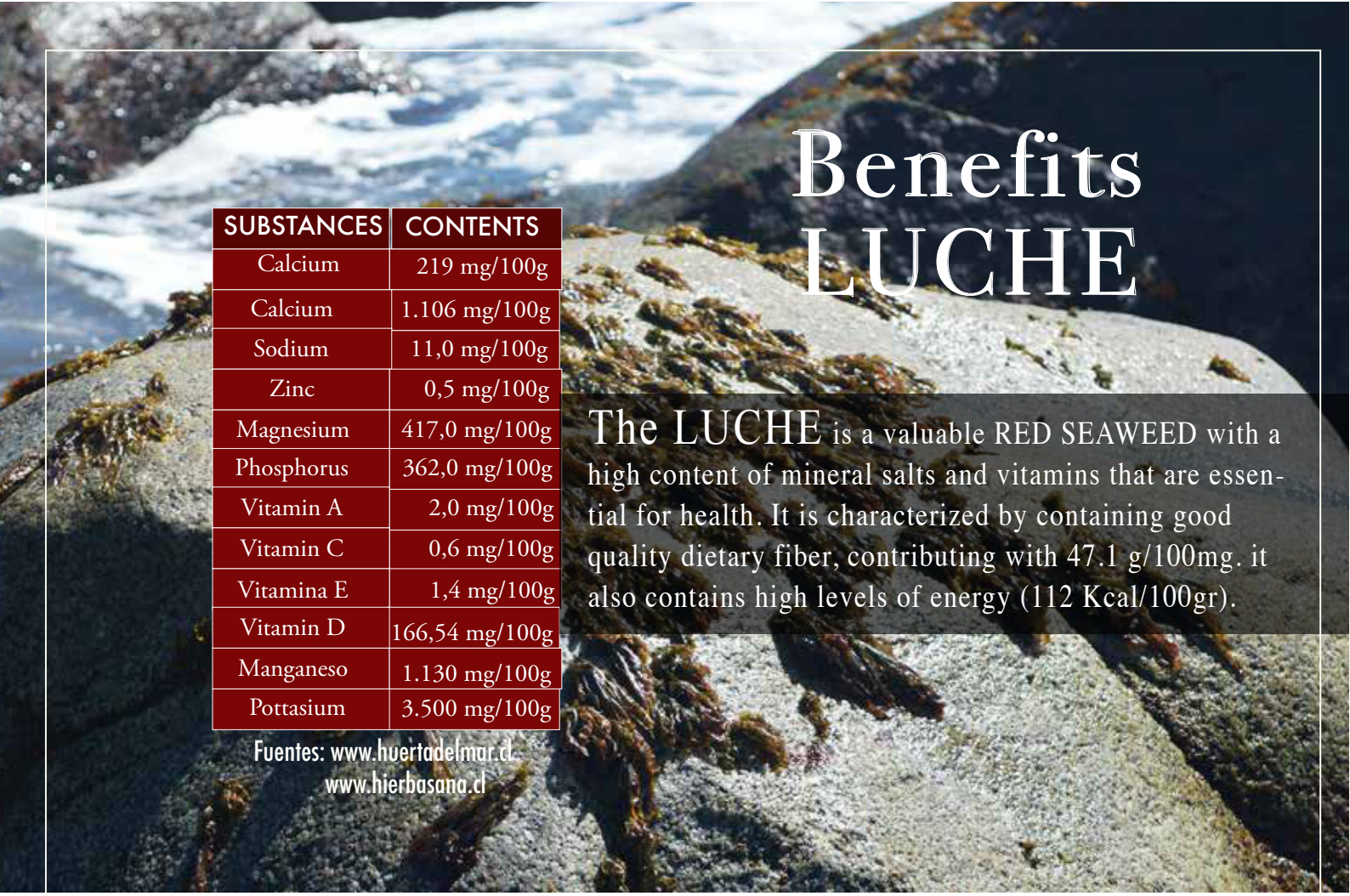
In the Chilean cuisine it is used as food fortifier. When dry, it is also used in stews and soups.

HABITAT

Isolated or clumped blades of LUCHE grow attached to coastal rocky masses.

CLUMPS OF LUCHE cover the rocks of the Chilean shores, where it is common to see its greenish red and light brown blades, eventually together with other algae and mollusks, attached to the rocks in the upper intertidal zone.

In Chile, it is harvested between the spring and summer months: it is easiest during low tide periods. To carry out a sustainable extraction, scientists recommend harvesting the blades without extracting the holdfast. This allows a quicker recovery of the kelp forests of this valuable red alga, which has a high protein and vitamin content, and is extracted by the seaweed gatheres in keeping with adequate management practices.



Benefits LUCHE

SUBSTANCES	CONTENTS
Calcium	219 mg/100g
Calcium	1.106 mg/100g
Sodium	11,0 mg/100g
Zinc	0,5 mg/100g
Magnesium	417,0 mg/100g
Phosphorus	362,0 mg/100g
Vitamin A	2,0 mg/100g
Vitamin C	0,6 mg/100g
Vitamina E	1,4 mg/100g
Vitamin D	166,54 mg/100g
Manganeso	1.130 mg/100g
Pottasium	3.500 mg/100g

Fuentes: www.huertadelmar.cl
www.hierbasana.cl

The LUCHE is a valuable RED SEAWEED with a high content of mineral salts and vitamins that are essential for health. It is characterized by containing good quality dietary fiber, contributing with 47.1 g/100mg. it also contains high levels of energy (112 Kcal/100gr).

IRON

Iron is a mineral that is necessary for the body's growth and development. The human body uses it to produce hemoglobin, a protein of red blood cells that transports oxygen from the lungs to different parts of the body, and also myoglobin, a protein that supplies oxygen to the muscles.

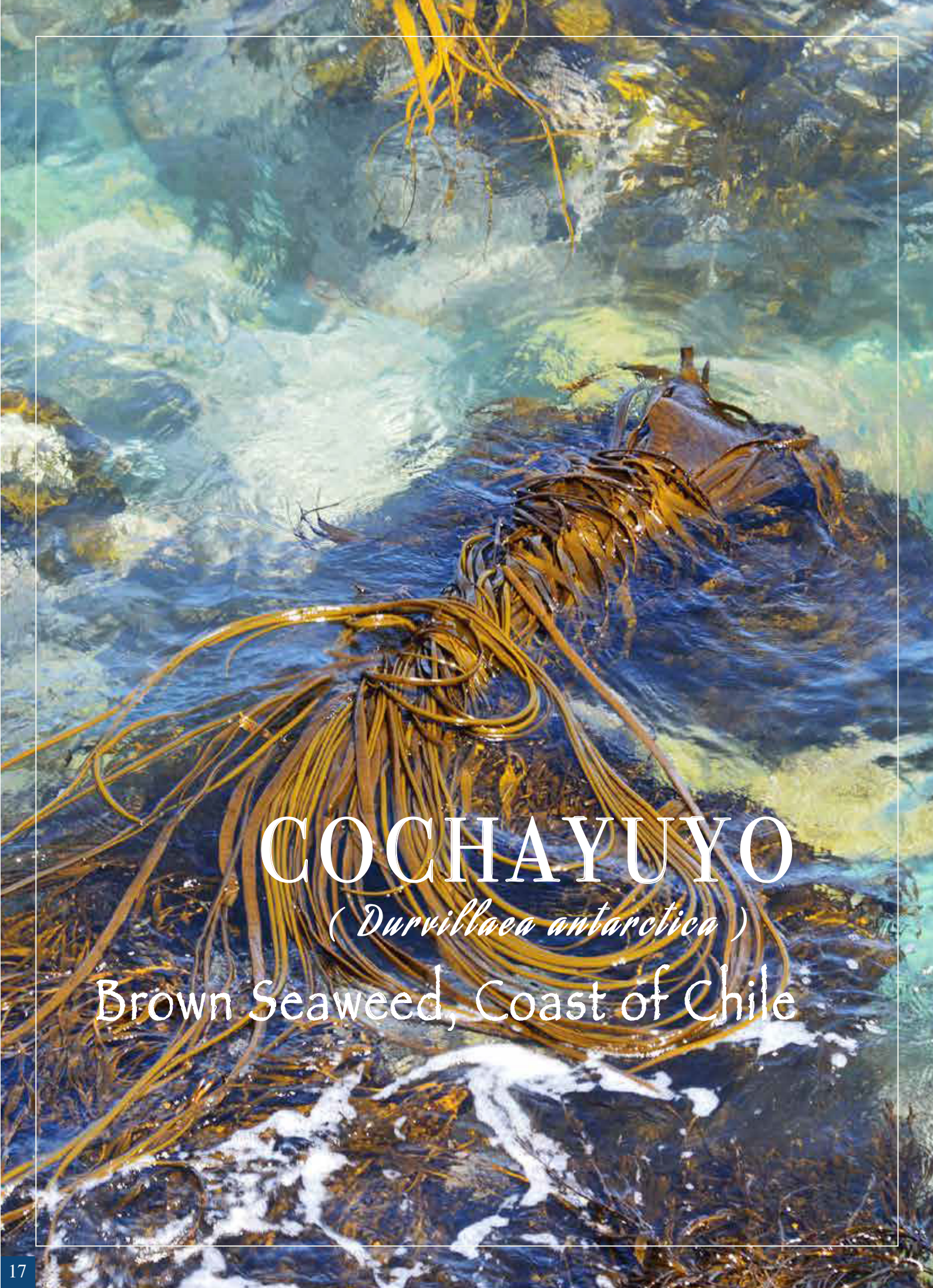
PHOSPHORUS

Phosphorus is a mineral that constitutes 1% of the total body weight of a person. It is the second most abundant mineral in the body. It can be found in each body cell. This mineral is another essential nutrient for the health of bones and teeth.

VITAMIN D

Vitamin D is necessary for forming bones and keeping them healthy. This vitamin enables calcium fixation in the body. The body produces vitamin D when direct sunlight converts a chemical substance of the skin into an active form of the vitamin (calciferol).

Valuable edible RED SEAWEED from the Chilean coast..



COCHAYUYO

(Durvillaea antarctica)

Brown Seaweed, Coast of Chile

COCHAYUYO
(*Durvillaea antarctica*)

The COCHAYUYO is a BROWN SEAWEED known by the scientific name *Durvillaea antarctica*, and more commonly known as: "ULTE", "COYOFE", "COYOI" or "HUILTE".

This plant can measure up to 20 m in length and, in general, present a single blade that originates from a single thick, cylindrical, flexible stipe. It is shaped like a flat hand, which then extends into several laminae shaped like flexible tubular chords or whips that are highly resistant to wave action. It has a sturdy, conical holdfast that has a smooth surface. The color of the blade ranges between dun and dark brown, while the color of its stipe ranges between yellow and pale green.

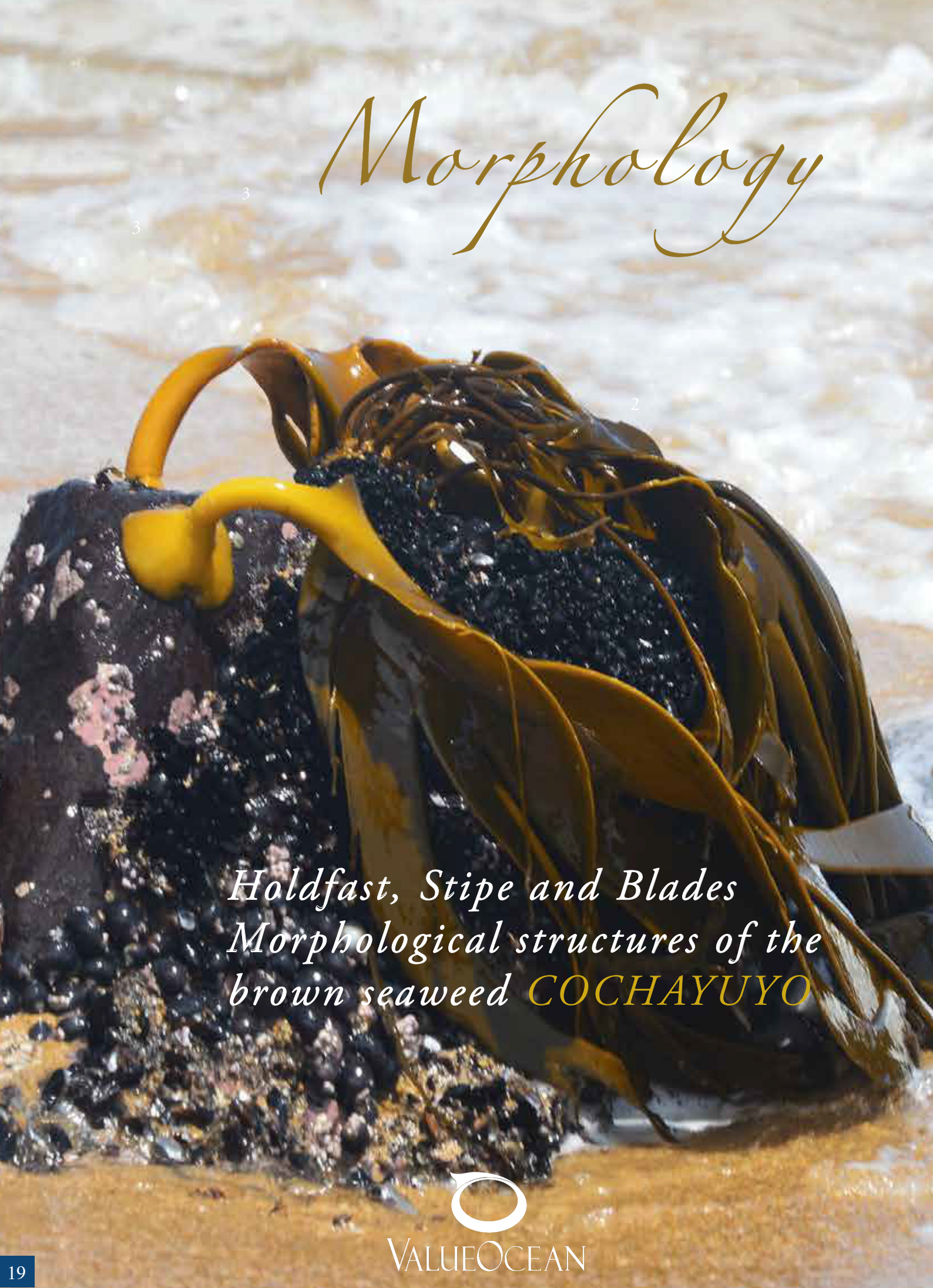
The COCHAYUYO inhabits the lower intertidal zone in rocky areas that are very exposed to the waves: it forms belts or strips of plants that are highly distinguishable by their shape and lovely yellowish brown color.

In Chile it can be found between Antofagasta and Cape Horn. There are records of its distribution between Coquimbo and Cape Horn. In addition, it spreads in the sub-Antarctic islands of Australia (Heard and McDonald Islands), New Zealand, and the Falkland Islands (Great Britain).

When fresh, its stipe (ulte or huilte) can be eaten as a salad, and its dry blades, in the preparation of different hot and cold meals. Nowadays, it is also being used as flour, in different cuts, and in diverse food products (hamburgers, snacks, cookies, among others).

A healthy and nutritious food..

Morphology



Holdfast, Stipe and Blades
Morphological structures of the brown seaweed COCHAYUYO

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Holdfast Stipe Blades...

Just as all macroalgae, the COCHAYUYO has a HOLDFAST, a STIPE and BLADES, which constitute its main morphological structure.

1. The HOLDFAST or basal holdfast, also known as "crampon" or "rhizoid", is equivalent to the root of plants on land. Its function is to attach or hold the alga to the substratum. The base of the disk-shaped holdfast has a groove that works as a sucker, enabling the alga to attach very strongly to the rocky substratum. It has a round conical shape. The stipe and the blade originate from this structure.

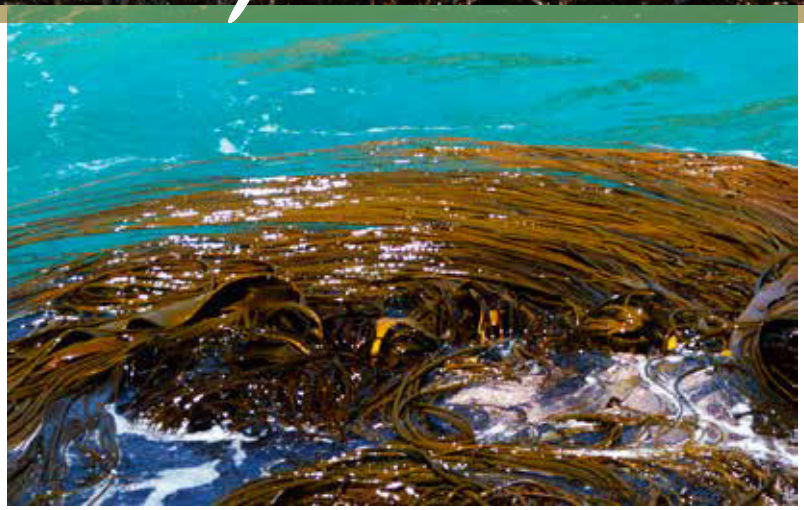
2. The STIPE is a cylindrical structure similar to the stem in a terrestrial plant: its function is to hold up the 'leaves' or blades of the alga. This part is known as "ulte" and is consumed when fresh, as a delicious salad that is very sought after in the Chilean cuisine.

3. The BLADE is equivalent to the leaves of terrestrial plants. Its function is to feed the plan by means of the biochemical process known as photosynthesis, which provides it with carbohydrates that are distributed throughout the whole plant. The COCHAYUYO normally presents one laminar blade that extends over several laminae shaped as cylindrical chords or whips. The blade is the main part that is allocated for human consumption.

ROCKY AREAS

The coastal rocky areas exposed to the strong wave action are the natural substratum on which the COCHAYUYO lives, along with diverse species of marine invertebrates (limpets, chitons, abalone, snails, starfish, and sea urchins, among others). This habitat is notable for having high water oxygenationand possessing valuable nutritious substances for the alga, and also for being in a sunny area: this allows for a more efficient photosynthesis.

INTERTIDAL
Kelp forest



The intertidal zone is a habitat of high marine wealth, where the COCHAYUYO normally lives. This habitat gathers the adequate conditions of temperature, light, and water quality, all necessary for its development and growth. It is possible to observe large plants of COCHAYUYO floating unrestrictedly in the intertidal zone, yet firmly attached to the rocks with the help of their basal holdfast.

Kelp forests
of Brown Seaweed

Benefits COCHAYUYO

The COCHAYUYO is a valuable BROWN SEAWEED, rich in mineral salts (calcium, sodium, iron, magnesium, phosphorus, potassium, manganese, and iodine), vitamins (A,E) and proteins, among others; all elements are essential for the health and wellbeing of people.

SUBSTANCES	CONTENTS
Calcium	850 mg/100g
Sodium	4.690 mg/100g
Iron	2,3 mg/100g
Magnesium	857,0 mg/100g
Phosphorus	130,0 mg/100g
Vitamin A	0,3 mg/100g
Vitamin E	0,2 mg/100g
Potassium	1.250 mg/100g
Manganese	1.130 mg/100g
Iodine	490,0 mg/100g

Fuentes: www.huertadelmar.cl
www.hierbasana.cl

MAGNESIUM

This mineral salt is important for human nutrition. It helps maintain the normal functioning of muscles and nerves, supports a healthy immune system, keeps the heart rate constant, and helps bones to remain strong. It also helps adjust glucose levels in the blood.

POTASSIUM

Potassium is a mineral salt that contributes to the proper functioning of the nervous system, to muscle contraction, and to keep the heart rate constant. A potassium, rich diet balances some of the harmful effects that sodium has on blood pressure.

VITAMIN E

Vitamin E is an important element for eyesight, reproduction, and the health of the blood, the brain, and the skin. It also has antioxidizing properties. Antioxidants are substances that may help protect cells against the effects of free radicals. Said vitamin helps prevent heart diseases, cancerous diseases, and neuropathies. The recommended dose of vitamin E for adults is 15 milligrams.
(www.mayoclinic.org)

Valuable edible BROWN SEAWEED from the coast of Chile..

MEDICINAL USES COCHAYUYO

The components of the edible seaweed COCHAYUYO, high in nutrients, vitamins and mineral salts, position it as a marine plant that is useful in some treatments and nourishing diets. Health professionals have recommended it for the following medicinal uses:

CLEANSING DIETS

The alginic acid of this alga's mucilage enables the detoxification and purification of the human body. This substance brings about a cleansing effect in the stomach.

HEARTBURN / GASTRITIS

The mucilage of the COCHAYUYO has an antacid action by retaining the gastric juices between its fibers, preventing irritation of the stomach walls.

WEIGHT CONTROL

It has a high fiber content that produces gastric satiety (fullness), given that the stomach gets bloated, reducing appetite. In addition, this alga has a low content of fat and calories.

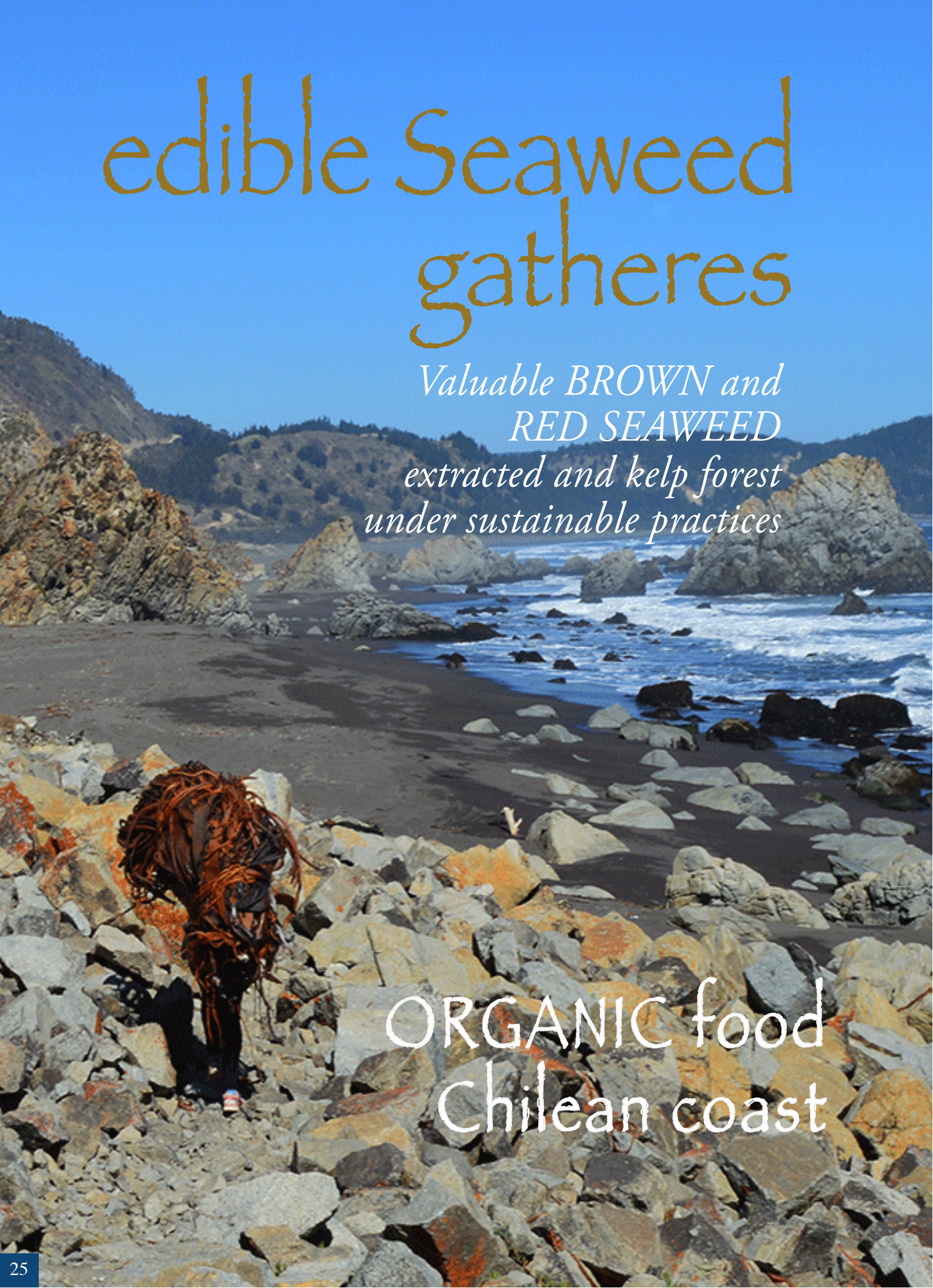
COLESTEROL LOWERING

Its high fiber content allows trapping the cholesterol and preventing it being absorbed in the intestines. It is able to reduce the levels of cholesterol and glucose in the blood.

HYPOTHYROIDISM

As it has a high iodine content, it is useful for preventing hypothyroidism, by decreasing the alteration in the heart rate, preventing the lowering of body temperature, and improving all metabolic aspects.

Despite the important benefits for health that this alga provides, its consumption is not recommended for persons with high blood pressure due to its high content of sodium (4,690 mg/100g) or with hyperthyroidism due to its iodine content (490.0 mg/100g).


edible Seaweed
gatheres
Valuable BROWN and
RED SEAWEED
extracted and kelp forest
under sustainable practices
ORGANIC food
Chilean coast

edible Seaweed gatheres

Coast of Chile

The harvesting and extraction of edible seaweed in the coast of Chile has been carried out since ancient times. Thus, the coastal indigenous people (Changos, Lafkquenches, and Chonos, among others) has already developed the trade of harvesting and extracting marine algae for direct human consumption, mainly eating BROWN and RED SEAWEED, such as COCHAYUYO and LUCHE. Undoubtedly, these collectors and harvesters were already protecting the kelp forests of algae, harvesting only the volume necessary for family consumption, striving to not affect their sustainability.

Later, this activity was adopted by the Chilean coastal communities and their artisan fishers, who made it a part of their daily tasks to feed their families and, subsequently, develop the marketing of these algae, with the intent of generating an income for their homes. Women were one of the main shore harvesters of these edible algae. They collect the algae stranded on the seashore, mainly COCHAYUYO, and cut LUCHE and LUGA CUCHARA from the coastal rocks with their own practices. They always endeavor to harvest only adult specimens to protect the resource, thus contributing to the sustainability of these marine plants and, of course, their future income. Meanwhile, extraction is basically done by men, given the greater risk in the rocky intertidal zone, where this activity takes place.

Seaweed gatherers

For decades, the men and women of the sea along the coast of Chile have been transferring from one generation to the next their practices of sustainable management, collection and harvesting of these marine plants, together with their empirical knowledge of the marine environment (tides, currents, and winds, among others), the algae life cycles and proper cutting methods. However even so, the challenges and responsibilities they face are even greater, due to the new climate conditions and the greater demands from the markets.

Nowadays, the demand for algae – both for human consumption and for the industry is gradually increasing, and government institutions have implemented legal extraction measures in favor of sustainability of these resources on the Chilean coast. This has motivated harvesters to get organized under the legal concepts of: syndicates, cooperatives, or union associations. The purpose is to better carry out their activity by adopting management plans as well as complying with all the legal standards required to later conduct a more appropriate marketing.

It is also worth noting the support from the Chilean scientists who have been carrying out diverse research, providing valuable recommendations to the algae harvesters and their organizations regarding the sustainable management of the algae and their kelp forests.

Indeed, the ancestral and present-day practices of algae collection and the new management measures established by government institutions, as well as those suggested by scientists, in connection with the appropriate way of harvesting the resources, provide a sustainable management framework for the exploitation of the edible algae of our country.

From this perspective, we could point out that nowadays the formal harvesting of edible algae in Chile is carried out under sustainable practices by collectors and harvesters who are increasingly more aware of protecting and preserving these valuable marine resources for future generations.

Cochayuyo gatheres

A long strenuous day
climbing dangerous cliffs in search of
this nutritious BROWN SEAWEED
Seaweed gatheres of the cove Puertecillo,
Sixth Region, Chile.

Cochayuyo gatheres

Main edible SEAWEED of the CHILEAN COAST

While exploring the coast of the Sixth Region in search of the wealth of our seaweed, we got to know the great work of the seaweed gatheres and harvesters of the COCHAYUYO: their efforts and dedication in this trade is admirable. Just as in this Region, we are sure that we shall find many other notable cases along our coastline.

Here in particular, we highlight the work of the seaweed gatheres of the beautiful, magical coastal cove PUERTECILLO, whose families possess valuable traditions developed over decades around the collecting and harvesting of this edible alga. It has been part of their staple foods and of their marketing management, taking to the market high quality specimens in terms of shape and color, for human consumption nationwide.

This alga is so important for this locality that it has become known in Chile as the "town of the COCHAYUYO". We had the opportunity of going to their "Cochayuyo Festival" that is held yearly in the month of February. There, tourists can sample different preparations based on this valuable BROWN SEAWEED.

Cochayuyo Brown Seaweed

Men and Women of the Sea on the coast of Puertecillo, in their activity of collecting the valuable Brown Seaweed COCHAYUYO

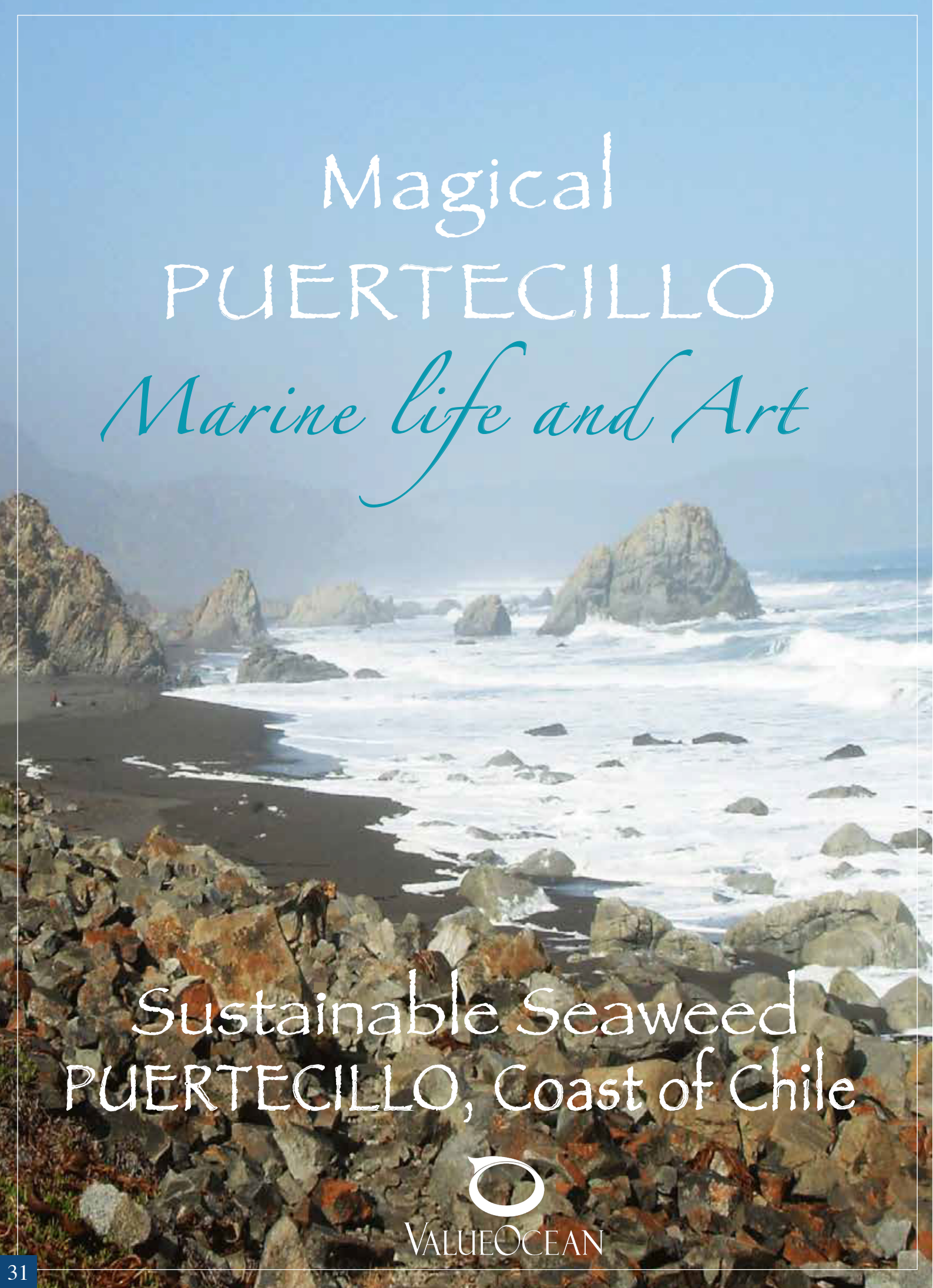
Cochayuyo gatheres PUERTECILLO

It is worth highlighting the work of the Puertecillo seaweed gatheres, who as a community have developed a novel and effective COCHAYUYO management system with the aim of maintaining the natural populations over time. Every year end they gather in an assembly, in which they have a raffle of small rocky zones with algae along the northern coastline of the town and allocate one zone to each family. Those zones accessed more easily are allocated to those families with older or physically impaired members, and those with difficult access or that are further away are assigned to families with younger, healthier members.

The collection of the COCHAYUYO stranded on the beach, in front of the town of Puertecillo, is mainly done by women and their children. Meanwhile, the harvesting from rocks is done by young and adult men, who move about with agility and boldness along the rocky areas and cliffs.

Just as in Puertecillo and in many other places along the coast of Chile, it is possible to observe hard-working men and women transporting big loads of COCHAYUYO on their shoulders (30 to 40 kg), with the satisfaction of carrying out an activity that is valuable for their families and for society.

A task that begins at dawn with a lot of effort and love for this trade.


Magical
PUERTECILLO
Marine life and Art
Sustainable Seaweed
PUERTECILLO, Coast of Chile
ValueOcean

Cochayuyo gatheres

Valuable involvement of the women
incollecting the COCHAYUYO on the coast
of the cove Puertecillo, Sixth Region, District of Navidad, Chile.

Admirable Women of the Sea

Passion and love
for their valuable trade
full of energy
during the process of
collecting and drying
COCHAYUYO
Coast of PUERTECILLO
Sixth Region
Chilean Coast..

Natural drying Cochayuyo

Beautiful black or white sandy beaches and large coastal rocky massifs accommodate the long COCHAYUYO plants during their initial drying. The sun will turn the lovely blades golden brown, with a high content of minerals and vitamins.

In Chile, the collectors and harvesters have for decades used the coastal area for the initial drying of the algae. During this first process, they clean any sediment off of the alga (sand, mud, among others) and then lay it flat on different substrata of the shore, seeking the most solar radiation possible for a faster and more effective drying. It is normal to see COCHAYUYO plants on rock formations, sandy beaches and stony beaches, covering vast areas of coastal grounds. To this end, the collectors pick sectors of the shore having the least possible influx of tourists.

This activity results in the algae having the appropriate moisture content (between 20% and 30% moisture) for folding it and, later, transporting it to storage sites for the final drying, packaging and marketing. It is how this nutritious dark brown or golden alga is distributed and sold in various package formats.

PACKAGING

There are three traditional packing formats in the marketing of COCHAYUYO.

Once the COCHAYUYO has reached the proper level of drying, (70% to 75%), the collectors begin the packaging process for the subsequent marketing.

In Chile, the seaweed gatheres have for generations made three types of simple, practical packaging for the marketing of the COCHAYUYO. With the help of these packages they commercialize the alga as a natural resource, the intent being intermediary commercializers as well as end consumers.

Packing 1: Denominated “PAQUETE” (package) or “MUÑECO” (doll), it is the first packing format, which is made from COCHAYUYO blades, cut to the dimensions of the length of a forearm (approximately 30 cm) and the width of one fist (about 10 cm).

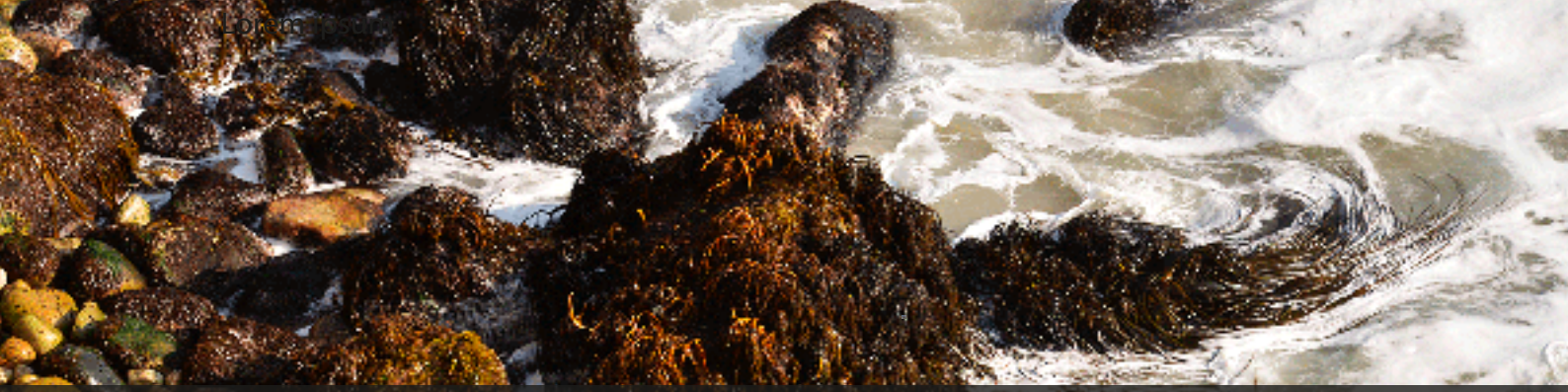
Packing 2: Denominated “MALETA” (trunk or case), it is made from three “paquetes” or “muñecos” described in the Packing 1 and whose approximate dimensions is 40 cm in length and 30 cm wide (Silberman, 2013).

Packing 3: Denominated “RODELA” (roundel), it corresponds to the largest packing.It is made with 25 “maletas” (trunk) of COCHAYUYO, described in Packing 2.

Roundel

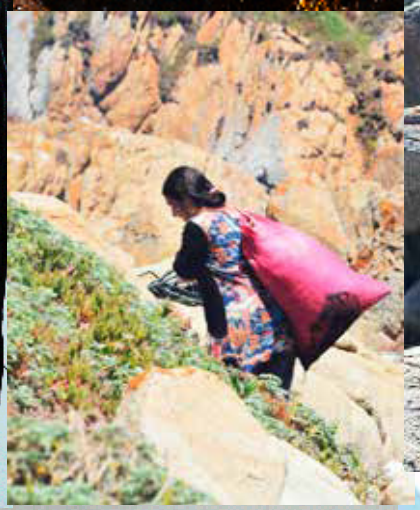
A large volume of COCHAYUYO that is rich in vitamins and mineral salts directly to human consumption of the Chilean society.

The COCHAYUYO roundel is made of 25 “MALETAS” (trunks) of this valuable alga that is dark brown to light golden in color. This is the minimum packing unit that the collectors sell to the intermediary commercializers, weighing about 7.5 to 11 kg, approximately.



PRODUCTIVE PROCESS

The harvested and collected COCHAYUYO from kelp forests of the Sixth Region, district of Navidad, is intended for the process ofdrying, selection and cut, under guidelines on quality standards and food quality and safety, for its subsequent commercialization.



Sustainable Seaweed
District of Navidad, Sixth Region
Chilean Coast

GLOBAL CONSUMPTION TREND

Edible Seaweeds

It is estimated that by 2050 the world population shall be 10,000 million people, a situation that would entail increasing food production by approximately 70% with respect to the current production. In view of this need, new food production techniques (both for land and sea) are now being developed.

From this perspective, the SEAWEED are an important marine resource that is increasingly being subjected to scientific research on the food potential they have for human consumption.

Worldwide, it is possible to observe a rise in demand for edible algae as well as for food made based on these marine plants, chiefly in Asian countries that possess the highest levels of algae consumption in their diet. In the European countries, too, there is a slight historical trend towards the use and consumption of algae in their cuisines.

Some studies have demonstrated a 147% growth in their use in food, between 2011 and 2015. According to the Transparency Market Research report, the outlook is that global algae market shall expand at an annual rate of 5.3% between 2016 and 2024.

In Ireland there are several small-scale companies that harvest, process and package edible algae to be sold as health food. Although there has been more public interest in marine algae products, the total national harvest of these species is still very small (less than 100 t per year).

In France, the fresh algae harvested in Bretagne are consumed under the name “légumes de la mer” (sea vegetables). The algae are sold in different formats: as raw products (dry or salty), as condiments, and as spreads (algae purée). These products are mainly marketed in organic or health food stores: however they can also be found in delicatessen stores.

SEAWEED

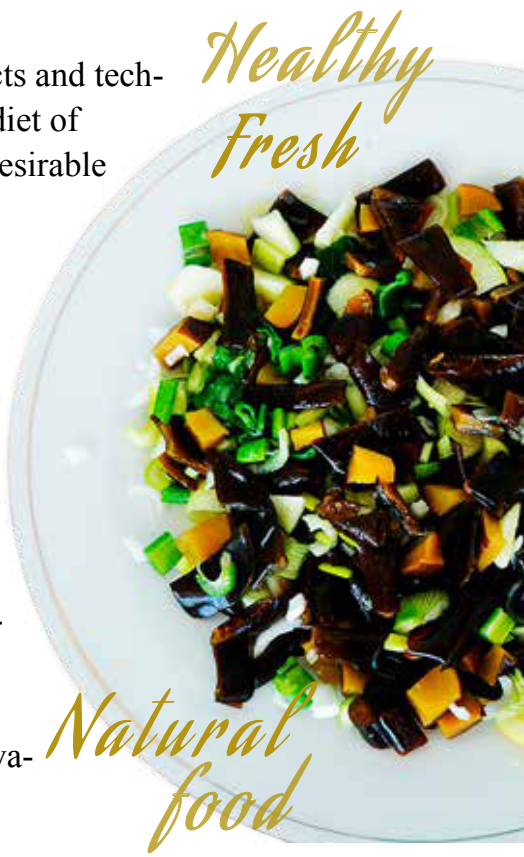
The expectation is a global trend towards a diet rich in marine plants

In Spain there are also some algae-based food processing companies, such as Grupo Dulcesol that manufactures innovative foods, like cookies and snacks, among others, using the green alga Chlorella sp., which has a high content of natural pigments such as chlorophyll, beta-carotene (having antioxidizing properties) and vitamins A,B (B2,B3,B5, and B12), among others.

No doubt, innovation in the development of food products and technology shall be key factors in bringing these vegetables to the diet of homes in a more attractive way, seeking to make the algae be desirable in organoleptic terms to increase their consumption worldwide.

In spite of all the benefits for health and food that the marine algae possess, in many places around the world they are still not considered as part of the diet.

In the case of Chile, an algae-based industry is gradually developing, opening a market that shall allow incorporating these vegetables into the Chilean homes and, potentially, even export them to international markets, under practices aligned with the new global trends of sustainability of marine resources, as well as with high standards in terms of food innovation, safety and quality.



GOURMET MARKET

Seaweed from the Chilean Coast

A new food industry based on edible algae is emerging in Chile, emphasizing the work of certain small enterprises focused on value added to these marine resources, developing healthy, innovative products under gourmet format, with the aim of opening a new market in the algae-based food business.

Through this publication we wish to make known the fabulous work carried out by some entrepreneursof this food industry in our country, who are always striving for innovative promotion of the consumption of these healthy, nutritious foods.

Indeed, to succeed in this new activity and to develop this new market an essential factor will be the joint work of all the stakeholders that are nowadays involved in the production chain, to bring the edible algae to the tables in the homes.

It all starts with the algae collection and harvest process, followed by the drying process. This task is done by groups of seaweed gatheres usually organized who work under sustainable practices, always trying to preserve the kelp forests.

The intermediary traders intervene in a second stage. They buy the algae and take it to processing plants or to local or regional markets.

The smaller-scale processing and gastronomic companies participate in a third stage. They carry out the productive process and process innovation under food safety and quality standards, for direct commercialization or indirectly through retailers.

gourmet Seaweed

GOURMET SEAWEED

Seaweed base gourmet food from the Chilean coast

At present, there are outstanding entrepreneurs who are promoting this food industry based on the main edible algae from the coast of Chile (Cochayuyo, Luche, Calabacillo and Luga Cuchara). They are adding value to these marine resources and developing innovative products in attractive formats, offering consumers a variety of food such as: snacks, cookies, marmalades, cereal bars, hamburgers, Cochayuyo lasagna, ceviche, and algae pesto, among others.

Within this group, it is worth noting the outstanding work that is being carried out by a small company called “Algueros de Navidad”, integrated by fishermen and seaweed gatheres. It has been driving this food industry in Chile, organizing the seaweed gather, harvest, and production process, which is aimed at human consumption under practices of sustainability and fair trade. This company has been a trailblazer in its region, providing added value to these marine plants, utilizing their own processing plant the only one in the area that has health certification for the processing of algae intended for human consumption.

GOURMET SEAWEED CHILEAN COAST

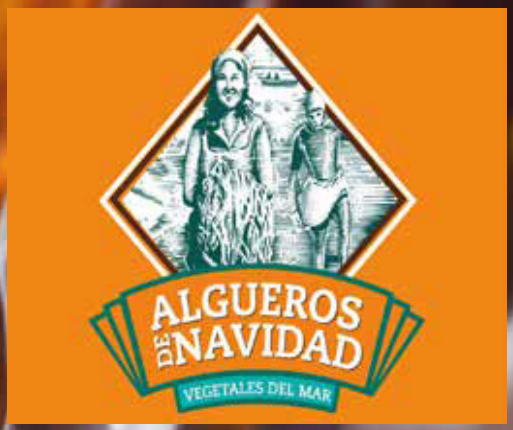
In recent years, the "Algueros de Navidad" has been supplying a group of local entrepreneurs that is boosting this new food industry, crafting new and delicious gourmet products, and seeking to captivate the palates of the new consumers. They are also making great efforts to take their products to international markets.

From this group of local entrepreneurs we highlight the following small companies: "Quelp", "Kollofquen", "Kollof" y "Algueros de Navidad".

It is important to note the value that these small companies have for the development of the coastal community of the Sixth Region. They generate an economic and social impact, and also provide natural, healthy and nutritious foods, and create innovative ways of consuming these valuable marine plants.

Next, we present a brief description of the activity of each of these entrepreneurs. The purpose is to make their valuable initiative in this industry known and, of course, to gain access to their healthy products and, in that way, contribute to maintaining their commercialization, particularly in times of health crisis.

GOURMET SEAWEED
CHILEAN COAST



Healthy FOOD
Edible SEAWEED
Kelp FOREST
Coast of CHILE

ValueOcean

GOURMET SEAWEED

Quelp

Seaweed food
Coast of Chile

QUELP is one of the small companies that is revolutionizing the food industry with their constant innovation and development of delicious, healthy food based on marine algae from the coast of the Sixth Region, Chile. This company is committed to the new trends in marine resource sustainability, supporting the caring of the kelp forests of these valuable resources.

Having formed a business alliance with the company "Algueros de Navidad", they are buying BROWN and RED seaweed from a sustainable harvest, contributing with the economic growth of the hard-working men and women of the sea of this locality, by purchasing these resources at a fair price.

Their directors, young professionals Alejandra Allendes and Alonso Díaz, are constantly searching for ways to innovate and to bring novel healthy products to the tables of Chileans. That is how – after several tests – they launch their first food products, the delicious and nutritious hamburgers based on marine algae. Today, they keep revolutionizing the local market, launching new products having high standards of food safety and quality, reinventing the way of consuming the valuable local algae.

PRODUCTS

ALGAE-BASED HAMBURGERS: (Cochayuyo 50% Calabacillo meal)
Classic, Paprika, a Pinch of Chili pepper
SEAWEED METALOAF (Cochayuyo, Calabacillo , meal)
SEAWEED BITES (Cochayuyo, Calabacillo . meal)

Página web: www.quelp.cl
Fanpage: www.facebook.com/quelp.cl
Instagram: @quelp

GOURMET SEAWEED

Kollof
Delicias del Mar

BOUTIQUE RESTAURANT

Seaweed - Fish - Seafood
Coast of Chile

KOLLOF is a boutique restaurant with signature cuisine, specializing in marine algae, fish and seafood from the coast of Navidad, Sixth Region, Chile.

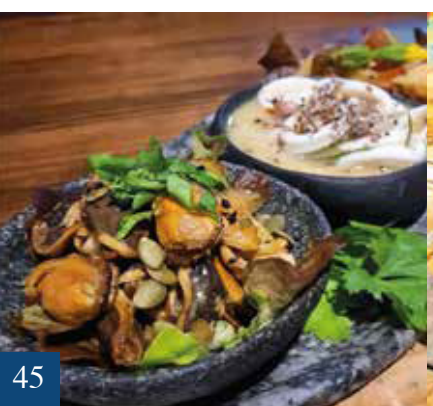
This venture arises from the experience, creativity and innovation in gastronomy of its founding partner, Florencia Díaz, who together with a team of young professionals bring to life this gourmet culinary project based on marine plants having a high content of mineral salts, vitamins, and delicious local fish and seafood.

Their gourmet dishes are prepared with the best algae from the region, from kelp forests, harvested under sustainable practices and bought from the company "Algueros de Navidad". In this way, they contribute towards improving the economy of the seaweed gatheres and harvesters and the sustainability of the district of Navidad.

In its signature cuisine it offers exquisite gourmet preparations based on marine algae, highlighting its signature dish "Cochayuyo Lasagna". The menu also includes the delicious courses: "Ulte Tartare" and "Seared Tuna Fish with Cochayuyo Crust", among others. All of their preparations are made with magic and a lot of love, seeking to delight the taste buds and eyes of their clients.

Fanpage: www.facebook.com/kollofchile

DELICASY FROM THE SEA..



GOURMET SEAWEED

kollofken
COCHAYUYO PREMIUM

PREMIUM SEAWEED
COAST OF CHILE

KOLLOFKEN arises from the vision of its founder, Fabián Ramírez, a marine biologist who researches and knows the virtues and benefits of edible seaweed for the health and wellbeing of people.

It is a pioneer company in the commercialization of PREMIUM SEAWEED from the Chilean coast. Just like the previous two entrepreneurs, it is working jointly with "Algueros de Navidad" and other organizations of seaweed gatheres and harvesters, basing its business model on marine resource sustainability and fair trade.

It presents a variety of formats and gourmet cutsof algae: Cochayuyo, Luche, Luga Cuchara, and Calabacillo, as part of their selection of healthy foods.

PRODUCTS

FORMATS / CUTS: **BRUNOISE, JULIENNE, FLAKES, CRUSHED**
SEAWEED SEASONINGS
SALT BASED ON LUGA CUCHARA

Products manufactured with the highest standards of food safety and quality, presented in attractive, resistant packages.

Página web: www.kollofken.cl
www.facebook.com/kollofken
Instagram: @kollofken

GOURMET SEAWEED

NAVIDAD, SIXTH RECION
COAST OF CHILE

ALGUEROS DE NAVIDAD

This is one of the pioneer companies of the Sixth Region in promoting the consumption of marine algae in Chile. To that end, they work with a group of seaweed gatheres and harvesters from the district of Navidad, organizing the collection of the seaweed that comes from kelp forests and sustainable harvests. This company has an algae processing plant that has health certification, which enables it to process under the best quality standards. It is also working on providing added value to these marine plants, marketing nutritious and novel products salty as well as sweet.

PRODUCTS

COCHAYUYO, LUCHE, CALABACILLO
(Finely sliced, chopped, crushed,meal)
MARMALADES (COCHAYUYO AND FRUITS)
SEAWEED SEAONING

Página web: www.alguerosdenavidad.cl
www.facebook.com/alguerosdenavidad
@alguerosdenavidad

GOURMET SEAWEED

VALUABLE SEAWEED FROM CHILEAN COAST

VALUEOCEAN

GOURMET SEAWEED

Marine Plants
Coast of CHILE

SNACKS

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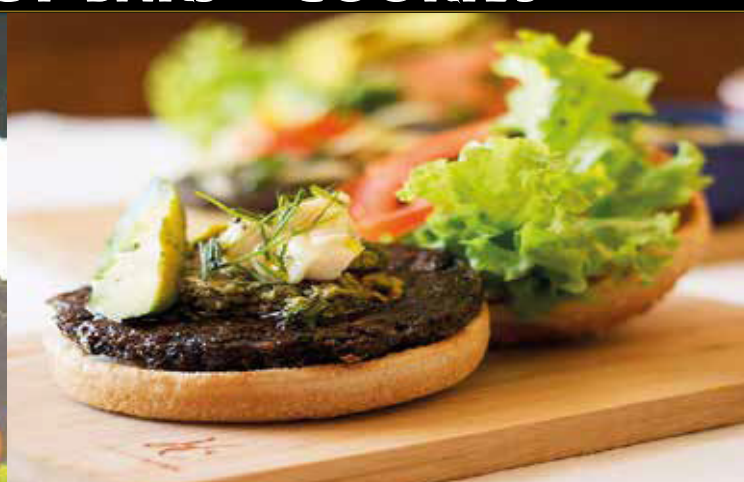
SEASONINGS

MARMALADES

ENERGY BARS - COOKIES

LASAGNA

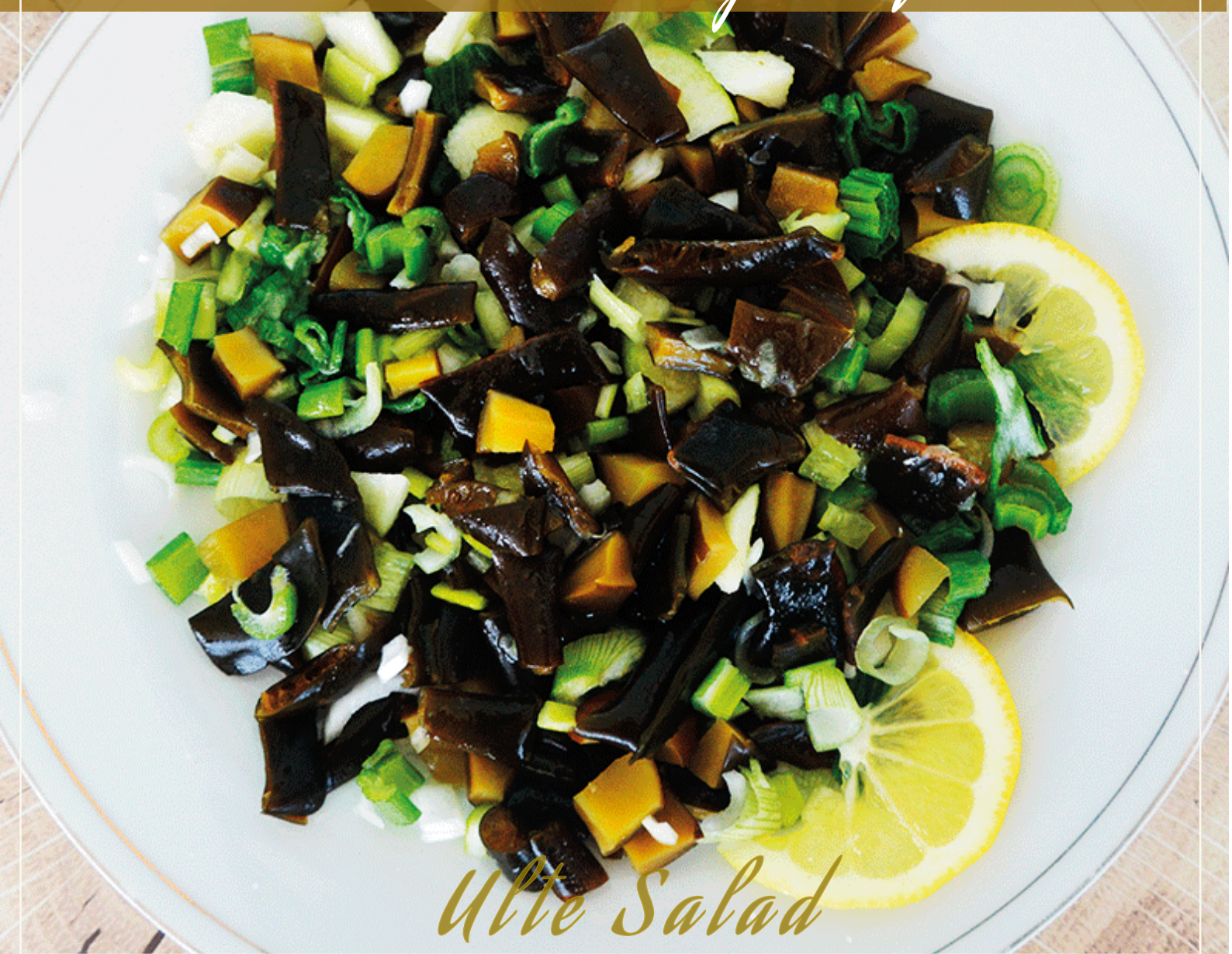


HAMBURGERS

GOURMET SEAWEED

Diet rich in fibers, vitamins, minerals salts

Organic food



Ulte Salad

GOURMET SEAWEED

Challenges for a future diet base on Seaweed...

Given all the virtues and benefits SEAWEEED provide for our health, and the potential yet to be discovered regarding these valuable plants, we believe that today it is a major challenge to incorporate them into our diet. It is a challenge that needs to be shared and tackled by all the stakeholders of this emerging industry.

The fundamental stakeholders, harvesters and collectors, should implement all of the regulations of the government entities : Subsecretaria de Pesca y Acuicultura (Under-Secretariat of Fisheries and Aquaculture), Servicio Nacional de Pesca y Acuicultura (National Service for Fisheries and Aquaculture), as well as all of the scientists' recommendations with respect to the best management practices for these resources, so as to contribute towards an effective protection of the kelp forests.

Similarly, all entrepreneurs who have begun great work in developing this food industry shall each day have to face new challenges in their management, both in productive and commercial terms. In addition, they shall need to continue their valuable business models, based on the sustainability of these resources and the joint work with the seaweed gatheres and harvesters, under practices of fair trade.

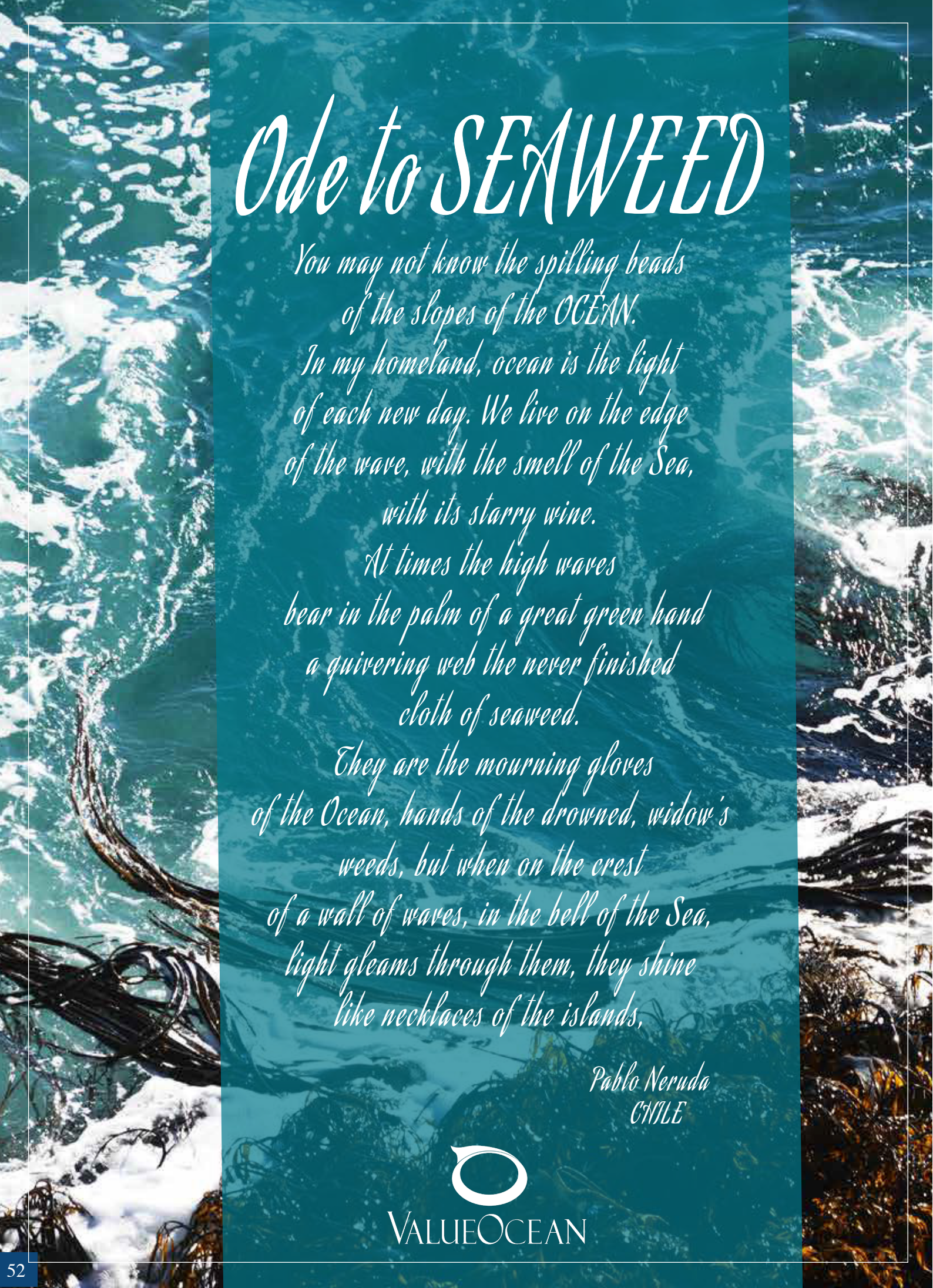
Furthermore and in pursuit of increasing consumption of algae-based foods, it will be crucial to continue developing innovative products, always having regard to high quality and food safety standards. The preparation and conduct of a communicational strategy shall no doubt be a key action to keepmaking known their products and new launchings, along with constantly informing their consumers about the benefits.

Meanwhile, the media should continue to make known the local ventures of this industry centered on food based on marinealgaefrom the Chilean coast.

It will be a challenge for us to keep exploring and supporting through our publications all of these notable local ventures and to reach with the help of these editions a large number of people for them to become aware of the value of these resources and to become consumers, by incorporating these MARINE PLANTS in the form of a delicious, healthy diet into their homes.

VALUABLE SEAWEED
KELP FOREST
COAST OF CHILE

VALUEOCEAN
COMUNICACIONES



Ode to SEAWEED

You may not know the spilling beads
of the slopes of the OCEAN.
In my homeland, ocean is the light
of each new day. We live on the edge
of the wave, with the smell of the Sea,
with its starry wine.
At times the high waves
bear in the palm of a great green hand
a quivering web the never finished
cloth of seaweed.
They are the mourning gloves
of the Ocean, hands of the drowned, widow's
weeds, but when on the crest
of a wall of waves, in the bell of the Sea,
light gleams through them, they shine
like necklaces of the islands,

Pablo Neruda
CHILE

VALUEOCEAN

GOURMET SEAWEED

Edible Seaweed from Chilean Coast..

TEXT , PHOTOGRAPHY AND EDITION

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CIENTIFIC TEXT

Gabriel Jerez, Biólogo Marino

ENGLISH TEXT

Translated by Marlene Riethmüller

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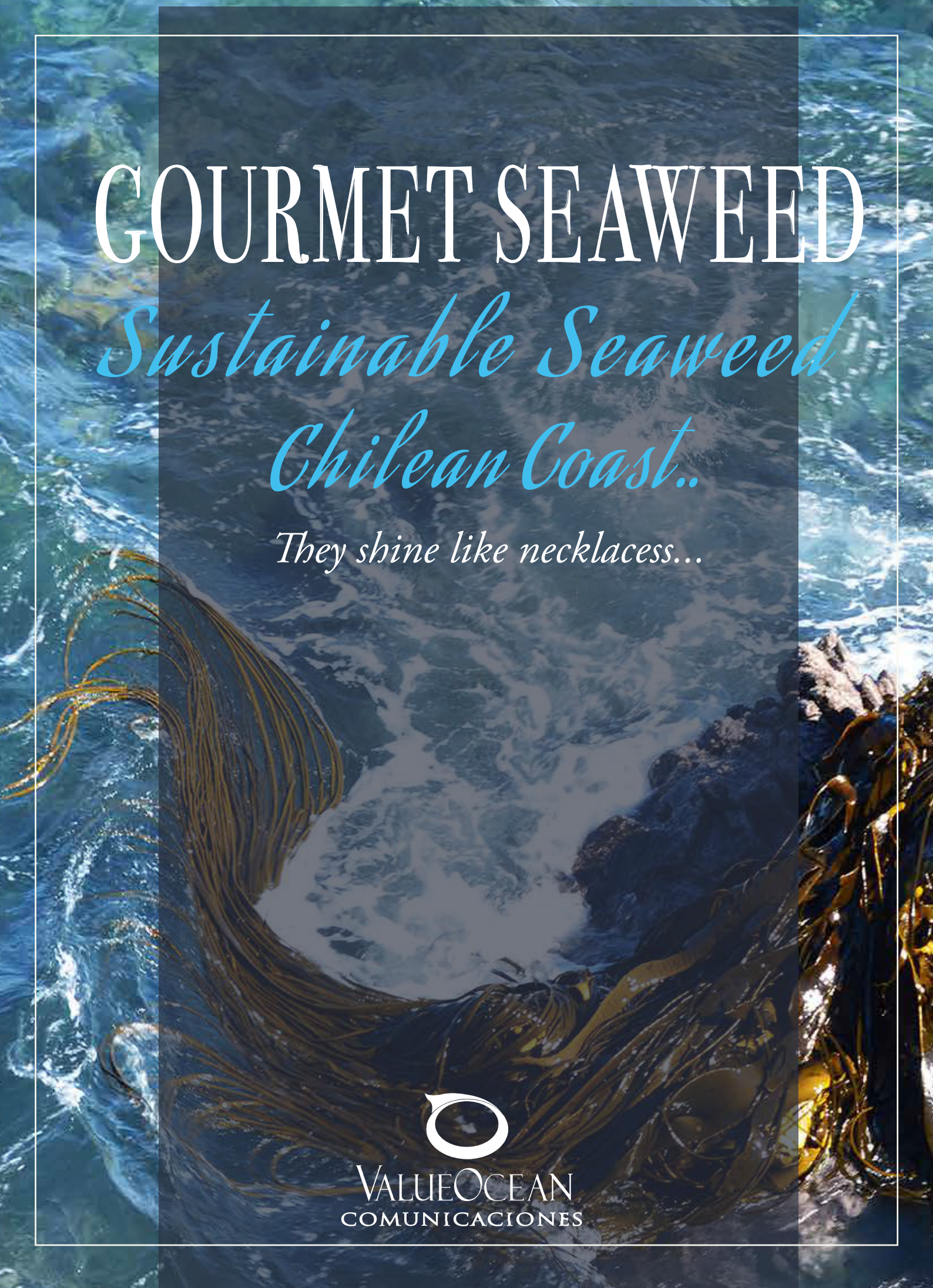
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