Canary Island's Lanzarote

Text and photos by Charles Stirling

A small, warm, sub-tropical Atlantic Ocean island with enough tourist visitors to make access easy and facilities plentiful, diving not mainstream but both good and also dependable—this is Lanzarote.

It is the most easterly, most northerly and fourth largest island of the volcanic chain of the seven main Canary Islands, which are part of Spain but located just off the African coast. Lazarote is only 37 miles (60km) long and 12 miles (20km) wide, with 130 miles (213km) of shoreline. The whole island has Unesco World Biosphere Reserve status and an ecological style of tourism without mass high rise developments.

Lanzarote attracts something around a million visitors a year with its good weather, low rainfall, clean streets, towns and beaches, lack of hassle, low crime and generally informal, friendly atmosphere. About 15,000 of those visitors go diving. In the past, it had a reputation as a 'get-drunk-and-party' destination, particularly for British youth, but that reputation has long ago faded with a much more diverse range of visitors now.

The divers range in experience from those doing their first ever dives through to the very experienced. Many divers, having found Lanzarote, treat it as an alternative to the more heavily promoted locations and return time after time.

In some respects, the island offers "a holiday with diving" while some of the many repeat dive visitors seem to think of it as a diving destination first with a smidgen of holiday thrown in. The good mild weather is attractive not just for holidays, which means diving is year round with few days lost due to inclement weather—it's dependable.

The island is volcanic in origin, as evidenced by underwater escarpments of lava walls, tunnels, caverns and sink holes along with the sandy areas. Marine life is a mixture of tropical and temperate, with reefs volcanic not coral. It's said there are about 500 species of fish and 1,200 of invertebrates here. Water temperatures run from 19ºC in winter to 23ºC in late summer. With little rainfall, no rivers and unpolluted waters, visibility

varies from 15m to 30m.

Lanzarote is one of the seven main islands in the Canaries archipelago, which forms a chain about 500km long off the African coast. All of the volcanic islands started to form some 20 million years ago, with the movement of the African tectonic plate and the submergence of the Atlantic plate. Lanzarote itself started forming about 11 million years ago in three phases with the oldest regions in the north and south of the island followed by later infill between these regions in the second phase four to seven million years ago.

The third phase and latest volcanic activity was in the 17th and 18th centuries and can now by seen in the Timanfaya region. These near-continuous volcanic eruptions in 1730-1736 were devastating, destroying the best farmland along with some 26 villages and hamlets covering a quarter of the island in lava. Smaller eruptions lasting for three months in 1824 produced three more volcanic cones. The results of these eruptions are well preserved, with little erosion due to the limited rainfall. The exact geological mechanisms are not fully understood. The common theory of a mantle plume, or hot spot, in the mantle giving rise to the volcanoes is contested by some.

The shelf around the island drops away to very deep water a mile or more offshore, which may have limited the numbers of naturally occurring wrecks (they end up too deep) and means most diving is near shore. There are a few

CLOCKWISE FROM TOP LEFT: Cuttlefish (*Sepia officinalis*) swimming; Playa del Reducto Beach and Arrecife skyline; Tube-dwelling anemone on sandy seabed

PREVIOUS PAGE: Town of El Golfo

Sea hare, *Aplisia dactylomela*, grazing on marine algae (above); Divers with school of grunts at Playa Chica (left)

moved on to look at its exterior. I would happily have spent all my time on the wreck, but my buddy wanted to check out the adjacent volcanic landscape, so we continued on a slow swim examining nooks and crannies, fish and invertebrates before surfacing after an hour's dive for the boat pick-up. It was a very enjoyable dive. Several divers back on the boat gushed with excitement and considering it one of their best dives. Our boatload of

Cuttlefish

"natural" wrecks and more wrecks that have been purposely sunk, but it is as much for the landscape and marine life that divers keep returning to the island. For the technical diver, deeper valleys and lava tubes and channels with faster drifts exist.

The islands highest point, 670m, isn't enough to induce rain producing cloud formations from sea winds, just clouds. This has limited the vegetation with more species diversity on the older, more weathered regions. Relatively few native land animals are found, predominately birds (40 nesting species); six mammal species are known and only three species of reptiles. The underwater world is much richer.

Wreck diving

After the briefing, a short boat ride of about five minutes on calm seas, a quick final buddy check and a giant stride into blue waters, a few moments passed on the surface before a gentle free descent commenced. Within a few metres of depth, the outlines of a wreck started to appear.

The wreck was listing on its side but looked like a ship. Its bow, stern, decking and holds were intact with enough ravages from the sea to feel real.

We were diving one of the "Harbour Wrecks" of the Los Erizos Wreck Park. It was an easy dive. I swam inside its open structure, exploring it without sediment exploding up to block visibility, and

Divers and angelshark buried in sand

nine divers included a few with dive numbers approaching or well over the 1,000 figure in number, and these divers rated it as a great dive.

Another wreck park and a marine conservation zone is just west of Puerto del Carmen. Off Punta Tinosa are the "New Wrecks". Three fishing boats were prepared and sunk in 2004 in shallow water, but with more currents here and the ravages of an occasional winter storm, they have moved from their initial resting places to slightly deeper water, nothing above 17m. One is only part of a shell now; the other two are more intact. It is still possible to dive all three in a single dive, but doing two or just one is probably a more interesting option. Going slow, you see more.

I dived two of these, and again, penetration was safe and easy. The exteriors were interesting with lots of fish. None of these wrecks pretend to be world class; they are simple good holiday dives.

Dive centres

There are many dive centres scattered mainly along the east cost of Lanzarote mostly located in resort areas—Playa Blanca, Arrieta, Mala, etc—but with the overwhelming majority in Puerto del Carmen. The Atlantic-facing west coast has diving, although limited, due to prevailing winds and is more the preserve of the surfer or kitesurfer.

In Puerto del Carmen most diving starts at the small protected beach of Playa Chica. A perfect location inside a natural protected horseshoe-shaped cove with stone outcrops extending on both sides providing shelter to the gently sloping sandy beach—ideal for divers, snorkelling or swimming with the family. The local dive centres from around the island visit this site.

The reefs formed by these outcrops and the area just beyond offer most of the marine life that can also be seen in other parts of the island. Depending on the season, angel sharks, octopus, cuttlefish, sea horses, yellow striped nudibranchs, arrow crabs, scorpionfish, wrasse, flatfish, bream and more can be seen.

The underwater volcanic arch of the Blue Hole, The Cathedral, Red Coral site, volcanic walls, small caverns are all right here at Playa Chica. Its protected beach entry

THIS PAGE: Scuba divers on and inside one of the "New Wrecks" off Puerto del Carmen

LEFT TO RIGHT: Diver on one of the "New Wrecks"; Easy entry on one of the "New Wrecks"; Bow of one of the "New Wrecks"

makes it ideal for training, and the marine life makes it interesting for underwater photographers.

Within the cove, the bottom is coarse salt and pepper sand, which settles relatively quickly when kicked up by someone else's fins—never your own, of course—with many flounder, lizardfish and garden eels present, and at night, tube anemones, which hide by day buried below the surface.

Depths of up to 10m are found inside the cove, which is protected by walls, lava boulders and overhangs in steps to 30 or more meters. It was the shallower rocky outcrops and sand right at the bottom of these steps that seemed to hold the greatest number of creatures.

Some of the divers reported seeing the rather shy angel sharks on nearly every dive and sea horses at specific locations. Garden eels seemed to be at the right of the cove or around its outer corner, and schools of jacks were found near shore. The site is the ideal place to just go exploring.

Most of the dive centres in Puerto del Carmen, and those outside town, seem to offer both shore and boat dives with boats varying from fast RIBs (Rigid-hulled Inflatable Boats, or Zodiacs) to small hard boats. Some have only guided group dives while others have both buddy and guided trips. Some have fixed times for dives, others are more flexible and, at least for shore dives, you can chose your own times.

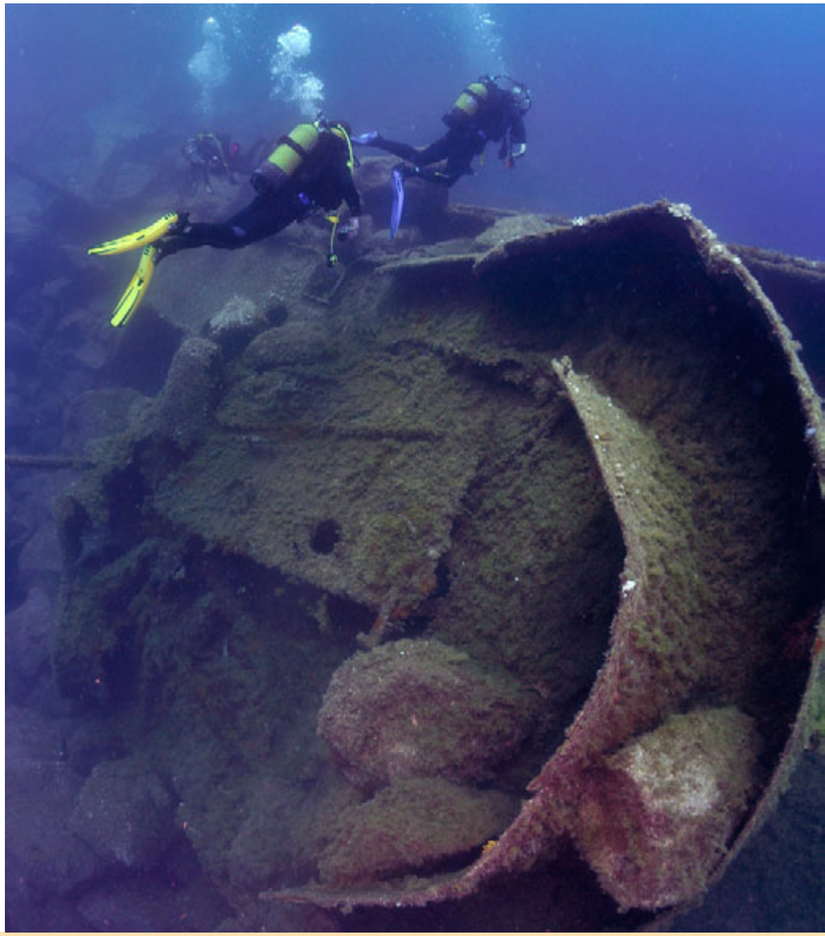
Many training agencies are represented including PADI, BSAC, CMAS, IANTD, BARAKUDA and more, so with the right choice, you can add qualifications that suit. They all offer holiday style dives with a single tank and air; many have nitrox; and a few offer technical diving, mix gas, rebreather dives and training.

Reviews and comments suggest that most operators are appreciated for what they offer, have rental equipment in good condition and are well run. So, pick your operator with your intentions in mind.

Spanish diving law is different from many destinations and changed substantially a few years ago. Now, one thing to watch for is that the operator you dive with is legally registered as a dive operator. Not all are, as it's expensive, and operators did not need to register in the past. It could void your insurance coverage if you do not use a registered centre. All the registered operations are listed at: www.turismolanzarote.com/en/buceo.jsp.

Do bring both your medical certificate and dive insurance card with you, as it's required by law in Spain. However, insurance can be arranged locally, if needed.

I dived with Safari Diving,



which is owned and operated by the British couple, Steve and Wendy Hicks, who offer both guided shore and boat dives and the possibility for simple unguided buddy diving—if you are a solo diver, they find you a buddy—as well as training. Using them as an example, one can note the questions to ask of any potential centre one might chose.

Safari Diving is exceptionally well placed right on Playa Chica beach where all their shore diving is conducted, with the boat diving jetty almost adjacent. Due to the location, the centre is relatively small, without the dry changing areas, locker rooms, hot showers, dry camera set-up areas, etc., which larger centres can offer, but it has wet storage for your kit, hire kits in good condition, rinse tanks and hose to wash down, and the water's edge is right there.

Safari Diving is a very popular centre with many visitors, so hired kit is not kept just for you but turned in and taken out for each day/dive. They do not bus you around to other locations, as there is no need since it is already at the prime location, so you save time but don't see other locations. Their hard boat is comfortable but goes to relatively local sites only. They can offer nitrox, but it's not routine, and they don't do technical dives.

They use a nearby hotel with a pool when needed for teaching, but also go though some teaching more informally over coffee in a café.

The guides know the area well and point out the unusual, so they are worth using. I totally missed the small wreck just beyond the bay entrance by not using a guide. Instead, I joined a buddy group, and we turned to the right instead of the left at the wrong point. On another occasion, I missed sea

CLOCKWISE: Arrow crab; Bastard grunt fish in shallows at Playa Chica; Yellow striped nudibranch, *Hypselodoris picta*, also known as *H. edenticulata*

horses for a similar reason.

Night dives are a regular item in the Playa Chica cove, staying relatively shallow at eight to 12 metres around the stone outcrops and off the boat jetty, which seems to offer the best observations. Again, I went with a buddy pair who went deeper than needed, so I missed some of what could have been seen.

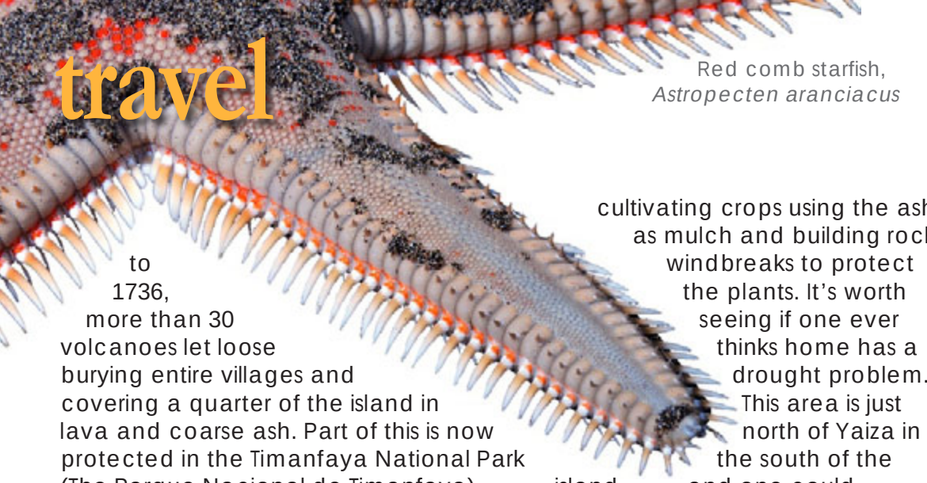
Most dive centres anywhere on the island offer Playa Chica with the adjacent attractions, or just the cove itself, and use the jetty for the popular wreck dives. They drive to the parking lot near the beach where divers change in the vans and carry their kits the short distance to the entry point at either the beach or the jetty. Other beach entry points along the Puerto del Carmen seafront, or around the island, also have good diving—so, just take your pick.

Holiday destination

Year round sun, minimal rainfall and many good "blue flag" beaches are enough to attract many holiday makers. If you want a bit more than lying on a beach, the natural environment plus a few of man's interventions are well worth a visit. Car rental and fuel are reasonably priced. The roads are good and not crowded outside of major towns, so driving is the most productive way to tour, but lots of coach tours exist as well.

During the volcanic eruptions of 1730

CLOCKWISE FROM TOP LEFT: Golden barrel cactus at Cactus Garden (Jardín de Cactus); Viewing cliffs, sea and black volcanic beach of El Golfo; Playa Chica; Camel ride at Parque National de Timanfaya; Tourists watching volcanic heat set fire to dry lichen in Timanfaya park



Red comb starfish, *Astropecten aranciacus*

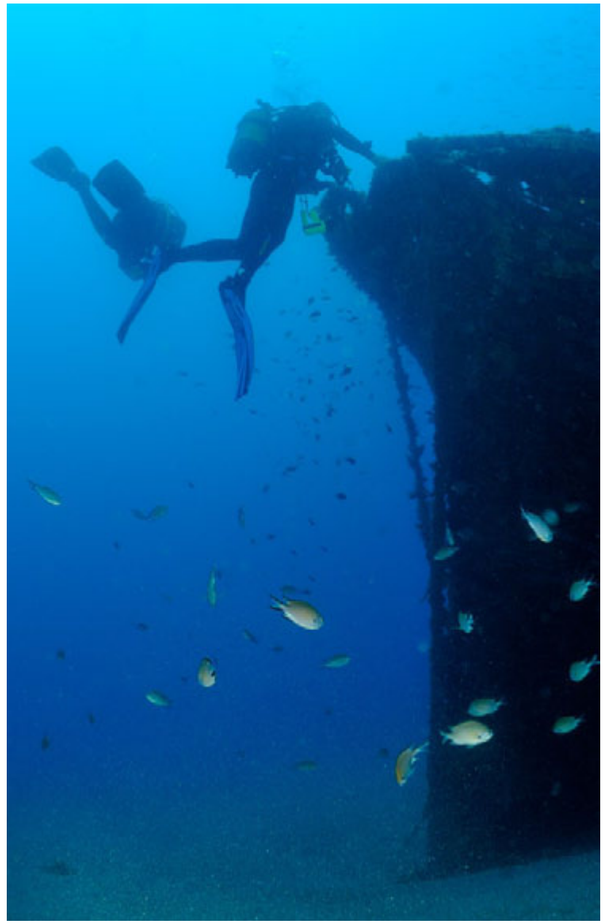
to 1736, more than 30 volcanoes let loose burying entire villages and covering a quarter of the island in lava and coarse ash. Part of this is now protected in the Timanfaya National Park (The Parque Nacional de Timanfaya), which is one of the visitor must-see locations. Parts of it, the badlands, really are still barren of nearly any plant or animal life. Outside the park, farmers are cultivating crops using the ash as mulch and building rock windbreaks to protect the plants. It's worth seeing if one ever thinks home has a drought problem. This area is just north of Yaiza in the south of the island, and one could include El Golfo with its volcanic lake and the flats producing sea salt in one slightly hurried outing.

To the north of the island, César Manrique's Cactus Garden (Jardin de Cactus) built in a volcano crater is much more interesting for its design than might be imagined and worth a visit. Surrounding this garden are plantations of prickly pear, host to the cochineal beetle. Not far away are the Los Jameos del Agua, the lava tube made into an underground entertainment venue with a lake that is home to blind albino crabs. The Green's Cave (Cueva de los Verdes) is also part of the lava tube. On the very northern most point of the garden, are views over to Isla Graciosa and Chinijo Archipelago with a park at Mirador del Río, which I missed, as it closes at 6:00pm—the all too often normal closing time for attractions. Six o'clock is too early if one is trying to fit in a lot of siteseeing after a morning dive. The island simply has too much to see and do on a short visit—yet, another reason to revisit.

Being a holiday destination has its advantages with bars, restaurants and cafes plentiful and nearly any nationality of cuisine on offer. For really local food, try a dining spot outside the main tourist areas. Shopping in both the small independent shops or larger malls plus various markets should be able to fill most desires, but avoid the majority of independent camera and electrical stores, as they have a reputation of carrying too many fraudulent deals. The streets are not full of hucksters, so you miss the fun of constantly saying you're not interested. Accommodation is plentiful and varied—maybe it's best to let the chosen dive centre organize it, but deals can be found independently. There are good museums, gallerias, festivals and things to do with the family.

The diving was good, relaxed holiday fare with lots of marine life to see. It would suit families, anyone wanting to learn to dive, anyone just wanting easy diving on a holiday as well as the underwater photographer interested in sub-tropical marine life. The possibility of deeper or technical diving including rebreathers is a possibility. ■

Biosfera shopping mall at night in "Old Town" Puerto del Carmen
Bleak landscape of Parque National de Timanfaya (center)



Bow of one the "New Wrecks" (above); Seaside board walk in "Old Town" Puerto del Carmen (top right)

fact file

Canary Islands, Spain

SOURCE: CIA.GOV WORLD FACTBOOK

NASA

History The earliest settlers were African about 1000 to 500BC probably from central Algeria. Some of the place names such as Yaiza, Teguise, Tinajo, and Timanfaya stem from those early settlers. Those settlers found the island with more substantial vegetation, and it is thought that the introduction of pastoral animals and cereal farming by early settlers destroyed much of this. These early settlers knew nothing of metal, of sea navigation, lived in caves or semi-buried huts when Europeans first arrived in 1312. By the latter half of the 14th century, marauding pirates had reduced the original population down to near 300 individuals. Norman privateers conquered the island protecting it from the pirates and slavers in 1402. Over the next 70 years, various battles, power struggles and issue of sovereignty finally ended with the treaty of Alcacovas granting the islands to Spain and governed by nobility under a feudal system.

To repopulate the island under Spanish feudalism, slaves were brought in from Africa, but Moorish and other pirate slavers also continued to raid the island. It was these slaves brought in who dug the hillside terraces with the help of camels introduced at the same time. This was a dangerous and difficult place to live in those times, and many fled to other islands or to South America. Feudalism and numerous conflicts continued until 1812 when the Canaries became a province of Spain.

It is now a Spanish autonomous community as Spain has decentralized after Franco's dictatorship ended, and it is an "outermost region of the European Union". In 1852, the law of free ports granted the islands immunity from customs and excise duties—which sort of still applies as duty is low so prices are low—but limits on what can be brought back into EU countries applies, as they are outside the European Union Value Added Tax Area.

Principally due to the growth in tourism and EU membership, but also the high birth rate, the islands population has grown dramatically in recent times, ten times the growth in Spain. With 65,503 in 1988 to 139,506 or more in 2008. It's a young population with over half between the ages of 25 and 39. Over a quarter are non-Spanish in origin.

Climate Warm and dry, pleasant year round with average temperature of 24°C and 3,000 hours of annual sunshine. Fuerteventura and Lanzarote have the sunniest weather of the Canaries, rainfall 5.9 inches (150 mm) annually. Moderate north-easterly trade winds come April through to October; at other times, winds can come from any direction. For diving, by moving around the island, a lee side can always be found. Water temperatures can go down to 18°C in winter, up to 23°C late summer, cooler at depth.

Environmental Issues A UNESCO World Biosphere Reserve, the island endeavours to have environmental friendly development such as no tall buildings, no billboard advertising, and houses must be painted white with woodwork either of two shades of green. Generally, the community is environmentally aware (hence little litter—it's clean). There is limited rainfall, so water is desalinated. It doesn't taste great, and drinking water is bottled. Most energy production does come from oil, but wind farms have been developed. Commercial fishing was a major industry, but is now much reduced probably helping the marine life.

Economy Up to the 1980's, agriculture and fishing were the major economic activities. With its good climate, tourism was inevitable, and large amounts of European investment money poured in during the 1970's and 1980's buying up prime coastal land to eventually develop into the resort centres of Puerto del Carmen, Costa Teguise and Playa Blanca. Infrastructure was greatly improved, various natural attractions were opened to visitors. The first desalination plant was inaugurated, and the airport was expanded with the first international flights in 1970. In 1974, the Island had 2,000 tourist beds on offer. By 2001, it was 50,000 rooms and 72,000 by 2006. The island has become very dependent on tourism, predominantly from Britain with Germany next in numbers. Scandinavia and the Benelux countries and even the USA add to this. The current recession saw visitor numbers fall in 2008-9 with some shifts in demographics but greatly recovering by 2011.

Agriculture seems an improbable activity in this dry environment, but onions and ,to a lesser extent, potatoes and a range of green vegetables are exported. Ploughing used to be done with camels. Now, it's cheaper to buy a tractor even though this degrades the volcanic chippings called picon or lapilli, which helps to hold moisture in the soil. The onions, which have a delicious sweet flavour, mainly go to Spain but also do reach much of the rest of Europe. Another product is the cochineal beetle, used to make a dye extracted from the crushed beetles raised on cactus leaves. The cochineal dye gives the red to the drink Campari and is also used in lipstick, sweets and toothpaste.

It's interesting to see the physical remains of former economic activities. Salt production by evaporating sea water in large holding ponds used to be a major export industry, which has since collapsed. The salt was particularly used in preserving fish on the fishing boats around the world just after catch before refrigeration/freezing became common. All around the island are now deserted salt pans. These pans once employed hundreds of workers. Now, the salt pan at Janubio has become a tourist attraction and produces more than 15,000 tons per year but this is less than half of its production 40 years ago.

Currency Euro

Time zone GMT, the same as London

Electrical 220 volt, uses standard European round pin sockets

Language Spanish (similar to South American dialect). Many other languages, particularly in tourist areas with English common.

Hyperbaric Chambers
Arrecife Recompression Chamber with five spaces. Hospital Insular Arrecife; Tel.: 0034 928 810 000; 928 810 500

Websites
Tourist board
www.canarias.es
Tourist board
www.turismolanzarote.com/en

Sea salt concentrating pans, Salinas de Janabio

PETER SYMES

Think fast - like a squid!

Text by Naiha Balal Khiljee

Squids, octopus and cuttlefish (who all belong to the phylum of molluscs) are among the most intelligent animals in the sea, and definitely the most intelligent marine invertebrates. We should in fact ask ourselves if the human mind is capable of thinking as fast as these creatures do.

We applaud our nervous system, but interestingly, squids have unusually large neurons, which makes them a lot faster than us. These gigantic neurons are much easier to study than the normal minute neurons found in animals and humans. This has assisted scientists in gaining further basic knowledge and understanding about the functioning of the rather complex nervous systems in animals as well as humans.

Neurons consist of a somatic cell body containing the nucleus with DNA, and several cell organelles in the cytoplasma surrounding the nucleus (see Figure 1). The somatic part has many dendritic ends who receive signals from many other neurons. A long axon runs from the somatic part of the neuron, where the electric nerve signal travels with an astonishing speed of about 360km per hour. This electrical signal finalizes its axonal journey into many synaptic ends, where it manages to trigger synaptic secretions of chemicals (neurotransmitters: e.g. certain hormones like oxytonin) which travel into the intercellular space and reaches specific receptors attached to the surface of adjacent neurons.

In squids, axons carry information to the muscles of a squid's mantle when it is startled, causing them to contract and jet to safety. It is the axonal part of the neuron in squids which is rather large (considering that typical axons in humans are only a few micrometers in diameter)—up to 1mm in diameter. The squid giant axon is several hundred times larger than the typical human axon. Such neurons are obviously much easier to see in microscopes than the typical smaller neurons. This helps researchers to comprehend how the mind functions.

The mind

The mind is an intriguing part of the body. It is like an abstract work of art, which we have not come to fully comprehend yet. The nervous system is complex and consists of two departments: The CNS—which is the central nervous system—and the PNS, which is the peripheral nervous system. The CNS consists of the brain and spinal cord, while the PNS consists of two kinds of nervous cells: sensory nervous cells and motor nervous cells. The motor nervous cells carry electrical impulses sent from the CNS to organs, muscles and glands.

The motor nervous system is divided into the autonomic nervous system and the somatic nervous system. The autonomic nervous system controls involuntary muscles (smooth and cardiac muscles), which explains why our heart beats even though we are not conscious about it. The autonomic nervous system can be divided into two additional nervous systems, which illustrates the complexity of the nervous system.

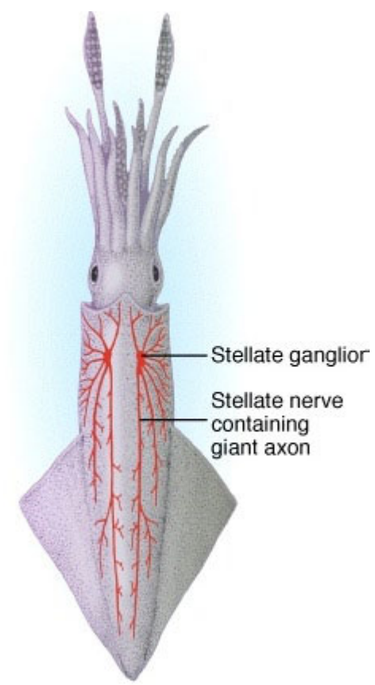


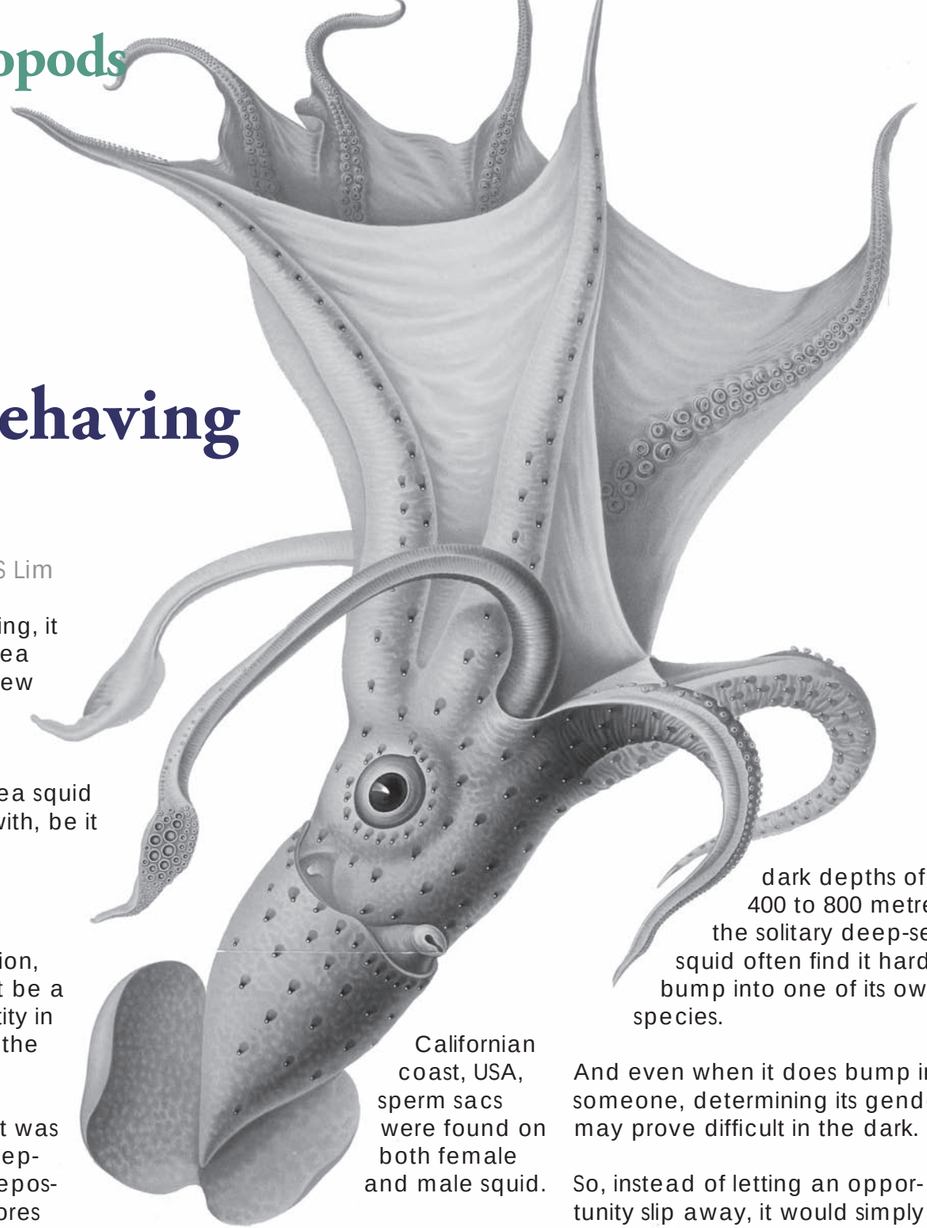
Figure 1

The somatic nervous system controls skeletal muscles as well as external sensory organs such as the skin—this nervous system is unlike the autonomic nervous system "conscious" while we control it consciously (with the small exception of reflex reactions).

Cells of the sensory nervous system send information to the CNS from internal organs or from external stimuli. So basically, the CNS, which consists of loads of neurons, is the "masterkey" of the entire nervous system.

When looking closely at these neurons, it is inevitable that the most essential part of a neuron is the axons, because the axons carry the electrical impulses, which allow one part of the nervous system to communicate with another.

We have doctors and specialists examining these axons, and we are all very fascinated by our nervous system, but rarely is it acknowledged that squids actually have much bigger axons, which means that information runs far more rapidly through their nervous system, making their reactions much faster than those of human beings. So, the next time you are diving in the wondrous ocean—know that you will not be able to reach a squid! ■



CHUN & VALDIVIA, DIE CEPHALOPODEN, 1910 / WIKIPEDIA PUBLIC DOMAIN

Squid Behaving Badly

Text by Catherine GS Lim

When it comes to mating, it seems that the deep-sea squid isn't too picky. New research has shown that the 12-centimetre cephalopod would mate with any deep-sea squid it came into contact with, be it female—or male.

However, despite the potentially sensational nature of this observation, this behaviour may just be a case of mistaken identity in the blinding depths of the deep ocean.

Prior to this discovery, it was believed that male deep-sea squid mated by depositing their spermatophores (packages containing millions of sperm) onto the female's body. The sperm are then absorbed into her tissues. Evidence of the interaction would be in the form of the sperm sac left on the female's body.

A straightforward concept, except that when researchers reviewed video footage taken over 20 years in the Monterey Submarine Canyon, off the Californian coast, USA, sperm sacs were found on both female and male squid.

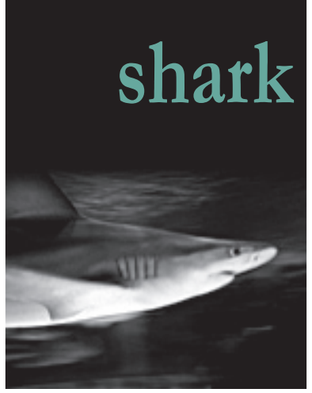
Writing about it in the Royal Society journal, *Biology Letters*, lead author Henk-Jan Hoving, from the Monterey Bay Aquarium Research Institute, explained that as "the locations of sperm packages were similar in both sexes, we concluded that males mate with males and females".

It seems that this behaviour is rooted in practicality. Living at dark depths of 400 to 800 metres, the solitary deep-sea squid often find it hard to bump into one of its own species.

And even when it does bump into someone, determining its gender may prove difficult in the dark.

So, instead of letting an opportunity slip away, it would simply initiate the mating process, and hope that its partner was indeed a prospective female.

Explaining this behaviour as a reproductive strategy, Hoving said, "Squid, including deep-sea species, only reproduce once and they have to find mates in time in an environment where encounters between individuals of the same species are few and far between." ■



Tiger shark going after chum

Do's & Don't's Responsible Shark Diving

Text and photos by Andy Murch

Maybe the concept of 'responsible shark diving' sounds a little oxymoronic, but there are many things that you can do to protect yourself and the sharks during your interaction.

First and foremost, I can't stress enough the need to gain as much knowledge as possible about the animals and their environment. To go into the water without at least a basic idea of how the sharks are likely to react is foolhardy to say the least. If you are participating in an organized "shark diving experience", you may feel that the operator's knowledge is sufficient and that you can sit back and watch the show.

It's important to remember that every shark interaction is different. Just because countless people have watched the parade of sharks at a particular site passively swim by does not mean that you will have the same experience.

Following are some guidelines for minimising the dangers associated with interacting in the wild with sharks and rays. Whilst the advice hopefully is useful, it should be regarded as a vague guideline only.

Your experiences will differ greatly from mine, and the sharks and rays you encounter may react in a completely different way. As such, I take no responsibility for the outcome of any encounters that you may have or for the validity of any information stated below.

Get educated!

Ask local divers and fishers what species of sharks you are likely to see. Knowing if an area is frequented by nurse sharks or tigers may make a big difference to how alert you feel you need to be on the dive. Learn the stats on different sharks. The shark attack file is a good place to start to find out which sharks have been responsible for attacks in the past.

Find out how the sharks in the area normally respond to divers. Most free swimming sharks will disappear the minute they see a noisy, bubble blowing diver heading their way, but some sharks are more curious. Occasionally sharks like to wander up to divers and give them a closer look. Being buzzed or even brushed by a shark does not necessarily mean that you are about to become lunch.

Are the sharks in the area regularly fed by divers? It can be disconcerting to drop down onto an area of reef where shark feeding normally take place and immediately find yourself surrounded by expectant sharks.

Ask if bait will be used or if any member of the dive group is planning to spear fish. Aggressive behaviour is significantly increased in the presence of struggling fish or when blood and other juices are in the water.

Find out if the sharks in the area are territorial. Sharks may respond to divers as threats to territory and defensively attack.

Dress appropriately

There are differing points of view on the subject of what colors are most likely to attract a shark's attention. Every conceivable color combination has been tried at one time or another in an effort

THIS PAGE: Lemon sharks and divers interact

to deter sharks from attacking. Even broad black and white stripes have been tried in an effort to replicate the appearance of a banded sea snake, which is an animal avoided by the majority of shark species.

As a rule of thumb, tropical sharks are mainly fish eaters and as such are attracted to bright and shiny objects. Therefore, it would seem logical that a neon yellow wetsuit would attract the attention of sharks looking for a meal. In shark diving circles, neon yellow has actually been given the nickname of "yum yum yellow". Other bright colours may also have the same effect, so if you're planning on regularly putting yourself in the presence of tropical fish eating sharks, it may be a good idea to tone down your fashion statement and choose a more muted color or black. Bear in mind that thousands of divers swim with tropical sharks every day wearing all manner of clothing from bikinis to camouflaged full body dive skins, and the incidence of attack is extremely low.

If you have bright metal objects such as reels or dive knifes attached to the outside of your BC, try to stash them out of sight in a pocket or replace them with darker coloured alternatives. Even a shark diver's first stage can look good to a hungry reef shark, as I found out in the Bahamas.

Wear dark gloves. From a shark's point of view, there's nothing more tempting than seeing two small lily white "fish" flapping around in front of them. If you don't have any gloves, try to keep your arms folded across your chest. Using your hands to swim with is asking for trouble. Full suits are better than shorty wetsuits. This is the same principle as exposing your hands. Try not to expose distinct areas of skin that a shark can focus on or mistake for a fish. Even if you have dark skin, it's a good idea to cover up. A lot of injury can occur from the brush of a shark's sandpaper-like skin.

Some sharks in temperate seas feed on seals and sea lions. The chances are that you will never see a white shark underwater. I have a friend that lives on Catalina Island who has seen a couple, but he considers himself very lucky indeed to have done so. Many divers prefer the tough guy black commando look, and this is reflected by the choices of suits that manufacturers offer. Personally, I think that mimicking a seal doesn't seem like such a good idea.

Keep in mind again that there are plenty of fish eaters in temperate seas as well, including smaller white sharks, so flashing bright colours and shiny objects may also be unwise. I own a nice neutral blue dry suit that hopefully differentiates me from both pinnipeds and schools of fish.

Lastly, fins tend to be prime targets for bites. This is more likely to do with their movements and exposed position rather than colour but white, silver, or bright fins should probably be avoided.

Avoid erratic movements

Sharks are able to pick up on disturbances in their environment. They are looking for the tell-tale signature of a wounded fish or other animal. Once they find one, they carry out their civic duty and remove the wounded creature from the gene pool.

Thrashing around in the water may mimic the vibrations sent out by a wounded fish and/or may replicate the movements of a feeding shark. Either way, slow, rhythmic fin strokes are more likely to be ignored. Good buoyancy is also important. Crashing into the reef or struggling to stay down could generate interest or may work in reverse and drive away sharks, which you were hoping would stay around.

Look but don't touch

The best way to get bitten by a shark is to grab it by the tail or any other part of its anatomy. You wouldn't think this needs putting into print, but a surprising amount of shark bites are the direct result of divers trying to manhandle otherwise docile creatures.

Joe shark diver sees a nurse shark's tail protruding from under the reef and thinks that if he gives it a little poke or tug, the nurse shark will shift into a position where Joe can get a better look at its head. He grabs the shark's tail, and before he has

Lemon shark

time to register exactly what has happened, he looks down to find a nurse shark jaw wrapped around his wrist.

Contrary to popular belief, nurse sharks do have rows of sharp little teeth, and once Joe is finally released (which sometimes doesn't happen until he is literally dragged out of the water) Joe gets to spend the rest of his holiday, at the very least, with a bandaged arm.

Don't be Joe Shark Diver. Sharks are extremely flexible and explosively fast.

Rays usually remain very docile if you approach them slowly until their personal space is encroached upon, and then they finally either bolt or slowly lift off the bottom and relocate a few meters away. The best way to get near them is to move in close to the sea bed. Rays feel more threatened when approached from above.

In rays, the two defence mechanisms that a diver needs to be aware of are: the stingray's tail barb and the electric ray's ability to shock.

Waders (often fishing) have been wounded and even killed where medical attention was not available, as the result of stingray barbs entering the abdomen or other vital organs. The barbs often carry toxins, which compound the medical problem and create immense pain. Luckily divers are rarely faced with stingrays using this defence mechanism, as it is only employed as a last resort when the animal is pinned down. Stingrays are more than happy to move away if they are too closely approached by a diver.

I am not aware of a single diver that has been stabbed whilst on a dive. This is not to say that you won't step on one with painful results whilst attempting a shore entry. If this occurs, wash the wound in fresh water and apply as much heat to the area as possible. This will help to break down the toxins and relieve some of the pain. Seek medical attention as soon as possible. Stingray barbs often break up upon entry, and the wound may need to be cut open and cleaned to avoid infection.

The electric organs of some rays are potentially dangerous, but again, in the majority of cases, the ray is far more likely to move away than to shock. However, torpedo rays are known to have a bad temper, and there have been a few cases of these animals chasing divers and repeatedly shocking them. Some torpedo rays have been shown to be able to emit in excess of 200 volts! Usually, if the animal is not harassed, it will leave divers alone.

Stay away from the chum

Sharks that come to a shark feed are not there to socialise. They want food, and if you're between them and dinner, you're in the wrong place at the wrong time. Keep your distance from any hanging bait that has been placed in the water, and if the current is moving a chum slick away from the area, make sure that you are positioned off to the side or up stream.

Having watched the shark's behaviour for some time, you may feel confident about moving in for better pictures or a better look. Remember that if the current is running and you are down stream, any sharks that are swimming up to the bait may think that those delicious odours are emanating from you. Now you're stuck in a position where a shark is coming toward you, and you are drifting into it. As it's very hard to swim against even a mild current, you probably now have to turn around to make headway against it to get back up stream, which puts you with your back to the approaching shark. A better course of action is to swim sideways until clear of the chum slick, at which point, you can kick up current without looking like a fleeing wounded animal.

Get underwater

Floating at the surface in the presence of sharks sends the wrong message. You want to descend as soon as you can for a few reasons:

Firstly, a body floating at the surface is high on the list of desirable objects for a shark to explore. In the ocean, dead things float. Oily chum tends to create a slick on the surface that you may be covering yourself in while you remain there.

Secondly, if your head is above water, you are effectively blind to the movements of any sharks underwater.

Thirdly, a positively buoyant diver's actions are far more limited. It takes time to become negative and descend out of trouble, and swimming at the surface in dive gear looks an awful lot like a thrashing animal.

Read the sharks

It's important to pay attention to the behaviour of the sharks participating in a shark feed. Although sharks become agitated as soon as they know food is available, they will usually continue to cruise around calmly waiting for the opportunity to strike at the bait. In a well-organized feed, access to the bait is often restricted to keep the sharks interested but not overexcited.

THIS PAGE: Photographer encounters oceanic whitetip shark (right) and silky sharks (left)

If too much bait ends up in the water, the sharks may become very aggressive. They may chase each other tearing at the food, and in their single-mindedness, any divers that get in the way stand a chance of getting hit. To understand the significance of being thumped by a shark underwater, it's necessary to look at the medium the sharks are moving through. If an adrenalin-filled dog were to hit you at 20 miles an hour, it would bowl you down. Now replay this scenario in a medium 800 times denser than air, and you don't get bowled over anymore because you're supported by the water. However, the object hitting you is still travelling at the same speed resulting in a tremendous impact. Even a leisurely swimming shark can hurt a diver, but sharks rarely collide with anything unless they are panicked. Pay attention to the dynamics of the feed.

Beyond a critical level of excitement, sharks may become too aggressive for divers to safely remain in the water, and it is difficult to judge when this point is approaching. If many sharks are in attendance and ploughing into the food, seemingly indifferent to anything else around them, they may become excited enough to bite randomly at whatever is close to them. Often the surprising thing is how fast the pace can change.

Some sharks regardless of food stimulus may become aggressive towards divers. Any type of posturing is a bad sign. The threat display of grey reef sharks has been well documented. This consists of exaggerated swimming motions, back arching, raising of the snout, lowering of the pectoral fins and head swinging. Not all sharks will give you these visual cues, but you may see some small modified behaviour. The message is a clear one: BACK OFF!

Hopefully the diver will notice the posturing and move away before the shark takes its next defensive strategy, which is often to attack. The most common scenario in which this situation occurs is when a shark is cornered. Try to always give sharks an escape route.

It may be tempting to want to photograph posturing behaviour, but this has proven to be the downfall of numerous divers in the past. A camera flash is often the catalyst that brings on the final attack. Even bringing a camera up to eye level may be enough to push a shark over the edge, and it's important to remember that no matter how ready you think you are, if a shark attacks at speed, you are unlikely to be able to block the attack in time.

Be a responsible participant

We have come a long way since the early days of Jacques Cousteau pitting himself against the monsters of the sea. The survival of the sharks that cruise today's oceans hangs in the balance. There is no excuse for harming any shark or even interrupting important behaviours such as mating or birthing. If you feel that a shark diving situation may require the use of a power head or other weapon for protection, then the dive should not take place.

It is also important to protect the fragile environment that sharks and rays inhabit. "Getting the shot" is secondary to protecting the reef regardless of what the subject is. Always practice good buoyancy skills, and if the situation calls for you to crouch inconspicuously on the sea floor, find a barren spot that will not damage any corals or other marine creatures. That group of orange sponges may make for a better photo location but not at the expense of the surrounding corals.

If baiting sharks into an area is enough to create a worthwhile experience, then actual feeding is not necessary. The consensus is that it is far more harmful and behaviour changing to actually feed sharks than to just lure them into the area.

Try to avoid creating a repetitive feeding area where resident sharks wait for a handout. Whilst this may be a convenient way to re-attract sharks, it provides an easy target for unscrupulous shark fishers.

Diving with sharks can be a fun and highly rewarding activity, but this becomes hollow and selfish enjoyment if you in any way harm the animals that you have come to see. ■

Dogfish shark chemical stops human viruses

Researchers report that squalamine—an antibiotic isolated from dogfish sharks—is also active against a broad spectrum of human viral pathogens

The spiny dogfish shark (Squalus acanthias) is the most common shark and travels in schools. They are called dogfish because they travel and hunt in packs. They are found in the Atlantic, Pacific, and Indian oceans, from tropical equatorial climates to the Arctic and Antarctic

Animal studies showed that squalamine controlled infections of yellow fever, Eastern equine encephalitis virus, and murine cytomegalovirus. In some cases, the animals were cured.

Squalamine appears to protect against viruses that attack the liver and blood tissues, and other similar compounds that we know exist in the shark likely protect against respiratory viral infections, and so on.

We may be able to harness the shark's novel immune system to turn all of these antiviral compounds into agents that protect humans against a wide variety of viruses. That would be revolutionary, lead researcher Prof Michael Zasloff said:

Because squalamine can be readily synthesized and has a known safety profile in man, the researchers believe its potential as a broad-spectrum human antiviral agent should be explored. ■

Marshall Islands now a safe haven for sharks

If you're a shark, head for the Marshall Islands. That's because in early October, its government declared the world's largest shark sanctuary within their home waters.

Comprising an area eight times larger than the United Kingdom, sharks within the 1,990,530 sq km area are now safe from being fished. Anyone who accidentally catches a shark has to release them alive.

In addition, trade in shark and shark products is prohibited. There would also be a ban on wire leaders, a longline fishing gear that has proved deadly for sharks.

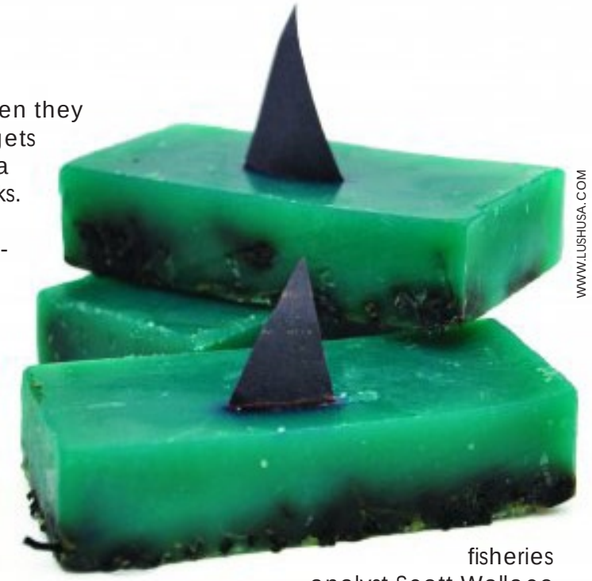
In the run-up to the bill, the Marshall Islands government had collaborated with the US-based Pew Environment Group, which has been instrumental in establishing shark sanctuaries worldwide.

"In passing this [shark protection] bill, there is no greater statement we can make about the importance of sharks to our culture, environment and economy," said Senator Tony deBrum, who co-sponsored the bill through the parliament.

"Ours may be a small island nation, but our waters are now the biggest place where sharks are protected," he added. ■

Lush Shark Fin Soap

This is perhaps the one time that shark-phobics won't panic when they see a shark fin popping out of the water. Lush's shark fin soap gets you squeaky clean with its blend of softening seaweed, fine sea salt and lime oil, while letting you do your part to save the sharks. You see, all proceeds from the sale of this limited edition soap goes to Shark Savers, the organisation dedicated to the protection and conversation of sharks. Now that's the perfect combination to make you feel good both on the inside and out! ■



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Spiny dogfish makes history as world's first 'sustainable' shark fishery

British Columbia's spiny dogfish has become the world's first shark fishery to be deemed sustainable, offering a glimmer of hope for globally overfished shark populations. The London, England-based Marine Stewardship Council (MSC) has concluded that B.C.'s commercial hook-and-line dogfish fishery is sustainable, following an independent scientific assessment by accredited certification body Moody Marine Ltd.

The council concluded that the dogfish met the "global standard for sustainable fisheries, which includes healthy fish stocks, minimal ecosystem impacts, an effective fisheries-management system," and is "managed within the precautionary framework" of the federal fisheries department.

"We're really excited," stated Michael Renwick, executive director of the B.C. Dogfish Hook and Line Industry Association. "We're hoping MSC certification will result in new interest for dogfish products. It's a small nugget of hope that environmental groups will open their eyes to this first initiative to ensure sustainability by a very rigorous process."

In an opinion letter in the journal Nature in 2010, scientists such as Jennifer Jacquet and Daniel Pauly of the University of B.C. Fisheries Centre said the MSC's credibility was at risk unless it "creates more stringent standards, cracks down on arguably loose interpretation of its rules, and alters its process to avoid a potential financial incentive to certify large fisheries."

However, the MSC's dogfish certification is supported by the David Suzuki Foundation (DSF) and World Wildlife Fund, which co-founded the MSC but is no longer involved in its operation. Despite ongoing questions about stock assessments, DSF fisheries analyst Scott Wallace said the fishery was worth supporting as all vessels utilise electronic monitoring, there is limited bycatch of dogfish in other fisheries and the total allowable catch is conservatively set. "This is an exception in the world of shark fisheries," he said.

The dogfish is the most common of B.C.'s 15 shark species and its most widely utilised fish. Its meat is sold as 'rock salmon' for fish and chips in England, the belly flaps smoked and sold in Germany, the fins for Asian shark-fin soup, cartilage for health pills (of dubious value), and the reminder for organic fertiliser. Among the other B.C. fisheries already MSC-certified as sustainable are hake, halibut and Fraser sockeye (the latter species being particularly disputed by some environmental groups). ■

The Fin Trail

The Fin Trail is a film about shark fin. From breath-taking images of sharks swimming free in the ocean, to graphic sequences of how the ingredients of the shark fin soup are harvested. Director Steve Bowles and his team intends to take the viewers on a worldwide journey to places where the shark finning is legal, and where it is not. They will reveal how the harvested fins make it to the consumer and how the dollars and cents of the trade add up for the suppliers of the business - and what it means for the rest of the world.

In short, The Fin Trail is the inside story told from both sides of the trade: from the businessmen, gangsters and politicians eager to fuel the demand, to the conservationists and activists fighting to stop the slaughter.

In conjunction with the filming, an online petition (http://www.thepetitionsite.com/1/the-fin-trail/) is underway, urging governments to ban shark finning and to outlaw the trade in shark fins except for those sourced from sustainable fisheries. ■

turtle tales

Edited by
Bonnie McKenna

Accidental sea turtle deaths drop by 90 percent in U.S. fisheries

According to a new study by Duke University Project GloBAL and Conservation International, the number of sea turtles accidentally caught and killed in fishing gear in the United States has declined by an estimated 90 percent. The report credits the drop to measures that have been put in place to reduce bycatch.

Before measures were put in place to reduce bycatch, it is estimated that sea turtle takes surpassed 300,000 annually. Of those, 70,000 turtles were killed.

The study collected data from 1990 to 2007 to determine the bycatch rates from more than 20 fisheries operating in Atlantic waters from the Gulf of Mexico to the Canadian border and in the Pacific Ocean along the west coast and around Hawaii. Shrimp trawls in the Gulf of Mexico and southwestern United States accounted for up to 98 percent of all bycatch takes and deaths during the study period.

Reducing bycatch

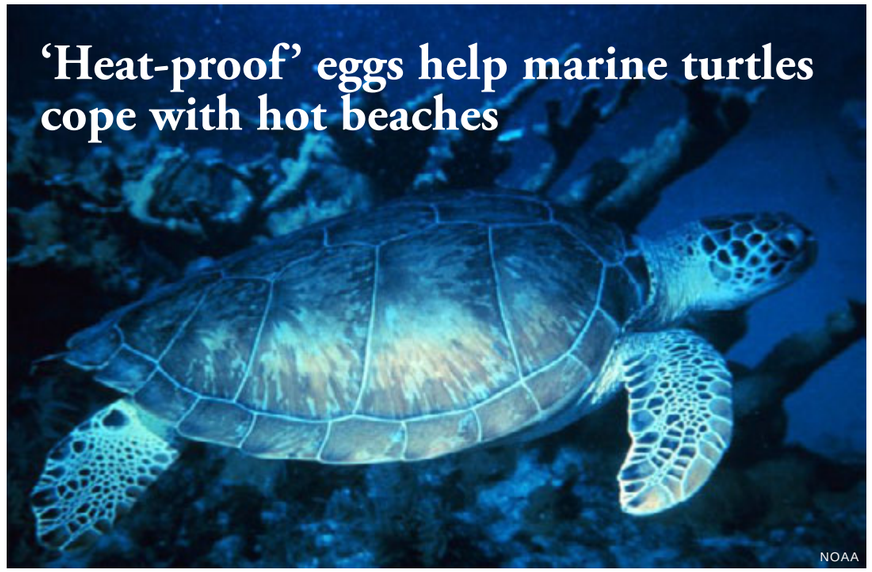
Bycatch is an acute threat to marine turtle populations worldwide. High bycatch rates can indicate unsustainable fishing practices that negatively impact the health of the marine ecosystem. Mitigation strategies that have helped reduce bycatch are: the use of circle hooks and dehooking equipment, the use of Turtle Excluder Devices (TEDs) in shrimp trawl nets, and the implementation of time-area closures to restrict fishing when turtles are most likely to be present.

Fragmented approach

Piecemeal regulation remains a problem. The fragmented approach of allowing a fishery-by-fishery to set bycatch limits does not account for the overall impact of all takes and leads to total allowed takes to exceed what the sea turtle populations can sustain.

The researchers note that the actual bycatch rates are likely higher than reported because in many fisheries, particularly the shrimp trawl fishery, the number of on-board observers is low relative to the amount of fishing that occurs. ■

'Heat-proof' eggs help marine turtles cope with hot beaches



NOAA

Research led by the University of Exeter shows that some turtles are naturally heat-tolerant.

The study focused on green turtles on Ascension Island. They found that eggs laid by turtles on a naturally hot beach withstand temperatures better than eggs found on cooler beaches just a few kilometers away.

The warmer beach had dark sand and the cooler beach had white sand. Since most female turtles nest on the beaches where they were hatched, it was concluded that the turtles became adapted to specific nesting locations.

Adaptaition to heat

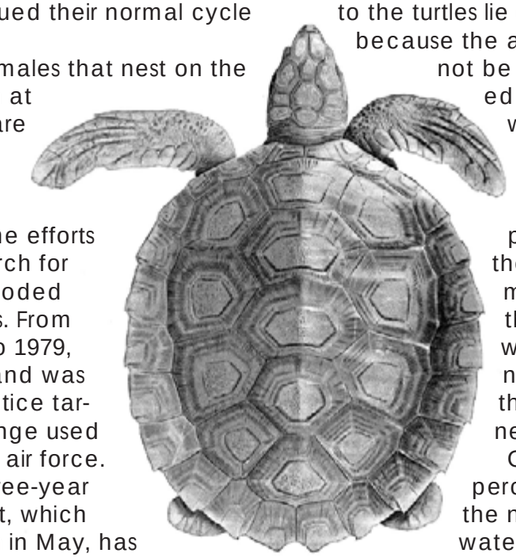
The researchers placed some eggs from each beach into incubators at either 32.5°C or 29°C and monitored the progress. They found the eggs from the warmer beach were better able to survive in the hot incubator than those from the cooler beach. Researchers believe that this is the first time that adaptation to local environmental conditions has been demonstrated in marine turtles.

Dr Sam Weber, who lead the study said, "Such adaptations probably evolve over many generations, so whether turtle evolution can keep pace with the rapid climate change that scientists have predicted remains to be seen. However, occasional movements of heat-adapted turtles to other nesting sites could help to spread favorable genes." ■

Turtles and unexploded bombs

Flatback turtles that nest on Bare Island, a deserted patch of sand dunes off the coast of Darwin, Australia, have continued their normal cycle of life.

The females that nest on the beach at night are oblivious to the daytime efforts to search for unexploded bombs. From 1945 to 1979, the island was a practice target range used by the air force. The three-year project, which began in May, has already unearthed a number of large bombs as well as an abundance of empty cartridges and projectiles.



ALAN RIVERSTONE MCCULLOCH (1885-1925) / WIKIPEDIA PUBLIC DOMAIN

Resting in peace

While the island's violent past would seem an unlikely place for the nesting turtles; the opposite is true due to the lack of predators on the barren island, which has resulted in a very high successful number of hatchlings making it to the sea. Despite the nesting successes, threats to the turtles lie offshore because the area will not be protected by a network of marine reserves proposed by the government for the northwest and north of the continent.

Only three percent of the northern waters would be protected by the draft plan. Sea turtles in that nest on Bare Island will be left vulnerable to oil spills, seabed mining and commercial and recreational fishing. The Australian Marine Conservation Society is disappointed that this important breeding ground for the flatback would not be protected by the network of proposed marine preserves. ■

Ingestion of plastic and latex by sea turtles is studied

Small pieces of latex and plastic were fed to sea turtles on different occasions. The turtles feeding behavior, as well as the time taken for the turtles to pass the ingested material were noted. The physiological and clinical status of the turtles was monitored constantly. Green and loggerhead turtles were observed actively seeking the offered material; some color preference was noted. The amount consumed depended on appetite. The studies noted no effects of plastic ingestion on gut function, metabolic rate, blood chemistry, liver function or salt balance. However, blood glucose declined for nine days following ingestion, indicating a possible interference with energy metabolism to gut function. Passing of the ingested material ranged from a few days to four months. Some turtles passed multiple pieces bound together although they had eaten the latex pieces at different times. It appears that some of the latex pieces are being held in the intestines, and those pieces that had been held in the gut the longest showed evidence of deterioration.

To read the full report, go to ***http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-154_P719.PDF*** ■

Almost half of the world's threatened turtles are found in the northern Indian Ocean

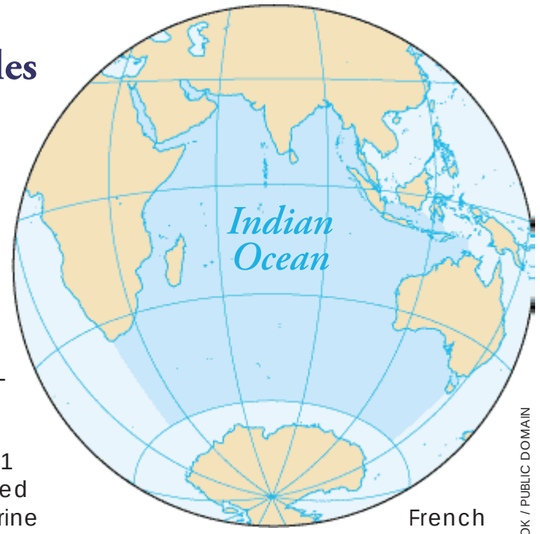
Top experts recently discovered that 45 percent of the world's threatened turtles are found in the northern Indian Ocean. The study also determined that the most significant threats across all threatened marine sea turtles are fisheries bycatch, accidental catches and the direct harvest of turtles, their eggs or their shells for commercial use.

The report, produced by the IUCN, Marine Turtle Specialist Group and supported by CI and the National Fish and Wildlife Foundation, is the first comprehensive status report of all marine turtles globally. The study is designed to provide a blueprint for conservation and research. The assessment system will provide a baseline status for all marine turtles from which conservationists can gauge their progress on recovering these threatened populations.

Sea turtles everywhere are conservation-dependent, but this framework will help us effectively target our conservations efforts around the world.

Five of the 11 most threatened species of marine turtles are found in the northern Indian Ocean. Other areas that proved to be most dangerous to marine turtles were the East Pacific Ocean (from the USA to South America) and the East Atlantic Ocean (off the coast of Western Africa).

The study also highlighted the 12 healthiest marine turtle populations in the world. The thriving habitats which include nesting sites and feeding areas are Australia, Mexico, Brazil, the Southwest Indian Ocean, Micronesia, and French Polynesia.



CIA WORLD FACTBOOK / PUBLIC DOMAIN

Dr Bryan Wallace, director of science for the Marine Flagship Species Program at CI said, "Before we conducted this study, the best we could say about sea turtles was that six of the seven sea turtle species are threatened with extinction globally, but this wasn't very helpful for conservation because it didn't help us set priorities for different populations in different regions. Sea turtles everywhere are conservation-dependent, but this framework will help us effectively target our conservations efforts around the world." ■

U.S. adds loggerhead sea turtles to the endangered list

After four years of lobbying, the U.S. National Marine Fisheries Service moved the loggerhead population in the North Pacific from threatened to endangered under the Endangered Species Act.

NOAA

The loggerhead populations have declined by at least 80 percent over the past decade, according to marine biologists.

According to the Sea Turtle Restoration Project, deadly high-seas longline fisheries, illegal poaching and radioactive debris offshore of loggerhead nesting areas in Japan jeopardize these sea turtles.

Swordfish boats from Hawaii often hook and drown loggerhead turtles on their longline hooks, but the real threats come from the Taiwanese, Chinese and Japanese longline fleets that are not subject to U.S. fishing regulations.

It is hoped that by adding the loggerhead to the endangered list it will allow pressure to be brought on the United Nations and other foreign nations to subject their fishing fleets to more stringent regulations regarding their longline fishing practices. ■