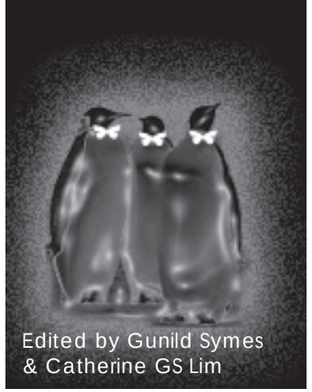


Edited by Gunild Symes & Catherine GS Lim

POINT & CLICK ON BOLD LINKS

Inspired by the Sea

Oceanic Design

Glowing Fish

At first glace, this table lamp by ZZZOOLIGHT looked like a stranded fish that leapt onto a boat by mistake. Yet it didn't take long for its soft delicate radiance and unique design to capture the heart. Measuring 34cm x 17cm x 21cm, its size makes it perfect as a centerpiece or in a child's room as a whimsical nightlight. Indeed the website states that ZZZOOLIGHT has created the lamp that makes your children dream. Polypropylene-sheet shade, unbreakable and resistant, certified children-proof. **www.officinacrea.it**

Fishy Forks

Getting the kids to help set the table at mealtimes won't be such a chore if you use this whimsical set of cutlery called, Gone Fishin', by Yamazaki. Established in 1918 in Tusbame, Japan, near the northwest coast of Honshu Island about 200 miles from Tokyo, this family operation once produced functional items in copper, silver and brass. It is now renown for its high quality stainless steel wares. Designed in the form of sea creatures, the set from the Art of Dining collection comprises a dinner knife and fork, salad/dessert fork, soup spoon and teaspoon. Now, if only it came with instructions on which spoon to place beside which fork... **yamazakitableware.com**

Sea Urchin Bowls

Banish all boring, mass-produced bowls from now on! Spice up your dinner table with these beautifully hand-rendered porcelain sea urchin bowls crafted by Christie Chaplin-Saunders of Chester, Nova Scotia, for Northern Tides Gallery in Maine, USA. You can indulge freely, savouring in the knowledge that the delicate seeming bowls are lead-free and suitable for use in the microwave and dishwasher. Available in green or blue, and in equally-authentic mussel shell design. Price: US$45.00-135.00. **www.northerntides.com**

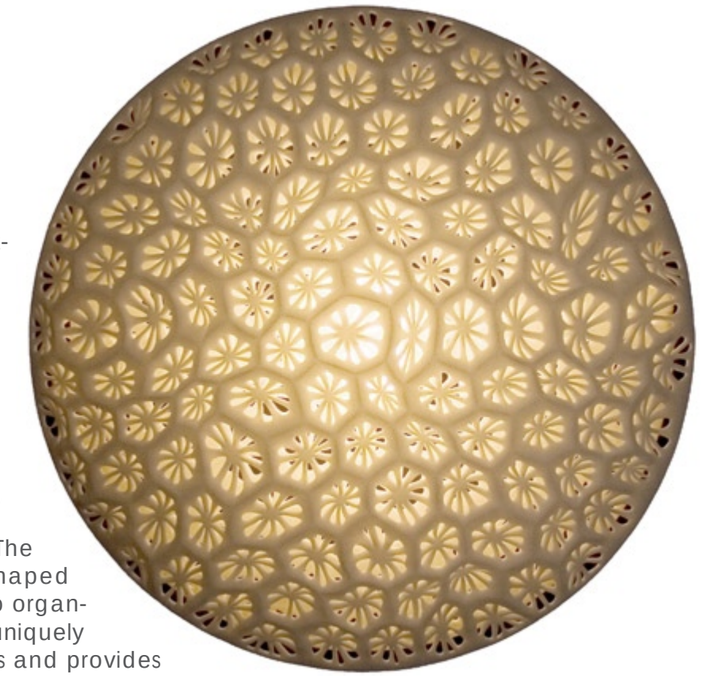
Lionfish

Okay, we realise the lionfish isn't popular in some parts of the world (to put it mildly), but how about having it as part of your home decor? This unique lamp design by Alex Earl of Melbourne, Australia, is made from polypropylene or heat-bent acrylic. The lighting pendant comes in a variety of colours and sizes to suit your specific preferences. So, fancy a couple of lionfish floating through the blackness of space over your bed at night or watching over you as you dine? **www.alexearl.com.au**

Coral chops

We know the rule is not to buy any coral products, but we'll make an exception with the Michael Aram Coral Reef Serving Set. For one thing, it's not real coral, but black or red lacquer over aluminium, topped with high-polished tops. Each spoon or fork measures 12 inches. There is also a complementary stainless steel bowl with a coral-patterned base. **www.trendir.com**

Reef Lamp



Sea coral patterns inspired the design of the REEF lamp by Tanja Soeter for Freedom of Creation (FOC), Amster-dam, a pioneer in 3D printing. The half dome shaped light has two organic layers of uniquely shaped cells and provides gentle lighting for walls or ceilings, creating dramatic shadows with its delicate structure. Diameter 320mm; Height 150mm. Laser Sintered Polyamide. Price: €696.99. **www.tanjasoeter.nl**

Coral Chair

It's fire-retardant, UV-resistant, ergonomic, recyclable, stackable and durable. Made from nylon with fibre glass reinforcements in a design inspired by coral reefs, the Coral Chair designed by Ton Haas of Harechare in the Netherlands is available in seven different colours and can be used outdoors. What more could you ask for in a chair? **www.harechair.com**

DEREK PEARCE

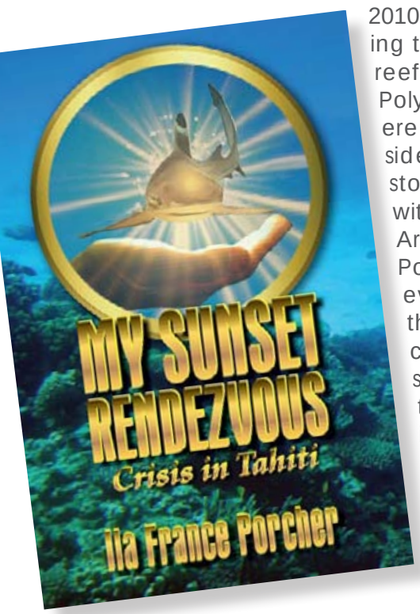
Dolphins

Get this coffee table expertly handcrafted by artist and designer Derek Pearce, and you'll always have dolphins dropping in for tea. The design seamlessly integrates the dolphins into the structure of the table in a playful manner. Other designs feature the hippo, frog, duck, sea otter and seal. Pearce has made pieces for celebrities such as Michel Roux, David Jason, Julian Clary, James Dyson and John Cleese. Prices start at GB£1,800. Pearce's studio is part of the Made at Kew Bridge collective of artists at the Kew Bridge Steam Museum in Brentford, London, England. Open house: March 10. **www.watertables.net**

media

Sharks

Sharks have had a bad rap as mindless, vicious man-eaters for many years. Author Ila France Porcher wants to dispell this notion with her recent book, *My Sunset Rendezvous*, which came out in December 2010. After years of studying the local blackfin reef shark population in Polynesia, Porcher discovered the kinder, gentler side of these misunderstood animals. Together with scientific colleague, Arthur A. Myrberg Jr., Porcher found the first evidence that sharks can think and what social creatures they are, with some strange and startling observations. But in 2003, a company from Singapore started finning her beloved sharks, and Porcher saw the devastation underwater that resulted from this cruel and wasteful practice in which sharks are finned alive and dumped back into the water to sink to the bottom where they suffocate in a horrible death. With lots of hard work and determination, wildlife advocates in Polynesia finally got protection for the sharks in 2006. Originally a wildlife artist and painter from British Columbia, Canada, Ila France Porcher now resides in Tahiti, French Polynesia, where she writes wildlife books.



Paperback: 640 pages
Publisher: Strategic Book Group (13 Dec 2010)
ISBN-10: 1609118103
ISBN-13: 978-1609118105

Madeira

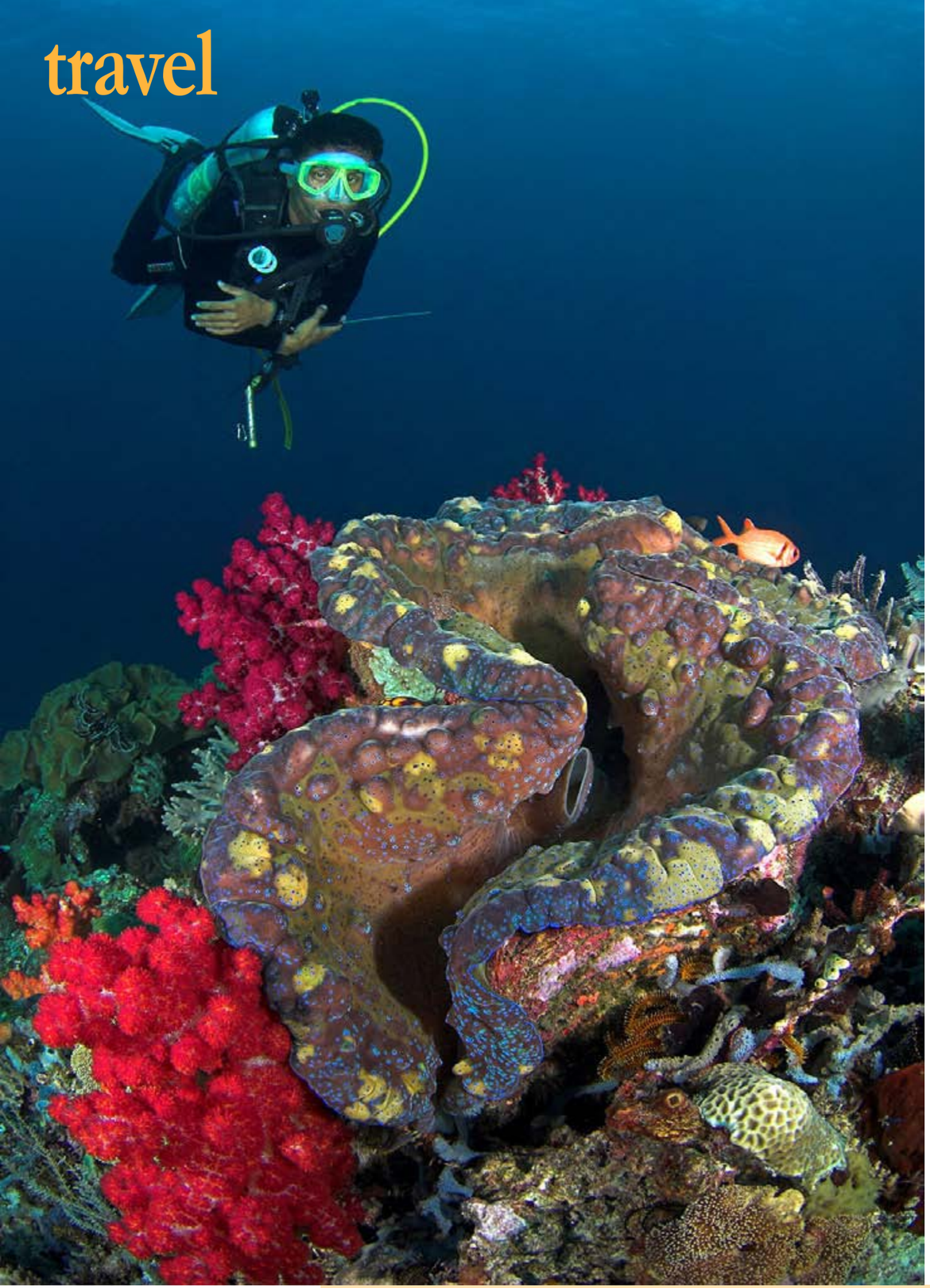
This diving guide is the result of 45 days of awsome diving, which the photographer, Nuno Sá, experienced in the warm waters of Madeira—a Portuguese archipelago found just north of the Canary Islands in the North Atlantic—with the marine biologist, Joana Almeida, who wrote the text. It's pages contain detailed descriptions of Madeira's 20 best dive sites. Images of Madeira's marine life species include big pelagic fishes, manta rays, sea turtles and marine mammals, plus shipwrecks on the sandy bottoms sheltering numerous species, that have become oasis of life. Madeira's waters are host to 360 sea vegetable species, as well as 550 fish species, 21 marine mammal species and various invertebrate species. Born in Montreal, Canada in 1977, Nuno Sá returned with his family to Portugal at age 11 where he fell in love with the sea and received his diving certification in 1997. After studying law for several years, he moved to the Azores where he pursued his love of the sea and worked as a professional photographer specializing in marine life since 2004. Sá is now part of the team of top nature photographers participating in the Wild Wonders of Europe nature photography project sponsored by the National Geographic Society.

Paperback: 112 pages
Publisher: Ver Açor Lda; 1st edition (2010)
ISBN-10: 9898123230
ISBN-13: 978-9898123237

Halmahera

—*A Diver's Haven in the Maluku Islands*

Text and photos by Don Silcock



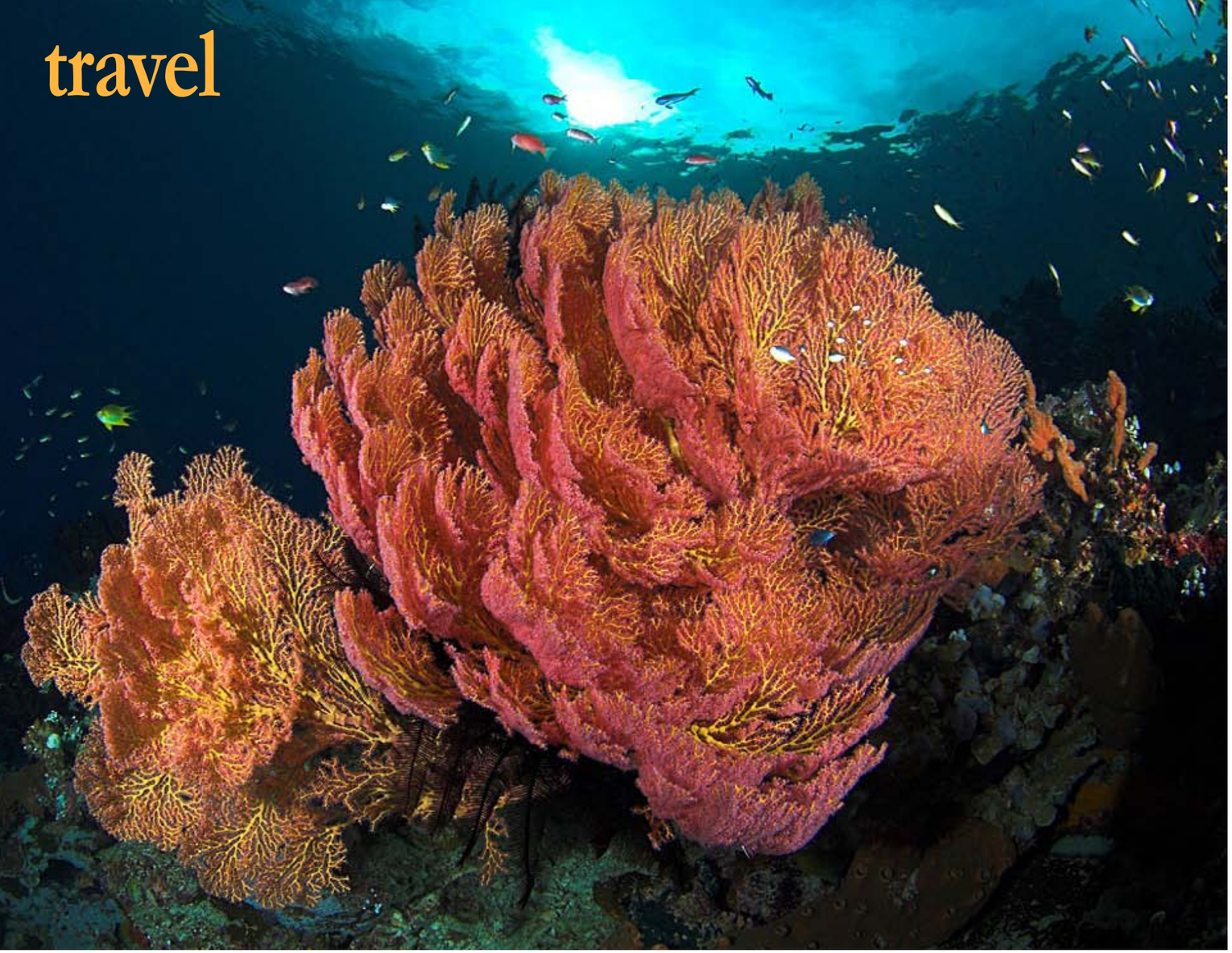
Diver and giant clam at Mios Kon near Raja Ampat (left); Fishing along the coast near Raja Ampat (above)
PREVIOUS PAGE: Superb soft corals and sponges at Pantai Sago reef on the southern side of Tifore

The sands of time have long since washed over the remote East Indonesian province called the Moluccas. Home to less than two million of the archipelago's 227 million in population, and spread out over nearly 1,000 islands, the area is little known within the country and few foreigners could even point to it on a map with any degree of certainty. Hard to believe then, that just over 500 years ago, the Moluccas were the trigger for the so-called "age of exploration"—a two hundred year period when the major powers of Europe sent fleets of sailing ships to find and then control the fabled Spice Islands of the far east.

For it was only in the Moluccas, with its equatorial climate and rich volcanic soils, that the aromatic spices of cloves, nutmeg and mace could be found. Perceived to offer protection against the horrendous great plagues that ravaged 16th century Europe and providing the only way at that time to preserve and flavor meat, these exotic spices were so valuable that they were literally worth their weight in gold.

In the great race to find and then control their source, Christopher

Mike's Point



Halmahera

Columbus discovered the New World of the Americas, Ferdinand Magellan's expedition circumnavigated the world for the first time, and Vasco Da Gama rounded the Cape of Good Hope at the tip of Africa and established the sea route to the Indian sub-continent.

Today, those spices are a common supermarket commodity and the Spice Islands, a group of five volcanic islands located off of the west coast of the island of Halmahera and the Banda Islands—some 500km to the southeast—are quiet outposts in the huge Indonesian archipelago.

These days, a new breed of adventurer is exploring the Halmahera area of the Moluccas. Instead of spices, explorers are looking for exciting places to dive. Ironically, many of the liveaboard vessels in this area are local Pinisi boats modeled after the European sailing ships that came looking for the spices in the 16th century.

The Indonesian Throughflow

– A Phenominal Force of Nature

Northern Indonesia first established itself on the international dive map with Bunaken Marine Park on the west coast of North Sulawesi near Manado, and then, the critter Mecca of the Lembeh Straits on the east coast, followed by the Raja Ampat area on the northeastern tip of Irian Jaya—the Indonesian eastern half of the island of New Guinea—which has established an almost legendary reputation in recent years as a must-dive location.

The diving in these areas is particularly special because of what is known as the "Indonesian Throughflow"—the phenomenal flow of water from the Pacific Ocean to the northwest of Indonesia into the Indian Ocean to the south of the archipelago. (See sidebar next page.)

Off the beaten track

The sheer size of Indonesia means that any journey to its more remote regions involves a fairly significant amount of travel, and to experience the Halmahera region means being prepared to go the distance—and roll with the punches.

My personal journey involved an overnight flight from Sydney to Singapore followed by the morning flight with Silk Air to Manado and an overnight stay—well sort of... we had to check out of the hotel at 2:00am to get to the airport in time for the 4:30am departure with

CLOCKWISE: Superb fan corals in the Proco Channel of the Patintie Straits; The *SMY Ondina* under full sail; Airborei pier

Luscious soft corals at Sardine Reef

THE INDONESIAN THROUGHFLOW

The Indonesian Throughflow is the result of monsoonal weather patterns and oceanic currents that combine to create higher water levels and temperatures in the Pacific Ocean, which together with its lower salinity, result in a flow of water so large that traditional measurements are not big enough to measure it!

The *Sverdrop*, named after the Norwegian scientist Harald Sverdrup who invented it, is used and one Sverdrup is one million cubic meters of water per second. A popular analogy used to visualize this flow of water is if you imagine a river 100m wide, 10m deep and flowing at four knots. Then imagine 500 similar rivers—that's one Sverdrup.

It is estimated that the total amount of seawater that passes through the Indonesia archipelago because of the Throughflow is 20-22 Sverdrups, or 10,000 of those fast-flowing rivers.

A basic understanding of the Throughflow mechanism, together with a look at the map quickly puts into perspective why parts of northeastern Indonesia offer such fantastic diving.

Northeast Sulawesi, together with Raja Ampat in Irian Jaya and the largely unexplored area of Halmahera in the Moluccas is where the flow of water from the Pacific Ocean first touch major landfall.

There is a very simple principal that applies with the world's oceans and seas, and the marine biota that inhabits them, which is when something dies, it usually sinks to the bottom. This detritus of the sea, rich in phosphorus and nitrogen from the decayed organisms, would remain on the bottom were it not for the effect of the Throughflow.

The tremendous flow of water resulting from the Throughflow produces cold water upwellings from the deep trenches and basins to the north of Indonesia, which bring the rich nutrients that are a significant part of the reason why those areas of Indonesia, which are exposed to it, are so rich and biodiverse. ■

Striped sweetlips at Mike's Point (above); Manta Ray at 3m near Raja Ampat (top right); Schooling Fusiliers at Mike's Point (right)

Merpati Airlines to Sorong in Raja Ampat. I did not complain though, as several of my new best friends on this trip were from the United States and had already been traveling for over 48 hours at that point in time.

Arrival in Sorong at 7:00 in the morning meant that, first of all, we were finally there and able to board our waiting liveaboard, the *MV Ondina*. Secondly, we still had a full day ahead of us and a chance to sample some of the superb diving in the area before starting our journey towards the strangely-shaped island of Halmahera and onwards to our final destination of the Lembeh Strait in North Sulawesi.

Raja Ampat

Much has been written about Raja Ampat in the last seven to eight years, and the area has achieved almost cult-like status in the diving community. There is absolutely no doubt that Raja Ampat truly is one of the last frontiers in global diving, and I have personally enjoyed some of my most memorable dives in the area.

On this trip, I was lucky enough to revisit two of my personal favorite locations—Sardine Reef and Mike's Point.

Sardine Reef is a large circular seamount located to the east of Kri Island on the northern side of the Dampier Strait, which means that it sits right in the path of the Indonesian Throughflow, as it surges through the Strait. Its eastern tip is where the current hits the seamount, and diving the site is a kind of like the Goldilocks and porridge situation—not too hot, as it's incredibly difficult to do much more than hold on to your mask, and not too cold, otherwise the phenomenal fish life goes off the boil.

Sardine is a very "fishy" dive, and when it is at its peak, it is hard to take in the sheer volume of pelagics schooling in the rich current—so many infact that you will often hear the so-called "fish thunder" phenomena produced by cavitation in the water column when a large volume of fish moves rapidly.

Mike's Point is also near Cape Kri on the northern side of the Dampier Strait, but rather than being a submerged seamount like Sardine, it makes its presence felt by breaking

LEFT TO RIGHT: Diver poses with soft coral at Pantai Sago reef on the southern side of Tifore; Beautiful fans and sponges at Rennie's Rock in the Goweba Channel in the Goraici group of islands; Goraici Islanders rowing home at sunset

the surface with a small rock roughly 30m in diameter. So strong is the current that can flow past it, that U.S. forces surveying the area in WWII thought it was the wake of a camouflaged Japanese ship and bombed the island!

There are two things that I think make Mike's Point really special in an area that has some pretty incredible diving—the massive aggregation of sweetlips on the southern wall and the sublime coral garden in about 10m of water, occupying what appears to be a large crater from the WWII bombing.

Exploring the wall and the sweetlip aggregation make for an exhilarating first part of the dive. Then, taking an extended deco stop in the coral gardens—with the sun streaming down creating a cathedral light effect—is to die for.

Misool

From Raja Ampat and the excitement of diving the Dampier Strait, our journey to Halmahera took us southwest on an overnight 12-hour cruise to the western tip of the large island of Misool and the group of six small islands called the Blue Water Mangroves.

As the name suggests, these low-lying islands are densely covered in mangroves, but unlike many other such habitats, their position in the Halmahera Sea and their close proximity to each other creates a situation whereby they are flushed with clear blue water on every rising tide—creating a pretty unique dive location.

Mangroves are normally associated with the word *swamp* because of the high concentration of sediment and

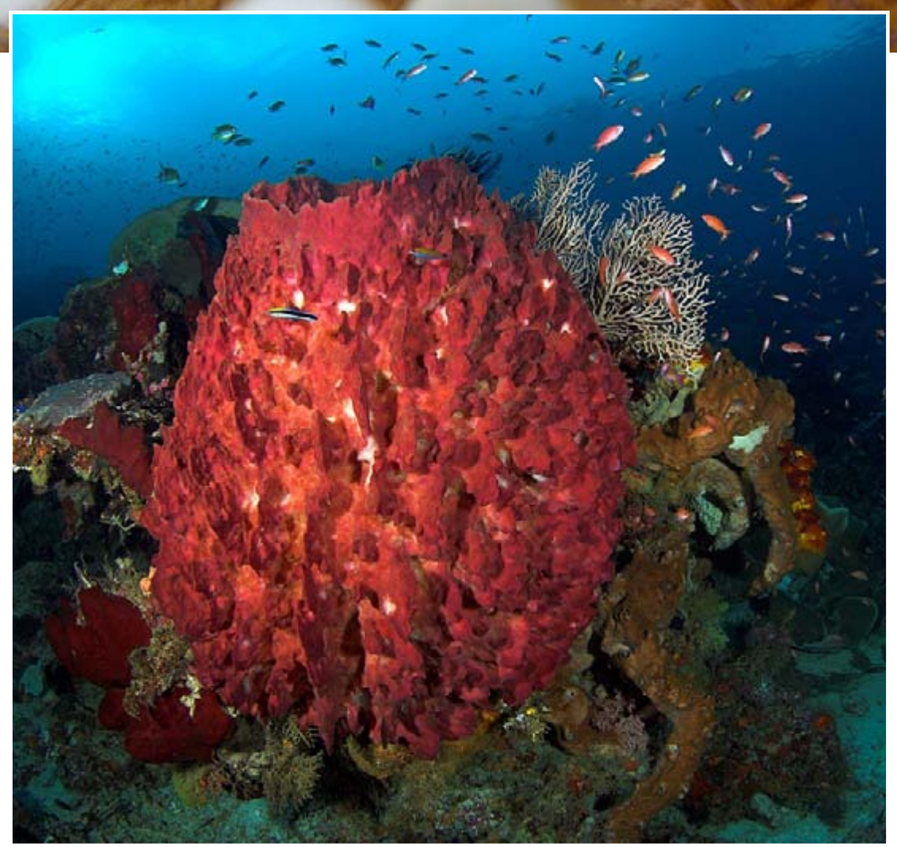
Archer fish in the gin clear water (top left) of the Blue Water Mangroves of Missool; A pair of archer fish and their reflections (bottom left); Soft corals at Airborei pier (above)

other organic detritus, which means that diving in them is not a particularly rewarding experience. But the Blue Water version at Misool is quite extraordinary, and diving them provides a unique insight into these special ecosystems, because you can actually see what is there.

Of particular interest are the coral growths on the mangrove, which are quite spectacular when backlit by an overhead sun streaming through the dense canopy. Also, in the inlets that reach deep into the mangroves, numerous archerfish are to be found practicing their special method of catching insects with a deadly accurate jet of water spat at high speed from their mouths.

Penetrating these inlets on a rising tide is quite surreal, as the water is so clear and so still that it's difficult to tell where the underwater world ends—the archerfish seem to float through the leafy mangroves above the water.

It's also a rather tense experience, as the mangroves are also the perfect habitat for the salt-water crocodile, and a diver was actually attacked by one in April 2009. He lived to tell the tale, but the moral



Halmahera

CLOCKWISE FROM FAR LEFT: Translucent anemone shrimp; Anemone fish; Amazing sponge garden in the Proco Channel of the Patintie Straits; Beautiful barrel sponge in the Proco Channel of the Patintie Straits

of the story is always let the dive masters know where you are going and be very vigilant.

Out there

In the middle of the Halmahera Sea roughly equidistant between Misool and Halmahera Island, and a six-hour sail northwest from the Blue Water Mangroves, is the large banana-shaped island called Pisang and the nearby two smaller islands called Batuanyer Kecil.

All three islands rise steeply from the deep waters of the Halmahera Sea and are richly coated in dense vegetation. Underwater, the two Batuanyer Islands and connected by a reef, which is extremely vibrant and covered in hard and soft corals in a kind of mirror image of the dense vegetation above water.

The three islands sit right in the path of the Indonesian Throughflow and, as it passes around them, their shapes and underwater topography produce the perilous downdrafts that are a constant potential danger when diving the best sites in Indonesia.

Diving such locations requires what Ricard Buxo, the Spanish cruise director of *MV Ondina*, calls a rapid negative entry whereby everybody in the dive tender is geared up and ready to go. The tender then positions itself up-current of the site, and on the signal, the engine is killed and

CLOCKWISE FROM LEFT:
Gorgeous sponges;
Crocodile fish;
Gorgonian fan

Halmahera

everybody rolls backwards at the same time, grab cameras and get down quickly before the currents take you away.

The trick is to get to the front of the site where the current hits it, central enough and deep enough to avoid being pulled to the side or taken over the top by the flow of water. This is where the effect of the current is reduced and the best action is to found, plus further down is often where the "big dogs" can be found.

Halmahera Island

From Pisang Island, it was another six-hour overnight sail to Djoronga Island, at the southern tip of Halmahera, where over the next few days we dived the reefs of Karang Dorobi, Ganone and Nenas, and then several sites in the Patintie Strait between the eastern side of Halmahera and the large island of Bacan.

Most of the sites in the Patintie Strait and particularly the ones in the Proco Channel, between two small islands that sit out in the Strait, are classic big current dives requiring the rapid negative entry and a pair of vigilant dive tenders.

On several of these dives, I tagged on behind Ricard Buxo as he centralized himself where the current hit the reef and then went down to around 40m looking for the "hot spot" where the current first touches the reef, bringing with it cold water from the deep rich with the detritus of the sea. Plankton feeders love this "sea soup" and gather where it hits the reef, which creates the foundation of a mini-ecosystem as the other layers of the marine food chain work the area.

Although quite deep, and pretty exciting because of the larger predators that gather there, the current is quite manageable, as it only really gathers intense velocity as the depth reduces. We saw numerous large gray reef sharks cruising the current

Delicate soft corals (left) can be found decorating the mangroves; Batfish at sunset underneath Airborei pier (above)

and down deep, way beyond the limits of recreational diving, were the unmistakable profiles of great hammerheads.

The Goraici Islands

From the Patintie Straits, another overnight sail took us further to the northwest into the Molucca Sea and the Goraici group of islands.

The Goraici's are about 75km south of Ternate and Tidore—the original main Spice Islands off the west coast of Halmahera, and the only place in the world where cloves could be found.

The people of the Goraici's have an enviable reputation as pragmatic environmentalists who have succeeded in keeping their reefs healthy and in good condition by preventing the twin scourges of dynamite and cyanide fishing that has done so much damage elsewhere in Indonesia.

The area is indeed rich in marine life and at Tagani Bay on the northwest tip of Kayoa Island is where the celebrated ichthyologist Jerry Allen had his highest fish count of 303 species on one dive. Our dives in the area were notable for strong currents, clear blue water, healthy reefs with rich hard and soft corals and cruising sharks and pelagics.

We spent two days diving the Goraici Islands, but could easily have spent a week in the area. However, our journey was coming to an end, and yet, we had one more treat in store—Tifore Island in the middle of the Molucca Sea halfway between Halmahera and North Sulawesi and just about as remote as it gets!

On the southern side of Tifore is a reef at Pantai Sago known for a school of barracudas said to number over a 1,000. We dived the southeast face of the reef where the current hits the reef. It is really a great dive, with superb hard and soft corals down deeper, and huge shoals of schooling fish.

The day we spent diving Tifore before the final nights sailing to Lembeh was the perfect end to a fantastic trip through Hamahera—remote locations, big currents and fantastic diving.

Hard to beat...

Don Silcock is a dive writer and underwater photographer originally from the United Kingdom, but now based in Sydney, Australia. For more information on diving in Indonesia, Papau New Guinea and Australia visit: ***www.indopacificimages.com*** ■

fact file

Indonesia

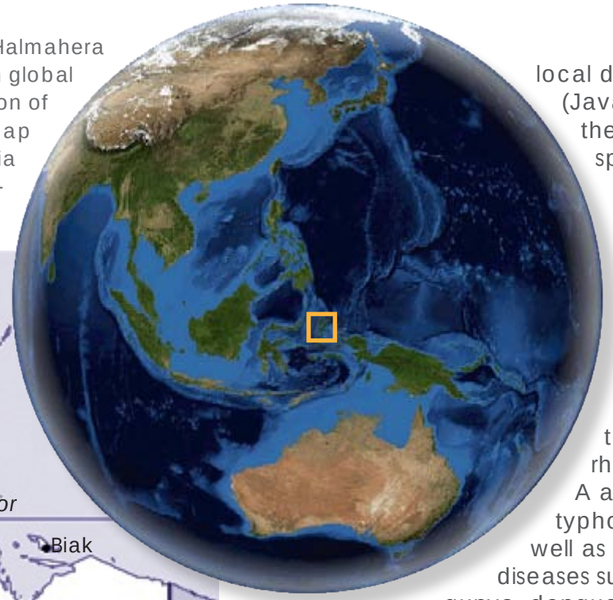
SOURCES: CIA.GOV WORLD FACTBOOK, STARFISH.CH

History In the early 17th century, the Dutch began to colonize Indonesia. From 1942 to 1945, Japan occupied the islands. After Japan's surrender in WWII, Indonesia declared its independence, however, it took four years of negotiations, recurring hostilities and mediation by the United Nations for the Netherlands to finally agree to transfer sovereignty in 1949. 1999 marked the year of Indonesia's first free parliamentary election after decades of repressive rule. The world's third-largest democracy, Indonesia is the world's largest archipelagic state. It is also home to the world's largest Muslim population. Current challanges include: improveing education, alleviating poverty, curbing terrorism, initiating economic and financial reforms, controling corruption, holding the military and police accountable for human rights violations in the past, addressing global warming, and controlling bird flu. An historic peace agreement with armed separatists in Aceh was reached in 2005, which led to democratic elections in Aceh in 2006. However, the government still faces sporadic armed resistance by the separatist Free Papua Movement. Government: republic. Capital: Jakarta

Geography Indonesia is an archipelago of islands located in Southeastern Asia, between the Indian Ocean and the Pacific Ocean. Coastline: 54,716 km. The terrain is mostly coastal lowlands with interior mountains on the larger islands. Lowest point: Indian Ocean 0m. Highest point: Puncak Jaya 5,030m. Note: Indonisea is made up of 17,508 islands of which 6,000 are inhabited. It straddles the equator in a strategic location adjacent to major sea lanes from Indian Ocean to Pacific Ocean. Piracy and armed robbery has been known to occur against ships in the territorial and offshore waters in the Strait of Malacca and South China Sea.

Climate Indonesia has a tropical, hot, humid climate with more moderate temperatures in the highlands. Natural hazards include severe droughts, occasional floods, earthquakes, tsunamis, volcanic activity and forest fires.

Environment Deforestation; water pollution from industrial wastes, sewage; air pollution in urban areas; smoke and haze from forest fires. Indonesia is party to agreements including: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands. The country has signed, but not ratified Marine Life Conservation.



RIGHT: Location of Halmahera Island of Indonesia on global map. BELOW: Location of Halmahera Island on map of Indonesia BOTTOM RIGHT: Clownfish in anemone

Economy As a vast polyglot nation, Indonesia has been able to weather the global financial crisis relatively smoothly due to its heavy reliance on domestic consumption as the impetus for economic growth. To counter the effects of the crisis, the government used fiscal stimulus measures and monetary policy and offered cash transfers to poor families. Consumption was partially buoyed by campaign spending in advance of legislative and presidential elections in 2010. Economic advances and significant reforms in the financial sector, including tax and customs reforms, the use of Treasury bills, and capital market development and supervision, were made under President Yudhoyono. Increasingly robust GDP growth and sound fiscal stewardship has steadily reduced Indonesia's debt-to-GDP ratio in recent years. Pursistent challenges include poverty and unemployment, inadequate infrastructure, corruption, a complex regulatory environment, and unequal resource distribution among regions. Natural resources: petroleum, tin, natural gas, nickel, timber, bauxite, copper, fertile soils, coal, gold, silver. Agriculture: rice, cassava, peanuts, rubber, cocoa, coffee, palm oil, copra; poultry, beef, pork, eggs. Industries: petroleum and natural gas, textiles, apparel, footwear, mining, cement, chemical fertilizers, plywood, rubber, food, tourism.

Currency Indonesian Rupiah (IDR). Exchange rates: 1EUR = 11,715.31 IDR; 1USD = 8,980.00 IDR; 1GBP = 14,032.15 IDR

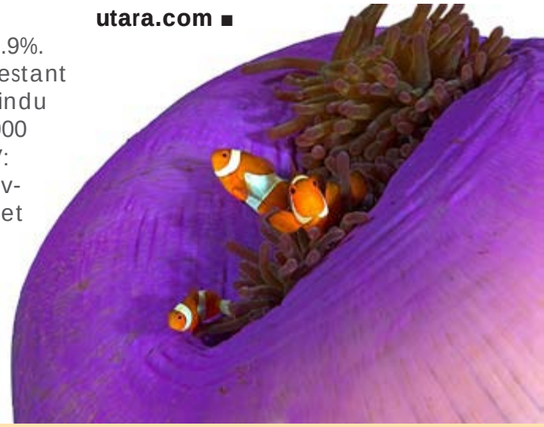
Population 240,271,522 (July 2010 est.) Ethnic groups: Javanese 40.6%, Sundanese 15%, Madurese 3.3%, Minangkabau 2.7%, Betawi 2.4%, Bugis 2.4%, Banten 2%, Banjar 1.7%, other groups 29.9%. Religions: Muslim 86.1%, Protestant 5.7%, Roman Catholic 3%, Hindu 1.8%, other religions 3.4% (2000 census). Living with AIDS/HIV: 270,000 (2007 est.) Below poverty line: 17.8% (2006). Internet users: 30 million (2008)

Language Bahasa Indonesia (which is the official, modified form of Malay), English, Dutch, local dialects (Javanese is the the most widely spoken)

Health There is a high degree of risk for food or waterborne diseases such as bacterial diarrhea, hepatitis A and E, and typhoid fever, as well as vectorborne diseases such as chikungunya, dengue fever and malaria. Note: There have been cases in Indonesia of the highly pathogenic H5N1 avian influenza. However, it poses a negligible risk to visitors.

Hyperbaric Chambers
Manado (Sulawesi): Malalayang Hospital, tel: 0812-4302970; and Professor Dr Kan-dou Hospital, tel: (+62) 8134-0000840
Makassar (Sulawesi): Rumah Sakit Umum Wahidin Sudirohusodo
Tel: (+62) 0411-584677

Websites
Tourism Indonesia
www.indonesia.travel
Halmahera Island Tourism
www.halmahera-utara.com ■



turtle tales

Edited by
Bonnie McKenna

Last year a deadly time for turtles

More sea turtles were killed or injured in the Gulf of Mexico during the months following the BP oil spill than any other time in the past 20 years.

The National Wildlife Federation suggested that as many as 600 turtles were hurt by the spill, but it is not clear how many died as a result to ingesting the crude or how many drowned in fishing nets as the fishing industry scrambled to catch as much fish and shrimp as they could before the oil spoiled them. Some turtles also died as a result of extreme cold.

NOAA

The Federation scientists said the turtles suffered more than any other species because their populations are already low, and it takes turtles a long time to reach maturity. It takes turtles 10 to 30 years to reach maturity, meaning it could take decades to restore their population.

During the spill, wildlife officials and volunteers undertook Herculean efforts to try to save to save the turtles. Hundreds of loggerhead nests, containing approximately 15,000 hatchlings, were successfully transported and later released into the Atlantic Ocean. ■

New legal settlement means fewer Loggerheads will die

Under a new agreement between environmental groups and the government, fewer sea turtles will die on the swordfish industry's longlines. The Turtle Island Restoration Network, Center for Biological Diversity, and KAHEA sued the National Marine Fisheries service for allowing 46 loggerhead turtles to be hooked last year; the new settlement caps the number at 17 per year. Meanwhile, the Fisheries Service is deciding whether loggerhead turtles need more protection under the Endangered Species Act.

For leatherback turtles, the bycatch limit is 16 per year. In 2010, eight Pacific leatherbacks and seven loggerheads were caught in the long line fisheries. In 2011, there have already been four loggerheads captured; this has the sea turtle conservationists concerned.

KAHEA said that this is a victory not just for the turtles, but for the people of Hawaii who rely on a healthy ocean ecosystem.

"Pacific loggerhead sea turtles are nearly extinct, so this bycatch rollback helps right a serious wrong," said Teri Shore, program director at Turtle Island Restoration Network.

Swordfish long line vessels trail up to 60 miles of invisible fishing line, suspended in the water with floats and with as many as 1000 baited hooks. Sea turtles, sea birds and sea mammals become hooked as they swim through this curtain of hooks in search of food; the result is drowning or serious injury. ■

USNPS

Baby loggerhead sea turtle

A record breaking cold in Texas results in 1,040 sea turtles needing rescue

Corpus Christi, Texas has experienced a record breaking cold. The number of cold-stunned green sea turtles that have been rescued in a two day period has risen to 1,040.

"We are snowed under with sea turtles," said Donna Shaver, division chief of Sea Turtle Science and Recovery at Padre Island National Seashore.

Kevin Weatherbee spent two days rescuing 42 cold-stunned turtles, sometimes wading into chilly water to bring them into his bait shop. There were so many turtles he ran out of blankets and towels to wrap them in.

"We've had hundreds of volunteers find more turtles in two days than have been found on the Texas coast in any individual year," said Shaver.

Because turtles are reptiles their body temperature fluctuates with the temperature of the environment, cold stuns the turtles. It leaves the turtle motionless, and they float to the surface. If not found, they cannot raise their heads out of the water, and they drown.

"We're working really hard, and I feel optimistic at this point that we've done a really good job," Shaver said. "Those turtles are going to get back into the wild safe and sound in a few weeks." ■

JEFF POLLIN/MARINE PHOTOBANK

Leatherback sea turtle hatchlings head to the sea

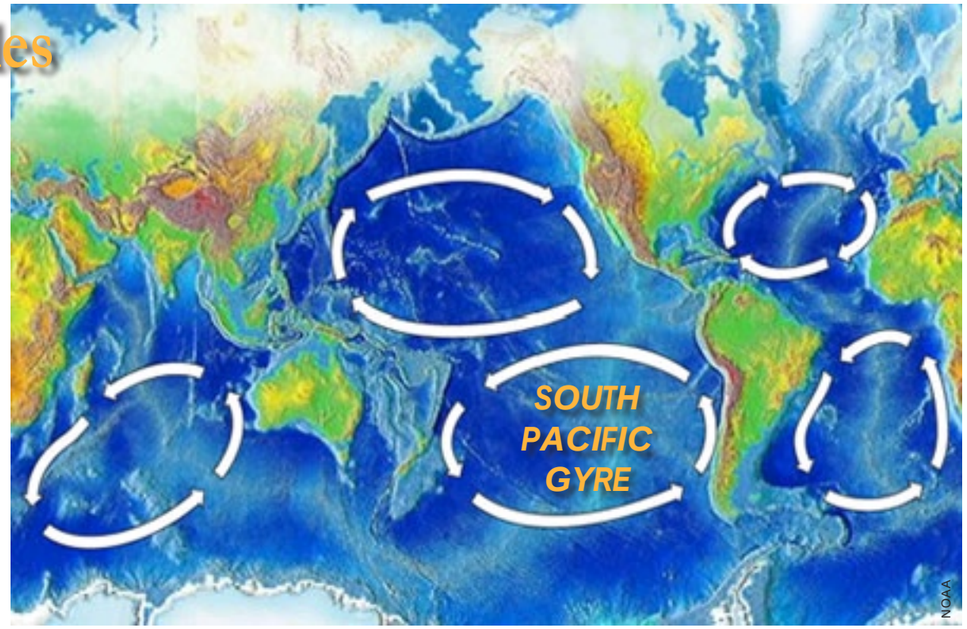
Leatherback nesting beaches in Costa Rica are threatened by development

A letter was delivered to Costa Rican President Laura Chinchilla from scientists opposed to legislation that would weaken protections for sea turtles in Las Baulas National Park, one of the last nesting beaches for critically endangered leatherback left in the world.

The scientists are concerned that the proposal will downgrade the national park to a wildlife refuge. Losing national park status will allow the building of beach houses hotels and other structures along the sensitive nesting beach. A vote on the proposal has not yet taken place.

Costa Rica's reputation for protecting leatherback turtles, preserving wildlife and planning for climate change would experience a major setback if the law were to be enacted.

The nesting beaches in Las Baulas National Park are critical to the survival of the leatherback sea turtle. Their populations have crashed by at least 95 percent in the past two decades and are not recovering. ■



The South Pacific Gyre is a clockwise-swirling vortex of ocean currents located in the South Pacific Ocean

Why leatherback turtles linger in the South Pacific Gyre

New data from a five-year project of tagging and tracking leatherback sea turtles are providing information into their behavior, explaining why they congregate in one of the most nutrient-poor regions in the oceans, the South Pacific Gyre and also helps predict their movements in the ocean.

This new information may offer a way to keep the turtles out of harm's way and give their population a chance to rebound.

Because only limited information is available concerning the diversity, abundance and distribution of the leatherback's favorite prey—jellyfish—within the South Pacific Gyre, no one knew whether the turtles had food there or not.

Data that came back from the tagged turtles suggests that there may be plenty of jellyfish there to feast upon.

Scientists saw a distinct reduction of swimming speed as the turtles approached the gyre, they made more turns, diving more frequently and diving deeper, all suggesting feeding behavior.

Another piece of evidence was the timing of the dives. Jellyfish engage in daily vertical migrations, moving to shallower depths at night and returning to deeper depths during the day. The leatherback's dives mirrored those movements. The nighttime dives averaged 38 meters while daytime dives averaged 65 meters.

The deepest reported dive in this study was to a depth of more than 900 meters, for approximately 84 minutes, the longest dive on record.

One of the biggest hazards leatherbacks face is longline fishing. The problem for the turtles is that the areas attractive to commercial fisheries are also attractive to leatherbacks and other non-targeted species know as bycatch.

Hopefully, the data will help scientists pinpoint areas where fishing activity is most likely to coincide with turtle activity and determine what mitigation measures would be most effective.

Temporary closure of certain areas: breeding zones, migration routes and foraging habitats may be one possible measure. Modification of fishing techniques, such as deploying hooks at depths that are least likely to be occupied by turtles is another suggestion.

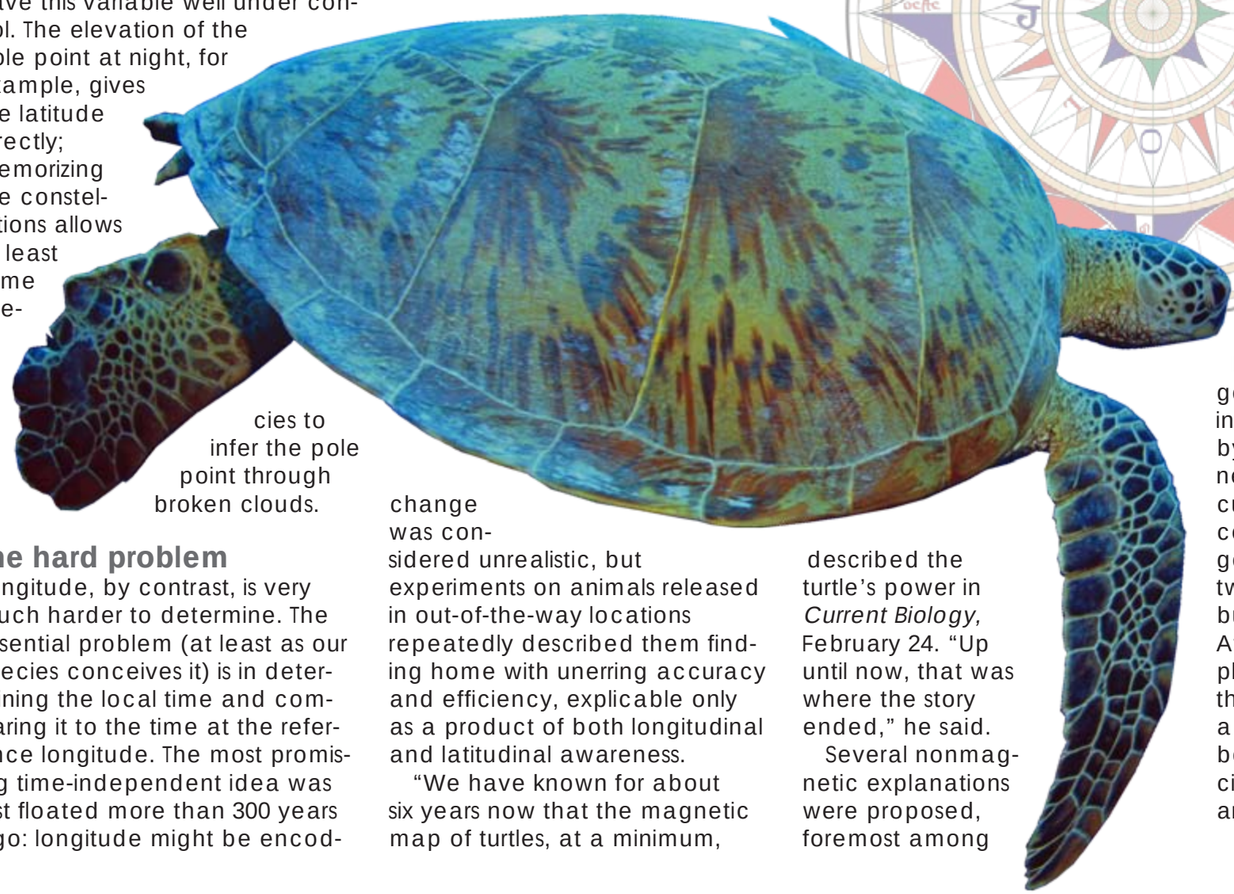
Another piece of data that has confounded scientists, in this study, involves some synchronized swimming. When the turtles hit about 35 to 37 degrees latitude south of the equator, the turtles stop swimming south and fan out along a belt east to west hundreds of miles apart. Then, in concert, responding to some unknown cue, they would swing northward, all at about the same time.

The scientists hope that these findings will further humanities efforts to develop workable solutions for reducing our impact and insure the survival of this unique, enigmatic and critically endangered leatherback turtle. ■

Sea turtles' magnetic sense

Migratory sea turtles are capable of sensing longitude, using almost imperceptible gradients in Earth's magnetic field.

A variety of animals regularly return to relatively precise locations after migration or displacement, homing pigeons being perhaps the best known example. This behavior seems to imply a *map sense* from which the creatures read either absolute or relative location from at least two coordinates. Direction is one thing but how about position? Latitude is fairly simple to judge, and there is good evidence that animals have this variable well under control. The elevation of the pole point at night, for example, gives the latitude directly; memorizing the constellations allows at least some species to infer the pole point through broken clouds.

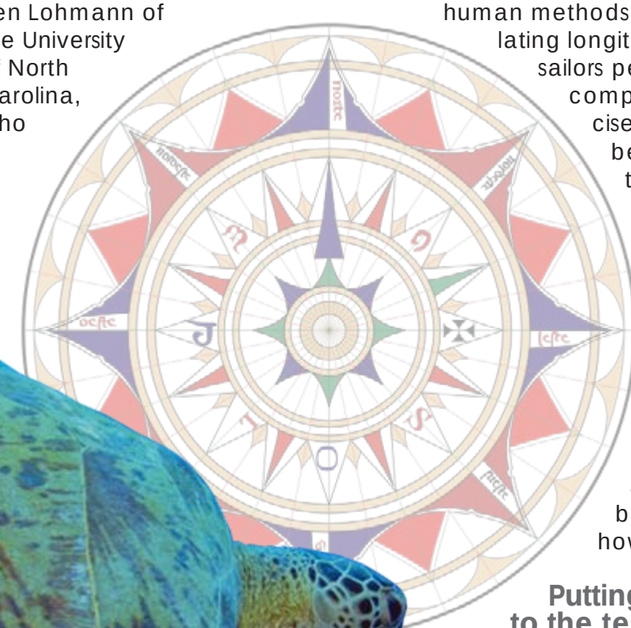


The hard problem

Longitude, by contrast, is very much harder to determine. The essential problem (at least as our species conceives it) is in determining the local time and comparing it to the time at the reference longitude. The most promising time-independent idea was first floated more than 300 years ago: longitude might be encoded in systematic variations in the Earth's magnetic field. Those differences, however, are far greater by latitude than by longitude. Travel north or south from Earth's magnetic poles, and their pull weakens noticeably. Travel straight east or west, and the pull doesn't change. Instead, the pull's angle changes, and only to an infinitesimally slight degree. That turtles and other migratory animals could detect such a small change was considered unrealistic, but experiments on animals released in out-of-the-way locations repeatedly described them finding home with unerring accuracy and efficiency, explicable only as a product of both longitudinal and latitudinal awareness.

"We have known for about six years now that the magnetic map of turtles, at a minimum, allows turtles to detect latitude magnetically," said biologist Ken Lohmann of the University of North Carolina, who described the turtle's power in *Current Biology*, February 24. "Up until now, that was where the story ended," he said.

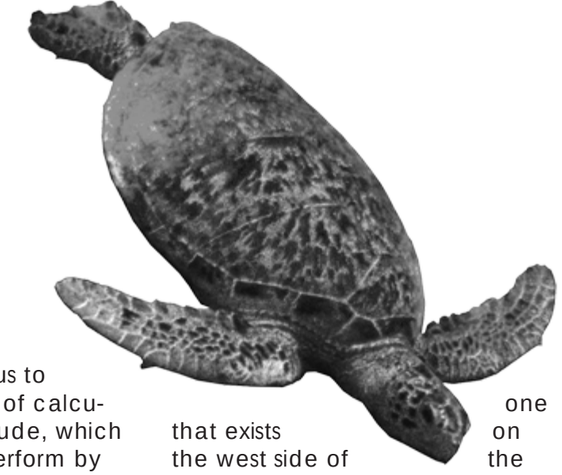
Several nonmagnetic explanations were proposed, foremost among them, a "dual clock" mechanism analogous to human methods of calculating longitude, which sailors perform by comparing precise differences between the time locally and at an arbitrary longitudinal line, such as the Greenwich Meridian. No such mechanism has been found, however.



Putting it to the test

Researchers led by Lohmann, placed hatchling loggerhead sea turtles from Florida inside pools of water surrounded by computer-controlled magnetic coil systems. By varying the currents, Lohmann and Putnam could precisely reproduce the geomagnetic characteristics of two points at identical latitude, but on opposite sides of the Atlantic. Into each pool they placed the hatchlings, which in the wild would instinctively follow a migratory path from their home beach and into the currents that circle the Sargasso Sea and loop around the Atlantic.

Turtles exposed to a field like one that exists on the west side of the Atlantic near Puerto Rico swam approximately northeast. Those exposed to a field like one that exists on the east side of the Atlantic near the Cape Verde Islands swam approximately southwest. ■



SOURCE: PUTMAN ET AL., LONGITUDE PERCEPTION AND BICOORDINATE MAGNETIC MAPS IN SEA TURTLES, CURRENT BIOLOGY (2011), DOI:10.1016/J.CUB.2011.01.057

The results demonstrate for the first time that longitude can be encoded into the magnetic positioning system of a migratory animal. Because turtles also assess north-south position magnetically, the findings imply that loggerheads have a navigational system that exploits the Earth's magnetic field as a kind of bicoordinate magnetic map from which both longitudinal and latitudinal information can be extracted.