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POINT & CLICK  
ON BOLD LINKS



Edited by  
Millis Keegan  
& Peter Symes

# Show me the Equipment



## Signature series

These tough headlamps for scuba, snorkeling, military and marine research, uses different colored LED lights for better vision. At crime scene investigations, blue light traces fibers and hairs. Blue and green light minimize the disturbance of marine life and allows the scuba diver to get closer to the marine life. [www.foxfury.com](http://www.foxfury.com)



## Dry or wet?

Ever wish you could get a drysuit with a streamlined fit for the price of a quality cold water wetsuit? Me too, and now we can—the Fusion from Whites. The Fusion consists of two layers. The inner layer (Dry Core) is a membrane suit with latex seals, a dry zipper and air intake and exhaust valves. The removable outer layer of durable stretch fabric is attached to the Dry Core at the wrists, ankles, valve openings and zipper to create the form fit. The Fusion is loaded with great features, easy self entry, heavy-duty, UV-resistant seals, Si Tech valves, reflective piping and an anatomically correct CAD-designed pattern for a perfect fit. [www.whitesdiving.com](http://www.whitesdiving.com)



## Dual Purpose

The Poseidon Platform, a back plate designed with a simple quick release to change from tank to tank, is the first product launched after Poseidon and Cis-Lunar joined forces. The back plate can be used for both tanks and rebreathers. One size fits all. An ergonomical fit promises to give good back support to the diver no matter his/her height even on land. [www.poseidon.se](http://www.poseidon.se)



## Dental Work

Tired of aching jaws after a dive? With the Seacure mouthpiece that molds to fit your mouth, that pain could be just a memory. An orthodontist has designed this mouth piece, which molds to a good fit around your teeth, gums and jaws. [www.seacure1.com](http://www.seacure1.com)



## Manta Necklace

This regulator necklace is derived from the home-made gizmo made out of surgical tubing that technical divers used to keep their back-up second stage close when needed. The material is soft silicon rubber, it comes in two sizes and in four colors including hot pink. [www.mantaind.com](http://www.mantaind.com)



## Pocket your light

The compact size Scubapro NOVA fits in the pocket of most BCs. A perfect little back-up light with a bright uniform beam. It is light weight, has a comfortable grip, and it is reliable too. Promises burn time up to 6-8 hours. [www.scubapro.com](http://www.scubapro.com)

## Kicking Lightly

The Twin Jet Fin has it all, at least according to its maker. The split fin propeller technology delivers a more forward motion, with less effort than traditional blades. Equipped with drag-reducing vents, it promises to decrease resistance on both the up and the down strokes in a way you will notice.

[www.scubapro.com](http://www.scubapro.com)



## Geo

Yet another dive watch enters the world, and it is digitalized all the way down. What GEO has that makes it stand out, is the possibility to set it in Air, Nitrox and Free Dive modes, allowing it to double as a backup to any dive computer. Includes advanced digital features, like stop watch, daily alarms, alternate time zone and more. And it is sportylicious as well.

[www.oceanicworldwide.com](http://www.oceanicworldwide.com)



## Zeagle

Bouyancy Control Belt. This "BCB" is a boyancy device designed for a freediver. A 4-cubic foot air cylinder, and a Razor valve regulator first stage combination will allow the diver to use the buoyancy advantages of a BCD and a tank. Saving energy during descend and ascent, the BCB will cut down on the risk of shallow water black out when passing through the danger zone. [www.zeagle.com](http://www.zeagle.com)



## Storm Power

This futuristic designed wetsuit comes in 7/5 mm and 54mm. For comfort, it promises some extra stretchy features and the Kevlar compressed kneepads will keep the wear and tear off a little longer. This suit design comes in 5 or 7 mm. Plus, it's made with a built in sixpack.

[www.ralftech.com](http://www.ralftech.com)

## UK International

And there was light. Provided by an ampted pair of 5-watt white LEDs, this is the brightest light in its class. A unique optical design unites the two high intensity LEDs into one beam, creating twice the intensity that lasts to the bitter, I mean battery, end. You can switch between full and half power to save battery life. Rated to 500 feet.

[Amazon.com](http://Amazon.com)



## Aeris

The ATMOS LX has a large rear-inflation bladder, designed to wrap around for maximum lift. The integrated weight system for up to 20 pounds has a "positive-lock" system to keep the weights where they are supposed to be. Rear trip pockets for non-dumpable weight and a padded backpack with lumbar support for comfort. [www.diveaeris.com](http://www.diveaeris.com)



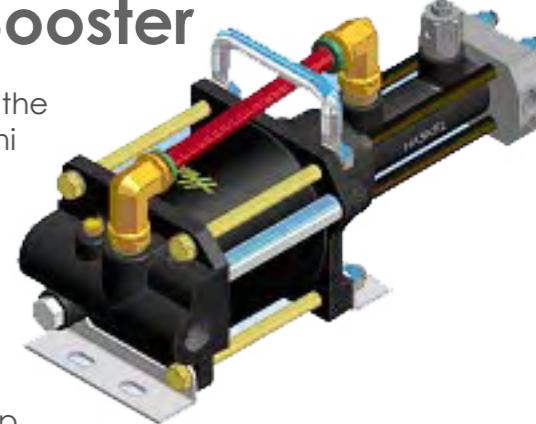
## Scubapro Module Light

Versatility is the key with this modular light system from Scubapro. The light system gives the user flexibility with its interchangeable heads. Top that with a battery pack and housing adaptable to a hand-held or umbilical configurations and you have quite a nice package to light your way. [www.scubapro.com](http://www.scubapro.com)



## Haskel Mini Sport Booster

Haskel International scored big in the dive market by unveiling this Mini sport booster for charging O<sub>2</sub> cylinders for rebreathers at the DEMA Show 2006. The 4" Drive air driven gas booster is lightweight for great portability. Charges gases up to 3500 psig with inlet gas pressures as low as 100 psig. [www.haskel.com](http://www.haskel.com)



## Surfacemarker

Using a webbing system, this safety sausage promises a more easy way to deploy your marker when at a safety stop. The idea is to reduce the risk of entanglement normally faced with a free-floating string. The compact lanyard is secured with an elastic cord and automatically unravels itself underwater upon deployment. [www.surfacemarker.com](http://www.surfacemarker.com)



## Swiss

This very marine, very blue, very limited edition diver's watch is heading to be a collector's item. You want the Maxi Marine Diver or something else unique? Check out the home page for your nearest dealer. [www.ulysse-nardin.com](http://www.ulysse-nardin.com)



## Neptunic

Featured on Animal Planet, Discovery Channel, and History Channel, the shark suit first tried out by Valerie Taylor 1978 has come a long way. The technology is basically the same, the design not quite, but it still does what it promises, prevents a shark bite from breaking the skin. Neptunic builds full body shark suits, the design resembles something out of early Star Trek movies. The designs of these protective suits are outstanding, and some of the suits are actually shown at museums. [www.neptunic.com](http://www.neptunic.com)



## Immersion & Aquanaut

Very few watches on the market can stand up to the daily abuse of saltwater and sand—dive watches are among them. Freestyle presents the Aquanaut stainless steel men's watch, and the Immersion—with all the features a dive watch should have—designed for watersports-minded people. The black dial face of the Aquanaut includes

sized Arabic numerals 6, 9, and 12 o'clock, luminous stick markers, and, of course, the oh-so-important scratch-resistant mineral crystal.

The Immersion comes with a screw down crown and night vision backlight display.

[Amazon.com](http://Amazon.com)



## Ralf Tech

The all new BC for the Ralf Tech range—"Club Tech". Ideal for the beginning diver, traveling diver or dive school, it's a great product at an attractive price. Comes in XXS, XS, S, M, L & XL. [www.ralftech.co.uk](http://www.ralftech.co.uk)



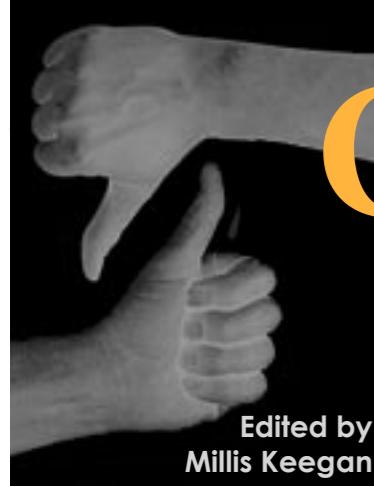
[Amazon.com](http://Amazon.com)



# Letters & Opinions

All perspectives expressed in this section are those of the individual author and do not necessarily reflect the views of X-RAY MAG, DiveGuru.Net, or their associates

Edited by  
Millis Keegan



**Online shopping is growing at an incredible fast speed making it tougher and tougher for small business shop owners to succeed. Even though many shop owners like to play the ostrich game, online shopping is here to stay. They will have to adapt.**

*It is not all bad, of course. Many dive shops run successful operations while some are struggling. We would like to hear from the latter.*

*How does online shopping affect your business, and what are you doing to counteract the negative effects of Internet-based shopping?*

We would also like to hear the view of customers. So, Shoppers, where do you shop and why? To spice it up a bit, and to get you started, I took the liberty of asking some divers aboard a dive boat in Key Largo about their preferences.

—Millis Keegan

## About the DiveGurus

Millis Keegan, owner and founder of Diveguru.net, the homepage that answers questions for divers, snorkelers, anyone with a love for our oceans, is a new member of X-Ray Magazine. With the help of reputable experts, [www.diveguru.net](http://www.diveguru.net) will find the answer.

**From Canada:**  
You need a local dive shop for your air fill. They can't live on that alone, so if you want them to be around, support them by shopping there.

—Kate and Dave, Canada

## What do you think?

Get heard! Send us your opinion to [diveguru@xray-mag.com](mailto:diveguru@xray-mag.com) by Jan 10, 2007, and get a chance to win these exquisite Silver Hammerhead Cufflinks generously sponsored by [ReefJewellery.com](http://ReefJewellery.com)

# Shopping for Dive Equipment Online vs. In-Store

### From Florida:

I live in Pompano Beach and got certified in Mexico last spring. It was such a great experience, and I was psyched. When I came home, I wanted to get my own equipment and also take another class or two. I found a dive shop nearby and went there to talk to a professional that could help me choose my equipment. I had a lot of questions. Half way through, I noticed that she got more and more frustrated with me and my questions, and all of a sudden she blurted out: "Are you going to buy something or what?" Then she flat out told me, that she thought I asked too many questions, and that I probably was going to go home and shop online after using her services.

There are many more dive stores around here, and someone else got the sale. I personally prefer to shop in a store. I don't even mind paying a bit extra for the service. But let me tell you, behavior like that is not okay.

—Mary, Pompano Beach, FL

*How does online shopping affect your business, and what are you doing to counteract the negative effects of Internet based shopping?*

### From Washington:

I enjoy shopping in the stores, more than I do online but only because I enjoy being in the vicinity of other people and because it gives me a chance to physically see, feel and try out what I'm buying.

—Mike G, Seattle, WA

### e-Shopper:

I do prefer online shopping—100 percent. And yes, I do shop some of my dive equipment online. Why shouldn't I? I get so much more information about the products over the Internet, and there is more to choose from. Plus, I can chat and get feedback from others. An added bonus is that I find information and links to new places to dive, and I get knowledge in general about what's up in the dive community. What's not to like?

—The Ibuy freak

### Mr Congeniality

When and where I shop is none of your business, it's my almighty dollar. I am just here because my wife told me to be here. What is online shopping anyway?

—Non-diver

### From Pennsylvania:

I love not getting what I want immediately. I like coming home from work and finding a box outside my door. It's like Christmas all over! But when it comes to my dive equipment, I shop in-store. To me, it is all about safety while diving.

Perhaps I am lucky, but the staff in my dive store really know their stuff. I trusted them with my training, of course, I trust their judgment. They have good arguments and every purchase I have made has been a good one.

In conclusion, yes to online shopping, and yes to in-store shopping. Why choose when you can have the best of two worlds?

—Jake Bunt, Philadelphia, PA

### STILL AT LARGE:

*Is it right or wrong, to feed the marine life?*

Is it right or wrong for Dive centers and Dive resorts to enable fish feeding by selling this kind of products?

We would like to think that divers bring to the water the notion of Take nothing but memories, Leave nothing but bubbles. However, we all know, that that is not always true, and in many cases bad behavior is encouraged by the dive centers and dive resorts. Feeding fishes while diving is a popular activity to bring the marine life to the divers/snorkelers in a misguided attempt to enhance the underwater experience.

We noticed that the Holidays put a dent in the number of replies to the Diveguru. Well, the holidays are over, and it is time to have an opinion again. We are leaving last issue at large, and adding another hot topic. ■

# whales & dolphins



Edited by  
Peter & Gunild Symes



## Extinct: Baiji Dolphin

The baiji dolphin, one of the world's most endangered dolphins, is now presumed extinct by zoologists working in China. According to researchers, these rare dolphins lived along the lower end of the polluted Yangtze River where they were thought to have lived for about 20 million years, unchanged as a species for at least 3 million years. Upon confirmation, the baiji will be remembered as the first large aquatic mammal driven to extinction in our times since the Caribbean monk seal was overfished to extinction in the 1950s.

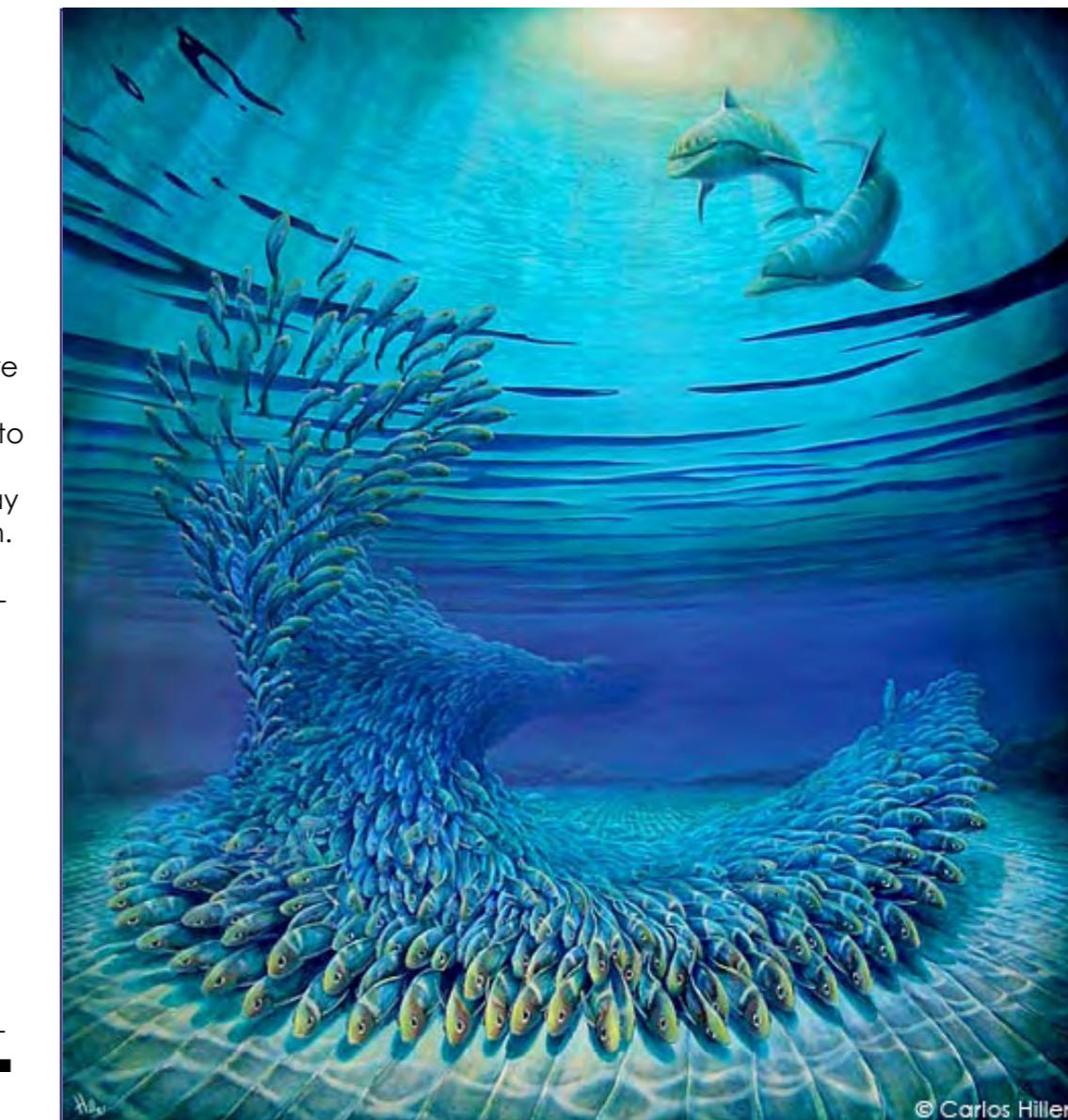
August Pfluger, director of baiji.org, told the BBC, "We lost the race... It is a tragedy, a loss not only for China, but for the entire world." He was the joint-leader of a six-week expedition using both visual and acoustic monitoring equipment to search for the endangered creature. They found none. What they did find is that another dolphin is also feeling the effects of pollution in the river, Yangtze finless porpoise, whose numbers have fallen below 400.

Nicola Hodgins, director of the Whale and Dolphin Conservation Society's International Projects said in the organization's newsletter, "The demise of the Baiji should be viewed as a warning and a reflection of the way the actions of human kind can have a devastating effect on wildlife and our natural resources. The Yangtze River, now one of the most highly polluted rivers in the world, supports some 350 million people, as well as wildlife. It has never been more important to act to avoid mass extinction of other vulnerable cetacean species." ■

## Living on the Edge: Hector's Dolphins

Hector's dolphins are one of the smallest species of dolphins to hit the endangered species list. They may be facing extinction. Found around the New Zealand coastline, the dolphins meet their fate all too often in gill-nets and trawl-nets in

which they become entangled and die a long excruciating death. It is estimated that more than 100 Hector's dolphins may be succumbing to death in this way each year, each one a significant death as each can have a serious impact on the survival of some dolphin populations. Apparently, fishermen are not following the voluntary codes of conduct, which request that they not set their nets in sensitive areas. The New Zealand government has put forth new measures, also based on voluntary control, to protect the dolphins. If you would like to send a letter to the New Zealand Ministers for Fisheries and Conservation urging them to do more to save the Hector's dolphin, go to the WDCS e-campaign page here: [wdcss-uk.org](http://wdcss-uk.org). SOURCE: WDCS ■



© Carlos Hiller

**2007 is the UN's Year of the Dolphin**

The UN has designated this year as the Year of the Dolphin in an effort to protect dolphins from threats to their survival and possible extinction. Working in collaboration with the Whale and Dolphin Conservation Society, the United Nations Education Program has plans to involve governments, conservation organizations and members of the private sector to increase awareness of the plight of the dolphin species and the need to protect them. As part of the program, various pro-dolphin events will be organized around the world. To join the effort or submit your ideas, go to: [www.yod2007.org](http://www.yod2007.org) ■

UNEP CMS TUI

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## It's Open Season on Dolphins in Japan

An estimated 20,000 dolphins are killed each year by Japanese fishermen. They call it "pest control". Slaughtered behind giant tarps, which mask the bloodbath, the dolphins are killed because they eat too many fish. Even though there has been mounting international pressure to stop the brutal killing, a small coastal town in Japan called Taiji has launched their yearly culling season. The fishermen there say that the dolphins are the same as fish and killing them is the same as killing cows for beef. Ric O'Barry of SaveJapanDolphins.com told the Independent that the slaughter is more about reducing competition for fish rather than ancient Japanese tradition. As 2007 has been declared the Year of the Dolphin by the U.N., there is ongoing speculation as to what role the organization will take in this matter. ■

## Leaping Dolphin Injures Boat Passenger

A 27-year-old New Zealand woman aboard a boat in the Bay of Plenty was struck by a dolphin which jumped from the sea into her boat. The dolphin caused a number of injuries to the woman who was rushed to intensive care, while the dolphin swam away unharmed. Alan Baker, dolphin expert, told New Zealand Radio, "I've been studying dolphins for 40 years and this is the first time I've heard of a dolphin jumping into a boat." SOURCE: int.iol.co.za ■



NOAA

## Attack of the Killer Dolphins!

The setting is the chilly Black Sea; the victim, a drunken Ukrainian; the situation, he decides to go for a swim. What happens next? A pod of dolphins attempts to push him out to sea. Soon the rescue workers come to his aid. They hit the water with clubs to scare away the dolphins, then, retrieve the intoxicated man, reportedly in good condition, although bewildered as to what was in his drink. It is thought that the dolphins saw the man as competition for the fish upon which they were feeding. SOURCE: int.iol.co.za ■

## Near Record Deaths for Florida Manatees in 2006

Red tide is to blame for a near record-setting year for the number of deaths in the endangered manatee populations of Florida, according to state wildlife officials. In 2006, there were 392 manatee deaths compared to 415 deaths in 1996, when red tide, a deadly marine algae bloom, was also a factor. Boat collisions were also to blame, claiming 82 manatee lives. While the annual survey claimed manatee populations have risen from 1,267 in 1991 to 3,117 in 2006, scientists argue that the increase is mainly due to better techniques for locating manatees. While the manatees are still protected by the federal Endangered Species Act of 1973, the Florida Fish and Wildlife Conservation Commission voted unanimously in February to take the manatee off the endangered species list. Now it is identified as a threatened species since its population is on the rebound according to the recent survey, even though scientists continue to warn government that the manatee population will drop 50 percent over the next 50 years due to habitat loss, red tide and boat collisions. SOURCE: The Ledger ■



PETER SYMES

## Thwaps, Waps, Grumbles and Snorts —Whales Have Elaborate Vocabularies

Researchers at the University of Queensland in Australia have discovered that humpback whales have a much broader vocabulary than previously thought. From land, the scientists monitored humpback sounds and activity along the whales' migratory routes off the east coast of Australia, the breeding grounds inside the Great Barrier Reef and the Antarctic feeding grounds.

Rebecca Dunlop, one of the scientists involved with the research, told LiveScience, "The most surprising thing was there were 35 different types of sounds found. We were expecting less

than ten."

Ranging from underwater sounds including what could be underwater blows as well as surface generated sounds created by breaching and slaps of the tail or fins, the whale language seems to have social uses that help mothers and calves stay together. The study also suggests that some sounds are competitive calls between groups of adults that could be specific to one sex. A previous study also found that the whales practice grammar. The male whale love song appears to have song units key to sexual signals when single males joined females. ■



FRITZ GELLER-GRIMM

However there are times when a whale will make sounds by itself, thus suggesting that whale language is not limited to social intercourse.

The study is important in helping scientists and governments understand what impact the noise of ships and other industrial sounds have on whales. The ocean is becoming more and more noisy according to Dunlop, and researchers have yet to find out how this noise pollution is affecting the whales. The first step to understanding is to find out how whales communicate in a noise-free ocean, said Dunlop. ■

## Whales Attacked by Seagulls

Off the coasts of Argentina's Valdés Peninsula, the southern right whale is being attacked by blubber craving seagulls. Authorities blame uncovered garbage dumps and waste from fish-processing operations to the increase in the number of kelp gulls in the area. While the gulls usually feed on dead animals and blubber dislodged by whales when they breach, some gulls are getting much more aggressive with their feeding habits. They love blubber and some of them will land on the whales and peck through the skin to get to the blubber, which is a calorie rich source of food for the birds according to Marcelo Bertellotti, a biologist at Argentina's Patagonia University.

The birds nest near prime breeding waters of the endangered whales, and mothers and calves are most often attacked by the voracious birds since they spend more time at the surface. The wounds inflicted often become infected with bacteria and viruses. The calves have the worst of it as their skin is softer and they spend the most time at the surface.

This situation is causing a change in the normal behavior of the whales. Bertellotti told National Geographic that the attacks force the whales to dive and flee which interrupts crucial feeding and rest periods, thus causing the animals to expend energy normally used to create fat. This fat is important for long migrations and the production of mother's milk. Now, the whale mothers spend up to a quarter of their day fleeing gull attacks. SOURCE: National Geographic ■



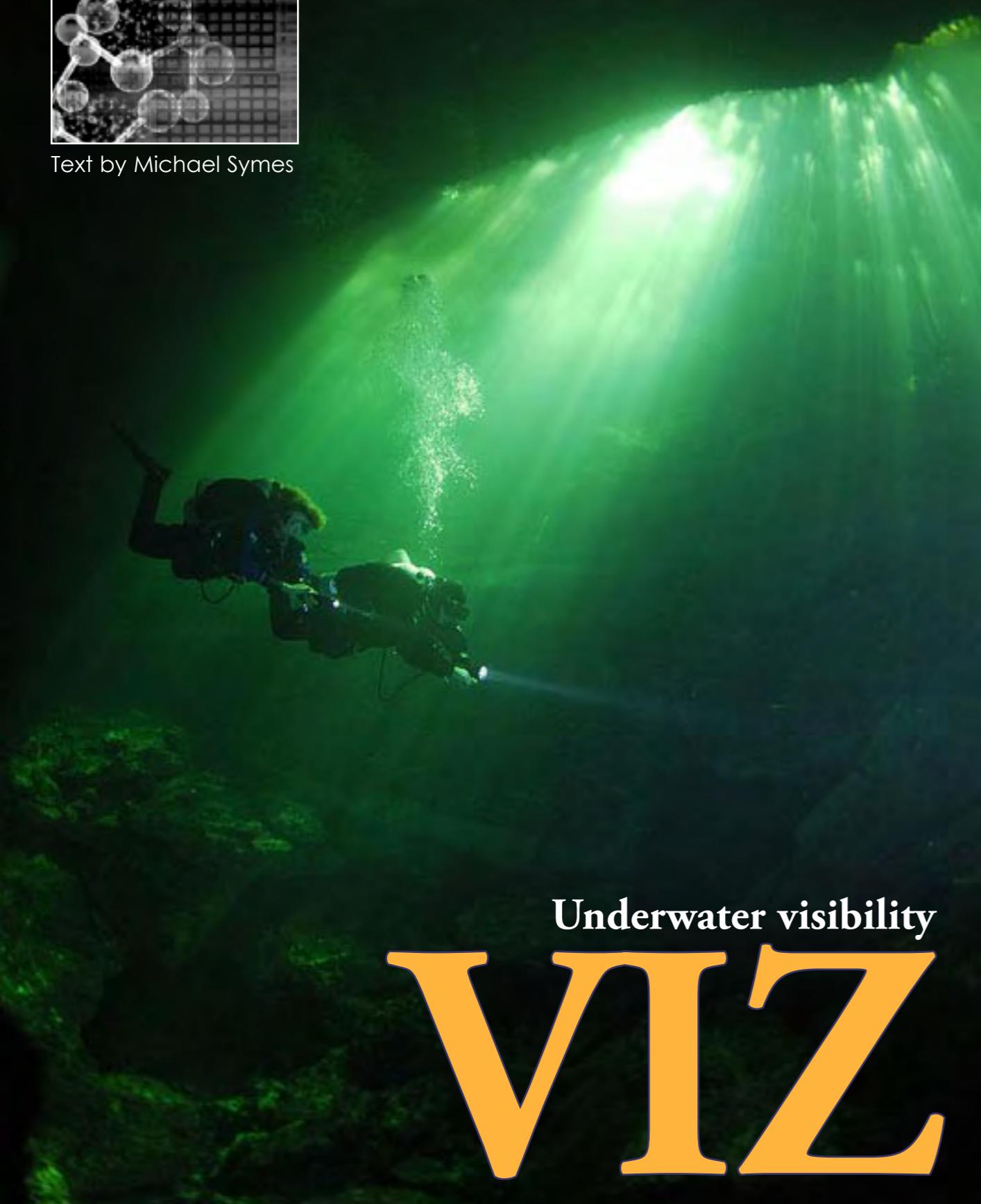
DANIEL GAMMERT



# science

JP BRESSER

Text by Michael Symes



# VIZ

## Underwater visibility

In a previous issue the reason for the blue colour of water was discussed. For the purposes of simplification it was assumed that the only phenomenon affecting the passage of light through water was the absorption coefficient of pure water. Now any diver knows that the visibility through sea water is not always very good. It can, in fact, be terrible.

Visibility is often affected by inorganic particulate matter such as silt particles or organic matter such as algae. Although dissolved substances such as inorganic salts can also affect the colour of the water, and thereby the visibility, it is the particulate matter that is the greatest factor affecting visibility.

### Scattering

Light passing through a medium is said to be scattered by particles suspended in it, i.e. it is the process of changing the direction of the light. We observe scattering, for example, when we see suspended dust particles dancing in a beam of sunlight. The dust particles are very small, and it is this scattering of light that makes them easily visible to the naked eye. Another well

The term Tyndall effect is usually applied to the effect of light scattering on particles in colloid systems, such as suspensions of particles in water. Colloids may be colored or translucent because of the Tyndall effect. (Location: Cenote in Mexico)

known effect is the scattering of the particles in a colloidal suspension, known as the **Tyndall effect**. This is seen when light passes through spilt milk, for example, when it has a bluish appearance. Even the blue colour of the sky is caused by the scattering of sunlight by molecules in the atmosphere. Both these two latter processes are caused by the scattering of the shorter, blue wavelengths of the incident light.

The amount of light scattered by a particle or molecule depends on its size and shape, and is a function of the wavelength of the incident light.

### Types of scattering

There are three types of scattering, depending on the size of the molecules and particles that cause the scattering.

**Raman scattering:** occurs when the incident light interacts with molecules. The scattered light is of a different wavelength from the incident light and the scattered intensities are low. This type of

*Rayleigh scattering is the source of the blue of the sky*



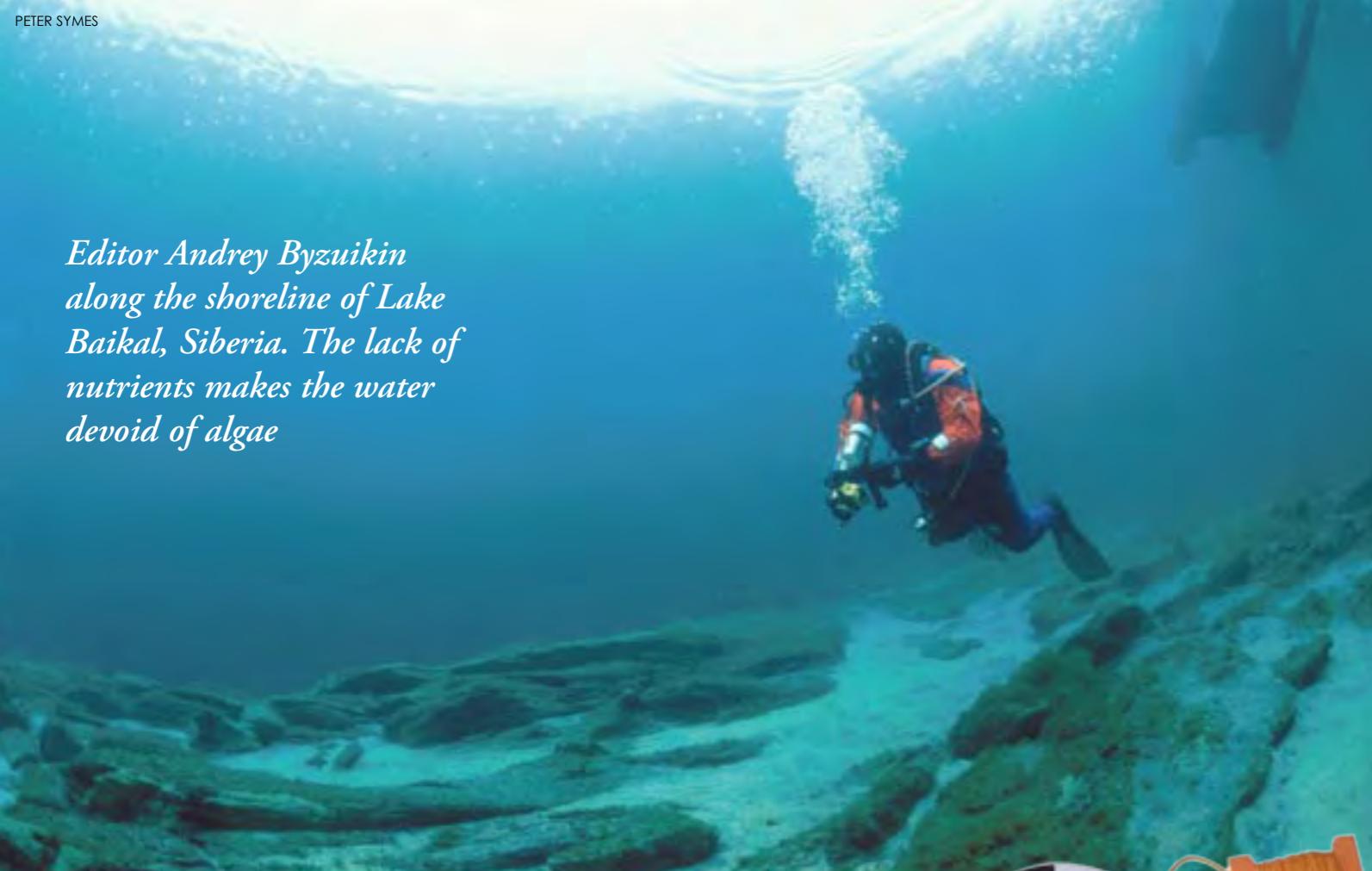
scattering has therefore little influence on visibility.

**Rayleigh scattering:** occurs at molecules and particles that are small with respect to the wavelength of light i.e up to about one tenth of the wavelength, which means about 50 nm. It is the source of the blue of the sky, and, as we can all see by looking at the sky, intensities can be quite high.

**Mie scattering:** occurs with particles that are larger than the wavelength of light. It typically occurs with microscopic organisms such as phytoplankton which are 20 - 200 µm in size. (Visible light has a wavelength of 0.4 – 0.7 µm). It is this form of scattering which is most important for visibility under water. Unlike Raman and Rayleigh scattering, the scattered light has the same wavelength composition as the incident light, i.e. it is "white". Such a

Lake Thingvellir, Iceland, boasts probably the best visibility on the planet. And, yes, those ARE divers in the distance

*Editor Andrey Byzuikin along the shoreline of Lake Baikal, Siberia. The lack of nutrients makes the water devoid of algae*



scattering effect is generally called turbidity.

### Measurement of Turbidity

There are several ways to quantify turbidity, the most direct being some measure of attenuation of light as it passes through a column of water. However, the most meaningful measurement of turbidity in water is obtained by determining the amount of scattering directly. Turbidity measured this way uses an instrument called a nephelometer (from the Greek word for cloud). It does so by employing a light beam and a light detector set to one side (most often at 90°). This method generally provides a very good correlation with the concentration of particles in the water that affect clarity.

A nephelometric turbidimeter always monitors light reflected off the particles and not attenuation due to cloudiness. The units

of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units, NTU. In the United States, for example, the allowable standard for turbidity for drinking water is 1 NTU. This amount of turbidity is easily observable.

Turbidity standards can be obtained with various values of NTU's. These are mostly used to calibrate nephelometers. There are also portable turbidity meters available for the measurement of turbidity over the range 0 to 4000 NTU.

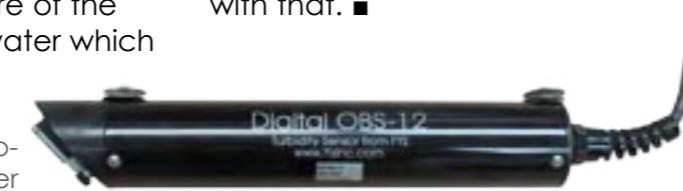
In a simpler, and cheaper but more approximate, way turbidity can be measured using a Secchi disc. This is a black and white disc which can be lowered into the water until it can no longer be seen. This Secchi depth is then recorded as a measure of the transparency of the water which



Secchi disc

is inversely proportional to turbidity. However, this method has the disadvantage that it cannot be used in relatively shallow waters where the disk can still be seen on the bottom.

Although it appears to be a very simple phenomenon, turbidity is a very complex analytical measurement which can be affected by many factors. Most divers, though, will just use their eyes to estimate visibility under water, and be perfectly satisfied with that. ■



A digital nephelometric turbidimeter

...AND THE SECOND

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# Eat Kelp

Text by Arnold Weisz  
Photos by Stein Johnson  
and Peter Symes

**Did you know that kelp is an ingredient in many household foods? Edibles like frozen foods, cakes, puddings, salad dressings, shampoos and even toothpastes contain alginate. Alginate is an apparently safe derivative of seaweed (kelp) and is used to maintain the desired texture in many products.**



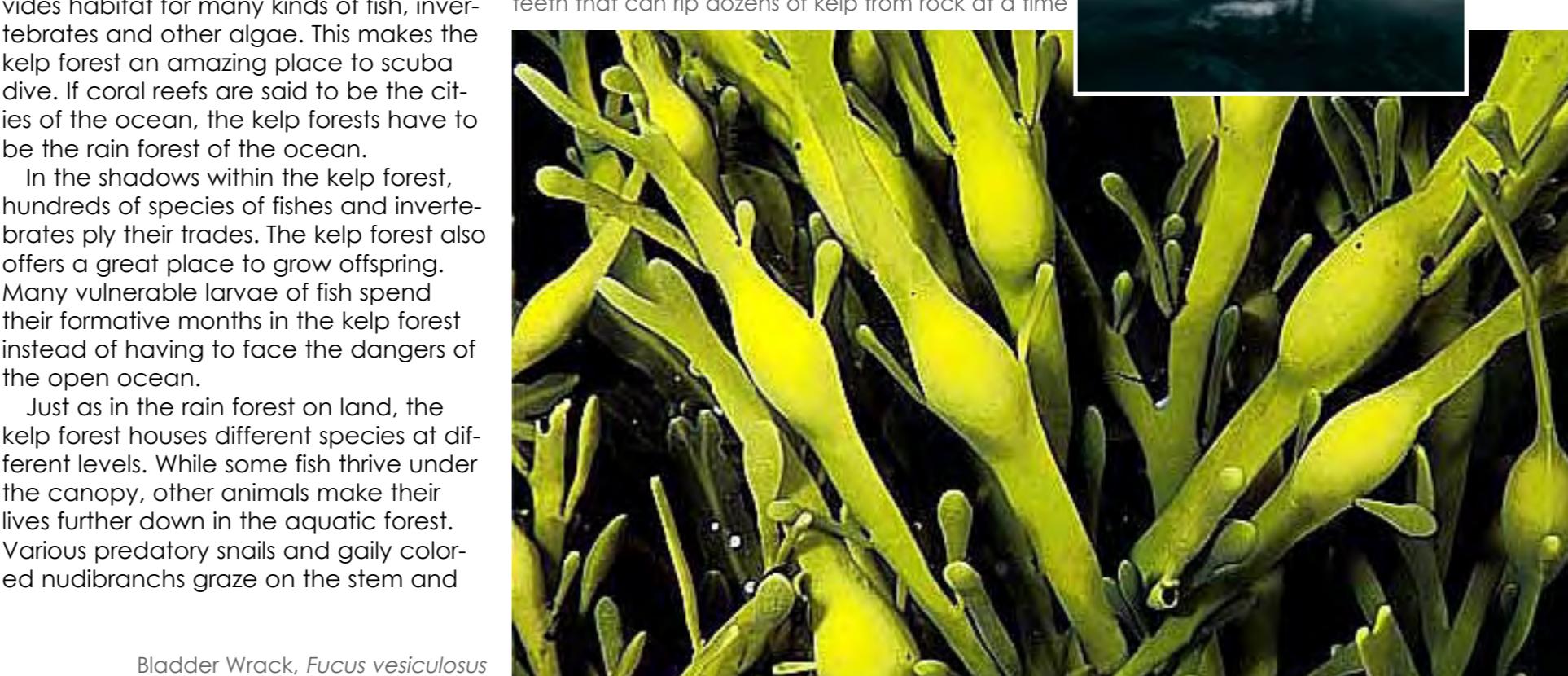
This food additive is the dehydrated and ground product prepared from different species of kelp: *Macrocystis pyrifera*, *Laminaria digitata*, *Laminaria saccharina*, and *Laminaria cloustonii*.

Giant kelp is one of the fastest growing plants in the world. When conditions are good, kelp can grow two feet per day! Giant kelp prefers water temperature in the 50-65°F range. Kelps occurs at and below low-tide levels in cool temperate regions throughout the world. They are a group of large brown seaweeds that live on the rocky sea bed as far down as sunlight penetration will allow. The plants often grow together in large numbers to form dense forests, usually composed of a single kelp species. A giant kelp plant can live up to six years. The plant is continuously pushing up new fronds to the surface, while the older fronds break off. Reaching lengths of more than 30 meters, it is the largest marine algae.

(Hudson) Lamouroux,  
*Laminaria digitata*



Bladder Wrack, *Fucus vesiculosus*



(Hudson) Lamouroux,  
*Laminaria digitata*

## Kelp harvesting

Kelp harvesting takes place in several countries around the world. The harvesting of kelp for the manufacture of food additives and agrochemical products is a significant business in Asia, Europe and parts of North America. Giant kelp has been harvested off the southern California coast for more than 90 years. In the 1970's, yearly harvests of more than 170,000 tons supported a California kelp industry worth US\$40 million. Also



the kelp leaves. Within the labyrinth of the kelp forest, many shrimp, crabs, sea stars and anemones also find their food and housing. Scientists have counted up to 100,000 life forms on a single kelp.

A kelp dredge harvests kelp with its large rake-like teeth that can rip dozens of kelp from rock at a time

# features



TOP: A common Baltic shrimp traverses Toothed Wrack fronds  
BOTTOM: Toothed Wrack, *Fucus serratus*

Norway is also harvesting kelp on a large-scale base—170,000 tons are harvested on the Norwegian west-coast every year.

Kelp harvesting is undertaken by tug-sized custom-built vessels with open holds the size of large caravans. Kelp harvest-

ing is managed on a rotational basis, ensuring that each area is harvested only once every four years to allow regrowth of the plants. The kelp dredge itself resembles a huge, iron garden rake—3m wide with elongated spiked teeth—



Red Rags,  
*Dilsea carnosa*

the depletion of fish stocks, as the kelp forest is a nursery for juvenile fish and are also major feeding grounds for blue water species. Less fish could also mean fewer seabirds. It will take some time before this study and others around the world can give satisfactory answers on whether commercial kelp harvesting is sustainable or not. ■

Kelp is a rich source of minerals and trace elements—iodine in particular, an adequate supply of which is essential to the proper functioning of the thyroid gland and the many important bodily processes controlled by it. Each tablet provides 150mcg of Iodine which assists thyroid hormones

control metabolism, growth and development. [Healthydirect.co.uk](http://Healthydirect.co.uk)



which is carried along the sea bed on raised skis. The weight of the dredge as it is pulled forward rips dozens of kelp plants from the rock, holdfast and all, which are then caught between the teeth.

At the end of a harvesting run, the dredge may have been drawn 50–250m along the sea bed, and have over a tonne of plants hanging in a compact mass from its teeth.

The process at the factory begins with the harvested seaweed being thoroughly washed in sea water to remove sand, silt, shells and small stones. Rotary drum dryers are used to dry the seaweed to be processed into seaweed meal.

## Resource management

Kelp harvesting is not without criticism. Several past and current on-going studies reveal the impact of commercial harvesting. Kelp harvesting impact on invertebrate species, seabirds and other marine mammal populations has not been satisfactorily investigated. Invertebrates, of all the groups of species that rely on kelp forests for their habitat, may be the most affected by

Carrageenan or Irish Moss, *Chondrus crispus*