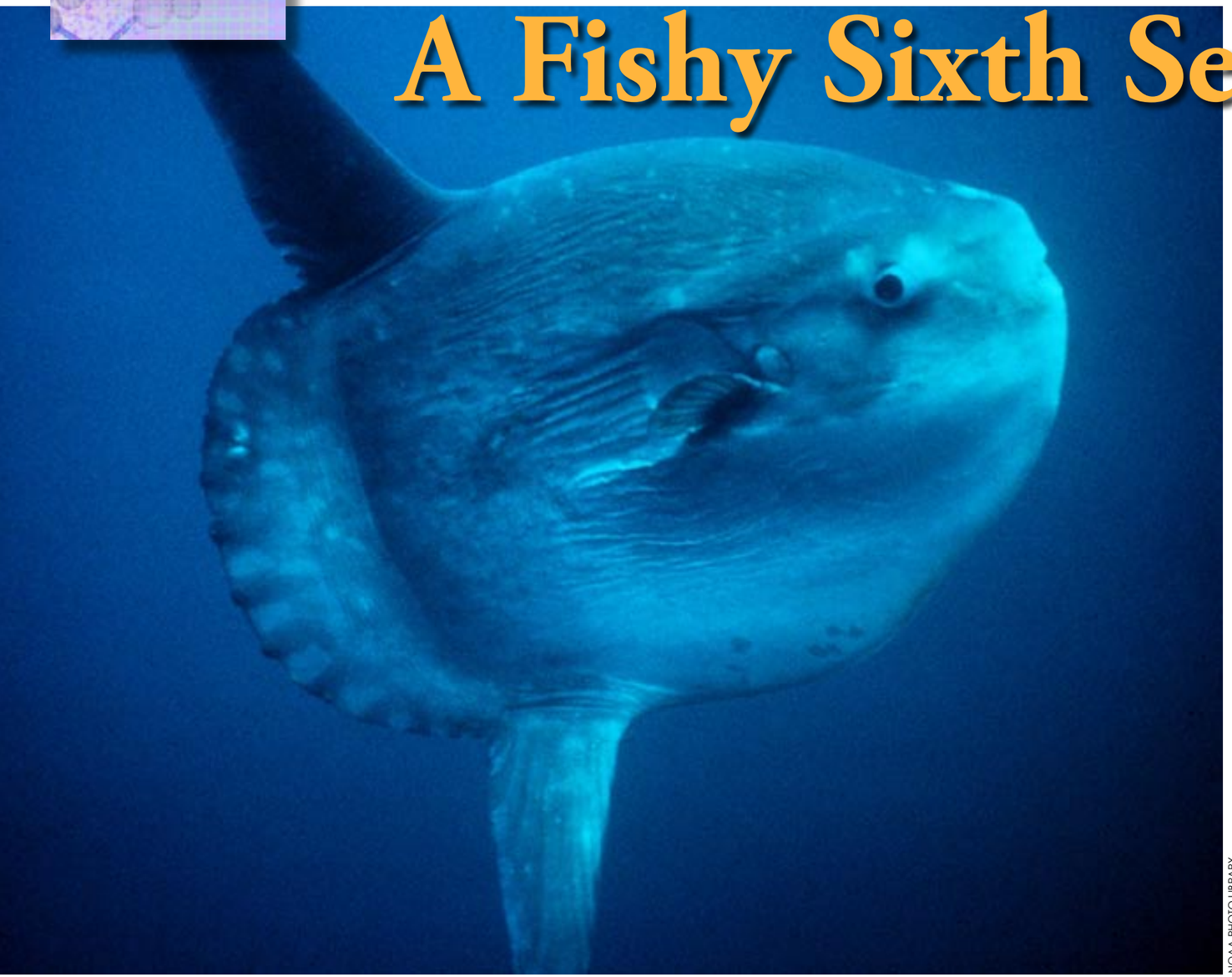
Why you can't sneak up on a fish...

Text by Michael Symes
Photos by Peter Symes, NOAA Photo Library, USDA Forest Service, Hawaii Biological Survey, Freshwater and Marine Image Bank

A Fishy Sixth Sense



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The ocean sunfish, or mola mola, is a deep sea fish found in the Gulf of the Farallones National Marine Sanctuary

USDA FOREST SERVICE

A rainbow trout in the shallows of a freshwater stream

The environments in which the many fish species have evolved are very diverse, ranging from the shoreline to the deep-sea depths, from fresh-water streams to tropical lakes. Because of the great variety of these habitats, the senses of these different species have consequently evolved quite differently, exhibiting a great diversity, with many senses not yet understood or even identified. There are thus still many mysteries regarding the behaviour of aquatic creatures. For example, how do eels find their way across the Atlantic ocean? Why is it so very difficult to swim up to a fish from behind without being detected? And even bank-side freshwater fishermen, for example, know that the vibrations from footsteps can be detected by fish. But what sense or senses are being used by the fish in such cases?

The senses of fish

Fish have been shown to have the five, commonly accepted, human senses. In fish, however, their relative importance is different from that of human beings.

Vision

As the amount of light available below the surface generally is small, this is not the primary sense for fish. Some aspects of fish-sight were discussed in Xray Mag #3.

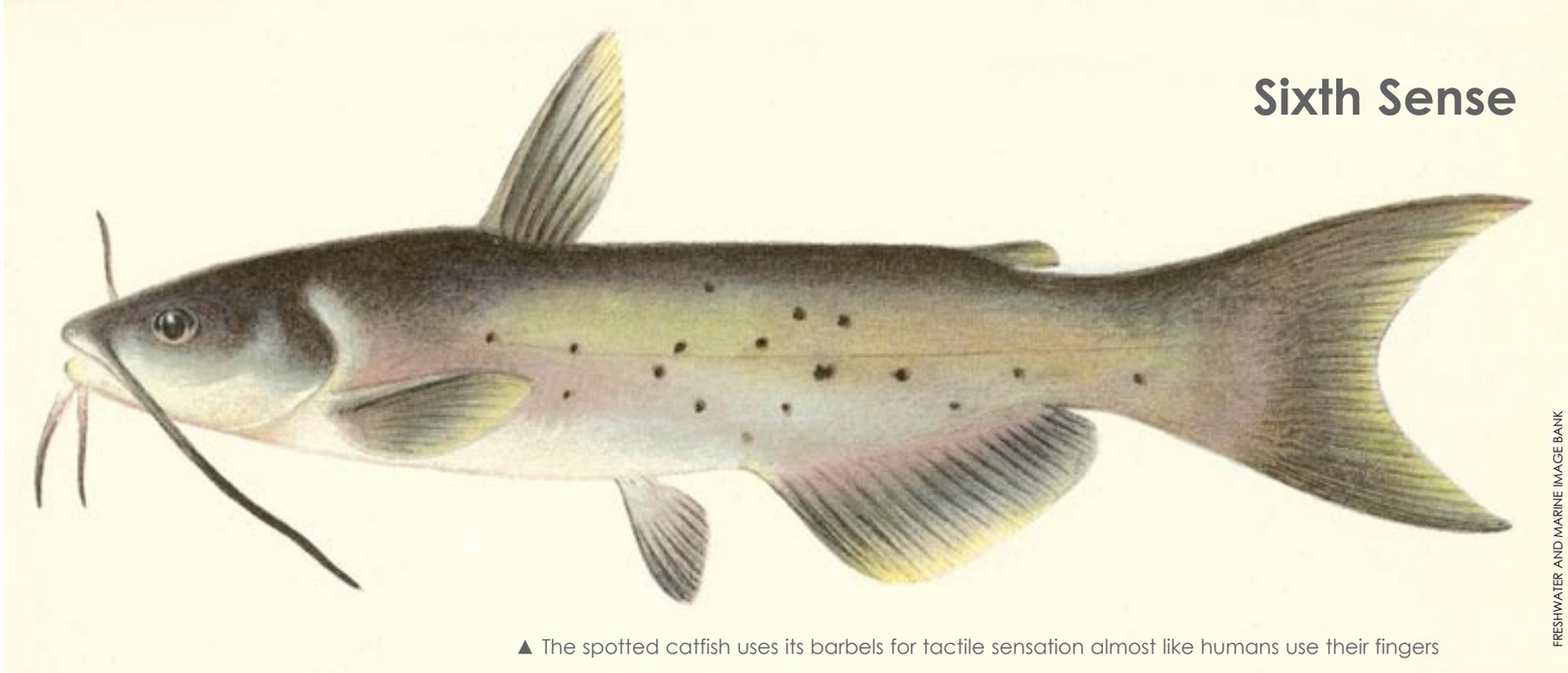
Smell

Generally, the sense of smell in fishes is very developed. Eels, for example, may detect a substance when only three or four molecules of it have entered its nose. It is probably that sense most used by fish in finding food.

Sixth Sense

PHOTO BY PETER SYMES

▲ The Needle Fish has a lateral line that runs very low on the sides



FRESHWATER AND MARINE IMAGE BANK

▲ The spotted catfish uses its barbels for tactile sensation almost like humans use their fingers

HAWAII BIOLOGICAL SURVEY

▶ The neon wrasse has a lateral line that has gaps along its length

Hearing

Hearing in fish is not very well understood, but seems mostly to be used for simple distance perception and sound source location.

Taste

Taste buds in fish are mainly located in the mouth, but also in the skin covering the head, body fins, barbels and lips. No reponse is obtained when a barbel is touched with an inert glass tip, for example, but an immediate response is obtained when it is touched with a morsel of food.

Touch

Fish have an fine tactile sense, as is shown, for example, by certain catfish who can use their barbels almost as humans feel with their fingers.

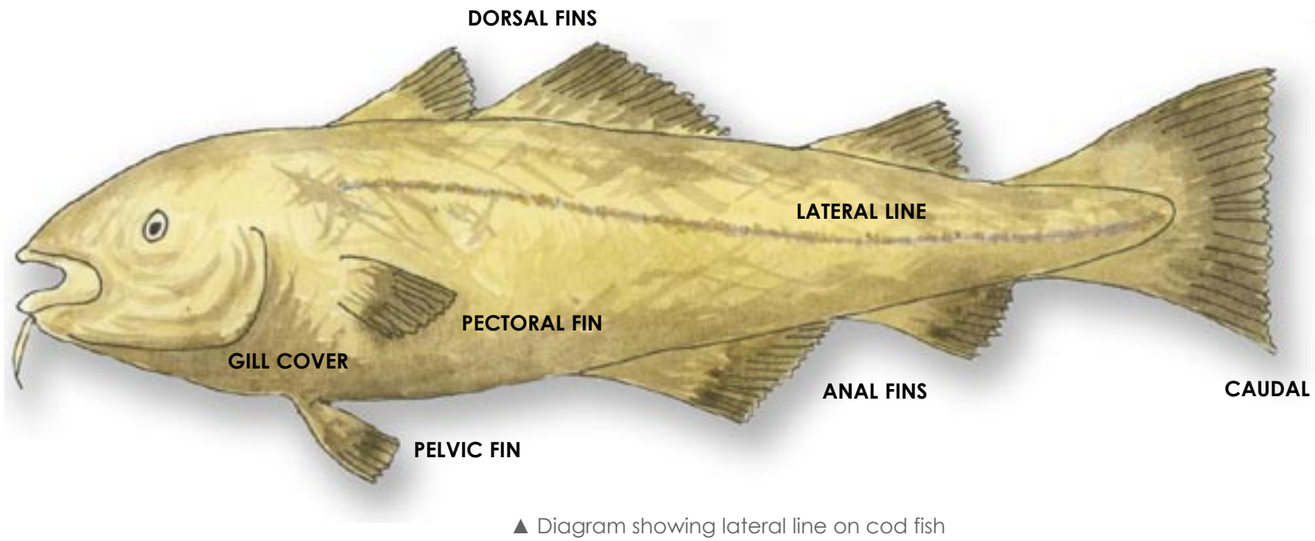
However, good as some of these senses might be, none of them can account for even simple phenomena such as the detection of the vibrations from footsteps. Fish must therefore have at least one other sense which enables them to detect low frequency vibrations. Such a sense is located in their lateral line.

The lateral line

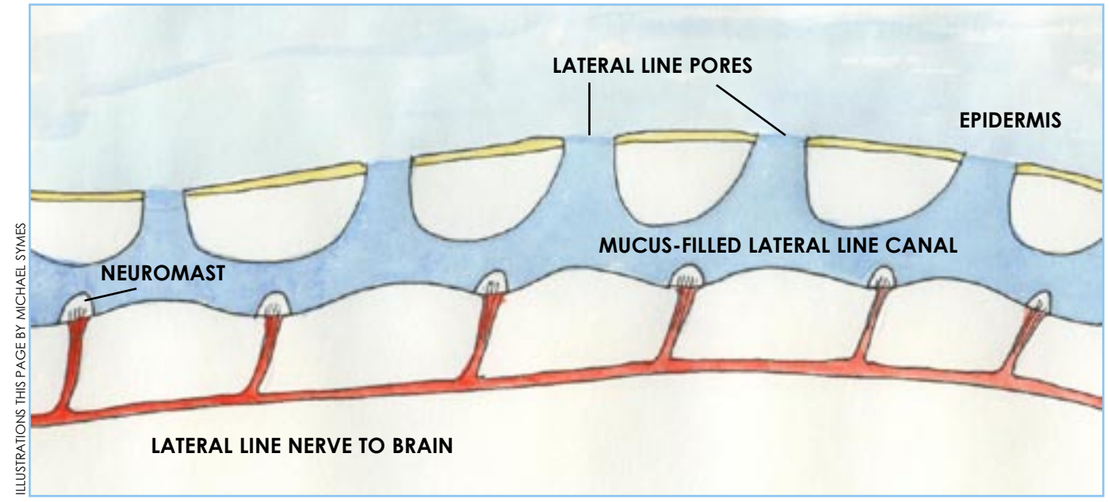
The lateral-line system is easy to observe in most fishes. There is usually only a single lateral line on each side of the body, but many variants of the typical lateral line may occur. For example, on the sides of the Belonidae (Needle Fish), the lateral line runs very low on the sides. On some species the lateral line may be incomplete, or it may also be interrupted, meaning that it ends and then recommences after a gap, as in some of the Labridae (Wrasse) species. And in a number of families the lateral line may be absent altogether.

The lateral line consists of a linear series of sensory cells or neuromasts. In many fishes, the neuromasts can also extend along the fish's head as well as sides, although these are not always as obvious. These neuromasts are situated in a mucus-filled canal, situated just under the skin, which is in direct contact with the surrounding water through pores in the skin or scales. The incoming stimuli from the neuromasts are fed into a nerve parallel to the canal which then feed the stimuli to the fish's central nervous system.

The neuromasts can be thought of as very sensitive hydrodynamic transducers that can detect water disturbances. They consist of a base of sense cells with sensory hairs (cilia) that project into the canal. These hairs are capped with a gel-like cupula. Movement of the mucus in the canal, caused by flow of water, makes the cupola bend. This in turn causes bending of the hairs, which stimulate the sense cells, thus generating minute electrical signals which



▲ Diagram showing lateral line on cod fish



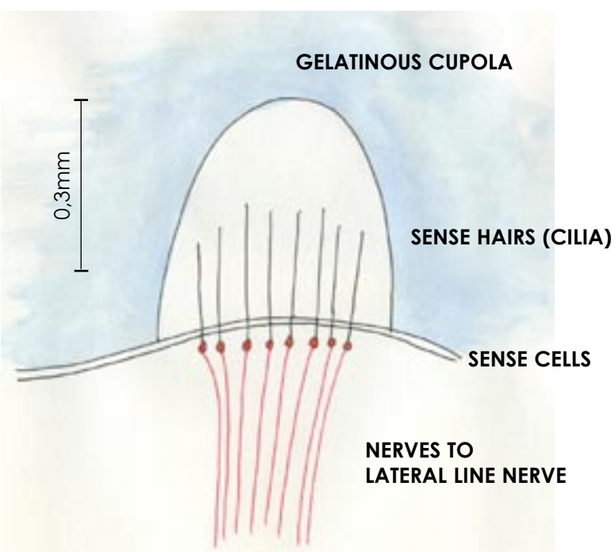
ILLUSTRATIONS THIS PAGE BY MICHAEL SYMES

▲ Schematic diagram of lateral line

pass along nerve fibres to the brain.

There are actually two main types of neuromast: *canal neuromasts,* where the water displacements are transferred to the canal fluid via pore openings, and *superficial neuromasts,* which are directly exposed to the flowing water. In either case, when the neuromasts are at rest, they send a continuous series of nerve impulses to the central nervous system.

In the case of the canal neuromasts, variations in water pressure between different pores along the canal cause a directional movement of the mucus through the canal. When pressure either increases or decreases due to a disturbance near a fish, the nerve impulse pattern changes, the fish registers the change, and takes appropriate action. In the case of the superficial neuromasts it is the drag of the water past the cupola that causes them to bend. The degree of this bending is directly related to the water velocity, i.e. to the velocity of the fish relative to the velocity of the water.



Schematic diagram of a neuroplast

Similar to the human inner ear For those with some knowledge of human anatomy, it will be clear that the structure of the cupola is homologous to the crista ampullaris of the human inner ear. Bending of the cupola by water currents and that of the crysta ampullaris by disturbance of the endolymph of the semicircular canals causes excitation of sensory cells of both organs. Gerard (1936) inferred that the inner ear of vertibrates has phylogenically derived from a primitive lateral line system.

So, the lateral line can be considered as a sort of higher hearing sense, reacting to certain types of pressure changes in the surrounding water, just as the human ear reacts to pressure changes in the surrounding air. However, while the lateral line is a linear system of receivers, the ear functions just as a single receiver, although covering a range of frequencies. It does improve matters, though, that we do have two of them, giving stereo-directional hearing.

What can this sense be used for?

The lateral line system obviously greatly expands the area of tactile perception by making it possible for the fish to interpret its environment without actually touching an object. The lateral-line thus helps the fish in a number of ways.

Rheotaxis

Rheotaxis is a behavioural orientation to water currents and is one of the most important functions of the lateral-line system.

The term, rheotaxis, comes from the Greek root *rheos,* meaning stream, flow or current; and *taxis,* meaning the movement of a cell or microorganism in a particular direction in response to an external stimulus, from the Greek via the New Latin *tassein,* to place in order.

Scientists at the University of Auckland, New Zealand, have demonstrated that some of the receptive cells in the lateral line are particularly well suited to provide information on water currents. It was found that the canal neuromasts are most sensitive to water acceleration whereas the superficial neuromasts are most sensitive to water velocity. Fish thus have one set of receptors designed to detect water acceleration and a second set to detect water velocity.

Rheotaxis is mostly mediated, however, by one specific receptor class of cells in the lateral line, the superficial neuromats. These velocity-sensitive receptors seem to enable a fish to sense its orientation in relation to stream flow, even in the absence of other clues. Facing upstream is highly advantageous, for not only does it present the most streamlined shape to the flow, but it also makes it easier for the fish to intercept food items drifting downstream.

Detection of food or enemies

Sound passing through water creates variations in pressure. The lateral line system can thus detect sound, though only at a low frequency, such as that arising from footsteps, for example. Pressure waves are also caused by unseen prey such as a struggling insect, or the movements of an injured fish, so they can be located – and eaten!

Distances from stationary objects

The lateral line can serve as a sonar system with which distances from stationary objects may be determined. A bow wave precedes a swimming fish. This wave is reflected from the object back to the fish where it is detected by the lateral line system, thus enabling the fish to determine the distance to the object.

Communication

Typically the lateral line system can

PHOTOS THIS PAGE BY PETER SYMES

The lateral line makes it possible for schooling fish to coordinate their movements and stay together. Some species of fish like the Blue Banded Snapper found in the Red Sea have a very strong sense of schooling

detect sound lower than 160 to 200 Hz. (The human ear can detect sounds down to about 10 Hz.) Many fish vocalisations are very low frequency crunches, grunts, and popping sounds. The lateral line system may thus play an important role in communication in some species of fish.

Schooling with other fish

The lateral line system makes it possible for schooling fish to coordinate their movements and stay together. The lateral line system is particularly good at detecting large disturbances in the water. Schooling fish often have a well developed lateral line. Sensing the movement of its schoolmates through water pressure variation, each fish can synchronize its movements with the school.

Wake detection

Modern submarines can estimate the current position of an enemy submarine by detecting its wake. Like many other 'new technologies' evolution has preceeded them. Recent research at the University of Konstanz, Germany, has shown that predatory catfishes use their lateral line for tracking the wake caused by prey as they swim after dark, and use past locations to predict the present position of their prey. Although the sense of taste is also used to detect chemical signatures produced by the prey fish, it was shown that stimulus of the lateral line was by far the most important factor.

All in all, then, it is clear that the lateral line system is a very complex and sensitive sense-organ. Or perhaps we should consider the lateral line as several different sense organs, for sensing motion, pressure, distance, etc.

In any event, it can therefore truely be said that fish do have, at the very least, a sixth sense, and a very complex one at that.

Do humans have an extra sense?

Although we must be careful to distinguish between sense and perception, it is obvious that we must more than five senses. For example, we can sense, and react to, pain, heat, pressure and movement. Even our sense of vision can be subdivided into one for light and one for colour. But do we have as yet any undetected senses? Perhaps an amusing experiment, described in the Electronic Naturalist, may be of interest regarding this question.

Blindfold a person and let them move within a room, making sure there is some open space along one wall. The aim is for the blindfolded person to try and determine when he/she is really close to a wall by using senses other than the commonly accepted five.

Move the person around a bit so they lose track of exactly how far they are from the selected wall, then face the person towards the wall and let them walk very slowly towards it. If the subject moves cautiously and carefully, just before arriving at the wall, they should be able to "feel" its presence just beyond their body. Not everyone is good at this but with a few trials many will be able to do this activity surprisingly well. Although people will be able to do this exercise, they will have trouble explaining just how they are able to do it.

So, perhaps we, too, have some vestigial extra sense, over and above those normally accepted. ■

Sixth Sense

Why are fish smart? Because they are often in schools

▼ Bigeye Jacks
Sipadan Island
Malaysia

Are fish ticklish?

Probably not! But there is an ancient way of catching trout, called tickling that's even described in Shakespeare's twelfth-night, written 1599-1601, where Maria says " .... for here comes the trout that must be caught by tickling", the trout in question here being Malvolio.

Trout can be found in most fast running streams, but they hide very well. You will occasionally see one near the edge of a river but it is important to be very quiet and move slowly. Slowly move closer and bring a hand underneath the trout from behind and to the side. If you prod crudely the fish will take flight and dash to another hiding place; and do not touch its tail or it will be off in a flash. But if you are careful enough you will feel something swaying in the current and stroking your fingers like the soft touch of a feather. It is the fish's tail but do not try to grab it, for it will twist from your grip before you can get it out of water. Instead, the fish is rubbed gently so that it moves slowly backwards into your hand. Your palm slides gingerly over the dorsal fin and goes on till you feel the gentle waving of the pectorals. Then suddenly you grip a thumb and finger into the gills, and with one strong heave lift your fish from beneath its rock and throw it to the bank.

Well! That's what they say, but it does seem to be a very difficult skill. So you probably shouldn't count on getting your supper using it. ■

Shark Tales

Cove's Questions

By **Edwin Marcow**

ILLUSTRATION COURTESY OF FIONA'S SHARK MANIA
WWW.OCEANSTAR.COM

When leading Hollywood directors want to simulate a realistic shark attack they most often go to Stuart Cove – the master of shark wrangling.

WB ONLINE

Stuart Cove is one of the most famous shark wranglers in the world. He is the owner of Stuart Cove's Aqua Adventures in the Bahamas. His portfolio of work includes three James Bond movies, one Jaws sequel, and recently, a commercial for a Japanese tooth paste company where he managed to hold a shark still while he brushed its teeth!

Stuart's journey to where he is now, started modestly at the age of 19, working for $150 dollars a day, a small fortune back in 1979, to his status in the industry today where he will charge USD 10,000 for two to three days shooting with a Tiger Shark.

What made Stuart famous was the film 'Open Water', which was produced on shop-bought digital camera equipment. But what made this film stand out from so many before it, were the very real shark encounters—made possible only with Stuart's deep understanding and knowledge of sharks—with only recently certified divers who had little time and experience in the water.

Stuart's experience with many species of sharks—from Caribbean Reef Sharks, Tigers, and so on—is that they are very discerning eaters, and will spit out anything that is either foreign to them or that, in the case of fish, is well beyond its 'sell date' and not healthy to eat.

Items Stuart has tried to feed sharks include leg of lamb, chicken, lobster—quite a banquet—and even once, a dead rat, but he could never induce a shark to partake of any of these food items.

Love Bites

Cove's generosity has not stopped him from being bitten three times by the sharks. On one such occasion, he was bitten on the hand through the knuckles—a very painful injury. Two other bites happened while snorkelling and baiting the water for a photo shoot. A shark approached Cove who was wearing little protection. All he could do was 'roll away' as the shark chewed (racked) his back. He was lucky to sustain only minor injuries.

The most serious attack occurred while in the making of Ocean Men, an Imax film. While Stuart broke up bait in the water, a piece of fish landed on his head.

A shark swam in and raked the top of his head, almost scalping him in the process. A massive body of 20 or more sharks descended and filled the water around him. Almost immediately, Stuart was engulfed by this mass. The water turned red, and everyone assumed that this was Stuart's last dive — that he was being eaten alive. Against all odds, he survived.

WB ONLINE

Stuart insist that anytime he has been bitten, it was because he was doing something for the camera. 'Hamming it up', you should not, while diving with sharks (e.g. arms failing about, waiving hands etc.)

Seeing green?

Although Stuart has successfully proved that sharks are discerning eaters, do they have colour vision? This is a question that has never been successfully answered.

A recent shark attack off Cottes Beach Australia, has once again triggered research into this question.

The US Navy, more than 40 years ago, funded many studies into shark visual systems. They found that their downed pilots were more likely to be attacked if they wore an orange jump suit, as apposed to those who wore a green jump suit. Those in green were never attacked.

Dr. Nathan Hart of the University of Western Australia was recently awarded $500,000 over a five-year period by the Australian Research Council's prestigeous QEII fellowship Scheme to research this very question.

Intelligent life

After many years of research, time in the water, the US Navy's findings into shark visual responses to different jump suit colours, work being undertaken by Dr. Nathan Hart, and the lifetime wealth of experience built by people like Stuart Cove feeding and interacting with different species of sharks in the open ocean, one can plainly see that a shark is just another intelligent being —living, breathing and hunting as nature intended it to, capable of making 'reasoned' decisions on what to eat, and more importantly, what not to eat.

With the work of the US Navy and Dr Hart, we can gain tantalizing insights into whether sharks can see colour. This may help to explain why some swimmers may get bitten and others do not. Was the colour of the swim suit the deciding factor?

Although Stuart has successfully proved that sharks are discerning eaters, do they have colour vision?

For many lucky divers around the world who have dived and interacted with any species of shark, under the supervision of a reputable shark diving company that respects the shark and the environment that the creature inhabits, it can be one of the most rewarding experiences of a lifetime.

It is these very divers who should act as ambassadors for the sharks. They can educate the rest of the world about how intelligent and discerning these animals really are. The shark is not some mindless killer, but an intelligent animal that can appear to differiate between colours and food that is within its natural diet and food that is alien to it. ■

manufacturer

The British Legend

Apeks

Edited by
Andrey Bizuykin

The Apeks Marine Equipment Company was founded more than 30 years ago with but one purpose – to make the best scuba diving equipment in the world.

Building on original design ideas and its own technological innovations, and constantly striving to excel in both design, manufacture and skill, Apeks' production by far now exceeds the requirements set forth in existing international standards. Their quality standard became the yardstick against which many other manufacturers measured themselves. They obtained the very stringent and coveted European ISO 9001 certification.

Absolutely full quality assurance of all manufacture, in combination with the highest standard of manufacture, that of the European Quality Assurance System BS EN ISO 9001, guarantees the top quality of all products which others today can only envy.

It was in the middle of the 1960s, that the magazine Practical Mechanics fell into the hands of Kenneth Smith Ainscough and Eric Partington, two young men from Bolton, in northern England. They were very interested in an article about aviation cylinders and propane gas reducers. Ainscough had trained at a technical college, and had worked on the railway, in a printing house, repairing trucks, had been employed by one of aerospace companies, and had even been a steward for the British airlines. But he was also a keen diver, being an active member of a scuba diver club. He enjoyed repairing all the club's equipment, everything from valves for cylinders, reducers and even compressors. His partner's speciality was engineering. They then started to design and make their own equipment for a scuba diving. At that time, in the whole of the UK, there were but few shops trading in underwater equipment, and it was only possible to buy the archaic Mistral. In 1967, a friend in Bolton, who had opened a small business, suggested that they sell their homemade products through his shop. The trade was very successful, and the partners quickly realised that there was a good opportunity for the manufacture of equipment for scuba diving.

Apeks Marine Equipment Ltd started vigorous activity in 1971-1972, when Ainscough and Partington used the first letters of their names for drawing up the trade mark Apeks.

Apeks comes from: **A**inscough, **P**artington, **E**ric, **K**enneth, **S**mith.

A look behind the scenes at Apeks Marine Equipment Company where engineers and technicians strive to design and build the best scuba diving equipment in the world

Apeks

Apeks headquarters in Lancashire, England

Apeks became an independent business unit with its own tools, lathes and press in the 70s

In the beginning, the partners organized the small business in Partington's garage. At that time, diving was not the fashionable sport it is today, and was at a more or less embryonic stage. The first project of the company was the manufacture of lobster hooks which divers used for pulling them out from nooks and crannies. This small business became the bread and butter work of the new company. The company then specialized in manufacturing hoops for cylinders and snap fasteners for weight belts.

At that time, the regulators on the market were only very simple in design, such as the Mistral. The Mistral was very far from perfect, it was unsafe and, because of long corrugated hoses, it was inconvenient in use. It was obvious, even then, that the future was in regulators. Therefore Ainscough, with the support of Partington, started to develop a new type of regulator.

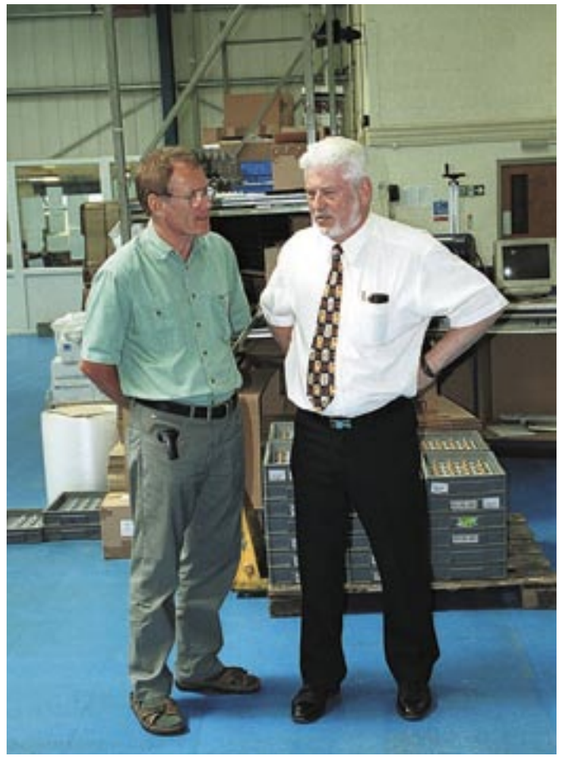
This project, however, had to be put on the back burner when the company were offered the chance of producing new valves for cylinders. The partners decided to make a jump into the unknown. They raised a bank credit, bought a small lathe and a pressing machine, and made one thousand valves. All these valves were sold immediately. It allowed the partners to pay off all the credit with interest, plus the purchase of the machine tools, and to make a small profit. The renown of the quality of their production quickly spread, and they received a new order. Manufacture of this second lot of valves proved to be even easier, as one of the partners left his former job to concentrate on the production of the valves. From then on, Apeks became an independent business unit with its own tools, lathes and press. The trade mark "Typhoon" valves for cylinders are well known, and still exist in the UK today. The small profit enabled the company to employ three people, two of whom are still working in the company today.

In 1976, Ainscough finally created the first regulator, and named it Manta. The real progress of the company really only began with the advent of the Manta. The Manta design has been altered and improved, and has achieved a stable position in the world market for regulators for scuba diving.

The Apeks TX50 regulator appeared in 1978. It was the first-ever regulator which could pass the EN 250 international test, and has been awarded the CE mark. It was a real success. The prestigious British magazin Diver published the results of testing it, and informed their readers that the TX50 is most clearly the best regulator in the world. After this publication, the sales volume started to grow continuously. The first regulator, the APEKS TX50, was strikingly different from the current modern model. The first TX50 did not have an antifreeze system in the second stage, and it had a completely different first stage. Ainscough had to make many experiments before he achieved a reliable, non-failure operation of the first stage. Furthermore, he devised the dry chamber system.

There was a crisis in 1979-80. The company had to dismiss all employees, with only the directors remaining and business went from bad to worse. A decision was therefore made to organise a business trip to Australia. Some of the partners worked in Adelaide, Victoria and Melbourne, where they received an order for the development of a new type of regulator. The company business began to improve once more. The crisis had passed, and the partners returned to the UK to continue the business. Even in the most difficult

Employees at work at Apeks



Apeks

By 1983, the company had expanded rapidly, and was manufacturing six different products. A strong advertising company had been developed, and a new trade mark created. Among the range of products was valve for dry suits. In 1995, when the number of employees had exceeded 50, the company moved to the new, specially constructed building in Blackburn.

During its existence the company has created nine types of Apeks regulator. Each of the regulators that Apeks makes today is suitable for pure oxygen.

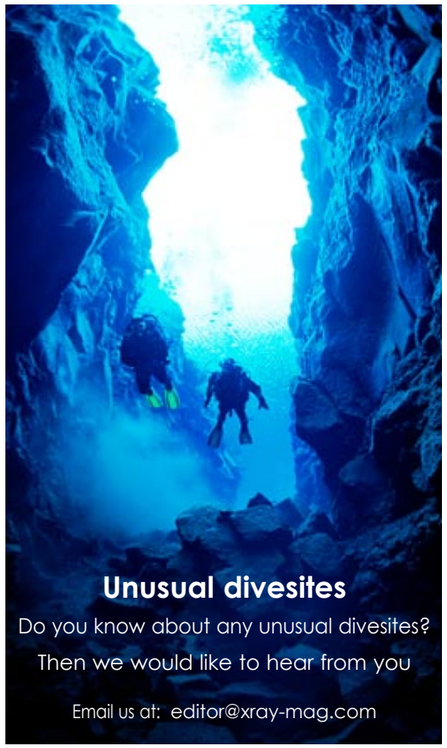
A confirmation that Apeks makes high quality equipment is that it produces equipment for several navies, including the British Navy. Fifteen percent of the total amount of manufacture is for military orders: these are respiratory equipment for helicopters, respiratory saving devices, devices for emergency escape from submarines, and equipment for hyperbaric chambers, non-magnetic valves, manifolds, valves for dry suits, and as well full-face masks and accessories for the naval rebreather MK-16. Apeks works for rescue services, coast guard, police and firemen over the world.

Today, Apeks production is exported to all corners of the world, and there are distributors in the USA, Japan, Germany, Australia, South Africa, Spain, Poland, Russia and other countries.

Apeks' mission does not end with the sale of equipment. Apeks' quality is also based on a professional after-servicing of all equipment. Apeks organizes and runs service courses for their own dealers and other professional organizations everywhere. Each Apeks dealer can help with advice and guarantees non-failure operation of its equipment worldwide.
Apeks is now one of the basic divisions of the Agualung corporation. All manufacture at Apeks, from planning, prototypes, manufacture, to quality assurance and marketing, is computer controlled. Except for its own production, the role of Apeks in the corporation is the manufacture of all metal accessories, and also parts of plastic elements for all Agualung regulators.

The 120 employees work the whole day round in three shifts. The company gives a lifetime guarantee on all its equipment. The company gives a lifetime guarantee on all its equipment. Today the turnover is about £4.5 million annually. It is a real British legend. Scuba diving is always an adventure. And if you are a keen diver, amateur or serious professional, Apeks should be the equipment for you. Apeks equipment is reliable and trouble-free, and works in practically all extreme conditions. It is thus the ideal choice for serious divers, who want to feel confident and free from anxiety under water. ■

See **www.apeks.co.uk**



CHRIS HUF OF HUF.ORG

Room with a view. Guests can expect to see a large variety of tropical fish, tuna and turtles, and with a bit of luck, sharks, from the comfort of their rooms, or even from their private jacuzzis

Poseidon Underwater hotel

Soon you might get a chance to sleep underwater face to face with sharks while enjoying the full comfort of a modern hotel.

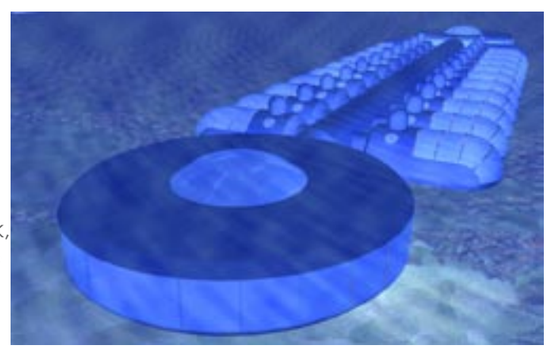
An undersea hotel is under way in the Bahamas. "People who are interested in experiencing something they can't find anywhere else in the world will find it a real bargain," says Bruce Jones who heads the 40-million-dollar project.

To date, there is only one other underwater hotel, and this is in a small refitted marine lab located off the coast of Key Largo, Florida. But Jones says his Poseidon resort will be one of a kind, as guests will not need to don scuba gear to reach their luxury suites.

The hotel, located off the Bahamian island of Eleuthera at a depth of 15 meters (50 feet), will be connected to the mainland through two tunnels and an escalator, and pressure will be the same as at the surface. The hotel will have its own restaurant, a bar and 20 large suites with transparent acrylic walls facing coral gardens that can be lit up at night. Guests can expect to see a large variety of tropical fish, tuna and turtles, and with a bit of luck, sharks, from the comfort of their rooms, or even from their private jacuzzis, says Jones. "They will enjoy five-star luxury accommodation, all with stunning views of the underwater world." Jones, who has spent 17 years designing, refitting and selling submarines, is confident the planned resort will become reality, probably sometime in 2006, even though a number of similar projects have foundered in the past.

poseidonresorts.com

CHRIS HUF OF HUF.ORG



Wet & Weird NEWS

News edited by Michael Symes

Robotic sharks in new giant aquarium

New amusing opportunity for trainee scuba divers

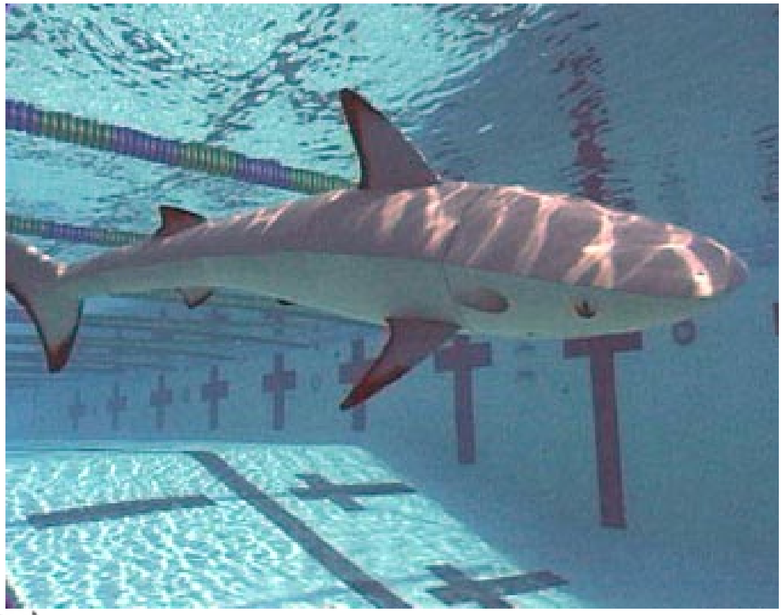
An artificial shark, called the Roboshark, was invented by Andrew Sneath to swim with wild sharks while carrying a movie camera in its head. In this way, animals could be filmed behaving in a natural way. Mr Sneath has now designed a 40 m diameter aquarium to house a number of these robotic fish in a seven-metre-deep tank.

The new aquarium will also include a shoal of robotic tuna, called Tintuna, and a collection of robotic sting rays. The fish will be programmed to behave in as natural a way as possible. It was said that the tintuna school look like real tuna, and behave like real tuna. They have cameras in their eyes and, in a simulated protective measure, will group together when they see a shark. On the other hand, the roboshark will also be programmed to chase the tuna, but only if it sees a lone fish moving on its own.

Diver training

As well as tourists, the Hydrodome will also welcome trainee scuba divers. Having robotic fish swimming about will give new divers familiarity because trainees are not used to having fish around them.

The aquarium will be housed in the new Hydrodome leisure centre situated near Birmingham, UK, and is expected to open in 2006. ■



Lost underwater robot still functioning after a year at sea

A little over a year ago, a VideoRay underwater robot was lost off Tasmania. After drifting over 30 km in rough seas, it was found by at Bruny Island. The VideoRay was lost during an inspection by Huon Aquaculture Company P/L, an Atlantic Salmon farming organization. Huon Aquaculture had been using the VideoRay for environmental monitoring surveys below and around fish farms, and for checking video systems and the deployment of underwater video systems in pens.

When found the unit was a bit knocked about, with a smashed up float block and scratches on thruster and camera and light domes. However, on being returned to its owners, it was plugged in and everything was found to be fully operational. The VideoRay will be put back into operation at Huon Aquaculture after being providing with a new control box, tethers, and side thrusters.

Weighing just 3½ kg, VideoRay ROVs are the smallest, most portable, and most responsive remotely operated vehicles available for use in underwater environments. VideoRays are used for underwater surveys, offshore inspections, search and rescue, homeland defence, science, fish farming, and other applications. ■

Deep-sea fish found after tsunami is an e-mail hoax

Many stories have been circulating regarding the recent South Asian tsunami, including rumours of improbable scientific discoveries. An example of such is a widely distributed e-mail showing pictures of deep-sea creatures that were supposedly washed ashore when the tsunami hit Phuket, Thailand. Although the animals in the photos are real deep-sea animals, the e-mail claiming they were tsunami victims is a hoax.

The photos originate from a scientific expedition, the NORFANZ voyage, that explored life in the deep seas, and around the seamounts, between Australia and New Zealand in May and June 2003.

Seamounts are underwater mountain ranges and peaks. Deep ocean currents can concentrate nutrients around seamounts, promoting abundant marine life. There are giant squid here, and sea spiders can grow to half a metre across. Many of the creatures on these seamounts are slow growing, and some can live for more than 100 years.

Researchers on the NORFANZ voyage collected animal specimens and photographed and video-taped seamounts over a kilometre down, and surveyed free-swimming animals that live in the waters around the seamounts.

Information about the expedition, including the circulated photos of alleged tsunami fishes, is available on the NORFANZ website. ■

News edited by Micahel Symes

Dangerous underwater dive attraction could have returned

Wastwater, in the Lake District, UK, is three miles long, half a mile wide and about 80m deep. It is the deepest in the Lake District, and is quite clear at the bottom, although there is nothing to see. However, towards the bottom of Wastwater, there used to a "gnome garden", which was well known among the diving community. Divers had taken gnomes down to about 48 meters, and placed them with a picket fence around.

But several years ago there were a number of fatalities and the Lake District National Park Authority asked the police to get rid of them, which they did. It is thought that the dead divers had spent too much time at too great a depth while searching for the site of the ornaments.

However, there is now a rumour about a new gnome garden placed deeper than 50 meters. And as police divers can't legally dive any deeper than this, the new garden, if it exists, could have been purposefully put out of their reach.

The Sub-Aqua Association states that different associations had different depth limits but theirs was 50 meters for air divers, and that was only for very experienced divers. However, technical divers, who used a mixture of gases, could go below that depth. ■

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Wushu goes underwater

Lunar New Year ushered in at Sentosa's Underwater World

Wushu exponents have taken the ancient martial arts to a whole new level - underwater. It is not easy to balance underwater, and the perfectly executed punches and kicks of the wushu performers astonish viewers

As all three award-winning wushu exponents had no diving experience, they had to take a crash course in diving. Non-certified divers have to dive with the sharks, and for all these dive programmes there is a set of regulations and requirements for them to meet in order to go in the water. And, of course, they must be in good health and able to swim.

As wushu performances are usually performed on land, little was known of the challenges presented by the aquatic environment. The buoyancy had to be dealt with because, unlike in the air where it is easy to jump and kick, it is more or less slow motion in the water. When floating, it is hard to control one's centre of gravity.

The group practiced at least three times a week, one hour each time for the past three months to come up with a unique routine and stunts that work underwater. ■

Photos of Crash Damage to Nuclear Submarine released

Photographs have been released of the shredded bow of a nuclear submarine, the San Francisco, that ran into an undersea mountain. The submarine limped back to Guam after smashing into the mountain, which was not on its navigational charts. The crash occurred 500 feet below the surface about 360 miles southeast of Guam. It was said that the San Francisco was traveling at more than 30 knots when the crash occurred.

The submarine's stronger inner hull, which protects the crew's living and working spaces, held firm, preventing a disaster. However, the sonar dome, made of fiberglass, shattered in the crash. The dome, which carries sonar gear, is normally flooded with water, so that the water there, along with water in the vessel's forward ballast tanks, probably helped cushion the blow and keep the inner hull intact.

The submarine's main chart was apparently prepared in 1989 and did not show any potential hazards within three miles of the crash site. Satellite images taken since then show the wedge-shaped outline of the undersea mountain.

East View Cartographic Inc., a map company based in Minneapolis, said that Russian Navy charts, which have been available for five years, indicate more hazards in that part of the ocean than were on the American charts, though they also fail to show the undersea mountain. It was stated that one of the Russian charts noted that the area where the crash occurred had been "insufficiently surveyed." It also warned: "Cautionary measures should be taken when sailing." ■

Giant squids to be plastinated

Gunther von Hagens, the anatomist behind the Body Worlds exhibition, where plastinated human bodies, as well as those of animals, were displayed, is to to do the same for giant squids. Giant squid have never been successfully put on display before because their bodies collapse under their own weight out of water. He will therefore use the same plastination technique on two huge giant squid specimens, which are being prepared to go on display as part of the Body Worlds exhibition.

Von Hagens invented plastination in the 1970s. The process involves replacing water and fat with a polymer, and it has allowed him to exhibit human bodies in life-like poses. But a giant squid, with its lack of a rigid internal skeleton for support, and relatively poorly understood circulatory system, poses some novel challenges.

The plastination process could take up to a year, and the squid will need a rigid framework for support. ■