PERSONALITY PROFILE
DANGEROUS MARINE ANIMALS THAT I HAVE MET

Dan Quick, born to a Cornish fishing family some 20-40 years ago. Did the usual rounds of Borstals and remand homes. Won a scholarship as a boy slave to a Government Research Unit and was allowed to study at London University in his spare time, but not being able to speak English proved to be a big disadvantage. Eventually got a Diploma in Electrical Engineering. At around this time a personal invitation was presented to him to join Her Majestys Royal Navy for 2 years National Service, which was spent plotting mutiny and rebellion (which proved good training for later life). On demob (dismissal) followed a period of several years of no official record, there were stories of course, like when, the French Security Police interviewed him and the whole affair setting back Anglo-French relationships 20 years; or a certain Bar Owner in Algeria that goes quite pale when his name is mentioned. In 1959 he decided to emigrate (deported) to Australia. Worked for several years as a research assistant at RPAH. Dan joined the SUM at its birth at HMAS RUSHCUTTER in 1965, originally being the one man band, he went on to specialize in diving equipment. He was involved in many of the medical breakthroughs of the SUM over the last 8 years, including the work on unconsciousness in divers, diver selection procedures and physical fitness requirements. He is the joint author of many SUM diving equipment reports and the instigator of an excellent history of the development of oxygen diving equipment. Recently he made available a very professional assessment (mainly thumbs down) on the SOS decompression meters.

The Quicks, Dan and Laurie his wife live in a Paddington Terrace overrun with dogs, cats, birds and building material.

Dan leaves the SUM this month to join another RAN Unit involved with guided missiles and on his past record it is unlikely we have heard the last of him.

MAN IN THE SEA: A SHORT HISTORY
Rex A Benson, Royal Australian Naval College, 1974

“The origins of free diving probably date back to the time man first entered the water”. This is the opening sentence of a treatise on diving, but one could well add “whence he came”, and immediately we are presented with a paradox. Life did originate in the oceans, and although man has evolved as a land animal, that he can adapt himself to living in a sea environment, albeit for only short periods, should be a natural consequence.

It is only in recent decades however that there have been serious attempts to bring about this adaptation. In the days of sail, most seamen could not swim, and did not think that this was a handicap. They chose not to learn supposing that to be swept overboard meant that they were going to be lost anyway, and better a quick death by immediate drowning than a lingering one after hours of treading water and eventual exhaustion.

It is one of the inexplicable traits of man that he first sought to conquer the air and persisted in so doing despite the fate of Icarus, a tale told down through the ages to deter man from trying to fly like the birds; moreover, that he succeeded with a heavier than air machine that defied the Law of Archimedes, when all the time it was well known that the sea was a more buoyant medium. Nevertheless there were the intrepid who gave substance to the thought that existence in the sea was possible, and we can trace a history up to the present, when diving is commonplace, and even a means of recreation. As is so often the case with rapid advancement in a new field, war hastened the process.

I once met a Greek hawker near Piraeus, whose only words of intelligible English were “lufly sponges”, as he traded his wares to do business with me. Sponges had been taken from the nearby seabed from the time of the Greek Empire, when they we familiar household articles. The slowly shuffling throng, admiring the Crown Jewels the Tower of London cannot fall to notice the enormous matching pearl ear-drops of Good Queen Bess which flank the Imperial State Crown. These must have been recovered by pearl-divers centuries ago. With the exception of shallow diving to examine wrecks of vessels close to shore, there is little evidence in the past of other forms of diving and the two examples referred to, sponge-diving and pearl-diving, took place in relatively clear waters.

Early man could well brace himself to explore the depths of a mysterious cave, holding a blazing band that gave him sufficient light. There was no incentive to want to explore a subterranean one in the dark, even if its existence were known. Darkness was the main deterrent to exploring the waters below the surface of the sea.

The first record of a meaningful plunge into the dark world underwater, dismissing tales from mythology, informs us that in 1538, at Toledo, and in the presence of Charles V, two Greeks were lowered into the River Tagus in a rudimentary diving-bell, each carrying a lighted candle. Robert Boyle had not then expounded his familiar law and they were ignorant of any traumatic effects that could have resulted. They suffered none and were brought to the surface dry and unharmed. In effect they had taken down with them part of their normal environment, the air, which had automatically adjusted itself to the increased pressure, but this was the first occasion of using a device to stay underwater, as distinct from the free-diving that had been carried out for centuries to gather sponges and oysters.

In the same way that Benjamin Franklin, in blissful ignorance of the risk he was running, had avoided electrocution when using his kite to demonstrate the idea of lightning during a thunderstorm, so did some of the early experimenters escape an early demise when using diving-bells. Halley, the renowned astronomer, spent over an hour with four others in a diving-bell of his own construction at a depth of sixty feet. They too were brought up without incident, but had they chosen to stay down longer, tolerance level would have been exceeded and all would have died. Halley, who was later to suffer from ear trouble as a result of his underwater sojourns, modified the type of diving-bell which had been used earlier by supplying extra air, first by utilising weighted buckets, and then incorporating an air hose for the same purpose.

The need for decompression, or the very nature of it, was unknown until the construction of caissons on a wide scale, and many years were to pass before it was realised that there was more to descending into water at depth than a superficial knowledge of the elementary laws of physics. There are many diving neophytes who have not realised this yet.

It seemed a natural step to go one better than the diving-bell by enclosing only the head with a miniature closed bell, to wit, a helmet, with the added refinement of a glass window through which to see. That any credit can be ascribed to Leonardo da Vinci for this novelty can be disregarded, as any device constructed according to his specifications and sketch plans to supply air through a simple tube leading to the surface, would be doomed to failure.

In the film “Dr No”, James Bond, together with his two companions Quarrel and the delectable Honeychile, who appeared to be endowed with a generous lung capacity remained undetected in the waters of a swamp by breathing through long reeds. Anyone with a knowledge of pressure differential and dead space would realise the extreme difficulty of attempting this for any period of time.

It has generally been acknowledged that the diving-dress designed by Augustus Siebe in 1819 was the forerunner of the modern type. He was a German engineer who had settled in England, where he considered that his inventive genius was more recognised than in the Fatherland. His first suit, supplied with compressed air from the surface, was a jacket-type affair from which the expired air was allowed to escape through vents around the waist, by which it was known as an open diving suit. It had one obvious drawback: the user was obliged to remain upright to avoid the entry of water into the suit, and consequently the helmet, which was riveted to the waterproof flexible jacket. As an upright stance was the normal working position, this restriction was not as serious as would at first seem.

An improved version of this suit had its first real test in 1839, which could be termed the year in which the art of clearance diving, as we know it today, was founded. In August of 1782, the “Royal George”, then at anchor at Spithead, capsized and sank in only eleven fathoms of water, which caused the wreck, in such a busy anchorage, to be a navigational hazard. She was too heavy, being a first-rate ship of the line, to be raised, and demolition by surface parties proved impossible. She was to lie neglected for over fifty years before considering new means of trying to break her up. A diving bell was decided upon, and a team of Army divers, which must have upset the Nautics, arrived for the task. The bell proved unsatisfactory, but Siebe’s new modified diving outfit, the first closed type comprising a helmet sealed to a suit now watertight at both wrists and feet, and serviced by efficient hand-pumps, proved equal to the task. An escape-valve fitted to the helmet dispensed with the vents, giving the diver greater freedom of movement. Lead weights were attached to the chest, back, and boots, and the modern diving-suit differs in only minor details.

One problem remained. The helmet-and-hose diver required an attendant boat overhead to supply the compressed air, and hence he could work only in situ. Was there a way of using a portable air supply?

In 1680, Giovanni Borelli suggested that the expended air could be purified and rebreathed by being passed through a copper tube cooled by sea water, causing condensation designed to trap the impurities. In 1831, Charles Condert, an American, made the first self-contained outfit of compressed air, and he went for walks under the East River until the breaking of an inlet tube put a sudden stop to his peregrinations when he drowned. This set back further investigations into a self-contained set until an Englishman, Henry Fleuss, in 1868, patented the first workable fully self-contained apparatus using pure compressed oxygen. This was a breakthrough, as it allowed him to stay down for more than an hour, since he used caustic potash to remove the carbon dioxide from the exhaled gas, all of which hitherto had been allowed to escape.

Many inventions have languished for want of an occasion to show their worth. News headlines in 1910 were of the arrest of Dr Crippen, whereas those of 1912 dealt with the sinking of the “Titanic”. In both of these events, which caught the interest of the world, wireless, then a novelty, played the major role.

In 1880, while Fleuss was trying to instil interest in his new gear, the Severn Tunnel flooded. This was being built for the Great Western Railway by Brunel, to connect Bristol with South Wales, and was one of Brunel’s engineering wonders of the age. The flooded tunnel could not be pumped out from the Bristol side until a heavy iron door within the tunnel was closed. To reach the door entailed a descent of two hundred feet, followed by a further distance horizontally of one thousand feet - an impossibility for one diver using the Siebe set with its length o£ hose. The most famous diver in England at the time was Alexander Lambert, and Fleuss offered him the use of his new device. Using it, Lambert closed the door but only a man of his physique could have done so, after superman exertions that would have taxed a normal man accomplishing the same task on land.

“Send for Lambert” was the cry three years later when the tunnel flooded again, but on this occasion, using the Fleuss gear that had stood him in good stead previously, the redoubtable diver almost died before reaching the trouble spot, yet recovered and had sufficient courage to complete the job using his trusty Siebe helmet dress, assisted by other divers who paid out his lines.

Unknown to Fleuss, Paul Bert had by this time published a warning of the toxic effect of pure oxygen being breathed below twenty-five feet. As in the case of Halley, Fleuss had survived his experiments with the apparatus by pure chance, having limited his dives to shallow water.

Bert, a French physiologist, was the first man to study underwater medicine as a science, but at first had been more interested in the physiological effects resulting from the decreased pressure as one went up in a balloon, or climbed a high mountain. He could thus also be considered as the founder of aviation medicine. He discovered that pressure acted to change the proportions of oxygen in the blood, causing toxic symptoms which, in excess, could kill. This was a discovery of great importance, and having exposed this hazard, Bert then turned his attention to another, “the bends”, which had occurred among sponge divers for centuries, and had been accepted philosophically as occupational hazard, without any research having been undertaken into its possible cause. “The bends” was a simple term, descriptive of the twisting of the body by a sufferer seeking to relieve pain in the limbs and joints.

It was in 1840 that there came to the fore reports of strange illnesses among workers in caissons and tunnels. For subaqueous mining, and in particular for tunnels under rivers, it had been found necessary to use compressed air to cut down seepage of water into the workings. In 1854, after an explosion in a caisson under pressure, six workmen died, and a post-mortem revealed that one of the deaths was the result of decompression. In the same sort of occupation, hundreds of workmen had reported cramps over the years.

As post-mortems could be carried out only on the dead, it was difficult initially to relate the symptoms to the cause, but Thomas Littleton in 1855 recalled the phenomenon of “The Viper’s Eye” which sounds like the intriguing title of one of Sherlock Holmes celebrated cases. Boyle had been studying the effect of pressure on animals in an elementary decompression chamber, and in this case the subject was a viper, one of England’s few snakes that was poisonous. Scientists were wont to use as specimens animals such as snakes, lizards, and toads, to which most people had a natural revulsion and Harvey had used a lizard to study the circulation of blood. Boyle had noticed a tiny air bubble, or aeroembolism, in the pupil of the snake’s eye which, unknown to him had been a tiny bubble of nitrogen. Littleton correctly diagnosed that decompression symptoms might arise as the result of such a bubble pressing on the brain, and recommended gradual pressure changes.

Bert took over from where Littleton and others had left off, and in 1878 published his classic work “Barometric Pressure. Researches in Experimental Physiology”. The original investigations were prompted by a problem existing on land, but it also existed underwater, and at last was offered an explanation for the painful sufferings and deaths of the sponge divers.

After Bert had advanced the knowledge of the effects on the body of high pressure, it was realised that decompression symptoms might be prevented, or at least minimised, by gradual decompression. He himself died in Indo-China a few years later as a French Colonial official, but was to be followed on the scene by John Haldane, a Scot, who was a Doctor of Medicine.

As with his predecessor, Haldane was at first not interested in any way in diving, but concerned himself with air-fouling and mine safety, social problems of the day which, in his view, were being swept under the carpet. Many lives were being lost in mine disasters near the turn of the century as a result of fire-damp, and the stench of open sewers in slums was a menace to health.

His later research was into the effects of high altitude, so he went mountaineering abroad to discover his own reaction to ratified air. This led him to the important discovery of the influence of carbon dioxide upon human respiration, which to prove of great value in the practice of safe diving. He then investigated “caisson disease”, but, like Bert, found himself involved with the medical aspects of diving. After he had advised the Admiralty that there appeared to be no guide lines for safe diving, such was his standing that in 1906 they appointed a committee to report on the matter, making Haldane a senior member.

Decompression was the major problem that needed solving, and Haldane was able to call upon the experience of the few diving officers in the Navy. It had already been shown by Paul Bert that divers did not suffer “bends” when drawn quickly from thirty three feet up to the surface, being a pressure change from two to one atmosphere.

Possessed of this knowledge, and knowing from basic physics that relative pressure changes were greater the nearer one approached the surface, Haldane devised the method of halving the pressure in steps, thus developing the system of underwater stage decompression. He also improved the design and efficiency of the hand-pumps, and by this time Service divers were able to work at a depth of two hundred feet using a normal Siebe suit.

Although in 1915 a US Navy diver reached a submarine sunk at a depth of 340 feet, this proved the limit for compressed air diving, and a new breathing mixture needed to be developed for deeper dives. This was not because of the oxygen in the compressed air. Admittedly at this depth it was being breathed as though it were in a pure state, but oxygen toxicity is not acquired over a short period of time, and such dives were of short duration. The villain was again nitrogen, but acting in a different manner than in decompression sickness with its bubble formation.

Whereas Bert himself had observed that divers appeared to become intoxicated at depth, this had been put down, in part at least, to psychological reasons, the effect being more marked with some than with others. Were there not men who could drink a yard of ale, whereas others were known as “two-pot screamers”?

It was not until 1938 that Behnke, a US Navy doctor proposed the now generally accepted theory that this intoxication or narcosis was due to the increased partial pressure of the metabolically inert gas nitrogen. The narcosis had been accorded other names, such as “the narks”’ and “rapture of the deeps”. Although other gases can produce varying degrees of narcosis, (xenon at atmospheric pressure), these effects vary, and it was found that helium has a less narcotic effect. Unfortunately at that time the United States held a virtual monopoly on the supply of this rare gas, and adopted a dog in the manger attitude which directly contributed to the loss of the German airship “Hindenberg” which had to use hydrogen instead and caught fire. Little research therefore was able to be done using this gas other than the United States.

It is sufficient to say that helium gas, now readily available, containing only a small percentage of oxygen, is now used for deep dives, and has almost eradicated the narcosis originally experienced when nitrogen was the inert gas involved. That it causes distortion of the voice is a small price to pay as a side effect.

We should now go back to the beginning of the century to mention the contribution made by RH Davis. All diving then was being done by “hard-hat” divers in conventional dress. Fleuss, still active had given up developing his oxygen apparatus, and it was not in popular use. He was encouraged by Davis to join forces with him at Siebe Gorman and Company, Submarine Engineers, and this combination led to the development of several oxygen sets, which included the original submarine escape set designed in 1903-06 in which Admiralty took no interest until the sinking of the American submarine S4 with all hands, the usual fate of all who went down with a submarine. In 1927 he improved upon his original design and produced the Davis Submarine Escape Apparatus, which four years later saved six lives from HM Submarine “Poseidon” which had been rammed and sunk in the Sough China Seas. His name became a household word and the set a model for all navies. A similar set was also adopted by firefighters and rescue workers. It has since been superseded by free ascent and the use of a different service in the submarine itself before escaping.

The set was essentially regenerating, and took the name CCOUBA, Closed Circuit Oxygen Underwater Breathing apparatus. Its use played an important part during World War II, particularly during the later part, and included escapes from submarines, attacks on ships by human torpedoes, and the clearing of obstructions from enemy beaches prior to landing operations. They were later used for the clearing of mines and booby-traps from occupied ports. These operations, even without the meeting of enemy opposition, were fraught with danger, and required a degree of courage that could not be expected in peacetime. This, together with the post-war advent of the compressed-air aqualung saw the gradual fading out of CCOUBA from diving.

Since a self-contained set, with its absence of tell-tale bubbles, still had military applications, a review of the use of CCOUBA during the war should find in a history of diving.

A recall of names such as Bert, Fleuss, Haldane and Davis would lead on expect that Britain was to the fore in its use, but this was not so, and the honour undoubtedly fell to the Italian Navy, which was hardly in the same league, according to the Royal Navy whose thinking was, “The German Navy we know, the United States Navy we have heard of, who are you?”

The Davis Submarine Escape Apparatus was being made by Pirelli, the well-known Italian rubber company, before the war, under licence, and in 1935 two young Italian Navy officers, Tesei and Toschi proposed the use of a human torpedo, to be known later as “the pig”, since it did not endear itself to those working with it. The idea had been given to them by the exploits of two earlier Italians in 1918, who had sunk an Austrian warship in harbour, riding a “chariot”, but not using diving-sets, choosing instead to keep their heads just above water, a ploy hardly likely to meet with success with more modern means of detection. The Italian Navy pushed ahead at full speed with the project, in case war with Britain resulted, during the Abyssinian campaign in 1936. This was not to eventuate until the fall of France in 1940, and the Royal Navy would not have been so indifferent towards the new Axis partner had they known of the new “pigs” which had a range of ten miles, could submerge to one hundred feet, and travel at three knots. Unknown to Royal Navy, the first attempts to use them in action proved unsuccessful because of mischance, and not from failure of the suits, but on the 19th of September, 1941, three British ships were sunk at Gibraltar. Fortunately for the British, two of the sets were recovered from the harbour, and within days the Admiralty were in possession of them. The new menace was even more forcibly driven home a week before Christmas, when two capital ships of the Mediterranean Fleet, “Queen Elizabeth” and “Valiant”, were severely damaged in harbour at Alexandria by Italian Navy divers using “Pigs”.

Their Lordships wasted no time in ordering the development of human torpedoes modified to operate in colder northern waters, and called for volunteers, many of whom had little idea of what they had volunteered. There were fatalities during the early experiments, as not sufficient heed had been taken of Bert’s warning regarding the use of oxygen below thirty feet, but by September 1943, after the usual series of abortive attempts, the Royal Navy was able to carry out a successful attack on “Tirpitz” using midget submarines known as “X-Craft”, each manned by divers using special suits of closefitting rubber, which gave good protection from the sub-arctic conditions. Together with their goggle-eyes, and the later use of flippers, it is little wonder that the word “Frogmen” was coined by the Press, and survives to the present day.

Today, almost all CCOUBA sets are restricted to Service use, mainly because they give no indication to the enemy in the form of bubbles, but they offer no advantage to the civilian user, being costly, difficult to service, and with the risk of oxygen poisoning, limited to a shallow operating depth of thirty feet. They have been superseded by compressed-air, open-circuit system, the oxygen rebreather being considered too risky. Both are types of SCUBA, self-contained underwater breathing apparatus, but the term “SCUBA diving” today would tend to exclude oxygen breathers, and they are not sold commercially.

The set in popular use, and which has revolutionised diving to the extent millions of people use them for sport, was co-invented by the Frenchmen Jacques-Yves Cousteau, and Emile Gagnan, in June, 1943. Ten years before, a retired French Navy Commander, Yves Le Prieur, after earlier work, had brought out the prototype air-lung for diving. It utilised a compressed-air tank and a hand-operated breathing valve, with light face-mask and fins, which gave great mobility but suffered from the disadvantage that the air supply needed to be adjusted by hand which meant constant fiddling and loss of air, cutting down diving time.

What was needed was a regulator of the demand type, and this Cousteau and Gagnan supplied. It was the answer. As well as giving great mobility also, it enabled the diver to breathe normally. Gagnan had already developed several kinds of gas-flow regulators used on cars, and in operating theatres during the war, but it was Cousteau who figured that they could be adapted for underwater use. So the sport of SCUBA-diving was born in war-time, but not for war purposes. Cousteau thought only of exploring the mysteries of the sea.

The basic single-stage, double-hose regulator used commonly today is little different from the 1943 model that enabled Cousteau to produce the underwater film "Sunken Ships" in 1944.

Even the cold, which was a problem for the crews of the "X-craft", poems no discomfort to the modern SCUBA-diver, who can break a hole in the ice and go under, thanks to the wet-suit. Made of unicellular, neoprene rubber with a synthetic cloth packing to prevent tearing, it traps a thin layer of water against the skin, which is quickly brought to body temperature to act as an insulator.

Safe diving is now a sport within the reach of everyone physically able to dive, add observe the basic rules of safety.

What of the future? Experiments begun in 1961 lead some to suppose that man can flood his lungs with oxygenated water and "breathe" it, if such an expression is permitted. This would lead to dives to depths previously unknown, and a return to the surface without any need for decompression. Reading through this brief history, when pioneers risked, and sometimes lost their lives trying out a new technique, who knows but that this might not succeed? There will be someone willing to try it.

AQUATIC STATISTICS

BY TERRY MURPHY

A summary. The full text is available from the School of Underwater Medicine Library. This article is a collection of statistical data related to aquatic deaths.

Drowning is responsible for 6 fatalities per 100,000 people on a world wide basis and 4 per 100,000 in Australia.

The World Health Organisation classified drowning under five groupings for statistical purposes:

1. All accidental deaths by drowning where the cause is known except suicide and those associated with water transport (E.910)
2. Accidents to watercraft causing drowning (E.830)
3. Other drownings associated with watercraft (E.832)
4. Suicide by drowning (E.954)
5. Drowning where there is doubt as to whether this was due to suicide or purposely inflicted (E.984)

The 1-4 age group is responsible for far more drownings than any other. Yet this should be the group of drownings most amenable to prevention, as it is largely due to inadequate supervision of a child unable to swim - as seen in backyard swimming pool deaths.

Watercraft accidents tend to affect the middle age groups predominantly. Studies in Geelong[4] and overseas have incriminated alcohol as being associated with almost half of the drownings in this middle age group. Giertson in 1970 obtained figures of 50% of drowning accidents in Norwegian seamen and one third of those in Finland occurred with the deceased being under the influence of alcohol. The use of small boats inadequate for the conditions, inexperience of the users and the non-wearing of flotation vests were also major factors.

A comparison with the 1967 deaths by drowning and motor vehicle deaths in Australia according to age groups gives the following results.