How Western Navies saw co-ordinated ASW in the 1970s. 18 mins
https://www.youtube.co-m/watch?v=ypZd_s0aBCY&t=0s
Hold fast on anti SSBN ASW which is very special, this a pretty good description of where I reckon Western Navies decided to park themselves against every other type of boat for the next 80 years looking at what they do today (with physically heaps less assets and worse when you add up the impact of the missing FIC bits) and what they are building for tomorrow (almost militarily FICless assets with the FIC emphasis on the 33% the voters can see or and/or drive past). No real mention of whacking the bullets either. The GOTLAND DESI boat floating back into its shiplift for the trip home without a scratch after 30 years of ASW practice, all the Collins happy snaps over the years and all the et ceteras you can think of says that implementation of towed arrays from the 80s hasn't changed much other than make skimmers behave strangely (see NORTHUMBERLAND) and give away heaps more than what they get - been there done that. BTW Towed Arrays were about the biggest change upwards, all the others have been retro: kill the HUK idea, take away the dip gang, stop thinking about DCs, burn IKARA type ideas, burn the Hoovers and so on. The 'fun' part was that when the first TAs came out they imposed more limitations that they gave rrrr whooping options and re-inforced the notion of Awfully Slow Warfare. Fantastic sales pitch to mullets that were just getting their first GTs and VPP/CPP in the Type 21s, the OHPs, the Spruances, the Ticos and the ABs and were happily adopting the nickname 'boy racers'. When I soon meander back to the Battery Hens- I'll address the implications of that from my perspective. Luckily there are some skimmer TA drivers and people who have served in local and foreign TA skimmers in the readership so that may broaden the dit. Unlike the DSTO promise 'soon' (which could be anything up to the second coming), I'll return to the henhouse 'shortly'.

NU KU LAR CORNER
Too hard to print you'll just have to open the link
https://www.theguardian.com/commentisfree/2022/mar/14/jellyfish-have-a-proud-history-of-ruining-nuclear-power-plants-all-over-the-world

Movements in the USN SM zoo
11 March the **Secretary of the Navy** and the **Chief of Naval Operations** announced the following assignments:

- **RADM Michael D. Bernacchi Jr., USN**, to deputy commander, Tenth Fleet, Fort George G. Meade, Maryland.
- **RADM Leonard C. Dollaga, USN**, to chief of legislative affairs, Washington, D.C.
- **RDML Anthony C. Carullo, USN**, to director, Plans and Policy, U.S. Strategic Command, Offutt Air Force Base, Nebraska.
- **RDML Robert M. Gaucher, USN**, to director, Strategic Integration, N2/N6T, Office of the Chief of Naval Operations, Washington D.C.
- **RDML Mark D. Behning, USN**, to commander, Submarine Group Nine, Silverdale, Washington.
- **RDML Thomas R. Buchanan, USN**, to commander, Submarine Group Ten, Kings Bay, Georgia.
- **RDML Oliver T. Lewis, USN**, to director, Plans and Operations, U.S. Naval Forces Europe – Sixth Fleet; deputy commander, Sixth Fleet; and commander, Submarine Group Eight, Naples, Italy.
- **RDML Richard E. Seif Jr., USN**, to commander, Submarine Group Seven; commander, Task Force Seven Four; and commander, Task Force Five Four, Yokosuka, Japan.
- **CAPT Martin J. Muckian, USN**, to commander, Undersea Warfighting Development Command, Groton, Connecticut.
- **CAPT Robert E. Wirth, USN**, to deputy director, Strategic Targeting and Nuclear Mission Planning, J5N, U.S. Strategic Command, Offutt Air Force Base, Nebraska.

Spy couple tried to sell submarine secrets in a peanut butter sandwich. They failed

By Julian E. Barnes, André Spigariol, Jack Nicas and Adam Goldman

March 16, 2022

Washington: In 2020, a US naval engineer and his wife made the fateful decision to try to sell some of America's most closely guarded military secrets, the technology behind the nuclear reactors that power the US submarine fleet.

Then the couple faced another important choice: to which foreign government should they try to peddle the stolen secrets?

The engineer appeared to believe that soliciting US adversaries like Russia or China was, morally, a bridge too far, according to text messages released in court. Instead, Jonathan and Diana Toebbe thought of a country that was rich enough to buy the secrets, not hostile to the US and, most importantly, increasingly eager to acquire the very technology they were selling: Brazil.

The identity of the nation approached by the Toebbes has until now remained shielded by federal prosecutors and other government officials. But, according to a senior Brazilian official and other people briefed on the investigation, Jonathan Toebbe approached Brazil nearly two years ago with an offer of thousands of pages of classified documents about nuclear reactors that he had stolen from the US Navy Yard in Washington over several years.

The plan backfired almost as soon as it began. After Jonathan Toebbe sent a letter offering the secrets to Brazil's military intelligence agency in April 2020, Brazilian officials handed the letter to the FBI legal attaché in the country.

Then, beginning in December 2020, an FBI undercover agent posed as a Brazilian official to win Toebbe's trust and persuade him to deposit documents in a location chosen by investigators. Toebbe eventually agreed to provide documents and offered technical assistance to Brazil's nuclear submarine program, using classified information he gained from years working for the US Navy.

The couple, who lived in Annapolis, Maryland, were arrested in October and pleaded guilty to espionage charges last month. He faces up to 17½ years in prison; she faces up to three.

Brazil has continued to struggle with its submarine nuclear reactor program and has approached Russia to seek a partnership on the nuclear reactor design, said a Russian military official who, like all the people interviewed for this article, spoke on the condition of anonymity because of the classified material and delicate diplomacy involved.

Last month, just a week before Russia invaded Ukraine, Brazilian President Jair Bolsonaro even brought up the technology during a trip to Moscow.

Bolsonaro has tried to maintain a positive relationship with Russian President Vladimir Putin, even amid his invasion of Ukraine. Analysts in Brazil believe that Bolsonaro, a former army captain, is in part hoping to keep the door open for a partnership on the nuclear reactor technology.

The Brazilian President's trip to Russia drew criticism from the Biden administration. Asked about Brazil's efforts to acquire Russian nuclear reactor technology, a senior US official said that seeking to acquire Russian military technology "is a bad bet for any country".

In some respects, Brazil was an odd choice for the Toebbes. While Brazil and the US have a limited military relationship, Jonathan Toebbe's outreach came during a period of some of the closest Brazil-US relations in decades, as Bolsonaro and then-president Donald Trump strengthened the countries' alliance.

While the US government initially wanted to release the name of the country the Toebbes had tried to sell the secrets to, Brazilian officials insisted their cooperation not be publicly disclosed, according to a person familiar with the investigation.

The White House, Justice Department and FBI declined to comment. US officials have repeatedly said the couple had not tried to sell the secrets to the United States' chief adversaries, nor to its closest NATO allies, like France.

In encrypted messages from 2019 recovered by the FBI, Jonathan and Diana Toebbe discussed what appear to be different plans to sell the secrets. One plan, Jonathan Toebbe wrote, was wrong to even consider. Another plan, presumably to sell to a friendlier country, was also questionable for Jonathan Toebbe, but his wife pushed for it.

"It's not morally defensible either," Jonathan Toebbe wrote, according to a transcript of the court proceedings. "We convinced ourselves it was fine, but it really isn't either, is it?"

Diana Toebbe responded: "I have no problems at all with it. I feel no loyalty to abstractions."

Jonathan Toebbe's public defender has said government rules prevent him from answering questions. A lawyer for Diana Toebbe declined to discuss the case before her sentencing, set for August. She has repeatedly said in court that the government has presented selected messages out of context.

There were only a few countries that were not overtly hostile to the US and could make use of the technology and designs Jonathan Toebbe had to sell. Only a country able to build a nuclear reactor and ready to invest billions in a nuclear submarine fleet would be willing to funnel him the hundreds of thousands of dollars in cryptocurrency that he was seeking.

Brazil began work on developing nuclear submarines in 1978, originally motivated by its rivalry with Argentina. In 2008, under the administration of then president Luiz Inácio Lula da Silva, it reinvested in an effort to create a nuclear submarine, to better patrol and protect its exclusive economic zone in the Atlantic Ocean, a source of fossil fuels and other resources.

The country aims to launch its first nuclear-powered submarine in 2029, part of a $US7.2 billion ($10 billion) program. It is building four more traditional submarines with France's help, but has struggled with the development of a fifth powered by a nuclear reactor.

As a result, Jonathan Toebbe's expertise, on how to make nuclear reactors even quieter and harder to detect, as well as other design elements of Virginia-class submarines, would have been of enormous value to Brazil.

An Opinion On Submarine Officer Qualification

LCDR Russell A. Piokett, USN written in 1985 about Nukes - so probably still pretty relevant -

The submarine force is proud of its rigorous qualification programs for officers and enlisted personnel. The foundations of these programs are so sound that they are used as the bases for Navy wide qualification programs and of other warfare communities. Because of the emphasis placed on submarine qualification, the junior officers or the submarine force have, over the years, developed as knowledgeable professionals who continue the proud traditions of the United States submarine force. However, it seems that the present officer qualification requirements may be too all-encompassing, detailed, and extensive so as to detract from the valuable learning experience offered by qualification. In fact, some junior officers are likely to become demoralized by the great number of qualification cards requiring action and the mass of knowledge which must be acquired. Without proper supervision by experienced officers, the knowledge level expected of experienced department heads may be required, creating an unnecessary burden on the qualifying J.O. This is particularly critical since, at the onset of qualification junior officers are excited at the imminence or being qualified in the foremost warfare specialty and that they will shortly be qualified to stand a watch which directs the movement of one of the nation's most costly, complex combatant warships.

Qualification requirements are currently contained in a joint force instruction entitled "Line Officer Requirements for Qualification in SUbmarines." Included are seven qualification oards varying from the "Officer Basic Orientation Card" to "Qualification in Submarines, Line Officer Requirements." The average "attack" submariner will be required to obtain nearly 540 different authenticating signatures on his qualification cards, while his SSBN counterpart needs nearly 570. As an example of the volume of material involved, the Officer of the Deck qualification card is 77 pages long. In addition to the cards, is a detailed library of 135 references which are utilized during the qualification process — dependent upon individual ship configuration. The requirements for authenticating signatures range from practical factors such as "hovering with the trim pump" to nearly a full page of knowledge requirements necessary for a check-out on "passive sonar performance prediction."

In order to be designated as "Qualified in Submarines" an officer must have served on an operational submarine for at least one year and it is expected that junior officers will complete their submarine qualification in less than eighteen months. Included in this eighteen months would be four months (six months for SSBN officers) allotted for Engineering Officer of the Watch I Engineering Duty Officer qualification. The number of signatures described above do ~ however include qualification requirements specified for the nuclear propulsion plant or SSBN weapons duty officer.

Qualification cards were certainly developed with the intent of simplifying the qualification process while improving the qualifying officer's level of knowledge. One of the goals of these cards was to standardize qualifications between Atlantic and Pacific forces. In addition, rather tban leaving tbe extent of knowledge required to the authenticating officer, qualification standards were developed and are included in the qualification cards. No longer do junior officers have to ask: "What do I need to know to get this signature?•. Fortunately, a detailed bibliography is referenced in each applicable signature section, eliminating an extensive hunt for references needed to obtain the requisite knowledge for a check-out. A major supplier of needed information is the extensive Naval Warfare Publication library — which did not exist until the middle seventies.

What makes qualification a formidable task for our junior officer? The J.O. is trained from “day one” of nuclear power training to strive for and assimilate an extensive, detailed knowledge of each and every nuclear propulsion plant system. To achieve this, the junior officer spends a full year in shore based training at nuclear power school and a propulsion plant prototype. This provides a significant core knowledge that simplifies qualification on the first at-sea propulsion plant. Initial “qualification” becomes essentially an advanced level requalification, using the systems and principles developed in the previous year. The Submarine Officer Basic Course at ~ub School provides the J.O. with an initial base for his submarine qualification. Yet, because of the additional great amount of knowledge required to complete “forward” qualification, the core knowledge received prior . to reporting to a J.0. 1s first submarine is just a beginning. Most of the required knowledge for qualification is therefore learned for the first time during the qualifying period. Because of the emphasis on detail in nuclear power training, the qualifying J.O. tends to believe that an extensive, detailed knowledge of each and every system is desired for submarine qualification. This is not an undesirable goal — at face value. However, because of the great mass of information to be learned, as required by the qualification cards, completion of submarine qualification within eighteen months is an exceotionally difficult task.

It should also be remembered that these same officers are tasked to serve as division officers for ten to fifteen people. A J.0. 1s time is quickly consumed by: formal maintenance procedures that he must research and technically approve before forwarding them on to his department bead and commanding officer; the routine leave/special request chits/personnel-related administration that must be promptly reviewed and forwarded; the different groups or evaluations that must be prepared; the two PHS systems (nuclear and nonnuclear) that many division officers must verity and approve; the five hours of formal lecture training which a nuclear division officer must attend each week; and the extensive ship and engineering drill programs which ensure today’s level of proficiency. As a result, the standards or performance both for a division officer and a qualifying officer tend to be varied in order to satisfy the basic minimum requirements of each. This is, in itself, counter to the pursuit of excellence that our junior officers are ingrained with, throughout their initial nuclear power training.

Despite the diversions during qualification, junior officers still manage to get their dolphins in the requisite time — in most instances. This is achieved by several means. Foremost is the hard work and late hours spent — sacrificing sleep at sea and sacrificing time with family in port. The XO’s and CO’s attempt to get the officers off the submarine by 1700 when in port. But it is often futile, and extra hours on board for pursuing qualification become the norm rather than the exception •• The Submarine Officer Basic Course is designed to alleviate the problem somewhat by recommending that Commanding Officers sign orr 39 knowledge factors based on the training the J.O. has received at Sub School.

Preventing the qualification program from becoming demoralizing and overly comprehensive must become the responsibility of our experienced department heads and those more senior. Although tasked with significant other duties, they must take time to train the junior officers for their qualification. This certainly is not a new idea. But it is one that has been pushed aside because of the management requirements burdening our department heads due to the technical complexity of today’s submarines. This problem is aggravated because department heads usually have only one prior sea tour under their belts. These experienced officers ~ instruct their junior officers that for every check-out there is knowledge that is core and need-to-know, and that other knowledge is merely background “graduate level” and nice-to-know. And such knowledge will ultimately be gained with experience on board and later at the Submarine Officers Advanced Course. As an example, a qualifying officer should not have to understand the specific circuitry of the AN/WLQ-4 “Sea Nymph” ESH system in the same detail which is required for a satisfactory check-out of the

Protection and Alarm System of the nuclear propulsion plant. He should rather learn how to tactically use the information supplied by the Sea Nymph system — leaving its operation to Electronic Technicians. This obviously includes an understanding of the capabilities of the system. It should be remembered that the goal in submarine qualification is to make a procedurally and tactically competent watgh officer and not to make an experienced department bead or enlisted technician. Many, like myself, have been told by their first commanding officer that professional knowledge comes primarily as a result of watch standing — not as a result of pre-qualification study. It is therefore important that junior officers get on the watch bill and wear their dolphins as early as is professionally tolerable.

The qualification program must not be allowed to devour junior officers. The standards expressed in tbe qualification cards should be reviewed to r~duce rather than expand the required amount of knowledge. Junior officers should not be expected to qualify on their own — as many have bad to during their qualification. Qualified officers should lead the J.O.'s through their qualification process, not nursemaiding, but teaching and prioritizing an extensive knowledge base, ensuring that the core knowledge is learned and that excessive time is not wasted on peripheral knowledge that tends to delay qualification. The junior officer should continually be able to see the goal of qualification in sight and those responsible Cor this process must ensure that the J.O.s qualify expeditiously and move ahead smartly with their professional growth.

LCDR Russell A. Piokett, USN

NAVWAR Strives for Industry-Style Innovation

March 1, 2022
By Robert K. Ackerman

The command emphasizes a culture of empowerment.

Right up to the moment somebody higher up the pecking order in the Organisation takes the Command(er) aside and counsels it WRT getting back inside the narrative boundary or suffer the career consequences.

I particularly liked her statement 'The Navy can learn from industry's agility as well, she adds.' If you look around the the local Primes, you'd have to say that the very thing they are set up to do is obliterate customer agility. They like it just the way it is. That's why I'd reckon chopping DCN put the wind up them big time; the biggest circus tent in town must be too big to fail; but down it came almost overnight. Defence now has a procedure - like a submarine attack: the first thing you know is there is a big hole under the foundations just waiting to whip you end to end and swallow you up. Just another reason to learn how to interfere with the incoming torpedoes!

Those big Primes , if the CoA chose to prime jobs itself, are full of talent that could be put to far better use than keeping their Svengali certification in date - only then would The Navy can learn from industry's agility as well, come into play. And there are a lot of people who appear inadequate in their current starry starry roles that dictate they avoid risk instead of managing it who would excel as a Project Owner - pretty much what being a Perisher grad is all about in many ways and just as much fun because you ARE the admiral at Admiral's Divisions.

Cunningham at Matapan -much the same as any day in the Sponge taking on the rent seekers and the supply chain trying to do a Hannibal at Cannae on you. The only difference is; if you lose the body count doesn't come into play till there is a shooting match. So you have to imagine any consequences and act like it is tonight's potential action.

Now came, in Cunningham's words, the "difficult moment of deciding what to do." He met with his staff. He was convinced that "having got this far, it would be foolish not to make every effort not to complete the Vittorio Veneto's destruction." He went on, "Some of my staff argued that it would be unwise to charge blindly after the retreating enemy with our three heavy ships, and the Formidable also on our hands, to run the risk of ships being crippled, and to find ourselves within easy reach of enemy dive bombers at daylight. I paid respectful attention to this opinion and as the discussion happened to coincide with my time for my dinner I told them I would have my evening meal and see how I felt afterwards."

then the other recollection:

"Respectful attention" is not how the meeting was recalled by Barnard: "The well known steely blue look was in ABC's eye and the staff had no doubt there was
going to be a party. Nevertheless on paper the compact mass of the enemy fleet looked to the staff a pretty formidable opposition for any form of night attack. I think ABC had made up his mind about 8pm to send in the light forces and follow up with the battle fleet, but he nevertheless on this occasion, went through the formality of asking the opinion of certain staff officers. Neither Power nor Brownrigg liked the idea much and said so in their different ways. I said I was keen to let the guns off but the battleships had not had a night practice for months and there might well be a pot mess. ABC took one look at his supposed helpers and said 'You are pack of yellow-livered skunks, I'll go and have my supper now and see after supper if my morale is not higher than yours.'"

Virtually every PWO/Dagger I ever worked with I could see revelling in that environment as a Prime PD - always lots of people trying to raid your party and you've got to have a bullet for every one of them. They have this secret: they know what the platform and everything in it is there for and how it has to interact with friends,neutrals and enemies at sea and when alongside. All it has to be is the Operational Requirements Custodian and his Hull, weapons systems, and support systems managers can rock and roll, because they have this OCD & ORM specialist on the hoof who sits at the head of the table, and better; the mobile OCD can keep its own kind in the picture on exactly where the next battlestar galactica is in space. Jeez they might even spruik to the taxpayers about what they are doing.

The Naval Information Warfare Systems Command is addressing human-technology synergy by empowering its workforce to both adapt new technologies and adapt to new technologies. The command's personnel are working with people in its industry partners on efforts that will affect operations across the entire Navy.

Tonya Nishio, command information officer, Naval Information Warfare Systems Command (NAVWAR), notes several technology areas in which NAVWAR will rely on innovation to advance its capabilities. Digital transformation, machine learning and robotic process automation will be the fiscal year 2022 focus across the command's five functional areas. And the key element in a NAVWAR information superiority strategy Nishio signed off on a year ago is to have an empowered culture with optimized resources and innovation, she relates.

Nishio offers that the organization has three high priorities spanning its five functional areas. One priority is to drive data-informed decision making and digital transformation across NAVWAR. This entails targeting end-to-end processes such as requests for information and information technology purchasing, and the group is developing an information technology effort across NAVWAR. It will use the Navy's Jupiter data analytics environment, she adds.

Her organization is using robotic process automation bots and other low-code/no-code automation platform efforts across NAVWAR. The Jupiter platform will serve to deliver data analytics and dashboards, she notes. And the Information Technology Procurement Request (ITPR) process will align all information technology purchasing and budget data across the entire Navy. The office's work on ITPR reform is the crux of what will drive many other efforts, she offers. This will allow the service to divest tools, expedite the purchasing process and cut costs servicewide via the Jupiter environment.

Data is the key to ITPR reform. Nishio relates that a 90-day pilot conducted last year took all the information-authoritative sources and connected all NAVWAR business intelligence systems to provide initial data upfront without a user having to look for it. All decisions would be automated upfront via a dashboard that approves criteria.

But this just scratches the surface, she continues. Her organization is seeking to feed data analytics and robotic process automation into machine learning (ML) and artificial intelligence (AI). The challenge is to make this happen at the Department of the Navy (DON) level to give the leadership an accurate image of information technology procurements and spending across the board.

This will require more than the NAVWAR business intelligence tools, she states. These capabilities must move into the Jupiter environment to be connected, accompanied by rule changes so that all the DON commands are using it the same way.

And putting all these capabilities in place is the key to exploiting AI and ML, she declares. "Everything is linked together," Nishio elaborates. "You can't do one data initiative or one data analytics/machine learning/artificial intelligence effort without it being linked to a million others."

Another priority is to enhance NAVWAR cybersecurity readiness and resiliency. Nishio relates that the command is scheduled for an enterprise cyber inspection this year, so it will address deficiency remediations arising from that inspection. The command also wants to improve its programs' cyber status by disconnecting or securing any operational systems with expired authorities. Defense in depth will be the approach, she notes, for mitigating the risks of any particular system.

The focus on information security must be holistic, Nishio says. When cyber defense orders are issued, all NAVWAR systems receive them. The future holds zero trust and other capabilities related to defense in depth, she explains. "We're targeting our risk management portfolio and ensuring that we have a capable system moving forward to evaluate where our vulnerabilities are," she elaborates.

The Navy as a whole is looking at risk management framework (RMF) reform, she continues. In the past, it was compliance-based within specific criteria. But instead, the Navy wants it to be more about specific systems—their assets and vulnerabilities. "It's about constant awareness instead of, 'Yes, you've gotten all your checks in the boxes and you've met your criteria and you're good to go for two years,'" she allows. "This is more of a constant review of a particular system." It would be more agile, dashboard-based and data-informed than just a compliance check.

A development, security and operations (DevSecOps) environment will secure the infrastructure so that patches and upgrades can move through the system quickly and securely to the end user, she states.

Nishio says that NAVWAR is “definitely all-in” on any capabilities involved with digital transformation within the command. Yet, NAVWAR is working on other innovation realms such as 5G and cloud service, and the command has pilots across NAVWAR on these and other capabilities. Late last year, the command undertook a couple of pilots on blockchain, for example. “When you start thinking about it in terms of security and integrating into networks, it gets very fuzzy,” she offers.

A third priority focuses on users and their information technology experience, she says. This entails expanding information technology and cyber knowledge and resources, as she notes that NAVWAR makes up nearly half of the Navy’s acquisition information technology workforce. Technical training will remain a NAVWAR responsibility, and the command already has rolled out a digital training platform. But NAVWAR needs to move forward toward a full learning management system, she adds. This will require consolidating and expanding licenses in information research and contracts.

These priorities that Nishio is addressing span NAVWAR’s five functional areas: information technology portfolio management; information technology capabilities and services; command information security office; data and digital innovation; digital workforce development and communications.

Information technology portfolio management is where the command has its compliance validation of the training and regulatory requirements. Nishio explains that this is done for all acquisition programs across all of the program executive offices composing NAVWAR. For all of these registered systems, this area conducts compliance requirements per the Clinger-Cohen Act, the information technology budget process and information technology procurement management. This group also manages the command’s overall information technology enterprise, such as legacy network authorization or cloud migration road maps.

The second area, the technology capabilities and services group, basically serves as the information technology command for NAVWAR. Nishio notes that this group serves NAVWAR the way that NAVWAR serves the rest of the Navy. It coordinates assets and devices for thousands of users across NAVWAR encompassing Navy Marine Corps Intranet computers, mobile devices, printers and SIPR tokens, for example. It also maintains four base area networks hosting several key applications at a campus in Old Town Alexandria.

The third group, the command information security office, coordinates execution of defense cyber operation orders for all NAVWAR systems. While responsible for securing systems and networks and defending against new attacks, this group also is in charge of incident response, cyber inspections and business continuity management. It also hosts the command’s RMF package permission office, to which every NAVWAR system or program must submit a request for connection authorization. Nishio points out that the command prepares all NAVWAR systems for high-risk escalation when needed.

One key development emerging from this group this year is a set of dashboards for program managers. It is part of a scorecard for a collective picture of the overall NAVWAR cybersecurity footprint, Nishio says, to abandon the approach of relying on compliance checks. Instead, the dashboards will empower program managers to improve their cybersecurity where necessary.

The fourth group, data and digital innovation, contains the command enterprise resource planning business office and the command knowledge management office. It also includes the command data director along with facilitators of the information superiority governance structure, which comprises many distributed teams, working groups and the executive governance board.

The fifth group, digital workforce development and communications, manages the official task orders that come down from the Navy chief information officer. These total about 1,600 annually, she adds, and the group also handles records management as well as information technology accessibility.

NAVWAR's involvement with industry ranges from contracting to implementing innovation. Nishio notes that the command's industry partners that work with it on a daily basis play a key role in developing the command's strategies and executing its activities. NAVWAR also works closely with its Naval Information Warfare Center (NIWC) Pacific and NIWC Atlantic research and development organizations, and both facilities have substantial ties to industry and academia. "Pulling information from industry is one thing, but then we really want to do some deeper dives as well," she states.

The command has a standing vendor brief that it performs an average of once a week. This entails a two-way discussion on what a company has to offer NAVWAR in the way of tools or technologies that can be implemented in the command's strategy, she relates.

The command has several challenges in which it will depend on industry, particularly in use case requirements such as collaboration. But NAVWAR has added challenges in that it must maintain a higher level of security than industry, Nishio notes.

But in the end, it all comes down to the workforce—government and industry, she allows. These workers are the font of innovation, and being connected across organizational lines increases the effectiveness of their inventiveness. The command must have people available, either internally or from industry, who can adapt industry solutions to meet Navy challenges in security and ease of use.

The Navy can learn from industry's agility as well, she adds.

Drone Observations of Marine Life and Human–Wildlife Interactions off Sydney, Australia

by


Vanessa Pirotta


David P. Hocking
[2,3],

Jason Iggleden
[4] and

Robert Harcourt


Put this in for a browse....because it gives you the idea of how much OPINTEL and National information there could be avaiable from a clever mix of Uninhabiteds, the right kinds of surveillance team mixes and the use of of the general population to play - get over it: a lot of things are NOT secret, but how you choose to verify and use the knowledge might be - pretty much the basis of 99.999999% of ACINT, since the birth of the PC and now lots of other INT 'thanks' to social media.

Abstract

Drones have become popular with the general public for viewing and filming marine life. One amateur enthusiast platform, DroneSharkApp, films marine life in the waters off Sydney, Australia year-round and posts their observations on social media. The drone observations include the behaviours of a variety of coastal marine wildlife species, including sharks, rays, fur seals, dolphins and fish, as well as migratory species such as migrating humpback whales. Given the extensive effort and multiple recordings of the presence, behaviour and interactions of various species with humans provided by DroneSharkApp, we explored its utility for providing biologically meaningful observations of marine wildlife. Using social media posts from the DroneSharkApp Instagram page, a total of 678 wildlife videos were assessed from 432 days of observation collected by a single observer. This included 94 feeding behaviours or events for fur seals (n = 58) and dolphins (n = 33), two feeding events for white sharks and one feeding event for a humpback whale. DroneSharkApp documented 101 interactions with sharks and humans (swimmers and surfers), demonstrating the frequent, mainly innocuous human–shark overlap off some of Australia's busiest beaches. Finally, DroneSharkApp provided multiple observations of humpback and dwarf minke whales with calves travelling north, indicating calving occurring well south of traditional northern Queensland breeding waters. Collaboration between scientists and citizen scientists such as those involved with DroneSharkApp can greatly and quantitatively increase the biological understanding of marine wildlife data.

Keywords: drone; drones; marine life; shark; whale; human-wildlife; citizen science; feeding; social media; behaviour

1. Introduction

The use of drones in wildlife research has enabled the collection of new information via readily accessible technologies [1]. For marine research, drones have made it safer and more cost-effective to study a variety of species [2,3]. In some cases, drones have replaced the need for close vessel approaches or vessels completely, e.g., when researching whales [4], and have enabled research to be conducted from the shore, e.g., in white shark research [5]. Drones have also been proven to be versatile tools for collecting animal morphometrics information relating to Australian sea lion size [6], dolphin pregnancy [7], lung microbiota or viruses in humpback whales [4,8], species abundance in sea turtles [2], species distribution [9], density in jelly fish [10], behaviour in leopard seal predation [11] and sting ray behaviour and habitat use [12]. Despite several challenges, such as limitations in terms of flight time, range and weather-dependent flying (e.g., low wind and little rain), drones offer multiple opportunities to collect observations that were not previously possible. Drone use by the general public has also become a popular method of observing and filming marine life. The advancements in drone technology, reductions in cost and ready availability have resulted in many high-quality observations of marine animals; such observations potentially can contribute to science, even when scientists have not been in the field [13]. In some cases, high observer efforts have enabled the general public to document information (usually via social media) on the presence, habitat use and interactions of various species with humans. Consecutive years of effort have also led to new knowledge of marine life behaviour in lieu of formal scientific observations [14]. As a

result, scientists have been investigating potential applications using observations from such platforms to learn more about marine life.
DroneSharkApp is an observation platform that uses drones to document marine life off the coast of Sydney, Australia. Having started in October 2017, DroneSharkApp posts nearly daily captures of habitat use and behaviours of coastal marine species through exhaustively searching a local region and filming sharks, fur seals, dolphins, rays and fish, as well as their interactions with humans. Migratory whale species are also filmed seasonally when present. The DroneSharkApp was originally created to film surfing conditions and promote awareness of sharks; however, it has expanded to make frequent observations of diverse coastal marine life. Sighting information is regularly provided to the public via a dedicated app and through communication with local surf clubs and via social media platforms (e.g., Instagram, Facebook, TikTok). Additional drone observations are occasionally made from other locations in New South Wales (NSW), including Byron Bay (northern NSW) and Jervis Bay (southern NSW).
Given the extensive effort and the records of the presence, behaviour and interactions of various species with humans provided by the DroneSharkApp, we assessed the quality and reliability of the information for scientific investigation. Specifically, we aimed to assess whether DroneSharkApp observations made off the coast of Sydney, Australia could provide information on the presence, behaviour and interactions of various species with humans. Finally, we propose that formal collaboration (the creation of a citizen science program) with observation platforms such as DroneSharkApp can improve our understanding of the local use of habitats by marine wildlife, as well as providing a large increase in observations of species presence and potentially phenology in a changing world.

2. Materials and Methods

Marine wildlife sightings were collected via drone from three main beaches off the coast of Sydney, Australia, namely Bondi, Tamarama and Bronte Beaches (Figure 1).

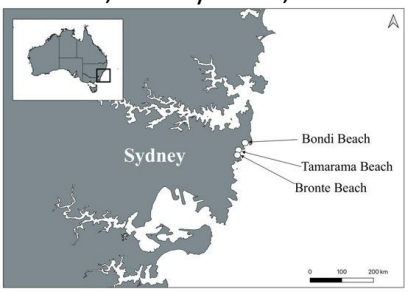

Figure 1. DroneSharkApp's land-based drone flying locations off Sydney, Australia. Drone observations of coastal marine life are regularly made from three Sydney beaches, namely Bondi, Tamarama and Bronte Beaches.
All observations were made by a single observer (Jason Iggleden, J.I.). Drone operations occurred from sunrise (0600) to mid-morning (0900-1000) and were limited to conditions of low wind (<45 km/h), no rain and good visibility (>1 km). Observations were made on average for three hours each morning (a flying session) and were stopped if drone operations were unable to continue due to poor weather conditions. Drone flights were not systematic and the intend was to spot wildlife and film any activity in the area through a simple haphazard search or scan of the area. Drone flights were kept within line of sight (within ~1 km) and limited by battery flight time.
All drone operations were performed in accordance with the New South Wales National Parks and Wildlife regulations for flying over marine animals (<100 m) (New South Wales Government, 2021) and conducted by an Australian Civil Aviation Safety Approved (CASA) Pilot (No.1031900). No animal ethics or scientific licences were obtained as this observation platform was not intended for scientific purposes.

Drone videos from each day were compiled during or after each flying session. Videos were made available via the DroneSharkApp application (paid service). A smaller portion of the content was also freely accessible to the public via the DroneSharkApp Instagram page (used for this study) and additional social media platforms (e.g., Facebook, TikTok). For bad weather days or when flying was not conducted, additional content was posted or previously shared content was reshared.

Video Assessment

Videos posted on DroneSharkApp's Instagram page (@dronesharkapp, Meta Platforms) were observed for the following information: location, species present, behaviour (e.g., feeding, swimming), interspecies association and specifically for sharks swimming with humans (swimmers and surfers). If sharks were present with humans, additional information on the general proximity between human and shark interactions were documented, e.g., observed within the frame (if both shark/s and human present in the same frame) or shark/s observed within the vicinity of humans in the same video.
The number of video posts used in this study and the actual number of days spent in the field were determined by identifying the date when videos were posted to Instagram and the description provided for each post. This ensured resharing of the same footage and that additional footage posted from the same day was not duplicated in the counting process. On one occasion, a post consisted of a mixture of new and previously shared footage. All uncertainties were clarified by JI.

3. Results

Drone Footage

Drone footage of marine life was collected between June 2018 and September 2021 (three years and three months) from Sydney, Australia (Figure 1). Drone observations continue to be made beyond this timeframe and from additional locations along the Australian East Coast (excluded from this study). A total of 678 wildlife videos posted to social media were assessed from 432 days of observations collected by a single observer. The higher number of videos compared with days in the field was a result of several factors, including multiple posts for some days, resharing of content from previous days and additional footage being provided during no-fly days, e.g., poor weather (rain, high winds, poor visibility) or when not in the field.
A variety of marine wildlife species were observed during drone flights off Sydney, Australia, including shark species such as the critically endangered grey nurse shark (Carcharias taurus), which was most the commonly seen shark (Table 1). White sharks, hammerhead sharks and most likely whaler species (unconfirmed Carcharhinus spp., e.g., bull and bronze whalers) were also seen. Other sightings included dolphins (mainly inshore bottlenose dolphins, Tursiops aduncus), fur seals (New Zealand fur seal, Arctocephalus forsteri), rays, various fish species (e.g., bump-head sunfish, Mola alexandrini) and migratory whales (Table 1). Humpback whales (Megaptera novaeangliae) were most commonly observed, along with dwarf minke (Balaenoptera acutorostrata) and southern right whales (Eubalaena australis).
Table 1. Marine life documented from drone observations off Sydney, Australia between October 2017 and September 2021. A variety of marine species were observed, including shark species, dolphins, fur seals, migratory whales, rays and various fish species (e.g., sunfish, Mola alexandrini).

Across the study period, shark sightings were higher compared to other wildlife, especially for the months of June (Austral winter) and December (summer) (Figure 2). Fur seals were most commonly sighted in winter, as were rays. Dolphin sightings were lower in the summer months. As expected, whale observations commenced from May (Autumn) and were reduced in November and December. This was consistent with the northward and southward migration commonly observed along the east coast of Australia (Pirotta et al., 2017).

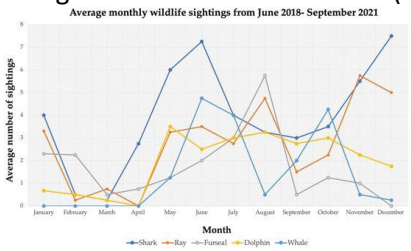

Figure 2. Average monthly wildlife sightings from June 2018 to September 2021 across the study period reported by DroneSharkApp off Sydney, Australia. Sightings were limited by observer effort, which was not recorded across the study.

The inspection of sightings by season provided an overview of the types of wildlife documented across the study period (Figure 3). Shark sightings were generally higher across all seasons compared with other marine life.

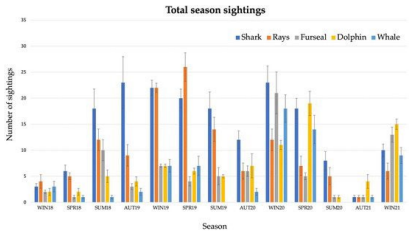

Figure 3. Seasonal sightings of marine wildlife observed via drone by the DroneSharkApp off Sydney, Australia.

Feeding Events

A total of 94 feeding events were observed (Figure 4) (Supplementary Materials). Fur seal predation (n = 58) was mainly on fish; however, two individuals were also observed consuming octopus post-capture. In total, 33 dolphin feeding events were recorded, consisting of group feeding behaviours (n = 26) and individual feeding (n = 7). Both fur seals and dolphins (bottlenose and common species) were observed targeting bait balls (large congregations of fish schools) and smaller groups of fish (fur seal and bottlenose dolphin only). A humpback whale was also observed lunge feeding, most likely on krill (n = 1), and there were two feeding events by a white shark.

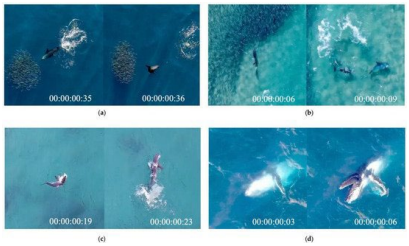

Figure 4. Evidence of multispecies feeding behaviour captured by drone via the DroneSharkApp off Sydney, Australia: (**a**) New Zealand fur seal (Arctocephalus forsteri) predates on a small school of fish, successfully separating a single individual; (**b**) bottlenose dolphins (Tursiops aduncus) swim into a school of fish in shallow waters, capturing a fish; (**c**) a white shark (Carcharodon carcharias) targets a single fish, biting onto the individual before circling around to grab the fish once again and thrash its body; (**d**) a humpback whale (Megaptera novaeangliae) observed surface lunge feeding, turning onto its side and exposing its baleen plates.

A total of 101 cases of co-occurrence between humans (swimmers and surfers) and sharks sharing the water was observed (Figure 5).

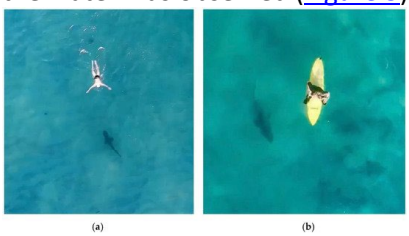

Figure 5. Drone observations of shark interactions with humans observed by the DroneSharkApp off Sydney, Australia: (**a**) a swimmer off Bondi with an unidentified shark passing beneath; (**b**) a surfer sits on his surfboard while a grey nurse shark (Carcharias taurus) swims below.

Several interspecies interactions of marine life were documented exploiting shared food resources (e.g., dolphins and fur seals predating on the same bait ball) and swimming in the same areas (e.g., sharks and rays). Social and playful interactions were commonly observed between dolphins and fur seals and less frequently with whales, dolphins and fur seals. Observations of northward-migrating humpback whales with neonates (less than two weeks old) and a dwarf minke whale mother with a calf provided evidence of calving occurring south of Sydney and south of known birthing or breeding grounds in Queensland (Figure 6).

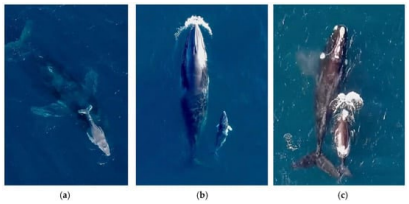

Figure 6. Migratory whale species observed by drone via DroneSharkApp off Sydney, Australia: (**a**) northward-migrating humpback whale mother (Megaptera novaeangliae) with small calf, which provides evidence of birth prior to Sydney and northern Queensland breeding grounds; (**b**) a dwarf minke whale mother and calf headed north past Sydney, also evidence of birth prior to Queensland waters; (**c**) a southern right whale (Eubalaena australis) mother and calf travel southward past Sydney.

4. Discussion

Advancements in drone technology and accessibility have made drones a popular method of observing marine life. The recreational use of drones by the general public to capture wildlife observations has provided new opportunities for scientists to collect information on marine species. At the same time, information collected in this way can promote awareness of marine wildlife and the marine environment through social media. In this study, field observations collected by DroneSharkApp demonstrate how this observation platform can help document a variety of coastal and migratory marine species off Sydney, Australia. This platform was also able to observe feeding behaviours, social interactions between species and the overlap of habitat use by a variety of species and humans.

Of particular interest was the number of feeding events documented for both fur seals and dolphins, as traditionally these behaviours are very difficult to reliably observe in the wild. The elevated observations were made feasible by use of a drone and the immense effort expended by J.I. in filming for several hours daily, year-round. Exploitation of the same prey sources was most likely the reason for the overlap in habitat and the cause of some social interactions. Observations were made of specific fur seal behaviour used by individuals to forage. This included foraging and searching behaviours (following fish) and prey capture attempts. The direct capture of fish was not observed for fur seals. This may have occurred or was not able to be detected via the drone. Dolphins were observed predating on fish individually and co-operatively. Only two clear examples of fish predation

by a shark (white shark) were obtained. Grey nurse sharks were frequently seen in fish schools but not seen predating, most likely due to their nocturnal foraging habits [15].

This study provides direct evidence of the co-occurrence of sharks with humans off three of Australia's busiest beaches. Grey nurse sharks were most commonly observed in close proximity to humans; however, this species is not generally regarded as a threat to humans and is thought to be placid in nature [16]. Dangerous species such as the white shark were only observed three times over the three-year period, with only one of those observations with humans in close proximity (both humans and shark seen in the same frame). This confirms that the likelihood of encountering larger, typically offshore species e.g., white sharks in this region is relatively low and is consistent with the locally low number of shark bites and few animals caught in the shark meshing program which fishes in this area [17]. Additionally, the presence of a variety of offshore species, e.g., hammerheads, may be as a result of variations in currents and ocean temperatures and following prey distributions [18]. Ongoing information on shark movements from scientific research and the DroneSharkApp may provide information on unusual occurrences of shark species off Sydney and the potential for interactions with humans for bather safety. Shark–human interactions are likely to change as shark distributions are strongly influenced by changes in the marine environment, and these observations may detect these changes in real time [19,20].

In addition to shark observations, migratory species such as humpback, dwarf minke and southern right whales were observed during the winter (northward–southward migration) and spring (southward migration) months. This paper supports the work of Pirotta et al. (2020), which previously documented whale calving occurring further south of Sydney's waters. Direct observations of dwarf minke whales with calves and mother humpback whales with neonate calves (Figure 4) travelling north suggest that calving occurred south of Sydney's waters for both species. The platform's observations of humpback whales feeding off the coast of Sydney expand the distribution of feeding behaviours in NSW waters during the humpback whale's southern migration [13]. Humpback whales may be using NSW's waters to supplement feeding energy intakes in addition to Antarctic feeding grounds, taking advantage of possible prey distribution changes occurring in these southeastern Australian waters [13]. Additional observations of humpback whales feeding off Sydney were also made by other recreational drone users who shared their images via social media.

Observations made through the DroneSharkApp observation platform were never intended to be used for science. Without the formal guidance from scientists, this work faces several limitations. For example, the DroneSharkApp is effectively a 'presence only' survey of marine life and the amount of effort was recorded; therefore, it did not account for days where no animals were observed or when there was poor weather. There are some social media posts that document days when no animals are sighted and with poor weather; however, reposted footage from previous days was largely used to fill these gaps, as well as on days where poor weather did not allow for flying.

Additionally, information on temporal sightings (Figure 2 and Figure 3) was limited and only provides an indication of wildlife presence at certain times of the year. DroneSharkApp was not based in Sydney for the entire study period and flights from other locations along the Australian East Coast were excluded. Absence (non-flying periods) during certain times of the year off Sydney would have also led to a lower number of observations across seasons and lower sighting information for all species. Sharks were also the main focus of this observation platform, which might explain the higher numbers observed compared with other marine species across the study period. The seasonal component of this data can be used as a guide only. We suggest that a more formal and systematic study is needed to provide an assessment of the presence of species across all seasons off the coast of Sydney.

In addition, our understanding the time of day at which species were present off Sydney was limited by the observation window set for each day (06:00 to 10:00), which was not provided through Instagram. Geographical locations of animals and their distances to the coast were also not recorded. The drone was capable of recording raw data, such as the time and the drone's position;

however, these additional data were not presented to the general public, as they had been discarded. For future data recording, the DroneSharkApp should be equipped with scientific tools such as LIDAR to collect accurate geographical information on animal locations and possible distances from the coast. Scientific guidance with regards to systematic surveys, including the use of set fight routes, sampling across all months, recording times when animals are sighted and recording observer efforts for all future observations, is to be established. Finally, an appropriate online platform for raw flight information should also be considered, enabling further use of the data. While the above are the limitations of this study, the quality of the images and internal consistency are strengths of this dataset. Observations were always made by the same observer, providing internal reliability. This also ensured that flying was kept to a minimum of 100 m above sea life, as per state flying rule requirements to ensure minimal to zero disturbance of animals. The drone images were able to be magnified or cropped to appear closer than was actually flown in the field. Despite the above constraints, this study provides a new perspective on wildlife activity off the coast of Sydney, Australia.

5. Conclusions

The DroneSharkApp observation platform is an example of the potential for scientists to work collaboratively with the general public to guide meaningful data collection. In this paper, we have provided examples of the types of observations scientists can gather from marine life when scientists are not in the field. Future collaboration between the DroneSharkApp and scientists could transition this observation platform into a formal citizen-science-based study tool. Additional requirements such as animal ethics approval and scientific licences would be needed, as well as training and continued inclusion of citizen scientists within the scientific publication processes (as with this paper) [14]. This will help guide how data are collected going forward. Future research could focus on animal behaviour (e.g., feeding) and potential habituation to humans through the use of ethograms. Furthermore, the exploration of social attitudes towards marine life through social media platforms, such as Instagram, may improve our understanding of follower interactions with different species and contribute to the growing area of 'marine citizen science' [21]. This may further aid awareness towards beach safety and our understanding of marine life off the coast of Sydney.

Supplementary Materials

The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/drones6030075/s1: Video S1: Fur seal feeding video. Video S2: Dolphin feeding video. Video S3: White shark feeding video. Video S4: Humpback whale feeding video.

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