Capt (Dr) Peter Kerkenezov
Shipmaster (Foreign Going/Unlimited), Occupational Diver, Veterinary Surgeon

To: Environment and Communications References Committee,
Re: Enquiry into the efficacy and regulation of shark mitigation and deterrent measures

Introduction

The following is based on long term observations and connection with the sea however I would also prefer to have had access to unbiased scientific data. It should be incumbent on all Australian state government departments to make available all pertinent data, including DNA, collated so far, to those of us who have been invited (on *12th December 2016*) to write submissions to the References Committee. I have not been granted access to germane government data, apart from that on the Wildlife Tracking web site, so the following remains an appraisal from the perspective of a veterinary surgeon, master mariner, professional diver and someone who has for a long time been fascinated by sharks.

It appears individual States closely guard their own data on sharks when this information ought to be made freely accessible. It is also unhelpful that the Fisheries NSW shark tracking information (Wildlife Tracking) maps and data observed in the public domain may not be used or referenced without explicit

written consent from the various project partners. Shark management policy should be at a federal level as sharks know no borders and State governments appear only to tell us what they would like us to believe. That is, transparency, co-operation and sharing of information are necessary ingredients to expedite the best outcome for the survival of all God's creatures, including man.

The problem as most know it is that there has been an escalation in human – shark encounter along the NSW coastline. The reason appears multipart necessitating investigation of, at least, the various controversial activities and natural phenomena identified further on in this essay.

The NSW Government's immediate response to the shark threat was set up a $16M tax payer fund to install shark barriers at Ballina and Lennox Head, implement a catch and release tagging program (using SPOT and internal acoustic V16 transmitting tags, and VR2 and VR4G receiver stations) to track sharks, and deploy gill nets as beach protective measures. These three contentious measures prompt discussion here and some reiteration of what has been said in previous articles (Figures 5 & 11) as the facts remain.

Shark Barrier at Lighthouse Beach Ballina

On 1st April 2016, the contractor revealed to me the intended operational plan to install a shark barrier at Lighthouse Beach, Ballina. It was plain from the start that the design and methodology for installation was flawed and unachievable. In essence, there was deemed a poor understanding of local conditions by the contractor. There was also the added high probability the structure would quickly fatigue and fail from ocean onslaught and subsequent recovery of 'the mess' would be difficult and expensive (as seen at Lennox Head). Furthermore, the commissioned work vessel was engaging work in the surf zone (Figure 1).

Fig. 1

The contractor was offered a workable and simple substitute method for installation but on 5th August reported the relevant government department civil engineers would not consent to any major changes to the initial operational plan. The upshot of this was a second attempt to install the barrier commenced early August and on 5th August this attempt to install the shark barrier at Ballina failed due to bad weather (Figures 2a & 2b). Fortunately all this paraphernalia had not yet been deployed out into the sea.

Fig. 2a

Fig. 2b

I understand this project was sanctioned by the Department of Primary Industries (DPI) and labelled a 'trial' (experiment). One would expect the DPI to have needed a marine execution plan from the contractor outlining an overview, the nature and scope of the intended methodology, a demonstration of operator awareness of local conditions, a demonstration of understanding regulatory requirements, the work vessel's safety management systems and operation certificate, and intended emergency response. Members of a government review committee should have at least included ocean engineers, master mariners and professional divers and local maritime professionals before engaging in advanced underwater works in such a hostile location. The trail should never have been allowed to commence, particularly as the apparent marine execution plan was sub-standard and the site unsuitable for the prescribed structure.

Smart Drum Lines and acoustic Tagging

The smart drum lines (Figure 3) are not that smart when there is mounting evidence worldwide of a likely link between coelom (abdominal, internal) telemetric tagging and increased human-shark encounters (Figure 5). Many citizens are concerned the DPI is using our local waters as a laboratory without invoking the 'precautionary principle'. Furthermore, the scientific validity of much of the tagging data is questionable due to high risk bias, and any harm-benefit analysis appears to have taken a back stage. Some researchers justifiably claim the first seven days of data after tagging is best discarded to diminish recognised latent bias due to abnormal post-release

behaviour. It is, however, highly probable the demeanour of most captured sharks, inserted with a 69 kHz abdominal V16 acoustic tag transmitting at 150 – 162 dB power output, is altered for the rest of its pitifully shortened life span (Figures 5, 9a and 9b).

Fig. 3

Veterinarians deal with confronting animal welfare ethical dilemmas daily so it should come as no surprise the current tagging of marine animals throughout Australia has triggered alarm (Figures 5, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 8, 9a and 9b). The tagging of marine animals for research purposes has reached the level of insanity. The size, shape, methods of attachment or insertion of telemetric tags into healthy whales and sharks has become disturbing and out of control.

At first glance it seems a good thing that a number of marine scientists have taken advantage of unexpected government funding to further their studies of large mid water sharks. It is particularly troubling however to learn the tagging procedures are causing mutilation, morbidity and death whilst the public are being deluded into believing the shark management strategies are virtuous when clearly not (Figures 4, 9a and 9b).

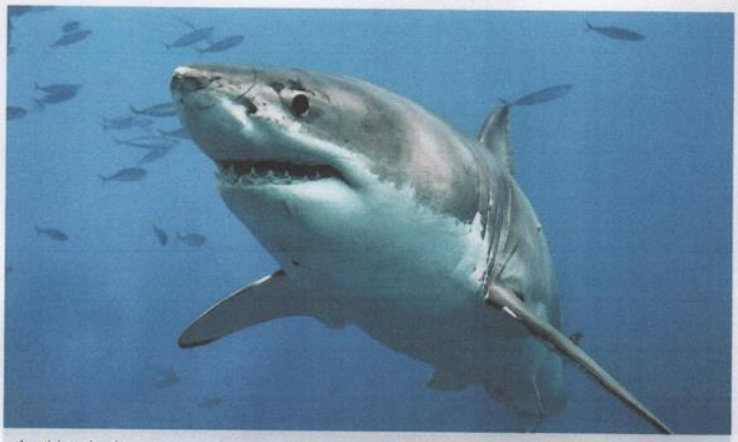
Bolting inhibitory telemetric tags to shark dorsal fins, driving titanium harpoons into whales with transmitters attached (Figure 8) and performing abdominal surgery without anaesthesia or sterility to implant transmitters (Figures 9a and 9b) is not ethically tolerable. Large mid water sharks rarely transmit for extended times following abdominal surgery.

Marine scientists Drs Barbara Block and Barry Bruce are reported to have tagged more sharks worldwide than most and have expressed concern something is happening to all these tagged Great White Sharks. They suggest long-liners and commercial fishermen are to blame (Discovery Channel). It must occur to them at some instant that possibly they are a major part of the problem since inserting a high power (160 dB) transmitting (69 kHz) foreign body into the abdominal cavity of any animal has a high probability of doing harm (Figure 4).

Fig. 4 The recent death of an Orca in Canadian waters all but confirms what many people have been saying – that the risks of invasive tagging is significant, and in many cases leads to undue stress, infection, maiming and death of the recipient animal.

Something Fishy About Shark Tagging Program

If a master mariner, a commercial diver and a vet got together, what would they talk about? Sydney branch member Captain (and Dr) Peter Kerkenezov is all three, and as everybody flocks to the beaches this summer, his thoughts are most definitely with the sharks.



A white shark.

A review of the current practices of large shark tagging in Australia signals urgent impartial investigation into apparent multiple detrimental outcomes from unethical surgical procedure and the use of the coded transmitter frequency of 69 kHz.

The movement mapping data derived from implanted intra-abdominal transmitters may also be flawed, and any conclusions erroneous or clouded, due to change of behaviour following surgery.

Visual documentation clearly demonstrates animal welfare and surgical principles being violated during catch and release, and the surgical implantation of transmitters into the body cavity of sharks.

This act of veterinary science is not being performed by licenced veterinary surgeons, but by non-vets, and there is no real idea of how many of these sharks die as a consequence after release.

It has been reported over 800 large sharks have been tagged in Australia with acoustic tags and less than 50 sharks have appeared on acoustic receivers in the last five years.

Where have all these acoustically tagged sharks gone? It seems mortality and morbidity data is unavailable, and if institutions do have such data, then it should be made available.

The West Australian Sharksmart website reveals only 27 White Sharks being detected, despite the network being operational for over five years.

Surgical implantation of a transmitter into the body cavity of a shark without anaesthetic is an inhumane act and should not be performed. Rolling sharks onto their backs induces a catatonic state and there is little firm evidence that this equates to a meaningful reduction in pain sensation.

Furthermore, the implantation of non-sterile transmitters into any animal, the use of non-sterile instruments and the failure to wear surgical gloves are also deemed inhumane acts.

The most fundamental objective of any surgery is to do no harm, and the following discussion will indicate this is clearly not happening.

The tagging program of sharks may have good intent to conserve the species, however growing evidence suggests otherwise.

If tagged sharks emitting acoustic pings at 69 kHz are readily detected by man-made receivers, it follows then that any animal which has a hearing range that includes this frequency will pick up a tagged shark's presence.

In areas such as Ballina, the white sharks, greater than 3.5m long, depend on dolphins, whales and large fish, and the 69 kHz frequency emission from implanted white sharks sits in the middle of the hearing range of dolphins.

A 69kHz coded transmitter

Dolphins could likely now avoid predation and a hungry shark could become a dangerous shark. That is, until it becomes sick and dies from surgical complications or detected and killed by its only ocean predator, the killer whale.

Research documents confirm harbour seals can detect 69 kHz up to 3.4km away.

Acoustic tagging has been undertaken at Port Stephens and on the Gold Coast for some years, and Ballina, Lennox Head, Evans Head and Byron Bay are geographically in between these two locations.

Is there a possibility that the tagged sharks are responsible for the increased attacks on surfers? The V16 tags transmit at 160 dB when on high power, and the ongoing ping noise could have a profound effect on a shark's health and be constantly annoying, enough to possibly cause behavioural change.

Overall, it appears the coelom implantation process should cease, at least until further independent investigation of the status quo and an independent ethics committee review.

All data to date has to be put on the table for all to see. There are too many negatives and no positives, unless the demise of the White Shark is in fact considered a positive.

If a shark survives the catch-and-release and surgery without ill health, and can continue catching prey and keep out of the way of Orcas then great, however it appears the odds are stacked against this happening at every turn, if the theory around 69 kHz is validated.

Acoustically tagging sharks has been popularised as a valuable tool for their conservation when in fact it may be contributing to their annihilation inter alia.

Maybe this is surreptitiously what governments want to achieve? ■

Fig. 5 *The Master Mariner* Dec 2015.

Fig. 6a

Fig 6b Hook wounds.

Fig. 7a

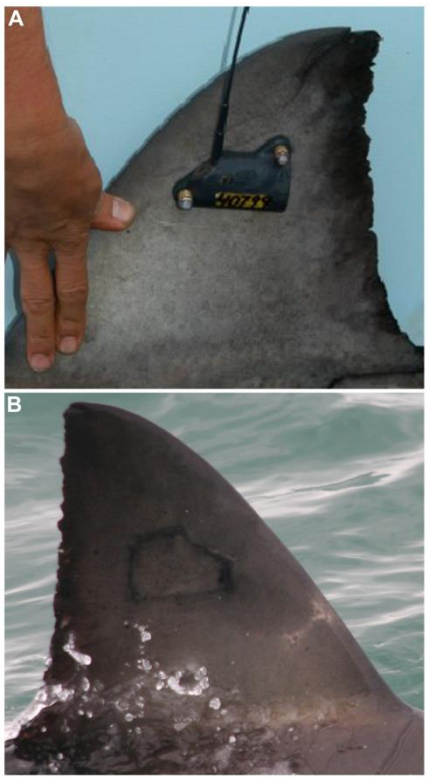


Fig. 7b SPOT tag.

Fig 7c

Fig 7d Mutilation.

Fig. 7e Mutilation.

Fig. 8 Harpoon type tracking transmitter thrusted into whales.

Fig. 9a A captured (baited, hooked, and dragged fighting alongside) White Shark (ram ventilator), unable to 'breathe', undergoing non-sterile invasive abdominal surgery to insert a foreign body (V16 69 kHz acoustic tag) without anaesthetic. The surgery is being performed underwater by non-veterinary surgeons. Fisheries NSW data published throughout 2015 and 2016 shows of 59 White Sharks tagged in this way, the published transmission times varied from 0 – 362 days (Wildlife Tracking) when the specified battery life for a V16 tag is 10 years. 11 sharks failed to transmit and could arguably be assumed dead from the start. It is believed the rest will die at varying short term intervals when the expected life span could normally be 50 – 70 years.

Fig. 9b A captured Bull Shark undergoing non-sterile abdominal surgery underwater by a non-veterinary surgeon. The way marine research activities are performed, the partiality of current animal ethics committees and credentials of committee members needs urgent independent review.

Scientific unanimity is absent as many are realising the pain and suffering the various types of tagging can cause. South African researchers recently observed SPOT tags causing permanent structural damage to White Shark dorsal fins depending on the duration of tag attachment. SPOT tags that detached within 12–24 months did not cause long term damage apart from pigmentation scarring however after 24 months permanent damage was evident (Published: 14th November 2011).

Drilling a shark's dorsal fin and bolting on a tag that becomes fouled with marine growth interferes with the hydrodynamics and normal function of the fin to maintain the animal's stability (rolling and yaw) and manoeuvrability (Figure 10).

Fig. 10 A healthy curious Tiger Shark is checking an unsuspecting diver and demonstrates dorsal and pectoral fins in action assisting stability and manoeuvrability.

Since the NSW Premier and his advisers would be unable to show a burden of proof the hook-tag-release procedures do not cause death (shark and human), violate marine animal welfare, and cause long lasting harm to the marine ecosystems, the current methods of tagging should cease forthwith.

Despite the vast majority of the population calling for the Government to leave the sharks alone as they are supposed to be there and have nowhere

else to go, the Premier has instead upped the ante to inflict further assault by introducing more mesh netting (Figure 11).

8 NEWS SPECIAL REPORT

Shark strategy 'lurching' round

Outspoken vet takes aim at netting proposal

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AN OUTSPOKEN Ballina vet and conservationist has accused the NSW Government of "lurching from one action plan to another" on sharks like a "drunken sailor".

Dr Peter Kerkenezov has taken aim at the government's decision to introduce mesh netting.

He said 12 shark encounters had been recorded on netted beaches off New South Wales in the past decade, including three white shark bites.

"The mesh nets will now probably catch the remaining live tagged sharks that the DPI has spent thousands of taxpayer dollars to tag," he said.

The Ballina vet, ship master and professional diver said there were wider issues at play.

"The food chain remains under intense pressure from unsustainable fishing, continuing ocean pollution, mangrove destruction, acidification of seawater and global warming," he said.

"The world's seabird population has declined 70% since the 1950s, reflecting long-term and large-scale change in marine ecosystems.

"The implications and complexities are profound.

"Decline in seabird waste causes decline in valuable nutrients that fertilise the sea and feeds marine life.

"The knock-on effect through the food chain from unicellular organisms to the top apex predators translates into less food for all.

"In essence, there is deemed a poor understanding of the status quo and the government needs to marshal its resources to determine the definitive basis for the increased human-shark encounters before embarking on a slaughter policy that could plunge our marine ecosystems into further decline.

"A forensic investigation into ocean outfalls and the Richmond River would be a good starting point."

Dr Kerkenezov has also repeated his criticisms of the NSW Government's "smart" drum lines being used for tagging great white sharks off Ballina.

He said the record length of time any tagged sharks had transmitted for was 400 days, hinting that the tagging process could be responsible for shark deaths.

"This part of the overall shark program is trotted out as legitimate research and relies on the Animal Research Act 1985 to provide protection to those deliberately mutilating the shark and providing protection for their demise," he said.

"Acoustically tagging sharks has been popularised as a valuable tool for their conservation when, in fact, it is contributing to their annihilation."

A response has been sought from the NSW Department of Primary Industries.

Fig. 11

It is reality many sharks cannot survive the stress of being hooked and released as evidence reveals only 53% of Hammerhead Sharks (rely on ram ventilation to 'breathe') and 76% of Bull Sharks (able to buccal pump to 'breathe') will survive. Equivalent data on White Sharks (ram ventilators) is unknown however one can safely conclude that to further stress and tow these animals by the mouth (a cartilaginous jaw) to a new location, further mutilate them by rolling them on their backs and inserting non-sterile acoustic tags into their abdominal cavities, and attaching transmitting hardware to the dorsal fin guarantees the morbidity and mortality rates will escalate.

"Over 500 white sharks have been tagged off the Australian and NZ coast by a number of researchers. There are over 2,000 acoustic receivers deployed around the Australian coastline and the national database repository, established to "share" tagging information, showed only 213 tagged white sharks transmitted at least once" (Kim Allen 2016)

A recent video clip of the DPI staff performing abdominal surgery on four Bull Sharks in the Bellinger River demonstrated a non-sterile technique carried out in river water that can only be described as an inhumane act. If this act of veterinary science was to be performed on a terrestrial animal, without anaesthetic, without sterility, without follow up, and by lay persons, then the perpetrators could expect prosecution.

"Veterinarians are uniquely qualified to take the lead on animal welfare and ethics, and that the public certainly expect us to, and our professional codes of conduct highlight that the welfare of animals should be our primary concern" (Dr. Rosemary Elliott 2015).

Mesh Nets

This succession of one controversial strategy to the next gives the impression of 'the blind leading the blind'.

It is my understanding the scientific community does not condone the deployment of gill nets favoured by the NSW government and the Ballina Shire councillors. It is perceived by many that the Department of Fisheries has become politicised and thus lost credibility.

Nets and drum lines were first introduced circa 1930 and over time these devices have killed tens of thousands of marine animals and driven many to near extinction. Since 1962 the Queensland Shark Control Program has been responsible for the mass capture of 84,800 marine animals including whales, dolphins, sharks, turtles, manta rays, and dugongs (Figures 12a, 12b, 12c, 12d).

Air breathing marine animals have no chance when enmeshed for a period beyond their breath holding capability (Figure 13).

Some mid water sharks such as White Sharks and Hammerheads employ ram ventilation to oxygenate their blood and this means they must keep swimming to 'breathe'. On the other hand, Bull Sharks and Tiger Sharks are able to buccal pump oxygenated sea water across their gills via their spiracles and thus more likely to survive entanglement in the short term.

Local fishermen described (December 2016) one recent entanglement of a 3.5m White Shark at Sharpes Beach that was subsequently cut free of the net and towed further out to sea to be acoustically tagged and released. This shark was spent on release and believed to have little chance of survival yet it was reported a successful undertaking. The Wildlife Tracking web site has yet to list this shark as surviving.

QUEENSLAND SHARK CONTROL PROGRAM NOV 1962-DEC 2014				
SPECIES	*TOTALS*	*Inc Pups*	*RATING*	*EPBC*
ANTARCTIC MINKE WHALE	1		DATA DEFICIENT	PROTECTED
AUSTRALIAN SHARPNOSE SHARK	6		LEAST CONCERN	
AUSTRALIAN BLACKTIP	21		LEAST CONCERN	
AUSTRALIAN SNUBFIN DOLPHIN	2		NEAR THREATENED	PROTECTED
BARRACUDA	7		DATA DEFICIENT	
BARRUMUNDI	16		VULNERABLE	
BATFISH	1		LEAST CONCERN	
BIGNOSE WHALER	5		DATA DEFICIENT	
BLACK KINGFISH COBIA	13		DATA DEFICIENT	
BLACKTIP REEF WHALER	4576	605	NEAR THREATENED	
BLIND SHARK	9		LEAST CONCERN	
BLUE GROPER	92		DATA DEFICIENT	
BLUE SHARK	45		NEAR THREATENED	
BONITA	69		LEAST CONCERN	
BOTTLENOSE DOLPHIN	52		LEAST CONCERN	PROTECTED
BRONZE WHALER	130	19	NEAR THREATENED	
BULL RAY	32		DATA DEFICIENT	
BULL WHALER	2940	154	NEAR THREATENED	
CATFISH	126		DATA DEFICIENT	
COD	54		DATA DEFICIENT	DATA DEFICIENT
COMMON BLACKTIP WHALER	101		NEAR THREATENED	
COMMON DOLPHIN	170		DATA DEFICIENT	PROTECTED
CONGA EEL	1		DATA DEFICIENT	
COWNOSE RAY	668		NEAR THREATENED	
CRAB	1		DATA DEFICIENT	
CRAYFISH	6		DATA DEFICIENT	DATA DEFICIENT
CREEK WHALER	13		LEAST CONCERN	
CROCODILE	3		LEAST CONCERN	PROTECTED
DEVILRAY	135		DATA DEFICIENT	
DOLPHIN	657		DATA DEFICIENT	PROTECTED
DUGONG	689		VULNERABLE	PROTECTED
DUSKY WHALER	310	15	VULNERABLE	
EAGLE RAY	433		DATA DEFICIENT	
EASTERN SHOVELNOSED RAY	23		LEAST CONCERN	
ELECTRIC RAY	6		DATA DEFICIENT	
FISH	142		DATA DEFICIENT	
FLATBACK TURTLE	9		VULNERABLE	PROTECTED
FOSSIL SHARK	6		VULNERABLE	
GIANT SHOVELNOSE RAY	4		VULNERABLE	
GIANT TREVALLY	2		DATA DEFICIENT	
GRACEFUL WHALER	49	4	NEAR THREATENED	
GREAT HAMMERHEAD	283		ENDANGERED	

Fig. 12a

GREEN SAWFISH*	1		CRITICALLY ENDANGERED	PROTECTED
GREEN TURTLE	278		ENDANGERED	PROTECTED
GREY CARPET SHARK	16		NEAR THREATENED	
GREY NURSE SHARK	265	21	CRITICALLY ENDANGERED	PROTECTED
GREY REEF WHALER	337	44	NEAR THREATENED	
GROPER	72		DATA DEFICIENT	
GUMMY	13		DATA DEFICIENT	
HAMMERHEAD SHARK	13223	3063	DATA DEFICIENT	
HARDNOSE WHALER	9		NEAR THREATENED	
HAWKSBILL TURTLE	33		CRITICALLY ENDANGERED	PROTECTED
HERRING	3		DATA DEFICIENT	
HUMPBACK WHALE	58		VULNERABLE	PROTECTED
INDO PAC HP DOLPHIN	30		NEAR THREATENED	PROTECTED
IRRAWADDY DOLPHIN	56		VULNERABLE	PROTECTED
JEWFISH	48		LEAST CONCERN	
KILLER WHALE	1		DATA DEFICIENT	PROTECTED
KINGFISH	10		DATA DEFICIENT	
LEATHERBACK TURTLE	47		ENDANGERED	PROTECTED
LOBSTER	2		DATA DEFICIENT	
LOGGERHEAD TURTLE	719		ENDANGERED	PROTECTED
LONG NOSE WHALER	1154	62	NEAR THREATENED	
MACKEREL	18		DATA DEFICIENT	
MAKO	121		DATA DEFICIENT	PROTECTED
MANGROVE WHALER	17		DATA DEFICIENT	
MANTA RAY	442		VULNERABLE	PROTECTED
MARLIN	39		DATA DEFICIENT	
MILK SHARK	42		LEAST CONCERN	
MUD CRAB	11		DATA DEFICIENT	
NARROW SAWFISH*	52		ENDANGERED	
NERVOUS SHARK	2		DATA DEFICIENT	
OLIVE RIDLEY TURTLE	4		ENDANGERED	PROTECTED
PIGEYE WHALER	319	8	DATA DEFICIENT	
PORPOISE	29		DATA DEFICIENT	PROTECTED

Fig. 12b

PORT JACKSON SHARK	2		LEAST CONCERN	
PUFFER FISH	29		LEAST CONCERN	
QUEENFISH	54		DATA DEFICIENT	
QUEENSLAND SAWFISH*	1		ENDANGERED	PROTECTED
RAYS	15306		DATA DEFICIENT	
RETICULATE WHIPRAY	14		VULNERABLE	
SALMON	18		DATA DEFICIENT	
SANDBAR WHALER	265	4	VULNERABLE	
SAND CRAB	4		DATA DEFICIENT	
SAWFISH*	3		DATA DEFICIENT	DATA DEFICIENT
SCALLOPED HAMMERHEAD	857	129	ENDANGERED	
SCHOOL SHARK	50		VULNERABLE	
SEA SNAKE	5		DATA DEFICIENT	PROTECTED
SHARKRAY	15		VULNERABLE	
SHARPTOOTH SHARK	223	45	VULNERABLE	
SHORT TOOTHED WHALE	28		DATA DEFICIENT	PROTECTED
SHOVELNOSE RAY	808		DATA DEFICIENT	
SILKY WHALER	31		NEAR THREATENED	
SILVERTIP WHALER	1		NEAR THREATENED	
SLITEYE SHARK	14		LEAST CONCERN	
SNAPPER	25		DATA DEFICIENT	
SPEARTOOTH SHARK	1		CRITICALLY ENDANGERED	PROTECTED
SPINNER DOLPHIN	17		DATA DEFICIENT	PROTECTED
SPOT-TAIL WHALER	337		NEAR THREATENED	
STINGAREE	3		DATA DEFICIENT	
SWEETLIP	1		DATA DEFICIENT	
SWORDFISH	10		LEAST CONCERN	
TASSLED WOBBEGONG	1		NEAR THREATENED	
TAWNY SHARK	911	5	VULNERABLE	
THRESHER SHARK	8		VULNERABLE	
TIGER SHARK	15410	2664	NEAR THREATENED	
TOADFISH	18		DATA DEFICIENT	
TUNA	773		DATA DEFICIENT	

Fig. 12c

TURRUM	10		DATA DEFICIENT	
TURTLE	3954		DATA DEFICIENT	PROTECTED
TROPICAL SAWSHARK	30		LEAST CONCERN	
UNKNOWN SHARK	398	42	DATA DEFICIENT	
WAHOO	2		LEAST CONCERN	
WEASEL SHARK	11		DATA DEFICIENT	
WHALE	33		DATA DEFICIENT	PROTECTED
WHALE SHARK	13		VULNERABLE	PROTECTED
WHALER	13825	2172	DATA DEFICIENT	
WHITE SHARK	785	14	VULNERABLE	PROTECTED
WHITE SPOTTED EAGLE RAY	203		NEAR THREATENED	
WHITE SPOTTED GUITARFISH	18		VULNERABLE	
WHITECHEEK SHARK	259	22	NEAR THREATENED	
WHITETIP REEF SHARK	31	6	NEAR THREATENED	
WINGHEAD HAMMERHEAD	7		NEAR THREATENED	
WOBBEGONG	34		DATA DEFICIENT	
ZEBRA SHARK	628		VULNERABLE	
NON SHARK SPECIES	26719			
UNBORN PUPS	9098			
TOTAL ALL SPECIES	84863			

*LISTED BY DAFF AS BY-CATCH

RAYS	18110
TURTLE	5044
BONY FISH	1652
DOLPHINS	1014
DUGONGS	689
WHALES	120
CRUSTACEANS	24
REPTILES	8
EEL	1

Fig. 12d

Fig. 13

Hawaii tried culling sharks for 18 years and eventually concluded nets and drums did not prevent shark related incidents. During the last ten years, twelve shark encounters have reportedly occurred off NSW's most popular and netted beaches including three attributable to White Sharks, four due to Bronze Whalers. To term deploying mesh nets off the coast at Ballina as a 'trial' or 'experimental' is misleading.

General Discussion

The Laws of Man and human activity are clearly not in harmony with the Law of Nature on many fronts. The law makers so far seem to have little understanding that the extinction of sharks, including the White Shark, will have a negative effect on ocean ecosystems and ultimately mans' survival.

Imagine a 'baseline' at a time when there were far more sharks and other marine life in the Richmond River than there are today. In 1954 the river was in its original state; vibrant and healthy. It was an epoch when the human inhabitants (Ballina population approximately 2,400) installed protective

barriers (pylons and wire mesh) to ensure safety rather than impose an orchestrated slaughter policy to kill sharks as we are seeing today.

Entering the sea always had inherent dangers and we still do so at our own risk (Figure 14). Knowledge of this 'original baseline' is fast disappearing as the older generations die off. New comers to the Ballina Shire, particularly politicians and young academics, who have no idea of the past, instate their own 'baselines' and standards that are abhorrent to those who have walked (and dived) before.

Fig. 14 Author performing a bottom survey in an area where large mid water sharks commonly frequent.

The 'timeline' reveals grubby outcomes to the point where today the Richmond River may be described as a 'drain' (Figure 15) by comparison and no longer a healthy habitat for numerous oyster farms, grey nurse sharks, sun fish, garfish, bonito, trevally and numerous other species including the occasional humpback whale.

Fig. 15 Richmond River devoid of fish and polluted by bilge oil October 2016.

Prawn trawling, fish trapping and whaling boomed in the 1950's – 60's. Humpback whales were harpooned to the brink of extinction and this industry eventually became nonviable and the whaling station at Byron Bay shut down. The future has given way to an enormous human population growth accompanied by immense pressure from unsustainable fishing, continuing ocean pollution, mangrove destruction, acidification of seawater and global warming. Oyster beds, the natural filters of sea water, have largely surrendered to pollution here in Ballina. *"Anyone who believes in indefinite growth on a physically finite planet is either mad or an economist" (David Attenborough)*

In today's world 90% of the wild fish stocks have been decimated, 70% of the sea birds have gone (Figure 16), 90% of the world's shark population has been lost since 1950 and our oyster farms are struggling. 100 million sharks are being killed annually for their fins (Figure 17). The oceans are already in crisis and further human interference in killing marine animals is senseless.

Fig. 16

Fig. 17

It appears the historic cluster of human – shark encounters locally stems from a number of different influences and is an expression of what is happening in the ocean beyond. Without first understanding 'the why' and engage in killing sharks (and other marine animal by-catch) to placate those engaging recreational board riding is reprehensible. This simplistic mindset has to change. It is disconcerting to read statements that sharks are *"useless monsters to be turned into fertiliser"* and broken logic such as *"save the kids"*, in local newspapers.

In recent times there have been plausible suggestions that some shark attacks in Western Australia could be linked to live export shipping, and cage diving with White Sharks in South Australia and Tasmania. Collected data since 1997 has shown livestock ships in close proximity to where human-shark encounters have occurred in many instances. These innuendoes need to be taken seriously as chumming (including livestock ship maceration and carcass jettison) does change shark behaviour that could lead to more accidents and tragedies for people and sharks.

"You should never bait a predator as once you associate humans with food they will have a hard time keeping away. Commodifying predators in any form is problematic". (Andrew Evans 2013).

"I understand the Western Australian government prohibit cage diving with White Sharks due to the risk of unknown potential problems" (Peter Stephenson 2016).

White Sharks are ocean nomads and travel to and from QLD, NSW, SA, WA, Victoria, Tasmania, South Africa, New Zealand, and the Middle East (Figure 18).

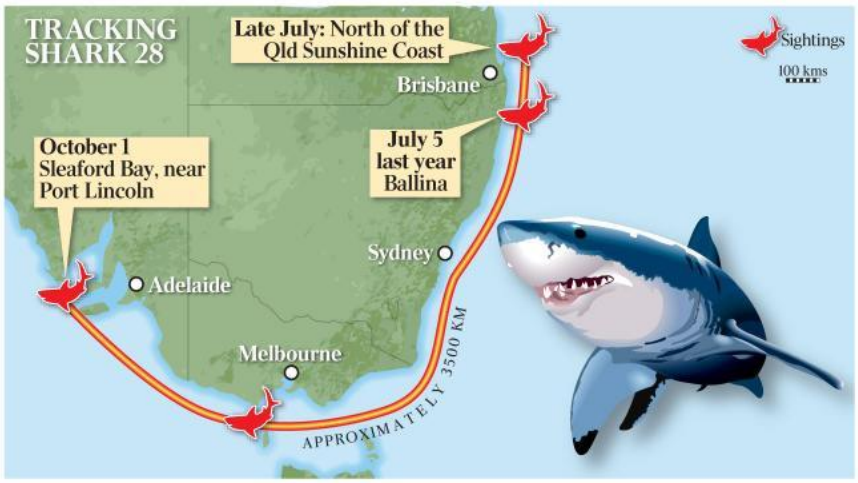

Fig. 18 Link between Ballina and South Australia cage diving location.

Fisheries NSW shark tracking project shows White Sharks 28 and 25 migrated from Ballina to the cage diving areas in South Australia. White Shark 4 migrated to South Australia and back to Ballina thus establishing a link.

White Pointers have been known to hang out in one location for around 2 months and on the other hand cover approximately 36 nautical miles in 24 hours. Sharks do accompany livestock ships on the Australian coast and to the Middle East and elsewhere.

On one occasion during 2003, whilst I was master of a 50,000 GT livestock ship on the Australian coast, some of the crew were observed to hook large sharks one after the other and allowed them to getaway by having the barbless hooks straighten out. It is, of course, natural for sharks to be attracted to a potential food source. It is my contention sharks are able to identify individual vessels by engine noise, smell, vibration, electromagnetic fields (magnetic signature) and possibly other means.

"During two voyages in 2008, a series of large sharks were observed following MV Merino Express and MV Hereford Express from Day 3 and Day 4 respectively out of Freemantle. Over the following days when sheep carcasses were disposed overboard after necropsy, sharks including a Great White were observed to take these carcasses soon after they entered the water" Prof Lloyd Reeve-Johnson former AAV, MV Merino Express May 2008 and MV Hereford Express November 2008.

"Several large sharks including Oceanic Whitetip and Mako sharks were observed to take carcasses just before we entered the Red Sea. After that point remaining carcasses were macerated so it was difficult to observe surface feeding, however it is highly likely that the sharks would have continued to follow the ship as we entered the Red Sea" Prof Lloyd Reeve-Johnson AAV, MV Merino Express 2008

In December 2010, Egypt launched a campaign to clear territorial waters of Australian dead sheep. A survey showed 33 carcasses scattered off Ras Mohammad National Park. Sham el Sheik, a popular resort in Egypt, recorded five shark attacks within 24 hours on 30th November and 1st December coinciding with the dumping of over 30 sheep carcasses in the area.

Whilst there may be no connection, information from a contemporary marine traffic application had the cattle carrier "Devon Express" departing Townsville on 27th January 2015 and may have passed Ballina around the 2nd February, southbound for Portland in Victoria to load more cattle for export.

The tragic death of a board rider at Shelly Beach occurred on 9th February, reportedly due to a White Shark that might have been travelling or a temporary resident.

Part of a ship's Passage Plan orders not to throw dead sheep overboard whilst within 12nm of the Australian coast. Tens of thousands of dead and terminally ill sheep are dispatched overboard from ships every year (Figure 19) and their corpses causing concern for people in the Maldives, Red Sea and even our own coast.

At times, wool and sheep fat has been recorded on WA beaches. Apart from being a huge animal welfare issue, the export of sheep and cattle on ships may be linked to shark attacks in WA, SA, Victoria and other parts of the world.

Fig. 19 Author performing autopsy mid Indian Ocean before the sheep being jettisoned overboard.

The whale population has increased in recent years and this singularity must have some influence in attracting White Sharks to those coast lines adjacent to their migratory pathways in winter and spring seasons. White Sharks do however frequent our local waters throughout the whole year including the height of summer.

When one combines the aforementioned factors with the massive number of people using the oceans it is conceivable to expect an increase in shark contact.

Conclusion

Bull Sharks, White Sharks and possibly Tiger Sharks have been blamed for shark injuries and deaths locally. The alarming decline of biodiversity entwined with cage diving, livestock shipping, acoustic tagging, increased whale populations, climate change (El Nino), animal behaviour (normal and anthropogenic), ocean outfalls, upwelling, bottom type, ocean currents and increased human presence are just some factors that need scientific exploration to determine their level of relevance. Any complexity here needs unravelling to understand fully what is going on before launching into a shark slaughter policy that is not scientifically based. The latest spate of incidents may also be due to sharks' no longer fearing human beings as they once did.

There is much more at stake here than some small scale conjectured local socioeconomic falling-off and whilst there has been injury and death, a significant proportion of blame appears to lie squarely at the feet of human beings.

Sharks have evolved over 450 million years however it is only in the last 20 years surfing has gained enormous popularity. The huge number of humans now entering the sea for entertainment, floating about in wetsuits and with added buoyancy has increased the exposure time to possible risk of shark-human contact. Any complexity in this issue has been set in motion by human beings and the term 'shark control program' is a misnomer!

When the most proficient cleaners of the sea are gone then what next? Will some other marine organism take advantage of the decline and the natural harmony of the sea disrupted even further for all time? Mankind cannot afford to take this risk. Sharks and other marine communities are vital components to the oceans' ecosystems.

"*One study in the U.S. indicates that the elimination of sharks resulted in the destruction of the shellfish industry in waters off the mid-Atlantic states of the United States, due to the unchecked population growth of cow-nose rays, whose mainstay is scallops. Other studies in Belize have shown reef systems*

falling into extreme decline when the sharks have been overfished, destroying an entire ecosystem. The downstream effects are frightening: the spike in grouper population (thanks to the elimination of sharks) resulted in a decimation of the parrotfish population, who could no longer perform their important role: keeping the coral algae-free and therefore reducing the oxygen quantities in our atmosphere. The knock on effects of this could be devastating for all life on Earth" (Sea Shepherd).

White Shark populations have been found to have a low level of genetic diversity that translates into this species being easily pushed to the brink of extinction due to a reduction in food supply, pollution, baited hooks, and mesh nets.

Explosion of the human population has generated the most devastating apex predator and ecosystem destroyer of all time – man.

19th January 2017