Issues that need addressing on the conduct and approach of the NCCP

Contents

THE CLEANUP PROCESS

1) ***The NCCP focuses clean up discussion on the initial kill. There is a concern that this sets an unreasonable expectation that significant clean-up will not be required in following years. The NCCP's research confirms that the expected kill rate is uncertain, that the fecundity of carp is on the extreme end of the scale for vertebrates and that the virus can reasonably be expected to be permanently present in the ecosystem once released causing ongoing kills.***

   Given this is the case, what planning is being done for the annual recurrences of the mass carp kills? What clean-up is expected to be required, at what cost and how far into the future will the NCCP budget for clean-up costs?

   Supporting Information:

   Recently the NCCP opened up the "yoursay" web page inviting questions on carp biomass collection and utilisation. The NCCP has stated on many occasions including in written responses to this page that:

   " With respect to how long mass carp kill events might occur, and so biomass reuse strategies might need to be in place, the carp virus has now been found in 33 countries worldwide, and has not caused ongoing mass fish kills in any other country, suggesting the likelihood of ongoing outbreaks occurring is low."

   This information is incorrect, as there are many examples of ongoing and often annual mass kills that require significant cleanup such as those seen in South Africa and the UK to name a few. A simple google search reveals these events as regular and damaging occurrences in the countries where they occur so it is concerning the NCCP are assuming this will not happen.

   http://www.zeekoevlei.co.za/2015/01/carp-fish-dying/

   Excerpt:

   "The disease was first noticed in the area when carp started dying in Zandvlei in December 2014 and was subsequently confirmed with DNA tests."

   https://www.news24.com/SouthAfrica/News/last-5-tons-of-dead-fish-to-be-removed-from-cape-town-vlei-20160308

   Excerpt:

   "Forensic analysis is currently being conducted by the State Veterinarian on the dead carp, but early signs show the fish may have died as a result of a koi herpes virus, which has plagued the city's waters before."

Furthermore, such assumptions call the whole basis of using the virus to control carp in to question as the initial studies conducted by members of the nccp scientific advisory committee and then used as part of the basis for proposing that viral biocontrol could be effective, assumes and indeed depends on ongoing mass kills, to achieve its goals.

The NCCP should not be based on such a contradictory set of assumptions. Putting forward a plan that presents the assumption that ongoing cleanup issues and costs are a low probability, when the NCCP's scientific advisory groups own study used to recommend viral biocontrol states that mass kills will and must occur to be effective is nonsensical.

The study by **Paul Brown ABD and Dean Gilligan** linked below stated the criteria required to achieve effective biocontrol using the carp herpes virus and required that "***broad-scale outbreaks occur in at least 40% of years"***occur for the viral release to be successful. Ongoing mass scale outbreaks are required and assumed for every second year, which means cleanup will also be required every second year, these should be treated as a minimum requirement for cleanup due to evidence that in many locations annual recurrences are common in carp herpes virus affected countries despite international efforts to contain the virus.

https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

The only two outcomes here are that the virus won't be effective but ongoing cleanup costs will be reduced, or it will be effective in reducing carp with very significant annual recurring cleanup costs will occur, it can't be both. It may be advantageous in ensuring the plan gets approved to downplay ongoing cleanup requirements and costs, but this is not in the interest of good policy.

2) ***The NCCP's statements on containing and controlling the initial release to try to keep the clean-up manageable seem contrary to its statements that the virus will be more successful than in countries where the virus was released accidentally, because the NCCP will seek to maximise the impact by hitting a lot more areas at once.***

Which outcome is being prioritised? Larger initial kills or a more manageable clean-up with reduced damage from the mass fish kills?

How can ongoing outbreaks be controlled once the virus is present throughout our waterways given the ease of transmission and number of vectors available to the virus in a wild release?

Supporting Information:

The carp herpes virus is very easily spread, anything wet can transmit the virus including carp, other fish, other animal species such as water birds, wet fishing equipment, water, sediment, boats or equipment contaminated with these sources. This would make containment in the wild virtually impossible. Relevant studies below.

The virus is transmissible and can remain live and viable in water:
http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/current/chapitre_koi_herpesvirus.pdf

2.1.2. Survival outside the host

Studies in Israel have shown that KHV remains active in water for at least 4 hours, but not for 21 hours, at water temperatures of 23–25°C (Perelberg et al., 2003). Studies in Japan have shown a significant reduction in the infectious titre of KHV within 3 days in environmental water or sediment samples at 15°C. However, the infectivity remained for >7 days when KHV was exposed to similar water samples that had been sterilised by autoclaving or filtration (Shimizu et al., 2006). The study also presented evidence for the presence of bacterial strains in the water with anti-viral activity. More recently, the detection of KHV DNA in river water samples at temperatures of 9–11°C has been reported, 4 months before an outbreak of KHVD in a river (Haramoto et al., 2007). However, persistence of the virus may have been aided by the presence of animate vectors and detection of DNA may not always be indicative of the presence of infectious virus.

Transmission of the virus from 6 non-carp species
https://www.researchgate.net/publication/235732844_Horizontaltransmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carpHorizontal_transmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carp

Abstract

Six fish species, defined as potential vectors in koi herpes virus (KHV) transmission, namely: common roach, European perch, tench, Eurasian ruffe, silver carp and grass carp were included in this study. The fish used to transmit infection originated from a fish culture facility where KHV had been diagnosed and prior to the beginning of the research study the presence of the virus genome was confirmed in each individual fish intended for cohabitation. Specific pathogen free (SPF) carp utilized in the experiment originated from the University of Wageningen. During a four-week period the SPF carp were exposed to infection through cohabitation with vector species previously confirmed as KHV carriers. The obtained results demonstrated the possibility of a horizontal transmission of KHV between selected species, even in the case of species showing no clinical signs of KHV disease (KHVD), while an average water temperature in the tanks ranged from 12°C to 16°C.

Wild fish species other than carp are capable of transmitting the virus
https://www.ncbi.nlm.nih.gov/pubmed/23121232

Abstract

The koi herpesvirus (KHV) has spread worldwide since its discovery in 1998 and causes disease and mortality in koi and common carp populations with a high impact on the carp production industry. Many investigations have been conducted to examine ways of distribution and to identify possible transmission vectors. The answers, however, raise many new questions. In the present study, different wild fish species taken from carp ponds with a history of KHV infection were examined for their susceptibility to the virus. In the tissue of these fish, the virus load was determined and it was tested whether a release of the virus could be induced by stress and the virus then could be transferred to naive carp. Wild fish were gathered from carp ponds during acute outbreaks of virus-induced mortality in summer and from ponds stocked with carp carrying a latent KHV infection. From these ponds, wild fish were collected during the harvesting process in autumn or spring when the ponds were drained. We found that regardless of season, temperature variation, age and infection status of the carp stock, wild fish from carp ponds and its outlets could be tested positive for the KHV genome using real-time PCR with a low prevalence and virus load. Furthermore, virus transfer to naive carp was observed after a period of cohabitation. Cyprinid and non-cyprinid wild fish can therefore be considered as an epidemiological risk for pond carp farms.

Survival of the carp herpes virus in water and sediment
https://www.researchgate.net/publication/37573811_Survival_of_Koi_Herpesvirus_KHV_in_Environmental_Water

The survivability of koi herpesvirus (KHV) in environmental water and sediment was evaluated using CCB cells. Samples were collected from Ibaraki prefecture, Kanagawa prefecture and Hakodate, Hokkaido. Significant reduction in the infectious titer of KHV was observed within 3 days in intact environmental water or sediment. However, KHV infectivity remained for more than 7 days in autoclaved or filtered (0.45 mm) water. In the autoclaved water containing sediment, KHV infectivity dropped below detectable limits within 7 days after inoculation. Ten of the 147 bacterial strains from rivers in Kanagawa, and two of the 62 bacterial strains from water from, Hakodate showed anti-KHV properties. The results suggest that in the absence of hosts, KHV can be rapidly inactivated in environmental water. 茨城県霞ヶ浦の湖水および底泥, 神奈川県鶴見川水系6地点および函館市内3河川5地点より水を採

Spreading the Carp Herpes Virus on fishing gear
https://marinescience.blog.gov.uk/2016/07/01/khv-fishery-angler-net-equipment/

So we held KHV diseased carp in a fine mesh keep-net overnight at 23°C. These infected carp were then removed, the net stored for 24 hours in a sealed plastic bag, and then we introduced carp without the disease to the net.

We found that these carp displayed clinical signs of KHV disease within 14 days of transfer to the contaminated net.

3) ***What test clean-up operations does the NCCP have planned, a clean-up of the scale of an estimated 2,000,000 tonnes of dead carp has never been realistically attempted anywhere, especially not in the short period of 24-48 hours required to avoid black water events.***

Would a test clean-up on 5% of the expected rotting fish volume be possible?

Supporting information:

It would not be unreasonable to suggest that even a cleanup of only 5% of the expected initial kill, or 100,000 tonnes of dead fish, completely cleaned up within 24 - 48 hours would be beyond feasibility without massive expenditure, access and resources not currently available, especially if the cleanup involved typical mixes of habitat and accessibility such as is found in the backwaters of the MDB.

A recent example that received significant media coverage was the cleanup of approximately 30 tonnes of carp by Parks Victoria of the Sale Common Nature Conservation Reserve to avoid a potential black water event.

http://parkweb.vic.gov.au/about-us/news/were-going-to-need-a-bigger-boat

Discussions with Park's Victoria Ranger Team Leader Chris Holmes revealed that the cost was in excess of $30,000 which is a conservative estimate used for cleanup costs at $1000 dollars a tonne. Chris said that the figure would have been much closer to $100,000 if they had actually had to dispose of the carp by burial or burning rather than supplying them to the NCCP for research. Additional costs he mentioned which were not considered as they were performed by salaried staff included rehabilitation operations. He highlighted access as an issue despite this area having excellent nearby road access, significant works and tractor access was required in order to allow boat access and carp removal.

Many of the factors here would be considered "best case" for much of the Murray Darling Basin, with the vast majority of temporary water holes being much farther from easy access. Extrapolation of this well planned and reasonably executed cleanup would put the initial cleanup cost in the range of 1.5 - 6 billion dollars with much of this possibly repeated with ongoing mass kills. It should be noted this cleanup still took 8 days, when recent research by NSW Water has shown that cleanup would be needed in 24-48 hours to avoid total deoxygenation and loss of complex life, so the actual cost would be far more significant once speed is taken into account.

http://www.researchcareer.com.au/archived-news/carp-study-sounds-warning

Other recent Australian and international examples of much smaller fish kills, mere 20 tonne kills took much longer to clean up or were abandoned due to difficulty. Examples include cape town in South Africa, the Murray River in W.A. the recent mass kills in the Hunter River Area in NSW, which while small in scale, killed many native species as well as pelicans, tortoises and other non-fish native wildlife due to the effects of the rotting fish.

https://www.news24.com/SouthAfrica/News/last-5-tons-of-dead-fish-to-be-removed-from-cape-town-vlei-20160308

http://www.water.wa.gov.au/news/news-items/lower-murray-river-fish-kill

http://www.watoday.com.au/wa-news/massive-catastrophic-murray-fish-kill-sparks-big-questions-20170601-gwikih.html

Cleaning up such kills are significant undertakings with risks to those performing the clean-up from secondary infections from pathogens such as Clostridia, Aeromonas and Vibrio which proliferate in dead carcasses.

To put the quantities of carp proposed to be cleaned up into perspective, since ‘Clean Up Australia Day’ started 27 years ago, more than 32 million volunteer hours have managed to remove 344 thousand tonnes of rubbish from over 171,000 sites across the country. The majority of these sites were easily accessible conventional sites not requiring special access, equipment or training and didn’t represent significant biohazards.

Clean up Australia’s efforts are impressive, but their entire history is equivalent to just over

17% of the amount of dead carp being predicted for the initial kill alone with an amount equivalent to at least 3x their total efforts being required every year into the foreseeable future from the recurring kills.

https://www.cleanupaustraliaday.org.au/about/about-the-organisation

Without taking the difficulty, risks and specialised equipment required for removing dead carp over regular roadside rubbish into account, a simple comparison would show that to clean up an initial kill of 2,000,000 tonnes of carp, even if we had 2,000,000 volunteers, we would need them to work 8 hours a day for 11 and a half days to clean up the carp, assuming optimal conditions were available.

When looking at these numbers, it is important to consider that initial testing on the deoxygenation of water by dead carp show that this task would need to be achieved within 2 days to avoid almost complete removal of oxygen from the water.

4) ***The National Carp Control Plan have frequently stated that clean-up will only take place in "priority areas" or "around major population centres". Obviously this would reduce the cost of clean-up on paper, however, the impacts on water quality of rotting fish such as black water and botulism outbreaks, coupled with massive increased in Biochemical Oxygen Demand will be present across the entire Murray Darling Basin. The cost to native fish, bird life, stock animals, industry and other native fish species could be enormous if significant portions of our waterways are left without clean up.***

The risks of botulism and non-direct impacts of the virus are not restricted to "high priority" or "high population" areas, so how can the NCCP justify limiting the clean-up to highly visible easily accessible areas?

Supporting information:

The NCCP have heavily focused their claims and studies of the virus release around the concept of species specificity, or the virus in its current form, being able to infect other species. While internationally even this claim has been brought into question, this focus misses the point entirely seeking to limit the discussion or studies to this single factor creates false reassurance that the fallout of a viral release would be minimal.

The approach itself, killing first then removing, rather than removing by other means causes many of the issues which cannot be mitigated if cleanup is restricted to a small percentage of the total MDB. Use of any knock-down control in a water body, be it poison or a virus, with a pest in these densities, presents a significant environmental risk.

Recent discussion has suggested that cleanup might be restricted to a small percentage of

effected waterways, using the initial estimate of killing 80% of two million tonnes, the simplest wastewater treatment calculations suggest that we could see a Biochemical Oxygen Demand resembling that of poor quality, secondary treated sewage for ALL water stored within the Murray-Darling.

This could potentially consume more than four times the available dissolved oxygen in the water, with lethal impacts for other organisms sharing the water body. The suggestion that we might look to perform cleanup in only a small portion of priority areas presents very real dangers for total ecosystem loss.

To have any chance of keeping nutrients within ANZECC guidelines (without considering the already degraded state of the basin), 50 to 90% of carp biomass would need to be removed within 48 hours of death. Practical considerations render this outcome all but impossible.

Beyond BOD issues, The release of the virus and the consistent and ongoing introduction of massive quantities of dead fish has consequences much further reaching than direct infection by the virus. Botulism is but a single example of deadly pathogens that arise when large quantities of dead animal matter are introduced to waterways. Botulism outbreaks occur when anaerobic conditions are significant quantities of dead matter are available, exactly the conditions the virus will create anywhere that clean-up does not occur.

This is in addition to the direct effects of black water where rotting fish remove oxygen from the water. Botulism is fatal, massive stock losses or treatment costs are likely for farmers many of which have already endured significant costs controlling botulism caused by relatively minor fish kills of just a couple tonnes at a time. Beyond direct treatment costs to agriculture, a far greater impact will be seen on native animals of all kinds which can't reasonably be isolated from their prime water sources and can't be expected to be treated in any way. Botulism is fatal, untreated animals will die.

Basic information on botulism

http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/general-livestock-diseases/avian-botulism

Risks for humans and pets

Humans can become sick from botulism typically by eating improperly canned or stored foods. Aside from this, humans and pets are primarily at risk only if they eat infected fish, birds or maggots. **Precautions should be taken when harvesting fish or waterfowl – they should not be harvested or eaten if they are sick or acting abnormally. Prevent pets from eating potentially infected fish, birds or maggots.**

Cause

Botulism spores, the resting stage of the bacteria, are abundant in anaerobic habitats (ie. those lacking low oxygen levels), such as soils, and aquatic sediments of many wetlands and lakes, and can be readily found in the gills and digestive tracts of healthy fish living in those lakes. The spores can remain in the ecosystem for extended periods of time, even years, and are quite resistant to temperature changes and drying. These spores, themselves, are harmless until the correct environmental factors and anaerobic conditions prompt them to germinate and begin the vegetative growth of the toxin-producing bacterial cells. The active bacteria that cause avian botulism grow only in a nutrient-rich substrate, such as in areas with large amounts of decaying plant or animal materials, which are also anaerobic. Fish that die for any reason and that contain the bacterial spores in their tissues are also suitable substrates for growth and toxin production by the bacteria.

Fish-eating birds that die of botulism are poisoned by eating fish that contain the toxin. Ingestion of maggots from the carcass of an infected animal can continue the spread of avian botulism, which may be responsible for large kills of birds.

Outbreaks of avian botulism occur only when a variety of particular ecological factors occur concurrently. This typically involves warmer water temperatures, anoxic (oxygen-deprived) conditions and adequate levels of bacterial substrate in the form of decaying plants, algae or animal materials. As average air and water

https://www.agric.wa.gov.au/livestock-biosecurity/botulism-cattle

Botulism in cattle

Botulism is a rapid onset, usually fatal disease caused by the botulinum toxin produced by the bacterium *Clostridium botulinum*.

Typical signs include hindlimb weakness progressing to paralysis, collapse and death.

Common sources of toxin include animal carcasses, rotting organic material and poorly prepared silage. Treatment is rarely attempted but vaccines are available for disease prevention in cattle.

https://www.dec.ny.gov/animals/28433.html

Type E Botulism

Description

Type E botulism is a form of food poisoning. The toxin is produced by a bacterium, *Clostridium botulinum*. *C. botulinum* produces several types of toxins, characterized by the letters A through E. Animals are affected after ingesting the bacteria, either through eating or drinking. The toxin remains viable in live animals, carcasses, maggots, and water. The toxin causes paralysis of the animal's muscles.

Where it Occurs

Type E botulism primarily occurs in the Great Lakes region. The first reports in New York involved an outbreak in Lake Erie in 1999.

Animals it Infects

This disease is responsible for extensive waterfowl and fish kills, mostly affecting the following species:

- fish-eating or scavenging waterbirds (gulls, ducks, loons, mergansers, and cormorants)
- fish (smallmouth bass, rock bass, channel catfish, and lake sturgeon)
- mudpuppies (large aquatic salamanders)

Symptoms/Signs

- Affected birds cannot hold their head up, which may cause waterbirds to drown (i.e., limberneck).
- Birds, especially gulls, cannot fly or walk properly, often dragging a wing.
- Birds may have paralysis of the third eyelid.
- Birds may swim in circles or be unable to right themselves while on the water.
- Fish struggle or swim erratically near the surface of the water.
- Fish usually die quickly and are most likely seen washed up on shore.

Recently the NCCP have cited the NSW Water study as evidence that the risk was less than that expressed by experienced estuarine ecologists. However, it has been pointed out to the NCCP that this study did not include significant sediment (it was excluded where possible) thus removing the primary source of introduction of these bacteria. Real world experience with mass fish kills has shown us time and again that were mass kills occur, rotting fish and botulism follows. Anaerobic conditions in degraded sediment all but assure this.

http://www.researchcareer.com.au/archived-news/carp-study-sounds-warning

5) ***Testing of the effects of black water published to date and the requirement for clean-up under the National Carp Control Plan have been restricted to small scale tests, including testing of single carp in 800L tubs which removed all oxygen within 48 hours, testing by NSW Water which showed total oxygen removal in 2000L tanks in all test conditions but one. Unpublished testing of a 2.5 hectare waterway, seeded with just 6 tonnes of dead carp has also been conducted with preliminary results showing total de-oxygenation in many areas. All studies show significant impacts on water quality, incompatible with most fish life and conducive to the anaerobic conditions in which botulism and other serious conditions occur.***

What studies have been conducted by the NCCP, specifically to determine the minimum levels of fish kills acceptable before the decomposing fish will impact on native species or more importantly, create conditions conducive to common bacterial and other pathogens often found in such mass kill events?

Supporting Information:

The focus by the NCCP on direct viral impacts is highly misleading, the impacts of releasing the virus are far larger than the significant risk of viral mutation. The dead fish themselves create far reaching impacts, the most immediately obvious are black water events depriving other aquatic animals of oxygen, but the potentially far more deadly impacts of botulism and other pathogens caused by rotting animal matter have been largely ignored in public discussion.

As discussed earlier using the initial estimate of killing 80% of two million tonnes, the simplest wastewater treatment calculations suggest that we could see a Biochemical Oxygen Demand resembling that of poor quality, secondary treated sewage for ALL water stored within the Murray-Darling.

This could potentially consume more than four times the available dissolved oxygen in the water, with lethal impacts for other organisms sharing the water body. The suggestion that

we might look to perform cleanup in only a small portion of priority areas presents very real dangers for total ecosystem loss.

To have any chance of keeping nutrients within ANZECC guidelines (without considering the already degraded state of the basin), 50 to 90% of carp biomass would need to be removed within 48 hours of death. Practical considerations render this outcome all but impossible.

Testing of the effects of black water and the requirement for clean-up under the National Carp Control Plan have been very limited, One study conducted prior to the NCCP tested the effect of a single carp in 800L tubs, this revealed that all oxygen was removed within 48 hours, which would certainly kill our native fish species and aquatic animals. The only other test funded under the NCCP was the testing of a 2.5 hectare waterway, seeded with just 6 tonnes of dead carp. While final results have not yet been released the NCCP have already acknowledged in media interviews that this study shows significant impacts on water quality.

Neither of these studies comes close to demonstrating a worst case scenario as far higher carp concentrations exist during carp congregation events such as spawning, but more importantly, neither of these studies demonstrates the minimum tolerable level of dead fish before deoxygenation occurs and more importantly, before anaerobic conditions are created which when combined with dead and animal matter are conducive to botulism and other serious outbreaks with the potential to affect our entire system of waterways.

In the absence of both actual worst case scenario studies in line with the density of carp at barriers during carp congregation events and more importantly, studies that determine the minimum conditions where aquatic life is impacted and conditions conducive to botulism and other common deadly pathogens occur, no claim of a minimum safe clean-up requirement can be justified. Certainly no claim of the safety of releasing the virus can be made without such benchmark studies.

http://www.abc.net.au/news/2016-08-14/herpes-carp-kill-in-river-murray-ecosystem-may-sap-oxygen/7731892

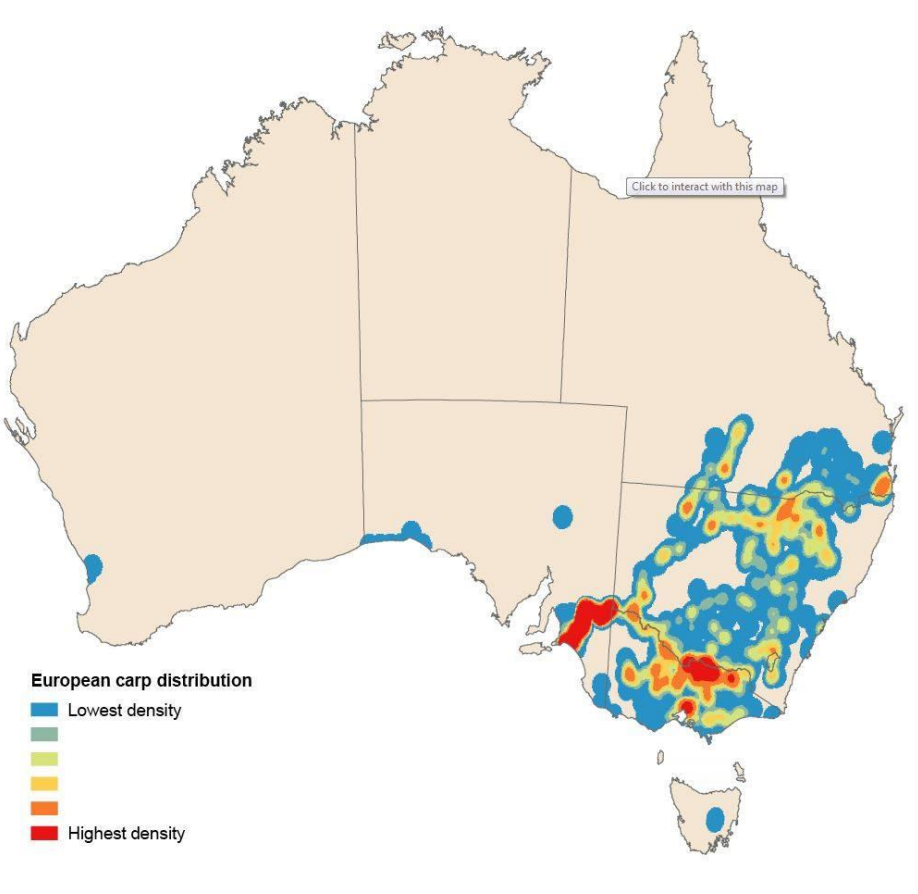
http://www.researchcareer.com.au/archived-news/carp-study-sounds-warning

6) ***Given that an existing Commonwealth government map of Carp distribution show most Carp sightings below Lock One and that this is likely to be the first management area, we really need to get the clean up right.***

How much water would it take to flush the expected fish volume out of the river system, after and during decomposition? If we had to do this quickly do we have enough water to achieve this? Do we have enough if we maintain current water use requirements?

Supporting information:

https://soe.environment.gov.au/theme/inland-water/topic/2016/pests-and-invasive-species



7) Using water to flush out large portions of the dead carp biomass has been proposed as a key method by the NCCP. Is it likely that likely the ideal conditions for viral release would co-occur with times when we have enough water in reserve, to flush the river?

Supporting information:

The ideal times to release the virus are during carp spawning seasons which occur during the hotter months of the year, this is the time when water reserves are under strain, limiting the availability of water for the purposes of flushing dead carp.

8) Future kills are unlikely to be as well timed as the initial release, Will we have enough water in reserve for future fish-kills regardless of when they occur?

Supporting information:

Once released the virus will not be controllable by the NCCP, future outbreaks will likely occur at the hottest times of the year when water reserves are lowest. The NCCP seem to be

focusing on convincing the public simultaneously that mass kills that ongoing mass kills will not occur, so cleanup costs will not be significant after the initial kill, while simultaneously promoting the idea that the viral release will be effective as it will deliver ongoing mass kills.

Recently the NCCP opened up the "yoursay" web page inviting questions on carp biomass collection and utilisation. The NCCP has stated on many occasions including in written responses to this page that:

" With respect to how long mass carp kill events might occur, and so biomass reuse strategies might need to be in place, the carp virus has now been found in 33 countries worldwide, and has not caused ongoing mass fish kills in any other country, suggesting the likelihood of ongoing outbreaks occurring is low."

This information is incorrect, as there are many examples of ongoing and often annual mass kills that require significant cleanup such as those seen in South Africa and the UK to name a few. A simple google search reveals these events as regular and damaging occurrences in the countries where they occur so it is concerning the NCCP are assuming this will not happen.

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The study by **Paul Brown ABD and Dean Gilligan** linked below stated the criteria required to achieve effective biocontrol using the carp herpes virus and required that "***broad-scale***

outbreaks occur in at least 40% of years"occur for the viral release to be successful. Ongoing mass scale outbreaks are required and assumed for every second year, which means cleanup will also be required every second year, these should be treated as a minimum requirement for cleanup due to evidence that in many locations annual recurrences are common in carp herpes virus affected countries despite international efforts to contain the virus.

https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

The only two outcomes here are that the virus won't be effective but ongoing cleanup costs will be reduced, or it will be effective in reducing carp with very significant annual recurring cleanup costs will occur, it can't be both. It may be advantageous in ensuring the plan gets approved to downplay ongoing cleanup requirements and costs, but this is not in the interest of good policy.

9) ***How will the NCCP ensure that the Black Water filled with rotting carp will move quickly and completely out of the tiny mouth of the Murray, rather than backing up, along the Coorong?***

Supporting Information:

This area experiences frequent river mouth closures and other events which would make the flushing of potentially millions of tonnes of dead carp, extremely unlikely.

BUDGETED COSTS AND ECONOMIC IMPACT

10) ***The costs to safely attempt the clean-up of this virus are very significant, and critically, are required every year.***

We need to know that the clean-up will be done and is achievable, across the entire affected waterway, not just priority areas, that it is fully budgeted for, not just immediately but on an ongoing basis and without significant environmental, economic, or human consequences.

Supporting Information:

The cost of releasing the virus can reasonably be expected to be far greater than the cost of carp. A reasonable cost for the initial clean-up has been calculated at approximately $1000 per tonne to which is needed to cover equipment, training, travel, retrieval of dead fish,

transport and then disposal. With an estimated initial kill of 2,000,000 tonnes of carp, this would put the initial cost for clean-up alone at 2 billion dollars. With are far higher cost being likely due to access issues in much of the Murray Darling Basin. Clean-up costs may vary in later years but would remain high.

The study by **Paul Brown ABD and Dean Gilligan,**used by the NCCP to recommend the use of the virus over other options, both assumes and requires that "***broad-scale outbreaks occur in at least 40% of years"***to achieve the goals of successful biocontrol outcomes.

https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

Given that this is the required result for a successful use of the carp herpes virus, it is fair to assume that ongoing annual or biannual outbreaks such as those seen in South Africa are all but certain, but on a much larger scale commensurate with the size of our carp population and the area of effected waterways. So a large portion of these initial clean-up costs would be required every second year at a minimum if the virus was working as planned.

Given the persistence of the virus and carp in the system, which is assumed (correctly) by the NCCP, it is also fair to assume that clean-up will be a significant and ongoing cost. Even if carp biomass is reduced by 50% over 10 years, the range needed to be covered, the speed required and the fixed costs of clean-up are likely to remain, and be required for an indefinite period. The cost in terms of impact on tourism and clean-up will also be continuous

A recent example that received significant media coverage was the cleanup of approximately 30 tonnes of carp by Parks Victoria of the Sale Common Nature Conservation Reserve to avoid a potential black water event.

http://parkweb.vic.gov.au/about-us/news/were-going-to-need-a-bigger-boat

Discussions with Park's Victoria Ranger Team Leader Chris Holmes revealed that the cost was in excess of $30,000 which is a conservative estimate used for cleanup costs at $1000 dollars a tonne. Chris said that the figure would have been much closer to $100,000 if they had actually had to dispose of the carp by burial or burning rather than supplying them to the NCCP for research. Additional costs he mentioned which were not considered as they were performed by salaried staff included rehabilitation operations. He highlighted access as an issue despite this area having excellent nearby road access, significant works and tractor access was required in order to allow boat access and carp removal.

Many of the factors here would be considered "best case" for much of the Murray Darling Basin, with the vast majority of temporary water holes being much farther from easy access. Extrapolation of this well planned and reasonably executed cleanup would put the initial cleanup cost in the range of 1.5 - 6 billion dollars with much of this possibly repeated with

ongoing mass kills. It should be noted this cleanup still took 8 days, when recent research by NSW Water has shown that cleanup would be needed in 24-48 hours to avoid total deoxygenation and loss of complex life, so the actual cost would be far more significant once speed is taken into account.

There should not be a recommendation to proceed with this plan unless perpetual funding in the order of 2-5 billion dollars per year has been committed into the foreseeable future and should be considered a permanent cost. This cost should not be passed on to local councils.

11) The NCCP and Barnaby Joyce have stated that the economic cost of carp is around $500 million per year, can the NCCP provide, in detail, how this figure has been reached?

Supporting Information:

How this figure has been reached is unclear, numerous requests have been made to the NCCP to clarify how this figure was calculated but this has not been provided to date, this is important as it is one of the key costs used to justify the risks associated with the project and of course the costs associated with the project.

The cost of releasing the virus can reasonably be expected to be far greater than the cost of carp. A reasonable cost for the initial clean-up at a cost of approximately $1000 per tonne to cover equipment, training, travel, retrieval, transport and disposal would put the cost of clean-up for the initial kill of 2,000,000 tonnes of carp at 2 billion dollars.

The study by **Paul Brown ABD and Dean Gilligan**which was usedby the NCCP to recommend the use of the virus over other options, both assumes and requires that "***broad-scale outbreaks occur in at least 40% of years"***to achieve successful outcomes as a biocontrol.

https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

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Given this, the cost of the clean-up is likely to be massive, regardless of how generous the $500 million annual cost of carp is, the clean-up cost would easily exceed this cost. That is before looking at the economic cost and loss of opportunity for protein farming, the koi carp industry, carp fishing, export opportunities, course fishing tourism and so on.

12) What will be the cost of the Clean- up campaign? If this is waiting on population estimates, what is the estimated clean-up cost per tonne?

Supporting Information:

Commercial estimates of $1,000 per tonne have been suggested for commercial waste management. Assuming several favourable conditions such as direct access being available, pre existing equipment, training and disposal capacity, none of which are likely to occur. The recent cleanup in sale which was performed in favourable conditions over a longer time frame and bore no actual disposal costs exceeded this estimate at over $30,000 for a cleanup of 30 tonnes.

Current estimates put the carp biomass at between 4,000,000 and 6,000,000 tonnes, but if we assume only 1.5 million tonnes of dead carp in line with the former deputy PM's estimate and only a 40% efficient contractor doing the clean-up, this would mean that as an absolute minimum, we would see a bill of some $600 million rising to $1.5 billion if an efficient contractor was used. With the bill potentially rising to 6 billion and beyond if more current data is used and the lack of ideal conditions are factored into the calculation.

13) What treatment cost is assumed and on what basis, for the treatment of stock and other impacted animals for botulism outbreaks and other pathogens caused by rotting fish?

Supporting Information:

The cost of treating cattle for botulism outbreaks caused by existing water quality issues and small scale fish kills is significant, but is a tiny fraction of the potential cost, both to farmers and our natural environment if this issue is not accounted for, both financially and in terms of lost wildlife. Botulism is usually not treated due to the cost, estimates from veterinarians in Western Australia put the cost at over $1000 per head of cattle including lab work and treatment.

ESTUARINE ECOLOGY

14) How will the sudden loss of a carp food-source impact the behaviour of Fur Seals, the breeding of Pelicans and predation on other rare native fish species?

Supporting Information:

Fur Seals already pose significant problems in the Coorong, the sudden loss of the carp food source would likely impact on the rest of the ecosystem as well as commercial and threatened fish species. Fur seals are just one example of predatory populations that will not suddenly exit the ecosystem if carp numbers rapidly drop, so they will switch to alternative food sources putting additional pressure on already threatened native fish stocks.

http://www.abc.net.au/news/2015-07-18/fur-seals-cull-would-not-work-environment-department-says/6629808

15) ***How much will the changed habitat (lack of emergent vegetation, lack of flows, coldwater discharges from dams etc, salinity and other ecological drivers impact on native fish breeding up to fill the void left by Carp? Is the void more likely to be filled by resistant Carp or other introduced species such as Redfin?***

Supporting Information:

Deteriorated environmental conditions favour carp over natives, this is the cause of high carp numbers in the first place. Carp are not the only invasive species out competing our natives. Without addressing the cause of high carp numbers two likely outcomes are that carp numbers will rebound into a now even less suitable environment for natives or other invasive species such as redfin will fill the void left by carp.

Carp have different impacts to other invasive species which could potentially take their place. The NCCP should be able to explain how certain they are that an environment filled with these species would be preferable to the status quo? Redfin in particular are an aggressive predatory fish, which carp are not, this means they eat natives directly, which carp generally do not, carp impacts are more in competition food eaten by small fish, not directly destroying larger native species populations by eating the juvenile fish.

16) ***In the event the void created by a mass kill of carp is filled by another invasive species such as redfin, how would this new situation compare to the status quo?***

17) ***In line with the ecological theory of alternative stable states, Is it the intention of the NCCP to decrease and maintain Carp populations below 20% of current densities for an indefinite time period of more than 30 years, while also helping significantly mitigate the impacts of geomorphological changes and flow on native fish populations? Alternatively, will the Carp be back to current densities (or close to) before the system has a chance to fully recover?***

Supporting Information:

Based on the theory of alternative stable states, the ecological principles of resistance and hysteresis (particularly where the state change is more entrenched and extensive), suggest that once an ecosystem has been pushed from one ecological state to another via an impact (sometimes referred to as crossing a threshold), it will generally require 80% of that impact mechanism (if known) to be reversed and maintained for a significant time period, before that system will start the transition back over than threshold. In the case of the MDB, the known major drivers of native fish populations are a combination of geomorphological changes (infrastructure/earthworks), nutrients, flows and carp.

Large estuaries and similar retentive, sediment-rich systems are known to have significant hysteresis effects and are therefore known to take at least 30 years to recover from significant ecological changes. It is unknown how long the hysteresis effects would last, for an entire riverine basin, however it is expected to be longer than this.

18) ***Recent reports from fisheries and the Murray Darling Basin Authority have shown an increase in Murray Cod numbers associated with an increase in carp numbers, essentially native species have adapted to the presence of carp and they have become part of the food chain. While these natives may prefer other natives, Can the NCCP explain how certain they are and on what basis, that significant food chain disruption will not further damage native species?***

Supporting Information:

Assuming the virus successfully and significantly reduced carp numbers in a very short period of time. What impacts specifically, might there be on the Murray cod. Other predatory invasive species by definition may out compete Murray cod for any new small prey items that emerge, giving rise to a situation where one invasive species with minimal impacts on large predatory natives, is replaced with a more aggressive predatory invasive species that does directly compete for food resources with high value native species such as Murray cod.

HIGH RISK, IRREVERSIBLE AND PERMANANT

19) ***What worst case scenario is modelled in the NCCP's studies and what is planned to deal with this scenario? Specifically if the predictions and warnings of mass carp deaths causing widespread black water events, which repeat on an annual basis as the carp population rebounds turned out to be unmanageable, how would the NCCP shut down the project and contain the damage?***

Supporting Information:

Put simply, the release of the virus is irreversible and is considered high risk by many local and most international scientists working with the carp herpes virus.

The NCCP in public releases and published studies from its scientific advisory group typically quote best case scenario's and numbers i.e.: only 500,000 tonnes of carp, Only small ongoing outbreaks, Insignificant risk of unintentional or uncontrolled vector based transmission.

We need to know what methods the NCCP see as viable in a worst case scenario so that these can be evaluated and scrutinised independently. How would they permanently eliminate the virus if it jumped species? How would they seek to control the spread if some or all of the optimistic assumptions on the impact of the virus and our ability (or funding) to deal with the clean-up, turn out to be incorrect or insufficient?

This is a high risk, irreversible plan. It has been described as such by many leading experts on the virus. Surely the worst case scenario is what should be being planned for. Surely this scenario should be discussed openly and the contingency plans allowed for in any costings and planning budgets.

This question has been asked of the NCCP many times but has not been responded to. Surely this is the most important step we could take for a responsible, low risk implementation.

20) What criteria have been established which would result in the virus not being released, what are the critical risks considered important enough to halt the release of the virus. Is the impact on people outside of direct viral infection a consideration? If so, what are those considerations and what acceptable thresholds have been determined?

Supporting information:

We can't go into this assuming only best case scenarios. We need to know what criteria or risks would be deemed significant enough to rule out the release of the virus to ensure these align with public expectations.

21) As both the virus and carp are expected to remain in the system, indefinitely, for all intents and purposes, what time frames do your assumptions operate on in terms of the likelihood of the virus mutating or other unplanned for events?

Supporting information:

The reality of a permanent and irreversible release has many implications. It is a very important question as the risk of the virus mutating is determined by 2 factors, how many

viral particles are simultaneously released and active in the system, and how long is it active in the system for. This was one of the key concerns expressed by the international scientists who wrote to the senate last year. These concerns were side stepped and an answer was provided that the program would only run for 10's of years. This is irrelevant, if the virus remains in the system forever once released the evolutionary potential to mutate in unexpected ways becomes a virtual certainty.

The virus is known to only have been in existence for approximately 20 years, it is only logical that it came into existence by mutating from another similar virus, most likely a benign carp herpes virus or a lethal herpesvirus in another species. How then can the NCCP be so confident it will not mutate again given that evidence of mutation is so widespread already.

Letter to the senate from international scientists
http://www.nature.com/articles/s41559-017-0087

Simple video discussing this concept and previous senate estimates answers:
https://www.youtube.com/watch?v=hsRNV922v9s&t=44s

The studies below demonstrate over 40 strains of the carp herpes virus already in existence (each one is a mutation) and a study discussing the origins of this virus as being related to catfish and frog herpesvirus, species which we obviously have significant native species examples.

Study with evidence of over 40 strains of the carp herpes virus
https://www.researchgate.net/publication/259319430_Detection_of_novel_strains_of_cyprinid_herpesvirus_closely_related_to_koi_herpesvirus

Study showing the evolutionary cross species relationships of the carp herpes virus

2.1.1. Aetiological agent, agent strains

The aetiological agent is koi herpesvirus (KHV) in the family *Alloherpesviridae* (Haramoto et al., 2007; Waltzek et al., 2009) although prior to taxonomic classification, it was also known as carp interstitial nephritis and gill necrosis virus (CNGV) (Ilouze et al., 2011). Waltzek et al., 2005provided evidence to support the classification of the virus as a herpesvirus, and named it cyprinid herpesvirus-3 (CyHV-3), following the nomenclature of other cyprinid herpesviruses: CyHV-1 (carp pox virus, fish papilloma virus) and CyHV-2 (goldfish haematopoietic necrosis virus). Sequence analysis of part of the genome has shown that KHV is closely related to CyHV-1 and CyHV-2, and distantly related to channel catfish virus (Ictalurid herpesvirus: IcHV-1) and Ranid (frog) herpesvirus (RaHV-1) (Waltzek et al., 2005). Aoki et al., 2007described the complete genome sequence of KHV and identified 156 unique protein-coding genes. They suggested that the finding that 15 KHV genes are homologous with genes in IcHV-1 confirms the proposed place of KHV in the family *Herpesviridae*. Forty viral proteins and 18 cellular proteins are incorporated into mature virions (Michel et al., 2010). Recently, CyHV-3 was designated the type species of the new *Cyprinivirus* genus within the *Alloherpesviridae* family, that also contains CyHV-1 and CyHV-2. Early estimates of the genome size of KHV varied from at least 150 kbp to 277 kbp but the size is now confirmed as 295 kbp. Virus nucleocapsids have been measured at 100–110 nm in diameter and are surrounded by an envelope (Ilouze et al., 2011).

22) ***When discussing the risk of mutation, The NCCP has stated that the program duration of only a decade or so makes the risk unlikely to eventuate. International scientists have warned that there will be unprecedented releases of viral particles, and that the permanence of releasing the virus will in turn have a huge evolutionary potential (chance to mutate).***

As the virus will remain in the system, for all intents and purposes, forever, how is it relevant that the program duration will only last a decade?

Supporting information:

The virus does not respect "program duration", once released, it is here forever, so the risks need to be examined on this time scale.

Letter to the senate from international scientists
http://www.nature.com/articles/s41559-017-0087

23) ***Is a perpetual timeline used when analysing risk. Is a risk considered insignificant if it won't be likely to occur in the first 10 years, the assumed program funding duration?***

Supporting information:

A perpetual timeline would be appropriate given that the virus can't kill all carp and won't leave the system unless all carp are gone, so risk analysis should take extended timescales into account.

VIRAL TRANSMISSION AND SPECIES SPECIFICITY

24) ***Of particular concern is the ready availability of international and Australian studies that questions many of the assertions made by the NCCP,***

Can the NCCP confirm the assertions or implied assertions that:

A) That this virus is species specific and will not mutate or jump species once introduced to Australian waters

B) That replication of the virus has not been observed in any non-carp species in peer reviewed studies worldwide.

C) *That the virus is not highly contagious or easily transferred by water, boats, birds, insects, non-target fish species or other animals and therefore, can be contained for a controlled or trial release.*

D) *That it will effectively control carp, with numbers lower than 40% of the current carp population a year after release.*

E) *Have the NCCP proven the virus can not affect native species?*

Supporting information:

Supporting studies for questions A-E, this list should not be considered exhaustive but covers some of the issues. It is important to consider that while a given study might not prove a particular concern is valid, the suggestion warrants significant investigation in each case when the implications are so serious for any proposed viral release. Where methods are deemed insufficient by the NCCP, a correct course would be to replicate these studies using their own methods rather than dismissing them out of convenience. Difference of peer reviewed opinion on scientific methodology is common, so to dismiss the whole body of global peer reviewed science on the topic without testing the conclusions is irresponsible.

A)

Viral replication confirmed in fat head minnows ie: it is not species specific):
https://www.ncbi.nlm.nih.gov/pubmed/17092898

Abstract

Koi herpesvirus (KHV), a highly contagious and lethal virus that affects both koi (Cyprinus carpio koi) and common carp (Cyprinus carpio), was isolated in 1998 from two outbreaks of koi suffering mass mortality in New York State, USA, and in Israel. The disease had been described as early as 1996 in Europe. In July 2004, this virus was found associated with a mass mortality event in wild common carp in the Chadakoin River, New York, USA (42 degrees 07' N, 79 degrees W). Affected fish typically showed marked hyperplasia of gill tissues, abdominal adhesions, and severe multifocal to diffuse external hemorrhages. The virus isolated in this outbreak was somewhat unusual in that it initially replicated well in fathead minnow cell cultures, which is typical of spring viremia of carp virus. Testing at the National Veterinary Services Laboratories, Ames, Iowa, USA, confirmed the virus's identity to be KHV. Koi herpesvirus is not currently on the OIE (World Organisation for Animal Health) list of notifiable diseases; however, it is capable of causing mass mortality in susceptible fish at permissive temperatures.

Carp Herpes Virus is not species specific
https://www.researchgate.net/publication/236858935_Managing_the_Impacts_of_Common_Carp

Spring Viraemia of Carp Virus (SVCV) is not specific to carp (Section 3.4.4). SVCV has been isolated from ten fish species from four different families (Crane and Eaton 1997) and is also able to infect fruit flies (Bussereau et al. 1975). However, testing of Australian native fish for susceptibility to the virus, conducted in England, found that river blackfish (*Gadopsis marmoratus*), flathead gudgeon (*Philypnodon grandiceps*), golden perch, silver perch, Murray cod, southern pygmy perch (*Nannoperca australis*) and dwarf galaxias were not sensitive to SVCV (Hume et al. 1983a). These results need to be treated with caution because apart from native fish, tests in England also found that goldfish were not sensitive to the virus. Since then, goldfish have been found to be susceptible (Crane and Eaton 1997), so that the apparent lack of sensitivity to the virus in native fish cannot be taken for granted. To date, outbreaks of Spring Viraemia of Carp Disease in wild carp have only occurred rarely if at all.

Other cyprinid species other than card are also vulnerable to the virus, Australia does not have native cyprinids, the point is, the carp herpes virus is not species specific as claimed.
https://www.ncbi.nlm.nih.gov/pubmed/17497237

Abstract
Cyprinid herpesvirus 3 is a highly contagious and lethal virus that affects ornamental koi and common carp worldwide. However, it is not yet known whether other cyprinids are infected and/or harbor the virus. Here, we report that cultured cells derived from common carp, koi, silver carp and goldfish allow CyHV-3 propagation, while cyprinid cells derived from fathead minnow and non-cyprinid cells derived from the channel catfish ovary are resistant to CyHV-3 infection. Interestingly, the epithelioma papulosum Cyprini cells derived from Cyprinus carpio are restrictive to the virus. These results indicate that CyHV-3 is not restricted to common carp and koi, but other cyprinids are also vulnerable to the virus.

Lack of species specificity in the carp herpes virus, rainbow trout susceptible
https://www.omicsonline.org/open-access/is-there-any-species-specificity-in-infections-with-aquatic-animalherpesvirusesthe-koi-herpesvirus-khv-an-alloherpesvirus-model-2150-3508-1000169.php?aid=72785

Most diseases induced by herpesviruses are host-specific; however, exceptions exist within the family Alloherpesviridae. Most members of the Alloherpesviridae are detected in at least two different species, with and without clinical signs of a disease. In the current study the Koi herpesvirus (KHV) was used as a model member of the Alloherpesviridae and rainbow trout as a model salmonid host, which were infected with KHV by immersion. KHV was detected using direct methods (qPCR and semi-nested PCR) and indirect (enzyme-linked immunosorbant assay; ELISA, serum neutralization test; SNT). The non-koi herpesvirus disease (KHVD)-susceptible salmonid fish were demonstrated to transfer KHV to naïve carp at two different temperatures including a temperature most suitable for the salmonid (15°C) and cyprinid (20°C). At 20°C KHVD was induced in carp cohabitated with infected trout. KHV was also detected virologically and serologically at the end of the experiment in both rainbow trout and carp.

The NCCP at the last senate estimates acknowledged at least 9 strains of the carp herpes virus, this alone demonstrates evidence of mutation, additional studies however show over 40 known strains related to this virus. Each one representing a mutation.

Study with evidence of over 40 strains of the carp herpes virus
https://www.researchgate.net/publication/259319430_Detection_of_novel_strains_of_cyprinid_herpesvirus_closely_related_to_koi_herpesvirus

B)

Replication has been observed in fathead minnows and other species, see the studies referenced for question A) above

Beyond this, it must be considered, as infection is likely possible in similar species such as fat head minnow, grass carp and certain goldfish among the limited number of species tested to date (remember only 8 fish species so far in Australia), It is completely unreasonable for the NCCP to state that the virus can not affect other species. If they choose to make this statement they should explain what criteria they you use to discount studies that demonstrate the opposite of their stated positions? What studies have the NCCP conducted in this area? Have they repeated the studies on fat head minnows? Surely if the virus can jump to similar species, it is not unreasonable to expect that given enough time and enough viral particles in the system, a jump to more diversified species is also possible.

C)

Before the NCCP facebook forum was shut down, On more than one occasion a member of the scientific advisory committee declared that he was satisfied by third party reports of casual observation to justify some of the conclusions of the NCCP scientific advisory team relating to the containability of the virus and the ease of transmission. To paraphrase, He had been concerned, but was not after hearing of ducks walking between ponds without infection.

Examples include expressed confidence that uncontrolled spread via non carp to carp vectors, will not occur and will be insignificant, this is despite a large volume of peer reviewed evidence to the contrary presented by members of the community. Some of which is included below.

This is extremely concerning because the ability for the virus to spread easily and rapidly eliminates the reasonable possibility of a contained release or a wild trial release. If the virus is released at all, it will escape and dominate our waterways. Evidence of the ease and modes of transmission from international peer reviewed studies is included below:

The virus is transmissible and can remain live and viable in water:
http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/current/chapitre_koi_herpesvirus.pdf

2.1.2. Survival outside the host

Studies in Israel have shown that KHV remains active in water for at least 4 hours, but not for 21 hours, at water temperatures of 23–25°C (Perelberg et al., 2003). Studies in Japan have shown a significant reduction in the infectious titre of KHV within 3 days in environmental water or sediment samples at 15°C. However, the infectivity remained for >7 days when KHV was exposed to similar water samples that had been sterilised by autoclaving or filtration (Shimizu et al., 2006). The study also presented evidence for the presence of bacterial strains in the water with anti-viral activity. More recently, the detection of KHV DNA in river water samples at temperatures of 9–11°C has been reported, 4 months before an outbreak of KHVD in a river (Haramoto et al., 2007). However, persistence of the virus may have been aided by the presence of animate vectors and detection of DNA may not always be indicative of the presence of infectious virus.

Transmission of the virus from 6 non-carp species
https://www.researchgate.net/publication/235732844_Horizontaltransmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carpHorizontal_transmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carp

Abstract

Six fish species, defined as potential vectors in koi herpes virus (KHV) transmission, namely: common roach, European perch, tench, Eurasian ruffe, silver carp and grass carp were included in this study. The fish used to transmit infection originated from a fish culture facility where KHV had been diagnosed and prior to the beginning of the research study the presence of the virus genome was confirmed in each individual fish intended for cohabitation. Specific pathogen free (SPF) carp utilized in the experiment originated from the University of Wageningen. During a four-week period the SPF carp were exposed to infection through cohabitation with vector species previously confirmed as KHV carriers. The obtained results demonstrated the possibility of a horizontal transmission of KHV between selected species, even in the case of species showing no clinical signs of KHV disease (KHVD), while an average water temperature in the tanks ranged from 12°C to 16°C.

Wild fish species other than carp are capable of transmitting the virus
https://www.ncbi.nlm.nih.gov/pubmed/23121232

Abstract

The koi herpesvirus (KHV) has spread worldwide since its discovery in 1998 and causes disease and mortality in koi and common carp populations with a high impact on the carp production industry. Many investigations have been conducted to examine ways of distribution and to identify possible transmission vectors. The answers, however, raise many new questions. In the present study, different wild fish species taken from carp ponds with a history of KHV infection were examined for their susceptibility to the virus. In the tissue of these fish, the virus load was determined and it was tested whether a release of the virus could be induced by stress and the virus then could be transferred to naive carp. Wild fish were gathered from carp ponds during acute outbreaks of virus-induced mortality in summer and from ponds stocked with carp carrying a latent KHV infection. From these ponds, wild fish were collected during the harvesting process in autumn or spring when the ponds were drained. We found that regardless of season, temperature variation, age and infection status of the carp stock, wild fish from carp ponds and its outlets could be tested positive for the KHV genome using real-time PCR with a low prevalence and virus load. Furthermore, virus transfer to naive carp was observed after a period of cohabitation. Cyprinid and non-cyprinid wild fish can therefore be considered as an epidemiological risk for pond carp farms.

Survival of the carp herpes virus in water and sediment
https://www.researchgate.net/publication/37573811_Survival_of_Koi_Herpesvirus_KHV_in_Environmental_Water

The survivability of koi herpesvirus (KHV) in environmental water and sediment was evaluated using CCB cells. Samples were collected from Ibaraki prefecture, Kanagawa prefecture and Hakodate, Hokkaido. Significant reduction in the infectious titer of KHV was observed within 3 days in intact environmental water or sediment. However, KHV infectivity remained for more than 7 days in autoclaved or filtered (0.45 mm) water. In the autoclaved water containing sediment, KHV infectivity dropped below detectable limits within 7 days after inoculation. Ten of the 147 bacterial strains from rivers in Kanagawa, and two of the 62 bacterial strains from water from, Hakodate showed anti-KHV properties. The results suggest that in the absence of hosts, KHV can be rapidly inactivated in environmental water. 茨城県霞ヶ浦の湖水および底泥, 神奈川県鶴見川水系6地点および函館市内3河川5地点より水を採

Spreading the Carp Herpes Virus on fishing gear
https://marinescience.blog.gov.uk/2016/07/01/khv-fishery-angler-net-equipment/

So we held KHV diseased carp in a fine mesh keep-net overnight at 23°C. These infected carp were then removed, the net stored for 24 hours in a sealed plastic bag, and then we introduced carp without the disease to the net.

We found that these carp displayed clinical signs of KHV disease within 14 days of transfer to the contaminated net.

D)

An example of doubts raised over the efficacy of the plan, in addition, tests conducted by the NCCP injecting and bathing adult carp with the virus showed efficacy as low as 40% in some cases, this is in a controlled environment, in the wilds results would likely be less reliable not more.
https://www.nature.com/articles/d41586-018-02315-4

E)

It is a basic scientific principle that a negative cannot be proven, you can prove something occurs but proving something doesn't occur is impossible. With exhaustive testing you increase the certainty that something doesn't occur, but generally speaking a single positive result will prove that it can and does occur.

That said if you were attempting to "prove" the virus couldn't affect native species, 8 fish species would be a completely insufficient number to make this assertion.

Any claim that the virus can not affect native species should be measured by the fact that in international studies the virus has been isolated from at least 10 fish species from four families, it has been shown to be able to infect fruit fly and has specifically been shown to replicate in fat head minnows as shown in the studies above. Furthermore, species that had been declared insusceptible to the virus such as goldfish were later found to be susceptible.

25) Did the trial conducted by Dr McColl et al in 2016 detect the CyHV-3 virus in non-Carp species of fish, please be specific as to all detections, conclusions reached and critically, what studies were conducted to verify the causes of those detections?

Supporting Information:

The NCCP have sought to limit discussion of cross species infection and transmission by dismissing detection of viral DNA found in non-carp species during their own testing as not being active replication.

By narrowly defining transmission or infection as only active replication, and by restricting the definition of active replication to their own methodologies, the study concludes that no infection has occurred. The studies then go on to assume a number of causes for the detection of viral DNA and carp herpes virus like symptoms, such as gill necrosis, which was observed in their native fish but concluded in the study as not being caused by infection.

To be clear, viral DNA was detected in native specimens and gill necrosis and other symptoms common to carp herpes virus were seen in native fish species during testing. The study concluded that these were not infections by the virus due to their inability to observe active replication in those samples. So instead of investigating the causes of viral DNA detection and carp herpes virus like symptoms, alternative reasons for those observations were proposed. None of these alternative reasons were tested, simply stated as possible causes.

Ultimately this is mute, as described in the explanation for question 9 B above, active replication has been demonstrated in non-carp species internationally.

Overall this experiment was flawed. Other issues include the loss of entire control groups and cross contamination of work areas.

Even when the work conducted by Dr K McColl showed that nearly 60% of the control fish (i.e. non-Carp species) died in their experiment, in some cases the entire control sample, or an entire sample of Murray cod and rainbow trout, this has been brushed aside as ‘poor animal husbandry’, rather than perhaps something else killing the fish (e.g. poor water quality caused by the other dead fish? Low level infection?).

At best the high mortality within the control groups could suggest that the efficacy of the virus isn’t as good as reported, especially when this study included samples of carp that only experienced 40% mortality when infected with the virus, FAR below the high 90’s-100 percent expected kill rate being quoted by the NCCP. It could also be assumed that some of the carp also died due to poor animal husbandry, but this is not accounted for in the experiment. At best, the failure of the control group should invalidate the experiment entirely but even worse, the contamination of the workspaces blamed for what they claim is

a false detection of infection in natives, should give significant pause to the NCCP who are claiming they can control the release and spread in the wild, when they couldn't even avoid contamination in Australia's most bio-secure facility.

HUMAN AND NON-TARGET ANIMAL HEALTH

26) The NCCP have recently claimed that a yet to be released study by the Australian National university has shown there "are absolutely no human health considerations associated with this virus" and that this study means "we can effectively close the book on this".

Can the NCCP confirm that this study evaluated the risk of Botulism, Aeromonas and E.Coli both directly through water supplies, for swimmers using contaminated water or in handling dead fish, but also the risk to human health from eating beef, duck or other animals that may be exposed to these or similar pathogens as a result of the introduction of large scale mass fish kills across the MDB?

Supporting information:

The NCCP should explain on what basis they are publically declaring that there are no human health considerations associated with the virus. If they are stating this, referring only to the potential for the virus to directly infect humans, this is grossly misleading and a dangerous statement to be made publically.

The plan is not simply to release a virus and kill carp, the impact of killing so many fish and the conditions this creates are even more important. Botulism and other pathogens are lethal if left untreated, Aeromonas and hemorrhagic E. coli are flesh eating, disfiguring diseases, normally present in very low numbers in our environment, but thriving in dead animals and anaerobic conditions caused by mass fish kills.

Given that small scale fish kills already require botulism treatment for cattle and other animals and Aeromonas and E.Coli infections already occur in water that is far less degraded than will be the case during the release of the virus. The NCCP should carefully explain why they deem it acceptable to claim there is no potential impact on human health and why it has chosen to restrict studies to focus on direct infection by the virus and not the full range of impacts that the viral release would have through the conditions it creates.

27) The NCCP has made numerous claims regarding improvements to drinking water taste and quality post virus release, can they explain the basis for these assertions given that this project will potentially add a large volume of rotting fish to drinking water sources?

Supporting Information:

These claims seem to focus on the muddying effect of carp, which has been discussed in other questions, but claims of improved drinking water seem to be particularly overstated

given the risks to this area from significant quantities of rotting fish entering the system.

The NCCP should declare if they expect noticeable improvements to drinking water taste and quality post virus release, if so on what basis, and what measures will be taken to rectify this situation if a negative outcome occurs as the evidence suggests in terms of the effects caused by rotting fish.

It is not logical to suggest that water will be safe due to the treatment systems used, being good enough to stop the negative health effects of dead carp, but that these same systems, currently used today, are so poor that the taste of water is affected by carp. It can't be both.

All this aside. As large numbers of adult carp will survive the virus (the ones blamed for muddying the water to a degree), their effects will remain, resulting in negligible improvement in any effects actually attributed to carp. Unfortunately, the negative effects from the rotting fish will be very real and will be solely attributable to the virus being released.

28) ***How are regional areas, particularly those in South Australia going to provide drinking water to the non-Adelaide portions of the State, those that rely on water from the Murray River and do not have a desalinisation plant, during the time that the river is polluted as a result of the fish kill? By this, we mean all riverine towns (Goolwa, Milang, Meningie, Wellington, Tailem Bend, Murray Bridge, Mannum etc), as well as Keith, Port Pirie, Port Augusta, Whyalla, Port Lincoln and Ceduna.***

Supporting information:

Many smaller communities and towns rely on water from the Murray river and do not have alternative supplies for even a short term loss of access to the water supply, let alone long term shortages that may arise from mass fish kills or the huge requirement for water to help flush the estimated 2,000,000 tonnes of dead carp from the system.

As mass kills are assumed at a minimum of 40% of years following release and are likely to occur every spawning season, this water shortage, if not addressed would be a permanent problem post release of the virus.

29) ***Is the NCCP still suggesting, as has been stated at various times by NCCP members and supporting politicians that volunteers will be utilised to clean up large volumes of rotting fish?***

Supporting information:

Explanation and follow up questions:

Cleaning up will be highly unpleasant and involve considerable health and safety risks from pathogens such as Clostridia, Aeromonas and Vibrio which proliferate in dead carcasses.

To put the quantities of carp proposed to be cleaned up into perspective, since 'Clean Up Australia Day' started 27 years ago, more than 32 million volunteer hours have managed to

remove 344 thousand tonnes of rubbish from over 171,000 sites across the country. The majority of these sites were easily accessible conventional sites not requiring special access, equipment or training and didn't represent significant biohazards.

Clean up Australia's efforts are excellent and impressive, but their entire history is equivalent to just over 17% of the amount of dead carp being predicted for the initial killalone. An amount equivalent to at least 3x this total would be required every year into the foreseeable future. The NCCP may like to comment on the risks to human volunteers and the realistic impact that could be expected from volunteers, given these realities.

https://www.cleanupaustraliaday.org.au/about/about-the-organisation
Without taking the difficulty, risks and specialised equipment required for removing dead carp over regular roadside rubbish into account, a simple comparison would show that to clean up an initial kill of 2,000,000 tonnes of carp, even if we had 2,000,000 volunteers, we would need them to work 8 hours a day for 11 and a half days to clean up the carp, assuming optimal conditions were available.

When looking at these numbers, it is important to consider that initial testing on the deoxygenation of water by dead carp show that this task would need to be achieved within 2 days to avoid almost complete removal of oxygen from the water.

30) What safety considerations and equipment requirements have been accounted for when suggesting that volunteers will be key to the clean-up, what risks are acknowledged in terms of secondary infections which are transmissible to other species including humans? (note: secondary bacterial infections and so on, not referring to the virus itself but its effects).

Supporting information:

Rotting carp cannot be handled safely by the public or other organisations without specialised equipment and training, rotting fish carry a large number of pathogens which can directly affect human health regardless of it the carp herpes virus itself is determined to not affect humans.

31) The risk of botulism has been raised by Veterinarians in several states, relating to fish rotting in water used by stock, native birds eating dead fish and other risks inherent in such massive fish kills. At the public consultation in Lismore, a veterinarian expressed concern about this issue having spent a significant portion of his time treating cattle for botulism following small scale fish kills.

When asked about the clean-up campaign and the likely implications to cattle farmers of the wide scale botulism outbreaks in livestock caused by the dead carp within rivers running through farmland, Mr Barwick was quoted as saying "we will all have to share the pain".

Can Mr Barwick clarify what was meant by this? Is there likely to be significant financial

pain not only to farmers but also local authorities? Is there a risk to birds, wildlife, stock and human water sources?

Supporting information:

Botulism could directly affect humans drinking from a water supply contaminated with rotting fish, while we assume the risk to drinking water for humans may be accounted for, the risk to wildlife, birds and stock is far harder to control. Botulism is caused by a toxin secreted by bacteria which infest animal carcasses, rotting organic material and poorly prepared silage.

There is potential for botulism outbreaks on an unprecedented scale, the risk will be highest to humans and livestock in cleared agricultural areas and to native wildlife and birds in areas that are harder to access, such as uncleared shallow backwaters, previously suggested as being left without clean up by the NCCP.

Basic information on botulism
https://www.agric.wa.gov.au/livestock-biosecurity/botulism-cattle

Botulism in cattle

Botulism is a rapid onset, usually fatal disease caused by the botulinum toxin produced by the bacterium *Clostridium botulinum*.

Typical signs include hindlimb weakness progressing to paralysis, collapse and death.

Common sources of toxin include animal carcasses, rotting organic material and poorly prepared silage. Treatment is rarely attempted but vaccines are available for disease prevention in cattle.

http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/general-livestock-diseases/avian-botulism

Risks for humans and pets

Humans can become sick from botulism typically by eating improperly canned or stored foods. Aside from this, humans and pets are primarily at risk only if they eat infected fish, birds or maggots. **Precautions should be taken when harvesting fish or waterfowl – they should not be harvested or eaten if they are sick or acting abnormally. Prevent pets from eating potentially infected fish, birds or maggots.**

Cause

Botulism spores, the resting stage of the bacteria, are abundant in anaerobic habitats (ie. those lacking low oxygen levels), such as soils, and aquatic sediments of many wetlands and lakes, and can be readily found in the gills and digestive tracts of healthy fish living in those lakes. The spores can remain in the ecosystem for extended periods of time, even years, and are quite resistant to temperature changes and drying. These spores, themselves, are harmless until the correct environmental factors and anaerobic conditions prompt them to germinate and begin the vegetative growth of the toxin-producing bacterial cells. The active bacteria that cause avian botulism grow only in a nutrient-rich substrate, such as in areas with large amounts of decaying plant or animal materials, which are also anaerobic. Fish that die for any reason and that contain the bacterial spores in their tissues are also suitable substrates for growth and toxin production by the bacteria.

Fish-eating birds that die of botulism are poisoned by eating fish that contain the toxin. Ingestion of maggots from the carcass of an infected animal can continue the spread of avian botulism, which may be responsible for large kills of birds.

Outbreaks of avian botulism occur only when a variety of particular ecological factors occur concurrently. This typically involves warmer water temperatures, anoxic (oxygen-deprived) conditions and adequate levels of bacterial substrate in the form of decaying plants, algae or animal materials. As average air and water

https://www.dec.ny.gov/animals/28433.html

Type E Botulism

Description

Type E botulism is a form of food poisoning. The toxin is produced by a bacterium, *Clostridium botulinum*. *C. botulinum* produces several types of toxins, characterized by the letters A through E. Animals are affected after ingesting the bacteria, either through eating or drinking. The toxin remains viable in live animals, carcasses, maggots, and water. The toxin causes paralysis of the animal's muscles.

Where it Occurs

Type E botulism primarily occurs in the Great Lakes region. The first reports in New York involved an outbreak in Lake Erie in 1999.

Animals it Infects

This disease is responsible for extensive waterfowl and fish kills, mostly affecting the following species:

- fish-eating or scavenging waterbirds (gulls, ducks, loons, mergansers, and cormorants)
- fish (smallmouth bass, rock bass, channel catfish, and lake sturgeon)
- mudpuppies (large aquatic salamanders)

Symptoms/Signs

- Affected birds cannot hold their head up, which may cause waterbirds to drown (i.e., limberneck).
- Birds, especially gulls, cannot fly or walk properly, often dragging a wing.
- Birds may have paralysis of the third eyelid.
- Birds may swim in circles or be unable to right themselves while on the water.
- Fish struggle or swim erratically near the surface of the water.
- Fish usually die quickly and are most likely seen washed up on shore.

32) How will the increased protein, organic carbon and nutrients due to Carp kills impact on the health wetland sediments, including increasing the presence of finer grain, eutrophic, anaerobic sediments, facilitating the establishment of permanent colonies of E. coli, including potentially harmful strains, such as haemorrhagic E. coli?

Supporting information:

These increases will be highly significant and will likely result in a significant rise in the number and scale of botulism outbreaks as detailed above as well as permanent colonies of E. coli and more harmful strains, such as haemorrhagic E. coli.

https://opencommons.uconn.edu/cgi/viewcontent.cgi?referer=https://www.google.com.au/&httpsredir=1&article=1257&context=gs_theses

ANIMAL WELFARE

33) The mechanism of the Carp Herpes Virus is extremely traumatic to the animals, the closest visual comparison would be a cross between Ebola and meningococcal. The RSPCA has given a position of caution regarding the release, what consideration has been given to animal welfare as part of this project?

Supporting information:

This carp herpes virus kills by covering the affected fish in necrotic lesions, they bleed from the gills for extended periods as their bodies quite literally rot away and then are eaten alive by invading bacteria. The decision to release such a virus should not be made by people with no field experience with this virus, and certainly not by people who have actively ignored the advice of the international experts who have decades of experience dealing with this virus in the wild.

The RSPCA's position on the proposed release of the virus, recommends using alternative measures instead of the virus.

http://kb.rspca.org.au/What-is-the-RSPCAs-view-on-the-release-of-Cyprinid-herpesvirus-to-kill-carp_707.html

> The RSPCA recognises the need to control introduced species to minimise their environmental and agricultural impacts where these are validated. However, we argue that the control methods used must be as humane as possible for all species, including fish. The available scientific evidence demonstrates that fish are sentient animals capable of experiencing pain and suffering and must therefore be treated humanely.

However, the use of disease-causing biological agents such as Cyprinid herpesvirus 3 is contentious due to the potential pain and suffering that infected carp might experience before death. The virus affects the gills, leading to reduced oxygen intake. Affected fish become lethargic and gasp at the surface with some experiencing loss of equilibrium and disorientation. Inflammation and damage is also caused to other organs including kidney, spleen, pancreas, liver, brain and the gut. Affected fish stop eating, become lethargic and may show skin lesions as well as excess mucous production, affecting the gills causing suffocation. Death may take 1-2 weeks, with some carp succumbing to parasitic and bacterial infections [4].

VESTED INTEREST VS PUBLIC AND COMMERCIAL INTERESTS

34) Are fish farmers, Carp fisherman, Carp Industry, Koi keepers, Aquaculture and pond industry, and Tourismindustry groups interests being taken into consideration, including issues of compensation, if so what is the budget for compensation and on what basis? What measures are being taken to protect the interests of these citizens?

Supporting information:

Based on dirty water pump sales from koi specialist stores, there are an estimated minimum 40,000 Koi carp keepers in NSW and WA alone.

There are multiple carp angling groups, with hundreds of members each and a significant number of unaligned recreational fishermen.

There are significant numbers of professional carp fishermen, some of which have negotiated carp contracts and orders which are now under threat due to speculation on the release of the carp virus.

Fishing clubs and supply businesses are also likely to be affected

Farmers depending on our waterways for stock water will be affected by varied water access and the risk of botulism and other effects on stock.

Native wildlife, bird life in particular is likely to be heavily impacted by avian and other forms of botulism, this represents a very significant public, tourism and environmental interest.

All of these groups are currently performing their activities legally with significant financial and time invested, in many cases, a lifetime of investment.

To date there has been no significant consultation with these groups other than a set of highly complex, commercially focused surveys, demanding a very high level of personal

detail and time from the respondents with no questions relevant to the 10's of thousands of smaller scale hobbyists, clubs and businesses.

The NCCP have dismissed the idea of providing compensation, or assisting these groups, stating that there is no significant carp related industry, that markets can't be created, but the reality on the group and in the community is very different.

The NCCP has even argued that the lack of compensation provided in other countries after outbreaks of this virus is justification for ignoring the lives and livelihood of these people, however they fail to acknowledge that no other country has ever deliberately released this virus, in every other country where it exists the government actively works to protect these groups and indeed work to limit and eliminate the virus.

35) The interests of irrigators and farmers have been heavily focused on by the NCCP, where the interests of the community, tourism, carp industry, farmers, fishermen, koi keepers, breeders, pond industry suppliers etc, seem to have been given considerably less time or thought.

36) What are the NCCP's terms of reference in relation to community interests, can you please detail the consideration given to these groups and what are considered acceptable outcomes in relation to these groups?
What reasonable and safe biosecurity measures have been identified and scientifically validated and locally tested as effective and practical for use by the Carp industry or the 40,000 or more Australian Koi hobbyists to protect their often extremely valuable collections from infection via non target species vectors or even tap water from affected sources.

Supporting information:

International experts and Koi hobbyists have made it clear to local Koi hobbyists, who have informed the NCCP that heat ramping, hand washing and as they have described it "basic biosecurity" are not effective, practical or even possible in the case of infected tap water to protect Koi carp collections from the carp herpes virus.

They point out that the virus can be transferred by water and therefore by water birds or frogs, even wet fishing equipment and therefore anything wet can transfer the virus. In terms of rapid heating of infected fish, they point out the impracticality of identifying infected fish in time to treat when the introduction is via tap water or wildlife. They point out the practical impossibility of achieving any kind of heat treatment for any significant collections of large high value fish due to the water volumes required to be heated in a short period of time, they also point out that rapid heating also has side effects of bleaching prize fish, rendering them worthless.

Australian koi keepers are not home fish tank fish keepers, the hobby often involves large collections of expensive and large fish (many collections consist of 30 or more fish up to and over 70cm in length, often kept in swimming pool size home ponds). Many public spaces and businesses also focus on large koi ponds, which could not be protected or quarantined from wildlife or water sources of infection.

It is also worth noting that koi keepers are not the source of the carp strains dominating our waterways (carp populations derived from koi are very limited compared to European carp, which dominate our river systems).

Koi clubs are active in promoting good fish keeping practice and many offer free unwanted fish collection and disposal services, specifically to avoid unwanted pets making their way into our waterways, they deserve our support.

37) ***The NCCP is often mentioned as a complimentary measure for the Murray Darling Basin Plan, the Murray Darling Basin Plan has recently had a number of high profile revelations as to undue influence of irrigator lobby groups on projects that manage our waterways. Has the NCCP received any funding from irrigator groups and is the NCCP aware of any demands made by these groups in relation to environmental water credits if the national carp control plan were to go ahead?***

Supporting information:

Groups such as the cotton growers association and rice growers association were reported to have offered and or donated funding to the NCCP. Blaming carp for water quality issues and reduction in native species is in the interests of this group as it draws attention away from the primary causes being land clearing, poor water and land management, irrigation, water redirection and cold water pollution.

Many high profile appointments from cotton lobby groups were made by Barnaby Joyce into the Murray Darling Basin Plan and positions that influence water policy, this is also true of the NCCP with the communications manager being the ex ceo of National Irrigators, Tom Chesson.

Of particular concern are the claims and demands for additional water allocations made by these groups in their annual reports and in media releases. The expectation presented by these groups is that they should receive additional water allocations in exchange for the national carp control plan going ahead.

Redirecting attention from agricultural impacts to scientifically less significant issues, such as carp, in order to lobby for further environmentally compromising concessions for irrigators is a problem in Australian environmental water management today.

http://www.farmonline.com.au/story/4266461/irrigators-fishing-for-new-ceo/

Cotton Australia's general manager quotation from the article "cotton says "hasta la vista" to pest fish"

"The potential environmental outcomes of the National Carp Control Plan should be recognised by governments within the Murray Darling Basin Plan, and so we call for a significant reduction in the amount of water recovery required to achieve environmental outcomes," Mr Murray said.

"In the past a credit to the Sustainable Diversion Limit of 200GL has been proposed, and we believe this would be an appropriate outcome once the Carp Control Plan is in effect."

SCIENTIFIC INCONSISTANCIES

An undertaking such as the National Carp Control Plan requires significant social licence, it is vitally important for maintaining the reputation of our institutions such as the CSIRO and FRDC that all representations made by members of the NCCP be scientifically accurate, complete and not presented in such a way that the public may be lead to false conclusions, even if the goal is to gain support for the program. The public, senators and the media, must not have demonstrably false beliefs encouraged by scientists who are funded by public revenue or the basis for future scientific undertakings will be undermined. It is our belief that the NCCP have presented information that is inconsistent with the historical record and international scientificconsensus and that the record must be set straight or explained for the NCCP to maintain credibility.

38) Incorrect information provided to the senate: Many statements were made in senate estimates by members of the NCCP and FRDC which appear to be misleading. The issue of transmissibility of the virus and viral viability outside of a carp host are clear in the results of international peer reviewed science. Unfortunately the opposite seemed to be communicated to the senate in a very explicit and repeated manner.

Can the NCCP state for the record if it stands by Dr Hone's quoted statement below, and if they would like to add any clarity to this statement?

SENATE ESTIMATES: RURAL AND REGIONAL AFFAIRS AND TRANSPORT LEGISLATION COMMITTEE(Public)THURSDAY, 25 MAY 2017 CANBERRA

Dr Hone: Can I just make two other comments. There is an inference that this virus lives in the free environment outside the host. The only host for this particular virus is carp. It cannot live in other native species. It cannot live in frogs. It cannot live in the water. It cannot live in the sediment. The only thing it lives in is carp. It is so specific to carp that even a genus right next to carp, it will not even reside in that.

Supporting information:

The issue of transmissibility of the virus and viral viability outside of a carp host is a critical concern as it determines if the virus can be contained for a trial release in the wild, or indeed if a release can reasonably be controlled as has been suggested by the NCCP. The international evidence clearly suggests that neither plan is possible due to the extremely infectious nature of the virus and the high transmissibility by almost every possible (wet) vector.

In Senate estimates, representatives of the NCCP and FRDC stated essentially the virus could not exist or live or be transmitted or remain viable outside of carp. The studies that describe these characteristics of the carp herpes virus are freely available even by web search, requiring far fewer resources than those available to the NCCP. The claims made by the NCCP that the virus cannot live outside the host, in water or sediment or other species were made in a style typical of "marketing" a virus release, as opposed to open and clear consultation, this is very concerning for a project with this level of associated risk.

The evidence is clear on this issue, the emphatic statements by Dr Hone were not accurate and did not allow fair assessment of the risks associated with this virus. The carp herpes virus is very easily spread, anything wet can transmit the virus including carp, other fish, other animal species such as water birds, wet fishing equipment, water, sediment, boats or equipment contaminated with these sources would also be logical vectors for transmission via bilges etc. This would make containment in the wild virtually impossible.

There are numerous studies and articles that demonstrate this, it would be considered a basic understanding of the modes of transmission of the carp herpes virus. Studies have demonstrated that the virus can live (as much as a virus is alive) in the free environment, is very highly infectious and can and will be transmitted live by almost every conceivable

vector. It has been shown to be viable for at least 18 hours in free form in water, 4 hours in a separate experiment. It has also been shown even in the CSIRO's own studies to continue "living" in non-target hosts as well as carp, in these studies it was shown not to replicate within them, but this study was only conducted on a very small number of species. Internationally studies on fat head minnows have indeed shown replication. So all the csiro study could demonstrate was that in its current form (hasn't mutated locally yet) and on those species, while the virus was live, viable, carried and was transmissible it didn't cause "active" infection they could detect.

The virus has been shown in numerous studies to be transmissible by water alone, it has been shown to be transmissible by other vector species including other fish, it has even been shown to be transmissible by used fishing equipment. Anything wet could logically transmit this virus, and that most certainly includes frogs. Interestingly the NCCP currently claim that this kind of unplanned transmission is unlikely to happen in their planned releases, despite the FACT that they could not even avoid cross contamination in their own experiment, with no public involvement, in the most highly controlled bio secure facility in Australia. This defies all logic and claiming otherwise causes distrust of the whole project.

This kind of misinformation and misleading by omission is leading the public to support the project due to the perceived authority of the CSIRO and should not be acceptable. If the science doesn't support the statements, justifications and assurances provided by the NCCP, the project should not be allowed to go ahead.

Relevant studies below.

The virus is transmissible and can remain live and viable in water:
http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/current/chapitre_koi_herpesvirus.pdf

2.1.2. Survival outside the host

Studies in Israel have shown that KHV remains active in water for at least 4 hours, but not for 21 hours, at water temperatures of 23–25°C (Perelberg et al., 2003). Studies in Japan have shown a significant reduction in the infectious titre of KHV within 3 days in environmental water or sediment samples at 15°C. However, the infectivity remained for >7 days when KHV was exposed to similar water samples that had been sterilised by autoclaving or filtration (Shimizu et al., 2006). The study also presented evidence for the presence of bacterial strains in the water with anti-viral activity. More recently, the detection of KHV DNA in river water samples at temperatures of 9–11°C has been reported, 4 months before an outbreak of KHVD in a river (Haramoto et al., 2007). However, persistence of the virus may have been aided by the presence of animate vectors and detection of DNA may not always be indicative of the presence of infectious virus.

Transmission of the virus from 6 non-carp species
https://www.researchgate.net/publication/235732844_Horizontaltransmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carpHorizontal_transmission_of_koi_herpes_virus_KHV_from_potential_vector_species_to_common_carp

Abstract

Six fish species, defined as potential vectors in koi herpes virus (KHV) transmission, namely: common roach, European perch, tench, Eurasian ruffe, silver carp and grass carp were included in this study. The fish used to transmit infection originated from a fish culture facility where KHV had been diagnosed and prior to the beginning of the research study the presence of the virus genome was confirmed in each individual fish intended for cohabitation. Specific pathogen free (SPF) carp utilized in the experiment originated from the University of Wageningen. During a four-week period the SPF carp were exposed to infection through cohabitation with vector species previously confirmed as KHV carriers. The obtained results demonstrated the possibility of a horizontal transmission of KHV between selected species, even in the case of species showing no clinical signs of KHV disease (KHVD), while an average water temperature in the tanks ranged from 12°C to 16°C.

Wild fish species other than carp are capable of transmitting the virus

https://www.ncbi.nlm.nih.gov/pubmed/23121232

Abstract

The koi herpesvirus (KHV) has spread worldwide since its discovery in 1998 and causes disease and mortality in koi and common carp populations with a high impact on the carp production industry. Many investigations have been conducted to examine ways of distribution and to identify possible transmission vectors. The answers, however, raise many new questions. In the present study, different wild fish species taken from carp ponds with a history of KHV infection were examined for their susceptibility to the virus. In the tissue of these fish, the virus load was determined and it was tested whether a release of the virus could be induced by stress and the virus then could be transferred to naive carp. Wild fish were gathered from carp ponds during acute outbreaks of virus-induced mortality in summer and from ponds stocked with carp carrying a latent KHV infection. From these ponds, wild fish were collected during the harvesting process in autumn or spring when the ponds were drained. We found that regardless of season, temperature variation, age and infection status of the carp stock, wild fish from carp ponds and its outlets could be tested positive for the KHV genome using real-time PCR with a low prevalence and virus load. Furthermore, virus transfer to naive carp was observed after a period of cohabitation. Cyprinid and non-cyprinid wild fish can therefore be considered as an epidemiological risk for pond carp farms.

Survival of the carp herpes virus in water and sediment

https://www.researchgate.net/publication/37573811_Survival_of_Koi_Herpesvirus_KHV_in_Environmental_Water

The survivability of koi herpesvirus (KHV) in environmental water and sediment was evaluated using CCB cells. Samples were collected from Ibaraki prefecture, Kanagawa prefecture and Hakodate, Hokkaido. Significant reduction in the infectious titer of KHV was observed within 3 days in intact environmental water or sediment. However, KHV infectivity remained for more than 7 days in autoclaved or filtered (0.45 mm) water. In the autoclaved water containing sediment, KHV infectivity dropped below detectable limits within 7 days after inoculation. Ten of the 147 bacterial strains from rivers in Kanagawa, and two of the 62 bacterial strains from water from, Hakodate showed anti-KHV properties. The results suggest that in the absence of hosts, KHV can be rapidly inactivated in environmental water. 茨城県霞ヶ浦の湖水および底泥, 神奈川県鶴見川水系6地点および函館市内3河川5地点より水を採

Spreading the Carp Herpes Virus on fishing gear

https://marinescience.blog.gov.uk/2016/07/01/khv-fishery-angler-net-equipment/

So we held KHV diseased carp in a fine mesh keep-net overnight at 23°C. These infected carp were then removed, the net stored for 24 hours in a sealed plastic bag, and then we introduced carp without the disease to the net.

We found that these carp displayed clinical signs of KHV disease within 14 days of transfer to the contaminated net.

39) At the same senate estimates, In response to a letter by international experts: Jackie Lighten and Cock Van Oosterhout, School of Environmental Sciences, University of East Anglia, Norwich Research. 'Biocontrol of common carp in Australia poses risk to biosecurity'. Expressing concerns about the risk of mutation, the national coordinator for the NCCP stated:

Essentially what the authors are questioning is the likelihood of mutation of this virus and the implications if mutation were to occur. There is a couple of components to answering that question. The first is the specific nature of this virus. There are different sorts of viruses. RNA viruses, for example, by the way they replicate themselves are more prone to mutation. DNA viruses, by comparison, which this carp virus is, are less prone to mutation. DNA viruses with a bigger genome are more stable again. They mutate less readily still. This is one of the larger genome DNA viruses described.

Mr Barwick: What I will say is that, of course, all living organisations mutate. The question ishow often and how significant are those mutations. This particular virus has around nine strains that have been identified throughout the world that are 98 per cent homologous. That means there is no evidence of significant mutation so far. The point they draw to directly is iflots of virus particles are released into Australian waterways does that increase the risk ofmutation?

It is very clear, looking at international case studies where this virus has caused significant outbreaks and kills of common carp, that the outbreaks are episodic. They are fast. Mutation of the likes that the authors refer to are actually undertaken over a period of millennia, not tens of years like we are proposing in this program.

Can the NCCP please clarify if a) the virus is expected to remain in the ecosystem beyond the 10's of years proposed by the program and b) if its permanent presence in the ecosystem and the unprecedented number of viral particles planned to be released in the initial kill could be expected to significantly increase the chance that of mutation occurring?

Supporting information:

Dr lighten has personally responded in a letter to the senate on the misrepresentations here, but some further detail: The NCCP choose to talk about the relative stability of the virus when asked about the chances of mutation, but they would be aware that this virus itself, mutated either jumping from another species to carp, or mutating from a similar carp virus into its current lethal form, only in the last 20-30 years. The virus did not spontaneously appear, and it first arrived via mutation in its current form in the last few decades.

They then go on to claim that the likelihood of mutation is very low for this project because they are only looking at a project that lasts 10 years or so. This has been a very common response for the NCCP, but the virus does not respect program duration, it is highly misleading to limit your response to a 10 year window if you are aware that the virus will continue to evolve once that window ends.

The NCCP to date continue to push the idea that there is no evidence of mutation, but the existence of multiple strains of the same virus clearly demonstrates this is false. The NCCP need to acknowledge that once the virus is released, it will be in the system forever, neither carp, nor the virus are expected to ever leave the system under the NCCP's current plans and it is a logical fact that as long as one exists, once the virus is released, the other will too.

So there is no artificial 10 year limit. They can correctly claim the chance of significant mutation or species jump is low in a 10 year time frame, if the number of viral particles was low, but that is not part of the plan either. The truth is, mutation is inevitable when you consider permanent residence of the virus in our waterways and long term presence of carp, that on an evolutionary timescale, this virus will mutate. How it will mutate cannot be predicted.

40) ***Included in many NCCP presentations in a series of slides entitled "what does success look like" there are two key points implied here which reinforce commonly believed but factually incorrect assumptions of the public, thatcarp are the main causes of turbidity across our waterways and the cause of a loss of key angling native species targets such as Murray cod and golden perch.***

Could the NCCP, for the record state if carp are the main reason identified by the historical record for the decline of Murray cod and golden perch and the main cause of turbidity across the Murray darling basin as a whole?

Supporting information:

The problem with this kind of incomplete information is that it encourages incorrect but commonly held public beliefs that set carp as a scapegoat for our waterways problems, this encourages public policy to be aimed at the wrong targets and allows vested interests responsible for the actual causes of those problems to continue with the status quo. It also encourages people to incorrectly weigh the risks vs the benefits of a high risk program in favour of taking the risk, potentially based on implied by highly unlikely benefits.

An example of the NCCP's presentations can be found here: https://vimeo.com/257885115

As can be seen, One slide shows a dirty tar-ru wetlands picture and then a cleaner picture of the same water, they attribute the clean water to the installation of carp screens after draining the wetland.

This is exceptionally misleading, The tar-ru wetlands project they discuss was a project where they drained an area and put up carp screens. What isn't mentioned is that the screens are really large to allow smaller native fish through and to stop them becoming blocked, the screens only stop the largest adult carp, given that we are currently seeing a

boom in young carp after a successful breeding season, the vast majority of carp are young carp at the moment.

Critically, The NCCP also fails to mention that the area they drained hadn't flowed naturally or received environmental watering for at least 10 years prior and was in terrible condition due to the accumulation of runoff and lack of natural drainage.

They drained this highly turbid water and at the same time, put up the screens, they also siphoned in a massive amount of new water, again for the first time in 10 years, to refill the area, clearer water after a drain and fill cycle is the normal response for Australian waterways, this would be far more apparent in a system that had been artificially blocked for over 10 years. However, the NCCP instead claim that carp were the cause of poor water quality and imply that the screens were the cause of water improvement.

No peer reviewed study is referenced for their claim that the carp reduction improved water quality, despite the very obvious nature of the other factors involved.

The presentation then goes on to tell people that in the 1920's fishermen on average caught 18 kilograms of Murray cod with matching photos, this is a carp control presentation, the presenter asks why would we release the virus, he is implying that releasing the virus would return these species to their former numbers, but carp were not the cause of the decline of these species and this has been proven.

The causes of drops in Murray Cod, golden perch and almost all prized angling species had nothing to do with carp, in fact, numbers of these species typically tend to rise during times when carp numbers explode, due to juvenile carp being a significant prey item for these predatory fish.

It is highly misleading to claim that releasing the carp herpes virus will increase numbers of these key angling species.

Carp are often used as a scapegoat for other much more serious problems in our waterways by vested interests who seek to maintain the status quo. The idea that carp caused the decline of our native species is easy to sell with videos of carp spawning events where many large carp congregate together giving the impression of overwhelming numbers. However, the idea that carp have caused the decline of these prized native species has also been thoroughly disproven in the scientific literature.

The referenced sections from the journal below and graph demonstrate that declines in numbers of these species had already occurred to roughly modern levels long before carp numbers first rapidly expanded in the late 1960's and 1970's. The causes were overfishing, habitat degradation due to land clearing, diversion and interruption of stream flow, increased runoff from agricultural activities, cold water pollution, relatively unrestricted stock access to waterways and the building of multiple locks and dams. The same activity is also responsible for the vast majority of the increase in turbidity (muddy water) also

attributed to carp in the media thanks in no small part to the NCCP's presentations on the issue.

There is no doubt that carp have an impact on turbidity and on native fish, primarily by competing for small invertebrate food sources, however the misrepresentation of the main causes of our waterways issues hinders the rectification of these problems, diverting resources into activities with no chance of delivering the implied outcomes of clear water and large catches of Murray cod. This approach in promoting the virus is also problematic as it favours vested interests that would prefer to maintain the current land and water use situation. Risks vs Reward cannot be evaluated if the rewards are misrepresented.

Three separate quotations and a graph demonstrating carp impact on key native species below from the following reference
https://www.researchgate.net/publication/236858935_Managing_the_Impacts_of_Common_Carp

The decline and conservation status of native fish species

Concern about declining numbers of native fish was raised as early as 1936 when fisheries agencies from New South Wales, Victoria and South Australia met to develop plans to protect fish in the Murray River (Anon 1936). By the time carp began their rapid expansion in the late 1960s and 1970s, declining populations had become critical for many native species, and commercial catches of Murray cod, golden perch and silver perch had already declined (Figure 11 Reid et al. 1997). In addition, migratory species such as golden perch had become locally extinct upstream of major impoundments (Weatherley and Lake 1967),

'Declines in catches of both Murray cod and golden perch occurred during the 1950s well before the expansion of carp populations.'

Within the Murray–Darling Basin, widespread catchment changes over the past 100 years, and changes to river habitats such as nutrient enrichment, removal of bankside vegetation, pollution, siltation, construction of dams and weirs, and flow alteration have contributed to the decline in native fish species (Frith and Sawer 1974; Cadwallader 1978; Harris 1984; Harris and Mallen-Cooper 1994; Harris and Gehrke 1997; Section 2.1).

More than one-third of Australia's freshwater fish species are considered to be under threat (Koehn 1995). Of these, 20 species are considered to be affected by interactions with introduced species. The majority of these threatening interactions are however, with species other than carp, including gambusia and trout.

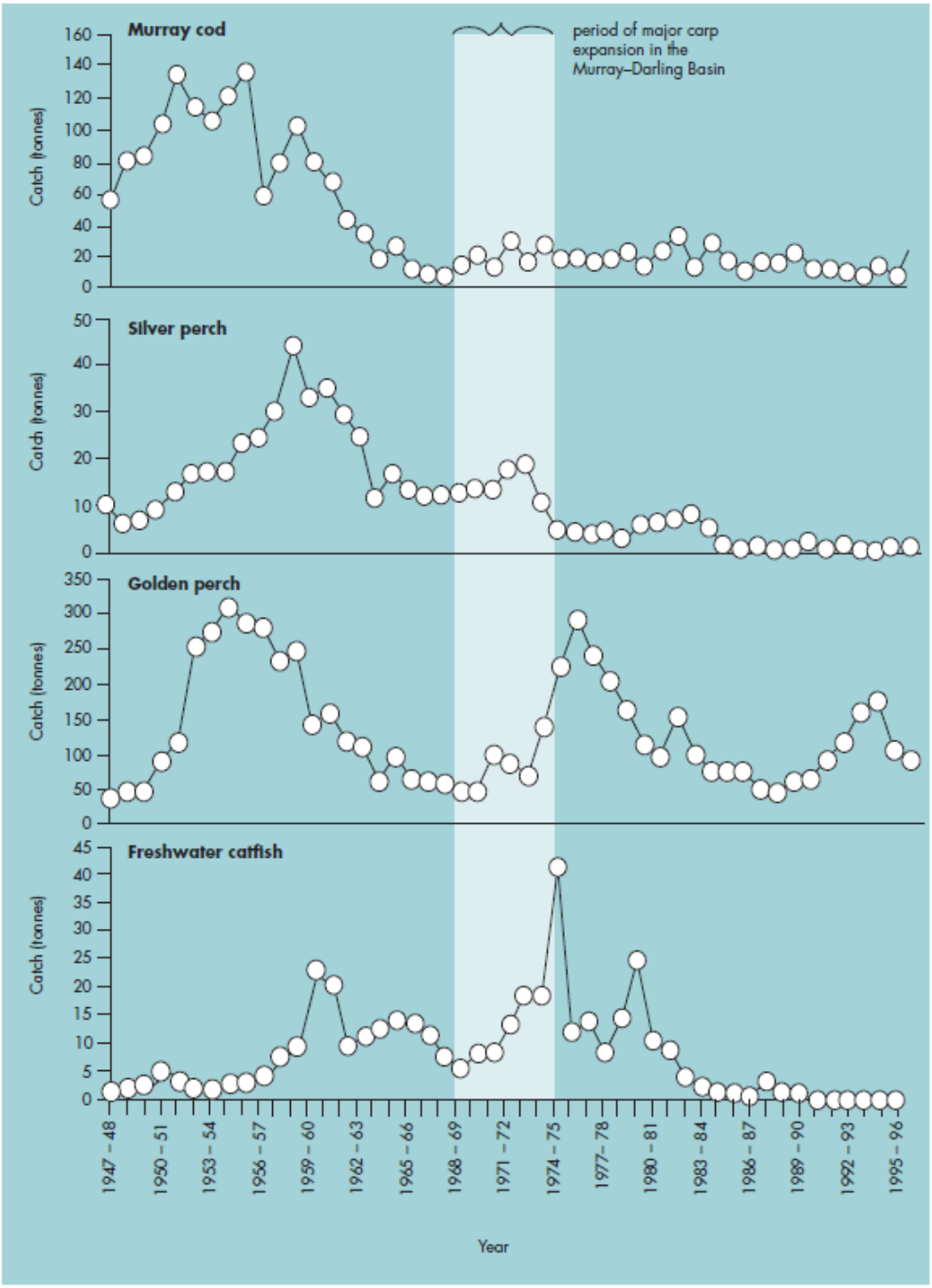

Figure 11: Commercial catches of Murray cod, silver perch and golden perch in New South Wales declined in the early 1960s before the expansion of carp, disproving claims that the decline of native fish was caused by the major expansion of carp throughout the Murray–Darling basin coinciding with widespread flooding in the early 1970s. Good catches of golden perch and freshwater catfish were taken following record floods in 1974-75, but later declined (after Reid et al. 1997). Note varying scale on y-axes.

41) ***The presence of numerous examples of Crystal clear lakes filled with carp across Australia, seem to suggest the accepted "carp are the cause of turbidity" argument is at best, overstated. Does the NCCP expect the return to a clear Murray river as a result of releasing the carp herpes virus into Australian waters as was implied at the previous senate estimates upon questioning from Senator Gallacher?***

Supporting information:

The key benefits described by members of the NCCP must be accurate, using carp as a scapegoat for the problems caused by land and water mismanagement do not help us deal with these issues and could make the problems much worse with the inherent risks of releasing the carp herpes virus. While carp do have an impact on turbidity, the effect has been greatly overstated and the implied benefits on water clarity are very unlikely to occur, especially when the massive increase in nutrient load from potentially millions of tonnes of dead carp are factored into the equation.

In addition to the references provided covering turbidity for question 34, please see below:

examples:

http://theconversation.com/stinking-dead-fish-portend-major-problem-with-carp-herpes-release-71489

Matt Landos, a lecturer in aquatic animal health at the University of Sydney posted important comments rejecting assertions that carp were the main or even a significant driver of water quality issues (as opposed to fish diversity issues).

In 1985 Fletcher and others said of a Goulburn valley study:
http://www.publish.csiro.au/mf/MF9850311

There was no association between high carp densities and high turbidity, and populations of carp did not appear to increase turbidity. Observed turbidity increases at each site appeared to be related to hydrological changes. Fluctuation of water levels was also an important factor determining the extent of aquatic vegetation communities.

Landos also noted King et al (1997) had stated:

factors other than carp usually contributed to most of the variation in measured water quality in Murrumbidgee billabong.

and

Cattle grazing and clearing has altered the vegetation communities of the floodplain in this region. The floodplain vegetation now consists of scattered mature river red gums. The understorey is dominated by introduced grass and weed species. Owing to the drought conditions and grazing by cattle, vegetation in the catchments surrounding the billabongs was sparse during most of the study period; this and heavy rain towards the end of the experiment combined to cause significant sediment loss from the adjacent hills.

http://www.pestsmart.org.au/experimental-manipulations-of-the-biomass-of-introduced-carp-cyprinus-carpio-in-billabongs-i-impacts-on-water-column-properties/

42) Presentations from the NCCP focus on pro-virus news coverage or scientific studies. The purpose of the NCCP is supposed to be the development of the best plan to control carp, not the promotion of a plan to release the carp herpes virus. If the NCCP is "not a foregone conclusion" and seeks to explore and discuss all the risks and "inform a decision based on science", why is this very large body of science being excluded from the consultation?

There is a large body of peer reviewed local and international science and scientists who question and in some cases have disproven the assertions made by the NCCP. Of particular concern is the ready availability of studies that disprove the assertion that this virus is species specific. None of which are discussed in NCCP presentations to the public. There is also a large body of journalism which expresses community concern regarding the project.

Q) Presentations from the NCCP are supposed to be open and present all of the facts and opposing views relating to this plan, this being the case, why are news stories that support the virus being heavily promoted in NCCP presentations to the exclusion of news stories that do not? Can the NCCP explain why these issues, scientific studies and news coverage have not been discussed or promoted in equal measure?

Supporting information:

A small selection of examples of peer reviewed studies, articles and documentation that discredits or questions the assertions on the NCCP:

Viral replication confirmed in fat head minnows ie, it is not species specific):
https://www.ncbi.nlm.nih.gov/pubmed/17092898

Abstract
Koi herpesvirus (KHV), a highly contagious and lethal virus that affects both koi (Cyprinus carpio koi) and common carp (Cyprinus carpio), was isolated in 1998 from two outbreaks of koi suffering mass mortality in New York State, USA, and in Israel. The disease had been described as early as 1996 in Europe. In July 2004, this virus was found associated with a mass mortality event in wild common carp in the Chadakoin River, New York, USA (42 degrees 07' N, 79 degrees W). Affected fish typically showed marked hyperplasia of gill tissues, abdominal adhesions, and severe multifocal to diffuse external hemorrhages. The virus isolated in this outbreak was somewhat unusual in that it initially replicated well in fathead minnow cell cultures, which is typical of spring viremia of carp virus. Testing at the National Veterinary Services Laboratories, Ames, Iowa, USA, confirmed the virus's identity to be KHV. Koi herpesvirus is not currently on the OIE (World Organisation for Animal Health) list of notifiable diseases; however, it is capable of causing mass mortality in susceptible fish at permissive temperatures.

Carp Herpes Virus is not species specific
https://www.researchgate.net/publication/236858935_Managing_the_Impacts_of_Common_Carp

Spring Viraemia of Carp Virus (SVCV) is not specific to carp (Section 3.4.4). SVCV has been isolated from ten fish species from four different families (Crane and Eaton 1997) and is also able to infect fruit flies (Bussereau et al. 1975). However, testing of Australian native fish for susceptibility to the virus, conducted in England, found that river blackfish (*Gadopsis marmoratus*), flathead gudgeon (*Philypnodon grandiceps*), golden perch, silver perch, Murray cod, southern pygmy perch (*Nannoperca australis*) and dwarf galaxias were not sensitive to SVCV (Hume et al. 1983a). These results need to be treated with caution because apart from native fish, tests in England also found that goldfish were not sensitive to the virus. Since then, goldfish have been found to be susceptible (Crane and Eaton 1997), so that the apparent lack of sensitivity to the virus in native fish cannot be taken for granted. To date, outbreaks of Spring Viraemia of Carp Disease in wild carp have only occurred rarely if at all.

Scientific study demonstrating carp are not the most significant cause of turbidity (muddy water)

http://www.publish.csiro.au/mf/MF9850311

Abstract

Densities of carp, ranges of turbidity, and details of communities of aquatic vegetation from 1979 to 1982 are given for several waterbodies in the Goulburn River valley including the Broken River, near Shepparton, Victoria. The turbidity values at all sites were high, typical of Australian inland waterbodies. There was no association between high carp densities and high turbidity, and populations of carp did not appear to increase turbidity. Observed turbidity increases at each site appeared to be related to hydrological changes. Fluctuation of water levels was also an important factor determining the extent of aquatic vegetation communities. However, circumstantial evidence is presented that shallow-rooted and soft-leaved aquatic vegetation such as *Potamogeton* spp. have been reduced by carp.

Article written by ecologists expressing concern at the risks of the project

https://theconversation.com/widespread-invasive-species-control-is-a-risky-business-77460

Concerns regarding the release, scientific studies referenced and quoted

https://theconversation.com/stinking-dead-fish-portend-major-problem-with-carp-herpes-release-71489

Letter to the senate from international scientists

http://www.nature.com/articles/s41559-017-0087

Articles discussing of letter to the senate from international scientists
http://www.scmp.com/news/asia/australasia/article/2073754/australias-plan-eradicate-carp-using-herpes-virus-serious-risk

https://uk.news.yahoo.com/australias-carp-herpes-plan-dubbed-191458617.html

Concerns from the public regarding the release of the virus
http://www.maitlandmercury.com.au/story/4370479/caution-urged-over-carp-herpes/

Research article describing sinking as opposed to floating dead carp, oxygen depletion and the impossible task of cleaning up such a large volume of fish in a timely manner
http://www.abc.net.au/news/2016-08-14/herpes-carp-kill-in-river-murray-ecosystem-may-sap-oxygen/7731892

Article describing the likely ineffectiveness of the virus and the risks involved
http://www.theland.com.au/story/4266010/carp-cull-plan-has-a-catch-experts-warn/

Article warning of the impact of ongoing carp kills on tourism
http://www.rebekhasharkie.com.au/carp_cull_could_kill_tourism

43) Members of the NCCP scientific advisory group, claimed to have conducted an international tour including Israel and Europe and visited experts in KHV otherwise known as the carp herpes virus.

These scientists have far more hands on field experience with this virus than any Australian researcher, why has this information not been released upon request and what is the justification for doing so?

Supporting information:

Members of the public have contacted many of the leading researchers into this area and have found almost universal condemnation of this plan, or warnings as to environmental, food security and other unintended consequences.

The NCCP have been asked for the feedback or reports from this tour to be made public, on many occasions dating back well over a year, to date this information has been withheld. While NCCP members have acknowledged that the advice they received was largely negative, their explanation for dismissing this advice was that “the international scientists don’t understand the Australian perspective”.

44) Contrary to the claims of the NCCP, Spring Viraemia of Carp Virus, or KHV or the Carp Herpes Virus, has been shown in numerous peer reviewed and other scientific literature to not be carp specific. The virus has been isolated from at least 10 fish species from four different families, it has been shown to replicate in fat head minnows and rainbow carp, it has also been shown to be capable of infecting fruit fly. Local and international scientists have warned that even testing which initially suggested species such as goldfish were not susceptible to the virus, were later disproven when further testing found them to be susceptible.

Why is the international body of research not being discussed publicly, and when it has been raised with NCCP members, why has it been dismissed?

Supporting information:

Viral replication confirmed in fat head minnows ie: suggests it is not species specific):
https://www.ncbi.nlm.nih.gov/pubmed/17092898

Abstract
Koi herpesvirus (KHV), a highly contagious and lethal virus that affects both koi (Cyprinus carpio koi) and common carp (Cyprinus carpio), was isolated in 1998 from two outbreaks of koi suffering mass mortality in New York State, USA, and in Israel. The disease had been described as early as 1996 in Europe. In July 2004, this virus was found associated with a mass mortality event in wild common carp in the Chadakoin River, New York, USA (42 degrees 07' N, 79 degrees W). Affected fish typically showed marked hyperplasia of gill tissues, abdominal adhesions, and severe multifocal to diffuse external hemorrhages. The virus isolated in this outbreak was somewhat unusual in that it initially replicated well in fathead minnow cell cultures, which is typical of spring viremia of carp virus. Testing at the National Veterinary Services Laboratories, Ames, Iowa, USA, confirmed the virus's identity to be KHV. Koi herpesvirus is not currently on the OIE (World Organisation for Animal Health) list of notifiable diseases; however, it is capable of causing mass mortality in susceptible fish at permissive temperatures.

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https://www.researchgate.net/publication/236858935_Managing_the_Impacts_of_Common_Carp

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Other cyprinid species other than card are also vulnerable to the virus, Australia does not have native cyprinids, the point is, the carp herpes virus is not species specific as claimed.
https://www.ncbi.nlm.nih.gov/pubmed/17497237

Abstract
Cyprinid herpesvirus 3 is a highly contagious and lethal virus that affects ornamental koi and common carp worldwide. However, it is not yet known whether other cyprinids are infected and/or harbor the virus. Here, we report that cultured cells derived from common carp, koi, silver carp and goldfish allow CyHV-3 propagation, while cyprinid cells derived from fathead minnow and non-cyprinid cells derived from the channel catfish ovary are resistant to CyHV-3 infection. Interestingly, the epithelioma papulosum Cyprini cells derived from Cyprinus carpio are restrictive to the virus. These results indicate that CyHV-3 is not restricted to common carp and koi, but other cyprinids are also vulnerable to the virus.

Lack of species specificity in the carp herpes virus, rainbow trout susceptible
https://www.omicsonline.org/open-access/is-there-any-species-specificity-in-infections-with-aquatic-animalherpesvirusesthe-koi-herpesvirus-khv-an-alloherpesvirus-model-2150-3508-1000169.php?aid=72785

Most diseases induced by herpesviruses are host-specific; however, exceptions exist within the family Alloherpesviridae. Most members of the Alloherpesviridae are detected in at least two different species, with and without clinical signs of a disease. In the current study the Koi herpesvirus (KHV) was used as a model member of the Alloherpesviridae and rainbow trout as a model salmonid host, which were infected with KHV by immersion. KHV was detected using direct methods (qPCR and semi-nested PCR) and indirect (enzyme-linked immunosorbant assay; ELISA, serum neutralization test; SNT). The non-koi herpesvirus disease (KHVD)-susceptible salmonid fish were demonstrated to transfer KHV to naïve carp at two different temperatures including a temperature most suitable for the salmonid (15°C) and cyprinid (20°C). At 20°C KHVD was induced in carp cohabitated with infected trout. KHV was also detected virologically and serologically at the end of the experiment in both rainbow trout and carp.

45) ***In the media there have been many reports from local and international concerned scientists and veterinarians who are experts in their fields, many with much more experience with the virus than our local teams, these voices either oppose the virus release or state that the level of knowledge is nowhere near sufficient to release it, why is this advice dismissed?***

Supporting information:

The carp herpes virus has been studied and actively worked with in the field by international experts for decades, no one in Australia has this experience due to the virus not existing in the wild here. Surely for a project as high risk as this, we should be at least consulting with any global experts who wish to participate. The global experts warning us do not have a financial incentive, they don't have jobs on the line if this project doesn't go ahead, their warnings are justified and genuine. Why would we refuse their input?

46) ***The figures of biomass vary significantly between 0.5 – 2.5 million tonnes of carp, while we appreciate that an more accurate population survey has been completed but not released, the real question this raises is, at the low end, is viral biocontrol justified and at the high end, can safe clean-up be guaranteed?***

Supporting information:

This question demonstrates the inappropriateness of the virus as a high risk plan, if the biomass is too low, it can't be justified, and if it is too high, the cost and likelihood of being able to successfully manage the clean-up without significant side effects is excessively high. Even with the most accurate estimates of carp biomass the window will be very large, allowing a high degree of risk when using a virus for biocontrol in the aquatic environment where mass fish kills are a guaranteed outcome of the method.

GAINING SOCIAL LICENCE

Related to the issue of Scientific Inconsistencies is the issue of gaining social license, at the end of the day, the process has to be open, transparent and trustworthy, without bias and without pushing the project to a pre-determined conclusion. It must not appear to push towards an outcome with potential employment of scientific funding benefits for the people advising the program.An example relevant to the NCCP would be if viral biocontrol was pushed over genetic sex biasing options. Public consultation for a national program should consult nationally and be representative.

47) ***Release of NCCP data for comment: There must be sufficient time for independent scientists and the public to analyse any data produced by the NCCP in order to give meaningful feedback to the project. Limiting the time between release of findings and raw data to a matter of weeks before the draft plan is finalised does not allow this to happen and could be seen as attempting to limit input from independent scientists and the public. Worse still after many months of requests, advice has been received from the NCCP that critical data on carp biomass and other studies will not be released to the public until December, months after the EPBC Act referral is due to take place in July and after the draft plan has been published in August/September.***

How does the NCCP expect the public and independent scientists to have meaningful input and the opportunity for consultation if they refuse to release the key data until after the opportunities to participate in these processes have passed?

Supporting information:

Scientists and concerned citizens have long been promised modelling, mapping and results from studies conducted by the NCCP but to date have received nothing, this data is planned to be released only a very short time, at time of writing, much of the data is actually being withheld until AFTER the draft plan and EPPB processes are scheduled to occur.

This is grossly unacceptable as it essentially precludes scientists who have been following this program for years, from having the data to analyse and scrutinise and ensures that they cannot give meaningful feedback. So will be dismissed.

This is unacceptable and removes the integrity of any claims of an open program of fair and unbiased consultation. It gives the impression of a programme that seeks to be closed to outside input and global science, which given the significant amount of global experts warning against this project, should represent a major concern for any legislators.

48) ***There have been many statements by the NCCP that the risk assessments, literature and peer reviews as well as the research being conducted are fully independent but it would appear that the majority of these tasks, including reviews and risk assessment are being conducted in house by the CSIRO.***

Can the NCCP please detail which fully independent scientists and researchers, both nationally and internationally are being used for this project, and what proportion of the team working on this project are fully independent of the researchers who initially proposed the use of the Carp Herpes Virus?

Supporting information:

The NCCP project has utilised a large number of associates of the original team that promoted the use of the carp herpes virus as a form of bio control. Literary reviews, peer

reviews, further research and risk assessments have all been conducted by associates of this team and for the most part, in house within CSIRO.

This leads to a situation where the majority of research is controlled by a small group within the CSIRO who historically focused on the virus and therefore have a vested interest in its release. Scientists who were actually independent from the project and proposed risk assessment studies, such as R. Keller Kopf but expressed concern over the planned release of the virus were excluded from the project.

Another high profile example is John D. Koehn who is regarded as one of the leading experts on Carp working in Australia. Among his many contributions to environmental research was the publishing of the highly regarded **"managing the impacts of common carp"**, linked below.

https://www.researchgate.net/publication/236858935_Managing_the_Impacts_of_Common_Carp

These are exactly the kinds of scientists which should have been conducting the risk analysis, but were excluded due to their publicly stated concerns on the carp herpes virus and their advocacy for alternative, higher success probability, lower risk strategies such as genetic controls.

49) A lot has been said about public consultation,yet to date, public consultation has amounted to a multimedia presentation explaining the process and approximately 20 minutes of Questions from the Audience. Genuine stakeholder consultation has been even more limited with most consultation being conducted at sites expected to see positive outcomes from the virus. By comparison, areas likely to be most heavily affected by the negative aspects of the project have received highly limited and delayed consultation.

Consultation, especially independent scientific consultation is essential and has not been provided with the time or the information required to make this meaningful. The short timelines remaining in this project with most of the data still not released mean this is highly unlikely to occur.

When does the NCCP plan to conduct in depth, inclusive, open consultation, focusing on the areas likely to be most heavily affected by the potential risks of this programme?

Supporting information:

The NCCP has artificially limited consultation and the feedback they receive and report on, by designating areas as "major carp centres", at their discretion. These areas are primarily upstream areas likely to be in favour of removing carp and far less likely to be affected by

the risks of the programme.

The number of consultations in these “pro virus” areas greatly outweigh the much more heavily impacted areas in South Australia. Non-compliant or pro-alternative control measure areas have also been avoided and not given equal opportunity to have input on this national program. W.A. was the only state to initially oppose the release of the virus, as a result, to date W.A. has had only a single public visit from the NCCP and even then, only for "introductory meetings". There were no visits at all to Western Australia in the last year, or the current year to date

Prior to these “public consultation” sessions, stakeholder meetings were extremely limited. South Australia is a prime example as it is likely to be the most heavily impacted by the fallout from any virus release, yet only had four, invite only stakeholder consultation sessions and a handful of one on one communications prior to moving to the marketing events which have been described as “public consultation”. By comparison, there were 13 duel sessions in VIC, 16 duel sessions in NSW, 1 duel session in ACT and 5 duel sessions in QLD.

The areas focused on have been largely regional areas with high proportions of irrigators and farmers. On a population basis the consultation has been overwhelmingly focused on these special interest groups and is not representative of the Australian population potentially impacted by the release of the virus. The release of the virus in a worst case scenario, will impact far more Australians than currently consider themselves to be impacted by carp.

The waterways belong to all Australians and a plan for national release could impact people in every part of the country. Surely all community groups deserve fair and equal consultation. The effects of the virus will hurt a lot of people who live a long way from the Murray Darling Basin.

Consultation has been grossly inadequate in many areas despite numerous requests for visits from the public and stakeholders. Responses from the NCCP have been very slow and when they came, were only to advise that dates will be determined in the future. Entire rounds of consultation have occurred without these updates being provided.

As of 12:51pm 24/03/2018 the NCCP web page still lists its single W.A. consultation session.

Perth, WA | TBC

Details TBC

Follow up questions:

a) Can the NCCP please explain why consultation has been so narrowly focused on groups they consider to be currently impacted by carp, rather than those who will be impacted if the virus is released?
b) Can the NCCP explain why states and areas that have shown to be against the release of the virus have been limited or had their consultation delayed to the final months of the project?

50) A large part of the National Carp Control Plan consists of conducting social science, or surveys of public opinion. To date these studies have been focused on areas which historically have demonstrated pro-virus views, particularly regional areas with higher than average numbers of irrigators.

Contact by members of the public attempting to participate in this research were advised that they were not eligible as they did not reside in the geographical areas designated by the NCCP. Importantly, the NCCP also excluded anyone who had previously contacted the NCCP, this means that if the NCCP contacted someone for any reason, they could be excluded from this consultation, which has the perverse outcome of allowing dissenting scientists to be removed from consultation with a single phone call from the NCCP.A survey of independent polls on the release of the virus finds that public opinion when taken broadly across the Australian community is against the release of the virus.

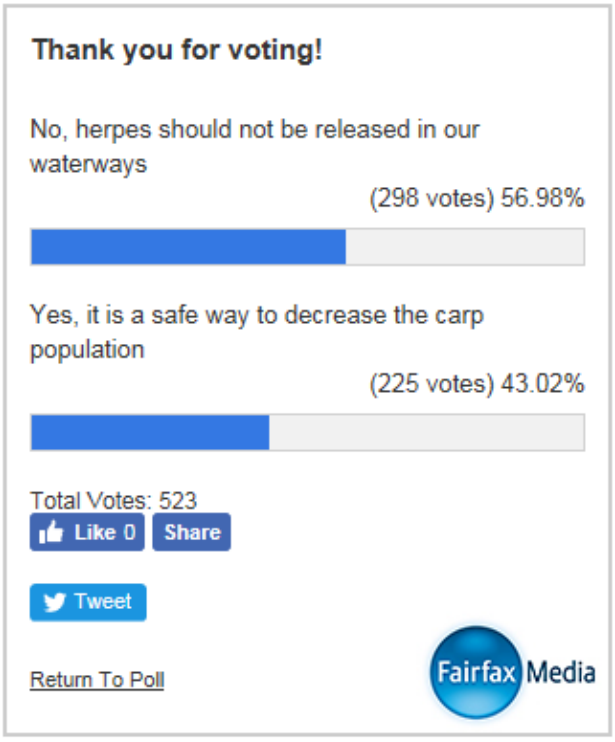
This is a national program, can the NCCP explain why has the social science has been restricted to areas likely to hold pro virus interests? How is the NCCP ensuring that the stakeholders selected are at least representative of all Australian's from all effected states proportionately?

Supporting information:

Contact with the organisations conducting the social science surveys have confirmed that their surveys were restricted to certain geographical areas to date, areas deemed to be highly impacted by carp. These are also the areas which the NCCP marketing / consultation efforts have heavily focused on.

However, the carp herpes virus release has the potential to cause significant damage to our entire network of rivers and waterways as a national program if the risks are not identified and handled appropriately. There is significant potential for impacts that do not currently exist for downstream and metropolitan Australians, to begin occurring if the virus is released, such as mass carp kills and black water flowing from regional areas towards the river mouths, impacts on recreational water use, tourism and so on.

The Social science surveys should not be restricted to areas likely to support the virus when surveys taken outside of these areas indicate a lack of support for the virus. Examples: Fairfax media conducted this survey in 2017:



More recently, the Recreational Fishing Alliance of NSW shared a public poll which was reshared 66 times from groups such as the Australian National Carp Control Discussion Group, Calarie Cod Catchers and numerous other groups.

As of 12:40pm 24/03/2018 this poll has reached 5396 people and has received a relatively high participation rate with 588 votes, the results to date indicate only 21% support for the release of the virus and 79% opposed.

https://www.facebook.com/RFANSW/posts/1835903249773507

The same poll showed final results on the Australian National Carp Control Plan - Discussion Page as shown below:

A follow up poll showed that 84% of the public would support carp control if the plan DID NOT include the use of the carp herpes virus

The social research needs to be conducted on a national, impartial basis, not selecting for geographical bias as the impacts of releasing this virus are national and can't be taken back, once the virus is released its impacts are irreversible and the virus will remain permanently in our waterways.

51) Members of the scientific advisory group to the National Carp Control Plan and the FRDC board is not transparent. The membership of most government boards are made public, while the FRDC boards and committees are confidential. This severely impacts on the openness and transparency of this project.

NCCP coordinator Matt Barwick has stated that the scientists reviewing the work are independent and consist evenly of both Pro and Anti-virus release scientists, he has gone so far as to say, he knows their positions on the virus because he insisted on having that mix, yet there is no evidence that this is the case in public statements from any NCCP scientists.
To the contrary, all public communications to date have been promoting the virus.

Can a list of members of the scientific advisory group be provided as well as a list of which scientists were selected for their scepticism towards using the Carp Herpes Virus for biocontrol?

Supporting information:

The public need to hear both sides of the story, in particular the opposing scientific views. We should know who the members of the NCCP scientific advisory group are and what the decision making hierarchy is. Who will ultimately be responsible for the consequences of any recommendation to proceed with the release of the virus.

Members of the team, particularly those who have reservations about the release of the carp herpes virus, should be free to speak out about these concerns. There should not be confidentiality clauses forbidding researchers from openly discussing their results.

It is also important that the team's positions and critically any ***vested interests in regards to historical, current or future funding*** that may be dependent on the virus being released, be clear and transparent to the public.

52) Consultation and public scrutiny is critical. With any scientific, non-political project it is vital that the conclusions of the scientific advisory group, stand up to scrutiny. As such, as a minimum they should be able to answer and justify positions to the public.

How many of the scientists from the NCCP scientific advisory group are actively participating in public consultation and discussion?

Supporting information:

To date participation in any form of public consultation by members of the scientific advisory board has been low to non-existent, despite many requests from concerned members of the public.The NCCP should be able to explain why.

To date, the NCCP facebook page and social media were the only opportunity for contact and even then, this was limited to a couple of the advisors. The social media accounts of the NCCP were all shut down very early in the process, cutting off the only forum where any members of the scientific advisory group participated or interacted with scientists in a publically accessible forum. Ultimately these membersof the advisory committee caused the page to be shut down due to their negative interactions with the public and scientists who questioned their assertions.

53) Why were the NCCP's public discussion forums and social media accounts shut down, as the only open official forums for the discussion of this issue, how did closing these down serve the stated goal of open discussion and consultation?

Supporting information:

The NCCP shut down their social media accounts and public forums without explanation cutting off the public's ability to interact with and question the statements being made by the NCCP. At that time, several key issues were being discussed, such as ease of transmission, which the NCCP to this day have still not acknowledged publically.

54) ***At this point in time, final research funding has effectively been allocated for the NCCP, the due date for the draft plan is months away.Yet no public consultation beyond "explaining the process" has occurred. How can the research have taken public consultation into account when enquiries to the NCCP on this issue have stated that the actual consultation hasn't begun even as funding has been allocated and the draft plan is being finalised.***

Supporting information:

This in effect means that the entire program of research has been decided and run, prior to any actual public consultation occurring and in defiance of international scientists whose feedback and advice has been overwhelmingly cautionary.

This is a national program yet public consultation has essentially been restricted to south eastern states. W.A. for example, has been visited only once in the lifetime of research into this virus by the CSIRO and since the start of the NCCP. What is worse is that this single visit was simply "explaining the process".

55) ***Research will be completed only months before the deadline for releasing the draft National Carp Control Plan. Given the serious risks and need for independent experts to analyse the findings and comment, Why is the timeline so short?***

Supporting information:

Scientists and concerned members of the public have contacted the NCCP on many occasions raising the issue of not enough time being allowed to go over the data and give meaningful feedback or critique the studies. The artificial deadlines are getting in the way of even the possibility of independent critique and collaboration.

In addition the short timeline has artificially eliminated the possibility of exploring other, safer, more effective options. No viable follow up control methods are ready or at least none that the NCCP are willing to trial. None appear to have been funded under this project either, least of all the leading proposal of genetic controls. The NCCP itself acknowledges (not in media releases but in its FAQ) that the virus alone is not capable of removing carp from our waterways and comes with significant risk.

Surely a decision this serious should be given all the time it needs and if follow up controls are known to be essential shouldn't we wait until we can finish the job and be certain of the facts.

IMPACT OF THE VIRUS ON ALTERNATIVE CONTROLS

56) Is this a case of the government Manual carp removal, including trapping and controlling access to breeding grounds, has seen some success in Tasmania's Lake Crescent and Lake Sorell. Lake Crescent was declared free of carp in 2007 after 12 years of manual removal work. Carp removal work is continuing in Lake Sorell. Selecting the cheapest option (ironically the most expensive long term with ongoing cleanup, but cheapest to release) with an abundance of safe alternative measures available, most of which have never been tried ON A NATIONAL SCALE why are these not being tried in earnest before releasing a non-containable, persistent virus with potential for ongoing environmental impacts.

Supporting information:

The NCCP frequently claims that the virus is the only choice because every other method of control has been tried, but this is simply not the case, for example:

Genetic controls produced 100% single sex offspring in the lab, but have never been trialled outside of the lab in Australia,

Commercial harvesting has never been supported by the government with the type of funds being required and offered for the virus. Commercial fishers of carp are still required to pay very significant licencing fees and have many other obstacles to exporting our carp resource. The most recent of which is speculation of the carp virus being released which has caused significant contracts to be stalled.

Electrofishing has never been tried on a mass scale, small scale trials have proven extremely effective.

Trapping trials in Australia have been extremely limited to a small number of simple traps, examples of carp specific trapping in New Zealand have proven very effective, the traps take advantage of carp's natural behaviour to push up on barriers, behaviour not seen in other species.

Manual carp removal including trapping, barriers and controlling access to breeding grounds, draining of water bodies and manually removing carp has seen carp totally eliminated from areas in Tasmania and the ACT as well as showing very promising signs in New Zealand with innovative pressure based trapping. This approach while expensive, is demonstrably successful and was completed in approximately a decade; this exceeds the projected success rate for the release of the virus which even on the most optimistic assumptions could only deliver a 40% reduction after 10 years with a far lower reduction

more likely without complimentary measures, which would not be viable if the virus was released.

57) ***We believe as a nation that integrated pest management is the best solution. There are many proposed control measures of various levels of effectiveness that are either in development, or have simply never been funded or trialled, these alternatives carry little short or long term risk. Measures like genetic controls certainly don't carry the risk of mass fish kills associated with the Carp Herpes Virus and offer the possibility of an ongoing and increasing degree of control as the population drops.***

Why is the NCCP, instead of building up a list of measures, with significantly less risk and using them all together, presenting the virus as the only option,despite it carrying substantially moreenvironmental risk in the form of black water events and mass fish kills?

Supporting information:

Despite claims that all approaches carry a similar level of risk by the NCCP, no explanation of how genetic biasing presents a comparable risk to the virus has ever been provided. Most international and local experts not associated with the NCCP, agree that this is the best way forward,while warning of the risks associated with the Carp Herpes Virus.

Alternative measures may carry some measure of risk, they may take longer, but have no permanence in the form of a persistent virus causing ongoing outbreaks and mass fish mortality, risking ecosystem collapse or food security issues, such as is seen in other Carp Herpes Virus affected countries.

In addition the ongoing costs of genetic measures are far less as the mass fish kills do not occur, or reoccur every year requiring ongoing clean up into the future.

58) ***Carp herpes virus is a notifiable, destroy on site disease in every country where it is found, it disfigures and leaves open infected wounds that later become scars on both killed and survivor carp.***

Given that this is the case, What prospects for fishing or food export are realistic as a follow up control method if the virus goes ahead?

Supporting information:

For decades all carp imports including koi have been banned in Australia expressly to keep notifiable diseases such as the carp herpes virus out of Australia. Once Australia releases the virus, the opportunity to export carp will be gone, even the discussions of releasing the virus have caused contacts to pause for local fishermen who focus on carp as a resource.

The carp herpes virus is extremely distressful for the fish, they develop actively bleeding lesions and take days to die. The RSPCA has expressed significant concerns at the animal welfare aspect of this, but beyond these concerns, the effects of the virus make commercial use of the carp for anything but fertiliser, impossible. It should be noted that even the use of carp as fertiliser requires them to be collected within 2 days of dying or the rot renders them too difficult to manage and unsuitable for fertiliser production.

59) ***The dismissal of commercial possibilities by the NCCP appears to be based on historical markets and not future demands, for example clean protein demand as the global population continues to explode and food shortages become an increasingly difficult problem to solve, global fish stocks are plummeting and ocean catch is declining rapidly, yet in Australia, we are still looking at using tuna for cat food. What consideration is the NCCP giving to the loss of future commercial or socially responsible opportunities that will be lost if the virus is released? How is this loss being accounted for or costed?***

Supporting information:

Recent senate estimates included a cat food manufacturer looking to set up additional barramundi harvesting for cat food, carp was raised and was simply dismissed as, “we haven’t looked into using carp”, the government and NCCP’s attitude towards carp being used as a resource not only reduces the possibility of harnessing this opportunity but also puts increased pressure on high value fish like barramundi and tuna.

60) ***Serious commercial fishing or a significant incentivised fishing program has never been funded or trialled, this option is often dismissed on commercial grounds due to the perceived current lack of demand for carp products in Australia or the cost of shipping carp to markets where carp is in demand. So why has a creation of demand not been trialled?***

As the release of the herpes virus has no commercial upside, only downside, and comes at significant cost especially once cleanup is taken into account, why hasn’t a bounty system with a fixed rate per fish or kilogram have not been trialled, or the government taken steps to invest in commercial processing of carp for fish farms or the pet industry been undertaken in the current market, not relying on failed attempts in the past when global protein demand was far lower?

Supporting information:

Commercial approaches are lost to us forever once the virus is released as is the prospect of offering clean virus free carp to the global market in the future. Carp is the world's most farmed fish for a reason. Economic opportunities such as these have the potential to create commercial and employment opportunity without community backlash or unintended consequences.

61) ***The potential effectiveness of the virus has been stated by the NCCP as being 95 - 100% of carp biomass to be killed in the initial release. Yet local and international studies show the results could be far lower in the natural environment, especially in the priority mature fish where it is likely to be lower than 50%.***

What assumed kill rate is expected as a minimum by the NCCP? What is the expected residual population of breeding age fish after the initial kill?

Supporting information:

Even studies conducted by members of the scientific advisory committee do not support claims of such high consistent fish kills as the 95-100% claimed by the NCCP in their marketing presentations. There are a few examples that show these sorts of kill rates, but these are usually smaller fish directly injected with high viral loads. There are far more examples, including those conducted by the NCCP team that show a much lower kill rate in more realistic testing (ie: average sized fish, not directly injected with the virus). The vast majority of carp biomass, the adult fish, will survive. This is reflected in the scientific studies actually conducted both locally and internationally. Generally across the scientific literature, only the smallest carp have particularly high mortality rates.

This is very important because it exposes just how ineffective the virus is likely to be, it will kill a lot of carp, so we will get the negative effects from the dead and rotting fish, but the larger the fish are, the more likely they are to survive. This means the vast majority of the largest breeding fish will survive and breed resistant fry.

To put this in context, rabbits rapidly rebounded after myxomatosis was released, in just a matter of years numbers had rebounded close to original levels, with that in mind, carp literally breed at a rate 10,000x faster than rabbits, so anything short of an almost total kill of carp will see full numbers returned in a very short period of time, even as the next generation of carp becomes resistant, we will continuously see the mass carp kills year on year as some will be less resistant than others. Even an annual 10% kill at the start of the spawning season would dump 200,000 tonnes of dead fish into our waterways with catastrophic consequences for our natives. Carp simply represent too much biomass to be added to the water in one go without significant consequences. Once released this cycle will continue indefinitely, year after year with the resultant damage to the environment that comes with it.

Another consideration is that while the kill rate will be low, most fish will be scared and deformed, infected with the virus but still able to breed and not killed. These fish will be rendered unusable for industry, not suitable for human consumption, and become a massive wasted resource in an increasingly protein starved world. There are many studies into the reduced kill rates as carp size increases but to provide some examples:

Local CSIRO example:
Cyprinid herpes virus 3 (CyHV-3): its potential as a biological control agent for carp in Australia Kenneth A McColl Mark St J Crane, Only 33% of carp 30 cm or larger died, Only 38% of carp 18.5cm or over died. Note, 18.5cm carp are well and truly still juvenile, likely younger than 6 months old. Juvenile carp had higher mortality rates.

Examples of international studies:
Perelberget al (2003) over 90% of 2.5 gm and 6 gm fish were killed following exposure to infected fish, whereas only 56% of 230 gm fish were killed.

62) ***The NCCP was initially presented as a program to look for the best available method of carp control, however, the work conducted seems to have revolved only around the release of the carp herpes virus. What steps have been taken to ensure other methods of control have been given equal hearing as part of this program? How much funding has been provided to alternative methods of carp control as part of this program, with particular respect to genetic controls such as the daughterless carp project?***

Supporting information:

Some of the lead scientific advisors involved in the NCCP have been provided with funding for over 8 years to study the carp herpes virus for biocontrol, as such there is a potential conflict of interest in this same group controlling the recommendations for which method of control is best suited to control carp in Australia, given that several competing methods exist and are under different departments, essentially competing for the same pool of funds. These scientists are essentially being asked to determine if their personal project is recommended to continue and to receive additional government funds.

They are being asked to choose from a list of options which includes the option they have advocated for and received funding for in the past, essentially being asked to recommend if their field of study, or a competing project is recommended for funding under this project. Virologists and geneticists for example, have very differing views on the best method of controlling carp in Australia.

The research funded under this project has almost exclusively revolved around the release of the virus despite the NCCP stating on many occasions that the use of the virus was just one option, that all options were on the table and that releasing the virus was not a foregone conclusion (contrary to the assertions made by politicians that the decision had been made).

Many of the scientific advisors, including the head of the scientific advisory committee were directly employed to work on the virus for potential release, prior to the formation of the NCCP and would stand to benefit with employment opportunities in their field (the study of viruses) were to be recommended for release.

As releasing the virus creates a stream of work in the field of virology, which many of the scientific advisory group stand to benefit from, the actions taken to minimise this potential conflict of interest is important for the project to be independent as is the actual funding allocated to alternative means of control, as promised under this project during early consultations.

63) Genetic controls such as the so called daughterless or sonless carp technology, have been proven capable of producing 100% single sex offspring in the lab, over time these technologies are capable of removing an increasing number of carp from our waterways, without mass kills and the black water events that go with it. Why then has the carp herpes virus been the focus of all funding and planning for the NCCP when the virus has also only been tested in the lab but has several known and serious consequences in terms of clean-up and environmental impact, without the possibility of removing all carp from our waterways?

64) Studies used to justify the release of the virus and the present plan under the NCCP acknowledge that the use of genetic controls and other follow up measures would be needed to remove carp completely, from our waterways, but no mention is made of the limiting effect the presence of the virus would have on these measures. Would genetic controls be as effective if the lethal virus was present in the system, limiting the modified carp chances of survival and breeding?

Supporting information:

This report was actually conducted by a member of the NCCP scientific advisory group and acknowledged that repeat mass outbreaks of the virus every 2 years or so would be required for the virus to be effective, it also stated that the virus alone could not eliminate carp and would require follow up measures.

https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

"A synergistic bio-control program using CHV-3, followed by a gene technology-based sex-ratio distortion program, is potentially the most effective strategy for reducing carp biomass by over 90% in the long term."

This study fails to acknowledge that the virus release precludes the cost effective use of these measures, given that genetic measures require genetically modified carp to live in the highest number possible and breed passing on their genes and causing sex ratio distortion. Once the virus is released, it would kill high numbers of genetically modified carp before

they have the chance to breed, rendering them largely ineffective. This suggests genetic controls should be the first choice, not a follow up measure.

65) A report by Dr Gilligan of the NCCP scientific advisory group, states that ongoing outbreaks are assumed and are required for success of the virus. Given this, what risks have been identified that must be countered to avoid the impact of ongoing outbreaks and associated clean-up costs and environmental impacts?

Supporting information:

Study by Dr Gilligan:
https://www.researchgate.net/publication/262732016_Optimising_an_integrated_pest-management_strategy_for_a_spatially_structured_population_of_common_carp_Cyprinus_carpio_using_meta-population_modelling

International evidence of repeated annual outbreaks, such as those which occur in capetown, indicates a very significant risk of this becoming a permanent occurrence in Australia. Annual large scale black water events caused by mass carp kills across the MDB.

Given that both carp and the virus are expected to remain in the system, with adult carp spawning approximately 1,000,000 fry per fish per year and that the virus will remain active in resistant carp, there is nothing to suggest that the ongoing mass fish deaths described by Dr Gilligan will recur every year, forever, with associated environmental impacts and costs.

66) The NCCP have claimed that the choice of the virus was not a foregone conclusion and claimed to be researching other forms of carp control such as 'Daughterless/Son-less carp', Trojan carp Gene drive and Commercial fishing.

Is this the case, and what are the findings of such research?

Can the NCCP demonstrate equal funding allocated towards furthering research of these other options?

Supporting information:

In other countries around the World, commercial fishing has been used successfully (for example 'The Big River Co.' Illinois and even our own 'Charlie Carp' here in Australia). Mr Barwick has stated several times in public meetings that CyHV-3 alone will not reduce carp populations to low enough or sustainably low levels. It seems odd therefore that we are intent on going ahead using CyHV-3 as the first piece of the puzzle, hoping against hope that the next pieces will be ready in time to make the financial pain and environmental suffering caused by the virus to have been worthwhile

Where is the funding to explore alternative programs or programs that will support the

NCCP, government funding to almost all environmental programs including those which would be required post virus release such as the national native fish program have been either completely cut, or defunded to the point of losing any potential efficacy. How can this project succeed in the goal of removing carp from our waterways and restoring biodiversity if the very projects that would allow this to happen, to finish the job, are not being funded and all available funds are channelled into the prospect of using viral biocontrol?

Furthermore, in selecting the virus, what peer reviewed studies have been done on the potential impact of the virus on the efficacy of follow up programs such as genetic biasing, often claimed as essential to the long term success of the virus. It would seem that a virus that kills carp would work against a method that requires carp to live and breed to spread the desired genetics.